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USNWC ltr, 30 Aug 1964

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FORM 12-1-62



Q4237

SPECIFICATION

1 of 1

1. COMPONENT/PART NAME PER GENERIC CODE Propulsion, Parts & Materials, Solid Fuel Engines, Propellants	2. PROGRAM OR WEAPON SYSTEM Multiple	3. DATE OF: DAY MO YR		
	5. ORIGINATOR'S SPEC. NO. WS 7651	ISSUE	13	10 67
4. ORIGINATOR'S SPECIFICATION TITLE Purchase Description - Cellulose Acetate	6. SPECIFICATION IS:			
	<input type="checkbox"/> DRAFT <input type="checkbox"/> PRELIMINARY <input checked="" type="checkbox"/> FINAL			

7. THIS SPECIFICATION COMPLEMENTS REPORT NO:

8. TYPE OF SPECIFICATION

<input checked="" type="checkbox"/> (A) GENERAL PRODUCT REQUIREMENTS FOR A FAMILY OF PARTS - PROCUREMENT DOCUMENT	<input type="checkbox"/> (E) SPEC. FOR PERFORMANCE, RELIABILITY, AND/OR ENVIRONMENT FOR ASSEMBLIES, EQUIPMENTS, SUBSYSTEMS AND SYSTEMS
<input type="checkbox"/> (B) INDIVIDUAL DETAIL PARTS DOCUMENT; STDS BOOK PAGES - FOR PROCUREMENT	<input type="checkbox"/> (F) PERFORMANCE AND APPLICATION DATA FOR DESIGN ENG. USE ON PARTS - NOT FOR PROCUREMENT
<input type="checkbox"/> (C) DETAIL INSPECTION, PROCESS CONTROL, AND/OR TEST PROCEDURES FOR SPECIFIC PARTS	<input type="checkbox"/> (G) OTHER (DETAIL IN 10.)
<input type="checkbox"/> (D) PROCESS (PAINTING, WELDING, FINISHING, HEAT TREATING ETC.) APPLICABLE TO MANY PARTS	

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9. APPLICABLE REFERENCED SPECIFICATIONS EXCEPT MIL-SPECS, STDS, OR OTHER UNIVERSALLY AVAILABLE DOCUMENTS.	ENCL.	AVAIL. ON REQ.	NOT AVAIL.	PREVIOUSLY SUBMITTED AND FILED AS IDEP REPORT OR SPEC. NUMBER
1963 Book of ASTM Std. Part 15			X	
1961 Book of ASTM Std. Part 27			X	
1965 Book of ASTM Std. Part 20			X	

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*Naval Fleet Missile Systems Analysis and Evaluation Group
Corona, Calif. 91700*

11. <i>R. S. Harper</i> R. S. Harper	12. CONTRACTOR NWC/CL	SUBCONTRACTOR
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13. SPEC. NO. 565.70.00.00-X7-075

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NOTICES PAGE

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Code Ident
30003

WS 7651

NAVAL AIR SYSTEMS COMMAND

DEPARTMENT OF THE NAVY

PURCHASE DESCRIPTION

CELLULOSE ACETATE

1. SCOPE.

1.1 Scope. This purchase description covers four grades of powdered cellulose acetate. ←

1.2 Classification. Cellulose acetate shall be of the following grades as specified (see 6.2):

Grade A
Grade B
Grade C
Grade D

For chemical and physical
analysis see Table I .

2. APPLICABLE DOCUMENTS.

2.1 The following document of the issue in effect on date of invitation for bids or request for proposal forms a part of this document to the extent specified herein.

FSC 6810

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STANDARDS

Military

MIL-STD-129

Marking for Shipment and Storage.

(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 document 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 (ASTM)

1963 Book of ASTM
Standards; Part 15

Test-Method ASTM D871-63,
"Testing Cellulose Acetate".

1961 Book of ASTM
Standards; Part 27

Test-Method ASTM D1303-55,
"Total Chlorine in Vinyl
Chloride Polymers and
Copolymers".

1965 Book of ASTM
Standards; Part 20

Test-Method ASTM D1343-56,
"Viscosity of Cellulose
Derivatives by Ball-Drop
Method".

(ASTM Publications are published by the American Society for Testing and Materials, Philadelphia 3, Pennsylvania.)

3. REQUIREMENTS.

3.1 Preproduction sample. Unless otherwise specified (see 6.2), a preproduction sample shall meet all requirements of this document. The preproduction sample shall be prepared using the same methods and procedures proposed for production. Any production prior to acceptance of the preproduction sample shall be at the risk of the supplier.

3.2 Data. No data is required by this document or by referenced documents in section 2 unless specified in the contract or purchase order.

3.3 Compliance to documents. Cellulose acetate shall conform to the requirements herein and to the applicable requirements of documents listed in section 2.

3.4 Product characteristics and performance. When tested in accordance with 4.7 of this document, cellulose acetate shall meet the following product characteristics and performance.

3.4.1 Chemical and physical analysis. The chemical and physical analysis of the material shall be as specified in Table I.

