

Certification Standards**Collecting, Storing and Transporting Used Lead Acid Batteries****Introduction**

Successful used lead acid battery (ULAB) recycling programs rely on the fact that used lead acid batteries have an intrinsic value due to the high lead content of the battery. Recovery of the polypropylene battery case plastic material and converting the battery acid into a saleable product will add value, but these are not the only factors that influence the financial viability of recovery and recycling.

The viability and the rate of recycling of ULAB will depend on any one or all of these elements:

- The metal price of the recovered lead bullion. (LME)
- The availability of sufficient quantities of ULAB to maintain a viable operation.
- The cost of collecting the ULAB.
- The cost of transporting the batteries to a recycling plant.

In most instances the four elements are such that ULAB recovery is viable, except in remote locations where transport costs not only render recovery uneconomic, but is not environmentally sound as the fuel use could be more harmful to the environment than failure to recover the battery. However, for the most part, battery recovery from remote areas represents a tiny fraction of ULAB recovery and is dealt with later in this section of the manual.

Standards for the recovery of ULAB are not just about compliance with national legislation, but are about the provision of a comprehensive collection, storage and transport network designed to facilitate and underpin the implementation of sustainable waste management practices for the recovery of ULAB. In addition, the standards will also contain safety procedures designed to minimize occupational exposure, minimize any fire hazards and reduce the chances of electrolyte leaking from ULAB into the environment.

ULAB have the potential to impact differently on the environment and human health, depending on how the ULAB are recovered, and the impact will be influenced by the collection system used, the locations where the ULAB is generated and the resources available to manage the recovery. In a sustainable and integrated system of ULAB recovery, all these factors must be taken into account when making decisions on how best to collect and where to ship the ULAB for recycling.

The standard will also have a strong emphasis on providing public information through good labelling and educational materials that explain how ULAB should be returned to the retailers for recovery.

Collection schemes fall into two main categories; those that are for domestic consumption and those that are shipped to sub-regional recycling hubs or exported to developed, and developing countries with recycling facilities.

In many countries there are government sponsored schemes, often backed up by legislation, to facilitate the return of ULAB through the formal recyclers, but the Green Lead standard for collecting ULAB is based entirely on the mechanisms required of the battery manufacturers and the retailers to ensure the return of ULAB through the formal sector with or without government intervention. Where government sponsored schemes and legislation exist for the collection of ULAB, battery manufacturers and retailers will be required to work within the legislation and take full advantage of government initiatives.

1. Standard Provisions for ULAB Recovery

1.1 Responsibilities

Within the context of Green Lead (GL) product chain, it is the responsibility of the battery manufacturer to make sure that they have in place schemes to ensure that used lead acid batteries (ULAB) are returned to an approved Green Lead Certified retailer, who in turn will make the necessary arrangements for the ULAB to be delivered to an approved Green Lead Certified secondary lead plant.

There are a number of alternative schemes that can be adopted as the means of ensuring that ULAB are recovered and recycled through a Green Lead Certified secondary lead plant.

It is the responsibility of the battery manufacturer to communicate with the battery retailer to train them in the safe handling procedures for ULAB.

2. ULAB Collection Schemes

2.1 Deposit/Refund Collection Schemes.

Battery manufacturers must ensure that any battery retailer or a garage that sells a new lead acid battery (LAB) must either:

- Collect a ULAB in part exchange for the new battery
- or
- Charge a small deposit of between US\$ 5 and 10 that is refundable when the used battery is returned to the retailer or any other certified GL retailer

Battery manufacturers must check on an annual basis that the number of new battery sales matches the number of ULAB collected and sent to the recycler and that any deficiency in the number of ULAB collected is accounted for by a deposit charge on new battery sales.

2.2 Purchase Discount Collection Schemes

As an alternative to a Deposit/Refund scheme, a battery manufacturer can set up a Purchase Discount scheme that operates in a similar way to the Deposit/Refund scheme, but instead of the consumer paying a deposit the first time a LAB is purchased, the consumer will only pay the retail price. However, when the battery is at the end of its useful life and is returned to the retailer, a discount will be given on the price of a new battery and the ULAB will be retained by the retailer and sent to a GL recycler.

