

HEALTH & SAFETY

THE GREAT
CANADIAN

**BATTERY
DRIVE**

1.0 HAZARDS

Vented lead acid batteries are commonly called “flooded”, “spillable” or “wet cell” batteries because of their conspicuous use of liquid electrolyte. These batteries have a negative and a positive terminal on their top or sides along with vent caps on their top. The purpose of the vent caps is to allow for the escape of gases formed, hydrogen and oxygen, when the battery is charging. During normal operation, water is lost due to evaporation. In addition, the vent caps allow water and acid levels of the battery to be checked during maintenance.

The main hazards associated with lead acid batteries are:

1. **Chemical (corrosive) hazards**
2. **Risk of fire or explosion**
3. **Electrical shocks**
4. **Ergonomic hazards related to their heavy weight**
5. **Transportation hazards**

Acid burns to the face and eyes comprise about 50% of injuries related to the use of lead acid batteries. The remaining injuries were mostly due to lifting or dropping batteries as they are quite heavy.

2.0 CHEMICAL HAZARDS

2.1 Sulphuric Acid

Lead acid batteries are usually filled with an electrolyte solution containing sulphuric acid. This is a very corrosive chemical ($\text{pH} < 2$) which can permanently damage the eyes and produce serious chemical burns to the skin. Sulphuric acid is also poisonous, if swallowed. The lead alloys found in batteries are also harmful to humans and can also seriously damage the environment. When working with battery acid, the following precautions must be taken:

- Wear the proper personal protective equipment (PPE), specifically splash proof goggles, acid resistant lab coat or apron, safety shoes and rubber gloves. A face shield must also be worn when refilling batteries with electrolytes.
- Know where the emergency showers and emergency eyewash stations are located; they must be located near lead acid battery storage and charging areas.
- Slowly pour concentrated acid into water; do not add water to acid. (warning: electrolyte will become hot; do not close battery vents until electrolyte has cooled down)

- Use non metallic containers and funnels.
- Ensure neutralizers (e.g. baking soda) are available for immediate use.
- Use extreme care to avoid spilling or splashing the sulphuric acid solution

2.2 Electrolyte Spill

In the event of a minor electrolyte spill, consult the appropriate Safety Data Sheet (SDS) for electrolyte spill containment, clean up and disposal details. Always ensure to wear adequate protective clothing (goggles, closed shoes and gloves) during clean up of spills. In case of a small electrolyte spilled, you should:

- Contain the spill with absorbents such as universal pads, hazmat pads, sand, earth or vermiculite.
- Remove the absorbents once it has soaked up the acid/electrolyte.
- Clean up spilled acid safely with an acid neutralizer and then with large volumes of water to rinse the area.
- Safely dispose of any contaminated material as chemical waste by contacting
- Advise your supervisor and complete an Injury report.

In the event of a large acid electrolyte spill:

1. Advise and warn coworkers.
2. Evacuate the area immediately.
3. Restrict the access to the area.
4. Notify your immediate supervisor, providing them with the following information:
 - Location of the spill
 - Name of hazardous material
 - Quantity involved
 - Related health risks and precautions to be taken

Provide the Safety Data Sheets (SDS) or appropriate documentation.

2.3 First Aid Measures

Contact with skin

- Flush the contaminated area, as quickly as possible, with gently flowing lukewarm water for at least 30 minutes; if any irritation persists, repeat flushing
- Under running water, remove contaminated clothing, shoes and other leather goods (e.g. watchbands, belts); discard any contaminated clothing, shoes, etc.
- Seek medical treatment if required.

Contact with eyes

- Immediately flush the contaminated eye(s) with gently flowing lukewarm water for at least 30 minutes while holding the eyelid(s) open.
- If any irritation persists, repeat flushing and seek medical treatment immediately



2.4 Bad Odors

Overcharging a vented lead acid battery can produce hydrogen sulfide (H₂S). The gas is colorless, very poisonous, flammable and has the odor of rotten eggs. Being heavier than air, the gas accumulates at the bottom of poorly ventilated spaces. Although noticeable at first (olfactory detection between 0.0010.13 ppm), the sense of smell deadens the sensation with time and potential victims may be unaware of its presence. When the odor is detected, one must turn off the charger, vent the facility and stay outside until the odor disappears.

