

**MIL-E-22267A**

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**SUPERSEDING****MIL-E-22267(Wep)**

11 APRIL 1962

**MILITARY SPECIFICATION****EXPLOSIVE COMPOSITIONS, HBX TYPE**

*This specification has been approved by the Department of Defense and is mandatory for use by the Departments of the Army, the Navy, and the Air Force.*

**1. SCOPE**

**1.1 Scope.** This specification covers three explosive compositions of the HBX type. These are: HBX-1, HBX-3 and H-6.

**1.2 Classification.** The explosive compositions shall be of the following grades, as specified (see 6.2).

Grade A — HBX type compositions prepared from new components

Grade B — HBX type compositions prepared from re-claimed explosives

**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 — Sieves; Standard, for Testing Purposes

**MILITARY**

JAN-T-248 — Trinitrotoluene (TNT)

MIL-R-398 — RDX

MIL-C-401 — Composition B

MIL-A-512 — Aluminum Powder, Flaked, Grained and Atomized

MIL-C-3301 — Compound, Asphaltic, Hot-Melt (Cavity Lining)

MIL-C-13573 — Calcium Chloride, Anhydrous

MIL-C-18164 — Composition D-2

MIL-C-51077 — Calcium Silicate, Technical

**STANDARDS****MILITARY**

MIL-STD-129 — Marking for Shipment and Storage

**PUBLICATIONS****BUREAU OF NAVAL WEAPONS**

OP 400 — General Instructions for the Design, Manufacture and Inspection of Naval Ordnance Equipment

OD 18796 — Advisory Process for the Preparation of

FSC 1375

**MIL-E-22267A****HBX Type Explosives**

(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.)

**INTERSTATE COMMERCE COMMISSION**

**49 CFR 71-90 — 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 and are available from the Superintendent of Documents, Government Printing Office, Washington 25, D. C. (Orders for the above publications should cite "the latest issue and supplements thereto).")

**3. REQUIREMENTS**

**3.1 Preproduction samples.** Unless otherwise specified in the contract or order, the preproduction sample shall be prepared by using the methods and procedures proposed for the production lot. The sample shall be tested as specified in Section 4 herein for the purpose of determining that the composition meets the requirements of this specification. Provision of the sample shall be as specified in 4.3.1.

**3.2 Form.** Unless otherwise specified in the contract or order, Explosive Composition, HBX Type, shall be supplied in the form of buds or as strips. Approximate dimensions of the strips shall be  $1\frac{1}{2}$  inches wide, 1 inch deep and 3 inches long (see 6.2).

**3.3 HBX preparation.** Advisory process techniques outlined in publication OD-18796 may be used in the batching and preparation of HBX compositions. However, when the applicable advisory process techniques are used, the order in which aluminum powder and calcium chloride are added in the HBX formulations shall be mandatory and in accordance with the batching procedures of OD-18796. During batching, the mixtures shall be free from foreign materials and visible impurities other than the polymerized organic material derived from the desensitizer compounds or hot melt in the Grade B compositions.

**3.4 Components.** The components used in the preparation of the Grade A HBX composition shall comply with the specifications listed in 2.1 and shall be of the following grade or class as applicable.

Composition B	Grade A
TNT	Grade I
Aluminum Powder	Type III, Grade F, Class 7

**3.5 Grade A compositions.** The composition of the Grade A HBX composition shall conform to the nearest-tenth percent as required in Table I when tested as specified in 4.4.3.2 or 4.4.3.3.

TABLE I. *Grade A compositions*

Ingredient	HBX-1 Percent by weight	HBX-3 Percent by weight	H-6 Percent by weight
* RDX plus nitrocellulose .....	40.4 ± 3.0%	31.3 ± 3.0%	45.1 ± 3.0%
plus ** Calcium Chloride			
plus *** Calcium Silicate			
TNT .....	37.8 ± 3.0%	29.0 ± 3.0%	29.2 ± 3.0%
Aluminum .....	17.1 ± 3.0%	34.8 ± 3.0%	21.0 ± 3.0%
**** Wax plus lecithin .....	4.7 ± 1.0%	4.9 ± 1.0%	4.7 ± 1.0%

\* Note. All of the RDX component and portions of the TNT and wax are added as Composition B.

\*\* A separate calcium chloride determination need only be done if required in the contract or order (see

6.2). Percentage requirement of Calcium Chloride is  $0.5\% \pm 0.1\%$ .

\*\*\* Calcium Silicate shall be determined as specified in 4.4.1.2 when used in the formulation of HBX compounds. The Calcium Silicate content shall be a minimum of 1.25 weight percent of the TNT content of the mixture and shall only be used in the HBX compositions when specified by the procuring agency (see 6.2). Calcium Silicate is designated for use only in Army formulations of HBX type explosive compositions.

\*\*\*\* The major portion of the wax and all of the nitrocellulose and lecithin are added as Composition D-2.

**3.6 Grade B compositions.** The composition of the Grade B HBX Composition shall conform to the nearest tenth percent as re-

quired in Table II when determined as specified in 4.4.3.4.

TABLE II. Grade B compositions

Ingredient	HBX-1	HBX-3	H-6
	Percent by weight	Percent by weight	Percent by weight
RDX plus nitrocellulose plus Calcium Chloride plus * Calcium Silicate	$40.4 \pm 3.0\%$	$31.3 \pm 3.0\%$	$45.1 \pm 3.0\%$
TNT	$37.8 \pm 3.0\%$	$29.0 \pm 3.0\%$	$29.2 \pm 3.0\%$
Aluminum	$17.1 \pm 3.0\%$	$34.8 \pm 3.0\%$	$21.0 \pm 3.0\%$
Wax plus lecithin	$4.7 \pm 1.0\%$	$4.9 \pm 1.0\%$	$4.7 \pm 1.0\%$

Hot melt (asphaltic lining material) — maximum allowable 0.75%.

A separate Calcium Chloride determination need only be done if required in the contract or order. An additional one half percent of Calcium Chloride shall be added whenever preparing the reclaimed explosive for re-use. Percentage requirement is  $0.7\% \pm 0.3\%$ .

\* The calcium silicate content shall be a minimum of 1.25 weight percent of the TNT content of the mixture and shall only be used in the HBX compositions when specified by the procuring agency (See 6.2). Calcium Silicate shall be determined as specified in 4.4. 1.2.

**3.7 Moisture.** The moisture content of the HBX compositions when tested as specified in 4.4.4, shall be as follows:

Grade A — 0.20% MAXIMUM

Grade B — 0.50% MAXIMUM

**3.8 Vacuum stability.** The maximum volume of gas liberated by the HBX compositions when tested as specified in 4.4.5 shall be 2cc/gram/48 hours at 100°C.

**3.9 Requests for deviation.** Requests for deviation from this specification or applicable documents which form a part of this specification shall be as set forth in OP 400.

**3.10 Conflicting requirements.** Conflicting requirements arising between this specification and any other specification or applica-

ble documents which form a part of this specification shall be referred in writing to the procuring agency or appointed agent for interpretation and clarification.

**3.11 Process verification and lot acceptance tests.** Unless otherwise specified in the contract or order, the process verification used as the inspection system and lot acceptance tests shall be conducted on each lot of HBX explosive composition.

