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DANGEROUS GOODS PANEL (DGP)

TWENTY-FIRST MEETING

Montréal, 5 to 16 November 2007

SHIPPING BATTERIES BROCHURE

(Presented by R. Richard)

Lithium Battery Safety Issues:

Batteries are used for everything from flashlights to pacemakers, but they do have the potential to be dangerous if they are damaged, improperly packaged or not carefully designed. Battery manufacturers are aware of these dangers and design safety measures into the cells. Likewise, lithium battery packaging manufacturers incorporate safety devices into the package designs to protect the battery from out of tolerance operating conditions and where possible, from damage.

Lithium Batteries

Lithium batteries are used in many devices such as cell phones, computers, and cameras. Even though they are more costly than alkaline batteries, lithium cells provide a much longer operating life, and can be much more powerful. If short-circuited, lithium batteries can discharge rapidly, releasing a powerful electric charge quickly enough to set fire to surrounding materials."

Packaging:

Fully enclose individual batteries in plastic blister wrap, pasteboard, or other inner packaging that will protect each battery from making contact with another battery or any item that is capable of short-circuiting (example: multiple batteries enclosed in a single, form-fitting "retail ready" blister pack).

Dry Cell Batteries:

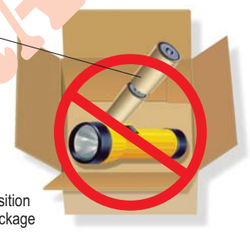
These are the sealed, non-vented batteries that are normally used in flashlights or small appliances. Examples include alkaline, nickel metal hydride, and carbon zinc batteries.

Fig. 8
Sample Packaging:
Dry Cell Batteries
• Cushioning
• Divider

Packaging Requirements:

Pack these batteries securely side-by-side, in order to prevent movement or dangerous short-circuit.

Fig. 9
Improper Packaging:
Loose batteries can cause dangerous short-circuit



When electronics are transported with batteries, the batteries should remain within the device.

Additional Requirements:

- Leave devices in the off position or remove batteries and package separately.
- Properly cushion items to prevent movement.
- Place contents in a sturdy outer container.

Recalled or Defective Batteries and Electronic Equipment:

- Upon learning that a battery is part of a recall, stop using the recalled battery immediately and contact the manufacturer. Do not attempt to recharge it.
- If the manufacturer recommends discharging the battery, follow the instructions to safely discharge the battery.
- Ship recalled batteries only in the packaging provided by the manufacturer in association with the recall.
- Assemble and close the packaging in accordance with the recall instructions you receive from the manufacturer.
- When shipping multiple recalled batteries to the manufacturer, individually package each battery. Never consolidate multiple batteries into a single package.
- Only ship recalled batteries by ground transportation (i.e., do not use express mail, overnight mail, or air-mail).
- Do not pack a recalled battery in checked or carryon baggage if traveling by plane.
- Additional information on packaging and shipping recalled batteries or electronic equipment may be obtained from the manufacturer or the Consumer Product Safety Commission (www.cpsc.gov).

This brochure is in no way intended to replace the training requirement mandated by the U.S. hazardous materials regulations (49 CFR) and ICAO Technical Instructions. This is for information purposes only. Refer to the 49 CFR and ICAO Technical Instructions for more comprehensive information.

For more information call the Hazardous Materials Info-Line at

1-800-467-4922,

visit our web site at http://hazmat.dot.gov, or e-mail us at training@hazmat.dot.gov.

For information on safe carriage of batteries and battery-powered devices during travel, visit http://SafeTravel.dot.gov.

To comment on hazardous materials publications in progress, please visit http://hazmat.dot.gov/HMpubsreview/, and check back frequently to review new hazardous materials training products under development.

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

Shipping Batteries Safely By Air: What You Need To Know

Batteries are an everyday staple of American life. From mp3-players and notebook computers, to motorized wheelchairs and cordless tools, batteries are in many products we use and rely on every day.

