Battery Requirements

BATTERY REQUIREMENTS FOR ELECTRIC BATTERY POWERED INDUSTRIAL TRUCKS AS LISTED IN UNDERWRITERS LABORATORIES STANDARD U.L. 583 (ANSI 6B.56.3-1972)

I. BATTERY ENCLOSURE

A. The battery shall be provided with support and protection by means of a noncombustible enclosure which, if of metal, shall be no less than 0.053 inch thick (No. 16MSG) and either shall be flanged not less than ½ an inch on all sides or shall remain closed by the force of gravity or shall be provided with a fastener.

B. A metal cover shall have such strength and rigidity that, in conjunction with air spacing provided between it and the battery terminals, the battery terminals are not short-circuited when a 250-pound force is applied to any one square foot area of the cover. In lieu of the spacing, insulation designed to prevent short-circuiting of the battery terminals shall be secured to the inner surface of a metal battery compartment cover.

II. BATTERY

A. A battery furnished with a noncombustible tray and cover intended to form the ultimate enclosure for the battery shall comply with the requirements in paragraphs I.A and I.B.

B. The battery enclosure shall be provided with means for ventilation that minimizes the possibility of accumulation of explosive hydrogen-air mixtures above the battery.

C. A battery of nominal voltage rating and representative of maximum ampere-hour capacity rating is to be supplied for the purpose of examining the truck.

D. Cells employing metal containers (such as alkaline batteries) shall be insulated from one another and from a metal tray or metal battery compartment. Insulation of wood or other material shall be (1) treated or painted to minimize deterioration by the battery electrolyte, and (2) constructed to minimize the risk of damage to the insulation in the normal operation and maintenance of the truck.

E. The connections shall be such that the potential between any two adjacent cells cannot be more than 24 volts(nominal).

F. Means shall be provided as a part of the truck to restrain the battery from moving more than a total of ½ an inch in a horizontal direction.

III. BATTERY LEADS

A. Battery leads shall be of a size and current-carrying capacity adequate for the application. They shall be neoprene insulated or insulated with an equivalent material, resistant to acids and/or alkaline, and able to withstand flexing, handling, and impact at temperatures between 54°C (130°F) and minus 29°C (minus 20°F).The average insulation thickness shall be no less than 0.060 inch for a No. 8-2 AWG wire and no less than 0.080 inch for a No. 1-4/0 AWG wire.

IV. BATTERY PLUGS AND RECEPTACLES

A. Each electric truck shall be equipped with a battery connector located to provide physical protection as required for other electrical parts of the truck.

B. One part of the connector shall be permanently mounted to either the truck or the battery enclosure. The length of the cable attached to the free part of the connector shall be as short as practicable, without interfering with the disconnecting operation and without placing stress on terminals.

C. The live parts shall be recessed from the face of the connector to minimize the possibility of shorting.

D. A battery connector shall have the proper rating for use in its particular application.

E. The removable portion of the connector shall be provided with means for being grasped during removal.

BATTERY MAINTENANCE

I. BATTERY CHECKS

A. Check the specific gravity of the electrolyte daily; specific gravity should be above 1.260. Check specific gravity daily at least at the center cells and weekly at all of the cells. When only the outer cells are checked, it will not necessarily indicate the true condition of the battery. After specific gravity is checked, return electrolyte to same cell from which it was taken.

B. The value of the specific gravity of the electrolyte in a lead-acid type battery should be approximately 1.275 with battery fully charged. Never continue to discharge a battery beyond the point where specific gravity falls below approximately 1.125.

C. To obtain "corrected specific gravity" readings when checking the electrolyte, add 1 point (0.001) of gravity for each 3°F, above 77°F (electrolyte temperature), or subtract 1 point for each 3°F below 77°F. Also subtract 15 points gravity for each 1/2" below normal level of electrolyte or add 15 points for each 1/2" above normal electrolyte level.

D. Check the battery cables, posts, and exterior of the battery daily. Battery cables must not be frayed nor loose at the battery posts. Also inspect battery connector and make certain there is no foreign material inside the connector. Make certain filler plugs are tight and vent holes in the filler plugs are not clogged.

