Pipeline and Hazardous Materials Safety Administration

January 23, 2020
Neal Suchak

Lithium Battery Recycling and Reuse
Disclaimer: These slides are informational and DOT DOT always advises you use the Hazardous Materials Regulations (HMR; 49 CFR Parts 171-180) when determining compliance
Why is this important?
Houston, TX - 2017
Agenda

• Overview of DOT/PHMSA

• DOT/PHMSA’s Role in the Supply Chain

• How DOT/PHMSA Regulations Work

• Special Topics
Overview of DOT/PHMSA
Who is PHMSA?
PHMSA MISSION

Our mission is to protect people and the environment by advancing the safe transportation of energy and other hazardous materials that are essential to our daily lives.
Federal Hazmat Law

Protect against the risks to life, property, and the environment which are inherent in the transportation of hazardous materials in intrastate, interstate, and foreign commerce.

49 U.S.C. Section 5101 et seq.
PHMSA Responsibilities

- Regulations
- Special Permits and Approvals
- Enforcement
- Outreach and Engagement

To Protect People and the Environment From the Risks of Hazardous Materials Transportation
DOT/PHMSA’s Role in the Supply Chain
DOT in the Supply Chain

Oversight Over the Transportation Process

Identification and Sorting

Packaging and Hazard Communication

Movement
How DOT/PHMSA’s Regulations Work
Hazardous Materials Regulations (HMR)

- The HMR govern the packaging and safe transportation of hazardous materials by highway, air, rail, and water
- Covers:
  - Identification and Classification
  - Hazard Communication
  - Packaging Requirements
  - Operational Rules
Hazardous Materials Regulations (HMR)

• Section 173.185 in the HMR addresses requirements for lithium batteries, including the exceptions for recycling lithium batteries:

1. Classification/UN 38.3 Testing
2. Packaging
3. Small battery exceptions
4. Disposal/Recycling Exceptions
5. Damaged, Defective, Recalled
Disposal/Recycling Exceptions (Motor Vehicle)

Classification/UN 38.3 Testing

Small Battery Exceptions

Specification Packaging

49 CFR § 173.185(d)
Batteries for Reuse

- Disposal/Recycling Exceptions
  - Classification/UN 38.3 Testing
  - Small Battery Exceptions
  - Specification Packaging
Three Major Components

1. Classify
2. Contain
3. Communicate

Compliance
1. Classify the Hazard - Hazard Classes

Explosives
Gases
Flammable Liquids
Flammable Solids
Oxidizers and Organic Peroxides
Poison and Infectious Substances
Radioactive
Corrosive
Miscellaneous
1. Classify the Hazard – Identification and Sorting

- Battery markings
- Physical characteristics
- Color
- Isolate damaged batteries
1. Classify the Hazard – Type of Lithium Batteries

**Lithium Ion**
- Lithium compound (e.g. lithium cobalt oxide)
- Size measured in Watt-hours (Wh)
- Generally rechargeable
- Typical shapes: cylindrical and rectangular
- Found in laptops, tablets, cell phones, power tools, etc.

**Lithium Metal**
- Metallic lithium or alloy
- Size measured in grams
- Generally not rechargeable (single-use)
- Typical shapes: coin cell, cylindrical, rectangular
1. Classify the Hazard – Lithium Metal
1. Classify the Hazard – Lithium Ion
1. Classify the Hazard – Lithium Batteries ID Numbers

<table>
<thead>
<tr>
<th>UN3480</th>
<th>• Lithium Ion Batteries</th>
</tr>
</thead>
<tbody>
<tr>
<td>UN3481</td>
<td>• Lithium Ion Batteries Contained in/Packed with Equipment</td>
</tr>
<tr>
<td>UN3090</td>
<td>• Lithium Metal Batteries</td>
</tr>
<tr>
<td>UN3091</td>
<td>• Lithium Metal Batteries Contained in/Packed with Equipment</td>
</tr>
</tbody>
</table>
1. Classify the Hazard – Battery Size

- The size of the lithium battery is an important consideration – larger batteries and quantities are subject to increased regulation. Thresholds:

<table>
<thead>
<tr>
<th>Lithium Ion</th>
<th>Lithium Metal</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 100 Wh</td>
<td>≤ 2 g</td>
</tr>
<tr>
<td>≤ 300 Wh ground only*</td>
<td>≤ 25 g ground only*</td>
</tr>
</tbody>
</table>

* Additional hazard communication is required
1. Classify the Hazard – Battery Size

- Watt-hour (Wh) = Ampere-hours (Ah) x Volts (V)
- In the case of milliampere hour (mAh), divide by 1000
2. Contain the Hazard - Packaging
2. Contain the Hazard – Small Consumer Lithium Batteries

**General Requirements**
- Prevent short circuits
- Prevent shifting
- Prevent accidental activation
- Prevent release of contents
- Packaging requirements are *performance-based*

**Basic Configuration**
- Inner packaging
- Cushioning material
- Outer packaging

49 CFR § 173.185(b)(1)–(3)/(c)
2. Contain the Hazard – Inner Packaging

Requirements
• Non-metallic
• Completely enclose the battery and terminals
• Separate batteries from contact with any conductive material

Examples
• Plastic bags
• Tape enclosures (e.g., ravioli taping method)
• ANY method meeting performance requirement of protecting terminals and preventing short circuit is acceptable

49 CFR § 173.185(b)(3)(i)
2. Contain the Hazard – Inner Packaging

Inner package did not protect from short circuits
2. Contain the Hazard – Inner Packaging

Photo courtesy of Cascade Asset Management
2. Contain the Hazard – Cushioning Material
2. Contain the Hazard – Outer Packaging

