MIL-C-216B
30 Dec 1976
SUPERSEDING
MIL-C-216A
3 July 1962
(see 6.6)

MILITARY SPECIFICATION

CELLULOSE, WOODPULP (SULFITE)

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

1. SCOPE

1.1 Scope. This specification covers two grades of cellulose, woodpulp sulfite (see 6.2).

1.2 Classification. The cellulose, woodpulp sulfite shall be of the following grades:

Grade A - 95 percent alpha cellulose, minimum (min)
Grade B - 90 percent alpha cellulose, min

2. APPLICABLE DOCUMENTS

2.1 Issue of documents. 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.

SPECIFICATIONS

FEDERAL

UU-P-31	Paper, General Specification and Methods of Testing
UU-P-268	Paper, Kraft, Untreated Wrapping
PPP-T-45	Tape, Gummed Paper, Reinforced and Plain for Sealing and Securing
PPP-T-76	Tape, Pressure Sensitive Adhesive, Paper, Water-Resistant (for Carton Sealing)
MMM-A-260	Adhesive, Water-Resistant for Sealing Waterproof Paper

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Picatinny Arsenal, Dover, New Jersey 07801 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

FSC: 6810

MILITARY

MIL-E-199	Ether Diethyl
MIL-N-244	Nitrocellulose
MIL-A-48078	Ammunition, Standard Quality Assurance Provisions, General Specification For.

STANDARDS

MILITARY

MIL-STD-129	- Marking for Shipment and Storage

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 shall apply.

TAPPI METHOD

Technical Association of the Pulp and Paper Industry

(Application for copies should be addressed to the Secretary, TAPPI, 1 Dunwoody Park, Atlanta, Ga. 30341).

UNIFORM CLASSIFICATION COMMITTEE

Uniform Freight Classification

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

AMERICAN TRUCKING ASSOCIATION PUBLICATION

National Motor Freight Classification Rules and Container Specifications

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

3. REQUIREMENTS

3.1 Material. The material used in the manufacture of sulfite woodpulp cellulose shall be bleached sulfite pulp from coniferous woods or a blend of coniferous and broadleaf woods of which at least 85 percent shall be coniferous wood. The bleached sulfite woodpulp shall have been washed to remove purifying chemicals.

3.2 Physical and chemical properties

3.2.1 Physical properties. The physical properties of the woodpulp cellulose when tested as specified in applicable paragraph listed in Table I or as otherwise specified in the contract.

Table I Physical Properties

Property	Minimum	Maximum	Applicable Paragraph
Density[1] gm/cm^3	...	0.80	4.5.2
Thickness, (mm)	1.015	1.390	4.5.3
Weight, grams per sq meters	610.0	...	4.5.4

1 gram per cubic centimeter over dry basis (O.D.).

3.2.2 Chemical. The woodpulp cellulose shall conform to the limits of the properties specified in Table II when tested in accordance with the applicable paragraph.

Table II Chemical Properties

Property	Grade A		Grade B		Applicable
	Minimum	Maximum	Minimum	Maximum	Paragraph
Moisture		10.0		10.0	4.5.1
Viscosity Centipoises	10.0	21.8	10.0	21.8	4.5.5
Alpha Cellulose	95.0	....	90.0	....	4.5.6
Ether Extractive Matter	....	0.20	....	0.40	4.5.7
Alkali soluble matter	....	7.00	....	15.00	4.5.8
Ash	....	0.30	....	0.50	4.5.9

3.3 Nitration. The nitrated woodpulp cellulose shall conform to Grade A, type II or Grade B nitrocellulose of MIL-N-244.

3.4 First article testing. This specification makes provisions for first article testing. Requirements for the submission of first article samples by the contractor shall be as specified in the contract (see 6.2).

3.5 Workmanship. The woodpulp cellulose shall be free from oil, grease, and other foreign material when examined as specified in 4.4.2.2, 4.4.2.3 and 4.4.2.4.

ems to the require- 3.6 Type II. Type II ethyl alcohol shall be made from alcohol which conic

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection and standard quality assurance provisions. Unless otherwise specified herein or in the contract, the provisions of MIL-A-48078 shall apply and are hereby made a part of this detail specification.

4.2 Classification of inspections. The following types of inspections shall be conducted on this item:

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

4.3 First article inspection.

4.3.1 Submission. The contractor shall submit a first article sample as designated by the Contracting Officer for evaluation in accordance with provisions of 4.3.2. The first article sample shall consist of 7 to 10 tons of cellulose woodpulp in accordance with instructions issued by the Contracting Officer.

