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10 September 1971
SUPERSEDING
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MILITARY SPECIFICATION

CELLULOSE ACETATE SHEET (FOR INHIBITORS)

This specification is mandatory for use by all departments and agencies of the Department of Defense.

1. SCOPE

1.1 This specification covers cast or extruded cellulose acetate sheet for the fabrication of inhibitors.

*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 the specification to the extent specified herein.

SPECIFICATIONS

Federal

O-A-51	Acetone, Technical

STANDARDS

Military

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

(Copies of documents, other than specifications and standards, required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer. Specifications and standards are available from the U. S. Naval Publications and Forms Center, 5801 Tabor Ave., Philadelphia, Pa. 19120.)

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

American Society for Testing and Materials

D871	Methods of Testing Cellulose Acetate
D1343	Viscosity of Cellulose Derivatives by Ball-Drop Method

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

3. REQUIREMENTS

*3.1 First article inspection. Unless otherwise specified and prior to regular production on a contract or purchase order, the cellulose acetate furnished under this specification shall have passed the first article inspection as specified herein (see 4.3 and 6.1.1).

3.2 Material. The sheet shall be manufactured from transparent cellulose acetate composition containing cellulose acetate and plasticizers. The plasticizers used in the sheet shall consist of a mixture of diethyl phthalate and triphenyl phosphate containing approximately 34 parts of triphenyl phosphate per 100 parts of total plasticizer. No foreign material shall be added to this composition, except dye as required for purposes of color.

3.3 Method of manufacture. The sheet shall be made by the cast process, the wet extrusion process, or the dry extrusion process.

3.4 Dimensions. The thickness, width, tolerances, and continuous lengths of rolls shall be as specified in the contract or purchase order.

3.5 Chemical requirements.

3.5.1 Plasticizer level. The sheet shall have a minimum of 22 percent and a maximum of 29 percent plasticizer.

3.5.2 Acetyl content. The average acetyl content shall be between 37.3 and 39.9 percent.

3.5.3 Viscosity. The viscosity of the cellulose acetate, when tested in accordance with 4.5.3, shall be between 10 and 70 seconds.

*3.6 Workmanship. The cellulose acetate sheet shall be free from such bubbles, striae, and other blemishes as would render the material unfit for its intended use.

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.

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

(a) First article inspection (see 4.3)
(b) Quality conformance inspection (see 4.4).

*4.3 First article inspection. Unless otherwise specified (6.1.1), the contractor shall produce a preproduction lot of cellulose acetate sheet at the same plant, using the same materials and processes that he proposes to use in fulfilling the contract. An additional preproduction lot or portion thereof, as directed by the contracting office, shall be produced when there is a lapse in production in excess of 90 days or when there is a change in the manufacturing process, material used, drawing, or specification such as to significantly affect product uniformity as determined by the government.

*4.3.1 First article lot size. The first article, or preproduction lot, shall consist of at least 2500 pounds of cellulose acetate sheet produced under the conditions specified in 4.3.

*4.3.2 First article acceptance. The first article, or preproduction lot, will be accepted when it has been tested and found to conform to all the requirements of this specification.

*4.4 Quality conformance inspection. For each inspection lot of material submitted for acceptance, quality conformance inspection shall consist of all the examinations and tests of this specification.

4.4.1 Inspection lot. Unless otherwise specified, an inspection lot shall consist of a single batch of material produced in continuous run, not to exceed 100,000 pounds. An individual shipment shall not contain cellulose acetate sheet from more than one inspection lot (see 6.2).

4.4.2 Sampling.

4.4.2.1 Sampling for dimensional and visual inspection. Unless otherwise specified, samples for dimensional and visual inspection shall be selected at random in accordance with MIL-STD-105.

4.4.2.2 Sampling for chemical tests. Specimens shall be selected from each lot in accordance with the following tabulation; no more than one sample shall be selected from one roll unless the sample size (or number of samples) is greater than the number of rolls submitted by the manufacturer.

Lot size (pounds)	No. of specimens for sample
1 - 30,000	3
30,001 - 60,000	4
over 60,000	5

4.4.2.3 Sample. Each specimen selected as prescribed in 4.4.2.1 shall consist of a 10-inch strip taken the width of the roll. (Each strip shall weigh approximately 100 grams.)

4.4.2.4 Nonvalid tests. Should one or more specimens fail to meet any of the chemical test requirements, a second test prior to resubmission shall be authorized only if failures can be ascribed to deficiencies in the testing conditions. In such event, the first test shall be discounted and the results of the second test shall be used to determine lot disposition. The number of specimens and the acceptance criteria

for any such additional testing shall be as designated in 4.4.2.2 and 4.4.2.3.