Table I. Chemical and Physical Analysis

Characteristics	Grade							
	A		B		C		D	
	Min	Max	Min	Max	Min	Max	Min	Max
Viscosity, sec.	1.8	3.9	6.0	13.0	53	79	26	34
Free Acidity as Acetic Acid, %		0.1		0.1		0.1		0.1
Average Acetyl Content, %	39.3	40.3	39.3	40.3	38.9	39.9	-	-
Average Combined Acetic Acid, %	55	56	55	56	54.5	55.5	54.3	55.1
Moisture, %		3.0		3.0		3.0		3.0
Chlorine, %		0.2		0.2		0.2		0.2
Ash, %		0.2		0.2		0.2		0.2

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3.5 Workmanship. The four grades of cellulose acetate shall be uniform in quality, free from foreign material, and shall be manufactured under conditions and procedures standard to the industry.

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, the supplier may utilize his own facilities or any commercial laboratory acceptable to the Government. The Government reserves the right to perform any of the inspections set forth in this document where such inspections are deemed necessary to assure that supplies and services conform to prescribed requirements.

4.2 Lot. A lot shall consist of material produced at one plant with no change in formulation or process. If manufacture is by batch process, each batch shall constitute a lot. A batch shall be as defined in 6.3.

4.3 Acceptance sampling. The number of containers to be chosen at random for acceptance sampling shall be equal to the square root of the total number of containers in the lot. If the number thus obtained is not a whole number, the number of containers to be sampled shall be increased to the next higher whole number. In no case, however, shall the number of containers to be sampled be less than seven (unless there are less than seven containers in the lot, in which case, each container shall be sampled).

4.3.1 Primary sample. From each selected container, a sample shall be taken from three or more places throughout the container. The total weight of the samples taken from each container shall weigh at least 50 grams (gm). Each sample thus taken shall be mixed thoroughly, placed in a clean dry container, and labeled to identify the material name, original container designation, contract number, and lot number.

4.3.2 Composite sample. Each primary sample shall be subdivided to prepare a composite sample (not in excess of 300 gm). Primary material not used shall be returned to the

primary sample container. After mixing the composite sample thoroughly, the composite sample shall be placed in a clean, dry container and sealed. The composite sample shall be identified with the material name, container designation, contract number, and lot number. All specified chemical tests shall be made on this composite sample representing the lot. Failure of the composite sample to pass all of the tests herein shall result in rejection of the lot represented.

4.4 Classification of tests. Inspection and testing of cellulose acetate shall be classified as follows:

- (a) Preproduction tests.
- (b) Quality conformance tests.

4.5 Preproduction tests. Preproduction test shall be conducted only on the preproduction sample and shall consist of all examinations and tests specified in 4.6.

4.6 Quality conformance tests. Quality conformance tests for acceptance of each grade of cellulose acetate shall consist of the following tests:

<u>Characteristic</u>	<u>Test</u>
Viscosity	4.7.1
Free acidity as acetic acid	4.7.2
Average acetyl content	4.7.3
Average combined acetic acid	4.7.3
Moisture	4.7.4
Chlorine	4.7.5
Ash	4.7.6

4.7 Tests. The following procedures shall be used to determine that the requirements of this document have been met. Any proposed change in test procedures or equipment shall necessitate, before adoption, prior approval of the procuring activity. In case of dispute between the results from any proposed method or equipment and what is cited herein, the results using the methods and the equipment specified in this document shall prevail. Unless otherwise specified, all tests shall be run in duplicate. The average of the two results shall be taken as the test result.

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4.7.1 Viscosity. Dry the sample for 1 to 2 hours at 100 to 110 degrees centigrade ($^{\circ}\text{C}$) (212 to 230 degrees Fahrenheit ($^{\circ}\text{F}$)), and cool in a desiccator. Prepare a solution of the dried sample in a solvent and at a concentration mutually agreed upon by the consumer and vender. Suitable solutions are listed in Table II. Measure the viscosity in accordance with the procedure given in Test Method D1343-56 "Test for Viscosity of Cellulose Derivatives by Ball-Drop Method" (Part 20 of ASTM, page 590). Report the results in seconds unless otherwise specified. The viscosity value may be prefixed with the letter A, B, C, etc., corresponding to the formula of the solution employed.

Table II. Solutions for Viscosity Determination

Ingredients ^a	Formula					
	A	B	C	D	E	F
Cellulose acetate, %	20 ^b	20 ^b	20 ^c	15 ^d	20 ^b	10 ^d
Acetone ^e , %	72	80	-	-	-	-
Acetone 96%	-	-	-	-	80	-
Water 4%						
Ethyl alcohol ^f , %	8	-	8	8.5	-	-
Methyl alcohol ^g , %	-	-	-	-	-	9
Methylene chloride ^h , %	-	-	72	76.5	-	81

Typical Solution Densities, gm Per ml at 25 $^{\circ}\text{C}$

0.85 0.86 1.25 1.25 0.86 1.24

^aAll percentages by weight.

^bAcetyl content 40.5%, maximum.

^cAcetyl content 40.5 to 42.7%.

^dAcetyl content 42.7 to 44.8%.