3.0 FIRE & EXPLOSION HAZARDS

3.1 Hydrogen Gas

Vented lead acid batteries vent little or no gas during discharge. However, when they are being charged, they can produce explosive mixtures of hydrogen (H₂) and oxygen (O₂) gases, which often contain a mist of sulphuric acid. Hydrogen gas is colorless, odorless, lighter than air and highly flammable.

Oxygen is an oxidizer than can promote the burning or explosion of flammable and combustible materials. The mixture of two parts hydrogen to one part oxygen produced is perfect for an explosion. If area ventilation is poor or the charging batteries are enclosed, the escaping hydrogen creates an explosive atmosphere around the battery.

4.0 ELECTRICAL HAZARDS

4.1 Electrical Shocks

Exposed terminals, even on disconnected batteries, present an electrical shock hazard. Batteries contain a lot of stored energy. Some battery systems are capable of discharging at extremely high rates of current. Accidental shorting of terminals or cables can result in severe electrical arcing, causing burns and electric shock to nearby personnel. Most batteries produce quite low voltages, and so there is little risk of electric shock. However, some large batteries produce more than 120 volts DC. Strictly follow all manufacturer's instructions when installing or maintaining battery systems.

Mainly:

- Do not allow conductive material to touch battery terminals. A dangerous short circuit may occur and cause battery failure and fire. If installed batteries are at risk of metal tools or other conductive materials touching terminals, then the terminals should be insulated.
- When batteries are stacked or palletized, cardboards must be placed between layers of stacked batteries, to avoid damage and short circuits (see Fig.1)
- Tools or cables should not be placed on batteries or in an area where they can fall onto the terminals.
- Only insulated tools should be used.
- When working on batteries, workers must not wear items of jewelry (e.g. watches, rings) as they may short out the terminals.
- Use an appropriate strap or cradle to carry batteries. Never carry them by their terminal posts.

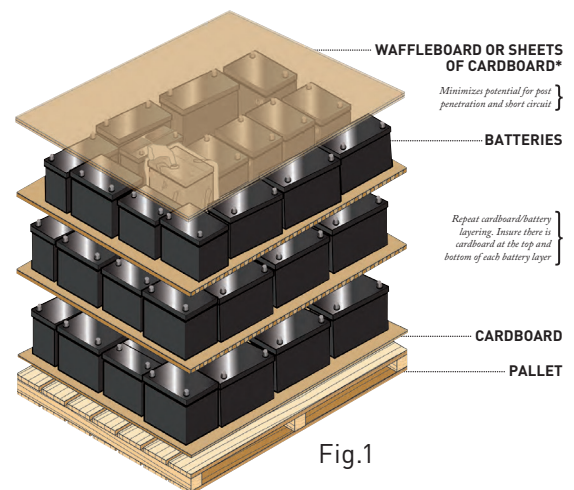


Fig.1

5.0 ERGONOMIC HAZARDS

Most lead acid batteries are heavy; the average weight for a car battery is 17 kg (39 lbs.) and more than half of the weight is lead. Industrial batteries used to power mobile equipment can weigh upwards of 680 kg (1,500 lbs.). Due to the heavy weight of these types of batteries, correct lifting, handling and transportation procedures should be followed to avoid any injuries:

- Get your body as close as possible to the battery before lifting or lowering it.
- Bend your knees slightly before lifting or lowering the battery.
- Do not lift a heavy battery alone ask for help from a coworker or use a lifting device.
- Use the battery carry straps to lift or carry a battery; battery carrier straps can be purchased
- Carry the battery close to your body and at the center of your body.
- Do not twist; first lift the battery and then move your feet to move the battery.
- Watch for slippery floors and obstructions as you move.
- When carrying the battery, avoid tilting it and wear appropriate protecting clothing (lab coat, smock or apron)

6.0 TRANSPORTATION

When transporting waste vented lead acid batteries make sure all the batteries are not damaged or leaking. Essentially, waste batteries should be in good physical condition and free

from any visual damage. Leaking or damaged batteries should be transported in a spill proof plastic tub or placed in to a sealed plastic bag to contain any leaking or residual acid.

7.0 WASTE VENTED LEAD ACID BATTERIES

Heavy metals found in lead acid batteries are toxic to wildlife and can contaminate food and water supplies. Sulphuric acid electrolyte spilled from lead acid batteries is corrosive to skin, affects plant survival and leaches metals from other landfilled garbage. Therefore, lead acid batteries are considered as hazardous waste and shall not be placed into regular garbage. Even though the battery components are recyclable, vented lead acid batteries shall not be placed into regular battery recycling boxes (Call2Recycle).

