

MIL-E-46495A (MU)  
30 November 1964  
SUPERSEDING  
MIL-E-46495 (Ord)  
28 February 1961

**MILITARY SPECIFICATION**  
**EXPLOSIVE COMPOSITION HTA-3**

**1. SCOPE**

1.1 This specification covers an explosive composition having two types (Type I and Type II) designated as HTA-3 for use in the loading of warheads and other ammunition items.

1.2 Classification.-Explosive Composition HTA-3 shall be of the following types as specified:

Type I - See Table II and 3.3 to 3.5  
Type II - See Table II and 3.3 to 3.5

**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 this specification to the extent specified herein.

**SPECIFICATIONS**

**MILITARY**

MIL-T-248 - Trinitrotoluene (TNT)  
MIL-A-512 - Aluminum Powder, Flaked, Grained and Atomized  
MIL-A-2550 - Ammunition and Special Weapons,  
General Specification for  
MIL-I-45208 - Inspection Requirements, General  
Specification for  
MIL-H-45444 - HMX  
MIL-O-45445 - Octol  
MIL-C-51077 - Calcium Silicate, Technical

FSC 1375
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MIL-E-46495A (MU)

**STANDARDS**

**MILITARY**

- MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes (ABC-STD-105)
- MIL-STD-109 - Quality Assurance Terms and Definitions
- MIL-STD-129 - Marking for Shipment and Storage
- MIL-STD-650 - Explosives: Sampling, Inspection and Testing
- MIL-STD-1235 - Single and Multilevel Continuous Sampling Procedures and Tables for Inspection by Attributes

**DRAWINGS**

**ORDNANCE CORPS**

- F7548644 - Box, Packing for High Explosives Assembly Details, Packing and Marking
- F7548645 - Carton, Packing, Reusable-Collapsible for High Explosives, Assembly, Details, Packing and Marking

(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 Publications**

**CODE OF FEDERAL REGULATIONS**

- 49 CFR 71-81 - Interstate Commerce Commission 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 (1949 Edition and revisions) available from the Superintendent of Documents, Government Printing Office, Washington 25, D.C. Orders for the above publication should cite "49 CFR 71-78 (latest revisions)".)

MIL-E-46495A (MU)

## 3. REQUIREMENTS

3.1 Material.-The raw materials used in the manufacture of the composition shall be in accordance with the applicable specification in Table I.

TABLE I

Material	Specifications
Octol	MIL-O-45445 - Type I (see 6.4)
HMX	MIL-H-45444 - Type I, Class 2 & 3
TNT	MIL-T-248 - Grade I, Type I
Aluminum	MIL-A-512 - Type III, Grade F, Class 7
Calcium Silicate	MIL-C-51077

3.2 Composition.-The composition of HTA-3, Type I and Type II shall conform to the applicable chemical requirements specified in Table II when tested as specified in the applicable paragraphs.

TABLE II

Material	Percent		Applicable Paragraphs
	Type I	Type II	
TNT	29.0 / 2.0	28.65 / 2.0	4.3.1.1
HMX	49.0 / 2.0	49.0 / 2.0	4.3.1.2
Aluminum	22.0 / 2.0	22.0 / 2.0	4.3.1.4
Calcium Silicate	---	0.35 / 0.05	4.3.1.3

3.3 Moisture content.-The moisture content of Composition HTA-3, Type I and Type II shall be 0.10 percent maximum, when tested as specified in 4.3.2.

3.4 Viscosity.-The viscosity of Composition HTA-3, Type I and Type II, shall be 15 efflux seconds, maximum, when tested as specified in 4.3.3. See 6.6.

MIL-E-46495A (MU)

3.5 Density.-The density (specific gravity) of HTA-3, Type I and Type II shall be 1.85 grams per cubic centimeter minimum when tested as specified in 4.3.4. See 6.6.

#### 4. QUALITY ASSURANCE PROVISIONS

4.1 General quality assurance provisions.-Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified, the supplier may utilize his own facilities or any commercial laboratory acceptable to the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements. Reference shall be made to Standard MIL-STD-109 in order to define terms used herein. The provisions of Specification MIL-A-2550 shall apply.

