

# 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

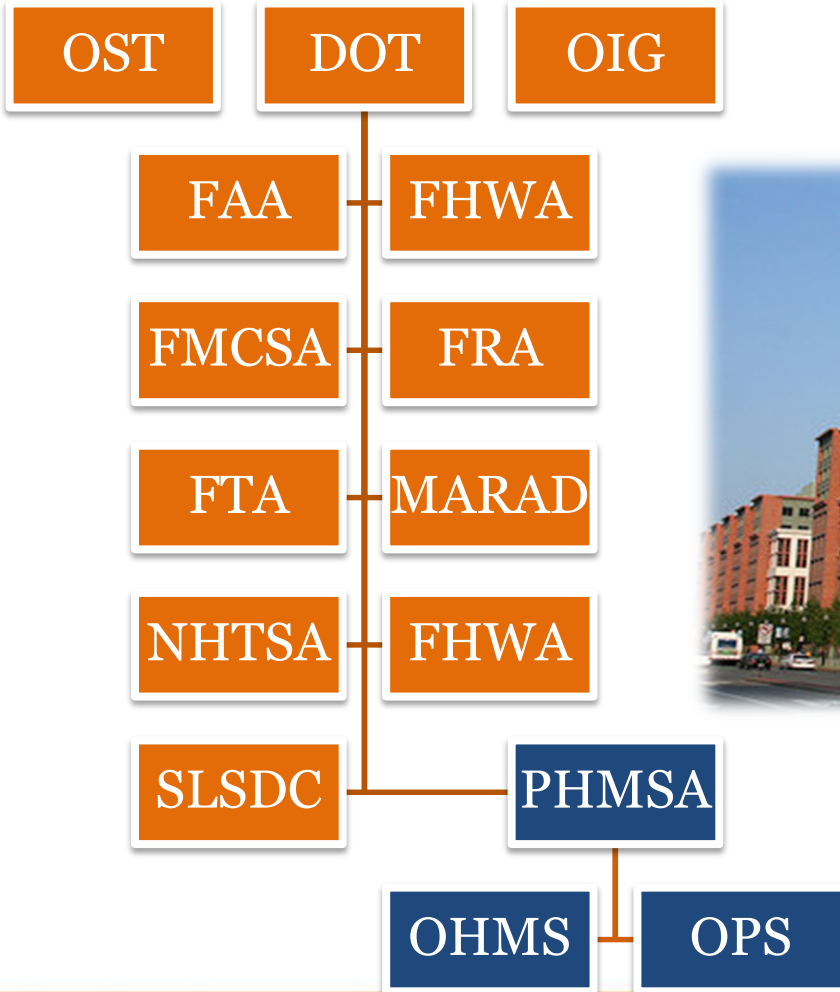
- Overview of DOT/PHMSA
- DOT/PHMSA's Role in the Supply Chain
- How DOT/PHMSA Regulations Work
- Special Topics



# Overview of DOT/PHMSA



# Who is PHMSA?



# PHMSA Regional Offices





# 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



# DOT/PHMSA's Role in the Supply Chain



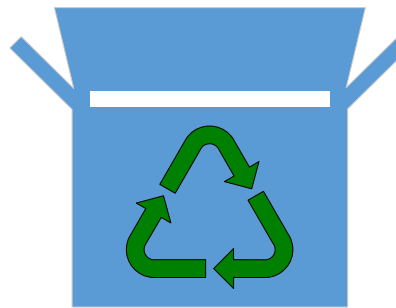
# DOT in the Supply Chain

## Oversight Over the Transportation Process

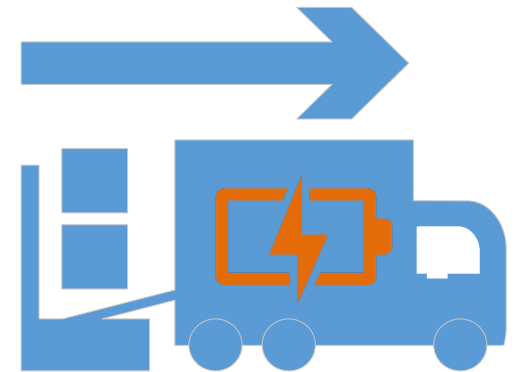
Identification  
and Sorting



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)

