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INCH-POUND

MIL-DTL-248D

SUPERSEDING
MIL-T-248C
8 November 1974

DETAIL SPECIFICATION

TRINITROTOLUENE (TNT)

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

1. SCOPE

1.1 Trinitrotoluene (TNT). TNT covered by this specification is a high explosive intended for use in ammunition (see 6.1).

1.2 Classification. TNT shall be of the following types and forms as specified (see 6.1.1 and 6.1.2):

Type I - Flake or Crystalline Form with a solidification point of 80.20°C min.

Type II - Fine Crystalline Form with a solidification point of 80.40°C min.

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements cited in sections 3 and 4 of this specification, whether or not they are listed.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use to improving this document should be addressed to: Commander, U.S. Army ARDEC, ATTN: AMSTA-AR-EDE-S, Picatinny Arsenal, New Jersey 07806-5000 by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks of the exact revision listed below form a part of this specification to the extent specified herein.

STANDARDS

FEDERAL

FED-STD-595 - Colors

MILITARY

MIL-STD-650 - Explosives: Sampling, Inspection and Testing
MIL-STD-1168- Lot Numbering of Ammunition
MIL-STD-1916 - DOD Preferred Methods for Acceptance of Product.

(Unless otherwise indicated, copies of the above specifications, standards and handbooks are available from the Standardization Document Order Desk, 700 Robbins Avenue, Bldg. 4D, Philadelphia, PA 19111-5094.)

2.3 Non-Government publications. The following documents of the exact revision listed below form a part of this specification to the extent specified herein.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM Designation E300 - Recommended Practice for Sampling Industrial Chemicals

(Address application for copies to the American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.)

3. REQUIREMENTS

3.1 First article. When specified in contract order (see 6.2), a sample shall be subjected to first article inspection in accordance with 4.2.

3.2 Material. Trinitrotoluene (Type I or Type II) shall conform to the requirements of Table I when tested in accordance with applicable paragraphs of 4.4. Trinitrotoluene that has been reworked because of non-compliance with specification requirements shall be considered for acceptance.

TABLE I

Property	Requirement		Applicable Paragraph
	Type I	Type II	
Form	Flake or Crystalline Form	Crystalline Form	4.4.1.1
Color	No darker than No. 30257	Light Yellow	4.4.1.2
Solidification Point, Degree centigrade (°C)	80.20 min	80.40 min	4.4.2
Moisture, percent	0.10 max	0.10 max	4.4.3
Acidity (as sulphuric acid), %	0.02 max	0.02 max	4.4.4
Alkalinity	None	None	4.4.5
Insoluble matter, percent	0.05 max	0.05 max	4.4.6
Sodium, percent	0.001 max	0.001 max	4.4.7

3.3 Thickness of flake (applicable to Type I in flake form only). The average thickness of the flakes shall be not more than 0.025 inch and the thickness of any individual flake shall be not more than 0.04 inch, when determined as specified in 4.4.8 (see 6.6).

3.4 Granulation (applicable to crystalline form only). The TNT shall conform to the granulation requirements of Table II when determined in accordance with 4.4.9.

TABLE II

Distribution	Percent by Weight, Min.	
	Type I	Type II
Through US Standard Sieve No. 14	95	100
Through US Standard Sieve No. 100	--	95

3.5 Workmanship. The material shall be processed in a manner that will produce the high quality material necessary to meet the requirements of this specification. The material shall be free of dirt, chips, and other foreign matter so that the safety and reliability of the explosive product are not compromised.

4. VERIFICATION.

4.1 General provision. See MIL-STD-1916 for general sampling and inspection requirements.

4.1.1 Classification of Verification. The verification requirements specified herein are classified as follows:

a. First article inspection (see 4.2)
b. Conformance Inspection (see 4.3)

4.2 First article inspection (see 4.2.1.1).

4.2.1 Submission.

4.2.1.1 For Continuous process. Prior to initiation of sustained production and after the process has been completely debugged, the contractor shall contact the Contracting Officer (see 6.2) for first article testing in accordance with the provisions of 4.3.3.1. The testing shall apply only to TNT that has been produced by the contractor using the same production process, procedures, and equipment that will be used in fulfilling the contract. All materials, except packaging, shall be obtained from the same sources as will be used in regular production. The first article tests shall be witnessed by the Government representative as designated by the Contracting Officer. The first article testing shall also apply wherever a change occurs in the manufacturing process, material used, drawing, specification or source of supply as to significantly affect product uniformity as determined by the Government and whenever there is a lapse in production for a period in excess of 90 days. 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 known not to conform to the requirements of the contract will not be submitted unless specifically authorized by the Contracting Officer.

4.2.1.2 For Batch process. Prior to initiation of sustained production, the contractor shall submit a first article sample as designated by the Contracting Officer (see 6.2) for evaluation in accordance with the provisions of 4.3.3.2. All samples submitted shall have been produced by the contractor using the same production processes, procedures, and equipment as will be used in fulfilling the contract. All materials, except packaging, shall be obtained from the same sources as will be used in regular production. The sample shall be accompanied by certificates of analysis. A first article quantity, or portion thereof, as directed by the Contracting Officer, shall also be submitted wherever there is a lapse in production for a period in excess of 90 days or wherever a change occurs in the manufacturing process, material used, drawing, specification or source of supply as to significantly 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.

