



PERFORMANCE STANDARD FOR
Engine Cranking Batteries Used
with Engine Generator Sets
EGSA 100B, 1997

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EGSA 100B 1997 PERFORMANCE STANDARD FOR ENGINE CRANKING BATTERIES USED WITH ENGINE GENERATOR SETS

1. SCOPE

The provisions of this Standard shall apply to all engine and turbine cranking applications where secondary (rechargeable) storage batteries are used to provide starter motor power for cranking purposes. The battery must be designed for float/standby service without excessive maintenance.

2. REFERENCE STANDARDS AND PRACTICES AS APPLICABLE:

ANSI/NFPA 20-1996	Centrifugal Fire Pumps.
ANSI/NFPA 99-1996	Health Care Facilities.
ANSI/NFPA 110-1996	Emergency & Standby Power Systems.
ANSI/IEEE 450-1995	Recommended practice for maintenance, testing & replacement of large lead storage batteries.
ANSI/IEEE 484-1984	Recommended practice for installation, design & installation of large lead storage batteries.
ANSI/IEEE 1106-1995	Recommended practice for maintenance, testing & replacement of nickel cadmium storage batteries.
ANSI/NEMA 250-1991	NEMA enclosures.

3. DEFINITIONS

Ambient Temperature. The ambient temperature is the stabilized temperature of the medium (usually air) surrounding the battery.

Average Ambient Temperature. The average ambient is the 24 hour mean average.

Battery Failure. The absolute measure of battery failure is when the required duty can no longer be performed, i.e. the engine can no longer be cranked.

Break-away Current. The current drawn by the starter motor to break the motor away from stalled condition.

Current Capability. A cell's current capability is defined as its ability to provide a given magnitude of current for a specified time period to a given cell end voltage measured with the load applied.

Flame Arresting Vent. A vent frequently fitted to cells to prevent an external explosion or flame from propagating into, or out of, the cells.

Fully Charged Battery. A cell is defined to be in a fully charged condition when it has been maintained on an "Equalize" or "Recharge" voltage setting of an adequately sized charger for a sufficient time period after the battery voltage comes up in the "Equalize" or "Recharge" Voltage level.

Rolling Current. The current drawn by the starter motor while it is cranking the engine.

Volt/Cell. The volt/cell (V/C) of the alkaline (nickel cadmium) and acid (lead) electrochemical couples are given below:

TABLE 1. VOLT/CELL

	Alkaline	Lead Acid @ 1.210 [77°F (25°C)] specific gravity
Nominal	1.20	2.00
Float	1.40 - 1.45	2.15 - 2.20
Equalize	1.50 - 1.65	2.25-2.35

4. RATINGS

Engine cranking batteries shall be high discharge rated at 70° F (21° C) in both break-away current capability and rolling current capability. The following values:

TABLE 2. RATINGS

	Nickel Cadmium	Lead Acid
Break-away current (first second of any cranking period)	.65 V/C	1.00 V/C
Rolling Current	.85 V/C	1.50 V/C

5. CLASSIFICATION

Storage batteries are classified by the voltage, current capacity, dimensions and suitability for the intended purpose.

6. APPLICATION DATA

6.1 **General Information.** The following important factors to consider when specifying a battery are:

- 6.1.1 **Low Battery Temperature.** Lowering the battery ambient temperature reduces the battery capacity.
- 6.1.2 **Low Engine Temperature.** Lowering the engine temperature increases the power required to crank the engine resulting in higher current required from the battery.
- 6.1.3 **Increased Battery Temperature.** Increasing the battery operating temperature slightly increases the battery capacity but reduces the projected life of the battery.
- 6.1.4 **Increased Electrolyte Specific Gravity.** Increasing the specific gravity of the battery acid (lead acid batteries) increases the battery capacity but reduces the projected life of the battery.

6.2 **Typical information required to properly size a battery for an engine cranking application.**

- 6.2.1 Nominal volts DC _____
--12 VDC, 24 VDC and 32 VDC are most common.

- 6.2.2 Engine model and make (diesel, gas) _____
--Two stroke or four stroke
- 6.2.3 Cubic inches displacement _____
-- Most battery manufacturers have sizing guides which size by engine cubic inches displacement. This is useful because cranking ampere data is not available from the engine manufacturers to match each individual application.
- 6.2.4 Number of cranks _____
-- Crank limiting equipment may not permit number of cranks specified. This would be wasted additional capacity and should be reviewed.
- 6.2.5 Duration of cranks (seconds) _____
-- Crank limiting equipment may not permit duration of cranks specified. This would be wasted additional capacity and should be reviewed.
- 6.2.6 Rest periods if applicable (and number of seconds) _____
-- Rest periods are not recommended for alkaline batteries
- 6.2.7 Worst case low battery temperature (F or C) _____
-- All batteries must be derated for cold temperature applications. Cold temperature requires additional battery capacity. Usual indoor temperature ranges from 40° to 70° F.
- 6.2.8 Worst case engine temperature _____
-- Engine block heaters and reduced oil viscosity are very helpful in reducing battery and starter size in cold temperature applications.
- 6.2.9 Oil viscosity (API Grade) _____
- 6.2.10 Battery type _____
-- The battery life can be drastically effected by the temperature, cycling and other factors.
- 6.2.11 Minimum required life (years and/or cycles) _____
- 6.2.12 Minimum seismic or conditions _____
-- Shock, seismic and mounting conditions should be considered and reviewed with the battery manufacturer.

