

MIL-P-70475 (AR)
8 JUNE 1984

MILITARY SPECIFICATIONS

PAPER, NITROCELLULOSE BASE

This specification is approved for use by the US Army Armament, Munitions and Chemical Command, and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 This specification covers requirements, quality assurance provisions and packaging for the paper used to manufacture container assemblies for the propelling charges designated as M204/205 Charge, Propelling, used on the Lightweight Company Mortar System (LWCMS) and 81MM, M29A1 Mortar System.

2. APPLICABLE DOCUMENTS

2.1 Governments documents.

2.1.1 Specifications and standards. Unless otherwise specified (see 6.2), the following specifications and standards of the issue listed in that issue of the Department of Defense Index of Specifications and Standards (DoDISS) specified in the solicitation, forms part of this specification to the extent specified within.

SPECIFICATIONS

MILITARY

MIL-A-48078 - Ammunition, Standard Quality Assurance Provisions, General Specification For

STANDARDS

MILITARY

MIL-STD-286 - Propellants, Solid: Sampling, Examination and Testing

2.1.2 Other government documents, drawings, and publications.

The following other government documents, drawings, and publications form a part of this specification to the extent specified herein.

FSC 1375

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, US Army Armament Research and Development Center, Attn. DRSMC-QA, 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.

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DRAWINGS

US ARMY ARMAMENT RESEARCH AND DEVELOPMENT CENTER

9381562 - Composition (Paper)

(Copies of specifications, standards, handbooks, drawings and publications required by manufacturers in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting officer.)

PUBLICATIONS

TECHNICAL ASSOCIATION OF THE PULP AND PAPER INDUSTRY (TAPPI)

- TAPPI T400 Sample and Accepting a Single Lot of Paper, Fiberboard, or Related Products.
- TAPPI T410 Weight Per Unit Area (Basis Weight or Substance) of Paper and Paperboard.
- TAPPI T411 Thickness (Caliper) of Paper and Paperboard.
- TAPPI T412 Moisture Content of Paper and Paperboard by Oven Method.
- TAPPI T494 Tensile Breaking Properties of Paper and Paperboard (Using Constant Rate of Elongation Apparatus).

(Application for copies should be addressed to: Technical Association of the Pulp and Paper Industry, TAPPI, 1 Dunwoody Park, Atlanta, GA 30341).

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- ASTM D685 Conditioning paper and paper products for testing.

(Applications for copies of ASTM publications should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103).

Technical society and technical association specifications and standards are generally available for references from libraries. They are also distributed among technical groups and using Federal Agencies.

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2.1.3 Order of precedence. In the event of a conflict between this specification and the reference cited herein, the text of this specification shall take precedence.

3. REQUIREMENTS

3.1 Paper. The paper shall comply with all the requirements specified in this specification, and with all requirements specified in applicable specifications and compositions listed on drawing 9381562 when tested in accordance with paragraph 4.5.1.

3.2 Form and dimensions. The paper shall be furnished in rolls of the width and length as specified in the contract or order.

3.3 Tensile strength.

3.3.1 Breaking strength. The paper shall have a tensile strength in the machine direction of 100 kilograms per meter, minimum, cross direction 80 kilograms per meter, minimum, when tested in accordance with paragraph 4.5.3.

3.3.2 Elongation. The paper shall exhibit a minimum of elongation in the machine direction of 1.3 percent, in the cross direction of 1.75 percent when tested in accordance with paragraph 4.5.3.

3.4 Thickness (caliper). The thickness of the paper shall be 0.050 plus or minus 0.005 inches when tested in accordance with paragraph 4.5.4.

3.5 Basis weight. The basis weight of the paper shall be 488 ± 24 grams per square meter when tested in accordance with paragraph 4.5.5.

3.6 Stability. The paper shall not completely change the color of the methyl violet paper to salmon pink color in less than thirty-five minutes when tested in accordance with paragraph 4.5.2.

3.7 Moisture content. The paper shall have a moisture content of 8 to 16 percent by weight when tested in accordance with paragraph 4.5.6.