4.2.2 Inspections to be performed. The sample will be subjected by the Government to any or all of the examinations or tests specified in 4.3 and 4.4 of this specification and any or all requirements of the applicable drawings.

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

4.3 Conformance Inspection

4.3.1 Lot Formation

4.3.1.1 Lot formation for Continuous process. A lot shall consist of TNT produced by one manufacturer in accordance with the same specification or same specification revision under one continuous set of operating conditions. Each interfix series shall consist of that quantity of TNT that has been subjected to the same chemical process intended to make the final product homogeneous. The product shall be submitted for inspection in accordance with MIL-STD-1916.

4.3.1.1.1 Lot Interfix. The interfix series as described in MIL-STD-1168 shall be controlled in the following way. The interfix series shall be changed whenever there is a significant change in the raw materials. A significant change to the raw materials shall be jointly defined by the Contractor and Contracting Officer.

4.3.1.1.2 Serial lot. A lot shall consist of the maximum amount of TNT loaded from one loading dock in a 24-hour period, manufactured under a continuous set of conditions without a significant process interruption or change during the manufacture of the lot (each transportation unit used will be identified as a sublot). Each box shall be serially marked. A significant process interruption or change may be defined by the contracting officer.

4.3.1.2 Lot Formation for Batch Process. The following shall apply to TNT produced by the Batch Process: The term "lot" as used throughout this specification, refers to an inspection lot which is defined as an essentially homogeneous collection of batches of product from which representative samples are drawn and inspected to determine conformance of the selected batches with applicable requirements. The sample selected shall represent only that batch from which the sample was drawn and shall not be construed to represent any prior or subsequent batches presented for inspection. A lot shall consist of batches of TNT produced by one manufacturer in accordance with the same specification or same specification revision under one continuous set of operating conditions. The criteria and procedures for assignment of lot numbers shall be in accordance with MIL-STD-1168.

4.3.2 Examination. Unless otherwise specified, sampling inspection for quality conformance characteristics listed in the classification of characteristic paragraph shall be conducted in accordance with MIL-STD-1916 using attribute sampling plans in MIL-STD-1916 and the verification levels as specified in the classification of characteristics paragraphs. (See MIL-STD-1916 for definitions of critical, major and minor classification of characteristics.)

4.3.2.1 Classification of characteristics - Filled box prior to closing (see dwg. 7548644 and 7548645).

Classification	Examination/test	Conformance criteria	Requirement paragraph	Inspection method reference (see 6.3)
Critical: None defined				
Major:				
101.	Foreign matter	Level IV	3.5 & 5.1 .	Visual
102.	Bag liner pierced or torn.	Level IV	3.5 & 5.1	.Visual
103	Bag liner improperly closed	Level IV	3.5 & 5.1	.Visual
104	Plastic bag liner bottom seal	Level IV	3.5 & 5.1	Visual
Minor:				
201.	Type of liner incorrect	Level II	3.5 & 5.1	Visual

4.3.2.2 Classification of characteristics - Sealed Wooden Boxes (see dwg 7548644).

Classification	Examination/test	Conformance criteria	Requirement paragraph	Inspection method ref..
Critical: None defined				
Major:				
101.	Top improperly assembled...	Level IV	3.5 & 5.1	Visual/Manual
102.	Box damaged.	Level IV	3.5 & 5.1	Visual
103.	Lot number misleading or unidentifiable.	Level IV	3.5 & 5.1 .	Visual
104.	Strapping missing, broken or loose.	Level IV	3.5& 5.1 .	Visual/Manual
105.	Board broken or split.	Level IV	3.5& 5.1	Visual
Minor:				
201.	Strapping improperly assembled.	Level II	3.5 & 5.1	Visual/Manual
202.	Marking misleading or unidentifiable	Level II	3.5& 5.1	.Visual
203.	Nail protruding.	Level II	3.5& 5.1	.Visual

4.3.2.3 Classification of characteristics - Fiberboard Box (see dwg 7548645).

Classification	Examination/test	Conformance criteria	Requirement paragraph	Inspection method ref..
Critical: None defined				
Major:				
101	Proper Grade of Fiberboard	Level IV	3.5 & 5.1	Visual
Minor:				
201	Score lines missing or incorrectly applied.	Level II	3.5 & 5.1	Visual
202.	Flaps improperly located.	Level II	3.5 & 5.1	Visual
203.	Delamination of scoreline at edge more than one inch.	Level II	3.5 & 5.1	Visual

4.3.2.4 Classification of characteristics - Sealed Multiwall Bag (see dwg 12972281).

Classification	Examination/test	Conformance criteria	Requirement paragraph	Inspection method ref..
Critical: None defined				
Major:				
101	Bag damaged or leaking.	Level IV	3.5& 5.1	Visual
102	Valve opening not securely taped.	Level IV	3.5& 5.1	Visual
103	Lot number incorrect or illegible.	Level IV	3.5 & 5.1	Visual
Minor:				
201	Marking incorrect or illegible.	Level II	3.5 & 5.1	Visual

