

# Pipeline and Hazardous Materials Safety Administration

August 14, 2019 – Neal Suchak and Jordan Rivera



## Lithium Battery Recycling and Disposal



# Why is this important?



U.S. Department of Transportation  
Pipeline and Hazardous Materials  
Safety Administration

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



# 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



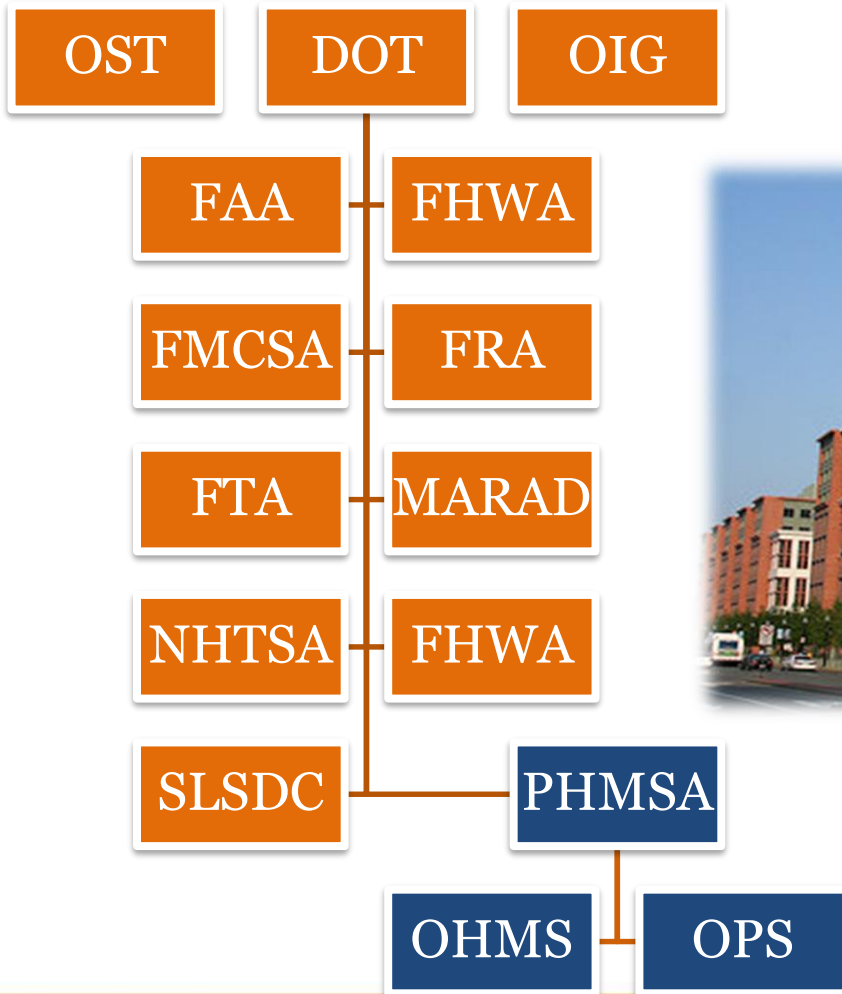
U.S. Department of Transportation  
Pipeline and Hazardous Materials  
Safety Administration