#### 4. QUALITY ASSURANCE PROVISIONS

**4.1** 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

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laboratory acceptable to the Government. The Government reserves the right to perform any of the inspections set forth in the specifications where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

**4.2 Lot size.** For the purpose of sampling, a lot of any HBX composition shall be limited in weight to 1300 pounds maximum and to one batch from a single vessel.

### 4.3 Sampling.

**4.3.1 Preproduction samples.** After award of contract but prior to entering quantity production, a preproduction sample shall be prepared for inspection and acceptance tests to determine conformance of the sample with the requirements of the specification (see 6.2). The sample shall be manufactured by the procedure and processes and at the same location proposed by the contractor for the execution of the contract. The sample will be supplied in bud form, strips or poured into trays to a thickness of approximately one inch as specified by the procuring activity (see 6.2). When preproduction sample has been approved, the contractor will be notified and will be authorized by the procuring activity to proceed with production. Any production started before such approval shall be at the contractor's risk. Preproduction samples accepted will be applied as part of the quantity specified by the contract or order. Packaging and shipment of the sample will be in accordance with Section 5.

**4.3.1.1 Preproduction sample for subsequent contracts.** The necessity for a preproduction sample will be determined by the procuring activity when production under a

new contract by the same contractor at the same location follows the preparation of any HBX composition covered by this specification.

### 4.3.2 Samples for destructive tests.

**4.3.2.1 Sample for chemical composition analysis.** A wafer sample approximately four inches in diameter by one quarter inch thick is taken from the stream of the explosive as it is being withdrawn for use. The sample is taken by catching a portion of the molten explosive, from the approximate center of the batch, and pouring into shallow aluminum mold of the dimensions given above. Tags, embedded in each sample while molten, identify the source of the sample.

**4.3.2.2 Sample for moisture analysis.** Reserve 50 grams of the sample from 4.3.2.1 and place in a closed container to be used in the moisture analysis.

### 4.4 Test procedures.

**4.4.1 Process verification.** Unless otherwise specified in the contract or order, process verification used as the inspection system shall be subject to Government verification at the time the first batch is prepared and at random intervals during the production, but not less than once during each week of continuous operation. Verification will consist of surveillance of the process and related equipment to determine that practices, methods and procedures are being properly applied, and that the products are produced under the requirements of this specification. A record shall be made of each batch of explosive prepared to insure that the following requirements have been met:

(a) Explosive components

Components shall meet the requirements of 3.4.

(b) Composition

The quantities of each component required shall be calculated and weighed to give the correct composition. Component weights may be calculated from Table III.

(c) Order of addition

The order of addition shall be recorded. Order of addition shall be mandatory as specified in 3.3.

- (d) Temperature The temperature shall be recorded, prior to, during, and after each phase of batching.
- (e) Agitation Agitation shall be maintained from the time of the addition of the first component until the kettle has been drained.
- (f) Mixing time The mixing time following the addition of the last component.

TABLE III. *HBX compositions*  
(Percent by weight)

	HBX-1	HBX-3	H-6
Composition B .....	66.08	51.33	74.20
Composition D-2 .....	4.66	4.73	4.69
Aluminum .....	17.10	34.75	20.61
Additional TNT .....	11.66	8.69	—
Calcium Chloride .....	0.50	0.50	0.50
Calcium Silicate .....	0.47 <sup>1</sup>	0.36 <sup>1</sup>	0.37 <sup>1</sup>

Each component shall be based on the percent by weight limitation listed in Table I or II for each HBX formulation.

<sup>1</sup> When specified by the procuring activity, Calcium Silicate used in the formulation of HBX components shall be a minimum of 1.25 weight percent of the TNT content.

**4.4.1.2 Determination of Calcium Silicate.** When specified by the procuring activity (see 6.2), Calcium Silicate used in the HBX composition shall be determined by visual verification of the weight of calcium silicate added to the batch. Quantities added shall be calculated in terms of weight percent of the TNT content.

**4.4.2 Lot acceptance tests.** Unless otherwise specified in the contract or order, samples selected from each inspection lot shall be subjected to all the requirements and tests of this specification. Failure of the HBX compositions to meet any of the requirements or tests of this specification shall be considered cause for rejection of the lot.

#### 4.4.3 Composition analysis.

**4.4.3.1 Sample preparation.** Reduce sample through a 20 mesh screen (U. S. Standard Sieve Series) using a wooden mortar and pestle.

#### 4.4.3.2 Method of analysis. Grade A.

**4.4.3.2.1 Determination of aluminum.** Weigh accurately a sample calculated to contain 0.4 grams of TNT into a tared sintered glass filtering crucible, medium porosity, 30-ml capacity. Extract on a Fisher filtrator with ethylene chloride (purified 1, 2 dichloroethane) at approximately 20° C., 5 equal portions totaling 45 ml, contact time of 1 minute each. Collect filtrate in a 50 ml volumetric flask. Reserve filtrate for TNT determination.

The residue remaining on the filtering crucible is extracted with hot cyclohexanone (highest purity grade) at approximately 100° C. Five consecutive 3 second extractions of 3 ml each with continuous vacuum filtration and no stirring are made. This is followed by four consecutive 30 second extractions of 10 ml each with stirring. After the cyclohexanone extraction, wash down the sides of the crucible with approximately 2 ml of reagent grade acetone. Repeat for a total of 3 washings. Dry in an oven at 90° C  $\pm$  10° C. for 30 minutes, cool in a desiccator and weigh. The residue is aluminum.



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

A = Weight of crucible plus aluminum residue

B = Original weight of empty crucible

W = Weight of sample

**4.4.3.2.2 TNT determination.** Dilute the TNT filtrate obtained in 4.4.3.2.1 to 50-ml with ethylene chloride. Compare its spectral absorbance at 20° C. with that of a solution (0.400 grams of TNT/50-ml ethylene chloride) at 367 millimicrons. TNT is determined by reference to a graph prepared in advance from known solutions. The preparation of the solutions and the graph is described in 4.4.3.5.1. A Beckman DK-2 or equivalent spectrophotometer may be used to determine the spectral absorbance.

The spectral absorbance may be measured on a Beckman DK-2 recording spectrophotometer under the following conditions:

- (a) 10 mm cell with a 9 mm spacer
- (b) Wavelength setting of 367 millimicrons
- (c) Time constant of 0.6
- (d) Scanning time of 1
- (e) Scale expansion - 2X
- (f) Sensitivity - 11.5
- (g) Absorption scale of - 0.3 + 0.7
- (h) Hydrogen lamp
- (i) Photomultiplier position - 1X

$$\text{Percent TNT} = \frac{A}{W} \times 100$$

A = Weight of TNT from graph

W = Weight of sample

**4.4.3.2.3 Determination of wax + lecithin.** A separate 3 gram portion of the HBX sample is accurately weighed and transfer-

red to small test tube. Accurately weigh the test tube and contents. Heat tube and contents to 90° C. stirring vigorously. Transfer the test tube to a water bath used to maintain the prisms of an Abbe' refractometer at 50.0° C.  $\pm$  0.5° C. After cooling, reweigh tube and contents to determine loss of tetrachloroethylene due to volatilization. The exact amount of tetrachloroethylene lost in heating shall be replaced and the test tube replaced in the water bath. Set the refractometer to read 1.4910 as the refractive index of tetrachloroethylene at 50.0° C.  $\pm$  0.5° C. Pour several drops of the supernatant liquid in the test tube onto the prisms of the refractometer. The prisms are quickly closed and at the end of 30 seconds the index of refraction to sodium D light is determined. The wax + lecithin concentration is determined by reference to a graph previously prepared from known solutions. The preparation of the solutions and the graph are described in 4.4.3.5.2.

$$\text{Percent wax + lecithin} = \frac{(C)}{W} (100)$$

C = Weight of wax + lecithin from the graph

W = Weight of the sample

**4.4.3.2.4 Determination of calcium chloride.** Weigh accurately a 2 gram HBX sample into a tared sintered glass filtering crucible, medium porosity, 30-ml capacity. Using a Fisher filtrator with water vacuum, extract sample with 100 ml of distilled water, 10 extractions, 10 ml each, of 30 seconds duration. Collect filtrate in a 250 ml Erlenmeyer flask. Cool to room temperature.