4.3.2.5 Classification of characteristics - Fiberboard box

Classification	Examination/test	Conformance criteria	Requirement paragraph	Inspection method ref..
Critical- None Defined				
Major				
101	Tears longer than 1 inch along score lines if not at open edge.	Level IV	Dwg 7548645 (see 6.4.5a)	Gage
102	Tears or cuts longer than ½ inch if at open edge.	Level IV	Dwg 7548645	Gage
103	Tears, cuts or holes which would expose bag liner to view.	Level IV	Dwg 7548645	Visual
104	Noticeable weakening from exposure to moisture or weather.	Level IV	Dwg 7548645	Visual
105	Contamination from explosive material, oil or grease on interior or exterior (8).	Level IV	DWG 7548644	Visual
106	Defacing interfering with legibility of printed matter making further marking impracticable.	Level IV	3.5& 5.1	Visual
107	Failure of box joints	Level IV	3.5& 5.1	Visual
108	A slight amount of explosive dust on the interior may be permitted to the extent that it does not create a safety hazard or result in classification of empty boxes as dangerous material thus causing higher freight rates.	Level IV	3.5& 5.1	Visual
109	More than 50 percent failure of any glued joint	Level IV	3.5& 5.1 (see 6.4.1.2.2)	4.4.10

4.3.2.6 Classification of characteristics - Sealed Fiberboard Box (see dwgs. 7548645).

Classification	Examination/test	Conformance criteria	Requirement paragraph	Inspection method ref..
Critical: None defined				
Major:				
101.	Assembly torn or pierced.	Level IV	3.5 & 5.1	Visual
102	Liner pierced or torn	Level IV	3.5& 5.1	Visual
103	Liner improperly closed	Level IV	3.5& 5.1	Visual
104	Lot number misleading or unidentifiable	Level IV	3.5& 5.1	Visual
105.	Strapping or banding strips missing, broken, or loose.	Level IV	3.5& 5.1	Visual/manual
Minor: (continue from 4.3.2.5)				
201	Type of liner incorrect	Level II	3.5 & 5.1	Visual
202.	Marking misleading or unidentifiable	Level II	3.5& 5.1	Visual
203.	Strapping or banding strips improperly assembled	Level II	3.5& 5.1	Visual
204.	Flaps improperly closed (as applicable).	Level II	3.5& 5.1	Visual

4.3.2.7 Classification of characteristics - TNT.

Classification	Examination/test	Conformance criteria	Requirement paragraph	Inspection method ref..
Major				
101	Form	4.3.3.1/4.3.3.2	3.2	4.4.1.1
102	Color		3.2	4.4.1.2
103	Solidification Point	4.3.3.1/4.3.3.2	3.2	4.4.2
104	Moisture	4.3.3.1/4.3.3.2	3.2	4.4.3
105	Acidity	4.3.3.1/4.3.3.2	3.2	4.4.4
106	Alkalinity	4.3.3.1/4.3.3.2	3.2	4.4.5
107	Insoluble matter	4.3.3.1/4.3.3.2	3.2	4.4.6
108	Sodium	4.3.3.1/4.3.3.2	3.2	4.4.7
109	Thickness of flake	4.3.3.1/4.3.3.2	3.3	4.4.8
110	Granulation	4.3.3.1/4.3.3.2	3.4	4.4.9

4.3.3 Sampling/Testing. Representative sample(s) (as detailed below) shall be taken from each batch of TNT in accordance with ASTM E300 for solids. The product shall be submitted for inspection to determine compliance with all the requirements in section 3. Failure of a sample to comply with any of the requirements shall be considered a major defect and will result in rejection of the lot.

4.3.3.1 Continuous nitration process sampling.

4.3.3.1.1 Pre-production sampling. After the debugging process has been completed, samples shall be selected every hour for the first 8 hours production from each line and subjected to the test specified in 4.4. If any sample fails to comply with the test requirements, the production shall be rejected and the contractor shall go through the debugging process again to bring the product within specification.

4.3.3.1.2 Samples for regular production (lot acceptance). After the testing for the Pre-production has been completed, samples that represent a sub-lot (a transportation unit regardless of its size) shall be selected from each line and subjected to the solidification test specified in 4.4.2 and tests specified in 4.4.1 and 4.4.3 through 4.4.9. If any samples fail to comply with the test requirements, the sub-lot shall be rejected. The sub-lot data will be recorded on the lot acceptance sheet of each lot.

4.3.3.1.2.1 Normal Sampling. An individual sample, consisting of approximately 8 ounces shall be randomly selected from each four hours of production, from each line. These samples shall be subjected to all tests specified in Table I, paragraph 3.3 and paragraph 3.4. Each sample shall be analyzed separately (no composite sampling) and evaluated independently. If any sample fails to comply with any requirement, all material since the last acceptable material produced shall be sampled at approximately 20 box intervals. Normal sampling can be resumed after seven consecutive samples tested (1 sample/20 boxes interval) satisfy the previously failed requirement. All boxes preceding or succeeding a failed sample shall be removed and rejected.

