MILITARY SPECIFICATION

BATTERY, SINGLE CELL, PRIMARY RESERVE

This specification is approved for use by the U.S. Army Armament Research and Development Command, and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 This specification contains requirements not normally covered by the drawings and provides quality assurance provisions for the fabrication of parts, assembly and packing of one type of primary reserve battery.

2. APPLICABLE DOCUMENTS

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

SPECIFICATIONS

MILITARY

MIL-A-48078 - Ammunition, Standard Quality Assurance Provisions, General Specification For
MIL-L-48765 - Lithium Hexafluoroarsanate
MIL-L-48766 - Lithium Tetrafluoroborate
MIL-M-48767 - Methyl Formate
MIL-L-48768 - Lithium Reserve Battery Electrolyte
MIL-G-48771 - Graphite
MIL-L-48772 - Lithium
MIL-V-48773 - Vanadium Pentoxide

FSC: 1345

STANDARDS

MILITARY

MIL-STD-105 - Sampling Procedures and Tables for inspection by Attributes (ABC-STD-105)
MIL-STD-271 - Non-destructive testing requirements for metals
MIL-STD-202D - Test methods for Electronic & Electrical Components Parts
MIL-STD-1168 - Lot Numbering of Ammunition
MIL-STD-1169 - Packaging, Packing and Marking for Shipment of Inert Ammunition Components

DRAWINGS

U.S. ARMY ARMAMENT RESEARCH AND DEVELOPMENT COMMAND PRODUCT DRAWING

9275567 - Battery, Single Cell Primary Reserve

INSPECTION EQUIPMENT DRAWINGS

9275635 - Molding Cylinder
9275636 - Power Source Assembly
9296892 - Primer, Stab
9275634 - Procedure, Assembly, Power Source
8841278 - Firing Pin
9275625 - Plug
9275620 - Wiring Assembly, Cell

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

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

American Society for Testing and Materials

ASTM E 493-73 - Standard Methods of Test for Leaks Using the Mass Spectrometer Leak Detector in the Inside-Out Testing Mode.

(Applications for copies shall be addressed to ASTM, 1916 Race Street, Philadelphia, PA 19103.)

3. REQUIREMENTS

3.1 Materials. - Materials and parts shall be in accordance with applicable drawings and specifications.

3.2 Components and assemblies. - The components and assemblies shall comply with all requirements specified on drawing 9275567 and associated drawings and with all requirements specified in applicable specifications and standards.

3.3 Non-activated voltage. - The non-activated voltage of the cell shall be less than five (5) millivolt(mv) when measured with a millivoltmeter having a minimum impedance of 10^7 ohms. The non-activated cell voltage shall be less than 3.0 volts when measured with a meter having 10^{14} ohms minimum impedance.

3.4 Battery cell voltage rise time. - The battery cell voltage shall rise to minimum voltage of 2.5 volts in a maximum of one half (0.5) second after activation over the temperature range of -45°F to +145°F.

3.5 Battery cell capacity. - The battery shall remain above 2.5 volts for a minimum of sixty (60) hours when subjected to a 3.3 Kohm ± 3% resistive load over the temperature range of -45°F to +145°F.

3.6 Weld integrity.

3.6.1 Anode lead to screen welds.

The anode lead to screen weld, when pulled to destruction, shall not result in separation of the weld. Parent material (screen or lead) shall fail before the weld.

3.6.2 Anode lead to terminal pin weld.

The anode lead to terminal pin weld, when pulled to destruction, shall not result in separation of the weld. Lead material shall fail before the weld.

3.6.3 Case to terminal plate weld. - The case to terminal plate weld shall not show evidence of pits or cracks when visually examined.

3.7 Terminal plate glass to metal seal. - The glass seal shall not have cracks on both sides of the pin or any one crack that extends over one-third the distance from the pin to the plate.

3.8 Radiographic examination. - X-Ray negatives of the cells shall be examined for the following:

a. There shall be continuity of the anode lead.

b. There shall be no sharp bends in the anode lead.

c. The anode lead shall not be bent against the outside case.

d. The anode lead shall not extend beyond the bottom edge of the anode screen.

e. The ampule shall be intact and show evidence of electrolyte.

3.9 Heat soak. - The ampule assembly, electrolyte (9275581) shall withstand a 24 hour heat soak at 165±5°F without leakage or breakage.

3.10 Environmental tests. - The cells shall meet the requirements of paragraphs 3.3, 3.4, 3.5, and after being subjected to the following tests:

a. Shock - 7 ft drop per MIL-STD-331, Test 111, except batteries shall be mounted in hardwood block of 40 cu. inches weighted to 5 pounds.

b. Transportation vibration - per MIL-STD-331, Test 104 procedure 1.

c. Acceleration - 15000 G's for 9.5 milliseconds along any axis.

3.11 Ampule assembly electrolyte condition. - The electrolyte, when examined inside the ampule shall be clear and of a colorless, light yellow or light yellow-brown appearance. There shall be the proper number of lithium wires and the surface of the wires in the solution shall be clearly visible. The wires shall be bright and shiny in appearance with some slight darkening on the ends permissible. The solution, when shaken, shall not be gelatinous but will have a fluidity similar to water. The lithium wires must be free floating in the solution.

3.12 Hardness of case. - The case (9275592) shall have a knoop hardness of 231 max at 200 gm load, or 96 Rockwell B.

3.13 Workmanship. - All parts and assemblies shall be fabricated and finished in a thorough workmanlike manner and all manufacturing, processing, and assembly operations shall be correctly performed. Metal parts shall be free of burrs, chips, sharp edges, cracks, crazes, unblended radii, porosity, warpage, burn marks, checks, chipped edges, blisters, excess flash, dirt, grease, rust, salt deposits, visible raised cement seams, solder splash, corrosion products, and other defects or foreign matter which would affect their serviceability. The cleaning method used shall not be injurious to any part or assembly, nor shall the parts be contaminated by the cleaning agent. All required markings shall be neat, legible and sharply defined.

