

# Backhaul Manual

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## Packaging Guidelines & Best Practices



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## Packaging Guidelines & Best Practices

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# Electronic Waste

## Inventory Estimates

The following are rough average weights and estimates that can be used for planning purposes:

| Material                | Avg. Weights  | Estimated Quantity per Pallet  | Estimated Pallet Weights       |
|-------------------------|---------------|--------------------------------|--------------------------------|
| CRT Monitors            | 35 lbs        | 18 CRT Monitors (9 per layer)  | CRT Pallet: 500-600 lbs        |
| CRT TV                  | 65 lbs        | 8 TVs per pallet (4 per layer) | TV Pallet: 400-500 lbs         |
| LCD Monitors            | 13 lbs        | 30-40 LCDs per Pallet          | LCD Pallet: 300-500 lbs        |
| Computer Towers (CPUs)  | 23 lbs        | 40 CPUs per pallet             | CPU Pallet: 700-800 lbs        |
| Mixed/Misc. Electronics | <i>Varies</i> | <i>Varies</i>                  | Mixed Electronics: 500-600 lbs |

## Personal Protective Equipment (PPE)

Suggested PPE for the consolidation and packaging of electronic waste includes the following items:

- Gloves
- Eye protection/Safety Glasses

## Supplies/Packaging Materials

Suggested supplies and packaging materials for preparing electronic waste for backhaul includes the following items:

- Sturdy Pallets
- Stretch Wrap (80 gauge or similar)
- Miscellaneous Boxes (For containing small items that would otherwise fall through a pallet, as needed)
- Miscellaneous Tools that may be of use (Wire cutters, Screwdrivers, Hammer, Sockets, etc.)

## Spill Cleanup/Emergency Response

In general, electronic waste does not pose a significant spill threat or potential emergency situation.

- Broom/Brush
- Buckets with lids
- Dust Mask

## General Packaging Guidelines

The following general packaging guidelines and notes apply to packaging and shipping electronic waste for recycling:

- If possible, package like materials on the same pallet. This should help achieve the best value for the material.
- Choose pallets that are not split, broken, or otherwise significantly damaged. Pallets should be able to support the full load of the packaged material.
- Materials on pallets should be wrapped tightly with stretch wrap. Material should not shift, spill, or collapse while being transported.

More detailed packaging guidelines are provided in the *Electronic Waste – Packaging Guidance* section.

## Labeling

There are no labeling requirements for electronic waste. Be sure to check with transporters and vendors to see if there are any labeling requirements specific to them.

## Shipping

If possible, staged materials should be kept dry prior to shipment. Individual boxes or full pallets of material may be shipped via plane, truck, or barge. Be sure to check with transporters and vendors to see if there are any additional requirements prior to shipping.

## Smaller Shipments

Small shipments of electronics do not have to be palletized. Electronics just need to be packaged in cardboard boxes.



**Boxes of electronics sent in from rural communities**

Please do not send miscellaneous office equipment, or other non-electronic items such as binders, notebooks, towels, etc.

Be sure to contact your recycling vendor to determine what materials are acceptable for electronic recycling.

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## Palletizing Miscellaneous Electronics

Many times what may seem like a lot of material can actually be consolidated into a small area. This is the advantage of packaging miscellaneous electronics on pallets.



Place heavy and flat items on the pallet first. This will build a strong, stable foundation. Build up the pallet of material. A good stopping point is when the material is between waist and chest height.

80-gauge stretchwrap works well for wrapping electronics. To tightly wrap the pallet, pull the stretchwrap tight as you go around the corners. When finished wrapping, give the material a push to check how tightly bound it is. Continue wrapping if needed.



**Finishing off a pallet by tightly securing it with stretchwrap**

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## Palletizing Computer Monitors

Begin placing computer monitors on a pallet. Start with one on each corner and one in the middle, all positioned facedown. Try to use the monitors with the flattest faces and backs for the first layer.

Next, place monitors face up between face down monitors. The curves in the monitors should allow them to fit together snugly (see below).



**Monitors will normally fit together nicely when using the face up/face down pattern**



Start the second layer, placing the monitors the same way as the first layer. Next, use stretchwrap to secure the load. 80-gauge stretchwrap works well for wrapping monitors. To tightly wrap the pallet, pull the stretchwrap tight as you go around the corners. When finished wrapping, give the stack a push to check how tightly bound it is. Continue wrapping, as needed.

## Palletizing Other Similar Electronics

If a large quantity of electronics has been collected, then it may be possible to palletize computer towers, televisions, and printer separately. Packing materials separately may help reduce recycling fees.



**Computer Towers**



**Televisions**



**Printers**

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# Fluorescent Lamps

## Inventory Estimates

The following are rough average weights and estimates that can be used for planning purposes:

| Lamp Length | Boxes   | Drums  | Gaylord/Pallet Box   |
|-------------|---|--|--|
| 4-ft Lamps  | <u>Appx Weight</u> : 35 lbs<br><u>Appx Qty</u> : T12 – 64 lamps<br>T8 – 120 lamps | <u>Appx Weight</u> : 65 lbs<br><u>Appx Qty</u> : T12 – 120 lamps<br>T8 – 240 lamps | <u>Appx Weight</u> : 600 lbs<br><u>Appx Qty</u> : T12 – 800 lamps<br>T8 – 1200 lamps |
| 8-ft Lamps  | <u>Appx Weight</u> : 30 lbs<br><u>Appx Qty</u> : T12 – 25 lamps<br>T8 – 50 lamps  | <u>Appx Weight</u> : 60 lbs<br><u>Appx Qty</u> : T12 – 60 lamps<br>T8 – 120 lamps  | <i>Not Applicable</i>  |

## Personal Protective Equipment (PPE)

Suggested PPE for the consolidation and packaging of fluorescent lamps includes the following items:

- Gloves (if possible, cut resistant gloves)
- Eye Protection/Safety Glasses
- Long sleeves

## Supplies/Packaging Materials

Suggested supplies and packaging materials for preparing fluorescent lamps for backhaul includes the following items:

- Sturdy Lamp Boxes (if possible, utilize the original lamp boxes)
- Fiber Drums, if appropriate
- Gaylord/Pallet Boxes, if appropriate
- Packaging Tape
- Stretch wrap (80 gauge or similar) if shipping multiple boxes on a pallet
- Labels

## Spill Cleanup/Emergency Response

Exposure to mercury vapor is the main risk when fluorescent lamps break. If a fluorescent lamp breaks, the EPA recommends the following steps prior to cleaning up the material:

- Have everyone leave the immediate area
- Allow the area to ventilate for 5-10 minutes
- Detailed Cleanup guidelines are provided here: [www.epa.gov/cfl/cleaning-broken-cfl](http://www.epa.gov/cfl/cleaning-broken-cfl)

Materials for cleaning up fluorescent lamps include the following

- Broom/Brush & Heavy plastic bag (for containing spill cleanup matter)
- DOT approved 5-gallon bucket with lid

Broken lamp material safety should be contained in a sealed bucket may be labeled as “*Accidentally Broken Fluorescent Lamps.*”

## General Packaging Guidance

The following general packaging guidelines and notes apply to packaging and shipping fluorescent lamps for recycling:

- Lamps can be contained in boxes, drums, or in some cases, pallet boxes.
- Lamp containers must be structurally sound
- Lamps must be fully contained within a container (no open tops, holes, gaps, etc...Lamps must not be exposed in any manner).
- Containers must be completely sealed; if lamps break within the container, no material should be able to “leak” out.
- Lamps boxes may be stacked on pallets and secured using stretch wrap.

More detailed packaging guidelines are provided in the *Fluorescent Lamps – Packaging Guidance* section.

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# Fluorescent Lamps

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## Labeling

The following labels should be used for staging and shipping fluorescent lamps to be recycled.

- Universal Waste Label
- Optional – “Fragile” Label
- Optional – “Glass” Label

## Shipping

Lamp containers **must** be kept dry prior to shipment. Further, ensure the following prior to shipping:

- All containers are appropriately labeled
- Ensure lamps are completely contained
  - Ends should be sealed (ex: with packaging tape)
  - Any holes, gaps, loose seams must be sealed (ex: with packaging tape)
  - If the box/package breaks, material should not be capable of leaking from the package
- Do not stack items on top of lamp boxes, drums, or pallets.

Individual boxes and full pallets can be shipped via plane, truck or barge. Be sure to check with transporters and vendors to see if there are any additional requirements prior to shipping.

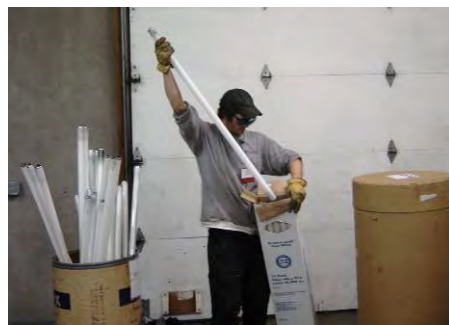


1) Be sure to use gloves and safety glasses when handling fluorescent lights.



**Marked used fluorescent tube**

3) Contact your vendor if no boxes are available in your community. Carefully place the expired fluorescent lamps in the light boxes. Be careful not to over-fill the boxes, BUT also make sure boxes are shipped full.



**Using gloves and safety glasses**

2) If available, use the original box for packing fluorescent lamps. When a new bulb is taken out, put the expired bulb in its place. Mark the old bulb to indicate it no longer works.



**Full box of used fluorescent tubes ready to be closed and labeled**



**Taped box lid**

4) Tape both ends of the boxes to seal them securely. Carefully tape all seams of the boxes and tape the corners so that if lamp breakage occurs, toxic components will stay in the box.

5) Contact your shipper concerning proper labeling. Boxes should include "Universal Waste" labels indicating they are Used Fluorescent Lamps and the start accumulation date.