However, many types of batteries have the potential to be dangerous if not handled and transported safely. Missused, misshandled, improperly stored, or defective batteries can short-circuit and overheat, which may lead to a fire. Some batteries contain corrosive liquid, which can injure people or damage property. For this reason, most batteries are considered hazardous materials (also called dangerous goods) and must be transported in accordance with regulations issued by the U.S. Department of Transportation (DOT), other countries, and international bodies (such as the International Civil Aviation Organization (ICAO) and the International Maritime Organization).

The purpose of all these regulations is to protect the safety of people and property. If the applicable packaging, communication (package marking, labeling and shipping papers) and handling requirements are not followed, these shipments may contribute to fires, burns, or other types of incidents during transport. For this reason, failure to comply with the applicable regulations may result in a fine or even jail time. If you are using a small package carrier such as FedEx, DHL, or UPS, you need to find out which regulations they require their customers to comply with.

In the United States, DOT's Pipeline and Hazardous Materials Safety Administration (PHMSA) works to ensure the safe transportation of hazardous materials – including batteries – shipped by highway, rail, water, or air.

PHMSA prepared this brochure with the help of industry partners to assist you in safely packaging batteries for transport. Whether you are shipping a single battery for a notebook computer, or a pallet load of D-cells for flashlights, the safety of your package, and of the people who handle it along the way, depends on these precautions.

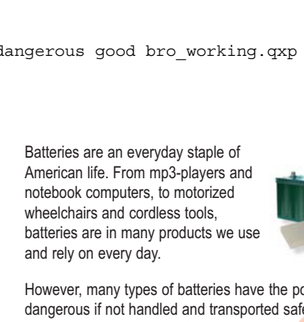


Fig. 1
UN SPECIFICATION PACKAGING

All metal containers must incorporate an acid/alkali leak-proof liner adequately sealed to prevent leakage in the event of a spill.

Wet Batteries:

- UN2794 batteries wet filled with acid, electric storage.
- UN2795 batteries wet filled with alkali, electric storage.

Class 8 Corrosive hazardous materials

Packaging Requirements:
Securely pack the batteries in a strong outer packaging that meets an authorized UN performance standard, as pictured in Fig. 1 on page 2. These containers must incorporate an acid/alkali leak-proof liner adequately sealed to prevent leakage in the event of a spill. When shipping by air, include absorbent material, if required, in the event electrolyte spills from battery.

Position batteries in an orientation within the package that is least likely to result in a shortcircuit.

Securely fasten the batteries with the fill openings and vents facing upward to prevent short-circuiting and spilling of battery electrolyte.

Orientation arrow markings must be on the outside of the packaging and pointing up. The words "This End Up" or "This Side Up" may be displayed on top of the package.

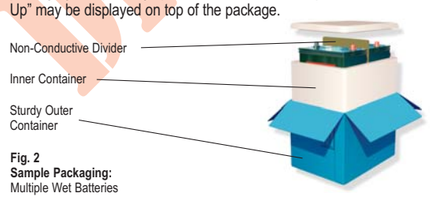


Fig. 2
Sample Packaging:
Multiple Wet Batteries

Nonspillable Batteries:

- UN2800 – Batteries, wet, nonspillable.

Class 8 Corrosive hazardous materials

A nonspillable wet electric storage battery is not subject to other U.S. or international hazardous materials regulations, when:

- the battery meets certain testing and specification requirements,
- the battery and its outer packaging are plainly and durably marked "NONSPILLABLE" or "NONSPILLABLE BATTERY", and
- the battery is packed in such a way as to prevent short circuits.

You can find these requirements in:

- DOT's Hazardous Materials Regulations, at 49 CFR §173.159(d).
- The ICAO Technical Instructions, in Packing Instruction 806 and Special Provision A67.

When shipping a nonspillable battery or a nonspillable battery contained in or packed with a piece of equipment, it is important to check the regulations carefully to be sure all of the requirements have been met.(No shipper's declaration required). If you are shipping a nonspillable battery under this provision, you must check the regulations carefully, to make sure special provision A67 applies.

