24 January 1974

MILITARY SPECIFICATION

BATTERIES, DRY (ALKALINE)

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

1. SCOPE

1.1 Scope. - This specification covers batteries for use with military equipment where greater performance over a wide temperature range is required. The battery is composed of electrochemical cells of the zinc-potassium hydroxide-manganese dioxide type.

1.2 Classification. -

1.2.1 Type designation. - The type designation of alkaline cell dry batteries shall be in the following form:

BA	3232/U
Component	Battery type number

1.2.1.1 Battery type number. - The battery type number identifies the basic design of the battery (See 3.1) and consists of a four-digit number (in the 3001 thru 3999 series).

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

FF-N-836	Nut, Plain, Hexagon, Square, Cap and Welding Nut, Slotted, and Castellated, Hexagon.
FF-S-92	Screw, Machine, Slotted or Cross-Recessed.
L-P-390	Plastic, Molding Material, Polyethylene, Low and Medium Density.
L-P-513	Plastic Sheet, Laminated, Thermosetting, Paper-Base, Phenolic-Resin.
QQ-B-613	Brass, Leaded and Non-Leaded, Plate, Rolled Bar, Sheet and Strip.
QQ-B-626	Brass, Leaded and Nonleaded, Rod, Shaped, Forgings, and Flat Products with Finished Edges, Bar and Strip.
QQ-B-750	Bronze, Phosphor, Bar, Plate, Rod, Sheet, Strip, Flat Wire, and Structural and Special Shaped Sections.
QQ-C-502	Copper Rods, and Shapes, and Flat Products with Finished Edges (Flat Wire, Strips and Bars).
QQ-C-530	Copper-Beryllium Alloy Bars, Rods, and Wire.
QQ-C-533	Copper-Beryllium Alloy Strip.
QQ-C-576	Copper Flat Products with Slit, Slit and Edge-rolled, Sheared, Sawed, or Machined Edges, (Plate, Bar, Sheet and Strip).
QQ-N-290	Nickel Plating (Electrodeposited).
QQ-P-416	Plating, Cadmium (Electrodeposited).
QQ-S-571	Solder: Lead Alloy, Tin Lead Alloy, and Tin Alloy; Flux Cored Ribbon and Wire, and Solid Form.
QQ-T-191	Terne Sheet (Long and Short Terne)
PPP-T-60	Tape, Pressure-Sensitive Adhesive, Waterproof, for Packaging.

MILITARY

MIL-M-14	Molding Plastics and Molded Plastic Parts, Thermo-setting.
MIL-W-76	Wire and Cable, Hook-up, Electrical Insulated.
MIL-W-530	Webbing, Textile, Cotton, General Purpose, Natural or in Colors.
MIL-B-857	Bolts, Nuts, and Studs.
MIL-W-6858	Welding, Resistance: Aluminum, Magnesium, Non-Hardening Steels or Alloys, Nickel Alloys, Heat-Resisting Alloys, and Titanium Alloys; Spot and Seam.
MIL-F-14256	Flux, Soldering, Liquid (Resin Base).
MIL-B-55521	Battery, Dry Packaging and Packing.

STANDARDS

FEDERAL

FED. STD. NO. 595	Colors.

MILITARY

MIL-STD-105	Sampling Procedures and Tables for Inspection by Attributes.
MIL-STD-143	Specification and Standard Order of Precedence for the Selection of.

(Copies of specifications, standards, specification sheets, 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.)

3. REQUIREMENTS

3.1 Military specification sheets for individual battery types. Detail requirements or exceptions applicable to individual types are specified on the military specification sheets of this specification. In the event of any conflict between requirements of this specification and the individual military specification sheet the latter shall govern.

3.2 Classification of requirements. - The requirements for the product are classified herein as follows:

Requirement	Paragraph
Selection of specifications and standards	3.3
First Article	3.4
Materials and components	3.5
Electrolyte Leakage	3.6
Design and construction	3.7
Electrolyte penetration	3.8
Dielectric strength	3.9
Capacity	3.10

Requirement	Paragraph
Electrical Insulation Continuity	3.11
Insulation Resistance	3.12
Vibration	3.13
Mechanical Shock	3.14
Labeling and marking	3.15
Workmanship	3.16

3.3 Selection of specifications and standards. - Specifications and standards for necessary commodities and services not specified herein shall be selected in accordance with MIL-STD-143.

3.4 First Article. - Batteries furnished under this specification shall be a product which has been tested, and passed the first article tests specified herein.

3.5 Materials and components. - When a definite material or component is specified, it shall be in accordance with the applicable specification or requirement listed in Table 1. When deemed necessary by the Government, certification from the source of the material or component will be required. In the absence of certification from the source, a certificate of analysis or certified inspection data will be required. (See par. 4.4 and 4.4.1)

3.5.1 Metals. - All metals which do not enter into the basic electro-chemical reaction of the cell shall resist or be treated to resist corrosion when subjected to any test or storage conditions specified herein.

3.5.1.1 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.

3.6 Electrolyte leakage. - There shall be no evidence of electrolyte leakage on the external surfaces of the jacket at any time prior to or during the performance of test specified in 4.7.10, or any other tests specified herein. Electrolyte leakage shall be considered to have occurred when a drop of phenolphthalein solution placed on the battery turns pink or red.

3.7 Design and construction. - Batteries shall be of the design, construction, physical dimensions, weight, and polarity specified. (See 3.1)

TABLE I - Materials and Components

Materials or components	Applicable specifications or requirements (See 4.4)	Methods of Test (4.4.1)
Solder 1/.....	QQ-S-571	
Soldering Flux 2/	MIL-F-14256	
Metals	3.5.1	
Brass	QQ-B-613 or QQ-B-626	
Copper	QQ-C-502 or QQ-C-576	
Beryllium copper	QQ-C-530 or QQ-C-533	
Phosphor bronze	QQ-B-750	
Terneplate	QQ-T-191	
Cadmium plating	QQ-P-416	
Nickel plating	QQ-N-290	
Wire	MIL-W-76	
Machine screws, studs and nuts	MIL-B-857, FF-N-836 or FF-S-92	
Plastic, laminated	L-P-513, type PBE	
Plastic, Molded	MIL-M-14, type MFE	
Plastic polyethylene ..	L-P-390, type 1	
Webbing, cotton	MIL-W-530	
Tape	PPP-T-60	
Insulating, impregnating potting and sealing compounds	3.7.2	4.7.1.1.1
Filler or padding	3.7.3	4.7.1
Cell-block-container material	3.7.4, 3.8 and 3.9	4.7.2 and 4.7.3
Intercell separation ..	3.7.5	4.7.2 and 4.7.3
Terminals	3.7.8 1, 3.7.8.2, 3.7.8.3 3.7.8.4, 3.7.8.5, 3.7.8.6 and 3.7.8.7	4.7.4.1.1, 4.7.4.2.1
Jackets, metallic 3/...	3.7.10.1	
Jackets, nonmetallic ..	3.7.10.2	4.7.2 and 4.7.3
Terminal mounting plate.	3.8 and 3.9	4.7.2.and 4.7.3
Strap handle 4/.....	3.7.9	

1/ For electrical connections, type $Sn40$ or higher tin content shall be used.

2/ If other fluxes are used, they shall not affect the performance of the battery or reduce its shelf life.
3/ Test method 4.7.2 is applicable only for metallic jackets of material other than terneplate.
4/ Applicable to batteries with metallic jackets only.

3.7.1 Battery voltage.

3.7.1.1 Open-circuit voltage. - Unless otherwise specified, the open-circuit voltage shall not exceed the specified nominal voltage by more than 15 percent. (See 3.1 and 4.7.8.1)

3.7.1.2 Closed-circuit voltage. - The closed-circuit voltage shall be not less than the voltage specified. (See 3.1 and 4.7.8.2)

3.7.2 Insulating, impregnating, potting and sealing compounds. - The insulating, impregnating, potting and sealing compounds shall exclude moisture from insulating material without impairing its electrical characteristics. When tested as specified in 4.7.1.1.1 the potting and sealing compounds shall not flow at high temperature (160°F) nor crack or draw away from the sides of a container at low temperature (-40°F) or during any temperature change between +160°F and -40°F sufficiently to impair electrical connections.