**An example of labeling**

Lamp boxes can be shipped individually or multiple boxes may be shipped on pallets. Ensure pallets containing boxes of lamps are stretch wrapped securely to pallets. Additionally, lamp drums (fiber and plastic) can be utilized, in lieu of boxes, to contain large volumes of lamps.



Wrapped Pallet of 4-ft Lamps



Wrapped Pallet of 4-ft Drums

### Additional Lamp Packaging Notes

When collecting and packaging fluorescent lamps for shipment, consider the following:

- **Do not tape groups of lamps together** – Taping lamps together increases the chance of breakage, increases the risk of cuts to lamp recycling personnel, and increases the chance of damaging lamp recycling equipment.
- **All Lamp containers must be closed, structurally sound, and compatible with its contents** – Lack evidence of leakage, spillage, or damage that could cause leakage under reasonable foreseeable conditions
- **Minimize the risk of lamp breakage** – Accumulate lamps in packages/containers that are structurally sound and adequate to prevent leakage
- **Keep lamp containers dry** – Universal waste lamps must be stored within containers that are staged in a manner that prevents the containers from being exposed to the elements (i.e. indoors, shed, connex, etc.).
- **Accidentally broken lamps can be managed as Universal Waste** – Place accidentally broken lamps in a plastic bag and seal. Then place the bag in a bucket or drum and seal. Buckets or drums containing accidentally broken lamps must be labeled “*Accidentally Broken Fluorescent Lamps*”.
- **Intentionally crushed lamps must be managed as Hazardous Waste** – Any intentionally crushed lamps cannot be shipped/transported as Universal Waste.



# Mercury Bearing Devices

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## Inventory Estimates

Mercury containing devices can vary in size. Typically, actual components containing the mercury are relatively small (switches, relays, ampules). Mercury has been used in a wide variety of equipment. Examples of mercury containing devices includes the following:

- Thermometers
- Thermostats
- Navigation equipment (ex: aircraft and vessel autopilot systems)
- Equipment designed to measure pressure (ex: barometers, manometers, etc.)
- Tilt switches (ex: chest freezers, vehicle hood and trunk lights)
- Telecommunication equipment (mercury wetted relays on circuit boards.)
- Gas fired appliances (ex: stoves, water heaters)

## Personal Protective Equipment (PPE)

Suggested PPE for the consolidation and packaging mercury containing devices includes the following items:

- Gloves (ex: cut resistant gloves)
- Eye protection (ex: protective glasses).

## Supplies/Packaging Materials

Suggested supplies and packaging materials for preparing mercury containing devices for backhaul includes the following items:

- Plastic Bags
- DOT approved sealable bucket with a lid
- Labels

## Spill Cleanup/Emergency Response

Exposure to mercury vapor is the main risk when mercury is released. The following materials are recommended to manage mercury spills:

- Nitrile Gloves
- Mercury Spill Kit
- Plastic Bags
- DOT approved sealable bucket with a lid

If possible, ventilate the area where the spill occurred after cleanup. Use mercury indicator powder (it be included in the spill kit) to determine if mercury is still present.

## General Packaging Guidance

The following general packaging guidelines and notes apply to packaging and shipping mercury bearing devices for recycling:

- Contain mercury bearing devices in a DOT approved plastic container with a lid that seals
- Contain individual devices in plastic bags
- Carefully lay bagged devices in the plastic container; pack in a manner that minimizes the chance of breakage
- Keep the lid on the plastic container sealed whenever the container is not being actively filled.

More detailed packaging instructions can be found in the *Mercury Bearing Devices – Packaging Guidance* section



# Mercury Bearing Devices

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## Labeling

The following labels should be used for staging and shipping mercury containing devices to be recycled.

- Universal Waste Label
- #8 Corrosive Label
- #6 Poison Label

## Shipping

Keep containers dry prior to shipment. Further, ensure the following prior to shipping:

- Declare as Hazmat
- All containers are appropriately labeled
- Ship materials upright
- #8 Corrosive placards will be needed for the shipping container

Contained mercury bearing devices can be shipped via plane, truck or barge. Be sure to check with transporters and vendors to see if there are any additional requirements prior to shipping.



## Mercury Bearing Devices

### Packaging Guidance

Manufactured articles that contain mercury (mercury bearing devices) should be handled with extreme care. If mishandled, switches, relays, and ampules that contain the mercury may break. Mercury, when released, can contaminate the environment and poses a risk to human health.



**Examples of Mercury Bearing Devices**

Mercury is extremely corrosive when it comes in contact with certain metals, especially aluminum. To protect people, equipment, and the environment from mercury releases, mercury bearing devices should be packaged in completely sealed containers (preferably plastic containers).

The following provides guidance for packaging and containing multiple mercury bearing devices:

- 1) Use a sturdy, plastic, leak-proof container (such as a screw-top bucket with a lid) for consolidating mercury bearing devices.



- 2) Line the container with a plastic bag.



- 3) Enclose mercury bearing devices into plastic bags.



# Mercury Bearing Devices

## Packaging Guidance

- 4) Gently pack the mercury bearing devices into the lined container.



- 5) Close up the liner.



- 6) Seal the lid and label appropriately.



Labels used for packaging *Manufactured Articles Containing Mercury* (i.e. mercury bearing devices).



**Universal Waste Label**



**Primary Hazard Class**  
**#8 Corrosive**



**Subsidiary Hazard Class**  
**#6 Poison**

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## Wet Batteries (Lead Acid & Ni-Cad)

### Inventory Estimates

The following are rough average weights and estimates that can be used for planning purposes:

| Battery Type                          | Weight  |
|---------------------------------------|---|
| ATV & UPS Batteries                   | 5 – 20 lbs                                    |
| Car and Truck batteries               | 40 lbs  |
| Deep Cycle Marine and Solar Batteries | 80 – 120 lbs                                  |
| Pallet of Wet Batteries               | 2,500 – 3,200 lbs (800 – 1,200 lbs per layer) |
| Tote of Wet Batteries                 | 1,600 – 2,000 lbs (800 – 1,000 lbs per layer) |

*Note: Wet batteries shipped in totes by air under special permit number SP 12283 are limited to a gross weight of 1,800 lbs (combination of batteries and packaging materials).*

### Personal Protective Equipment (PPE)

Suggested PPE for the sorting, consolidation, and packaging of wet batteries includes the following items:

- Gloves (ex: chemical resistant gloves)
- Eye protection (ex: protective goggles).
- Long sleeves
- Heavy pants
- Steel/composite toed boots

### Supplies/Packaging Materials

Suggested supplies and packaging materials for preparing wet batteries for backhaul includes the following items:

- Sturdy pallet
- Material to separate & insulate battery layers (Cardboard, Waffle board, etc.)
- Stretch wrap (80 gauge or similar)
- Banding
- Non-leaking fish tote with a lid, if needed
- Labels

### Spill Cleanup/Emergency Response

The potential for fire/explosion and the risk of leaking electrolyte are the main risk when managing wet batteries; Battery terminals should be insulated and to reduce the threat of fire/explosion. Batteries should be handled, stacked, and staged in a responsible manner to limit the risk of spilling electrolyte.

When handling batteries the following materials will assist with emergency response and spill cleanup:

- Nitrile Gloves
- Heavy/Thick Plastic Bags
- Chemical Resistant gloves
- Absorbent (ex: vermiculite, kitty litter, absorbent powder)
- Electrolyte neutralizer (ex: Baking powder for Acid, Vinegar for Alkali)
- Broom/Brush & Heavy plastic bag (for containing spill cleanup matter)
- Fire Extinguisher

### General Packaging Guidance

The following general packaging guidelines and notes apply to packaging and shipping wet batteries for recycling:

- Packaging Wet Batteries on Pallets
  - Choose pallets that are not split, broken, or otherwise significantly damaged. Pallets should be able to support the full load of the packaged batteries.



## Wet Batteries (Lead Acid & Ni-Cad)

- Materials on pallets should be wrapped tightly with stretch wrap and secured with banding. Material should not shift, spill, or collapse while being transported.
- Do not stack more than 3 layers of batteries.
- Ensure each layer (including the top layer) has a significant amount of insulating material separating the layers of batteries.
  - Insulating layers should prevent accidental short circuit (leading to fires/explosions)
  - Insulating layers should protect against battery terminals on lower layers from puncturing the bottom of batteries stacked on top of them.
  - Insulation on the top layer should be thick enough to ensure banding material does not come in contact with any battery terminals.
- Packaging Wet Batteries in Totes
  - Typically, totes can hold 2 layers of batteries.
  - Ensure each layer (including the top layer) has a significant amount of insulating material separating the layers of batteries.
    - Insulating layers should prevent accidental short circuit (leading to fires/explosions)
    - Insulating layers should protect against battery terminals on lower layers from puncturing the bottom of batteries stacked on top of them.
  - Ensure the lid can fully cover the tote and securely band the lid shut when finished packaging

More detailed packaging guidelines are provided in the *Wet Battery – Packaging Guidance* sections (for packaging on pallets and totes, respectively)

### Labeling

The following labels should be used for staging and shipping wet batteries to be recycled.

- Labeling for transport by barge or road
  - Universal Waste Label
  - Corrosive #8
- Labeling for transport by air (Batteries packed in a tote utilizing SP 12283)
  - Universal Waste Label
  - Corrosive #8
  - Up arrows
  - “Danger – Do not ship on passenger aircraft” or similar
  - Special Permit – Full document attached to the container

### Shipping

If possible, keep pallets and totes dry prior to shipment. Further, ensure the following prior to shipping:

- All battery containers are appropriately labeled
- Declare batteries as Hazmat
- Ship materials upright
- Do not stack battery pallets/totes on top of any other pallets of material.
- Block/brace battery pallets/totes into place to ensure materials don't shift during transport
- #8 Corrosive placards will be needed for the shipping container
- Remember, wet batteries shipped in totes by air under special permit number SP 12283 are limited to a gross weight of 1,800 lbs.