3.8 Percent by weight of resin and additives, kraft and polyester staple fiber. The percent by weight of resin and additives, kraft and polyester, staple fiber shall not be less than 12.95 and not more than 21.55 when tested in accordance with 4.5.1.3.5.

3.9 Workmanship.

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3.9.1 Rolls before wrapping. The rolls of paper shall be free from dirt, grit, oil, grease and other foreign material. The paper shall have no blue, gray or other non-conforming colored spots.

3.9.2 Rolls after wrapping. The rolls of paper and wrapping shall be free from oil, grease and other foreign material that may be absorbed by the wrapping.

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. The paper shall have no lumps, spots or high spots before made into a roll.

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

- a. First Article inspection
- b. Quality conformance inspection

4.3 First article inspection. Not required.

4.4 Quality conformance inspection.

4.4.1 Inspection lot formation. Inspection lots shall comply with the lot formation provisions of MIL-A-48078.

Each lot of paper shall contain:

- (1) Nitrocellulose from not more than one lot from one manufacturer.
- (2) Diphenylamine from not more than one lot from one manufacturer.
- (3) Acrylic fibers from not more than one lot from one manufacturer.
- (4) Polyester fibers from not more than one lot from one manufacturer.
- (5) Kraft fibers from not more than one lot from one manufacturer.
- (6) Resin from one manufacturer.
- (7) Resin additives from one manufacturer.

4.4.2 Examination. See MIL-A-48078. Conditioning shall be in accordance with ASTM Method D 685, for a minimum of 4 hours. 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.

QUALITY CONFORMANCE INSPECTION

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CLASSIFICATION OF DEFECTS & TESTS

PARAGRAPH	TITLE	SHEET 1 OF 1		DRAWING NUMBER 9381562	
CATEGORY	EXAMINATION OR TEST	NO. OF SAMPLE UNITS	AQL OR 100%	REQUIREMENT PARAGRAPH	PARAGRAPH REFERENCE / INSPECTION METHOD
4.4.2.1	Paper, Nitrocellulose Base				
<u>Critical</u>	None defined				
<u>Major</u>					
101	Tensile strength test		1/	3.3.1	4.5.3
102	Elongation		1/	3.3.2	4.5.3
103	Thickness		1/	3.4	4.5.4
104	Basis weight		1/	3.5	4.5.5
105	Stability		1/	3.6	4.5.2
106	Composition		1/	3.1	4.5.1
107	Moisture		1/	3.7	4.5.6
<u>Minor</u>					
201	Evidence of poor workmanship		1/	3.9	Visual
NOTE: 1/ Sample size and selection thereof shall be in accordance with TAPPI-T400.					

QUALITY CONFORMANCE INSPECTION

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CLASSIFICATION OF DEFECTS & TESTS

PARAGRAPH	TITLE	SHEET 1 OF 1			DRAWING NUMBER
4.4.2.2	Paper, Nitrocellulose Base, After Wrapping				NEXT HIGHER ASSEMBLY
CATEGORY	EXAMINATION OR TEST	NO. OF SAMPLE UNITS	AQL OR 100%	REQUIREMENT PARAGRAPH	PARAGRAPH REFERENCE /INSPECTION METHOD
<u>Critical</u>	None defined.				
<u>Major</u>					
101	Wrapping material torn or not secure		100%	3.2	Visual
<u>Minor</u>					
102	Evidence of poor workmanship		0.65%	3.9	Visual
NOTES:					

DRSMC-DA (D) Form 160, 1 Aug 83 replaces edition of 1 Jul 77 which may be used until exhausted.

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4.4.3 Testing.

4.4.3.1 Composition (see dwg. 9381562). Five samples shall be selected from each lot and tested in accordance with 4.5.1. The lot shall be rejected if any sample fails to comply with the requirements.

4.4.3.2 Stability. Five samples shall be selected from each lot and tested in accordance with 4.5.2. The lot shall be rejected if any sample fails to comply with the requirements.