4.3.3.1.2.2 Reduced Sampling. After ten consecutive production lots meet all these (see 4.3.3.1.2.1) requirements, the sampling frequency shall be reduced to once a shift for each production line. If any sample fails to comply with any requirement, all material since the last acceptable material is produced shall be sampled at approximately 20 box intervals. In addition, after seven consecutive samples (1 sample/20 boxes) tested satisfy the previously failed requirement, sampling can then be reverted to normal sampling (one sample per four hour operation). All boxes preceding or succeeding a failed sample shall be removed and rejected.

4.3.3.2 Batch Process Sampling. For TNT produced by the batch process, a representative sample of approximately 8 ounces shall be randomly selected from each batch and subjected to the tests depicted in 4.4.1 and 4.4.3 through 4.4.9. In addition, the test depicted in 4.4.2 shall be performed on individual samples obtained from ten percent of the number of boxes in each batch. The selection of batches for sampling for tests in 4.4.1 and 4.4.3 through 4.4.9 shall be in accordance with MIL-STD-1916 except that in lieu of Table IV (MIL-STD-1916), the following continuous sampling plan shall be used: i = 10, f =1/3 and there shall be no reduced or

tightened inspection level. If any sample fails to meet any test requirement, the batch represented by the sample shall be rejected. All batches produced between the time of production of the last tested and accepted batch and the batch that failed shall be tested in accordance with the applicable methods given in paragraph 4.4. If any of these batches fail to meet the requirement of the previously failed test that batch shall also be rejected. In addition, after any failure of a batch the contractor shall return to 100% inspection until "i" successive batches are accepted as required by MIL-STD-1916.

4.3.4 Inspection equipment.-For the performance of all tests and examinations specified in 4.3 and 4.4, commercial inspection equipment should be employed. The contractor shall have available, and utilize correctly this equipment, and is charged with the responsibility of insuring that proper calibration procedures are followed. Government approval of all inspection equipment is required prior to its use for acceptance purposes.

4.4 Test Methods and Procedures (see 6.7). ACS recommended practice with respect to blanks, reagents, and standards shall be utilized to avoid degradation, contamination and change in concentration due to prolong storage of these chemical solutions.

4.4.1 Form and Color

4.4.1.1 Form. The form of the applicable type of TNT shall be determined by visual examination.

4.4.1.2 Color. The color of the applicable type of TNT shall be determined by visual examination. The color for Type I, TNT, shall be determined in accordance with FED-STD-595, Color Number 30257.

4.4.2 Determination of solidification point. The solidification point shall be determined in accordance with Method 210.1 of MIL-STD-650 except that a National Bureau of Standard Thermometer with a range of 79-82 degrees Centigrade shall be used.

4.4.3 Moisture. The moisture shall be determined in accordance with MIL-STD-650, Method 101.4.

4.4.4 Acidity. Transfer an accurately weighed portion of 10.0 grams of sample to 250 mL glass-stoppered iodine flask or equivalent. Add 40 ml methylene chloride from a graduated cylinder to the sample and also to an empty flask which will serve as a blank. Stopper the flask. Swirl the sample flask until dissolution is complete. Put 0.75 ml (approx. 20 drops) of bromothymol blue indicator in a 100 ml graduated cylinder and dilute to the mark with CO_2 - free distilled water. Stopper the flask containing the CO_2 - free water. Transfer the 100 ml of water containing the indicator to the blank flask and replace stopper. Repeat this procedure with the sample flask. Swirl both sample and blank flasks vigorously for 10-20 seconds to ensure interaction of methylene chloride and water layers.

NOTE: Too vigorous swirling or shaking must be avoided or an emulsion will be produced which may take hours to disperse.

Titrate the blank solution first. If the lower (aqueous) layer is blue, add a measured amount of 0.01 N H_2SO_4 dropwise until it turns green or yellow and add an equal amount to the sample. If the solution is green or yellow at the start, begin to titrate with 0.01 N NaOH. Add the NaOH dropwise, stoppering the flask after each addition and swirling vigorously for 5-10 seconds (see note above). The end point is taken as a blue color which persists for 2 minutes after the methylene chloride and water have separated into distinct layers and which persists after one additional 5-10 second swirling.

NOTE: The blue color may fade somewhat or acquire a trace of green coloring after the final swirl but this is acceptable.

The sample is now titrated in a manner similar to that of the blank titration. The end point is a persistent blue color as described in the blank determination but care must be taken to look through the aqueous layer horizontally against a white or colorless background since transmitted or reflected light from the yellow methylene chloride solution will cause a green coloration. In addition, incomplete separation of methylene chloride and water may result in a cloudiness which may also impart a slight green cast to the aqueous layer.

Experience with the method should allow a determination of the end point to within ± 0.05 ml NAOH.

$$\% \text{ Acidity (as } H_2SO_4) = \frac{4.9\ (A-B)\ N}{W}$$

Where:

A = ml NaOH for sample
B = ml NaOH for blank
N = Normality of NaOH
W= Sample wt., grams

4.4.5 Alkalinity. The specimen shall be considered unsatisfactory with respect to alkalinity when B is greater than A in the calculations under "Acidity", para. 4.4.4.

