

MIL-E-0014970C (AR)  
29 May 1986  

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USE IN LIEU OF  
MIL-E-14970B  
24 September 1974

## MILITARY SPECIFICATION

### EXPLOSIVE COMPOSITION A5

This military specification has been prepared by the US Army Armament Munitions and Chemical Command based upon currently available technical information but has not been approved for promulgation as a coordinated revision of MIL-E-14970B. It is subject to modification. However, pending its promulgation as a coordinated military specification, it may be used in acquisition.

#### 1. SCOPE

1.1 Scope. This Military Specification covers an explosive designated as Explosive Composition A5 (see 6.3).

1.2 Classification. Explosive Composition A-5 shall be of the following classes:

Class 1 - Explosive Composition A-5 which has not been subjected to density/sensitivity test (sampling inspection, see 4.5.3.1).

Class 2 - Explosive Composition A-5 which has passed the density/sensitivity test (100% inspection, see 4.5.3.2.1)

#### 2. APPLICABLE DOCUMENTS

##### 2.1 Government documents.

2.1.1 Specifications and standards. The following specifications and standards form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of these documents shall be those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, U.S. Army Armament Research, Development and Engineering Center, Attn: AMSMC-QA, Dover, New Jersey 07801-5001 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A

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FSC 1376

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## SPECIFICATIONS

## MILITARY

- MIL-S-271 - Acid, Stearic
- MIL-R-398 - RDX

## STANDARDS

## MILITARY

- MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes
- MIL-STD-109 - Quality Assurance Terms and Definitions
- MIL-STD-650 - Explosive: Sampling Inspection and Testing
- MIL-STD-1168- Lot Numbering of Ammunition
- MIL-STD-1171- Acceptance and Description Sheets (For Propellants and Explosives)
- MIL-STD-1218- ACS Chemicals
- MIL-STD-1235- Single and Multilevel Continuous Sampling Procedures and Tables for Inspection by Attributes

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. Unless otherwise specified, the issues shall be those in effect on the date of the solicitation.

## DRAWINGS

## US ARMY ARMAMENT RESEARCH, DEVELOPMENT AND ENGINEERING CENTER (ARDEC)

- 7548644 - Box, Packing for High Explosives; Assembly Details, Packing and Marking
- 7548645 - Carton, Packing, Reusable-Collapsible for High Explosives; Assembly, Details Packing and Marking
- 9257923 - Box, Fiberboard, Packing, Reusable, Collapsible for High Explosives, Single Piece

## NAVAL ORDNANCE SYSTEMS COMMAND

- 2426912 - Explosive Properties Assembly (see 6.7)
- 2426913 - Donor Assembly (see 6.7)
- 2426914 - Acceptor Assembly (see 6.7)
- 2426917 - Attenuator (see 6.7)
- LD549486- Explosive Properties, List of Drawings, Assemblies, Parts, Specifications, Etc.

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(Copies of specifications, standards, 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).

## CODE OF FEDERAL REGULATIONS

49 CFR 100-100 - Department of Transportation Rules and Regulations for the Transportation of Explosives and Other Dangerous Articles

(The Interstate Commerce Commission Regulations are now a part of the Code of Federal Regulations, available from the Superintendent of Documents, US Government Printing Office, Washington, DC 20402. Orders for the above publications should cite "49 CFR".

2.2 Other publications. The following documents(s) form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of the documents which are DOD adopted shall be those listed in the issue of the DODISS specified in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS shall be the issue of the nongovernment documents which is current on the date of the solicitation.

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM Designation E300 - Recommended Practice for Sampling Industrial Chemicals

ASTM D2905 - Statement on Number of Specimens Required to Determine the Average Quality of a Textile Material

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

2.3 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein (except for associated detail specifications, specification sheets or MS standards), the text of this specification shall take precedence. Nothing in this specification, however, shall supersede applicable laws and regulations unless a specific exemption has been obtained.

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## 3. REQUIREMENTS

3.1 Material.

3.1.1 Composition A5. Composition A5 shall consist of Type II RDX, complying with the requirements of MIL-R-398 for RDX and Stearic Acid complying with the requirements of MIL-S-271. The composition shall be made by the wet slurry method by coating the RDX with stearic acid dissolved in cyclohexanone (see 6.6).

3.2 Chemical and physical tests. Unless otherwise specified in the contract or purchase order, Composition A5 shall conform to the requirements specified in Table I when tested as specified by the applicable test methods.

