INCH-POUND

MIL-DTL-0023933C(OS)
28 November 1995
SUPERSEDING
MIL-C-23933B(Navy)
23 August 1993

MILITARY SPECIFICATION

CARTRIDGE, IMPULSE, MARK 44 MOD 0

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

1. SCOPE

1.1 Scope. This specification covers the requirements for the Mark 44 Mod 0 Impulse Cartridge (see 6.1).

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 documents specified in sections 3 and 4 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplements thereto, cited in the solicitation (see 6.2).

SPECIFICATIONS

MILITARY

MIL-D-21625 Design and Evaluation of Cartridges for Cartridge Actuated Devices

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Indian Head Division, Naval Surface Warfare Center, Standardization Branch (Code 8420), 101 Strauss Avenue, Indian Head, MD 20640-5035, by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by sending a letter.

AMSC N/A FSC 1377

DISTRIBUTION STATEMENT A: Approved for public release; distribution is unlimited.

STANDARDS

MILITARY

MIL-STD-414	Sampling Procedures and Tables for Inspection by Variables for Percent Defective
MIL-STD-453	Inspection, Radiographic
MIL-STD-810	Environmental Test Methods and Engineering Guidelines
MIL-STD-1168	Ammunition Lot Numbering

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

2.2.2 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues are those cited in the solicitation.

DRAWINGS

Naval Air Systems Command (CAGE Code 30003)

DL537925	Cartridge, Impulse, Mk 44 Mod 0
2240764	Body and Bridgewire Assembly
2240772	Cartridge, Impulse, Mk 44 Mod 0 Assembly
2406487	Primer Mix No. 487
838AS102	Powder, Smokeless

(Application for copies should be addressed to: Commander, Indian Head Division, Naval Surface Warfare Center, Data Control Branch (Code 8410), Indian Head, MD 20640-5035.)

2.3 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 First article. When specified (see 6.2), a sample shall be subjected to first article inspection (see 6.3) in accordance with 4.2.1.

3.2 Primary components. For the purposes of this specification, the primer mix (Drawing 2406487) and the propellant charge (Drawing 838AS102) are considered primary components. Only primary components

from a single lot shall be used in a production lot of cartridges; however, one primary component production lot may be used in more than one cartridge production lot.

3.2.1 Primer mix. The primer mix shall be compounded and loaded in accordance with Drawings 2406487 and 2240772, respectively.

3.2.2 Propellant charge (smokeless powder).

3.2.2.1 Condition. There shall be no evidence of decomposition of the smokeless powder (see 4.3.2.1).

3.2.2.2 Quantity. All propellant charges shall be as specified on Drawing 2240772. Charges shall be determined by weight rather than by volume measurements.

3.2.2.3 Handling and loading. The smokeless powder shall be subjected to no unnecessary handling or exposure to the atmosphere. The handling and loading of smokeless powder exposed to the atmosphere shall be performed only under conditions that do not permit the relative humidity to exceed 75 percent.

3.3 Cartridge production. The cartridges shall be manufactured in accordance with all documents listed on DL 537925. Each production cartridge shall meet the requirements of 3.3.

3.3.1 Inspection resistance. Prior to welding the bridgewires to the pins, the insulation resistance between the metal parts of the assemblies shall be a minimum of 50 megohms at a relative humidity of 80 percent or less when measured as specified in 4.3.1.

3.3.2 Visual inspection. Cartridges shall be free of the following defects when inspected in accordance with 4.3.2: illegible, missing, or inaccurate identification markings, incomplete threads, perforated closure disc, incomplete or improper welding of closure disc, bent pins, damaged O-rings, deep scratches, dents, sharp edges, burrs, or other defects which may prevent entry of the cartridge into the firing chamber, or affect the resistance of the cartridge to moisture. Each cartridge shall meet the requirements of 3.2, 3.5, and Drawing 2240772.

3.3.3 Radiographic inspection. When radiographically examined, each cartridge shall show proper assembly, presence of parts, proper welding, sealing and proper electrical connections, proper thread form, presence of the propellant, no foreign materials, and proper assembly of pyrotechnic/non-metallic materials when inspected in accordance with 4.3.3.

3.3.4 Bridge circuit resistance. The resistance of each of the two bridge circuits in each completely assembled cartridge, when measured electrically as specified in 4.3.4, shall be 0.30 ± 0.05 ohms.