4.4.6 Insoluble matter. The insoluble matter shall be determined in accordance with MIL-STD-650, Method 105.1 using methylene chloride as the solvent. Furthermore, the residue in the filtering crucible shall be dried in an oven at 100 ± 5°C

4.4.7 Sodium

4.4.7.1 Atomic Absorption Spectrophotometric Methods for the Determination of Sodium

4.4.7.1.1 Apparatus. Any satisfactory Atomic Absorption Spectrophotometer

4.4.7.1.2 Reagents. Reagent Grade ACS dimethylformamide (DMF) shall be used. Sodium-free distilled water shall be used. All references in this method to distilled water means sodium-free distilled water.

4.4.7.1.3 Preparation of standard sodium solutions.

4.4.7.1.3.1 Stock solution (sodium chloride solution). Preparation: Accurately weigh 127 mg of reagent grade sodium chloride (or equivalent of other suitable sodium standard) to the nearest 0.1 mg on an analytical balance and transfer to a clean dry 1000 ml volumetric flask. Dissolve in sodium-free distilled water and make up to the mark. This solution contains approximately 50 parts per million of sodium. Then transfer a 10 ml aliquot from the 1000 ml volumetric flask into another 1000 ml volumetric flask and dilute to the mark with sodium-free distilled water.

4.4.7.1.3.2 Standard sodium solutions. Preparation: Only sodium-free distilled water shall be used in these solutions. Transfer 2 ml, 4 ml, 6 ml and 8 ml aliquots of the stock solution into 100 ml volumetric flasks and dilute to volume with distilled water. These solutions will contain approximately 0.01, 0.02, 0.03, and 0.04 ppm sodium, respectively. The concentration of the standards may be adjusted to cover the ranges experienced in the test samples. Calculate the exact concentration according to the following:

a. The following steps form the basis for the calculation of concentration:

$$\text{mg of Na in sample} = \text{mg NaCl used} \times \frac{\text{AW of Na}}{\text{MW of NaCl}}$$

Where:

AW = atomic weight
MW = molecular weight

Initial ppm may be expressed as:

$$\text{ppm Na} = \frac{\text{mg of Na}}{\text{total dilution volume}} \times 1000$$

b. The second dilution may be expressed as follows:

$$\text{ppm Na after second dilution} = \frac{\text{VA(1)}}{\text{1000 mL}} \times \text{initial ppm}$$

where VA(1) = volume to aliquot of stock solution

c. The exact concentration of sodium is then:

$$\text{ppm Na after final dilution} = \frac{\text{VA(2)}}{\text{100 mL}} \times \text{ppm found in (b) above}$$

where VA(2) = volume of each aliquot taken in 4.4.7.1.3.2.

4.4.7.1.3.3 Standard solutions (dimethylformamide). Preparation: Transfer by buret ½ ml, 1 ml, and 2 ml aliquots of the stock solution into 10 ml volumetric flasks. Add 9.5 ml, 9.0 ml

and 8.0 ml of distilled water to the respective flasks and dilute each flask to volume with DMF. The concentration of the standards may be adjusted to cover the ranges experienced in the test samples. These solutions will contain approximately 0.025, 0.050, and 0.10 ppm sodium. Prepare a blank using 10.0 mL of distilled water diluted to the mark in a 100 ml volumetric flask with DMF. Use the same source of water and DMF as used for the standard solution.

4.4.7.1.4 Adjustment of apparatus for analysis of sodium The apparatus used shall be adjusted according to the manufacturer's prescribed settings. A nominal wavelength of 589 millimicrons should be used for sodium.

4.4.7.1.5 Calibration of apparatus with standard solutions.

4.4.7.1.5.1 Sodium-free distilled water. Place sodium-free distilled water in aspirator cup and aspirate into the flame. Record absorbance. Repeat with the nominal 0.01, 0.02, 0.03, and 0.04 ppm standard solutions and record absorbance. Prepare a graph plotting absorbance versus exact concentration."

4.4.7.1.5.2 Dimethylformamide. Place the DMF/distilled water blank in aspirator cup and aspirate into the flame. Record absorbance. Repeat with the nominal 0.025, 0.050, and 0.10 ppm standard solutions and record absorbance. Prepare a graph plotting absorbance versus exact concentration.

4.4.7.1.6 Test procedures. Prepare and test a sample of TNT by one of the following methods:

4.4.7.1.6.1 Sodium by Atomic Absorption. (Water as solvent) Weigh to the nearest mg approximately 5 gm of TNT and transfer to a 50 ml beaker. Add 15 ml of sodium free water to the beaker. Place the beaker covered with a watch glass on a steam bath or in a hot water bath for 30 minutes at 90 ± 5°C with frequent or continuous agitation. Cool the mixture, filter and collect the filtrate in 25 ml volumetric flask. Wash the TNT with two 3 ml portions of sodium-free water and collect the filtrate in the 25 ml volumetric flask. Make up to volume with sodium-free water. Using an atomic absorption spectrometer, measure the absorbance of the specimen solution. Determine the ppm sodium in the water extract from the calibration curve. Calculate the percent sodium in the TNT as follows:

$$\text{Percent Sodium} = \frac{\text{ppm sodium in water extract}}{\text{TNT Weight (g)} \times 400}$$

