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MILITARY SPECIFICATION

BATTERIES AND CELLS, STORAGE, NICKEL-CADMIUM, AIRCRAFT GENERAL SPECIFICATION FOR

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

1. SCOPE

1.1 Scope. This specification covers the general requirements for vented, rechargeable nickel-cadmium aircraft batteries and cells. (See 6.1.)

2. APPLICABLE DOCUMENTS

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

SPECIFICATIONS

FEDERAL

L-P-378	- Plastic, Sheet and Strip, Thin Gage Polyolefin
FF-N-836	- Nut, Square, Hexagon, Cap, Slotted, Castellated, Clinch, Knurled and Welding
FF-S-92	- Screw, Machine, Slotted, Cross Recessed or Hexagon Head
QQ-C-502	- Copper Rods and Shapes; and Flat Products with Finished Edges (Flat Wire, Strips and Bars)
QQ-N-290	- Nickel Plating (Electrodeposited)
PPP-B-566	- Box, Folding Paperboard

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Engineering Specifications and Standards Department (Code 93), Naval Air Engineering Center, Lakehurst, NJ 08733, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

SPECIFICATIONS

FEDERAL (Continued)

PPP-B-636	- Box, Shipping Fiberboard
PPP-B-676	- Boxes, Setup
PPP-F-320	- Fiberboard Corrugated and Solid, Sheet Stock (Container Grade), and Cut Shapes
PPP-T-76	- Tape, Packaging, Paper, (For Carton Sealing)

MILITARY

MIL-M-14	- Molding Plastics and Molded Plastic Parts, Thermosetting
MIL-P-116	- Preservation-Packaging, Methods of
MIL-P-6063	- Packaging of Batteries, Storage, Charged and Dry Uncharged and Moist, General Specification for
MIL-M-13231	- Marking of Electronic Items
MIL-C-16173	- Corrosion Preventive Compound, Solvent Cutback, Cold-Application
MIL-P-18148	- Plug, Electric, Aircraft Storage Battery
MIL-I-45208	- Inspection System Requirements
MIL-C-45662	- Calibration Systems Requirements
MIL-E-81099	- Electric Devices, Simple, General Specification for

STANDARDS

FEDERAL

FED-STD-595	- Colors

MILITARY

MIL-STD-105	- Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-129	- Marking for Shipment and Storage

STANDARDS (Continued)

FEDERAL

MIL-STD-143	- Standards and Specifications, Order of Precedence for the Selection of
MIL-STD-202	- Test Methods for Electronic and Electric Component Parts
MIL-STD-454	- Standard General Requirements for Electronic Equipment
MIL-STD-480	- Configuration Control - Engineering Changes, Deviations and Waivers
MIL-STD-481	- Configuration Control-Engineering Changes, Deviations and Waivers (Short Form)
MIL-STD-810	- Environmental Test Methods
MIL-STD-889	- Dissimilar Metals
MS3509	- Receptacle, Electric, Aircraft Storage Battery

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

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

AMERICAN SOCIETY FOR TESTING AND MATERIALS

D4066-82 - Nylon injection and extrusion materials.

(Copies of ASTM Publications may be obtained from the American Society for Testing and Materials, 1916 Race Street, Philadelphia PA 19103

3. REQUIREMENTS

3.1 Specification sheets. The individual item requirements shall be as specified herein and in accordance with the applicable specification sheets. In the event of any conflict between the requirements of this specification and the specification sheet, the latter shall govern (see 6.2).

3.2 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.

3.3 Qualification. Qualification under this specification is required. The batteries and cells furnished under this specification shall be products which have been tested and have passed the Qualification Tests specified herein and approved for listing on the applicable Qualified Product List (see 4.2.1 and 6.3) unless agreement is obtained in writing from the cognizant engineering activity that no qualified product is practical for the application. In the latter case, a product which has been tested and has qualified to a detail specification accepted in writing by the cognizant engineering activity may be utilized. In either case, each unit delivered shall fully meet all the requirements of the applicable detail specification and shall be capable of successfully completing the tests required by the detail specification for acceptance and for any one of the qualification samples.

3.4 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 I. 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 4.2.1).

3.4.1 Dissimilar metals. Unless suitably protected against electrolytic corrosion, dissimilar metals shall not be employed in intimate contact with each other. Dissimilar metals are defined in MIL-STD-889.

3.5 Design and construction. Each type of nickel-cadmium storage battery and cell covered by this specification is listed in the supplement and shall be designed and constructed in conformance to the requirements specified herein. Detailed requirements for the individual battery and cell types are as specified in the applicable specification sheets.

3.5.1 Batteries. Batteries shall be furnished in a wet discharged, but fully formed (see 6.4.6) state with a shorting strap across receptacle terminals.

* 3.5.2 Battery container and cover. The battery container and cover shall be of alkali-resistant high strength steel, free of rough spots, pits, blow holes and other deformations. The container and/or cover shall be completely coated by an epoxy resin to a minimum thickness of 0.015 ± 0.008 inch. The dimensions and locations of receptacles, hold-downs, latches and latch hooks, vent tubes, name and instruction plates shall conform to the applicable specification sheet (see 3.1). The cover shall be fitted with a hold-down pad having an integral elastomer gasket (see 3.1) positioned so as to match the rim of the container body for a gastight fit and effective fluid seal between the cover and the container body and shall conform to 3.6.8.

3.5.3 Latches. The cover shall be secured to the container body by latches mounted on the container body and latch hooks mounted on the cover. The latches shall conform to Corbir Cabinet Lock Division, American Hardware, Item Number 15834, or Nielson Latch Number C-833314-2-SS-302 or equal and the latches and hooks shall be mounted on the cover and container body as specified on the applicable specification sheet (see 3.1).

3.5.4 Venting. The container body shall be provided with tubular vents to permit gases liberated by the cells of the battery to be purged. These vents shall be located as shown on the applicable specification sheet (see 3.1).

3.5.5 Receptacles. Each battery shall include, as its electric connections, a receptacle as shown on the applicable specification sheet (see 3.1).

3.5.6 Connectors, intercell. The connectors shall conform to the applicable specification sheet (see 3.1.).

3.5.7 Cells. When cells are furnished separately from a battery, they shall be furnished in a wet discharged, but fully formed (see 6.4.6) state, with the terminals shorted, and complete with the proper amount of electrolyte to provide a level of 1/8 to 1/4 inch above the baffle 2 hours after charging by the method described in paragraph 4.5.1.4.2.

3.5.7.1 Cell Mountings. The cells shall be removable but securely mounted in the battery container such that they are not adversely affected by tests performed on the battery to determine its compliance with the requirements of this specification.

3.5.7.2 Cell container. The cell container shall be made of high strength, non-porous, alkali-resistant polyamide. The surfaces of containers shall have a smooth finish, free from pits, blow-holes, rough spots, or other deformations.