3.14 First article inspection. - This specification contains technical provisions for first article inspection. Requirements for the submission of first article samples by the contractor shall be as specified in the contract.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection and standard quality assurance provisions. - Unless otherwise specified herein or in the contract, the provisions of MIL-A-48078 shall apply and are hereby made a part of this detail specification.

4.2 Classification of inspection. - The following types of inspection shall be conducted on this item.

a. First Article Inspection

b. Quality Conformance Inspection

4.3 First article inspection

4.3.1 Submission. - The contractor shall submit a first article sample as designated by the Contracting Officer for evaluation in accordance with provisions of 4.3.2 and 4.3.3. The first article sample shall consist of the following items in sample quantities as indicated.

Part Description	Drawings	Quantity
Battery, Single Cell, Primary Reserve	9275567	126

4.3.2 Inspections to be performed. - See MIL-A-48078 and paras. 4.4.2, testing per para. 4.4.3 and Table I specified herein.

4.3.3 Rejection. - See MIL-A-48078

TABLE 1.

FIRST ARTICLE INSPECTION

CLASSIFICATION OF DEFECTS & TESTS MIL-B-48761 (AR)

PARAGRAPH	TITLE		SHEET 1 OF 1		DRAWING NUMBER
4.3.4	Battery, Single Cell, Primary Reserve				9275567
					NEXT HIGHER ASSEMBLY
					N/A
CATEGORY	EXAMINATION OR TEST	NO. OF SAMPLE UNITS	AQL OR 100%	REQUIREMENT PARAGRAPH	PARAGRAPH REFERENCE /INSPECTION METHOD
	Environmental Test	54	N=54,C=0	3.10	4.4.6.7
	Battery, Single Cell, Primary Reserve				
	X-Ray Examination	126	100%	3.8	4.4.3.3
	Fine Leak	126	100%	3.2	4.4.6.5
	Gross Leak	126	100%	3.2	4.4.6.5
	Non-Activation Voltage	126	100%	3.3	4.4.6.1
	Voltage Rise Time & Capacity Test	72	N=72,C=1	3.4 &3.5	4.4.6.2

NOTES:

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4.4 Quality conformance inspection

4.4.1 Inspection lot formation. - Inspection lots shall comply with the lot formation provisions of MIL-A-48078.

4.4.2 Examination. - (See MIL-A-48078). Unless otherwise specified in the classification of defects and test tables, sampling plans for major and minor defects shall be in accordance with MIL-STD-105, Inspection Level II. Equipment necessary for the performance of the inspections listed shall be in accordance with 4.4.5.

CLASSIFICATION OF DEFECTS & TESTS

PARAGRAPH	TITLE		SHEET 1 OF 1		DRAWING NUMBER
4.4.2.1	Battery, Single Cell, Primary Reserve				9275567
					NEXT HIGHER ASSEMBLY
CATEGORY	EXAMINATION OR TEST	NO. OF SAMPLE UNITS	AQL OR 100%	REQUIREMENT PARAGRAPH	PARAGRAPH REFERENCE /INSPECTION METHOD
Critical	None defined				
Major					
101	Fine Leak		100%	3.2	4.4.6.5
102	Gross Leak		100%	3.2	4.4.6.5
103	Radiographic Examination	32		see note 1	4.4.6.3
104	Lead to Terminal Plate Weld Checks (prior to terminal plate closure	3	-	3.6.1	4.4.3.2
105	Glass to metal seal		0.40%	3.7	Visual
106	Non-Activation Voltage	See	See	3.3	4.4.6.1
107	Voltage Rise Time	Para	Para	3.4	4.4.6.2.2
108	Capacity	4.4.3.	4.4.3.1	3.5	4.4.6.2.2
109	Electrical Short Anode to Cathode		100%	3.2	4.4.6.11
110	Shim, Ampul Support missing		100%	3.2	Visual
111	Disc, insulator missing		100%	3.2	Visual
Minor					
201	Length		0.65%	3.2	Gage
202	Diameter		0.65%	3.2	Gage
203	Case to Terminal Plate Weld Improper		0.65%	3.6.3	Visual
204	Evidence of poor workmanship		0.65%	3.13	Visual

NOTES:

Note #1 - Radiographic Examination shall be for information only.

QUALITY CONFORMANCE INSPECTION

CLASSIFICATION OF DEFECTS & TESTS

MIL-B-48761 (AR)

PARAGRAPH	TITLE		SHEET 1 OF 1		DRAWING NUMBER 9275568
4.4.2.2	Terminal Plate Assembly - Machined				NEXT HIGHER ASSEMBLY 9275567
CATEGORY	EXAMINATION OR TEST	NO. OF SAMPLE UNITS	AQL OR 100%	REQUIREMENT PARAGRAPH	PARAGRAPH REFERENCE /INSPECTION METHOD
Critical	None defined				
Major					
101	Outside diameter improper		0.40%	3.2	Gage
Minor					
201	True position of OD with terminal pin		1.0%	3.2	Gage
202	Surface finish improper		1.0%	3.2	Visual/Standard
203	Taper not present		1.0%	3.2	Visual
204	Evidence of poor workmanship		1.0%	3.2	Visual

NOTES:

DRDAR-QA Form 160 Jul 77 Replaces SARPA-QA Form 2567 Feb 74 Which is Obsolete

QUALITY CONFORMANCE INSPECTION

CLASSIFICATION OF DEFECTS & TESTS

MIL-B-48761 (AR)

