Guidelines for Shipping & Packaging of Batteries

Batteries contain both toxic materials, including: heavy metals such as mercury (Hg), lead (Pb), cadmium (Cd), and nickel (Ni); and corrosive materials, including: acids or alkaline solutions, pastes and gels containing sulfuric acid or potassium hydroxide. When improperly managed or disposed of, these materials can pose significant safety hazards and contaminate the environment.

AERC.com, Inc., dba AERC Recycling Solutions (AERC) encourages both consumers and persons commonly considered part of the regulated community, i.e., commercial or industrial generators, to use best management practices when handling these materials. AERC has developed these guidelines to encourage proper management and packaging of batteries in agreement with federal environmental, safety and transportation regulations. By following these recommended practices and packaging guidelines AERC believes that potential hazards associated with the logistics of battery recycling will be minimized during collection; accumulation; preparation and offering for shipment; and transportation by highway, rail and cargo vessel.

This information is offered to our customers as guidance ONLY and that Persons/Companies who act as Generators/Shippers and/or Transporters are obligated to follow any and all applicable regulations. This document details AERC requirements with reference to appropriate U.S. Environmental Protection Agency (EPA) universal waste (UW) management regulations | 40 CFR Part 273 and U.S. Department of Transportation (DOT) hazardous material regulations (HMR) | 49 CFR Parts 100-185. Regulated parties must meet applicable HMR requirements including, employee training provisions set forth in 49 CFR §172.204. It should be recognized that any person who loads or unloads hazardous materials into or from a transport vehicle must be properly trained.
Revision Summary

The release of this updated guidance is in response to changes in the HMR that have occurred during 2009 including final regulatory changes published within the Federal Register on January 14, 2009 entitled, Hazardous Materials: Revision to Requirements for the Transportation of Batteries and Battery-Powered Devices (Effective Date: February 13, 2009); the publication of an advisory letter from Mr. Ryan Posten, Director of HM Enforcement, DOT Pipeline and Hazardous Materials Safety Administration (PHMSA) (Date: April 3, 2009); and a number of clarifying letter of interpretation with regard to the applicability of the HMR to all battery types and chemistries (Most recent Date: November 25, 2009).

The revisions to 49 CFR include amendments and clarifications addressing the safe transportation of batteries and battery-powered devices. Key to these changes:

- Requirements for reporting incidents involving batteries and battery-powered devices;
- Clarification of requirements for prevention of short-circuiting, dangerous evolution to heat, damage to terminals, and (in the case of air transport) unintentional activation;
- Clarification of requirements for determining whether a battery is considered non-spillable, including a revision to the proper shipping name;
- Requirements for a certification on the shipping documentation that batteries....have met the conditions and all requirements for transport as specified in the applicable exception or special provision;
- Clarification of the requirements for transport of dry batteries, including a revision to the proper shipping name.

Overall, the Final Rule looks to maintain alignment of the HMR with international requirements.

This document is organized to provide ready reference to relevant information by:

1. Defining battery categories and key characteristics with regard to the primary types of batteries commonly recycled – detailing the construction, composition and hazardous constituents associated with each type of battery.
2. Specifying general guidance for all batteries – most notably, transportation (of batteries) in a manner that prevents short circuiting and damage to the battery or its terminals so that to prevent the potential of a dangerous evolution of heat.
3. Detailing DOT shipping and packaging guidelines for both intact, i.e., universal waste, batteries and damaged (commonly hazardous waste) batteries.
4. Providing supplemental information to allow ready access to excerpts from the DOT regulations regarding applicable special provisions and packaging specifications (See Appendix I).

The PDF version of this document has added functionality through established document hyperlinks. Blue underlined text links take the reader to the referenced or supporting documents and/or initiates an transfer to another section of the document related to the topic in question. For example:

CAT - Goto the definition and description for the battery category in question.

TABLE 2 - Goto the associated DOT shipping description and packaging guideline for the battery class or category in question (when managed as a universal waste or non-RCRA regulated material).

TABLE 3 - Goto the associated DOT shipping description and packaging guideline for management of the material as a hazardous waste.

TOC - Goto the Table of Contents, i.e, top of the document.
Table of Contents

<table>
<thead>
<tr>
<th>Exhibits</th>
<th>Pg #</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHMSA Battery Recycling Advisory Letter, dated April 3, 2009</td>
<td>1</td>
</tr>
<tr>
<td>PHMSA Response Letter of Interpretation, dated November 25, 2009</td>
<td>7</td>
</tr>
</tbody>
</table>

| Battery Categories                              |      |
| General Guidance                               | 1    |

| Shipping & Packaging Guidelines                |      |
| TABLE 1: 49 CFR §172.101 Hazardous Material (HM) Table | 10   |
| TABLE 2: Management of Intact UW Batteries     | 12   |
| TABLE 3: Damaged and/or Broken Batteries       | 23   |

| Material Discrepancies & Incident Reporting    |      |
| Appendix I - Referenced Special Provisions & Packaging Specifications | 30   |
| Appendix II – AERC Forms                      |      |

Resource Links

- EPA Battery Product Stewardship
- EPA Universal Waste Battery Regulations
- PHMSA Hazardous Materials Regulations
- PHMSA 74 FR 2199 – Final Rule: Revision to Requirements for the Transportation of Batteries and Battery-Powered Devices
- Title 49 CFR 172.101 Table (List of Hazardous Materials)
EXHIBITS

PHMSA Battery Advisory Letter
April 3, 2009

PHMSA Letter of Interpretation
November 25, 2009
April 3, 2009

To: All battery recyclers and battery collection points and related associations.

Based on recent investigations conducted by the U.S. Department of Transportation (DOT), Pipeline and Hazardous Materials Safety Administration (PHMSA), and based on recent incidents, this letter is generated to convey our findings and our ongoing effort to improve compliance and transportation safety. PHMSA has noted an ongoing trend of serious safety problems and non-compliance regarding the classification, packaging, marking, labeling, documentation, and transportation of spent batteries in commerce. PHMSA has great concern over the lack of compliance with and understanding of the transportation requirements for batteries. PHMSA recognizes the breadth and scope of the battery recycling and disposal industries. However, due to several incidents resulting in serious consequences, PHMSA pledges its efforts to reduce this risk by enforcing the safety standards and increasing awareness. In order to magnify its safety and compliance efforts, PHMSA feels this letter will help increase the awareness and provide a means of contact for the prescribed safety requirements to the appropriate battery recycling and disposal transportation streams.

PHMSA is concerned that many persons who ship batteries for recycling or disposal do not appreciate the hazards posed by batteries during transportation. PHMSA has documented numerous shipments that were not in compliance with requirements in the Hazardous Materials Regulations (HMR, 49 CFR Parts 171-180).

Common violations and safety problems noted during these investigations include:

1. Large numbers of used batteries, of many different types, are collected in large containers that do not adequately prevent damage to the batteries or prevent their release during transportation.

2. Outer packages are not marked and labeled as required to indicate that they contain batteries; the shipments are not described as required on accompanying shipping documents.
3. No action is being taken to prevent a short circuit, such as *separating the batteries by placing each one in a separate plastic "baggie"* or *taping the terminals of the battery.*

These types of violations appear to have directly led to a November 2006 incident in which a shipment of used, rechargeable lead acid batteries caused a fire that completely destroyed the vehicle transporting the batteries.

PHMSA has also investigated two additional parcel carrier delivery truck fires. These incidents occurred in April and of July 2008. Both of these incidents involved batteries destined for recycling.

(July 2008 truck fire in Jackson, MI)

The following is a brief summary of the requirements that apply to ground shipments of batteries for recycling or disposal. These requirements also apply to shipments of batteries from battery manufacturers, equipment manufacturers, distributors and retail sales outlets. While additional requirements apply to air shipment of batteries PHMSA is not aware of used batteries being shipped by air.

*All batteries* are subject to requirements in the HMR because they have two types of hazards: (1) the chemicals or other materials contained in the battery, and (2) the electrical potential of the battery.
All batteries must be packaged for transportation in a manner that prevents short circuiting and damage to the battery or its terminals. This may be achieved by packing each battery in fully enclosed inner packagings made of non conductive material or separating the batteries from each other and other conductive material in the same package and pack to prevent damage and shifting while in transport.

Lithium batteries (including lithium-ion batteries) are "Class 9" miscellaneous hazardous materials, and are subject to requirements in § 173.185. Note that "small" and "medium" sized lithium batteries may be shipped by ground under the requirements in § 172.102 Special Provisions 188 and 189.

Batteries, wet including batteries containing electrolyte acid or alkaline battery fluid are "Class 8" corrosive hazardous materials, and are subject to requirements in § 173.159. This section allows for reduced requirements when the batteries are shipped by ground by themselves (i.e., no other hazardous materials on the same vehicle).

Batteries containing sodium are "Division 4.3" dangerous when wet hazardous materials, and are subject to the requirements in § 173.189.

Batteries, dry, containing potassium hydroxide solid are class 8 corrosive hazardous materials, and are subject to requirements in 49 C.F.R. § 173.213.

Batteries, dry, include the common household type alkaline batteries. Additionally, these include nickel cadmium (NiCad), nickel metal hydride (NiMH) and silver-zinc batteries. These "dry" batteries unless specifically covered by another entry in the Hazardous Material Table (HMT) are not subject to the HMR provided they are in conformance with § 172.102 Special Provision (SP) 130. SP 130 prescribes they are to be securely packaged to prevent the dangerous evolution of heat and protect against short circuits. Insulating the exposed terminal ends and securely packaging the batteries is an effective means for complying with SP 130.

Except as specified in §§ 171.14, 171.25, 172.102, 172.448, and 178.703 as amended, compliance with the amendments adopted in this final rule will be required beginning January 1, 2010, with a voluntary compliance date of January 1, 2009.

This final rule:

- Requires reporting of incidents involving batteries and battery-powered devices that result in a fire, violent rupture, explosion, or dangerous evolution of heat. Immediate notice is limited to air transport of batteries and battery-powered devices.

- Clarifies the requirement that batteries and battery-powered devices and vehicles be offered for transportation and transported in a manner that prevents short-circuiting, the potential of a dangerous evolution of heat, damage to terminals, and, in the case of transportation by aircraft, unintentional activation.

Includes several examples of packaging methods that meet the requirement to be packed in a manner that prevents short circuits.

DOT encourages and supports the safe recycling and disposal of used batteries. However, we take an aggressive approach to swiftly investigate and enforce the safety requirements in the HMR for complaints and transportation incidents such as the parcel carrier delivery truck battery incident in November 2006.

(November 2006 truck fire in Galesburg, IL)
Persons who violate the HMR may be subject to significant civil penalties and criminal fines and imprisonment. The maximum penalties depend on several factors, including the nature and circumstances, extent and gravity, and severity of the consequences of the violation, but can range up to $100,000 for a civil penalty and $500,000 and ten years in jail for a criminal penalty. In a recent enforcement case, PHMSA assessed a total civil penalty of $360,000 for multiple violations of the HMR relating to the improper shipment of used batteries for recycling or disposal.

More detailed information on the requirements in the HMR governing the shipment of batteries and additional guidance are available on DOT’s Hazmat Safety web site: http://www.phmsa.dot.gov/hazmat. The HMR are also accessible through our website, and you can obtain answers to specific questions from the Hazardous Materials Information Center at 1-800-467-4922 (in Washington, DC, call 202-366-4488).

Sincerely,

R. Ryan Posten
Director, Office of Hazardous Materials Enforcement

Battery Recycling Advisory Letter
Mr. George Kerchner  
Wiley Rein LLP  
1776 K Street NW  
Washington, DC 20006  

Ref. No. 09-0150R

Dear Mr. Kerchner:

Recently, our Office issued several letters, including our August 13, 2009 letter (Ref. No. 09-0150) responding to your request, regarding the applicability of the Hazardous Materials Regulations (HMR; 49 CFR Parts 171-180) to the transport of used or spent dry cell batteries. This letter supersedes the response given in our August 13, 2009 letter.

After further consideration and analysis of dry battery chemistries and sizes and based on information available to us, it is the opinion of this Office that used or spent dry, sealed batteries of both non-rechargeable and rechargeable designs, described as “Batteries, dry, sealed, n.o.s.” in the Hazardous Materials Table in §172.101 of the HMR and not specifically covered by another proper shipping name, with a marked rating up to 9-volt are not likely to generate a dangerous quantity of heat, short circuit, or create sparks in transportation. Therefore, used or spent batteries of the type “Batteries, dry, sealed, n.o.s.” with a marked rating of 9-volt or less that are combined in the same package and transported by highway or rail for recycling, reconditioning, or disposal are not subject to the HMR. Note that batteries utilizing different chemistries (i.e., those battery chemistries specifically covered by another proper shipping name) as well as dry, sealed batteries with a marked rating greater than 9-volt may not be combined with used or spent batteries of the type “Batteries, dry, sealed, n.o.s.” in the same package. Note also, that the clarification provided in this letter does not apply to batteries that have been reconditioned for reuse.

I hope this information is helpful. If you have further questions, please contact this office.

Sincerely,

Charles E. Betts,  
Chief, Standards Development  
Office of Hazardous Materials Standards
Battery Categories & General Guidance

AERC has developed battery category descriptions to facilitate effective billing practices and to more readily communicate safety standards for proper packaging based on general battery properties. Of primary importance is that persons offering batteries for management recognize that ONLY batteries of a similar chemistry be commingled, i.e., packaged within the same shipping container, and that these materials are properly prepared for shipment according EPA and DOT regulations.

AERC manages batteries for recycling based on the following categories:

<table>
<thead>
<tr>
<th>Category #</th>
<th>Category Name</th>
<th>Hazardous Constituents</th>
<th>Description of Battery Types</th>
<th>Construction</th>
<th>Composition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Lead Acid</td>
<td>✽️ Lead</td>
<td>✒️ Sulfuric Acid</td>
<td>Lead acid batteries are the oldest type of rechargeable battery consisting of a lead anode and a lead dioxide cathode. The electrolyte, an aqueous solution of 28 to 51 wt % sulfuric acid and battery cell plates, containing 60 to 75 wt % lead and lead oxide, present hazards in handling, storage and transport. Off-gassing of hydrogen, common during recharging, presents an explosion/fire hazard.</td>
<td>TABLE 2</td>
</tr>
<tr>
<td>TABLE 2</td>
<td>Wet-Cell Lead Acid</td>
<td>✽️ Lead</td>
<td>✒️ Sulfuric Acid</td>
<td>[Flooded lead acid batteries of various sizes used in industrial, automotive and standby power (UPS) applications.]</td>
<td></td>
</tr>
<tr>
<td>TABLE 2</td>
<td>Dry-Cell (Sealed)</td>
<td>Non-spillable or Valve Regulated Lead Acid (VRLA)</td>
<td>✽️ Lead</td>
<td>✒️ Sulfuric Acid</td>
<td>Similar construction to wet-cell batteries, having a lead anode and lead dioxide cathode (50-75 wt %) combined with a sulfuric acid electrolyte that will not spill. Specifically, there are two primary categories of non-spillable batteries: 1. Absorbed glass mat (AGM) batteries, these batteries contain a liquid electrolyte that is absorbed into a glass mat sandwiched between the electrodes. 2. Gel cell batteries, these are batteries which have a chemical added to the electrolyte which causes it to form a gel which will not spill from the battery.</td>
</tr>
<tr>
<td>TABLE 2</td>
<td>Cell (Sealed)</td>
<td>Non-spillable or Valve Regulated Lead Acid (VRLA)</td>
<td>✽️ Lead</td>
<td>✒️ Sulfuric Acid</td>
<td>[Non-Automotive/Si batteries D-Size and larger used in portable/rechargeable tools, emergency lighting and marine applications.]</td>
</tr>
</tbody>
</table>

Waste Mgmt Considerations | Rules specific to the recycling of lead acid batteries are contained in 40 CFR Part 266 Subpart G. As an alternative, Generators may choose to manage their lead acid batteries in accordance with the UW standards (40 CFR 273). When managed as a UW, each battery or each package containing batteries must be marked with the words “Universal Waste Batteries” or “Used Lead Acid Batteries for Recycling”. When not managed as noted above, the characteristic RCRA waste codes and uniform hazardous waste manifest would be required. Damaged and/or broken batteries and associated cleanup residuals may be considered characteristic hazardous wastes - D002 (Corrosivity) | D008 (Lead) and must be managed in accordance with applicable regulatory requirements.
# Guidelines for Shipping & Packaging of Batteries

## Category # | Category Name | Description of Battery Types | Construction | Composition

| 2 | Corrosive Metal | **Mercury; Cadmium; Nickel; Zinc**<br>**Potassium Hydroxide; Manganese Dioxide; Nickel Hydroxide**<br> **TABLE 2 | TABLE 3 | SP** | Alkaline batteries have an anode containing a zinc powder and a cathode made up of manganese dioxide, graphite and an electrolyte paste of either potassium hydroxide or sodium hydroxide. These components, in addition to conductors, e.g., brass nail, and separators, including a plastic gasket, a steel washer and a metal end cap, assembled within a sealed unit. | **Zinc-carbon (Non-Hg)**<br> [Used in consumer devices (non-rechargeable) with common sizes: A, AA, AAA, C, D, 9-volt, button & coin.] | **Zinc-carbon is a generic term for primary dry batteries that have a zinc anode and a cathode of manganese dioxide, and a slightly acidic electrolyte. The aqueous electrolyte may be a mixture of ammonium chloride and zinc chloride, i.e., LeClanche chemistry, or a solution of zinc chloride. As with other dry cell batteries, the electrolyte is mixed the other components to form a paste. All of these components, including the conductors and separators, are assembled into sealed unit.**<br> **Nickel-Cadmium (NiCd)**<br> [wet and dry] | **Nickel cadmium (NiCd) batteries have a cadmium anode (≈ 10 - 25% by wt) and a nickel oxyhydroxide cathode. The electrolyte used in a dry-cell NiCd battery is a paste of potassium hydroxide. The construction of these sealed casing batteries is based on a well-established electrochemical, rechargeable battery history.**<br> **Of similar construction, the vented (or valve regulated) wet-cell NiCd battery contains an aqueous electrolyte solution of potassium hydroxide.**<br> **Nickel Iron** | **Nickel-iron (NiFe) batteries contain a nickel oxide-hydroxide cathode and an iron anode, with an electrolyte of potassium hydroxide. The active materials are held in nickel-plated steel tubes or perforated pockets within a sealed unit.**