3.3.5 Leakage. The leakage rate of each cartridge shall not exceed 1×10^{-5} cm^3/sec of air when tested in accordance with 4.3.5.

3.4 Cartridge performance. Cartridges shall be capable of meeting all requirements of 3.4.1 through 3.4.7. Applicable first article tests are defined in table I and applicable lot acceptance tests are defined in table III.

3.4.1 Power current. The cartridge shall not fire when subjected to the power current test of 4.3.6.

3.4.2 Static discharge. The cartridge shall not fire when the static discharge test is applied in accordance with 4.3.7.

3.4.3 Stray voltage. The cartridge shall not fire when a stray voltage of 100 milliamperes is applied in accordance with 4.3.8.

3.4.4 Shock. The cartridge shall not incur damage nor deformation when subjected to the shock test in accordance with 4.3.9.

3.4.5 Vibration. The cartridge shall not incur damage nor deformation when subjected to the vibration test in accordance with 4.3.10.

3.4.6 Temperature and humidity cycling. The cartridge shall not incur damage nor deformation when subjected to temperature and humidity cycling in accordance with 4.3.11.

3.4.7 Ballistic requirements. The cartridge shall meet the requirements of 3.4.7.1 through 3.4.7.3 when subjected to the test prescribed in 4.3.12.

3.4.7.1 Hangfire. The cartridge shall fire within 75 milliseconds of the application of 5 ± 0.10 amperes to each of the bridge circuits (10 amperes total current).

3.4.7.2 Maximum pressure. The maximum pressure produced by the cartridge shall be between 1050 and 1900 psig.

3.4.7.3 Misfire. There shall be no misfires.

3.5 Workmanship. Cartridges shall be constructed and finished in a manner to ensure compliance with all requirements of this specification.

4. VERIFICATION

4.1 Classification of inspections.

a. First article inspection/tests (see 4.2.1)
b. Primary component inspection (see 4.2.2)
c. Production inspection (see 4.2.3)
d. Lot acceptance inspection/tests (see 4.2.4)

4.2 Inspections.

4.2.1 First article inspection. Unless otherwise specified in the contract or purchase order (see 6.2), a first article sample of 64 cartridges shall be subjected to first article testing as specified in table I. Sixty of these cartridges shall be expended in the tests listed in table I and four cartridges shall be retained for investigative purposes. Any damage inflicted by the environmental treatments which would adversely affect the performance of the item in the service application shall be cause for rejection of the first article sample. Any further production prior to notification by the contracting agency of first article acceptance shall be at the

contractor's risk. Failure of any cartridge to comply with the requirements of section 3 shall be cause for rejection of the first article represented.

TABLE I. First article test plan.

Tests	Requirement Paragraph	Test Paragraph	A	B	C	D	E	F	G
Insulation resistance 1/	3.3.1	4.3.1	4	12	12	12	6	6	12
Visual inspection	3.3.2	4.3.2	4	12	12	12	6	6	12
Radiographic inspection	3.3.3	4.3.3	4	12	12	12	6	6	12
Bridge circuit resistance	3.3.4	4.3.4	4	12	12	12	6	6	12
Leakage	3.3.5	4.3.5	4	12	12	12	6	6	12
Power current 2/	3.4.1	4.3.6	4						
Static discharge 2/	3.4.2	4.3.7	4						
Stray voltage 2/	3.4.3	4.3.8	4						
Shock 3/	3.4.4	4.3.9					6		---
Vibration 3/	3.4.5	4.3.10						6	
Temperature and humidity cycling 2/	3.4.6	4.3.11							12
Ballistic test -65°F 70°F 160°F	3.4.7	4.3.12		12	12	12	6	6	12

1/ The contractor shall conduct tests during production and shall provide data that all cartridges submitted as part of the first article test sample comply with the requirements of 3.3.1.
2/ A bridge circuit resistance test shall be conducted following the specified test for information only.
3/ A visual, bridge circuit resistance test, leakage and X-ray inspection shall be conducted following the specified test for information only.

4.2.2 Primary component inspection. All primary component lots intended for use in the manufacture of the cartridges shall be inspected and handled in accordance with the requirement of 3.2. Primary component lots failing to meet the requirements of 3.2 shall not be used for the manufacture of the cartridges.

4.2.3 Production inspection. All production cartridges manufactured under the contract shall be inspected and screened for the defects specified in table II. Cartridges failing to meet the requirements listed in table III shall be rejected and removed from the lot.