PARAGRAPH	TITLE		SHEET 1 OF 1		DRAWING NUMBER 9275569
4.4.2.3	Pin, Terminal				NEXT HIGHER ASSEMBLY 9275603
CATEGORY	EXAMINATION OR TEST	NO. OF SAMPLE UNITS	AQL OR 100%	REQUIREMENT PARAGRAPH	PARAGRAPH REFERENCE /INSPECTION METHOD
Critical	None defined				
Major	None defined				
Minor					
201	Length improper		1.0%	3.2	Gage
202	Diameter improper		1.0%	3.2	Gage
203	Evidence of poor workmanship		1.0%	3.13	Visual

NOTES:

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QUALITY CONFORMANCE INSPECTION

CLASSIFICATION OF DEFECTS & TESTS

MIL-B-48761 (AR)

PARAGRAPH	TITLE		SHEET 1 OF 1		DRAWING NUMBER 9275570
4.4.2.4	Plate, Terminal				NEXT HIGHER ASSEMBLY 9275603
CATEGORY	EXAMINATION OR TEST	NO. OF SAMPLE UNITS	AQL OR 100%	REQUIREMENT PARAGRAPH	PARAGRAPH REFERENCE /INSPECTION METHOD
Critical	None defined				
Major	None defined				
Minor					
201	Overall height		1.0%	3.2	Gage
202	Height of inner shoulder		1.0%	3.2	Gage
203	Evidence of poor workmanship		1.0%	3.13	Visual

NOTES:

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QUALITY CONFORMANCE INSPECTION

CLASSIFICATION OF DEFECTS & TESTS

MIL-B-48761 (AR)

PARAGRAPH	TITLE		SHEET 1 OF 1		DRAWING NUMBER 9275571
4.4.2.5	Cell Assembly				NEXT HIGHER ASSEMBLY 9275567
CATEGORY	EXAMINATION OR TEST	NO. OF SAMPLE UNITS	AQL OR 100%	REQUIREMENT PARAGRAPH	PARAGRAPH REFERENCE /INSPECTION METHOD
Critical	None defined				
Major					
101	Anode lead not positioned on inner diameter of anode assembly		0.40%	3.2	Visual
102	Bottom separator not present or out of position		0.40%	3.2	Visual
103	Anode assembly not uniformly expanded against the verticle separator or anode gap not present along total anode length.		0.40%	3.2	Visual
Minor					
201	Evidence of poor workmanship		0.65%	3.13	Visual

NOTES:

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QUALITY CONFORMANCE INSPECTION

CLASSIFICATION OF DEFECTS & TESTS

MIL-B-48761 (AR)

PARAGRAPH	TITLE		SHEET 1 OF 1		DRAWING NUMBER 9275572
4.4.2.6	Anode Assembly				NEXT HIGHER ASSEMBLY 9275571
CATEGORY	EXAMINATION OR TEST	NO. OF SAMPLE UNITS	AQL OR 100%	REQUIREMENT PARAGRAPH	PARAGRAPH REFERENCE /INSPECTION METHOD
Critical	None defined				
Major					
101	Any evidence of the screen exposed at the edges		0.40%	3.2	Visual
102	Lead side of screen pressed onto anode pad		0.40%	3.2	Visual
Minor					
201	Evidence of poor workmanship		0.65%	3.13	Visual
202	Length Improper		0.65%	3.2	Gage
203	Width Improper		0.65%	3.2	Gage
204	Thickness Improper		0.65%	3.2	Gage

NOTES:

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QUALITY CONFORMANCE INSPECTION

CLASSIFICATION OF DEFECTS & TESTS

MIL-B-48761 (AR)

PARAGRAPH	TITLE		SHEET 1 OF 1		DRAWING NUMBER 9275574
4.4.2.7	Screen Assembly, Anode				NEXT HIGHER ASSEMBLY 9275576
CATEGORY	EXAMINATION OR TEST	NO. OF SAMPLE UNITS	AQL OR 100%	REQUIREMENT PARAGRAPH	PARAGRAPH REFERENCE /INSPECTION METHOD
Critical	None defined				
Major					
101	Weld Integrity	See 4.4.3.2.2	-	3.6.1	
102	Location of lead		0.40%	3.2	Gage
103	Weld missing		0.40%	3.2	Visual
Minor					
201	Lead Length Improper (Min) Note# 1	See para. 4.4.4	0.65%	3.2	Gage
202	Screen Length Improper (Max) Note# 2		0.65%	3.2	Gage
203	Lead Thickness Improper (Min) Note# 1 and Note#3		0.65%	3.2	Gage
204	Lead Width Improper (Max) Note# 1 and Note# 3		0.65%	3.2	Gage
205	Screen Thickness Improper (Max) Note# 2 and #3		0.65%	3.2	Gage
206	Screen Width Improper (Max) Note# 2 and Note# 3		0.65%	3.2	Gage
207	Evidence of poor workmanship		0.65%	3.13	Visual

NOTES:

1. Ref Dwg 9275575
2. Ref Dwg 9275576
3. Does not apply in the weld area

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QUALITY CONFORMANCE INSPECTION

MIL-B-48761 (AR)

CLASSIFICATION OF DEFECTS & TESTS

PARAGRAPH	TITLE		SHEET 1 OF 1		DRAWING NUMBER 9275575
4.4.2.8	Lead				NEXT HIGHER ASSEMBLY 9275574
CATEGORY	EXAMINATION OR TEST	NO. OF SAMPLE UNITS	AQL OR 100%	REQUIREMENT PARAGRAPH	PARAGRAPH REFERENCE /INSPECTION METHOD
Critical	None defined				
Major					
101	Material Improper			3.1	Certificate of Conformance
Minor	None defined				

