

BATTERY RECYCLING GUIDELINE

Storing, packing & safe
transport of mixed
batteries to recyclers

ACKNOWLEDGEMENTS

This Guide was prepared with the support of the Battery Stewardship Council (BSC). The BSC is the operator of B-cycle, Australia's official battery stewardship scheme which commenced on 1 January 2022.

ABRI works collaboratively with the BSC, to support safe and smooth operations for the B-cycle Scheme and ensure that we successfully reduce the 90% of mixed, portable batteries currently going to landfill in a safe and environmentally sound manner.

About the B-cycle Scheme

B-cycle is authorised by the Australian Competition and Consumer Commission and accredited by the Australian government. The Scheme has received start-up funding from all Federal, state and territory governments, and ongoing operations are being funded by industry through a levy paid by battery importers.

Rebates are available to B-cycle accredited Collectors, Sorters and Recyclers who are required to demonstrate safety, traceability, and recycling outcomes.

The B-cycle Scheme is not a recycling service in the traditional sense, it is a network of more than 100 organisations across Australia independently accredited by B-cycle. This enables Australians to choose to buy batteries from brands that are part of the solution, and to be confident that batteries being dropped off for recycling are collected and recycled in a safe and environmentally sound manner.

Battery Stewardship Council

Further information on BSC can be found at www.bsc.org.au



Further information on B-cycle can be found at www.bcycle.com.au



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1. PURPOSE OF THIS GUIDE

This Guideline supports companies participating in the collection, storage and transport of used handheld batteries to a battery recycler. It provides an overview of typical packaging, transport, storage and work safety obligations. The Guideline also provides a starting point on where to find the latest regulatory information.

Handheld batteries cover a range of different chemistries, including lithium-based batteries. This Guideline focuses on the requirements to manage mixed, used battery loads across four key activities:

1. Packaging of used batteries for storage and transport.
2. Planning approvals and environmental licensing, also known as permissioning, at a storage or processing facility.
3. Transport at any stage of the process, either directly to a battery recycler or to a consolidation point, such as a warehouse or sorting facility, and then on forwarding to a battery recycler.
4. Handling of batteries at all times during the battery recycling process (including collection, storage, transport and processing).

In this Guideline, the Australian Battery Recycling Initiative (ABRI) seeks to provide companies with an overview of the core aspects of managing each activity. However, circumstances will be unique to each business, and therefore, this Guideline should be used as a starting point only. Variations will depend on factors such as the business activities, site locations where batteries are collected and/or stored, state and territory regulations, and battery chemistry mixes. Each user of this Guideline must undertake their own risk assessment and due diligence, to identify the circumstances specific to their situation and the requirements that apply to their business activities.

The business providing transport and/or recycling services will be well placed to advise on individual packaging and transport requirements. Further information on management of new and used batteries can be found in a battery manufacturer or importer's product safety data sheet. B-cycle, Australia's battery stewardship scheme, also has a range of useful materials including a guideline on conducting risk assessments. Further information can be found at <https://bcycle.com.au/>

This Guideline is focused on land transport.

The information in this Guideline is valid at August 2022. However, regulations can change at any time, and you should check the relevant legislation and supporting instruments.

2. WHAT ARE USED MIXED, PORTABLE BATTERIES?

There is no commonly agreed definition and terminology can also refer to consumer or household batteries. This section provides an explanation of some terms which are useful for framing what may fall into the category of mixed, portable batteries.

Mixed batteries are loads of loose batteries that may contain any combination of the batteries in Table 01. This list is not exhaustive and provides a guide to common battery types.

Portable batteries¹ are batteries that are sealed, can be hand-carried without difficulty, are designed to be changed by the user of the equipment, and are not used for automotive or industrial purposes, which may often require specialists to install or remove. This excludes battery energy storage systems, which must also meet electricity safety installation and distribution network connection requirements.

