

MIL-C-427A
13 September 1968
SUPERSEDING
JAN-C-427
12 December 1946

MILITARY SPECIFICATION

COMPOSITION C-3

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

1. SCOPE

* 1.1 Scope - This specification covers one grade of Composition C-3 for use in explosive compositions.

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

RR-S-366 Sieve, Test

Military

MIL-R-398 RDX

MIL-C-14003 Caps, Blasting, Special

STANDARDS

Military

MIL-STD-105 Sampling Procedures and Tables for Inspection by Attributes

MIL-STD-129 Marking for Shipment and Storage

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Military (Continued)

MIL-STD-1314

Safety Precautions for Explosive
Loaded Items

MILITARY MANUALS

DSAM 4145.3

AFM 71-4

TM 38-250

NAVWEPS 15-30-500

MCO P4030.19A

Packaging and Handling of Dangerous
Materials For Transportation by Mili-
tary Aircraft

(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 document forms 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.

Department of Transportation

49 CFR 171-190

Department of Transportation (DOT)
Regulations for the Transportation
of Explosives and Other Dangerous
Articles by Land and Water.

(Application for copies should be addressed to the Superintendent of Documents, Government Printing Office, Washington, D. C. 20402. Orders for the publications should cite "The latest issue and supplements thereto.")

3. REQUIREMENTS

- * 3.1 Material - Composition C-3 shall consist of RDX crystals conforming to MIL-R-398 which shall be completely coated with an approved plasticizer (see 6.4), so that the end product shall be suitable for the purpose intended.
- * 3.2 Composition - The composition by weight of Composition C-3 shall conform to the following percentage requirements when tested as specified in 4.3.2.

RDX (Type B, Class A) plus nitrocotton	78.0 ± 2.0
C-3 plasticizer minus nitrocotton	22.0 ± 2.0

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The formulation of Composition C-3 listed in 6.5 should be complied with in order to formulate a composition which will meet all the requirements of this specification.

3.3 Moisture - The moisture content of Composition C-3 when tested as specified in 4.3.3 shall not be greater than 0.25 percent.

3.4 Acetone insoluble material - The acetone insoluble material of Composition C-3 when tested as specified in 4.3.4 shall not be greater than 0.15 percent.

3.5 Acetone insoluble material (inorganic) - The acetone insoluble material (inorganic) of Composition C-3 when tested as specified in 4.3.5 shall not be greater than 0.05 percent.

3.6 Grit - No gritty particles in Composition C-3 shall be retained on a No. 40 U. S. standard sieve and not more than 5 gritty particles shall be retained on a No. 60 U. S. standard sieve (sieves conforming to RR-S-366) when tested as specified in 4.3.6.

* 3.7 Plasticity - Composition C-3 shall undergo a minimum extension of 0.9 inch and a maximum extension of 2.5 inches prior to fracture of the test piece when tested as specified in 4.3.7.

3.8 Detonation - Composition C-3 shall detonate completely and shall effect perforation of the test plate immediately beneath the charge when tested as specified in 4.3.8.

3.9 Acidity - The acidity of Composition C-3 shall not be greater than 0.05 percent when tested as specified in 4.3.9.

* 3.10 Temperature stability - When molded in block form, Composition C-3 shall not exude any free standing lacquer on the surface of bond paper and the block shall retain its basic shape when tested as specified in 4.3.10.

3.11 Workmanship - Composition C-3 shall have a soft putty-like consistency and shall not crumble when kneaded by hand. It shall be free of surface incrustation, coarse gritty particles, visible impurities and foreign matter.

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.

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- * 4.2 Quality conformance inspection - For each lot of material submitted for acceptance, quality conformance inspection shall consist of an examination for acceptability of quality control methods used by the manufacturer, an examination of filled containers for conformance to packaging, packing, and marking requirements (4.2.1.3.2), examination for workmanship (4.2.1.3.1), and all the tests of this specification as specified in 4.3 for conformance to all the requirements of this specification.

