

Battery Rescue

Report on Transport of Used Lead acid batteries in UNISEG Pallets.

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Overview

Battery Rescue has developed a collapsible plastics battery box (UNISEG Pallet) for collecting and transporting used lead acid batteries for disposal. This report is a review of the suitability of the UNISEG Pallet (battery box) for its intended purpose with respect to the requirements of the Australian Dangerous Goods Code 7th Edition (ADG7). The report also comments on typical methods of transport in current use and the levels of compliance and the safety enhancements from the transport method proposed by Battery Rescue.

It is my opinion that the transport method described by Battery Rescue of a plastics box with a reservoir to contain any leaked free liquid, the UNISEG Pallet, complies with the current requirements of ADG7 and the United Nations Model Regulations for Transport of Dangerous Goods 18th Rev for the transport of used lead acid batteries (UN2794).

Transport Requirements (ADG7)

Packing Instruction P801 and Special Provision 295 apply to the transport of UN2794, BATTERIES, WET, FILLED WITH ACID, electric storage. These provisions in ADG7 for used batteries are identical with those in the United Nations Model Regulations 18th Rev.

The attached photographs show how batteries (UN2794 and others) are typically collected and transported in Australia currently.

The tables below show the requirements of Packing Instruction P801 and Special Provision 295 as they apply to UN2794 BATTERIES, WET, FILLED WITH ACID, electric storage.

Requirements of P801

P801 PACKING INSTRUCTION P801

This instruction applies to new and used batteries assigned to UN Nos. 2794, 2795 or 3028. The following packagings are authorized, provided the general provisions of 4.1.1, except 4.1.1.3, and 4.1.3 are met:

- (1) Rigid outer packagings;
- (2) Wooden slatted crates;
- (3) Pallets.

Used storage batteries may also be transported loose in stainless steel or plastics battery boxes capable of containing any free liquid.

Additional requirements:

1. Batteries must be protected against short circuits.

Comments

The transport method will apply only to UN2794 (lead acid batteries)

See comments on 4.1.1 and 4.1.3 below

Not proposed

Not proposed

Plastics battery box integrated into pallet

The proposed packaging method comprises a robust, lockable, plastics box mounted on a pallet base that contains a reservoir to collect any spilled liquid.

See Note 1

Given the allowance to transport used batteries loose in plastics battery boxes, these additional requirements do not apply, however Battery Rescue will comply with them as indicated below. Short circuit protection is provided by limiting the possibility of batteries' terminals coming into contact with each other. Batteries are packed side-by-side, in layers with minimal chance of movement. The short circuit protection is more effective than the current recommended ABRI method. .

See also Note 2

2. Batteries stacked must be adequately secured in tiers separated by a layer of non-conductive material.

Batteries are transported “loose” in plastics UNISEG pallet. The construction of the box and method of stacking secures the batteries in position and the non-conductive base of batteries is an effective non-conducting material between layers. See Note 1

3. Battery terminals must not support the weight of other superimposed elements.

The allowance to transport loose in plastics boxes and the provision of the pallet bunding makes this requirement redundant. The design of the UNISEG Pallet provides enhanced safety and environmental protection.

4. Batteries must be packaged or secured to prevent inadvertent movement.

The cardboard separator currently permitted under the ABRI standard is completely ineffectual for supporting superimposed loads.

Special Packing Provision:

The UNISEG Pallets are designed to meet this requirement.

PP1A For road or rail transport only within Australia: it is permissible to dispense with outer packagings for batteries provided the provisions of the above ‘additional requirements’ are met.

Based on the wording of the packaging method allowing the transport of loose batteries (used) in plastics battery boxes, this requirement in PP1A applies to new but not to used batteries.

Battery Rescue proposes that its packaging method provides a greater level of safety and environmental protection than currently approved methods (eg, ABRI)

NOTES

Note 1

Battery Rescue has studied the transport of used batteries and has found they are typically transported loose in plastics boxes and the amount of spillage is of the order of 20 L. (This equates to approximately seven batteries of a typical load of 60 batteries. Consequently it has designed the spillage capacity of its UNISEG Pallet to hold 25 L, which should allow an ample safety margin.

Note 2

The current non-conductive material in use (as prescribed by ABRI) is cardboard. This material becomes conductive immediately it becomes wet, which is typical for most transport operations. It is therefore completely ineffectual for its intended purpose.

The photographs show examples of typical battery transport: batteries are mixed by type and size; they are not separated by any materials and terminals are not protected. Though this is clearly contrary to the requirements of the ADG Code, the accident reports (or lack thereof) indicate that there is a high margin of safety for battery transport.

Additional Requirements (Special Provision 295)

Special Provision 295	
Batteries need not be individually marked and labelled if the pallet bears the appropriate mark and label.	The pallet cage will be labelled as required by the ADG Code.

General Provisions 4.1.1

The application of packaging method P801 to used batteries is conditional upon ADG7 general provisions of 4.1.1, except 4.1.1.3, and 4.1.3 being met. These conditions are set out below.

