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SUPERSEDING
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Fed. Spec. L-C-110C
December 19, 1958

FEDERAL SPECIFICATION

CELLOPHANE
(COATED AND NONCOATED REGENERATED CELLULOSE FILM)

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 commercial regenerated cellulose films up to 0.0018 inch in thickness.

1.2 Classification.

1.2.1 Types and classes. Cellophane covered by this specification shall be of the following types and classes, as specified (see 6.4):

Type I - Noncoated, nonheat sealing.
Type II - Both sides coated with cellulose nitrate, nonheat sealing.
Type III - Both sides coated with cellulose nitrate, nonheat sealing, water resistant.
Type IV - Both sides coated with cellulose nitrate, heat sealing.
Class 1 - Intermediate water-vapor permeability.
Class 2 - Low water-vapor permeability.
Class 3 - High water-vapor permeability (non-moistureproof).
Class 4 - Low water-vapor permeability (anti-oxidant).
Type V - Both sides coated with cellulose nitrate, heat sealing, water resistant.
Class 1 - Intermediate water-vapor permeability.
Class 2 - Low water-vapor permeability.
Type VI - Both sides coated with synthetic resins, heat sealing, water resistant.
Type VII - One side coated with cellulose nitrate or synthetic resin, heat sealing, water resistant.
Class 1 - Intermediate water-vapor permeability.
Class 2 - Low water-vapor permeability.

2. APPLICABLE DOCUMENTS

2.1 The following documents, of the issues 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:

PPP-B-576 - Boxes, Wood, Cleated, Veneer, Paper Overlaid.
PPP-B-591 - Boxes, Shipping, Fiberboard, Wood-Cleated.
PPP-B-601 - Boxes, Wood, Cleated-Plywood.
PPP-B-621 - Boxes, Wood, Nailed and Lock-Corner.
PPP-B-636 - Boxes, Shipping, Fiberboard.
PPP-D-723 - Drums, Fiber.
PPP-T-45 - Tape, Gummed, Paper, Reinforced and Plain, for Sealing and Securing.

Federal Standard:

Fed. Std. No. 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 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 Specification:

MIL-L-10547 - Liners, Case, and Sheet, Overwrap; Water-Vaporproof or Waterproof, Flexible.

Military Standards:

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

(Copies of Military Specifications and Standards 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.

Laws and Regulations:

21 CFR 121 - Federal Food, Drug, and Cosmetic Act and Regulations Promulgated Thereunder.

(The Code of Federal Regulations (CFR) and the Federal Register (FR) are for sale on a subscription basis by the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402. When indicated, reprints of certain regulations may be obtained from the Federal agency responsible for issuance thereof.)

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, NW., 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.)

3. REQUIREMENTS

3.1 Material. Cellophane shall consist of sheeting composed of regenerated cellulose, uncoated or coated as specified, and formulated with a suitable plasticizing agent when tested as specified in 4.3.2. Finished cellophane, classified in 6.1 as belonging to type IV, classes 2, 3, and 4; type V, class 2; and type VII, classes 1 and 2, shall conform to the requirements stipulated by the Food and Drug Administration, Code of Federal Regulations for Contact with Food (Title 21:121.2507).

3.2 Coatings for types II through VII. Coatings for types II through VII shall conform to the requirements in 1.2.1 when tested as specified in 4.3.3 and 4.3.4. Types II through V cellophane shall be coated with cellulose nitrate on both sides of the film. Type VI cellophane shall be coated with synthetic resin on both sides of the film. Type VII shall be coated with either cellulose nitrate or synthetic resin on one side of the film.

3.2.1 Determination of uncoated side. The determination of the uncoated side of type VII cellophane shall be made according to 4.3.3.3.

3.3 Thickness and area factor. The thickness of the film shall be as specified in the contract or order. The standard nominal thickness and tolerance on thickness shall be plus or minus 0.0001 inch and tolerance on area factor plus or minus 5 percent, unless otherwise specified herein, when determined as specified in 4.3.5 and 4.3.6.

