Downloaded from http://www.everyspec.com

INCH-POUND

MIL-PRF-49471A(CR)
1 October 1998
Superseding
MIL-PRF-49471(ER)
2 June 1995

PERFORMANCE SPECIFICATION

BATTERIES, NON-RECHARGEABLE, HIGH PERFORMANCE

This specification is approved for use within Army Communications-Electronics Command, Department of the Army, and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers non-rechargeable batteries of the non-reserve type composed of electrochemical cells (see 6.1).

1.2 Classification.

1.2.1 Type designation. The type designation of non-rechargeable batteries may be in the following form (see 3.1). For example:

BA-	5590	/U
Component	Battery Type number	Installation indicator
(1.2.1.1)	(1.2.1.2)	(1.2.1.3)

1.2.1.1 Component. Non-rechargeable batteries are identified by the two-letter symbol "BA" followed by a hyphen.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, US Army Communications Electronics Command, ATTN: AMSEL-LC-LEO-E-EP, Fort Monmouth, New Jersey 07703, by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A FSC 6135
DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

Downloaded from http://www.everyspec.com

1.2.1.2 Battery type number. The battery type number identifies the basic design of the battery (see 3.1) and consists of a four digit number.

1.2.1.3 Installation indicator. The installation indicator identifies equipment the battery is used in, i.e., /PRC-25 or if "universal", i.e., /U indicates use in various equipment.

2. APPLICABLE DOCUMENTS

2.1 Government documents. 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 cited 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 supplement thereto, cited in the solicitation (see 6.2).

(See Supplement 1 for list of associated specifications sheets.)

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

2.3 Non-Government publications. The following document(s) form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DoD adopted are those listed in the issue of the DODISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS are the issues of the documents cited in the solicitation.

UL-1642 Standard for Lithium Batteries

(Applications for copies should be addressed to the Underwriters Laboratories, Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096.)

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

Downloaded from http://www.everyspec.com

3. REQUIREMENTS

3.1 Specification sheets. The individual item requirements shall be as specified herein and in accordance with the applicable specification sheet. In the event of any conflict between requirements of this specification and the specification sheet, the latter shall govern.

3.2 First article. When specified in the contract or purchase order, a sample shall be subjected to first article inspection (see 4.4 and 6.3).

3.3 Materials.

3.3.1 Metals. All metals which do not enter into the basic electrochemical reaction of the cell shall resist, or be treated to resist, corrosion.

3.3.1.1 Dissimilar metals. When dissimilar metals which would adversely affect battery performance are used in intimate contact with each other, protection against electrolysis and corrosion shall be provided.

3.3.2 Insulating compounds - flow or shrinking. When tested as specified in 4.7.14 the insulating, impregnating, potting and sealing compounds shall not flow at high temperature, nor crack or draw away from the sides of a container at low temperature. Any compound used shall be non-flammable and non-toxic. Potting shall not inhibit cell vent operations (see 4.7.10).

3.3.2.1 Electrical connection wires and tabs. All electrical connecting wires and tabs for the cells and the battery shall be covered by an insulation with the following characteristics:

Softening temperature: 302^{o}F (150^{o}C) minimum
Lengthwise shrinkage: 3% maximum after application
Thickness: 0.005 inch minimum

The material shall be non-flammable and non-toxic.

3.4 Design and construction. Batteries shall be of the design, construction, physical dimensions, weight, and polarity as specified in 3.1.

3.4.1 Intercell connections. Intercell connections shall be connected in accordance with the contractor's established procedures. Intercell conductors shall be insulated to prevent or preclude short circuiting within a multi cell battery. The cell series insulation resistance shall not be less than 25 megohms when tested as specified in 4.7.8.

3.4.2 Shelf life. The manufacturer shall certify that the battery is capable of delivering 85 percent of the minimum capacity (see 3.1) after 60 months of casual storage.

Downloaded from http://www.everyspec.com

3.4.3 Insulation resistance (battery terminals and cell series string). Terminals shall be as specified on the applicable specification sheet (see 3.1) and insulation resistance shall be not less than 25 megohms when tested as specified in 4.7.8.

3.4.3.1 Cell positive terminal coating. The positive terminal of each cell shall be coated with a non-conducting compound which is impervious to moisture. The compound shall meet the requirements specified in 3.3.2. This coating is not required when the positive terminal is made of tantalum and the glass around it has a high silica content, such as glass conforming to Mansol Industries No. 88 or equivalent .

3.4.4 Safety Features

3.4.4.1 Containers. Cell containers shall be capable of releasing excess pressure due to heating or short circuits to prevent explosions and expulsion of cell components. The pressure required to test shall be determined by the contractor using pressure equivalents between 205°F and 300°F (use of limits within these extremes is permitted). The pressure limits so determined shall be included in the First Article Test Plan along with the calculations used for them. When tested per 4.7.10.1, cell containers shall open only as designed within the pressure range determined.

3.4.4.2 Cells. Cells shall not burn, emit flame, or explode due to excessive heating, short circuit, or other conditions. This shall be verified per 4.7.10.1, 4.7.10.2, and when specified, batteries shall be tested per 4.7.10.4 or 4.7.10.5. No cell shall emit a flame, explode, or burn when subjected to the tests of 4.7.10.2, 4.7.10.4 or 4.7.10.5.

3.4.4.3 Battery leg. Unless otherwise specified (see 3.1), each battery or each leg within a multi-leg battery shall contain a mechanism that will open under the conditions listed below (see 4.7.10.3). When short circuited per 4.7.10.3, the short circuit current shall exceed 300% of the device's rated current and the device shall open in 1 second or less.

- 10 seconds, maximum when subjected to 200% of the device's rated current.
- 4 hours, minimum when subjected to 110% of the device's rated current.

Batteries shall not be constructed using parallel arrangements of cells.

3.4.5 High temperature device. A non-resettable high temperature device is required when specified (see 3.1). The device shall remain closed below 180°F and shall remain open at 200, +5 -0°F (see 4.7.10).

3.4.5.1 High temperature device location. The high temperature device shall be located as close as possible to the geometric center of the battery or as indicated below. For a two or three cell in-line arrangement, the high temperature switch or thermal fuse shall be located between any two adjacent cells. For a cluster arrangement of three or more cells, the high temperature switch or thermal fuse shall be located at the geometric center of the cluster (see 4.7.10).