3.7.3 Filler or padding. - Filler or padding shall be a cushioning electrically nonconducting material which maintains its insulating characteristics under adverse environmental conditions.

3.7.4 Cell-block container. - Cell-block container shall be an insulating material surrounding a group or a stack of individual cells.

3.7.5 Intercell separation. - A separator shall be placed between cells in series connected multicell batteries. The separator shall be an insulating material.

3.7.6 Intercell connections. - Intercell connections shall be spot welded in accordance with MIL-W-6858, class B, or soldered depending upon the applicable terminal. Connections between cell blocks and between cell block and terminal shall be so insulated or positioned as to avoid contact with other conducting material or jacket of the battery. When insulated wire is soldered to terminal lugs, it shall not be bared more than 3/32 inch from the lug nor shall it extend more than 3/32 inch beyond the lug.

3.7.7 Age of cells. - The minimum age of cells, from the time of their fabrication to the time of their presentation for acceptance inspection as batteries, shall be 5 days. The maximum age of cells, from the time of their fabrication to the time of their shipping date shall be 90 days. Batteries shall be submitted for acceptance inspection not more than 30 days prior to the shipping date.

3.7.8 Terminals. - The type, dimensions, location, and mounting of terminals shall be as specified herein. (See 3.1)

3.7.8.1 Stud and nut - Stud and nut terminals shall be as shown in figure 1 and shall be made of brass or other approved metal, except when otherwise specified (See 3.1). When specified, the nut shall be made of insulated material with a brass insert (See 3.1). A bronze or brass plated steel external tooth lockwasher shall be provided for each terminal.

3.7.8.1.1 Mounting. - It shall be possible to screw the nut down by hand to make a firm seat with the shoulder of the stud, without turning of the stud.

3.7.8.2 Spring clip. - Spring clip terminals shall be of the Fahnestock type made of spring brass or other approved metal, or phosphor bronze (See 3.1), and shall be large enough to accommodate a wire having a cross-sectional area of 4,200 circular mils.

3.7.8.2.1 Mounting. - Each clip shall be mounted in such a manner that the entire contact surface of the clip will be located above the surface adjacent to the clip.

3.7.8.3 Wire leads. - Wire-lead terminals shall be hookup wire, type MW-C18(16)U or larger of MIL-W-76.

3.7.8.3.1 Mounting. - The external length of each wire lead shall be 6-1/2 ± 1/2 inches. The wire leads shall be color coded as follows: Positive-red, negative-black, intermediate as specified, (See 3.1). The free end of each wire shall be bared for a distance of 1/2 ± 1/8 inch. The strands of each lead, so bared, shall be twisted together and soldered, and then covered with an adherent insulating waterproof material, or an equivalent method shall be used to prevent short circuits during storage and handling.

3.7.8.4 Snap-on. - Snap-on terminals shall consist of two parts: stud (nonresilient member) for positive terminal, and socket (resilient member) for negative terminal as shown in figure 2.

3.7.8.4.1 Mounting. - Each member shall be securely mounted. Mating member engagements and disengagements shall be made without dislocating the terminals or distorting the battery beyond the specified limits during or after any tests performed on the battery (See 3.1). Each member shall be mounted so that the battery jacket does not interfere with the proper mating of terminals.

3.7.8.4.2 Contact resistance. - The contact resistance between the plug gage and socket when tested in accordance with 4.7.4.1.1 shall not exceed .005 ohm.

3.7.8.5 Socket. - Socket terminals shall be as specified in 3.1. When the following types are specified they shall be as shown in figure 3, as applicable:

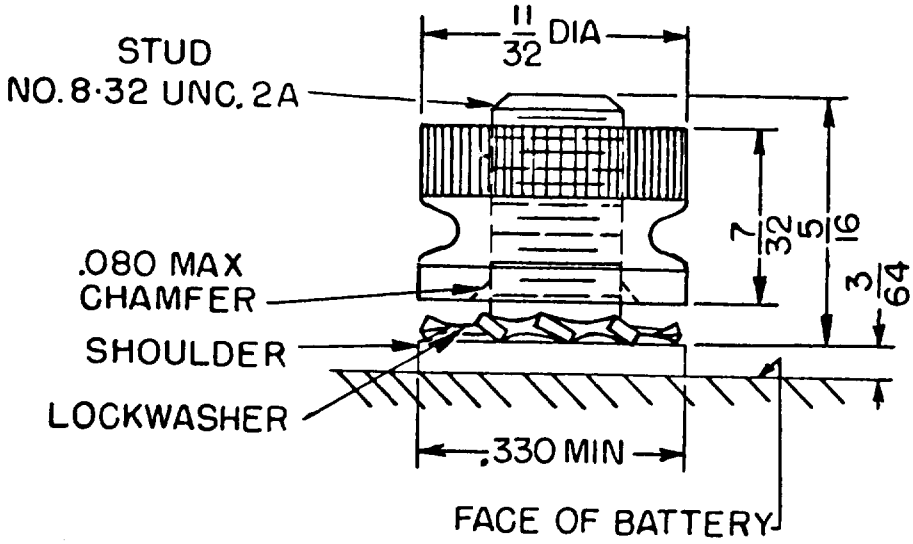
Type	No. of holes
I	2
IV	2
VIII	3
XIII	4
IX	5
A	8
B	8

Contact components of socket terminals shall be made of phosphor bronze, beryllium copper, plated spring brass or other approved metal (See 3.1). Sockets shall be so designed and constructed that there will not be contact of any of the pins of the mating plug to any socket terminal other than those for which such pins are intended without using undue force. Insulating materials shall be of plastic. The pinhole-spacing tolerances shall be ±0.005 inch.

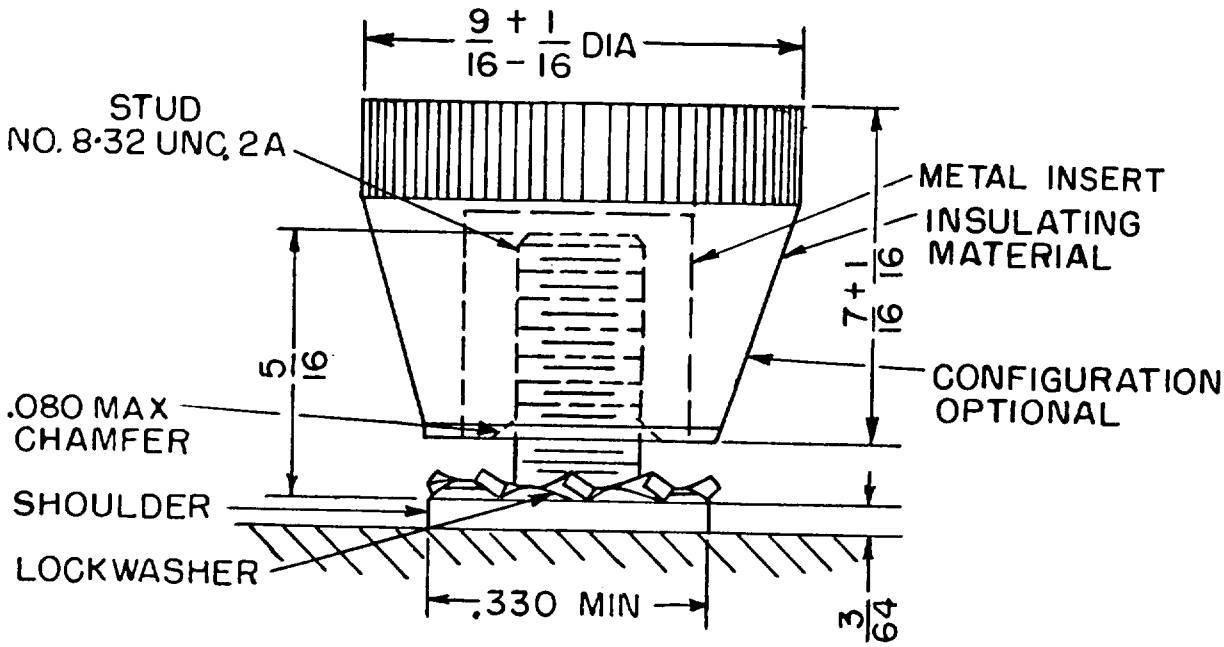
3.7.8.5.1 Mounting. - The socket shall be so supported and mounted that the top surface of the socket shall not protrude above the adjacent surface of the jacket and shall be not more than 1/16 inch below the surface of the jacket or socket dome, when used, initially, during, and after subsequent insertions of the mating plug. The socket pin-circle center shall be located as specified, and the jacket opening shall be positioned so that its center is within 3/32 inch diameter circle whose center coincides with the socket pin-circle center, initially, during and after insertions of the mating plug. The angular orientation of the socket shall be within 5° of the battery centerlines or other lines of orientation as specified. Socket well depth, when measured from the top surface of the jacket or socket dome, shall be as specified. (See 3.1)

