

Navigating Lithium-Ion Battery Management

Regulations and Compliance

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Clean Air, Safe Water,
Healthy Land for Everyone



Universal Waste Regulations

Regulation for Small Quantity Generator (SQG), Large Quantity Generator (LQGs), Small Quantity Handler (SQHs), and Large Quantity Handler (LQHs)

Universal Waste Batteries

Definition of Lithium batteries, waste batteries, universal waste (UW), and household hazardous waste

Management Practices

Best management practices for businesses and practices for you at home to be safe

Response Incidents

Several incidents in AZ and many nationwide

Recycling Regulations

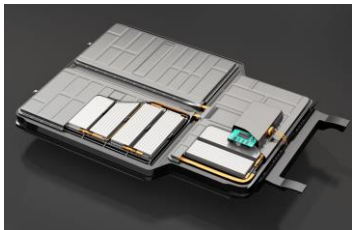
ADEQ policies and expectations



Universal Waste Overview

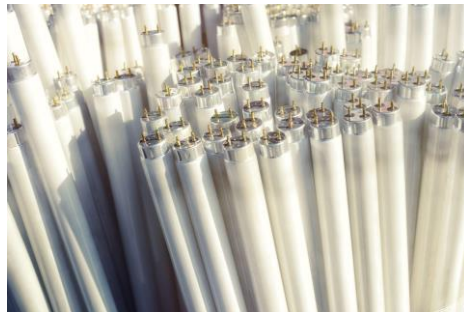
Materials Managed under Universal Waste Regulations

Batteries



Lamps

Fluorescent, mercury vapor, metal halide, etc.



Mercury Containing Equipment

Thermometers or other medical equipment, etc.



Aerosol Cans



Pesticides



Note: Lead-Acid batteries are managed under CFR 40 Part 266.80

Universal Waste Handler Types



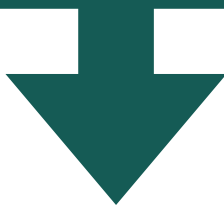
Large Quantity Handler

> 5,000 kg (11,000 lbs)
accumulated

- Includes accepting UW from off-site
- Status remains for the calendar year

Small Quantity Handler

Generator or Receiver
of UW and
accumulates
< 5,000 kg (11,000
lbs) at any one time





What are Universal Waste Batteries?

01

Waste Batteries

- Used: Date when the batteries become waste
- Unused: Date handler decides to discard it

02

Hazardous Waste Batteries

- Hazardous waste = toxic, corrosive, ignitable, reactive
- Facility elects not to manage under UW rules

03

Universal Waste Batteries

- Facility decides to manage under UW Regs
- Batteries are not damaged

Damaged Batteries

If a battery is leaking fluid, complete a hazardous waste determination on the material.



Waste Batteries by Chemistry

Single Use (Primary) Lithium Batteries



AA/AAA, C, D, Coin/Button cell, 9v

MUST be fully discharged before recycling/disposal

Rechargeable (Secondary) Lithium-Ion Batteries



Many forms (power tools, cell phones, electric vehicles)

