


## Lithium Battery Transportation: Why is it a big deal? Why is it a pain?

15 September 2020  
Gene Sanders, CDGP  
*Live and Online*



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### 2020 | AHMP Live

# NATIONAL CONFERENCE

August 31 - September 3, 2020





## Lithium Battery Transportation

Gene Sanders, CDGP

## Who Regulates?



### • UN Recommendations

#### – Modal Treaty Organizations

- IMO
  - IMDG Code
- ICAO
  - IATA, A.I.R. shipper
- ADR

#### – States (countries)

- 49CFR
- TDG
- ADOT
- Etc.



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## US D.O.T. limits modal regulation usage



- And so do other countries

### §171.22 Authorization and conditions for the use of international standards and regulations.

(a) *Authorized international standards and regulations.* This subpart authorizes, with certain conditions and limitations, the offering for transportation and the transportation in commerce of hazardous materials in accordance with the International Civil Aviation Organization's Technical Instructions for the Safe Transport of Dangerous Goods by Air (ICAO Technical Instructions), the International Maritime Dangerous Goods Code (IMDG Code), Transport Canada's

(b) *Limitations on the use of international standards and regulations.* A hazardous material that is offered for transportation or transported in accordance with the international standards and regulations authorized in paragraph (a) of this section—

(c) *Materials excepted from regulation under international standards and regulations.* A material designated as a hazardous material under this subchapter, but excepted from or not subject to the international transport standards and regulations authorized in paragraph (a) of this section (e.g., paragraph 1.16 of the Transport Canada TDG Regulations excepts from regulation quantities of hazardous materials less than or equal to 500 kg gross transported by rail) must be transported in accordance with all applicable requirements of this subchapter.

*Paragraph (e) says no DOT forbidden can be shipped using other regulations.*



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## Batteries?



§173.21 Forbidden materials and packages.  
Unless otherwise provided in this subchapter,  
the offering for transportation or transportation of  
the following is forbidden:

- (a) ...
- (b) ...
- (c) Electrical devices...



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## Batteries?



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Unless otherwise provided in this subchapter, the  
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**following is forbidden:**

- (a) ...
- (b) ...
- (c) Electrical devices, such as **batteries** and **battery-powered devices**, ...



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## Battery incidents on passenger planes



### B. Recent Transportation Incidents

Over the past several years, we have received a number of reports of transportation incidents involving various kinds of batteries and battery-powered devices, including incidents involving passenger airline operations. The most recent incident occurred on February 10, 2007, aboard a flight originating at JFK International Airport. Shortly after takeoff, a fire ignited in a passenger bag stowed in an overhead bin. Fast and appropriate action by the crew brought the fire under control and prevented injury to passengers and crew. The flight crew promptly extinguished the fire and the flight returned to JFK for an emergency landing. Although the fire is still under investigation by **PHMSA**, the Federal Aviation Administration (FAA), and the National Transportation Safety Board (NTSB), preliminary reports indicate batteries were involved in the incident.

Other incidents have occurred on the ground. Last May, we received a report of a fire involving a spare lithium ion battery that had been stowed in a passenger's notebook computer carrying case. A flight attendant removed the burning case from the passenger cabin, and tossed it onto the ramp, where the fire was extinguished by ground personnel.

On April 18, 2004, at Chicago's Midway Airport, a power drill with an installed nickel cadmium battery activated while in checked luggage. This caused a fire that spread to other bags on a luggage cart waiting to be loaded onto a passenger aircraft.



## Tools?



## Battery incidents on passenger planes



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In June 2003, we received reports that an overheated battery had been discovered in a routine baggage inspection of a flight departing from Logan Airport in Boston. The battery had been loosely packed in a toolbox, along with various metal tools. We believe the heat build-up was caused by short-circuiting when the battery's exposed terminals came in contact with metal objects in the toolbox.



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## UPS #1



Photo courtesy of National Transportation Safety Board



## UPS #2



### UPS Airlines Flight 6

From Wikipedia, the free encyclopedia

**UPS Airlines Flight 6** was a cargo flight operated by **UPS Airlines**. On September 3, 2010, the **Boeing 747-400F** flying the route between **Dubai**, United Arab Emirates, and **Cologne**, Germany, developed an in-flight fire which caused the aircraft to crash, killing both crew members, the only people on board.<sup>[1][2][3]</sup> It was the first fatal air crash for UPS Airlines.<sup>[4]</sup> The crash prompted a re-evaluation of safety procedures protecting airliners from cockpit smoke.

- 81,000 lithium batteries on a pallet
- The fire started there



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## Asiana Airlines



### Asiana Airlines Flight 991

From Wikipedia, the free encyclopedia

On 28 July 2011, **Asiana Airlines Flight 991**, a **Boeing 747-400F** cargo aircraft on a flight from **Seoul**, South Korea, to **Shanghai**, China, crashed into the sea off **Jeju Island** after suffering a main deck fire. Both pilots, the only two people on board, were killed.<sup>[1]</sup>

- 400 kg of Lithium Batteries
- Fire started near them
- 18 minutes later, plane down



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## Batteries?



### §173.21 **Forbidden materials and packages.**

Unless otherwise provided in this subchapter, the offering for transportation or **transportation of the following is forbidden:**

- (a) ...
- (b) ...
- (c) Electrical devices, such as **batteries** and **battery-powered devices**, which are likely to create sparks or generate a dangerous quantity of heat, ...



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## Battery & Energy Release




- Even very small batteries can start fires
- Or just squeeze a small lithium battery

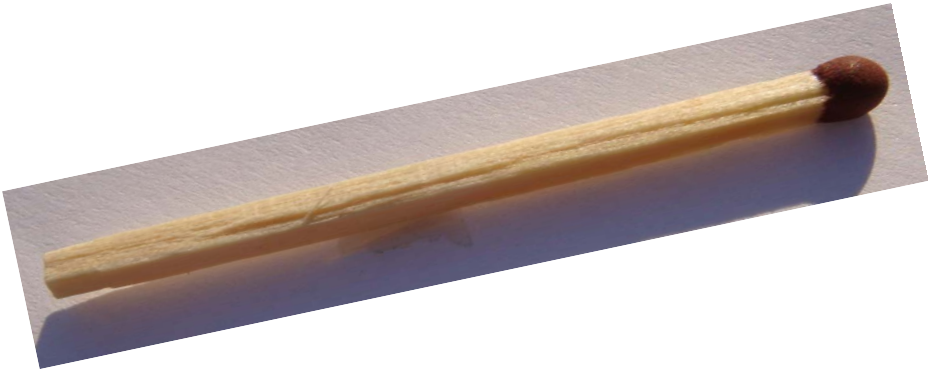


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*How many matches does it take to light a candle?*





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*How many matches does it take to light a million acre forest fire?*



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## Batteries?



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- (a) ...
- (b) ...
- (c) Electrical devices, such as **batteries** and **battery-powered devices**, which are likely to create sparks or generate a dangerous quantity of heat, *unless* packaged in a manner which precludes such an occurrence.