4.3.2 Inspection to be performed. The sample will be subjected by the Government to any or all of the examinations or tests specified in 4.5 of this specification. In addition, the woodpulp cellulose sulfite shall be shredded and nitrated to grade A, type II or grade B nitrocellulose of Specification MIL-N-244 to determine suitability in plant scale equipment.

4.3.3 Rejection. See MIL-A-48078.

4.4 Quality conformance inspection.

4.4.1 Inspection lot formation. Inspection lots shall comply with lot formation provisions of MIL-A-48078. In addition, inspection lots of cellulose woodpulp, sulfite shall contain:

a. Cellulose woodpulp from not more than one lot from one manufacturer.

4.4.2 Examination. Unless otherwise specified in the Classification of Defects and test tables, sampling plans for major and minor defects shall be in accordance with MIL-STD-105, Inspection Level II (See MIL-A-48078).

CLASSIFICATION OF DEFECTS & TESTS

MIL-C-216B

PARAGRAPH	TITLE		SHEET 1 OF 1		DRAWING NUMBER
4.4.2.1	Core				NA
					NEXT HIGHER ASSEMBLY
CATEGORY	EXAMINATION OR TEST	NO. OF SAMPLE UNITS	AQL OR 100%	REQUIREMENT PARAGRAPH	PARAGRAPH REFERENCE /INSPECTION METHOD
Critical	None defined.				
Major:	None defined.				
Minor:					
201.	Inside diameter		0.65	5.1 & 5.2	Gage

NOTES:

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CLASSIFICATION OF DEFECTS & TESTS

PARAGRAPH	TITLE		SHEET 1 OF 1		DRAWING NUMBER
4.4.2.2	Sheets prior to winding				NEXT HIGHER ASSEMBLY
CATEGORY	EXAMINATION OR TEST	NO. OF SAMPLE UNITS	AQL OR 100%,	REQUIREMENT PARAGRAPH	PARAGRAPH REFERENCE /INSPECTION METHOD
Critical	None defined.				
Major:					
101.	Width		0.40	5.1	Gage
Minor:					
201.	Length min.		0.65	5.1	Gage
202.	Evidence of poor workmanship		0.65	3.5	Visual

NOTES:

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CLASSIFICATION OF DEFECTS & TESTS

MIL-C-216B

PARAGRAPH	TITLE		SHEET 1 OF 1		DRAWING NUMBER
4.4.2.3	Rolls prior to wrapping				NEXT HIGHER ASSEMBLY
CATEGORY	EXAMINATION OR TEST	NO. OF SAMPLE UNITS	AQL OR 100%	REQUIREMENT PARAGRAPH	PARAGRAPH REFERENCE /INSPECTION METHOD
Critical	None defined				
Major:	None defined				
Minor:					
201.	Outside diameter of roll, max.		0.65	5.1	Gage
202.	Core missing		0.65	5.1	Visual
203.	Evidence of poor workmanship		0.65	3.5	Visual

NOTES:

SARPA QA FORM 2567 FEB 74

CLASSIFICATION OF DEFECTS & TESTS

PARAGRAPH	TITLE	SHEET 1 OF 1	DRAWING NUMBER
4.4.2.4	Rolls after wrapping and sealing		NEXT HIGHER ASSEMBLY

CATEGORY	EXAMINATION OR TEST	NO OF SAMPLE UNITS	AQL OR 100%	REQUIREMENT PARAGRAPH	PARAGRAPH REFERENCE /INSPECTION METHOD
Critical	None defined.				
Major:	None defined.				
Minor:					
201.	Protective wrapping, torn, cut, perforated or incomplete		0.65	5.2	Visual
202.	Adhesive missing, incomplete or improperly positioned		0.65	5.2	Visual
203.	Tape incorrect type, missing, incomplete or improperly positioned		0.65	5.2	Visual
204.	Markings incorrect, misleading or unidentifiable		0.65	5.2	Visual
205.	Evidence of poor workmanship		0.65	3.5	Visual

NOTES:

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TABLE III

Classification of Defects

Test	Classification
Moisture	Major
Density	Major
Thickness	Major
Weight	Major
Viscosity	Major
Alpha Cellulose	Major
Ether Extractive Matter	Major
Alkali Soluble Matter	Major
Ash	Major
Nitration	Major

4.4.3 Testing

4.4.3.1 Sampling. The sampling of the cellulose woodpulp shall be in accordance with specification UU-P-31 method 160 or TAPPI Method T414. These samples shall be subjected to the tests of paragraph 4.5. If any sample fails to comply with any requirements, the lot shall be rejected. The classification for the tests shall be as given in Table III.