3.7.8.5.2 Contact resistance. - Contact resistance between each socket insert and the applicable pin of the mating-plug when tested in accordance with 4.7.4.2.1 shall not exceed .005 ohm.

3.7.8.6 Flat surface. - Flat surface terminals shall be a flat plate of nickel plated steel or other approved metal, the center of which may be level, have a raised or a recessed portion, or a punched or drilled hole, as specified. When one terminal is the bottom of the can housing the battery, it shall be smooth and not injured as a result of cleaning or polishing. When the positive terminal is the raised center portion of a flat plate, it may be provided with a centered outward projecting point not to exceed 0.020 inch (See 3.1).



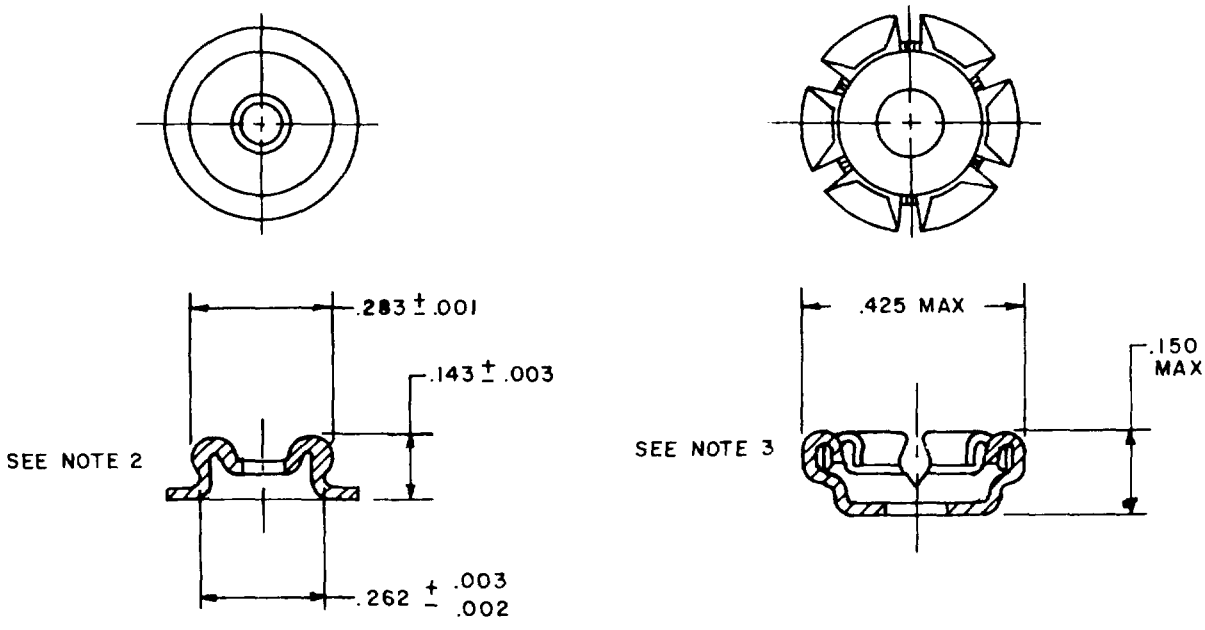
METAL NUT



INSULATED NUT

1. ALL DIMENSIONS IN INCHES.
2. UNLESS OTHERWISE SPECIFIED TOLERANCES ARE ± 1/32.
3. STUD AND NUT TERMINAL AND METAL INSERT SHALL BE OF BRASS OR OTHER APPROVED METAL. (SEE 3.1)

FIGURE 1. STUD AND NUT TERMINAL



STUD, POSITIVE TERMINAL

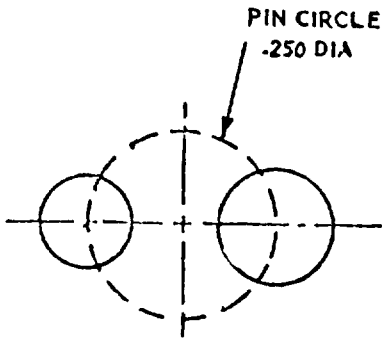
SOCKET, NEGATIVE TERMINAL

NOTES:

1. ALL DIMENSIONS IN INCHES.
2. STUD SHALL BE OF PLATED SOFT BRASS NOT LESS THAN 0.015 IN THICKNESS.
3. SOCKET SHALL BE PLATED SPRING BRASS.

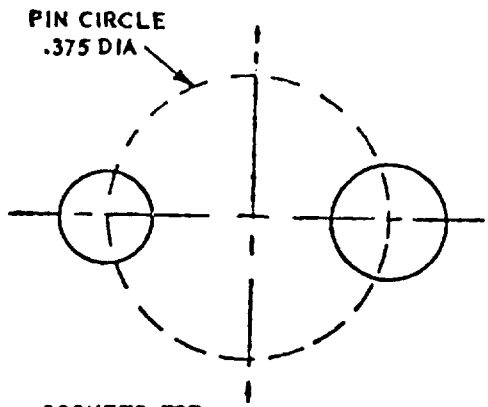
FIGURE 2. SNAP-ON TERMINALS

TYPE I



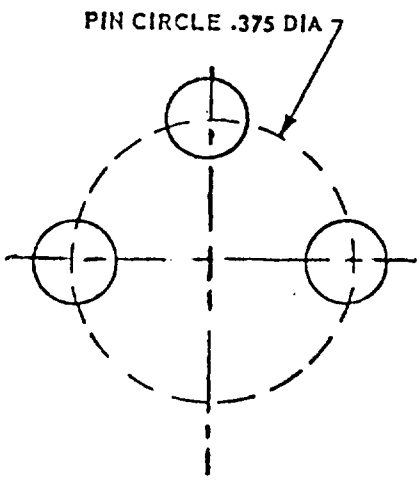
SOCKETS FOR
1 PIN 1/8 DIA(0.125 ± 0.002)
1 PIN 5/32 DIA (0.156 ± 0.002)

TYPE IV



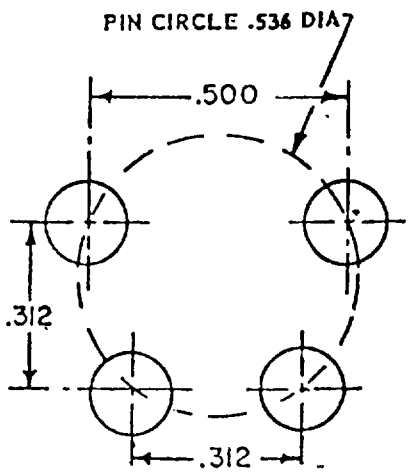
SOCKETS FOR
1 PIN 1/8 DIA (0.125 ± .002)
1 PIN 5/32 DIA (0.156 ± .002)