3.5.7.3 Cell Terminals. The size and spacing shall be as specified in the applicable specification sheet (see 3.1). Contact surfaces of the terminals shall not be obstructed by insulating compounds.

3.5.7.4 Cell Seals. The seals between cell terminals and cover, and cover to cell container shall be so constructed that the cells shall be capable of meeting the requirements of 3.5.7.5 and 3.6.13.

a. Cell cover to case seal cure methods.

1. Room temperature cure.

2. Hot water cure by inverting the cell and immersing only the seal area in a hot water bath.

3. Machine applied heat seal applied locally to the seal area.

3.5.7.5 Electrolyte leakage. There shall be no evidence of electrolyte leakage during the performance of any of the tests specified in Section 4. Venting of gasses containing entrained electrolyte is permitted during charge.

3.5.7.6 Vented filler cap. It shall meet the requirements of the applicable specification sheet (see 3.1).

* 3.5.7.7 Cell plate separators. Each cell plate separator shall include a layer of Permion P-2291, manufactured by RAI Research Corporation, Hauppauge, L.I. New York 11787, or, Celgard 3400, manufactured by Celanese Corporation, Charlotte, North Carolina 28232.

3.5.7.7.1 Resistivity. The electrical resistance of the materials, measured in a 31% solution of potassium hydroxide at ±25° 1°C after a maximum 24 hours immersion at room temperature shall not exceed:

Permion P-2291	Celgard 3400
16 milliohm - in^2	10 milliohm - in^2

3.5.7.7.2 Thickness. The thickness of the materials, when dry, shall be:

Permion P-2291	Celgard 3400
0.0012 ± 0.0003 in.	0.0010 ± 0.0001 in.

3.5.7.7.3 Cell electrolyte mix (for Permion P-2291 only). The cell electrolyte mix in each cell shall consist of the following stock solution:

a. 1 cc Emulphogene BC-610 (General Aniline and Film Corp., New York, NY).

b. 75 gm Oxidized Cellulose Powder (Eastman Chemical Products, Inc., Kingsport, TN).

c. 110 gm Lithium Hydroxide Monohydrate (LX 350 CB 884-Matheson, Coleman and Bell).

d. 1 liter Deionized Water.

e. 28.03 liters 36° to 40° Baume Potassium Hydroxide.

3.5.8 Operating position. The battery shall be capable of operating in an inverted position without loss of any electrolyte from the cells, when subjected to the test of 4.6.19.

3.5.9 Corrosion prevention. After the battery has been assembled, all exposed metal surfaces of the cells, intercell connectors and associated hardware shall be coated with a corrosion preventative compound which meets the requirements of MIL-C-16173, Grade 4. Care shall be taken not to expose rubber vent valve sleeves, vent openings or current carrying surfaces to the corrosion preventative film. Coating shall be applied evenly and without voids.

3.6 Examination and test requirements.

3.6.1 Corrosion resistance. External metal or component parts of each cell and battery shall show no evidence of cracking, pitting, chipping, scaling, corrosion or other deleterious effects after being tested as specified in 4.6.1.

3.6.2 Alkali absorption of plastic materials. When tested as specified in 4.6.2, plastic material shall show no cracks or blisters and shall not change more than 2.5 percent in weight or 2.0 percent in any dimension.

3.6.3 Alkali resistance of elastomer material. All elastomer materials used in the battery shall show no cracks, blisters, or other deterioration after being tested in accordance with 4.6.3. Material of pads, gaskets and O-rings shall be selected to provide adequate seal and minimize compression set.

3.6.4 Venting test. Vented filler caps conforming to the applicable specification sheet (see 3.1) shall vent at 6 + 4 psig when tested to 4.6.4.

3.6.5 Color and marking.

3.6.5.1 Color. The color of the container and cover except latches, hold-down hooks, other external hardware, pads and liners, and identification marking of each battery shall conform to FED-STD-595 within the range of color numbers 15090 to 15193 (blue).

3.6.5.2 Marking.

3.6.5.2.1 Cell terminal marking. Positive terminal markings shall be impressed or embossed with a (+). Negative terminal markings shall be impressed or embossed (-). The polarity marking shall be placed as close as possible to the terminal on the cover of the cell. The positive half of the cell cover shall be permanently dyed red. Minimum width of the red band shall be no less than 0.5 inch.

3.6.5.2.2 Cell identification. Each cell shall be provided with permanent identification resistant to 1.300 ± 0.025 specific gravity KOH electrolyte when tested in accordance with 4.6.2. Each cell shall have the manufacturer's name, military part number and date code (see 3.6.5.2.5) impressed or embossed on the top of the cell. Marking on one of the two largest vertical surfaces of the cell shall be in accordance with the requirements of MIL-M-13231 and shall show the following:

Information Required	Example
Battery, Storage, (Cell)	BATTERY, STORAGE, (CELL)
Military Cell Part No. (see 3.1)	M81757/1-6
National Stock Number	NSN 6140-01-***-***
Military "C" Rated Capacity	30AH/1HR/80°F/0.95V
Contract Number	***
Manufacturer Part Number	***

(*** = Fill in applicable information)

3.6.5.2.3 Battery identification. Each battery shall have its identification marking silk screened with an epoxy overlay, or equal, that is impervious to 1.300 ± 0.025 specific gravity KOH electrolyte, in accordance with applicable specification sheet (see 3.1.). Marking shall be in white print per MIL-M-13231. The marking shall show the following:

Information Required	Example
Battery, Storage	BATTERY, STORAGE
Military Battery Part No. (see 3.1)	M81757/9-2
Military Battery Type Designation	B-433 A/A
(If Required by Individual Specification)	
Replaces (Include Applicable Replacement Data from MIL- B- 81757/7, /8 or /9)	Replaces MS18045-46, -50 MS24498-1, -2, M81757/9-1
Military Cell Part Number Required	Cell Required (M81757/1-6)
National Stock Number	NSN 6140-01-***-****
Voltage (nominal)	24 Volts
Maximum Weight	Max. Wt. 81 lbs.
Military "C" Rated Capacity	30 AH/1HR/80°F/18V)

Contract Number	***
Date Code (see 3.6.5.2.5)	Date Code ***
Manufacturer's Name	***
Manufacturer's Part Number	***

(***) Fill in applicable information

3.6.5.2.4 Battery caution marking. This marking, in accordance with applicable specification sheet (see 3.1), shall be in white printing in accordance with MIL-M-13231. It shall be impervious to 1.300 ± 0.025 specific gravity KOH electrolyte. It shall be located as shown on the applicable specification sheet (see 3.1) and read as follows:

"CAUTION"	0.375 ± 0.030 inch lettering height
This battery shall be serviced only in an authorized nickel-cadmium battery shop. All cells within this battery must have the same manufacturer's part number.	0.200 ± 0.030 inch lettering height
RECEPTACLE	0.500 ± 0.030 inch lettering height

3.6.5.2.5 Date code. The date code shown shall indicate the month and year of manufacture of the battery and cells by means of a four digit number in which the first two digits indicate the month of the year and the last two digits indicate the year. Months earlier than the tenth shall be indicated by a single digit preceded by "0". When the manufacture of a battery and cell is completed during the last three working days of the month, or the first three working days of the subsequent month, the manufacturer is permitted to use either month as the coded month of manufacture.