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





# 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***



U.S. Senate Photo

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



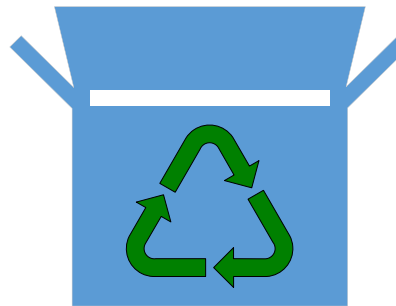
# DOT in the Supply Chain

## Oversight Over the Transportation Process

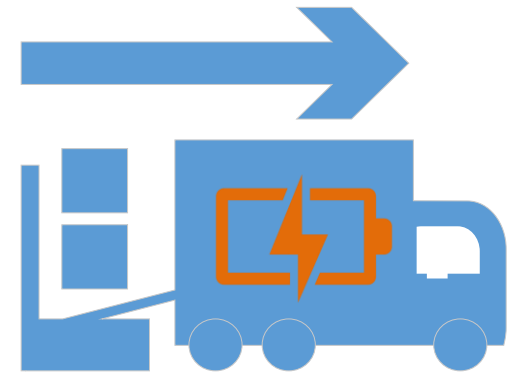
Identification  
and Sorting



Packaging and Hazard  
Communication



Movement





# How DOT/PHMSA's Regulations Work

## Highway Transportation of Small Lithium Batteries



# 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

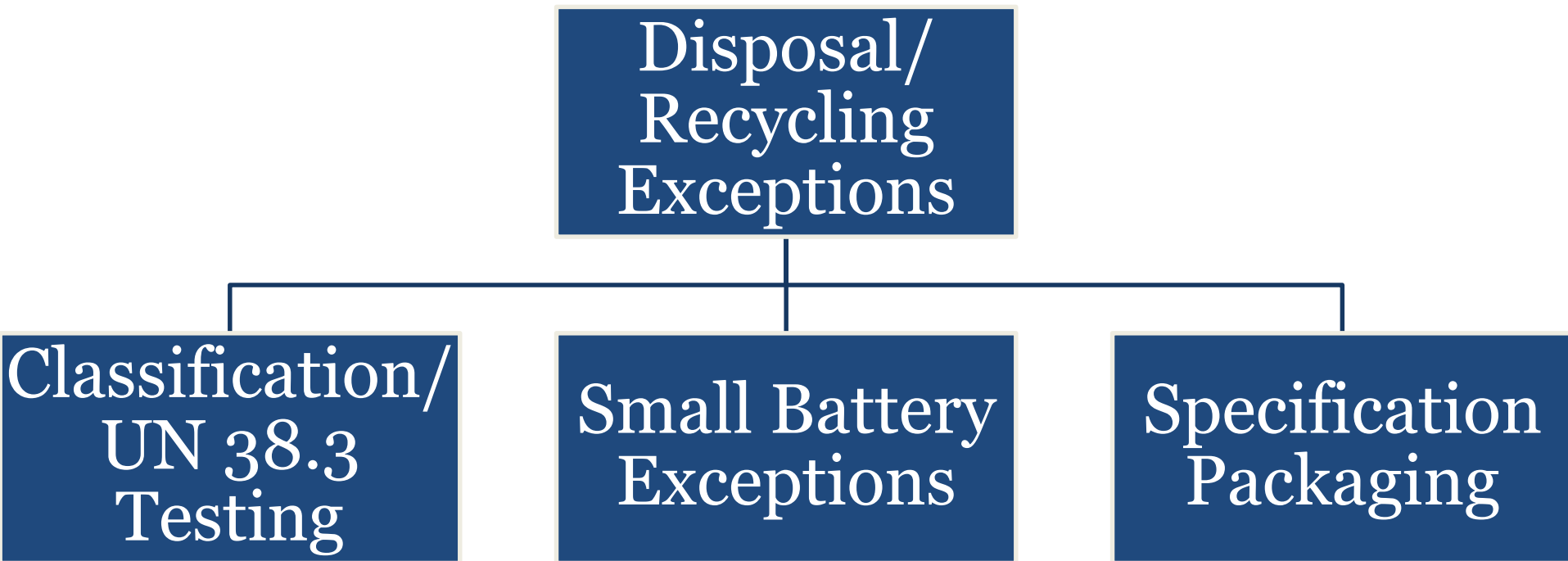
3. Small battery  
exceptions

4.  
Disposal/Recycling  
Exceptions

5. Damaged,  
Defective, Recalled



# Disposal/Recycling Exceptions (Motor Vehicle)



49 CFR § 173.185(d)





# Classify the Hazard - Hazard Classes



**Explosives**



**Gases**



**Flammable Liquids**



**Flammable Solids**



**Oxidizers and Organic Peroxides**



**Poison and Infectious Substances**



**Radioactive**



**Corrosive**



**Miscellaneous**



# Classify the Hazard – Identification and Sorting

- Battery markings
- Physical characteristics
- Color
- Isolate damaged batteries