TABLE II. Production inspections.

Tests	Requirement Paragraph	Test Paragraph
Insulation resistance	3.3.1	4.3.1
Visual inspection	3.3.2, 3.5	4.3.2
Radiographic inspection	3.3.3	4.3.3
Bridge circuit resistance	3.3.4	4.3.4
Leakage	3.3.5	4.3.5

4.2.4 Lot acceptance inspection. Lot acceptance inspection shall consist of the examinations and tests specified in table III. Failure of any sample cartridge to comply with the requirements listed in table III shall be cause for rejection of the lot represented. Packaging defects shall be corrected before acceptance.

TABLE III. Lot acceptance inspections and tests.

Tests	Requirement	Test Method	Quantity
Visual inspection	3.3.2, 3.5	4.3.2	Test and retain sample
Radiographic inspection	3.3.3	4.3.3	Test and retain sample
Bridge circuit resistance	3.3.4	4.3.4	Test and retain sample
Leakage	3.3.5	4.3.5	Test and retain sample
Ballistic	3.4.7	4.3.12	Test sample

4.2.4.1 Sample size. A random sample from each production lot, including the retained sample for investigative purposes, shall be selected in accordance with table IV for lot acceptance inspection. Test sample cartridges and cartridges for investigative purposes shall not be applied as part of the quantity specified for delivery by the contract or purchase order.

4.3 Inspections and tests.

4.3.1 Insulation resistance. Prior to welding the bridgewires to the pins, to the complete body, and to the bridgewire assemblies (Drawing 2240764), the insulation resistance between the pins and between the pins and the cartridge body shall be checked with an applied voltage of 500 ± 25 volts DC for 60 seconds. Each cartridge shall meet the requirements of 3.3.1. A leakage current that exceeds 0.1 milliamperes shall be cause for rejection.

TABLE IV. Lot acceptance sampling.

Lot Size	Ballistic Test Sample Size	Retain Sample Size	Total Sample Size
111 to 180	15	2	17
181 to 300	20	2	22
301 to 500	25	2	27
501 to 800	30	2	32
801 to 1300	35	2	37
1301 to 3200	40	2	42

4.3.2 Visual inspections.

4.3.2.1 Primary component inspection. The primer mix shall be visually inspected during compounding and loading for conformance to 3.2.1. The propellant charge shall be inspected for conformance to 3.2.2.1. Evidence of decomposition shall be cause for rejection. The charge quantity shall be measured for conformance to 3.2.2.2.

4.3.2.2 Cartridge inspection. The external condition and appearance of the cartridges shall be determined by comparison to Drawing 2240772. Specific inspections of the electrical connector, electrical shielding cap, threads, stainless steel case, output closure, weld, and identification label shall be conducted as a minimum. Each cartridge shall meet the requirements of 3.3.2.

4.3.3 Radiographic examination. Radiographic examination shall include X-ray in accordance with MIL-STD-453. Each cartridge shall be positioned for the most revealing exposure with the long axis perpendicular to the radiographic beam. One radiographic plate shall contain one identified inert cartridge to be used as a comparison aid. The inert cartridge shall be separated from the remaining cartridges on the plate. All cartridges shall be identified with serial numbers beginning with 001 prior to examination. The cartridges shall be arranged on boards or trays in consecutive order with any missing serial numbers identified on the radiographic plate. Each radiograph shall carry a permanent identification of the items displayed thereon in a 4 x 6 inch region maximum. The radiographic identification shall include the drawing number, the complete lot number in accordance with MIL-STD-1168, the contract number, and the span of serial numbers displayed. Radiographs of the entire production lot shall accompany the ballistic sample to the activity conducting the tests. Any observable imperfections as outlined in 3.3.3 shall be cause for rejection of the cartridge. Defective cartridges found during radiographic review are to be marked on the radiographic plate and removed from the production lot.

4.3.3.1 Sample radiographic plate. A sample radiographic plate and x-ray technique shall be submitted by the contractor for approval prior to x-raying production lot. The production lot x-rays shall be made using the identical technique utilized to produce the approved sample plate.