## Table 2

<table>
<thead>
<tr>
<th>Category #</th>
<th>Category Name</th>
<th>Description of Battery Types</th>
<th>Construction</th>
<th>Composition</th>
</tr>
</thead>
</table>
| 2 | Corrosive Metal | **Mercury; Cadmium; Nickel; Zinc**<br>**Potassium Hydroxide; Manganese Dioxide; Nickel Hydroxide**<br> **TABLE 2 | TABLE 3 | SP** | Alkaline batteries have an anode containing a zinc powder and a cathode made up of manganese dioxide, graphite and an electrolyte paste of either potassium hydroxide or sodium hydroxide. These components, in addition to conductors, e.g., brass nail, and separators, including a plastic gasket, a steel washer and a metal end cap, assembled within a sealed unit. | **Zinc-carbon (Non-Hg)**<br> [Used in consumer devices (non-rechargeable) with common sizes: A, AA, AAA, C, D, 9-volt, button & coin.] | **Zinc-carbon is a generic term for primary dry batteries that have a zinc anode and a cathode of manganese dioxide, and a slightly acidic electrolyte. The aqueous electrolyte may be a mixture of ammonium chloride and zinc chloride, i.e., LeClanche chemistry, or a solution of zinc chloride. As with other dry cell batteries, the electrolyte is mixed the other components to form a paste. All of these components, including the conductors and separators, are assembled into sealed unit.**<br> **Nickel-Cadmium (NiCd)**<br> [wet and dry] | **Nickel cadmium (NiCd) batteries have a cadmium anode (≈ 10 - 25% by wt) and a nickel oxyhydroxide cathode. The electrolyte used in a dry-cell NiCd battery is a paste of potassium hydroxide. The construction of these sealed casing batteries is based on a well-established electrochemical, rechargeable battery history.**<br> **Of similar construction, the vented (or valve regulated) wet-cell NiCd battery contains an aqueous electrolyte solution of potassium hydroxide.**<br> **Nickel Iron** | **Nickel-iron (NiFe) batteries contain a nickel oxide-hydroxide cathode and an iron anode, with an electrolyte of potassium hydroxide. The active materials are held in nickel-plated steel tubes or perforated pockets within a sealed unit.**

## Table 3

<table>
<thead>
<tr>
<th>Category #</th>
<th>Category Name</th>
<th>Description of Battery Types</th>
<th>Construction</th>
<th>Composition</th>
</tr>
</thead>
</table>
Guidelines for Shipping & Packaging of Batteries

AERC.com, Inc | Corporate Offices: 3 Gold Mine Road, Suite 106, Flanders, NJ
Operating Locations: Allentown, PA | Ashland, VA | Hayward, CA | Houston, TX | West Melbourne, FL

<table>
<thead>
<tr>
<th>Category #</th>
<th>Category Name</th>
<th>Hazardous Constituents</th>
<th>Construction</th>
<th>Composition</th>
</tr>
</thead>
<tbody>
<tr>
<td>TABLE 2</td>
<td>Nickel-Metal Hydride (NiMH)</td>
<td>[Used in consumer devices and portable tools (rechargeable) with common sizes: AA, C, D, 9-volt &amp; flat box.]</td>
<td>Nickel metal hydride (NiMH) batteries, constructed of a hydrogen-absorbing metal alloy anode and a nickel oxyhydroxide cathode, offer advantages to NiCd batteries with a higher energy density and limited heavy metal toxicity. The electrolyte is typically a potassium hydroxide paste that is assembled with conductors and separators into a hermetically sealed unit.</td>
<td></td>
</tr>
<tr>
<td>TABLE 2</td>
<td>Zinc Air</td>
<td>[Sealed battery used consumer devices (as non-rechargeable) commonly found as a button or coin cells.]</td>
<td>Cells using zinc-air technology are energized only when atmospheric oxygen is absorbed into the electrolyte through a gas-permeable, liquid-tight membrane. Zinc-air battery electrochemistry is similar to Alkaline Manganese and have similar safety and environmental properties.</td>
<td></td>
</tr>
</tbody>
</table>

Waste Mgmt Considerations | The classes of dry-cell batteries that include alkaline and zinc-carbon are not known to fail TCLP for RCRA metals nor to contain any free liquid. Based on this solid waste characterization, these classes of batteries are not deemed hazardous waste and therefore not subject to the Federal UW standards and may be considered Non-Regulated under these regulations. However, individual states may adopt more stringent regulations, e.g., California, and as such, these batteries may be classified as UW in some jurisdictions. Ni-Cd batteries, both wet and dry, contain cadmium, a TCLP toxic RCRA metal. As such, deemed hazardous waste.

NOTE: In accordance with guidance published by the CA Integrated Waste Mgmt Board, all batteries are considered hazardous waste in California when they are discarded. This includes all batteries of sizes AAA, AA, C, D, button cell, 9 Volt, and all other batteries, both rechargeable and single use. All batteries must be recycled, or taken to a household hazardous waste disposal facility, a universal waste handler (e.g., storage facility or broker), or an authorized recycling facility.

When managed as a UW, each battery or each package containing batteries must be marked with the words “Universal Waste Batteries” or “Used Batteries for Recycling”. When not managed as UW, applicable characteristic RCRA waste codes and uniform hazardous waste manifest shipping papers would be required (for certain types of batteries in this Category).

Damaged and/or broken NiCd batteries and associated cleanup residuals may be considered characteristic hazardous wastes - D002 (Corrosivity) | D006 (Cadmium) and must be managed in accordance with applicable regulatory requirements.
### Guidelines for Shipping & Packaging of Batteries

<table>
<thead>
<tr>
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</tr>
</thead>
</table>
| 3          | Mercury Bearing | Mercury; Silver Oxide; Zinc |Mercury batteries have a zinc anode and a mercuric oxide cathode with an electrolyte paste of either potassium hydroxide or sodium hydroxide. In mercuric oxide batteries, mercury is used as an electrode rather than an additive to control gas buildup. The mercury, accounting for 35 to 50% of the battery weight, is required to maintain current levels of energy output. Like other dry-cell batteries, the components are assembled within a sealed unit.

#### TABLE 2

<table>
<thead>
<tr>
<th>Description of Battery Types</th>
<th>TABLE 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mercury</td>
<td>Mercury</td>
</tr>
<tr>
<td>[Used in consumer devices (non-rechargeable) with common sizes: AA, AAA, C, D &amp; button cell.]</td>
<td><img src="Image" alt="Mercury Battery" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Description of Battery Types</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Carbon Zinc</td>
<td>Carbon Zinc</td>
</tr>
<tr>
<td>[Used in consumer devices, e.g., flashlights and toys - non-rechargeable.]</td>
<td><img src="Image" alt="Carbon Zinc Battery" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Description of Battery Types</th>
<th>TABLE 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silver Oxide (aka Silver-Zinc)</td>
<td>Silver Oxide</td>
</tr>
<tr>
<td>[Used in consumer devices such as hearing aids, watches, cameras and calculators (non-rechargeable) - common size: button cell.]</td>
<td><img src="Image" alt="Silver Oxide Battery" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Description of Battery Types</th>
<th>TABLE 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATON</td>
<td>ATON</td>
</tr>
<tr>
<td>“Aids to Navigation” batteries vary in construction and chemistry but commonly contain zinc and mercury and an alkaline electrolyte (such as sodium hydroxide).</td>
<td><img src="Image" alt="ATON Battery" /></td>
</tr>
</tbody>
</table>

### Waste Mgmt Considerations

Category 3 batteries are expected to fail TCLP for mercury. As such, the characteristic EPA waste codes D009 applies. When managed as a UW, each battery or each package containing batteries must be marked with the words “Universal Waste Batteries” or “Used Batteries for Recycling”. When not managed as UW, applicable characteristic RCRA waste codes and uniform hazardous waste manifest shipping papers would be required. Damaged and/or broken Category 3 batteries and associated cleanup residuals are commonly considered to be characteristic hazardous wastes - D009 (Mercury) | D011 (Silver) and must be managed in accordance with applicable regulatory requirements.
# Guidelines for Shipping & Packaging of Batteries

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</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Reactive Metals</td>
<td>Lithium; Magnesium; Sodium; Chromium</td>
<td>Lithium Metal; Lithium Ion (Li-ion) &amp; Lithium Polymer (Li-Polymer) [Used in consumer devices such as cameras and calculators (non-rechargeable) in sizes: AA, C, 9-volt, button &amp; coil cell. Li-ion or Li-Poly batteries are rechargeable and commonly used in consumer electronics, e.g., laptops.]</td>
<td>Lithium batteries employ a variety of chemistries comprising many types of cathodes and electrolytes in conjunction with a lithium metal or lithium compound anode. The most common types of lithium cells used in consumer applications use metallic lithium as an anode and a manganese dioxide cathode, with an organic solvent-based lithium salt as the electrolyte. Common constructions of primary lithium {Anode</td>
<td>Cathode</td>
</tr>
</tbody>
</table>

---

**TABLE 2**

Lithium Metal; Lithium Ion (Li-ion) & Lithium Polymer (Li-Polymer)

**TABLE 2**

Magnesium (MgMnO2)
**Guidelines for Shipping & Packaging of Batteries**

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Operating Locations: Allentown, PA | Ashland, VA | Hayward, CA | Houston, TX | West Melbourne, FL

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</tr>
</thead>
<tbody>
<tr>
<td><strong>TABLE 2</strong></td>
<td>Sodium Nickel Chloride</td>
<td>Sodium Nickel Chloride</td>
<td>Sodium Nickel Chloride batteries, aka molten salt batteries, are constructed of a molten sodium negative electrode and a nickel-nickel chloride positive electrode. The use of the molten sodium requires battery operating temperatures in excess of 250°C.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>[Used in industrial and/or military applications requiring high power density, e.g., weapon systems and possible applications in electrical vehicles (rechargeable).]</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Waste Mgmt Considerations** | When managed as a UW, each battery or each package containing batteries must be marked with the words “Universal Waste Batteries” or “Used Batteries for Recycling”. When not managed as UW, applicable characteristic RCRA waste codes (D003 or D007) and uniform hazardous waste manifest shipping papers would be required.

**Damage and/or broken Category 4 batteries are highly hazardous** and associated cleanup residuals are commonly considered to be characteristic hazardous wastes. Both lithium and sodium metal are water reactive - D003 (Reactivity) code applies. The D007 (Chromium) waste code may apply to magnesium batteries due to the presence of this toxic metal (as noted above). Such materials must be managed in accordance with applicable regulatory requirements.

---

**Section Endnotes**

1) It is recognized that EPA UW regulations allow for the use of the words “Waste Batteries” and “Used Batteries.” AERC encourages the use of the terms presented in this guidance document to provide a complete a description of the material as possible and to avoid confusion that may be caused in the use of the word “waste.” Thus, the suggested language “Used Lead Acid Batteries for Recycling.” The descriptor is updated based on the type/category of battery being recycled.

The information presented here-in is for ready reference with regard to over-the-road transport. Check the full text of 49 CFR for all applicable requirements – most notable with regard to Quantity Limitations and Vessel Stowage.
General Guidance

The following guidelines are applicable to a majority of battery types and sizes. EXCEPT as noted below¹, batteries are subject to requirements of the HMR because of two underlying hazards:

1. The chemicals or other hazardous materials contained within the battery, and
2. The electrical potential of the battery.

As such, batteries subject to the HMR must be packaged for transportation in a manner that prevents short circuiting and damage to the battery or its terminals so that to prevent the potential of a dangerous evolution of heat. This may be achieved by:

- Packing each battery in fully enclosed inner packaging made of non-conductive material, or
- Separating the batteries and battery-powered devices from each other and other conductive material in the same package AND
- Packing to prevent damage and shifting while in transport.

- AERC, in cooperation with other industry partners, is working to evaluate methods for meeting requirements to prevent short circuiting and to prevent damage to terminals while in transit. Although the DOT does not explicitly require any one method, the Agency has offered the following recommendations -

As acceptable methods of short circuit protection:

- Ensuring exposed terminals are protected with non-conductive caps, non-conductive tape, or by other appropriate means. Proper insulation includes taping the terminals of the batteries or packaging in individual plastic bags. Clear tape is preferred so that battery identification is still possible. Other forms of insulation may also be used.

As acceptable methods for protecting battery terminals:

- Securely attaching covers of sufficient strength to protect the terminals;
- Packaging the battery in a rigid plastic packaging; or
- Constructing the battery with terminals that are recessed.

¹ EXCEPTIONS to the HMR have been published by the USDOT Pipeline and Hazardous Materials Safety Administration (PHMSA) during 2009 – most notable was the letter of interpretation dated November 25, 2009. Management of spent dry-cell batteries with a rating ≤ 9-volt are not subject to regulation under the HMR when transported by highway or rail and separated from other types of batteries of different chemistries. See comments regarding these exceptions on the following pages.
Only chemically compatible battery types should be packaged in the same package, i.e., category. For example, do not mix acidic batteries with alkaline batteries.

- Batteries that evolve gas and are packaged in drums must have pressure relief bungs in the lids.
- Shipping containers must be properly closed and sealed, e.g., drums must have bungs in lids.
- All batteries should be stored in a cool, dry environment. However, it is AERC does not recommend packaging batteries with vermiculite, desiccant or other packaging material.
- Containers larger than 5-gallon capacity must be secured to pallets for shipping.
- Leaking batteries must be individually packaged and may require shipment as an EPA hazardous waste.
- Batteries secured to a pallet with shrink-wrap in accordance with 49 CFR §173.159(c)(1) are considered to be a single non-bulk package even if the completed package weighs more than 400 kg (882 pounds). Therefore, marking and labeling should be in accordance with the non-bulk packaging requirements found under §172.301 and §172.400.
- Incident reporting in accordance with §171.16 is required for ALL incidents of fire, violent rupture, explosion, or a dangerous evolution of heat which occur as a direct result of a battery or battery-powered device. This requirement applies to all battery shipments, including batteries that are prepared as excepted from the HMR requirements.
- Due to safety and handling concerns; in-process, off-specification batteries will not be returned to the Generator/Shipper if AERC is capable of handling the material. Off-spec fees will be applied as noted below.
- Practices that do not adhere to these packaging guidelines will result in an off-spec fee that may be applied per occurrence in addition to an hourly labor rate for processing. Hourly labor rates - $50/Hr.

---

2 Dangerous evolution of heat is defined as an amount of heat sufficient to be dangerous to packaging or personal safety to include charring of packaging, melting of packaging, scorching of packaging or other evidence.
Shipping & Packaging Guidelines

This section details guidance for proper packaging and shipment in accordance with the HMR and based upon the DOT PHMSA website and the Hazardous Material Table (HMT). AERC recommends that the hazardous material proper shipping descriptions summarized in TABLE 1, 49 CFR §172.101 Hazardous Materials (HM) Table - Excerpts of Interest for Management of Spent Batteries, is considered when managing universal waste (UW) batteries for recycle.

Additional information regarding the assignment of a proper shipping name and recommended packaging is provided following the excerpts from the HMT. This information, found in TABLES 2 and 3, provides details on packaging requirements and reviews the proper sequencing of the DOT basic description as required by 49 CFR §172.202(b) for both Intact UW Batteries, i.e., hazardous materials, and Damaged/Broken Batteries, i.e., potential hazardous wastes, respectfully, grouped according to AERC Battery Category.

NOTE:
The management of materials that result from incidental breakage of UW batteries is allowed in agreement with the UW regulations as long as such breakage occurs as part of the handling of the batteries, i.e., it is incidental and not intentional. Package incidentally damaged UW batteries in a separate 1H2 container – containing both the battery casing and electrolyte, e.g., battery acid. This container must be uniquely identified (labeled/marked) and included within the shipment of other UW batteries. Manage any other materials generated from the cleanup, i.e., contaminated PPE, wipers/booms and/or contaminated soil, in agreement with the full hazardous waste regulations as appropriate with proper identification/characterization of such solid waste.

Batteries that are significantly damaged/broken, as may result from an emergency response or during an intentional act to change the characteristics of the intact battery must be evaluated and managed according to the full requirements of the hazardous waste regulations (both federal and state specific).

See additional details for management of these materials within the information presented for each battery category/type in the tables which follow.