Add 2 ml of 0.1 M potassium chromate indicator to the filtrate. For the preparation of the 0.1 M potassium chromate see 4.4.3.5.3. Titrate to the end point with 0.1 N silver nitrate. For the preparation of the 0.1 N silver nitrate see 4.4.3.5.4. The end point is noted by the first appearance of a permanent colored precipitate of silver chromate. The end point should be determined by using a

white background or by transferring filtrate plus a minimum of distilled water washings to a white casserole.

$$\text{Percent Calcium Chloride} = \frac{(V) (N) (0.0555) (100)}{W}$$

W

V = ml of silver nitrate

N = Normality of silver nitrate

0.0555 = Millequivalent weight of calcium chloride

W = Weight sample

**4.4.3.2.5 Determination of RDX + nitrocellulose.** The percentages of TNT, calcium chloride, aluminum, and wax + lecithin are added and their sum subtracted from 100 percent. The remainder is taken to be the percentage of RDX plus nitrocellulose.

**4.4.3.3 Alternate method of analysis.** Grade A.

**4.4.3.3.1 Determination of RDX + nitrocellulose.** Weigh accurately a sample of HBX calculated to contain between 0.35 and 0.40 grams of TNT into a tared 100 ml beaker. Add 20 ml of RDX saturated benzene to the beaker. The preparation of the RDX saturated benzene is described in 4.4.3.5.5. Cover beaker with a watch glass and place on a steam bath for 30 minutes, swirl solution frequently. (An oscillating hot plate may be used if available.) Do not boil the benzene! After removal from the steam bath, cool sample to room temperature. Allow a minimum of 1 hour cooling.

Make a quantitative transfer of the sample to the original tared filtering crucible. Filter using a Fisher filtrator with water suction. Use a small polyethylene wash bottle which contains benzene saturated with RDX to make the transfer. Make a total of 3 washings of the beaker and residue on the crucible, using between 10 and 15 ml of benzene saturated RDX per rinse. Make a

final rinse of the crucible contents with 5 ml of benzene saturated with RDX. Collect the filtrate which contains TNT and wax in a 100-ml volumetric flask. Reserve the filtrate to determine the TNT content. Aspirate the crucible for 1 minute after the final rinse.

The crucible plus its contents are placed on a Fisher filtrator and extracted with hot distilled water, 3 portions of 5 ml each, 30 seconds contact time for each washing. This is necessary to remove any calcium chloride that may be remaining in the residue. Dry crucible and its contents in an oven at 90° C. ± 10° C. for 1 hour. Cool the sample in a desiccator and weigh.

The crucible and its contents are placed on a Fisher filtrator, attached to a water aspirator. Extract the sample with four - 20-ml portions of hot, reagent grade, acetone. Allow 30 seconds contact time between solvent and sample before applying suction for each extraction. Wash down the sides of the crucible with two additional portions of 10 ml each of hot acetone. Place crucible and its residue in an oven to dry at 90° C. ± 10° C. for 30 minutes, cool in a desiccator and weigh. RDX and nitrocellulose are removed in the filtrate. Aluminum remains as the residue on the crucible.

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

A = Weight of sample plus crucible before acetone extraction

B = Weight of residue plus crucible after acetone extraction

W = Weight of sample

**4.4.3.3.2 Determination of aluminum.** The aluminum is the residue remaining on the crucible after the acetone extraction.

$$\text{Percent aluminum} = \frac{(B-D) (100)}{W}$$

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B = Weight of residue plus crucible  
after acetone extraction

D = Weight of original crucible

W = Weight of sample

**4.4.3.3.3 Determination of TNT.** For method of preparation and standardization of solutions needed in the TNT determination see 4.4.3.5.6 through 4.4.3.5.13.

Dilute the TNT and wax filtrate obtained in 4.4.3.3.1 to 100-ml with benzene saturated with RDX. Transfer a 10 ml aliquot of the TNT solution which contains 35-40 mg of TNT to a 300 ml reduction flask (Scientific Glass Apparatus Co. JD2776 or equivalent is satisfactory.) Evaporate the benzene to dryness with a slow stream of dry air (connect a drying tube between air supply and inlet tube of flask.)

Dissolve the residue in 25 ml of reagent grade glacial acetic acid (measure in a cylinder.) Sweep the flask with N<sub>2</sub> or CO<sub>2</sub> gas for 5 minutes. Pipette accurately 25 ml of 0.2N titanous chloride solution into the flask. Add 25 ml of 6N HCl. A current of CO<sub>2</sub> or N<sub>2</sub> should be passed through the reaction flask during the refluxing, cooling and titration periods to prevent air oxidation of the titanous ion. Reflux for 15 minutes, using glass beads to reduce bumping. (Ground glass joints on the flask and condenser are to be preferred. A Glass-Col heating mantle is the most convenient source of heat, though a hot plate may be used.) Cool the flask to room temperature without disconnecting the reflux condenser. (Lift the flask and condenser and substitute a pan of cold water for the heater.) Titrate the sample in the flask with standard ferric ammonium sulfate (0.15N) solution, using a magnetic stirrer if available. As the end point is approached (the Ti(III) color gets light) add 5-ml of 20 percent ammonium thiocyanate and continue the titration to the appearance of the red color.

At least 4 ml of 0.15 N Fe(III) solution

should be required in back titration. If less, repeat adding more Ti(III) solution in excess to the TNT-wax filtrate. (If less than 4 ml of Fe(III) solution is used in the back titration in either standardization of Ti(III) solution or in the determination of TNT, low values may be obtained. If the excess Ti(III) at the end of the refluxing is too small, reduction of the nitro groups may be incomplete. On the other hand, if more than 10-ml of Fe(III) solution is used, an unnecessarily large excess of Ti(III) solution is being added.)

Run a blank on a volume of RDX saturated benzene equal to the volume of the aliquot of sample solution used in the preceding titration.