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## PREVENT ENERGY RELEASE



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## Lithium battery problems



- [Laptop fire at LAX](#)
- 
- [FAA remarks re LAX laptop fire](#)



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## Batteries are HazMat (dangerous goods)



UN No.	Name and description	Class	Classification code	Packing group	Labels	Special provisions	Limited quantities	Packaging			Portable tanks and bulk containers	
								Packing instructions	Special packing provisions	Mixed packing provisions	Instructions	Special provisions
	3.1.2	2.2	2.2	2.1.1.3	5.2.2	3.3	3.4.6	4.1.4	4.1.4	4.1.10	4.2.5.2 7.3.2	4.2.5.3
(1)	(2)	(3a)	(3b)	(4)	(5)	(6)	(7)	(8)	(9a)	(9b)	(10)	(11)
2800	BATTERIES, WET, NON-SPILLABLE, electric storage	8	C11		8	238 295 598	LQ0	P003 P801a	PP16			
2794	BATTERIES, WET, FILLED WITH ACID, electric storage											
3028	BATTERIES, DRY, CONTAINING POTASSIUM HYDROXIDE SOLID, electric storage											
3090	LITHIUM BATTERIES											
3091	LITHIUM BATTERIES CONTAINED IN EQUIPMENT or LITHIUM BATTERIES PACKED WITH EQUIPMENT											



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# BATTERIES ARE HAZMAT!

**WETRAIN**  
CONSULTING


**NON-SPILLABLE**

**NONSPILLABLE BATTERY**



**UN3496, Batteries,  
Nickel-metal Hydri**

**LiFePO<sub>4</sub>**



IL201R LABELMASTER® (800) 821-5808 www.labelmaster.com

**UN3090**

**UN3091**

**UN3480**

**UN3481**



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**LITHIUM BATTERIES -  
FORBIDDEN FOR TRANSPORT  
ABOARD AIRCRAFT AND VESSEL**

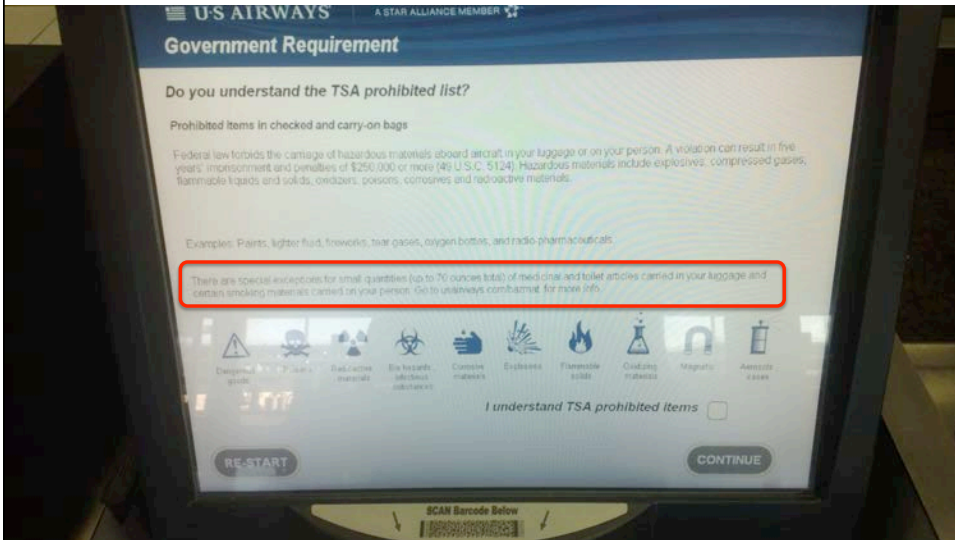
L415 LABELMASTER® (800) 821-5808 www.labelmaster.com

**PRIMARY LITHIUM BATTERIES -  
FORBIDDEN FOR TRANSPORT  
ABOARD PASSENGER AIRCRAFT**

L415 LABELMASTER® (800) 821-5808 www.labelmaster.com

# “Commercial” Air Travel?

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**U.S. AIRWAYS** A STAR ALLIANCE MEMBER

**Government Requirement**

Do you understand the TSA prohibited list?

Prohibited items in checked and carry-on bags

Federal law forbids the carriage of hazardous materials aboard aircraft in your luggage or on your person. A violation can result in five years' imprisonment and penalties of \$250,000 or more (49 U.S.C. 5124). Hazardous materials include explosives, compressed gases, flammable liquids and solids, oxidizers, poisons, corrosives and radioactive materials.

Examples: Paints, lighter fluid, fireworks, hair gases, oxygen bottles, and radio pharmaceuticals.

There are special exceptions for small quantities (up to 70 ounces total) of medical and toilet articles carried in your luggage and certain smoking materials carried on your person. Go to [usairways.com/batteries](#) for more info.

Explosive  
 Flammable  
 Corrosive  
 Toxic  
 Radioactive  
 Compressed gas  
 Oxidizer  
 Hazardous material  
 Flammable solid  
 Corrosive solid  
 Toxic solid  
 Radioactive solid  
 Explosive solid

I understand TSA prohibited items ☐

**RE-START** **CONTINUE**

SCAN Barcode Below

## 49CFR 175.10 – Non-reg if...

(18) Except as provided in §173.21 of this subchapter, portable electronic devices (e.g., watches, calculating machines, cameras, cellular phones, laptop and notebook computers, camcorders, medical devices etc.) containing dry cells or dry batteries (including lithium cells or batteries) and spare dry cells or batteries for these devices, when carried by passengers or crew members for personal use, Portable electronic devices powered by lithium batteries may be carried in either checked or carry-on baggage. Spare lithium batteries must be carried in carry-on baggage only. Each installed or spare lithium battery must be of a type proven to meet the requirements of each test in the UN Manual of Tests and Criteria, Part III, Sub-section 38.3 and each spare lithium battery must be individually protected so as to prevent short circuits (e.g., by placement in original retail packaging, by otherwise insulating terminals by taping over exposed terminals, or placing each battery in a separate plastic bag or protective pouch). In addition, each installed or spare lithium battery must not exceed the following:

## Commercial Air Travel...

- ...regulations apply to your personal travel, too!
  - ...although really, what if we use that laptop for business?
  - ...and do personal travelers really know about UN38.3?
  - ...or tape terminals on spare batteries? Really?

## So...



- Transport Rules require that we train for, and do:
  - IDENTIFY what's dangerous,
    - **CLASSIFICATION**
  - CONTAIN dangerous materials,
  - TELL EVERYONE what's being shipped,
  - PREPARE FOR EMERGENCIES,
  - ... and do it all while keeping SECURITY in mind.



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## Lithium Battery Definitions




- Battery Types (chemistries)




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## CLASSIFY – Lithium Batteries




- PRIMARY
  - Metal
    - Non-rechargeable
  - also,
    - Lithium Alloy
- SECONDARY
  - Ion
    - Rechargeable
  - e.g.,
    - Lithium Polymer
    - LiFe (LiFePO<sub>4</sub>)
    - LiCobaltOxide




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## Lithium Battery Definitions



- Battery Types
- Battery Shapes



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## Battery Shapes



- Button – Round, with height < diameter
- Coin – Same as button
- Cylinder – Round, with height > diameter



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## Lithium Battery Definitions



- Battery Types
- Battery Shapes
- Battery Measurements



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## Battery Measurements



*Duh, net weight and gross weight, of course, Gene.*

- Lithium Content
  - For lithium metal batteries
    - In grams
- ~~Equivalent Lithium Content~~
  - ~~For lithium ion batteries~~
    - ~~No longer used in transport regulations~~
- Watt-hours
  - For lithium ion batteries
    - Rated capacity • voltage (Amp-hours x voltage)
    - Soon to be marked on all new lithium ion batteries



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## CLASSIFY – Lithium Batteries



- ~~AmpHours x 0.3 = E.L.C.~~ (Equivalent Lithium Content)
- Volts x AmpHours = WattHours (Wh)
  - Calculating Watt Hours



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## Oh my, how?