Once again, battery manufacturers must check on an annual basis that the number of discounted new battery sales matches the number of ULAB collected and sent to the recycler and that any deficiency in the number of ULAB collected is accounted for by a full charge paid on any new battery sales.

Purchase discount schemes are already the standard method for the sale and purchase of industrial batteries (~ 5-10%) and that is why lead acid batteries used for motive power and lifting equipment throughout the world are all recovered. This is also the reason why battery manufacturers will also be familiar with this alternative to Deposit/Refund Collection Schemes.

2.3 Local Collection Schemes for Domestic LAB

Whilst the most efficient method of collecting ULAB is through the battery retailers using deposit/discount or purchase discount schemes, some countries without a national electricity grid will find that the widespread use of LAB for domestic purposes, such as lighting and TV, does not lend itself to these types of collection schemes, especially in remote areas.

However, in the developing world, there are those in every city, town and local community that scavenge for discarded materials that can be reused or recycled. Where such situations exist, battery manufacturers in conjunction with the local battery retailers are required to recruit local personnel who will call at Garages, Repair Shops and Breaker's Yards to collect ULAB and take them to a Green Lead certified retailer or government sponsored ULAB collection point. Scavengers are very popular in rural areas of the developing world, because they will collect any ULAB from a person's home; pay them to take it away, and for a small sum of money, return with a new battery to replace the used battery returned to the retailer.

3. Storing ULAB

3.1 Local Collections

ULAB awaiting transport to a recycler at a battery retailer or local collection center must be stored upright in a way that prevents children from “touching” with them.

For shops and garages with space inside their premises they can be secured and locked in an area away from the public, but for many retailers in the developing world space is at a premium and ULAB will be stored outside the shop or garage.

In these instances, a wire mesh cage provides a safe and convenient way of storing the ULAB prior to transport to the recycler.

- The cages must be made of stainless or heavy gauge steel with an open mesh floor with wheels running on nylon bearings.
- The ULAB are placed inside the cage, which must have a lockable lid to prevent anyone removing a ULAB.
- The cages must be chained to the outside of the shop or garage.

The use of a cage eliminates the risk of the build up of explosive gases and keeps the ULAB off the ground, enabling any spillage to be seen and the appropriate action to remove the contamination taken.



Pic¹. 1 – ULAB Collection Cage with wheels

- X** Closed containers must never be used to store more than one or two ULAB because of the risk of explosive gas build up in the container.
- X** ULAB storage containers must not be located near to a storm drain and should stand on a “spill tray”

¹ Animated and embedded Powerpoint Slide Presentation - Use the right mouse button and click on the cage; from the menu select “Presentation Object” and click on “Show” from the menu. Press “ESC” when the animation has finished to return to the Word document.

3.2 ULAB Reception and Control Measures

ULAB delivered to a shop, a garage, a service center, a collection center or a temporary storage depot, must be handled in a safe manner and should undergo a series of checks to ensure that a ULAB is safe to store and transport to a recycling plant.

X Batteries should not be drained: The indiscriminate drainage of battery electrolyte may become a risk to human health and the environment (see [Appendix 4](#) – Human Health Hazards & Lead Exposure) because:

- It contains high lead levels as dissolved ions and suspended particles.
- It is highly corrosive and may cause burns to the skin if accidentally spilled.
- The high acidity of the battery electrolyte is detrimental to plant growth and may have other adverse effects on an eco system.

✓ Every single ULAB should be inspected for:

- Leaks
- Cracks in the battery casing
- Missing vent caps
- Leaking batteries, i.e. those spilling electrolyte, and these must be stored inside acid-resistant plastic containers.

✓ Test every ULAB

Electronic testing of every ULAB must be undertaken to determine whether the battery could be recharged and reused. This practice is a legitimate and worthwhile activity.

- Firstly, it ensures that any batteries still charged are identified and thereby reduces the risk of sparking during transit, as the ULAB can then be discharged.
- Secondly, if a ULAB just needs to be recharged to restore it to full service, then a lead acid battery can be returned to the market without the need for recycling, while at the same time, earning the ULAB collector additional income from the sale of a recharged battery. (See [Appendix 1](#) for battery testing methods)

- ✓ If ULAB are kept in freezing conditions, then there must be an inspection regime to check for split or cracked casing and electrolyte leakage.

