2022 Hawai‘i Chemical Safety Days

Lithium Batteries
Transportation and Storage

Presented by:
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Why Lithium Batteries?

- High energy densities
- Potential short circuiting leading to thermal runaway
- Past recycling-related, landfill incidents
- Expected exponential increases volumes
Thermal Runaway

www.pcpitstop.com/pcsafety
~ 420,000 lbs of batteries
• Clean-up Mar. 2020 - Jun. 2021
• Total cost > $2.8M
• High % of inventory were damaged lithium batteries ("DDR")
Superior Battery - Morris, IL

- Fire began on Jun. 29, 2021
- ½ mile evacuation
- Gov. Pritzker issues disaster proclamation
- Fire extinguished Jul. 10, 2021
- Estimated 550,000 lbs of batteries with 140,000 lbs of them being lithium batteries
- Cement poured on batteries
- Clean-up continuing April 2022
Recycler fire on Dec. 8, 2021
Mostly electric scooter batteries
Intended to be shipped to Korea
Batteries continued to reignite after being observed and re-packaged
Used salt water bath to make inert before continuing removal
On March 4, a shipping container was reported to Coast Guard Sector Los Angeles-Long Beach. The container was on board a vessel bound for China. Batteries were undeclared, and on the bill of lading as “synthetic resins” and “computer parts.” De-vanning containers delayed the response significantly.
End of Life Implications

Waste Not
The volume of lithium ion battery cells being sold is set to surge, creating opportunities for recyclers

- Electronics
- Power tools
- Electric cars
- E-buses, bikes and scooters
- Energy storage
- Industrial automation
- Data centers
- Telecom
- Other

Source: Creation Inn
Danger to Waste Mgmt Facilities
Overview of DOT/PHMSA

DOT Operating Administrations

OST  DOT  OIG

FAA   FHWA
FMCSA  FRA
FTA   MARAD
NHTSA  FHWA
SLSDC  PHMSA

PHMSA: Your Safety is Our Mission

U.S. Department of Transportation Headquarters – Washington, DC
PHMSA Responsibilities

**Regulations**
- Rulemakings
- Letters of Interpretation

**Special Permits and Approvals**
- Approvals for Fireworks or Self-Reactive materials
- Special Permits for packaging (ex: DDR Kits)

**Enforcement**
- Inspections
- Multi-Agency Strike Force Operations
- Accident Investigation

**Outreach and Engagement**
- Publications
- Community Liaisons
- Workshops or conferences
DOT in the Battery Supply Chain

Oversight Over the Transportation Process

Identification and Classification (collection/sorting)

Packaging and Hazard Communication

Movement
DOT Hazard Classes

Explosives
Gases
Flammable Liquids
Flammable Solids
Oxidizers and Organic Peroxides
Poison and Infectious Substances
Radioactive

Corrosive
Miscellaneous
Class 9 Lithium Battery
49 CFR Section 173.185 addresses requirements for lithium batteries, including the exceptions for recycling lithium batteries:

1. Classification/ UN 38.3 Testing Paragraph (a)
2. Packaging Paragraph (b)
3. “Small” battery exceptions Paragraph (c)
4. Disposal/ Recycling Exceptions Paragraph (d)
5. Damaged, Defective, Recalled (DDR) Requirements Paragraph (f)
Disposal/Recycling Exceptions

Classification/UN 38.3 Testing

Small Battery Exceptions

Specification Packaging

*For motor vehicle transportation ONLY

49 CFR § 173.185(d)
Classify the Hazard – Type of Lithium Batteries

- Lithium Metal
  - Metallic lithium or alloy
  - Size measured in grams
  - Generally not rechargeable (single-use)
  - Typical configurations: coin cell, cylindrical, and rectangular
  - Examples: watches, thermometers

- Lithium Ion
  - Lithium compound
  - Size measured in Watt-hours (Wh)
  - Generally rechargeable
  - Typical configurations: cylindrical, rectangular, and pouch packs
  - Examples: laptops, tablets, cell phones, power tools
Classify the Hazard – Lithium Metal
Classify the Hazard – Lithium Ion
Communicate the Hazard – Small Batteries

Universal Waste Label
OR Marking (EPA)

Cargo Aircraft Only Label (DOT)

Lithium Battery Handling Mark (DOT)

49 CFR § 173.185(c)(3) & 40 CFR §§ 273.14, 273.34
Communicate the Hazard – Larger Batteries and Quantities

NOTE: Specification package required for rail and vessel – not motor vehicle.
Shippers must identify and separate batteries that pose an increased risk of producing a dangerous evolution of heat, fire, and short circuit.
Classify the Hazard - DDR

- Batteries to Look For:
  - Defective
  - Leaked or vented
  - Sustained physical or mechanical damage
  - Cannot be diagnosed (i.e., cannot say for sure they are not damaged)

- Consider:
  - Risk of acute hazards (e.g., gas, fire, electrolyte leaking)
  - Known misuse of the battery
  - Signs of physical damage
  - Damage to safety features, components, or short circuit protection

Source: 21\textsuperscript{st} Revised Edition of the UN Model Regulations 3.3.1, Special Provision 376
2. Contain the Hazard – DDR

- Batteries must be **individually** packaged as follows:
  - Non-metallic, inner packaging that completely encloses the battery
  - Inner packaging surrounded by non-combustible, non-conductive, and absorbent cushioning material
  - Single inner packaging must be placed in **performance-oriented** packaging at the Packing Group I performance level.
Example DDR Kits

Disclaimer: images are examples of DOT Special Permit packaging and not an endorsement of any particular product or company

Pictured L-R: DOT-SP 20549, DOT-SP 20432, DOT-SP 20910
Disclaimer: images are examples of DOT Special Permit packaging and not an endorsement of any particular product or company

Pictured: DOT-SP 20331
Next Steps?

- Regulatory changes?
- ERG 2024
- Emergency Response survey
- Inspections
- Outreach
  - Safety Advisory
  - Conferences
Training Modules

Hazardous Materials Transportation

Related Links

- Hazardous Materials Training Modules

Contact Us

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NEW: 7 Useful Tips to Help You Ship Hazardous Materials Safely in Commerce, a quick e-resource guide
Lithium Battery Guide for Shippers

Comprehensive guide for transporting all configurations and sizes of lithium batteries to include packaging and hazard communication requirements

Available digitally or in hard copy (contact training@dot.gov)

Video: How to Use the Lithium Battery Guide for Shippers
Hazardous Materials Safety Assistance Team (HMSAT)

About HMSAT

PHMSA's Hazardous Materials Safety Assistance Team (HMSAT) is responsible for face-to-face outreach and field compliance assistance on the Hazardous Materials Regulations (HMR). HMSAT's goal is to improve hazardous materials transportation safety and security through increased communication and education. HMSAT members are assigned to each of PHMSA's regional offices and are available to help businesses comply with the hazardous materials transportation regulations through educational and technical assistance. HMSAT also provides compliance assistance to federal, state, and local governments.

PHMSA Hazmat Transportation Webinars: https://www.phmsa.dot.gov/hazmat/seminars/webinars
Hazardous Materials Information Center

1-800-HMR-4922
1-800-467-4922
202-366-4488
infocntr@dot.gov

Have a question about transporting hazardous materials? Need clarification on an entry in the Hazardous Materials Regulations? PHMSA’s Hazmat Information Center provides live, one-on-one assistance Monday through Friday from 9 a.m. - 5 p.m.

Call the Info Center:

• for help with use of the Hazardous Materials Regulations (49 CFR

1-800-467-4922