3.4 Size. The size of film in sheets, or in rolls on cores shall be as specified in the contract or order.

3.4.1 Rolls. Cellophane of one type and class only, in width and diameter of roll as specified, shall be compactly wound on a spiral-wound kraft tube. The tube shall be 3.016 to 3.031 inches inside diameter by 9/32-inch wall thickness. A 1/4-inch wide thermo-plastic strip applied to the tube surface parallel to the axis shall be used to secure the cellophane web to the tube.

3.4.2 Sheets. When purchased in flat-cut sheets, the sheets shall be evenly and uniformly stacked.

3.5 Heat seal strength. Heat seal strength shall comply with the requirements in table II when tested as specified in 4.3.7.

3.6 Water immersion stability. Types III, V, and VI film shall show no evidence of sloughing coating from the base sheet, but may show pinhead blisters, when tested as specified in 4.3.8 and 4.3.8.1.

TABLE I. Thickness and area factor

Type	Thickness, nominal Inches	Area factor Square inches per pound
I	0.0016	12,400*
	0.00145	12,700*
	0.0013	15,000*
	0.0009	21,500
	0.0008	23,400
II	0.0014	14,000
	0.0009	22,000
III	0.0010	19,500
	0.0009	21,000
IV, class 1	0.0010	19,500
IV, class 2	0.0014	13,600
	0.0014	14,000
	0.0011	18,700
	0.0010	19,500
	0.0009	21,000
	0.0009	22,000
	0.00085	22,000
IV, class 3	0.0010	19,500
IV, class 4	0.0014	13,600
	0.0011	18,700
	0.0010	19,500
	0.0009	21,000
	0.0009	22,000

TABLE I. Thickness and area factor (CONT'D)

Type	Thickness, nominal Inches	Area factor Square inches per pound
V, class 1	0.0014	14,000
	0.0010	19,500
V, class 2	0.0014	13,600
	0.0014	14,000
	0.0010	19,500
VI	0.0019	10,300
	0.0017	11,600
	0.0014	14,000
	0.0011	18,000
	0.0010	19,500
	0.0009	21,000
	0.0008	25,000
VII, class 1	0.0014	14,000
	0.0010	19,500
VII, class 2	0.0011	18,250

*Tolerance on area factor - plus or minus 7.5 percent.

3.7 Water-vapor permeability. When tested as specified in 4.3.9, the water-vapor permeability of cellophane shall comply with the requirements specified in table III.

TABLE II. Heat seal strength

Type	Peel strength - grams per inch of width At 75°F. and 35 percent R.H.	At 75°F. and 80 percent R.H.
IV	80	40
V	100	50
VI	130	80
VII 1/	100	100

1/ Seal shall be made coated side to coated side in view of the film being one-side coated.

TABLE III. Water-vapor permeability

Type	Water-vapor permeability, grams per 100 square inches per 24 hours at 100°F., 90 percent R.H.
	Maximum
II	1.0
III	1.0
IV:	
Class 1	above 10.0
Class 2, 4	1.0
V:	
Class 1	above 10.0
Class 2	1.0
VI	1.0
VII:	
Class 1	75.0
Class 2	15.0

3.8 Color. The color of films shall be as specified in the contract or order.

3.9 Uniformity. The film shall be uniform in color, transparency, finish, density, and other physical properties consistent with good commercial practice and when defined in sections 3 and 4 of this specification.

3.10 Workmanship. The film shall be free from pinholes, pits, warpage, checks, cracks, blisters, and other defects which affect the appearance or which might affect the serviceability.

3.11 Quality. The quality shall conform to levels established in this specification. The occurrence of defects shall not exceed the number permitted under the acceptable quality levels (AQL's) specified in section 4 for all examinations and tests of materials, components, and end items, as applicable.

3.12 Certification. When specified in the contract or order, the contractor shall forward to the procuring agency for each order of film a certified statement (1) identifying the material by manufacturer's name, trade name, and identification number; (2) certifying that the material is the same as to manufacturing process and composition as that which was tested in accordance with 4.3.2 and found to conform to all requirements of this specification; (3) presenting the results of the material acceptance tests; and (4) certifying that the film conforms to the requirements of the specification. The report covering the material evaluation tests shall be referenced on the certified statement.

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 that supplies and services conform to prescribed requirements.