- State of Charge (SoC)
  - Li Ion only
  - ‘just’ or ‘only’, not “with” nor “in”
  - CAO, not PASS
  - No good way to measure
    - Unenforceable, probably
      - How does shipper certify?
        - » Manufacturer, sure
        - » Distributor, or Redistributor?
        - » If used, not new?



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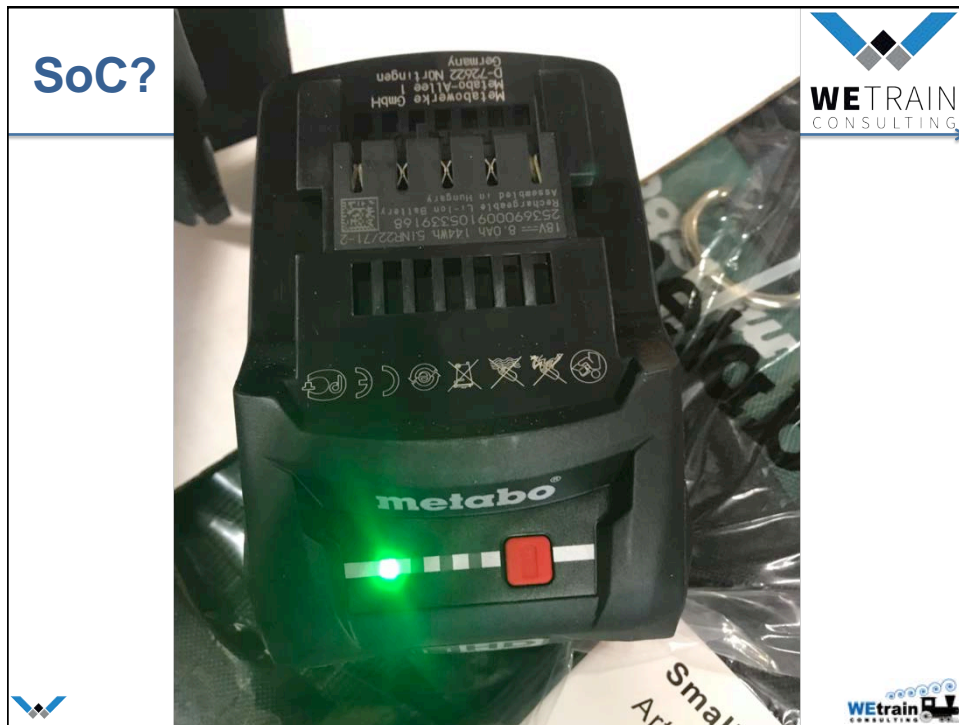


## Okay, SoC maybe this way?



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## Lithium Battery Definitions

- Battery Types
- Battery Shapes
- Battery Measurements
- Batteries that aren't "batteries"

## Cells vs. Batteries



*US DOT uses "button cell batteries" in 49CFR 173.185(c)(3)*

- Cell – A single encased unit with voltage differential
  - UN Manual of Tests & Criteria, 5<sup>th</sup> Edition
- Battery – Two or more cells electrically connected together
  - 2015 IATA DGR Appendix A – Glossary
- A single cell battery is a cell for DG compliance.



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## Seriously?



- [Nail through multi-cell lithium ion battery](#)



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## Lithium Battery Definitions



- Battery Types
- Battery Shapes
- Battery Measurements
- Batteries that aren't "batteries"
- Battery Sizes



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## Battery Sizes



- UN Manual of Tests and Criteria, 5<sup>th</sup> Edition
  - Large Cell: lithium metal > 12 g
  - Large Cell: lithium ion > 150 Wh
  - Large Battery: both types, gross mass > 12 kg
  - Small Cells & Batteries: those that aren't "large"



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## Battery Sizes



- US Department of Transportation
  - “smaller”
    - Depends upon mode
    - Air or Water
      - Cells: < 1 g, or, < 20 Wh
      - Batteries: < 2 g, or, < 100 Wh
    - Ground (road and/or rail)
      - Cells: < 5 g, or, < 60 Wh
      - Batteries: < 25 g, or, < 300 Wh



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## Lithium Battery Definitions



- Battery Types
- Battery Shapes
- Battery Measurements
- Batteries that aren't “batteries”
- Battery Sizes
- Battery Escorts



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## Battery Escorts



- Alone, or 'just'
  - Say nothing
- With equipment
  - But not in the equipment
- In equipment
  - INside, INstalled
- Integral
  - Welded, soldered, permanently attached
  - Some overlap with IN
- In or With Life-saving appliances, not self-inflating, UN3072
  - Also considering whether other DG is included
- In a vehicle
  - To power it
  - Unless a hybrid



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## Lithium Battery Definitions



- Battery Types
- Battery Shapes
- Battery Measurements
- Batteries that aren't "batteries"
- Battery Sizes
- Battery Escorts
- Battery Categorization



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## Battery Categorization



*But definitely NOT PG. Don't get them confused*

- Air shipment only, from the Pls
  - Section I
  - Section IA
  - Section IB
  - Section II
    - (that's a two, not a one-eye) 😊
- A lot like PG
  - from worst to least dangerous



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## For classification, which matter?



- Battery Types
- Battery Shapes
- Battery Measurements
- Batteries that aren't "batteries"
- Battery Sizes
- Battery Escorts
- Battery Categorization



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## For classification, which matter?



- Battery Types
- Battery Shapes
- Battery Measurements
- Batteries that aren't "batteries"
- Battery Sizes
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- Battery Categorization



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## Lithium Battery Proper Shipping Names



- Lithium Metal Batteries
- Lithium Ion Batteries
- Lithium Metal Batteries IN equipment
- Lithium Ion Batteries IN equipment
- Lithium Metal Batteries WITH equipment
- Lithium Ion Batteries WITH equipment
- **PLUS**



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## Lithium Battery Proper Shipping Names



- **PLUS**

- Sometimes,
- UN3171, **Battery-powered vehicle**, or
- UN3072, **Life-saving appliances, not self-inflating**

*Depends upon what else is in there...*



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## Lithium Cell Proper Shipping Names?



- Ummm..., no
- For classification purposes, cell = battery.
- For packing purposes, cell  $\neq$  battery.



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So...



- Transport Rules require that we train for, and do:
  - IDENTIFY what's dangerous,
  - CONTAIN dangerous materials,
    - **PACKAGING**
  - TELL EVERYONE what's being shipped,
  - PREPARE FOR EMERGENCIES,
  - ... and do it all while keeping SECURITY in mind.