Disposal/  
Recycling  
Exceptions

Classification/  
UN 38.3  
Testing

Small Battery  
Exceptions

Specification  
Packaging

49 CFR § 173.185(d)



# Batteries for Reuse

Disposal/  
Recycling  
Exceptions

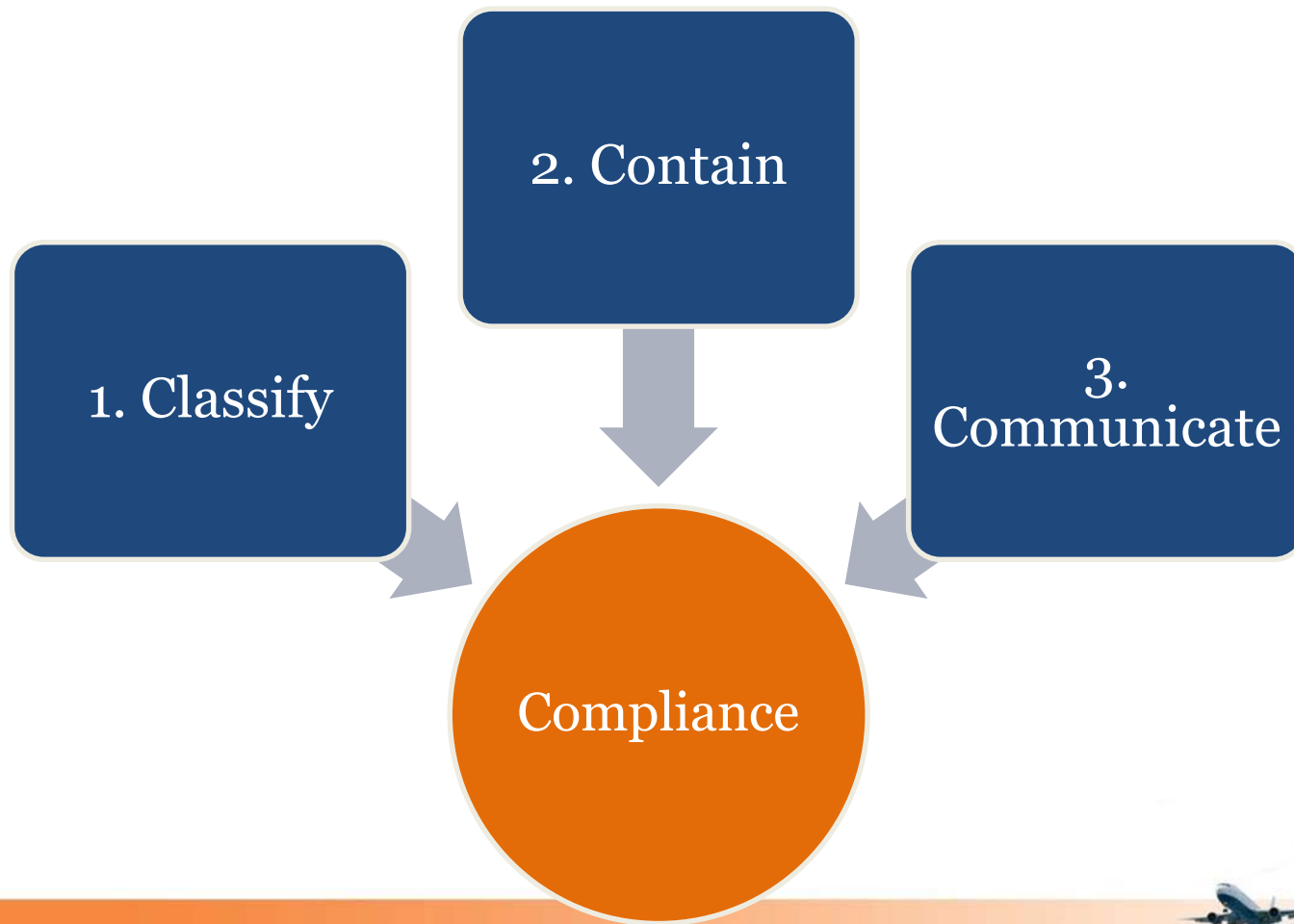
Classification/  
UN 38.3  
Testing

Small Battery  
Exceptions

Specification  
