3 August 1977
SUPERSEDING
WS.1724A
(see Section 6)

MILITARY SPECIFICATION

EXPLOSIVES, CYCLOTOL. 25/75 and 29/71, RDX/TNT

This specification is approved for use by the Naval Sea Systems Command (OS), and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers two types of cyclotol explosive referenced herein as the "explosive".

1.2 Classification. The explosive shall be of the following types and classes as specified in the contract (see 6.2).

Type I - 25/75, RDX/TNT
Type II - 29/71, RDX/TNT
Class I - RDX of Class 5 granulation
Class 2 - RDX of Class 6 granulation

2. APPLICABLE DOCUMENTS

2.1 Issues of documents. The following documents, of the issue in effect on date of invitation for bids or request for proposal, form a part of the specification to the extent specified herein.

SPECIFICATIONS

FEDERAL

RR-S-366	Sieve, Test

MILITARY

MIL-T-248	Trinitrotoluene (TNT)
MIL-R-398	RDX

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Naval Ordnance Station, Attn: Standardization Division (611), Indian Head, MD. 20640 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

STANDARDS

FEDERAL

FED-STD-313	Material Safety Data Sheets, Preparation and the submission of

MILITARY

MIL-STD-129	Marking for Shipping and Storage
MIL-STD-105	Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-1167	Ammunition Data Cards
MIL-STD-1218	ACS Chemicals

PUBLICATIONS

ARMY ARMAMENT RESEARCH AND DEVELOPMENT COMMAND

F 7548644	Box, Packing, for High Explosives Assembly, Details, Packing and Marking
F 7548645	Carton, Packing, Reuseable, Collapsible, for High Explosives, Assembly, Details, Packing and Marking

(Copies of specifications, standards, drawings, and publications required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer).

2.2 Other Publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on the date of invitation for bids or request for proposal shall apply.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 1744-64	Water in Liquid Petroleum Products by Karl Fischer Reagent
ASTM E 300-73	Sampling Industrial Chemicals

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

CODE OF FEDERAL REGULATIONS

49 CFR 100-199 Transportation

(The Code of Federal Regulations is available from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402. Orders should specify "49 CFR 100-199 (latest revision))".

(Technical society and technical association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups and using Federal agencies).

3. REQUIREMENTS

3.1 Preproduction sample. When specified in the contract (see 6.2), a preproduction sample of the explosive is required and shall be manufactured using the methods and procedures proposed for production. The sample shall be tested as specified in Section 4 for the purpose of determing that, prior to starting production, the contractor's production methods are capable of producing explosives that comply with the technical requirements of the contract (see 4.4.1). No raw material or process changes shall be made, subsequent to approval of the preproduction sample, without prior written approval of the procuring activity.

3.2 Material. RDX in accordance with Type I, Class 5 or 6 as specified of MIL-R-398 shall be thoroughly and uniformly incorporated in molten trinitrotoluene (TNT) in accordance with Type I of MIL-T-248. These ingredients shall be combined in the proportion specified in TABLE I to form a mixture free from gritty particles or other visible impurities as specified in 3.6.

3.3 Form. Unless otherwise specified in the contract (see 6.2), the explosive shall be supplied in the form of buds or strips approximately 3.8 centimeters(cm) wide and 7.6 cm long.

3.4 Composition. The composition of the explosive shall be as specified in TABLE I.

TABLE I. Composition of cyclotol explosive.

Ingrediant	Type I	Type II
RDX, wt%	25.0 ± 1.0	29.0 ± 1.0
TNT, wt%	75.0 ± 1.0	71.0 ± 1.0

3.5 Moisture. The moisture content shall be 0.25 percent by weight (wt%) maximum.

3.6 Insoluble particles. Not more than five particles shall be retained on a U.S.A. Standard Series 250µm (No. 60) sieve in accordance with RR-S-366.

3.7 Material safety data sheets. The contractor shall prepare and submit material safety data sheets in accordance with FED-STD-313 as specified in the contract.

3.8 Workmanship. The material shall be uniform, free from contaminants, foreign material or any other defect that would prevent its use for the purpose intended.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure that supplies and services conform to prescribed requirements.

4.2 Classification of inspections. The inspection requirements specified herein are classified as follows:

1. Preproduction inspection (see 4.5).
2. Quality conformance inspection (see 4.6).

4.3 Inspection conditions. Unless otherwise specified (see 6.2), all inspections shall be performed under the following conditions:

a. Temperature: Room ambient 18 to 35°C (65 to 95°F)
b. Altitude: Normal ground
c. Vibration: None
d. Humidity: Room ambient to 95 percent relative, maximum

4.4 Sampling.

4.4.1 Preproduction sample. When specified in the contract or order (see 6.2), a preproduction sample of explosive manufactured in accordance with 3.1 and packaged per section 5 shall be subjected to the preproduction inspection detailed in 4.5 at an activity designated by the procuring activity (see 6.2). The preproduction sample size shall be as specified in the contract (see 6.2). Acceptance of the preproduction sample shall be based on no defects in the sample. Further production of the explosive by the contractor, prior to the approval of the preproduction sample, shall be at the contractor's risk.