3.6.5.2.6 Battery polarity marking. The polarity shall be conspicuously and durably marked on the battery container and adjacent to the terminals as shown on the applicable specification sheets (see 3.1).

3.6.6 Insulation resistance. All current carrying parts shall be insulated from the battery container. The insulation resistance between any current carrying part and the battery container shall be above one megohm during one minute of test in accordance with 4.6.6.

3.6.7 Dimensions and weights. The dimensions and weights of batteries and cells shall be as shown on the applicable specification sheet (see 3.1).

3.6.8 Container body to container cover seal. The design of the battery container body and container cover shall be such that, when these are latched correctly, the loss in pressure (when the seal is tested per 4.6.8) shall be less than 2.75 inches of water.

3.6.9 Potassium carbonate (K_2CO_3). Cells from the battery shall be tested for carbonate content in the electrolyte. The electrolyte shall not contain K_2CO_3 concentration greater than 60 grams/liter when tested in accordance with 4.6.10.

3.6.10 Altitude. For the discharges of 4.6.15(c), the minimum discharge time to the specified cutoff voltage shall be four (4) minutes.

3.6.11 Temperature rise and float. When tested per 4.6.20, the charging current shall be recorded every 30 minutes maximum. The charging currents shall not exhibit increasing values of more than a total of 2 amperes for a 10 ampere-hour battery, 4 amperes for a 20 ampere-hour battery, and 7 amperes for a 30 ampere-hour battery at any time during the charge. At no time during this test shall the temperature of the battery center cell exceed 71°C (160°F). The battery shall meet Requirement 1 of Table II.

3.6.12 Cycling test. Batteries when cycled per 4.6.21 at ambient conditions of 4.5.1.1 shall meet the minimum requirements as follows:

a. The 5-second voltage for each 20-second discharge shall be 14.0 volts or above (during any duty cycle discharge).

b. The 20-second voltage shall be 12.0 volts or above (during any duty cycle discharge.)

c. The capacity on the 46th, 47th and 48th cycle shall equal or exceed that specified in Table II.

d. The battery shall successfully complete 48 cycles.

e. At no time during the Duty Cycling test shall the temperature of the battery center cell exceed 60°C (140°F).

3.6.13 Internal pressure test. A cell, when tested per 4.6.22, shall be capable of withstanding an internal pressure of 20 ± 1 psig for 15 seconds.

3.6.14 Receptacle mounting test. The receptacle mounting shall withstand a pull-out force of 250 ± 25 pounds and a torsional force of 6 ± 0.5 foot-pounds.

3.6.15 Electrical performance. The discharge current in amperes for each discharge time shall be equal to the nominal rated capacity (C-rating) in ampere-hours multiplied by the factor listed in Table II. The minimum end voltage for each discharge time shall be the value listed in Table II. The temperatures for each discharge time shall be value listed in Table II unless otherwise specified in the description of the test. Upon failure of the battery to meet the specified minimum requirements of any electrical test, unless otherwise specified in the description of the test, it shall be subjected to reconditioning as described in 4.5.1.5, after which the test will be repeated. Inability to meet the specified minimum requirements during the repeated test constitutes a failure. Should the battery meet the test requirements, the specified test schedule shall be resumed. For discharges conducted at various C-ratings the current shall be maintained within a tolerance of ± 3 percent of the specified value.

3.6.16 Environmental requirements. The battery, when subjected to tests listed in Table III, shall show no:

a. Dimensional distortion beyond specified limits or cracking of cases or covers of either cells or batteries

b. Radical current or voltage fluctuations during any test

c. Mechanical failure of any part

d. Electrolyte leakage or spilling of electrolyte at any time during the test. Venting of gasses containing entrained electrolyte is permitted during charge

e. Breakdown of insulation, stripping of metal plating from any component part, corrosion of metal parts, or loosening of protective coating from the battery container or cover

f. Deterioration of battery/cell identification markings

* 3.6.17 Workmanship. The batteries shall be manufactured and assembled in accordance with MIL-STD-454 Requirement 9.

4. QUALITY ASSURANCE PROVISIONS

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

4.1.1 Inspection system. The supplier shall have and maintain an inspection system in accordance with MIL-I-45208.

4.2 Classification of inspection.

a. Qualification Inspection. A qualification inspection shall consist of tests accomplished on batteries, battery components and materials submitted for qualification (see 4.2.1)

b. Quality conformance inspection. The quality conformance inspection shall consist of tests conducted on production samples to determine compliance with specification requirements and for qualification re-evaluation (see 4.3.1 and 4.4).

4.2.1 Qualification inspection. Qualification inspection shall be performed by the Government on samples of components, materials and batteries furnished by the supplier. The samples shall be representative of the components, materials and batteries proposed to be furnished the Government under contract and shall not be produced with the use of any equipment or procedure that will not normally be used in production. Qualification inspection on these samples shall be conducted at a Government test facility and shall consist of the examinations and tests specified herein and the evaluation of inspection results in relation to applicable requirements. The batteries will be considered qualified and will be placed on the Qualified Products List upon successful completion of the qualification inspection tests of Table V in essentially the order shown. The batteries shall be retained on the Qualified Products List as long as the Group C samples continue to demonstrate conformance to the requirements of the specification. The cost of the qualification inspection shall be borne by the Government for the period of time required to establish a minimum of two qualified suppliers on the applicable Qualified Products List and except as noted in 4.2.1.4.

4.2.1.1 Inspection of battery components and materials. Three (3) samples each of applicable battery components and materials, treated and processed as they would be for fabrication of finished batteries, shall be furnished for inspection in accordance with Table IV. All samples shall be marked properly with identifying information.

4.2.1.2 Inspection of batteries. Four (4) samples each of complete batteries shall be furnished for inspection in accordance with Table V and in the order shown.

4.2.1.3 Retention of samples. If the manufacturer becomes qualified, the sample batteries on which the qualification is based will be retained at the Government agency which did the testing as long as he is qualified.

4.2.1.4 Failure and retest. Failure of a qualification sample to pass any of the examinations or tests specified herein shall be cause for the Government to refuse to conduct additional testing until the defects revealed by the inspection have been corrected. With the approval of the Government, a retest may be allowed with an increase in the number of qualification samples as specified by the qualifying activity. The cost of retesting shall be borne by the supplier.