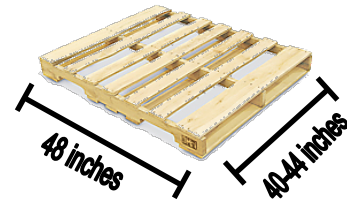
Battery containers can be shipped via plane, truck or barge. Be sure to check with transporters and vendors to see if there are any additional requirements prior to shipping.

# Wet Batteries (Lead Acid & Ni-Cad)

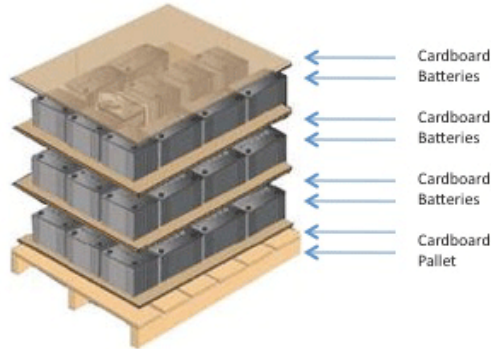
## Packaging Guidance – Pallets

### Important Pallet and Packaging Specifications:

1. Maximum pallet sizes: 40" x 48" or 44" x 48"



2. Maximum layers per pallet: 3 – roughly 24 batteries/layer = 72 batteries for 3 layers.



**Wet batteries must have a layer cardboard separating each level.**

**This includes a layer of cardboard on the bottom and the top of the load.**

3. Typical Pallet Weight (for 3 layers): *Between 2800 and 3300 lbs – Pallets are not to exceed 3300 lbs.*

4. Only lead-acid batteries may be packaged: *No mixing in other batteries or recyclables.*

5. Pallet must be built with a minimum of **3** bottom boards and durable enough to handle the weight of the batteries.

**This pallet has 3 bottom boards**



### Instructions for Stacking Wet Batteries on a Pallet

1. Select a sturdy pallet with no broken or missing boards. Be sure there are no nails sticking out, which could puncture the batteries or pose a safety hazard.



**An example of a typical wood pallet**

2. Place a layer of cardboard on the pallet to create a flat work surface and help prevent batteries from sliding off of the pallet.



**A pallet with a layer of cardboard**

# Wet Batteries (Lead Acid & Ni-Cad)

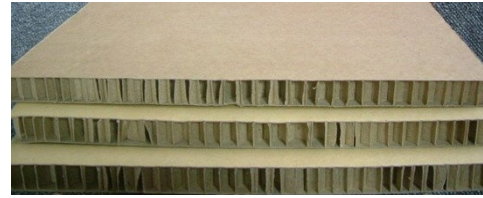
## Packaging Guidance – Pallets

3. Make the first layer of batteries as level and as close together as possible.
  - If some of the batteries are shorter, they should be placed in the center of the layer.
  - Batteries that are relatively taller should be saved and placed on the top layer (if stacking more than 1 layer).
  - Ensure no batteries are hanging over the edge of the cardboard/pallet.



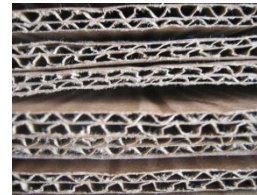
**Single layer of batteries**

4. Place cardboard (multiple sheets if necessary) between each layer of batteries.
  - It is best to use the thick honeycomb cardboard (if available).



**Examples of honeycomb cardboard**

- Alternatively, multiple layers of cardboard can also be used.



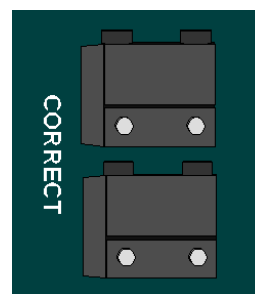
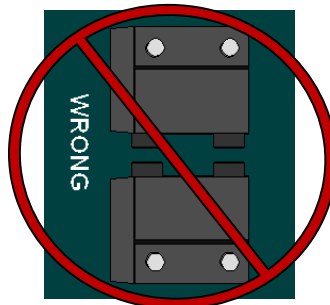
**Examples of layers of typical cardboard**

- Enough layers of cardboard must be applied to achieve the following:
  - Prevent the possibility of short circuits; and
  - Prevent the terminals from puncturing the underside of the batteries in the layer above.



**2 layers of batteries with honeycomb cardboard separating the two layers**

**Note #1:** Side terminal batteries must be stacked so the posts are facing away from each other and not facing towards the outside of the pallet. Side terminals must never touch (below displays overhead views of “Side Terminal Batteries”).

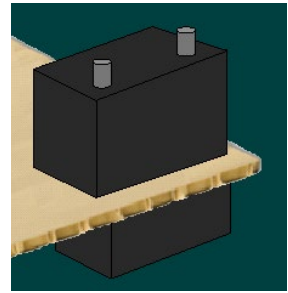




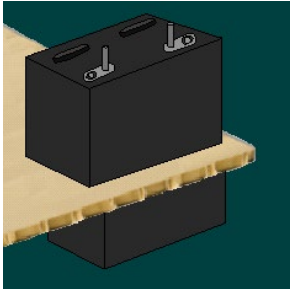
# Wet Batteries (Lead Acid & Ni-Cad)

## Packaging Guidance – Pallets

**Note #2:** Top posts must be positioned toward the outside of the pallet so the layer above it leans toward the center. Make sure that no batteries are overhanging the cardboard.



**Example:** The top battery has the terminals positioned toward the outside of the pallet.



**Note #3:** Stud post batteries (such as Marine Batteries) should be on the top layer. If this is not possible, you will need extra layers of cardboard between the layers of batteries to prevent punctures. This is also important when stacking three layers high.

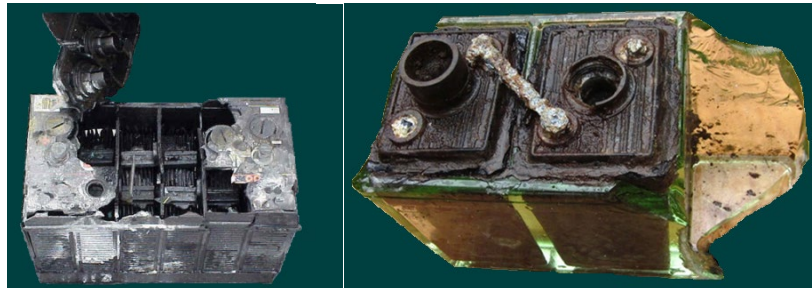
**Example:** The top “stud post” battery has its terminals positioned toward the outside of the pallet, and would need extra layers of cardboard to prevent puncturing the next layer of batteries.

5. A maximum of 3 layers of batteries may be placed on a pallet. When stacking is complete, place cardboard on top of the final layer of batteries.



**3 layers of batteries with a layer of cardboard on top.**

6. Any battery that has been damaged and has the potential to leak must first be placed in a container capable of holding its contents.



**Examples of damaged lead acid batteries**

- Damaged batteries that are not visibly leaking electrolyte should be put in heavyweight polyethylene plastic bags (minimum: 6 mil), properly sealed with plastic tie, and placed in the middle of the top layer.
- Damaged batteries that have the potential to leak must be placed in a container that is capable of holding its contents (i.e. will not leak fluid) such as a DOT approved 5- gallon bucket.



**An example of a DOT approved 5-gallon container**

# Wet Batteries (Lead Acid & Ni-Cad)

## Packaging Guidance – Pallets

### Instructions for Wrapping Pallet

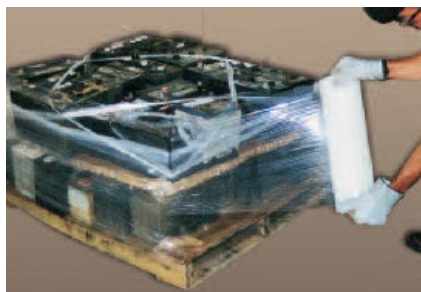
All batteries should be secured to the pallet with stretch wrap. An 80 gauge (or stronger) stretch wrap is recommended. Stretch wrap works best if it is pulled tight before stretching it around the corners.

1. Start with the stretch wrap turned sideways to create a “rope-effect”. Wrap around the top layer twice.\*
2. Using the rope-effect, wrap the top layer twice\* more, each time crossing over the top to form an “X-pattern.” This should pull the batteries towards the center, preventing batteries from falling off of the pallet.



**Creating a “rope-effect” with stretch wrap**

3. Holding the stretch wrap open, wrap around the bottom layer twice\*, being sure to catch the edges of the pallet.

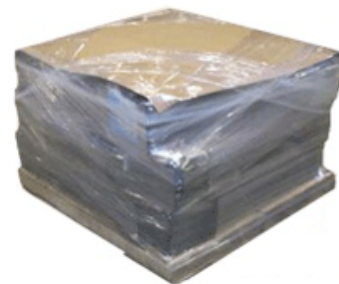


**Holding the stretch wrap open**



**3 layers of batteries wrapped up**

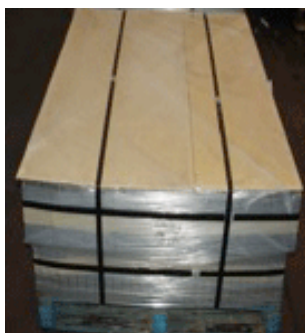
4. After placing a layer of cardboard on top of the batteries, wrap around the top layer at least twice\* and tear-off the stretch wrap at the last corner.



**Fully wrapped pallet of batteries**

***\*Note:*** After wrapping twice (during each step) judge the load; wrap as many times as necessary to stabilize the load.

5. To further secure the load, band the material to the pallet.



**A wrapped and banded pallet of lead acid batteries (3 levels)**

6. Finally, ensure the pallet is properly labeled. At minimum, the pallet should include a #8 Corrosive and a Universal Waste Label. Check with your transporter to see if any additional labeling is required.



