# Lead-Acid Batteries

## What's at Stake?

Electric forklifts produce zero emissions, virtually eliminate the hazard of carbon monoxide poisoning, and run more quietly than internal combustion forklifts. However, the lead-acid batteries used to power these forklifts present four serious, and potentially life-threatening hazards.

## What's the Danger?

There are four main dangers to be concerned about when it comes to battery changing and charging:

1. Weight – Forklift batteries are very heavy and may weigh up to 900 kg (2,000 lbs.) or more. When the batteries are suspended or being moved by battery handling equipment there is the potential to be struck-by or crushed-by the battery.
2. Corrosive Liquids – Sulfuric acid is the acid used in lead-acid batteries and it is corrosive. If you come in contact with sulfuric acid when pouring it or when handling a leaky battery, it can burn and destroy your skin, eyes, respiratory tract and your digestive system.
3. Explosive Gases – Without proper ventilation, the hydrogen gas batteries emit during the charging process can build up to dangerous levels and cause fire or an explosion.
4. Electrical Hazards – Active battery cells hold an electrical charge that can short circuit if you touch them. This can cause serious burns. Electrical arcing also increases the chance of explosion.

## How to Protect Yourself

Only charge and change batteries in specially designated battery rooms or areas. A properly equipped battery charging and changing area will have the following items, among others:

- Warning signs posted – i.e. No Smoking.
- A dry chemical, CO2 or foam fire extinguisher and other emergency equipment such as an emergency shower and eyewash.
- Soda ash, water, or other neutralization materials for flushing and neutralizing spilled electrolyte.
- Adequate ventilation to prevent the build up of hydrogen gas.

When charging or changing batteries do these steps first:

- Safely position the truck and apply the brakes.
- Don’t allow sparks, open flames or electric arcs – this means no smoking, removing metal jewelry and keeping tools and other metallic objects out of the area and away from the top of uncovered batteries.
- Use a battery extractor or other suitable material handling equipment to lift and move a battery.

Next, check the following:

- Electrolyte and water levels. Do this before beginning active charging, but don’t add water until after charging.
- The voltage. If the battery has sealed vents, do not recharge with a current greater than 25 amperes.

Before connecting or disconnecting the clamp connections:

- Unplug and turn off the charger first.
- Then attach the positive clamp, usually red, to the positive terminal first and then the negative clamp, usually black, to the negative terminal.

Be alert:

- If the battery becomes hot or the electrolyte fluid comes out of the vents, turn off the charger and restart charging at a lower charging rate.
- Do not overcharge a battery.

Then:

- Check the water level after charging and add distilled or de-ionized water if needed.
- Remember! When mixing the electrolyte, always **pour acid into water**, not the other way around and pour slowly.
    - Because of the reactive properties of sulfuric acid, the water in a strong acidic solution can boil and fizz, creating spillover.
    - When acid is poured into water, the solution is weaker, and the risk of spilling electrolyte is reduced.

The right PPE:

- Wear rubber or neoprene gloves and apron, acid-resistant safety shoes or boots, safety goggles, and a face shield when watering and changing batteries, and during cleaning and neutralizing acid spills.
- If you wear contact lenses, you must wear chemical splash goggles during battery charging.
    - If acid were to splash into your eye, the contact lens could hold the acid to your eye, making it more difficult to flush the acid away and causing more serious eye damage.

## Final Word

Lead-acid battery safety is a mixed bag of hazards but with the right set-up, safe work practices, and PPE it’s possible to work safely with them during charging and changing.