4.3 Quality conformance testing

4.3.1 Inspection of product for delivery. The supplier shall perform the inspections specified for Groups A and B. This does not relieve the supplier 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 inspector shall select all samples for Group C testing and shall review and evaluate the supplier's inspection procedures, and examine his inspection records. Batteries and cells produced under this specification will be accepted upon successful completion of Group A and B inspection as oulined in Tables VI and VII respectively and provided that Group C samples have been shipped to the qualifying activity in accordance with 4.4. Additionally, changes to equipment must have been processed in accordance with MIL-STD-480 or MIL-STD-481 as applicable.

4.3.1.1 Inspection lot definition. An inspection lot shall be defined as the quantity of batteries or cells of any one type, produced at any one place of manufacture on any one contract, submitted at one time to quality conformance inspection. Batteries or cells with no more than two consecutive date codes shall appear in a particular inspection lot. A specific date code shall not be found in any more than one inspection lot. For a cell inspection lot the total number of cells shall be divided by (19) to determine the lot size for Group B inspections. Each group of 19 cells shall be considered as a battery for inspection purposes.

4.3.1.2 Group A inspection. Each unit of each inspection lot of batteries shall be subjected to the examination and test requirements of Table VI.

4.3.1.3 Group B Inspection. This inspection, including sampling, shall conform to Table VII and procedures of MIL-STD-105 with tests of each subgroup conducted in the order shown on the same samples. Group B inspection shall be performed on inspection lots that have passed Group A inspection and on samples selected from batteries or cells that have been subjected to and met Group A inspection. Samples for subgroup II are to be selected from units that have passed subgroup I inspection, and the remainder of subgroup I batteries may be furnished under contract. Samples for subgroup III are to be selected from units that have passed subgroup II inspection and the remainder of subgroup II batteries may be furnished under contract if not used for Group C inspection. Samples from subgroup III shall not be furnished under the contract. No shipment shall be made until Group B inspection is completed and approved by the Government inspector.

* 4.4 Group C inspection. The Group C inspection shall be conducted for qualification re-evaluation by the qualifying activity in accordance with Tables VIII and IX in the order shown. Sample batteries in quantities conforming to Table VIII shall be shipped by the supplier to the qualifying activity within three (3) working days after acceptance of the applicable inspection lots by the Government inspector. Samples shall be randomly selected by the Government inspector, from the entire inspection lot, upon the successful completion of the Group B (acceptance) inspection, excluding the Group B subgroup III units. Additionally, the samples shall be in quantities specified in Table VIII and shall not be included in the contract lot size. Shipment of inspection lots that have passed Group A and B (acceptance) inspection requirements shall be held up pending results of the first 7 days of Group C inspection performed on samples representing these lots. Once qualified, production samples successfully passing the acceptance criterion are to be accepted until qualification is officially rescinded. Unless otherwise specified in the contract the cost of Government testing shall be borne by the Government for Defense Supply Agency procurements and by the supplier for single service procurements (see Section 6).

4.4.1 Non-compliance. Failure of any sample to pass any Group C test may be cause for the qualifying activity to initiate action to remove the supplier from the applicable Qualified Products List. The qualifying activity shall notify the procuring agency and the supplier of each Group C failure, including details of the failure and characteristics affected. Upon

notification by the qualifying activity the supplier shall immediately investigate the cause of failure and further report the results of the investigation and details of the proposed corrective action on (1) the process, materials, and components as applicable and (2) all units of product which were manufactured under the same conditions and which the qualifying activity considers subject to the same failure. Supplier reports shall be forwarded to the qualifying activity with an information copy to the procuring agency.

4.4.2 Contract lot definition. A contract lot is the total number of batteries of any one type, delivered under the terms of any one contract. For a cell contract lot the total number of cells shall be divided by 19 to determine the contract lot size for Group C inspection purposes. Each group of 19 cells shall be considered as a battery for inspection purposes.

4.4.3 Inspection of preparation for delivery. Preparation for delivery shall be examined for conformance to Section 5. The sample unit shall be one item, one package, or one shipping container. The inspection level shall be S-2, and the Acceptable Quality Level (AQL) shall be 4.0 percent as set forth in Military Standard, MIL-STD-105.

4.5 Inspection conditions and equipment.

4.5.1 Standard test conditions. All tests of this specification shall be performed in the following conditions unless otherwise specified in the description of the test.

4.5.1.1 Ambient air temperature. Unless otherwise specified, all measurements and tests shall be made in an ambient temperature 23° ± 5°C (73° ± 9°F) at ambient atmospheric pressure and relative humidity.

4.5.1.2 Low temperature. Unless otherwise specified, all low temperature discharge tests shall be conducted at the temperature indicated in the applicable test paragraph with a storage time of 16-72 hours prior to discharge. A tolerance of ± 1.1°C (2°F) shall be allowed.

4.5.1.3 Paragraph deleted.

4.5.1.4 Charging.

4.5.1.4.1 Constant potential method. Unless otherwise specified, batteries shall be charged at 1.50 ± 0.01 volts per cell for one (1) hour and 55 minutes with a power source having a current capacity of not less than 10 times the capacity rating of the battery being tested.

4.5.1.4.2 Constant current method. Unless otherwise specified, batteries shall be charged constant current at the C rate (± 3 percent) to 1.55 ± 0.01 volts per cell then C/5 (± 3 percent) for 3 ± 0.1 hours (see 6.4.1). The electrolyte level of each cell shall be adjusted with deionized or distilled water to 0.25 inch above the baffle 2-4 hours after charge termination unless otherwise specified.

4.5.1.5 Reconditioning. Reconditioning during testing to this specification shall consist of subjecting a fully charged battery, with electrolyte level adjusted, to a C-rate discharge and applying a one-ohm resistor across each cell's terminals when its potential is 0.5 volt. Following a minimum 24-hour stand the resistance shall be removed and the battery shall be charged per 4.5.1.4.2. The electrolyte of each cell shall be adjusted with deionized or distilled water to 0.25 inch above the baffle 2-4 hours after charge termination unless otherwise specified.

4.5.2 Test equipment and inspection facilities. Test equipment and inspection facilities shall be of sufficient accuracy, quality, and quantity to permit performance of the required inspection. Test equipment for Government verification inspection shall be made available by the supplier. The contractor shall establish and maintain a system for the calibration of all measuring and test equipment in accordance with MIL-C-45662.

4.5.3 Instrument accuracy.

4.5.3.1 Electrical indicating instruments. All voltmeters and ammeters shall be accurate within ± 0.5 percent of the full scale reading. The range shall be such that the readings are taken on the upper half of the scale. Timers shall be accurate within ± 0.5 percent. The sensitivity of voltmeters shall be at least 1000 ohms per volt.

4.5.3.2 Resistance tolerances. In all tests involving discharge through a resistance, the total circuit resistance shall be accurate within ± 0.5 percent.

