Focus on: Lithium-Ion Batteries Under the Dangerous Waste Regulations

Figure 1: Portable lithium-ion batteries in power banks can become universal waste.

From cell phones and laptops to power tools and electric cars, rechargeable lithium-ion batteries power our everyday lives. However, if damaged or improperly managed at the end of life, lithium-ion batteries can cause fires, explosions, or release toxic metals into the environment. Businesses and other regulated dangerous waste generators are responsible for proper handling of wastes at their site, including lithium-ion batteries.

Note: These rules don't apply to households. Household hazardous wastes are excluded from the dangerous waste regulations pursuant to WAC 173-303-071(3)(c). Find a drop-off site by contacting your local household hazardous waste facility[1] or by visiting 1-800-Recycle[2] or Call2Recycle.[3]

When a battery becomes a waste

With repeated use, the chemical flow of charged ions in a battery break down, making the battery less effective and eventually unusable. Used batteries become waste at the end of their life. End of life means the battery will no longer be used for its intended purpose and includes when the battery is discarded, or a decision was made to discard the battery.

[1] https://ecology.wa.gov/FindSiteHHW
[2] http://1800recycle.wa.gov/
[3] https://www.call2recycle.org/locator/

Some used batteries can't hold enough charge for their original purpose but may still be repurposed for other applications. If you repurpose a battery, it isn't solid waste under WAC 173-303-017(2)(a)(ii).[4] For example, electric vehicle batteries taken out of service may no longer efficiently power a car, but they often still have about 70% of the original energy capacity and can be used for other applications. This includes reusing the batteries for energy storage in electrical grids and communications towers, as well as energy storage for solar farms, wind farms, and other renewable sources. Prior to reuse, the battery should be thoroughly inspected by a trained professional and cannot be damaged. Check with a licensed electrician and your local fire code official to ensure your energy storage system meets required codes.

Figure 2: Undamaged lithium-ion batteries may be repurposed in energy storage systems like solar farms.

Lithium-ion battery waste codes

Businesses and other regulated dangerous waste generators must determine whether any waste they produce is dangerous waste, including spent lithium-ion batteries. Waste lithium-ion batteries typically designate as ignitable and reactive dangerous waste (waste codes D001 and D003). However, if properly managed, generators may recycle batteries under the universal waste rules.[5]

What you should know about universal waste rules

Universal waste[6] includes a category of materials that technically designate as dangerous waste but are commonly generated, such as lamps, batteries, and mercury-containing equipment. The universal waste rules provide a simplified set of management standards to increase recycling rates and promote easier collection.

Sites that generate used batteries are called "universal waste handlers" and the regulations define two separate categories:

1. Small quantity handler
2. Large quantity handler (less common)

Large quantity universal waste handlers are subject to more rules than a small quantity handler. Learn more about determining your handler category.[7]

Any battery chemistry may be handled under the universal waste rules; however, some waste companies require you to separate batteries by type (such as alkaline, nickel metal-hydride, lithium, etc.) The universal

[4] WAC 173-303-017: https://app.leg.wa.gov/WAC/default.aspx?cite=173-303-017
[5] WAC 173-303-573: https://app.leg.wa.gov/WAC/default.aspx?cite=173-303-573
[6] https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Dangerous-waste-guidance/Common-dangerous-waste/Universal-waste
[7] https://ecology.wa.gov/regulations-permits/guidance-technical-assistance/dangerous-waste-guidance/common-dangerous-waste/universal-waste#LQH

waste rules also don't have battery size limits. Even large electric vehicle or electric bicycle batteries may be managed as universal waste.

If you manage batteries as universal waste, it means you **aren't** required to:

- Assign waste codes to waste batteries.
- Ship waste batteries on a Uniform Hazardous Waste Manifest.
- Count waste batteries towards your monthly generator category.
- Report waste batteries on your Dangerous Waste Annual Report.

To manage batteries as universal waste, you must follow several requirements, including:

- Send to another universal waste handler or destination facility[8] authorized to receive waste batteries.
- Accumulate waste batteries no longer than one year.
- If you're a large quantity handler, notify Ecology using our Notification of Dangerous Waste Site Identification (ID) Form.[9]
- Label or mark clearly with any one of the following phrases: "Universal Waste-Battery(ies)," or "Waste Battery(ies)," or "Used Battery(ies)."