Percent TNT =

(0.1261) (AN-BF) — (CN-DF) (100)

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W

A = ml of Ti(III) solution

N = Normality of Ti(III) solution

B = ml of Fe(III) solution

F = Normality of Fe(III) solution

C = ml Ti(III) added to blank

D = ml Fe(III) added to blank 0.01261  
gm TNT = 1 meq. of TNT

W = Weight of sample represented by  
aliquot

AN-BF = Meq. Ti(III) used by TNT &  
RDX

CN-DF = Meq. Ti(III) used by RDX

**4.4.3.3.4 Determination of calcium chloride.** Calcium chloride is determined as in 4.4.3.2.4.

**4.4.3.3.5 Determination of wax + lecithin.** The percentages of TNT, RDX plus nitrocellulose, calcium chloride, and aluminum are added and their sum subtracted from 100



percent. The remainder is taken to be the percentage of wax plus lecithin.

#### 4.4.3.4 Method of analysis. Grade B.

**4.4.3.4.1 Determination of hot melt—Visually.** Weigh accurately a 1 gram sample of HBX into a tared sintered glass filtering crucible, medium porosity, 30-ml capacity. Using approximately 5 ml of ethylene chloride, divided into 5 equal portions, 1 minute contact time each, extract sample on a Fisher filtrator with water vacuum. Collect filtrate in a 50-ml volumetric flask and dilute to the mark with ethylene chloride. Compare the color of the filtrate visually with previously prepared standards to determine the weight of hot melt present. The preparation of the hot melt standard solutions are described in 4.4.3.5.14.

$$\text{Percentage of hot melt} = \frac{(A)}{W} (100)$$

A = Weight of hot melt from comparison with standards

W = Weight of sample

**4.4.3.4.2 Determination of hot melt—Spectrophotometer.** Compare the spectral absorbance at 20° C. of the ethylene chloride filtrate obtained in 4.4.3.2.1 or 4.4.3.4.1 with that of a standard solution (0.4 gram of TNT/50 ml of ethylene chloride) at 430 millimicrons. The weight of hot melt is determined by reference to a graph prepared in advance from standard hot melt solutions. The preparation of the solutions and graph are described in 4.4.3.5.14. The TNT + wax + hot melt filtrate collected in 4.4.3.3.1, diluted to 50 ml with RDX saturated benzene may be substituted for the ethylene chloride — TNT solution obtained in 4.4.3.4.1. All graphs and standard solutions needed will substitute RDX saturated benzene for ethylene chloride.

$$\text{Percentage of hot melt} = \frac{(A)}{W} (100)$$

A = Weight of hot melt obtained from the graph

W = Weight of sample

**4.4.3.4.3 Determination of TNT—Spectrophotometer.** Hot melt interferes with the method for the absorbance of TNT as described in 4.4.3.2.2. Corrected TNT values can be obtained by comparing the TNT solution at 430 millimicrons in addition to 367 millicrons. At 430 mu, the absorption is due to the hot melt alone. Correct the weight for TNT obtained from TNT spectral absorbance graph by subtracting from it the value obtained from a correction graph prepared in advance as described in 4.4.3.5.15. The TNT + wax + hot melt filtrate collected in 4.4.3.3.1, diluted to 50 ml with benzene saturated RDX may be substituted for the ethylene chloride solution in 4.4.3.2.2. All graphs and standard solutions needed will substitute RDX saturated benzene for ethylene chloride.

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

A = Weight of TNT from TNT spectral calibration graph

B = TNT correction value from the TNT correction graph

W = Weight of the sample

**4.4.3.4.4 Determination of TNT—Titanous chloride method.** Hot melt is present in the TNT wax filtrate obtained in 4.4.3.3.1. This filtrate is used in the TNT determination by the titanous chloride method. Hot melt does not interfere with the TNT determination.

**4.4.3.4.5 Determination of aluminum.** The method described in 4.4.3.2.1 or 4.4.3.3.2 may be used to determine the aluminum content.

**4.4.3.4.6 Determination of RDX + nitrocellulose.** The method described in 4.4.3.2.5 or 4.4.3.3.1 may be used to determine the RDX + nitrocellulose content.

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**4.4.3.4.7 Determination of calcium chloride.** The method described in 4.4.3.2.4 is used to determine the calcium chloride content.

**4.4.3.4.8 Determination of wax + lecithin.** The percentages of TNT, RDX plus nitrocellulose, calcium chloride, aluminum, and hot melt are added and their sum subtracted from 100 percent. The remainder is taken to be the percentage of wax plus lecithin.

Where the method of analysis described in 4.4.3.3 is not used in its entirety, the wax plus lecithin content can be determined as follows:

The crucible plus residue obtained after the RDX saturated benzene extraction as described in 4.4.3.3.1 is extracted with an additional 50 ml of RDX saturated benzene (5-10 ml portions, 30 seconds each.) The sample is dried at 100° C. for 30 minutes. The crucible plus residue are cooled in a desiccator and weighed. The loss in weight of the sample is equal to the weight of the TNT + wax + hot melt extracted.

Percent wax + lecithin =

$$(A) - (B + C)$$

W

A = Loss in weight of sample after RDX saturated benzene extraction

W = Weight of sample

B = Weight TNT determined in 4.4.3.2.2 or 4.4.3.3.3

C = Weight hot melt determined in 4.4.3.4.1 or 4.4.3.4.2

The refractive index method for the determination of wax plus lecithin described in 4.4.3.2.3 cannot be used when hot melt is present.

**4.4.3.5 Preparations of solutions, graphs and standardization of solutions.**

**4.4.3.5.1 Preparation of TNT standard solutions and TNT spectral calibration graph.** Prepare a stock TNT solution. Accurately weigh and transfer 8 grams of TNT into a 500-ml volumetric flask. Dilute to mark with ethylene chloride.

Into each of seven — 50 ml volumetric flasks, pipette accurately the following quantities of the TNT stock solution respectively, 22-ml, 23-ml, 24-ml, 25-ml, 26-ml, 27-ml, 28-ml. Dilute with ethylene chloride to the mark.

Weight of TNT in each standard solution = (A) (0.016)

A = Volume of TNT stock solution added to 50 ml volumetric flask

0.016 = Weight of TNT (gms)/ml of TNT stock solution

Prepare the TNT spectral calibration graph by determining the absorbance at 367 mu of the standard TNT solutions at 20° C. compared to a solution of 0.400 grams of TNT/50 ml of ethylene chloride using 1 mm path cells. Plot absorbance against weight of TNT.

**4.4.3.5.2 Preparation of wax standard solutions and wax refractive index calibration graph.** Prepare 3 gram HBX samples with different weights of wax and lecithin. The samples must be prepared with the same materials used to prepare the HBX being analyzed. The weight of wax + lecithin in the sample is based on the wax from the D-2 and Comp B (if used). The standard wax samples are treated as described in 4.4.3.2.3 to obtain the wax in solution.

Prepare the wax refractive index calibration graph by determining the refractive index of the various solutions of known wax concentration under the same conditions described in 4.4.3.2.3. Plot the refractive index readings from the samples against weight of wax + lecithin.

**4.4.3.5.3 Preparation of 0.1 M potassium chromate solution.** Accurately weigh 1.942 grams of reagent grade potassium chromate

into a 100-ml volumetric flask. Dilute to mark with distilled water. Mix well.

**4.4.3.5.4 Preparation of 0.1 N silver nitrate solution.** Accurately weigh 16.989 grams of reagent grade silver nitrate into a liter volumetric flask. Dilute to mark with distilled water. It is not necessary to standardize the silver nitrate solution if care is taken in the preparation of the solution. Store the silver nitrate solution in a dark place.