Battery (electrode) chemistry is important for determining whether the batteries are considered Dangerous Goods (DG). DG refers to a specific international and Australian system to regulate goods which present a significant danger during their transport.² The relevant method for identifying DG is the United Nations (UN) classification system. The UN Classification system recognises the need for consistency in standardizing: criteria for identification of dangerous goods; and communication tools (such as labelling) to support safe global transport. The United Nations Economic Commission for Europe (UNECE) administers the UN classifications and the UN Model Regulations for transport of dangerous goods.³

¹ This definition is based on the EU Battery Directive. https://ec.europa.eu/environment/topics/waste-and-recycling/batteries-and-accumulators_en

² The terminology "hazardous goods" may also be heard in relation to the management of batteries. Hazardous goods definitions are generally driven by the chemical content of a battery and may apply around handling and safe work procedures. The terms hazardous and dangerous goods may be used interchangeably and therefore, always check the meaning and context.

³ Further information can be found here <https://unece.org/transport/dangerous-goods>

Table 01: Examples of types of portable batteries

Battery Chemistry	Examples	Usage Type	Comment	Un number* (Relevant for transport rules)
Alkaline, Zinc carbon, & Zinc oxide	Household batteries – often cylindrical AA, AAA, 9V & 6V lantern batteries. Some button batteries.	Single use / not-rechargeable	Not listed as dangerous goods. However, battery packaging, transport, storage and work safety practices should be applied to mitigate risks, given the potential environmental and human health impacts.	NA
Mercury oxide cells	Button batteries and power cell batteries.	Single use / not-rechargeable		NA
Nickel Cadmium (NiCd)	Household, portable power tools, torches, emergency lighting, and portable electronic devices batteries. Various shapes and less widely used AA, AAA, 9V, C & D.	Multiple use / rechargeable		NA
Nickel Metal hydrid (NiMh)	Consumer electronic devices, such as cellular phones, shavers, transceivers, computers, and other portable applications. Often cylindrical. AA, AAA, 9V, C & D.	Multiple use / rechargeable	Less detrimental to the environment than NiCd as it uses hydrogen rather than cadmium to support battery chemistry	3496 when transported by sea only, not classified as dangerous goods by road and rail (SP 117)

Battery Chemistry	Examples	Usage Type	Comment	Un number* (Relevant for transport rules)
Small, sealed lead acid batteries	Home alarm systems, toys, backup systems, workout equipment, generators. Variety of shapes. C, D, & some medical equipment.	Multiple use / rechargeable	Requires careful handling as lead based chemistry is dangerous to human health and the environment	2794, 2800
Lithium metal	Some lighting, medical equipment & hearing aid batteries. Button cell batteries.	Single use / not-rechargeable	Broad description for a family of batteries, including lithium alloy batteries	3090, 3091
Lithium ion	Mobile phone batteries, laptop batteries, modern power tools. Variety of shapes. AA & AAA.	Multiple use / rechargeable	Broad description for a family of batteries, including LCO (lithium cobalt oxide), lithium iron phosphate and lithium-ion polymer batteries	3480, 3481

*The UN Code determines packaging and transport requirements globally, and consequently impacts the Australian Dangerous Goods Code and relevant state/territory legislative frameworks (see section 5.1).

3. RULES GOVERNING PACKAGING, STORAGE, TRANSPORT AND WORK SAFETY

The regulatory framework for the packing, storing and transport of used batteries can broadly be understood as follows:

