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The Engineering Resource For Advancing Mobility®

400 COMMONWEALTH DRIVE, WARRENDALE, PA 15096

AEROSPACE RECOMMENDED PRACTICE

ARP 1817

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Revised

BATTERY INDUSTRIAL, LEAD ACID TYPE, FOR USE IN ELECTRIC POWERED GROUND SUPPORT EQUIPMENT

1. SCOPE:

1.1 This recommended practice describes an industrial battery, lead acid type, for use in electric powered ground support equipment.

2. GENERAL DESCRIPTION:

2.1 The battery shall consist of the number of individual cells required to make up the specified voltage and shall be assembled in a rigid tray with or without cover to specific layout dimensions and specifications. The batteries shall be equipped with specified leads and connectors. The total weight of the battery with electrolyte must be stated in all quotations.

3. PHYSICAL REQUIREMENTS:

3.1 TRAY:

3.1.1 The following minimum requirements shall apply for batteries of 36 volt and above:

Minimum Steel Thickness

Bottom of Tray	1/4"	/	No. 3 gage	/	6.35mm
Ends	1/4"	/	No. 3 gage	/	6.35mm
Sides	3/16"	/	No. 7 gage	/	4.76mm
Partitions	1/8"	/	No. 10 gage	/	3.17mm

3.1.1 (Continued):

The outer surface of the tray shall be smooth.

1-3/8" (35 mm) lifting holes shall be provided on the tray as required. Each pair of holes shall be positioned in line with the center of gravity of the complete battery assembly, so that during lifting, the battery will remain stable. Each lifting hole shall be capable of carrying the full weight of the battery.

Protection shall be provided to prevent accidental contact between lifting hooks and terminals.

The tray shall be designed to provide adequate ventilation and to prevent the accumulation of hydrogen gas under the cover. The tray shall provide an adequate number of drain holes in the bottom of the tray and adequate cell partition for rigidity of the tray.

When battery covers are provided, a means of support shall be provided when the cover is in the open position. (See ARP 1247 paragraph 3.4.3.2 and next several paragraphs).

3.1.2 Trays for 12 volt batteries shall be 12 gage (2.8 mm) minimum with 16 gage (1.6 mm) partitions. Trays for 24 volt batteries shall be 7 gage (4.8 mm) minimum steel with hinged cover optional. The cover shall be supported in such a way as to prevent the cover from touching the top of the cell in the event that the hinge is damaged. The tray lifting slot and hinge arrangement shall be per vehicle manufacturer's specification. Each lifting hole shall be capable of carrying the full weight of the battery.

3.1.3 All battery trays shall be protected from damage by sulfuric acid. Coating shall be fused epoxy powder or equivalent applied on a clean dry, steel surface.

3.1.4 All batteries shall be stamped at the lifting point with the actual service weight of the individual battery per American National Standards Institute B56.1.

3.1.5 Means shall be provided to prevent corrosion between cell and tray and partitions.

3.2 CELL CONTAINERS AND COVERS:

3.2.1 All cell containers and covers shall meet the acid absorption test of ASTM D-639 and impact, rupture and distention tests of ASTM D-530. As a minimum standard, cell containers and covers shall conform to Federal Specifications WB-133C and shall have a minimum resistance of 240 inch pounds (27.12 joules).

3.2.2 The seal between the cell cover and the cell container, and all openings on the top of the battery other than the filling vents shall be gas tight and effectively sealed against seepage of electrolyte. The seal can utilize asphalt, epoxy or heat seal. If sealing compound is used to seal the cover-container joints, it shall be virgin, acid-resisting material. It shall be capable of maintaining an unbroken seal between the cover and container throughout a temperature range of -25°F to +140°F (-32°C to +60°C) ambient. Sealing compound recovered from batteries previously in use shall not be reused.

3.2.3 Cell container and cover material shall be compatible to each other in melt properties in a heat seal joint. An impact test on actual jar to cover seal sample shall show cover or container material failure only. No sealing failure shall be permitted.

3.2.4 Jar to cover seal shall be maintainable throughout the life of the battery.

3.2.5 Battery post seal to cover shall have a positive seal against leakage throughout the battery life.

3.2.6 The vent cap shall be of the twist bayonet type. Suitable baffling shall be provided in the cell, vent or cap to avoid spraying and to minimize creepage of electrolyte while at the same time permitting gas to escape.

3.2.7 Containers shall have space above plate tops to provide for an electrolyte normal level of a height sufficient that the cells need not be watered more frequently than is customary for the service application intended.

3.2.8 Containers shall have sediment space sufficient to accommodate all the active material which will settle therein during the life of the cell so that during this period there will be no contact between the deposited sediment and the plate.