May be difficult to extract

Nickel Cadmium (secondary) & Silver Oxide (primary) Batteries



Black mass is hazardous for cadmium



Universal Waste Battery Regulations

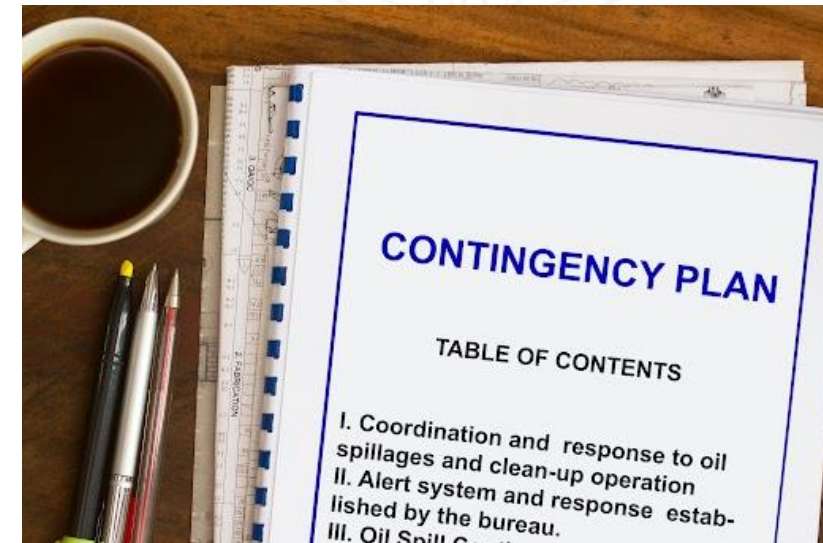
Training

SQH – § 273.16 and LQH - § 273.36

Employees be aware of:

- Proper handling of containers and batteries
- Emergency procedures if release of hazardous materials occurs

Training may be included with a hazardous waste generator's required RCRA training, if applicable.



Universal Waste Battery Regulations

Transport

§ 273.50 - § 273.56

SQHs and LQHs of universal waste are prohibited from transporting universal waste, otherwise, follow transporter requirements.

UNIFORM HAZARDOUS WASTE MANIFEST

Please print or type. Form Approved OMB No. 2050-0039

UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator ID Number
2. Page 1 of
3. Emergency Response Phone
4. Manifest Tracking Number

5. Generator's Name and Mailing Address
Generator's Site Address (if different than mailing address)

Generator's Phone
6. Transporter 1 Company Name U.S. EPA ID Number
7. Transporter 2 Company Name U.S. EPA ID Number
8. Designated Facility Name and Site Address U.S. EPA ID Number

Facility's Phone

10. U.S. DOT Description (including Proper Shipping Name, Hazard Class, ID Number, and Packing Group (if any))	10. Containers No.	11. Total Quantity	12. Unit No./Vol.	13. Waste Codes																
					1	2	3	4	5	6	7	8	9	10						
1																				
2																				
3																				
4																				

14. Special Handling Instructions and Additional Information

15. **GENERATOR/SUPPLIER'S CERTIFICATION:** I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/consolidated, and are in all respects in proper condition for transport in compliance with applicable international and national governmental regulations. I export shipment and I am the Primary Exporter. I certify that the contents of this consignment conform to the terms of the attached EPA Acknowledgment of Consent. I certify that the waste information statement (identified in 40 CFR 263.23) (a) (1) (I am a large quantity generator) or (b) (I am a small quantity generator) is true.
Generator's/Supplier's Printed Name Signature Month Day Year

16. International Shipments Import to U.S. Export from U.S. Part of entry/exit: Date leaving U.S.:
Transporter signature (for exports only):
Transporter 1 Printed Name Signature Month Day Year
Transporter 2 Printed Name Signature Month Day Year

17. Discrepancy
18a. Discrepancy Indication Space Quantity Type Residue Partial Rejection Full Rejection
Manifest Reference Number: U.S. EPA ID Number
18b. Alternate Facility (or Generator) U.S. EPA ID Number
Facility's Phone
18c. Signature of Alternate Facility (or Generator) Month Day Year

19. Hazardous Waste Report Management Method Codes (i.e., codes for hazardous waste treatment, disposal, and recycling systems)

20. Designated Facility Owner or Operator: Certification of receipt of hazardous materials covered by the manifest except as noted in item 18b.
Printed Name Signature Month Day Year

EPA Form 8700-22 (Rev. 12-17) Previous editions are obsolete. DESIGNATED FACILITY TO EPA'S e-MANIFEST SYSTEM

General Requirements for Handlers

- Date the battery when determined to be waste
- Store onsite for maximum of one year
- LQHs retain tracking records for three years (log, invoice, any type of shipping document)
- SQHs are not required to retain records of universal waste
- SQHs and LQHs are prohibited from treating universal waste (§273.11(b) and 273.31(b))



UNIVERSAL WASTE
FEDERAL LAW PROHIBITS IMPROPER DISPOSAL
THE FOLLOWING MATERIALS ARE REGULATED AS A
UNIVERSAL WASTE IN ACCORDANCE WITH 40 CFR PART 273.