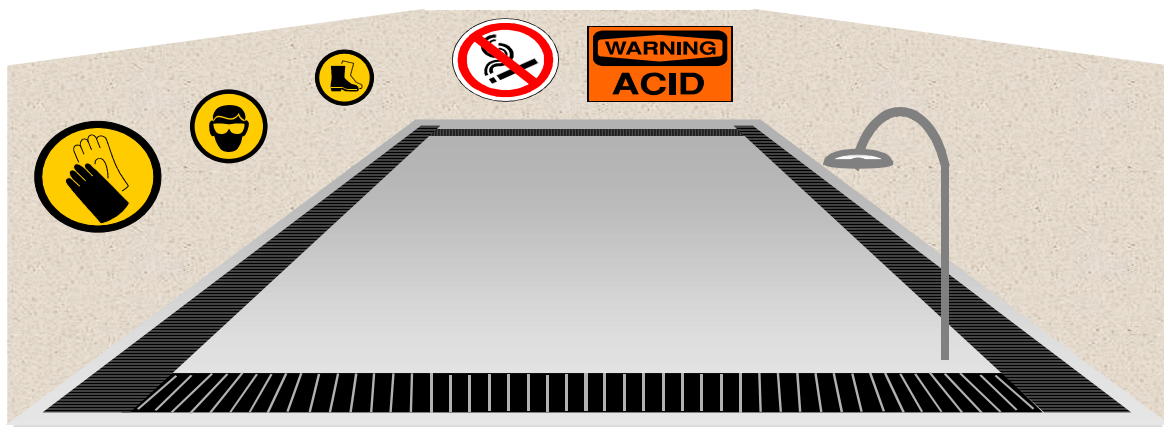


3.3 Storage Compound

Large quantities of ULAB must be stored in a secure compound to minimize the risk of accidental spillage, to allow any batteries found to be damaged or leaking to be contained and to provide a safe workplace.

The base of the storage area must be acid resistant concrete or some other suitable impermeable surface to prevent the ingress of any sulfuric acid that might leak from a ULAB or be spilled during handling.

“Impermeable surface” means a surface or pavement constructed and maintained to a standard sufficient to prevent the transmission of liquids beyond the surface of the floor.



Pic². 2 – A schematic of the inside of a model storage yard

If the store is under cover then an exhaust ventilation system must be installed, or simply a fast air renovation scheme, in order to avoid hazardous gas accumulation.

The storage area must have a clean water supply to clean the floors and drainage channels that run into the sealed drainage system and collection sump.

² Animated and embedded Powerpoint Slide Presentation - Use the right mouse button and click on the storage area; from the menu select "Presentation Object" and click on "Show" from the menu. Press "ESC" when the animation has finished to return to the Word document.

A sealed drainage system means a drainage system with impermeable components that does not leak and ensures that no liquid effluent will run off the floor area other than through the secondary containment drainage system, and that any liquid run off is collected in a sealed sump.

In order to distinguish between a local or retail ULAB collection and a licensed collection site, it is suggested that no more than one ton of ULAB can be kept for more than 180 days at single location, or some form of similar restriction appropriate to the premises.

4. Safety

Safety procedures must be observed and employees should be wearing appropriate neoprene or acid resistant overalls, goggles or safety glasses, neoprene gloves, neoprene boots.

- ✓ Respirators should be available to wear if necessary. Normally respirators are not required to be worn when handling whole, un-drained ULAB, but in those cases where the ULAB is broken, there is the potential risk of lead oxide dust from the dry battery blowing into the face of the operator when handling the ULAB.

All ULAB should be handled and stored on the basis that they are a potential fire-risk, due to the possible build up of explosive gasses if ULAB are stored in a confined unventilated container or room and that a battery might short-circuit accidentally and spark if it is not completely discharged. Therefore:

- ✓ Fire extinguishers, in compliance with local regulations must be on hand
- ✓ Operators must be trained in the use of Fire Extinguishers and/or hydrants.

In addition:

- ✓ It is essential to install an emergency shower for use when acid is accidentally sprayed onto the skin or in the eyes and for after care.
- ✓ First Aid kits with eye wash bottles and sterile solution must be available.
- ✓ A LAB Materials Safety Data Sheet (MSDS) must be readily available for Supervisors and workers to seek additional information about potential hazards and the appropriate corrective action in the event of an accident. (A typical and Generic MSDS is available in [Appendix 2](#))
- ✓ ULAB are heavy and workers must be trained in correct lifting techniques.