Downloaded from http://www.everyspec.com

3.4.5.2 Charge protection. Unless otherwise specified (see 3.1), each battery or each leg in a multi-leg battery shall contain a device that prevents reverse currents in excess of 2.0 milliamperes (see 4.7.10.6).

3.4.5.3 Complete discharge device. Unless otherwise specified (see 3.1), each battery on contract shall be equipped with a device capable of rendering the battery nonreactive after use so that it will qualify as Non Hazardous Solid Waste for disposal purposes in accordance with Resource Conservation and Recovery Act (RCRA) regulations. The device shall consist of, as a minimum, a load that can discharge the battery within 5 days and an actuator for connecting the load with the cells inside the battery. The device shall provide a visual means for determining the status of the actuator and shall be protected from inadvertent activation. The circuit for the device shall bypass all fuses within the battery. When tested per 4.7.10.7, no battery shall have a voltage in excess of 1 volt per cell or 4 volts per section, whichever is less, at the end of the five day storage period. No cell within the batteries shall vent, rupture, leak, or burn during or after complete discharge.

3.4.6 State of charge. The battery shall contain a state of charge indicator, when specified. The state of charge indicator shall indicate the highest state of charge when tested during any time prior to capacity testing. During testing per 4.7.19, the indications shall indicate the correct state of charge corresponding to the level of discharge at each stage of the test. A device that measures the state of charge (i.e. remaining capacity) shall be incorporated in the battery. If any battery fails any one reading, retest with a new set of samples. If any battery fails any one reading during the retest, the batteries have failed the test. As a minimum, the state of charge shall be displayed as three distinct ranges of remaining capacity in the battery (see 4.7.19). The three ranges shall be:

1) less than 20 percent
2) 20 to 70 percent
3) greater than 70 percent

3.4.6.1 State of charge indicator. The mechanism for displaying the state of charge shall be located on one of the faces of the battery that is perpendicular to the face that contains the connector. The state of charge display mechanism shall not be located on the same face as the connector. A label or equivalent shall be located on the same face of the battery. This label or equivalent shall make clear the method for reading the state of charge mechanism.

3.4.7 Battery enclosure. The battery enclosure shall be a non-metallic material that does not support combustion when subjected to flame.

3.4.7.1 Battery enclosure (plastic). Plastic battery enclosures shall exhibit no signs of cracking, breaking, swelling, or distortion after testing per 4.7.11.1.

3.4.7.2 Color of jackets. The color of exposed surfaces of jackets shall be lusterless green. Examples of lusterless greens may be found in 6.5.

Downloaded from http://www.everyspec.com

3.4.7.3 Battery Enclosure Combustibility - The battery enclosure shall be a non-metallic material that does not support combustion when subjected to flame (see 4.7.11.2).

3.4.8 Connectors. Connectors shall be as specified on the applicable specification sheet. Location of the connectors shall be verified as specified in 4.7.15. Only sockets which are electrically connected shall require electrical contacts.

3.4.8.1 Socket strength (when specified). After the batteries have been tested as specified (see 3.1), they shall meet the open-circuit voltage, jacket integrity, and visual and mechanical requirements (see 3.5.1, 3.4.7 and 3.4).

3.5 Battery voltages.

3.5.1 Battery open-circuit voltage. The open-circuit voltage shall not exceed the maximum voltage specified (see 3.1 and 4.7.2.1).

3.5.2 Battery closed-circuit voltage. The closed-circuit voltage shall be not less than the minimum voltage specified (see 3.1 and 4.7.2.2).

3.5.3 Cell closed-circuit voltage. When cells are tested as specified in 4.7.12.1, the voltage shall be at least 2/3 of the minimum useful voltage at the completion of the test. Minimum useful voltage is the minimum Open Circuit Voltage (OCV) used by the contractor as the pass/fail criteria for cells.

3.5.4 Cell series string voltage. When cells are tested as specified in 4.7.12.1, cell series strings shall rise to minimum voltage specified in the time specified (see 3.1).

3.6 Capacity. When the battery is tested for capacity as specified in 4.7.9 the time required to reach its specified minimum voltage shall be not less than the minimum capacity requirement specified (see 3.1). If a voltage delay occurs when the battery is tested for capacity as specified in 4.7.9, the calculated time will start when the battery reaches the voltage specified under “Initial voltage delay” (see 3.1). The calculated time will end when the battery reaches its minimum voltage as the voltage falls. A failure shall be defined as below:

a. The battery voltage or the voltage of any one leg falls below the specified minimum voltage prior to exceeding the capacity required or fails to reach minimum voltage in the required time. Any safety device operates before the I, L, H, HT, LT, or IT test is complete. During LR1, LR2, IP, LP, HP, HTP, LTP, or ITP test operation of safety devices other than the vent mechanism (where applicable) after cut-off voltage is reached shall not be considered a failure.

Downloaded from http://www.everyspec.com

b. Excessive initial voltage delay.

c. Battery exceeds dimensional tolerances after discharge.

d. Battery vents, leaks, burns or ruptures.

3.6.1 Initial voltage delay. When the battery is tested for capacity, the time required at the beginning of discharge for the battery or its legs to meet the specified minimum battery voltage after the load is applied shall be not more than the time specified (see 3.1 and 4.7.9.1.1).

3.7 Cell leakage. Unless otherwise specified (see 3.1), each cell shall have a leakage amount not to exceed 0.005% of the total fill weight in the cell when tested as specified in 4.7.13.

3.7.1 Cell forced discharge. After the cells have been tested as specified in 4.7.18, there shall be no leaking, venting, fire, or explosion.

3.8 Vibration. After the batteries have been tested as specified in 4.7.6 they shall meet the visual and mechanical and battery voltage requirements (see table V and 3.5.1).

3.9 Mechanical shock. After the batteries have been tested as specified in 4.7.5 they shall meet the visual and mechanical and battery voltage requirements (see table V and 3.5.1).

