

CHARGING PLANT VEHICLE BATTERIES SAFELY

Introduction

Every year in the UK, at least 25 people are seriously injured when using lead/acid batteries (referred to as batteries) at work. This toolbox talk has been developed to give a basic introduction to working safely with batteries and minimising the risks involved.

Batteries are used to store electrical energy. Many of the things we use every day rely on the instant power provided by batteries. However, the larger batteries found in workplaces can be dangerous and may explode if used incorrectly.

Injuries from batteries include serious chemical burns to the face, eyes and hands, and wounds from flying pieces of metal and plastic. Burns from metal objects that have become very hot or have exploded after short-circuiting the battery's terminals occur frequently. Serious electric shocks and burns are common in accidents involving high-voltage battery packs.

Hazards

Chemical

Batteries are usually filled with solutions (electrolytes) containing either sulphuric acid or potassium hydroxide. These very corrosive chemicals can permanently damage the eyes and produce serious chemical burns to the skin. Sulphuric acid and potassium hydroxide are also poisonous if swallowed.

The lead, nickel, lithium or cadmium compounds often found in batteries are harmful to humans and animals. These chemicals can also seriously damage the environment.

Explosion

Hydrogen and oxygen are usually produced inside a battery when it is being charged. A source of ignition – for example, a flame, a spark, a cigarette or any hot object, electrical equipment, a mobile phone – will often cause mixtures of these gases to ignite and explode. The explosion is often so violent that it shatters the battery and produces a highly dangerous shower of fragments and corrosive chemicals.

Hydrogen and oxygen are produced more quickly as the battery gets close to being fully charged. If you continue charging after the battery is fully charged, a lot of gas will be produced, greatly increasing the risk from explosion.

During charging, gas bubbles often become trapped inside the battery. The mixture of two parts hydrogen to one part oxygen produced is perfect for an explosion.

When a vented battery is moved, the trapped gases are released into the air around the battery. A tiny spark is all that is needed to ignite the gases. If this happens in a confined space (eg inside the battery, or in an enclosure or a poorly ventilated battery room), a violent explosion is likely.

The gases that come out of a vented lead/acid battery during charging often contain a fine mist of sulphuric acid. Take care to avoid breathing these fumes, and wear suitable eye protection.

Valve-regulated ('maintenance-free') batteries are much less likely to release hydrogen than vented batteries. However, it is still important to take care when charging them. Gas pressure may build up inside the battery if it is charged too quickly or for too long. If this happens, the pressure relief valves in the battery may open and let the gases escape. An explosion is likely if this happens close to an ignition source.

Work Safely!

Remember

When working with or near batteries, and also when moving or handling them:

The Dos

- Wear gloves and suitable eye protection, preferably goggles or a visor.
- Wear a plastic apron and suitable boots when handling battery chemicals such as sulphuric acid or potassium hydroxide.
- Empty your pockets of any metal objects that could fall onto the battery or bridge across its terminals.
- Keep sources of ignition – such as flames, sparks, electrical equipment, hot objects and mobile phones – well away from batteries that are being charged, have recently been charged, or are being moved.
- Use suitable single-ended tools with insulated handles.
- Fit temporary plastic covers over the battery terminals.
- Charge batteries in a dedicated, well-ventilated area.
- Share the load with a workmate when lifting batteries – they can be very heavy.
- Use insulated lifting equipment and check there are no tools, cables or other clutter you could trip on.
- Wash your hands thoroughly after working with batteries, especially before eating, smoking or going to the toilet.

The Don'ts

- Work with batteries unless you have been properly trained.
- Smoke.
- Wear a watch, ring, chain, bracelet or any other metal item.
- Overcharge the battery – stop charging as soon as it is fully charged.

Charging

Explosive gases are given off when batteries are charged. The risk of an explosion is great if the gases are allowed to collect. When charging batteries, follow the procedure below:

Getting ready

- Make sure you understand the battery manufacturer's instructions on charging.
- Always use a dedicated, well-ventilated charging area and make sure that the batteries are placed on a non-conductive surface ie wooden bench or rubber mat etc.
- Do not smoke, carry out hot work (eg welding, brazing, grinding), or use a mobile phone in the charging area.
- Do not charge batteries below electric lights or other equipment that could be an ignition source.
- Check that the charging equipment is suitable for the battery, eg correct voltage and charging rate.

Charging Process

- Raise the lid or open the doors of the battery compartment before starting to charge the battery. This will help to prevent an explosive mixture of gases building up.
- Before starting to charge a vented battery, check that the electrolyte level is just above the tops of the plates in all the cells. Top up the cells with distilled or deionised water if the level is too low.
- Make sure the charger is switched off before connecting the charging leads to the battery (unless the charger manufacturer specifies a different procedure).
- Connect the charger's positive (+) lead to the battery's positive terminal and the negative (-) lead to the negative terminal.
- Check that the charging leads are securely clamped in position before switching on the charger.
- Never charge the battery faster than the battery manufacturer's specified maximum charging rate.
- Do not remove or adjust the charging leads while the charger is switched on. Always switch it off first.
- Switch off the charger before disconnecting the charging leads from the battery (unless the manufacturer's instructions specify otherwise).
- Allow a vented battery to stand for at least 20 minutes after disconnecting it from the charger.
- Carefully top up the electrolyte with distilled or deionised water to the manufacturer's recommended level.
- Store the charging leads so that the uninsulated parts do not rest against each other or any earthed metalwork. This will prevent short-circuiting if the charger is switched on suddenly.

Details of the working life of each battery must be recorded: eg installation date, charging performance, volume of water added to which cell.

Some equipment is capable of carrying out 'fully controlled charging'. Here, the charging current is automatically reduced as the battery gets near to being fully charged. This type of equipment greatly reduces the risk of overcharging and so makes charging much safer.

QUESTIONS – (there may be more than one correct answer)

		A	B	C
1	Don't work with batteries unless:	You know it's flat	You have been authorised	You have been properly trained
2	What explosive gas is given off when a battery is being charged?	Carbon dioxide	Oxygen	Hydrogen
3	What minimum time should you allow a vented battery to stand after disconnecting it from the charger?	20 minutes	5 minutes	24 hours
4	To prevent a build up of explosive gases, battery charging areas should:	Have a warning notice posted	Have a dry powder fire extinguisher available	Be well ventilated
5	Smoking and other ignition sources near battery charging areas:	Are strictly prohibited	Are restricted to daylight hours	Are allowed if we are very busy