4.4.4 Inspection equipment. The inspection equipment required to perform the examinations and tests prescribed herein is described in the "Paragraph Reference/Inspection Method" column in the Quality Conformance Inspection Tables. The contractor shall submit for approval inspection equipment designs in accordance with the terms of the contract. See Section 6 of MIL-A-48078 and 6.3 herein.

4.5 Test methods and procedures. NOTE: "This specification covers sampling and testing of chemical, toxic, or explosive materials which are potentially hazardous to personnel. It is emphasized that all applicable safety rules, regulations, and procedures must be followed in handling and processing these materials".

4.5.1 Composition.

4.5.1.1 Preparation of samples. Each sample shall be cut into approximately 1/4 inch squares. From each sample, approximately 0.5 gram shall be selected for testing and weighed to the nearest 0.2 milligram (Weight A) in an extraction thimble. The same thimble shall be utilized during the extractions in 4.5.1.3.1 and 4.5.1.3.3.

4.5.1.2 Total volatiles. The samples from 4.5.1.1 shall be dried for 3 hours and $100 \pm 2^{\circ}\text{C}$, cooled in a desiccator (1/2 hr. min.), and weighed to the nearest 0.2 mg (Weight W). Calculate the percent total volatiles as follows:

$$\text{Percent (\%)} \text{ Total Volatiles} = \frac{A - W}{A} \times 100$$

4.5.1.3 Analytical procedure.

4.5.1.3.1 Solvent extraction. Using a tared, extraction coarse, sintered glass thimble, extract each sample from 4.5.1.2, with methylene chloride, for a minimum of 16 hours in a Roweg extractor (MIL-STD-286, Method 104.1.3). Evaporate the extract to dryness, using a current of clean, dry air. This extract is to be used for diphenylamine determination in 4.5.1.3.2. Dry the residues (non-extractable material) in the extraction thimbles by aspirating the thimble and contents until the odor of methylene chloride is non discernable. Dry the thimble plus residue for 1/2 hour minimum at

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100 ± 2°C. Cool in a desiccator (1/2 hr. min.). Determine the dry weight of this residue (Weight C) to the nearest 0.2 mg as the difference between this weight and the weight of the empty thimble. The residue is to be used for the nitrocellulose determination in 4.5.1.3.3.

4.5.1.3.2 Diphenylamine (DPA). To the dried extract from 4.5.1.3.1 add 50 milliliters (ml) of glacial acetic acid. If necessary, warm slightly to dissolve the extract, then cool to room temperature. Complete the determination of diphenylamine in the solution according to Method 201.1.4 (starting with paragraph 5.5) of MIL-STD-286 except that 25 ml of methylene chloride is to be added after addition of the potassium iodide solution. When the end point appears to have been reached, (absence of blue color) the flask is stoppered and shaken. If no color appears, the end point has been reached; otherwise, continue titration until the blue color is discharged and shaking produces no further color. Calculate the percent DPA as shown in MIL-STD-286, Method 201.1.4, paragraph 5.13.

4.5.1.3.3 Nitrocellulose. To provide heat conduction to the solvent, place a sufficient quantity of glycerin on the flask bottom and on the surface of the heat source to produce a continuous film. Add 10 ml of ethyl alcohol to the thimble and residue from 4.5.1.3.1 and extract with acetone using the method in 4.5.1.3.1. After extraction dry the residue remaining @ 100 ± 2°C for one hour. Cool in a desiccator (1/2 hr. min.), weigh to the nearest 0.2 mg (Weight D) and save the acrylic determination in 4.5.1.3.4. Evaporate the acetone extract to dryness and add 25 ml of n-butyl acetate and 45 ml of glacial acetic acid. Replace the air with a stream of inert gas (CO₂ or N₂). Maintain the inert atmosphere throughout this test. Reflux the solution for five minutes. Add to the flask, via the condenser, 25 ml of 0.7N ferrous ammonium sulfate (prepared per MIL-STD-286, Method 604.1.1) and 10 ml concentrated hydrochloric acid. Reflux for thirty minutes more to obtain a yellow liquid in which the specimen is completely disintegrated. With the inert gas still running, cool in a water bath to room temperature. Add 5 ml of 20% ammonium thiocyanate solution (MIL-STD-286, Method 706.1) Titrate with a 0.2N titanous chloride solution (MIL-STD-286, Method 601.1.1). Perform a blank titration on the reagents. Calculate percent NC as follows:

$$\text{Percent (\%) NC} = \frac{(46.69) (N) (V-B)}{(EXW)}$$

Where:

V = Volume titanous chloride used for sample, ml
 B = Volume titanous chloried used for blank, ml
 W = Weight of dried sample, gm
 N = Normality of titanous chloride
 E = Percent nitrogen in the nitrocellulose

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4.5.1.3.4 Acrylic.ReagentsSULFURIC ACID - 93 - 98% H_2SO_4 , N_2 FreeMERCURIC OXIDE (HgO) - Reagent Grade, N_2 FreePOTASSIUM SULFATE OR ANHYDROUS SODIUM SULFATE - Reagent Grade, N_2 FreeTHIOSULFATE SOLUTION - 160 g $Na_2S_2O_3 \cdot 5H_2O$ dissolved in one liter of H_2O SODIUM HYDROXIDE - 400 g solid NaOH dissolved in H_2O and diluted to one literMETHYL RED INDICATOR - 1 g methyl red dissolved in 200 ml ethyl alcoholMETHYLENE BLUE INDICATOR - 1 g methylene blue dissolved in 200 ml ethyl alcoholHYDROCHLORIC or SULFURIC ACID STANDARD SOLUTION - 0.1NBORIC ACID SOLUTION - 4 g H_3BO_4 dissolved in 100 ml H_2O HENGAR GRANULESApparatus

DIGESTION - Use Kjeldahl flasks of hard, moderately thick wall-annealed glass with total capacity of 500 to 800 ml. Conduct digestion over a safety-approved heating device adjusted to bring 250 ml H_2O at $25^\circ C$ to a rolling boil in five minutes.

DISTILLATION - Use a Kjeldahl flask of 500 to 800 ml capacity fitted with a rubber stopper. The low end of an efficient scrubber bulb or trap is passed through the rubber stopper to prevent mechanical carry over of a NaOH during distillation. Use rubber tubing to connect the upper end of the bulb to the condenser tube. Trap the condenser outlet to insure complete absorption of distilled NH_3 into boric acid in the receiver.

Analysis

Quantitatively transfer the residue from 4.5.1.3.3 to a Kjeldahl flask, add 3-4 Hengar granules, 0-7g of HgO , 15.0g of K_2SO_4 or Na_2SO_4 , and 25 ml H_2SO_4 to the flask. Place the flask in an inclined position, and heat gently until frothing ceases. Boil the contents of the flask briskly until the solution clears. Continue

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boiling 1/2 hour minimum. Allow the solution to cool to room temperature. Add 200 ml H₂O. Cool the solution to below 25°C. Add 25 ml thiosulfate solution and mix to precipitate the mercury. Tilt the flask and add a layer of 100 ml NaOH solution without agitation. Immediately connect the flask to the distilling bulb on the condenser. With the tip of the condenser immersed in the boric acid in the receiver, rotate the flask to mix the contents thoroughly. Heat the flask until all of the NH₃ has distilled, (approximately 250 ml). Titrate the boric acid solution with the standard acid using a mixed indicator containing four drops of methyl red, and two drops of methylene blue solution. Correct for the reagent blank. Calculate the percent acrylic as follows:

$$\text{Percent (\%) Acrylic} = \frac{(6.05) (V-B) (N)}{W}$$

Where:

V = Volume of standard acid for sample, ml

B = Volume of standard acid for blank, ml

N = Normality of standard acid

W = Dried sample weight, g

4.5.1.3.5 Resin and Additives, Kraft and Polyester Staple Fiber. Calculate the percent (%) resin and additives, kraft and polyester staple fiber as follows:

$$\% \text{ Resin} + \% \text{ additives} + \% \text{ kraft} + \% \text{ polyester staple fiber} = 100 - (\% \text{ NC} + \% \text{ acrylic} + \% \text{ DPA})$$