NOTES:

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QUALITY CONFORMANCE INSPECTION

MIL-B-48761 (AR)

CLASSIFICATION OF DEFECTS & TESTS

PARAGRAPH	TITLE		SHEET 1 OF 1		DRAWING NUMBER 9275578
4.4.2.9	Disc, Insulator				NEXT HIGHER ASSEMBLY 9275567
CATEGORY	EXAMINATION OR TEST	NO. OF SAMPLE UNITS	AQL OR 100%	REQUIREMENT PARAGRAPH	PARAGRAPH REFERENCE /INSPECTION METHOD
Critical	None defined				
Major	None defined				
Minor					
201	Outside diameter (max)		0.65%	3.2	Gage
202	Inside diameter (min)		0.65%	3.2	Gage
203	True position of ID with OD		0.65%	3.2	Gage
204	Outside radius improper		0.65%	3.2	Gage
205	Evidence of poor workmanship		1.0%	3.13	Visual

NOTES:

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QUALITY CONFORMANCE INSPECTION

CLASSIFICATION OF DEFECTS & TESTS

MIL-B-48761 (AR)

PARAGRAPH	TITLE		SHEET 1 OF 1		DRAWING NUMBER
4.4.2.10	Shim Ampule Support				9275579
					NEXT HIGHER ASSEMBLY
					9275567
CATEGORY	EXAMINATION OR TEST	NO. OF SAMPLE UNITS	AQL OR 100%	REQUIREMENT PARAGRAPH	PARAGRAPH REFERENCE /INSPECTION METHOD
Critical	None defined				
Major					
101	Material Improper			3.1	Certificate of Conformance
102	Hardness Improper			3.2	Perform the hardness check on a coupon of the material in accordance with ASTM D2000.
Minor					
201	Outside diameter (max)		0.65%	3.2	Gage
202	Inside diameter (min)		0.65%	3.2	Gage
203	Height (min)		0.65%	3.2	Gage
204	Evidence of poor workmanship		0.65%	3.13	Visual

NOTES:

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QUALITY CONFORMANCE INSPECTION

CLASSIFICATION OF DEFECTS & TESTS

MIL-B-48761(AR)

PARAGRAPH	TITLE			SHEET 1 OF 1	DRAWING NUMBER 9275581
4.4.2.11	Ampule Assembly, Electrolyte				NEXT HIGHER ASSEMBLY 9275567
CATEGORY	EXAMINATION OR TEST	NO. OF SAMPLE UNITS	AQL OR 100%	REQUIREMENT PARAGRAPH	PARAGRAPH REFERENCE /INSPECTION METHOD
Critical	None defined				
Major					
101	Heat soak		100%	3.9	4.4.6.6
102	Condition of ampule assembly	See	100%	3.11	Visual
103	Electrolyte volume improper			3.2	4.4.6.4
104	Outside diameter (max)		0.40%	3.2	Gage
105	Overall length (max)		0.40%	3.2	Gage
106	True position of tip to outside diameter		0.40%	3.2	Gage
107	Water content improper	See 4.4.6.12		3.2	4.4.6.12
Minor	None defined				

NOTES:

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QUALITY CONFORMANCE INSPECTION

CLASSIFICATION OF DEFECTS & TESTS

MIL-B-48761 (AR)

PARAGRAPH	TITLE		SHEET 1 OF 1		DRAWING NUMBER
4.4.4.12	Separator Assembly				9275584
					NEXT HIGHER ASSEMBLY 9275571
CATEGORY	EXAMINATION OR TEST	NO. OF SAMPLE UNITS	AQL OR 100%	REQUIREMENT PARAGRAPH	PARAGRAPH REFERENCE /INSPECTION METHOD
Critical	None defined				
Major					
101	Bottom separator missing or damaged or not completely covering bottom insulator (black insulator visible) (See note I)		0.40%	3.2	Visual
102	Vertical separator missing damaged or not overlapped at seam.		0.40%	3.2	Visual
103	Insulator cathode missing or damaged.		0.40%	3.2	Visual

NOTES: The dark spots caused by the corrugated edge of the bottom separator where it overlaps the vertical separator shall not be cause for rejection.

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PARAGRAPH	TITLE		SHEET 1 OF 1		DRAWING NUMBER 9275585
4.4.2.13	Cathode Assembly				NEXT HIGHER ASSEMBLY 9275584
CATEGORY	EXAMINATION OR TEST	NO. OF SAMPLE UNITS	AQL OR 100%	REQUIREMENT PARAGRAPH	PARAGRAPH REFERENCE /INSPECTION METHOD
Critical	None defined				
Major					
101	Bottom insulator missing, damaged or not flat on bottom of case		0.40%	3.2	Visual
102	Weight of cathode composition improper		0.40%	3.2	4.4.6.9/Scale
103	Height from top of cathode material to edge of case		0.40%	3.2	Gage
104	Inside diameter of cathode composition improper (min)		0.40%	3.2	Gage
105	Cathode composition damaged		0.40%	3.2	Visual
Minor					
201	Evidence of workmanship		1.00%	3.13	Visual

NOTES:

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CLASSIFICATION OF DEFECTS & TESTS

MIL-B-48761 (AR)

PARAGRAPH	TITLE		SHEET 1 OF 1		DRAWING NUMBER 9275586
4.4.2.14	Insulator, Bottom				NEXT HIGHER ASSEMBLY 9275585
CATEGORY	EXAMINATION OR TEST	NO. OF SAMPLE UNITS	AQL OR 100%	REQUIREMENT PARAGRAPH	PARAGRAPH REFERENCE /INSPECTION METHOD
Critical	None defined				
Major	None defined				
Minor					
201	Diameter improper	See Para 4.4.4	1.0%	3.2	Gage
202	Thickness improper		1.0%	3.2	Gage