Remember, all of the information contained here-in is offered as a guide and that you as the Shipper must always check the HMR, Part 172, Subpart C, for specific requirements. Additional requirements, special provisions, and/or revisions may be applicable. The information contained here-in should be considered current as of the date of this revision.
### TABLE 1: 49 CFR §172.101 Hazardous Material (HM) Table – Excerpts of Interest for Management of UW Batteries

<table>
<thead>
<tr>
<th>£ (1)</th>
<th>HM Descriptions and Proper Shipping Name</th>
<th>Hazard Class or Division (3)</th>
<th>ID Number (4)</th>
<th>PG (5)</th>
<th>Label Codes (6)</th>
<th>Special Provisions (§172.102)* (7)</th>
<th>Packaging (§173.*** (8A)</th>
<th>ERG # (8B)</th>
<th>Battery Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Batteries, dry, sealed, n.o.s.</td>
<td>.....</td>
<td>.....</td>
<td>.....</td>
<td>.....</td>
<td>130</td>
<td>.....</td>
<td>.....</td>
<td>.....</td>
<td>Various dry-cell battery chemistries, including: alkaline, zinc-carbon, nickel-cadmium, nickel-metal hydride and button cells containing mercury (Hg</td>
</tr>
<tr>
<td>Batteries, dry, sealed, n.o.s. are not subject to HMR under the following conditions:</td>
<td>Spent dry-cell batteries with a rating of ≤ 9-volts when not combined with used or spent batteries of chemistries meeting the other shipping descriptions, e.g., alkaline; zinc-carbon; NiCd; NiMH; and button-cell carbon zinc, mercury</td>
<td>8</td>
<td>UN3028</td>
<td>III</td>
<td>8</td>
<td>237</td>
<td>None</td>
<td>213</td>
<td>154</td>
</tr>
<tr>
<td>Batteries, dry, containing potassium hydroxide solid, electrical storage.</td>
<td>8</td>
<td>UN3028</td>
<td>III</td>
<td>8</td>
<td>237</td>
<td>None</td>
<td>213</td>
<td>154</td>
<td>NiCd; Nickel Metal Hydride; Most dry-cell rechargeable batteries when &gt; RQ</td>
</tr>
<tr>
<td>Batteries, wet, filled with acid, electrical storage.</td>
<td>8</td>
<td>UN2794</td>
<td>III</td>
<td>8</td>
<td>.....</td>
<td>159</td>
<td>159</td>
<td>154</td>
<td>Lead acid</td>
</tr>
<tr>
<td>Batteries, wet, filled with alkali, electrical storage.</td>
<td>8</td>
<td>UN2795</td>
<td>III</td>
<td>8</td>
<td>.....</td>
<td>159</td>
<td>159</td>
<td>154</td>
<td>Alkaline (wet); NiCd (industrial grade</td>
</tr>
<tr>
<td>Batteries, wet, non-spillable, electrical storage.</td>
<td>8</td>
<td>UN2800</td>
<td>III</td>
<td>8</td>
<td>.....</td>
<td>159a</td>
<td>159</td>
<td>154</td>
<td>Dry-Cell (Sealed)</td>
</tr>
<tr>
<td>Batteries, containing sodium</td>
<td>4.3</td>
<td>UN3292</td>
<td>II</td>
<td>4.3</td>
<td>.....</td>
<td>189</td>
<td>189</td>
<td>138</td>
<td>Sodium Nickel Chloride</td>
</tr>
<tr>
<td>Battery fluid, acid</td>
<td>8</td>
<td>UN2796</td>
<td>II</td>
<td>8</td>
<td>N6, N34</td>
<td>154</td>
<td>202</td>
<td>157</td>
<td>Sulfuric acid Solution (Lead acid batteries)</td>
</tr>
<tr>
<td>Battery fluid, alkali</td>
<td>8</td>
<td>UN2797</td>
<td>II</td>
<td>8</td>
<td>N6</td>
<td>154</td>
<td>202</td>
<td>157</td>
<td>Potassium or Sodium Hydroxide Solution</td>
</tr>
</tbody>
</table>
Guidelines for Shipping & Packaging of Batteries

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<th>Revision Date: 4/19/10</th>
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<td>Revision #: C</td>
</tr>
<tr>
<td>Page: Page 11 of 32</td>
<td></td>
</tr>
</tbody>
</table>

**TABLE 1: 49 CFR §172.101 Hazardous Material (HM) Table – Excerpts of Interest for Management of UW Batteries**

<table>
<thead>
<tr>
<th>£ (1)</th>
<th>HM Descriptions and Proper Shipping Name (2)</th>
<th>Hazard Class or Division (3)</th>
<th>ID Number (4)</th>
<th>PG (5)</th>
<th>Label Codes (6)</th>
<th>Special Provisions (§172.102)† (7)</th>
<th>Packaging (§173.***)(8A) (8B)</th>
<th>ERG #</th>
<th>Battery Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lithium battery</td>
<td>Alternative Shipping Descriptions³</td>
<td>9</td>
<td>UN3090</td>
<td>II</td>
<td>9</td>
<td>29, 188, 189, 190</td>
<td>185</td>
<td>185</td>
<td>138</td>
</tr>
<tr>
<td></td>
<td>Lithium ion batteries including lithium ion polymer batteries</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lithium metal batteries including lithium alloy batteries</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lithium batteries contained in equipment</td>
<td>Alternative Shipping Descriptions⁴</td>
<td>9</td>
<td>UN3091</td>
<td>II</td>
<td>9</td>
<td>29, 188, 189, 190</td>
<td>185</td>
<td>185</td>
<td>138</td>
</tr>
<tr>
<td></td>
<td>Lithium ion batteries contained in equipment including lithium ion polymer batteries</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Li-Ion; Li-Poly</td>
</tr>
<tr>
<td></td>
<td>Lithium metal batteries contained in equipment including lithium alloy batteries</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Lithium; Li Metal; Li-Alloy</td>
</tr>
<tr>
<td>Lithium batteries packed with equipment</td>
<td>Alternative Shipping Descriptions³</td>
<td>9</td>
<td>UN3091</td>
<td>II</td>
<td>9</td>
<td>29, 188, 189, 190</td>
<td>185</td>
<td>185</td>
<td>138</td>
</tr>
<tr>
<td></td>
<td>Lithium ion batteries packed with equipment including lithium ion polymer batteries</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Li-Ion; Li-Poly</td>
</tr>
</tbody>
</table>

³ PHMSA provided a Notice of Approval: Lithium Battery Shipping Descriptions within the Federal Register/Vol. 74, No. 163/Tuesday, August 25, 2009. This notice adopts the use of international shipping descriptions as alternatives to the lithium battery hazardous material descriptions and UN identification numbers currently authorized in the HMT, effective the date of publication of the notice. These alternatives have not been formerly published within the HMT and therefore may be used as of this notice pending future updates to HMT.
# Guidelines for Shipping & Packaging of Batteries

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<td></td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>£</th>
<th>HM Descriptions and Proper Shipping Name</th>
<th>Hazard Class or Division (3)</th>
<th>ID Number (4)</th>
<th>PG (5)</th>
<th>Label Codes (6)</th>
<th>Special Provisions (§172.102)* (7)</th>
<th>Packaging (§173.*** (8A)</th>
<th>ERG #</th>
<th>Battery Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Lithium metal batteries packed with equipment including lithium alloy batteries</td>
<td>9</td>
<td>UN3091</td>
<td>II</td>
<td>9</td>
<td>29, 188, 189, 190</td>
<td>185 185</td>
<td></td>
<td>Lithium; Li Metal; Li-Alloy</td>
</tr>
<tr>
<td>A</td>
<td>Mercury contained in manufactured articles</td>
<td>8</td>
<td>UN2809</td>
<td>III</td>
<td>8</td>
<td>.....</td>
<td>None 164</td>
<td>172</td>
<td>Mercury button cell</td>
</tr>
<tr>
<td>G</td>
<td>Environmentally hazardous substance, liquid, n.o.s.</td>
<td>9</td>
<td>UN3082</td>
<td>III</td>
<td>9</td>
<td>8, 146, 335</td>
<td>155 203</td>
<td>171</td>
<td>.....</td>
</tr>
<tr>
<td>G</td>
<td>Environmentally hazardous substance, solid, n.o.s.</td>
<td>9</td>
<td>UN3077</td>
<td>III</td>
<td>9</td>
<td>8, 146, 335</td>
<td>155 213</td>
<td>171</td>
<td>.....</td>
</tr>
<tr>
<td>D G</td>
<td>Hazardous waste solid, n.o.s.</td>
<td>9</td>
<td>NA3077</td>
<td>III</td>
<td>9</td>
<td>No non-bulk SP applies.</td>
<td>155 213</td>
<td>171</td>
<td>Various categories of UW batteries managed as hazardous waste – Table 3.</td>
</tr>
</tbody>
</table>

## NOTES

+ ONLY Special Provisions specific to multi-modal application that may apply to bulk and non-bulk packagings, i.e., consisting only of numbers (for example, “29”) and codes containing the letter “N” (referring only to non-bulk packaging requirements) are presented in this summary. See the full text of the HMT for all applicable Special Provisions references for each cited proper shipping name.

### £ NOTE:
The additional prefix “RQ” may apply to a particular shipping description if the container contains > than reportable quantity for an individual hazardous constituent as contained within specific battery types (based upon the Manufacturer’s MSDS). However, RQ’s do not apply for metals in a solid form with mean particle size > 0.004 inches according to USEPA CERCLA exclusion. As such, RQ does not apply to common batteries containing: cadmium, chromium, copper, lead, nickel, silver and zinc.

- Corrosivity – RQ = 100 Lbs [D002] & Reactivity – RQ = 100 Lbs [D003]
- RCRA Metals: Cadmium (Cd) – RQ = 10 Lbs [D006] | Chromium (Cr) – RQ = 10 Lbs [D007] | Lead (Pb) – RQ = 10 Lbs [D008] | Mercury (Hg) – RQ = 1 Lb [D009] | Silver (Ag) – RQ = 1 Lb [D011]
- Sodium (Na) – RQ = 10 Lbs | Zinc (Zn) – RQ = 1,000 Lbs

## NOTEs for TABLES 2 & 3

- HM – Specifies the material to be a DOT hazardous material. As such, the “HM” column on the BOL or MANIFEST must be marked with an “x” or the letters “RQ” in the case of the shipment of a reportable quantity.

See TABLE 3 for information detailing handling waste batteries (including broken and/or damaged batteries – other than incidental) managed as Hazardous waste.
### Table 2: Management of Intact UW Batteries

<table>
<thead>
<tr>
<th>Cat #</th>
<th>Category Name</th>
<th>Packaging Requirements</th>
<th>Proper Shipping Description(s)</th>
<th>Shipping Papers</th>
<th>Labeling</th>
<th>Marking</th>
</tr>
</thead>
</table>
| 1     | Lead Acid     | Package SMALL (< 3" x 5" X 6") non-leaking wet cell batteries or dry-cell (sealed) Non-spillable in one of the following DOT specification packages as listed in 49 CFR §173.159:  
- 1H2 – Plastic, removable head drum; or  
- 1G2 – Fiberboard drum with poly liner (4 mil thickness); or  
- CF – Fiber box with poly liner (4 mil thickness).  
Metal drums (1A2) are not acceptable for shipping of wet cell batteries. PG III performance level spec packaging required.  
Vented pressure relief bungs are required for containers > 5-gallon capacity to avoid potentially dangerous overpressure.  
Package LARGE, non-leaking lead acid batteries using one of the following methods:  
1. Place batteries securely on a wooden pallet. Place a piece of electrical tape over each terminal to avoid terminal contact. Use shrink-wrap or nylon strapping to secure batteries to the pallet. DO NOT USE METAL STRAPPING TO SECURE BATTERIES TO THE PALLET. Batteries may be double stacked on pallets, but pallet height may not exceed 2 times the height of the battery.  
2. Individual, large lead acid batteries may be packaged one battery per pallet, poly 5-gallon pail or fiberboard box. Terminals must be insulated, e.g., taped, to avoid short circuit. | BOL |
| CAT   |               |                        |                                 |                 |          |         |
| TOC   |               |                        |                                 |                 |          |         |
| 1     | Wet Cell      | **UN2794, Batteries, wet, filled with acid, 8, III (Used lead acid batteries for recycling)(ERG #154)**  
# TABLE 2: Management of Intact UW Batteries

<table>
<thead>
<tr>
<th>Cat #</th>
<th>Category Name</th>
<th>Additional Info</th>
<th>Packaging Requirements</th>
<th>Proper Shipping Description(s)</th>
<th>Shipping Papers</th>
<th>Labeling</th>
<th>Marking</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dry-Cell (Sealed)</td>
<td>Non-spillable or Valve Regulated Lead Acid (VRLA)</td>
<td>UN2800, Batteries, wet, non-spillable, 8, III (Used lead acid batteries for recycling)(ERG #154)</td>
<td>DOT 49 CFR §172.102 Special Provision - None</td>
<td>DOT Packaging – 49 CFR §173.159 &amp; 159</td>
<td>Batteries must be contained in a strong outer packaging with the battery and outer packaging plainly identified with a durable marking stating “NONSPILLABLE” or “NONSPILLABLE BATTERY.”</td>
<td>× HM</td>
</tr>
<tr>
<td>1</td>
<td>Incidental Damaged UW Batteries</td>
<td></td>
<td>Handle UW batteries having incidental damage as UW packaged in a separate 1H2 container (Plastic, removable head drum/pail). Ship on BOL with other UW batteries under separate line item with the appropriate DOT name on as noted above and the following description: (Used/damaged lead acid batteries and battery acid for recycling)(ERG #154)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
TABLE 2: Management of Intact UW Batteries

<table>
<thead>
<tr>
<th>Cat #</th>
<th>Category Name</th>
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<th>Packaging Requirements</th>
<th>Proper Shipping Description(s)</th>
<th>Shipping Papers</th>
<th>Labeling</th>
<th>Marking</th>
</tr>
</thead>
</table>
| 2     | Corrosive Metal |                 | Dry-Cell, non-leaking Category 2 batteries (segregated from leaking) in one of the following DOT specification packages. PG III performance level spec packaging required.  
- 1A2 – Steel, removable head drum with a minimum 4-mil thickness poly liner; or  
- 1H2 – Plastic, removable head drum; or  
- 1G2 – Fiberboard drum with poly liner (4 mil thickness).  
LARGE, non-leaking wet NiCd batteries (> 3” x 5” x 6”) must be packaged using one of the following methods:  
1. Place batteries securely on a wooden pallet. Place a piece of electrical tape over each terminal to avoid terminal contact. Use shrink-wrap or nylon strapping to secure batteries to the pallet. DO NOT USE METAL STRAPPING TO SECURE BATTERIES TO THE PALLET. Batteries may be double stacked on pallets, but pallet height may not exceed 1/1/2 times the width of the pallet.  
2. Individual, large Category 2 batteries may be packaged one battery per pallet, poly 5-gallonail or fiberboard box. Terminals must be insulated, e.g., taped, to avoid contact. | BOL | Individual labeling & marking information applies as noted for each battery type within this category. |
| 2     | Alkaline [Dry - includes 1.5 & 9-volt] | Zinc-carbon [Dry | Non-Hg | 6-volt] | Batteries, dry, sealed, n.o.s.,  
(Used alkaline/zinc-carbon batteries for recycling) | Non-RCRA Regulated Material - The solid waste determination for these batteries commonly concludes this class of batteries to be non-hazardous. As such, not regulated as UW (EXCEPT IN THE STATE OF CALIFORNIA).  
As specified in the DOT exception letter dated November 25, 2009 (Ref No. 09-0150R) – management of used or spent batteries of the type “Batteries, dry, sealed, n.o.s.” with a marked rating of 9-volt or less that are combined in the same package when transported by highway or rail and separated from other types of batteries of different sizes or chemistries are not subject to regulation under the HMR. | [Continued next pg] |
### Guidelines for Shipping & Packaging of Batteries

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<td>Revision #: C</td>
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<tr>
<td>Page: Page 16 of 32</td>
<td></td>
</tr>
</tbody>
</table>

#### TABLE 2: Management of Intact UW Batteries

<table>
<thead>
<tr>
<th>Cat #</th>
<th>Category Name</th>
<th>Additional Info</th>
<th>Packaging Requirements</th>
<th>Proper Shipping Description(s)</th>
<th>Shipping Papers</th>
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<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>NiMH</td>
<td>CAT HW</td>
<td>Batteries, dry, sealed, n.o.s., <em>(Used nickel-metal hydride batteries for recycling)</em></td>
<td>DOT 49 CFR</td>
<td>DOT Packaging – Not applicable.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>DOT-approved packaging and/or short-circuit protection <strong>ARE NOT required</strong>. However, AERC requests that containers are closed and labeled to identify the batteries as noted above.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Alkaline</td>
<td>CAT HW</td>
<td><strong>UN2795, Batteries, wet, filled with alkali, 8, III</strong> <em>(Used <em>fill-in</em> batteries for recycling)(ERG #154)</em></td>
<td>DOT 49 CFR §172.102 Special Provision - None</td>
<td>DOT Packaging – 49 CFR §173.159</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>[Wet] NiFe</td>
<td></td>
<td></td>
<td>Metal drums (1A2) are <strong>not acceptable</strong> for shipping of wet cell batteries. PG III performance level spec packaging required.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Zinc Air</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### TABLE 2: Management of Intact UW Batteries

<table>
<thead>
<tr>
<th>Cat #</th>
<th>Category Name</th>
<th>Additional Info</th>
<th>Packaging Requirements</th>
<th>Proper Shipping Description(s)</th>
<th>Shipping Papers</th>
<th>Labeling</th>
<th>Marking</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>NiCd</td>
<td>CAT HW</td>
<td>Batteries, dry, sealed, n.o.s., (Used nickel-cadmium batteries for recycling)</td>
<td>DOT 49 CFR</td>
<td>DOT Packaging – Not applicable.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>DOT-approved packaging and/or short-circuit protection ARE NOT required for dry-cell ≤ 9-volts. However, AERC requests that containers are closed and labeled to identify these batteries.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>RCRA Regulated Universal Waste</strong> - These batteries commonly fail TCLP for cadmium. As such, regulated as UW, using the above noted DOT description. Batteries must be contained in strong outer packaging. See additional details in TABLE 3.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>NiCd (Wet)</td>
<td>CAT HW</td>
<td>UN2795, Batteries, wet, filled with alkali, 8, III (Used nickel-cadmium batteries for recycling)(ERG #154)</td>
<td>DOT 49 CFR §172.102 Special Provision – None</td>
<td>DOT Packaging – 49 CFR §173.159</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Metal drums (1A2) are not acceptable for shipping of wet cell batteries. PG III performance level spec packaging required.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Incidental Damaged UW Batteries</td>
<td>CAT HW</td>
<td>Handle UW batteries having incidental damage as UW packaged in a separate 1H2 container (Plastic, removable head drum/pail). Ship on BOL with other UW batteries under separate line item with the appropriate DOT name on as noted above and the following description (as appropriate): (Used/damaged (fill-in) batteries and electrolyte for recycling)(ERG #154)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### TABLE 2: Management of Intact UW Batteries

<table>
<thead>
<tr>
<th>Cat</th>
<th>Category Name</th>
<th>Packaging Requirements</th>
<th>Proper Shipping Description(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Mercury Bearing</td>
<td>Non-leaking Category 3 batteries (segregated from leaking) in one of the following DOT specification packages. PG III performance level spec packaging required:</td>
<td>Batteries, dry, sealed, n.o.s., (Used mercury-containing batteries for recycling)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- 1A2 – Steel, removable head drum with a minimum 4-mil thickness poly liner; or</td>
<td>DOT 49 CFR</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- 1H2 – Plastic, removable head drum; or</td>
<td>DOT-approved packaging and/or short-circuit protection <strong>ARE NOT required</strong>. However, AERC requests that containers are closed and labeled to identify the batteries as noted above.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- 1G2 – Fiberboard drum with poly liner (4 mil thickness).</td>
<td>Batteries must be contained in strong outer packaging. <strong>Packages</strong> which contain ≥ 2½ pounds of this type of battery meet the DOT definition of a hazardous material (exceeding the RQ for mercury) and are subject to additional HMR requirements.</td>
</tr>
<tr>
<td>3</td>
<td>Mercury Oxide</td>
<td>&amp; Carbon Zinc and</td>
<td>Use the alternate shipping description that follows on the next page.</td>
</tr>
<tr>
<td>CAT</td>
<td>Mercury Oxide</td>
<td>Silver Oxide (w/Hg)</td>
<td></td>
</tr>
<tr>
<td>HW</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### TABLE 2: Management of Intact UW Batteries