- 4.2.1 Sampling -

- 4.2.1.1 Lot and batch - For the purpose of sampling and inspection, a lot shall consist of Composition C-3 from one batch offered for delivery at one time, but not to exceed 60,000 pounds. A batch is that quantity of material which has been subjected to some unit chemical or physical mixing process intended to make the final product substantially uniform.

- 4.2.1.2 For lot acceptance tests -

- * 4.2.1.2.1 Bulk form - Select 10 percent but in no case more than 10 of the containers comprising the lot. By means of a scoop remove from each selected container a sufficient amount of material to form a primary sample of approximately 1/2 pound. Mix this sample thoroughly, place a 4-ounce portion in a rubber-stoppered bottle, and label each primary sample so that the container from which it was taken can be easily identified. Mix the remaining portion of the primary samples thoroughly and quarter until a composite sample of approximately 2 pounds is obtained. Place the composite sample in a rubber-stoppered bottle and label so as to show the name of the material, manufacturer, contract or order number, lot number and number of pounds in the lot. All quality conformance tests shall be made on the composite sample representative of the lot. Hold the primary samples for possible future examination and testing should the composite sample fail to meet the requirements.

- * 4.2.1.2.2 Demolition block - When Composition C-3 is used to make demolition blocks, select 3 blocks at random from each lot. The lot shall be unacceptable if a sample fails to meet any one of the test requirements.

- 4.2.1.3 For examination -

- * 4.2.1.3.1 Examination of Composition C-3 - The samples selected as specified in 4.2.1.2 shall be examined for conformance to the requirements for workmanship (3.11).
- * 4.2.1.3.2 For examination of filled containers - A random sample of filled unit containers and a sample of shipping containers fully prepared for delivery shall be selected from each lot of Composition C-3 in accordance with MIL-STD-105. The Inspection Level shall be I and the Acceptable Quality Level shall be 2.5 percent defective. Containers shall be examined to verify compliance with all requirements of this specification in regard to fill, closure, marking and other requirements not involving tests.

4.3 Tests - Physical and chemical values specified in Section 3 apply to the average of the determinations made on the samples for those values which fall within any stated repeatability or reproducibility limits of the applicable test method.

- * 4.3.1 Conformance of Composition C-3 to the requirements for material (3.1) shall be determined by appropriate testing.

4.3.2 Composition -

4.3.2.1 Preparation of RDX stock solution - Prepare a stock solution of RDX in benzene saturated with RDX at room temperature, and store it in a stock bottle containing an excess of RDX crystals. The supernatant liquid should be as nearly saturated as possible at the temperature at which the analysis is conducted.

4.3.2.2 RDX plus nitrocotton (benzene insoluble material) - Weigh accurately a portion of approximately 5 gm of Composition C-3 and transfer to a tared 50-ml beaker. Add 15 ml of the saturated benzene-RDX stock solution. Crush the lumps with a spatula or stirring rod. When the sample has been thoroughly disintegrated, add 15 ml more of benzene-RDX stock solution, stir a few minutes, and filter on a tared, Gooch type crucible of sintered glass (Ace porosity D or equivalent). Transfer the bulk of the residue to the crucible. Wash the beaker, crucible, and residue five times with the benzene-RDX stock solution, stirring the contents of the crucible while the wash-liquor runs through by gravity. When dripping stops, apply suction to remove the bulk of the residual wash-liquor. Break the vacuum before adding a fresh portion of the benzene-RDX stock solution to prevent precipitation of RDX in the crucible by evaporation and cooling. Dry the beaker and crucible for 2 hours at $70 \pm 2^\circ\text{C}$ ($158 \pm 4^\circ\text{F}$). Cool in a desiccator and weigh beaker and crucible. Calculate the percent RDX plus nitrocotton as follows:

$$\text{Percent RDX plus nitrocotton} = \frac{100 (A + B)}{W}$$

where A = gm of residue contained in the crucible
 B = gm of residue contained in the beaker
 W = gm of moisture-free sample

4.3.2.3 C-3 plasticizer minus nitrocotton - Calculate the percent C-3 plasticizer minus nitrocotton on a dry basis by subtracting from 100 percent, the percent of RDX plus nitrocotton as obtained in 4.3.2.2.