NOTES:

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CLASSIFICATION OF DEFECTS & TESTS

MIL-B-48761 (AR)

PARAGRAPH	TITLE		SHEET 1 OF 1		DRAWING NUMBER 9275589
4.4.2.15	Separator Bottom				NEXT HIGHER ASSEMBLY 9275584
CATEGORY	EXAMINATION OR TEST	NO. OF SAMPLE UNITS	AQL OR 100%	REQUIREMENT PARAGRAPH	PARAGRAPH REFERENCE /INSPECTION METHOD
Critical	None defined				
Major	None defined				
Minor					
201	Diameter improper (min)	See Para. 4.4.4	1.0%	3.2	Gage
202	Thickness improper (min)		1.0%	3.2	Gage

NOTES:

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PARAGRAPH	TITLE		SHEET 1 OF 1		DRAWING NUMBER
4.4.2.16	Separator, Vertical				9275590
					NEXT HIGHER ASSEMBLY 9275584
CATEGORY	EXAMINATION OR TEST	NO. OF SAMPLE UNITS	AQL OR 100%	REQUIREMENT PARAGRAPH	PARAGRAPH REFERENCE /INSPECTION METHOD
Critical	None defined				
Major	None defined				
Minor					
201	Length improper (min)	See Para. 4.4.4	1.00%		Gage
202	Width improper (min)		1.00%		Gage
203	Thickness improper (min)		1.00%		Gage

NOTES:

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CLASSIFICATION OF DEFECTS & TESTS

MIL-B-48761 (AR)

PARAGRAPH	TITLE	SHEET 1 OF 1	DRAWING NUMBER
4.4.2.17	Case		9275592
			NEXT HIGHER ASSEMBLY 9275567

CATEGORY	EXAMINATION OR TEST	NO. OF SAMPLE UNITS	AQL OR 100%	REQUIREMENT PARAGRAPH	PARAGRAPH REFERENCE /INSPECTION METHOD
Critical	None defined				
Major					
101	Material improper	-	-	3.1	Certificate of Conformance
102	Hardness improper	3	-	3.12	4.4.6.8
103	Inside diameter improper		0.40%	3.2	Gage
104	Length improper		0.40%	3.2	Gage
Minor					
201	Thickness improper		0.65%	3.2	Gage
202	Finish improper		0.65%	3.2	Visual/Standard
203	Evidence of poor workmanship		1.0%	3.13	Visual

NOTES:

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QUALITY CONFORMANCE INSPECTION

CLASSIFICATION OF DEFECTS & TESTS MIL-B-48761 (AR)

PARAGRAPH	TITLE		SHEET 1 OF 1		DRAWING NUMBER 9275602
4.4.2.18	Insulator, Cathode				NEXT HIGHER ASSEMBLY 9275584
CATEGORY	EXAMINATION OR TEST	NO. OF SAMPLE UNITS	AQL OR 100%	REQUIREMENT PARAGRAPH	PARAGRAPH REFERENCE /INSPECTION METHOD
Critical	None defined				
Major					
101	Material improper			3.1	Certificate of Conformance
Minor					
201	Outside diameter (min) (See Note 1)		1.0%	3.2	Gage
202	Thickness (min)		1.0%	3.2	Gage

NOTES:

1. May include permissable flashing to .005

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QUALITY CONFORMANCE INSPECTION

CLASSIFICATION OF DEFECTS & TESTS

MIL-B-48761 (AR)

PARAGRAPH	TITLE		SHEET 1 OF 1		DRAWING NUMBER 9275603
4.4.2.19	Plate Assembly, Terminal				NEXT HIGHER ASSEMBLY 9275568
CATEGORY	EXAMINATION OR TEST	NO. OF SAMPLE UNITS	AQL OR 100%	REQUIREMENT PARAGRAPH	PARAGRAPH REFERENCE /INSPECTION METHOD
Critical	None defined				
Major	None defined				
Minor					
201	Height of terminal pin above inside shoulder improper		0.65%	3.2	Gage

NOTES:

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CLASSIFICATION OF DEFECTS & TESTS

MIL-B-48761(AR)

PARAGRAPH	TITLE		SHEET 1 OF 1		DRAWING NUMBER
4.4.2.20	Barrier, Ampule				9275610
					NEXT HIGHER ASSEMBLY 9275567
CATEGORY	EXAMINATION OR TEST	NO. OF SAMPLE UNITS	AQL OR 100%	REQUIREMENT PARAGRAPH	PARAGRAPH REFERENCE /INSPECTION METHOD
Critical	None defined				
Major:	None defined				
Minor:					
201	Thickness improper (max)	see para 4.4.4	1.0%		Gage
202	Profile improper (four places)		1.0%		Gage
203	Length improper (four places)		1.0%		Gage

NOTES:

DRDAR-QA Form 160 Jul 77 Replaces SARPA-QA Form 2567 Feb 74 Which is Obsolete

QUALITY CONFORMANCE INSPECTION

CLASSIFICATION OF DEFECTS & TESTS

MIL-R-4876 (AR)

PARAGRAPH	TITLE	SHEET 1 OF	DRAWING NUMBER
4.4.2.21	Wire Lithium		9317599
			NEXT HIGHER ASSEMBLY 9275581

CATEGORY	EXAMINATION OR TEST	NO. OF SAMPLE UNITS	AQL OR 100%	REQUIREMENT PARAGRAPH	PARAGRAPH REFERENCE /INSPECTION METHOD
Critical	None defined				
Major					
101	Length improper	See 4.4.3.7		3.2	4.4.6.10
102	Diameter improper	4.4.3.7		3.2	4.4.6.10
Minor	None defined				