4.4.7.1.6.2 Sodium by atomic absorption. (Water-DMF as solvent) Prepare the sample by placing 5 mg of the TNT sample, weighed to within 0.2 mg, into a 100 ml volumetric flask and add 10 ml of sodium-free water. Add DMF and shake until the sample is dissolved. Adjust to volume with DMF in a constant temperature bath (20 ± 1 degrees Centigrade). Place the standards and the samples in aspirator cup. Using an atomic absorption spectrometer, measure the absorbance of the specimen solution. Determine the ppm sodium in the specimen solution from the calibration curve. To convert the weight of the TNT sample from mg (as measured) to g (as shown in the formula below) divide the weight in mg by 1000. Then calculate the percent sodium in the TNT as follows:

$$\text{Percent Sodium} = \frac{\text{ppm sodium in specimen solution}}{\text{TNT weight (g)} \times 100}$$

4.4.7.2 Alternate method, sodium from TNT dissolution in dimethylformamide (DMF) and atomic absorption spectrophotometry.

4.4.7.2.1 Preparation of washed TNT. Add approximately 300 g flake TNT to a 2 L beaker and cover with approximately 1 L of sodium-free distilled water. Heat on a steam bath until the TNT has melted. Stir the suspension for 4 to 5 minutes with a teflon rod. Decant the water. Repeat twice more.

4.4.7.2.2 Preparation of sodium solution standards. A 1000 mg/L sodium solution is prepared by weighing 2.54 g (to ± 0.1 mg) dried reagent grade NaCl and quantitatively transferring it to a 1000 ml volumetric flask. Dissolve the NaCl in sodium-free distilled water and make up to volume with sodium-free distilled water. A 10 mg/L sodium solution is prepared by pipetting 10 ml of the 1000 mg/L solution to a 1000 ml volumetric flask and diluting to volume with sodium-free distilled water. The 0, 0.2, 0.5, and 1.0 mg/L sodium solutions are prepared by first adding 85 ml of DMF and 5.00 g of washed TNT from 4.4.7.2.1 to each of four 100 ml volumetric flasks. Next add by pipette 0, 2.0, 5.0 and 10.0 ml of the 10 mg/L solution to the separate flasks prepared above. Dilute each to volume with sodium-free distilled water

$$[Na]\ (mg/L) = \frac{W\ (g) \times 23 \times 1000 \times V\ (mL)}{58.5 \times 100 \times 100} = W \times V \times 0.0393$$

where: Na = Concentration of sodium in standard solutions for calibration in mg/L.
W = Weight of NaCl in grams.
V = Volume of 10 mg/L sodium solution used to prepare the 0, 0.2, 0.5, and 1.0 mg/L solutions in ml.

4.4.7.2.3 Sample preparation and sodium determination. Weigh 5.00 g (to nearest mg) of TNT sample and transfer quantitatively to a 100 mL volumetric flask. Add 85 ml reagent grade DMF and agitate until completely dissolved. Complete to volume with sodium-free distilled water. Set up and adjust the atomic absorption spectrophotometer according to the manufacturer's instructions for sodium determination. Zero the instrument with the blank solution ("0" prepared in 4.4.7.3.2 above). Measure the standard solutions and sample. Construct a calibration curve with the standard readings and determine the concentration in the sample from the reading obtained.

Calculate % Na in sample as follows:

$$\%\ Na = \frac{C\ (mg/L) \times 100 \times 100}{1000 \times 1000 \times W\ (g)} = C/(100 \times W)$$

where C = Sodium concentration in sample from calibration curve in mg/L.
W = Weight of TNT sample added to 100 ml flask in grams.

4.4.8 Thickness of flake (applicable to Type I, flake TNT, only). The thickness of each of 100 flakes of TNT shall be measured by means of a micrometer accurate to at least 0.001 inch. The maximum thickness shall be noted and the average thickness calculated. (see 6.6).

4.4.9 Granulation. The granulation of the TNT shall be determined in accordance with Method 204.1 of MIL-STD-650.

4.4.10 Adhesion of glued carton joints. The glued carton shall be torn apart by lifting a corner of the glued flap and tearing it from the side wall. Examine the manner of separation of the joint and note the percentage of fiber failure. (see 6.4.1.2.2)).

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When actual packaging of materiel is to be performed by DOD personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activity within the Military Department or Defense Agency, or within the Military Department's System Command. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity. (See 6.4)

6. NOTES

6.1 Intended use

6.1.1 Type I.-Type I TNT is intended for use in the loading of shells and bombs and in the manufacture of demolition blocks and explosive mixtures.

6.1.2 Type II.-Type II TNT is intended for use in primer mixtures and in special compositions that require either high purity TNT or fine crystalline form.

6.2 Acquisition requirements. Procurement documents should specify the following:

a. Title, number and date of this specification.
b. Issue of DODISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced.
c. Acceptance and description sheets shall be prepared for each lot in accordance with MIL-STD-1171.
d. Provisions for submission of first article samples.
e. Type and form of the trinitrotoluene.
f. Levels of preservation and packing.
g. Item hazard classification.