4.2 Sampling for inspection and tests. Sampling for inspection and tests shall be performed in accordance with the provisions set forth in MIL-STD-105, except where otherwise indicated. For purposes of sampling, a lot shall consist of all end items of the same type and class submitted for delivery at one time.

4.2.1 Inspection of materials and components. In accordance with 4.1 above, the supplier is responsible for insuring that materials and components used in the end items were manufactured, tested, and inspected in accordance with the requirements of referenced subsidiary specifications and standards to the extent specified; or, if none, in accordance with this specification. In the event of conflict, this specification shall govern.

4.2.2 Inspection of the end item.

4.2.2.1 Examination of the end item. The end item shall be examined in accordance with the classification of defects in applicable subparagraphs below and at the inspection levels and AQL's set forth in 4.2.2.1.6. Random samples shall be drawn from each lot of end items of the same type and class for examination of visual, dimensional, count, and preparation for delivery defects. The lot size, for purposes of determining the sample size in accordance with MIL-STD-105, shall be expressed in units of rolls or packages of sheets, as applicable for the examinations in 4.2.2.1.1, 4.2.2.1.2, 4.2.2.1.3, 4.2.2.1.4, and in units of shipping containers for examination under 4.2.2.1.5.

4.2.2.1.1 Examination of the end item for defects in appearance, construction, and workmanship. For examination of defects within rolls, the sample unit shall be 12 consecutive yards full width of roll. For examination of sheets, the sample unit shall be 5 sheets (flat cut) randomly selected from a package. No more sheets than 3 sample units shall be examined in 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 within a sample unit for rolls and once per sheet for flat cuts.

Examine	Defects
Class	Other than as specified.
Color	Other than as specified.
Workmanship	Any dirt, oil, or foreign matter affecting appearance. Any deep gouge or scratch. Any holes (other than allowable pinholes). Any rough or sharp edges. Any cuts, blisters, bubbles, tears, scuffs, cracks, pits, or creases. Any chipping. Any spot, stain, or other discoloration affecting appearance.

4.2.2.1.2 Examination of the end item for defects in dimensions. The sample unit for this examination shall be one full size sheet or one complete roll.

Examine	Defects
Size of sheets	Any variation greater than tolerances specified in contract or order.
Width of roll	Any width greater or less than 1/16 inch of the specified width.
Thickness	Any thickness deviation greater than applicable tolerances specified in 3.3.

4.2.2.1.3 Examination of the end item for content of unit package. The sample unit for this examination shall be one unit package or roll, as applicable. The average count of sheets per package or the average length of roll shall be not less than the specified quantity.

Examine	Defect
Counts per package of sheets	Less than specified or indicated amount.
Roll diameter	Any diameter greater or less than 1/4 inch of specified diameter.

4.2.2.1.4 Examination of the end item for defects in packaging of sheets and unrolling of rolls. The sample unit for this examination shall be one package of sheets or one roll.

Examine	Defect
Form	Not roll form or in sheets as specified.
Construction:	
Rolls	Rolls not evenly or tightly wound on cores with plugs. Cellophane slips over core during unwinding. Not suitably restrained from unwinding. One or both plugs missing from roll. Plugs too long, causing it to fall out of or into core hole. Hole missing from plug, not centered. Plugs or cores crushed, mutilated, distorted, or broken.
Sheets	Sheets block to the extent that separation caused damage or tearing, rendering material unserviceable.

4.2.2.1.5 Examination of preparation for delivery. An examination shall be made to determine that packaging, packing, and markings comply with the requirements of section 5 of this specification. The sample unit for this examination 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.

Examine	Defects
Packaging (as applicable)	Not level specified; not in accordance with contract requirements. Rolls not unit wrapped as specified; and discs missing or not as specified. Sheets not packaged or wrapped as specified: fiberboard sheets missing or not as specified; unit outside wrapping not as specified.
Packing (as applicable)	Not level specified; not in accordance with contract requirements. Rolls not packed in fiber drum as specified. Arrangement or number of unit rolls per container not in accordance with contract requirements. Container material not as specified; closure not accomplished by specified or required methods or materials. Any nonconforming component, component missing, damaged, or otherwise defective, affecting serviceability.
Weight	Gross or net weight exceeds contract requirements.
Markings	Interior or exterior markings, as applicable, omitted, illegible, incorrect, incomplete, or not in accordance with contract requirements.