**4.4.3.5.5 Preparation of RDX saturated benzene.** To a gallon of reagent grade benzene, add RDX in excess of solubility, and stir for several hours. Let stand overnight. The solution should be prepared and kept at the same temperature as will prevail at the time of filtering the extracted sample. Filter solution just before use.

**4.4.3.5.6 Preparation of 20 percent solution of ammonium thiocyanate.** Dissolve 60 grams of reagent grade ammonium thiocyanate ( $\text{NH}_4\text{SCN}$ ) in 240-ml of distilled water. Filter until clear and store.

**4.4.3.5.7 Preparation of 6 N hydrochloric acid.** Add 250-ml of reagent grade 38 percent hydrochloric acid to 250 ml of distilled water. Mix well.

**4.4.3.5.8 Preparation of 0.2 N titanous chloride solution.** Mix 150-ml of 20 percent titanous chloride solution with 100-ml of 38 percent HCl solution. (As the concentration of the 20 percent titanous chloride varies from bottle to bottle, one may use an adjusted volume for the preparation of additional 0.2 N Ti(III) solution rather than the 150-ml of 20 percent solution.) Dilute quantitatively to 1 liter with distilled water. Mix by bubbling a stream of nitrogen or carbon dioxide gas through the solution, filter through Whatman #41 (fluted) or equivalent paper, store in a system arranged so that only  $\text{CO}_2$  or  $\text{N}_2$  gas will be drawn into the stock bottle as the solution is used. (Scientific Glass Apparatus Co. JB-7670,

burette, automatic, for titanous chloride solution, improved form; or JB-7615, burette, automatic, or equivalent is satisfactory. Teflon stopcocks are to be preferred.)

**4.4.3.5.9 Preparation of 0.15 N ferric ammonium sulfate solution.** Dissolve 75 grams of hydrated ferric ammonium sulfate ( $\text{FeNH}_4(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$ ), reagent grade, in 600-ml distilled water. Add to this 25-ml of 95 percent reagent grade sulfuric acid. When dissolved, dilute with distilled water to 1 liter; filter, mix thoroughly, and store.

**4.4.3.5.10 Preparation of 0.200 N p-nitroaniline solution.** Use p-nitroaniline with a melting point of  $147-148^\circ\text{C}$ ., and recrystallize once from ethanol. Dry in a desiccator. For a 0.200 N solution weigh exactly 1.151 grams of recrystallized p-nitroaniline, dissolve in reagent grade glacial acetic acid, transfer to a 250-ml volumetric flask and dilute to the mark with glacial acetic acid. Mix well.

**4.4.3.5.11 Comparison of titanous chloride and ferric ammonium sulfate solutions (determination of R).** This value is necessary in the determination of the normality of the Ti(III) and the normality of the Fe(III). R equals the ml of Ti(III) reacting with 1.00 ml of Fe(III) solution.

Sweep the air from a 300-ml reduction flask with a current of nitrogen or carbon dioxide gas for 5 minutes. Continue to pass the current of nitrogen or carbon dioxide gas through the flask until the titration is completed.

Pipette 50.00 ml of approximately 0.15 N Fe(III) solution into the air free reduction flask. Add 25 ml of 6N HCl (use a cylinder to measure the HCl.) Titrate with approximately 0.2 N Ti(III) solution until near the end point (the Ti(III) color gets light.) Add 5 ml of 20 percent ammonium thiocyanate solution (by cylinder), and continue the titration until the red color just disappears.

Repeat the procedure until two successive

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values for R agree to within 1 part per thousand of their mean.

$$R = \frac{A}{B}$$

A = ml of Ti(III) solution

B = ml of Fe(III) solution

**4.4.3.5.12 Standardization of 0.2 N titanous chloride solution.** Sweep the air from a 300 ml reduction flask with a current of nitrogen or carbon dioxide gas for 5 minutes. Continue to pass the current of gas through the flask until the titration is completed.

Pipette 20.00 ml of the 0.200 N p-nitroaniline solution into the reduction flask. Pipette 25 ml of titanous chloride approximately 0.2 N into the same flask. Add 25 ml of 6 N HCl (by cylinder), and a few glass beads. Connect the reduction flask to a reflux condenser and boil for 15 minutes. Cool the flask to room temperature without disconnecting the condenser (lift the flask and condenser, remove the heater, and let the flask down into a pan of cold water.)

Titrate the excess Ti(III) with Fe(III) solution. As the end point is approached, Ti(III) color gets light, add 5 ml of 20 percent ammonium thiocyanate (by cylinder), as an indicator and titrate to the appearance of the red color.

Run a blank, substituting 20 ml of glacial acetic acid for the p-nitroaniline solution.

$$\text{Normality of Ti(III) solution} = \frac{4.000}{(A-RB) - (C-RD)}$$

$$(A-RB) - (C-RD)$$

4.000 = Millequivalents of p-nitroaniline in 20.00 ml of 0.200 N solution

A = ml of Ti(III) solution

B = ml of Fe(III) solution

C = ml of Ti(III) in blank

D = ml of Fe(III) in blank

$$R = \frac{\text{ml of Ti(III) reacting with 1.00 ml of Fe(III) solution}}{\text{ml of Fe(III) solution}}$$

The term (C-RD) should be zero. If the value lies outside the range + 0.10 and - 0.10, either R is incorrect, or the acetic acid is contaminated. Repeat the determination of R. Continued high or low values for (C-RD) probably means impure acetic acid.

If normality of Ti(III) solution falls outside of the range 0.19 — 0.22, add 20 percent titanous chloride solution or water as required to bring normality to approximately 0.2 N. Then repeat the determination of R and repeat the determination of the normality.

**4.4.3.5.13 Determination of the normality of the ferric ammonium sulfate solution.** Using the value of R and the value of the normality of titanous chloride determined in 4.4.3.5.11 and 4.4.3.5.12, calculate the normality of the ferric ammonium sulfate solution.

$$F = \text{Normality of Fe(III) solution} = \frac{R}{(R) (N)}$$

$$R = \frac{\text{ml of Ti(III) solution reacting with 1.00 ml of (Fe(III) solution)}}{\text{ml of (Fe(III) solution)}}$$

$$N = \text{Normality of Ti(III) solution}$$

**4.4.3.5.14 Preparation of hot melt standard solutions and hot melt spectral calibration graph.** Prepare a stock TNT solution by accurately weighing and transferring 8 grams of TNT into a 500-ml volumetric flask. Dilute to mark with ethylene chloride. Prepare a stock hot melt solution using material conforming to Specification MIL-C-3301. Accurately weigh and transfer 0.45 grams of hot melt into a beaker and dissolve in a 100 ml of ethylene chloride. Filter solution through a sintered glass filtering crucible, medium porosity, 30-ml capacity until filtrate shows no sign of sedimentation.

To determine weight of hot melt per ml of filtrate, accurately pipette 15 ml of filtrate



into a tared evaporating dish with cover. Evaporate to dryness on a steam bath or hot plate below 75° C. Replace cover, cool in a desiccator to room temperature and weigh.