4.4.3 Inspection procedures.

*4.4.3.1 For examination of preparation for delivery . The sample unit shall be one filled and closed shipping container ready for shipment. Sample containers and the preparation for delivery thereof shall be examined for compliance with all requirements of this specification in regard to contents, damaged or improper container, and marking. The inspection level shall be level I and the acceptable quality level (AQL) shall be 2.5 percent defective. The sample containers shall be shipped as part of the lot if the lot is accepted.

*4.4.3.2 For chemical tests. The specimens selected as specified in 4.4.2.2 shall be subjected to the chemical tests of 4.5. Failure of any test sample to meet any test requirement shall result in the rejection of the lot represented.

*4.4.3.3 For visual examination. The samples taken in 4.4.2.2 shall be visually examined for conformance to the requirements of 3.4 and 3.6. Failure of any sample to meet any requirement shall be cause for rejection of the lot represented.

4.5 Test procedures.

4.5.1 Plasticizer level.

4.5.1.1 Preparation of sample. The following three methods of preparing the sample are acceptable. Enough sample is prepared to permit the plasticizer content to be determined in duplicate. Generally, 12 grams will be sufficient.

4.5.1.1.1 Rotary file. File the sample using a rotary file attached to an electric drill, and collect the filings in a pan or tray. Screen through a No. 20 U. S. standard sieve. Dry the amount of screened filings necessary for the evaluation for 1/2 hour at 100° centigrade (C), cool in a desiccator, and weigh.

4.5.1.1.2 Shavings. Place a convenient number of the 3- by 3/4-inch strips in a vise and obtain very thin shavings by drawing a sharp metal sheet, held almost perpendicularly, across the length of the sheets. Maximum thickness of the shavings is to be 0.001 inch. Collect at least 12.0 grams of shavings in a tall form weighing bottle. Place the weighing bottle uncovered into the 50° C vacuum oven for 3 hours ± 10 minutes. Remove from the oven, cover, and cool in a desiccator.

4.5.1.1.3 Wiley mill. The plastic is cut into thin strips and ground in a Wiley or similar mill to pass through a No. 20 U. S. standard sieve. About 12 grams of the ground plastic is prepared for use in the determination. Place the weighing bottle uncovered into the 50° C vacuum oven for 3 hours ± 10 minutes. Remove from the oven, cover, and cool in a desiccator.

4.5.1.2 Test method 1 - Extraction with 100 percent hexane.

4.5.1.2.1 Apparatus.

(a) Usual soxhlet extraction equipment with ground glass joints, including: a tall form coarse sintered glass thimble, 125- to 250-milliliter (ml) round bottom flask, an extractor (13 inches long with 2-1/4-inch inside diameter), a condenser, or other similar equipment as applicable

(b) Hot water bath heated by steam

(c) Steam bath (laboratory standard)

(d) Electric oven maintained at 100° C

(e) Analytical balance, sensitivity 0.1 milligram (mg)

(f) Weighing bottles (30 × 50 millimeters (mm))

(g) Desiccator (10-inch diameter)

(h) Hood (laboratory)

(i) Hexane, normal, technical grade; distillation range 66° to 69° C; nonvolatile, maximum 0.002 percent.

4.5.1.2.2 Preparation of thimble. Obtain a preliminary weight of the thimble prior to drying. Dry for at least 6 hours at 100° C; cool in a desiccator for 1 hour before weighing.

4.5.1.2.3 Extraction. Transfer the weighed sample into the thimble. To the round bottom flask add 125 to 220 ml of hexane and connect the soxhlet apparatus. Insert the flask into the hot water bath in such a manner that the contents of the flask will reflux at a steady rate for 72 hours if a 3- to 10-gram sample is used and at least 96 hours if more than 10 grams are being used. The optimum sample size is 5 grams. After the refluxing is completed, cool and remove the thimble. The thimble and its contents after draining are dried for 2 hours in a steam oven (60° to 70° C) to drive off the hexane, then further dried for 4 hours in an electric oven maintained at 100° C, cooled in a desiccator for 1 hour, and weighed. The liquid is collected in a clean, dry, tared 250-ml beaker and evaporated on a steam batch until only the extracted plasticizer remains, free from hexane odor. The plasticizer and beaker are then dried for 1/2 hour at 100° C, cooled in a desiccator for 30 minutes, and weighed.

4.5.1.2.4 Calculate plasticizer level. Calculate the amount of plasticizer as follows:

$$\text{Percent plasticizer} = \frac{\text{Weight of extracted material} \times 100}{\text{Weight of sample}}$$

4.5.1.2.5 Precaution. Hexane is flammable. All flames and open top electric heaters must be kept away from the bench where the analysis is being run.