4.2.2.1.6 Inspection levels and AQL's for examination. 1/ The inspection levels for determining the sample size and the AQL's expressed in defects per 100 units, shall be as follows:

Examination paragraph	Inspection level	AQL
4.2.2.1.1	I	2.5
4.2.2.1.2	S-2	2.5
4.2.2.1.3	S-2	-
4.2.2.1.4	S-2	4.0
4.2.2.1.5	S-2	4.0

1/ The same rolls, packages of sheets, or sheets, as applicable, of the specified material shall be used for examinations under 4.2.2.1.2 through 4.2.2.1.4, inclusive, and shall be within the rolls or packages of sheets randomly selected for examination under 4.2.2.1.1.

4.2.2.2 Testing of the end item. The end item shall be tested for the applicable characteristics as listed in table IV. The sample unit shall be 3 square yards of film. The sample shall be taken from a point in the package separated from the wrapper by at least 6 layers of film. The inspection level for determining the sample size shall be S-1 except that no less than 3 sample units shall be randomly selected throughout the lot. The AQL's shall be 6.5 defects per 100 units. The lot size shall be expressed in units of rolls or packages of sheets as applicable. The supplier shall furnish a Certificate of Compliance indicating conformance to the "Area Factor" requirements of table I.

TABLE IV. Instructions for testing

Characteristic	Specification reference: Requirements	Specification reference: Test method	Requirements applicable to: Indiv. unit	Requirements applicable to: Lot aver.	Number determinations per unit	Results reported as: Pass or fail	Results reported as: Numerically to nearest
Coatings Types II thru VII, as applicable	3.2	4.3.3 & 4.3.4	X	-	2	X	-
Heat strength seal	3.5	4.3.7	X	-	Avg. of 2	-	gram
Water immersion stability, types III, V, and VI	3.6	4.3.8	X	-	2	X	-
Water vapor permeability, as applicable	3.7	4.3.9	X	-	Avg. of 2	-	gram per 100 sq. in. per 24 hours

1/ If failure is indicated, report description of failure.

2/ Test reports shall include all values on which results are based.

4.3 Test procedures.

4.3.1 Standard conditioning. Unless otherwise specified, single sheet samples for test shall be conditioned at a temperature of 73.5° ± 2°F. (23.1° ± 1.1°C.) and a relative humidity of 50 ± 4 percent for a period of not less than 16 hours for type I through V and type VII film, and one week for type VI film. This requirement may be waived with the approval of the procuring agency upon certified proof from the manufacturer that he employs more rigorous test conditions.

4.3.2 Identification of regenerated cellulose. Identification of regenerated cellulose shall be made by immersing a sample of the film in an aqueous solution of Fuchsine dye and observing the effect of the dye on the film. The dye solution shall be prepared by setting eight grams of Azo Fuchsine 6B (General Dyestuffs), or equivalent, with a small amount of water, to form a paste and dissolving the paste in 2,000 mil. of distilled water. Samples of film to be identified shall be immersed in the dye bath for one hour, removed and washed with water to remove excess dye, and then examined for dye stains. A deep red stain covering all or part of the area of the sample or thin red line along the cut edges of coated samples (see 4.3.3) shall be construed as identification of regenerated cellulose.

4.3.3 Presence and identification of coating. A small sample of film shall be immersed as specified in table V, then removed and examined for sloughable coating materials by rubbing between the fingers.

TABLE V. Soak tests on film

Type	Solution	Time	Conditions
II thru V and VII	Acetic acid, 1 percent Naccanol, 0.2 percent	1 hour	90 - 95°C.
VI	Acetic acid, 5 percent Naccanol 1/, 0.3 percent	5 hours	90 - 95°C.

1/ Naccanol is product of General Aniline and Film Corporation.

4.3.3.1 Certain synthetic resin coatings may be difficult to remove under the conditions of soaking specified in table V. To determine whether synthetic resin is present, proceed as follows: Place one drop of pyridine on the sample and next add one drop of saturated methanolic solution of potassium hydroxide to the pyridine. If a dark brown-black color appears, polyvinylidene chloride is present.