4.4.2 Lot. Unless otherwise specified in the contract (see 6.2), a lot shall consist of one or more batches of explosive manufactured by the same process, from the same raw materials, by one manufacturer at one plant, under essentially identical conditions, and to be offered for acceptance at one time. Each batch shall consist of that quantity of explosive that has been subjected to the same unit chemical or physical mixing process intended to make the final product homogenous. Lots containing more than one batch

of explosive shall be sufficiently blended prior to packaging to assure homogeneity. In addition a lot shall be subject to the following limitations:

a. A lot of explosive shall contain Type I TNT from only one lot number of TNT from one manufacturer.

b. A lot of explosive shall contain Type I RDX of one class from only one lot of RDX, from one manufacturer.

4.4.3 Quality conformance inspection sampling.

4.4.3.1 Sampling for test and examination. A representative 5.0 kilogram (Kg) sample shall be selected at random from each lot of explosive. For sampling purposes the unit of product shall be one container of explosive in accordance with section 5. The number of sample containers shall be determined in accordance with inspection level II of MIL-STD-105 for the number of containers comprising the lot. Each sample container shall be sampled at least twice in accordance with the procedures of ASTM E 300-73 for solids. The mass of the individual samples shall be such that the total mass of all samples will be approximately 5.0 Kg. All individual samples shall be thoroughly mixed together to form a composite sample. This composite sample shall be divided into two roughly equal portions and each portion placed in a clean, dry, metal container. Each container shall be sealed and marked with the material name, contractor's name, contract number, lot number, date and safety precautions. One container shall be stored for possible reference, while the other is subjected to quality conformance inspection.

4.4.3.2 Sampling for packaging inspection. Sampling for packaging examination shall be in accordance with inspection level II of MIL-STD-105. Sample containers for the examination of TABLE II shall be selected at random after filling and liner closure but prior to container closing. Following examination the sample containers shall be returned to the lot and a separate group of sample containers selected at random for the examination of TABLES III and IV.

4.5 Preproduction inspection. The preproduction inspection shall consist of the tests of 4.7 and the visual examinations of 4.8. Failure to meet any requirement of this specification shall result in the rejection of the preproduction sample.

4.6 Quality conformance inspection. The quality conformance inspection shall consist of the tests of 4.7, the visual examinations of 4.8 and the packaging inspection of 4.9 performed on samples selected in accordance with 4.4.3.2. Failure to pass any test in 4.7, examination in 4.8, or meet the acceptance criteria of the packaging inspection of 4.9 shall be cause for rejection of the lot represented.

4.7 Tests. Unless otherwise specified, all chemicals shall be ACS grade in accordance with MIL-STD-1218.

4.7.1 RDX content. The RDX content shall be determined as follows:

a. Weigh 5g of sample to the nearest mg and place in a 50 milliliter (mL) beaker. Add 15 mL benzene saturated with RDX. Cover the beaker with a watchglass and heat on a steam bath for 30 minutes. Break up any lumps with a glass rod and agitate by swirling occasionally.

b. After removal from the heat, cool to room temperature and filter the solution through a tared filtering crucible. Transfer the insoluble residue from the beaker to the crucible using four or more 2 to 3 mL portions of benzene saturated with RDX.

c. Draw heated air through the crucible until the odor of benzene is no longer detectable. Dry the crucible and contents in an air circulating oven at 100 ± 5°C until constant weight is obtained. Cool in a desiccator and obtain the weight of the crucible and sample.

d. Calculate the wt% RDX as follows:

$$\text{wt\% RDX} = \frac{100\ A}{W - (MW)}$$

where A = Increase in weight of filtering crucible, g
W = Weight of sample, g
M = Weight fraction $\left[\frac{\text{wt\%}}{100}\right]$ moisture in explosive

4.7.2 TNT content. The TNT content shall be obtained by difference:

100 - wt% RDX (from 4.7.1) = wt% TNT

4.7.3 Moisture content. The moisture content shall be determined by a Karl Fischer method in accordance with ASTM D 1744-64 except that a solvent consisting of 1:1 anhydrous methanol:carbon tetrachloride (moisture free) shall be used.

4.7.4 Insoluble particles. The insoluble particles shall be determined in accordance with the following:

a. Weigh a 50g portion of the sample to the nearest mg in a 400 mL beaker. Add 100 mL of benzene and heat the beaker and contents on a steam bath until all lumps are broken down and all soluble material is dissolved.

b. Pour the contents through a small U.S.A. Standard series 250µm (No. 60) sieve in accordance with RR-S-366. Carefully wash all insoluble matter from the beaker to the sieve with benzene.

c. Wash the residue on the sieve with acetone to remove RDX. Dry the sieve with warm air. Count the retained particles.

4.8 Visual examinations.

4.8.1 Form. Spread approximately 50g of sample over a flat surface and visually examine the material to verify conformance to 3.3.

4.8.2 Workmanship. Spread approximately 100g of sample over a flat surface and visually examine the material to verify conformance to 3.8.