TABLE I Physical and chemical requirements.

| <u>Property</u>                         | <u>Requirement</u> |                | <u>Test Method Paragraph</u> |
|---|--------------------|----------------|------------------------------|
|   | <u>Class 1</u>     | <u>Class 2</u> |                              |
| Composition                             |                    |                | 4.6.1                        |
| RDX, %                                  |                    |                |                              |
| Min.                                    | 98.5               | 98.5           |                              |
| Max.                                    | 99.0               | 99.0           |                              |
| Stearic Acid, %                         |                    |                |                              |
| Min.                                    | 1.0                | 1.0            |                              |
| Max.                                    | 1.5                | 1.5            |                              |
| Insoluble Particles                     |                    |                | 4.6.2                        |
| No. Particles Retained on USSS 40, Max. | 0                  | 0              |                              |
| No. Particles Retained on USSS 60, Max. | 5                  | 5              |                              |
| Moisture, % Max.                        | 0.10               | 0.10           | 4.6.3                        |
| Solvent, % Max.                         | 0.30               | 0.30           | 4.6.4                        |
| Bulk Density, g/cc Min.                 | 0.95               | 0.95           | 4.6.5                        |
| Granulation, % Passing                  |                    |                | 4.6.6                        |
| USSS 12, Min.                           | 99.0               | 99.0           |                              |
| USSS 200, Max.                          | 2.4                | 2.4            |                              |
| Density/Sensitivity                     |                    |                | 4.6.7                        |
| Density, g/cc                           |                    |                |                              |
| Min.                                    | -                  | 1.673          |                              |
| Max.                                    | -                  | 1.755          |                              |
| Average, Max.                           | -                  | 1.746          |                              |
| Sensitivity Explosions, No.             | -                  | 0              |                              |

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3.3 Data requirements. Description Sheets for each lot of Composition A5 produced shall be provided to the Technical Agency in accordance with 4.5.4.

3.4 First article inspection. This specification contains technical provisions for first article inspection. Requirements for the submission of first article samples by the contractor shall be as specified in the contract (see 4.4.1).

3.5 Process controls. The contractor shall submit a Process Control Document to the Government specifying the process variables which are considered critical for the production of Composition A5. The Process Control Document shall be submitted in accordance with 4.2.

3.6 Workmanship. The manufacturer shall use procedures and controls which assure that the Composition A5 produced does not contain foreign material such as dirt, rust, paint or metal chips, etc., and that the safety and reliability of the explosive are not compromised. Compliance with this requirement shall be as specified in 4.6.8.

#### 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 inspections specified herein. Except as otherwise specified in the contract or purchase order, the supplier may use his own or any other facilities suitable for the performance of the inspections 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 the prescribed requirements. Reference shall be made to MIL-STD-109 to define terms used herein.

4.1.1 Responsibility for compliance. All items must meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's over-all inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of assuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling in quality conformance does not authorize submission of known defective material, either indicated or actual, nor does it sommit the Government to acceptance of defective material.

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4.2 Submission of process control data. A Process Control Document shall be submitted to the Technical Agency (AMSMC-QAR-R (D)) in accordance with Data Item Description, DI-P-1604 (Tailored). The document shall contain a description of the process, all materials used, process conditions/procedures and production/inspection equipment used to produce composition A5 meeting the requirements of this specification (see 6.1.2). In addition, whenever there is a change (change in source of materials, process conditions, procedures, etc.), from previously reported process control data, the Technical Agency shall be notified of the new process control data and the reason for the change.

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

- a. First article inspection (see 4.4).
- b. Quality conformance inspection (see 4.5).

4.4 First article inspection.

4.4.1 Submission. When specified in the contract or purchase order, the contractor shall submit a first article sample as designated by the contracting officer for evaluation in accordance with provisions of 4.4.2. The first article sample shall be ten (10) pounds of Composition A5. The sample shall be obtained from the first production lot which has been produced by the contractor using the same production processes, procedures and equipment as will be used in fulfilling the contract. All materials shall be obtained from the same sources of supply as will be used in regular production. A first article quantity, or portion thereof, as directed by the Contracting Officer, shall also be submitted whenever there is a lapse in production of a period in excess of 90 days, or whenever a change occurs in manufacturing process, or in sources of constituents or process materials, drawings or specifications which could affect product uniformity as determined by the Government. Prior to submission, the contractor shall inspect the sample to the degree necessary to assure that it conforms to the requirements of the contract and submit a record of this inspection with the sample. A sample containing known defects will not be submitted unless specifically authorized by the Contracting Officer (see 6.1).