- ➔ Planning approvals and environmental licensing requirements for storage and waste management facilities, such as a warehouse and/or a consolidation site, will be informed by planning and environmental legislation and regulations in each state or territory. This may require a business undertaking these activities to apply for an environmental licence or permission. Any business and activity based at a business' premises may also need to comply with relevant state, territory and/or local government business activity and planning approvals.
- ➔ Transport is informed by the Australian Dangerous Goods Code (ADGC) in conjunction with relevant state or territory law. The purpose of the ADGC is to provide consistent technical requirements for the land transport of dangerous goods across Australia. The ADGC follows the United National Recommendations on the Transport of Dangerous Goods Model Regulations, while retaining Australian-specific provisions. Each state and territory implements the updated ADGC and associated updates to their dangerous goods transport regulations separately. Businesses must comply with their state/ territory-specific act and regulations and the ADG Code. A list of the relevant legislation can be found at <https://www.infrastructure.gov.au/infrastructure-transport-vehicles/transport-strategy-policy/transport-dangerous-goods/legislation-status>.
- ➔ Packaging may be informed by environmental and transport requirements. It may also depend on whether the batteries are being stored or transported. Using the packaging requirements for transport first may be a practical starting point for collection, as used batteries typically need to be transported to be processed or disposed of. There may be practical differences between storage and transport requirements. For example, when storing batteries, requirements may propose greater minimum distances between battery containers, than when transporting.
- ➔ Work safety requirements such as manual handling, use of personal protective equipment, and safe work procedures will apply to all activities, particularly to the management of hazardous goods. These will also be informed by the manufacturer and or importer's safety data sheet.

Questions to consider when examining the regulatory framework that applies to the storage, transport and packaging of used batteries in each state/territory are:

- ✓ What substances are you transporting? Are they dangerous goods? Are they hazardous substances? Are they both dangerous and hazardous?
- ✓ Are there volumes or other quantitative thresholds that apply to the amount you can store, package and/or transport?
- ✓ How long will items be stored?

A risk assessment will help identify your used battery mix and quantities.

4. PACKAGING

Packaging requirements will vary based on battery type and mix, and whether batteries are damaged. If in doubt about the battery mix and the state of the batteries, then a risk assessment should inform the optimal approach to selecting containers and packing batteries within those containers.

Use the following scenarios to consider required controls for packaging during transport:

1. No lithium batteries
2. One or more lithium batteries (not damaged)
3. One or more damaged lithium batteries.

The Australian Dangerous Goods Code provides detailed instructions for packing batteries. While these only apply to transport, they also provide a tool for packing stored used batteries. However, for storage of used batteries there may also be other requirements specific to your site and/or included in environmental and planning rules.

The instructions that apply to lithium batteries, packaged with or without other battery types, are:

1. Packing Instruction P909, which applies to transport of lithium metal and ion batteries for disposal or recycling. This applies to lithium-ion cells with a Watt-hour rating of more than 20 Wh, lithium-ion batteries with a Watt-hour rating of more than 100 Wh, lithium metal cells with a lithium content of more than 1 g and lithium metal batteries with an aggregate lithium content of more than 2 g.
2. Packing instruction P908 and P911, which applies to transport of damaged and defective lithium-ion cells. P911 provides additional instructions for highly dangerous lithium batteries.

The packaging instructions are governed by internationally agreed battery definitions known as UN numbers. The relevant UN numbers for lithium metal and ion batteries are:

Code	Battery
3090	Lithium metal batteries
3091	Lithium metal batteries contained in or packed with equipment
3480	Lithium-ion batteries
3481	Lithium metal batteries contained in or packed with equipment

The packaging instructions provide information on the following:

- ➔ Size of containers
- ➔ Packaging material required inside the containers to minimise fire risks
- ➔ Additional requirements such as protecting battery terminals
- ➔ Types of containers, such as drums, boxes and jerricans, and the features of the containers such as ventilation requirements. Internationally approved packaging containers will come with UN markings, shown below:



4.1 Additional guidance around packaging

While the packaging rules provide a good starting point for considering how to package used lithium-ion batteries for transport, they only form a small part of the process. The Australian Dangerous Goods Code also sets out generic container requirements and prohibitions around:

- ➔ Reuse of packaging, including age, quality, liner replacements, ventilation cap replacements, and labelling
- ➔ Container specifications
- ➔ Preventing short circuits and dangerous heat generation

5. STORAGE

Storage of used batteries at a consolidation site, such as a warehouse or sorting facility, are generally governed by planning and environmental regulatory arrangements set by each state or territory and planning approvals. Environmental regulators work closely with other government organisations, such as WorkSafe, and fire departments, to set the conditions of environmental approvals for on-site business activities. Any business activity for a site needs to be approved and consistent with local government planning, zoning and, where relevant, state/territory planning approval processes.