4.4.4 Inspection equipment. The government reserves the right to inspect the contractor's equipment and determine that he has available and utilizes correctly, measuring and test equipment of the required accuracy and precision and that the instruments are of the proper type and range to make measurements of the required accuracy. Commercial inspection equipment, shall be employed where applicable for all tests and examinations specified in 4.4 and 4.5. The contractor is responsible for assuring proper calibration procedures are followed. Government approval of all inspection equipment is required prior to its use for acceptance purpose (see 6.3).

4.5 Test methods and procedures (see 6.4). The tests in 4.5.1 through 4.5.9 shall be performed using prescribed analytical procedures for duplicate determinations given in standard analytical textbooks.

4.5.1 Determination of moisture. The percentage of moisture shall be determined in accordance with Specification UU-P-31, Method 240 or Tappi Method T412. The percentage of moisture shall be calculated as follows:

$$\text{Moisture percent} = \frac{(A-B)\ 100}{A}$$

Where:

A = weight in grams (gm) of original specimen
B = weight in gm. of dried specimen

The Moisture Factor (F) used as a correction factor to reduce "as is" test specimens to a dry basis for use in other determinations shall be calculated as follows:

$$\text{Moisture Factor (F)} = \frac{B}{A}$$

Where:
B = weight in gm. of dried specimen
A = weight in gm. of original specimen

The dried specimen shall be retained for the determination of ether extractive matter in 4.5.7.

4.5.2 Determination of density. The density shall be determined in accordance with Specification UU-P-31, method 110 or TAPPI Method T411m, except that the calculation shall be made in gm per cubic centimeter.

4.5.3 Determination of thickness. The thickness shall be determined in accordance with Specification UU-P-31, method 173 or TAPPI Method T411m.

4.5.4 Determination of weight. The weight shall be determined in accordance with Specification UU-P-31, method 110 or TAPPI Method T410m, except that calculation shall be made in gm per cubic centimeter.

4.5.5 Viscosity. The viscosity shall be determined in accordance with TAPPI, Method T230 (0.5 percent Cuprietheylene-diamine Method.)

4.5.6 Alpha Cellulose. The percentage of alpha cellulose shall be determined in accordance with Specification UU-P-31, method 201 or TAPPI Method T235.

4.5.7 Ether extractive matter. The specimen retained from the moisture determination (see 4.5.1) shall be transferred to a Soxhlet or similar extractor. Sufficient ether, diethyl (see MIL-E-199) to carry out the extraction shall be added, and the specimen shall be extracted on a steam bath for a minimum of 3 hours. The ether extract shall be poured into a tared 250 milliliter (ml) beaker. The flask and the extractor shall be individually rinsed with several small portions of ether, and the rinsings shall be added to the contents of the beaker. The beaker shall be placed on a steam bath in the hood, with filter paper under it. The contents of the beaker shall be carefully evaporated. A gentle current of air if available, may be used to aid the evaporation. After the ether has evaporated, the beaker and residue shall be transferred to a drying oven maintained at 105° ± 5°C. and dried for a period of one hour. At the conclusion of this period the beaker shall be cooled in a desiccator and weighed. The percentage of ether extractive matter shall be calculated on a moisture free basis as follows:

$$\text{Percentage of ether extractive} = \frac{(A-B)\ 100}{W}$$

Where:

A = weight of beaker and residual gms, after evaporation
B = weight in gms of empty beaker
W = weight of specimen (dried) in gms.

4.5.8 Alkali soluble matter. A portion of the undried sample, of approximately 2.0 gms weighed to the nearest 0.1 milligram (mg) shall be transferred to a 250 ml Erlenmeyer flask. A volume of 100 ml of 1.92 ± 0.10 normal (N) sodium hydroxide solution shall be added to the flask. The flask shall be fitted with a rubber stopper through which passes a long glass tube (min 92 cm) which services as an air cooled reflux condenser. The flask shall be permitted to reflux for 3 hours at a temperature of 100° ± 2°C. At the end of this period, the contents of the flask shall be poured into a two liter flask containing one liter of distilled water. The excess alkali present shall be neutralized using an excess of acetic acid solution; blue litmus paper may be employed as an indicator. A clean, dry, prepared Gooch crucible shall be placed in a clean, dry, glass-stoppered weighing bottle. The crucible and the weighing bottle shall be weighed to the nearest 0.1 mg. The contents of the beaker shall be transferred to the Gooch crucible within 5 minutes. The cellulose residue in the Gooch crucible shall be thoroughly washed with successive portions of hot, distilled water, alcohol and ether. The crucible and contents shall be placed in an oven maintained at 105° ± 2°C. for 2 hours. The crucible shall then be placed in a weighing bottle and the weighing bottle, glass stopper, and contents shall be cooled to room temperature in a desiccator. The stopper shall be replaced in the weighing bottle and then the weighing bottle and its contents shall be weighed. The drying, cooling, and weighing procedures shall be repeated at hourly intervals until two successive weighings do not differ by more than 0.5 milligram or there is no gain in weight. The percent of alkali soluble matter shall be calculated on a moisture free basis as follows:

$$\text{Percentage of alkali soluble matter} = \frac{(FA) - B}{FA} \times 100$$

Where:

A = weight in gms of original specimen
B = weight in gms of dried residue
F = moisture factor (see 4.5.1)

4.5.9 Ash. The percentage of ash present shall be determined in accordance with Specification UU-P-31, method

202 or TAPPI Method T413. The percentage of ash shall be calculated on a moisture free basis as follows:

$$\text{Percentage of ash} = \frac{100\ A}{B\ F}$$

Where:

A = weight of ash in gms
B = weight of "as is" specimen
F = moisture factor (see 4.5.1)

5. PREPARATION FOR DELIVERY

5.1 Packing

5.1.1 Level A. Unless otherwise specified, cellulose woodpulp may be furnished in rolls. Each roll shall be supported by a central core of approximately 3 inches inside diameter. Rolls shall be suitably restrained from unwinding. Each roll may be completely wrapped and headed with at least one thickness of Kraft paper, Grade B, 60 pound basis weight in accordance with Specification UU-P-268. The paper may be sealed with Grade B adhesive in accordance with Specification MMM-A-260 or with four inch wide water resistant tape complying with Specification PPP-T-45 Type 1, or 3 inch wide water resistant tape complying with Specification PPP-T-76, centered along the edge of the paper and applied across the full width of the roll.

5.1.2 Level C. Unless otherwise specified, rolls, supported on cores shall be packed to afford protection against damage during direct shipment from the supply source to the first receiving activity for immediate use. Shipment shall comply with Uniform Freight Classification Rules and Container Specification for truck shipments, as applicable.

5.2 Marking. Unless otherwise specified, marking shall be in accordance with MIL-STD-129.

6. NOTES

6.1 Intended use. The intended use of the cellulose woodpulp (sulfite) is for the manufacture of nitrocellulose.

6.2 Ordering data for MIL-A-48078. Procurement documents should specify the following:

a. Grade required (see 1.2)
b. Level of packing required (see 5.1)

6.3 Submission of inspection equipment designs for approval. See MIL-A-48078. Submit equipment designs, as required, to Commander, Picatinny Arsenal, ATTN: SARPA-QA-T, Dover, New Jersey 07801.

6.4 Prior approval of the Contracting Officer is required for use of equivalent test methods. A description of the proposed method should be submitted through the Contracting Officer to: Commander, Picatinny Arsenal, ATTN: SARPA-QA-A-P, Dover, New Jersey 07801. This description should include but not be limited to the procedures used, the accuracy and precision of the method, test data to demonstrate the accuracy and precision and drawings of any special equipment required.

6.5 Unless otherwise specified, a certificate of compliance shall be submitted.

6.6 Changes from previous issues. Asterisks are not used in this revision to identify changes with respect to the previous issue, due to the extensiveness of the changes.

Custodian:

Army - PA
Navy - OS

Preparing activity:

Army - PA

Project No. 6810-B088

rous to personnel. All applicable safety rules regul- ... chemical material which is potentially dange

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5. PROBLEM AREAS

a. Paragraph Number and Wording:

b. Recommended Wording

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7a. NAME OF SUBMITTER *(Last, First, MI)* – Optional	b. WORK TELEPHONE NUMBER *(Include Code)* – Optional
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DD FORM 82 MAR 1426

PREVIOUS EDITION IS OBSOLETE.

MILITARY SPECIFICATION
CELLULOSE, WOODPULP (SULFITE)

This interim Amendment is issued for use by the US Army Armament Research and Development Command with Military Specification MIL-C-216B dated 30 December 1976.

PAGE 3

Paragraph 3.2.1 Physical Properties

Table I, Density - Delete "0.80 Max." and substitute "0.84 Max."

Custodian:
Army (AR)

Preparing Activity:
Army (AR)

Project No. 6810-AB17

FSC: 6810