4.4.2 Inspections to be performed. The sample may be subjected by the Government to any or all of the examinations and tests specified in 4.5 and 4.6 of this specification and any or all requirements of the applicable drawings.

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4.4.3 Rejection. If any sample fails to comply with any of the applicable requirements, the first article quantity shall be rejected. The Government reserves the right to terminate its inspection upon any failure of a sample to comply with any of the stated requirements.

4.5 Quality conformance inspection.

4.5.1 Lot formation. A lot shall consist of one or more batches of Composition A5 produced by one manufacturer, in accordance with the same specification or specification revision, under one continuous set of operating conditions. Each batch shall consist of that quantity of Composition A5 that has been subjected to the same unit chemical or physical mixing process intended to make the final product homogeneous. In addition, each lot shall contain:

- a. RDX from one manufacturer only.
- b. Stearic acid from one manufacturer only.

The product shall be submitted for inspection in accordance with MIL-STD-105 unless otherwise specified. The criteria and procedures for the assignment of lot numbers shall be in accordance with MIL-STD-1168.

4.5.2 Examination. Sampling plans and procedures for the following classifications of defects shall be in accordance with MIL-STD-105. Contractor's sampling plans, if used, shall be approved by the Government and shall provide as a minimum, the protection afforded the Government by the sampling plans in MIL-STD-105. Continuous sampling plans in accordance with MIL-STD-1235 may be used if approved by the contracting officer. Also at the option of the contracting officer, AQL's and sampling plans may be applied to the individual characteristics listed, using an AQL of 0.40 percent for each Major Defect and an AQL of 0.65% for each Minor Defect.

QUALITY CONFORMANCE INSPECTION

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CLASSIFICATION OF DEFECTS & TESTS

| PARAGRAPH                         | TITLE  | SHEET |   | NO. OF SAMPLE UNITS | EXAMINATION OR TEST | AQL OR 100%       | REQUIREMENT PARAGRAPH | DRAWING NUMBER                                |
|-----------------------------------|--|-------|---|---------------------|---------------------|-------------------|-----------------------|---|
|                                   |  | OF    | 1 |                     |                     |                   |                       |   |
| 4.5.2.1                           | Wooden or fiberboard box   |       |   |                     |                     |                   |                       | 7548644/7548645<br>NEXT HIGHER ASSEMBLY       |
| <u>CATEGORY</u>                   |  |       |   |                     |                     |                   |                       | <u>PARAGRAPH REFERENCE /INSPECTION METHOD</u> |
| <u>Critical</u>                   | None defined   |       |   |                     |                     |                   |                       |   |
| <u>Major</u><br>101<br>102<br>103 | Foreign matter<br>Liner pierced or torn<br>Liner improperly closed |       |   |                     |                     | 1.0<br>1.0<br>1.0 |                       | Visual<br>Visual<br>Visual                    |
| <u>Minor</u><br>201               | Type of liner incorrect  |       |   |                     |                     | 1.0               |                       | Visual  |
| <u>NOTES:</u>                     |  |       |   |                     |                     |                   |                       |   |



QUALITY CONFORMANCE INSPECTION

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CLASSIFICATION OF DEFECTS & TESTS

| PARAGRAPH       | TITLE                             | EXAMINATION OR TEST | NO. OF SAMPLE UNITS | SHEET OF 1  |                       | DRAWING NUMBER                                |
|-----------------|-----------------------------------|---------------------|---------------------|-------------|-----------------------|---|
|                 |                                   |                     |                     | AQL OR 100% | REQUIREMENT PARAGRAPH |   |
| 4.5.2.2         | Sealed wooden box                 |                     |                     |             |                       | 7548644<br>NEXT HIGHER ASSEMBLY               |
| <b>CATEGORY</b> |                                   |                     |                     |             |                       | <b>PARAGRAPH REFERENCE /INSPECTION METHOD</b> |
| <u>Critical</u> | None defined                      |                     |                     |             |                       |   |
| <u>Major</u>    | Box damaged                       |                     |                     | 1.5         |                       | Visual  |
| 101             | Lot number incorrect or illegible |                     |                     | 1.5         |                       | Visual  |
| 102             | Board broken or split             |                     |                     | 1.5         |                       | Visual/manual                                 |
| 103             | Strapping missing broken or loose |                     |                     | 1.5         |                       | Visual/manual                                 |
| 104             | Top improperly assembled          |                     |                     | 1.5         |                       | Visual/manual                                 |
| 105             |                                   |                     |                     |             |                       |   |
| <u>Minor</u>    | Nail protruding                   |                     |                     | 1.5         |                       | Visual  |
| 201             | Marking incorrect or illegible    |                     |                     | 1.5         |                       | Visual  |
| 202             | Strapping improperly assembled    |                     |                     | 1.5         |                       | Visual/manual                                 |
| 203             |                                   |                     |                     |             |                       |   |
| <b>NOTE:</b>    |                                   |                     |                     |             |                       |   |