- X ULAB must not be stored by stacking them one on top of another because some makes of LAB are still manufactured to a design that leaves the terminals and the cell caps proud of the top of the battery, and there is a risk that the protruding terminal posts could puncture a battery case placed upon it. Such a puncture in the case will lead to acid leakage and risks to those handling the ULAB and the environment.
- X Do not smoke or eat in the vicinity or the battery storage areas.

5. Packaging of Used Lead Acid Batteries for transport to the Recycler

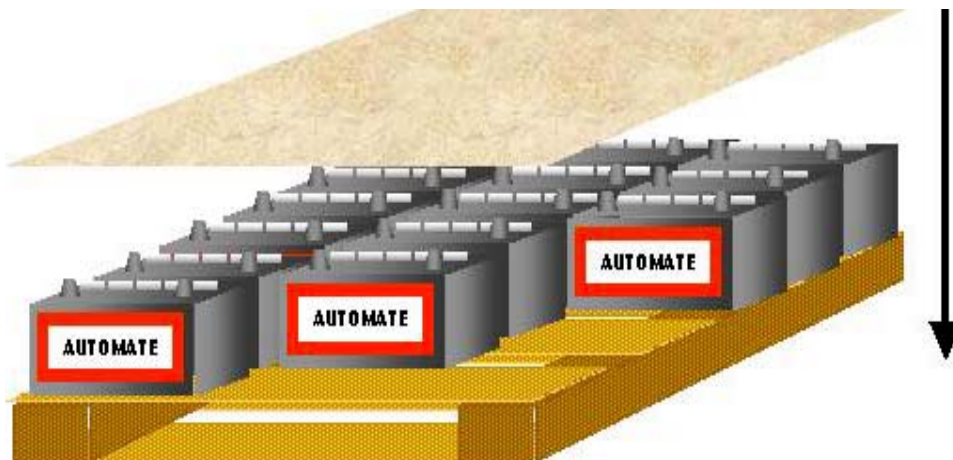
5.1 Inspection

Prior to packing all the ULAB must be inspected and checked for leaks and it is important to ensure that all the ULAB have the vent caps shut to avoid spillage during shipping. If possible, replace a missing vent cap or seal the inspection hole. Obtain a selection of caps from the nearest smelter or supplier and always have them readily available.

Damaged batteries can be transported with intact batteries, but must be contained in sealed plastic containers or drums.

5.2 Packing

- ✓ ULAB should be stacked onto wooden pallets no more than four high³ to minimize the risk that the stack will become unstable.
- ✓ Place ULAB of the same size in the separate layers to maintain stability.
- ✓ A sheet of corrugated heavy duty cardboard is placed between each layer of batteries to reduce movement, absorb any electrolyte that might spill and prevent the terminal posts from the batteries puncturing the plastic case of the battery stored above. Battery Retailers must retain the wooden pallet and the corrugated heavy duty cardboard that is used to pack new LAB for use in the packing process for ULAB.



Pic. 3⁴. – ULAB are placed on a wooden pallet and corrugated heavy duty cardboard is placed between each layer

- ✓ A sheet of corrugated heavy duty cardboard is also placed on top of the final layer of ULAB so that the palletized ULAB can be stored on top of each other.
- ✓ Finally, the whole stack is “shrink” wrapped as tight as possible in plastic to minimize any movement during transit.
- ✗ When storing palletized ULAB prior to transportation or shipment the layers of pallets should never be stacked more than two high.
- ✓ When the pallet is full, that is, four ULAB layers high, collection by the local smelting company, the scrap dealer or the transport company must be arranged.
- ✓ For any company that uses the metal cages to transport ULAB, a sheet of corrugated cardboard must be placed between each layer of ULAB to reduce the risk of spillage. Apart from that, the ULAB can be transported to the main collection center or recycler in the cages. The cage then needs to be returned to the drop off center or retailer for use again to collect more ULAB.