Weight of hot melt per ml of solution =

$$\frac{(A - B)}{V}$$

V

A = Weight of evaporating dish plus cover plus residue

B = Weight of evaporating dish plus cover

V = Volume of hot melt filtrate pipetted into evaporating dish

Into each of six — 50-ml volumetric flasks, pipette accurately 25 ml of the TNT stock solution, add to each of the flasks respectively, by pipetting accurately, 0.5 ml, 1.0 ml, 1.5 ml, 2.0 ml, 2.5 ml, 3.0 ml of the hot melt filtrate. Dilute with ethylene chloride to the mark.

Weight of hot melt in standard =  
(W) (D)

W = Weight of hot melt per ml of solution

D = ml of hot melt added to the standard

Prepare the hot melt spectral calibration graph by determining the absorbance at 430 mu of the standard hot melt and TNT solutions at 20° C. compared to a solution of 0.400 grams of TNT/50 ml of ethylene chloride using 1 mm path cells. Plot absorbance against weight of hot melt.

**4.4.3.5.15 Preparation of the TNT correction graph for the presence of hot melt.** Determine the spectral absorbance of the hot melt and TNT standard solutions at 367 mu, at 20° C., using 1 mm path cells. The preparation of the solutions is described in 4.4.3.5.14. From this data determine the apparent weight of the TNT from the TNT spectral calibration graph described in

**4.4.3.5.1.** Subtract the actual weight of TNT (0.4 grams) in the standard hot melt solution from the apparent weight of TNT. This gives the TNT correction value.

Determine the spectral absorbance of the hot melt standard solutions at 430 mu as described in 4.4.3.4.14.

For the TNT correction graph for the presence of hot melt plot the absorbance of the standard hot melt solutions at 430 mu against the TNT correction values obtained at 367 mu.

**4.4.4 Moisture determination.** Remove sample of HBX from closed sample container. Sample size shall be approximately 100 grams for Grade A material and 50 grams for grade B material. Break up quickly and transfer the sample to a tared liter Erlenmeyer flask with a ground glass neck. Stopper flask and record weight of flask plus sample. (When sample is broken up, it should be exposed to the air as little as possible as the calcium chloride in the HBX quickly takes up moisture.)

To the flask containing the sample add 200 ml of toluene and a magnetic stirring bar. Attach flask to a Bidwell-Sterling trap (graduated 5 ml in 0.1 ml.) To the top of the trap is attached a cold water condenser. (See Figure 1). (The use of Teflon sleeves on the ground glass joints in place of a lubricant will facilitate the cleaning of the glassware.)

Heat the assembly on a magnetic stirrer hot plate, with agitation provided by the magnetic stirrer. Heat to boiling. (The toluene-water azeotrope condenses and falls back into the trap. Water being heavier, collects in the trap and the excess toluene returns to the boiling flask.) Continue boiling until no change in the water volume has been observed for 15 minutes. Boil a minimum of 1 hour.

**CAUTION:** Keep solution well agitated at all times. When solution begins distilling,



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position flask so that an air space is between the flask and hot plate. This is to prevent a hot spot from building up in the chunk explosive. Sample should not be left unattended during the moisture determination. Care must be taken that the cold water condenser is operating properly at all times. If the condenser should fail to trap the toluene and the flask were to boil dry, there could be a possibility of overheating the explosive.

Care should be taken to prevent condensation of atmospheric moisture in the condenser. Five minutes before heating is discontinued wash down the condenser with toluene to remove any water clinging to the tip of the condenser.

After the moisture has been collected, transfer the trap to a constant temperature bath at  $40^{\circ}\text{C.} \pm 2^{\circ}\text{C.}$  Allow about 30 minutes for trap contents to reach the temperature of the bath. By means of a wire loop work any droplets of water trapped along the side to the bottom of the trap. Read the volume of the water collected.

Run a blank on the toluene to determine water present in the toluene. Calculate the percentage of water in the sample.

Percentage of water =

$$\frac{(A - B) (C) (100)}{W}$$

W

A = ml of water

B = ml of water in toluene

C = Density of water at temperature of the water bath

W = Weight of the sample

#### 4.4.5 Vacuum stability test. $100^{\circ}\text{C.}$

**4.4.5.1 Calibration of glass tube.** Determine the volume in mls of the 15.5 cm heating tube by running in mercury from a buret until the tube is filled to the level at which the ground glass joint of the capillary tube will make contact with the mercury. Subtract from the indicated buret reading, the volume of explosive used in the test. The difference shall be represented by the symbol A. Transfer 7.0 ml of mercury to the cup at the lower end of the capillary tube. Clamp the tube in an upright vertical position, and measure the height in mm of the mercury column in the capillary tube (approximately 25 mm.) Measure the length in mm of each of the 3 parts of the capillary tube and add these values to obtain total length. From the total length subtract the height of the mercury column in the capillary tube as previously obtained. Represent this difference by the symbol B<sub>1</sub>. From the total length subtract the height of the column of mercury in the capillary tube measured at the end of the test described in 4.4.5.1.

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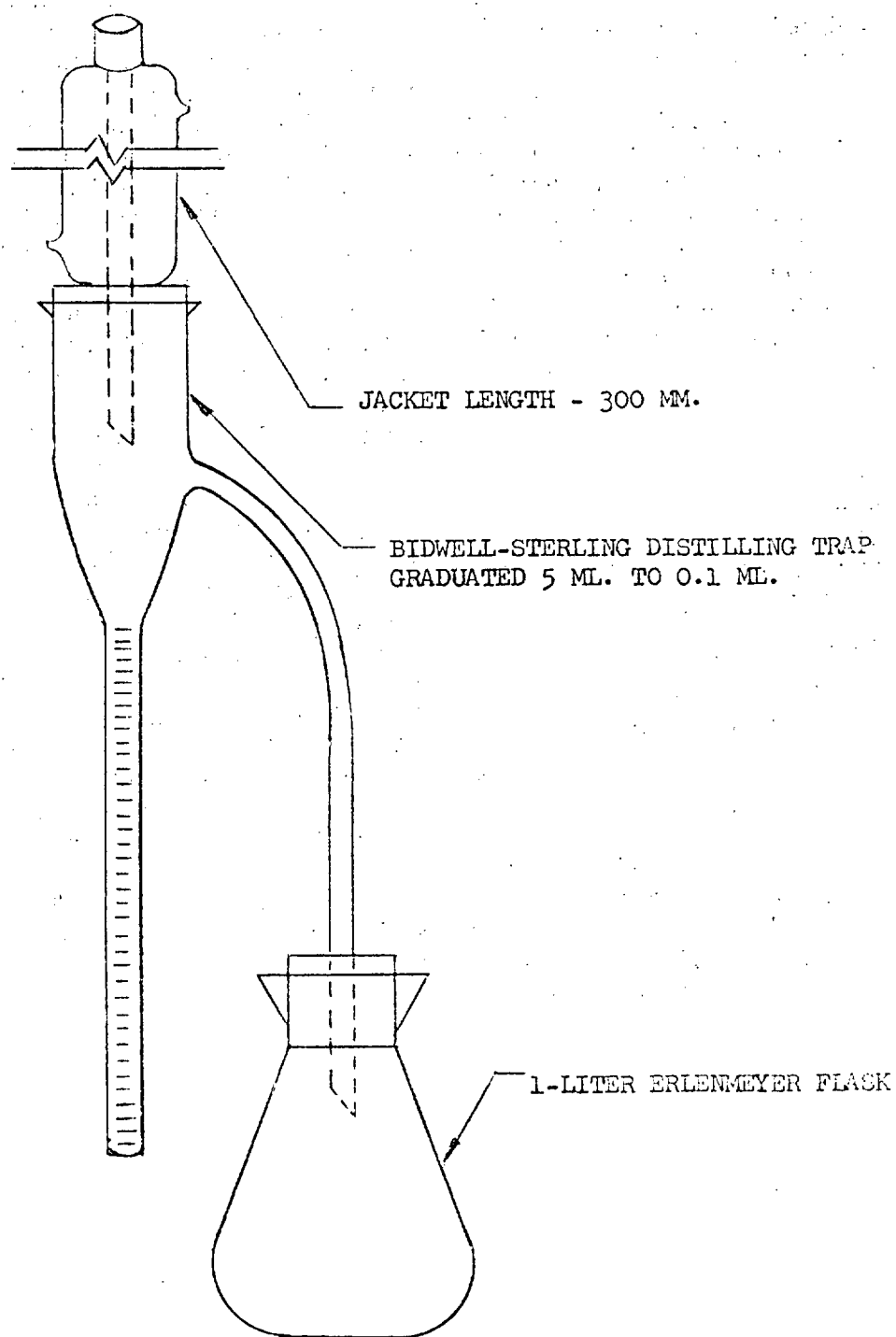