4.3.4 Bridge circuit resistance. Conformance with the bridge circuit resistance of 3.3.4 shall be ascertained by means of a test circuit which limits the bridge current to 25 milliamperes, maximum. The test circuit shall be connected to the cartridge through a fully assembled electrical connector, Bendix PC06E-8-4S or equivalent. A new connector shall be used after a maximum of 500 connections. A suitable bridge which is known to be accurate within one percent, in the range of resistance specified, shall be used to determine whether or not the requirement is being met. Units which fail to meet the requirements of 3.3.4 or fail to assemble completely, by hand, with the specified connector shall be rejected. The results of bridge circuit resistance measurements shall not be affected by resistance of the test circuit and connector.

4.3.5 Leakage. Leakage shall be measured after bombing in helium gas for 60 +1.0, -0.0 minutes at a pressure of 2 +0.1, -0.0 atmospheres absolute and venting with air for 10 +2, -0 minutes or washed with dry nitrogen. The cartridges shall then be tested in a dry gas leak tester. Each cartridge shall meet the requirements of 3.3.5; those failing to meet this requirement shall be rejected.

4.3.6 Power current. Power current shall be evaluated by conditioning the cartridge at 200 ± 5°F for 4 hours minimum and then applying a direct current of not less than 1 ampere supplying a minimum of 1 watt from terminal stud to case for 5 + 0.25, -0 minutes. The test current shall be regulated to within 2 percent. Each cartridge shall meet the requirement of 3.4.1.

4.3.7 Static discharge. The cartridge shall be subjected to a static discharge test by being connected to a 500 ± 5 percent picofarad capacitor charged to 25,000 ± 500 volts and 5,000 ± 5 percent ohm resistor connected in a 500 microhenry total inductance series circuit. The cartridge shall be subjected to the static discharge between the pins shorted together and the case. Failure of any cartridge to comply with the requirements of 3.4.2 shall be cause for rejection of the lot or first article.

4.3.8 Stray voltage. Stray voltage shall be evaluated by applying 100 ± 5 milliamperes in 300 ± 10 millisecond pulses at a rate of two pulses per minute for a total of 2,000 pulses. Stray voltage shall be applied across each bridge circuit of the cartridge. Cartridges shall be conditioned at 70 ± 5°F for 4 hours minimum prior to testing. Each cartridge shall meet the requirements of 3.4.3.

4.3.9 Shock. The shock pulse shall be applied to the cartridge's mounting points in both directions along each of three mutually perpendicular axes, for a total of 18 shocks. This test shall be conducted in accordance with method 516, procedure I of MIL-STD-810. The shock pulse wave form shall be terminal peak sawtooth. The peak amplitude shall be 20 g and the duration shall be 11 milliseconds. After being subjected to the shock test the cartridges shall be test fired at 70°F. Failure of any cartridge to comply with the requirements of 3.4.4 shall be cause for rejection of the lot or first article.

4.3.10 Vibration. The cartridge shall be subjected to vibration testing in accordance with MIL-STD-810B, Method 514.1-I, curve Z, except that: 1) there shall be no resonance search or dwell, 2) the cycling period shall be divided equally at -65, 70, and 160°F. After vibration testing has been completed, the cartridges shall be test fired at 70°F. Failure of any cartridge to comply with the requirements of 3.4.5 shall be cause for rejection of the lot or first article.

4.3.11 Temperature and humidity cycling. The test shall be conducted in accordance with the temperature and humidity cycling test of MIL-D-21625. Failure of any cartridge to comply with the requirements of 3.4.6 shall be cause for rejection of the lot or first article.

4.3.12 Ballistic tests. Sample cartridges for the function test shall be conditioned for a period not less than 4 hours nor more than 24 hours at the specified temperatures. The cartridges shall be removed from the conditioning chamber and test fired within 5 minutes. If any cartridge is not fired within 5 minutes after removal, it shall be reconditioned at the specified temperature for an additional 4 hours and then tested. The cartridges shall be initiated by applying a current of 5.0 ± 0.10 amperes to each of the bridge circuits (10 amperes total). The cartridge shall be fired in the test set manufactured in accordance with the drawings listed on DL 2519737. The cartridges shall be fired with the collar installed. Suitable instrumentation shall be used for each firing to record pressure versus time and the elapsed time between actuation of the ignition element and the start of pressure rise. The cartridges shall meet the requirements of 3.4.7.

4.3.12.1 Maximum pressure. Lot acceptability for maximum pressure shall be determined in accordance with the applicable provisions of MIL-STD-414 at an AQL of 0.10.

4.3.12.2 Hangfire. The time from application of current to the cartridge bridge circuits to the start of pressure rise shall be used to determine compliance with the hangfire requirement.