4.6 Examination and test methods.

4.6.1 Corrosion resistance. Samples of all metal parts of the cells and/or battery shall comply with 3.6.1 after being subjected to this test. Additionally, a four- by six-inch panel shall be furnished for this test, coated as it would be supplied on the battery and containing sample identification markings. Soak one-half of each specimen along its horizontal length with a solution of 1.300 ± 0.025 specific gravity KOH electrolyte and allow to stand for 7 days at 65.5° ± 1.1°C (150° ± 2°F). Specimens shall then be rinsed, dried, and observed for the requirements of 3.6.1.

4.6.2 Alkali absorption of plastic material. Three specimens each two by three inches, shall be cut from each different plastic material submitted by the contractor. The cut edges may be sealed with the same resin used in fabrication of the case. Plastic materials normally containing identification markings shall be supplied with sample markings for this test. After being measured with a micrometer and weighed in a dry condition (dried in a temperature chamber for 2 0.5 hours at 32.2° ± 1.1°C (90° ± 2°F) on a chemical balance, each specimen shall be immersed in a covered vessel containing 150 cc of 1.300 ± 0.025 specific gravity KOH electrolyte. This vessel shall be held for 7 days in a temperature chamber at 65.5° ± 1.1°C (150° ± 2°F). At the end of the heating period, the specimens shall be rinsed in water and dried on the surface. The identification marking sample shall be observed for the requirements of 3.6.5.2.2. All samples shall then be inspected for evidence of cracks or blisters and shall be measured and weighed, and the percentage change in dimensions and weight shall be calculated to determine conformance to the requirements specified in 3.6.2.

4.6.3 Alkali resistance of elastomer material. Three samples each of pads, gaskets, O-rings, etc., made of elastomer material used in the battery or cell shall be immersed for 7 days in 1.300 ± 0.025 specific gravity KOH electrolyte in a temperature chamber at 65.5° ± 1.1°C (150° ± 2°F). They shall then be rinsed with water and allowed to dry. They shall meet the requirements of 3.6.3.

4.6.4 Venting tests.

4.6.4.1 Ambient air temperature test (see 4.5.1.1). The vented filler cap shall be attached to an adapter to which a variable pressure source of compressed air is connected. The air pressure shall then be adjusted from the lower limit to the higher limit and returned to the lower limit specified. The vented filler caps shall meet the requirements of 3.6.4.

4.6.4.2 Low temperature test (see 4.5.1.2). The above test shall be repeated at -30°C (-22°F) except that the vented filler cap shall be conditioned at -30°C (-22°F) in air for 48 ± 1 hours. The vented filler caps shall meet the requirements of 3.6.4.

4.6.5 Visual and mechanical. Samples of batteries and/or cells, as applicable, shall be examined to verify that the basic materials, component materials and parts, design and construction, marking and workmanship are in accordance with all the requirements of 3.5, 3.6.5 and 3.6.17, and Table X, and that all screws, nuts, or bolts are tightened to the torque specified by the contractor.

4.6.6 Insulation resistance. The insulation resistance of a discharged battery shall be measured between either battery terminal and the exposed metal of the latch in accordance with MIL-STD-202, Method 302, Test Condition B, for one minute, and meet the requirements of 3.6.6.

4.6.7 Dimensions and weight. Samples of batteries or cells as applicable shall be examined to verify compliance with the requirements of 3.6.7 for dimensions and weight.

4.6.8 Container body to container cover seal test. The battery, with the cover secured (latches applied normally), shall have a manometer attached to one of the battery vents and air pressure, equivalent to 55 inches of water, applied through the other battery vent and sealed at that level for two minutes. The manometer shall be read at the instant of attaining and sealing in the required pressure and again at two minutes after the sealing. The battery shall meet the requirements of 3.6.8.

4.6.9 Capacity discharge. After being charged in accordance with 4.5.1.4.2, the battery shall be stabilized (per 4.5.1.1). It shall then be discharged and meet Requirement No. 1, Table II. Discharge shall be continued until end voltage is reached.

4.6.10 Potassium carbonate. Conduct the capacity discharge test of 4.6.9 the required number of additional times to provide a total of three discharges. Following the third discharge, the battery shall stand on open circuit for one hour, after which the battery shall be charged in accordance with 4.5.1.4.2. Following a one-hour stand, electrolyte from five cells shall be tested by the following method or equal:

a. Accurately measure 0.5 ml of electrolyte from a cell using a measuring pipette. The electrolyte level in the pipette is measured to the bottom of the meniscus against the top mark of the pipette. The measured electrolyte sample (V_1) is then emptied into a 250 ml Erlenmeyer flask.

b. To the electrolyte sample in the flask add approximately 25ml of distilled water which should cover the bottom of the flask. Add 2 drops of phenolphthalein indicator to the sample turning it pink.

c. Titrate the sample with 0.1 normal hydrochloric acid (HCl) to an end point. The end point is reached when the pink just turns colorless. Record the volume of HCl required to reach the end point (V_2).

d. To the colorless sample add one drop of methyl purple indicator. The sample should turn green if it contains potassium carbonate (K_2CO_3), or violet if no potassium carbonate is present. If the sample turns green, titrate the solution to an end point. The end point is reached when the solution turns violet. (Just before the violet end point occurs the green sample will turn to a grey-blue color. The addition of one or two drops of HCl will turn it to violet.) Record the additional volume of HCl necessary to reach the violet end point (V_3).

e. The strength (normality) of an alkali can be determined by titrating a known volume of known strength of acid against a known volume of alkali:

I. $V_{alkali} \times N_{alkali} = V_{acid} \times N_{acid}$

II. $\dfrac{(V_2-V_3) \times N_1 \times 56.1}{V_1} = \dfrac{\text{grams}}{\text{liter}}$ Free KOH — To find the percent of KOH in sample use Chemical Handbook

III. $\dfrac{2 \times V_3 \times N_1 \times 69.1}{V_1} = \dfrac{\text{grams}}{\text{liter}}$ K_2CO_3 in sample

Where

V_1 = measured volume of electrolyte sample

V_2 = volume of HCl required to reach KOH colorless end point

V_3 = additional volume of HCl required to reach K_2CO_3 violet end point

N_1 = normality (strength) of HCl

TYPICAL SCHEMATIC

molecular weight of potassium hydroxide (KOH) = 56.1
One-half molecular weight of potassium carbonate (K_2CO_3) = 69.1

f. the electrolyte shall meet the requirements of 3.6.9.

NOTE

A titralyzer (automatic titrator) may be used in lieu of the manual titration procedure provided the titralyzer is at least equal to the manual procedure in accuracy

4.6.11 Humidity and charge retention test. With the cover secured on the battery and charged per 4.5.1.4.2, it shall be subjected to the humidity test of Procedure II, Method 507.1 of MIL-STD-810. The axis of the inlet and air outlet vents shall be parallel with the environmental chamber air flow. After completion of the test period, accumulated water may be removed from the battery and the battery shall deliver 75 percent of Requirement No.1 of Table II, and shall meet the requirements of 3.6.16.