FIGURE 1. *Moisture content apparatus*

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Represent this difference by the symbol B. Determine the capacity of the capillary tube per unit of length as follows: Transfer an accurately weighed sample of approximately 10 gm. of mercury to the cup at the lower end of the capillary tube. Manipulate the tube so that when it is horizontal, mercury is contained in a continuous section of the longest part of the tube and measure the length of the mercury column. Repeat this twice with the mercury in 2 other parts of the long section of the tube. Calculate the average of the 3 measured lengths of the mercury column. Represent the unit capacity in ml per mm of the capillary tubing by the symbol C. This can be obtained from the formula:

$$C = \frac{W}{DL}$$

DL

C = Unit capacity of capillary tubing in ml per mm

W = Grams of mercury

D = Density of mercury at temperature of determination

L = Average measured lengths of mercury column in mm

**4.4.5.2 Test procedure.** Transfer a 1 gram sample, dried at 65° C. for 2 hours, to the heating tube of the apparatus shown in Figure 2. Connect the capillary tube to the heating tube. Clamp the apparatus so that the long section of the capillary tube is in a

nearly vertical position. Transfer 7.0 ml of mercury to the cup at the lower end of the capillary tube. Connect a vacuum pump to the lower end of the capillary tube and evacuate the system until the pressure is reduced to approximately 5 mm of mercury. (Evaluation of the capillary tube is facilitated by placing the cup of the tube in a horizontal position so that mercury does not block the capillary opening.) After evacuation, disconnect the pump. Seal the connection between the capillary tube and the heating tube with 1 ml of mercury. Measure the total vertical height of the column of mercury in the capillary tube. Measure and subtract the vertical height of the mercury in the cup. The difference shall be represented by the symbol  $H_1$ . Note the room temperature ( $t_1$ ) and the barometric pressure. Subtract the value  $H_1$  from the barometric pressure in mm. Represent this difference by the symbol  $P_1$ . Insert the heating tube in a constant temperature bath consisting of a solution of glycerin and water (specific gravity 1.05). Maintain at a temperature of 100.0° C.  $\pm$  0.5° C. for 48 hours. Remove the heating tube from the bath and allow to cool to room temperature. Measure the total vertical height of the column of mercury in the capillary tube and subtract the vertical height of the mercury in the cup. This difference shall be represented by the symbol H. Note the room temperature ( $t$ ) and the barometric pressure in mm. Represent this difference by the symbol P.

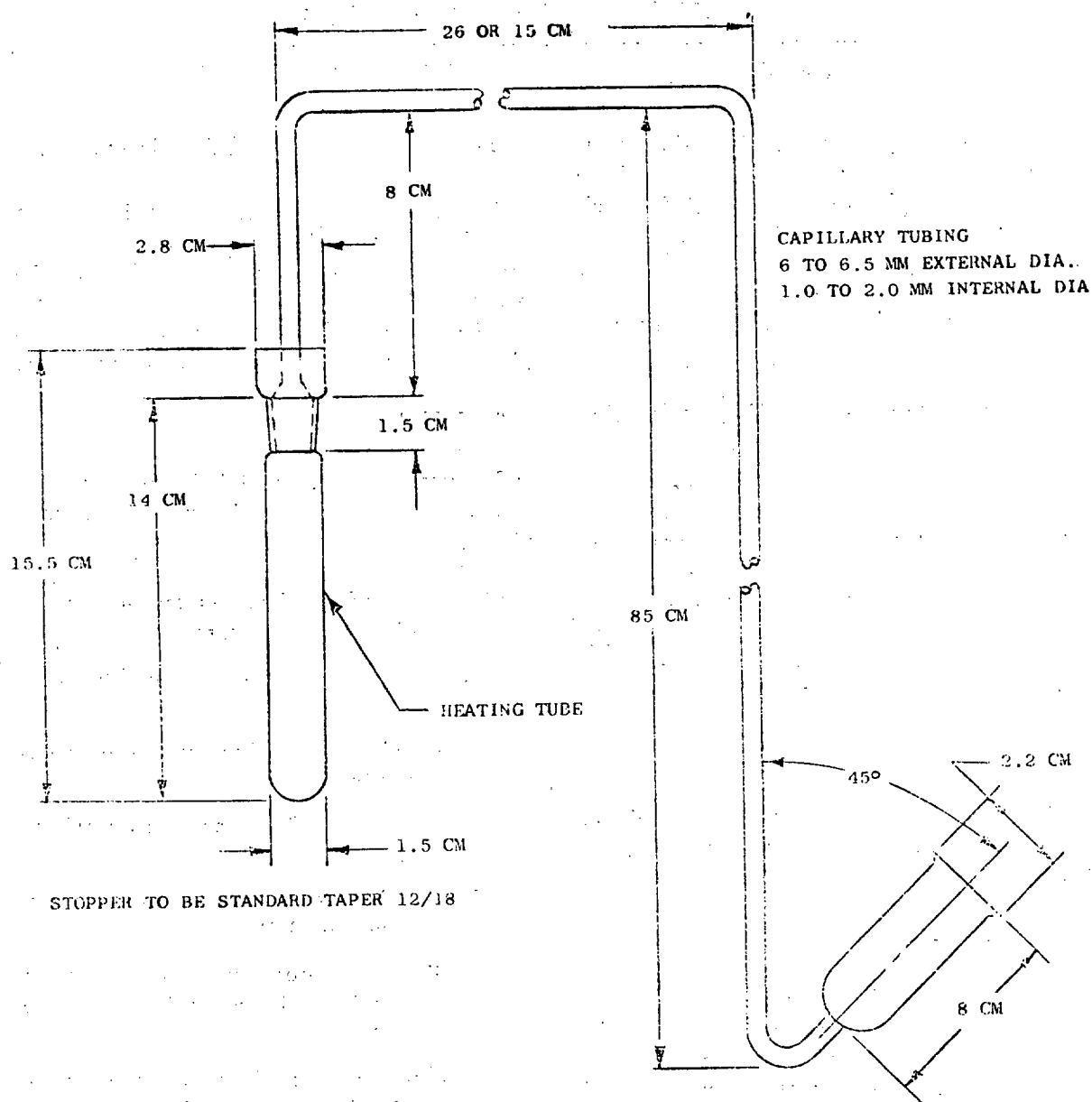


FIGURE 2. Apparatus for 100° C vacuum stability test

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**4.4.5.3 Calculation of liberated gas volume.** Calculate the volume of gas in ml, at standard conditions, liberated in the test

described in 4.4.5.2, using the values described by the symbols in 4.4.5.2 and 4.4.5.1 in the following formula:

$$V = \frac{[A + C(B-H)] 273 P}{760(273 + t)} - \frac{[A + C(B_1 - H_1)] 273 P_1}{760(273 + t_1)}$$