3.10 Drop test. After the batteries have been tested at each temperature as specified in 4.7.3, they shall meet the battery voltage requirements (see 3.5.1). Batteries shall be visually examined before and after each drop; no cells shall be visible with a multi-cell battery. Following the battery drop test, the connector shall remain within the limits specified on the individual specification sheet (see 3.1).

3.11 Altitude. After the batteries have been tested as specified in 4.7.7, they shall meet the visual and mechanical and battery voltage requirements (see table V and 3.5.1).

3.12 Labeling and marking. All labeling and marking shall be clear and legible throughout all the tests specified herein. Labeling and marking shall be black. Jackets may have the labeling and marking engraved, or die stamped, in which case it may be the same color as background.

Downloaded from http://www.everyspec.com

3.12.1 Labels. Each battery shall have a label as specified in 3.1. As a minimum, the following information shall be on the label:

BATTERY, NON-RECHARGEABLE, (Chemistry)
Type Designation
(Contract Number)
(Date Code)
Manufacturer's name or Trade name
Manufacturer's location

DO NOT CHARGE, SHORT CIRCUIT, INCINERATE, OR MUTILATE THIS BATTERY
OTHERWISE BATTERY MAY VENT OR RUPTURE RELEASING TOXIC MATERIALS

EXAMPLE:

BATTERY, NON-RECHARGEABLE, LITHIUM SULFUR DIOXIDE
BA-5590/U
DAAB05-95-C-1234
0395B
James E. Doe Company
Bruntherman, N.J.

DO NOT CHARGE, SHORT CIRCUIT, INCINERATE OR MUTILATE THIS BATTERY
OTHERWISE BATTERY MAY VENT OR RUPTURE RELEASING TOXIC MATERIALS

NOTE: The code may be placed on the bottom of single-cell batteries.

3.12.1.1 Date Code. The date code shown shall indicate the month, year and week of manufacture of the battery by means of a four-digit number. This shall be followed by a single letter. The first two digits shall indicate the number of the month. The last two digits shall indicate the year. Months earlier than the tenth month shall be a single digit preceded by "O". The letter shall represent the week of the month. The letter "A" shall be used for the first week of the month, "B" for the second week of the month, etc. Sunday shall be considered the first day of a week. A tolerance of two days is allowed for production delays and disruptions. Actual date and printed date cannot be more than two days apart.

EXAMPLES:

A battery manufactured during the second week of March 1995 will bear the code "0395B".

A battery manufactured during the third week of November 1995 will bear the code "1195C".

Downloaded from http://www.everyspec.com

3.12.2 Terminal marking. On batteries having socket-type terminals, all markings required to indicate polarity by a + or - sign, voltage, and the voltage leg of the battery (A, B, C, etc.) shall appear on the face of the battery bearing the socket. On other type terminals, the terminal markings may appear on the surface with the terminal or the side of the battery, or both. Markings shall indicate clearly the terminals to which they refer.

3.12.3 Complete discharge device label. Unless otherwise specified (see 3.1), each battery shall have a label affixed to it that provides the actuation procedures for the complete discharge device. Any precautions needed to assure both safe and complete actuation shall be included. It shall begin with the following:

WARNING
DISCHARGE FOR DISPOSAL
BY DESIGNATED PERSONNEL ONLY

3.12.4 Attention card. Each battery shall be packaged with an ATTENTION card, describing the procedures to follow in order to render the battery nonreactive for disposal purposes. The card shall begin with the word “ATTENTION” in bold lettering and shall fill the available area of the top panel. Instructions shall include, as a minimum, the actuation procedure, storage location, storage time, ventilation, and spacing requirements for safe and complete discharging.

3.13 Cell water content. Water content inside a cell shall not exceed 800 parts per million by weight. The contractor shall certify that this limit is not exceeded throughout production (see 4.7.17).

3.14 Workmanship. Batteries shall be processed in such a manner as to be uniform in quality and shall be free from defects that will affect their life, serviceability, interchangeability, or appearance (see 3.1).

3.15 Humidity. After the batteries have been tested as specified in 4.7.20, they shall meet the visual and mechanical and battery voltage requirements (see table V and 3.5.1).

Downloaded from http://www.everyspec.com

4. VERIFICATION

4.1. Test equipment and inspection facilities. Test and measuring equipment and inspection facilities shall be of sufficient accuracy, quality and quantity to permit performance of the required examinations and tests. Unless otherwise specified herein, all examinations and tests shall be performed under ambient temperature, humidity, and atmospheric pressure conditions.

4.1.1 Instrument accuracy.

4.1.1.1 Voltmeters and ammeters. All voltmeters and ammeters used in testing the batteries shall be accurate within 1 percent of the full scale value. The sensitivity of voltmeters shall be not less than 10,000 ohms per volt.

4.1.1.2 Resistor tolerance. During all tests involving discharge through a resistance, such resistance shall be accurate within the following percentages:

	Percent
Up to and including 1 megohm	±1.0
Above 1 megohm	±5.0

In determining the resistance used as a test load, the resistance of all continuously operating voltmeters shall be considered as part of the specified load.

4.1.1.3 Power supplies. Power supplies used for discharges specified herein shall be accurate within ±1 percent.

4.1.1.4 Timing. Timing equipment shall be accurate within 0.1 percent when the measured time is greater than 120 seconds. Otherwise, the accuracy shall be 0.5 percent or better.

4.2 Classification of inspection. The examination and testing of batteries shall be classified as follows:

a. First article inspection (see 4.4).

b. Quality conformance inspection (see 4.5).

c. Periodic (annual) inspection (see 4.6).

4.3 Inspection conditions. Except as otherwise specified herein, all examinations and tests shall be performed at a temperature of 80 ±20°F.

Downloaded from http://www.everyspec.com

TABLE I - Cell/Component Level Tests.

Inspection	Requirement Paragraph	Test Method Paragraph	Sampling Size
Cell, closed circuit voltage	3.5.3	4.7.12	4.4.1.1
Cell leakage	3.7	4.7.13	4.4.1.1
Cell forced discharge	3.7.1	4.7.18	4.4.1.1
Cell water content	3.13	4.7.17	Certification
Insulating compound, flow and shrinking	3.3.2	4.7.14	4.7.14
Cell series string insulation resistance	3.4.3	4.7.8	4.4.1.1
Cell series string voltage	3.5.4	4.7.12.1	4.4.1.1
High temperature device	3.4.5	4.7.16	20
Electrical connection wire and tabs	3.3.2.1		Certification
Container pressure	3.4.4.1	4.7.10.1	5
Cell short circuit	3.4.4.1	4.7.10.2	5

4.4 First article inspection. First article inspection (when required), shall be performed by the contractor, after award of contract and prior to production. First article inspection shall be performed on sample units which have been produced with equipment and procedures normally used in production.