4.3.3 Moisture - Accurately weigh approximately 50 gm of Composition C-3 and transfer to a 500 ml dry, round-bottom flask. Add 200 ml of carbon tetrachloride, dried over anhydrous calcium chloride. Connect the flask with a moisture tube (Figure 1) and condenser (Liebig type, 250 mm straight tube with lower end cut obliquely) by means of corks carefully selected and bored so that vapors will not escape through the connections. There shall be at all times a sufficient stream of cold water through the condenser jacket to condense all the solvent. The moisture tube shall have been previously cleaned with dichromate cleaning solution with not more

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than six determinations run between cleanings. Connect a calcium chloride tube to the top of the condenser to keep out atmospheric moisture. Heat the flask by means of a suitable steam, hot water, or oil bath so that the distillate falls from the end of the reflux condenser in a steady stream. Continue the heating for 30 minutes. Remove the apparatus from the bath and allow to cool to room temperature. Disconnect the apparatus from the condenser and tilt the tube so that sufficient carbon tetrachloride drains back into the flask to bring the water layer into the graduated tube. Drain the upper part of the tube completely so that all the water is collected in the graduated area. Hold the tube in a vertical position and read (1) the top of the upper meniscus of the water layer (straight across), and (2) the top of the carbon tetrachloride layer, estimating to 0.01 ml on each reading. Should the water layer extend beyond the graduated portion of the tube, repeat the determination using a smaller sample. Calculate the percent moisture as follows:

$$\text{Percent moisture} = \frac{100 V}{W}$$

where V = corrected volume of water in ml
W = weight of sample in gm

4.3.4 Acetone insoluble material - Place a weighed portion of approximately 10 gm of C-3 in a 400-ml beaker and add 200 ml of acetone. Heat the sample gently on a steam bath with occasional stirring for 15 minutes. Filter through a tared filtering crucible, transferring all insoluble material to the crucible. Wash with hot acetone, dry at $105 \pm 2^{\circ}\text{C}$ ($221 \pm 4^{\circ}\text{F}$) for 1 hour, cool in a desiccator and weigh. Calculate the increase in weight as percent acetone insoluble material.

4.3.5 Acetone insoluble material (inorganic) - If the percent acetone insoluble is less than 0.05 percent, no further test need be made. If greater than 0.05 percent, ignite the crucible containing the acetone insoluble material, cool in a desiccator and weigh. Calculate the weight of ignited residue as percent inorganic insoluble material.

4.3.6 Grit - Place a weighed portion of approximately 50 gm of C-3 in a 400-ml beaker. Add 100 ml of carbon tetrachloride and heat on a steam bath until all lumps are broken down and all soluble material is dissolved. Decant through a small No. 40 U. S. Standard sieve placed on a No. 60 U. S. Standard sieve retaining the insoluble material in the beaker. Add acetone to the beaker and heat to dissolve the insoluble matter. Pour this mixture through the nest of sieves making sure all insoluble matter is transferred to the sieves. Wash any residue on the sieves with acetone and dry the sieves. Count and examine any particles retained. Note if the particles are grit as indicated by the persistence of a scratching noise when pressing and rubbing the material with a smooth steel spatula on a smooth glass slide.

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4.3.7 Plasticity - Make a cylinder of Composition C-3 approximately 1 inch in diameter and 250 and 300 gm in weight by handworking. Place it in the half-section mold (item 1, Figure 2) and slip a brass ring (item 2, Figure 2) over each end so that the flanges are toward the center. Place the second half-section mold in position, press the composition firmly in at one end and attach the end cap (item 3, Figure 2). Treat the other end similarly, then remove the end-caps and the half-section molds and adjust the distance between the flanges to 1 inch. Hold one ring firmly, and pull the other slowly and steadily along the edge of a graduated rule fixed on a bench so that the cylinder of Composition C-3 is gradually extended. Note the distance between the flanges when fracture occurs. This distance, less 1 inch, is the measure of the extension. The temperature of the Composition C-3 shall be maintained between 25° and 30°C (77° and 86°F) during the test.