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## PACKAGING – Authorizations



Sym-bols	Hazardous materials description and proper shipping names	Hazard class or Division	Identification Numbers	PG	Label Codes	Special provisions (172.102)	Packaging (173.***)			Quantity limitations		Vessel stow-age	
							Excep-tions	Non Bulk	Bulk	Passenger aircraft / rail	Cargo aircraft only	Location	Other
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8A)	(8B)	(8C)	(9A)	(9B)	(10A)	(10B)
	Accelerene, see p-Nitrosodimethylaniline												
	Accumulators, electric, see Batteries, wet etc												
	Accumulators, pressurized, pneumatic or hydraulic (containing non-flammable gas), see Articles pressurized, pneumatic or hydraulic (containing non-flammable gas)												
	Acetal	3	UN1088	II	3	IB2, T4, TP1	150	202	242	5 L	60 L	E	
	Acetaldehyde	3	UN1089	I	3	A3, B16, T11, TP2, TP7	None	201	243	Forbidden	30 L	E	
A	Acetaldehyde ammonia	9	UN1841	III	9	IB8, IP3, IP7, T1, TP33	155	204	240	200 kg	200 kg	A	34
	Acetaldehyde oxime	3	UN2332	III	3	B1, IB3, T4, TP1	150	203	242	60 L	220 L	A	
	Acetic acid, glacial or Acetic acid solution, with more than 80 percent acid, by mass	8	UN2789	II	8, 3	A3, A6, A7, A10, B2, IB2, T7, TP2	154	202	243	1 L	30 L	A	
	Acetic acid solution, not less than 50 percent but not more than 80 percent acid, by mass	8	UN2790	II	8	A3, A6, A7, A10, B2, IB2, T7, TP2	154	202	242	1 L	30 L	A	
	Acetic acid solution, with more than 10 percent and less than 50 percent acid, by mass	8	UN2790	III	8	IB3, T4, TP1	154	203	242	5 L	60 L	A	
	Acetic anhydride	8	UN1715	II	8, 3	A3, A6, A7, A10, B2, IB2, T7, TP2	154	202	243	1 L	30 L	A	40
	Acetone	3	UN1090	II	3	IB2, T4, TP1	150	202	242	5 L	60 L	B	

## 'Li Batts' Must Pass Tests



- UN Test Series 38.3
  - And, BTW, be made under a Quality Management Program



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## Testing: Not just cells



### ELECTRONIC CODE OF FEDERAL REGULATIONS

**e-CFR Data is current as of October 23, 2014**

[Title 49](#) → [Subtitle B](#) → [Chapter I](#) → [Subchapter C](#) → [Part 173](#) → [Subpart E](#) → §173.185

[Browse Previous](#) | [Browse Next](#)

Title 49: Transportation

PART 173—SHIPERS—GENERAL REQUIREMENTS FOR SHIPMENTS AND PACKAGINGS

Subpart E—Non-bulk Packaging for Hazardous Materials Other Than Class 1 and Class 7

#### §173.185 Lithium cells and batteries.

As used in this section, *lithium cell(s) or battery(ies)* includes both lithium metal and lithium ion chemistries. *Equipment* means the device or apparatus for which the lithium cells or batteries will provide electrical power for its operation.

(a) *Classification.* (1) Each lithium cell or battery must be of the type proven to meet the criteria in Part III, sub-section 38.3 of the UN Manual of Tests and Criteria (IBR; see §171.7 of this subchapter). Lithium cells and batteries are subject to these tests regardless of whether the cells used to construct the battery are of a tested type.

## 'Li Batts' Must Pass Tests



- UN Test Series 38.3
  - And, BTW, be made under a Quality Management Program
- HOW DO WE KNOW?



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## Lithium Battery Test Summary



- Different effective dates globally
- UN 38.3 passed, but not the test report
- Measurements, e.g. WattHours
- NOT sent proactively
  - Compare to mSDS distribution rules



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## Batteries?



### §173.21 Forbidden materials and packages.

Unless otherwise provided in this subchapter, the offering for transportation or **transportation of the following is forbidden:**

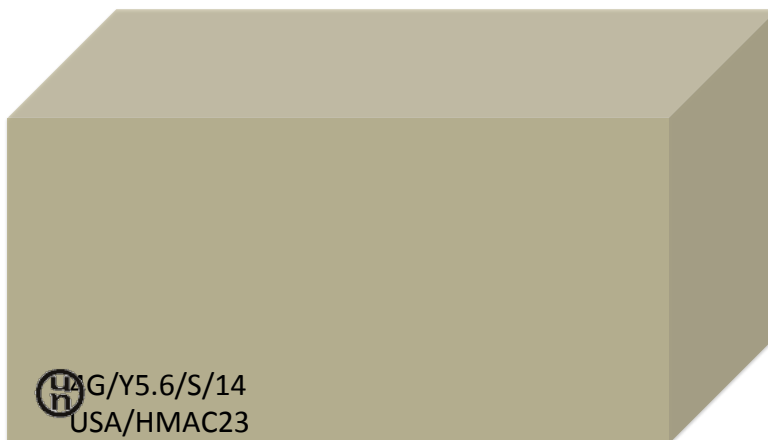
- (a) ...
- (b) ...
- (c) Electrical devices, such as **batteries** and **battery-powered devices**, which are likely to create sparks or generate a dangerous quantity of heat, *unless packaged in a manner which precludes such an occurrence.*



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## Sometimes pre-tested packaging



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## Sometimes not...



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## So...



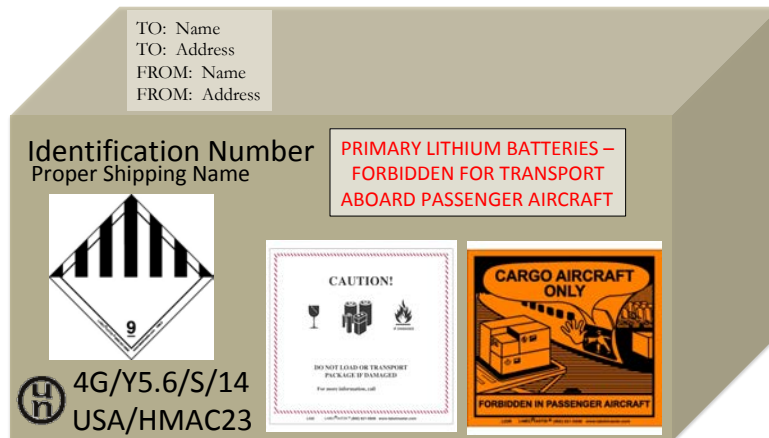
- Transport Rules require that we train for, and do:
  - IDENTIFY what's dangerous,
  - CONTAIN dangerous materials,
  - TELL EVERYONE what's being shipped,
    - **HAZARD COMMUNICATION**
      - Marks & Labels
      - Shipping Papers
      - Placards
  - PREPARE FOR EMERGENCIES,
  - ... and do it all while keeping SECURITY in mind.



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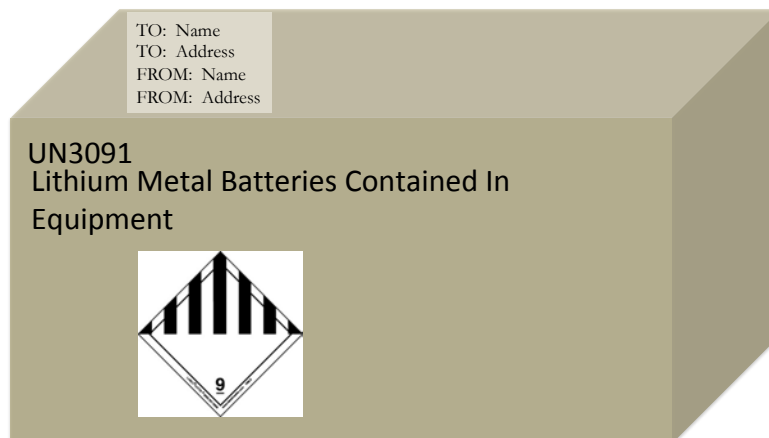
## Could be on outer package...