Lithium Batteries:

- UN3090 Lithium batteries (both lithium metal and lithium ion batteries)
- UN3091 Lithium batteries packed with or contained in equipment

Class 9 Miscellaneous hazardous materials

Regulations.
Lithium metal batteries and lithium ion batteries are used in everything from flashlights to pacemakers to cell phones and notebook computers. They also are used extensively by the military and in products such as electric vehicles and mobility devices. These batteries provide more energy and provide a much longer operating life than other battery chemistries. They have the potential to generate a significant amount of heat and catch fire if damaged, improperly packaged, cared for, or not carefully designed. The U.S. and international regulations pertaining to the transportation of lithium (metal) cells and batteries and lithium ion cells and batteries have changed significantly over the past five years.

Testing. Under both sets of regulations, the batteries or cells must be tested under the series of tests set forth in the UN Manual of Tests and Criteria. See 49 CFR §173.185 and the ICAO Technical Instructions, Packing Instruction 903, and Special Provision A45.

Medium size and Large size batteries and cells must be shipped as Class 9 hazardous materials (medium size need only be classified as Class 9 when transported via aircraft). This means that shippers of larger cells and batteries must comply

with specific requirements for packaging, marking, labeling, and describing the cells or batteries on a shipping paper and training their employees.

Smaller batteries may often be shipped under relaxed requirements:

- The ICAO Technical Instructions contain limited marking, shipping paper, and packaging requirements for packagings that contain more than 12 batteries or 24 cells.

The U.S. DOT hazardous materials regulations prohibit the transport of lithium metal batteries on passenger-carrying aircraft. In addition, the U.S. DOT requires specific markings on packagings that contain small, consumer-type lithium metal batteries ("PRIMARY LITHIUM BATTERIES – FORBIDDEN FOR TRANSPORT ABOARD PASSENGER AIRCRAFT"). A "cargo aircraft only" label must be placed on packagings containing larger cells and batteries that are shipped as fully regulated hazardous materials.

Some Safe Packaging Practices for Lithium Metal Batteries and Lithium ion Batteries:

- Fully enclose individual batteries in plastic blister wrap, pasteboard, or other inner packaging that will protect each battery from making contact with another battery or any item that is capable of short-circuiting (example: multiple batteries enclosed in a single, form-fitting "retail ready", blister pack).

Fig. 3
Sample Packaging:
ICAO A45 Special Provision Package

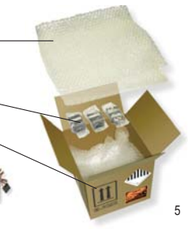


Fig. 4
Sample Packaging:
Fully Regulated UN3090

Contact the hazardous materials or dangerous goods office of the carrier you plan to use, such as UPS, FedEx, or DHL. Certain carriers will require you to certify that you have complied with the U.S. international hazardous materials regulations, and additional carrier specific requirements.

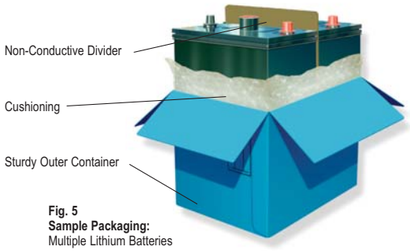


Fig. 5
Sample Packaging:
Multiple Lithium Batteries

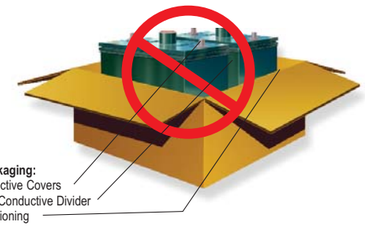


Fig. 6
Improper Packaging:
- Missing Protective Covers
- Missing Non-Conductive Divider
- Missing Cushioning

Battery Short-Circuit
Batteries may overheat or catch fire if the terminals are short-circuited (external short-circuits).

Crushing or dropping batteries may lead to internal short-circuits.

Protect terminals from foreign objects and freight.

Handle packages containing batteries with care.

Fig. 7
Example of a typical battery incident