Packaging



# Three Major Components



# 1. Classify 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

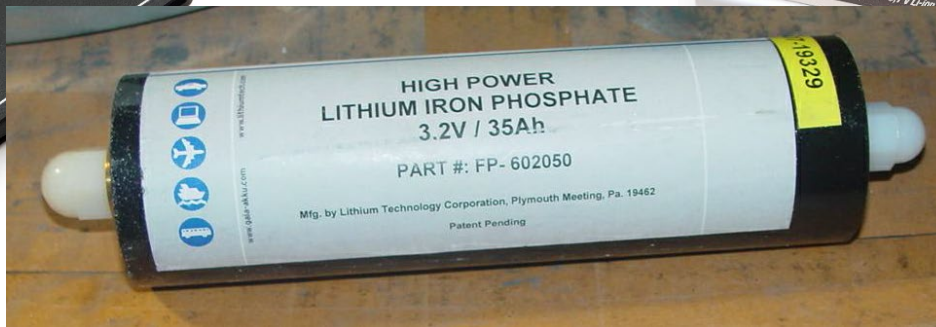
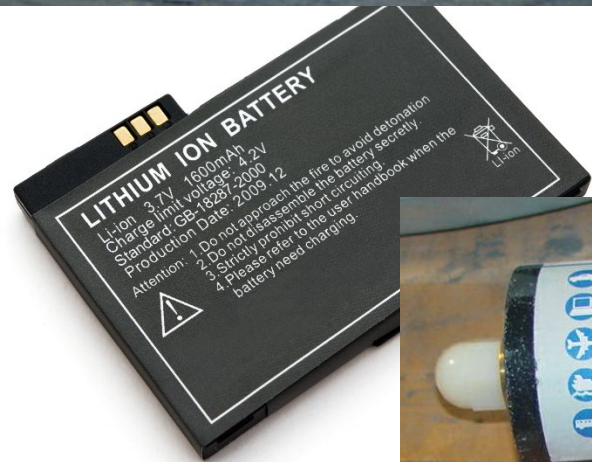
- Metallic lithium or alloy
- Size measured in grams
- Generally not rechargeable (single-use)
- Typical shapes: coin cell, cylindrical, rectangular