NOTES:

DRDAR-QA Form 160 Jul 77 Replaces SARPA-QA Form 2567 Feb 74 Which is Obsolete

QUALITY CONFORMANCE INSPECTION

CLASSIFICATION OF DEFECTS & TESTS

MIL-B-48761 (AR)

PARAGRAPH	TITLE		SHEET 1 OF 1		DRAWING NUMBER 9317601
4.4.2.22	Cell and Ampule Assembly				NEXT HIGHER ASSEMBLY 9275561
CATEGORY	EXAMINATION OR TEST	NO. OF SAMPLE UNITS	AQL OR 100%	REQUIREMENT PARAGRAPH	PARAGRAPH REFERENCE /INSPECTION METHOD
Critical	None defined				
Major 101	Barrier, Ampul missing		100%	3.2	Visual
Minor	None defined				

NOTES:

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CLASSIFICATION OF DEFECTS & TESTS

PARAGRAPH	TITLE		SHEET 1 OF 1		DRAWING NUMBER
4.4.2.3	Ampul Blank				9317600
					NEXT HIGHER ASSEMBLY
					9275581
CATEGORY	EXAMINATION OR TEST	NO. OF SAMPLE UNITS	AQL OR 100%	REQUIREMENT PARAGRAPH	PARAGRAPH REFERENCE /INSPECTION METHOD
Critical	None defined				
Major					
101	Ampul diameter improper		0.40%	3.2	
102	Ampul length to shoulder improper		0.40%	3.2	
103	Stricture OD improper (2 places)		0.40%	3.2	
104	Stricture ID improper		0.40%	3.2	
105	Stricture true position improper		0.40%	3.2	
106	Wall thickness improper		0.40%	3.2	
107	Bottom thickness improper		0.40%	3.2	
Minor	None defined				

NOTES:

DRDAR-QA Form 160 Jul 77 Replaces SARPA-QA Form 2567 Feb 74 Which is Obsolete

4.4.3 Testing

4.4.3.1 Non-activation voltage, major defect, battery cell voltage rise time, major defect, cell capacity, major defect. - Samples of battery cells shall be tested for non-activated voltage, rise time and capacity in accordance with the following table.

Cell Lot Size	Total Sample Size	Non-Activation Voltage(para 3.3) Test at Room Ambient	Rise Time Capacity (para. 3.4) (para. 3.5) Test as below
120 to 1200	72	N=72, C=0	N=72, C=1
1201 to 10,000	180	N=180, C=1	N=180, C=2
10,001 to 35,000	300	N=300, C=1	N=300, C=3

Samples shall be equally divided into three (3) groups and one group tested at -45°F, one group tested at room ambient and one group tested at +145°F. Allowable defects shall be as indicated. Testing for the non-activated voltage shall be performed as specified in 4.4.6.1. Testing for the voltage rise time and voltage capacity shall be performed as specified in 4.4.6.2.2.

4.4.3.2 Weld integrity

4.4.3.2.1 Lead to terminal plate assembly

Major Defect - At the start of each days welding of units and after welder parametrics have been set, weld three (3) dummy terminal plate and leads. Pull lead to destruction to determine weld suitability (para. 3.6). Do not proceed with production welding until all three (3) dummy units are accepted. At the end of each four (4) hour period during the continuous production run and at the end of each day's production, three (3) assemblies shall be randomly selected from the last ten (10) welded and the weld pulled to destruction. If a reject occurs, that quantity of assemblies welded since the last acceptable check shall be rejected.

4.4.3.2.2 Lead to anode screen assembly

Major Defect - At the start of each day welding of units and after welder parametrics have been set, weld three (3) anode lead to screen assemblies. Pull lead to destruction to determine weld suitability (para. 3.6). Do not proceed

with production welding until all three (3) units are accepted. At the end of each four (4) hour period during the continuous production run and at the end of each day's production, three (3) units shall be randomly selected from the last ten (10) welded and the weld pulled to destruction. If a reject occurs, that quantity of assemblies welded since the last acceptable check shall be rejected.

4.4.3.3 Radiographic examination. - Radiographic examination shall be performed on a sample of 32 cells for information only.

4.4.3.4 Electrolyte volume. - Major Defect. At the start of each day, ten (10) electrolyte samples shall be taken and the volume of electrolyte checked. Do not proceed with production until all ten samples are accepted. At the end of each two (2) hour period during the continuous production run and at the end of each day's production, five (5) units shall be randomly filled and the volume of electrolyte checked. If that quantity of ampule assemblies filled since the last acceptable check shall be rejected. This check shall be made in accordance with para. 4.4.6.4.

4.4.3.5 Heat soak. - Major Defect. - Each ampule (9275581) shall be subjected to the test. Any ampule exhibiting cracks or leaking after the heat soak shall be rejected and removed from the lot. The test shall be performed as specified in para. 4.4.5.7.

4.4.3.6 Hardness. - Major Defect. - A sample of three(3) cases (9275592) shall be selected from each lot and tested for hardness. Failure of any one (1) sample to meet the requirement of 3.12 shall result in rejection of the lot. This test shall be performed as specified in 4.4.6.8.

4.4.3.7 Lithium wires. - Major Defect. - At the start of each day's production, four (4) lithium wires shall be removed from each machine and examined for length and diameter. Do not proceed with production unless all samples are acceptable. At the end of each two (2) hour period during the continuous production run and at the end of each day's production, two (2) wires shall be removed from each machine and examined for length and diameter. If any wire fails to comply with the drawing requirement, the equipment shall not be used in production. Further, that quantity of ampules filled since the last acceptable check shall be rejected.