UNIVERSAL WASTE - BATTERY(IES)
 UNIVERSAL WASTE - MERCURY THERMOSTAT(S)
 UNIVERSAL WASTE - MERCURY CONTAINING EQUIPMENT
 UNIVERSAL WASTE - PESTICIDE(S)
 UNIVERSAL WASTE - LAMP(S)

ACCUMULATION START DATE: 10/13/22

Fluorescent Bulbs

D.O.T. PROPER SHIPPING NAME AND UN OR NA NO. WITH PREFIX
REQUIRED DURING TRANSPORT, WHEN MATERIAL IS ALSO
REGULATED BY 49CFR PARTS 172-180

HANDLE WITH CARE!

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If each battery is intact and closed handlers can:

- Mix battery types in one container – **recommend separating lithium ion batteries**
- Discharge batteries to remove electric charge
- Regenerate used batteries
- Disassemble batteries/battery packs into individual batteries
- Remove batteries from consumer products
- Remove electrolytes from batteries





Best Management Practices

01

Packing

- Tape batteries or terminals with **Clear Packing Tape**
- Individual plastic bags
- Keep batteries **visible** for future handlers

02

Temperature

- Keep batteries in temperature controlled areas
- Stack **large** batteries no more than two high to minimize thermal activations



03

Sorting

- Sort batteries based on chemistry (lithium, lead-acid, nickel-cadmium)
- When sorting, minimize storage of batteries in metal or conductive containers

04

Handling

- Minimize the possibility of dropping, crushing or puncturing batteries
- Maintain a contingency plan for **when** a thermal event happens

Thermal Runaway of Lithium Ion Batteries

Flammable electrolyte
+
Electric current
+
Lack of heat dissipation



Thermal Runaway

When a high temperature is reached, and heat cannot be dissipated, the fire becomes self sustaining, causing thermal runaway.