TYPE VIII



SOCKETS FOR
3 PINS 3/32 DIA(0.093 ± .002)

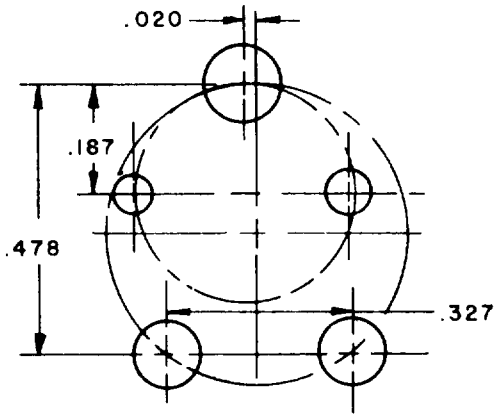
TYPE XIII



SOCKETS FOR
4 PINS 1/8 DIA(0.125 ± .002)

FIGURE 3. *Socket terminals (top views).*

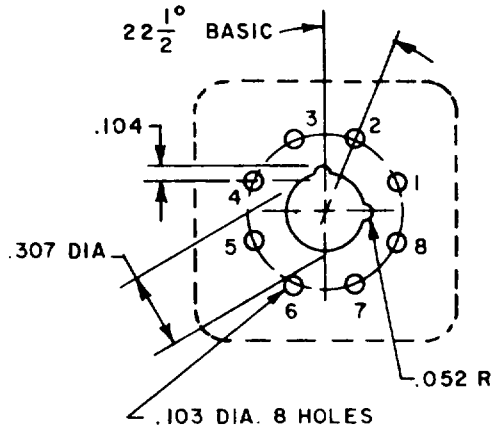
PIN CIRCLE .535 DIA
PIN CIRCLE .375 DIA



SOCKETS FOR
2 PINS 3/32 DIA (0.093 ± 0.002)
3 PINS 1/8 DIA (0.125 ± 0.002)

TYPE IX

INSULATING PLATE
SIZE OPTIONAL

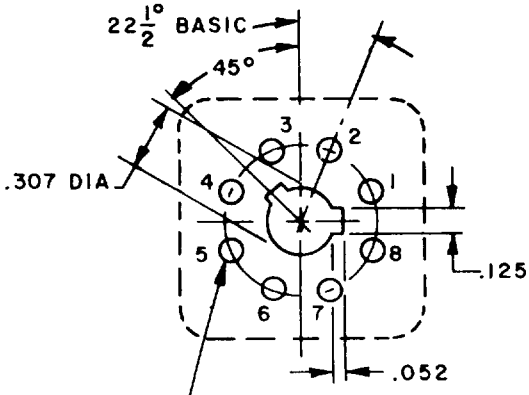


.103 DIA. 8 HOLES
EQUALLY SPACED ON
.687 DIA PIN CIRCLE

SOCKETS FOR
8 PINS (0.093 ± 0.002) DIA

TYPE A

INSULATING PLATE
SIZE OPTIONAL



.103 DIA 8 HOLES EQUALLY SPACED
ON .687 DIA PIN CIRCLE

SOCKETS FOR 8 PINS (0.093 ± 0.002) DIA

TYPE B

1. ALL DIMENSIONS IN INCHES
2. TOLERANCES ARE ± 1/64 ON FRACTIONS AND ± .005 ON DECIMALS EXCEPT AS OTHERWISE SPECIFIED.

FIGURE 3 CONTINUED

3.7.8.7 Coil and flat spring. - Coil and flat spring terminals shall be made of beryllium copper, spring brass, phosphor bronze, or other approved metal, and shall be as specified. (See 3.1)

3.7.8.8 Protection of terminals. - When flash-dip microcrystalline wax or equal is used to waterproof the jacket, the terminals shall be covered with a removable tape or cap. Markings shall be legible after removal of the tape or cap. The wax dip shall be applied after the application of the tape or cap.

3.7.9 Strap handle. - Strap handle shall be of webbing, using natural or synthetic fiber, or of plastic material. The width of the strap shall be 7/16-inch minimum. The effective length of the strap shall be at least one inch longer than the distance between its anchorage. The strap shall withstand the test specified in 4.7.5 without breaking or separating from its anchorages.

3.7.10 Jackets. - The jackets may consist of either metallic or nonmetallic material. The contents of multicell batteries shall fit snugly enough in the jackets to minimize movement of the cells. Jackets covering one or more cylindrical cells stacked end on end, and having open top and open bottom, shall be so attached to the cells as to prevent them from slipping out when held or shaken vertically. The bottom opening of the jacket shall be of the size specified. (See 3.1)

3.7.10.1 Metallic jacket.

3.7.10.1.1 Prior to battery fabrication. - The inside of the jacket, when other than terneplate, shall be coated or lined with an electrolyte, corrosion resistant material.

3.7.10.1.2 As a fabricated battery. - The outside of the battery shall have a coating to protect the jacket from corrosion during or at the conclusion of any of the tests specified herein. The contents of the jackets shall be completely insulated from the metal unless otherwise specified. The jacket shall not become permanently distorted nor open at any of its seams after being subjected to the test specified in 4.7.6.1. The test of 4.7.6.1 shall be applicable to batteries weighing 5 pounds or more.

3.7.10.2 Nonmetallic jacket. - When wax coating a nonmetallic jacket, microcrystalline wax or equal shall be used. All excess wax shall be removed from the external surfaces of the jacket.

3.7.10.3 Waterproofing of jackets (WOJ). - Metallic jackets shall show no evidence of water penetration and nonmetallic jackets shall not fall apart and the seams shall remain intact when tested as specified in 4.7.6.2. This WOJ requirement shall not apply to single cell batteries with metallic or plastic jackets.

3.7.10.4 Color of jackets. - The color of exposed surfaces of jackets shall match one of the following lusterless greens 34079, 34086, 34087, 34096, 34102, 34127, and 34128 per Federal Standard No. 595.

3.7.11 Closure. - The closure is defined as the seal of the cell or battery.

3.7.11.1 Sealing compound. - When sealing compound is used for closures in batteries, the outer edge of the sealing compound shall be approximately level with the top of the container or the top of the jacket. On multicell batteries, the exposed sealing compound shall be approximately level with the edge of the jacket and shall not obstruct the contact surfaces of the terminals. (See 4.7.1.1.1)

3.7.11.2 Metal or plastic covers. - Metal or plastic covers for tops of cells or batteries may be used in lieu of sealing compound provided such covers and accessory parts are not adversely affected by leakage, corrosion, or deformation during any of the tests specified herein. Construction shall be such that it will be impossible for one cell to be short-circuited by coming in contact with another cell of the same type when placed end to end.

3.8 Electrolyte penetration. - When applicable materials are tested as specified in 4.7.2, the milliammeter deflection shall be less than 0.225 ma during the entire test period.

3.9 Dielectric strength. - When applicable materials are tested as specified in 4.7.3, there shall be no voltage breakdown during the entire test period.

3.10 Capacity. - When the battery is tested for capacity as specified in 4.7.9, the discharge time period to termination of test as required in 4.7.9.5 shall be not less than the minimum time specified. (See 3.1)

3.11 Electrical Insulation Continuity. - The D.C. resistance between each terminal and the outer metal jacket of the battery, shall be not less than 1 megohm, when tested as specified in 4.7.11.

3.12 Insulation resistance. - The insulation resistance between any two terminals not electrically connected, and between all ungrounded terminals and the container of the battery, shall be not less than five megohms, when tested as specified in 4.7.12.

