

MIL-C-50697  
17 February 1971

## MILITARY SPECIFICATION

### CORD, DETONATING

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

#### 1. SCOPE

1.1 This specification establishes the performance, design and acceptance requirements for metal sheathed detonating cord used to transfer explosive energy in ballistic energy transfer systems.

1.2 Classification. Detonating cord (DC) shall be of the types and classes as specified in Section 3.

#### 2. APPLICABLE DOCUMENTS

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

#### SPECIFICATIONS

##### Federal

TT-I-559	Ink, Marking Stencil, Opaque for Porous. Surfaces (wood boxes fiber cartons).
WW-T-775	Tube, Copper, Seamless (For Refrigeration and General Use)
MMM-A-178	Adhesive, Paper Label, Water-resistant
PPP-B-636	Box, fiberboard
PPP-B-676	Box, Setup

##### Military

MIL-P-387	Pentaerythrite Tetranitrate (PETN)
MIL-R-398	RDX

FSC 1377

MIL-C-50697

MIL-B-2427	Box, Ammunition Packing, Wood, Nailed
MIL-A-2550	Ammunition and Special Weapons; General Specification for
MIL-S-13282	Silver and Silver Alloy
MIL-R-21723	RDX Composition CH 6

Department of the Navy

WS 4660	DIPAM
WS 5003D	HNS Explosive

## STANDARDS

Military

MIL-STD-105	Sampling Procedures and Table for Inspection by Attributes
MIL-STD-109	Quality Assurance Terms and Definitions
MIL-STD-810	Environmental Test Methods
MIL-STD-1168	Lot Numbering of Ammunition
MIL-STD-1235	Single and Multilevel Continuous Sampling Procedures and Tables for Inspection by Attribute

## PUBLICATIONS

DOD 4145.26M	DOD Contractors Safety Manual for Ammunition, Explosives and Related Dangerous Material
--------------	---

(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 date of invitation for bids or request for proposal shall apply.

Code of Federal Regulations

CFR 171-178 Department of Transportation Rules and Regulations for the Transportation of Explosives and other Dangerous Articles by Land and Water.

Society of Automotive Engineers

AMS-7721	Lead Alloy Sheet and Extrusions
----------	---------------------------------

MIL-C-50697

(Applications for copies should be addressed to the Society of Automotive Engineers, Inc., 485 Lexington Ave., New York, N. Y. 10017.)

### 3. REQUIREMENTS

3.1 Material. The detonating cord shall consist of an explosive encased in a metal sheath. The material used in the manufacture of the detonating cord shall designate the type and class; i.e., the type by the core explosive and the class by the metal sheath material.

3.1.1 Type I (PETN). The PETN used in the manufacture of the detonating cord shall comply with MIL-P-387. (Not for naval aircraft application)

3.1.2 Type II (RDX). The RDX (cyclotrimethylenetrinitramine) used in the manufacture of detonating cord shall comply with MIL-R-398, Type II Class C. (Not for naval aircraft application)

3.1.3 Type III (DIPAM). The DIPAM (dipicramide) used in the manufacture of detonating cord shall comply with WS 4660.

3.1.4 Type IV (HNS). The HNS (hexamitrostilbene) used in the manufacture of detonating cord shall comply with WS-5003D.

3.1.5 Type V (CH6). The CH6 used in the manufacture of detonating cord shall comply with MIL-R-21723.

3.1.6 Class A (Copper). The copper used in the manufacture of detonating cord shall comply with WW-T-775.

3.1.7 Class B (Silver). The silver used in the manufacture of detonating cord shall comply with MIL-S-13282.

3.1.8 Class C (Lead). The lead used in the manufacture of detonating cord shall comply with AMS 7721.

3.1.9 Class D (Aluminum). The aluminum used in the manufacture of detonating cord shall be free of impurities and have a minimum content of 99.78% pure aluminum.

3.2 Dimension. Unless otherwise specified, dimensions shall be in accordance with Table I and shall apply after all manufacturing, process treatments and nondestructive testing have been completed. There shall be no deviation from applicable drawing configuration, dimensions and tolerances.

TABLE I

<u>No.</u>	<u>Core Load grains/foot</u>	<u>Outer Dia for Metal Sheath + .010"</u>
1	2.5	.073
2	3	.080
3	4	.092
	3	

MIL-C-50697

TABLE I continued

4	5	.061
5	7	.072
6	10	.086
7	15	.105
8	20	.122
9	25	.136
10	30	.150
11	40	.175
12	50	.195

3.3 Radiographic examination. The detonating cord shall be X-rayed to ascertain there are no voids, inclusions or impurities in the explosive core or metal sheath.