4.4.4 Dimensional control of stamped/molded parts

The paragraph applies to the following parts:
Insulator Bottom 9275586, ref. para. 4.4.2.14
Separator, Bottom 9275589, ref. para. 4.4.2.15
Separator, Vertical 9275590, ref. para. 4.4.2.16
Screen Assembly Anode 9275574, ref. para. 4.4.2.7
Barrier Ampule, 9275610, ref. para. 4.4.2.20

(The requirements of the paragraph apply to those dimensions which are considered "as stamped" and which do not undergo subsequent operations).

In place of the normal sampling associated with the Classification of Defect for the parts listed above, a sample of at least ten (10) parts shall be dimensionally inspected to qualify the tool used in the stamping process for use in production. In addition, a sample of five (5) parts shall be selected during the first hour of each day's production and during the last hour of each day's production (up to and including 8 hours) for dimensional inspection as a control of the tool during production. As a control of each tool during production, the above quantity of parts shall be inspected for at least the defects listed in the referenced paragraphs for the above part. If any defective parts are found during qualification of the tool, the tool producing the defective part shall not be used in production. If any defective parts are found when inspection is performed for control of the tool, the tool producing the defective part shall be removed from production. Further, that portion of production since the last tool control check shall be inspected for each separate type of defect in accordance with the sampling plan and AQL's as specified in the referenced paragraphs. All tools removed from production because of some fault, may after reworking, be returned to production providing they pass the qualification test above.

4.4.5 Inspection equipment. - The inspection equipment required to perform the inspections and tests prescribed in this specification is identified in the 'Paragraph Reference/Inspection Method' column in the tables starting with paragraph 4.4.2.1, and the test method paragraphs (see 4.4.6). The contractor shall submit for approval, inspection equipment designs in accordance with the terms of the contract. See Section 6 of MIL-A-48078, and section 6 herein.

4.4.6 Test methods and procedures

specification where such inspections are deemed necessary to

4.4.6.1 Non-activation voltage. - Battery cells specified in 4.4.3.1 shall be measured for non-activation voltage using an acceptable digital millivolt meter having a minimum impedance of 10^7 ohms. Any cell which measures more than five (5) millivolts shall be checked using an electrometer or equivalent meter having a minimum impedance of 10^{14} ohms. Cells exhibiting more than 3.0 volts shall be classed defective and removed from further tests. Acceptable cells may be used for the rise time and capacity test.

4.4.6.2 Rise time and capacity test

4.4.6.2.1 First article test. - Battery cells specified in 4.3.4 shall be assembled in pairs in the molding cylinder (9275635) to form the power source assembly as shown on dwg. 9275636. The assembly shall be loaded with the stab primer, dwg. 9296892, in accordance with procedures dwg. 9275634. The assemblies shall be divided into three equal groups. One group shall be placed in a temperature chamber and conditioned at 145°F for a minimum of two (2) hours and one group shall be conditioned at room ambient for a minimum of two (2) hours and one group shall be conditioned at -45°F for a minimum of two (2) hours. All temperatures ± 5°F.

Each battery shall then be connected to a 6.6K± 3% resistive load and activated. Activation shall be accomplished by applying a two (2) inch ounce force to the primer through the firing pin (dwg. 8841278). Rise time shall be measured by an oscilloscope or other approved measuring equipment and the voltage measured and recorded at the time of activation and at one hour intervals during the duration of the test. Any power source failing to meet the rise time or capacity requirement shall be classed defective (Destructive test).

4.4.6.2.2 Lot acceptance test. - Battery cells specified in paragraph 4.4.3.1 shall be divided into three (3) equal groups. One group shall be placed in a temperature chamber and conditioned at +145°F for a minimum of one (1) hour. One group shall be conditioned at room ambient for a minimum of one (1) hour, and one group shall be conditioned at -45°F for a minimum of one (1) hour. (All temperatures ±5°F.)

Each cell, after conditioning, shall be connected to a 3.3K± 5% resistive load and activated. Activation shall be accomplished by striking the center of the non terminal end of the cell with a right circular steel cylinder having a mass of 0.2± .02 grams and traveling at a velocity of 175 ± 30 feet per second. The diameter of the cylinder shall be 0.071 - .005 inches

with corner breaks of .020 ± 005 inches. Rise time shall be measured by approved measuring equipment and the voltage measured and recorded at the time of activation and at one (1) hour intervals during the duration of the test. (Activation time shall be measured from the time the case is depressed.)

4.4.6.3 Radiographic examination. - Inspection equipment and image quality of the radiographics for the examination shall be satisfactory to the procurement Contracting Officer. The direction of the x-ray beam employed in the inspection shall be perpendicular to the cylindrical wall of the cell with the anode lead to screen welds at the right side. Retain x-ray films in the file during production. Supply film to Government DRDAR-QAA-R at completion of contract. (Non-destructive test).

4.4.6.4 Electrolyte volume. - Pre-weigh and record the weight of ten (10) ampule blanks. Randomly place these ampule blanks into magazine feeding the electrolyte fill machine. Re-weigh the filled ampules and calculate the weight of the electrolyte. Using the specific gravity of the electrolyte batch, calculate the volume. Repeat at interval specified in para. 4.4.3.4 with five (5) blanks.

4.4.6.5 Leak test

4.4.6.5.1 Gross leak. - Each cell shall be subjected to the gross leak test. The test shall be performed in accordance with MIL-STD-202E, Method 112B Condition B. Any evidence of bubbles shall be cause for rejecting the leaking cell. (Non-destructive test).