E. The top of the battery should be kept clean and dry so corrosion, dust, or moisture cannot offer a conducting path to short-circuit the cells or contact a ground. A dirty battery or one where electrolyte has been spilled should be washed with a solution of baking soda and water (one pound of baking soda to one gallon of water). Disconnect battery connector and remove battery from lift truck for cleaning operation. Clean entire top of battery with the soda solution. After foaming stops, flush with clean water. Dry battery completely and install in lift truck. Apply a thin coat of petroleum jelly to battery post and cable terminals.

DO NOT FLUSH TOP OF BATTERY WHILE IT IS INSTALLED IN THE LIFT TRUCK. WATER COULD SEEP INTO ELECTRICAL COMPARTMENTS AND CAUSE SERIOUS DAMAGE.

II. BATTERY CHARGING

MAKE CERTAIN THE VENT HOLES IN THE FILLER PLUGS ARE OPEN TO ALLOW THE GAS TO ESCAPE FROM THE CELLS. WHEN BATTERY CHARGER IS CONNECTED TO THE BATTERY CONNECTOR, IT IS IMPERATIVE THAT CORRECT POLARITY BE OBSERVED. THAT IS, POSITIVE LEAD OF THE CHARGER MUST BE CONNECTED TO THE POSITIVE TERMINAL AND NEGATIVE LEAD TO THE NEGATIVE TERMINAL.

A. The most important factor in battery service and life is proper charging. Make certain the proper method for each application is carefully followed. In general, a battery may be charged at any rate in amperes that does not cause excessive gassing or produce temperatures above 110° F (120°F for short periods only).

B. A lead-acid battery should not require any routine overhaul or electrolyte changes during its entire life except in case of accidental loss of electrolyte. For exact information regarding charging and maintenance of individual battery, refer to the manufacturer's data.

REFRAIN FROM SMOKING IN IMMEDIATE VICINITY OF BATTERY OR FROM EXPOSING BATTERY TO AN OPEN FLAME DURING OR IMMEDIATELY AFTER CHARGING.

C. Battery specific gravity readings with electrolyte at 80°F are as follows:

Hydrometer Indication Charge Condition

1.110 - 1.135 ..... completely discharged

1.140 - 1.200 ..... one-fourth charged

1.205 - 1.230 ..... one-half charged

1.235 - 1.260 ..... three-fourths charged

1.265 - 1.290 ..... fully charged

III. BATTERY STORAGE

A. The battery should be stored in a clean, cool, dry location that is well-ventilated and away from a radiator or a heat duct.

B. Before the battery is placed in storage, make certain electrolyte is a proper level in all the cells, filler plugs are tight, and battery is fully charged.

C. Check electrolyte level and specific gravity every 30 days during storage. Whenever specific gravity is less than 1.230, the battery must be charged.

IV. BATTERY REPLACEMENT

A. Removal

1. Park truck on a firm, level floor.
2. Disconnect connector from of battery.
3. Attach chains and a suitable a hoist (see battery capacity tag) to remove battery.
4. Carefully lift battery up and away from truck. Place battery on suitable supports.

B. Installation

1. Attach chains and hoist to battery. Carefully lift battery into position on truck.
2. Connect truck cable connector to battery connector and lock in position.
3. Operate truck and check operation.

V. BATTERY SERVICING

A. Charging

1. The battery used with this vehicle must be kept charged for proper operation. Be certain there is enough solution in each cell to cover battery plates. While charging, do not allow battery temperature to exceed 110°F. Test occasionally while charging with a thermometer and reduce charging current if battery is excessively hot. Give battery ample ventilation while charging.

NOTE - Never allow battery to stand in a discharged condition.

B. Cleaning

1. Keep battery connections and terminals clean and dry. Tighten vent plugs and clean battery with a brush dipped in an alkaline solution such as ammonia or a solution of bicarbonate of soda and water. If terminals and cable connections are corroded, disconnect and clean in same manner as the battery. When battery is excessively dirty, remove connections and steam clean if possible. After a thorough cleaning and drying, apply a thin coat of petroleum jelly or other protective grease to connections.

NOTE - Oil should not be used on leads or connections as most insulating materials are softened and disintegrate with oil, thereby permitting arching to occur.