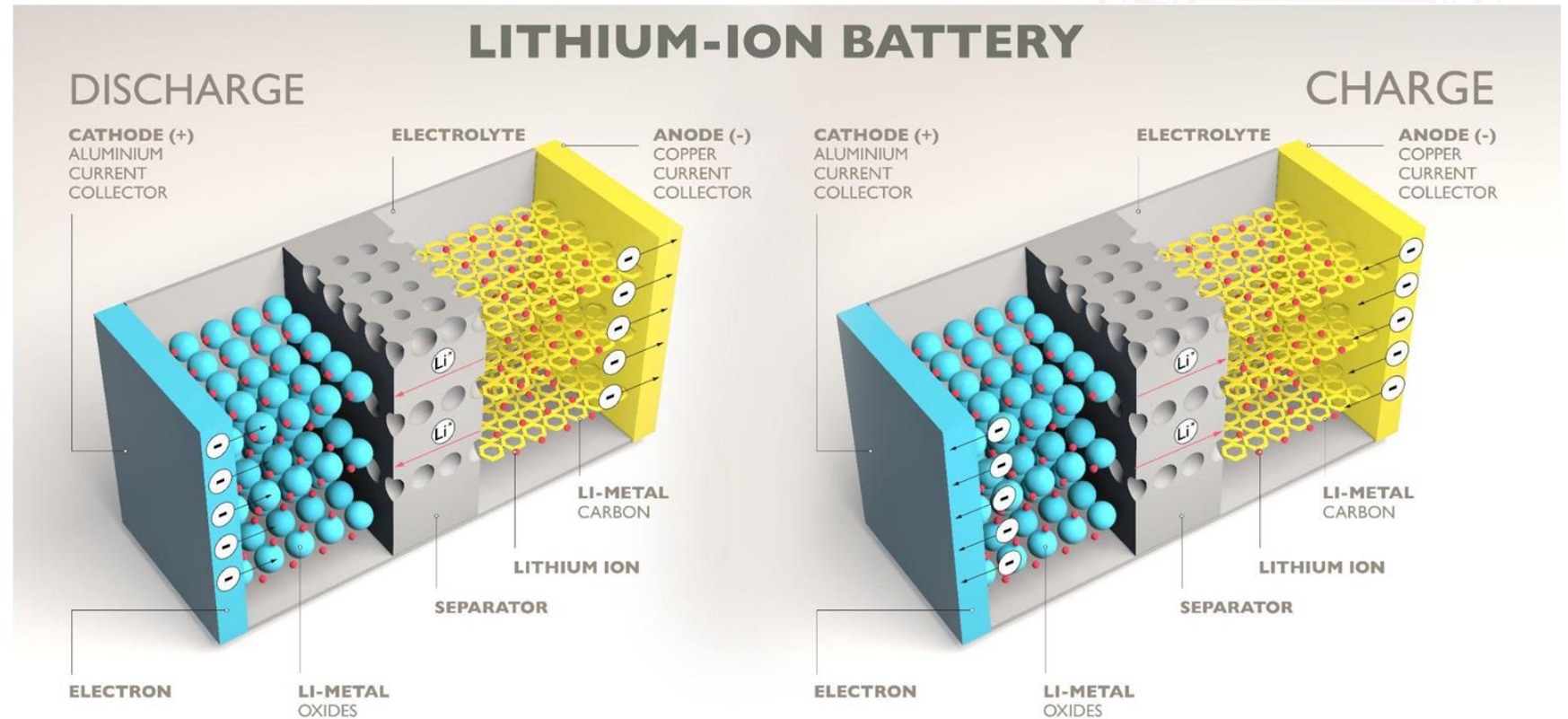
Causes for lithium battery damage:

- Mechanical damage
- Lithium plating, overcharging or charge at low temperatures
- Exposure to heat, cause battery to collapse



Thermal Runaway of Lithium Ion Batteries

Lithium plating:
When the separator is punctured, lithium ions can overwhelm the anode causing a short circuit.



Oxygen and other flammable gases are produced,
creating an explosive environment.



Thermal Runaway Videos:

[What Is Thermal Runaway?](#)

[What is thermal runaway? Electric vehicle fires explained!](#)



Current recycling challenge:

Lithium present in shredded materials could ignite





Battery Fire Incidents

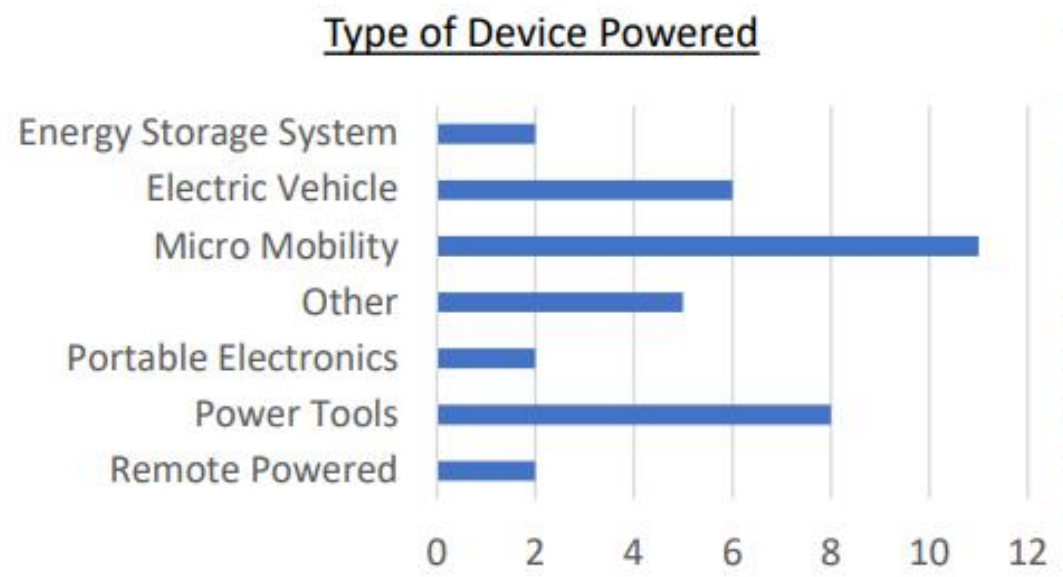
July 2023

Lithium-Ion Battery Fire Incidents



In the month of July, 12 lithium-ion battery fires were entered into the statewide database. There are a total of 37 lithium-ion battery fires entered year-to-date.

Agencies that have contributed to the data collection include Phoenix, Glendale, Mesa, Tempe, and Tucson Fire Departments. Below is a summary of the data collected so far in the database.



YTD there have been 3 incidents with injuries/fatalities



In July, there was one lithium-ion battery related injury that resulted in second degree burns.

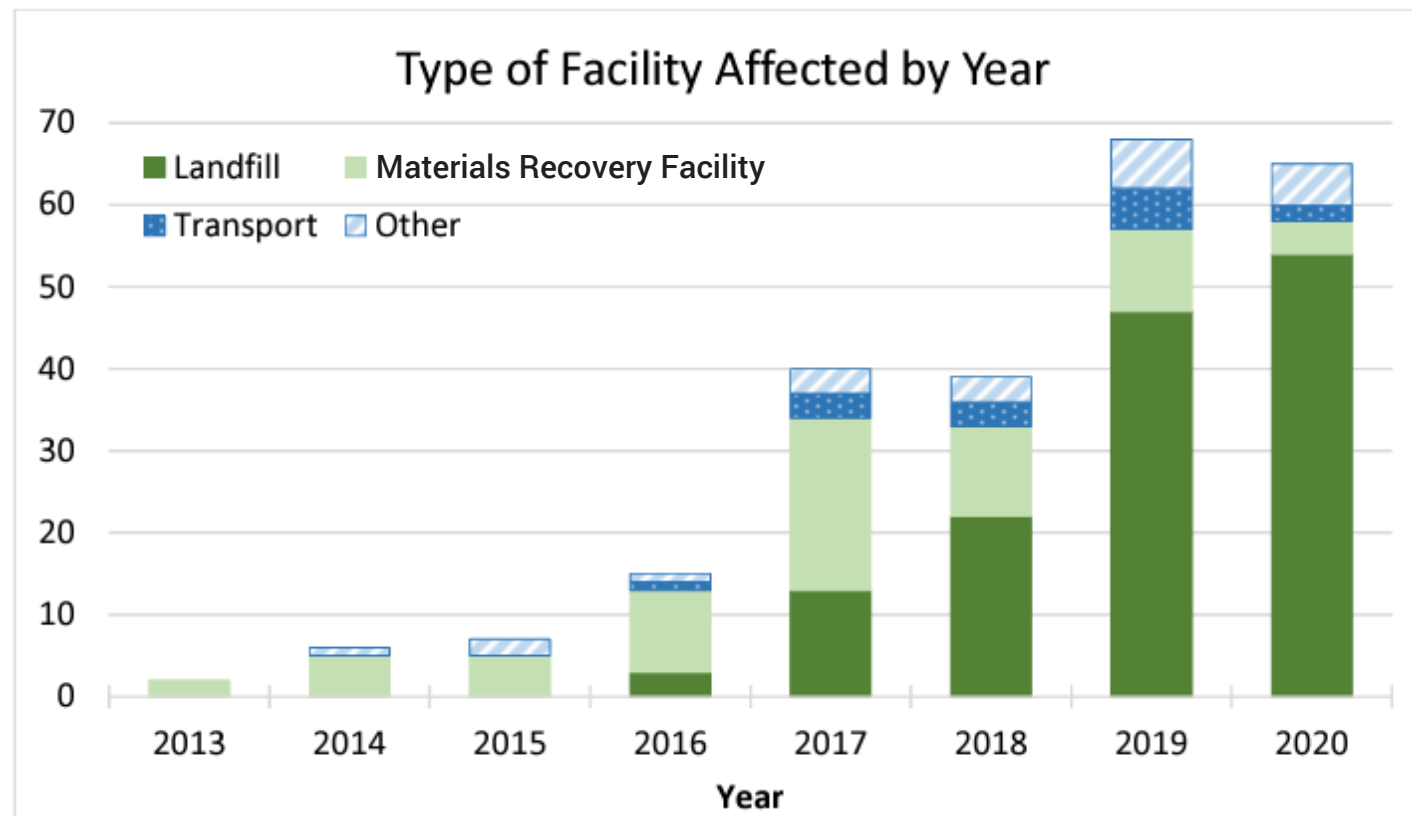
A battery pack the size of a cell phone was sitting on the floor in the victim's car, on top of a pile of clothes in direct sunlight. The vehicle caught fire and spread to the house and other vehicles.