# 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.

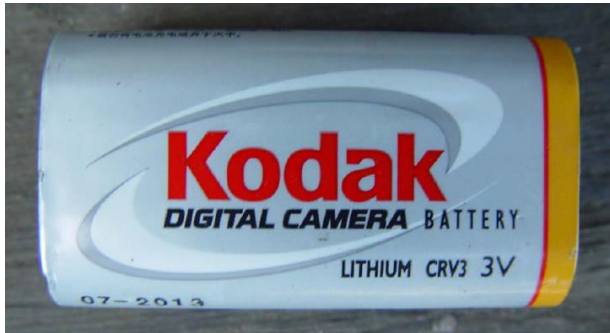
# Lithium Metal

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



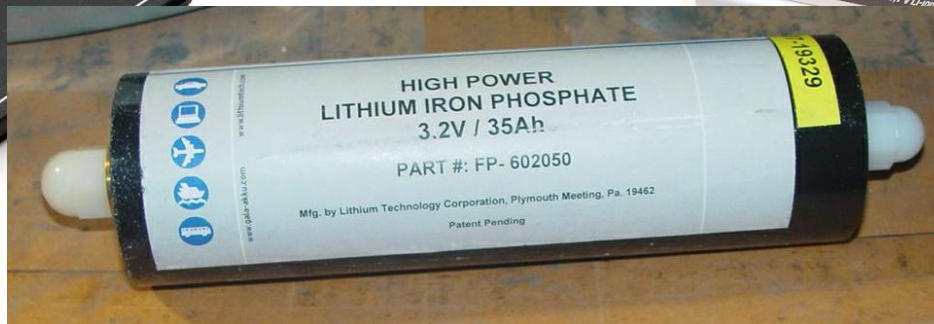
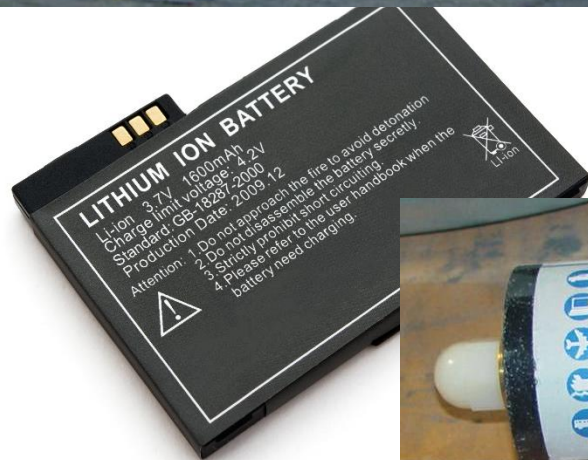


# Classify the Hazard – Lithium Metal





# Classify the Hazard – Lithium Ion



U.S. Department of Transportation  
Pipeline and Hazardous Materials  
Safety Administration

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



# Classify the Hazard – Lithium Batteries ID Numbers

**UN3480**

- Lithium Ion Batteries

**UN3481**

- Lithium Ion Batteries Contained in Equipment

**UN3090**

- Lithium Metal Batteries

**UN3091**

- Lithium Metal Batteries Contained in Equipment



# 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





# Classify the Hazard – Battery Size



- Watt-hour (Wh) = Ampere-hours (Ah) x Volts (V)
- In the case of milliamper hour (mAh), divide by 1000





# Contain the Hazard - Packaging



# Contain the Hazard – Small Consumer Lithium Batteries

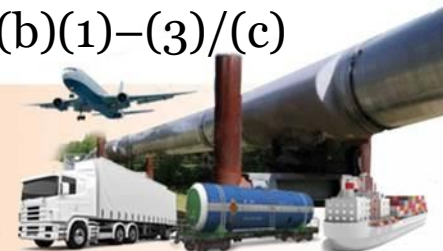
# General Requirements

- 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)