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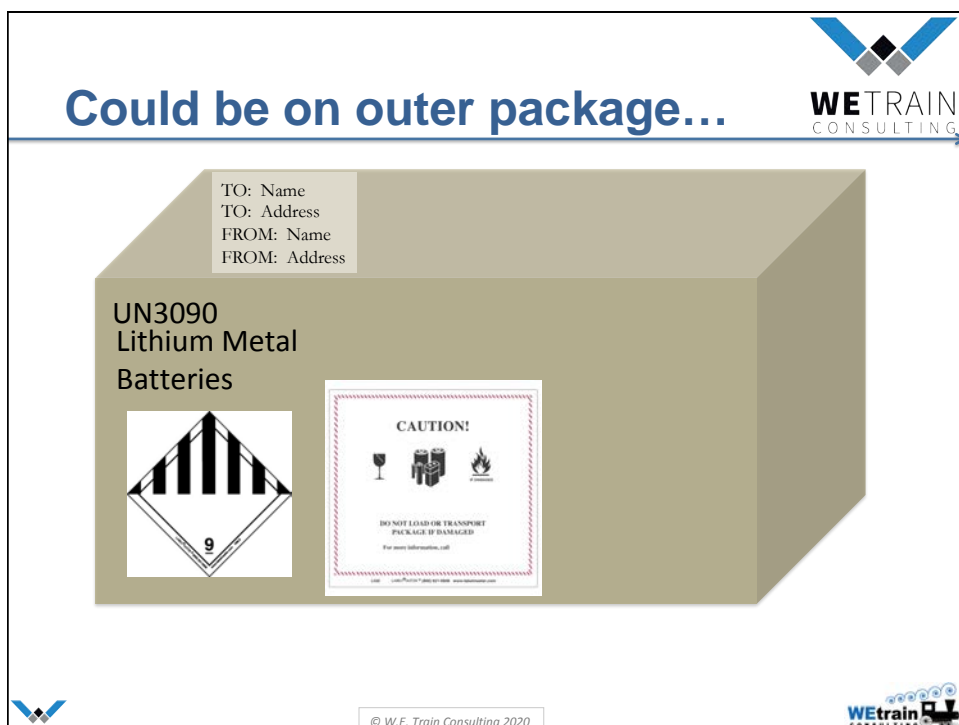
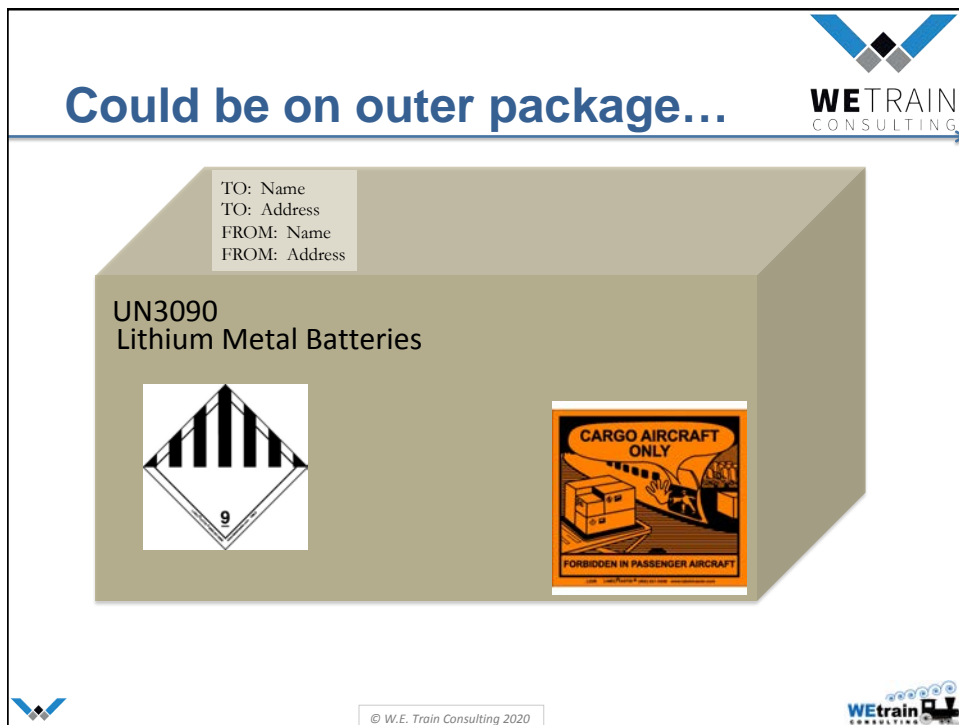


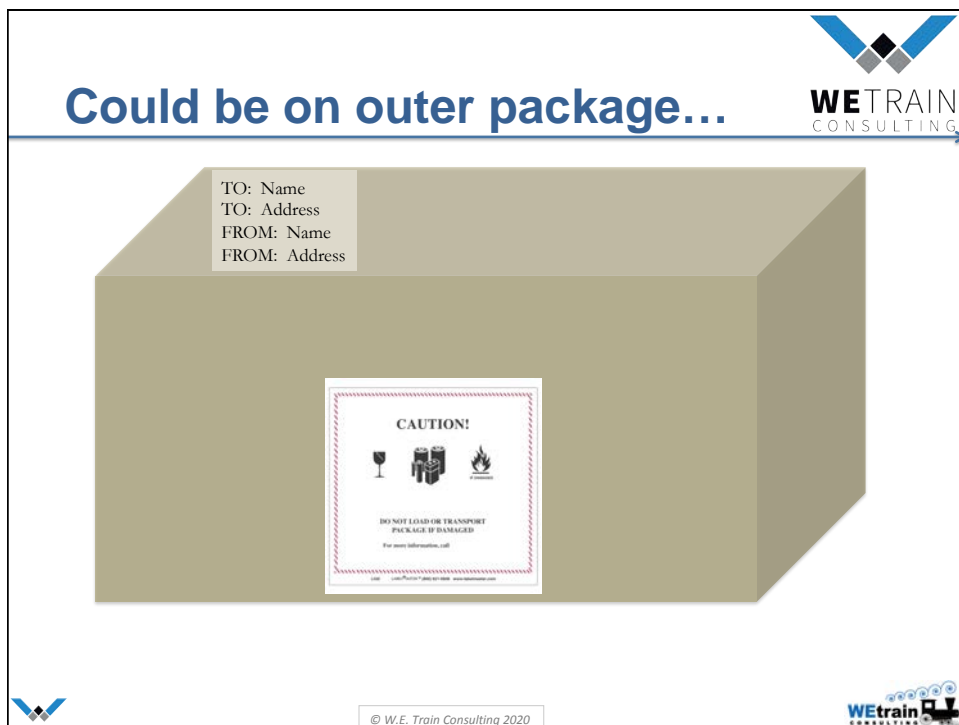
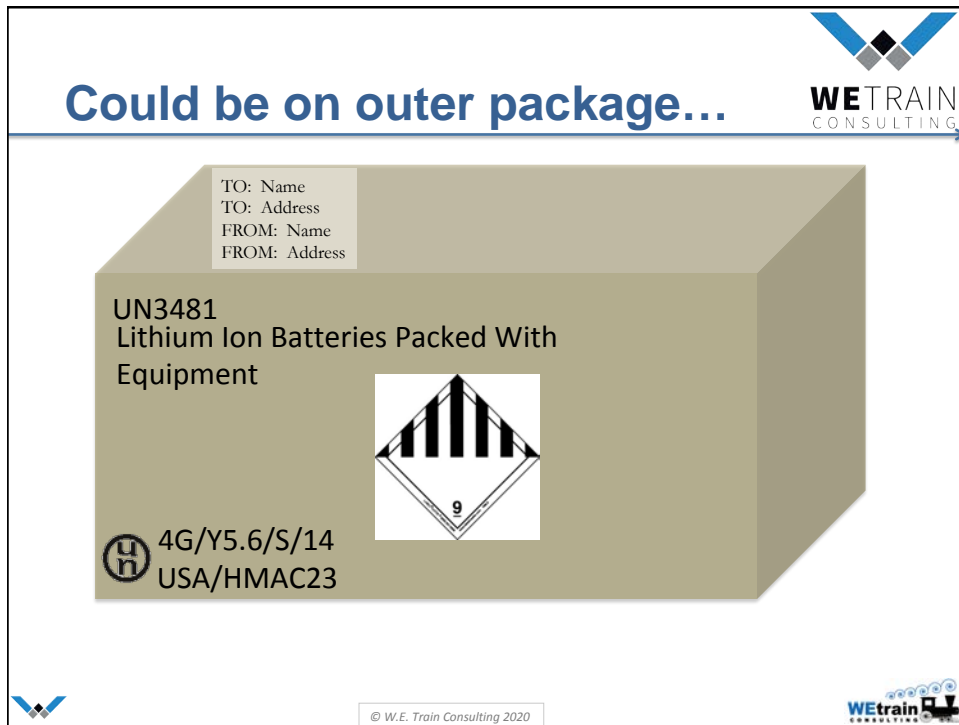
## Could be on outer package...