6. Transportation of ULAB

- ✓ ULAB must be categorized as hazardous waste when making the necessary arrangements to transport them to a recycler.
- ✓ ULAB must be transported in a sealed shock resistant container that will not leak any electrolyte in the event of unforeseen leakage.
- ✓ The vehicle used to transport the ULAB, whether it is a ship a truck or a van, must be correctly identified, following international conventions and local legislation using the appropriate symbols and colors to identify the fact that corrosive and hazardous waste is being transported.
- ✓ It is essential that prior to the transport of any ULAB the necessary legal forms are located, completed and where required, are sent to the appropriate authorities prior to the movement of the ULAB in compliance with Department of Transport regulations for the transport of ULAB. This means that in some countries, the containers with the ULAB must be properly labeled, and the ULAB placed in the truck, ship or van in a manner that will minimize the risk to acid leakage.

⁴ Animated and embedded Powerpoint Slide Presentation - Use the right mouse button and click on any of the batteries; from the menu select “Presentation Object” and click on “Show” from the menu. Press “ESC” when the animation has finished to return to the Word document.

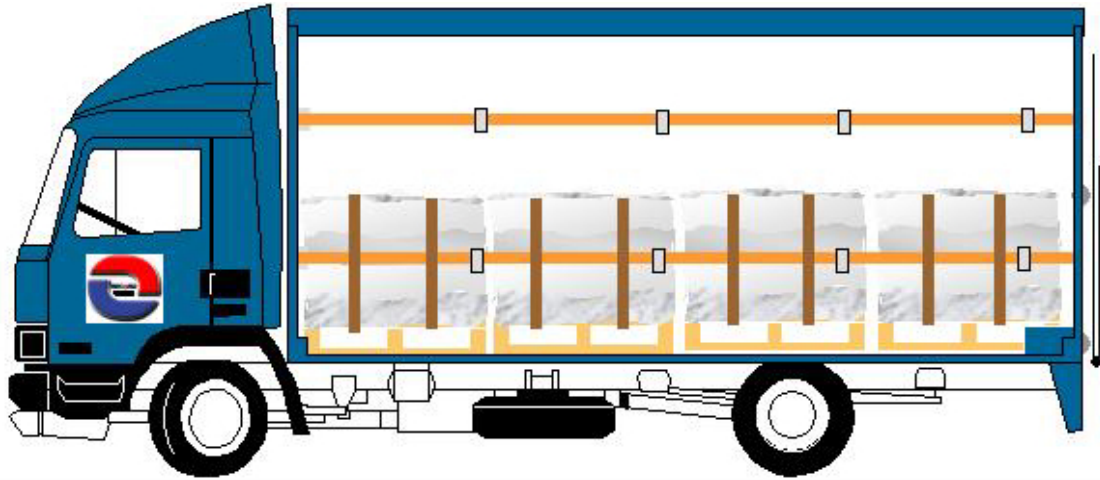
- ✓ Palletized ULAB loaded onto a container truck or a ship's hold, must be braced properly to prevent any damage, leakage of lead dust or battery fluid, or short circuits as the vehicle moves or a ship rolls.
- ✗ No other materials must be loaded or carried in the same truck or container as the ULAB.
- ✓ When all the ULAB are loaded and secured, the truck or container must then be sealed and locked.
- ✓ The pallets of ULAB or the cages must be secured to the inside of a truck using strapping attached to the battens inside the vehicle. Pallets or cages must be "snug" and any voids should be packed with wood or some other suitable material. Metal or wooden bracing should be used to block any movement of the pallets at the end of the vehicle. (See Pictures 4, 5, 6, 7 and 8)



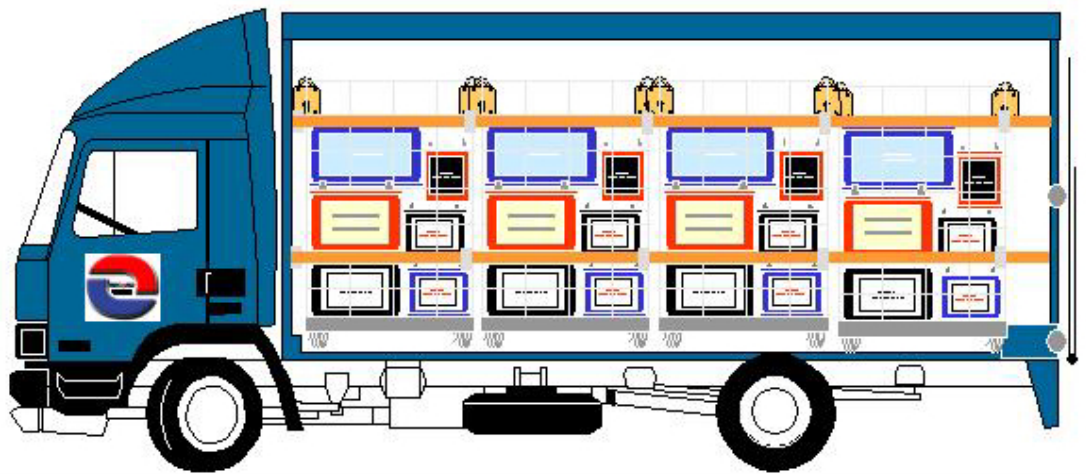
Pic. 4 – ULAB shrink-wrapped, palletized and strapped inside the truck.