3.4 Flexibility. The detonating cord shall be capable of being bent on a radius as specified in Table 2, without any visual signs of cracking of the metal sheath or degradation of performance.

TABLE 2

FLEXIBILITY REQUIREMENTS

<u>No.</u>	<u>Explosive Loading (grains/foot)</u>	<u>Bend Radius (inches)</u>
4	5	0.50
5	7	0.75
6	10	1.00
7	15	1.50
8	20	2.00
9	25	2.50
10	30	3.00
11	40	4.00
12	50	5.00

3.5 Splicing. There shall be no splices.

MIL-C-50697

3.6 Impact Resistance. The detonating cord while mounted on a steel plate shall not detonate or deflagrate when impacted with a twenty pound steel ball dropped from a height of 30 inches.

3.7 Detonation Velocity. The minimum detonation velocity of the DC shall be as listed in Table 3.

TABLE 3

DETONATION VELOCITY

<u>Explosive Core</u>	<u>Minimum Detonation Velocity</u>
PETN	8200 meters/sec
RDX	8100 meters/sec
DIPAM	7000 meters/sec
HNS	6800 meters/sec
CH6	6800 meters/sec

3.8 Detonation Continuity. The detonating cord shall uniformly propagate along its complete length when tested in accordance with 4.5.6.

3.9 Core Loading (grains per foot) and Sheath Diameter. In addition to type and class, the detonating cord shall be assigned a numerical character, to designate the core loading and sheath diameter. Table I lists the numerical designation and the associated core loading and sheath diameter.

3.10 High Temperature. The detonating cord shall be capable of withstanding the high temperature as specified in Table 4 without degradation of performance.

TABLE 4

HIGH TEMPERATURE

<u>Explosive</u>	<u>Temperature</u>
PETN	150°F
RDX	250°F
CH6	250°F
DIPAM	350°F
HNS	350°F

3.11 Low Temperature. The detonating cord shall be capable of withstanding a low temperature of -65°F without degradation of performance.

MIL-C-50697

3.12 Workmanship. Workmanship shall be of the highest grade throughout and in accordance with the best standard practice.

#### 4. QUALITY ASSURANCE PROVISIONS

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

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

- (a) A statement that the lot complies with all quality assurance provisions specified in this specification.
- (b) Number of units or product inspected.
- (c) Results obtained for all inspections performed.
- (d) Drawing, specification number and date, together with an identification and date of changes.
- (e) Certificates of conformance on all material purchased by the contractor when such material is controlled by government or commercial specifications referenced in any of the contractual documents.
- (f) Number of items in the lot.
- (g) Date submitted.

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

4.1.2 Government Verification. Using the contractor's written quality assurance procedure, this detail specification, the applicable drawings and other contractual documents as a guide, the government inspector shall verify at unscheduled intervals all quality assurance operations performed by the contractor. Verification will be performed to the extent necessary to assure compliance with the contractual requirements. Severity of government inspection of individual characteristics will be directly related to the seriousness of the classification assigned.

#### 4.1.3 Preproduction Inspection.

4.1.3.1 Submission. Prior to the start of regular production, the contractor shall submit a preproduction sample to a government approved facility as designated by the Contracting Officer (see 6.3) for evaluation in accordance with the provisions of 4.1.3.2. The preproduction sample shall consist of five spools which have been produced by the contractor or furnished by a supplier and which have been manufactured using the same production processes, procedures and equipment which will be used in fulfilling the contract. All materials, including packaging and packing, shall be obtained from the same sources of supply as will be used in regular production. The sample shall be accompanied by certificates of conformance for materials. A preproduction sample, or portion thereof, as directed by the contracting officer, shall also be submitted whenever a change occurs in manufacturing process, material used or source of supply such 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.

4.1.3.2 Inspections to be Performed. The spools will be subjected by the government to any or all of the examinations specified in this specification and any or all requirements of the applicable drawing.

4.1.3.3 Rejection. If any sample fails to comply with any or all of the applicable requirements, the initial production sample shall be rejected. The government reserves the right to terminate its inspection upon any failure of any component in the sample to comply with any of the stated requirements. In the event of rejection, the government reserves the right to require the contractor to take corrective action and submit a new initial production sample or portion thereof. Until an initial production sample is accepted, the contractor is in no way authorized by the government to initiate regular production unless otherwise directed by the Contracting Officer.