3.13 Vibration. - After the batteries have been tested as specified in 4.7.13 they shall meet the visual and mechanical, dimensional, closed circuit voltage and terminal requirements. (See 3.1, 3.7, 3.7.1.2 and 3.7.8)

3.14 Mechanical shock. - After the batteries have been tested as specified in 4.7.14 they shall meet the visual and mechanical, dimensional, closed circuit voltage and terminal requirements. (See 3.1, 3.7, 3.7.1.2 and 3.7.8)

3.15 Labeling and marking. - All labeling and marking shall be clear and legible throughout all of the tests specified herein. Labeling and marking shall be black. Battery jackets may have the labeling and marking embossed or die depressed, in which case it may be the same color as the background.

3.15.1 Labels. - Each battery shall have label positioned as specified, in 3.1. If there is insufficient space to show all required information on one face of the battery, it shall be continued on another face. There shall be no information on the label other than the following:

BATTERY, DRY
Type designation
(Contract number) . . .
(Code) . . . .
Manufacturer's name
(Trade name may also be used)
Manufacturer's plant

EXAMPLE:

BATTERY, DRY
BA-3232/U
DAAB05-71-C-1234
0371
John Doe Company
JODOCO
Batteryville, N.J.

3.15.1.1 Code. - The code shown shall indicate the month and year of manufacture of the battery by means of a four-digit number in which the first two digits shall indicate the number of the month and the last two digits shall indicate the year. Months earlier than the tenth month shall be single digit preceded by "0".

EXAMPLES:

A battery manufactured in March 1978 will bear the code "0378."

A battery manufactured in November 1978 will bear the code "1178".

When a battery is completed during the last 3 working days of a month, or the first 3 working days of the subsequent month, the manufacturer is permitted to use either month as the date to be coded.

3.15.2 Terminal markings. - On batteries having socket-type terminals, all markings such as polarity, voltage, and the unit of 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 top or the side of the battery, or both. Markings shall indicate clearly the terminals to which they refer.

3.16 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, or appearance.

4. QUALITY ASSURANCE PROVISIONS

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

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 voltmeter and ammeter ranges shall be such that all readings are taken on the upper half of the scale. The sensitivity of voltmeters shall be not less than 1,000 ohms per volt.

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

	Percent
Up to and including 25,000 ohms	0.5
From above 25,000 ohms 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 Timing. - Timing equipment shall be accurate within 0.5 percent.

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

(a) Materials and components inspection. (See 4.4)

(b) First Article inspection. (See 4.5)

(c) Quality conformance inspection.

(1) Inspection of product for delivery. (See 4.6.1)

(2) Inspection of preparation for delivery. (See 4.6.2)

4.3 Inspection conditions. - Except as otherwise specified herein, all examinations and tests shall be performed at a temperature of 80° ± 20°F. (26.7° ± 11.1°C), ambient atmospheric pressure, and relative humidity.

4.4 Materials and components inspection. - Materials and components inspection shall consist of verification by certification from the source that the materials and components used in fabricating the batteries are in accordance with applicable requirements prior to such fabrication. In the absence of certification from the source a certificate of analysis or certified inspection data shall be required as proof of conformance to applicable requirements. Materials and components involved are listed in table I.

4.4.1 Samples of materials and components. - For those items listed in table I for which the specification requirement does not reference a subsidiary specification; eight samples of materials or components, treated and processed as they would be in the finished batteries shall be inspected.

4.5 First Article inspection. - Unless otherwise specified in the contract or purchase order, first article inspection shall be performed by the contractor as specified in 4.5.1 through 4.5.1.2.

4.5.1 Sample batteries. - The contractor at no additional cost to the Government shall make 36 batteries constituting a first article inspection lot. (46 batteries when Electrolyte Leakage Test is applicable)

4.5.1.1 Inspection routine. - First article inspection shall consist of Groups I, II, III, IV & V per table II. Group V shall consist of one sample battery, untested, to remain at the suppliers plant to be available as a standard for comparative purposes.

TABLE II - First Article Inspection

Group	No. of Batteries	Examination & Test	Req. Par.	Method of Test Par.
I	10	Visual-Mechanical (External)	3.7	4.7.1
		Battery voltage	3.7.1 3.7.1.1 &3.7.1.2	4.7.8, 4.7.8.1 & 4.7.8.2
		Dimensions and weight	3.7	4.7.7 and 4.7.7.1
		Vibration	3.13	4.7.13
		Mechanical Shock	3.14	4.7.14
		Electrical Insulation Continuity 1/	3.11	4.7.11
		Insulation Resistance	3.12	4.7.12
		Capacity Discharge I	3.10	4.7.9.1.1, 4.7.9.2 - 4.7.9.5
II	15	(10) Electrolyte leakage 1/	3.6	4.7.10
		(3) WOJ	3.7.10.3	4.7.6.2
		(2) Visual-Mechanical (Internal)	3.7	4.7.1
III	10	Visual-Mechanical (External)	3.7	4.7.1
		Battery voltage	3.7.1, 3.7.1.1 &3.7.1.2	4.7.8, 4.7.8.1 & 4.7.8.2
		Capacity Discharge HT	3.10	4.7.9.1.2, 4.7.9.2 thru 4.7.9.5
IV	10	Visual-Mechanical (External)	3.7	4.7.1
		Battery Voltage	3.7.1 3.7.1.1 &3.7.1.2	4.7.8, 4.7.8.1 & 4.7.8.2
		Capacity Discharge LT	3.10	4.7.9.1.3, 4.7.9.2 - 4.7.9.5
V	1	Untested-referenced sample	-	4.5.1.1

1/ When applicable

4.5.1.2 Failure. - If one or more sample batteries fail to meet any of the first article examinations and tests, the supplier shall immediately make the remedial changes. The supplier at no additional cost to the government shall be required to submit additional first article sample for reinspection. A description of the corrective action taken or to be taken shall be included in the first article inspection report. Official approval to begin producion will be given upon successful completion of first article inspection.

4.5.2 Start of production. - Any production prior to materials and components inspection and approval of the first article samples shall be at the supplier's risk. (See 4.4 and 4.5)

4.6 Quality conformance inspection.

4.6.1 Inspection of product for delivery. - The contractor shall perform the inspection specified in 4.4 and 4.6.1.2 through 4.6.1.4. This does not relieve the contractor of his responsibility for performing any additional inspection which is necessary to control the quality of the product and to assure compliance with all specification requirements. The government will review and evaluate the contractor's inspection procedures and examine the contractor's inspection records. In addition, the Government--at its discretion--may perform all or any part of the specified inspection, to verify the contractor's compliance with specified requirements. (See 6.3) Test equipment for Government verification inspection shall be made available by the contractor.

4.6.1.1 A lot shall be defined as the quantity of batteries of any one type, of any one contract, submitted at one time to quality conformance inspection.

4.6.1.1.1 Shipment lot. - The shipment lot (Ns) is the quantity of batteries (exclusive of the number of batteries required as samples) of any one type, of any one code, and produced at any one place of manufacture on any one contract.

4.6.1.1.2 Contract lot. - The contract lot (N) 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.

4.6.1.2 Group A inspection. Each unit on contract or purchase order shall be inspected for conformance to the inspections specified in Table III. Discrete lots shall be formed from units that pass this inspection. Factors of lot composition not defined herein, or in the contract or purchase order, shall be in accordance with MIL-STD-105.

Each lot shall be subject to sampling inspection, utilizing the procedures of MIL-STD-105, using the general inspection levels, and AQL's indicated in Table III.