**Ex: #8 Corrosive Label**



**Ex: Universal Waste Label**





# Household Batteries

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## Inventory Estimates

The following are rough average weights and estimates that can be used for planning purposes:

- 1-Gallon Container – 15 lbs
- 5-Gallon Bucket – 80 lbs

*Note: Lithium/Lithium Ion/Lithium Polymer containers are limited to a gross weight not exceeding than 66 lbs (Combination of batteries and packaging materials)*

## Personal Protective Equipment (PPE)

Suggested PPE for the sorting, consolidation, and packaging of household batteries includes the following items:

- Gloves
- Eye protection

## Supplies/Packaging Materials

Suggested supplies and packaging materials for preparing household batteries for backhaul includes the following items:

- Containers that are closeable, structurally sound, compatible with the contents of the battery, and lacks evidence of leakage, spillage, or damage.
- UN rated (packing group II or higher) buckets with lids, when required.
- Insulating material (ex: packaging tape, electrical tape)
- Appropriate Markings & Labels

## Spill Cleanup/Emergency Response

The potential for fire and explosion is the main risk when managing batteries; Lithium, Lithium-Ion, and Lithium Polymer batteries pose the greatest threat of fire/explosion. When handling batteries the following materials will assist with cleanup and emergency response.

- Nitrile gloves
- Chemical resistant gloves
- Absorbent (ex: vermiculite, kitty litter, absorbent powder)
- Broom/Brush & Heavy plastic bag (for containing spill cleanup matter)
- Bucket or other container with a sealable lid;
- Fire Extinguisher

## General Packaging Guidelines

The following general packaging guidelines and notes apply to packaging and shipping electronic waste for recycling:

- The following batteries must be insulated to prevent short circuits (leading to fires/explosions)
  - All batteries greater than 9-volts
  - All Ni-MH batteries, if shipped by barge/vessel
  - All "Lantern" style batteries
  - All batteries containing lithium (Lithium, Lithium-Ion, Lithium Polymer, etc.)
  - Any battery with an "unknown" chemistry
- Batteries should be fully contained in a DOT approved shipping container with a sealing lid.
- Avoid storing batteries in a manner that could allow water to mix with the batteries



# Household Batteries

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## Labeling

The following labels should be used for staging and shipping batteries to be recycled.

- Universal Waste (Lead Acid, Ni-Cad, Lithium, Lithium-Ion, Lithium Polymer)
- Corrosive #8 (Lead Acid, Ni-Cad)
- Miscellaneous #9 (NiMH)
- Miscellaneous #9 Lithium Batteries (Lithium, Lithium-Ion, Lithium Polymer)
- UN 3090 (Lithium Primary)
- UN 3480 (Lithium-Ion, Lithium Polymer)
- "Danger – do not ship on passenger aircraft/Cargo Air Craft only" (Lithium-Ion, Lithium Polymer)

## Shipping

Further, ensure the following prior to shipping:

- All battery terminals are insulated to prevent fires or short circuits.
- Follow all applicable Hazardous Materials Regulations
- Ship materials in appropriate containers that are marked, labeled, closed, secure, & upright.
- When needed, block/brace into place to ensure containers don't shift during transport.
- Placards shipping connexes, when applicable
- Ensure all Lithium, Lithium-Ion, and Lithium Polymer battery containers' gross weight do not exceed 66 pounds
- Remember all Lithium, Lithium-Ion, and Lithium Polymer batteries cannot be shipped on passenger aircraft.

Battery containers can be shipped via plane, truck or barge. Be sure to check with transporters and vendors to see if there are any additional requirements prior to shipping.

# Alkaline Batteries

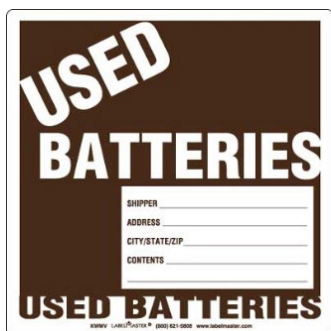
## Packaging Guidance

**Chemistry:** Alkaline

### Identification Information:

- Alkaline Batteries look like “typical” household batteries that are commonly used in everyday devices.
- In general, Alkaline Batteries are not rechargeable (but rechargeable Alkaline do exist).
- Carbon-Zinc batteries can be easily confused with Alkaline Batteries.
- Alkaline Batteries also exist in button cell form.

### Labels:



*Note:* This is not a DOT label.

### Suggested Packaging:



Screw-top plastic bucket

### Examples:



| Universal Waste? | USDOT HazMat? | Need UN Certified Specific Packaging for Shipment? |
|------------------|---------------|--|
| NO               | NO*           | NO   |

### Detailed Shipping Description:

Batteries, dry, sealed n.o.s. (Alkaline Batteries)

### Special Handling Instruction:

- Preferably, contain in a sturdy undamaged screw top plastic bucket;
- If shipping by air or barge, insulate terminals all battery terminals.
- In general, do not mix with Lithium, Lithium Ion, Nickel Metal Hydride, and Nickel Cadmium batteries.

\* Alkaline Batteries are not subject to requirements of 49 CFR Subchapter C (i.e. Hazardous Materials Regulations) if the conditions in 49 CFR 172.102 Special Provision 130 are met.

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# Carbon-Zinc Batteries

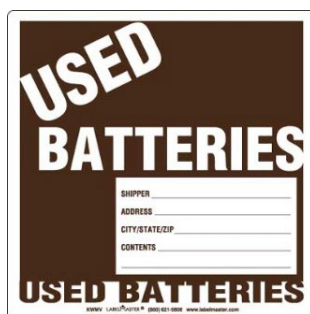
## Packaging Guidance

**Chemistry:** Carbon-Zinc (also Zinc-Chloride)

### Identification Information:

- Carbon-Zinc look like “typical” household batteries that are commonly used in everyday devices (similar applications as Alkaline Batteries).
- Alkaline Batteries can be easily confused with Carbon-Zinc Batteries.
- Carbon-Zinc Batteries are often labelled “Heavy Duty”, “Extra Heavy Duty”, and “Super Heavy Duty.”
- Carbon-Zinc Batteries are not rechargeable.

### Labels:



Note: This is not a DOT label.

### Suggested Packaging:



Screw-top plastic bucket

### Examples:



| Universal Waste? | USDOT HazMat? | Need UN Certified Specific Packaging for Shipment? |
|------------------|---------------|--|
| NO               | NO*           | NO   |

### Detailed Shipping Description:

Batteries, dry, sealed n.o.s. (Carbon-Zinc Batteries)

### Special Handling Instruction:

- Preferably, contain in a sturdy undamaged screw top plastic bucket;
- If shipping by air or barge, insulate terminals all battery terminals.
- In general, do not mix with Lithium, Lithium Ion, Nickel Metal Hydride, and Nickel Cadmium batteries.

\* Carbon-Zinc Batteries are not subject to requirements of 49 CFR Subchapter C (i.e. Hazardous Materials Regulations) if the conditions in 49 CFR 172.102 Special Provision 130 are met.

# Nickel Cadmium (Ni-Cad) Batteries

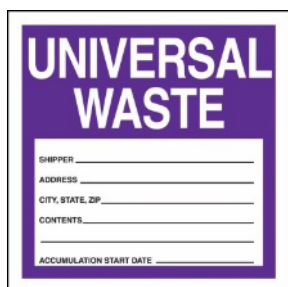
## Packaging Guidance

**Chemistry:** Nickel Cadmium (Ni-Cad) dry cells

### Identification Information:

- Nickel Cadmium Batteries occur in multiple forms:
  - Some look like "Typical" household batteries;
  - They are found in Power Packs (ex: power tools, cordless phones).
- Nickel Cadmium Batteries can be easily confused with Nickel Metal Hydride (NiMH) Batteries.
- Nickel Cadmium Batteries are rechargeable.
- The base voltage (of a single cell) for a Ni-Cad Battery is 1.2 Volts.
- Nickel Cadmium Batteries also exist in button cell form (rarely).
- Wet Nickel Cadmium Batteries (similar to Lead Acid Batteries) also exist – See *Wet Battery Packaging Guidance* section

### Labels:



### Suggested Packaging:



Screw-top plastic bucket

### Examples:



| Universal Waste? | USDOT HazMat? | Need UN Certified Specific Packaging for Shipment? |
|------------------|---------------|--|
| YES              | NO*           | NO**   |

### Detailed Shipping Description:

Batteries, dry, sealed n.o.s. (Nickel Cadmium Batteries)

### Special Handling Instruction:

- Preferably, contain in a sturdy undamaged screw top plastic bucket;
- If shipping by air or barge, insulate terminals all battery terminals.
- In general, do not mix with Lithium, Lithium Ion, or Nickel Metal Hydride, and Alkaline batteries.

\* Dry cell Ni-Cad Batteries are not subject to requirements of 49 CFR Subchapter C (i.e. Hazardous Materials Regulations) if the conditions in 49 CFR 172.102 Special Provision 130 are met.

\*\* Universal Waste Regulations require containers are closeable, structurally sound, compatible with the contents of the battery, and must lack evidence of leakage, spillage, or damage that could cause leakage under reasonably foreseeable conditions.

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# Nickel Metal Hydride (NiMH) Batteries

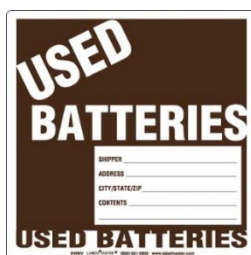
## Packaging Guidance

**Chemistry:** Nickel Metal Hydride (NiMH)

### Identification Information:

- Nickel Metal Hydride Batteries occur in multiple forms:
  - Some look like "Typical" household batteries;
  - They are found in Power Packs (ex: power tools, cordless phones).
- Nickel Metal Hydride Batteries can be easily confused with Nickel Cadmium (Ni-Cad) Batteries.
- Nickel Metal Hydride Batteries are rechargeable.
- The base voltage (of a single cell) for a NiMH Battery is 1.2 Volts.
- Nickel Metal Hydride Batteries also exist in button cell form (rarely).