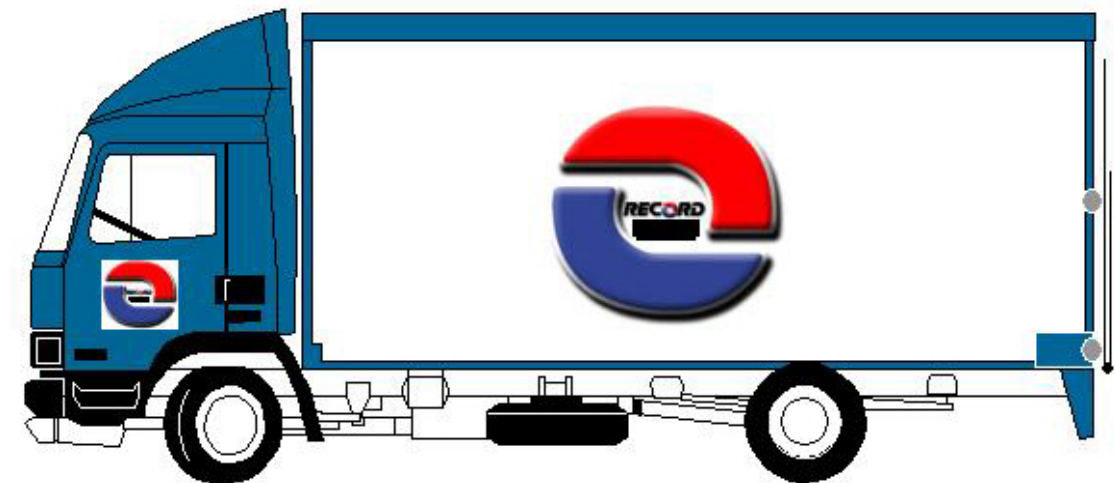
Pic. 5 – Properly blocked back row to prevent movement of the palletized ULAB



Pic. 6 – Purpose designed ULAB pick up truck showing palletized and shrink



wrapped ULAB secured by strapping to the inside battens ready for transit.
Pic. 7 – Purpose designed ULAB pick up truck with tailgate lift and racks for the wire cages that are secured to the wooden battens inside the truck for transit.



Pic⁵. 8 – Purpose designed ULAB pick up truck with the side down

- ✓ Similar procedures are recommended for packing shipping containers for the export of ULAB.
- ✓ A bill of lading (see [Appendix 3](#)) or Hazardous Waste Manifest matching the consent documentation for a transboundary movement will be required by the driver and that requires the following information:
 - Date of shipment
 - Description of waste - Used Lead Acid Batteries
 - The number of batteries included in the shipment
 - Transporter's name and address
 - The name and address of the recycling plant

7. Transport – Personal Health and Safety Requirements

- ✓ Each truck carrying ULAB should have the necessary equipment to combat any simple spillage or leakage problems.
- ✓ There must be personal protective equipment available to wear, such as goggles, gloves and neoprene boots.
- ✓ The appropriate authorities and emergency services must be notified of the transport route for truck loads of ULAB from collection centers and wherever possible a route should be chosen that minimizes the risk of possible accidents and avoids populated areas.
- ✓ Personnel involved in the transport of ULAB must be trained in hazardous waste emergency procedures, including fire, spillage and skin burns. It is also essential they know how to contact local and national emergency response teams.
- ✓ A truck containing ULAB must have a label on the truck and inside the cab displaying an emergency telephone number to call in the event of an emergency.
- ✓ If the ULAB are being transported out of the country then it will be necessary to comply with the Basel Convention's regulations for the transboundary movement of hazardous waste and have the appropriate export documents with the load of ULAB.