#### 4.2 Inspection Provisions.

4.2.1 Lot Formation. A lot size shall not exceed that quantity of detonating cord produced in one continuing process using one lot of explosive and one lot of sheathing material. The sample selected shall represent only that quantity of units from which the sample was drawn and shall not be construed to represent any prior or subsequent quantities presented for inspection. Homogeneity shall be considered to exist provided the lot has been produced by one manufacturer, in one unchanged process, in accordance with the same drawing, specification, or revision thereof. Changes to either the process, specification or drawing not affecting safety, performance, interchangeability or storage, as determined by the government inspector, shall not be deemed to alter the homogeneity of the lot. Inspection lots shall comply with MIL-STD-105 and shall be numbered in accordance with MIL-STD-1168. Unless otherwise approved by the Contracting Officer, the inspection lot size of major assemblies or end items deliverable under the contract shall be not less than the smallest weekly estimate of quantities contractually scheduled for production during the contract period nor more than the largest quantity contractually scheduled for delivery during any month of the contract period.

MIL-C-50697

4.2.2 Examination. Inspection for critical defects (and major defects, when so specified) shall be 100 percent. Sampling plans and procedures for major and minor defects shall be in accordance with MIL-STD-105 except that continuous sampling plans in accordance with MIL-STD-1235 may be used if approved by the procuring activity.

#### 4.2.3 Testing.

4.2.3.1 General. The contractor shall make available to the government all inspection equipment necessary for determining conformance with contract requirements. Personnel for operating the equipment and verification of its accuracy, shall be supplied by the contractor for the performance of examination or test by the government.

4.2.3.2 Sampling. Visual Inspection. Unless otherwise specified visual inspection shall be performed on all samples.

4.2.3.3 Testing. Unless otherwise specified acceptance tests shall be performed on 110 feet of the production lot of detonating cord. Test samples shall be chosen at random in as much as possible and cut to the size required for individual test.

4.2.3.4 X-Ray Examination. The detonating cord shall be X-Rayed to ascertain there are no voids, inclusions or impurities in the explosive core or metal sheath.

4.3 Classifications of Test. The inspection and testing of the DC shall be classified as follows:

- (a) preproduction tests
- (b) production acceptance tests

4.3.1 Preproduction tests. When required by the contract or purchase order a preproduction sample 110 feet of DC shall be produced and tested to demonstrate that the DC shall be capable of meeting all the requirements of this specification.

4.3.2 Production Acceptance Test. Unless otherwise specified, acceptance test on samples of production lots of DC shall be performed to insure that quality levels are maintained during production.

#### 4.4 Tests.

4.4.1 Preproduction Test. The preproduction lot samples of detonating cord submitted for test shall be representative of a production lot. The samples shall be selected at random and subjected to the following tests:

	<u>Number of Samples</u>	<u>Sample Length</u>
(a) Visual inspection	All Samples	
(b) Radiographic examination	10	1.0 ft
(c) Cord load determination	2	0.5 ft



MIL-C-50697

	<u>Number of Samples</u>	<u>Sample Length</u>
(d) Flexibility test	5	2.0 ft
(e) Detonation velocity	10	2.0 ft
(f) High temperature test	10	2.0 ft
(g) Low temperature test	10	2.0 ft
(h) Impact test	10	0.5 ft

4.4.2 Production acceptance test. Unless otherwise specified, samples from each lot of DC submitted for acceptance shall be subjected to the following tests:

	<u>Number of Samples</u>	<u>Sample Length</u>
(a) Visual inspection	All Samples	
(b) Radiographic examination	10	1.0 ft
(c) Detonation velocity	10	2.0 ft
(d) Core load determination	2	0.5 ft

#### 4.5 Test Methods and Procedure.

4.5.1 Visual Inspection. The samples shall be visually inspected to verify that the materials, design, dimensional characteristics, and workmanship comply with the requirements of this specification and Table I.

4.5.2 Radiographic examination. The test samples of DC shall be radiographically examined to verify that there is no voids, inclusions, impurities or discontinuities in the explosive core or metal sheath.

4.5.3 Core Load. The test samples of the DC shall be weighed before and after dissolving out the explosive core. If the core weight of any sample varies more than  $\pm 10\%$  from the nominal weight per foot ordered, the entire lot shall be rejected.