Electric vehicle fire after being controlled with sand.






According to the July 2021 EPA's *An Analysis of Lithium-ion Battery Fires in Waste Management and Recycling*, the EPA reported:

Across 28 states, 245 fires recorded from 2013-2020, occurred mostly landfills by cell phone batteries, tablets, and laptop batteries.



Notable Fires reported in July 2021 EPA's *An Analysis of Lithium-ion Battery Fires in Waste Management and Recycling*:

Salt River Landfill, Scottsdale, AZ

10/19/2019		
<i>Likely or Definite</i>	Definite	<i>Details and Impacts:</i>   
<i>Battery Type</i>	Unknown LIB	The fire burned for over a day and destroyed the facility, which caused the town of Fountain Hills, AZ, to suspend its recycling program. Recyclable material was taken to a landfill temporarily until the town found another MRF. The fire was so large that a nearby highway closed for several hours (<i>Republic halts recycling after fire, 2019; Stone, 2019</i>).
<i>Fire Count</i>	1	



Best to let the battery burn, because all flammable ions will be consumed.

- If lithium is not consumed, fire could reignite, even if put out with water.
- To cool the fire, thousands of gallons of water may be used.

Fire suppression can be ineffective, such as:

- Fire extinguisher
- Fire suppression foam
- Fire blankets (though could contain fire from neighboring objects)