### Labels:



*Note: This is not a DOT label.*



When shipped by Barge/Vessel

### Suggested Packaging:



Screw-top plastic bucket

### Examples:



| Universal Waste? | USDOT HazMat?                                  | Need UN Certified Specific Packaging for Shipment? |
|------------------|--|--|
| NO               | Vessel – YES<br>Other Modes of Transport – NO* | NO**   |

### Detailed Shipping Description:

Barge/Vessel Shipments – UN3496, Batteries, Dry, Nickel-Metal Hydride, 9

All Other Modes of Shipment – Batteries, dry, sealed, n.o.s. (Nickel Metal Hydride Batteries)

### Special Handling Instruction:

- Preferably, contain in a sturdy undamaged screw top plastic bucket;
- Insulate **ALL** terminals (regardless of size and shape); and
- Do not mix with Lithium, Lithium Ion, Nickel Cadmium, and Alkaline batteries.

\* NiMH Batteries, when shipped in any mode other than vessel/barge, are not subject to requirements of 49 CFR Subchapter C (i.e. Hazardous Materials Regulations) if the conditions in 49 CFR 172.102 Special Provision 130 are met.

\*\* When shipped by vessel/barge, 49 CFR 172.102 Special Provision 130, states NiMH batteries must be prepared and packaged for transport in a manner to prevent a dangerous evolution of heat, short circuits, and damage to terminals

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# Lithium Ion & Lithium Polymer Batteries

## Packaging Guidance

**Chemistry:** Lithium Ion (Li-Ion) & Lithium Polymer (Li-Poly) Batteries

### Identification Information:

- Li-Ion and Li-Poly batteries are all rechargeable batteries.
- Li-Ion and Li-Poly batteries will generally have a label indicating it is a rechargeable lithium battery.

### Suggested Packaging:



Screw-top plastic bucket – Not to exceed 66 lbs

### Insulate All Terminals:

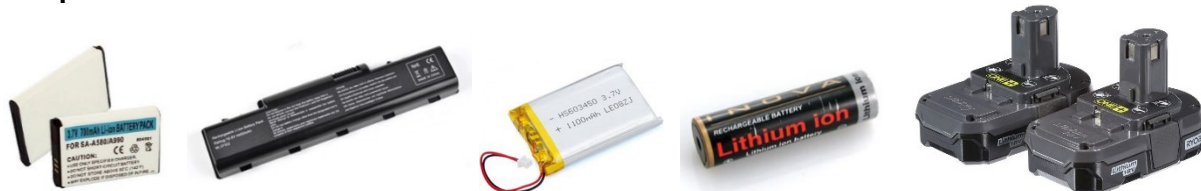


- Terminals can be insulated using tape.
- Avoid excessive taping and ensure labels can be read.

### Required Marks & Labels (requirements vary depending on battery size and shipping mode\*):



### Examples:



| Universal Waste? | USDOT HazMat? | Need UN Certified Specific Packaging for Shipment? |
|------------------|---------------|--|
| YES              | YES*          | YES*   |

### Detailed Shipping Description:

UN3480, Lithium Ion Batteries, 9

### Special Handling Instruction:

- *Handle carefully* – Damaged and short-circuited Li-Ion batteries can cause intense fires/explosions.
- Insulate terminals on all Li-Ion and Li-Poly batteries without recessed terminals.
- Contain in a UN Rated (level II packaging or greater) screw-top plastic bucket – Not to exceed 66 lbs.
- Do not mix with other battery chemistries.

\* Marking, labelling, and packaging requirements for Li-Ion batteries vary depending on size and mode of transportation. Please refer to 49 CFR 173.185 for specific instructions for your shipping situation.

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# Lithium (Primary) Batteries

## Packaging Guidance

**Chemistry:** Lithium Metal (Li) Batteries

### Identification Information:

- Lithium batteries are non-rechargeable batteries found in high-energy household items (ex: cameras), but also in commercial equipment such as medical devices.
- Lithium batteries can be very similar to common household batteries (double check labels).

### Suggested Packaging:



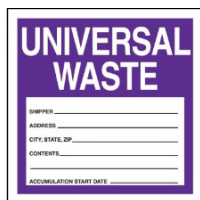
Screw-top plastic bucket – Not to exceed 66 lbs

### Insulate All Terminals:



- Terminals can be insulated using tape.
- Avoid excessive taping and ensure labels can be read.

### Required Marks & Labels (requirements vary depending on battery size and shipping mode\*):



### Examples:



| Universal Waste? | USDOT HazMat? | Need UN Certified Specific Packaging for Shipment? |
|------------------|---------------|--|
| YES              | YES*          | YES*   |

### Detailed Shipping Description:

UN3090, Lithium Metal Batteries, 9

### Special Handling Instruction:

- Handle carefully* – Damaged and short-circuited Lithium batteries can cause intense fires/explosions.
- Insulate terminals on all Lithium Batteries.
- Contain in a UN Rated (level II packaging or greater) screw-top plastic bucket – Not to exceed 66 lbs.
- Do not mix with other battery chemistries.

\* Marking, labelling, and packaging requirements for Lithium batteries vary depending on size and mode of transportation. Please refer to 49 CFR 173.185 for specific instructions for your shipping situation.

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## Battery Labeling Matrix

| TYPE                            | PROPER SHIPPING NAME   | UNIVERSAL WASTE? | HAZARDOUS MATERIAL? |
|---------------------------------|--|------------------|---------------------|
| ALKALINE                        | BATTERIES, DRY, SEALED, N.O.S (ALKALINE)   | NO               | NO*                 |
| NICKEL METAL HYDRIDE            | <i>Vessel/Barge Shipment:</i><br>UN3496, BATTERIES, DRY, NICKEL METAL HYDRIDE, 9                                     | NO               | YES                 |
| NICKEL METAL HYDRIDE            | <i>Truck/Air/Rail Shipment:</i><br>BATTERIES, DRY, SEALED, N.O.S (NICKEL METAL HYDRIDE)                              | NO               | NO*                 |
| NI-CAD (Dry)                    | BATTERIES, DRY, SEALED, N.O.S (NICKEL CADMIUM)   | YES              | NO*                 |
| NI-CAD (Wet)                    | UN2795, BATTERIES, WET, FILLED WITH ALKALI, 8 (NICKEL CADMIUM)   | YES              | YES                 |
| LEAD ACID (Wet)                 | UN2794, BATTERIES, WET, FILLED WITH ACID, 8 (LEAD ACID)  | YES              | YES                 |
| LITHIUM                         | <i>Small Battery Exemption (Truck or Vessel – Limited to 30 kg or 66 lbs):</i><br>UN3090, LITHIUM METAL BATTERIES, 9 | YES              | NO**                |
| LITHIUM                         | <i>Small Battery Exemption (Air – Limited to 2.5 kg or 5.5 lbs):</i><br>UN3090, LITHIUM METAL BATTERIES, 9           | YES              | YES                 |
| LITHIUM                         | <i>Fully Regulated (Limited to 35 kg or 77 lbs on Cargo Aircraft):</i><br>UN3090, LITHIUM METAL BATTERIES, 9         | YES              | YES                 |
| LITHIUM ION (including Li-Poly) | <i>Small Battery Exemption (Truck or Vessel – Limited to 30 kg or 66 lbs):</i><br>UN3480, LITHIUM ION BATTERIES, 9   | YES              | NO**                |
| LITHIUM ION (including Li-Poly) | <i>Small Battery Exemption (Air – Limited to 10 kg or 22 lbs):</i><br>UN3480, LITHIUM ION BATTERIES, 9               | YES              | YES                 |
| LITHIUM ION (including Li-Poly) | <i>Fully Regulated (Limited to 35 kg or 77 lbs on Cargo Aircraft):</i><br>UN3480, LITHIUM ION BATTERIES, 9           | YES              | YES                 |



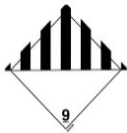






\* These batteries are not subject to requirements of 49 CFR Subchapter C (i.e. Hazardous Materials Regulations) if the conditions in 49 CFR 172.102 Special Provision 130 are met.

\*\* Marking, labelling, and packaging requirements for Lithium batteries vary depending on size and mode of transportation. Please refer to 49 CFR 173.185 for specific instructions for your shipping situation.

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## Battery Labeling Matrix

| TYPE                 | PROPER SHIPPING NAME   | LABELS  | ADDITIONAL LABELS   | ADDITIONAL LABELS |
|----------------------|--|---|---|-------------------|
| ALKALINE             | BATTERIES, DRY, SEALED, N.O.S (ALKALINE)   |    | ---   | ---               |
| NICKEL METAL HYDRIDE | <i>Vessel/Barge Shipment:</i> UN3496, BATTERIES, DRY, NICKEL METAL HYDRIDE, 9        |    |    | ---               |
| NICKEL METAL HYDRIDE | <i>Truck/Air/Rail Shipment:</i> BATTERIES, DRY, SEALED, N.O.S (NICKEL METAL HYDRIDE) |    | ---   | ---               |
| NI-CAD (Dry)         | BATTERIES, DRY, SEALED, N.O.S (NICKEL CADMIUM)                                       |   | ---   | ---               |
| NI-CAD (Wet)         | UN2795, BATTERIES, WET, FILLED WITH ALKALI, 8 (NICKEL CADMIUM)                       |  |  | ---               |
| LEAD ACID (Wet)      | UN2794, BATTERIES, WET, FILLED WITH ACID, 8 (LEAD ACID)                              |  |  | ---               |