4.1.1 Contractor inspection system.-The contractor shall provide and maintain an effective inspection system in compliance with the requirements of Specification MIL-I-45208. If due to the nature of the manufacturing process the contractor desires to utilize a quality assurance system, which is at variance with the quality assurance provisions of Specification MIL-I-45208 and other documents referenced herein, he shall submit a written description of the system to the contracting officer for approval prior to initiation of production. It shall include a description covering controls for lot formation and identification, inspections to be performed, inspection stations, sampling procedures, methods of inspection, (measuring and testing equipment,) and provisions for control and disposition of non-conforming material. The written description will be considered acceptable when, as a minimum, it provides the quality assurance provisions required by the provisions of 4.2 and 4.3 and the other documents referenced herein. The contractor shall not be restricted to the inspection station or the method of inspection listed in this specification provided that an equivalent control is included in the approved quality assurance procedure. In cases of dispute as to whether certain procedures of the contractor's system provide equal assurance, the comparable procedure of this specification shall apply. The contractor shall notify the Government of, and obtain approval for, any changes to the written procedure that effects the degree of assurance required by this specification or other documents referenced herein.

MIL-E-46495A (MU)

4.1.2 Submission of product.-At the time the completed lot of product is submitted to the Government for acceptance the contractor shall supply the following information accompanied by a certificate which attests that the information provided is correct and applicable to the product being submitted:

- a. A statement that the lot complies with all quality assurance provisions of the approved current written description of the system.
- b. Number of units of product inspected.
- c. Results obtained for all inspection performed.
- d. Drawing, specification number and date, together with an identification and date of changes.
- e. Certificates of compliance on all material purchased by the contractor when such material is controlled by Government specifications referenced in any of the contractual documents.
- f. Number of items in the lot.
- g. Date submitted.

The certificate shall be signed by a responsible agent of the certifying organization. The initial certificate submitted shall be substantiated by evidence of the agent's authority to bind his principal. Substantiation of the agent's authority will not be required with subsequent certificates unless, during the course of the contract, this authority is vested in another agent of the certifying organization.

4.1.3 Government verification.-Using the contractor's written quality assurance procedure, this detail specification, the applicable drawings and other contractual documents as a guide, the Government inspector shall verify at unscheduled intervals all quality assurance operations performed by the contractor. Verification will be in accordance with Specification MIL-I-45208 and will be performed to the extent necessary to assure compliance with the contractual requirements. Severity of Government inspection of individual characteristics will be directly related to the seriousness of the classification assigned. In no instance will a characteristic classified "critical" be accepted solely on the basis of the contractor's records.

#### 4.2 Inspection provisions

4.2.1 Lot formation.-A lot shall consist of one or more batches of the composition produced by one manufacturer, in accordance with the same specification, or same specification revision, under one continuous set of operating conditions.

MIL-E-46495A (MU)

Each lot shall consist of that quantity of the composition 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. TNT from one lot, from one manufacturer.
- b. Octol from one lot, from one manufacturer. (see 6.4)
- c. Aluminum from one lot, from one manufacturer.
- d. HMX from one lot, from one manufacturer.
- e. Calcium Silicate from one lot, from one manufacturer.

The product shall be submitted for inspection in accordance with Standard MIL-STD-105 (or Standard MIL-STD-1235 when applicable).

4.2.2 Examination.-Sampling plans and procedures for the following classification of defects shall be in accordance with Standard MIL-STD-105. Continuous sampling plans, in accordance with Standard MIL-STD-1235, may be used if approved by the procuring activity. Also, at the option of the procuring activity, 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 percent for each minor defect.

4.2.2.1 Wooden box or fiberboard carton, prior to closing (see Drawing (dwg.) F7548644, F7548645)

Categories	Defects	Method of Inspection	Code No. (see 6.2)
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Critical: None defined.

Major: AQL 0.40 percent

101.	Liner pierced or torn .....	Visual	01001
102.	Liner improperly closed .....	Visual	01002
103.	Foreign matter .....	Visual	01003

Minor: None defined.

4.2.2.2 Sealed wooden box (see dwg. F7548644)

Categories	Defects	Method of Inspection	Code No.
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Critical: None defined.

Major: AQL 0.40 percent

101.	Box damaged .....	Visual	02001
102.	Top improperly assembled .....	Visual	02002
103.	Strapping broken or loose .....	Visual-Manual	02003

## MIL-E-46495A (MU)

Minor: AQL 1.50 percent  
 201. Nail protruding ..... Visual 02004  
 202. Marking misleading or  
 unidentifiable ..... Visual 02005  
 203. Strapping improperly assembled. Visual-Manual 02006

## 4.2.2.3 Sealed fiberboard carton (see dwg. F7548645)

Categories	Defects	Method of Inspection	Code No.
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Critical: None defined.