4.3.12.3 Misfire. The failure of any cartridge to fire shall result in rejection of the lot represented, unless such failure is plainly attributable to faulty test equipment or procedure.

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.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful but is not mandatory).

6.1 Intended use. The Mark 44 MOD 0 Impulse Cartridge is intended for use in a helicopter hoist cable cutter which severs a steel cable and releases its load during an emergency. The cartridge is also used in the destruct unit of a target drone.

6.2 Acquisition requirements. Acquisition documents must specify the following.

a. Title, number, date, and revision letter of this specification.

b. Issue of DODISS to be cited in the solicitation and if required, the specific issue of individual documents referenced (see 2.2.1 and 2.2.2).

c. Whether a first article sample is required and, if so, specify the test activity (see 4.2.1).

d. Test activity and production lot size if other than as specified (see 4.2.4.1)

e. Whether a radiographic sample plate is required (see 4.3.3.1).

f. Whether a production inspections report is required (see 4.2.3).

g. Packaging requirements (see section 5).

h. Directions for shipping radiographs of entire lot along with ballistic sample to the activity conducting production lot acceptance tests.

i. The safety precaution requirements of the "Contractor's Safety Manual for Ammunition and Explosives" (DOD 4145.26M), are applicable and should be specified in the contract as required by the Federal Acquisition Regulation (FAR) 23.3. NOTE: When this specification is used as part of the description of work to be accomplished by a Government activity, the safety requirements of "Ammunition and Explosives Ashore" OP 5 are applicable.

j. Certification of conformance that all deliverables met requirements of section 3 of this specification.

6.3 First article. When a first article inspection is required, the contracting officer should provide specific guidance to offerors whether the items should be a preproduction sample, a first article sample, a first production item, a sample selected from the first production items, standard production item for the contractor's current inventory (see 3.1) and the number of items to be tested as specified in 4.2.1. The contracting officer should also include specific instructions in acquisition documents regarding arrangements for examination, approval of first article test results, and disposition of first articles. Invitations for bids should provide that the Government reserves the right to waive the requirement for samples for first article inspection to those bidders offering a product which has been previously acquired or tested by the Government, and that bidders offering such products, who wish to rely on such production or test, must furnish evidence with the bid that prior Government approval is presently appropriate for the pending contract. Bidders should not submit alternate bids unless specifically requested to do so in the solicitation.

6.4 Loaded assembly hazard information.

DOD, DOT, NATO Hazard Classification	Class 1, Division 4
United Nation Serial Number	0276
Storage Compatibility Grouping	C
UN Proper Shipping Name	Cartridge, Power Device

6.5 Contract packaging and marking. The following packaging and marking requirements should be specified in the contract.

6.5.1 Preservation. Preservation shall be level A or C as specified (see 6.2).

6.5.1.1 Level A. Level A preservation shall be used for all production lots for service use. Four cartridges shall be preserved in an inner container in accordance with the drawings of LD 537927.

6.5.1.2 Level C. When directed by the contracting activity, those cartridges which are intended for expenditure in first article testing or production lot acceptance testing, shall be preserved in accordance with Method III of MIL-P-116 and 49 CFR 171-178.

6.5.2 Packing. Packing shall be level A or C, as specified (see 6.2).

6.5.2.1 Level A. Level A packing shall be used for packing of all production lots for service use. Twelve inner containers, preserved as described in 6.5.1.1, shall be packed in accordance with the drawings of LD 537928.

6.5.2.2 Level C. When directed by the contracting activity, cartridges intended for expenditure in first article testing or production lot acceptance testing, shall be preserved as described in 6.5.1.2 and packed to afford protection against damage during direct shipment from the supply source to the first receiving activity for immediate use. Shipping containers shall be in accordance with 49 CFR 171-178.

6.5.3 Marking.

6.5.3.1 Special marking. In addition to any special marking required by the contract or order (see 6.2), marking of exterior containers shall be in accordance with 49 CFR 171-178.

6.5.3.2 Normal marking. Unless otherwise specified in the contract or order (see 6.2), the marking information on unit packs shall be as specified on LD 537927 and the marking information on shipping containers shall be as specified on LD 537928. The specified marking information shall be applied to the containers in accordance with the applicable provisions of MIL-STD-129.

6.6 Subject term (keyword) listing.

Cable cutter
Cartridge
Ordnance
Target drone

Preparing activity:
Navy - OS
Project (1377-030)