



LARGE USED BATTERIES

SAFETY GUIDELINES

Summary

DISCLAIMER STATEMENT

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Safety & Logistics Group

How to safely handle, transport, collect and store large, used batteries

What is a large, used battery?

This guide uses the definitions developed for the B.I.G. product stewardship scheme design. Broadly, large batteries are those used for stationary energy storage or in electric and hybrid vehicles. The product stewardship scheme design defines these a bit more precisely, and lists the types of vehicles and applications that are considered to use large batteries.

If they do not fall into one of the specified uses, a battery may be considered 'large' if the unit is over a threshold weight of 5kg or if it requires specialist removal and handling.

A 'used' battery is one that has reached the end of its first life and may then be recycled or used in a different vehicle, application, or at a different site.

Simple rules for managing large, used batteries



1. Know the risks and act appropriately.



4. Know the signs of a damaged or defective battery.



2. Get batteries checked for safety before transportation, storage or reuse.



5. Call emergency services if things go wrong.



3. Ask yourself if you are qualified for the task and/or if you have the right set up for these activities. If not, get a professional.



What are some of the main risks of large, used batteries?



Fire



Physical injury from trying to lift or move large batteries



Chemical spills and burns



Exposure to toxic components like lead or cadmium



Electrocution



Get large, used batteries checked for safety by a professional before transportation, storage, or reuse

A large used battery has been used before and has reached the end of its first life. This may be for performance reasons that do not raise safety concerns, but sometimes it will be because the battery is damaged or defective.

It is not always obvious when a battery is damaged or defective. Some of the safety risks increase if a large, used battery turns out to be damaged or defective.

All large, used batteries should have their state of safety assessed against the battery manufacturer's safety criteria before they are transported, put in storage, or sent for recycling or reuse.



Who is qualified to make a state of safety assessment?

Battery state of safety assessments should be carried out by a technical expert— such as an electrician, electrical engineer, or certified high-voltage expert—with knowledge of the battery's safety features, or a person trained in these areas for the purpose of assessing battery safety.



Signs that a battery is damaged or defective

A battery may be damaged or defective if it shows any of the following signs:

- The battery casing is visibly deformed or miscoloured, or the battery is open or partially disassembled.
- Leaking fluid.
- Emitting an unusual smell.
- Changing shape, e.g. swelling or bulging.
- Overheating.
- Making a hissing sound.
- Visible crystallisation or white powder formation.
- Signs of water or fire damage (i.e. water stains or char marks).



What you should do with damaged or defective batteries

- **Call emergency services immediately.**

If possible:

- **Put the battery in a fireproof container** (see page 8).
- **Clear the surrounding area**, either:
 - Move the battery into a separate room with non-combustible building materials (e.g. concrete walls) or take it outside, well away from any structures; or
 - Clear the area surrounding the battery of other objects, including removing any nearby source of heat and electricity.
- **Evacuate any people from the area.**



Only qualified professionals should undertake certain tasks, following the manufacturer's guidelines

Unless you are a qualified person, do not:

- Attempt to remove a battery from an electric vehicle (EV).
- Attempt to de-install an energy storage system (ESS) battery.
- Open, break down, dismantle, or disassemble a battery pack, for example, to replace cells or modules.

Any of these activities, if done incorrectly or without appropriate equipment, can result in electrocution, fire, chemical or acid spills, and serious personal injury or death.

A qualified person is someone with a knowledge of the battery system who is also:

- an electrician or electrical engineer;
- a certified high voltage expert; and/or
- a person specifically trained in these areas or certified by the manufacturer to undertake the relevant task, such as refurbishing or recycling batteries, or servicing and replacing ESS or EV battery systems.

Extra guidelines for qualified people

1. When refurbishing batteries or removing them from an ESS or an EV, always source and follow the relevant manufacturer's instructions, dismantling manuals or guidelines.
2. Make sure you have the appropriate Personal Protective Equipment (PPE) and that all tools are properly insulated. Avoid wearing metal jewellery, exposed metal zips, watches and other conductive items.
3. When removing an EV or ESS battery, place high voltage safety signs on the ESS or EV, and set up cordons and safety notices to prevent unauthorised personnel entering the area.
4. If removing a battery from an EV that has been involved in a moderate to severe crash, flood, fire or other event, clear the area surrounding the car before a qualified person removes the battery.