Major: AQL 0.40 percent  
 101. Assembly torn or pierced ..... Visual 03001  
 102. DOD symbol misleading or  
 unidentifiable ..... Visual 03002  
 103. Strapping broken or loose ..... Visual-Manual 03003

Minor: AQL 0.40 percent  
 201. Marking misleading or  
 unidentifiable ..... Visual 03004

## 4.2.3 Testing

4.2.3.1 Composition of explosive charge (see 3.2-3.5) -  
 Major defect.-Five sample wafers of approximately 100 grams (gms) each shall be taken from the batch at the pouring spout at regularly spaced intervals. One each of the wafers shall be taken near the beginning and near the end of each batch. One half of each wafer shall be ground, thoroughly blended and a portion selected for analysis. Failure of the sample in meeting one or more of the composition requirements shall reject the batch represented by the sample. The analyses shall be performed as detailed in 4.3.

4.2.3.1.1 Reduced sampling.-After twenty (20) consecutive batches have been found acceptable, control limits for the analytical results of each ingredient may be computed and used to prepare a process control chart (see 6.5). The same quantity of wafers shall be selected and prepared for analysis from each batch poured thereafter and a random sample from each 10 shall be analyzed. If all analytical results of the sample are within the established control limits, the nine other samples may be

MIL-E-464854 (MU)

destroyed and the product represented by those samples shall be accepted. If one or more of the ingredients in the analyzed sample are outside the established control limits, but inside the specification limits, the batch shall be accepted and the nine (9) other samples shall be analyzed. All batches within specification limits shall be accepted. If one (1) or more of the nine (9) batches contain one or more ingredients outside the established control limits the following ten (10) batches shall be analyzed and the data from those batches and the ten (10) previous batches shall be used to compute new control limits providing the specification requirements have been met.

4.2.3.1.2 Control limits (see 6.5).--To establish control limits the results obtained from twenty consecutive samples shall be used. These twenty samples are to be divided into five groups as follows:

- Group 1 is samples of batches 1-4
- Group 2 is samples of batches 5-8
- Group 3 is samples of batches 9-12
- Group 4 is samples of batches 13-16
- Group 5 is samples of batches 17-20

The batches shall be accepted if the average range (the average of the individual ranges of the 5 groups) of the twenty batches does not exceed 0.343 times the difference between the upper specification limit and lower specification limit (average range shall be greater than 0.343 (USL-LSL)), and the differences between the upper specification limit and the upper control limit, and the lower specification limit and the lower control limit is equal to or greater than 0.73 times the average range. (USL-UCL shall be equal to or greater than 0.73 times the average range and LSL-LCL shall be equal to or greater than 0.73 times the average range)

#### 4.3 Test methods and procedures

##### 4.3.1 Composition

4.3.1.1 TNT - Code No. 04001.--Place an accurately weighed portion of approximately 2.5 grams in a 200 milliliter (ml) beaker and add 75 ml of benzene saturated with HMX. Cover the beaker with a watch glass and place beaker and contents on a steam bath. Break up the lumps with a glass stirring rod and agitate the solution occasionally by swirling. Remove the beaker and contents from the steam bath when all of the TNT has dissolved, as evidenced by the settling out of the other ingredients. Cool to room



MIL-E-46495A (MU)

temperature and filter the solution quantitatively through a tared medium porosity filtering crucible. Transfer any of the insoluble matter remaining in the beaker into the crucible by using an additional 150 ml of benzene saturated with HMX. Draw air through the crucible until the odor of benzene is no longer detectable. Dry the crucible and contents in an oven maintained at  $100 \pm 5$  degrees Centigrade ( $^{\circ}\text{C}$ ) for one hour. Cool the crucible and contents in a desiccator and weigh. Retain the crucible and contents for the determinations which follow.

Calculate the TNT content of the sample as follows:

$$\text{Percent TNT} = \frac{100 (W-A)}{W-(MW)}$$

Where:

A = Weight of residue in crucible, gms

W = Weight of sample, gms

M = Percent moisture, expressed as a decimal (4.3.2)

4.3.1.2 HMX - Code No. 05001.-Place the crucible and contents retained from the TNT determination on a filtering apparatus and wash with ten 20 ml portions of acetone. Allow each portion of the acetone to remain in contact with the residue in the crucible for one minute before applying suction. Asperate the crucible and contents until the odor of acetone is no longer detectable. Dry the crucible and contents in an oven maintained at  $100 \pm 5^{\circ}\text{C}$  for one hour. Cool in a desiccator and weigh. Wash the crucible and contents with an additional 20 ml portion of acetone, and dry and weigh again. Repeat the washings and weighings until constant weight is obtained. Retain the crucible and contents for the determinations which follow.