4.6.12 Mechanical shock. Batteries, charged per 4.5.1.4.2, shall be subjected to the shock test of Procedure I, Method 516.2 of MIL-STD-810. All shock tests on batteries shall be made with the cover secured. The batteries shall be shocked in a normal upright position and in two additional mutually perpendicular directions from the vertical. However, they shall not be mounted or shocked in the upside down position. Upon completion of the shock phases of this test, the batteries shall be examined for the requirements of 3.6.16. After examination, the batteries shall meet discharge Requirement No.1 of Table II.

4.6.13 Vibration. The battery, charged per 4.5.1.4.2 with cover in place, shall be subjected to the vibration test of Procedure I, curve D, Method 514.2 of MIL-STD-810. Vibration tests at high and low temperatures shall not be required. The battery shall be mounted only in the normal upright position (see 6.4.5) with the cover secured in place. During the vibration test, monitor the open circuit voltage. Upon completion of the vibration phase of this test, the battery shall meet discharge Requirement No.1 of Table II. The current and voltage values shall be observed during the discharge. The battery shall be examined for the requirements of 3.6.16.

4.6.14 Temperature shock. The battery, charged per 4.5.1.4.2, shall then be subjected to the thermal shock test of Procedure I, Method 503.1 of MIL-STD-810, except that exposure periods shall be 4(-0, +0.5) hours. Upon completion, the battery shall be stabilized per 4.5.1.1 and shall meet discharge Requirement No.1 of Table II. The battery shall be examined for the requirements of 3.6.16.

4.6.15 Altitude. This test shall consist of the following steps:

a. Fully charge the battery per 4.5.1.4.2.

b. Immediately, place the battery with cover in place (on open circuit) into an environmental chamber and within 15 minutes lower the chamber pressure to simulate the ambient conditions at 60,000 feet.

c. Discharge battery at 9C rate to an end voltage of 0.758 v/cell to determine compliance with a minimum discharge requirement of 4 minutes.

d. Charge battery at 1.50 ± 0.01 volts per cell under conditions established in step b for two hours.

e. Open circuit the battery and, within 5 minutes, return the chamber to ground ambient air pressure (see 4.5.1.1)

f. Repeat steps b, c and e

g. Inspect the battery for physical defects per 3.6.16. The battery shall meet the requirements of 3.6.10.

4.6.16 Salt fog. With the cover secured on the battery, it shall be subjected to the salt fog test of Procedure I, Method 509.1 of MIL-STD-810. After completion of the test period, the battery shall meet requirements of 3.6.16.

4.6.17 High rate, low temperature discharge.

a. The battery shall be charged as specified in 4.5.1.4.2 and stored under the specified temperature and storage conditions. (See 4.5.1.2).

b. The battery shall be discharged at the 9C rate per Requirement 3 of Table II.

c. The following shall be recorded:

(1) The terminal voltage, 5 seconds after the start of discharge

(2) The elapsed time for the voltage to drop to the end voltage after the start of discharge

d. Battery shall meet discharge Requirement No.3 of Table II or the applicable specification sheet (see 3.1).

4.6.18 Twenty-second pulse discharge.

a. Charge battery as specified in 4.5.1.4.2 at the ambient temperature specified in 4.5.1.1

b. Stabilize battery per 4.5.1.2 and discharge at the rate specified by Requirement No.4, Table II for 20 seconds at -17.8°C (0°F).

c. Rest on open circuit for 120 seconds.

d. Repeat b and c immediately.

e. Repeat b immediately.

f. Total cycle time 300 seconds.

g. The following shall be recorded:

(1) The terminal voltage 5 seconds after start of each discharge.

(2) The terminal voltage at the end of each 20-second discharge

h. The battery shall meet discharge Requirement No. 4 of Table II for -17.8°C (0°F).

4.6.19 High rate discharge, operating position.

a. The battery shall be charged as specified in 4.5.1.4.2 and stored under the specified temperature and storage conditions.

b. The battery shall be discharged at the 9C rate as specified in Requirement No. 2 of Table II. During the first two and one-half minutes ofdischarge, the battery shall be in the inverted position.

c. The following shall be recorded:

(1) The terminal voltage, 5 seconds after the start of discharge

(2) The elapsed time for the voltage to drop to the end voltage after the start of discharge

d. The battery shall meet the requirements of 3.5.8 and shall meet discharge Requirement No.2 of Table II.

4.6.20 Temperature rise and float test. The battery, with cover removed and charged per 4.5.1.4.2, shall be placed in a temperature chamber at 49° ± 3°C (120.2° ± 5.4°F) until the temperature of the electrolyte in the center cell reaches the ambient temperature of the chamber. At this temperature the battery shall be immediately discharged at the 9C rate for 5 minutes. Immediately following this discharge, with the battery still in the chamber at 49°C (120.2°F), a constant potential charge of 1.50+.01, -0 volts per cell shall be conducted for 24 ± 0.1 hours.

The battery will then be stabilized and discharged per 4.5.1.1 at the 1C rate to the specified end voltage. Voltage, time and center cell temperature shall be recorded throughout the test. The battery shall be examined for compliance with 3.6.16 and shall meet the requirements of 3.6.11 and Requirement No.1 of Table II. No water additions shall be made after placement of the battery in the chamber.

4.6.21 Cycling test. The battery shall be tested and the center cell shall be monitored for temperature throughout the test.

a. Preconditioning. The battery shall be charged per 4.5.1.4.2 and discharged per 4.6.9 and meet Requirement No. 1 of Table II.

b. Duty cycles.

(1) Charge per 4.5.1.4.2

(2) Rest on open circuit for 2 hours

(3) Discharge through a fixed resistance of $R = \frac{0.600}{C}$ where:

R = ohms

C = rated capacity in ampere hours as follows:

Discharge for 20 seconds.
Rest on open circuit for 260 seconds.
Discharge for 20 seconds.
Total time 300 seconds.

Voltage readings shall be taken at 5 seconds and at 20 seconds after start of each discharge.

(4) Within 3 ± 1 seconds after end of second discharge, charge per 4.5.1.4.1. Repeat (2) above, repeat (3) above.

(5) Repeat (4) continuously for 45 cycles total.

c. Cycle 46. Charge per 4.5.1.4.1. Discharge per Requirement No. 1 of Table II to specified end voltage.

d. Cycle 47. Charge per 4.5.1.4.2. Adjust electrolyte levels with distilled or deionized water and record amount added. Discharge per Requirement No. 1 of Table II to specified end voltage.

e. Cycle 48 Charge per 4.5.1.4.2. Discharge per Requirement No. 4 of Table II.

f. Reconditioning will not be permitted during the duty cycles.

g. The test shall be terminated upon failure of the battery to meet any one of the specified requirements of 3.6.12.

4.6.22 Internal pressure test. Adequately restrained cells shall have dry nitrogen or air at an internal pressure of 20 ± 1 psig at ambient temperature (see 4.5.1.1) applied to them through an airtight adapter to their venting aperture. The source of pressure shall be shut off and the pressure maintained in the cells for a minimum of 15 seconds. The cells shall meet the requirements of 3.6.13.

