WTCS Risk & Loss Control Committee
Recommendation for

Lead Acid Battery Maintenance and Safety Protocol

Published 1/2010

NOTE: The WTCS Risk & Loss Control Committee meets quarterly to assist in developing minimum recommendations regarding environmental, health and safety policies. One such recommendation is provided below and is being forwarded to the WTCS Risk Managers as a resource for their respective District

Lead Acid Battery Maintenance and Safety Protocol

General:

Lead-acid batteries are physically large batteries that contain lead plates in a solution of acid to create electricity. They are a common power source for many applications; mostly cars, boats, standby power generators. Each year a state employee is injured during the operation and maintenance of these batteries. Nationally, 2300 people are injured each year using lead acid batteries. Acid burns to the face and eyes comprise about 50% of these injuries as these batteries can easily explode. The remaining injuries were mostly due to lifting or dropping batteries as they are quite heavy.

Lead-Acid battery Basics:

- The electrolyte is a solution of sulfuric acid (35%) and water (65%). This solution can cause chemical burns to the skin and especially to the eyes.
- During normal operation, water is lost from a non-sealed (or flooded) battery due to evaporation.
- During charging, lead acid batteries produce hydrogen and oxygen gases (highly flammable/explosive) as electrolysis occurs.
- Many lead acid explosions are believed to occur when electrolytes are below the plates in the battery and thus, allowing space for hydrogen/oxygen to accumulate. When the battery is engaged, it may create a spark that ignites the accumulated gases and causes the battery to explode.

Standard Precautions:

- Always store or recharge batteries in a well ventilated area away from sparks or open flames
- Damaged lead acid batteries shall be kept in properly labeled acid-resistant secondary containment structures.
- Use only chargers that are designed for the battery being charged.
- Always keep lead acid battery vent caps securely in place.
- Do not store acid in hot locations or in direct sunlight.
- Pour concentrated acid SLOWLY into water; do not add water into acid.
- Use nonmetallic containers and funnels.
- If acid gets into your eyes, flush immediately with water for 15 minutes, and then promptly seek medical attention.
- If acid gets on your skin, rinse the affected area immediately with large amounts of water. Seek medical attention if the chemical burns appears to be a second degree or greater.
- Never over charge a lead acid battery and only replenish fluid with distilled water.
- Emergency wash stations should be located near lead-acid battery storage and charging areas.
- Prevent open flames, sparks or electric arcs in charging areas.

Any questions on the above information, please contact the DMI Risk and Loss Control Consultant at: 414-403-9343 or tim@districtsmutualinsurance.com.

NOTE: Many WTCS Districts have in place a variety of policies/activities to address various environmental, health and safety programs. This information is intended to provide "guidance" and not strict policy as Districts look at their needs and dynamics. The subject information, and documents found on the Districts Mutual Insurance (DMI) website may be used to develop program requirements by other Districts, however, there is no guarantee of completeness or inclusion of all possible factors and situations present within each District. For questions, contact: Tim Greene, DMI Risk and Loss Control Consultant at tim@districtsmutualinsurance.com or (414) 403-9343.

- Lead-acid storage and charging areas should be posted with "Flammable - No Smoking" signs.
- Neutralize spilled or splashed sulfuric acid solution with a baking soda solution, and rinse the spill area with clean water.

What to do when servicing batteries:

- Keep metal tools and jewelry away from the battery.
- Inspect for defective cables, loose connections, corroded cable connectors or battery terminals, cracked cases or covers, loose hold-down clamps and deformed or loosed terminal posts.
- Replace worn or unserviceable parts.
- Check the state of charge of non-sealed and sealed batteries with an accurate digital voltmeter while the engine is not running, and lights and other electrically-powered equipment are turned off. Also check the electrolyte levels and specific gravity in each cell of non-sealed batteries.
- When checking the electrolyte liquid levels of the batteries use a rated flashlight that is intrinsically safe. In the event one is not available, Use a plastic/non metallic flashlight, turn on the flash light prior to getting near the battery when checking cell levels and turn off the flash light when you are away from the batteries.
- Follow the battery manufacturer's recommendations about when to recharge or replace batteries.
- Tighten cable clamp nuts with the proper size wrench. Avoid subjecting battery terminals to excessive twisting forces.
- Use a cable puller to remove a cable clamp from the battery terminal.
- Remove corrosion on the terminal posts, hold-down tray and hold-down parts.
- Use a tapered brush to clean battery terminals and the cable clamps.
- Wash and clean the battery, battery terminals, and case or tray with water. The corrosive acid can be neutralized by brushing on some baking soda (sodium bicarbonate) solution. If the solution does not bubble, the acid is probably neutralized. Rinse the battery with water to remove the baking soda solution.
- To prevent shocks, never touch or come in contact with both terminals at the same time. If baking soda solution is applied with a cloth, remember that these solutions can conduct electricity.
- When battery cables are removed, ensure that they are clearly marked "positive" and "negative" so that they are reconnected with the correct polarity.
- Use a battery carrier to lift a battery, or place hands at opposite corners. Remember, batteries can weight 30 to 60 pounds, so practice safe lifting and carrying procedures to prevent back injuries.
- Use a self-leveling filler that automatically fills the battery to a predetermined level. Never fill battery cells about the level indicator.
- Do not squeeze the syringe so hard that the water splashes acid from the cell opening.

Required safety equipment in the battery recharging area:

- Plumbed tepid water safety shower and eyewash station.
- Personal or Portable eyewash stations may be installed in the area immediate to the battery charging, if plumbed units cannot be installed. However, plumbed tepid water wash stations must be installed nearby to facilitate the required flushing of the eyes and skin.
- Non-vented safety goggles
- Face shield (considered secondary safety protection)
- Acid resistant gloves (neoprene is sufficient)
- Apron (If there is a potential to spill acid)
- Steel-toe boots or foot guards if the battery is lifted

Forklift Battery Information:

- Another style of battery used in Fork Lifts is the nickel-iron battery. It also has the same hazards as the lead-acid battery.
- To protect against the danger associated with the battery's weight, the batteries should only be removed and replaced from the forklifts using an appropriately equipped forklift or battery cart specifically designed for transporting batteries.

- Batteries being removed should be securely placed and restrained in the cart or forklift to avoid dropping the battery.

Sources for more information:

1. 29 CFR 1910.178, Powered Industrial Trucks
2. 29 CFR 1910.151, Medical Services and First Aid
3. ANSI/ASME B56.1-1993, Safety Standards for Low Lift and High Lift Trucks
4. ANSI/NFPA 505, Powered Industrial Trucks Including Type, Area Use, Maintenance and Operation.
5. Powered Industrial Truck Owner's Manual
6. ANSI Z358.1 – 2004 Compliance Check List