Calculate the HMX content of the sample as follows:

$$\text{Percent HMX} = \frac{100 (A-B)}{W-(MW)}$$

Where:

A = Weight of residue in crucible retained from 4.3.1.1, gms

B = Weight of residue in crucible, gms

W = Weight of sample, gms

M = Percent moisture, expressed as a decimal (4.3.2)

## MIL-E-46495A (MU)

4.3.1.3 Calcium Silicate - Code No. 06001 (applicable to Type II only).--Place the crucible and contents retained from the HMX determination on a filtering apparatus and wash with ten 10 ml portions of the sodium hydroxide to remain in contact with the residue in the crucible for one minute before applying suction. Caution should be exercised when performing this procedure to preclude a too vigorous reaction between the aluminum and the sodium hydroxide. Aspirate the crucible and contents for a minimum of five minutes. Wash the crucible and contents with five 20 ml portions of distilled water. Dry the crucible and contents in an oven maintained at 100 ± 5°C for one hour or until constant weight is obtained. Cool in a desiccator and weigh.

Calculate the Calcium Silicate content of the sample as follows:

$$\text{Percent Calcium Silicate} = \frac{100 C}{W - (MW)}$$

Where:

C = Weight of residue in crucible, gms  
 W = Weight of sample, gms  
 M = Percent moisture, expressed as a decimal (4.3.2)

## 4.3.1.4 Aluminum - Code No. 07001

Calculate the aluminum content as follows:

$$\text{Percent Aluminum} = 100 - (A \text{ plus } B \text{ plus } C)$$

Where:

A = Percent TNT (4.3.1.1)  
 B = Percent HMX (4.3.1.2)  
 C = Percent Calcium Silicate (4.3.1.3)

## 4.3.2 Determination of moisture content

4.3.2.1 Special solvent.--The special solvent shall be equal volumes of anhydrous methanol and carbon tetrachloride thoroughly mixed. If necessary the solvents shall be dried by distillation.

4.3.2.2 Method.--Determine the moisture content in accordance with Method No. 101.4 which is described in Specification MIL-STD-650, using solvent indicated in 4.3.2.1.

MIL-E-46495A (MU)

4.3.3 Viscosity.-Determine the viscosity (efflux) in accordance with Method No. 212.1 which is described in Specification MIL-STD-650. See 6.6

4.3.4 Density.-Determine the density in accordance with Method No. 203.1 described in Specification MIL-STD-650.  
NOTE: Use a chunk of the sample to make this determination. See 6.6

## 5. PREPARATION FOR DELIVERY

### 5.1 Packing (see 6.1)

5.1.1 Level A.-The composition shall be packed and marked in accordance with dwg. F7548644.

5.1.2 Level B.-The composition shall be packed and marked in accordance with dwg. F7548645.

## 6. NOTES

6.1 Ordering data.-Procurement documents shall specify title, number and date of this specification as well as level of protection required.

6.2 Inspection code numbers.-The five digit code numbers assigned to the inspection herein are to facilitate future data collection and analysis by the Government.

6.3 Intended use.-The material covered by this specification is intended for use in the manufacture of explosive filler for warheads.

6.4 HTA-3 can be made from Octol and the addition of TNT, Aluminum and Calcium Silicate to conform to the desired composition.

6.5 Calculations of control limits:

$$\bar{X} = \frac{\sum_{i=1}^5 X_i}{5}$$

$$R = X_{max} - X_{min}$$

$$\bar{R} = \frac{\sum_{i=1}^5 R_i}{5}$$

MIL-E-46495A (MU)

$$\bar{X} = \frac{\sum X}{5}$$

$$UCLX = \bar{X} \text{ plus } .73 \bar{R}$$

$$LCLX = \bar{X} \text{ minus } .73 \bar{R}$$

$$UCLR = 2.28 \bar{R}$$

Where:

X = is the determined value by chemical analysis

$\bar{X}$  = Sample mean

R = Range

$\bar{R}$  = Average range

$\bar{X}$  = Grand mean

UCLX = Upper Control Limit for  $\bar{X}$

LCLX = Lower Control Limit for  $\bar{X}$

UCLR = Upper Control Limit for R

NOTE: Lower control limit for R is zero.

6.6 The determination of density and viscosity is not necessary when the WTA-3 is manufactured at the time of loading.

Custodian:  
Army-MU

Preparing activity:  
Army-MU

Project No. 1375-A828

## SPECIFICATION ANALYSIS SHEET

Form Approved  
Budget Bureau No. 119-R004INSTRUCTIONS

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

ORGANIZATION (of submitter)

CITY AND STATE

CONTRACT NO.

QUANTITY OF ITEMS PROCURED

DOLLAR AMOUNT

\$

MATERIAL PROCURED UNDER A



DIRECT GOVERNMENT CONTRACT



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?



YES



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 BY: Printed name and position

FOLD

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