6.3 Consideration of data requirements. When this specification is used in a procurement contract, which incorporates DD Form 1423, contract data requirements list, acceptance and description sheets (for explosives) are required for each lot. These sheets should be prepared and submitted by the contractor in accordance with MIL-STD-1171 or otherwise as directed by the contract. In reporting the density/sensitivity test results, all individual sample densities and sensitivities should be included. In addition, the following data requirements should be considered when this specification is applied on a contract, per the Contract Data Requirements List, DD Form 1423:

Reference	DID Number	DID Title
6.4.3	DI-PACK-81059	POP Test Report

6.4 Acceptable packaging requirements. The following packing and marking requirements have been used for packaging TNT, and are found to be acceptable to the Government. These requirements should be included in the contract or order for the procurement of TNT because TNT is a hazardous energetic material. (Caution: If the following paragraphs are to be incorporated in a contract, they must be modified, using standard contract language, to make them compulsory requirements.)

6.4.1 Preservation and packaging.

6.4.1.1 Packing Level A.-The trinitrotoluene (TNT) shall be packed in accordance with Dwg. 7548644.

6.4.1.2 Packing Level B.-The trinitrotoluene (TNT) shall be packed in accordance with Dwg. 7548645 or Dwg. 12972281.

6.4.1.2.1 Fiberboard Carton, Dwg. 7548645. When assembling the body or cover, the flap edges shall not be more than 1/8 inch above or below the edge of the part. Delamination of the fiberboard which may occur where diagonal scores meet the edge of the part will be acceptable, provided the width of the delamination does not exceed one inch.

6.4.1.2.2 Adhesion of glued carton joints. Each glued joint shall meet the requirements for fiber failure as given on Dwg. 7548645 when determined as specified in 4.4.10

6.4.2 Marking.-The marking shall be in accordance with Dwg. 7548644, Dwg. 7548645 and Dwg. 12972281.

6.4.3 Performance oriented packaging (POP). The exterior packs cited above should meet all of the POP test requirements in accordance with the Code of Federal Regulations, Title 49 (49 CFR), including testing, and retesting as specified in paragraph 178.601 (e) of 49 CFR. A POP test report should be generated in accordance with DI-PACK-81059 following the tests. POP testing may be waived if an acceptable non-government analogy can be made IAW 49 CFR to another pack which has successfully completed the testing. This analogy must also be documented IAW DI-PACK-81059. When completed, either the contractor generated POP test

or non-government analogy must be kept on file by the contractor and must also be submitted to the U.S. Army Research Development and Engineering Center, ATTN: AMSTA-AR-WEP, Picatinny Arsenal, NJ 07806-5000. (NOTE: If a POP test report is prepared against an acceptable analogy; the analogous POP test report must also be submitted to AMSTA-AR-WEP). The POP marking symbol applied to the exterior pack should be that belonging to the organization which conducted the POP testing.

6.4.4 Item hazard classification. All U.S. manufacturers should make certain that the item is tested in accordance with Part 173, Subpart C, Section 173.58 (a) of 49 CFR, Parts 106-180 to assign proper Class and Division for all explosives (Division 1.1, 1.2, 1.3 and 1.4 Explosives). Registration with the Associate Administrator of Hazardous Materials Safety is required in accordance with Part 173, subpart C, Section 173.56 (b) (1) or 173.56 (c) of 49 CFR so that proper markings in accordance with Part 172, Subpart D, Section 172.301 (a) and 172.320 (a) are met.

All foreign manufacturers should make certain that the dangerous goods are tested in accordance with United Nations Committee of Experts on the Transportation of Dangerous Goods (as published in UN Document ST/SG/AC.10.11 latest revision, Recommendations for the Transport of Dangerous Goods - Tests and Criteria) to determine the proper class and division (Class 1-9 and Division 1.1 -1.6 for explosives). Registration for air and vessel transport is required with each manufacturing country's National Competent Authority which is issued in accordance with part 2, paragraph 1.3 of the International Civil Aviation Organization (ICAO) technical instructions which approves the hazard classification and compatibility group assignment and assigns the appropriate shipping name to the dangerous goods. The proper packaging, marking and labeling is contained in the United Nations Committee of Experts on the Transport of Dangerous Goods (as published in UN Document ST/SG/AC.10.1, latest revision, recommendations on the Transport of Dangerous Goods).

For air transport the dangerous goods must comply with the provisions of the International Air Transport Associate (IATA) Dangerous Goods Regulations and for vessel transport, the dangerous goods must comply with the provisions of the Intergovernment Maritime Organization's International Maritime Dangerous Goods (IMDG) Code.

6.4.5 Referenced documents for packaging. The following list of documents referenced in 6.4 should be included in the contract or purchase order as requirement documents. Document users are cautioned that they must meet all requirements of these documents if cited in the contract or purchase order.

a. Government documents, drawings and publications. Unless otherwise specified, the issues of documents are those cited in the solicitation.

DRAWINGS

U.S. 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
12972281 – Packing and Marking for Bag, Multiwall for Explosives

(Copies of other Government documents, drawings, and publications required by contractors in connection with specific acquisition functions should be obtained from the US Army TACOM-ARDEC, AMSTA-QAW-E, Picatinny Arsenal, NJ 07806-5000.).

b. CODE OF FEDERAL REGULATIONS

49 CFR 100-199 - 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, U.S. Government Printing Office, Washington, DC 20402. Orders for the above publication should cite, "49 CFR 100-199 (latest revision)".)