4.4.1 Sampling size. The number of batteries constituting an inspection lot shall be in accordance with Table I and II.

4.4.1.1 Cell level sample size. The total number of cells for these tests shall be equal to 4 times the number of cells in a battery plus 5 ($4c + 5 = x$). All cells shall be subject to the closed circuit voltage test and the electrolyte leakage test. When specified (see 3.1), a quantity of 2c of the cells shall be used to perform the cell forced discharge test on two separate cell strings per 4.7.18. A quantity of 2c cells shall be separated into two equal groups and assembled into cell strings in the same manner employed for production units. Each cell string shall then be subjected to the cell series string insulation resistance and cell series string voltage tests. Cell strings passing this test may then be used in production. The remaining 5 cells shall be subjected to the safety feature test of 4.7.10.2.

4.4.2 Inspection routine. First article inspection shall consist of all the examinations and tests in accordance with Tables I and II. These tests shall be conducted in the order specified for each group. One sample battery, untested, is to remain at the contractor's plant and is to be available as a standard for comparative purposes.

4.4.2.1 Failure. If one or more sample batteries fail to meet any of the first article requirements and tests, the contractor shall immediately notify the Government of the failure. The contractor shall determine the root cause of the failure and take appropriate corrective action. A

Downloaded from http://www.everyspec.com

description of the failure(s) and corrective action(s) taken shall be included in the first article inspection reports.

Downloaded from http://www.everyspec.com

TABLE II - First-article inspection.

Group	No. of Batteries	Examination or Test	Requirement Paragraph	Method or Test Paragraph
I	See 4.4.1.1	Cell/component level tests	Table I	
II	40	Visual-mechanical	3.1	4.7.1
		Battery voltage	3.5	4.7.2
		Battery Insulation Resistance	3.4.3	4.7.8
		Charge protection	3.4.5.2	4.7.10.6
		Dimensions and weight	3.4	4.7.4.
		Altitude	3.11	4.7.7
		Vibration	3.8	4.7.6
		Shock	3.9	4.7.5
		Drop	3.10	4.7.3
		Negative terminal insulation (when specified)	3.1	3.1
IIA	10	"I (and IP 1/)" test	3.6	4.7.9.1.2
IIB	10	"L (and LP 1/)" test	3.6	4.7.9.1.3
IIC	10	"H (and HP 1/)" test	3.6	4.7.9.1.4
IID	10	State of charge	3.4.6	4.7.19
III	40 3/	Visual-mechanical	3.1	4.7.1
	10	"HT (and HTP 1/)" test	3.6	4.7.9.1.6
	10	"LT (and LTP 1/)" test	3.6	4.7.9.1.5
	10	"IT (and ITP 1/)" test	3.6	4.7.9.1.7
	10	LR1 test	3.6	4.7.9.1.8
IV	40 2/	Visual-mechanical	3.1	4.7.1
	35	Humidity	3.15	4.7.20
	30	Capacity (I, L, H and IP, LP, a HP 1/)	3.6	4.7.9.1.2 4.7.9.1.3 4.7.9.1.4
	5	Socket Strength (when specified)	3.4.8.1	3.1
		Complete discharge device (CDD)	3.4.5.3	4.7.10.7
	5	Connector (when specified)	3.4.8	4.7.15
		Safety features	3.4.4	4.7.10
V	5	Battery enclosure (when required)	3.4.7.1 and 3.4.7.2	4.7.11
VI	1	Untested reference sample		

Downloaded from http://www.everyspec.com

1/ When required (see 3.1), half of the capacity samples shall be discharged in parallel.

2/ The five fresh batteries in this subgroup shall be combined with Humidity tested batteries, divided, and tested as follows: Three fresh batteries and two humidity tested batteries shall be subjected to the CDD test. Two fresh and three humidity tested batteries shall be subjected to the safety feature test.

3/ LR1 test required for all battery types except BA-X567/U and BA-X372/U. For these two battery types, Group III shall consist of 30 samples

4.5 Quality conformance inspection.

4.5.1 Inspection of product for delivery. Inspection of product for delivery shall consist of Groups A, B and C inspection. Test equipment for government verification inspection shall be made available by the contractor, if required.

4.5.1.1 Group A inspection. Each battery on contract or purchase order shall be 100 percent inspected for conformance to the inspections in the order specified in Table III. All failures shall be removed. Discrete lots shall be formed from batteries that pass this inspection.

TABLE III - Group A inspection.

Examination or Test	Requirement Paragraph	Method or Test Paragraph
Visual-mechanical inspection	3.1	4.7.1
Battery voltage	3.5	4.7.2

4.5.1.2 Group B inspection. Group B inspection shall consist of the tests specified in Table IV in the order shown. Sample size shall be twenty (20) randomly selected samples. Group B inspection shall be performed on sample units from each shipment lot which has been subjected to and passed group A inspection. If any battery fails any group B test, the shipment lot is rejected.

Downloaded from http://www.everyspec.com

TABLE IV - Group B inspection.

Examination or Test	Requirement Paragraph	Method or Test Paragraph
Dimensions and weight	3.1	4.7.4
Insulation resistance	3.4.3	4.7.8
Safety features	3.4.4	4.7.10

TABLE V - Classification of visual and mechanical examination defects.

Categories 1/	Defects
001	Improper assembly causing parts to be inoperative or unsafe in service.
002	Electrolyte leaking caused by missing or defective sealing or closure.
101	Deformed or damaged parts which are inoperative or malfunction in service.
102	Contact surfaces obstructed by insulation material so that electrical use is affected.
103	Torn non-metallic jackets - any tear, rip, or crack with dimension greater than 1/2 inch.
104	Improper jacket closure.
105	Location, polarity and marking of terminals not as specified.
106	Labeling and marking wrong, missing or illegible so that utilization is affected.
107	State of Charge Indicator fails to indicate highest state of charge when tested prior to capacity testing.
201	Deformed or damaged parts which do not adversely affect electrical performance.
202	Burrs or imperfections which do not interfere with proper use in operation, assembly or disassembly, or cause unsafe condition in service.
203	Improper marking which doesn't hamper utilization or identification of the battery.