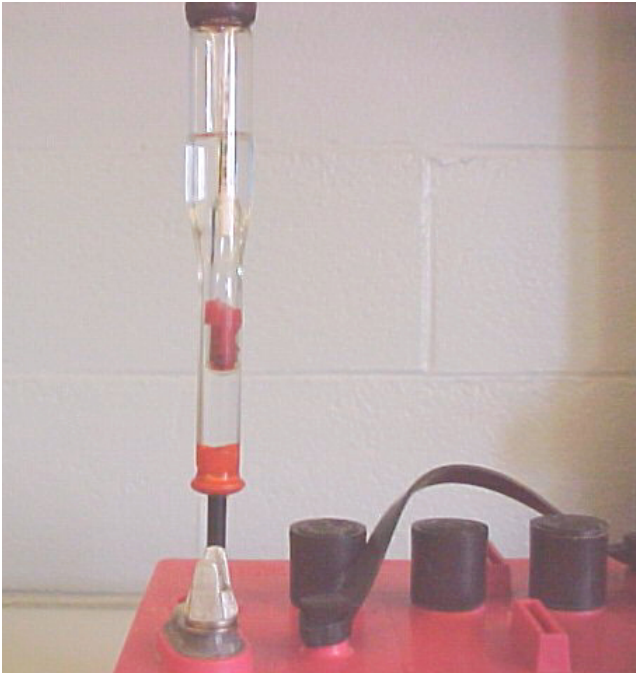
8. Communications

⁵ Animated Powerpoint Slide Presentation - Use the right mouse button and click on the "**Record**" logo; from the menu select "Presentation Object" and click on "Show". Press "ESC" when the animation has finished to return to the Word document.

Communications are a key element in securing public acceptance of, and co-operation in, schemes for the environmentally sound recovery of ULAB. Effective communication will fall into two main categories, information contained on battery labels and public awareness and education schemes. Please see the GL Standards for Battery Labels, Community Outreach Programs, and Public Communications and Awareness.

Testing a Lead Acid Battery

A battery can be tested in more than one way, but the easiest methods are to measure the specific gravity of the battery electrolyte and battery voltage. Specific gravity (SG) measurement requires the use of a temperature compensating hydrometer and to measure voltage the use of a digital D.C. Voltmeter is essential.



You must first have the battery fully charged. The surface charge must be removed before testing. If the battery has been sitting at least several hours (I prefer at least 12 hours) you may begin testing. To remove surface charge the battery must experience a load of 20 amps for at least 3 minutes. Turning on the headlights to high beam will be enough. After turning off the lights, the battery is ready to be tested.

A fully charged battery has SG of 1.255 to 1.280. Fully discharged batteries have a SG between 1.110 and 1.130.

State of Charge	Specific Gravity	Voltage	
		<u>12V</u>	<u>6V</u>
100%	1.265	12.7	6.3
*75%	1.225	12.4	6.2
50%	1.190	12.2	6.1
25%	1.155	12.0	6.0
Discharged	1.120	11.9	6.0



Hydrometer SG readings should not vary by more than .05 between cells. Note that the SG of sealed LAB cannot be measured unless the battery has a built in hydrometer. Most well designed maintenance free batteries have a built in hydrometer that measures the SG of cell 1 of 6. However, it is possible to get a good reading from cell 1 and have a problem with other cells in the battery.

The sulfation of battery grids starts when the specific gravity falls below 1.225 or the voltage measures less than 12.4 (12v Battery) or 6.2 (6 volt battery). Sulfation hardens the surface of the battery plates reducing and eventually the battery's ability to discharge and be recharged.



Load testing is yet another way of testing a battery by removing amps from a battery to simulate starting an engine. Some battery companies display the amp load for testing on the battery label. A load test can only be performed if the battery is near or at full charge.



The results of your testing should be as follows:

Digital Voltmeters are recommended and should display the voltage is shown in the table above. The sealed valve regulated battery's voltage will be slightly higher in the 12.8 to 12.9 ranges. Voltage readings displayed in the 10.5 volts range on a charged battery indicate a shorted cell and that the battery should be replaced and sent to the recycler.