Figure 3: You can use Ecology's free labels.[10]

- Immediately contain any releases and appropriately manage materials resulting from a release (e.g., absorbents, contaminated soils, etc.). See Best management practices for damaged, defective or recalled lithium-ion batteries below.
- Train all employees who handle or manage universal waste. Ecology offers guidance that could help you with training.
- Prevent releases by managing universal waste batteries safely (for instance, minimize breakage).

Best management practices for lithium-ion batteries

Separate and store waste lithium-ion batteries apart from other battery types.

Prevent the terminals from coming into contact by covering them with non-conductive tape, placing the batteries in separate plastic bags to reduce the potential for electric discharge and fires or using other means.

Follow safe recharging practices to prevent unintentional damage or rupturing of the battery:

- Only recharge batteries marked as rechargeable.
- Use charging equipment that meets manufacturer's specification.
- Avoid overcharging, which can lead to excessive heat or degrade battery performance and lifespan.
- Monitor charging by not leaving the batteries unattended.

[8] As defined in WAC 173-303-040
[9] https://apps.ecology.wa.gov/publications/SummaryPages/ECY070133.html
[10] https://ecology.wa.gov/PrintDWLabels

- Use a stable power source and avoid overloading outlets.

Store lithium-ion batteries safely:

- In a dry environment, away from extreme cold and heat (store and use batteries at temperatures between -4 to 140 degrees Fahrenheit)
- Separately from other flammable materials.
- In a location with good ventilation and compliant with Fire Code.
- Where you can easily access the battery if there's an emergency.
- In a manner that won't result in puncturing, crushing, or any other damage.

Conduct regular inspections to look for evidence of damage such as:

- Swelling
- Fire/smoke/gas
- Discoloration
- Melting
- Cracking
- Corrosion
- Leaking liquids
- Electrical burning odor
- Any noises (buzzing, popping, hissing)

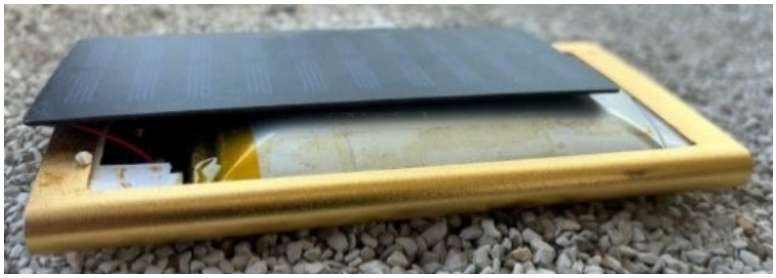

Figure 4: Lithium-ion batteries can swell when damaged or malfunctioning. In this photo, the swollen lithium-ion battery pushed on the attached solar panel, popping it out of place.

Train employees on handling lithium-ion batteries safely.

Prepare for emergencies:

- Provide and maintain emergency equipment such as a fire alarm, sprinkler system, fire extinguisher, decontamination equipment, and spill supplies.
- Post dangerous waste emergency information.[11]
- Maintain a battery fire emergency kit. Consider including sand or recycled glass, flame-resistant containment, or other products specifically designed for battery fires.
- Develop a plan for how to respond and evacuate in case of an emergency.
- Refer to the U.S. Department of Transportation's Emergency Response Guidebook[12] for incident responses involving hazardous materials/dangerous goods.

[11] https://apps.ecology.wa.gov/publications/SummaryPages/0804022.html
[12] https://www.phmsa.dot.gov/training/hazmat/erg/emergency-response-guidebook-erg

Best management practices for damaged, defective, or recalled lithium-ion batteries

Determine if your battery is damaged, defective or recalled. The U.S. Department of Transportation's Understanding the Risks of Damaged, Defective, or Recalled (DDR) Lithium Batteries[13] guide includes information about making this determination.

Contact the battery manufacturer to see if the battery has been recalled, or if they provide a take-back service. You may be able to return the batteries.

Immediately respond to emergencies. If you observe signs of overheating, melting or smoking, cover the battery with sand, recycled glass, or other products specifically designed to suppress battery fires. Contact 911 if conditions are unsafe.

Promptly send damaged and defective batteries offsite for recycling or disposal. This can lower the chances of a battery-related incident happening at your site. Ecology recommends shipping damaged or defective batteries off-site to a universal waste destination facility or permitted treatment, storage, and disposal facility[14] within **90 calendar days**.