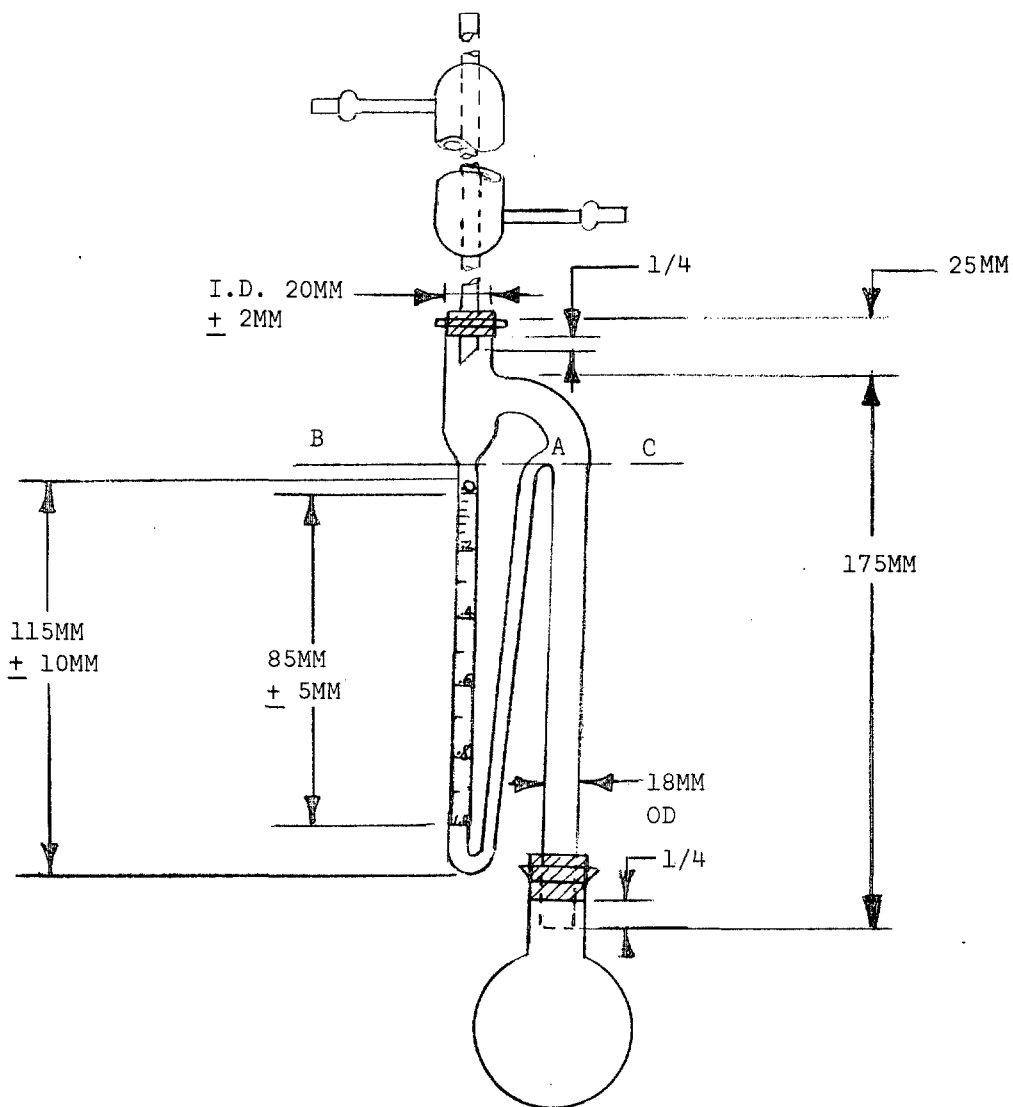
4.3.8 Detonation - Prepare 5 detonation assemblies as follows: Press 20 gm of Composition C-3 into a paper tube, 1 inch long, 1 inch inside diameter and 0.01-inch wall thickness. Make one end of the charge flat and flush with the edges of the paper tube. Select a steel plate 4 inches square and 0.250 inch +0.008 -0.005 inch thick, cut from hot rolled mild steel plate having a carbon content of 0.15 to 0.25 percent. Grease the center of the plate lightly with mineral jelly. Apply the flat end of the charge to the greased center of the plate and press firmly to insure good contact between the charge and the plate. Make the top surface of the Composition C-3 as flat as possible and flush with the top edge of the paper tube. Make a hole 1/4 inch in diameter and 1/2 to 3/4 inch deep in the center of the charge. Place the plate, with charge, on a flat bed of sand at least 4 inches deep. Select an electric blasting cap conforming to the requirements for Type II of MIL-C-14003, except that the base charge shall be not more than 9.5 grains of PETN (pentaerythrite tetranitrate). Insert the cap in the hole and fire. Inspect the plate for perforation immediately beneath the charge. The lot shall be considered acceptable if five complete detonations and five perforations of the steel plate are secured from tests on the five samples that represent the lot.