**4.4.6 Test equipment.** The following items of test equipment are required to perform the Acceptance Tests set forth in this specification:

Moisture Apparatus Figure 1

Vacuum Stability Apparatus Figure 2

Standard Testing Sieves — top plate

bottom plate — Federal Specification  
RR-S-366

Balance — Accuracy  $\pm 0.1$  mg.

## 5. PREPARATION FOR DELIVERY

**5.1 Application.** The packaging, packing, and marking requirements specified herein apply only to preproduction samples submitted to a government laboratory.

### 5.2 Packaging.

**5.2.1 Level C.** Unless otherwise specified, the sample shall be packaged in moisture-proof containers.

### 5.3 Packing.

**5.3.1 Level C.** The preproduction sample shall be packed in a manner as to comply in all respects with Interstate Commerce Commission regulations for transportation of explosives and other dangerous articles.

### 5.4 Marking.

**5.4.1 Special marking.** Marking of exterior containers shall be in accordance with the Code of Federal Regulations, 49CFR 71-90. In addition, each container shall be marked

in accordance with applicable documents.

**5.4.2 Normal marking.** In addition to the marking required by contract or order, unit packages and shipping containers shall be marked in accordance with the requirements of Standard MIL-STD-129 including explosive lot number and date of manufacture.

## 6. NOTES

**6.1 Intended use.** The HBX type explosive compositions are intended for use in ammunition.

**6.2 Ordering data.** Procurement documents should specify the following:

- a. Title, number and date of this specification
- b. Applicable drawings and other documents
- c. Grade of HBX type compositions (see 1.2)
- d. Required form, buds, strips or otherwise (see 3.2)
- e. Size of preproduction sample in pounds and required form (see 4.3.1)
- f. Whether a calcium chloride determination is required
- g. Laboratory responsible for conducting tests on preproduction samples
- h. Specific provisions for delivery and testing of preproduction samples prior to production of the item
- i. Specific provisions in the contract



or order when Calcium Silicate is required in the formulation of HBX compositions (see 3.5)

- j. Specific provisions for acceptance inspection by either Government agency or contractor.

**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 contractor or manufacturer of responsibility for the safety of his operations. Listed below are certain minimum provisions which a contractor or manufacturer (who prepares the item covered) should observe in order to fulfill his responsibility for safety. At Bureau of Naval Weapons, Navy Department, and other government plants, these provisions are mandatory. Such other warnings and precautions, pertinent to the operational effectiveness or safety during preparation of the specified items, are included in detailed technical requirements of the specification.

**6.3.1** All handling and batching operations should be conducted in a neat and orderly manner.

**6.3.2** Safe equipment and methods should be utilized for transporting and handling explosives components and mixtures. Where required, remote controlled barricaded handling equipment shall be used for explosives operations, such as mixing, pouring, weighing, charging, sifting, drying, casting, etc.

**6.3.3** The exposure of explosive materials and related parts should be so controlled as to minimize the absorption of moisture from the atmosphere or other sources during handling and batching operations.

**6.3.4** All explosive components and mixtures should be stored in suitable storage magazines located in accordance with Amer-

ican Table of Distances (ATD) or other applicable safety standards; and while in process, in safety lockers and chests if in loading rooms, or in adequate ready or service magazines located in accordance with Intraplant distances when outside of loading rooms. For Navy managed explosive loading plants, the provisions of the Armed Services Explosives Safety Board covering quantity-distance relations for explosives will apply.

**6.3.5** Proper care must be exercised at all times to protect personnel from accidents, fires, or explosions, and to limit damage to equipment and loading areas. In this connection, the precautionary measures in the following paragraphs should be observed.

**6.3.5.1** Employ properly proportioned and properly located protective barricades, screens or shields at all required points.

**6.3.5.2** Keep only minimum limited quantities of explosives components and explosive mixtures at each stage of operations.

**6.3.5.3** Keep explosives and explosive components in approved covered receptacles with covers in place when material is not being taken out of or put into the receptacles. Where necessary, receptacles should be conductive to ground electrostatic charges.

**6.3.5.4** Protect operations from electrostatic charges by effectively grounding all machinery, equipment and fixtures; and, where necessary, employ suitable grounded conductive coverings for floors, work benches and tables, and workers' conductive shoes. Workers' clothing of a type to minimize the accumulation of static charges should be employed. Fabrics such as silk and nylon, which promote static generation should be avoided. Additional precautions should include mechanical shielding to contain fragments and blast, also electrical shielding from induced electric currents generated by sources such as lightning, static, radiations from communications apparatus, radar, or high frequen-

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cy heat apparatus, etc. Additional grounding devices such as grounding bracelets for workers should be employed where operations are conducted with items which are unusually sensitive to initiation by static electricity. Where necessary for safety, humidity of work rooms should be appropriately increased, as required, to lessen electrostatic effects but without inducing excessive moisture absorption by any of the components.

**6.3.5.5** Protect all explosive operations from effects of electric current originating from equipment such as soldering irons, heaters, switches, wiring, motors, lights, test instruments, etc., by suitable insulation, grounding, separation or shielding. Such electric sources may initiate explosives by heat, sparks, arcs. Circuits may be inadvertently completed, for example: from a defective soldering iron through a grounded contact.

**6.3.5.6** Enforce, where necessary, the wearing of suitable safety footwear, gloves, goggles, respirators, and impregnated garments to protect personnel against burns, poisoning, and associated industrial hazards.

**6.3.5.7** Allow no fires or exposed electrical or other sparking equipment, and little or no flammable material to be present in loading, handling and storage spaces. Enforce proper "Match" and "No Smoking" rules where necessary.

**6.3.5.8** Enforce good housekeeping and maintain effective policing, inspection and supervisory methods throughout the loading area and surroundings. Employ effective cleaning methods periodically to minimize the accumulation of explosives and explosives dust and other contaminants upon, and assure its removal from floors, walls, ceilings, ledges, tables, benches, piping and equipment or the item loaded; also, clean up any spilled material immediately.

**6.4 Manufacture by government activities.** When the HBX type explosive compositions are to be prepared in accordance with this specification by government activities, the requirements given herein for bidders and contractors shall apply to such government activities.

**Notice.** When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

**Custodians:**

Army—MU  
Navy—Wep  
Air Force—OOA

**Preparing activity:**

Navy—Wep  
(Project 1375-0332)