4.5.1.3 Test method 2 - Precipitation with isopropyl ether.

4.5.1.3.1 Apparatus and reagents.

(a) Analytical balance, sensitivity 0.1 mg
(b) Tall form weighing bottles (45 × 100 mm) with ground glass covers
(c) Vacuum oven, 50° C ± 1.0°
(d) Crucibles, ACE no. 6130, D or E porosity (or equivalent)
(e) Suitable mechanical shaker
(f) Other ordinary laboratory equipment
(g) Gravity convection oven (100° C ± 2°)
(h) Acetone, O-A-51
(i) Isopropyl ether (technical grade) must be peroxide free
(j) Isopropyl ether-acetone solution (3:1 by volume).

4.5.1.3 2 Procedure. To a clean, dry, tared 125-ml Erlenmeyer flask, add 0.5 gram ± 0.1 of sample. Reweigh the flask and calculate the weight of sample to 0.1 mg by difference. Add 10 ml of acetone to the flask containing the sample and dissolve by placing on a shaker. Remove the flask from the shaker and, while vigorously shaking the flask by hand, add slowly from a burette 30 ml of 3:1 isopropyl ether-acetone solution. As soon as most of the precipitation has taken place (approximately 15 ml addition), the remainder of the isopropyl ether-acetone solution is added as rapidly as possible. It is important to shake the flask vigorously and to add the first portion of the solution slowly to avoid lumping of the precipitate. Add 25 ml of isopropyl ether from a graduate. Loosen the precipitate from the sides of the flask with a fire-polished glass stirring rod, and filter under vacuum through a clean, dry, glass crucible tared to 0.1 mg. Remove any precipitate remaining in the flask by adding 5 ml of acetone to bring the precipitate into solution and reprecipitating with a considerable excess of isopropyl ether (approximately 75 ml), and filter. If the filtrate is cloudy, run it through the filtering crucible again, slowly. Run about 15 to 20 ml of isopropyl ether through the filtering crucible. Maintain vacuum on the filtering crucible until dry. Dry the crucible and contents to constant weight for a minimum of 1 hour in the 100° C oven. Remove from the oven and cool in a desiccator. Weigh to 0.1 mg. Calculate the weight of the precipitate by difference.

4.5.1.3.3 Calculations.

$$\text{Percent plasticizer} = \frac{(A - B) \times 100}{A}$$

where

A = weight of sample
B = weight of precipitated cellulose acetate.

4.5.1.3.4 Precautions. Strict quantitative technique should be observed at all times. Isopropyl ether is very flammable. All flames and open-top electric heaters must be kept away from the bench where the analysis is being run. Weighings should be made rapidly to minimize water absorption by cellulose acetate which takes place very rapidly.

4.5.1.4 Test method 3 - Extraction with 1:1 hexane-absolute alcohol.

4.5.1.4.1 Apparatus and reagents.

(a) Analytical balance, sensitivity 0.1 mg

(b) Usual soxhlet extraction equipment

(c) Hexane, normal, technical grade; distillation range 66° to 69° C; nonvolatile, maximum 0.002 percent

(d) Alcohol (absolute).

4.5.1.4.2 Procedure. The determination shall be made in duplicate. About 5 grams of the sample are extracted in a glass soxhlet apparatus for 20 hours or longer using approximately 150 ml of 1:1 (by volume) mixture of alcohol (absolute) and the above specified hexane. Adjust the heat so that the solvent drips off the end of the condenser at the rate of 2 to 3 drops per second. After extracting for 20 hours or more, disconnect the flask, place it on a steam bath, and evaporate the solvent to a volume of about 5 ml by means of the gentle current of dry air. Do not evaporate to dryness. Place the flask in a vacuum desiccator that contains no drying agent, and evacuate for 30 minutes or longer, using a water aspirator. Connect the desiccator to an oil pump, and evacuate for 2 hours at 1 to 2 mm pressure. Weigh the flask, return it to the desiccator, and evacuate for an additional hour. The flasks are considered to have come to constant weight when the difference between successive weighings is 0.002 gram or less.

4.5.1.4.3 Calculation. The plasticizer level is calculated as follows:

$$\text{Percent plasticizer} = \frac{\text{Weight of extracted material} \times 100}{\text{Weight of sample}}$$

4.5.1.4.4 Precaution. Hexane is flammable. All flames and open-top electric heaters must be kept away from the bench where the analysis is being run.

4.5.2 Average acetyl content. The average acetyl content shall be determined in accordance with ASTM Method D871, using the extracted or precipitated residue from 4.5.1 as the sample.

4.5.3 Viscosity.

4.5.3.1 Equipment and reagents.

(a) Ordinary laboratory equipment

(b) Acetone, O-A-51
(c) Formula 2B (95 percent by volume) ethyl alcohol.