4.3.9 Acidity - Place a 10 gm sample of C-3 in a liter beaker, add 100 ml of acetone and heat on a steam bath without boiling off the solvent. Crush the lumps and stir until the sample is dissolved. Add 100 ml carbon tetrachloride and stir to insure homogeneous solution, then add 500 ml water. The first 200 ml of water should be added slowly with vigorous stirring to insure complete washing of the carbon tetrachloride. The final 300 ml may be added more rapidly. Cool and add 12 drops of mixed indicator made by dissolving 0.15 gm brom cresol green and 0.10 gm methyl red in sodium hydroxide solution, then neutralized and made up to 250 ml with water. Titrate with 0.05N sodium hydroxide to a blue green end point. Run a blank and correct for acidity or alkalinity of reagents. Calculate the acidity as percent HNO₃ as follows:

$$\text{Acidity as percent HNO}_3 = \frac{6.302 (V-v) N}{W}$$

Where V = ml NaOH used in titration of sample
 v = ml NaOH used in blank titration
 N = normality of NaOH solution
 W = gm of sample

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CAPACITY: 1 ml. in graduated portion

GRADUATION INTERVAL: 0.02 ml. numbered every 0.2 ml. Graduation lines to be etched fine but distinct as follows:

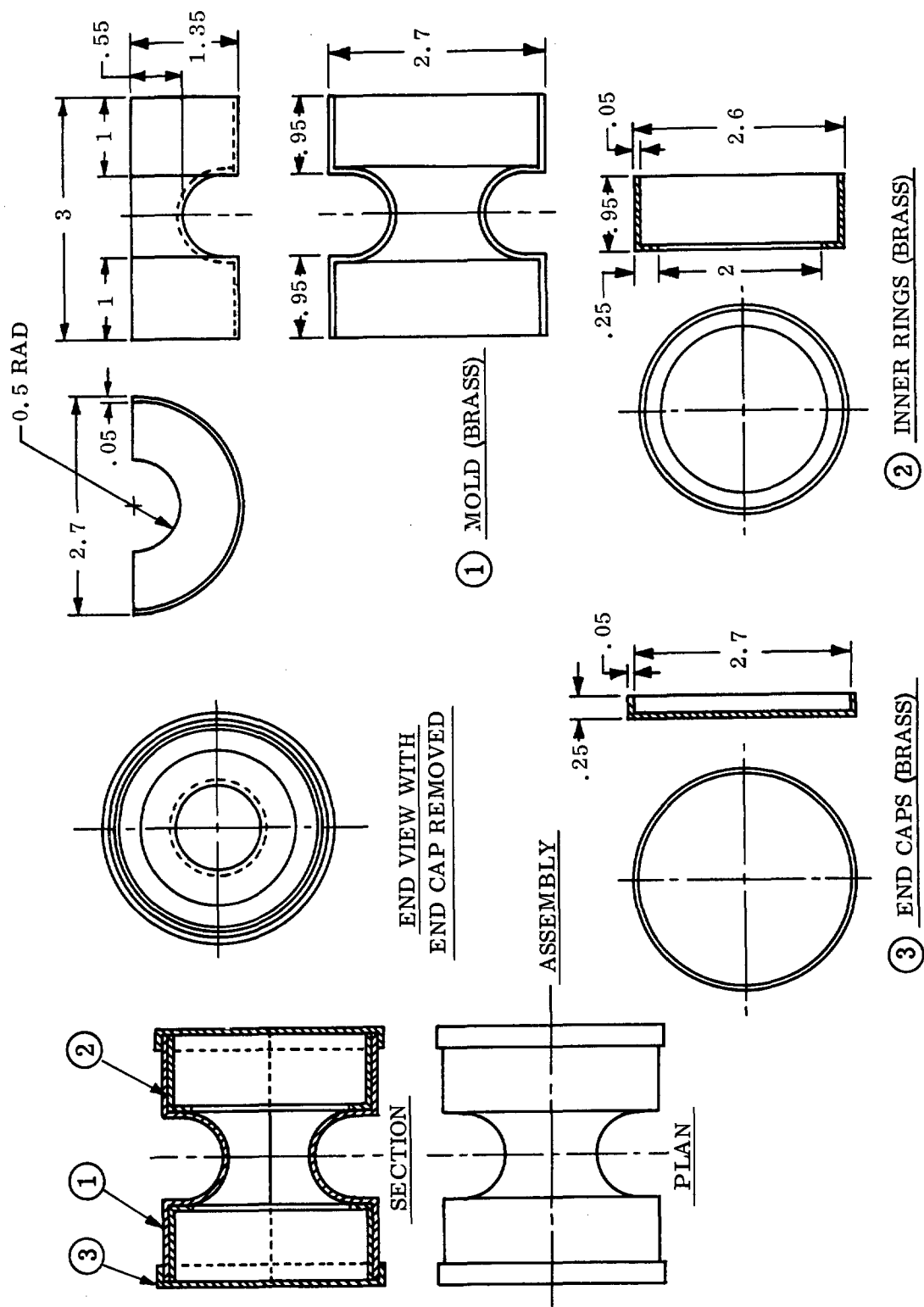