4.5.4 Flexibility Test. The sample of DC shall be spiral wound around a mandrel for three 360° turns (see Table 2) and then unwound until straightened. This procedure shall be repeated for a total of three times. Any evidence of cracking or breaking of the metal sheath shall be cause for rejection of the entire lot. The DC samples shall then be subjected to the detonation velocity test of paragraph 4.5.5.

MIL-C-50697

4.5.5 Detonation Velocity. Approximately two feet of detonating cord from each spool selected in accordance with 4.2.3.3 shall be used for tests of 4.5. If any sample fails to meet the requirements of 3.2 and 3.3, the lot shall be rejected. The DC velocity measurement shall be made with an electronic time intervalometer, an oscilloscope or similar method. The detonation velocity shall be recorded and shall be in accordance with Table 3.

#### 4.5.6 Detonation Continuity.

4.5.6.1 Type I. A number 6 commercial blasting cap shall be attached parallel and in close contact with the end of the detonating cord by means of adhesive tape and detonated. (see Fig. 1)

4.5.6.2 Type II, III, and IV. A number 8 commercial blasting cap shall be securely attached to a square cut dry end of the cord using a butt joint with the end of the blasting cap in line with the cord and in immediate contact with the explosive core and detonated. (see Fig. 1)

4.5.7 High Temperature Test. The DC shall be subjected to the high temperature test of MIL-STD-810, method 501.1, except the temperature shall be as stated per paragraph 3.10. Then the DC shall be fired at the high temperature per paragraph 3.10. Setup time between removal from the conditioning cabinet and firing shall not exceed 5 minutes. Tolerance on temperature is  $+5^{\circ}\text{F}$ .

4.5.8 Low Temperature Test. The DC shall be subjected to the low temperature test of MIL-STD-810 method 502.1, except that the temperature shall be  $-65^{\circ}\text{F}$ . Then the DC shall be fired at the low temperature per paragraph 3.11. Setup time between removal from the conditioning cabinet and firing shall not exceed 5 minutes.

4.5.9 Impact resistance Test. The DC shall be placed between two steel plates (2" X 2" X .25") supported by a solid base and the upper plate impacted by solid steel ball weighing  $20 \pm 0.5-0$  pounds dropped from a height of  $30 \pm 0.5-0$  inches. The DC shall not detonate or deflagrate upon impact, and shall be safe to dispose of. (See Fig. 2)