# 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)



U.S. Department of Transportation  
Pipeline and Hazardous Materials  
Safety Administration

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





# Contain the Hazard – Inner Packaging



Inner package did not protect from short circuits



U.S. Department of Transportation  
Pipeline and Hazardous Materials  
Safety Administration

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





# Contain the Hazard – Inner Packaging



Photo courtesy of Cascade Asset Management



Photo courtesy of Cascade Asset Management



U.S. Department of Transportation  
Pipeline and Hazardous Materials  
Safety Administration

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





# Contain the Hazard – Cushioning Material



# Contain the Hazard – Outer Packaging



49 CFR § 173.185(c)(2)



U.S. Department of Transportation  
Pipeline and Hazardous Materials  
Safety Administration

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





# 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  
(Rail/Vessel)

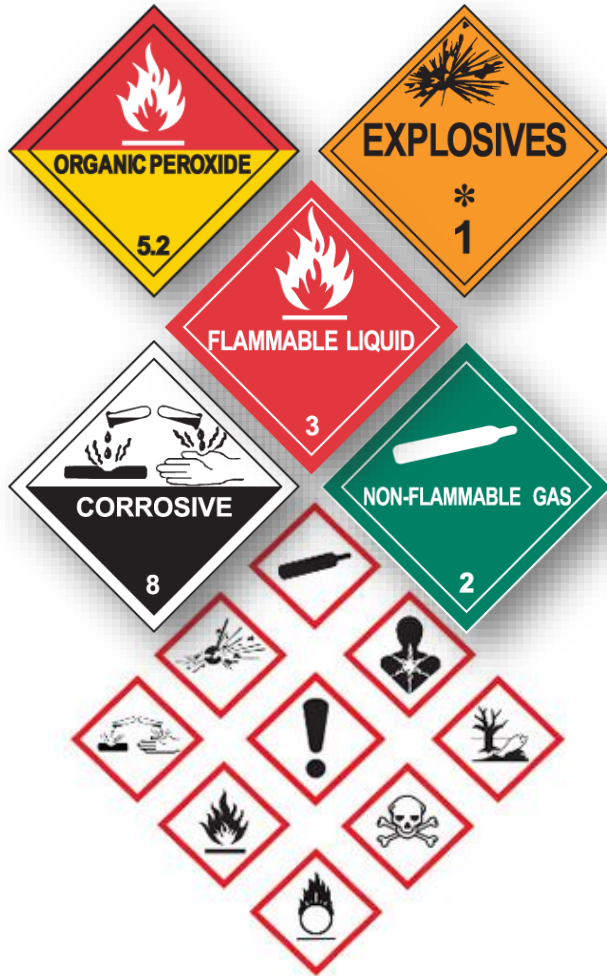


1A2/X40/S/05  
USA/0000

49 CFR § 173.185(b)(3)



# Communicate the Hazard – Hazard Communication



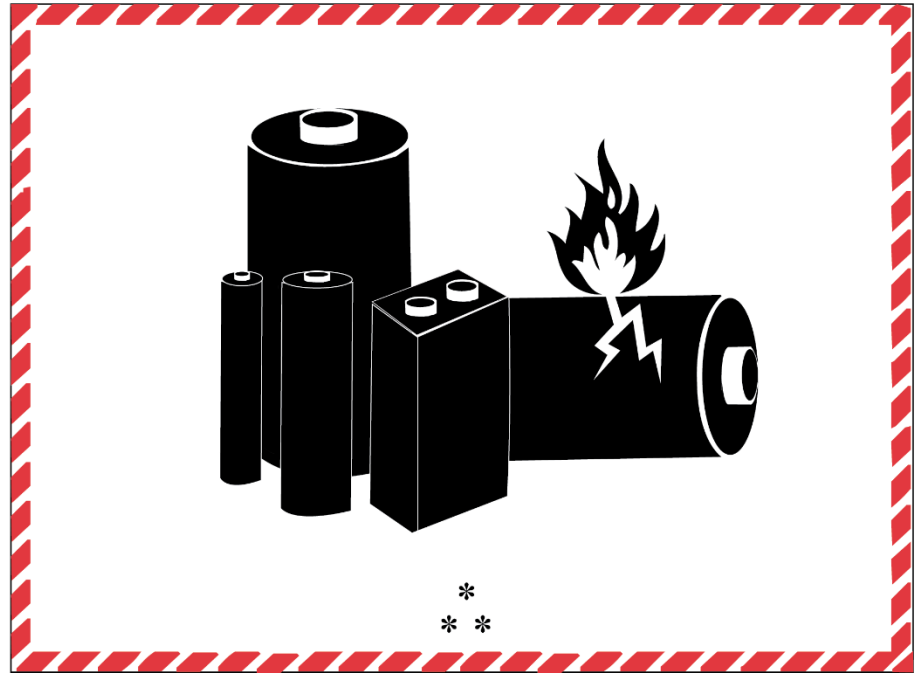
U.S. Department of Transportation  
Pipeline and Hazardous Materials  
Safety Administration

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



# 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)



U.S. Department of Transportation  
Pipeline and Hazardous Materials  
Safety Administration

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





# 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)



U.S. Department of Transportation  
Pipeline and Hazardous Materials  
Safety Administration

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

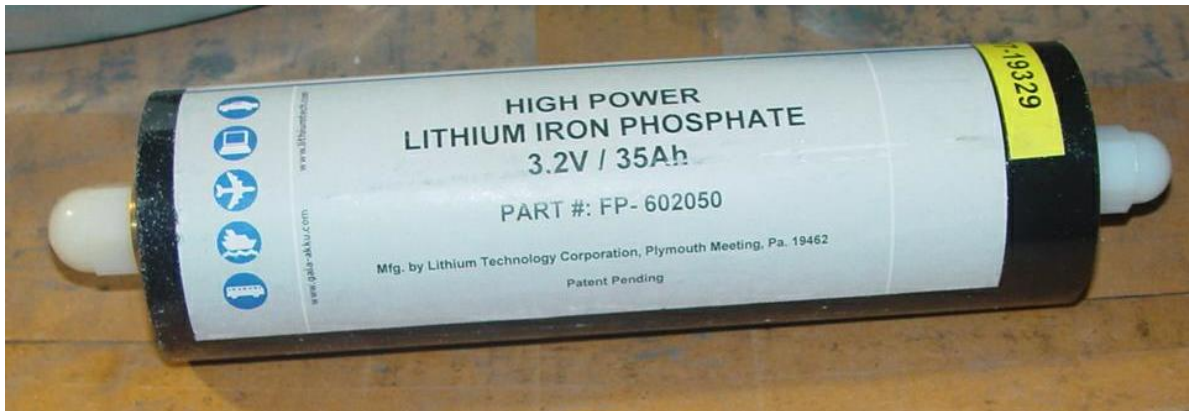


# Communicate the Hazard - Package



# 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)



# 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



# 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)

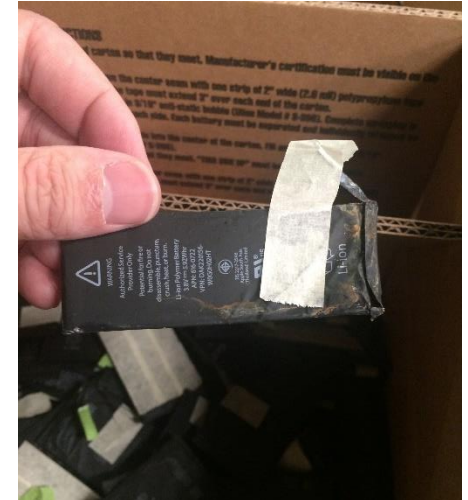
## Consider:

- 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





# Classify the Hazard – Damaged, Defective, or Recalled



# 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.**





# Contain the Hazard – Damaged, Defective, Recalled



Photos courtesy of Cascade Asset Management



U.S. Department of Transportation  
Pipeline and Hazardous Materials  
Safety Administration

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



# 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)





# 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.



# 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

PHMSA  
Pipeline and Hazardous Materials  
Safety Administration

Sign-Up for Email Alerts | Newsroom

Search PHMSA site

ABOUT PHMSA   SAFETY   REGULATIONS AND COMPLIANCE   RESOURCES

Home » Training » Hazmat

Hazardous Materials Outreach & Engagement

Training Requirements for Industry

Emergency Response Guidebook (ERG)

Webinars and Workshops

Hazardous Materials Safety Assistance Team (HMSAT)


Publications

Training Modules

Videos and Mobile Apps

Contact Us

## Training Modules



### Hazardous Materials Transportation

#### 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](mailto:phmsa.hm-training@dot.gov)  
Phone: 202-366-4900





# PHMSA Training Publications

**PHMSA**  
Pipeline and Hazardous Materials  
Safety Administration

Sign-Up for Email Alerts | Newsroom

Search PHMSA site

ABOUT PHMSA   SAFETY   REGULATIONS AND COMPLIANCE   RESOURCES

Home » Training » Hazmat

Hazardous Materials Outreach & Engagement

Training Requirements for Industry

Emergency Response Guidebook (ERG)

Webinars and Workshops

Hazardous Materials Safety Assistance Team (HMSAT)


Publications

Training Modules

Videos and Mobile Apps

Contact Us

## Publications



The Outreach and Training Branch develops materials that make it

### Related Links

- Order Training Materials Online

### 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](mailto:phmsa.hm-training@dot.gov)  
Phone: 202-366-4900





# PHMSA Videos and Mobile Apps

[Sign-Up for Email Alerts](#) | [Newsroom](#)

## PHMSA

Pipeline and Hazardous Materials  
Safety Administration

Search PHMSA site



[ABOUT PHMSA](#)

[SAFETY](#)

[REGULATIONS AND COMPLIANCE](#)

[RESOURCES](#)

[Home](#) » [Training](#) » [Hazmat](#)

[Hazardous Materials  
Outreach & Engagement](#)

[Training Requirements  
for Industry](#)

[Emergency Response  
Guidebook \(ERG\)](#)

[Webinars and Workshops](#)

[Hazardous Materials  
Safety Assistance Team  
\(HMSAT\)](#)

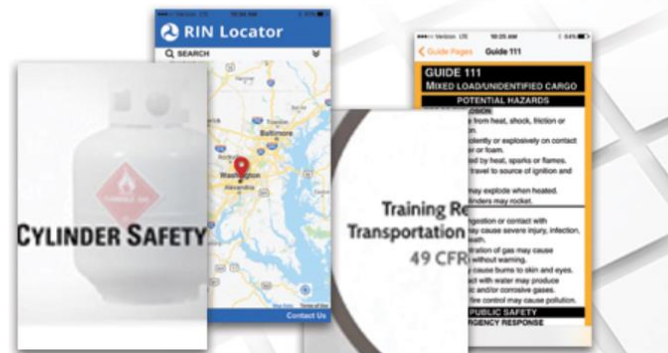
[Publications](#)

[Training Modules](#)

[Videos and Mobile Apps](#)

[Contact Us](#)

## Videos and Mobile Apps



### Related Links

- [PHMSA Youtube page](#)

### Share



U.S. Department of Transportation  
Pipeline and Hazardous Materials  
Safety Administration

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



# PHMSA's OCFR

[Sign-Up for Email Alerts](#) | [Newsroom](#)

## PHMSA

Pipeline and Hazardous Materials  
Safety Administration



[ABOUT PHMSA](#)