<table>
<thead>
<tr>
<th>Cat #</th>
<th>Category Name</th>
<th>Additional Info</th>
<th>Packaging Requirements</th>
<th>Proper Shipping Description(s)</th>
<th>Shipping Papers</th>
<th>Labeling</th>
<th>Marking</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><strong>[Packages exceeding the RQ for mercury]</strong></td>
<td><strong>RQ, UN2809, Mercury contained in manufactured articles, 8, III (Used mercury batteries for recycling)(ERG #172)</strong></td>
<td>DOT 49 CFR §172.102 Special Provision - None</td>
<td>DOT Packaging – 49 CFR §173.164</td>
<td><strong>RCRA Regulated Universal Waste</strong> - When not managed as UW, applicable characteristic RCRA waste codes and uniform hazardous waste manifest shipping papers would be required. The solid waste determination for these batteries may conclude this class of batteries to be characteristically toxic hazardous waste for mercury. See additional details in TABLE 3.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Silver Oxide</td>
<td><strong>CAT HW</strong></td>
<td><strong>Batteries, dry, sealed, n.o.s., (Used silver oxide batteries for recycling)</strong></td>
<td>DOT 49 CFR</td>
<td>DOT Packaging – Not applicable. DOT-approved packaging and/or short-circuit protection <strong>ARE NOT required.</strong> However, AERC requests that containers are closed and labeled to identify the batteries as noted above. <strong>RCRA Regulated Universal Waste</strong> - When not managed as UW, applicable characteristic RCRA waste codes and uniform hazardous waste manifest shipping papers would be required. The solid waste determination for these batteries may conclude this class of batteries to be characteristically toxic hazardous waste for silver. See additional details in TABLE 3.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## TABLE 2: Management of Intact UW Batteries

<table>
<thead>
<tr>
<th>Cat #</th>
<th>Category Name</th>
<th>Additional Info</th>
<th>Packaging Requirements</th>
<th>Proper Shipping Description(s)</th>
<th>Shipping Papers</th>
<th>Labeling</th>
<th>Marking</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>ATON</td>
<td>CAT HW</td>
<td><strong>UN2795, Batteries, wet, filled with alkali, 8, III (Used ATON batteries for recycling)(ERG #154)</strong></td>
<td>NOTE: “RQ” added as prefix to description if package contains &gt; 2 ½ pounds (mercury). DOT 49 CFR §172.102 Special Provision – None</td>
<td>DOT Packaging – 49 CFR §173.59 Metal drums (1A2) are not acceptable for shipping of wet cell batteries. PG III performance level spec packaging required.</td>
<td>x HM</td>
<td><img src="image" alt="Universal Waste" /> <img src="image" alt="Corrosive" /></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Incidental Damaged UW Batteries</td>
<td></td>
<td>Handle UW batteries having incidental damage as UW packaged in a separate 1H2 container (Plastic, removable head drum/pail). Ship on BOL with other UW batteries under separate line item with the DOT name on as noted above (based on RQ) and the following descriptions: <em>(Used/damaged mercury-containing batteries for recycling)</em> or <em>(Used/damaged silver oxide batteries for recycling)</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### TABLE 2: Management of Intact UW Batteries

<table>
<thead>
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<th>Proper Shipping Description(s)</th>
<th>Shipping Papers</th>
<th>Labeling</th>
<th>Marking</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Reactive Metal</td>
<td></td>
<td>Non-leaking Category 4 batteries (segregated from leaking) in one of the following DOT specification packages. <strong>PG II performance level spec packaging required.</strong>&lt;br&gt;• 1A2 – 5-gallon steel, removable head drum with a minimum 4-mil thickness poly liner; or&lt;br&gt;• 1H2 – 5-gallon plastic, removable head drum; or&lt;br&gt;• 1G2 – 5-gallon fiberboard drum with poly liner (4 mil thickness).&lt;br&gt;&lt;br&gt;AERC requests that based on the high-energy density and reactivity of this battery category, containers of reactive metal batteries are limited to a maximum size of 5-gallons (66 lb gross weight per container).&lt;br&gt;&lt;br&gt;Package each battery to ensure protection of the terminals and avoid electrical short circuit. The following practices are recommended:&lt;br&gt;• Place each battery in sealed individual plastic bag; OR&lt;br&gt;• Use original packaging in which the batteries were received (if in good condition and can be resealed); OR&lt;br&gt;• Place a piece of electrical, i.e., insulating, tape over each terminal to avoid terminal contact.&lt;br&gt;&lt;br&gt;<strong>Reactive Metal →</strong> <strong>FAILURE TO PROTECT TERMINALS WILL LEAD TO OVERHEATING and/or FIRE and EXPLOSION DURING STORAGE and/or TRANSPORTATION.</strong>&lt;br&gt;Provide cushioning for each battery to prevent contact with other batteries by layering with vermiculite, speedi-dry or kitty litter. Failure to provide adequate cushioning may lead to a fire or explosion during storage and/or transportation!&lt;br&gt;&lt;br&gt;Additional exceptions for small and medium sized lithium cells/batteries – Relief from certain DOT requirements can be found in 49 CFR §172.202 Special Provisions <a href="#">188</a> and <a href="#">189</a>. See Appendix I.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### TABLE 2: Management of Intact UW Batteries

<table>
<thead>
<tr>
<th>Cat #</th>
<th>Category Name</th>
<th>Additional Info</th>
<th>Packaging Requirements</th>
<th>Proper Shipping Description(s)</th>
<th>Shipping Papers</th>
<th>Labeling</th>
<th>Marking</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Lithium (Primary); Li-Ion &amp; Li-Poly (Secondary)</td>
<td></td>
<td>DOT 49 CFR §172.102 Special Provisions 29, 188, 189, 190 applies</td>
<td>DOT Packaging - 49 CFR §173.185</td>
<td></td>
<td></td>
<td>x HM</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>UN3090, Lithium battery, 9, II (Used lithium batteries for recycling)(ERG #138)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CAT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HW</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NOTE: PHMSA provided a Notice of Approval: Lithium Battery Shipping Descriptions within the Federal Register/Vol. 74, No. 163/Tuesday, August 25, 2009. This notice adopts the use of international shipping descriptions as alternatives to the lithium battery hazardous material descriptions and UN identification numbers currently authorized in the HMT, effective the date of publication of the notice. These alternative descriptions may be used – see alternatives below:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| 4     | Lithium Metal (Primary) & Li-Alloy | Li-Ion & Li-Poly (Secondary) | UN3090, Lithium metal batteries, 9, II (Used lithium metal batteries for recycling)(ERG #138) | DOT 49 CFR §172.102 Special Provisions 29, 188, 189, 190 applies | DOT Packaging - 49 CFR §173.185 | | x HM |
| CAT   |               |                 | | | | | |
| HW    |               |                 | | | | | |
| UN3480, Lithium ion batteries, 9, II (Used lithium ion polymer batteries for recycling)(ERG #138) | DOT 49 CFR §172.102 Special Provisions 29, 188, 189, 190 applies | DOT Packaging - 49 CFR §173.185 | | | | |
## TABLE 2: Management of Intact UW Batteries

<table>
<thead>
<tr>
<th>Cat #</th>
<th>Category Name</th>
<th>Additional Info</th>
<th>Packaging Requirements</th>
<th>Proper Shipping Description(s)</th>
<th>Shipping Papers</th>
<th>Labeling</th>
<th>Marking</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Magnesium</td>
<td></td>
<td>Batteries, dry, sealed, n.o.s. (Used magnesium batteries for recycling)</td>
<td>DOT 49 CFR §172.102 Special Provision 130 applies</td>
<td>DOT Packaging – Not specified. RCRA Regulated Universal Waste - When not managed as UW, applicable characteristic RCRA waste codes and uniform hazardous waste manifest shipping papers would be required. The solid waste determination for these batteries may conclude this class of batteries to be characteristically toxic hazardous waste for chromium. See additional details in TABLE 3.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Sodium Nickel</td>
<td></td>
<td>UN3292, Batteries, containing sodium, 4.3, II (Used sodium batteries for recycling)(ERG #138)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>DOT Packaging - 49 CFR §173.130, Applies</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Incidental Damaged UW Batteries</td>
<td>Handle UW batteries having incidental damage as UW packaged in a separate 1H2 container (Plastic, removable head drum/pail). Ship on BOL with other UW batteries under separate line item with the appropriate DOT name on as noted above and the following description: (Used/damaged (fill-in) batteries for recycling)(ERG #138) or (Used/damaged magnesium batteries for recycling)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### TABLE 3: Damaged and/or Broken Batteries

<table>
<thead>
<tr>
<th>Category Name</th>
<th>Additional Info</th>
<th>Packaging Requirements</th>
<th>Proper Shipping Description(s)</th>
<th>Shipping Papers</th>
<th>Labeling</th>
<th>Marking</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1</strong></td>
<td>Lead Acid</td>
<td>Leaking, lead acid batteries must be packaged as follows:</td>
<td></td>
<td></td>
<td></td>
<td>MANIFEST</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1. Separate all free liquid from battery casing. This liquid should be placed in a poly 1H1 drum or other DOT container compatible with the battery liquid. Profile this solution separately using an AERC Recycling Profile.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Place the battery carcasses in a poly drum liner (4 mil thickness) and place in a poly 1H2 (removable head) drum. Leaking batteries must be labeled and shipped as a hazardous waste.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Do not pack battery carcasses with vermiculite, desiccant or packaging material.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>NOTE: An approval (separate from the UW battery authorization) is required to manage any Category 1 batteries or associated clean-up residuals as solid waste.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>1</strong></td>
<td>Damaged Wet Cell</td>
<td>UN2794, Waste Batteries, wet, filled with acid, 8, III (ERG #154)</td>
<td>EPA hazardous waste code D008 (Characteristic of Toxicity - Lead) should be entered in Item 13 of the manifest.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Waste lead acid batteries for recycling)</td>
<td>NOTE: “RQ” added as prefix to description if shipping container contains &gt; 10 Lbs of lead.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Containerized battery acid</td>
<td>UN2796, Waste Battery fluid, acid, 8, II, (ERG #157)</td>
<td>EPA hazardous waste code D002 (Characteristic of Corrosivity) should be entered in Item 13 of the manifest.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Containerized battery acid</td>
<td>NOTE: “RQ” added as prefix to description if shipping container contains &gt; 100 Lbs of acid.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Containerized battery acid</td>
<td>DOT 49 CFR §172.102 Special Provision N6 &amp; N34 apply</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 3: Damaged and/or Broken Batteries

<table>
<thead>
<tr>
<th>Cat #</th>
<th>Category Name</th>
<th>Additional Info</th>
<th>Packaging Requirements</th>
<th>Proper Shipping Description(s)</th>
</tr>
</thead>
</table>
| 2     | Corrosive Metal |                 | Some alkaline batteries have been determined to contain mercury. Although most alkaline batteries have been determined to be non-hazardous, i.e., TCLP for Mercury < 0.2 mg/L, the Generator must appropriately assess their individual situation through the use of available specification data (e.g., MSDS) to properly examine applicability of characteristic EPA waste codes.  
NOTE: An approval (separate from the UW battery authorization) is required to manage any Category 2 batteries or associated clean-up residuals as solid waste. |

UN3077, Environmentally hazardous substance, solid, n.o.s., (Potassium Hydroxide), 9, III (Used/damaged alkaline batteries for recycling – Non RCRA Regulated)(ERG #171)  

DOT 49 CFR §172.102 Special Provision 8, 146 & 335 apply  

This class of batteries not known to fail TCLP for RCRA metals nor does it contain any free liquid. Based on this solid waste characterization, these batteries are not deemed hazardous waste and therefore not subject to the Federal UW standards. However, individual states may adopt more stringent regulations; as such, these batteries may be classified as UW in some jurisdictions.  

If the material is shipped with hazardous materials on a manifest, the word “None” should be entered in Item 13 of the manifest to with regard to applicable EPA waste code numbers.
### TABLE 3: Damaged and/or Broken Batteries

<table>
<thead>
<tr>
<th>Cat #</th>
<th>Category Name</th>
<th>Additional Info</th>
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<th>Proper Shipping Description(s)</th>
<th>Shipping Papers</th>
<th>Labeling</th>
<th>Marking</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Damaged Alkaline [Wet] Zinc Air</td>
<td>Containerized battery fluid (if packaged separately) manage as:</td>
<td>UN2795, Waste Batteries, wet, filled with alkali, 8, III (Waste alkaline batteries for recycling)(ERG #154)</td>
<td>EPA hazardous waste code D002 (Corrosivity) should be entered in Item 13 of the manifest. NOTE: “RQ” added as prefix to description if shipping container contains &gt; 100 Lbs. DOT 49 CFR §172.102 Special Provision – None</td>
<td>X HM</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>UN2797, Waste Battery fluid, alkali, 8, II, (ERG #157)</td>
<td>EPA hazardous waste code D002 (Corrosivity) should be entered in Item 13 of the manifest. NOTE: “RQ” added as prefix to description if shipping container contains &gt; 100 Lbs of acid – characteristic corrosive hazardous waste. DOT 49 CFR §172.102 Special Provision N6 applies</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Damaged NiCd [Dry]</td>
<td></td>
<td>UN3028, Waste Batteries, dry, containing potassium hydroxide solid, 8, III (Waste nickel-cadmium batteries for recycling)(ERG #154)</td>
<td>EPA hazardous waste code D006 (Characteristic of Toxicity - Cadmium) should be entered in Item 13 of the manifest. NOTE: “RQ” added as prefix to description if shipping container contains &gt; 10 Lbs of cadmium. DOT 49 CFR §172.102 Special Provision 237 applies</td>
<td>X HM</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Above labeling & marking information applies to these batteries.
TABLE 3: Damaged and/or Broken Batteries

<table>
<thead>
<tr>
<th>Cat #</th>
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<th>Additional Info</th>
<th>Packaging Requirements</th>
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<th>Marking</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Damaged NiCd</td>
<td>[Wet]</td>
<td>UN2795, Waste Batteries, wet, filled with alkali, 8, III (Waste nickel-cadmium batteries for recycling)(ERG #154)</td>
<td>EPA hazardous waste codes D002 (Corrosivity) and D006 (Characteristic of Toxicity - Cadmium) should be entered in Item 13 of the manifest. NOTE: “RQ” added as prefix to description if shipping container contains &gt; 10 Lbs of cadmium. DOT 49 CFR §172.102 Special Provision – None</td>
<td>DOT Packaging – 49 CFR §173.159 Metal drums (1A2) are not acceptable for shipping of wet cell batteries. PG III performance level spec packaging required.</td>
<td>x HM</td>
<td></td>
</tr>
</tbody>
</table>

3 Mercury Bearing

Category 3 batteries expected to fail TCLP for mercury. As such, the characteristic EPA waste codes D009 applies.

NOTE: An approval (separate from the UW battery authorization) is required to manage any Category 3 batteries or associated clean-up residuals as solid waste.

3 Mercury Mercury Oxide & Carbon Zinc and Silver Oxide (w/Hg)

UN2809, Waste Mercury contained in manufactured articles, 8, III (Waste mercury batteries for recycling)(ERG #172) EPA hazardous waste code D009 (Characteristic of Toxicity - Mercury) should be entered in Item 13 of the manifest.


[Continued on next pg]
### TABLE 3: Damaged and/or Broken Batteries

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<tr>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>**Shipping Papers</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>NOTE:</strong> “RQ” added as prefix to shipping description if package contains &gt; 2 ½ pounds. RQ for Mercury</td>
<td>D009 = 1 Lb.</td>
</tr>
<tr>
<td>3</td>
<td>Silver Oxide</td>
<td>NA3077, Hazardous waste, solid, n.o.s., (Silver), 9, III</td>
<td>(Waste silver oxide batteries for recycling)(ERG #171)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EPA hazardous waste code D011 (Characteristic of Toxicity - Silver) should be entered in Item 13 of the manifest.</td>
<td>DOT 49 CFR §172.102 Special Provisions – Not applicable.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NOTE: “RQ” added as prefix to shipping description if package contains &gt; 1 Lb</td>
<td>RQ for Silver (D011).</td>
</tr>
<tr>
<td>3</td>
<td>ATON</td>
<td>UN2795, Waste Batteries, wet, filled with alkali, 8, III</td>
<td>(Waste ATON batteries for recycling)(ERG #154)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EPA hazardous waste code D002 (Characteristic of Corrosivity) should be entered in Item 13 of the manifest.</td>
<td>DOT 49 CFR §172.102 Special Provision – None</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NOTE: “RQ” added as prefix to description if package contains &gt; 2 ½ pounds (mercury).</td>
<td>DOT Packaging – 49 CFR §173.159</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PG III performance level spec packaging required.</td>
<td>[Continued on next pg]</td>
</tr>
</tbody>
</table>
# Guidelines for Shipping & Packaging of Batteries

**AERC.com, Inc | Corporate Offices: 3 Gold Mine Road, Suite 106, Flanders, NJ**  
**Operating Locations: Allentown, PA | Ashland, VA | Hayward, CA | Houston, TX | West Melbourne, FL**

<table>
<thead>
<tr>
<th>Cat #</th>
<th>Category Name</th>
<th>Additional Info</th>
<th>Packaging Requirements</th>
<th>Proper Shipping Description(s)</th>
<th>Shipping Papers</th>
<th>Labeling</th>
<th>Marking</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Reactive Metal</td>
<td></td>
<td>Metal drums (1A2) are not acceptable for shipping of wet cell batteries. PG III performance level spec packaging required.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:** An approval (separate from the UW battery authorization) is required to manage any Category 4 batteries or associated clean-up residuals as solid waste.

**NOTE:** PHMSA provided a Notice of Approval: Lithium Battery Shipping Descriptions within the Federal Register/Vol. 74, No. 163/Tuesday, August 25, 2009. This notice adopts the use of international shipping descriptions as alternatives to the lithium battery hazardous material descriptions and UN identification numbers currently authorized in the HMT, effective the date of publication of the notice. These alternative descriptions, although not shown within this table, may be used as appropriate.

<table>
<thead>
<tr>
<th>Cat #</th>
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<th>Shipping Papers</th>
<th>Labeling</th>
<th>Marking</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Lithium (Primary); Li-Ion &amp; Li-Poly (Secondary)</td>
<td>UN3090, Waste Lithium battery, 9, II (Waste lithium batteries for recycling)(ERG #138)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

EPA hazardous waste code D003 (Characteristic of Reactivity) should be entered in Item 13 of the manifest.