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## Battery Labeling Matrix

| TYPE                               | PROPER SHIPPING NAME   | LABELS  | ADDITIONAL LABELS   | ADDITIONAL LABELS   |
|------------------------------------|--|---|---|---|
| LITHIUM                            | <i>Small Battery Exemption (Truck or Vessel):</i> UN3090, LITHIUM METAL BATTERIES, 9 |    |    |    |
| LITHIUM                            | <i>Small Battery Exemption (Air):</i> UN3090, LITHIUM METAL BATTERIES, 9             |    |    |     |
| LITHIUM                            | <i>Fully Regulated:</i> UN3090, LITHIUM METAL BATTERIES, 9                           |    |    | <i>If shipping by air</i><br>  |
| LITHIUM ION<br>(including Li-Poly) | <i>Small Battery Exemption (Truck or Vessel):</i> UN3480, LITHIUM ION BATTERIES, 9   |    |    |    |
| LITHIUM ION<br>(including Li-Poly) | <i>Small Battery Exemption (Air):</i> UN3480, LITHIUM ION BATTERIES, 9               |   |   |   |
| LITHIUM ION<br>(including Li-Poly) | <i>Fully Regulated:</i> UN3480, LITHIUM METAL BATTERIES, 9                           |  |  | <i>If shipping by air</i><br>  |

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## Suggested Battery Recycling Supplies

| Items  | Lead Acid | Wet Ni-Cad | SP12283 | Alkaline | Ni-Cad | NiMH | Lithium | Li-Ion |
|--|-----------|------------|---------|----------|--------|------|---------|--------|
| <b>General Packaging Supplies</b>  |           |            |         |          |        |      |         |        |
| Pallets (Strung Sturdy)  | X         | X          | X       |          |        |      |         |        |
| Fish Tote w/lid  | o         | o          | X       |          |        |      |         |        |
| Banding Kit (Straps, Buckles, Tensioner)                                       | X         | X          | X       |          |        |      |         |        |
| Stretch Wrap (80 gauge or better)  | X         | X          | X       |          |        |      |         |        |
| Heavy Plastic Bags ("Battery Bags" or similar)                                 | X         | X          | X       |          |        |      |         |        |
| UN Rated Bucket w/screw top lid  |           |            |         | o        | o      | o    | X       | X      |
| Containers (Strong, sturdy, capable of containing any leaks)                   |           |            |         | X        | X      | X    |         |        |
| Tape (ex: electrical, packaging tape) for insulating terminals                 |           |            |         | X        | X      | X    | X       | X      |
| Plywood, Foam Board, Cardboard, Waffleboard, etc. (for stacking wet batteries) | X         | X          | X       |          |        |      |         |        |
| <b>Labels &amp; Markings</b>   |           |            |         |          |        |      |         |        |
| Universal Waste  | X         | X          | X       |          | X      |      | X       | X      |
| "Used Batteries" (or similar)  |           |            |         | o        |        | o    |         |        |
| #8 Corrosive   | X         | X          | X       |          |        |      |         |        |
| #9 Misc (for NiMH vessel/barge shipments only)                                 |           |            |         |          |        | X    |         |        |
| #9 Lithium   |           |            |         |          |        |      | X       | X      |
| Cargo Aircraft Only  |           |            | X       |          |        |      | X       | X      |
| "Up" Arrows  |           |            | X       |          |        |      |         |        |
| UN3090 Markings  |           |            |         |          |        |      | X       |        |
| UN3480 Markings  |           |            |         |          |        |      |         | X      |
| <b>Spill Cleanup</b>   |           |            |         |          |        |      |         |        |
| Absorbent (Vermiculite, Kitty Litter, etc.)                                    | X         | X          | X       |          |        |      |         |        |
| Baking Soda  | X         |            | X       |          |        |      |         |        |
| Vinegar  |           | X          | X       |          |        |      |         |        |
| Broom & Dust Pan   | X         | X          | X       |          |        |      |         |        |
| Heavy Mil. Plastic Bags  | X         | X          | X       |          |        |      |         |        |
| <b>PPE</b>   |           |            |         |          |        |      |         |        |
| Chemical Resistant Apron   | X         | X          | X       |          |        |      |         |        |
| Chemical Resistant Gloves  | X         | X          | X       |          |        |      |         |        |
| Eyewash  | X         | X          | X       | X        | X      | X    | X       | X      |
| First Aid Kit  | X         | X          | X       | X        | X      | X    | X       | X      |
| Fire Extinguisher  | X         | X          | X       | X        | X      | X    | X       | X      |
| Steel Drum & Fine Sand (or similar)  |           |            |         |          |        |      | X       | X      |
| Fine Sand  |           |            |         |          |        |      | X       | X      |
| Safety Glasses   | X         | X          | X       | X        | X      | X    | X       | X      |
| Safety Goggles   | X         | X          | X       |          |        |      |         |        |
| Work Gloves  | X         | X          | X       | X        | X      | X    | X       | X      |
| Nitrile Gloves   | X         | X          | X       | X        | X      | X    | X       | X      |

"X" – Required or Strongly Recommended

"o" – Optional, but Recommended

# **Online Resources**

## **.USDOT – PHMSA: [www.phmsa.dot.gov](http://www.phmsa.dot.gov)**

- Electronic Code of Federal Regulations (eCFR): [www.ecfr.gov](http://www.ecfr.gov)  
49 CFR App for Andriod: <https://play.google.com/store/apps/details?id=gov.dot.phmsa.ocfr&hl=en>  
49 CFR App for iOS: <https://itunes.apple.com/us/app/ocfr/id1228220888?mt=8>
- Hazardous Materials Information Center  
[www.phmsa.dot.gov/standards-rulemaking/hazmat/hazardous-materials-information-center](http://www.phmsa.dot.gov/standards-rulemaking/hazmat/hazardous-materials-information-center)
- Chart 17 (Marking, Labeling, Placarding):  
[www.phmsa.dot.gov/training/hazmat/dot-chart-17-markings-labeling-and-placarding-guide](http://www.phmsa.dot.gov/training/hazmat/dot-chart-17-markings-labeling-and-placarding-guide)  
App for Andriod: <https://play.google.com/store/apps/details?id=gov.dot.phmsa.ocfr&hl=en>  
App for iOS: <https://itunes.apple.com/us/app/dot-chart-16/id1245251292?mt=8>
- Lithium Battery Guide for Shippers  
[www.phmsa.dot.gov/training/hazmat/lithium-battery-guide-shippers](http://www.phmsa.dot.gov/training/hazmat/lithium-battery-guide-shippers)
- Safety Tips for Lithium-Ion Battery-Powered Micromobility Devices  
<https://www.phmsa.dot.gov/training/hazmat/safety-tips-lithium-ion-battery-powered-micromobility-devices>
- Understanding the Risks of Damaged, Defective, or Recalled (DDR) Lithium Batteries  
[www.phmsa.dot.gov/training/hazmat/understanding-risks-damaged-defective-or-recalled-ddr-lithium-batteries](http://www.phmsa.dot.gov/training/hazmat/understanding-risks-damaged-defective-or-recalled-ddr-lithium-batteries)
- Online HazMat Regulations Training: <https://dothazmat.vividlms.com>

## **FAA – HazMat: [www.faa.gov/hazmat](http://www.faa.gov/hazmat)**

- Alaska Dangerous Goods Resources: [www.faa.gov/hazmat/resources/alaska](http://www.faa.gov/hazmat/resources/alaska)
- FAA Lithium Battery Resources: [www.faa.gov/hazmat/resources/lithium\\_batteries](http://www.faa.gov/hazmat/resources/lithium_batteries)
- FAA Interactive Guide to Shipping Lithium Batteries:  
[www.faa.gov/hazmat/safecargo/resources/lithium-battery-guide](http://www.faa.gov/hazmat/safecargo/resources/lithium-battery-guide)

## **EPA – [www.epa.gov](http://www.epa.gov)**

- Universal Waste: [www.epa.gov/hw/universal-waste](http://www.epa.gov/hw/universal-waste)
- Used Household Batteries: [www.epa.gov/recycle/used-household-batteries](http://www.epa.gov/recycle/used-household-batteries)
- Used Lithium-Ion Batteries: [www.epa.gov/recycle/used-lithium-ion-batteries](http://www.epa.gov/recycle/used-lithium-ion-batteries)

## **Other Resources**

- Rechargeable Battery Association (PRBA): [www.prba.org](http://www.prba.org)
- Call2recycle.org Safety Portal: [www.call2recycle.org/safety](http://www.call2recycle.org/safety)
- Call2recycle.org Avoid the Spark Campaign: [www.call2recycle.org/avoid-the-spark](http://www.call2recycle.org/avoid-the-spark)
- Lithium Battery Guide: [www.hazmateam.com/content/Lithium-Battery-Transportation.aspx](http://www.hazmateam.com/content/Lithium-Battery-Transportation.aspx)
- Lithium Battery Fire Code: [www.prba.org/areas-of-focus/fire-codes](http://www.prba.org/areas-of-focus/fire-codes)

*For an electronic version of this document with “clickable” links, email Reilly Kosinski at [rkosinski@zendergroup.org](mailto:rkosinski@zendergroup.org)*

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*NOTE: The information, guidance, and instructions herein are made in good faith and are believed to be accurate at the date of preparation. The authors of this document make no guarantee of the information’s current and future accuracy, either expressed or implied. It is incumbent of individuals collecting, packaging, and shipping materials to be aware of and comply with all current applicable regulations and other relevant requirements.*