5.1 Environmental legislation and regulators

This section provides a list of the environmental legislation and regulators in each state and territory.

Environmental legislation is as follows:

- ➔ **Australian Capital Territory (ACT):** Environment Protection Act 1997
- ➔ **New South Wales (NSW):** Protection of the Environment Operations Act 1997
- ➔ **Northern Territory (NT):** Waste Management and Pollution Control Act 1998
- ➔ **Queensland (QLD):** Environmental Protection Act 1994
- ➔ **South Australia (SA):** Environment Protection Act 1993
- ➔ **Tasmania (TAS):** Environmental Management and Pollution Control Act 1994
- ➔ **Victoria (VIC):** Environment Protection Act 2018
- ➔ **Western Australia (WA):** Environmental Protection Act 1986

Regulatory authorities, who usually are responsible for licensing and administration of the legislation, are as follows:

- ➔ **Australian Capital Territory:** ACT Environment Protection Authority
- ➔ **New South Wales:** NSW Environment Protection Authority
- ➔ **Northern Territory:** NT Environmental Protection Authority
- ➔ **Queensland:** Queensland Department of Environment and Science
- ➔ **South Australia:** SA Environment Protection Authority
- ➔ **Tasmania:** Environment Protection Authority Tasmania
- ➔ **Victoria:** Environment Protection Authority Victoria
- ➔ **Western Australia:** Department of Water and Environmental Regulation

5.2 Licensing to undertake used battery storage and sorting

Generally, waste management activities, including sorting and storing used batteries, requires environmental approval. The type of approval is specific to the business activities and the materials on the site. An approval can be called a variety of names, such as a licence, permission or registration, and it may be developed in consultation with other agencies. Information on approvals, conditions of approval, and other requirements will be found on your state or territory's environmental agency website.

Factors to consider in undertaking storage and sorting of batteries include:

- ✓ Preparing a risk management plan
- ✓ Developing emergency and incident management procedures
- ✓ The availability of government guidelines and supporting materials
- ✓ Consulting with fire authorities and reviewing fire protection systems

5.3 Supporting materials to assist businesses

Government agencies may provide supporting materials - examples related to battery recycling are:

- ➔ **Australia and New Zealand National Council for Fire & Emergency Services** – Fire Safety in Waste Management Facilities, May 2022⁴
- ➔ **NSW** – Fire Safety Guideline – Fire Safety in Waste Facilities, February 2020⁵
- ➔ **Queensland** - Guideline – Prevention of fires in waste stockpiles, December 2020⁶
- ➔ **Victoria** - Management and storage of combustible recyclable and waste materials - indoor storage guideline, April 2020⁷
- ➔ **Victoria** – Storage and management of waste batteries – guideline, December 2021⁸
- ➔ **Western Australia** – Dangerous goods waste - safe storage and handling of dangerous goods in the waste industry⁹

⁴ AFAC <https://www.afac.com.au/auxiliary/article/fire-safety-in-waste-management-facilities>

⁵ NSW Fire & Rescue https://www.fire.nsw.gov.au/gallery/files/pdf/guidelines/guidelines_fire_safety_in_waste_facilities.pdf

⁶ Qld Department of Environment and Science https://environment.des.qld.gov.au/_data/assets/pdf_file/0024/222954/cm-gl-waste-stockpile-fire-external.pdf

⁷ Vic Country Fire Authority (CFA) https://search.cfa.vic.gov.au/mycfa/appsearch_ui_public/?q=CFA%20Publication%20%E2%80%93%20Management%20and%20storage%20of%20combustible%20recyclable%20and%20waste%20materials%20%E2%80%93%20indoor%20storage%20guideline&size=n_20_n

⁸ Vic Environment Protection Authority (EPA) <https://www.epa.vic.gov.au/about-epa/publications/2018>

⁹ WA Department of Mines, Industry Regulation and Safety https://www.dmp.wa.gov.au/Documents/Dangerous-Goods/DGS_IS_DG_WasteIndustry.pdf

