



Battery Use and Disposal Guidelines

General Guidelines

These guidelines apply to batteries that are rechargeable and non-disposable, but that have a service life and require periodic replacement. However, even non-rechargeable household-type alkaline batteries (AAA, AA, C, D, 9-volt, etc.) can present hazards. They can leak over time, particularly when left in equipment, creating visible deposits of potassium hydroxide or potassium carbonate that can be corrosive to the skin. Wear gloves when handling or removing batteries, or cleaning residues off equipment terminals.

- It is UNLV's policy to follow the National Electrical Code (NEC) Articles 370, 373 and 374 when working with batteries. All materials used must be listed by Underwriters Laboratories (UL).
- For field use of equipment containing rechargeable batteries, all personnel must use the required personal protective equipment (PPE) as specified in their field Hazard Analysis



nearby in case of accidental contact. Do not wear nylon clothes as this can cause a static



Battery Charging

- Make sure that the batteries you want to charge are designed for this. For example, inadvertently charging an alkaline (non-rechargeable) battery can cause an explosion.
- Use the appropriate kind of charger for your battery type.

Lithium batteries require very specialized chargers and interlocks

Consult the manufacturer for the proper charger for your battery type, paying special attention in case of newer high energy density types.

- Battery charging can produce explosive gases and an electrolyte film may form on top of the batteries. Adequate ventilation is required for all lead acid and gel battery charging operations to avoid buildup of flammable gas. No smoking or open flames or ignition sources should be present in a battery charging area. The presence of an electrolyte film can cause an acid burn and also act as a conductor to transmit a charge to any grounded source. It is recommended that this film be removed using a neutralizer.
- During charging operations, wear the PPE described above in General Guidelines, and ensure that eyewash and safety shower stations are functional before charging.
- Always check the battery's electrolyte level before and after charging to guarantee it is at a safe level. "Dry" charging can cause a fire or explosion.

Disposal

- Lead acid and gel batteries, mercury button batteries, nickel cadmium, nickel metal hydride, and other rechargeable batteries all contain heavy metals in quantities that are hazardous to the environment. In addition, many also contain corrosive chemicals (typically sulfuric acid)



Figure 1

Left: 3V lithium batteries, which can be recycled

Right: AA alkaline battery, which cannot currently be recycled

Shipping Batteries or Equipment that Contains Batteries

Most rechargeable equipment at UNLV contains either lithium-ion, nickel-cadmium, or nickel-metal hydride (NiMH) batteries. Periodically, a situation is faced where such equipment must be shipped, such as to the manufacturer, a service/repair center, or other collaborators. There are inherent hazards in shipping battery-powered equipment, particularly with lithium batteries. The guidance below will help you determine if such a shipment would qualify as Dangerous Goods, or if any additional postings or declarations might be necessary. ***In general, it is best to discharge, disconnect, and/or remove the batteries from a piece of equipment before shipping, in order to reduce the likelihood of shorting out or overheating.***

Not all lithium batteries are the same. Lithium metal batteries use metallic lithium as their anode, have high



Figure 2. Example of lithium-ion batteries that are packed with, or contained in, the equipment they power. At energy levels of <100 W-h per battery pack or 20 W-h per cell, these are exempt from Dangerous Goods shipping requirements.

You must place the special label depicted below (with a working contact number) on your shipment of equipment with lithium-ion batteries <100 W-h, even if you plan on using ground-shipment methods. The only exception is if one of the following conditions are met:

- The package contains only button-cell batteries installed in equipment, or
- Each package contains <4 cells (contained in equipment) or <2 batteries (contained in or packed with equipment).



Figure 3. Mandatory label for lithium ion battery shipments that fall below DOT thresholds for Hazardous Materials labeling



FedEx Ground guidance for shipping lithium batteries (ion and metal):

<http://www.fedex.com/us/services/pdf/Shipping-Lithium-Batteries-via-FedEx-Ground.pdf>

Rules on lithium-