4.6.23 Receptacle mounting test. A special grooved steel shaft similar to the clamping shaft of the battery quick disconnect plug conforming to MIL-C-18148, shall be so inserted in the receptacle socket that the socket pins are secured in the steel shaft. A tensional force of 250 ± 25 pounds shall be exerted against the socket pins. Following this test, the steel shaft shall be subjected to torsional force of 6 ± 0.5 foot-pounds. The receptacle mounting shall meet the requirements of 3.6.14.

5. PACKAGING

5.1 Preservation-packaging. Preservation-packaging shall be level A (see 6.2).

5.1.1 Army procurements. For Army procurements only, the requirements for packaging shall be in accordance with SPI 1G00071.

5.1.2 Cleaning. Each battery or cell shall be cleaned in accordance with process C-1 of MIL-P-116.

5.1.3 Drying. Each battery or cell shall be dried in accordance with applicable procedure of MIL-P-116.

5.1.4 Preservation application. No preservative required.

5.2 Level A packaging. Each battery shall be individually packaged in accordance with MIL-P-6063 and as follows:

5.2.1 Materials. Materials used shall be as specified herein. Pads and inserts used for protective and support purposes shall be constructed of weather-resistant fiberboard conforming to PPP-F-320, triple-wall (TW) variety. The bursting strength of sheets combined to thickness of one inch shall be from 1800 to 2000 pounds per square inch. Other weather-resistant materials may be used if the same protection is afforded the battery without increase in weight, cubage or cost. Tape for sealing shall conform to PPP-T-76.

5.2.2 Vents. All vent caps and covers shall be tightened and container vent holes closed by plastic dust caps. Vent caps employing a rubber diaphragm valve or other rubber part, except seal gasket, shall be protected in such a manner that undue strain shall not be imposed on the rubber portion.

5.2.3 Packaging cells. Cells shall be packaged Level A as follows: Place each cell in a snug-fitting box conforming to PPP-B-566, variety 1, PPP-B-676. The boxed cell shall then be placed in a bag fabricated of material conforming to L-P-378, Type I, Grade B, Finish 1, having a uniform thickness of 2.0 ± 0.5 mils. The bag closure shall be by heat seal.

5.2.4 Intermediate packaging. A quantity of 19 cells, bearing the same manufacturers part number and packaged as specified in 5.2.3, shall be placed in a snug-fitting container conforming to PPP-B-636, class weather resistant. Intermediate containers shall be uniform in size and style.

5.3 Packing. Batteries shall be packed as specified in the contract or order.

6. NOTES

6.1 Intended use. Battery, storage, vented, nickel-cadmium, is used in aircraft.

6.2 Ordering data. Procurement documents should specify the following:

a. Title, number, and date of this specification and any amendment thereto

b. Title, number, and date of the applicable specification sheet (see 3.1)

c. Battery or cell required

d. Level of packing required for shipment (see section 5)

e. When rough handling test is required

f. Marking and shipping samples

g. Place of final inspection

6.3 Provisions for qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time set for opening bids, qualified for inclusion in the applicable Qualified Products List whether or not such products have actually been so listed by that date. In the absence of a Qualified Products Lists, these same qualification tests shall be conducted as First Article or Preproduction tests with the prior approval of the qualifying activity. The attention of the supplier is called to this requirement and manufacturers are urged to arrange to have the products that they propose to offer the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. The activity responsible for the Qualified Products List is the Naval Air Systems Command; however, information pertaining to qualification of products may be obtained from Weapons Quality Engineering Center, Electrochemical Power Sources Division, Attn: 3052, Naval Weapons Support Center, Crane, Indiana 47522.

6.4 Definitions.

6.4.1 Fully charged batteries. Batteries shall be considered fully charged when charged in accordance with 4.5.1.4.2.

6.4.2 Fully discharged battery. A fully discharged battery shall be zero volts per cell.

6.4.3 End voltage. The end voltage of the battery is the specified end voltage terminating a specified discharge rate.

6.4.4 Cycle. A cycle is a combination of a charge and discharge.

6.4.5 Normal upright position. Perpendicular to the plane of the horizon.

6.4.6 Fully formed. Batteries and cells shall be considered fully formed if they have been charged to the point where all available cadmium oxide has been converted to cadmium metal and both hydrogen and oxygen gases were evolved at close to stoichiometric ratios.

6.5 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 may be adjusted to make maximum utilization of the contractor's quality control system and the quality history of the product (see 4.2).

6.6 International standardization. Certain provisions of this specification are the subject of international standardization agreement (ASCC AIR STANDARD 12/15 and STANAG 3514). When amendment, revision or cancellation of this specification is proposed which will effect or violate the international agreement concerned, the preparing activity will take appropriate reconciliation action through international standardization channels, including departmental standardization offices, if required.

6.7 Group C costs. Unless otherwise specified in the contract, the cost of Government testing shall be borne by the Government for Defense Supply Agency procurements and by the supplier for single service procurements. An estimate of the cost for Government testing for single service procurements, for use by a supplier at time of preparation of bids, may be obtained from the Naval Weapons Support Center, Code 3052, Crane, Indiana 47522.

6.8 Changes from previous issue. The margins of this specification are marked with asterisks to indicate where changes (additions, modifications, corrections, deletions) from the previous issue were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the last previous issue.

Custodians:
Navy - AS
Air Force - 11
Army - ER

Review Activities:
Air Force - 99
Army - AV

User Activity:
Coast Guard - CG

Preparing Activity:
Navy-AS
(Project No. 6140-0583)

TABLE I. Material/component specification requirements.

Material or components	Applicable specifications or requirements	Methods of test (see 4.6)
Metals	3.6.1	4.6.1
Nickel plating	QQ-N-290	Where applicable
Machine screws, studs and nuts	FF-N-836 or FF-S-92	Where applicable
Connectors, Intercell	QQ-C-502	Where applicable
Receptacle	MS3509 and MIL-E-81099	4.6.23
Molded plastic parts	3.6.2, MIL-M-14, Type MFE	4.6.2
Elastomers	3.6.3	4.6.3
Polyamide material	3.6.2, ASTM D 4066-82 Class PA 111, PA 611 and PA 312LG2B00000	4.6.2

TABLE II.

Performance requirements.