4.3.3.2 Polyethylene coating is indicated if negative results are obtained with the tests described in 4.3.2, 4.3.3.1, and 4.3.4.

4.3.3.3 The uncoated side of type VII cellophane is determined by immersing a 1- by 6-inch sample in tap water for 10 seconds. Remove the sample, shake off excess water, and suspend so that the sample is unrestrained. The sample will curl and the uncoated side is opposite the direction of the curl.

4.3.4 Identification of cellulose nitrate. A drop of a solution of diphenyl benzidine in concentrated sulfuric acid (0.5 gram of diphenyl benzidine in 100 ml. of 95 percent sulfuric acid) shall be placed on the surface of a sample of film. The appearance of a blue color in the diphenyl benzidine solution indicates the presence of cellulose nitrate, and on samples previously identified as regenerated cellulose film, the blue color shall be construed as identification of cellulose nitrate in the coating.

4.3.4.1 Identification of synthetic resins. Coated regenerated cellulose film which does not impart a blue color to the diphenyl benzidine solution under 4.3.4 shall be taken as identification of synthetic resin in the coating.

4.3.5 Thickness. The gage used for the measurement of thickness shall be of a dead weight type equipped with a dial graduated to read directly to 0.0001 inch. The presser foot shall be circular with a diameter of 0.35 ± 0.01 inch. The presser foot and moving parts connected therewith shall be weighted so as to apply a total load of 3 ± 0.1 ounce to the specimen. The presser foot and anvil surface shall be weighted plane to within 0.0001 inch and parallel to each other within 0.0001 inch. Thickness shall be measured to the nearest 0.0001 inch at three different locations on the test specimen.

4.3.6 Area factor. Area factor shall be determined by weighing samples measuring not less than 20 inches in the grain direction and 40 inches across the grain. When specified in the contract or order, in the case of rolls, or cut-to-size sheets from which samples measuring 40 by 20 inches cannot be cut, the contractor shall forward to the procuring agency for each order of film, a certified statement certifying that 40- by 20-inch samples taken from mill rolls used in preparing the cut-to-size cellophane had area factors within the specified limits.

4.3.7 Heat seal strength. Heat seal strength shall be determined by measuring the force required to peel the seal apart. Three strips, 1.5 by 10 inches, shall be cut from each conditioned sample with the long dimensions of the strip parallel with the grain of the cellophane. Each strip shall be cut in half to give two strips, 1.5 by 5 inches and the two halves shall be superimposed so that the opposite surfaces are in contact and all edges in line. The seals shall be made on a conventional bar-type sealing machine, having one heated and one unheated jaw approximately 1/2-inch wide. The seals shall be made at a pressure of approximately 5 lbs. per square inch and with a dwell time of 1/4 second. The seals shall be made parallel to and about 1 inch from one end of the sample. The heated bar shall be maintained at a temperature of 140° ± 2°C. The sealed strips shall be conditioned in accordance with the temperatures and relative humidities specified in table II for 12 hours before testing. The force in grams required to peel the seals apart shall be measured on a modified Suter Single Strand Strength Tester (Alfred Suter & Company, 200 Fifth Avenue, New York City) or equivalent. The testing apparatus shall be equipped with two No. 325 Acco clamps, the lower clamp being mounted rigidly and the upper one mounted so that it is free to pivot. The equipment shall be adjusted so that the rate of fall of the mechanism holding the lower clamp is 6 inches in 28 to 32 seconds. One end of the sealed sample shall be placed in the upper clamp and one in the lower clamp, and the sealed area shall be held at the angle of 90°, with the plane along which the peeling force is being applied. The peel strength of a sample shall be reported as 0.66 times the average of the values obtained for three strips. In the case of films coated on one side only, the seals shall be made with the coated sides together.

4.3.8 Water-immersion stability. Samples 4 inches wide, cut across the full roll of sheet width, shall be immersed for 1-1/2 hours (see 4.3.8.1) in distilled water at 45°C. The sample shall then be washed with water containing a wetting agent, such as Glim, in order to remove air bubbles and surface droplets. The films shall then be examined for evidence of blistering. While still wet, the film shall be rubbed between the fingers and examined for evidence of sloughing of coating from the base sheet.