Table III - Group A inspection

Examination and Test	Requirement Paragraph	Method of Test Para.	AQL Major	AQL Minor	Insp Level
Visual-Mechanical (External)	3.7	4.7.1	1.0%	4.0	II
Battery Voltage	3.7.1,3.7.1.1 & 3.7.1.2	4.7.8 4.7.8.1 & 4.7.8.2	1.0%	-	II
Electrical Insulation Continuity 1/	3.11	4.7.11	1.0%	-	II

1/ When Applicable

4.6.1.3 Group B1 inspection. - This inspection, including sampling, shall conform to Table IV and to special procedures for small-sample inspection of MIL-STD-105. Group B1 inspection shall be performed in the order listed in Table IV on the same sample batteries and shall normally be performed on inspection lots that have passed group A inspection and on samples selected from units that have been subjected to and met the group A inspection with the exception that the WOJ test can at the option of the manufacturer be performed on any batteries representing the inspection lot. (See 4.6.1.1)

Table IV - Group B_1 Inspection

Test	Requirement Paragraph	Method of Test Para.	AQL	Insp Level
Dimensions & weight	3.7	4.7.7& 4.7.7.1	1.0%	S-1
Insulation Resistance 1/	3.12	4.7.12	1.0%	S-1
Vibration	3.13	4.7.13	2.5%	S-1
Mechanical Shock	3.14	4.7.14	2.5%	S-1
Battery Voltage	3.7.1,3.7.1.1 & 3.7.1.2	4.7.8,4.7.8.1 & 4.7.8.2	2.5%	S-1
Visual-Mechanical (External)	3.7	4.7.1	2.5%	S-1
WOJ	3.7.10.3	4.7.6.2	2.5%	S-1
Electrolyte Leakage 1/ 2/	3.6	4.7.10	1.5%	S-4

1/ When Applicable
2/ Batteries shall be selected at random during the first 1/3 of the monthly production lot.

4.6.1.4 Group B_2 Inspection. - This inspection, including sampling, shall conform to Table V and to special procedures for small-sample inspection of MIL-STD-105. Group B_2 inspection shall be performed on separate samples for each sub-group and shall normally be performed on inspection lots that have passed group A inspection and on samples selected from units that have been subjected to and met the group A inspection. (See 4.6.1.1)

Table V - Group B_2 Inspection

Test	Requirement Paragraph	Method of Test Para.	AQL	Inspection Level
Subgroup I:				
HT	3.10	4.7.9, 4.7.9.1.2	4.0%	S-3
Subgroup II:				
LT	3.10	4.7.9, 4.7.9.1.3	4.0%	S-3

4.6.1.5 Group C Inspection. - Group C inspection shall be performed at the Government inspection facility (see 6.1.e) on sample batteries subjected to the examination and tests specified in table VI. Shipment of the lot represented by the sample batteries shall not be held up pending the results of group C inspection.

4.6.1.5.1 Sampling plan. - A sample of n_s batteries shall be selected at random from production for each shipment lot in amounts determined from the following formula, and rounded off in the case of fractions to an adjacent interger (up or down for each shipment lot), so that exactly n batteries have been assigned to each capacity test (T&D) when the sample for the final shipment of the contract lot has been drawn.

$$n_s = \frac{Ns}{N} \quad (2n)$$

Where:

n_s = total number of sample batteries to be taken from each shipment lot.

N_s = number of batteries in the shipment lot.

N = number of batteries in the contract lot. (See table VII.)

n = number of batteries to be taken from the contract lot for each of the two capacity tests, T and D in accordance with table VII. (Total number of batteries selected is 2n.)

4.6.1.5.1.1 Smaller-than-shipment. - (sub-shipment) lots. - At the supplier's option selection of sample batteries (see 4.6.1.5.1) may be made on a smaller-than-shipment (sub-shipment) lot basis. In such case, the sample size for the subshipment lot shall bear the same ratio to the sample size for the shipment lot as the subshipment lot bears to the shipment lot.

4.6.1.5.1.2 Allocation of sample batteries for group C inspection. - The number of batteries n_s, selected from a shipment lot (see 4.6.1.5.1) shall be assigned at random for group C inspection, as follows:

(a) The quantity of batteries ($2n\ ^{Ns}/_{N}$) in the sample of the first shipment lot shall be taken at random and assigned to the capacity tests. The first battery shall be assigned to T test, and the second to the D test. This shall be repeated until all the batteries have been assigned. This sequence of assignment of sample batteries to the two capacity tests shall be resumed in each succeeding shipment lot at the same point at which it ended in the previous shipment lot.

(b) The assignment of batteries to capacity tests shall result in the allocation of exactly n batteries to each of the two capacity tests after the final shipment on the contract lot is made. If necessary, the sample size n_s taken from the last shipment lot of a contract shall be adjusted so that this result is achieved.

Table VI - Group C Inspection

Examination and tests	Requirement paragraph	Method of test paragraph
Capacity T	3.10	4.7.9.1.4, 4.7.9.2 through 4.7.9.5
Capacity D	3.10	4.7.9.1.5, 4.7.9.2 through 4.7.9.5

Table VII - Sample Size and Acceptance Number for Each Capacity Test

Contract lot size "N"	Sample size "n" for each capacity test from contract lot	1/ Acceptance No. T & D test
0 to 110	2/ 5	2/ --
111 to 500	15	3
501 to 800	25	5
801 to 1,300	35	7
1,301 to 3,200	50	9
3,201 to 8,000	75	13
8,001 to 22,000	110	18
22,001 to 110,000	150	24
over 110,000	225	34

1/ When the number of capacity values falling below the minimum requirements specified (see 3.1) for a given test is equal to or less than the associated acceptance number, the contract lot from which the sample was drawn has met the requirements of that test.

2/ Determination of compliance specified in 4.6.1.5.3 shall not apply to contract-lot sizes of less than 111.

4.6.1.5.2 Determination of compliance.

4.6.1.5.2.1 The entire contract lot shall be considered as complying when the T test results show compliance.

4.6.1.5.2.1.1 To determine whether the contract lot conforms to the specified T test requirements, the number of batteries in the sample with capacity values below the minimum capacity value specified in 3.1 for the T test shall be compared with the applicable acceptance numbers for sample sizes n in table VII. When the number for a given test is less than or equal to the corresponding acceptance number, the contract lot complies with the requirements of that test. When the number is greater than the acceptance number, the contract lot does not comply.

4.6.1.5.2.1.2 Missing capacity values. - If, for any reason, upon the completion of the T test, there are fewer than n valid capacity values available for the evaluation of contract lot quality, the missing values shall be set equal to the applicable requirement.

4.6.1.5.3 Noncompliance.

4.6.1.5.3.1 Capacity T. - If the capacity T test results do not show compliance with the requirements as defined in 4.6.1.5.2.1.1, the entire contract lot shall be considered as not complying with the requirements of this specification and an adjustment shall be made.

4.6.1.5.3.2 Capacity D. - If the number of failures on samples subjected to capacity D Test exceeds the applicable acceptance number for the contract lot size n permitted by table VII, the contract lot is considered as not complying, and the conditions of paragraph 6.2 are applicable.

4.6.1.5.4 Shipment. - When the inspection lot passes group A, B_1 and B_2 inspection, as applicable, all sample batteries selected as specified in 4.6.1.5.1 shall be shipped to the Government inspection facility (see 6.1(e)) at no additional cost to the Government.

4.6.1.5.5 Marking. - Sample batteries allocated to tests specified in 4.6.1.5 shall be marked "(*) TEST SAMPLE." (The asterisk (*) shall be replaced by "T" or "D", as applicable.) The marking shall be rubber stamped or placed on a label securely attached to each battery. However, on batteries weighing eight ounces and less, the above marking shall be placed on the outside of each unit package.

4.6.1.5.6 Packaging. - Sample batteries allocated as specified in 4.6.1.5 shall be separately unit-packaged as specified in Specification MIL-B-55521 (See 5.1). Any void spaces in unit packages containing sample batteries shall be filled with filler material or dummy batteries. Each unit package shall be marked "RESERVED FOR (*) TEST, DO NOT OPEN UNTIL COMPLETION OF STORAGE PERIOD." The asterisk (*) shall be replaced by "T" or "D" as applicable.