0.2 ml. lines - circumferential
 0.1 ml. lines - 3/4 circumferential
 0.02 ml. lines - 1/2 circumferential

MATERIAL: Pyrex or equal heavy wall glass tubing. Minimum wall thickness of small dia. tube - 1.5mm. Minimum wall thickness of large dia. tube - 2mm.

ACCURACY: 0.01 ml. maximum error at any point.

SPECIAL FEATURE: Overflow point A shall be at least 5mm above line BC.

FIGURE 1. - MOISTURE TUBE ASSEMBLY



DIMENSIONS IN INCHES

FIGURE 2. MOLD FOR PLASTICITY TEST

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- * 4.3.10 Temperature stability - A block of C-3 approximately 4 inches by 2 inches by 1 inch shall be formed by hand in a suitable mold. The molded block shall be placed on a sheet of hard-surfaced white bond paper. The block and paper shall then be placed on a plywood board for support in an environment of 125-135°F (52-57°C) for 4 hours. The block shall be examined for retention of its basic shape and the bond paper examined for any free standing lacquer exudate.
- * 4.4 Rejection criteria - When any acceptance test sample fails to meet any of the test requirements or examinations of this specification or when the number of defective filled containers exceeds the acceptance number as specified in 4.2.1.3.2, the lot represented by the sample shall be rejected.