4.3.8.1 Type VI only. Samples shall be treated as in 4.3.8 except that the soaking time shall be 16 hours.

4.3.9 Water-vapor permeability.

4.3.9.1 Samples and equipment. Three specimens, 6 inches square, shall be taken from points as widely separated as possible in each sample. The humidity cabinet or room for this test shall provide a relative humidity of 90 to 95 percent at a temperature of 100°F. with no condensation on the test dishes or in the space in which the test dishes are placed. The air circulation over the test dishes shall be negligible. A standard cabinet which meets these requirements is known as the General Foods Water-Vapor Transmission Cabinet.

4.3.9.2 Procedure. A 50 cc beaker shall be filled with eight mesh anhydrous calcium chloride (minimum 96 percent as $CaCl_2$) and then emptied evenly over the bottom surface of the dish and test specimen (the uncoated side of type VII film shall be exposed to the high humidity atmosphere), placed over the calcium chloride concentric with the rim of the dish. The brass template shall be carefully placed over the film, care being taken to have the template centralized with respect to the dish top, before allowing it to come into contact with material being tested.

4.3.9.2.1 A wax mixture consisting of 60 percent amorphous wax and 40 percent paraffin wax shall be heated in a porcelain crucible to at least 212°F. It shall then be poured through a 20 mesh screen to remove any large pieces of foreign matter or film that may be in the wax. The wax mixture shall be poured into the annular space to approximately flush with the top of the template. The dish shall then be cooled to harden the wax sufficiently so that the template can be removed. Care should be taken not to cool the dish so long as to make the wax hard and brittle. The template shall be removed by inserting a screwdriver under an ear of the template and giving a

slight twist, tending to press the wax against the dish; and at the same time, raising the template. This shall be done on the three ears of the template. Any difficulty experienced in extracting the template from the dish can be overcome by first rubbing the edge of the template with vaseline before pouring the wax.

4.3.9.2.2 After the template has been removed, the dish shall be inspected for loose pieces of wax, etc., and examined for flaws in the seal. It shall then be conditioned in the humidity cabinet for 24 hours. It shall then be removed from the humidity cabinet, cooled for 15 minutes, and weighed on an analytical balance. The dish shall then be replaced in the humidity cabinet for a period of 68 hours, removed, cooled as before, and reweighed. Exposure in the humidity cabinet, cooling, and weighing shall be repeated at intervals for 24 hours hereafter, until two consecutive weighings indicated that a practically constant rate of vapor transmission has been attained.

4.3.9.2.3 Calculation. The unit of water-vapor transfer shall be grams of water per 100 square inches of area, for 24 hours. The results for the three tests specified shall be averaged and reported as the final result. In case of inconsistent values between individual results, a duplicate set of tests shall be run to determine whether the variance is due to error in procedure or lack of uniformity in the samples submitted.

5. PREPARATION FOR DELIVERY

5.1 Packaging. Packaging shall be level A, B, or C, as specified (see 6.4).

5.1.1 Level A.

5.1.1.1 Rolls. The cellophane rolls shall be prepared as specified in 3.4.1. The rolls shall be wrapped with a sheet of moisture-proof cellophane and overwrapped with a sheet of 40-pound minimum basis weight kraft paper waxed on one side to approximately 48 pounds minimum basis weight, or with a minimum of 0.002-inch thickness sheet of polyethylene film or with a minimum of 0.00075-inch thickness sheet of oriented polypropylene film. A chipboard disc, 0.025-inch minimum thickness by roll diameter plus zero, minus 1/2-inch with a 4-inch diameter hole in the center, shall be placed at each end of the roll. A metal plug shall be inserted in each end of the roll to firmly hold the wrappers and discs in place. The metal plugs shall be constructed of 0.020-inch minimum thickness steel and finished with a rust preventative coating. The dimensions of the metal plugs shall be 2-31/32 inches cylinder diameter, 1-inch minimum depth, and shall have a 1-inch diameter hole in the center.