4.9 Packaging inspection. The packaging inspection shall consist of the examinations of 4.9.1 and 4.9.2 performed on sample containers selected in accordance with 4.4.3.2. The acceptable quality levels (AQL's) shall be as specified in TABLE's II, III, and IV. When specified in the contract (see 6.2), AQL's may be applied to the individual attributes listed, using an AQL of 0.25 defects per one hundred units inspected for major defects and an AQL of 0.40 defects per one hundred units inspected for minor defects.

4.9.1 Examination prior to closing. Sample containers selected prior to closing shall be examined for the defects listed in TABLE II. The AQL's shall be as specified.

4.9.2 Examination of closed containers. Sample containers selected following closure shall be inspected in accordance with TABLE III for level A packaging (see 5.1) and TABLE IV for level C packaging (see 5.2). The AQL's shall be as specified in the applicable TABLE.

TABLE II. Examination of Containers prior to closing.

Catagory	Defect	AQL	Method of examination
Critical	None defined		
Major			
101	Liner pierced or torn	0.40	visual
102	Liner improperly closed	0.40	visual
103	Foreign matter present	0.40	visual
104	Incorrect liner material	0.40	visual
Minor	None defined		

TABLE III. Examination of closed wooden box (7548644).

Catagory	Defect	AQL	Method of examination
Critical	None defined		
Major			
101	Box damaged	1.00	visual
102	DoD Symbol misleading, missing, or unidentifiable	1.00	visual
103	Top improperly assembled	1.00	visual
104	Strapping broken, loose, or missing	1.00	visual/manual
Minor			
201	Nail protruding	1.50	visual
202	Marking misleading, unidentifiable or missing	1.50	visual
203	Strapping improperly assembled	1.50	visual/manual

TABLE IV. Examination of sealed fibreboard carton (7548645).

Catagory	Defect	AQL	Method of examination
Critical	None defined		
Major			
101	Assembly torn or pierced	0.40	visual
102	DoD Symbol misleading, unidentifiable or missing	0.40	visual
103	Strapping broken, loose or missing	0.40	visual/manual
104	Marking, misleading, unidentifiable or missing	0.40	visual
Minor	None defined		

5. PACKAGING.

5.1 Preservation-packaging and packing. Preservation-packaging and packing shall be level A or level C as specified in the contract (see 6.2).

5.1.1 Level A. The explosive shall be preserved, packaged and packed in accordance with Drawing F 7548644.

5.1.2 Level C. The explosive shall be preserved, packaged and packed in accordance with Drawing F 7548645.

5.2 Marking. In addition to any special marking required by the contract (see 6.2), each container shall be marked in accordance with Drawing F 7548644 or Drawing F 7548645, and in accordance with MIL-STD-129 and Code of Federal Regulations 49 CFR 171-179.

5.3 Data cards. Data cards shall be prepared in accordance with MIL-STD-1167 and furnished as specified in the contract (see 6.2).

6. NOTES.

6.1 Intended use. Cyclotol explosive in accordance with this specification is intended to be used as the main explosive charge in Naval Ordnance.

6.2 Ordering data. Procurement documents should specify the following:

6.2.1 Procurement requirements.

a. Title, number and date of this specification
b. Quantity required
c. Type and class required (see 1.1)
d. When a preproduction sample is required (see 3.1 and 4.4.1)
e. Preproduction sample size required (see 4.4.1)
f. Activity designated for preproduction inspection (see 4.4.1)
g. Whether preproduction sample explosive is included in the quantity specified for delivery on contract (see 6.2.1b)
h. When AQL's are to be applied to individual attributes (see 4.9)
i. Level of packaging required (see 5.1)
j. Any special marking required (see 5.2)
k. Safety precautions (see 6.3)

6.2 Contract data requirements. Items of deliverable data required by this specification are cited in the following paragraph herein:

Paragraph	Data Requirement	Applicable DIDs
5.3	Data Card	DI-E-2001

DIDs (Data Item Descriptions/DD Forms 1664) for the above requirements will be documented in the applicable ADL (Authorized Data List). Such data will be delivered as identified on completed (numbered) DIDs when specified on DD Forms 1423 (Contract Data Requirements Lists) and incorporated into applicable contracts.

6.3 Safety precautions. The safety precaution requirements of the Contractor's Safety Manual for Ammunition, Explosives and Related Dangerous Material, DOD 4145.26M, are applicable.

NOTE: When this document is used as part of the description of work to be accomplished by a Government activity, the safety precaution requirements of Ammunition and Explosives Ashore, OP 5 should be made applicable.

6.4 Supersession information. This specification supersedes purchase description WS 1724A (Code Ident 10001) dated 25 February 1963. The types and classes of MIL-E-82668 are identical to those of WS 1724A.

6.5 Surface active agent. A maximum of 0.10 wt% sorbitan trioleate in accordance with MIL-S-547 or other approved surface active agent may be added to facilitate the filtration of RDX.

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MIL-E-82668(OS), "EXPLOSIVES, CYCLOTOL, 25/75 and 29/71, RDX/TNT"

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