1/ Category 0XX defects are critical, category 1XX are major, and category 2XX are minor. These categories are used solely to qualify the levels of nonconformances. Critical defects affect safety; major defects affect use; batteries with minor defects may be serviceable with qualification.

4.5.1.3 Group C inspection. Group C inspection shall consist of (a) HT and HTP (where applicable) capacity test and (b) LT and LTP (where applicable) and (c) IT and ITP (where applicable) capacity test and (d) LR1 test (where applicable). Each capacity test shall be preceded by both the mechanical shock and vibration tests described in paragraphs 4.7.5 and 4.7.6 respectively.

Downloaded from http://www.everyspec.com

4.5.1.3.1 Sampling plan. Samples shall be selected at random in accordance with Table VI and shall represent a shipment lot. Sample Size A shall apply to the BA-X567/U of MIL-PRF-49471/4 and to the BA-X372/U of MIL-PRF-49471/9; Sample Size B shall apply to all other battery types covered by this specification. For Sample Size A, one third of the samples shall be used for the LT and LTP (where applicable), one third for the HT and HTP (where applicable), and one third for the IT and ITP (where applicable). For Sample Size B, one fourth shall be used for the LT and LTP (where applicable), one fourth for the HT and HTP (where applicable), one fourth for the IT and ITP (where applicable), and one fourth for the LR1.

4.5.1.3.2 Group C failures. Accept/reject criteria of Table VI shall be used for failures described by paragraph 3.6 (a), (b) and (c). No failures shall be allowed for (d) (see 3.6).

TABLE VI - Group C inspection sampling plan.

Inspection Lot Size	Sample Size A	Sample Size B	Maximum number of defects
500 or less	9	12	0
501-1,200	15	16	0
1,201-10,000	21	24	1
10,001-35,000	33	36	1
35,001 or more	51	52	2

4.6 Group D (annual inspection). Group D inspection, to be performed by the contractor, shall consist of the tests specified in table VII. These tests shall be performed with samples selected annually at a maximum of 12 months after successful completion of first article testing and shall be repeated every 12 months thereafter until contract completion. This testing shall not be started prior to eight months after successful completion of first article testing. The government shall be notified immediately if any failures occur. Any failures may result in partial or complete repetition of first article testing, at the government’s discretion.

Downloaded from http://www.everyspec.com

TABLE VII - Group D inspection.

Examination or Test	Requirement Paragraph	Test Paragraph	Sample size
Cells			
Electrolyte leakage	3.7	4.7.13	30
Cell forced discharge	3.7.1	4.7.18	2 cell strings 1/
Cell short circuit	3.4.4.1	4.7.10.2	5
Batteries			30 2/
Humidity	3.15	4.7.20	20
I and IP capacity	3.6	4.7.9.1.2	5
L and LP capacity	3.6	4.7.9.1.3	5
H and HP capacity	3.6	4.7.9.1.4	5
LR2 capacity	3.6	4.7.9.1.9	10
Complete discharge device	3.4.5.3	4.7.10.1	5
Container pressure	3.4.4.1	4.7.10.1	5

1/ The number of cells required is 2 x number of cells in the battery. Cells that have passed the electrolyte leakage test may be used.
2/ LR2 capacity test is required for all batteries except the BA-X567/U and the BA-X372/U. For these two batteries, only 20 batteries shall be required.

4.7 Test methods and examination.

4.7.1 Visual and mechanical examination. Batteries and cells shall be examined to determine compliance with all applicable requirements and characteristics as specified herein (see 3.12 and Table V). The state of charge indicator (where applicable) shall be tested by activating it as described on the battery. Interpretation of the reading shall also be per the instructions on the battery.

4.7.2 Battery voltage.

4.7.2.1 Open-circuit voltage. A direct current voltmeter of appropriate range and sensitivity shall be used to measure the open-circuit voltage (see 3.5.1).

4.7.2.2 Closed-circuit voltage. A direct current voltmeter of proper range and sensitivity shall be used to measure the closed-circuit voltage utilizing the load specified (see 3.5.2).

4.7.3 Drop test. Each battery shall be dropped once, for each temperature, from a height of 30 ±2 inches onto a hard surface consisting of concrete. The smallest side of the battery perpendicular to the plane of the connector face and nearest to the connector (where applicable) shall be parallel to the concrete surface and facing downward upon release, but need not be parallel upon impact. In the case of cylindrical batteries, the axis of the cylinder shall be parallel to the concrete surface upon release. The drop test shall be performed on batteries

Downloaded from http://www.everyspec.com

preconditioned at 130°F and -20°F. The batteries shall be stabilized a minimum of 4 hours at each test temperature and dropped within 10 minutes after removal from the temperature chamber (see 3.10). Open circuit voltage of 4.7.2.1 shall be tested for compliance to 3.5.1 upon completion of the drop test.

4.7.4 Dimensions and weight. Batteries shall be examined by gauging or measuring and by weighing to determine conformance (see 3.4).

4.7.4.1 Dimensions. All dimensions shall include any coating which may be used, and shall remain within the specified tolerances throughout the required tests. Both minimum and maximum dimensions shall be determined. When box gauges are used, batteries, loaded with the following weights, shall pass freely through the applicable gauge openings:

a. Batteries weighing less than 5 pounds - loading weight of 5 pounds.

b. Batteries weighing 5 pounds or more - loading weight equal to the weight of the battery.

The dimensions of the box gauge shall be the specified maximum outside dimensions of the battery. Cylindrical battery dimensions shall be checked with a ring gauge meeting the above requirements.