4.6.1.5.7 Packing. - The unit packages shall be packed in a shipping container in accordance with Specification MIL-B-55521 for Level C Packing (see 5.1). Maximum gross weight of shipping containers for these samples shall be sixty (60) pounds.

4.6.2 Inspection of preparation for delivery. - Inspection of preparation for delivery shall be accomplished in accordance with the quality assurance provisions of Military Specification MIL-B-55521.

4.7 Methods of examination and tests.

4.7.1 Visual and mechanical examination. - Batteries shall be examined to determine compliance with all applicable requirements and characteristics listed in table VIII. When internal examination is necessary it shall be performed either during fabrication of the battery, or by dismantling the finished battery.

4.7.1.1 Potting. - The manufacturer shall determine the minimum weight of an adequately potted battery, and shall not present for acceptance any batteries failing to meet this minimum weight requirement. This shall be done by determining the minimum weight of a battery filled with a sufficient quantity of potting material to withstand the vibration and mechanical-shock tests specified. (See 3.1)

Table VIII - Visual and Mechanical Examination

Requirement	Reference paragraph
External	
Design and construction 1/	3.7
Terminals	3.7.8
Jackets	3.7.10
Closure	3.7.11
Strap handle (when applicable)	3.7.9
Internal	
Dissimilar metals	3.5.1.1
Filler or padding	3.7.3
Cell-Block container	3.7.4
Intercell separation	3.7.5

Table VIII - Visual and Mechanical Examination (Cont'd)

Requirement	Reference paragraph
Intercell Connections	3.7.6
Age of cells	3.7.7
Metallic Jackets	3.7.10.1
Insulating, impregnating Potting and sealing compounds.....	3.7.2

1/ With exception of dimensions and weight shall be performed in group B_1 inspection. (See 4.6.1.3)

4.7.1.1.1 Flow or shrinking. - Potting and sealing compounds, when used, 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 160° ± 5°F. (71.1° ± 2.8 C.) and the container shall be held in an inverted position for 24 hours. Then the temperature of the compound shall be lowered to -40° ± 5°F. (-40° ± 2.80°C.) The flow, cracking or shrinking of the compound from the sides of the container shall be noted and the batteries shall be examined to determine that there is no impairment of electrical contact. If flow is noted at 160° ± 5°F. (77.1° ± 2.8°C.) five batteries of type involved shall be exposed to 160° ± 5°F. (77.1° ± 2.8°C.) storage for 24 hours with terminals resting in lowest possible position. At the end of this exposure period batteries shall be examined to determine that there is no impairment of electrical contact. (See 3.7.2)

4.7.2 Electrolyte penetration. - Applicable specimens of materials and components shall be placed on a metal plate, and a cylindrical plastic tube 2 inches high with an internal diameter of 1-1/2 inches shall be clamped over the material. The tube shall then be filled to a depth of 1 inch with a solution of approximately 31 percent KOH by weight or the specified electrolyte to be used in the batteries. A metal electrode shall be inserted into this solution to a depth of approximately 1/2 inch. A direct-current potential of 22.5 volts shall be applied between this electrode and the metal plate with a milliammeter of proper range in the circuit. The test shall continue for a period of 72 hours, but may be terminated if failure occurs sooner.

4.7.3 Dielectric strength. - Applicable specimens of material and components shall be conditioned for 48 hours at 160° ± 2°F. (71.1° ± 1.1 C.) and a relative humidity of 50 ± 15 percent, then for 1 hour at 70° ± 5°F. (21.1° ± 2.8°C.) and a relative humidity of 50 ± 15 percent. Each specimen of material shall then be placed between two electrodes in such a manner that the electrodes will make contact with both sides of the specimen being tested. Each electrode shall have a diameter of 2 inches with the edge rounded to a radius of 1/4 inch, so that the contact surface is a circle 1-1/2 inches in diameter. The specimen shall extend at least 1/2 inch beyond the electrode surfaces around the entire circumference of the electrode to prevent flashover at the edge of the specimen. The specimens of material shall be subjected to a potential of 1,000 volts root mean square, alternating current, at commercial frequency, for a period of 1 minute. The transformer used shall be rated not less than 1/2 kilovolt-ampere and shall be capable of delivering up to 10,000 volts root mean square, 60-cycle alternating current, to the electrodes. The applied voltage shall be increased, starting at zero voltage, at an approximate rate of 500 volts per second.

4.7.4 Terminals.

4.7.4.1 Snap-on terminals.

4.7.4.1.1 Contact resistance. - Contact resistance between the stud and socket shall be measured during engagement nos. 1, 5, 6 and 10 when a current of 5 amperes is flowing through the point of contact. (See 3.7.8.4.2)

4.7.4.2 Socket terminals.

4.7.4.2.1 Contact resistance. - Contact resistance between each socket insert and the applicable pin of the mating-plug shall be measured after insertions No. 1, 10, 11, and 20 while a current of 5 amperes is flowing through the point of contact. (See 3.7.8.5.2)

4.7.5 Strap handle strength. - The sample battery, or a strap handle attached to a metal plate (mockup) shall be supported by the strap handle. The battery or the mockup shall be conditioned for 6 hours at a temperature of 160° ± 5°F. (71.1° ± 2.8°C.) and ambient relative humidity. Immediately following the conditioning a weight shall be added gradually in such a manner that the total weight (including the weight of the battery, if used) applied to the strap handle and its anchorages shall be at least 80 pounds; and it shall be maintained inspection conditions specified in 4.3 for at least 1 minute. This test shall be repeated again after conditioning the battery or the mockup at a temperature of -40° ± 5°F. (-40° ± 2.8°C.) for 6 hours. Condition of the strap handle as a whole and of the strap at its anchorages shall be observed.

4.7.6 Jackets. -

4.7.6.1 Metallic jackets. - Metallic jacketed batteries weighing five pounds or more shall be loaded by applying weights totalling 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 3.7.10.1.2)

4.7.6.2 Waterproofing of jackets (WOJ). - All multicell batteries and paper jacketed single cell batteries shall be immersed to within 1/4 inch of the top of the jacket in water maintained at a temperature of 160° ± 5°F. (71.1° ± 2.8°C.) for a period of 48 hours. In case of multicell metallic jacketed batteries the metal containers without covers may be subjected to this test in place of assembled batteries. In the case of nonmetallic jacketed batteries the jackets may be applied to dummy batteries in place of actual batteries. Condition of the jacket and its seams shall be observed. (See 3.7.10.3)

4.7.7 Dimensions and weight. - Batteries shall be examined by gaging or measuring and by weighing to determine conformance.

4.7.7.1 Dimensions. - All dimensions shall include any coating which may be used, and shall remain within the specified tolerances throughout the required tests. When box gages are used, batteries, loaded with the following weights, shall pass freely through the applicable gage 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 inside dimensions of the box gage shall be the specified maximum outside dimensions of the battery.

4.7.8 Battery Voltage.

4.7.8.1 Open-circuit voltage. - A direct current voltmeter of proper range and sensitivity shall be used to measure the open-circuit voltage.

4.7.8.2 Closed-circuit voltage. - A direct current voltmeter of proper range and sensitivity shall be used to measure the closed circuit voltage utilizing resistance specified. (See 3.1)

4.7.9 Capacity. -

4.7.9.1 Capacity Tests. - Sample batteries selected for capacity tests specified in the individual battery specification sheet (see 3.1) shall be stored and discharged, as applicable, in accordance with 4.7.9.1.1 through 4.7.9.5.