6.3 **Vented Cells**

- 6.3.1 **Vent Caps.** Battery shall be provided with flame arrestor vent caps.
- 6.3.2 **Level Indicators.** Cells should have electrolyte minimum and maximum level interval with stated conditions.
- 6.3.3 **Watering Interval.** Battery manufacturers should give estimated watering interval with stated conditions.
- 6.3.4 **Top Up.** Top up (fill) with distilled or deionized water only.

6.4 **Valve Regulated Cells**

6.4.1 **Ventilation.** These lead cells are not sealed and require ventilation. They are called sealed because they have no provision for the addition of water or electrolyte. During high rate charging, towards the end of the charging cycle, or when temperatures exceed 80° F, they will generate corrosive gas.

6.4.2 **Maintenance.** They are not maintenance-free because they require connectors to be cleaned and torqued regularly per the manufacturer's instructions.

6.5 **Battery Racks or Cabinets/Consoles:**

6.5.1 **Racks**

6.5.1.1 **Standards Racks.** Should be of steel, acid resistant (lead batteries), or alkaline resistant (nickel cadmium batteries) primed and painted. They should be sturdy, prevent batteries from slipping off rack, and allow accessibility for inspection, service or replacement. Rack should be securely bolted to floor.

6.5.1.2 **Earthquake Racks.** In addition to standard racks they should be capable of allowing systems to survive shock limit for specified zone.

6.5.1.3 **Installation/Assembly Instructions and Drawings.** Should be supplied with each shipment.

6.5.2 **Battery Cabinet/Consoles**

6.5.2.1 **Construction.** The enclosure should have an acid resistant (lead batteries) or alkaline resistant (nickel cadmium) finish. Enclosure must be properly ventilated. Shelves should be sturdy, prevent batteries from slipping off and allow accessibility for inspection service or replacement. Cabinets should be hinged or removable to facilitate inspection and maintenance.

6.5.2.2 Consoles should have a shelf separating the charger from battery compartment.

6.5.2.3 Enclosures with heating elements should ensure even distribution of heat around batteries and avoid direct contact. Check with battery manufacturer to insure this will not induce early failure of cells. Heating pad must be acid (lead batteries) or alkaline (nickel cadmium batteries) resistant. Strip heaters and heating pads must be supplied with an adjustable thermostat.

7. INSTALLATION DATA

7.1 **Battery Cabling**

7.1.1 The electrical connection between the battery and starter motor shall be designed to hold the cable resistance to a minimum to eliminate excessive voltage drop. A reasonable conductor resistance* is:

.0015 Ohms for 12 Volt systems
.002 Ohms for 24 Volt systems
.0025 Ohms for 32 Volt systems

*This includes both the positive and negative leads.

7.1.2 **Location.** Battery bank should be as close as possible to engine and controls so as to minimize resistance.

7.1.3 **Lug Torque.** Intercell connectors and terminal lugs should be torqued to manufacturer's standards.

7.2 **Location**

7.2.1 **Away from Heat.** Batteries should not be located next to air conditioning or heating vents.

7.2.2 **Ventilated Room.** All batteries should be located in ventilated rooms to allow hydrogen to rapidly dissipate. The hydrogen level should not exceed 1% concentration.

7.2.3 **Cleanliness.** Keep all vents, connectors and cables clean and protected from dirt.

7.2.4 **Maintenance Space.** Space should be available to check specific gravity on vented lead cells.

7.2.5 **Top off Space.** Space should be available to top off with (distilled or deionized) water vented cells.

7.2.6 **Mounting.** All vented cells must be mounted upright. Valve regulated (sealed) cells as per manufacturer's instructions (but do not block safety vents).

8. MAINTENANCE

8.1 **Service Life.** A battery which provides only 80% of manufacturer's capacity rating is stated as to be at the end of its service life. (Nickel cadmium batteries may be used in applications which require a lower capacity).

8.2 **Safety Gear.** Personnel who work on batteries should have the following minimum protective gear:

8.2.1 Goggles and face shields.

8.2.2 Acid or alkaline resistant gloves.

8.2.3 Rubber aprons and shoe covers.

8.2.4 Portable eye and skin rinse.

8.2.5 Avoid wearing jewelry or metal objects.

8.2.6 Safety shoes.

8.3 Tools

All metallic tools should have insulated handles.

8.3.1 **Hydrometer.** For checking specific gravity of electrolyte in vented cells. (Caution: Do not use the same hydrometer in acid as in alkaline solution).

8.3.2 **Thermometer.** For checking temperature of electrolyte in vented cells. (Caution: Do not use the same thermometer in acid as in alkaline solution).

8.3.3 **Digital Volt Meter.** Check with battery manufacturer for nominal and open circuit voltage.

8.3.4 **Torque Wrench.** All connections should be torqued as per the battery manufacturer's standards and checked annually.

9. SUBMITTAL DATA

9.1 **Battery Layout Drawings.** Should be provided by the battery manufacturer and indicate all connections and dimensions.

9.2 **Battery Rack Drawings.** Should be provided listing overall length, depth and height with cells mounted.

9.3 **Sizing Calculations.** The battery manufacturer must provide calculations to indicate how the specific battery type was chosen. Items in Section 6.2 are to be included.

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