If possible:

- Place the car on a forklift and move it to an outside area away from any other cars or other objects.
 - Put the removed battery in a fireproof container (see page 8) or in a cleared area away from other combustibles, at least 15m away from a building where there are human activities.
5. Refer to the manufacturer's instructions for the appropriate person to contact to remove and transport the battery.

I would like to Reuse an EV Battery for an ESS—is that safe?

Before reusing a large, used battery—for example, reusing an EV battery for a domestic ESS—or seeking to on-sell a large, used battery for reuse, the battery must be verified as safe for reuse after having its state of safety assessed by a person who is qualified or accredited to make such an assessment.

Be careful when handling or moving large, used batteries

If large, used batteries suffer mechanical abuse they can short circuit, ignite or emit noxious gases, substances and liquids. Large batteries can also be heavy, so lifting them can cause injury. To protect human and environmental health, exercise caution when handling or moving batteries by taking the following steps:

General handling precautions

1. Do not crush, drop, throw, or puncture a battery, or expose large, used batteries to shock or vibration.
2. Do not handle batteries with exposed terminals (unless you are a qualified person) and do not allow battery terminals to contact the terminals of other batteries.
3. Insulate terminals and electrical contacts with electrical tape or other safe and suitable means of assuring electrical safety.

Moving or lifting batteries

1. When preparing to move a large battery, follow Worksafe's Code of Practice for Manual Handling on the Worksafe website. Use correct lifting procedures to avoid risk of injury. It is better to move a large battery with more than one person.
2. If available, consider moving a battery with a suitably weight rated trolley or lift. Any workplace that collects, stores, transports or processes batteries should have procedures and training for forklift operators.



Correct lifting procedures:

bend your knees, use a whole hand grip, have a secure footing and a wide stance, keep the load close to your body, and do not twist or bend sideways.

Transporting large, used batteries

Large, used batteries are classified as Dangerous Goods under both international and New Zealand law, meaning their transportation is regulated. There are rules about how to transport them, who should do it, and how they should be packaged, labelled, handled, separated, stowed and inspected.

Individuals can transport large, used batteries for the purpose of domestic or residential use. However, individuals still need to follow the majority of the dangerous goods rules (with only some exceptions).

To reduce risk of non-compliance and/or injury or incident, large, used batteries should be transported by professionals who are certified to transport dangerous goods. More information about transporting large, used batteries can be found in the full safety and logistics guidelines.



How can I safely collect and store large, used batteries?

Preparing batteries for storage

- Always store batteries in accordance with the manufacturer's recommendations.
- Cover all terminals with electrical insulating tape.
- For EV batteries, remove the service plug and cover the socket with high voltage insulation tape.
- For lithium-ion batteries, store them at a reduced state of charge.
- Keep batteries of different chemistry types segregated—do not store them together.
- You can stack multiple batteries of the same chemistry type together on a wrapped pallet. Place a layer of non-conductive material between each battery (such as high voltage insulation mat), and strap the batteries to the pallet so that they cannot move, using strapping without metal buckles or connectors.
- Do not stack batteries or pallets of batteries higher than 2m.

What is the right type of location to collect or store multiple large, used batteries?

If are collecting and storing multiple large, used batteries, the facility or building in which you do this should be appropriate, reflecting the level of risk. The facility should conform with these basic criteria:

- Cool, dry and under cover, protected from direct sunlight, water, humidity and any water condensation, and away from any source of heat or ignition.
- Protected from extreme and fluctuating temperatures and well ventilated.
- Bunded with impermeable surfaces and weatherproof coverings to retain any contaminated run-off, e.g. heavy metals.
- Fitted with fire detection and suppression equipment, such as fire and some detectors, infra-red cameras, automatic sprinkler protection, fire extinguishing media (e.g. CO₂, sand, vermiculite, copper powder, sodium bicarbonate), and fire extinguishing systems (e.g. hydrants).