Requirement number	Minimum discharge time	Multiplying factor to obtain discharge current from the C-rating	Minimum voltage at end of discharge for 19-cell Batteries Volts/Cell (Volts)		Discharge temperature
(1)	1 hr.	1.0	18.0 1/	0.947 2/	(See 4.5.1.1)
(2)	5 min.	9.0	14.4 1/ 3/	0.758	(See 4.5.1.1)
(3)	3 min.	9.0	13.0 1/ 3/	0.684	-30°C (-22°F)
(4)	60 sec. 2/ (3 pulses of 20 sec. each within 5 minutes)	25.0/5.0 2/	18.0 3/	0.947	-17.8°C (0°F)

1/ Discharge to specified minimum end voltage
2/ Discharge for specified minimum discharge time
3/ 17.0 volts minimum at 5 seconds

4/ 13.0 volts minimum during discharge
5/ 12.0 volts minimum at 5 seconds after the beginning of each pulse
6/ The discharge rate for each 20-second pulse shall be 25C initially and shall decrease linearly to 5C over the 20-second time period.
7/ Minimum voltage for each cell at 1 hour of the IC rate discharge (initial capacity test only).

TABLE III.

Battery testing.

Examinations and tests	Test paragraph
Humidity and charge retention test	4.6.11
Mechanical shock	4.6.12
Vibration	4.6.13
Temperature shock	4.6.14
Altitude	4.6.15
Salt fog 1/	4.6.16
Temperature rise and float test	4.6.20

1/ Not applicable to cell procurements

TABLE IV.

Qualification inspection of components and materials.

Test	Part	Requirement Paragraph	Method Paragraph
Corrosion resistance	Metal parts 1/	3.6.1	4.6.1
Alkali absorption of plastic material	Plastic parts	3.6.2	4.6.2
Alkali resistance of elastomer material	Elastomers	3.6.3	4.6.3
Venting test	Vented filler caps	3.6.4	4.6.4

1/ Container, cover and latches; external cell terminal hardware; intercell connectors and hardware, etc.

TABLE V.

Qualification inspection of batteries.

Test no.	Examinations and Tests	Sample number 1	2	3	4	Req'mt para	Method of insp. para
1	Visual and mechanical	X	X	X	X	3.5, 3.6.5 & 3.6.17	4.6.5
2	Insulation resistance	X	X	X	X	3.6.6	4.6.6
3	Dimensions and weight	X	X	X	X	3.6.7	4.6.7
4	Container body to container cover seal			X	X	3.6.8	4.6.8
5	Capacity discharge	X	X	X	X	3.6.15(#1)	4.6.9
6	Potassium carbonate	X	X	X	X	3.6.3	4.6.10
7	Humidity and charge retention test			X	X	3.6.15(#4), 3.6.15	4.6.11
8	Mechanical shock	X		X		3.6.15(#1), 3.6.16	4.6.12
9	Vibration	X		X		3.6.15(#1), 3.6.16	4.6.13
10	Temperature shock		X		X	3.6.15(#1), 3.6.14	4.6.14
11	Altitude		X		X	3.6.10, 3.6.15	4.6.15
12	Salt fog	X	X			3.6.4	4.6.16
13	High rate, low temperature			X	X	3.6.15(#3)	4.6.17
14	Twenty-second pulse discharges (3 each) low temp - 17.8°C (0°F)			X	X	3.6.15(#1)	4.6.18
15	High rate discharge, operating position	X	X			3.6.15(#2)	4.6.19
16	Temperature rise and float test			X	X	3.6.15(#1), 3.6.11 & 3.6.16	4.6.20

TABLE V.

Qualification inspection of batteries. (Continued)

Test no.	Examinations and Tests	Sample number 1	2	3	4	Req'mt para.	Method of insp. para.
17	Cycling test	X	X			3.6.12	4.6.21
18	Internal pressure test (cell's)	X	X	X	X	3.6.13	4.6.22
19	Receptacle mounting test			X	X	3.6.14	4.6.23

TABLE VI.

Group A Inspection.

Examinations	Requirement paragraph	Method of inspection paragraph
Visual and mechanical	3.5, 3.6.5 & 3.6.17	4.6.5
Insulation resistance 1/	3.6.6	4.6.6
Internal pressure test (cells)	3.6.13	4.6.22

1/ Not applicable to cell procurements

TABLE VII

Group B Inspection.

Examination and tests	Method of Inspection AQL	Requirement level	inspection paragraph	paragraph
Subgroup I				
Dimensions and weight	1%	II	3.6.7	4.6.7
Container body to container cover seal 1/	1%	II	3.6.8	4.6.8
Venting test (2 vented filler caps/battery	1%	II	3.6.4	4.6.4
Subgroup II				
Capacity discharge	2.5%	S-3	3.6.15(#1)	4.6.9
Twenty-second pulse discharges (3 each) low temp. -17.8°C (0°F)	2.5%	S-3	3.6.15(#4)	4.6.18
Subgroup III				
Temperature rise and float test	6.5%	S-1	3.6.11, 3.6.15(#1) & 3.6.16	4.6.20
Internal pressure test	6.5%	S-1	3.6.13	4.6.22

1/ Not applicable for cell procurement.

TABLE VIII.

Group C Inspection.

Contract lot size	Total Number of batteries of 19 cell groups	Subgroup sample size I	II	III
1 thru 280	3	1	1	1
281 thru 500	6	2	2	2
501 thru 3,200	9	3	3	3
3,201 thru 10,000	12	4	4	4
10,001 thru 35,000	15	5	5	5
35,001 or more	21	7	7	7

TABLE Ix. GROUP C INSPECTION

Examinations and Test	Requirement Paragraph	Method of Inspection Paragraph
Subgroup I		
Capacity Discharge	3.6.15 (#1)	4.6.9
Altitude	3.6.10, 3.6.15	4.6.15
Cycling Test	3.6.12	4.6.21
Internal Pressure Test (5-Cell/Battery)	3.6.13	4.6.22
Subgroup II		
Capacity Discharge	3.6.15 (#1)	4.6.9
Humidity and Charge Retention Test	3.6.16 (#1) 3.6.16	4.6.11
High-Rate Discharge and Operating Position	3.6.15 (#2)	4.6.19
Internal Pressure Test (5-Cell/Battery)	3.6.13	4.6.22
Subgroup III		
Capacity Discharge	3.6.15 (#1)	4.6.9
High-Rate, Low-Temperature Discharge	3.6.15 (#3)	4.6.17
Temperature Rise and Float	3.6.15 (#1) 3.6.11, 3.6.16	4.6.20
Internal Pressure Test (5-Cell/Battery)	3.6.13	4.6.22

TABLE X.

Identification of defects.

Number	Description	Method of inspection
1	Electrical contact surfaces obstructed by insulation compounds	Visual
2	Pitting or blow holes on the external cell container	Visual
3	Electrolyte leakage and quantity of electrolyte	Visual
4	Location and polarity of terminals not as specified	Visual
5	Terminal and identification markings not as specified	Visual
6	Terminal seal missing or defective	Visual
7	Corrosion	Visual
8	Particles of foreign material	Visual
9	Insulators or insulation missing or damaged	Visual
10	Welds containing blow holes, cracks, or slag inclusions	Visual
11	Burrs on battery container, cover or interconnecting hardware	Visual
12	Improper color on outside of container and cover	Visual

* U.S. GOVERNMENT PRINTING OFFICE: 1984-766-640/A3599

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