^eAcetone (99.4 \pm 0.1%) containing 0.3 to 0.5% water and under 0.3% of ethyl alcohol.

^fEthyl alcohol (95% by volume). Formula 2B or 3A denatured ethyl alcohol may be used.

^gMethyl alcohol, sp gr 0.785 to 0.795 at 20/20 $^{\circ}\text{C}$.

^hMethylene chloride having a boiling range of 39.2 to 40.0 $^{\circ}\text{C}$, and less than 0.001% acidity calculated as Hydrochloric Acid.

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4.7.1.1 Acceptance criteria. For the lot represented to pass the viscosity test, the value obtained for viscosity in seconds shall be within the range shown in 3.4.1.

4.7.2 Free acidity. Determine the amount of free acidity in accordance with the procedure given in Test Method D871-63 "Testing Cellulose Acetate" (Part 15 of ASTM, page 271).

4.7.2.1 Acceptance criteria. For the lot represented to pass the free acidity test, the value obtained for the percent free acidity shall be no greater than the value specified in 3.4.1.

4.7.3 Average acetyl and combined acetic acid content. The average acetyl and combined acetic acid content of each grade specified in 3.4.1 shall be determined in accordance with the procedure given in Test Method D871-63 "Testing Cellulose Acetate" (Part 15 of ASTM, page 271).

4.7.3.1 Acceptance criteria. For the lot represented to pass the average acetyl and combined acetic acid content test, the value obtained for the average percent acetyl and combined acetic acid content shall be within the range specified in 3.4.1.

4.7.4 Moisture. The moisture content of each grade specified in 3.4.1 shall be determined in accordance with the procedure given in Test Method D871-63 "Testing Cellulose Acetate" (Part 15 of ASTM, page 271).

4.7.4.1 Acceptance criteria. For the lot represented to pass the moisture test, the value obtained for percent moisture shall be no greater than the value specified in 3.4.1.

4.7.5 Chlorine. The percentage of chlorine of each grade specified in 3.4.1 shall be determined in accordance with the procedure given in Test Method D1303-55 "Total Chlorine in Vinyl Chloride Polymers and Copolymers" (Part 27 of ASTM, page 472), except use ferric alum indicator in place of ferric nitrate indicator, and the electrical ignition of the Parr bomb in place of ignition by use of a Bunsen burner.

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4.7.5.1 Acceptance criteria. For the lot represented to pass the chlorine test, the value obtained for percent chlorine shall be no greater than the value specified in 3.4.1.

4.7.6 Ash. The percentage of ash of each grade specified in 3.4.1 shall be determined in accordance with the procedure given in Test Method D871-63 "Testing Cellulose Acetate" (Part 15 of ASTM, page 271).

4.7.6.1 Acceptance criteria. For the lot represented to pass the ash test, the value obtained for percent ash shall be no greater than the value specified in 3.4.1.

4.8 Packing and marking. Determine that all packing and marking conforms to section 5 of this document.

5. PREPARATION FOR DELIVERY.

5.1 Preservation and packaging. Not applicable (unless specified in the contract or purchase order).

5.2 Packing.

5.2.1 Level A. Not applicable.

5.2.2 Level B. Not applicable.

5.2.3 Level C. The material shall be packed as directed in the contract or order to afford protection against damage during direct shipment from the supply source to the first receiving activity for immediate use. Containers shall comply with common carrier regulations applicable to the mode of transportation to be used. (See 6.2.)

5.3 Marking. In addition to the markings required by contract or order, unit packages and shipping containers shall be marked in accordance with the requirements of MIL-STD-129.

6. NOTES.

6.1 Intended use. Grades A, C and D of cellulose acetate described in this document are intended for use as a plastic in ammonium-nitrate-based solid propellants and grade B as a plastic in plasticized cellulose acetate restrictor.

6.2 Ordering data. Procurement documents should specify the following:

- (a) Title, number, and date of this document.
- (b) Whether a preproduction sample is required (see 3.1).
- (c) Grade of cellulose acetate (see 1.2).
- (d) Type and size of shipping container (see 5.2.3).

6.3 Definition.

6.3.1 Batch. A batch is defined as that quantity of material which has been subjected to one or more chemical or physical processes (or combinations thereof) intended to produce a desired product having substantially uniform characteristics. The final step in the processing must have treated the entire contents of the batch at one time.

6.4 Safety and health warning. When the use of any chemical is specified herein, suitable safety and health precautions should be observed.

6.5 Acceptable products. Acceptable products under this document are as follows:

- Grade A - Cellulose Acetate E-398-3 manufactured by Eastman Chemical Products, Inc., Kingsport, Tennessee.
- Grade B - Cellulose Acetate E-398-10 manufactured by Eastman Chemical Products, Inc., Kingsport, Tennessee.
- Grade C - Cellulose Acetate E-394-60 manufactured by Eastman Chemical Products, Inc., Kingsport, Tennessee.
- Grade D - Cellulose Acetate HLFS-85 produced by Celanese Polymer Company, New York, New York.

Custodian:
NASC 52021E

Preparing Activity:
NWC/China Lake, California