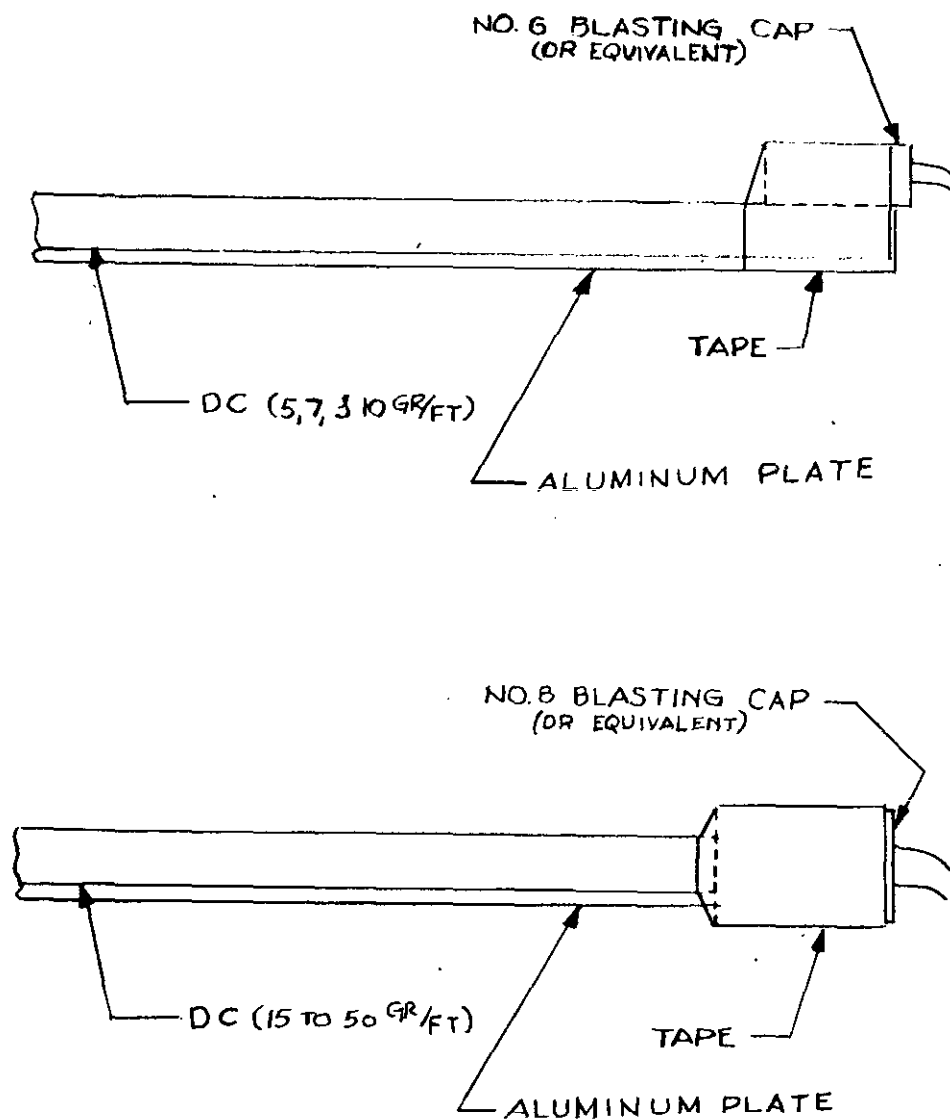
### 5. PREPARATION FOR DELIVERY

#### 5.1 Preservation and Packaging.

5.1.1 Spools. The detonating cord shall be furnished on commercial spools.

#### 5.1.2 Packaging.

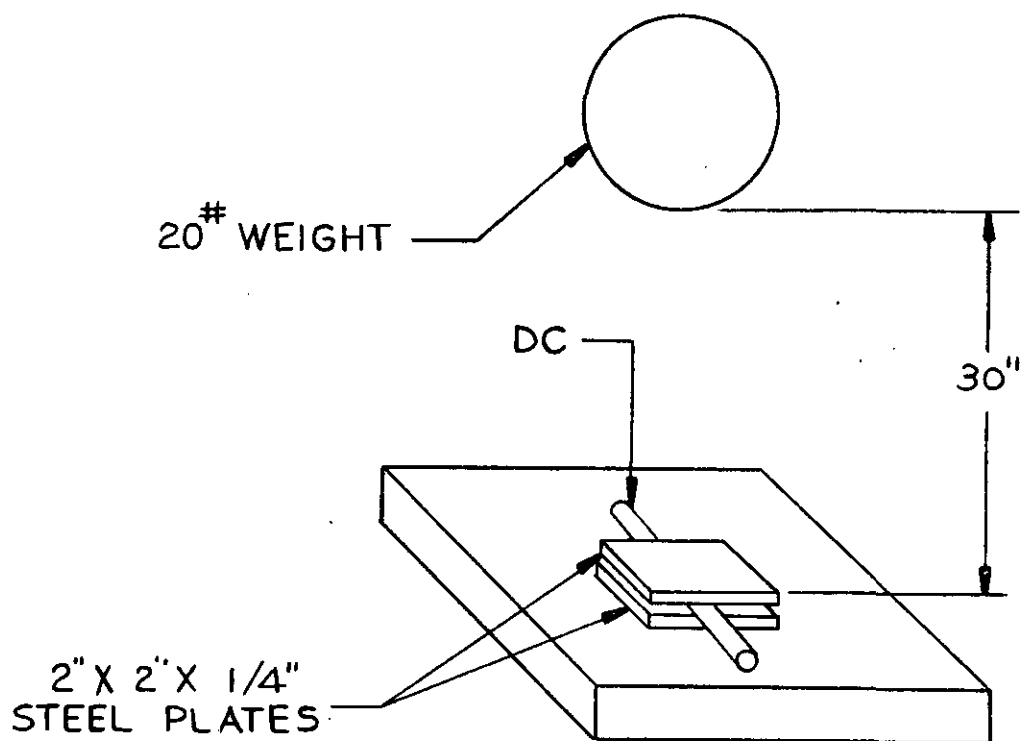
5.1.2.1 Level A. Each spool of detonating cord as specified in 5.1.1 shall be packaged in unit containers conforming to Specification PPP-B-676, Type I or II, Variety 2 or PPP-B-636, W6. The detonating cord shall be wrapped and cushioned to the extent necessary to provide protection from hazards of contamination and physical damage encountered in handling and storage. Boxes shall be in accordance with closure instructions contained in the appendix of the applicable box specification.