### TABLE 3: Damaged and/or Broken Batteries

<table>
<thead>
<tr>
<th>Cat #</th>
<th>Category Name</th>
<th>Additional Info</th>
<th>Packaging Requirements</th>
<th>Proper Shipping Description(s)</th>
<th>Shipping Papers</th>
<th>Labeling</th>
<th>Marking</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Sodium Nickel Chloride</td>
<td>UN3292, Waste Batteries, containing sodium, 4.3, II (Used sodium batteries for recycling)(ERG #138)</td>
<td>PG II performance level spec packaging required.</td>
<td>EPA hazardous waste code D003 (Characteristic of Reactivity) should be entered in Item 13 of the manifest.</td>
<td>DOT 49 CFR §172.102 Special Provisions - None</td>
<td>DOT Packaging - 49 CFR §173.189</td>
<td>PG II performance level spec packaging required.</td>
</tr>
</tbody>
</table>
Material Discrepancies & Incident Reporting

Material Discrepancies

As noted in the April 3, 2009, Battery Advisory Letter, PHMSA has noted “an ongoing trend of serious safety problems and non-compliance regarding the classification, packaging, marking, labeling, documentation, and transportation of spent batteries in commerce.” As part of this action, Battery Recyclers are obligated to examine materials offered for transport, including associated paperwork, markings/labels and packaging, to ensure requirements set forth by DOT for safe transport of recycled batteries are achieved.

- To improve communications specific DOT issues, AERC has revised load inspection notification documentation. AERC Form TR-02004-F1, Load/Piece Count/Paperwork Discrepancy Form, shall be completed and forwarded to Customers in order to identify non-compliances and to communicate violations of transportation safety regulations found with material either offered for transport or received via third-party carriers.

AERC believes that this action supports sound environmental, health and safety practices and is necessary to ensure the welfare of both our personnel, our Customers and the general public.
Incident Reporting | §171.16

Included within the federal register release of the updated battery regulations on January 14, 2009 were specific requirements regarding when an incident (as it is associated with the transportation of a battery or battery-device) must be reported to the DOT. The following is an excerpt from this updated regulation. AERC will meet necessary reporting requirements when/if batteries either offered for transport or received via third-party carriers meet this regulatory standard.

**Detailed hazardous materials incident reports.**

(a) General. Each person in physical possession of a hazardous material at the time that any of the following incidents occurs during transportation (including loading, unloading, and temporary storage) must submit a Hazardous Materials Incident Report on DOT Form F 5800.1 (01/2004) within 30 days of discovery of the incident:

1. Any of the circumstances set forth in §171.15(b);
2. An unintentional release of a hazardous material or the discharge of any quantity of hazardous waste;
3. A specification cargo tank with a capacity of 1,000 gallons or greater containing any hazardous material suffers structural damage to the lading retention system or damage that requires repair to a system intended to protect the lading retention system, even if there is no release of hazardous material;
4. An undeclared hazardous material is discovered; or
5. A fire, violent rupture, explosion or dangerous evolution of heat (i.e., an amount of heat sufficient to be dangerous to packaging or personal safety to include charring of packaging, melting of packaging, scorching of packaging, or other evidence) occurs as a direct result of a battery or battery-powered device.
APPENDIX I

Referenced Special Provisions
& Packaging Specifications
Referenced Special Provisions & Packaging Specifications

This appendix details excerpts from the DOT regulations as referenced within HMT (TABLE 1) and as listed within the packaging requirements specified in TABLE 2 and TABLE 3. The information contained here-in includes:

- **Special Provisions** – As detailed in HMT Column (7) with reference to the appropriate 49 CFR §172.102 paragraph. ONLY Special Provisions specific to multi-modal application that may apply to bulk and non-bulk packagings, i.e., consisting only of numbers (for example, “29”) and codes containing the letter “N” (referring only to non-bulk packaging requirements) are presented in this summary. See the full text of the HMT for all applicable Special Provisions references for each cited proper shipping name.
  
  - SP 130 | Ref: Batteries, dry, sealed, n.o.s.
  - SP 237 | Ref: Batteries, dry, containing potassium hydroxide solid
  - SP 134 | Ref: Battery-powered vehicle
  - SP N6, N34 | Ref: Battery fluid
  - SP 29, 188, 189, 190 | Ref: Lithium battery(ies)
  - SP 8, 146, 335 | Ref: Environmentally hazardous substance, solid/liquid, n.o.s.

- **Packaging Specifications** – As detailed in HMT Columns (8A) & (8B) with reference to the appropriate 49 CFR §173.*** section as it applies to the HM described here-in.

The information contained here-in should be considered current as of the date of this revision.

**Special Provisions | §172.102**

**SP 8**

A hazardous substance that is not a hazardous waste may be shipped under the shipping description “Other regulated substances, liquid or solid, n.o.s.”, as appropriate. In addition, for solid materials, special provision B54 applies.

**SP 29**

For transportation by motor vehicle, rail car or vessel, production runs (exceptions for prototypes can be found in §173.185(e)) of not more than 100 lithium cells or batteries are excepted from the testing requirements of §173.185(a)(1) if—

- a. For a lithium metal cell or battery, the lithium content is not more than 1.0 g per cell and the aggregate lithium content is not more than 2.0 g per battery, and, for a lithium-ion cell or battery, the equivalent lithium content is not more than 1.5 g per cell and the aggregate equivalent lithium content is not more than 8 g per battery;
- b. The cells and batteries are transported in an outer packaging that is a metal, plastic or plywood drum or metal, plastic or wooden box that meets the criteria for Packing Group I packagings; and
- c. Each cell and battery is individually packed in an inner packaging inside an outer packaging and is surrounded by cushioning material that is non-combustible, and non-conductive.
Dry batteries not specifically covered by another entry in the §172.101 Table must be described using this entry. Batteries described as “Batteries, dry, sealed, n.o.s” are hermetically sealed and generally utilize metals (other than lead) and/or carbon as electrodes. These batteries are typically used for portable power applications. The rechargeable (and some non-rechargeable) types have gelled alkaline electrolytes (rather than acidic) making it difficult for them to generate hydrogen or oxygen when overcharged and therefore, differentiating them from non-spillable batteries. “Batteries, dry, sealed, n.o.s.” are not subject to any other requirements of this subchapter except for the following:

1. Incident reporting requirements. For transportation by aircraft, a telephone report in accordance with §171.15(a) is required if a fire, violent rupture, explosion or dangerous evolution of heat (i.e., an amount of heat sufficient to be dangerous to packaging or personal safety to include charring of packaging, melting of packaging, scorching of packaging, or other evidence) occurs as a direct result of a dry battery. For all modes of transportation, a written report submitted, retained, and updated in accordance with §171.16 is required if a fire, violent rupture, explosion or dangerous evolution of heat occurs as a direct result of a dry battery or battery-powered device;

2. Batteries and battery-powered device(s) containing batteries must be prepared and packaged for transport in a manner to prevent:
   i. A dangerous evolution of heat;
   ii. Short circuits, including but not limited to the following methods:
      a. Packaging each battery or each battery-powered device when practicable, in fully enclosed inner packagings made of non-conductive material;
      b. Separating or packaging batteries in a manner to prevent contact with other batteries, devices or conductive materials (e.g., metal) in the packagings; or
      c. Ensuring exposed terminals or connectors are protected with non-conductive caps, non-conductive tape, or by other appropriate means; and
   iii. Damage to terminals. If not impact resistant, the outer packaging should not be used as the sole means of protecting the battery terminals from damage or short circuiting. Batteries must be securely cushioned and packed to prevent shifting which could loosen terminal caps or reorient the terminals to produce short circuits. Batteries contained in devices must be securely installed. Terminal protection methods include but are not limited to the following:
      a. Securely attaching covers of sufficient strength to protect the terminals;
      b. Packaging the battery in a rigid plastic packaging; or
      c. Constructing the battery with terminals that are recessed or otherwise protected so that the terminals will not be subjected to damage if the package is dropped.

3. When transported by aircraft, for a battery whose voltage (electrical potential) exceeds 9 volts:
   i. When contained in a device, the device must be packaged in a manner that prevents unintentional activation or must have an independent means of preventing unintentional activation (e.g., packaging restricts access to activation switch, switch caps or locks, recessed switches, trigger locks, temperature sensitive circuit breakers, etc.); and
   ii. An indication of compliance with this special provision must be provided by marking each package with the words “not restricted” or by including the words “not restricted” on a transport document such as an air waybill accompanying the shipment.
**SP 134**

This entry only applies to vehicles, machinery and equipment powered by wet batteries, sodium batteries, or lithium batteries that are transported with these batteries installed. Examples of such items are electrically-powered cars, lawn mowers, wheelchairs, and other mobility aids. Self-propelled vehicles that also contain an internal combustion engine must be consigned under the entry “Vehicle, flammable gas powered” or “Vehicle, flammable liquid powered”, as appropriate. Except as provided in Special Provision A101, vehicles, machinery and equipment powered by primary lithium batteries that are transported with these batteries installed are forbidden aboard passenger-carrying aircraft.

**SP 146**

This description may be used for a material that poses a hazard to the environment but does not meet the definition for a hazardous waste or a hazardous substance, as defined in §171.8 of this subchapter, or any hazard class, as defined in part 173 of this subchapter, if it is designated as environmentally hazardous by another Competent Authority. This provision may be used for both domestic and international shipments.

**SP 188**

*Small lithium cells and batteries.* Lithium cells or batteries, including cells or batteries packed with or contained in equipment, are not subject to any other requirements of this subchapter if they meet all of the following:

a. **Primary lithium batteries and cells.**

   (1) Primary lithium batteries and cells are forbidden for transport aboard passenger-carrying aircraft. The outside of each package that contains primary (nonrechargeable) lithium batteries or cells must be marked “PRIMARY LITHIUM BATTERIES—FORBIDDEN FOR TRANSPORT ABOARD PASSENGER AIRCRAFT” or “LITHIUM METAL BATTERIES—FORBIDDEN FOR TRANSPORT ABOARD PASSENGER AIRCRAFT” on a background of contrasting color. The letters in the marking must be:

   (i) At least 12 mm (0.5 inch) in height on packages having a gross weight of more than 30 kg (66 pounds); or

   (ii) At least 6 mm (0.25 inch) on packages having a gross weight of 30 kg (66 pounds) or less, except that smaller font may be used as necessary to fit package dimensions; and

   (2) The provisions of paragraph (a)(1) do not apply to packages that contain 5 kg (11 pounds) net weight or less of primary lithium batteries or cells that are contained in or packed with equipment and the package contains no more than the number of lithium batteries or cells necessary to power the piece of equipment;

b. For a lithium metal or lithium alloy cell, the lithium content is not more than 1.0 g. For a lithium-ion cell, the equivalent lithium content is not more than 1.5 g;

c. For a lithium metal or lithium alloy battery, the aggregate lithium content is not more than 2.0 g. For a lithium-ion battery, the aggregate equivalent lithium content is not more than 8 g;

d. Effective October 1, 2009, the cell or battery must be of a type proven to meet the requirements of each test in the UN Manual of Tests and Criteria (IBR; see §171.7 of this subchapter);

e. Cells or batteries are separated or packaged in a manner to prevent short circuits and are packed in a strong outer packaging or are contained in equipment;

f. Effective October 1, 2008, except when contained in equipment, each package containing more than 24 lithium cells or 12 lithium batteries must be:

   (1) Marked to indicate that it contains lithium batteries, and special procedures should be followed if the package is damaged;
(2) Accompanied by a document indicating that the package contains lithium batteries and special procedures should be followed if the package is damaged;
(3) Capable of withstanding a 1.2 meter drop test in any orientation without damage to cells or batteries contained in the package, without shifting of the contents that would allow short circuiting and without release of package contents; and
(4) Gross weight of the package may not exceed 30 kg (66 pounds). This requirement does not apply to lithium cells or batteries packed with equipment;

h. For transportation by aircraft, a telephone report in accordance with §171.15(a) is required if a fire, violent rupture, explosion or dangerous evolution of heat (i.e., an amount of heat sufficient to be dangerous to packaging or personal safety to include charring of packaging, melting of packaging, scorching of packaging, or other evidence) occurs as a direct result of a lithium battery. For all modes of transportation, a written report submitted, retained, and updated in accordance with §171.16 is required if a fire, violent rupture, explosion or dangerous evolution of heat occurs as a direct result of a lithium battery or battery-powered device; and

i. Lithium batteries or cells are not authorized aboard an aircraft in checked or carry-on luggage except as provided in §175.10.

**Medium lithium cells and batteries.** Effective October 1, 2008, when transported by motor vehicle or rail car, lithium cells or batteries, including cells or batteries packed with or contained in equipment, are not subject to any other requirements of this subchapter if they meet all of the following:

a. The lithium content anode of each cell, when fully charged, is not more than 5 grams.

b. The aggregate lithium content of the anode of each battery, when fully charged, is not more than 25 grams.

c. The cells or batteries are of a type proven to meet the requirements of each test in the UN Manual of Tests and Criteria (IBR; see §171.7 of this subchapter). A cell or battery and equipment containing a cell or battery that was first transported prior to January 1, 2006 and is of a type proven to meet the criteria of Class 9 by testing in accordance with the tests in the UN Manual of Tests and Criteria, Third revised edition, 1999, need not be retested.

d. Cells or batteries are separated or packaged in a manner to prevent short circuits and are packed in a strong outer packaging or are contained in equipment.

e. The outside of each package must be marked “LITHIUM BATTERIES—FORBIDDEN FOR TRANSPORT ABOARD AIRCRAFT AND VESSEL” on a background of contrasting color, in letters:
   (1) At least 12 mm (0.5 inch) in height on packages having a gross weight of more than 30 kg (66 pounds); or
   (2) At least 6 mm (0.25 inch) on packages having a gross weight of 30 kg (66 pounds) or less, except that smaller font may be used as necessary to fit package dimensions.

f. Except when contained in equipment, each package containing more than 24 lithium cells or 12 lithium batteries must be:
   (1) Marked to indicate that it contains lithium batteries, and special procedures should be followed if the package is damaged;
   (2) Accompanied by a document indicating that the package contains lithium batteries and special procedures should be followed if the package is damaged;
   (3) Capable of withstanding a 1.2 meter drop test in any orientation without damage to cells or batteries contained in the package, without shifting of the contents that would allow short circuiting and without release of package contents; and
(4) Gross weight of the package may not exceed 30 kg (66 pounds). This requirement does not apply to lithium cells or batteries packed with equipment.

g. Electrical devices must conform to §173.21 of this subchapter; and

h. A written report submitted, retained, and updated in accordance with §171.16 is required if a fire, violent rupture, explosion or dangerous evolution of heat (i.e., an amount of heat sufficient to be dangerous to packaging or personal safety to include charring of packaging, melting of packaging, scorching of packaging, or other evidence) occurs as a direct result of a lithium battery or battery-powered device.

**SP 190**

Until the effective date of the standards set forth in Special Provision 189, medium lithium cells or batteries, including cells or batteries packed with or contained in equipment, are not subject to any other requirements of this subchapter if they meet all of the following:

a. **Primary lithium batteries and cells.**

(1) Primary lithium batteries and cells are forbidden for transport aboard passenger-carrying aircraft. The outside of each package that contains primary (nonrechargeable) lithium batteries or cells must be marked “PRIMARY LITHIUM BATTERIES—FORBIDDEN FOR TRANSPORT ABOARD PASSENGER AIRCRAFT” or “LITHIUM METAL BATTERIES—FORBIDDEN FOR TRANSPORT ABOARD PASSENGER AIRCRAFT” on a background of contrasting color. The letters in the marking must be:

   (i) At least 12 mm (0.5 inch) in height on packages having a gross weight of more than 30 kg (66 pounds); or

   (ii) At least 6 mm (0.25 inch) on packages having a gross weight of 30 kg (66 pounds) or less, except that smaller font may be used as necessary to fit package dimensions; and

(2) The provisions of paragraph (a)(1) do not apply to packages that contain 5 kg (11 pounds) net weight or less of primary lithium batteries or cells that are contained in or packed with equipment and the package contains no more than the number of lithium batteries or cells necessary to power the piece of equipment.

b. The lithium content of each cell, when fully charged, is not more than 5 grams.

c. The aggregate lithium content of each battery, when fully charged, is not more than 25 grams.

d. The cells or batteries are of a type proven to meet the requirements of each test in the UN Manual of Tests and Criteria (IBR; see §171.7 of this subchapter). A cell or battery and equipment containing a cell or battery that was first transported prior to January 1, 2006 and is of a type proven to meet the criteria of Class 9 by testing in accordance with the tests in the UN Manual of Tests and Criteria, Third Revised Edition, 1999, need not be retested.

e. Cells or batteries are separated so as to prevent short circuits and are packed in a strong outer packaging or are contained in equipment.

f. Electrical devices must conform to §173.21 of this subchapter.

**SP 237**

“Batteries, dry, containing potassium hydroxide solid, electric storage” must be prepared and packaged in accordance with the requirements of §173.159(a), (b), and (c). For transportation by aircraft, the provisions of §173.159(b)(2) are applicable.
Mixtures of solids that are not subject to this subchapter and environmentally hazardous liquids or solids may be classified as “Environmentally hazardous substances, solid, n.o.s,” UN3077 and may be transported under this entry, provided there is no free liquid visible at the time the material is loaded or at the time the packaging or transport unit is closed. Each transport unit must be leakproof when used as bulk packaging.

Battery fluid packaged with electric storage batteries, wet or dry, must conform to the packaging provisions of §173.159 (g) or (h) of this subchapter.

Aluminum construction materials are not authorized for any part of a packaging which is normally in contact with the hazardous material.
Packaging Specifications | §173.24

Title 49: Transportation
PART 173—SHIPPERS—GENERAL REQUIREMENTS FOR SHIPMENTS AND PACKAGINGS

§ 173.24 General requirements for packagings and packages.

(a) Applicability. Except as otherwise provided in this subchapter, the provisions of this section apply to—
(1) Bulk and non-bulk packagings;
(2) New packagings and packagings which are reused; and
(3) Specification and non-specification packagings.

(b) Each package used for the shipment of hazardous materials under this subchapter shall be designed, constructed, maintained, filled, its contents so limited, and closed, so that under conditions normally incident to transportation—
(1) Except as otherwise provided in this subchapter, there will be no identifiable (without the use of instruments) release of hazardous materials to the environment;
(2) The effectiveness of the package will not be substantially reduced; for example, impact resistance, strength, packaging compatibility, etc. must be maintained for the minimum and maximum temperatures, changes in humidity and pressure, and shocks, loadings and vibrations, normally encountered during transportation;
(3) There will be no mixture of gases or vapors in the package which could, through any credible spontaneous increase of heat or pressure, significantly reduce the effectiveness of the packaging;
(4) There will be no hazardous material residue adhering to the outside of the package during transport.