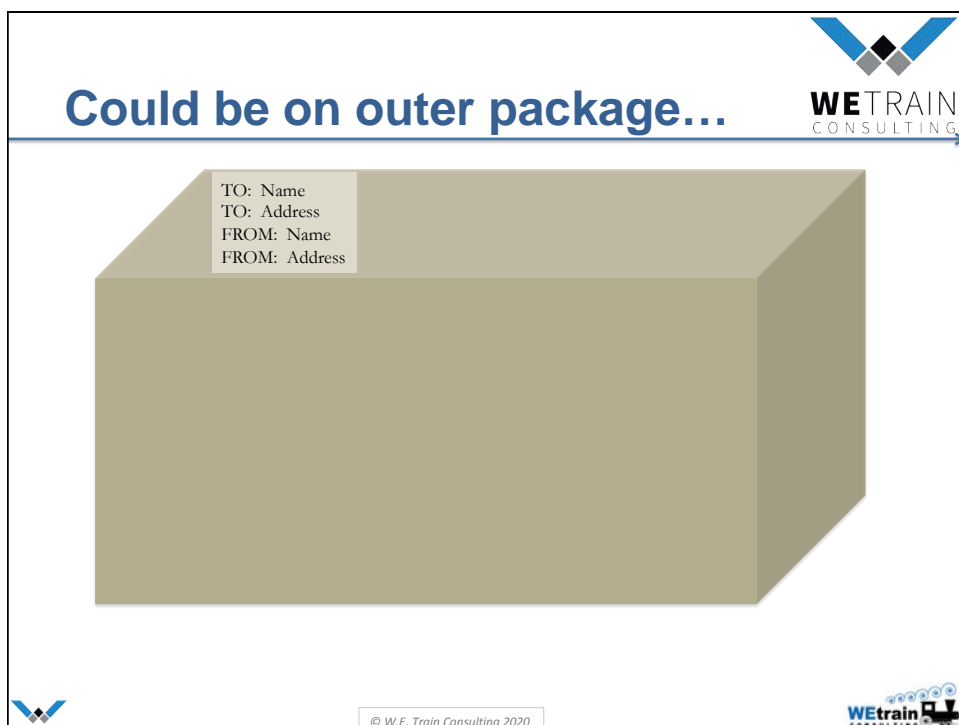
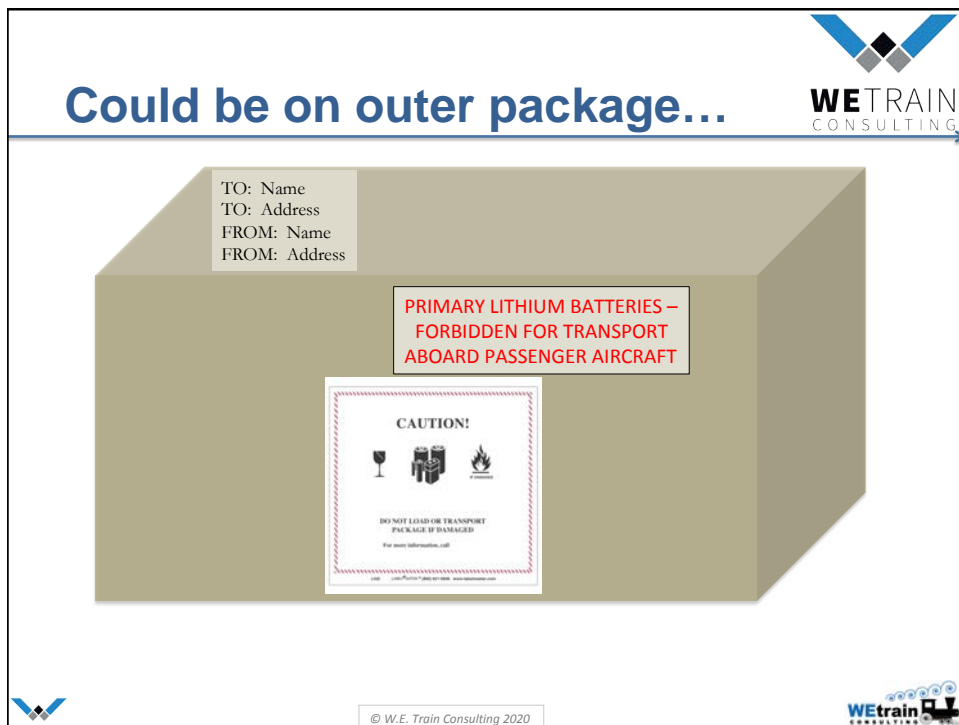


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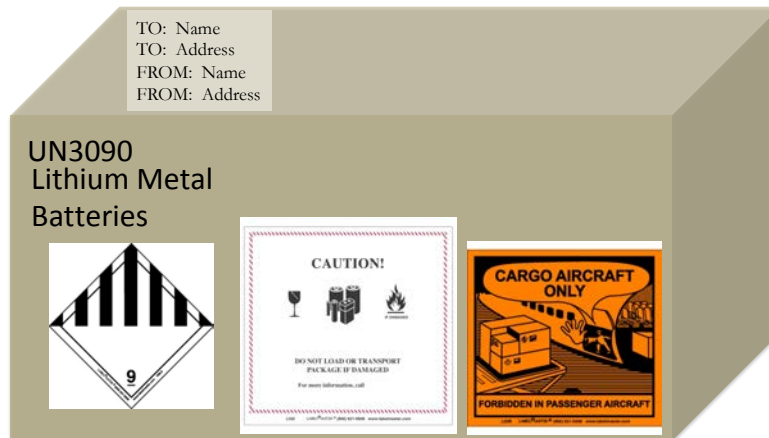








## Could be on outer package...



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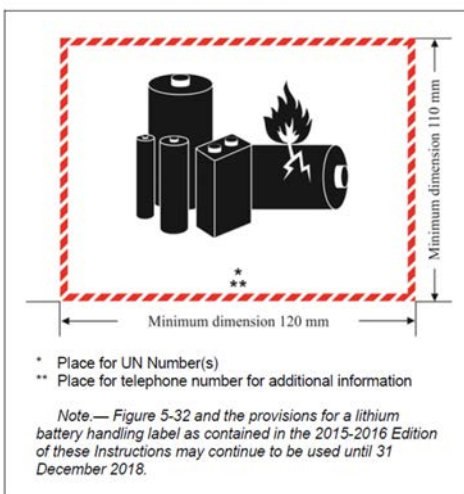