- Fitted with personal protective equipment and first aid kits in designated, clearly marked locations.
- Fitted with a sacrificial roof if the storage area is enclosed.
- Of fire rated construction so that any fire can be contained.

What other precautions should I take to store large, used batteries?

1. Make sure any facility where large, used batteries are collected or stored has appropriate signage, including relevant danger class labels and UN Numbers.



2. Make sure batteries of different chemistry types are stored separately.
3. Make sure any damaged or defective batteries are stored separately, in clearly labelled fireproof containers.
4. Develop and implement a storage, fire and emergency management plan that outlines how you will prevent or manage a battery failure event. Consider developing the plan with a fire engineer, emergency services and/or the relevant regulatory authority.
5. Make sure any personnel employed on the premises are trained in:
 - the nature of the work and safe methods of operation
 - the properties and hazards of large, used batteries
 - the correct use of personal protective equipment, its care and maintenance; and
 - actions (including emergency procedures) to be taken in various emergencies.

What are fireproof containers and when should I have access to them?

Those who collect, store and transport large, used batteries are likely to have to deal with damaged or defective batteries at some point. A battery that is deemed damaged or defective is most safely stored and transported in a fireproof container.

Therefore, you should have access to appropriate fireproof containers if you:

- run a site where large, used batteries may be collected or stored, or
- undertake business that means you may have to transport large, used batteries.

An appropriate fireproof container could include:

- A bespoke container with an in-built smoke detector and automatic fire extinguishing system (you can find examples of these on the BIG website).
- Enclosed steel containers filled with non-combustible, non-conductive material, such as sand or vermiculite.

What to Do When Things Go Wrong: fire, electrocution and chemical leakage



If a battery pack starts smoking or is on fire

1. Call emergency services immediately.
2. Ventilate the affected area and avoid inhalation of fumes.
3. If possible:
 - remove and isolate the battery and compartmentalise the fire and maintain frequent checks;
 - use available fire extinguishers or water to cool and extinguish the fire, and take action to stop the fire from spreading by cooling the surrounding area with water; and
 - consider use of non-combustible products, such as sand or vermiculite.
4. If the fire of a burning battery cannot be extinguished, allow the pack to burn out on its own in a controlled and safe manner.
5. Reinstate fire protection systems after a battery fire has gone out.
6. **WARNING:** lithium batteries can reignite several days after an initial fire. A seemingly burnt out battery should be monitored for some time after the fire has been extinguished.
7. Only re-enter a building or site where a battery fire has occurred after the site has been professionally remediated.



If a person is exposed to high voltage from a battery

1. Turn off the power source, if possible.
2. Contact emergency services immediately.
3. If safe to do so, move the source away from you and the person (victim), using high voltage rescue hooks, or a dry, non-conducting object made of cardboard, plastic or wood.



If a battery pack leaks chemicals or electrolyte



1. Do not touch any fluids from a battery spill or leaking battery pack.
2. Use appropriate personal protective equipment (PPE), avoid contact with skin and eyes, ventilate the area and position yourself in the wind direction.
 - Appropriate PPE includes a protective mask for acidic vapours or a self contained breathing apparatus, neoprene gloves or equivalent, safety glasses with side-shields, boots, an apron, and long sleeved clothing.
3. Eliminate all possible sources of heat or ignition.
4. If safe to do so, prevent further leakage or spillage using:
 - a chemical spill kit;
 - an absorbent cloth or other inert absorbent non-conductive material mineral such as sand, sodium bicarbonate, alumina or vermiculite; or
 - dry clothes (provided there is no fire).
5. Do not allow material to contaminate ground water system. For example, establish emergency procedures to block or cover drains in the event of an emergency.
6. In the case of inhalation, skin contact, eye contact or ingestion of electrolytes, vapours or leaking battery fluids, seek immediate medical attention.



What to do after a battery fire or chemical leakage

Batteries emit toxic gases and liquids during a fire or chemical leakage event. Any water used to douse a fire or wash off battery fluid becomes toxic effluent. Measures must be taken to contain these toxic materials and remediate the site. It is recommended that qualified remediation professionals are brought in to do this work.

FOR MORE INFORMATION //

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