## Backhaul Manual

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# Appendix



## Reference Documents





# Backhaul Program

## Worker Training

The following training topics that workers involved in Backhaul programs should consider. When applicable, certain trainings are required by regulation:

| Training Component  | Description & Further Information  |
|---|--|
| <b>General Workplace Safety</b>                                     | General Workplace Safety involves a safety orientation specific to the position and the site(s) where trainees will be performing work activities. More extensive worker safety training, such as OSHA 10 & OSHA 30, are also available. Employers should determine which safety training(s) best fit their programs – <a href="#">29 CFR 1910</a>   |
| <b>Personal Protective Equipment (PPE)</b>                          | OSHA requires employers to train employees when PPE use during work is required by regulation – <a href="#">29 CFR 1910.132(f)</a>   |
| <b>Hazardous Communication (HazCom)</b>                             | OSHA requires employers to inform & train employees regarding any hazardous chemicals in their work area. This includes initial assignment (ex: upon hire), and whenever a new chemical hazard the employees have not previously been trained about is introduced into their work area – <a href="#">29 CFR 1910.1200(h)</a>   |
| <b>Hazardous Materials Regulations (HMR)</b>                        | DOT requires employers to provide HMR training for any employee involved in the preparation and transportation of hazardous materials – <a href="#">49 CFR 172.700</a>   |
| <b>Collection, Handling, &amp; Packaging Best Practices</b>         | Employer should provide best practices for safe and proper handling and packaging of backhaul materials. If any backhaul materials are classified as HazMat, then this becomes a requirement under DOT's HMR training regulations (see above)  |
| <b>Universal Waste Management</b>                                   | The EPA requires any organization that is a small quantity handler of universal waste to train employees (who handle or have responsibility for managing universal waste) in the proper handling and emergency procedures appropriate to the type(s) of universal waste handled – <a href="#">40 CFR 273.16</a>  |
| <b>Hazardous Waste Operations and Emergency Response (HAZWOPER)</b> | OSHA requires all employees (such as, but not limited to, equipment operators, general laborers – including supervisors & managers) exposed to hazardous substances, health hazards, or safety hazards to receive training regarding hazardous waste operations that could expose them to hazardous substances, safety, or health hazards. Regulations define which employees require 24 hr training vs. 40 hr training – <a href="#">29 CFR 1910.120(e)</a> |
| <b>Powered Industrial Truck (PIT – a.k.a Forklift)</b>              | OSHA requires employers train and evaluate powered industrial truck operator to ensure employees are competent to operate a powered industrial truck safely – <a href="#">29 CFR 1910.178(l)</a>   |
| <b>Heavy Equipment Operation</b>                                    | In general, heavy equipment operator training requirements are the same as powered industrial truck operator training requirements – <a href="#">29 CFR 1926.602(d)</a>  |
| <b>Lockout-Tagout</b>   | OSHA requires employers to train authorized and affected employees as part of their energy control program. The program and employee training must communicate the knowledge and skills required for the safe application, usage, and removal of energy controls used by the organization – <a href="#">29 CFR 1910.147(c)(7)</a>  |
| <b>Respirators (including volunteer-use)</b>                        | OSHA requires employers to provide training to all employees who are required to wear respirators in carrying out their work activities. If respirators are not required, but are available for volunteer use, then employers must provide employees basic information regarding respirator use (as found in the regulations) – <a href="#">29 CFR 1910.134(k)</a>   |

*Note, this list is not comprehensive and additional training requirements and programs may be required, dependent on the worker activities and worksite conditions. Please review your program's processes & practices to develop a compliant & comprehensive worker training program.*

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# Suggested Backhaul Supplies

## Backhaul Supplies

### E-waste Packaging

- Stretch Wrap (18-in, 80 Gauge or similar)

### Fluorescent Lamp Packaging

- Lamp Boxes (use original, when possible)
- Packaging Tape
- Tape Gun

### Lead Acid Batteries Packaging

- Strapping
  - Strapping (Metal or Plastic)
  - Strapping Clips
  - Tensioner
  - Sealer (Metal Strapping)
  - Cart (Metal Strapping)
- Vermiculite
- Insulating Material (Cardboard, Plywood, Foam Board, Waffle Board, etc.)
- Electrical Tape, Plastic Spray, Other means of insulating terminals

### Battery Spill Cleanup

- Baking Soda
- Absorbent (Vermiculite, Kitty Litter, etc.)
- Broom
- Dust Pan
- Heavy Mil Plastic Bags
- Buckets w/lids (UN rated if available)

### General Spill Cleanup

- Oil absorbent pads
- Universal absorbent pads

### Spill PPE

- Chemical Resistant Gloves
- Chemical Apron (when needed)
- Chemical Resistant Suit (when needed)
- Berm
- Safety Goggles
- Nitrile Gloves

### General PPE

- Work Gloves
- Safety Glasses
- Side Shields (when needed)
- Steel Toed Work Boots (or equivalent)
- Hi Vis Vest
- Ear Plugs/Hearing Protection
- First Aid Kit (working in the field)
- Fire Extinguisher

### General Tools

- Socket Set
- Screw Drivers/Screw Gun (Philips, Flat Head, Hex, Allen, etc.)
- Wire Cutters/Diagonal Cutters
- 3-5 lb Sledge Hammer
- Punch
- Box Cutters
- Reciprocating Saw (i.e. Sawzall)
- Metal cutting blades
- Buckets with sealing lids

### Junk Vehicle Preparation

- 55-gal Drums (Oil, Antifreeze, Fuel)
- Hand Pumps (Fluid extraction)
- Hoses (for hand pumps)
- Drain Pans
- Funnels
- Tire Iron (or equivalent)
- Non-Sparking Punch (ex: Brass Punch)
- R134a and R12 Couplers for refrigerant recovery.

*Note that Junk Vehicle Preparation would require refrigeration recovery, when present.*

### Refrigerant Recovery

- Recovery Pump
- Manifold Gauge Set
- ¼ inch charging hoses (at least 4)
- Extra Gaskets (for charging hoses)
- Piercing Clamps (at least 2)
- Recovery Cylinder (at least one 30lb cylinder)
- Hand Torch (small propane Torch)
- Extension Cords
- Generator (if no power is available)
- Scale (for weighing cylinders)

### Labels

- #8 Corrosive
- #8 Corrosive Placards
- #9 Miscellaneous
- #9 Miscellaneous (Lithium Battery)
- #2 or 2.2 Nonflammable compressed gas (refrigerant cylinders)
- Universal Waste
- Up Arrows (if shipping wet batteries in a tote)
- Cargo Aircraft Only (if shipping wet batteries by air in a tote)



## Suggested Backhaul Supplies

| Items  | General | E-waste | Fluorescent Lamps | Household Batteries | Lead Acid Batteries | Refrigerant Recovery | Junk Vehicle Prep* |
|--|---------|---------|-------------------|---------------------|---------------------|----------------------|--------------------|
| <b>Packaging Supplies</b>                    |         |         |                   |                     |                     |                      |                    |
| ¼ inch recovery hoses                        |         |         |                   |                     |                     | X                    |                    |
| 3-5 lb Hammer                                | X       |         |                   |                     |                     | X                    | X                  |
| 55 gallon Drums                              |         |         |                   |                     |                     |                      | X                  |
| Box Cutter                                   | X       |         | X                 |                     |                     |                      |                    |
| Buckets w/sealing lids                       | X       |         |                   | X                   | X                   |                      | X                  |
| Cardboard (scrap)                            |         |         |                   |                     | X                   |                      |                    |
| Drain Pans                                   |         |         |                   |                     |                     |                      | X                  |
| Electrical Tape                              |         |         |                   | X                   | X                   |                      |                    |
| Extension Cord                               |         |         |                   |                     |                     | X                    |                    |
| Extra Gaskets (for charging hoses)           |         |         |                   |                     |                     | X                    |                    |
| Foam Board                                   |         |         |                   |                     | X                   |                      |                    |
| Funnels                                      |         |         |                   |                     |                     |                      | X                  |
| Generator                                    | X       |         |                   |                     |                     | X                    |                    |
| Hand Pumps                                   |         |         |                   |                     |                     |                      | X                  |
| Hand torch                                   |         |         |                   |                     |                     | X                    |                    |
| Hoses  |         |         |                   |                     |                     | X                    |                    |
| Lamp Boxes                                   |         |         | X                 |                     |                     |                      |                    |
| Manifold gauge set                           |         |         |                   |                     |                     | X                    |                    |
| Metal cutting blades (for Reciprocating Saw) | X       |         |                   |                     |                     |                      | X                  |
| Non-Sparking Punch                           |         |         |                   |                     |                     |                      | X                  |
| Packaging Tape                               | X       | X       | X                 | X                   |                     |                      |                    |
| Piercing Tools                               |         |         |                   |                     |                     | X                    |                    |
| Plastic Spray                                |         |         |                   | X                   | X                   |                      |                    |
| Plywood                                      |         |         |                   |                     | X                   |                      |                    |
| Punch  |         |         |                   |                     |                     | X                    | X                  |
| Reciprocating Saw (ex: Sawzall)              | X       |         |                   |                     |                     |                      | X                  |
| Recovery Cylinder                            |         |         |                   |                     |                     | X                    |                    |
| Refrigerant Recovery Pump                    |         |         |                   |                     |                     | X                    |                    |
| Scale  |         |         |                   |                     |                     | X                    |                    |
| Screw Drivers                                | X       | X       |                   |                     |                     |                      |                    |
| Socket Set                                   | X       | X       |                   |                     |                     |                      |                    |
| Strapping                                    | X       | X       |                   |                     | X                   |                      |                    |
| Stretch Wrap                                 | X       | X       |                   |                     | X                   |                      |                    |
| Tape Gun                                     | X       |         | X                 | X                   |                     |                      |                    |
| Tire Iron (or equivalent)                    |         |         |                   |                     |                     |                      | X                  |
| Waffle Board                                 |         |         |                   |                     | X                   |                      |                    |
| Wire Cutters/Diagonal Cutters                | X       | X       |                   |                     |                     | X                    | X                  |