5.1.1.2 Sheets. Cellophane of one type and class only, in sheet sizes as specified, shall be packaged in units. The number of sheets in each unit shall be in accordance with the industry's practice - 250, 500, 1,000, 2,000, 5,000, or other quantity depending upon the dimensions and the thickness of the cellophane to provide an easily handled package. Each unit shall consist of the cellophane sheets, a top and bottom chipboard pad of 72-pound minimum basis weight, and a complete package wrap as follows: (a) polyethylene shrink wrap of minimum 0.002-inch thickness; (b) a laminated sheet of kraft paper of 25-pound minimum basis weight - machine glazed kraft, 12-pound wax, and 25-pound minimum basis weight - machine glazed kraft; or (c) a wrap of two sheets of moisture-proof cellophane, an outside wrap of 50-pound minimum basis weight kraft paper waxed to 59 pounds minimum basis weight, and sealed with 1-1/2 inch minimum width gummed paper tape conforming to PPP-T-45, type III, grade B.

5.1.2 Level B.

5.1.2.1 Rolls. For level B shipments, the cellophane shall be packaged as specified in 5.1.1.1, except when specified, cardboard plugs may be used. The plugs shall be constructed of ammunition container board and the finished plug shall have a minimum crushing strength of 8 pounds when placed in a testing machine with the plug axis perpendicular to the direction of travel of the machine crushing jaws, and tested at a crushing rate of the jaws of 2 inches per minute. The dimensions of the plug shall be 2.932 ± 0.005 inches outside diameter, 2.742 ± 0.007 inches inside diameter, and a length of 1.125 ± 0.016 inches.

5.1.2.2 Sheets. Level B standard pack (civil agencies) shall be as specified in paragraph 5.1.1.2, except that 1,000 sheets of one type and class shall be placed in each package.

5.1.3 Level C. Cellophane shall be packaged to afford adequate protection against physical damage during shipment from the supplier to the first receiving activity. The package and the quantity per package shall be the same as that normally used by the supplier for retail distribution.

5.2 Packing. Packing shall be level A, B, or C, as specified (see 6.4).

5.2.1 Level A.

5.2.1.1 Rolls. Cellophane of one type and class only, packaged as specified in 5.1, shall be packed in fiberboard drums with recessed ends conforming to PPP-D-723, type III, grade D.

5.2.1.2 Sheets. Cellophane of one type, class, and sheet size only, packaged as specified in 5.1, shall be packed in a snug-fitting fiberboard shipping container conforming to PPP-B-636, grade V2s. Each fiberboard 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. Alternatively, shipping containers may be used that conform to PPP-B-591, class II; PPP-B-601, overseas type; PPP-B-576, style A or B, class 2; or PPP-B-621, class 2, style 2 or 4, except that the requirements for additional battens shall not apply. Each wood container shall be provided with a type I or II, grade B or C, sealed case liner conforming to MIL-L-10547. Each wood shipping container shall be closed and reinforced with flat strapping or tape banding in accordance with the appendix of the applicable container specification. The weight of the contents of each shipping container shall not exceed 65 pounds for PPP-B-636 containers and 150 pounds for the wood containers.

5.2.2 Level B.

5.2.2.1 Rolls. Cellophane of one type and class only, packaged as specified in 5.1, shall be packed in fiberboard drums with recessed ends conforming to PPP-D-723, type I, grade D.

5.2.2.2 Sheets. Cellophane of one type, class, and sheet size only, packaged as specified in 5.1, shall be packed in a close-fitting fiberboard shipping container conforming to PPP-B-636, type CF (variety SK), or type SF, class domestic, grade 275. Each fiberboard shipping container shall be closed in accordance with method II of the appendix of PPP-B-636. Alternatively, shipping containers may be used that conform to PPP-B-576, style A or B, class 1; PPP-B-591, class I, style A or B; PPP-B-601, type domestic; PPP-B-621, class 1, style 2 or 4, except that the requirements for additional battens shall not apply. The weight of the contents of each shipping container shall not exceed 65 pounds for PPP-B-636 containers and 150 pounds for the wood containers.