(c) Authorized packagings. A packaging is authorized for a hazardous material only if—
(1) The packaging is prescribed or permitted for the hazardous material in a packaging section specified for that material in Column 8 of the §172.101 table and conforms to applicable requirements in the special provisions of Column 7 of the §172.101 table and, for specification packagings (but not including UN standard packagings manufactured outside the United States), the specification requirements in parts 178 and 179 of this subchapter; or
(2) The packaging is permitted under, and conforms to, provisions contained in subparts B or C of part 171 of this subchapter or §§173.3, 173.4, 173.4a, 173.4b, 173.5, 173.5a, 173.6, 173.7, 173.8, 173.27, or §176.11 of this subchapter.

(d) Specification packagings and UN standard packagings manufactured outside the U.S. —
(1) Specification packagings. A specification packaging, including a UN standard packaging manufactured in the United States, must conform in all details to the applicable specification or standard in part 178 or part 179 of this subchapter.
(2) UN standard packagings manufactured outside the United States. A UN standard packaging manufactured outside the United States, in accordance with national or international regulations based on the UN Recommendations (IBR, see §171.7 of this subchapter), may be imported and used and is considered to be an authorized packaging under the provisions of paragraph (c)(1) of this section, subject to the following conditions and limitations:
   (i) The packaging fully conforms to applicable provisions in the UN Recommendations and the requirements of this subpart, including reuse provisions;
   (ii) The packaging is capable of passing the prescribed tests in part 178 of this subchapter applicable to that standard; and
   (iii) The competent authority of the country of manufacture provides reciprocal treatment for UN standard packagings manufactured in the U.S.

(e) Compatibility.
(1) Even though certain packagings are specified in this part, it is, nevertheless, the responsibility of the person offering a hazardous material for transportation to ensure that such packagings are compatible with their lading. This particularly applies to corrosivity, permeability, softening, premature aging and embrittlement.
(2) Packaging materials and contents must be such that there will be no significant chemical or galvanic reaction between the materials and contents of the package.

(3) Plastic packagings and receptacles. (i) Plastic used in packagings and receptacles must be of a type compatible with the lading and may not be permeable to an extent that a hazardous condition is likely to occur during transportation, handling or refilling.

(ii) Each plastic packaging or receptacle which is used for liquid hazardous materials must be capable of withstanding without failure the procedure specified in appendix B of this part (“Procedure for Testing Chemical Compatibility and Rate of Permeation in Plastic Packagings and Receptacles”). The procedure specified in appendix B of this part must be performed on each plastic packaging or receptacle used for Packing Group I materials. The maximum rate of permeation of hazardous lading through or into the plastic packaging or receptacles may not exceed 0.5 percent for materials meeting the definition of a Division 6.1 material according to §173.132 and 2.0 percent for other hazardous materials, when subjected to a temperature no lower than—

(A) 18 °C (64 °F) for 180 days in accordance with Test Method 1 in appendix B of this part;
(B) 50 °C (122 °F) for 28 days in accordance with Test Method 2 in appendix B of this part; or
(C) 60 °C (140 °F) for 14 days in accordance with Test Method 3 in appendix B of this part.

(iii) Alternative procedures or rates of permeation are permitted if they yield a level of safety equivalent to or greater than that provided by paragraph (e)(3)(ii) of this section and are specifically approved by the Associate Administrator.

(4) Mixed contents. Hazardous materials may not be packed or mixed together in the same outer packaging with other hazardous or nonhazardous materials if such materials are capable of reacting dangerously with each other and causing—

(i) Combustion or dangerous evolution of heat;
(ii) Evolution of flammable, poisonous, or asphyxiant gases; or
(iii) Formation of unstable or corrosive materials.

(5) Packagings used for solids, which may become liquid at temperatures likely to be encountered during transportation, must be capable of containing the hazardous material in the liquid state.

(f) Closures.

(1) Closures on packagings shall be so designed and closed that under conditions (including the effects of temperature, pressure and vibration) normally incident to transportation—

(i) Except as provided in paragraph (g) of this section, there is no identifiable release of hazardous materials to the environment from the opening to which the closure is applied; and
(ii) The closure is leakproof and secured against loosening. For air transport, stoppers, corks or other such friction closures must be held in place by positive means.

(2) Except as otherwise provided in this subchapter, a closure (including gaskets or other closure components, if any) used on a specification packaging must conform to all applicable requirements of the specification and must be closed in accordance with information, as applicable, provided by the manufacturer’s notification required by §178.2 of this subchapter.

(g) Venting. Venting of packagings, to reduce internal pressure which may develop by the evolution of gas from the contents, is permitted only when—

(1) Except for shipments of cryogenic liquids as specified in §173.320(c) and of carbon dioxide, solid (dry ice), transportation by aircraft is not involved;
(2) Except as otherwise provided in this subchapter, the evolved gases are not poisonous, likely to create a flammable mixture with air or be an asphyxiant under normal conditions of transportation;
(3) The packaging is designed so as to preclude an unintentional release of hazardous materials from the receptacle;
(4) For bulk packagings, other than IBCs, venting is authorized for the specific hazardous material by a special provision in the §172.101 table or by the applicable bulk packaging specification in part 178 of this subchapter; and
(5) Intermediate bulk packagings (IBCs) may be vented when required to reduce internal pressure that may develop by the evolution of gas subject to the requirements of paragraphs (g)(1) through (g)(3) of this section. The IBC must be of a type that has successfully passed (with the vent in place) the applicable design qualification tests with no release of hazardous material.

(h) Outage and filling limits—

(1) General. When filling packagings and receptacles for liquids, sufficient ullage (outage) must be left to ensure that neither leakage nor permanent distortion of the packaging or receptacle will occur as a result of an expansion of the liquid caused by temperatures likely to be encountered during transportation. Requirements for outage and filling limits for non-bulk and bulk packagings are specified in §§173.24a(d) and 173.24b(a), respectively.

(2) Compressed gases and cryogenic liquids. Filling limits for compressed gases and cryogenic liquids are specified in §§173.301 through 173.306 for cylinders and §§173.314 through 173.319 for bulk packagings.

(i) Air transportation. Except as provided in subpart C of part 171 of this subchapter, packages offered or intended for transportation by aircraft must conform to the general requirements for transportation by aircraft in §173.27.

§ 173.24a Additional general requirements for non-bulk packagings and packages.

(a) Packaging design. Except as provided in §172.312 of this subchapter:

(1) Inner packaging closures. A combination packaging containing liquid hazardous materials must be packed so that closures on inner packagings are upright.

(2) Friction. The nature and thickness of the outer packaging must be such that friction during transportation is not likely to generate an amount of heat sufficient to alter dangerously the chemical stability of the contents.

(3) Securing and cushioning. Inner packagings of combination packagings must be so packed, secured and cushioned to prevent their breakage or leakage and to control their shifting within the outer packaging under conditions normally incident to transportation. Cushioning material must not be capable of reacting dangerously with the contents of the inner packagings or having its protective properties significantly weakened in the event of leakage.

(4) Metallic devices. Nails, staples and other metallic devices shall not protrude into the interior of the outer packaging in such a manner as to be likely to damage inner packagings or receptacles.

(5) Vibration. Each non-bulk package must be capable of withstanding, without rupture or leakage, the vibration test procedure specified in §178.608 of this subchapter.

(b) Non-bulk packaging filling limits.

(1) A single or composite non-bulk packaging may be filled with a liquid hazardous material only when the specific gravity of the material does not exceed that marked on the packaging, or a specific gravity of 1.2 if not marked, except as follows:

(i) A Packing Group I packaging may be used for a Packing Group II material with a specific gravity not exceeding the greater of 1.8, or 1.5 times the specific gravity marked on the packaging, provided all the performance criteria can still be met with the higher specific gravity material;

(ii) A Packing Group I packaging may be used for a Packing Group III material with a specific gravity not exceeding the greater of 2.7, or 2.25 times the specific gravity marked on the packaging, provided all the performance criteria can still be met with the higher specific gravity material; and

(iii) A Packing Group II packaging may be used for a Packing Group III material with a specific gravity not exceeding the greater of 1.8, or 1.5 times the specific gravity marked on the packaging, provided all the performance criteria can still be met with the higher specific gravity material.
(2) Except as otherwise provided in this section, a non-bulk packaging may not be filled with a hazardous material to a gross mass greater than the maximum gross mass marked on the packaging.

(3) A single or composite non-bulk packaging which is tested and marked for liquid hazardous materials may be filled with a solid hazardous material to a gross mass, in kilograms, not exceeding the rated capacity of the packaging in liters, multiplied by the specific gravity marked on the packaging, or 1.2 if not marked. In addition:

(i) A single or composite non-bulk packaging which is tested and marked for Packing Group I liquid hazardous materials may be filled with a solid Packing Group II hazardous material to a gross mass, in kilograms, not exceeding the rated capacity of the packaging in liters, multiplied by 1.5, multiplied by the specific gravity marked on the packaging, or 1.2 if not marked.

(ii) A single or composite non-bulk packaging which is tested and marked for Packing Group I liquid hazardous materials may be filled with a solid Packing Group III hazardous material to a gross mass, in kilograms, not exceeding the rated capacity of the packaging in liters, multiplied by 2.25, multiplied by the specific gravity marked on the packaging, or 1.2 if not marked.

(iii) A single or composite non-bulk packaging which is tested and marked for Packing Group II liquid hazardous materials may be filled with a solid Packing Group III hazardous material to a gross mass, in kilograms, not exceeding the rated capacity of the packaging in liters, multiplied by 1.5, multiplied by the specific gravity marked on the packaging, or 1.2 if not marked.

(4) Packagings tested as prescribed in §178.605 of this subchapter and marked with the hydrostatic test pressure as prescribed in §178.503(a)(5) of this subchapter may be used for liquids only when the vapor pressure of the liquid conforms to one of the following:

(i) The vapor pressure must be such that the total pressure in the packaging (i.e., the vapor pressure of the liquid plus the partial pressure of air or other inert gases, less 100 kPa (15 psia)) at 55 °C (131 °F), determined on the basis of a maximum degree of filling in accordance with paragraph (d) of this section and a filling temperature of 15 °C (59 °F)), will not exceed two-thirds of the marked test pressure;

(ii) The vapor pressure at 50 °C (122 °F) must be less than four-sevenths of the sum of the marked test pressure plus 100 kPa (15 psia); or

(iii) The vapor pressure at 55 °C (131 °F) must be less than two-thirds of the sum of the marked test pressure plus 100 kPa (15 psia).

(5) No hazardous material may remain on the outside of a package after filling.

(c) Mixed contents.

(1) An outer non-bulk packaging may contain more than one hazardous material only when—

(i) The inner and outer packagings used for each hazardous material conform to the relevant packaging sections of this part applicable to that hazardous material;

(ii) The package as prepared for shipment meets the performance tests prescribed in part 178 of this subchapter for the packing group indicating the highest order of hazard for the hazardous materials contained in the package;

(iii) Corrosive materials (except ORM-D) in bottles are further packed in securely closed inner receptacles before packing in outer packagings; and

(iv) For transportation by aircraft, the total net quantity does not exceed the lowest permitted maximum net quantity per package as shown in Column 9a or 9b, as appropriate, of the §172.101 table. The permitted maximum net quantity must be calculated in kilograms if a package contains both a liquid and a solid.

(2) A packaging containing inner packagings of Division 6.2 materials may not contain other hazardous materials except—

(i) Refrigerants, such as dry ice or liquid nitrogen, as authorized under the HMR;

(ii) Anticoagulants used to stabilize blood or plasma; or

(iii) Small quantities of Class 3, Class 8, Class 9, or other materials in Packing Groups II or III used to stabilize or prevent degradation of the sample, provided the quantity of such materials does not exceed 30 mL (1 ounce) or 30 g (1 ounce) in each inner packaging. The maximum quantity in an outer package, including a
hazardous material used to preserve or stabilize a sample, may not exceed 4 L (1 gallon) or 4 kg (8.8 pounds). Such preservatives are not subject to the requirements of this subchapter.

d) Liquids must not completely fill a receptacle at a temperature of 55 °C (131 °F) or less.

§ 173.154 Exceptions for Class 8 (corrosive materials).

(a) General. Exceptions for hazardous materials shipments in the following paragraphs are permitted only if this section is referenced for the specific hazardous material in the §172.101 table of this subchapter.

(b) Limited quantities. Limited quantities of corrosive materials (Class 8) in Packing Group II and III are excepted from labeling requirements, unless the material also meets the definition of Division 6.1 or is offered for transportation or transported by aircraft, and the specification packaging requirements of this subchapter when packaged in combination packagings according to this paragraph. For transportation by aircraft, the package must also comply with the applicable requirements of §173.27 of this subchapter and only hazardous materials authorized aboard passenger-carrying aircraft may be transported as a limited quantity. In addition, shipments of these limited quantities are not subject to subpart F (Placarding) of part 172 of this subchapter. Each package must conform to the packaging requirements of subpart B of this part and may not exceed 30 kg (66 pounds) gross weight. The following combination packagings are authorized:

(1) For corrosive materials in Packing Group II, inner packagings not over 1.0 L (0.3 gallon) net capacity each for liquids or not over 1.0 kg (2.2 pounds) net capacity each for solids, unless the material has a subsidiary hazard of Division 6.1, Packing Group II in which case the inner packagings may not exceed 100 mL (3.38 ounces) for liquids or 0.5 kg (1.1 pounds) for solids, packed in a strong outer packaging.

(2) For corrosive materials in Packing Group III, in inner packagings not over 5.0 L (1.3 gallons) net capacity each for liquids, or not over 5.0 kg (11 lbs) net capacity each for solids, and packed in strong outer packagings.

(c) Consumer commodities. Except for a material that has a subsidiary hazard of Division 6.1, Packing Group II, a limited quantity which conforms to the provisions of paragraph (b) of this section, and is a “consumer commodity” as defined in §171.8 of this subchapter, may be renamed “Consumer commodity” and reclassified as ORM–D. In addition to the exceptions provided by paragraph (b) of this section, shipments of ORM–D materials are not subject to the shipping paper requirements of subpart C of part 172 of this subchapter, unless the material meets the definition of a hazardous substance, hazardous waste, marine pollutant, or are offered for transportation and transported by aircraft, and are eligible for the exceptions provided in §173.156.

(d) Materials corrosive to aluminum or steel only. Except for a hazardous substance, a hazardous waste, or a marine pollutant, a material classed as a Class 8, Packing Group III, material solely because of its corrosive effect—

(1) On aluminum is not subject to any other requirements of this subchapter when transported by motor vehicle or rail car in a packaging constructed of materials that will not react dangerously with or be degraded by the corrosive material; or

(2) On steel is not subject to any other requirements of this subchapter when transported by motor vehicle or rail car in a bulk packaging constructed of materials that will not react dangerously with or be degraded by the corrosive material.

§ 173.155 Exceptions for Class 9 (miscellaneous hazardous materials).

(a) General. Exceptions for hazardous materials shipments in the following paragraphs are permitted only if this section is referenced for the specific hazardous material in the §172.101 table of this subchapter.
(b) **Limited quantities.** Limited quantities of miscellaneous hazardous materials (Class 9) are excepted from labeling, unless offered for transportation or transported by aircraft, and the specification packaging requirements of this subchapter when packaged in combination packagings according to this paragraph. For transportation by aircraft, the package must also comply with the applicable requirements of §173.27 of this subchapter and only hazardous materials authorized aboard passenger-carrying aircraft may be transported as a limited quantity. In addition, shipments of these limited quantities are not subject to subpart F (Placarding) of part 172 of this subchapter. Each package must conform to the packaging requirements of subpart B of this part and may not exceed 30 kg (66 pounds) gross weight. The following combination packagings are authorized:

1. For liquids, inner packagings not over 5.0 L (1.3 gallons) net capacity each, packed in strong outer packagings.
2. For solids, inner packagings not over 5.0 kg (11 pounds) net capacity each, packed in strong outer packagings.

(c) **Consumer commodities.** A limited quantity which conforms to the provisions of paragraph (b) of this section and is a “consumer commodity” as defined in §171.8 of this subchapter, may be renamed “Consumer commodity” and reclassed as ORM-D material. In addition to the exceptions provided by paragraph (b) of this section, shipments of ORM-D materials are not subject to the shipping paper requirements of subpart C of part 172 of this subchapter, unless the material meets the definition of a hazardous substance, a hazardous waste, or a marine pollutant or unless offered for transportation or transported by aircraft, and are eligible for the exceptions provided in §173.156.


§ 173.159 Batteries, wet.

(a) Electric storage batteries, containing electrolyte acid or alkaline corrosive battery fluid (wet batteries), may not be packed with other materials except as provided in paragraphs (g) and (h) of this section and in §§173.220 and 173.222; and any battery or battery-powered device must be prepared and packaged for transport in a manner to prevent:

1. A dangerous evolution of heat (i.e., an amount of heat sufficient to be dangerous to packaging or personal safety to include charring of packaging, melting of packaging, scorching of packaging, or other evidence);
2. Short circuits, including, but not limited to:
   1. Packaging each battery or each battery-powered device when practicable, in fully enclosed inner packagings made of non-conductive material;
   2. Separating or packaging batteries and battery-powered devices in a manner to prevent contact with other batteries, devices or conductive materials (e.g., metal) in the packagings; or
   3. Ensuring exposed terminals are protected with non-conductive caps, non-conductive tape, or by other appropriate means; and
3. **Damage to terminals.** If not impact resistant, the outer packaging must not be used as the sole means of protecting the battery terminals from damage or short circuiting. Batteries must be securely cushioned and packed to prevent shifting which could loosen terminal caps or reorient the terminals. Batteries contained in devices must be securely installed. Terminal protection methods include but are not limited to:
   1. Securely attaching covers of sufficient strength to protect the terminals;
   2. Packaging the battery in a rigid plastic packaging; or
   3. Constructing the battery with terminals that are recessed or otherwise protected so that the terminals will not be subjected to damage if the package is dropped.

(b) For transportation by aircraft:

1. The packaging for wet batteries must incorporate an acid- or alkali-proof liner, or include a supplementary packaging with sufficient strength and adequately sealed to prevent leakage of electrolyte fluid in the event of spillage; and
(2) Any battery-powered device, equipment or vehicle must be packaged for transport in a manner to prevent unintentional activation or must have an independent means of preventing unintentional activation (e.g., packaging restricts access to activation switch, switch caps or locks, recessed switches, trigger locks, temperature sensitive circuit breakers, etc.).