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**CLASSIFICATION OF DEFECTS & TESTS**

| PARAGRAPH       | TITLE                                     | SHEET |    | NO. OF SAMPLE UNITS | EXAMINATION OR TEST | AQL OR 100% | REQUIREMENT PARAGRAPH | DRAWING NUMBER | NEXT HIGHER ASSEMBLY | PARAGRAPH REFERENCE / INSPECTION METHOD |
|-----------------|---|-------|----|---------------------|---------------------|-------------|-----------------------|----------------|----------------------|---|
|                 |   | 1     | OF |                     |                     |             |                       |                |                      |   |
| 4.5.2.3         | Sealed fiberboard box                     |       |    |                     |                     |             |                       | 7548645        |                      |   |
| <u>Critical</u> |   |       |    |                     |                     |             |                       |                |                      |   |
| <u>Major</u>    |   |       |    |                     |                     |             |                       |                |                      |   |
| 101             | None defined                              |       |    |                     |                     |             |                       |                |                      |   |
| 102             | Assembly torn or pierced                  |       |    |                     |                     | 1.0         |                       |                |                      | Visual                                  |
| 103             | Lot number incorrect or illegible         |       |    |                     |                     | 1.0         |                       |                |                      | Visual                                  |
|                 | Binding strips broken, missing or loose   |       |    |                     |                     | 1.0         |                       |                |                      | Visual/manual                           |
| <u>Minor</u>    |   |       |    |                     |                     |             |                       |                |                      |   |
| 201             | Marking incorrect or illegible            |       |    |                     |                     | 1.5         |                       |                |                      | Visual                                  |
| 202             | Stitches missing or loose (when required) |       |    |                     |                     | 1.5         |                       |                |                      | Visual/manual                           |
| 203             | Banding strips improperly assembled       |       |    |                     |                     | 1.5         |                       |                |                      | Visual/manual                           |
| <b>NOTE:</b>    |   |       |    |                     |                     |             |                       |                |                      |   |

Replaces DRSMC-QA (D) Form 160, 1 Aug 83, which may not be used.

AMSMC Form 1570, 1 Feb 85

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4.5.3 Testing.

## PRECAUTION WARNING

This specification covers sampling and testing of toxic or hazardous materials. Accordingly, it is emphasized that all applicable safety rules, regulations and procedures must be followed in handling and processing these materials.

4.5.3.1 Sampling of composition A5. The tests in 4.6 shall be performed on samples representative of the batch which were taken in accordance with ASTM Procedure E300, for solids. Approximately 1 kg sample shall be obtained from each batch. The selection of batches for testing shall be in accordance with MIL-STD-1235, CSP-1 Plan, AQL 6.5%. If any sample fails to meet any test requirement, the batch represented by the sample shall be rejected. All batches produced between the time that the last batch was tested and accepted and the batch which failed shall be tested in accordance with the applicable methods given in paragraph 4.6, unless otherwise directed by the contracting officer (see 6.4). If any of these batches fail to meet any of the test requirements, that batch shall also be rejected. In addition, after any failure of a batch the contractor will return to 100% inspection until "i" successive batches are accepted in accordance with MIL-STD-1235. The classification of defects shall be as given in Table II.

4.5.3.2 Sampling for density/sensitivity test. A representative sample of approximately 200 grams Composition A5 shall be taken from the sample obtained in accordance with 4.5.3.1.

4.5.3.2.1 Class 2 composition A5. The inspection of samples shall be 100%. If any sample fails to meet the test requirements of 4.6.7.1 and 4.6.7.2, the batch represented by the sample shall be rejected.

4.5.4 Product testing. Unless otherwise specified, the samples obtained in 4.5.3.1 shall be subjected to the tests listed in Table II. Unless otherwise specified in the contract (see 6.1) the results of the tests shall be reported in accordance with MIL-STD-1171.