4.4.6.5.2 Fine leak. - Each cell shall be subjected to this test. The test shall be performed in accordance with ASTM E 493-73, Method A, The Volume V for calculating the actual leak rate shall be 0.5cc.
Any cell failing to meet the actual leak rate requirements of the drawing shall be rejected. (Non-destructive test).

4.4.6.6 Heat soak. - Each ampule assembly (9275581) shall be placed in a chamber heated to 165°F± 5°F for 24 hours minimum. After the 24 hours has elapsed the ampule shall be removed from the chamber and visually examined for cracks and leakage. Any unit exhibiting cracks or leakage shall be classed defective and removed from the lot. (Non-destructive test).

4.4.6.7 Environmental testing. - Cells specified in 4.3.4 shall be assembled in pairs as specified in 4.4.6.2.1. These batteries shall be tested as specified below:

T-V	(6)	-	-
7 Ft. drop		(6)	
BRG	6	6	15
TOTAL TESTED	6	6	15

Circled quantities are batteries that, having been subjected to the environmental condition, are tested in the ballistic rail gun.

The following procedures shall be followed in performing the tests.

a. Shock - 7 ft. Drop - MIL-STD-331 Method 111 - The six (6) battery assemblies shall be placed within a block of hard wood or other suitable material weighted to five (5) pounds ± 1/4 lb. The shape of the block shall be approximately a right circular cylinder two (2) inches high by five (5) inches in diameter. Three (3) assemblies shall be conditioned at -45°F for two (2) hours minimum and three (3) at +145°F for two hours minimum. One (1) unit from each temperature group shall be dropped on the flat of the cylinder, one (1) unit from each temperature group shall be dropped on the outside of the cylinder approximately perpendicular to the longitudinal axis of the battery assembly and one (1) unit from each temperature group shall be dropped on the outside of the cylinder approximately perpendicular to the ends of the battery assembly.

b. Transportation Vibration - MIL-STD-331, test 104 procedure 1, except that the test shall be performed at ambient temperature.

c. Acceleration - The units to be tested for acceleration shall be shipped to ARRADCOM where they shall be mounted in fixtures, representative of the XM70 Mine, loaded into the appropriate projectile and subjected to the zone environment of the ballistic rail gun. One half of the battery assemblies shall be tested at -45°F and one half tested at +145°F.

After each environment, the battery assembly shall be checked for non-activation voltage in accordance with 4.4.6.1.

After being subjected to the ballistic rail gun, the assemblies shall be checked for non-activation voltage. Units passing the non-activation voltage test shall then be tested for rise time and capacity in accordance with 4.4.6.2.1. Units that were fired in the BRG at -45°F shall be placed in the cold chamber for the duration of the test and units fired at +145°F in the BRG shall be placed in the hot chamber for the duration of the test.

4.4.6.8 Hardness. - Hardness of the cases shall be measured using a knoop hardness tester by taking readings on the side and closed end. A minimum of three readings shall be made along the side and three on the closed end approximately 120° apart. Parts should be mounted and sectioned before taking 200 gm load knoop impressions.

4.4.6.9 Cathode weight. - A sample of cases (9275592) shall be selected from each lot in accordance with MIL-STD-105D, level II. The selected units shall be weighed and the weights identifiable to the cases. These cases shall be returned to the lot in such a manner so that the subsequent cathode composition insertion into the weighed cases is done randomly. After the cathodes have been inserted into the lot of cases, the previously weighed cases shall be reweighed and the cathode composition weight obtained by subtracting the tare weight from the assembly weight. An average value for the weight of the Insulator, Bottom (9275586) shall be used in calculating the tare weight. Units failing to comply with the weight specified on the drawing shall be classed defective. (Non-destructive test).

The following alternate method may be used but is not preferred:

The sample of cathode assemblies shall be randomly selected and each unit weighed with the weight identifiable to the assembly. The cathode composition shall be removed from the case and the case with the bottom insulator reweighed.

The cathode composition weight shall be calculated by subtracting the two (2) values and the tare weight of the insulator.

Units failing to comply with the weight specified on the drawing shall be classed defective (Destructive Test).

4.4.6.10 Lithium wire dimensions

The length and diameter of the lithium wire shall be measured using standard measuring equipment.

4.4.6.11 Electrical Short Test Anode to Cathode. - After assembly each cell shall be tested for evidence of anode to cathode short using standard measuring equipment. (Short is defined as resistance of less than five (5) megohms.)

4.4.6.12 Electrolyte Water Content Check. - For each new bottle of electrolyte inserted in the dispenser, a sample will be taken and analyzed for water content using approved measuring equipment. If the amount of water is excessive (ref. MIL-L-48768) the ampules filled from that bottle will be rejected and that bottle of electrolyte not used in production.

5. PREPARATION FOR DELIVERY

5.1 Preservation and packaging

5.1.1 Level C. - Battery cells shall be packed for shipment in accordance with MIL-STD-1169.

5.2 Packing

5.2.1 Level C. - Battery cells shall be packed for shipment in accordance with MIL-STD-1169.

5.3 Marking. - Marking of the carton shall comply with MIL-STD-1169 and lot numbering with MIL-STD 1168.

5.4 Shipping. - When parts from more than one lot are shipped as a carload, each lot shall be kept separate, and the division between lots clearly indicated to prevent mixing of lots in transit.

6. NOTES

6.1 Ordering data. - See MIL-A-48078 (AR)

6.2 Submission of designs for approval. - See 6.2.3 of MIL-A-48078. Submit equipment designs, as required, to Commander, U.S. Army Armament Research and Development Command, ATTN: DRDAR-QAA-I, Dover, New Jersey 07801.

Custodian:
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Army-AR

Project Number: 1345=A207

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MIL-B-48761Battery, Single Cell, Primary Reserve

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