4.7.5 Mechanical shock. Each battery shall be secured to the testing machine by means of a rigid mount . Each battery shall be subjected to a total of three shocks of equal magnitude. The shocks shall be applied in each of three mutually perpendicular directions for rectangular configurations or two for cylindrical configurations. Each shock shall be applied in a direction normal to a face of the battery. The faces of the battery are identified by their position in relation to the face which bears the electrical connector. For each shock, the battery shall be accelerated in such a manner that the acceleration at the mid point between the peak and the start of the pulse shall be 75 +/- 20 gravity units. The effective duration of each pulse shall be between 3 and 6 milliseconds. Effective duration shall be measured from the point where the acceleration first reaches one third of the peak acceleration obtained and end when the acceleration passes below the one third value and stays below this value. The peak acceleration shall be a minimum of 125 G; exact value shall be recorded (see 3.9). Upon completion of the shock test open circuit voltage shall be tested for compliance (see 3.5.1) and the batteries shall be examined for the visual and mechanical defects identified in Table V (see 3.9).

4.7.6 Vibration. Each battery shall be tested in accordance with the vibration test method of UL-1642. Upon completion of the vibration test, open circuit voltage of 4.7.2.1 shall be tested for compliance to 3.5.1 and the batteries shall be examined for the visual and mechanical defects identified in Table V(see 3.8).

4.7.7 Altitude. Batteries shall be placed in an altitude chamber, in which the pressure is maintained at a value corresponding to an altitude of 50,000 feet and the temperature is kept at 75 ±5°F, for a period of six (6) hours (see 3.11). Upon completion of the altitude test, open circuit

Downloaded from http://www.everyspec.com

voltage of 4.7.2.1 shall be tested for compliance to 3.5.1 and the batteries shall be examined for the visual and mechanical defects identified in Table V (see 3.11).

4.7.8 Insulation resistance (battery terminals and cell series string). Insulation resistance test shall be performed, except as otherwise specified (see 3.1). Batteries and cell series strings shall be stored for a period of 48 hours at +70 ±5°F and a relative humidity of 50 ±15 percent. After storage and while at these conditions, the insulation resistance shall be measured by applying a direct-current potential of 500 ±20 volts between any two battery terminals or cell series string terminations not electrically connected and between all ungrounded terminals and the container of the battery. The insulation resistance of batteries and cell series strings having non-metallic containers shall be measured by the use of an appropriately sized copper plate making physical contact with the container or cell series string. The plate shall be placed with the broad surface against any areas of any surface other than that on which the battery terminals or cell series strings terminations are located (see 3.4.3).

4.7.9 Capacity (see 3.6).

4.7.9.1 Capacity tests. Sample batteries selected for capacity tests specified in the individual specification sheet (3.1) shall be stored and discharged in air as applicable, in accordance with 4.7.9.2. All batteries shall be discharged to zero volts. The time required to fall to the specified minimum voltage shall be used to determine the battery capacity. The time required to rise to the specified minimum initial voltage shall not be included in the capacity determination. A continuous temperature recording shall demonstrate the accuracy of the discharge temperature within the discharge chamber.

4.7.9.1.1 Initial voltage delay. At the start of the capacity discharge test, each battery shall be monitored to determine the time in seconds required for battery closed circuit voltage to rise to the minimum voltage after the specified loads are applied as specified in the individual specification sheets. The device used to monitor the voltage rise to the minimum voltage shall be capable of recording voltage values in 1 second intervals minimum. No loads shall be applied at any time during storage or prior to the discharge test following such storage (see 3.6.1). This requirement does not apply to either the LR1 or LR2 test when required.

4.7.9.1.2 Capacity test I & IP (where applicable). Discharge at +70 ±5°F without previous storage to zero volts.

4.7.9.1.3 Capacity test L & LP (where applicable). Discharge at -20 ±3°F after storage at -20 ±3°F for a minimum of sixteen (16) hours.

4.7.9.1.4 Capacity test H & HP (where applicable). Discharge at +130 ±3°F after storage at +130 ±3°F for a minimum of sixteen (16) hours.

4.7.9.1.5 Capacity test LT & LTP (where applicable). Discharge at -20 ±3°F after a minimum of four (4) weeks storage at +130 ±3°F followed by a minimum of sixteen (16) hours at

Downloaded from http://www.everyspec.com

-20 ±3°F. No load shall be applied during the storage at +130 ±3°F and -20°F prior to discharge test.

4.7.9.1.6 Capacity test HT & HTP (where applicable). Discharge at +130 ±3°F after a minimum of four (4) weeks storage at +130 ±3°F . No load shall be applied during the storage at 130°F prior to discharge test.

4.7.9.1.7 Capacity test IT & ITP (where applicable). Discharge at +70 ±5°F after a minimum of four (4) weeks storage at +130 ±3°F and a minimum of sixteen (16) hours at +70 ±5°F. No load shall be applied during the storage at +130 ±3°F and 70°F prior to discharge test.

4.7.9.1.8 Capacity test LR1 (where applicable). Discharge at +95±5°F after four (4) weeks storage at +130±3°F and a minimum of 16 hours at +95±5°F. No load shall be applied during the four weeks or 16 hours storage periods. Loads shall be as specified in the specification sheets. Cycling shall be continuous with one (1) minute at the constant wattage specified followed immediately by four (4) minutes at the constant current specified to zero volts. Multi-sectioned batteries shall be discharged in the series mode only. For discharge past the minimum voltage to zero volts, the test system shall have a minimum current gate of 5.0 amperes.

4.7.9.1.9 Capactiy test LR2 (where applicable). Discharge at +95±5°F after 13 weeks storage at +105±5°F and a minimum of 16 hours at +95±5°F. No load shall be applied during the 13 week or 16 hour storage period. Loads shall be as specified in the specification sheet. Cycling shall be continuous with four (4) minutes at the constant current specified followed immediately by one (1) minute at the constant wattage specified to zero volts. Multi-sectioned batteries shall be discharged in the series mode only.

4.7.9.2 Storage conditions. The storage conditions specified herein shall prevail during storage periods specified. A continuous temperature recording device shall demonstrate the accuracy of the storage temperature. No loads shall be applied at any time during storage prior to the discharge test following storage. Batteries shall be oriented in storage to have at least 50 percent of the cell seals facing down (see 3.1).