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Table II Chemical and physical tests  
required tests

| <u>Inspection/Requirement</u> | <u>Defect Classification</u> |
|-------------------------------|------------------------------|
| Stearic acid content          |                              |
| below minimum requirement     | Critical Defect              |
| above maximum requirement     | Major Defect                 |
| RDX content                   |                              |
| below minimum requirement     | Major Defect                 |
| above maximum requirement     | Critical Defect              |
| Insoluble particles           | Major Defect                 |
| Moisture content              | Major Defect                 |
| Solvent content               | Major Defect                 |
| Bulk density                  | Major Defect                 |
| Granulation                   | Major Defect                 |

4.5.5 Inspection equipment. For the performance of all tests and examinations specified in 4.5 and 4.6, commercial inspection equipment should be employed. The contractor shall have available, and utilize correctly, this equipment and is charged with the responsibility of assuring that proper calibration procedures are followed. Government approval of all inspection equipment is required prior to its use for acceptance purposes (see 6.5).

4.6 Methods of inspection. The following tests shall be performed using prescribed analytical procedures for replicate determinations given in standard analytical textbooks or ASTM Method D2905. Also, unless otherwise specified herein, all chemicals and reagents shall be ACS grade in accordance with MIL-STD-1218 or reagent grade. The density/sensitivity test (4.6.7) shall not be run in duplicate. (See 6.2 for the use of equivalent test methods.)

4.6.1 Composition.

4.6.1.1 Stearic acid content. Place an approximately 5 g portion of the sample in a tared medium porosity filtering crucible. Place the crucible in a vacuum oven set at  $60 \pm 2^{\circ}\text{C}$  for about one hour. Cool in a desiccator and weigh to the nearest 0.0002 g to obtain the sample weight. Extract the specimen with three separate 20 ml portions of chloroform which have been saturated with RDX, maintaining each portion in contact with the residue for approximately five minutes before applying suction. Stir occasionally to break up any lumps and wash down the sides of the crucible with 20 ml portions of chloroform to insure complete removal of the stearic acid. Aspirate the residue until the odor of chloroform is no longer detectable. Place the crucible and contents in a drying oven at  $100^{\circ}$  to  $105^{\circ}\text{C}$  for one half hour. Cool in a desiccator and weigh. Repeat the above extraction, drying and weighing procedure with individual 20 ml portions of chloroform until the loss in weight on two consecutive extractions is less than 0.001 g. Calculate the loss in weight of the crucible plus contents to percent stearic acid, on a moisture-free basis as follows:

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$$\text{Percent stearic acid} = \frac{100A}{W}$$

Where:

A = loss in weight of the crucible plus contents in grams (g).

W = weight of specimen on a moisture-free basis, in grams (g).

4.6.1.2 Stearic acid content alternate method. Place an approximately 5 g portion weighed to the nearest 0.1 mg of the dried sample in a tared, clean, dry, medium porosity filtering crucible containing a filter pad or approved Holston Defense Method (HDC), ASM C-39 as an alternate method. Place the crucible containing the sample into a stainless steel pan. Add 20 ml of aliphatic naphtha saturated with RDX into the crucible and allow the solvent to remain in contact with the explosive, at room temperature, for approximately 5 minutes. Stir the contents of the crucible to break up lumps and to aid in extraction of the sample. Perform all extractions and dispensing of naphtha under a fume hood. Remove the crucible from the pan and place it on a vacuum source to filter off the solvent. Repeat the addition of 20 ml of naphtha, extraction for 5 minutes with occasional stirring and filtering, two additional times. Wash the interior of the crucible with approximately 20 ml of naphtha from a wash bottle. Aspirate the residue until the naphtha solvent is no longer detectable (approx. 2 minutes). Dry the crucible and residue in a drying oven at 90°C to 105°C for approximately 30 minutes. Remove the crucible and residue from the oven and allow it to cool to room temperature in a desiccator and weigh to the nearest 0.0002 g. Calculate the percent of stearic acid on a moisture free basis as follows:

$$\text{Percent, stearic acid} = \frac{100 (X-Y)}{W}$$

Where:

X = initial weight of crucible and contents

Y = final weight of crucible and contents

W = weight of specimen on a moisture free basis

4.6.1.3 RDX content. Place the residue from the determination of stearic acid in a 200 ml beaker and add 100 ml of acetone. Cover the beaker with a watch glass and heat the beaker and contents on a steam bath until the material is dissolved. Filter the contents of the beaker through a tared filtering crucible. The crucible shall have been previously prepared by washing with acetone, igniting and weighing. Care shall be taken to transfer all insoluble matter into the crucible. Wash the residue 3 times with 30 ml portions of acetone. Dry the crucible for 30 minutes in an oven at 105°C ± 5°C, cool in a desiccator and weigh. Calculate the percent of RDX as follows:

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$$\text{Percent, RDX} = \frac{100 (Y-Z)}{W}$$

Where:

- Y = Final weight of crucible and contents from the determinations of stearic acid
- Z = Final weight of crucible and contents.
- W = Weight of original sample on a moisture-free basis.

4.6.2 Insoluble particles. The insoluble particles shall be determined in accordance with MIL-STD-650, Method 106.1 with acetone as the solvent. The material previously obtained in 4.6.1.3 may be used for this determination.

4.6.3 Moisture content. The moisture content shall be determined in accordance with Method 101.4 of MIL-STD-650, with methanol as the special solvent. Use a five gram sample for this determination.

4.6.4 Solvent content. The solvent content of Composition A5 shall be determined with a gas chromatograph (GC) equipped with a flame ionization detector (FID) and an electronic integrator. If the electronic integrator is not capable of printing out a chromatogram a strip chart recorder shall also be used. The GC shall be fitted with a 1/8 inch O.D. stainless steel column of a suitable length (3 ft or 6 ft may be used) packed with 80-100 mesh Porapak P (see 6.8) or a 1/8 inch O.D. teflon lined aluminum column of suitable length (3 ft or 6 ft may be used) packed with 80-100 mesh Porapak P-S (see 6.8). Prior to performing the solvent content determination a calibration curve of peak area versus concentration shall be prepared using cyclohexanone standards of known concentrations. The standards shall be made up by appropriate dilutions of a standard stock solution prepared by accurately weighing 1.0 g to the nearest 0.0001 g into a tared 100 ml volumetric flask, filling the flask with C.P. acetone to the 100 g mark and inverting several times to thoroughly mix the solution. The standard stock solution will contain 0.01 g of cyclohexanone per ml. Suggested GC conditions are as follows: Carrier gas pressure-50 psig (suggested for a 3 ft or 6 ft column); injection temperature - 135 to 150°C; oven temperature - 190 to 210°C; detector and outlet manifold temperature - 200 to 210°C; recorder (if used) chart speed - 0.5 cm/min and injection volume - 1.0 microliters. Appropriate calibration solutions shall first be injected and their peak areas determined. The calibration curve shall be constructed. An approximate 5.0 g sample of Composition A5 shall be weighed to the nearest 0.0001 g and transferred to a 100 ml volumetric flask and C.P. acetone shall be added to below the 100 ml mark in order to dissolve the sample. After the sample has dissolved C.P. acetone shall be added to the 100 ml mark and the flask inverted several times to thoroughly mix the solution. A 1.0 microliter portion of the sample shall be injected into the GC. The percent of cyclohexanone solvent shall be calculated using the following equation:

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$$\text{Cyclohexanone solvent, percent} = \frac{100 (A_1 \times C)}{A_S \times S}$$

Where:  $A_1$  = the cyclohexanone peak area in integrator units (IU) of the sample  
 $A_S$  = The average peak area in IU of the standard sample injection having a peak area nearest to the sample peak area  
 $C$  = the concentration in g/ml of cyclohexanone in the standard sample as above and  
 $S$  = the concentration of Composition A5 in g/ml of the sample injected.

4.6.5 Bulk density. The bulk density shall be determined using a 250 ml graduated cylinder and a 4 inch by 4 inch plywood box which is padded on the inside surfaces with rubber foam having a density of approximately 0.029g/cc. The top of the box shall have a circular hole cut in the center of sufficient diameter so that the cylindrical portion of the graduate fits easily through it. To determine the bulk density of the sample pass the cylindrical portion of the graduate through the hole in the top of the box so that the base of the graduate is in contact with the inside of the box top. Place the top on the box enclosing the bottom portion of the graduated cylinder inside the box. Place the box on a firm flat surface and transfer an accurately weighed to the nearest 0.001g portion of the sample to the graduate. Lift the protruding portion of the graduate until the base comes into contact with the top of the box and release allowing the base of the graduate to strike the padded bottom of the box. Repeat the lifting and dropping procedure until twenty drops have been completed. Read the volume of the compacted powder in the cylinder to the nearest ml. Calculate bulk density in grams per ml, as follows:

$$\text{Bulk density} = \frac{A}{B}$$

Where:  $A$  = weight of powder (g)  
 $B$  = volume of compacted powder (ml)

4.6.6 Granulation. Use method specified in Method 204.1 of MIL-STD-650 using the following sieves in the nest:

USS Sieve No. 12  
 USS Sieve No. 200

The nest of sieves shall be shaken for 3 minutes with a mechanical shaker in accordance with local safety rules.