5.2.3 Level C. Cellophane, packaged as specified in 5.1, shall be packed in a manner to insure carrier acceptance and safe delivery to 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 Uniform Freight Classification Rules or National Motor Freight Classification Rules, as applicable.

5.3 Marking.

5.3.1 Civil agencies. In addition to any special marking required by the contract or order, interior packages and shipping containers shall be marked with the date of shipment and in accordance with Fed. Std. No. 123.

5.3.2 Military activities. In addition to any special marking required by the contract or order, interior packages and shipping containers shall be marked with the date of shipment and in accordance with MIL-STD-129.

6. NOTES

6.1 Intended uses. The following tabulation illustrates the general end uses for each type of cellophane:

Type	General end uses
I	General wrapping where a moistureproof film is not needed.
II	Wrapping of products which require some degree of moisture-proofness where packages are closed by folding or twisting and sealed with adhesive or tapes rather than by heat sealing.
III	Same as type II, but used specifically for wet products or products which are liable to come in contact with water.
IV: Class 1	Where limited moisture protection is required.
Class 2	For wrapping bakery products or for carton overwraps where moisture protection is required and packages are closed by heat seals.
Class 3	For heat seal closure packaging where no moisture protection is desired (e.g., crust pies, and hard crusted bread).
Class 4	Direct wrap or bags for snacks and any food product containing high oil, shortening, or fat content.
V: Class 1	Same as type IV, class 1, but for wet products. Used mainly for produce packaging.
Class 2	Same as type IV, class 2, but for wet products and frozen foods.
VI	For wrapping products or for carton overwraps where extra moisture or grease protection is required.
VII: Class 1	For wrapping fresh red meats with uncoated side next to meat.
Class 2	For wrapping fresh red meat cuts, 2 pounds and over in weight, with uncoated side next to meat.

6.2 Flexibility. Most types of film can be supplied in at least two ranges of flexibility: (1) high flexibility for low temperature service (0° to 40°F.), and (2) intermediate flexibility for normal temperature service (above 40°F.). Type VII is supplied in intermediate flexibility only.

6.3 Code designations. The following manufacturer's code designations are used (see note):

Type	American Viscose	DuPont	Olin
I	P and C	PD	PT and PC
II	M	MD	MT
III	MB	MAD	MAT
IV:			
Class 1	DS	LSD	LST
Class 2	MS, CMS	MSD	MST, MSC
Class 3	---	PSD	---
Class 4	---	---	OF-20
V:			
Class 1	DSB	LSAD	LSAT
Class 2	MSB	MSAD	MSAT
VI		K, KFC	OX, V
VII:			
Class 1	MSBO	MSAD-80	OF-16
Class 2	REO	MSAD-90	MSAT-80, OF-18

NOTE: Manufacturers introduce new films from time to time. This specification is not limited to the films shown by these code designations.

6.4 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) Type and class required (see 1.2.1).
(c) Color, if required (see 3.8).

(d) Whether rolls or sheets are required (see 3.4).
  (1) Rolls: Thickness, width, and length required.
  (2) Sheets: Thickness, length, and width required.
(e) Selection of applicable levels of packaging and packing (see 5.1 and 5.2).
(f) What end use is involved.
(g) The standard pack requirements in paragraph 5.1.2.2 are intended for use in procurements of stores stock replenishments. Procuring officers should use the standard pack requirements when it is known that the material will be shipped from a supplier to a domestic warehouse, supply depot, or intermediate storage point for temporary storage, subsequent issue and/or shipment to eventual user.

6.5 Storage. Recommended storage temperatures are 65° to 75°F. Cellophane in rolls should be stacked on end. Cellophane in roll or sheet form should be used within one year of date of shipment.

MILITARY INTERESTS:

Custodians:
Army - CL (MCA)
Navy - SA
Air Force - 69

Review Activities:
Army - EA, MD
Air Force - 71, 82, 84

CIVIL AGENCY COORDINATING ACTIVITIES:
GSA - FSS
NASA - JFK

Preparing activity:

GSA - FSS

Orders for this publication are to be placed with General Services Administration, acting as an agent for the Superintendent of Documents. See Section 2 of this specification to obtain extra copies and other documents referenced herein. Price 40 cents each.