(c) The following specification packagings are authorized for batteries packed without other materials provided all requirements of paragraph (a) of this section, and for transportation by aircraft, paragraph (b) of this section are met:

1. Wooden box: 4C1, 4C2, 4D, or 4F.
2. Fiberboard box: 4G.
3. Plywood drum: 1D.
4. Fiber drum: 1G.
5. Plastic drum: 1H2.

(d) The following non-specification packagings are authorized for batteries packed without other materials provided all requirements of paragraph (a) of this section, and for transportation by aircraft, paragraph (b) of this section are met:

1. Electric storage batteries are firmly secured to skids or pallets capable of withstanding the shocks normally incident to transportation are authorized for transportation by rail, highway, or vessel. The height of the completed unit must not exceed 11/2 times the width of the skid or pallet. The unit must be capable of withstanding, without damage, a superimposed weight equal to two times the weight of the unit or, if the weight of the unit exceeds 907 kg (2,000 pounds), a superimposed weight of 1814 kg (4,000 pounds). Battery terminals must not be relied upon to support any part of the superimposed weight and must not short out if a conductive material is placed in direct contact with them.
2. Electric storage batteries weighing 225 kg (500 pounds) or more, consisting of carriers’ equipment, may be shipped by rail when mounted on suitable skids. Such shipments may not be offered in interchange service.
3. One to three batteries not over 11.3 kg (25 pounds) each, packed in strong outer boxes. The maximum authorized gross weight is 34 kg (75 pounds).
4. Not more than four batteries not over 7 kg (15 pounds) each, packed in strong outer fiberboard or wooden boxes. The maximum authorized gross weight is 30 kg (65 pounds).
5. Not more than five batteries not over 4.5 kg (10 pounds) each, packed in strong outer fiberboard or wooden boxes. The maximum authorized gross weight is 30 kg (65 pounds).
6. Single batteries not exceeding 34 kg (75 pounds) each, packed in 5-sided slip covers or in completely closed fiberboard boxes. Slip covers and boxes must be of solid or double-faced corrugated fiberboard of at least 91 kg (200 pounds) Mullen test strength. The slip cover or fiberboard box must fit snugly and provide inside top clearance of at least 1.3 cm (0.5 inch) above battery terminals and filler caps with reinforcement in place. Assembled for shipment, the bottom edges of the slipcover must come to within 2.5 cm (1 inch) of the bottom of the battery. The completed package (battery and box or slip cover) must be capable of withstanding a top-to-bottom compression test of at least 225 kg (500 pounds) without damage to battery terminal caps, cell covers or filler caps.
7. Single batteries exceeding 34 kg (75 pounds) each may be packed in completely closed fiberboard boxes. Boxes must be of double-wall corrugated fiberboard of at least 181 kg (400 pounds) test, or solid fiberboard testing at least 181 kg (400 pounds); a box may have hand holes in its ends provided that the hand holes will not materially weaken the box. Sides and ends of the box must have cushioning between the battery and walls of the box; combined thickness of cushioning material and walls of the box must not
be less than 1.3 cm (0.5 inch); and cushioning must be excelsior pads, corrugated fiberboard, or other suitable cushioning material. The bottom of the battery must be protected by a minimum of one excelsior pad or by a double-wall corrugated fiberboard pad. The top of the battery must be protected by a wood frame, corrugated trays or scored sheets of corrugated fiberboard having minimum test of 91 kg (200 pounds), or other equally effective cushioning material. Top protection must bear evenly on connectors and/or edges of the battery cover to facilitate stacking of batteries. No more than one battery may be placed in one box. The maximum authorized gross weight is 91 kg (200 pounds).

(e) When transported by highway or rail, electric storage batteries containing electrolyte or corrosive battery fluid are not subject to any other requirements of this subchapter, if all of the following are met:

1) No other hazardous materials may be transported in the same vehicle;
2) The batteries must be loaded or braced so as to prevent damage and short circuits in transit;
3) Any other material loaded in the same vehicle must be blocked, braced, or otherwise secured to prevent contact with or damage to the batteries; and
4) The transport vehicle may not carry material shipped by any person other than the shipper of the batteries.

(f) Batteries can be considered as non-spillable provided they are capable of withstanding the following two tests, without leakage of battery fluid from the battery:

1) Vibration test. The battery must be rigidly clamped to the platform of a vibration machine, and a simple harmonic motion having an amplitude of 0.8 mm (0.03 inches) with a 1.6 mm (0.063 inches) maximum total excursion must be applied. The frequency must be varied at the rate of 1 Hz/min between the limits of 10 Hz to 55 Hz. The entire range of frequencies and return must be traversed in 95 ± 5 minutes for each mounting position (direction of vibrator) of the battery. The battery must be tested in three mutually perpendicular positions (to include testing with fill openings and vents, if any, in an inverted position) for equal time periods.

2) Pressure differential test. Following the vibration test, the battery must be stored for six hours at 24 °C ± 4 °C (75 °F ± 7 °F) while subjected to a pressure differential of at least 88 kPa (13 psig). The battery must be tested in three mutually perpendicular positions (to include testing with fill openings and vents, if any, in an inverted position) for at least six hours in each position.

(g) Electrolyte, acid or alkaline corrosive battery fluid, packed with batteries wet or dry, must be packed in one of the following specification packagings:

1) In 4C1, 4C2, 4D, or 4F wooden boxes with inner receptacles of glass, not over 4.0 L (1 gallon) each with not over 8.0 L (2 gallons) total in each outside container. Inside containers must be well-cushioned and separated from batteries by a strong solid wooden partition. The completed package must conform to Packing Group III requirements.

2) Electrolyte, acid, or alkaline corrosive battery fluid included with electric storage batteries and filling kits may be packed in strong rigid outer packagings when shipments are made by, for, or to the Departments of the Army, Navy, or Air Force of the United States. Packagings must conform to military specifications. The electrolyte, acid, or alkaline corrosive battery fluid must be packed in polyethylene bottles of not over 1.0 L (0.3 gallon) capacity each. Not more than 24 bottles, securely separated from electric storage batteries and kits, may be offered for transportation or transported in each package.

3) In 4G fiberboard boxes with not more than 12 inside packagings of polyethylene or other material resistant to the lading, each not over 2.0 L (0.5 gallon) capacity each. Completed packages must conform to Packing Group III requirements. Inner packagings must be adequately separated from the storage battery. The maximum authorized gross weight is 29 kg (64 pounds). These packages are not authorized for transportation by aircraft.

(h) Dry batteries or battery charger devices may be packaged in 4G fiberboard boxes with inner receptacles containing battery fluid. Completed packagings must conform to Packing Group III requirements. Not more
than 12 inner receptacles may be packed in one outer box. The maximum authorized gross weight is 34 kg (75 pounds).

(i) When approved by the Associate Administrator, electric storage batteries, containing electrolyte or corrosive battery fluid in a separate reservoir from which fluid is injected into the battery cells by a power device cartridge assembled with the battery, and which meet the criteria of paragraph (f) are not subject to any other requirements of this subchapter.

[74 FR 2257, Jan. 14, 2009]

§ 173.159a Exceptions for Non-spillable batteries.

(a) Exceptions for hazardous materials shipments in the following paragraphs are permitted only if this section is referenced for the specific hazardous material in the §172.101 table or in a packaging section in this part.

(b) Non-spillable batteries offered for transportation or transported in accordance with this section are subject to the incident reporting requirements. For transportation by aircraft, a telephone report in accordance with §171.15(a) is required if a fire, violent rupture, explosion or dangerous evolution of heat (i.e., an amount of heat sufficient to be dangerous to packaging or personal safety to include charring of packaging, melting of packaging, scorching of packaging, or other evidence) occurs as a direct result of a nonspillable battery. For all modes of transportation, a written report in accordance with §171.16(a) is required if a fire, violent rupture, explosion or dangerous evolution of heat occurs as a direct result of a nonspillable battery.

(c) Non-spillable batteries are excepted from the packaging requirements of §173.159 under the following conditions:

(1) Non-spillable batteries must be securely packed in strong outer packagings and meet the requirements of §173.159(a). A non-spillable battery which is an integral part of and necessary for the operation of mechanical or electronic equipment must be securely fastened in the battery holder on the equipment;

(2) The battery and outer packaging must be plainly and durably marked “NONSPILLABLE” or “NONSPILLABLE BATTERY.” The requirement to mark the outer package does not apply when the battery is installed in a piece of equipment that is transported unpackaged.

(d) Non-spillable batteries are excepted from all other requirements of this subchapter when offered for transportation and transported in accordance with paragraph (c) of this section and the following:

(1) At a temperature of 55 °C (131 °F), the battery must not contain any unabsorbed free-flowing liquid, and must be designed so that electrolyte will not flow from a ruptured or cracked case; and

(2) For transport by aircraft, when contained in a battery-powered device, equipment or vehicle must be prepared and packaged for transport in a manner to prevent unintentional activation in conformance with §173.159(b)(2) of this Subpart.

[74 FR 2258, Jan. 14, 2009]

§ 173.164 Mercury (metallic and articles containing mercury).

(a) For transportation by aircraft, mercury must be packaged in packagings which meet the requirements of part 178 of this subchapter at the Packing Group I performance level, as follows:

(1) In inner packagings of earthenware, glass or plastic containing not more than 3.5 kg (7.7 pounds) of mercury, or inner packagings which are glass ampoules containing not more than 0.5 kg (1.1 pounds) of mercury, or iron or steel quicksilver flasks containing not more than 35 kg (77 pounds) of mercury. The inner packagings or flasks must be packed in steel drums (1A2), steel jerricans (3A2), wooden boxes (4C1), (4C2), plywood boxes (4D), reconstituted wood boxes (4F), fiberboard boxes (4G), plastic boxes (4H2), plywood drums (1D) or fiber drums (1G).
(2) [Reserved]

(3) When inner packagings of earthenware, glass or plastic are used, they must be packed in the outer packaging with sufficient cushioning material to prevent breakage.

(4) Either the inner packagings or the outer packagings must have inner linings or bags of strong leakproof and puncture-resistant material impervious to mercury, completely surrounding the contents, so that the escape of mercury will be prevented irrespective of the position of the package.

(b) Manufactured articles or apparatuses, each containing not more than 100 mg (0.0035 ounce) of mercury and packaged so that the quantity of mercury per package does not exceed 1 g (0.035 ounce) are not subject to the requirements of this subchapter.

(c) Manufactured articles or apparatuses containing mercury are excepted from the specification packaging requirements of this subchapter when packaged as follows:

(1) Manufactured articles or apparatuses of which metallic mercury is a component part, such as manometers, pumps, thermometers, switches, etc. (for electron tubes, mercury vapor tubes and similar tubes, see paragraph (c)(3) of this section), must be in strong outer packagings, having sealed inner liners or bags of strong leakproof and puncture-resistant material impervious to mercury, which will prevent the escape of mercury from the package irrespective of its position. Mercury switches and relays are excepted from these packaging requirements, if they are totally enclosed, leakproof and in sealed metal or plastic units.

(2) Thermometers, switches and relays, each containing a total quantity of not more than 15 g (0.53 ounces) of mercury, are excepted from the requirements of this subchapter if installed as an integral part of a machine or apparatus and so fitted that shock of impact damage, leading to leakage of mercury, is unlikely to occur under conditions normally incident to transport.

(3) Electron tubes, mercury vapor tubes and similar tubes must be packaged as follows:

(i) Tubes which are packed in strong outer packagings with all seams and joints sealed with self-adhesive, pressure-sensitive tape which will prevent the escape of mercury from the package, are authorized up to a total net quantity of 450 g (15.9 ounces) of mercury per package;

(ii) Tubes with more than 450 g (15.9 ounces) of mercury are authorized only when packed in strong outer packagings, having sealed inner liners or bags of strong leakproof and puncture-resistant material impervious to mercury which will prevent escape of mercury from the package irrespective of its position;

(iii) Tubes which do not contain more than 5 g (0.2 ounce) of mercury each and which are packed in the manufacturer's original packagings, are authorized up to a total net quantity of 30 g (1.1 ounces) of mercury per package;

(iv) Tubes which are completely jacketed in sealed leakproof metal cases are authorized in the manufacturer's original packagings.

(4) A person offering for transportation electron tubes, mercury vapor tubes, and similar tubes shall indicate the quantity of mercury therein on the shipping paper.

(5) Mercurial barometers conforming to paragraph (c)(1) of this section, which are loaded and unloaded from an aircraft under the supervision of, and accompanied in flight by, a National Weather Service official or similar United States agency official, are excepted from any other requirements of this subchapter.

(d) For transportation by other than aircraft, mercury must be packaged—

(1) In any packaging which meets the requirements of part 178 of this subchapter at the Packing Group III performance level; or

(2) In non-specification reusable metal packagings.

(e) Except for a hazardous substance or a hazardous waste or for transportation by aircraft or vessel, packages containing less than 0.45 kg (1.0 pound) net weight of mercury are not subject to the requirements of this subchapter.
§ 173.185 Lithium cells and batteries.

(a) Cells and batteries. A lithium cell or battery, including a lithium polymer cell or battery and a lithium-ion cell or battery, must conform to all of the following requirements:

(1) Be of a type proven to meet the requirements of each test in the UN Manual of Tests and Criteria (IBR; see §171.7 of this subchapter). A cell or battery and equipment containing a cell or battery that was first transported prior to January 1, 2006 and is of a type proven to meet the criteria of Class 9 by testing in accordance with the tests in the UN Manual of Tests and Criteria, Third Revised Edition, 1999, need not be retested.

(2) Incorporate a safety venting device or otherwise be designed in a manner that will preclude a violent rupture under conditions normally incident to transportation.

(3) Be equipped with an effective means to prevent dangerous reverse current flow (e.g., diodes, fuses, etc.) if a battery contains cells or series of cells that are connected in parallel.

(4) Be packaged in combination packagings conforming to the requirements of part 178, subparts L and M, of this subchapter at the Packing Group II performance level. The lithium battery or cell must be packed in inner packagings in such a manner as to prevent short circuits, including movement which could lead to short circuits. The inner packaging must be packed within one of the following outer packagings: metal boxes (4A or 4B); wooden boxes (4C1, 4C2, 4D, or 4F); fiberboard boxes (4G); solid plastic boxes (4H2); fiber drums (1G); metal drums (1A2 or 1B2); plywood drums (1D); plastic jerricans (3H2); or metal jerricans (3A2 or 3B2).

(5) Be equipped with an effective means of preventing external short circuits.

(6) Except as provided in paragraph (d) of this section, cells and batteries with a liquid cathode containing sulfur dioxide, sulfuryl chloride or thionyl chloride may not be offered for transportation or transported if any cell has been discharged to the extent that the open circuit voltage is less than two volts or is less than 2/3 of the voltage of the fully charged cell, whichever is less.

(b) Lithium cells or batteries packed with equipment. Lithium cells or batteries packed with equipment may be transported as Class 9 materials if the batteries and cells meet all the requirements of paragraph (a) of this section. The equipment and the packages of cells or batteries must be further packed in a strong outer packaging. The cells or batteries must be packed in such a manner as to prevent short circuits, including movement that could lead to short circuits.

(c) Lithium cells or batteries contained in equipment. Lithium cells or batteries contained in equipment may be transported as Class 9 materials if the cells and batteries meet all the requirements of paragraph (a) of this section, except paragraph (a)(4) of this section, and the equipment is packed in a strong outer packaging that is waterproof or is made waterproof through the use of a liner unless the equipment is made waterproof by nature of its construction. The equipment and cells or batteries must be secured within the outer packaging and be packed so as to prevent movement, short circuits, and accidental operation during transport.

(d) Cells and batteries, for disposal or recycling. A lithium cell or battery offered for transportation or transported by motor vehicle to a permitted storage facility, disposal site or for purposes of recycling is excepted from the specification packaging requirements of paragraph (a)(4) of this section and the requirements of paragraphs (a)(1) and (a)(6) of this section when protected against short circuits and packed in a strong outer packaging conforming to the requirements of §§173.24 and 173.24a.

(e) Shipments for testing (prototypes). A lithium cell or battery is excepted from the requirements of (a)(1) of this section when transported by motor vehicle for purposes of testing. The cell or battery must be individually packed in an inner packaging, surrounded by cushioning material that is non-combustible and nonconductive. The cell or battery must be transported as a Class 9 material.
(f) A lithium cell or battery that does not comply with the provisions of this subchapter may be transported only under conditions approved by the Associate Administrator.

(g) Batteries employing a strong, impact-resistant outer casing and exceeding a gross weight of 12 kg (26.5 lbs.), and assemblies of such batteries, may be packed in strong outer packagings, in protective enclosures (for example, in fully enclosed wooden slatted crates) or on pallets. Batteries must be secured to prevent inadvertent movement, and the terminals may not support the weight of other superimposed elements. Batteries packaged in this manner are not permitted for transportation by passenger aircraft, and may be transported by cargo aircraft only if approved by the Associate Administrator prior to transportation.

[72 FR 44949, Aug. 9, 2007]

§ 173.189 Batteries containing sodium or cells containing sodium.

(a) Batteries and cells may not contain any hazardous material other than sodium, sulfur or polysulfides. Cells not forming a component of a completed battery may not be offered for transportation at a temperature at which any liquid sodium is present in the cell. Batteries may only be offered for transportation, or transported, at a temperature at which any liquid sodium present in the battery conforms to the conditions prescribed in paragraph (d) of this section.

(b) Cells must consist of hermetically sealed metal casings which fully enclose the hazardous materials and which are so constructed and closed as to prevent the release of the hazardous materials under normal conditions of transport. Cells must be placed in suitable outer packagings with sufficient cushioning material to prevent contact between cells and between cells and the internal surfaces of the outer packaging, and to ensure that no dangerous shifting of the cells within the outer packaging occurs in transport. Cells must be packaged in 1A2, 1B2, 1D, 1G, 1H2, 4C1, 4C2, 4D, 4F, 4G or 4H2 outer packagings which meet the requirements of part 178 of this subchapter at the Packing Group II performance level.

(c) Batteries must consist of cells secured within, and fully enclosed by a metal casing so constructed and closed as to prevent the release of the hazardous materials under normal conditions of transport. Batteries may be offered for transportation, and transported, unpacked or in protective packagings that are not subject to the requirements of part 178 of this subchapter.

(d) Batteries containing any liquid sodium may not be offered for transportation, or transported, by aircraft. Batteries containing liquid sodium may be transported by motor vehicle, rail car or vessel under the following conditions:

1. Batteries must be equipped with an effective means of preventing external short circuits, such as by providing complete electrical insulation of battery terminals or other external electrical connectors. Battery terminals or other electrical connectors penetrating the heat insulation fitted in battery casings must be provided with thermal insulation sufficient to prevent the temperature of the exposed surfaces of such devices from exceeding 55 °C (130 °F).

2. No battery may be offered for transportation if the temperature at any point on the external surface of the battery exceeds 55 °C (130 °F).

3. If any external source of heating is used during transportation to maintain sodium in batteries in a molten state, means must be provided to ensure that the internal temperature of the battery does not reach or exceed 400 °C (752 °F).