## Lithium Batteries



**Label  
vs.  
Mark**

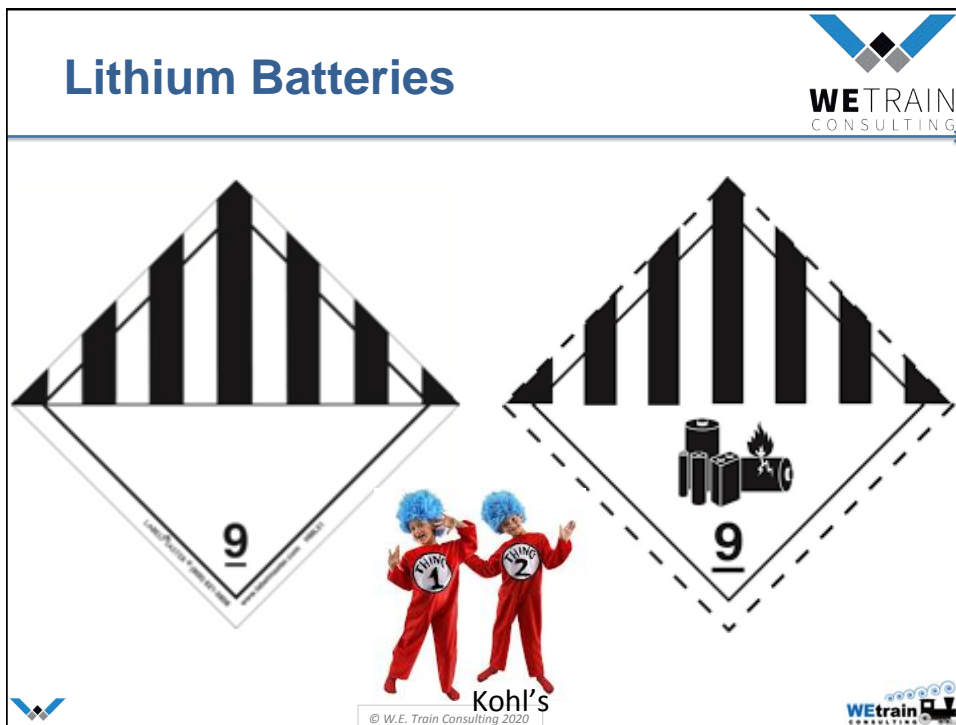
Insert new Figure 5-3:



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## Lithium Batteries



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## How do we know?

1. HazMatTable or DGList
2. Read Special Provisions
3. Read Packaging Instruction/Authorization

*Usually marking & labeling info is there, rather than in typical M&L sections of regulations*

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## So...



- Transport Rules require that we train for, and do:
  - IDENTIFY what's dangerous,
  - CONTAIN dangerous materials,
  - TELL EVERYONE what's being shipped,
  - PREPARE FOR EMERGENCIES,
    - **EMERGENCY RESPONSE**
      - Documents that go with shipment
      - 24-hour phone response
  - ... and do it all while keeping SECURITY in mind.



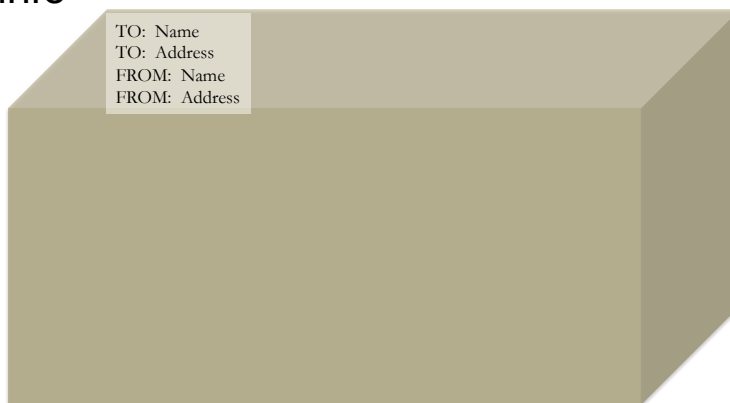
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## Could be no documents!



- ...and maybe no Emergency Response info



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## Could be this document



- ...and maybe with some specific extra wording

322  
600

**FedEx. USA Airbill**  
Express

Tracking Number: 8373 0209 7920

Form No. 0215

SPG13

Sender's Copy

1 From Please print and print last  
Date ☒ Sender's FedEx Account Number  
Sender's Name ☒ Phone (616) 395-7185  
Company HOPE COLLEGE  
Address 141 E 12TH ST  
City HOLLAND State MI ZIP 49423-3607

2 Your Internal Billing Reference ☒ OPTIONAL

3 To  
Recipient's Name ☒ Phone ( ) ☒  
Company ☒  
Address ☒ We cannot deliver to P.O. boxes or F.O.D.P. codes  
City ☒ State ☒ ZIP ☒

4a Express Package Service  
☒ FedEx Priority Overnight Next business morning  
☐ FedEx Standard Overnight Next business afternoon  
☐ FedEx 2Day Second business day  
☐ FedEx Express Saver Next business day  
☐ FedEx 10Day Freight\* Next business day  
☐ FedEx 2Day Freight Second business day  
☐ FedEx 3Day Freight Third business day

4b Express Freight Service  
☒ FedEx 10Day Freight\* Next business day  
☐ FedEx 2Day Freight Second business day  
☐ FedEx 3Day Freight Third business day

5 Packaging  
☒ FedEx Envelope\* ☐ FedEx Pak\* ☐ Other  
\*Excludes FedEx Small Pak, FedEx Large Pak, and FedEx Heavy Pak

6 Special Handling  
☒ SATURDAY Delivery ☐ HOLD (Weekday at FedEx Location) ☐ HOLD (Saturday at FedEx Location)  
\*Excludes FedEx Priority Overnight and FedEx 2Day to select locations  
Does this shipment contain dangerous goods?  
☐ No ☐ Yes ☐ Yes (per shipper's declaration) ☐ Yes (per shipper's declaration and packaging)  
Dangerous Goods including Dry Ice cannot be shipped in FedEx packaging  
☐ Sender ☐ Recipient ☐ Third Party ☐ Credit Card ☐ Cash/Check

7 Payment Bill to:  
Sender ☐ Recipient ☐ Third Party ☐ Credit Card ☐ Cash/Check

8 Release Signature ☒ Signature ☐ Signature

Try online shipping at fedex.com

By using this Airbill you agree to the service conditions on the back of this Airbill and to our standard Service Guide, including terms, conditions, rates and charges.

## Could be one of these



SHIPPER'S DECLARATION FOR DANGEROUS GOODS

Shipper  
Air Waybill No.  
Page of Pages  
Shipper's Reference Number (optional)

Consignee

Two completed and signed copies of this Declaration must be handed to the operator

TRANSPORT DETAILS  
This shipment is under the regulations prescribed for:  
PASSENGER AND CARGO AIRCRAFT ONLY  
AIRPORT OF DEPARTURE:  
AIRPORT OF DESTINATION:  
SHIPMENT TYPE (Select one):  
NON-RESTRICTIVE RESTRICTIVE

WARNING  
Failure to comply in all respects with the applicable Dangerous Goods Regulations may be in breach of the applicable law, subject to legal penalties.

NATURE AND QUANTITY OF DANGEROUS GOODS

UN ID No.	Proper Shipping Name	Class or Division (Identify if any)	Packaging	Quantity and Type of Loading	Posting Date	Authorization

Additional Handling Information

Signature/Title of Signatory  
Place and Date  
Signature (and printing name)

By using this Airbill you agree to the service conditions on the back of this Airbill and to our standard Service Guide, including terms, conditions, rates and charges.