1. Identification of Waste Materials and the Company

Product	Used Lead Acid Battery
Product Name	Jack Tarr Automotive Battery
Importer	The Best Recycling Company
Technical/Emergency Support	Telephone Numbers

2. Composition/Information about the Materials in Transit

Main components	Lead, Lead Sulfate, Sulfuric Acid (20%)
Other components	Polypropylene,

3. Hazard Identification

Lead Acid Battery	Electrical hazard if short circuited. Battery can produce high current if the positive and negative terminals are short circuited which can result in sparks leading to fire hazard. Maximum Voltage per battery 12 Volts.
Constituents	Lead and Lead Alloys toxic if ingested. Sulfuric Acid – corrosive. If the battery case is broken acid leaks can damage skin and eyes on contact. Damage will also occur if in contact with materials and clothing.

4. First Aid Measures

Sulfuric Acid	Skin contact – flush with water, seek medical assistance if contact area is large or blisters form. Eye contact – flush with plenty of water until medical assistance is provided. Ingestion – flush mouth with water – give patient milk or sodium bicarbonate solution until medical assistance arrives.
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5. Fire-Fighting Measures

In the event of fire	Keep containers cool by spraying with water The plastic components may release toxic fumes, advisable to wear breathing apparatus.
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6. Accidental Release Measures

Damaged batteries	<p>Use goggles, rubber gloves and protective clothing to prevent direct contact with hazardous substances.</p> <p>Have eyewash bottle and clean water available.</p> <p>Put any damaged items into a plastic acid proof container and identify as a corrosive hazard.</p> <p>Dilute any spillage with clean water and neutralize with sodium bicarbonate.</p>
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7. Handling and Storage

Precautions	<p>Store in cool dry conditions out of direct sunlight.</p> <p>When packed for transport the terminals should always be protected from short circuit. Do not store with items that could cause short circuit. Prevent sparks and naked flames in the vicinity.</p> <p>Wear protective footwear - the batteries are heavy.</p>
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8. Exposure Control & Personal Protection

Precautions	<p>Do not remove any ULAB from the packing or the containers.</p> <p>Wear neoprene gloves when handling the packed batteries or any of the containers with ULAB.</p> <p>Wear protective footwear - the batteries are heavy.</p>
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9. Physical and Chemical Properties

Lead-Acid Battery	Some sealed and will not spill, some liable to leak.	
Lead	Appearance: Colour: Odour: Flammability: Density: Solubility: Melting Point: °C (Boiling)	Solid Silver-grey metal None None 11.34 None 327.4 °C
Lead Sulfate	Appearance: Colour: Odour: Flammability: Density: Solubility: (15°C) Melting Point: °C (Boiling)	Powder White None None 6.2 40mg/l 1,070

Lead Dioxide	Appearance: (compressed as solid) Colour: Odour: Flammability: Density: Solubility: Melting Point:(Boiling)	Powder Brown None None 9.4 None 290° C
Sulphuric Acid	Appearance: Colour: Odour: Flammability: Density: Solubility: Melting Point:	Liquid Colourless Acidic None 1.3 approx. 100% 114°C approx. (Boiling)
Plastics	Appearance: Colour: Odour: Flashpoint: Density: Solubility: Softening point	Solid Various None 400°C 0.9 – 2.6g.cm ³ at 25°C None 95°C

10. Stability and Reactivity

Lead	Oxidizes (If battery case split and lead is exposed)
Sulfuric Acid	Corrosive
Plastic	Combustible

11. Toxicology

Lead and Lead Compounds	Toxic if ingested - seek medical help
Sulfuric Acid	Corrosive and irritant

12. Environmental

Lead Acid Battery	Do not dispose of battery in household/domestic waste. Return complete battery for recycling. Under no circumstances incinerate.
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13. Recycling

Lead Acid Battery	Local regulations apply – consult Environment Agency for nearest recycling ULAB collection center.
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14. Transport Regulations

Lead Acid Battery	Local/National/International regulations apply.
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Sample Bill of Lading

Date:	
Number of batteries:	
Transporter's Name and Address:	
Receiving Location's Name and Address:	
Generator's Name and Address:	
Keep Bill of Lading for <u>(insert time period here)</u> years	