4.5.3.2 Preparation of sample. Weigh approximately 65 grams of plasticized cellulose acetate in a tared aluminum dish, and dry for 3 hours at 105° C. Remove from oven, cover tightly, and cool in desiccator. Add to a clean, dry, 16-ounce wide-mouth bottle 250 grams of 90:10 (by weight) mixture of acetone-alcohol. Transfer to the bottle rapidly and with constant shaking exactly 62.5 grams of the dried cellulose acetate; close immediately with a cork stopper covered with aluminum foil. A bottle with a ground glass stopper is also satisfactory for this purpose. Place on a suitable shaker for 12 hours or until solution is complete.

*4.5.3.3 Procedure. The determination shall be completed in accordance with ASTM-D-1343 and D-871, Formula A, with the exception in actual ball-drop distance and container. For this test, Fisher Scientific glass tubing catalog number 11-365, or equivalent, shall be used. A 14-inch length of this tubing should be adequate for the test. A 10-inch ball-drop distance shall be used. The lower timing mark should be approximately 2 inches above the lower end of the tube and the upper timing mark 10 inches ± 0.02 above the lower mark. Measure the time of drop between the marks as specified in ASTM-D-1343.

5. PREPARATION FOR DELIVERY

*5.1 Packaging.

5.1.1 Level C. Unless otherwise specified, cellulose acetate sheet made by the cast process or the wet extrusion process shall be interleaved with tissue. The inside diameter of the core on which the sheet is wrapped shall be as specified in the contract or purchase order.

5.2 Packing.

5.2.1 Level C. Unless otherwise specified, the rolls of sheet packaged in accordance with 5.1 shall be packed in substantial commercial shipping containers, so constructed as to insure acceptance by common or other carrier for safe transporatation at the lowest rate to the point of delivery.

5.3 Marking. In addition to any special marking required by the contract or order, shipments shall be marked in accordance with MIL-STD-129.

6. NOTES

*6.1 Ordering Data. Procurement documents should specify the following:

(a) Title, number, and date of this specification

(b) Thickness, width, tolerances, lengths of rolls, and core inside diameter (see 3.4 and 5.1)

(c) Point of delivery.

*6.1.1 Contracts or orders should specify the following provisions for first article inspection.

6.1.1.1 Whether first article inspection is required. When a supplier is in continuous production from contract to contract, consideration should be given to waive the first article inspection. If first article inspection is required, indicate:

(a) Where the first article inspection is to be conducted (at the supplier's or Government plant)

(b) That approval of first article samples or the waiving of the first article inspection shall not relieve the supplier of his obligation to fulfill all other requirements of this specification and the contract.

6.2 Inspection lot. As applied to government inspection of units of product, the term "lot" shall mean "inspection lot;" i.e., a collection of units of product used as a basis for Government inspection. Unless otherwise specified, the number of units of product in "inspection lots" shall be as determined by the Government inspector and may differ from the quantity designated in the contract or order as a lot for production, shipment, or other purpose.

6.3 Changes from previous issue. The margins of this specification are marked with an asterisk to indicate where changes (additions, modifications, corrections, deletions) from the previous issue were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the last previous issue.

Custodian:
Navy - OS
Army - MU

Review activities:
Army - MU
Navy - OS

Preparing activity:
Navy - OS
(Project No. 9330-0258)

SPECIFICATION ANALYSIS SHEET

Form Approved
Budget Bureau No. 22-R255

INSTRUCTIONS: This sheet is to be filled out by personnel, either Government or contractor, involved in the use of the specification in procurement of products for ultimate use by the Department of Defense. This sheet is provided for obtaining information on the use of this specification which will insure that suitable products can be procured with a minimum amount of delay and at the least cost. Comments and the return of this form will be appreciated. Fold on lines on reverse side, staple in corner, and send to preparing activity. Comments and suggestions submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or serve to amend contractual requirements.

SPECIFICATION

MIL-C-17576B, Cellulose Acetate Sheet (For Inhibitors)

ORGANIZATION

CITY AND STATE

CONTRACT NUMBER

MATERIAL PROCURED UNDER A

☐ DIRECT GOVERNMENT CONTRACT ☐ SUBCONTRACT

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

   A. GIVE PARAGRAPH NUMBER AND WORDING.

   B. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES

2. COMMENTS ON ANY SPECIFICATION REQUIREMENT CONSIDERED TOO RIGID

3. IS THE SPECIFICATION RESTRICTIVE?

   ☐ YES ☐ NO *(If "yes", in what way?)*

4. REMARKS *(Attach any pertinent data which may be of use in improving this specification. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity)*

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

DATE

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REPLACES EDITION OF 1 OCT 64 WHICH MAY BE USED.

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