4.7.9.2.1 Discharge. Following stabilization, the batteries shall be discharged at the ambient discharge conditions as specified. There shall be at least a two (2) inch separation between all batteries that are being discharged. All batteries subjected to capacity tests shall be discharged as specified in individual specification sheets. Certification of that temperature shall be made at five equal time intervals over the test period. After each capacity test, each battery shall be checked with a voltmeter to insure compliance to the requirement of 3.6a. Additionally, if a State of Charge Indicator is required (see 3.1), the device shall be checked at the end of each capacity test to insure that it indicates a dead battery.

Downloaded from http://www.everyspec.com

4.7.10 Safety Features.

4.7.10.1 Container pressure test – Each cell container subjected to pressure testing shall be fitted with an airtight seal and have its' internal pressure raised to a preset value (see 3.4.4.1). Containers tested shall meet the requirements of 3.4.4.1.

4.7.10.2 Cell short circuit test - Each cell subjected to short circuit testing shall be subjected to a short circuit with a minimum length of copper wire No. 16 AWG or larger gauge. Each cell under test shall be stored at 130 $\pm 3^{o}$F for a minimum of 2 hours prior to testing. Each cell shall then be shorted at 130 $\pm 3^{o}$F. The short circuit shall be maintained for a minimum of 30 minutes at this temperature regardless of the cell's reaction. After the 30 minute period, the short circuit shall be broken. Cells tested shall meet the requirements of 3.4.4.2.

4.7.10.3 Battery short circuit test - When specified (see 3.1), each battery shall be short circuited by connecting the positive and negative terminals of the battery with a minimum length of copper wire No. 16 AWG or larger gauge until the short circuit is broken by the battery leg safety feature. The maximum current and time required to activate the battery leg safety feature shall be determined and recorded.

4.7.10.4 Liquid cathode batteries - Following the direct shorting, all batteries using liquid cathode systems shall be placed at +200°F minimum for at least two hours. At the end of the two hours the batteries shall be checked to see that no cell has vented or leaked. If any cell has vented or leaked, the battery has failed this test. If no cell has vented or leaked, the ambient temperature shall be raised to $+295 \pm 5$°F. This may be done in another oven. Batteries shall be maintained at an ambient of $+295 \pm 5$°F for two hours or until all vents open. Any cell that vented or leaked at or below 300°F must be checked to insure that the venting occurred only through the designed vent. Venting or leakage through any portion of the cell other than the designed vent is a failure. Batteries containing cells that exploded, burned or did not vent are failures (see 3.4.4). Distortion of labeling and battery jackets is permitted.

4.7.10.5 Solid cathode batteries – After short circuit testing per 4.7.10.3, batteries using solid cathode systems shall be disassembled to the extent necessary to permit testing of the individual cells. Each cell shall be subjected to the Crush Test of UL 1642 Standard for Lithium Batteries with the following exceptions:

a. A minimum compression of 50% for each cell shall be used in lieu of the maximum force specified as the limit.
b. The test surfaces need not be flat.

4.7.10.6 Charge protection device. A DC power supply capable of delivering at least 2.50 mA shall be used. The voltage to be used shall be 32 (+0, -1) volts, plus the voltage obtained by multiplying the number of cells in series by the maximum open circuit voltage of the cell. It shall be electrically connected with low impedance contacts to the connector terminals of series connected strings of the battery to force reverse current flow (charging) through the individual cell string (i.e., positive to positive and negative to negative). This voltage shall be applied for a

Downloaded from http://www.everyspec.com

mnimum of 1.0 second. The amount of current flowing shall not exceed the amount specified (see 3.4.5.2).

4.7.10.7 Complete discharge device. Location and operability shall be verified. Ability to discharge a fresh battery after activation of complete discharge device shall be verified during first article inspection (see 3.4.5.3). After activation, batteries shall be discharged at the ambient conditions specified in 4.3 with a minimum of two inches of space between them for a minimum of five days. Batteries shall meet the requirements specified (see 3.4.5.3).

4.7.11 Battery enclosure.

4.7.11.1 Battery enclosure (plastic). Plastic jacketed batteries weighing five pounds or more shall be loaded by applying weights totaling 100 pounds evenly distributed over the top of the battery and shall remain so loaded at least one minute. The condition of the jacket shall be observed (see 3.4.7).

4.7.11.2 Battery Enclosure Combustibility. A sample enclosure shall be exposed to a flame for 30 seconds. After 30 seconds the test item shall be withdrawn from the flame. There shall be no combustion of the enclosure (see 3.4.7.3).

4.7.12 Cell closed-circuit voltage. The cells shall be tested for five (5) seconds at the rate specified (see 3.1). Any cell whose voltage is not above the minimum useful voltage within 5 seconds shall be rejected (see 3.5.3).

4.7.12.1 Cell series string voltage. Cell series strings shall be subject to the loads specified for the battery closed circuit voltages (see 3.1). Voltage values shall be detected using a voltmeter of proper range and sensitivity. Voltage shall rise to the value specified for the battery in the time specified (see 3.5.4).

4.7.13 Cell leakage. At no time shall there be potting substance or cell jackets applied to the cells designated for this test. Each of the cells shall be weighed prior to and after filling with the electrolyte mixture. Each selected cell shall be weighed to the nearest tenth of a milligram and the weight recorded. The cells shall then be stored for one week (7 days) at +130 $\pm 3^{o}$F. On the seventh day, the cells shall be tested to determine if leakage has occurred. If leakage is detected during the seventh day of storage, the sample has failed. If there are no failures, continue the test. At the end of one week, the cells shall be removed from the temperature cabinet, placed in a desiccator, and cooled at room temperature for at least two hours. Each cell shall be reweighed to the nearest tenth of a milligram. After weighing, all cells shall be placed in the temperature cabinet and stored for three weeks (21 days) at +130 $\pm 3^{o}$F. At the completion of this three week storage period, the cells shall be removed, placed in a desiccator and cooled for at least two hours at room temperature. Each cell shall be weighed to the nearest tenth of a milligram. The weight loss between day 7 and day 28 shall be recorded (see 3.7). If there are one or more failures, the sample has failed.