4.6.7 Density/sensitivity test. (See LD549486) A representative sample of Explosive Composition A5 from 4.5.3.1 shall be subjected to the procedures of the following paragraphs:



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4.6.7.1 Loading and calibration of donor assemblies. A minimum batch of twenty-five donor assemblies shall be prepared in accordance with NAVORD Drawing 2426913. Sample donors shall be selected from each batch in accordance with MIL-STD-105 Inspection Level II. These donors shall be assembled in the test arrangement and fired against the block by initiation of the detonator with a 50 volts DC (minimum) 20 amperes (minimum) power supply. To be acceptable for use in the sensitivity test, the average depth of dent produced in the block by the donors must be between 63 and 69 mils and the standard deviation must not exceed 5.0 mils. Each block shall be used once and only once. The measurement of the indentation depth shall be made in accordance with 4.6.7.5.

4.6.7.2 Preparation of acceptor specimens and measurement of density. The Explosive Composition A5 shall be loaded in eight equal weight increments and each consolidated at  $16,000 \pm 1,000$  psi. The first trial loading shall be with increment weights of 0.16 g of the explosive. The acceptor body (NAVORD Drawing 2426914) shall be weighed before and after loading. If all eight increments fit in the acceptor body with room to spare, adjust the subsequent acceptor by measuring the remaining unloaded column height and increasing equally the weight of each increment to meet the tolerance shown in NAVORD Drawing 2426914. If all eight increments do not fit into the acceptor body, adjust equally the individual increment weights based on the actual weight of explosive contained in the body such that the tolerances shown in NAVORD Drawing 2426914 are obtained. Load another test body to assure that the drawing tolerance has been met. When the adjustment is satisfactory, load the acceptor bodies to form a total of exactly 20 acceptors meeting the tolerance shown in NAVORD Drawing 2426914. The acceptors shall be weighed before and after loading and the density of each individual acceptor shall be determined and reported to three decimal places. The individual densities shall be between 1.673g/ml and 1.754 g/ml and the average density shall not exceed 1.746 g/ml.

4.6.7.3 Sensitivity test assemblies. Twenty explosive properties assemblies shall be prepared in accordance with NAVORD Drawing 2426912 from a random selection of the acceptable donors prepared in accordance with paragraph 4.6.7.1 and the acceptors prepared in accordance with paragraph 4.6.7.2. The concentricity of the acceptor to the dent block shall be within 0.250 inch. The longitudinal axis of the donor, acceptor and barrier shall be made concentric by taping with two wraps of masking tape around the periphery of these pieces to form a single unit.

4.6.7.4 Test procedure. Twenty and only twenty assemblies shall be tested using 3.5 decibang attenuators (NAVORD Drawing 2426917 Pc. No. 41). The dents produced in the witness blocks shall be measured in accordance with paragraph 4.6.7.5.



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4.6.7.5 Measurement of indentation depth. Depth of indentation made in the block by the explosion of the donor or acceptor as applicable, shall be measured with a dial indicator accurate to 0.0001 inch or better. The point of the dial indicator probe shall have an approximate 30 degree included angle and the end of the point shall have a radius of  $0.025 \pm 0.002$  inch. Before measuring the depth of indentation in the block, remove any foreign material, such as deposits, from the dent. Zero the indicator with the point of the probe in the deepest part of the dent. Then take the readings on the surface of the block at four points near the periphery of the block. These points shall be approximately 0.125 inch away from the periphery and 90 degrees apart. The dent shall be computed as the average of the four readings.

4.6.7.6 Acceptance criteria. The explosive shall be considered to have passed the density/sensitivity test if, for the specified loading pressure, all densities fall between 1.673 and 1.754 and the average does not exceed 1.746. The explosive shall be considered to have passed the sensitivity test, if there are no acceptor explosions in the 20 trials. Any reaction causing a dent of 0.0020 inch or more shall be considered an explosion.