4.7.9.1.1 Capacity Test I. - Discharge at 70°F without previous storage specified in 4.7.9.3.

4.7.9.1.2 Capacity Test HT. - Discharge at 70°F after one week (7 days) storage at 160°F.

4.7.9.1.3 Capacity Test LT. - Discharge at 0°F after storage at 0°F for a minimum of sixteen (16) hours.

4.7.9.1.4 Capacity Test T. - Discharge at 70°F after 13 weeks storage at 113°F.

4.7.9.1.5 Capacity Test D. - Discharge at 70°F after (52 weeks) storage at 70°F.

4.7.9.2 Ambient storage and discharge conditions. - The ambient conditions specified in table IX shall prevail during storage and discharge periods. Normal conditions shall be maintained insofar as possible. Deviations from normal conditions are permitted, provided that: (1) the extreme conditons specified in table IX do not exist for more than five percent (cumulative) of the specified storage or discharge periods; and (2) that at no time are the extreme conditions exceeded.

4.7.9.3 Storage. - Sample batteries (packaged per contract) shall be stored at applicable storage conditions for the specified period. (See 3.1) The storage period shall be considered to have started from the date the batteries are actually placed in storage. At the conclusion of the storage period the outside of the battery container shall be examined for corrosion. (See 3.7.10)

4.7.9.4 Stabilization preceding discharge. - Following storage, and conditioning, when applicable, the batteries shall be further stored for 48 hours at ambient discharge conditions specified in table IX. Prior to initiation of discharge, LT samples shall be stored at 0°F for a minimum of sixteen (16) hours.

4.7.9.5 Discharge.- Following stabilization the batteries shall be discharged at the ambient discharge conditions specified in table IX. The discharge shall be terminated when any one of the following conditions occur:

(a) The battery voltage or the voltage of any one unit falls below the specified test-end voltage. (For batteries requiring discharge alternately through two resistances, the voltage shall be read during the final minute of the heavier-load period.)

(b) The battery dimensions exceed the maximum specified. (See 3.1)

(c) Electrolyte leakage becomes apparent on the exterior surface of the battery.

4.7.10 Electrolyte leakage. - Sample batteries shall be discharged as specified in 3.1 and then stored for 15 days. Fifty percent of the batteries shall be stored in an inverted position. The storage and discharge shall be performed at inspection conditions specified in 4.3. During the 15-day storage period, each battery shall be examined daily for evidence of electrolyte leakage on the external surfaces of the jacket. (See 3.6)

4.7.11 Electrical Insulation Continuity. - Only metal jacketed single cell batteries shall be subjected to electrical insulation continuity. The electrical insulation continuity shall be measured by the application of appropriate instrumentation (Ohm-Meter) between each terminal and the outer metal jacket of the battery. One contact of the circuit shall be applied to one of the battery terminals while the other contact of the circuit shall be applied to the metal jacket. This contact shall be applied in such a manner as to assure intimate contact with the metallic portion of the jacket. This procedure shall be repeated with the other battery terminal.

TABLE IX - AMBIENT STORAGE AND DISCHARGE CONDITIONS

Kind of Storage or Discharge	Normal Conditions		Extreme Conditions	
	Temperature	Relative Humidity	Temperature	Relative Humidity
T Storage	113 + 2°F. - 8°F. (45° + 1.1°C -4.4°C)	50 ± 20	88°F(31,1°C) thru 105°F(40.6°C) and 115°F(46.1°C) thru 118°F(47.8°C)	10 thru 30 and 70 thru 90
D Storage	70° ± 5°F (21.1° ± 2.8°C)	50 ± 20	60°F(15.7°C) thru 65°F.(18.3°C) and 75 F.(23.9°C) thru 80°F.(26.7°C)	10 thru 30 and 70 thru 90
HT Storage	160° + 3°F - 7°F (71.1° + 1.7°C) - 3.9°C)	NA	140°F (60°C) thru 153°F (67.2°C) and 163°F (72.8°C) thru 165°F (73.9°C)	NA
70°F Discharges	70° ± 2°F. (21.1° ± 1.1°C.)	50 ± 20	65°F (18.3°C) thru 68°F. (20.0°C) and 72°F. (22.2°C.) thru 80°F. (26.7°C.)	10 thru 30 and 70 thru 90
LT Storage and discharge	0°F ± 2°F. (-17.7°C. ± 1.1°C)	NA	-5°F.(20.5°C) thru -2°F.(18.8°C) and +2°F.(-16.6°C) thru +5°F(-15°C)	NA

4.7.12 Insulation resistance. - Insulation-resistance test shall be performed, except as otherwise specified. (See 3.1) Batteries shall be stored for a period of 48 hours at 70° ± 5°F. (21.1° ± 2.8°C.) 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 terminals not electrically connected and between all ungrounded terminals and the container of the battery. The insulation resistance of batteries having a nonmetallic container shall be measured by the use of a 1 inch-square copper plate making physical contact with the container. The plate shall be placed with the broad surface against any area of any surface of the jacket other than that on which the battery terminals are located. (See 3.12)

4.7.13 Vibration. - Vibration test shall be performed, except as otherwise specified. Each battery shall be rigidly clamped to the platform of a vibration machine in a manner approximating as closely as practicable the manner in which the batteries are clamped when in use. (See 3.1) A simple harmonic motion shall be applied having an amplitude of 0.03 inch (0.06 - inch total maximum excursion). The frequency shall be varied at the rate of 1 cycle per second per minute between the limits of 10 and 55 cycles per second. The entire range of frequencies and return shall be traversed in 95 ± 5 minutes for each mounting position, (direction of vibration) of the battery. The batteries shall be vibrated in three equal periods in mutually perpendicular directions, one of which shall be perpendicular to the terminal face of the battery. Open-circuit voltage shall be observed for 30 seconds during the last quarter of each of the three vibration periods.

4.7.14 Mechanical shock. - Mechanical shock test shall be performed except as otherwise specified. Each battery shall be secured to the testing machine by means of a rigid mount which will support all mounting surfaces of the battery. 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. Each shock shall be supplied in a direction normal to a face of the battery. The faces of the battery are identified by their position in relation to the front face (the face which bears the label). For each shock, the battery shall be accelerated in such a manner that during the first 3 milliseconds the minimum average acceleration is 75 gravity units (G). The peak acceleration shall be between 125 to 175 G.

5. PREPARATION FOR DELIVERY

5.1 Preservation, packaging, packing and marking. - Preservation, packaging, packing and marking shall be in accordance with Military Specification MIL-B-55521. Preservation and packaging shall be level A or C with each unit packaging containing one battery, and packing shall be level A, B or C, as specified in contract or order. (See 6.1(d)).

6. NOTES

6.1 Ordering data. - Contractual documents should specify the following:

(a) Title, number, and date of this specification.

(b) Complete battery type designation and the title, number and date of the applicable specification sheet. (See 1.2.1 and 3.1)

(c) Date for notice of availability for shipment.

(d) Applicable levels of preservation, packaging and packing.

(e) Government inspection facility performing Group C inspection.

6.1.1 Indirect shipments. - The packaging, packing and marking specified in section 5 apply only to direct purchases by or direct shipment to the Government and are not intended to apply to contracts or orders between the supplier and prime contractor.

6.2 Awarding of contract. - Contracts will be awarded only to suppliers who guarantee to meet the requirements of this specification. No combining of performance requirements should be undertaken. Bids that offer to guarantee higher capacities will receive no special consideration in awarding a contract. Contracts will be awarded to the lowest bidder on a cost-per-unit battery basis provided that all performance requirements are guaranteed. Failure on a prior contract, of a manufacturer's particular battery type to meet any of the performance requirements of this specification, will be adequate cause for rejection of bids on that particular type until the supplier submits certified data providing that --

(a) Action has been taken to eliminate the cause of failures; and

(b) The battery meets all the performance requirements of this specification.

6.3 Verification inspection. - Verification by the Government will be limited to the amount deemed necessary to determine compliance with the contract and will be limited in severity to the definitive quality assurance provisions established in this specification and the contract. The amount of verification inspection by the Government will be adjusted to make maximum utilization of the contractor's quality control system and the quality history of the product.

Custodian:

Army-EL

Preparing Activity:

Army - EL

Project No. 6135-A123