## Suggested Backhaul Supplies

| Items                                       | General | E-waste | Fluorescent Lamps | Household Batteries | Lead Acid Batteries | Refrigerant Recovery | Junk Vehicle Prep* |
|---|---------|---------|-------------------|---------------------|---------------------|----------------------|--------------------|
| <b>Spill Cleanup Supplies</b>               |         |         |                   |                     |                     |                      |                    |
| Absorbent (Vermiculite, Kitty Litter, etc.) | X       |         |                   |                     | X                   |                      | X                  |
| Baking Soda                                 |         |         |                   |                     | X                   |                      |                    |
| Broom                                       | X       | X       | X                 |                     | X                   |                      |                    |
| Buckets w/lids                              | X       | X       | X                 | X                   | X                   | X                    | X                  |
| Dust Pan                                    | X       | X       | X                 |                     | X                   |                      |                    |
| Heavy Mil. Plastic Bags                     | X       |         | X                 | X                   | X                   |                      |                    |
| Oil Absorbent Pads                          | X       |         |                   |                     |                     |                      | X                  |
| Universal Absorbent Pads                    | X       |         |                   |                     |                     |                      | X                  |
| <b>PPE</b>                                  |         |         |                   |                     |                     |                      |                    |
| Absorbent Berm                              | X       |         |                   |                     | X                   |                      | X                  |
| Chemical Resistant Apron                    |         |         |                   |                     | X                   |                      |                    |
| Chemical Resistant Gloves                   |         |         |                   |                     | X                   |                      |                    |
| Chemical Resistant Suit                     |         |         |                   |                     | X                   |                      |                    |
| Ear Plugs/Hearing Protection                | X       |         |                   |                     |                     |                      |                    |
| Eyewash                                     |         |         |                   |                     | X                   | X                    | X                  |
| First Aid Kit                               | X       | X       | X                 | X                   | X                   | X                    | X                  |
| Fire Extinguisher                           | X       |         |                   | X                   | X                   |                      | X                  |
| Hi Vis Vest                                 | X       | X       | X                 | X                   | X                   | X                    | X                  |
| Nitrile Gloves                              | X       |         |                   | X                   | X                   |                      | X                  |
| Safety Glasses                              | X       | X       | X                 | X                   | X                   | X                    | X                  |
| Safety Goggles                              |         |         |                   |                     | X                   |                      |                    |
| Side Shields (when needed)                  | X       | X       | X                 | X                   | X                   | X                    | X                  |
| Steel Toed Work Boots (or equivalent)       | X       | X       | X                 | X                   | X                   | X                    | X                  |
| Work Gloves                                 | X       | X       | X                 | X                   | X                   | X                    | X                  |
| <b>Labels</b>                               |         |         |                   |                     |                     |                      |                    |
| #2 or 2.2 Nonflammable compressed gas       |         |         |                   |                     |                     | X                    |                    |
| #8 Corrosive                                | X       |         |                   | X                   | X                   |                      |                    |
| #8 Corrosive Placards                       | X       |         |                   | X                   | X                   |                      |                    |
| #9 Miscellaneous                            |         |         |                   | X                   |                     |                      |                    |
| #9 Miscellaneous (Lithium Battery Specific) |         |         |                   | X                   |                     |                      |                    |
| Cargo Aircraft Only                         |         |         |                   | X                   | X                   |                      |                    |
| UN3091 (Lithium Primary)                    |         |         |                   | X                   |                     |                      |                    |
| UN3480 (Lithium Ion)                        |         |         |                   | X                   |                     |                      |                    |
| Universal Waste                             | X       |         | X                 | X                   | X                   |                      |                    |
| Up Arrows                                   | X       |         |                   |                     | X                   |                      |                    |

\* Please note that Junk Vehicle Preparation would require refrigeration recovery, when present

### Common Landfill Equipment and Products

| Item   | Brand/ Model/or Supplier   | Contact Info   |
|--|--|--|
| <b>GLASS CRUSHER</b>   |  |  |
| Glass Crusher  | Cemco Glass Gator  | Joseph Trujillo,<br>joseph@cemcoturbo.com  |
| <b>USED OIL BURNERS</b>                                      |  |  |
| Smart Ash burner   | Smart Ash from Spill Shield                                      | <a href="mailto:lark@spillshield.com">lark@spillshield.com</a>   |
| Oil away attachment for Smart Ash                            | Smart Ash from Spill Shield                                      | <a href="mailto:lark@spillshield.com">lark@spillshield.com</a>   |
| Used Oil Furnace   | Energy Logic   | Doug Huntman<br>dhuntman@dbcalsaska.net  |
| Used Oil Furnace   | Clean Burn CB 140 with Recycling Center                          | Nenana Heating Services, David Shaw<br><a href="mailto:NHSI@alaska.net">NHSI@alaska.net</a>  |
| <b>BURN UNITS</b>  |  |  |
| Homemade burn unit   | Using whatever local materials are available                     | contact your local craftsman   |
| Tok Burn unit  | Tok Welding  | <a href="mailto:christokmarshall@hotmail.com">christokmarshall@hotmail.com</a> ;<br><a href="http://www.alaskanstoves.com">www.alaskanstoves.com</a> |
| Tire Mounted serves population up to 250                     | Tok Welding  |  |
| Skid Mounted serves population up to 475                     | Tok Welding  |  |
| Summit Burn unit   | Summit Consulting Services Inc                                   | <a href="mailto:dconstantine@scsalaska.com">dconstantine@scsalaska.com</a> or<br><a href="http://scsalaska.com">scsalaska.com</a>                    |
| Summit #2, serves up to 100 people                           | Summit Consulting Services Inc                                   |  |
| Summit #4, serves up to 300 people                           | Summit Consulting Services Inc                                   |  |
| Summit #10, serves up to 900 people                          | Summit Consulting Services Inc                                   |  |
| Summit #12, serves up to 1200 people                         | Summit Consulting Services Inc                                   |  |
| <b>FENCING</b>   |  |  |
| AAA Fencing  | 8 ft. chain link fencing   | aaafenceak.com Jeffery Johnson<br><a href="mailto:jeffery@aaafenceak.com">jeffery@aaafenceak.com</a>   |
| ACME Fencing   | 8 ft. chain link fencing   | amefence.net, Alex Wiita<br><a href="mailto:alex@acmefence.net">alex@acmefence.net</a>   |
| <b>SIGNAGE</b>   |  |  |
| Aluminum   | reflective backing   | Vital Signs, Sign Pro, Alcan Signs, Signs Now, Arctic Signs, Action Signs, etc.  |
| Plastic or Vinyl   | last longer when backed with plywood                             | Same as metal Signs  |
| <b>CONNEX BOXES</b>  |  |  |
| 40ft FOB ANC   | Container Specialties Alaska                                     | <a href="http://containerspecialtiesak.com">containerspecialtiesak.com</a> ;<br><a href="http://akcontainer.com">akcontainer.com</a>                 |
| 20 ft. FOB ANC   | Container Specialties Alaska                                     | <a href="http://containerspecialtiesak.com">containerspecialtiesak.com</a> ;<br><a href="http://akcontainer.com">akcontainer.com</a>                 |
| 40Ft FOB FAI   | Summit Logistics   | <a href="http://summitlogisticsalaska.com">summitlogisticsalaska.com</a>   |
| 20Ft FOB FAI   | Summit Logistics   | <a href="http://summitlogisticsalaska.com">summitlogisticsalaska.com</a>   |
| Contact your Local Barge Service                             |  |  |
| <b>FISH TOTES</b>  |  |  |
|  | Arctic Fire and Safety   | <a href="http://arcticfireandsafety.com">arcticfireandsafety.com</a>   |
| <b>FREON EXTRACTION EQUIPMENT</b>                            |  |  |
|  | Appion G5Twin, Robinair RG3, Fieldpiece MR45 (can buy on Amazon) | Highly recommend training prior to purchase  |
| <b>LANDFILL PERMIT</b>                                       |  |  |
|  | ADEC   | ADEC Solid Waste Program rural landfill specialist   |
| <b>SMALL COMPACTOR/CAN CRUSHER</b>                           |  |  |
| Pneumatic Can Crusher  | Mil-tek 2101 can crusher   | Mark Mentzer at<br><a href="mailto:mmentzer@miltekusa.com">mmentzer@miltekusa.com</a>  |
| <b>CONTAINMENT PALLETS/SPILL KITS</b>                        |  |  |
| 4 Drum Spill Containment Pallet w/ drain                     | ULINE  | <a href="http://uline.com">uline.com</a>   |
| Roll Top Hardcover Spill Pallet (2 Drum) for outdoor storage | New Pig  | <a href="http://www.newpig.com">www.newpig.com</a>   |
| 20 Gallon Universal Spill Kit for oil, coolant, and solvents | New Pig  | <a href="http://www.newpig.com">www.newpig.com</a>   |
| Oil Only absorbent Pads-Box of 100                           | New Pig  | <a href="http://www.newpig.com">www.newpig.com</a>   |
| <b>COLLECTION/STORAGE/HHW SHED</b>                           |  |  |
| 12X16 All Purpose Shed, assembly required                    | Spenard Builders Supply  | <a href="http://sbsalaska.com">sbsalaska.com</a>   |
| 10X12 Shed, assembly required                                | Spenard Builders Supply  | <a href="http://sbsalaska.com">sbsalaska.com</a>   |
| 8X8ft Shed, assembly required                                | Spenard Builders Supply  | <a href="http://sbsalaska.com">sbsalaska.com</a>   |
| <b>FIRE SUPPRESSION PUMPS</b>                                |  |  |
| JJS Fire Supply  | Home Firefighting Pump System                                    | <a href="http://jjsfiresupply.com">jjsfiresupply.com</a>   |
| Arctic Fire and Safety                                       | Honda portable pump  | <a href="http://arcticfireandsafety.com">arcticfireandsafety.com</a>   |
| <b>COLLECTION TRAILERS AND BINS</b>                          |  |  |
| Stationary Collection Bin                                    | Tok Welding  | see above  |
| Wheeled Collection Trailer                                   | Tok Welding  |  |
| 3 cubic yd. roll off dumpster, bear proof                    | Summit Consulting Services Inc                                   | see above  |
| Collection Trailer 4 cubic yd.                               | Summit Consulting Services Inc                                   |  |

This list was compiled and provided by The Alaska Department of Environmental Conservation - Solid Waste Program

NOTE: This is not an exhaustive list of products and equipment nor meant as preferential list of vendors. For informational purposes only.