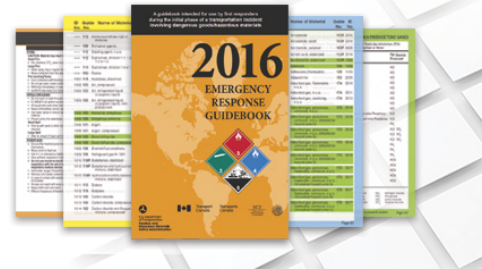
# IF THIS...

# Likely This, too



**SHIPPER'S DECLARATION FOR DANGEROUS GOODS**

Shipper	Air Waybill No.																																																																		
Consignee	Page 1 of 1 (Shipper's Reference Number optional)																																																																		
<p>Two completed and signed copies of this Declaration must be presented to the carrier.</p> <p><b>TRANSPORT DETAILS</b></p> <p>This declaration is valid for the transport of dangerous goods by air.</p> <p>Point of Departure: <input type="text"/></p> <p>Point of Destination: <input type="text"/></p> <p>Additional Handling Information: <input type="text"/></p>																																																																			
<p><b>WARNING</b></p> <p>Failure to comply in all respects with the applicable Dangerous Goods Regulations may be in breach of the applicable law, subject to legal penalties.</p> <p>Shipper's Declaration is not applicable for: <input type="checkbox"/> <b>EXPLOSIVES</b> <input type="checkbox"/> <b>FLAMMABLE LIQUIDS</b> <input type="checkbox"/> <b>FLAMMABLE SOLIDS</b> <input type="checkbox"/> <b>FLAMMABLE GASES</b> <input type="checkbox"/> <b>TOXIC GASES</b> <input type="checkbox"/> <b>TOXIC LIQUIDS</b> <input type="checkbox"/> <b>TOXIC SOLIDS</b> <input type="checkbox"/> <b>INFECTIOUS SUBSTANCES</b> <input type="checkbox"/> <b>RADIOACTIVE MATERIALS</b></p>																																																																			
<p><b>NATURE AND QUANTITY OF DANGEROUS GOODS</b></p> <table border="1"> <thead> <tr> <th>UN No.</th> <th>Proper Shipping Name</th> <th>Class or Division (See Table)</th> <th>Quantity and Type of Packing</th> <th>Packing Date</th> <th>Authorization</th> </tr> </thead> <tbody> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </tbody> </table>		UN No.	Proper Shipping Name	Class or Division (See Table)	Quantity and Type of Packing	Packing Date	Authorization																																																												
UN No.	Proper Shipping Name	Class or Division (See Table)	Quantity and Type of Packing	Packing Date	Authorization																																																														
<p>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 labelled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations. I declare that all of the applicable air transport requirements have been met.</p> <p>Name/Title of Signatory: <input type="text"/></p> <p>Place and Date: <input type="text"/></p> <p>Signature: <input type="text"/></p>																																																																			



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# So...



- Transport Rules require that we train for, and do:
  - IDENTIFY what's dangerous,
  - CONTAIN dangerous materials,
  - TELL EVERYONE what's being shipped,
  - PREPARE FOR EMERGENCIES,
  - ... and just a little bit more...



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## Exceptions & Special Permits



- ...are authorized TRADE OFFs
  - If, we do something to make the shipment safer,
  - Then, DOT allows some relief from other safety requirements
- Listed in 49CFR = Exception
- Obtained in writing = Special Permit



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## Exceptions & Special Permits



- |   |   |
|---|---|
| <ul style="list-style-type: none"> <li>• <b>SPECIAL PERMIT</b> <ul style="list-style-type: none"> <li>– Not in the regulations</li> <li>– Only a few know 'em</li> <li>– May change:               <ul style="list-style-type: none"> <li>• hazard communication</li> <li>• packaging</li> <li>• handling</li> </ul> </li> <li>– Requirements include:               <ul style="list-style-type: none"> <li>• DOT-SP xxxxx on package</li> <li>• DOT-SP xxxxx on paperwork</li> <li>• Copy of special permit with shipment</li> </ul> </li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>• <b>EXCEPTION</b> <ul style="list-style-type: none"> <li>– In the regulations</li> <li>– Everybody knows 'em</li> <li>– May change:               <ul style="list-style-type: none"> <li>• hazard communication</li> <li>• packaging</li> <li>• handling</li> </ul> </li> <li>– Examples include:               <ul style="list-style-type: none"> <li>• Teeny-weeny quantity                   <ul style="list-style-type: none"> <li>– 49CFR 173.4's</li> </ul> </li> <li>• Consumer Commodity                   <ul style="list-style-type: none"> <li>– ORM-D</li> </ul> </li> <li>• Limited Quantity                   <ul style="list-style-type: none"> <li>– LTD QTY</li> </ul> </li> </ul> </li> </ul> </li> </ul> |
|---|---|



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## Special Permits



- Read 'em
- Obey 'em
- Keep 'em

*Approvals and Special Permits are different terms for essentially the same thing*



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## 49CFR 172.101(c)(9)



- *Hazardous wastes.* If the word “waste” is not included in the hazardous material description in Column 2 of the Table, the proper shipping name for a hazardous waste (as defined in §171.8 of this subchapter), shall include the word “Waste” preceding the proper shipping name of the material. For example: Waste acetone.



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## WASTE = Non-dangerous?



- [Lithium Polymer battery that "doesn't work any more"](#)



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## CONSIGNMENTS



- More than one package...
  - ...picked up at same time,
  - ...going to the same address.
- Many of the Lithium Battery exceptions are not just per battery nor just per package, but are PER CONSIGNMENT.
  - IOW, how you prepare a package can depend upon what's in other packages.



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## New LiBatt classification scheme?



- May depend upon how the batteries burn
- May need data and info not yet known
- May depend upon packaging
- May depend upon...?



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## New LiBatt Packaging



- SAE G-27 Working Group
  - Packaging for air transport of LiBatts
    - Must 'contain' the effects of LiBatt fires
      - Smoke
      - Heat
      - Flame
- Some current packagings do some of this.
  - But aren't UN specification



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## PAIN



- Classification depends upon what else is in the package.
- Exceptions depend upon what is in other packages.
- Battery vs. cell matters, except when it doesn't.
- Marking & Labeling are in PI's and SP's.
- **IT KEEPS CHANGING!!!**



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## So...



- **Transport Rules require that we train for, and do:**
  - IDENTIFY what's dangerous,
  - CONTAIN dangerous materials,
  - TELL EVERYONE what's being shipped,
  - PREPARE FOR EMERGENCIES,
  - ... and do it all while keeping SECURITY in mind.



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## Recognize Batteries & Equipment



*Secure ID tokens, cell phones, GPS, alarms, portable DVD players, temp tells, etc...*



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## STAY CURRENT with the REGS



- Look everything up, every time
- Beware of outdated guides and info on the Internet
- And comment BEFORE regulations get approved
  - Stay current through DGTA, DGAC, COSTHA, et al



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## Fines and Penalties

(Doubled if someone dies)

- Accidental violations – Civil
  - \$75,000 per violation per day



### ■ Intentional violations – Criminal

- \$500,000 per violation
- Jail



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93



Sitting in a 3.8-metre sea kayak and watching a four-metre great white approach you is a fairly tense experience

## Worse than enforcement...



Photo courtesy of National Transportation Safety Board



THIS HAS BEEN...

## Lithium Battery Transportation: Why is it a big deal? Why is it a pain?

15 December 2020

[Gene@WEtrainConsulting.com](mailto:Gene@WEtrainConsulting.com)

*Live and Online*



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