DC INITIATION

FIGURE 1

MIL-C-50697



## IMPACT RESISTANCE TEST SETUP

FIGURE 2

MIL-C-50697

5.1.2.2 Level C. Spools of detonating cord as specified in 5.1.1 shall be packaged to afford protection from contamination and physical damage during direct shipment from source of supply to the first receiving activity for immediate use.

## 5.2 Packing.

5.2.1 Level A. Detonating cord packaged according to 5.1.2.1 shall be packed in wooden ammunition boxes conforming to MIL-B-2427 Grade A, Type I, Class I. Pack three (3) unit containers per wooden ammunition box. Boxes shall be closed and strapped in accordance with instructions as provided.

5.2.2 Level C. Detonating Cord packaged as specified in 5.1.2.2 shall be packed in accordance with Code of Federal Regulation 171-178 and afford adequate protection from damage during shipment from source of supply to the first receiving activity. The shipping container shall comply with carrier rules and regulations applicable to the mode of transportation.

5.3 Marking. Each unit box shall be labeled, stamped or printed with the following:

1-CORD, DETONATING, (No. Ft.) Class, Type,  
LOT NO. DATE PKD (MO/YR)

Letters shall be upper case. Letter and number size min inch. Labels shall be white gummed stock. Stamping ink shall be black conforming to Specification TT-I-559. Labels shall be coated on exterior with waterproof adhesive conforming to MMM-A-178 on Level A shipments.

## 6. NOTES

6.1 Intended Use. The DC covered by this specification is intended to transfer explosive energy in the ballistic energy transfer systems.

6.2 Ordering Data. Procurements documents shall specify the following:

- a. Title, number and date of this specification
- b. Whether a preproduction sample is required
- c. Responsibility for performance of the examination and tests
- d. Requirement for performance or examination and test
- e. Disposition of inspection records
- f. Quantity of preproduction samples required
- g. Sampling plan if other than specified
- h. Unit lengths of the detonating cord and lot size
- i. Applicable levels of preservation, packaging and packing
- j. Special marking if required

MIL-C-50697

6.3 Submission of Initial Production Sample. Instructions as to the location for evaluation of initial production shall be obtained from the Contracting Officer.

6.4 Safety. Manufacturer of the DC shall conform to the safety standards as outlined in DOD 4145.26M.

Custodian:

Preparing Activity:

Army - MU

Army - MU

Navy - AS

Air Force - 11

Project Number 1377-0416

SPECIFICATION ANALYSIS SHEET.		Form Approved Budget Bureau No. 22-R255
<p><b>INSTRUCTIONS:</b> This sheet is to be filled out by personnel, either Government or contractor, involved in the use of the specification in procurement of products for ultimate use by the Department of Defense. This sheet is provided for obtaining information on the use of this specification which will insure that suitable products can be procured with a minimum amount of delay and at the least cost. Comments and the return of this form will be appreciated. Fold on lines on reverse side, staple in corner, and send to preparing activity. Comments and suggestions submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or serve to amend contractual requirements.</p>		
SPECIFICATION		
ORGANIZATION		
CITY AND STATE	CONTRACT NUMBER	
MATERIAL PROCURED UNDER A <input type="checkbox"/> DIRECT GOVERNMENT CONTRACT <input type="checkbox"/> SUBCONTRACT		
1. HAS ANY PART OF THE SPECIFICATION CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE? A. GIVE PARAGRAPH NUMBER AND WORDING.		
B. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES		
2. COMMENTS ON ANY SPECIFICATION REQUIREMENT CONSIDERED TOO RIGID		
3. IS THE SPECIFICATION RESTRICTIVE? <input type="checkbox"/> YES <input type="checkbox"/> NO (If "yes", in what way?)		
4. REMARKS (Attach any pertinent data which may be of use in improving this specification. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity)		
SUBMITTED BY (Printed or typed name and activity - Optional)		DATE

DD FORM 1426

JAN 66

REPLACES EDITION OF 1 OCT 64 WHICH MAY BE USED.

FOLD

---

POSTAGE AND FEES PAID  
Department of the Army

OFFICIAL BUSINESS

Commanding Officer  
Frankford Arsenal  
ATTN: SMUFA-T1000  
Philadelphia, Pa. 19137

FOLD

---