5. PREPARATION FOR DELIVERY

- * 5.1 Packaging, packing and marking - Packaging, packing and marking shall be in accordance with the Department of Transportation Regulations 49 CFR 171-190. Additionally, when shipment by military air is involved, the requirements in DSAM 4145.3/AFM 71-4/TM 38-250/NAVWEPS 15-03-500/MCO P4030.19A, "Packaging and Handling of Dangerous Materials for Transportation by Military Aircraft" shall be complied with.
- * 5.2 Normal marking - In addition to any marking required by the contract or purchase order, unit packages and shipping containers shall be marked in accordance with MIL-STD-129, including explosive lot number and date of manufacture.

6. NOTES

- * 6.1 Intended use - Composition C-3 is intended for use in explosive compositions, demolition blocks or in loading of ammunition.
- * 6.2 Ordering data - Procurement documents should specify the following:
 - (a) Title and number of this specification
 - (b) Unit quantity and total quantity in pounds
 - (c) Selection of applicable level of packaging and packing required
 - (d) Type and class of unit containers
 - (e) Whether bag liners are required
- * 6.3 General safety precautions - The preparation and handling of the items covered by this specification, and the subassemblies thereof, involve hazardous operations and therefore require explosives safety precautions. Use of this specification will not be construed as to relieve the supplier or manufacturer of responsibility for the safety of his operations. The provisions of MIL-STD-1314 are certain minimum safety requirements recommended for use by the supplier or manufacturer in the preparation and handling of the materials covered by this specification. At the Naval Ordnance Systems Command and other Government plants, these provisions are mandatory.

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- * 6.4 C-3 plasticizer (minus nitrocotton) - The C-3 plasticizer which has been approved for use in the formulation of Composition C-3 consists essentially of the component materials listed below. Authorization pertaining to the substitution of component materials in the approved C-3 plasticizer may be obtained from the Naval Ordnance Systems Command, Department of the Navy, Washington, D. C. 20360.

<u>Component Material (See 6.5)</u>	<u>Nominal Percent by Weight</u>
Tetryl	3
TNT	4
Dinitrotoluene	10
Mononitrotoluene	5

- * 6.5 Advisory formulation for Composition C-3 (see 3.2) -

<u>Component Material</u>	<u>Specification</u>	<u>Type, Grade or Class</u>	<u>Nominal percent by weight</u>
RDX	MIL-R-398	Type B, Class A	77
Tetryl	JAN-T-339	Grade I, Class A	3
TNT	MIL-T-248	Type I, Coarse Flake	4
Dinitrotoluene	MIL-D-204	--	10
Mononitrotoluene	Commercial Technical grade	--	5
Nitrocellulose	MIL-N-244	Grade A, Type I or II	1

- * 6.6 Supersession data - The grade of Composition C-3 furnished under this specification is completely interchangeable with and substitutable for Grade B procured under the previous issue, JAN-C-427 dated 12 December 1966. Composition C-3, Grade A of the previous issue has been deleted from the Federal Supply System.

- * 6.7 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.

Custodians:
Navy - OS
Air Force - 70

User activities:
Navy - AS, CG
Air Force - 70

Review activities:
Navy - OS

Preparing activity:
Navy - OS
(Project No. 1375-0091)

SPECIFICATION ANALYSIS SHEET		Form Approved Budget Bureau No. 119-R004	
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 (as indicated on reverse hereof).			
SPECIFICATION MIL-C-427A		COMPOSITION C-3	
ORGANIZATION (Of submitter)		CITY AND STATE	
CONTRACT NO.	QUANTITY OF ITEMS PROCURED	DOLLAR AMOUNT	
MATERIAL PROCURED UNDER A			
<input type="checkbox"/> DIRECT GOVERNMENT CONTRACT <input type="checkbox"/> 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?			
<input type="checkbox"/> YES <input type="checkbox"/> 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 (Printed or typed name and activity)			DATE

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