4.6.8 Workmanship. Visually examine the production of Composition A5 and all samples shall be submitted for testing to verify compliance with the requirements given in 3.6.

## 5. PACKAGING

5.1 Packing. (See Code of Federal Regulations 49CFR 100-199)

5.1.1 Level A. Composition B shall be packed in accordance with Drawing 7548644.

5.1.2 Level B. Composition B shall be packed with Level A packing requirements.

5.1.3 Level C. Composition B shall be packed in accordance with Drawing 7548645 or 9257923.

5.2 Marking.

5.2.1 Level A. Composition B shall be marked in accordance with Drawing 7548644.

5.2.2 Level B. Composition B shall be marked in accordance with Level A marking requirements.

5.2.3 Level C. Composition B shall be packed in accordance with Drawing 7548645 or 9257923.

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## 6. NOTES

6.1 Ordering data.6.1.1 Acquisition requirements.

- a. Title, number and date of this detail specification.
  - b. Quantity required and delivery schedules.
  - c. Class required (see 1.2).
  - d. First article requirements - sample provisions (see 3.4 and 4.4).
3. Level of packing protection required.

6.1.1.1 Navy acquisition. If specified in the contract or purchase order Composition A5 for Navy acquisition may be supplied from those batches which have been subjected to and have passed the requirement of the density/sensitivity test (4.6.7). The Naval Sea Systems Command restricts Navy procurement to Class 2 only.

6.1.2 Data requirements. When this specification is used in a procurement contract which incorporates DD Form 1423, acceptance and description sheets prepared in accordance with MIL-STD-1171, DRSAR-P-702-109 or as directed in the contract shall be supplied by the contractor. In reporting the density/sensitivity tests results all individual sample densities and sensitivities shall be included. In addition, the Process Control Document (see 3.5 and 4.2) shall be submitted in accordance with DI-P-1604 (tailored).

6.2 Equivalent test methods. The test methods given in this specification are the official methods to be used. The contractor may request using other methods providing that the proposed method is equivalent (accuracy and precision) to the method given in this specification. 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, AMCCOM, ATTN: AMSMC-QAR-R (D), Dover, NJ 07801-5001. 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 (see MIL-I-45208).

6.3 Intended use. Explosive Composition A5 is intended for use as a lead, booster, and main charge explosive by the Army and as a lead and booster by the Navy.

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6.4 Screening for specific defects. At the direction of the contracting officer, and with the recommendation of the preparing activity (AMSMC-QAR-R (D)), batches may be screened for specific defects.

6.5 Submission of inspection equipment designs for approval. Submit designs as required to Commander, AMCCOM, ATTN: AMSMC-QAR-R (D), Dover, NJ 07801-5001.

6.6 Process. The following wet slurry method has been found satisfactory. Molten stearic acid is added concurrently with Cyclohexanone to a RDX water slurry in which the RDX was previously recrystallized with cyclohexanone. The solvent is then removed and the Comp A5 slurry is cooled, filtered, and dried.

6.7 Other use of this drawing. This drawing is included in LD549486.

6.8 Porapak p and porapak p-s. Porapak P and Porapak P-S are products of Waters Associates, Milford Ma.

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

Custodians:  
Army-AR

Preparing activity:  
Army-AR

(Project No. 1376-A294)

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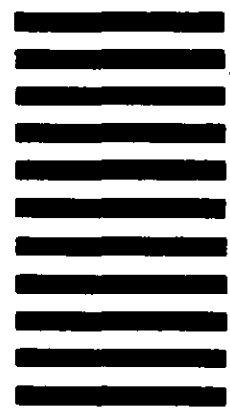
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| 1. DOCUMENT NUMBER<br>MTI-E-0014970C                                 |  | 2. DOCUMENT TITLE<br>EXPLOSIVE COMPOSITION A5  |  |
| 3a. NAME OF SUBMITTING ORGANIZATION                                  |  | 4. TYPE OF ORGANIZATION <i>(Mark one)</i><br><input type="checkbox"/> VENDOR<br><input type="checkbox"/> USER<br><input type="checkbox"/> MANUFACTURER<br><input type="checkbox"/> OTHER <i>(Specify):</i> _____ |  |
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| a. Paragraph Number and Wording:                                     |  |  |  |
| b. Recommended Wording:  |  |  |  |
| c. Reason/Rationale for Recommendation:                              |  |  |  |
| 6. REMARKS   |  |  |  |
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