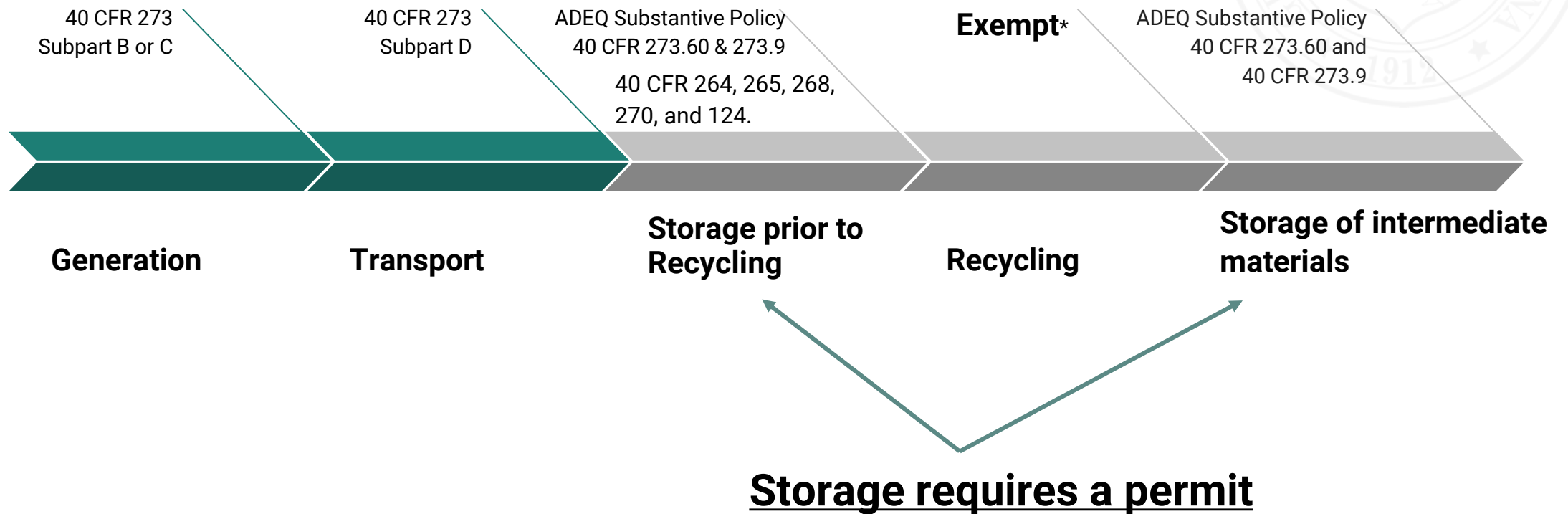
Notes: if a EV battery is on fire, do not puncture batteries cells to put out the fire. It is too hard to identify which battery cell is on fire.



Universal Waste Battery Recycling

ADEQ Policies and Regulations

Universal Waste Battery Recycling = Exempt from RCRA regulations* What isn't exempt?



*Except subparts AA and BB as applicable

Procedures

7.1 Storage of hazardous waste recyclable materials requires a permit, except:

7.1.1 If immediately incorporated into a reclamation process, hazardous waste recyclable materials received from an off-site facility, other than those specified in the A.A.C. and C.F.R and those not considered solid waste pursuant the same, will not be deemed storage.

Upon receipt, Universal Waste goes into process **immediately**

Operational day: period of time, not to exceed 24 hours, during which an owner or operator is on-site actively monitoring the reclamation process

Substantive Policy: static.azdeq.gov/legal/subs_hazstorage_priorrecycling.pdf

Recycling hazardous secondary materials for the purpose of the exclusions or exemptions from the hazardous waste regulations must be **legitimate**.

Legitimate recycling must produce a legitimate product or intermediate of the recycling process.





What about you?

Options for pickup:

- Local municipality household hazardous waste collection events
- Local municipality scheduled pick up

Put damaged batteries in sand and separate from other items



Battery Recycling Resources:

- Earth911 [search.earth911.com](https://www.earth911.com)
- Call2Recycle [call2recycle.org/locator](https://www.call2recycle.org/locator)
- Household Hazardous Waste [azdeq.gov/recycling-your-community](https://www.azdeq.gov/recycling-your-community)
- ADEQ Consumer Guide
static.azdeq.gov/wpd/hazwaste/battery_consumer.pdf

01

Universal Waste Identification

- Universal waste is an exclusion of hazardous waste
- Damaged batteries need a waste determination

02

Best Management Practices

- Recommend separating lithium batteries
- Discharge before disposal
- Tape terminals with clear tape

03

Arizona Recycling Policies

- Storage before or during recycling requires a permit
- Certain recycling activities are exempt from permitting, check with ADEQ

04

Use your City Resources

- Local municipality household hazardous waste collection events
- Local municipality scheduled pick up

Questions?

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Healthy Land for Everyone**