49 CFR § 173.185(c)(2)
Contain the Hazard – Larger Batteries and Quantities

Increased Regulation

- Batteries over 300 Wh rating (Lithium Ion) or 25 g (Lithium Metal)
- Packages over 66 lbs gross weight

UN Specification Packaging (ONLY Rail/Vessel)

49 CFR § 173.185(b)(3)

1A2/X40/S/05 USA/0000
Contain the Hazard – Electric Vehicle or Electric Storage Batteries

Alternative packaging

- Batteries that weigh over 12 kg (26.5 lbs)
- Must have strong, impact-resistant outer casing

May be packed:
- In “strong outer packagings”
- In protective enclosures (e.g., crates)
- On pallets

49 CFR § 173.185(b)(5)

Not permitted for passenger aircraft (Cargo Aircraft requires Approval by AA)
3. Communicate the Hazard – Hazard Communication
3. Communicate the Hazard – Lithium Battery Handling Mark

- “*” = the applicable UN ID number
- “**” = telephone number for information about the shipment

49 CFR § 173.185(c)(3)
3. Communicate the Hazard – Aircraft Restrictions

- “LITHIUM METAL/ION BATTERIES—FORBIDDEN FOR TRANSPORT ABOARD PASSENGER AIRCRAFT”

49 CFR § 173.185(c)(1)(iii)
3. Communicate the Hazard - Package
3. Communicate the Hazard — Batteries $>100 \text{ Wh}$, but $\leq 300\text{ Wh}$

- Additional package marking requirement:
  “LITHIUM BATTERIES—FORBIDDEN FOR TRANSPORT ABOARD AIRCRAFT AND VESSEL.”

49 CFR § 173.185(c)(1)(iv)
Communicate the Hazard – Larger Batteries and Quantities (All Modes)

Increased Regulation

- Batteries over 300 Wh rating (Lithium Ion) or 25 g (Lithium Metal)
- Packages over 66 lbs gross weight

Shipping Papers
Emergency Response Information
Marks
Labels
Communicate the Hazard – Larger Batteries and Quantities

Consignment: Name/Address

Consignee: Name/Address

UN 3480 Lithium Ion Batteries

4G/X40/S/05
USA/0000
DOT Training Requirements

- General Awareness/Familiarization
- Function-Specific
- Safety
- Security Awareness

49 CFR § 172.700-704
Special Topics

Damaged Batteries

49 CFR § 173.185(f)
1. Classify the Hazard – Damaged, Defective, or Recalled

- Identify and separate batteries that pose an increased risk of producing a dangerous evolution of heat, fire, and short circuit
1. Classify the Hazard – Damaged, Defective, or Recalled

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
1. Classify the Hazard – Damaged, Defective, or Recalled
2. Contain the Hazard – Damaged, Defective, Recalled

• 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.
2. Contain the Hazard – Damaged, Defective, Recalled

Photos courtesy of Cascade Asset Management
2. Contain the Hazard – Damaged, Defective, Recalled

- Performance-oriented packaging at the Packing Group I performance level means:
  - Designed and tested to a specific performance standard by packaging manufacturer
  - You **MUST** follow the packaging manufacturer’s instructions **EXACTLY**, including the use of any specific packaging components specified (e.g., cushioning, tape)
3. Communicate the Hazard – Damaged, Defective, Recalled

- Requires the same hazard communication as a larger, fully-regulated lithium battery (e.g., marks, labels, shipping paper)

- “Damaged/defective lithium ion battery” and/or “Damaged/defective lithium metal battery” as appropriate.
3. Communicate the Hazard – Damaged, Defective, Recalled

Consignor: Name/Address
Consignee: Name/Address

UN 3480 Lithium Ion Battery
DAMAGED/DEFECTIVE LITHIUM ION BATTERY

DOT SP XXXXX

4G/X40/S/05
USA/0000

To Protect People and the Environment From the Risks of Hazardous Materials Transportation
Special Topics

Special Permits (SPs) and Approvals
What are Special Permits?

• DOT special permits (SPs) are an extension of the regulations and offer alternative provisions

• There are two types of SPs:
  - Manufacture, mark, and sell (MMS) packaging
  - Offer
What are examples of DOT SPs?
PHMSA Resources

- Outreach materials
- Compliance assistance to industry (Outreach and Engagement)

- Training materials

- Emergency Response Guidebook (ERG)
PHMSA Training Modules

Training Modules

Related Links
- Hazardous Materials Training Modules

Contact Us
Hazardous Materials Training Program
U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration
1200 New Jersey Avenue, SE
Washington, DC 20590
United States
phmsa.hm-training@dot.gov
Phone: 202-366-4900
PHMSA Videos and Mobile Apps

Videos and Mobile Apps

Related Links
- PHMSA Youtube page

Share

[Social media icons]
PHMSA’s Online CFR (oCFR)

The oCFR tool is an interactive web-based application that allows users to navigate with a single click between all content connected to a HMR citation. The oCFR includes tools to sort, filter, and export search results. Besides providing the regulated community with a new way to access documents, the system also provides additional tools to make it easier to understand the status of documents and identify recent rulemakings which may have impacted the documents.

Also, the oCFR tool includes a separate tab for the Hazardous Materials Table (HMT) and Appendices. This tab provides PHMSA’s first database version of the HMT as well as tables of hazardous substances in

Related Links
- oCFR Tool

Related Documents
- oCFR Quick Reference Guide

Contact Us
Hazardous Materials Standards and Rulemaking
U.S. Department of Transportation,
Pipeline and Hazardous Materials Safety Administration
1200 New Jersey Avenue, SE
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.
Hazardous Materials Information Center

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

Contact Us

Hazardous Materials Standards and Rulemaking
U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration
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To Protect People and the Environment From the Risks of Hazardous Materials Transportation
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