# 1. Classify the Hazard – Lithium Metal



# 1. Classify the Hazard – Lithium Ion





# 1. Classify the Hazard – Lithium Batteries ID Numbers

**UN3480**

- Lithium Ion Batteries

**UN3481**

- Lithium Ion Batteries Contained in/Packed with Equipment

**UN3090**

- Lithium Metal Batteries

**UN3091**

- Lithium Metal Batteries Contained in/Packed with Equipment



# 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:

## Lithium Ion

- $\leq 100$  Wh
- $\leq 300$  Wh ground only\*

## Lithium Metal

- $\leq 2$  g
- $\leq 25$  g ground only\*

\* 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

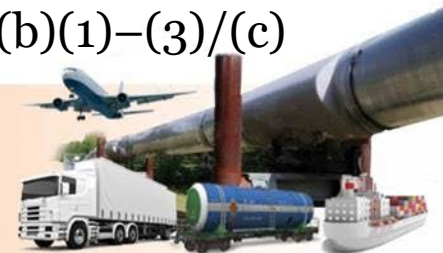
## General Requirements

- 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



Inner package did not protect from short circuits



# 2. Contain the Hazard – Inner Packaging



Photo courtesy of Cascade Asset Management

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

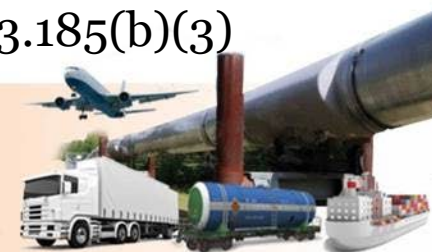
- Batteries over 300 Wh rating (Lithium Ion) or 25 g (Lithium Metal)
- Packages over 66 lbs gross weight

UN Specification Packaging  
(ONLY Rail/Vessel)



 1A2/X40/S/05  
USA/0000

49 CFR § 173.185(b)(3)



# 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

**Not permitted for passenger aircraft (Cargo Aircraft requires Approval by AA))**

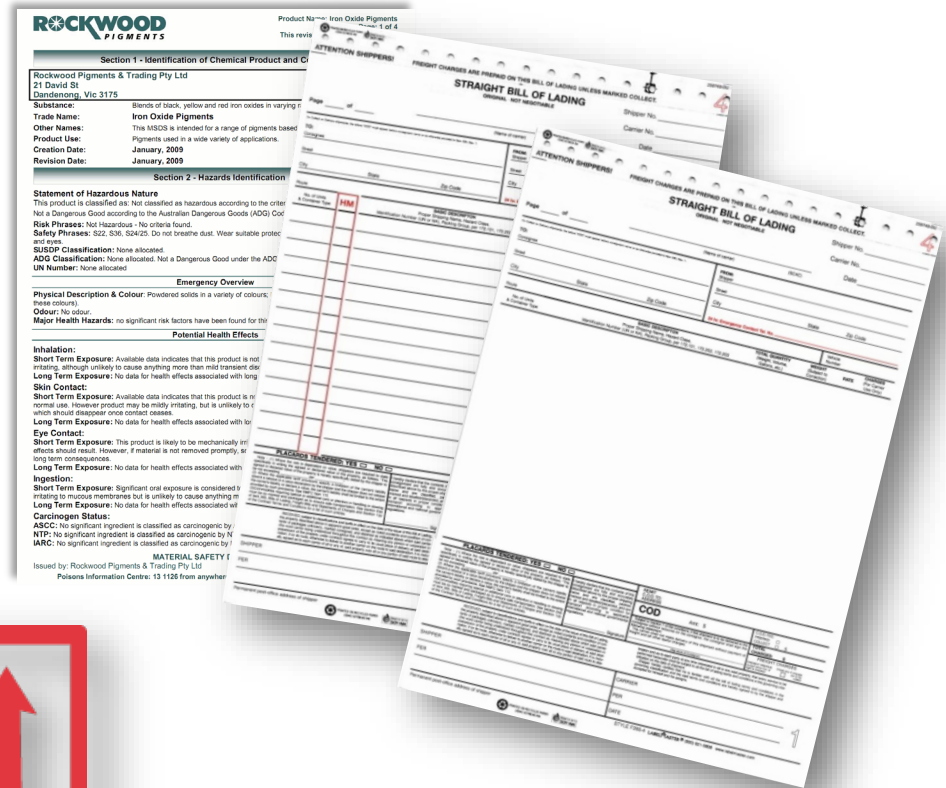
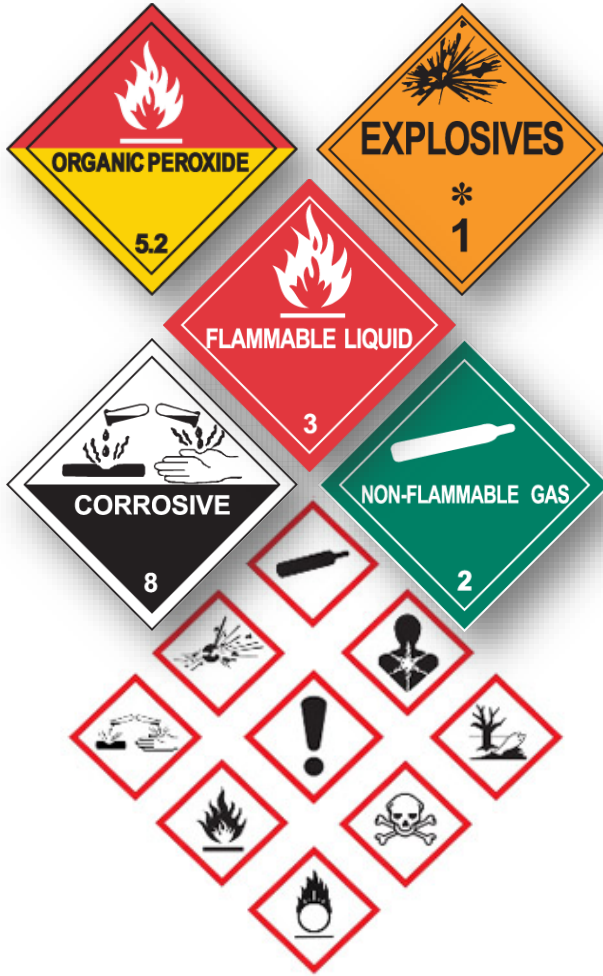
May be packed:

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

49 CFR § 173.185(b)(5)

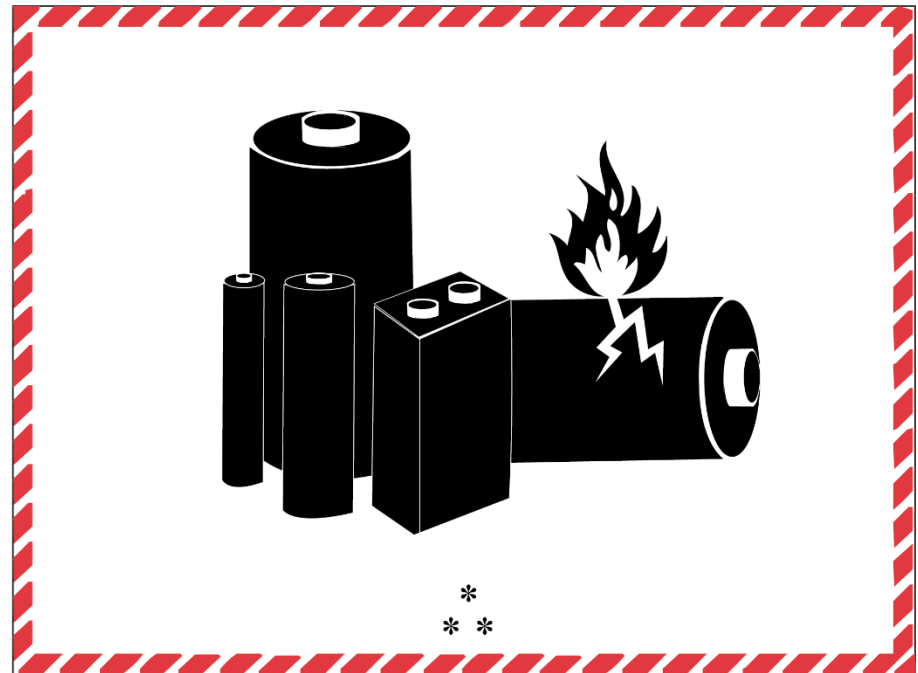


# 3. Communicate the Hazard – Hazard Communication



# 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”



*Cargo Aircraft Only Label*

49 CFR § 173.185(c)(1)(iii)



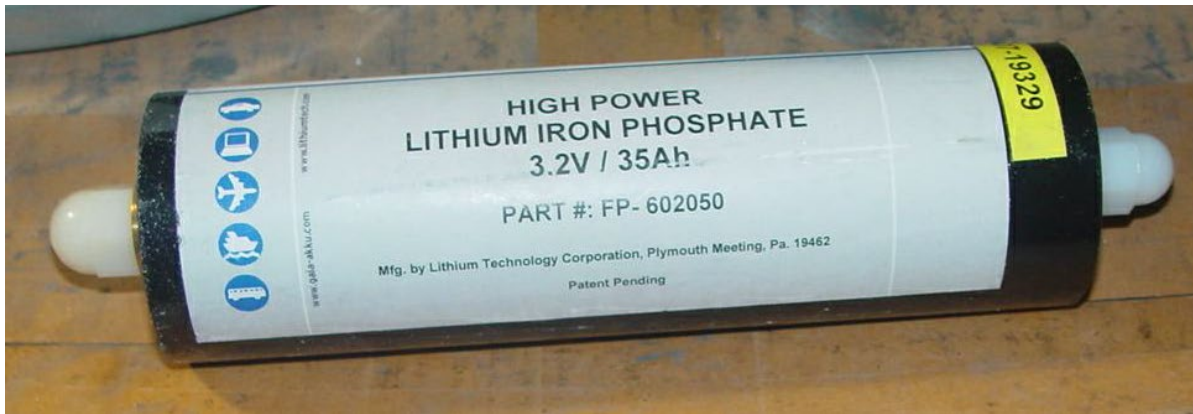
# 3. Communicate the Hazard - Package





# 3. Communicate the Hazard – Batteries >100 Wh, but ≤ 300Wh

- 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

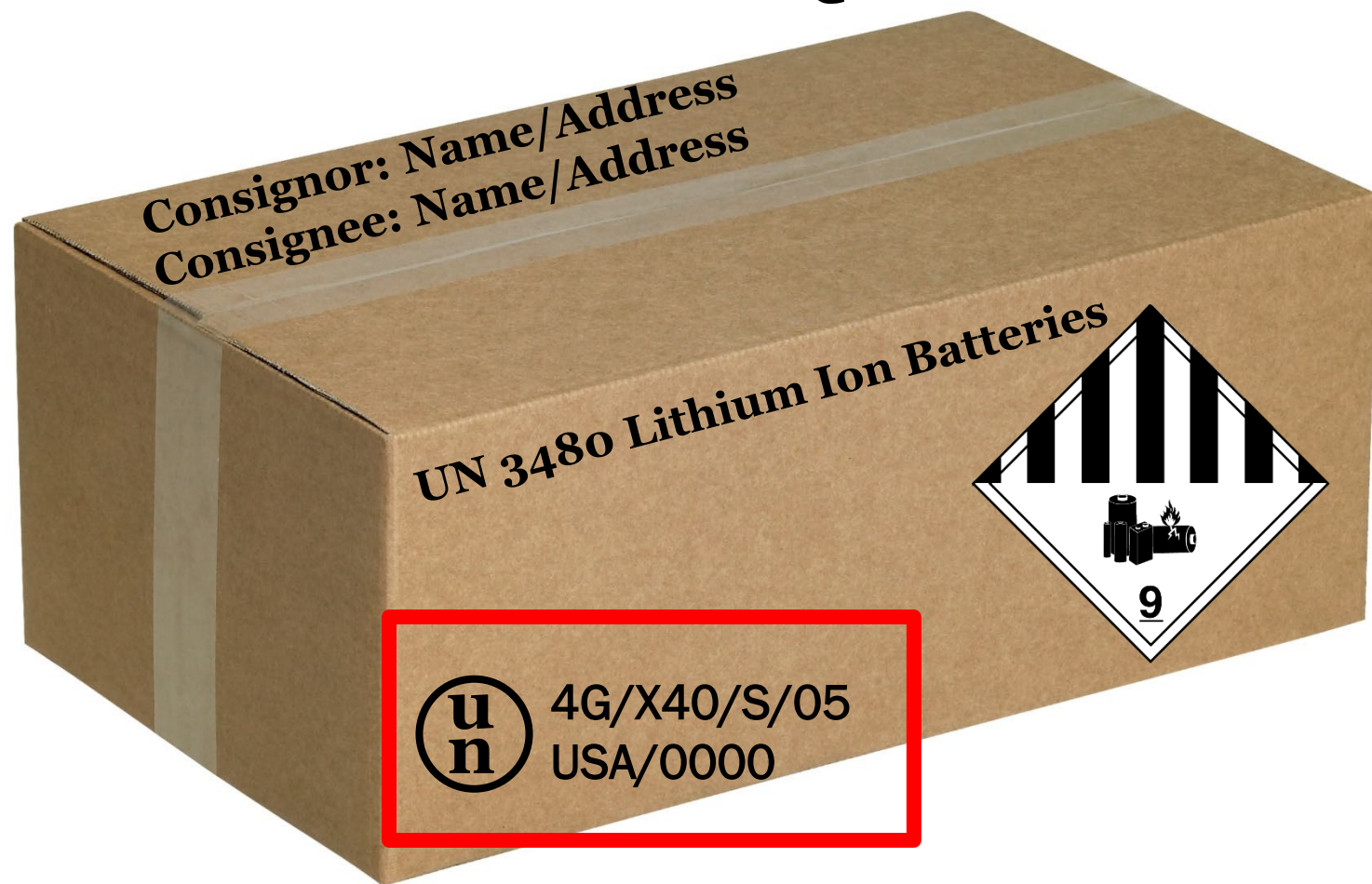
Emergency Response Information

Marks

Labels



# Communicate the Hazard – Larger Batteries and Quantities



# 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



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### 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



# 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
  - Training materials
  - Emergency Response Guidebook (ERG)
- Compliance assistance to industry (Outreach and Engagement)



# PHMSA Training Modules

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## Training Modules



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Pipeline and Hazardous Materials Safety  
Administration  
1200 New Jersey Avenue, SE  
Washington, DC 20590  