Downloaded from http://www.everyspec.com

4.7.14 Flow or shrinking (insulating compounds) (see 3.3.2). Compounds shall be placed in a container, approximately 3 inches wide by 6 inches long by 3/4 inch high, to within 1/4 inch of the top. The temperature of the compound within the container shall be raised to +200 $\pm 5^{o}$F and the container shall be held in an inverted position for 24 hours. Then the compound shall be stored at -40 $\pm 5^{o}$F for eight hours minimum (see 3.3.2).

4.7.15 Connector. Connector location shall be verified by use of a mating connector mounted on a gauge within the dimensions specified (see 3.4.8).

4.7.16 High temperature device. This test shall be performed on devices prior to installation in batteries. Test sample shall be placed in a temperature chamber at +175 $\pm 5^{o}$F for a minimum of two hours. Each sample shall then be checked to verify that the device is closed. The temperature shall be raised to +200 +5-0^{o}F. After 45 minutes, each sample shall be checked to verify that the device is open (see 3.4.5).

4.7.17 Cell water content. Cell water content shall be certified (see 3.13).

4.7.18 Cell forced discharge. A completely discharged cell (cell discharged to two-thirds of its open circuit voltage) is to be forced-discharge in accordance with method 2 of the forced-discharge test of UL-1642. One cell for each cell string shall be discharged at the rate specified (see 3.1) to a test end voltage of two-thirds of its open circuit voltage. It shall then be connected in series with the appropriate number of fresh cells which shall then be discharged at the rate specified (see 3.1) to a test end voltage of two-thirds of its open circuit voltage times the number of fresh cells in use. All cells shall comply with requirements (see 3.7.1).

4.7.19 State of charge. When specified (see 3.1) five fresh batteries shall be discharged at the 10 ± 1 hour rate to the minimum voltage specified. If parallel discharge is specified for the battery under test, then two batteries shall be discharged in parallel and three in series configuration. Calculate the average capacity. Discharge five fresh batteries (2 parallel, 3 series, when specified) at the 10 hour rate to 80+0,-5 percent of average capacity. Activate the state of charge indicator and record the status indication. Discharge the batteries at the same rate to 50+5,-0 percent of average capacity. Activate the state of charge indicator and record the indication. Discharge the batteries at this rate to 25+5, -0 percent capacity. Activate the state of charge indicator and record the status indication. Discharge the batteries to 5+5, -0 percent capacity. Activate the state of charge indicator and record the status indication. Discharge the batteries to zero volts. Activate the state of charge indicator and record the status indication (see 3.4.6).

4.7.20 Humidity. Batteries shall be tested in accordance with the humidity test of UL-1642 (see 3.15). Upon completion of the humidity test, open circuit voltage of 4.7.2.1 shall be tested for compliance to 3.5.1 and the batteries shall be examined for the visual and mechanical defects identified in Table V

Downloaded from http://www.everyspec.com

5. PACKAGING

5.1 Packaging requirements. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2e). When the actual packaging of the 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 which may be helpful, but is not mandatory.)

6.1 Intended use. The primary batteries included are of the non-reserve type composed of electrochemical cells. The batteries are capable of storage and use under wide temperature ranges.

6.2 Acquisition Requirements. Procurement documents should specify the following:

a. Title, number and date of this specification.

b. Applicable specification sheet (see Supplement 1).

c. Complete type designation (see 1.2.1).

d. Requirement for first article testing.

e. Packaging requirements (see 5.1).

f. Government first article test requirements (when applicable).

g. Issue of DoDISS to be cited in the solicitation, and if required, the specific issue to individual documents referenced (see 2.2)

6.3 First article. When a first article inspection is required, the item(s) should be a first article sample. The first article should consist of the number of cells and batteries specified in table II. The contracting officer should include specific instructions in acquisition documents regarding arrangements for examinations, approval of first article test results and disposition of first articles. Solicitations 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,

Downloaded from http://www.everyspec.com

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.

6.4 Definitions.

6.4.1 Non-flammable and non-toxic materials. Non-flammable and non-toxic materials are those materials which will not support combustion, produce smoke, or be capable of emitting toxic fumes when subjected to the environmental conditions specified for the battery.

6.4.2 Shipment lot. The shipment lot is the quantity of batteries (exclusive of the number of batteries required as samples) of any one type, of any one month or less, and produced at any one place of manufacture on any one contract.

6.4.3 Contract lot. The contract lot is the total of all batteries (exclusive of the number of batteries required as samples) of any one type, delivered in one or more shipment lots, under the terms of any one contract.

6.5 Examples of lusterless green. Examples of lusterless green are 34079, 34086, 34087, 34096, 34102, 34127, and 34128 per FED-STD-595.

6.6 Subject term (key word listing).
Battery
Non-rechargeable
Non-reserve

6.6 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extent of the changes.

Custodians:
Army - CR

Preparing Activity
Army - CR

(Project 6135-0398)

Downloaded from http://www.everyspec.com

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.

2. The submitter of this form must complete blocks 4, 5, 6, and 7.

3. The preparing activity must provide a reply within 30 days from receipt of the form.

NOTE: This form may not be used to request copies of documents, nor to request waivers, or clarification of requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

I RECOMMEND A CHANGE:	**1. DOCUMENT NUMBER** **MIL-PRF-49471A(CR)**	**2. DOCUMENT DATE (YYMMDD)** 981001

3. DOCUMENT TITLE
BATTERIES, NON-RECHARGEABLE, HIGH PERFORMANCE

4. NATURE OF CHANGE (Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)

5. REASON FOR RECOMMENDATION

6. SUBMITTER

a. NAME (Last, First, Middle initial)	b. ORGANIZATION	
c. ADDRESS (Include Zip Code)	d. TELEPHONE (Include Area Code) (1) Commercial (2) AUTOVON (If applicable)	7. DATE SUBMITTED (YYMMDD)

8. PREPARING ACTIVITY

a. NAME US Army Communications-Electronics Command	b. TELEPHONE (Include Area Code) (1) Commercial (732) 532-9139 (2) AUTOVON 992-9139
c. ADDRESS (Include Zip Code) ATTN: AMSEL-LC-LEO-E-EP Fort Monmouth, NJ 07703-5023	**IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT:** Defense Quality and Standardization Office 5203 Leesburg Pike, Suite 1403, Falls Church, VA 22041-3466 Telephone (703) 756-2340 AUTOVON 289-2340