[SAFETY](#)

[REGULATIONS AND COMPLIANCE](#)

[RESOURCES](#)

[Home](#) » [Standards and Rulemaking](#) » [Hazmat](#)

[Hazardous Materials  
Standards & Rulemaking  
Overview](#)

[International Program  
Overview](#)

[PHMSA's Online CFR  
\(oCFR\)](#)

[Rulemakings](#)



[Petitions for Rulemaking](#)

[Interpretations](#)

[Regulations](#)

[Preemption  
Determinations](#)

[Notices and Advisory](#)

## 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](#)

### Contact Us

#### Hazardous Materials Standards and Rulemaking

U.S. Department of Transportation,  
Pipeline and Hazardous Materials Safety  
Administration  
1200 New Jersey Avenue, SE



U.S. Department of Transportation  
Pipeline and Hazardous Materials  
Safety Administration

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



# HMSAT

**PHMSA**

Pipeline and Hazardous Materials  
Safety Administration

[Sign-Up for Email Alerts](#) | [Newsroom](#)

Search PHMSA site



[ABOUT PHMSA](#)

[SAFETY](#)

[REGULATIONS AND COMPLIANCE](#)

[RESOURCES](#)

[Home](#) » [Training](#) » [Hazmat](#)

[Hazardous Materials  
Outreach & Engagement](#)

[Training Requirements  
for Industry](#)

[Emergency Response  
Guidebook \(ERG\)](#)

[Webinars and Workshops](#)

[Hazardous Materials  
Safety Assistance Team  
\(HMSAT\)](#)

[Publications](#)

[Training Modules](#)

[Videos and Mobile Apps](#)

[Contact Us](#)

## Hazardous Materials Safety Assistance Team (HMSAT)

Share



### 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



U.S. Department of Transportation  
**Pipeline and Hazardous Materials  
Safety Administration**

[WWW.PHMSA.DOT.GOV](http://WWW.PHMSA.DOT.GOV)

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



# Hazardous Materials Information Center

[Sign-Up for Email Alerts](#) | [Newsroom](#)

## PHMSA

Pipeline and Hazardous Materials  
Safety Administration



[ABOUT PHMSA](#)

[SAFETY](#)

[REGULATIONS AND COMPLIANCE](#)

[RESOURCES](#)

[Home](#) » [Standards and Rulemaking](#) » [Hazmat](#)

[Hazardous Materials  
Standards & Rulemaking  
Overview](#)

[International Program  
Overview](#)

[PHMSA's Online CFR  
\(oCFR\)](#)

[Rulemakings](#)



[Petitions for Rulemaking](#)

[Interpretations](#)

[Regulations](#)

[Preemption  
Determinations](#)

[Notices and Advisory](#)

## Hazardous Materials Information Center

1-800-HMR-4922  
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

### Contact Us

#### Hazardous Materials Standards and Rulemaking

U.S. Department of Transportation,  
Pipeline and Hazardous Materials Safety  
Administration  
1200 New Jersey Avenue, SE  
Washington, DC 20590  
United States  
[infocntr@dot.gov](mailto:infocntr@dot.gov)

Phone: 202-366-8553  
Alt: 800-467-4922  
Fax: 202-366-7435



U.S. Department of Transportation  
Pipeline and Hazardous Materials  
Safety Administration

[WWW.PHMSA.DOT.GOV](http://WWW.PHMSA.DOT.GOV)

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





# Contact Information

**Neal Suchak**

*Hazardous Materials Safety  
Assistance Team (HMSAT)*  
PHMSA Central Region

[Neal.Suchak@dot.gov](mailto:Neal.Suchak@dot.gov)

Cell: (202) 839-0498

Office: (816) 329-3802



# Questions?



U.S. Department of Transportation  
Pipeline and Hazardous Materials  
Safety Administration

[WWW.PHMSA.DOT.GOV](http://WWW.PHMSA.DOT.GOV)

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