4. When loaded in a transport vehicle or freight container:
   i. Batteries must be secured so as to prevent significant shifting within the transport vehicle or freight container under conditions normally incident to transportation;
(ii) Adequate ventilation and/or separation between batteries must be provided to ensure that the
temperature at any point on the external surface of the battery casing will not exceed 240 °C (464 °F)
during transportation; and
(iii) No other hazardous materials, with the exception of cells containing sodium, may be loaded in the
same transport vehicle or freight container. Batteries must be separated from all other freight by a
distance of not less than 0.5 m (1.6 feet).

(e) Vehicles, machinery and equipment powered by sodium batteries must be consigned under the entry “Battery-
powered vehicle or Battery-powered equipment.”


§ 173.202 Non-bulk packagings for liquid hazardous materials in Packing Group II.  

(a) When §172.101 of this subchapter specifies that a liquid hazardous material be packaged under this section,
only non-bulk packagings prescribed in this section may be used for its transportation. Each packaging must
conform to the general packaging requirements of subpart B of part 173, to the requirements of part 178 of this
subchapter at the Packing Group I or II performance level (unless otherwise excepted), and to the particular
requirements of the special provisions of column 7 of the §172.101 table.

(b) The following combination packagings are authorized:

Outer packagings:
Steel drum: 1A1 or 1A2
Aluminum drum: 1B1 or 1B2
Metal drum other than steel or aluminum: 1N1 or 1N2
Plywood drum: 1D
Fiber drum: 1G
Plastic drum: 1H1 or 1H2
Wooden barrel: 2C2
Steel jerrican: 3A1 or 3A2
Plastic jerrican: 3H1 or 3H2
Aluminum jerrican: 3B1 or 3B2
Steel box: 4A
Aluminum box: 4B
Natural wood box: 4C1 or 4C2
Plywood box: 4D
Reconstituted wood box: 4F
Fiberboard box: 4G
Expanded plastic box: 4H1
Solid plastic box: 4H2

Inner packagings:
Glass or earthenware receptacles
Plastic receptacles
Metal receptacles
Glass ampoules

(c) Except for transportation by passenger aircraft, the following single packagings are authorized:
Steel drum: 1A1 or 1A2
Aluminum drum: 1B1 or 1B2
Metal drum other than steel or aluminum: 1N1 or 1N2
Plastic drum: 1H1 or 1H2
Fiber drum: 1G (with liner)
Wooden barrel: 2C1
Steel jerrican: 3A1 or 3A2
Plastic jerrican: 3H1 or 3H2
Aluminum jerrican: 3B1 or 3B2
Plastic receptacle in steel, aluminum, fiber or plastic drum: 6HA1, 6HB1, 6HG1 or 6HH1
Plastic receptacle in steel, aluminum, wooden, plywood or fiberboard box: 6HA2, 6HB2, 6HC, 6HD2 or 6HG2
Glass, porcelain or stoneware in steel, aluminum or fiber drum: 6PA1, 6PB1 or 6PG1
Glass, porcelain or stoneware in steel, aluminum, wooden or fiberboard box: 6PA2, 6PB2, 6PC or 6PG2
Glass, porcelain or stoneware in solid or expanded plastic packaging: 6PH1 or 6PH2
Plastic receptacle in plywood drum: 6HD1
Glass, porcelain or stoneware in plywood drum or wickerwork hamper: 6PDL or 6PD2
Cylinders, specification, as prescribed for any compressed gas, except for Specifications 8 and 3HT

§ 173.203  Non-bulk packagings for liquid hazardous materials in Packing Group III.

(a) When §172.101 of this subchapter specifies that a liquid hazardous material be packaged under this section, only non-bulk packagings prescribed in this section may be used for its transportation. Each packaging must conform to the general packaging requirements of subpart B of part 173, to the requirements of part 178 of this subchapter at the Packing Group I, II or III performance level, and to the requirements of the special provisions of column 7 of the §172.101 table.

(b) The following combination packagings are authorized:

**Outer packagings:**
- Steel drum: 1A1 or 1A2
- Aluminum drum: 1B1 or 1B2
- Metal drum other than steel or aluminum: 1N1 or 1N2
- Plywood drum: 1D
- Fiber drum: 1G
- Plastic drum: 1H1 or 1H2
- Wooden barrel: 2C2
- Steel jerrican: 3A1 or 3A2
- Plastic jerrican: 3H1 or 3H2
- Aluminum jerrican: 3B1 or 3B2
- Steel box: 4A
- Aluminum box: 4B
- Natural wood box: 4C1 or 4C2
- Plywood box: 4D
- Reconstituted wood box: 4F
- Fiberboard box: 4G
- Expanded plastic box: 4H1
- Solid plastic box: 4H2

**Inner packagings:**
- Glass or earthenware receptacles
- Plastic receptacles
- Metal receptacles
- Glass ampoules
(c) The following single packagings are authorized:

- Steel drum: 1A1 or 1A2
- Aluminum drum: 1B1 or 1B2
- Metal drum other than steel or aluminum: 1N1
- Plastic drum: 1H1 or 1H2
- Fiber drum: 1G (with liner)
- Wooden barrel: 2C1
- Steel jerrican: 3A1 or 3A2
- Plastic jerrican: 3H1 or 3H2
- Aluminum jerrican: 3B1 or 3B2
- Plastic receptacle in steel, aluminum, fiber or plastic drum: 6HA1, 6HB1, 6HG1 or 6HH1
- Plastic receptacle in steel, aluminum, wooden, plywood or fiberboard box: 6HA2, 6HB2, 6HC, 6HD2 or 6HG2
- Glass, porcelain or stoneware in steel, aluminum or fiber drum: 6PA1, 6PB1, or 6PG1
- Glass, porcelain or stoneware in steel, aluminum, wooden or fiberboard box: 6PA2, 6PB2, 6PC or 6PG2
- Glass, porcelain or stoneware in solid or expanded plastic packaging: 6PH1 or 6PH2
- Plastic receptacle in plywood drum: 6HD1
- Glass, porcelain or stoneware in plywood drum or wickerwork hamper: 6PD1 or 6PD2
- Cylinders, as prescribed for any compressed gas, except for Specifications 8 and 3HT

§ 173.213 Non-bulk packagings for solid hazardous materials in Packing Group III.

(a) When §172.101 of this subchapter specifies that a solid hazardous material be packaged under this section, only non-bulk packagings prescribed in this section may be used for its transportation. Each package must conform to the general packaging requirements of subpart B of part 173, to the requirements of part 178 of this subchapter at the Packing Group I, II or III performance level, and to the requirements of the special provisions of column 7 of the §172.101 table.

(b) The following combination packagings are authorized:

**Outer packagings:**

- Steel drum: 1A1 or 1A2
- Aluminum drum: 1B1 or 1B2
- Metal drum other than steel or aluminum: 1N1 or 1N2
- Plywood drum: 1D
- Fiber drum: 1G
- Plastic drum: 1H1 or 1H2
- Wooden barrel: 2C2
- Steel jerrican: 3A1 or 3A2
- Plastic jerrican: 3H1 or 3H2
- Aluminum jerrican: 3B1 or 3B2
- Steel box: 4A
- Aluminum box: 4B
- Natural wood box: 4C1 or 4C2
- Plywood box: 4D
- Reconstituted wood box: 4F
- Fiberboard box: 4G
- Solid plastic box: 4H2

**Inner packagings:**
Glass or earthenware receptacles
Plastic receptacles
Metal receptacles
Glass ampoules

(c) The following single packagings are authorized:
Steel drum: 1A1 or 1A2
Aluminum drum: 1B1 or 1B2
Plywood drum: 1D
Plastic drum: 1H1 or 1H2
Fiber drum: 1G
Metal drum other than steel or aluminum: 1N1 or 1N2
Wooden barrel: 2C1 or 2C2
Steel jerrican: 3A1 or 3A2
Plastic jerrican: 3H1 or 3H2
Aluminum jerrican: 3B1 or 3B2
Steel box: 4A
Steel box with liner: 4A
Aluminum box: 4B
Aluminum box with liner: 4B
Natural wood box: 4C1
Natural wood box, sift proof: 4C2
Plywood box: 4D
Reconstituted wood box: 4F
Fiberboard box: 4G
Expanded plastic box: 4H1
Solid plastic box: 4H2
Bag, woven plastic: 5H1, 5H2 or 5H3
Bag, plastic film: 5H4
Bag, textile: 5L1, 5L2 or 5L3
Bag, paper, multiwall, water resistant: 5M2
Plastic receptacle in steel, aluminum, plywood, fiber or plastic drum: 6HA1, 6HB1, 6HD1, 6HG1 or 6HH1
Plastic receptacle in steel, aluminum, wood, plywood or fiberboard box: 6HA2, 6HB2, 6HC, 6HD2 or 6HG2
Glass, porcelain or stoneware in steel, aluminum, plywood or fiber drum: 6PA1, 6PB1, 6PD1 or 6PG1
Glass, porcelain or stoneware in steel, aluminum, wooden or fiberboard box: 6PA2, 6PB2, 6PC or 6PG2
Glass, porcelain or stoneware in expanded or solid plastic packaging: 6PH1 or 6PH2
Cylinders, as prescribed for any compressed gas, except for Specification 8 and 3HT

APPENDIX II

AERC Forms

- Load/Piece Count/Paperwork Discrepancy Form | TR-004-F1
- AERC Profile for Recycling of Batteries | EP-02003-F1
Load/Piece Count/Paperwork Discrepancy Form

Generator Name: ________________________________

Customer Name: ________________________________ [If different than Generator, i.e., Broker or 3rd Party]

Document #: ________________________________ Date: __________

☐ BOL ☐ Uniform HW Manifest

AERC Location:

☐ 02 | Allentown, PA ☐ 04 | West Melbourne, FL ☐ 05 | Hayward, CA
☐ 07 | Ashland, VA ☐ 06 | Houston, TX ☐ 15 | Hayward, CA

Details of Discrepancy:

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

49 CFR noted non-compliance items:

☐ Lack of insulation/prevention of short circuiting (SP 130 | §173.21(c), §173.159 and/or §173.185)
☐ Improper packaging or container in poor condition (§173.24)
☐ Improper or missing markings/labels (§172.300 through 400 et al)
☐ Shipping description/material identification (§172.201 et al)
☐ Lack of adequate bracing (§173.159)
☐ Missing caps/leaking cells (§173.3(c))

ACTION TAKEN:

☐ Customer Contacted Name of Person Spoken With: ________________________________

By Whom: ________________________________ Date/Time: ________________________________

☐ All Copies Changed ☐ Write-up in Section 18

☐ Other Action: ________________________________

Additional Details:

________________________________________________________________________

________________________________________________________________________

INSTRUCTIONS
Use this form to document any discrepancy found on HMR shipments received by the noted facility. The original copy of this document must be filed with the associated shipping papers and a copy provided to the Customer (with supporting documentation such as the BOL or Manifest) as necessary to resolve the discrepancy. This form can be used in conjunction with the standard Discrepancy Form to document the processing and billing for the noted materials.

TR-004-F1a 04/26/10 JWS
AERC Profile for Recycling of Batteries

(Please type or print in ink)

**Customer No:**

Waste Name/Description:

Generator: 

EPA ID #:

Shipping Address (Street, City, State, Zip):

Generator Contact: 

E-Mail Address: 

Phone: 

Fax:

Billing Information (Company, Street, City, State, Zip):

Billing Contact: 

E-Mail Address: 

Phone: 

Fax:

Process Generating Waste—Be Specific:

---

**Waste Description/Characterization & DOT Information** (Describe material and designate appropriate category and type of battery(ies)):

Reference 40 CFR and 49 CFR for applicable requirements. Complete all sections as appropriate for ALL categories of batteries expected to be managed under this approval.

Generator must follow applicable waste handling and transportation requirements as set forth in 40 CFR and 49 CFR. See AERC's Guidelines for Shipping & Packaging Batteries for specific guidance and recommended practices.

**Physical Description of Waste:**

- Intact or Incidentally Broken Batteries | Manage as Universal Waste (40 CFR Part 273)
- Leaking/Damaged Batteries | Manage in Agreement with Hazardous Waste Mgmt Requirements
  
  (40 CFR 261 | 262, et. Al.) Applicable EPA Waste Codes:

**Category 1 | Lead Acid Battery**

- Lead Acid
- Sealed Lead Acid | VRLA

**Proper DOT Shipping Description**(2)

- UN2794, Batteries, wet, filled with acid, 8, III
  
  (Used lead acid batteries for recycling)(ERG #154)

- UN2800, Batteries, wet, non-spillable, 8, III
  
  (Used sealed lead acid batteries for recycling)(ERG #154)

**Is material being managed as:**

- Universal Waste (40 CFR Part 273)
- Lead Acid for Reclalm (Exemption per 40 CFR part 266 subpart G)

---

**Category 2 | Corrosive Metal Battery**

- Alkaline – Dry cell | 1.5-volt | 9-volt | Not-Mixed with other chemistries/DOT descriptions.
- Alkaline – Wet cell
- Zinc Carbon (non-Hg) | Zinc Air | 6-volt | Not-Mixed with other chemistries/DOT descriptions.
- NiCd – Dry cell | 9-volt | Not-Mixed with other chemistries/DOT descriptions.
- NiCd – Wet cell
- Nickel Iron Batteries
- Nickel Metal Hydride (NiMH)

**Proper DOT Shipping Description**(2)

- Batteries, dry, sealed, n.o.s. (Used alkaline batteries for recycling)
- UN2795, Batteries, wet, filled with alkali, 8, III (Used alkaline batteries for recycling)(ERG #154)
- Batteries, dry, sealed, n.o.s. (Used zinc carbon batteries for recycling)
- Batteries, dry, sealed, n.o.s. (Used nickel-cadmium dry-cell batteries for recycling)
- Batteries, dry, sealed, n.o.s. (Used nickel-cadmium batteries for recycling)(ERG #154)
- Batteries, dry, sealed, n.o.s. (Used nickel-iron batteries for recycling)(ERG #154)
- Batteries, dry, sealed, n.o.s. (Used NiMH batteries for recycling)

**NOTE:** NiCd batteries rated > 9-volts must meet SP 130 requirements.
AERC Profile for Recycling Batteries

Category 3 | Mercury Bearing Battery

☐ Zinc Carbon (w/Hg) *
☐ Mercury | Mercuric Oxide *
☐ Silver Oxide (w/Hg) *

* Containers of > 2 ½ lbs these batteries meet the definition of a hazardous material (RQ Hg - 1 Lb).

☐ Batteries, dry, sealed, n.o.s. (Used mercury-containing batteries for recycling)
☐ Batteries, dry, sealed, n.o.s. (Used silver oxide mercury-containing batteries for recycling)

RQ, UN2809, Mercury contained in manufactured articles, 8, III
(Used mercury batteries for recycling)(ERG #172)

☐ Silver Oxide

☐ Non-DOT Regulated | RCRA-Regulated Universal Waste (Used silver oxide batteries for recycling)

☐ ATON

☐ UN2795, Batteries, wet, filled with alkali, 8, III
(Used ATON batteries for recycling)(ERG #154)

Category 4 | Reactive Metal Battery

☐ Lithium Metal (Primary)
☐ Li-Ion | Li-Polymer
☐ Li-Thionyl Chloride | Li-Co

Alternative Shipping Descriptions may be used:
(As per 8/25/09 PHMSA Notice of Approval)

☐ UN3090, Lithium battery, 9, II
(Used lithium batteries for recycling)(ERG #138)

☐ (Also, to be more descriptive, use:)
☐ (Used Li-ion or Li-Polymer or Li-Thionyl Chloride batteries for recycling)(ERG #138)

☐ UN3090, Lithium battery, 9, II
(Used lithium batteries for recycling)(ERG #138)

☐ UN3480, Lithium ion batteries, 9, II
(Used lithium ion polymer batteries for recycling)(ERG #138)

☐ Magnesium Metal

☐ Batteries, dry, sealed, n.o.s. (Used magnesium batteries for recycling)

☐ Sodium | NaNiCl

☐ UN3292, Batteries, containing sodium, 4.3, II
(Used sodium batteries for recycling)(ERG #138)

NOTES:

(1) Materials to be managed under this approval are assumed to meet the requirements of the universal waste standard (40 CFR Part 273 & associated applicable state regulations). Management under the full hazardous waste standard REQUIRES SUBMITTAL OF A SEPARATE HAZARDOUS WASTE PROFILE. Shipment must be completed on a hazardous waste manifest using an alternative shipping description than noted above and may require management alternate processing/charges. Contact AERC Customer Service representative and/or Regulatory Affairs Department staff.

(2) Specified DOT Shipping Description for management of batteries that are not classified for management under the full hazardous waste requirements. Specify “RQ” upon reaching hazardous substance threshold(s) as detailed within 49 CFR §172.101 Appendix A, Table 1 and Table 2.

Alternative DOT Description Not Specified Above:

<table>
<thead>
<tr>
<th>DOT Shipping Name:</th>
<th>Packing Group:</th>
<th>Hazard Class:</th>
<th>UN/NA:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reportable Quantity:</td>
<td>ERG#:</td>
<td>EPA Waste Codes if Applicable:</td>
<td></td>
</tr>
</tbody>
</table>

Estimated Quantity of Waste for Management: ☐ Event/One-Time ☐ Base/On-going (Check One)

Estimated Quantity: Lbs Tons Cu Yd DM/DF Other (specify): (Check One)

Shipping Frequency: Units per Mth Qtr Yr Other (specify): (Check One)

Annual Report Information (Codes)

<table>
<thead>
<tr>
<th>SIC Code(s):</th>
<th>Source Code(s):</th>
<th>Form Code(s):</th>
<th>Mgmt Method Code(s):</th>
</tr>
</thead>
</table>

Certification

I hereby certify that I have personally examined and am familiar with the information submitted in this and all attached documents. Based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete to the best of my knowledge and ability and that all known and suspected hazards have been disclosed. As Authorized Representative for the Generator, I hereby certify that material offered for management will meet applicable waste handling and transportation requirements as set forth in 40 CFR and 49 CFR. Materials offered for shipment and management that are not prepared in accordance with the applicable requirements will be subject to rejection and/or notice of discrepancy (and surcharge). I understand that batteries will be managed by AERC according to the appropriate regulatory standards, i.e., Universal Waste Standards 40 CFR 473, unless otherwise agreed upon and authorized between the Generator and AERC.

Signature:

Date:

Print Name/Title:

I have received a copy of the AERC guidance for shipping & packaging of batteries. ________ (Initial)