6. TRANSPORT

The rules around transport of dangerous goods are prescriptive and are set out in the Australian Dangerous Goods Code (ADG). Some of these have been discussed in the packaging section above. The ADG Code lists provisions applicable to the transport of dangerous goods, including:

- ➔ Classification
- ➔ Packaging and performance testing of packaging for approval
- ➔ Use of bulk containers, IBCs, freight containers and unit loads
- ➔ Marking, labelling and placarding
- ➔ Vehicle requirements
- ➔ Segregation and stowage
- ➔ Documentation
- ➔ Safety equipment
- ➔ Procedures during transport emergencies
- ➔ The dangerous goods list with UN numbers

The ADG Code also contains an information guide and a section with frequently asked questions.

For operational advice in each state/territory:

Australian Capital Territory	Dangerous Substances Licensing, WorkSafe ACT
New South Wales	SafeWork NSW - For premises-based activities such as packaging approvals, labelling and classification
	NSW Environment Protection Authority - All other matters inc transport
Northern Territory	NT WorkSafe
Queensland	Department of Transport and Main Roads
South Australia	SafeWork SA
Tasmania	WorkSafe Tasmania
Victoria	WorkSafe Victoria
Western Australia	Resources Safety, Department of Mines, Industry Regulations and Safety



For the most up to date information, including contact email addresses and phone numbers, visit: <https://www.infrastructure.gov.au/infrastructure-transport-vehicles/transport-strategy-policy/transport-dangerous-goods/competent%20authorities>

7. WORK SAFETY

Always put safety first by using safe work practices



At all stages, including packaging, storage and transport of used batteries, work safety requirements must be considered. This includes manual handling rules, the need for personal protective equipment, and other work safety procedures and training requirements. Many batteries contain toxic substances which are dangerous to human health and the environment, and the risk assessment process should take these into account.

A manufacturer or importer's safety data sheet may contain useful information to inform work health and safety requirements. These data sheets contain information such as:

- ➔ Product information/specification
- ➔ Hazard identification
- ➔ First-aid measures
- ➔ Firefighting measures
- ➔ Accidental release measures
- ➔ Handling and storage, including how the chemical may be safely used
- ➔ Exposure controls and personal protection
- ➔ Physical and chemical properties
- ➔ Stability and reactivity
- ➔ Toxicological information
- ➔ Ecological information
- ➔ Disposal considerations
- ➔ Transport information

For further details, visit <https://www.safeworkaustralia.gov.au/safety-topic/hazards/chemicals/safety-data-sheets>.

8. DAMAGED BATTERIES

Damaged and leaking batteries present a higher risk during transport. Advice from your transporting company should be sought in this case. ADG Packing Instructions P908 and P911 specifically address the requirements for damaged or leaking batteries.

9. TRANSPORT BY AIR AND SEA

Used mixed batteries are not permitted to be transported by air due to the possible presence of lithium batteries.

Any sea freight must comply with international Dangerous Goods conventions, which vary from these instructions. More information is available at the Australian Maritime Safety Authority (www.amsa.gov.au) and the International Maritime Dangerous Goods (IMDG) Code.

9. B-CYCLE BATTERY RECYCLING GUIDANCE

B-cycle, Australia's battery stewardship scheme, has a range of practical tools and guidance documents available at www.bcycle.com.au including:

- ➔ Conducting a Risk Assessment Guidance
- ➔ Drop off Point Risk Assessment Safety Template

More information

For more information about battery recycling go to the Australian Battery Recycling Initiative website:

www.batteryrecycling.org.au

Check the website to make sure you have the most up to date version of these guidelines.

DID YOU FIND THIS GUIDANCE USEFUL?

If so, please consider joining ABRI to support the work we do to improve battery stewardship and recycling in Australia and internationally.

Disclaimer: The information provided here is general in nature and provided for educational purposes only. Organisations must do their own research to understand their legal obligations and to ensure that they are compliant with all relevant laws and regulations. ABRI does not accept responsibility for any loss or damage occasioned by any person acting or refraining from action as a result of reliance on this document.