Broken or damaged lithium-ion batteries may only be managed as universal waste if the breakage or damage does not constitute a breach in an individual cell casing. Batteries with a **breached individual cell casing** should only be sent to a permitted treatment, storage, and disposal facility *as **dangerous waste***.

Store damaged or defective batteries safely:

In containers that are in good condition and made of material that is compatible (i.e. won't react) with damaged or defective lithium-ion batteries.

Separately from other batteries in a flammables storage cabinet and away from other combustible or flammable materials.

In closed containers, unless temporary venting is required to prevent dangerous situations such as the build-up of extreme pressure. When temporary venting is required, manage the damaged battery as dangerous waste and store the container in a satellite accumulation area[15] where temporary venting is allowed. Ecology recognizes the risk of vapors and off-gassing when a battery catches on fire; therefore, closed containers may not always be the safest management option.

Label or mark clearly a damaged or defective battery container with the words "Damaged/defective lithium-ion battery." The label should be visible and legible from a distance of 25 feet, or the lettering size should be a minimum of 0.5 inch in height. If managed as dangerous waste, meet all additional labeling requirements[16] under the dangerous waste regulations.

Follow all U.S. Department of Transportation hazardous materials shipping requirements for damaged, defective, or recalled batteries.

[13] https://www.phmsa.dot.gov/training/hazmat/understanding-risks-damaged-defective-or-recalled-ddr-lithium-batteries
[14] https://ecology.wa.gov/DWcontractors
[15] https://apps.ecology.wa.gov/publications/SummaryPages/1904029.html
[16] https://ecology.wa.gov/LabelDW

Handling burned batteries under the dangerous waste regulations

If a lithium-ion battery catches on fire, it no longer meets the criteria to be managed as universal waste because the fire will likely result in a broken or breached cell casing or the battery will no longer contain an anode, cathode, and electrolyte. These are key components that define a battery.[17]

Burned batteries are solid waste subject to designation.[18] Either test the waste to determine if any dangerous waste characteristics or criteria apply, or manage burned or partially burned batteries as dangerous waste by sending them to a permitted treatment, storage, and disposal facility.

Figure 4: Electric vehicle batteries contain thousands of cells that can become severely damaged and burned during a fire.

Other laws and regulations

Sites generating used batteries must also comply with all other applicable federal, state and local regulations including, but not limited to local building and fire codes, and the U.S. Department of Transportation Hazardous Materials Regulations, see the Lithium Battery Guide for Shippers.[19]

Upcoming rulemaking

The United States Environmental Protection Agency plans to propose new universal waste rules specific to lithium batteries in 40 CFR 273.[20] To view the proposal summary and schedule for this rulemaking, please visit the Unified Regulatory Agenda entry for this action.[21]

Until new rules are codified and adopted by Washington State, follow all current regulations and the recommended best management practices in this focus sheet to safely handle end of life lithium batteries.

[17] "Battery" means a device consisting of one or more electrically connected electrochemical cells which is designed to receive, store, and deliver electric energy. An electrochemical cell is a system consisting of an anode, cathode, and an electrolyte, plus such connections (electrical and mechanical) as may be needed to allow the cell to deliver or receive electrical energy. The term battery also includes an intact, unbroken battery from which the electrolyte has been removed. See WAC 173-303-040.

[18] https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Dangerous-waste-guidance/Dangerous-waste-basics/Designation

[19] https://www.phmsa.dot.gov/sites/phmsa.dot.gov/files/2023-07/Lithium%20Battery%20Guide.pdf

[20] https://www.ecfr.gov/current/title-40/chapter-I/subchapter-I/part-273

[21] https://www.reginfo.gov/public/do/eAgendaViewRule?pubId=202310&RIN=2050-AH32

For more information:

- Batteries - Washington State Department of Ecology.[22]
- Lithium-ion battery safety and management[23] for waste generators and emergency responders.
- Guide to Universal Waste.[24]
- Battery stewardship - Washington State Department of Ecology.[25]

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To request an ADA accommodation, contact Ecology by phone at 360-407-6700 or email at hwtrpubs@ecy.wa.gov, or visit ecology.wa.gov/accessibility. For Relay Service or TTY call 711 or 877-833-6341

[22] https://ecology.wa.gov/batteries
[23] https://ecology.wa.gov/lithium-ion
[24] https://apps.ecology.wa.gov/publications/SummaryPages/2104017.html
[25] https://ecology.wa.gov/waste-toxics/reducing-recycling-waste/our-recycling-programs/battery-stewardship