4.5.1.3.6 Methylene chloride extractables. Calculate the total methylene chloride extractables $\frac{(W-C)}{W} \times 100$ and

the total methylene chloride extractables $\frac{(C-D)}{W} \times 100$

4.5.2 Stability. Samples shall be tested in accordance with MIL-STD-286, Method 404.1.2 heat tests at 134.5°C.

4.5.3 Tensile strength and elongation. Each sample shall be tested in accordance with TAPPI-T494 or approved equivalent. Failure of any sample to comply with the applicable requirement shall cause the lot to be rejected.

4.5.4 Thickness. Each sample shall be tested in accordance with TAPPI-T411. Failure of any sample to comply with the applicable requirement shall cause the lot to be rejected.

4.5.5 Basis weight. Each sample shall be tested in accordance

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with TAPPI-T410. Failure of any sample to comply with the applicable requirement shall cause the lot to be rejected.

4.5.6 Moisture. Each sample shall be tested in accordance with TAPPI-T412. Failure of any sample to comply with the applicable requirement shall cause the lot to be rejected.

5. PACKAGING

5.1 Packaging requirements. The paper shall be placed in black polyester bags (4 to 6mm thickness) with a 8 by 10 inches square blotter. The blotter shall be saturated with a biostatic solution of 5% formaldehyde, 10% acetic acid, and 85% water.

6. NOTES

6.1 Intended use. The materials covered by this specification are intended for use in the manufacture of container assemblies used for M204/205 propelling charges used on the Lightweight Company Mortar System (LWCMS) and 81MM, M29A1 Mortar System.

6.2 Ordering data. See MIL-A-48078.

6.3 Submission of inspection equipment for design approvals. See MIL-A-48078. Submit designs as required to the Commander, Armament Research and Development Center, ATTN: DRSMC-QAT-I(D), Dover, NJ 07801.

6.4 Drawings. Drawings listed in Section 2 of this specification under the heading Armament Research and Development Center (ARDC) may also include drawings prepared by, and identified as ARRADCOM, Edgewood Arsenal, Frankford Arsenal, Rock Island Arsenal, or Picatinny Arsenal drawings. Technical data originally prepared by these activities is now under the cognizance of ARDC.

6.5 Additives. Additives shall have prior approval of the contracting officer. Processing aids are considered additives.

6.6 Data requirements. Deliverable data required by this specification and not referenced elsewhere are cited below. Data shall be furnished to DRSMC-QAT-B(D), ARDC, Dover, N.J. 07801 and parts and container assembly manufacturer.

<u>Paragraph</u>	<u>Data Requirement</u>	<u>Applicable DID</u>
3.3, 3.4, 3.5, 3.6, 3.7, 3.8	Test and Demonstration Reports	DI-P-1906

Custodian:
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Preparing Activity:
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(Project 1375-A286)

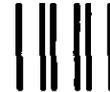
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STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions - Reverse Side)

1. DOCUMENT NUMBER MIL-P-70475 (AR)		2. DOCUMENT TITLE Paper, Nitrocellulose Base	
3a. NAME OF SUBMITTING ORGANIZATION		4. TYPE OF ORGANIZATION (Mark one)	
b. ADDRESS (Street, City, State, ZIP Code)		<input type="checkbox"/> VENDOR	
		<input type="checkbox"/> USER	
		<input type="checkbox"/> MANUFACTURER	
		<input type="checkbox"/> OTHER (Specify): _____	
5. PROBLEM AREAS			
a. Paragraph Number and Wording:			
b. Recommended Wording:			
c. Reason/Rationale for Recommendation:			
6. REMARKS			
7a. NAME OF SUBMITTER (Last, First, MI) - Optional		b. WORK TELEPHONE NUMBER (Include Area Code) - Optional	
c. MAILING ADDRESS (Street, City, State, ZIP Code) - Optional		8. DATE OF SUBMISSION (YYMMDD)	

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