3.3 ELECTROLYTE:

3.3.1 Electrolyte furnished in or with the cells shall be a solution of sulfuric acid in pure water and shall conform to the requirements of Federal Specification O-S-801. The electrolyte shall be free of any added substance which alters the specific gravity thus invalidating the indications of the state of charge. Reclaimed electrolyte shall not be used.

3.3.2 Cells supplied under this specification shall be furnished with fully charged specific gravity of 1.290 with a tolerance of ± 0.010 points and at an electrolyte temperature of 77°F (25°C).

3.4 ELEMENTS:

Elements (also called cells) shall be assembled by intermeshing positive and negative plates. The plates shall be insulated from each other by microporous rubber or plastic separators with 50% minimum porosity. Positive plates shall be designed to assure the active material is retained throughout the life of the battery. Protection from mossing shall be inherent in the design.

3.4.1 All cells shall consist of one or more positive plates and one more negative plate than positive plate. The end plates shall be negative ones.

3.4.1.1 Positive plates shall consist of one piece grids of lead antimony or calcium alloy with a minimum grid thickness of 0.250 inch. The design of the grid and the composition of the active material shall be such as to insure that the active material is held securely in place and in complete electrical contact with the grids.

3.4.1.2 The negative plates will use a lead-antimony or calcium alloy grid and shall be the size, number and thickness that conforms to the manufacturer's commercial standards for the various sizes and types of batteries and shall approximate the size of the positive plates, thickness excepted.

3.5 POSTS AND INTERCELL CONNECTORS:

3.5.1 Posts and intercell connectors shall be adequate to carry, without excessive heating or voltage drop, the current incident to the service application. Intercell connectors shall be burned to the cell terminals and shall not obstruct the filling vents. Copper inserts, when used, shall be completely embedded in posts or intercell connectors to prevent contact with electrolyte. Copper strips, when used for intercell connectors, shall be protected with a uniform and homogeneous lead or lead alloy coating not less than 0.002" thick. This coating shall be suitably bonded to the copper strips to prevent peeling and shall be free from blisters and pin holes. When lead-coated copper connectors are used in conjunction with cast alloy and pieces, the lead coating on the connectors shall become an intergral part of the cast alloy pieces.

3.5.2 Intercell connectors and terminals shall be individually covered with an insulated cover. Covers shall be removable and will be provided with a means for checking voltage.

3.5.3 Posts shall be sealed as stated in 3.2.5.

3.6 MARKINGS:

Batteries shall be provided with the following information which shall be legibly shown on the intercell connector between number 1 and number 2 cell and/or on the side of the tray under the lifting tab.

MANUFACTURER'S NAME

BATTERY MODEL

BATTERY SERIAL NUMBER

AMPERE HOUR CAPACITY

DATE OF MANUFACTURE (MONTH AND YEAR)

4. PERFORMANCE REQUIREMENTS:

4.1 CAPACITY RATINGS: The battery shall deliver 90% of the capacity ratings upon shipment and 100% of the ratings on or before the 10th cycle.

4.1.2 CAPACITY TESTING PROCEDURE:

4.1.2.1 The battery shall be supplied in a charged and wet, or dry charged condition. When a capacity check is conducted, it may be given 10 cycles of charge-discharge prior to a determination of its conformity to rated capacity.

4.1.2.2 Testing shall be performed in accordance with NEMA 1B2-1974.

4.2 LIFE CYCLE TESTS:

The supplier shall state how many 80% discharge cycles the battery will deliver before it fails to discharge at least 80% of the rated capacity. This shall in no case be less than 1500 cycles. The capacity of life cycles shall be measured in accordance with NEMA Standard 1B3-1978.

4.3 WORKMANSHIP:

4.3.1 The workmanship in fabricating the parts, the assembly of the battery and the lead burning shall be first class in every particular. Plate active material shall be free from breaks and loose parts. Grids shall be free of open sections, evidence of cold pouring, cracks or blowholes. All sections of plates involving lead burning shall be homogeneous and free from blowholes or imperfect bonds between the portions joined.

4.4 SUPPLIER'S INSPECTION RESPONSIBILITIES:

4.4.1 Unless otherwise specified herein, the supplier is responsible for the performance of all inspection and test requirements prior to offering batteries for acceptance. The suppliers may utilize his own facilities or any other commercial laboratory acceptable to the purchaser. Inspection records of the examination shall be kept complete and made available to the purchaser.

Where it is impractical to complete any test on batteries taken from current production prior to delivery, such as performance test, the supplier shall make available his records of tests on preceding production.

4.5 COLD CLIMATE OPERATIONS: For temperatures below 0°F (-18°C) special actions must be taken to obtain acceptable battery performance, i.e. heat augmentation, insulation, charging and operating procedure modification.

4.6 HOT CLIMATE OPERATIONS: For temperatures above 104°F (40°C) special actions must be taken to insure safe battery charging i.e. cooling fans, shield from sun etc.