United States  
[phmsa.hm-training@dot.gov](mailto:phmsa.hm-training@dot.gov)  
Phone: 202-366-4900



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The Outreach and Training Branch develops materials that make it

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#### Hazardous Materials Training Program

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Pipeline and Hazardous Materials Safety  
Administration

1200 New Jersey Avenue, SE

Washington, DC 20590

United States

[phmsa.hm-training@dot.gov](mailto:phmsa.hm-training@dot.gov)

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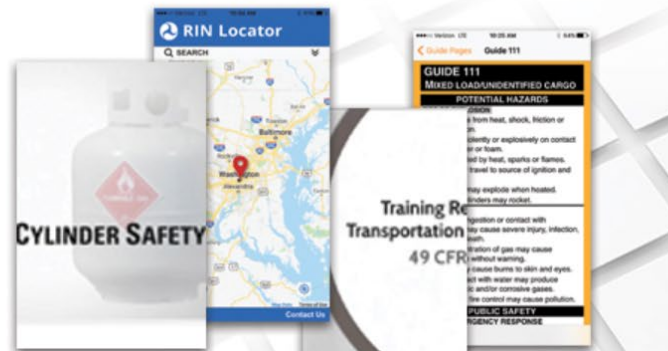
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## PHMSA's Online CFR (oCFR)



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 Appendixes. 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](#)

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## 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.

### HMSAT Bios

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1-800-467-4922  
202-366-4488  
[infocntr@dot.gov](mailto: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

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# Questions?

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