6.5 International standardization agreement.-Certain provisions, Section 3 and 4.4, of this specification are subject to international standardization agreement of STANAG 4025 and ABC-ARMY-STD-118. When an amendment, revision, or cancellation of this specification is proposed, the departmental custodians will inform their respective Departmental Standardization Offices so that appropriate action may be taken with respect to the international agreement concerned.

6.6 Flake thickness. This test is applicable to the Process evaluation testing and the first ten lots of production. After the process is under control, as evidenced by the first ten lots meeting the flake thickness requirement, testing for this requirement will be discontinued.

6.7 Equivalent test method. Prior approval of the Contracting Officer is required for use of equivalent test methods. A description of the proposed method should be submitted thru the Contracting Officer to: Commander, TACOM-ARDEC, ATTN: AMSTA-AR-QAT-P, Picatinny Arsenal, N.J., 07806-5000, and ATTN: AMSTA-AR-WEP-R, Rock Island, Illinois, 61299

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.

Preparing Activities:
Army-PA

Custodians:
Army-PA
Navy-OS
Air Force -70

Review Activities:
Army-PA; EA
Navy-OS
Air Force-70

Project Number:

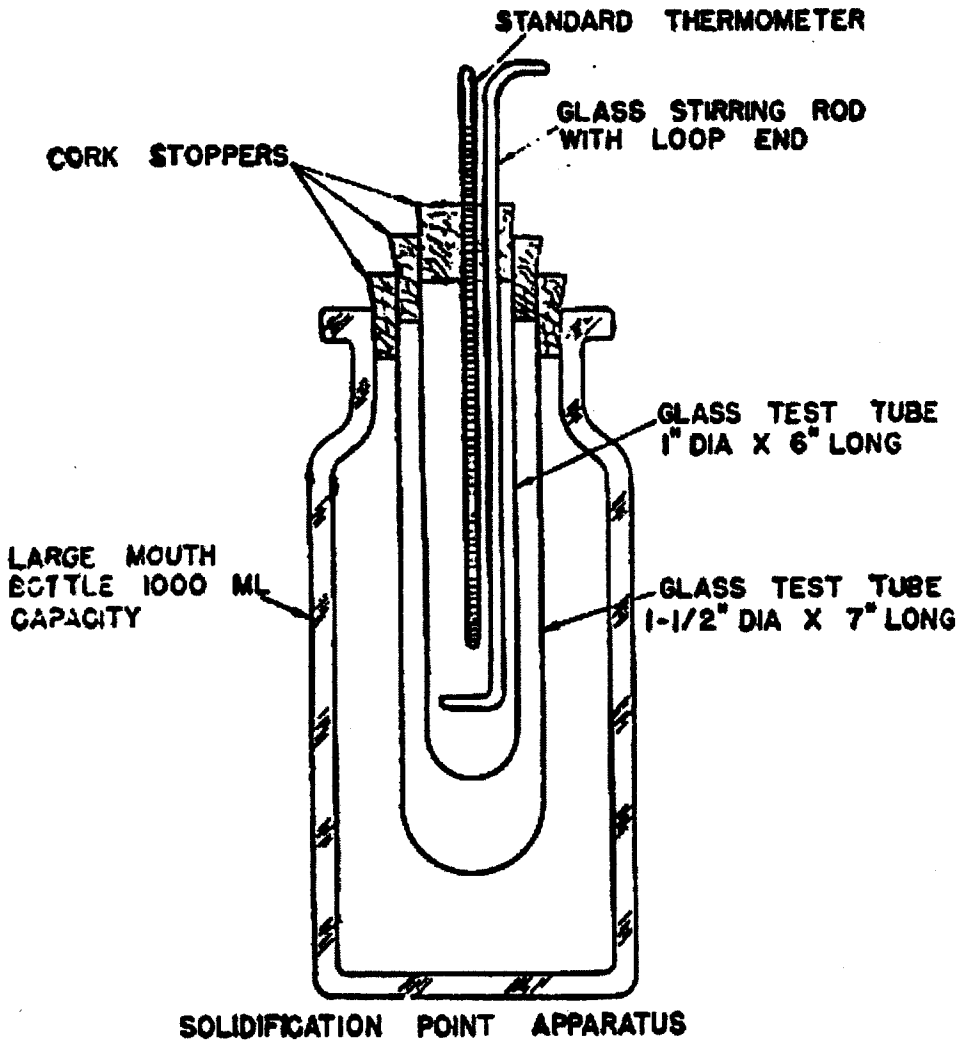
STANDARD THERMOMETER
GLASS STIRRING ROD WITH LOOP END
CORK STOPPERS
GLASS TEST TUBE 1" DIA X 6" LONG
LARGE MOUTH BOTTLE 1000 ML CAPACITY
GLASS TEST TUBE 1-1/2" DIA X 7" LONG
SOLIDIFICATION POINT APPARATUS

FIGURE 1.