ADG7	General Provisions of 4.1.1	Comments
4.1.1.1	Dangerous goods must be packed in good quality packagings, including IBCs and large packagings, which must be strong enough to withstand the shocks and loadings normally encountered during transport, including trans-shipment between transport units and between transport units and warehouses as well as any removal from a pallet or overpack for subsequent manual or mechanical handling.	Batteries are articles and are being transported for disposal and recycling of the contents. The UNISEG pallets are of good quality and are strong enough to withstand the shocks and loadings normally encountered during transport and for unloading of the contents at the recycling centre.
	Packagings, including IBCs and large packagings, must be constructed and closed so as to prevent any loss of contents when prepared for transport which may be caused under normal conditions of transport, by vibration, or by changes in temperature, humidity or pressure (resulting from altitude, for example).	If there is any loss of contents it will be contained by the UNISEG pallet bunding. See also 4.1.1.5.
	Packagings, including IBCs and large packagings, must be closed in accordance with the information provided by the manufacturer.	The closure method has been designed to only close one way to ensure that it is done properly.
	No dangerous residue must adhere to the outside of packages, IBCs and large packagings during transport.	Batteries will be clean of residues when loaded and will be unloaded by trained personnel at the recycling point.
	These provisions apply, as appropriate, to new, reused, reconditioned or remanufactured packagings, and to new, reused, repaired or remanufactured IBCs, and to new or reused large packagings.	The batteries are used, being transported for recycling.
4.1.1.2	Parts of packagings, including IBCs and large packagings, which are in direct contact with dangerous goods:	
(a)	must not be affected or significantly weakened by those dangerous goods; and	The batteries are designed to this standard. The UNISEG pallet is plastics; unaffected by acid or alkali.
	(b) must not cause a dangerous effect e.g. catalysing a reaction or reacting with the dangerous goods.	The UNISEG pallet is plastics; unaffected by acid or alkali.
	Where necessary, they must be provided with a suitable inner coating or treatment.	The UNISEG pallet is plastics; unaffected by acid or alkali.
4.1.1.3	Unless provided elsewhere in this Code, each packaging, including IBCs and large packagings, except inner packagings, must conform to a design type successfully tested in accordance with the requirements of 6.1.5, 6.3.2, 6.5.6 or 6.6.5, as applicable. However, IBCs manufactured before 1 January 2011 and conforming to a design type which has not passed the vibration test of 6.5.6.13 may still be used.	Not relevant to this application (see exception in P801).

ADG7	General Provisions of 4.1.1	Comments
4.1.1.4	When filling packagings, including IBCs and large packagings, with liquids, sufficient ullage (outage) must be left to ensure that neither leakage nor permanent distortion of the packaging occurs as a result of an expansion of the liquid caused by temperatures likely to occur during transport. Unless specific requirements are prescribed, liquids must not completely fill a packaging at a temperature of 55°C. However, sufficient ullage must be left in an IBC to ensure that at the mean bulk temperature of 50°C it is not filled to more than 98% of its water capacity.	All batteries comply with this requirement.
	4.1.1.4.1 For air transport, packagings intended to contain liquids must also be capable of withstanding a pressure differential without leakage as specified in the international regulations for air transport.	Not relevant to this application. Air transport not contemplated.
4.1.1.5	Inner packagings must be packed in an outer packaging in such a way that, under normal conditions of transport, they cannot break, be punctured or leak their contents into the outer packaging.	Batteries are articles and the transport method proposed is intended to provide a better method of achieving the intent of this requirement than methods currently in use.
	Inner packagings containing liquids must be packaged with their closures upward and placed within outer packagings consistent with any orientation markings (see 5.2.1.7).	Batteries are articles, so outer packagings are not applicable. Articles will be transported with closures upward and restrained in the outer box.
	Inner packagings that are liable to break or be punctured easily, such as those made of glass, porcelain or stoneware or of certain plastics materials, etc., must be secured in outer packagings with suitable cushioning material. Any leakage of the contents must not substantially impair the protective properties of the cushioning material or of the outer packaging.	Leakage will not impair the outer UNISEG pallet. The secondary containment will ensure no uncontrolled leakage from the batteries.
4.1.1.5.1	Where an outer packaging of a combination packaging or a large packaging has been successfully tested with different types of inner packagings, a variety of such different inner packagings may also be assembled in this outer packaging or large packaging.	The UNISEG pallet is designed to transport a wide variety of lead acid batteries.
	In addition, provided an equivalent level of performance is maintained, the following variations in inner packagings are allowed without further testing of the package:	Not applicable; batteries are articles.
(a)	Inner packagings of equivalent or smaller size may be used provided:	
(i)	The inner packagings are of similar design to the tested inner packagings (e.g. shape - round, rectangular, etc.);	Not applicable; batteries are articles.
(ii)	The material of construction of the inner packagings (glass, plastics, metal, etc.) offers resistance to impact and stacking forces equal to or greater than that of the originally tested inner packaging;	Not applicable; batteries are articles, however, the materials of construction of the UNISEG Pallet are resistant to adverse effects from impact and stacking forces.
(iii)	The inner packagings have the same or smaller openings and the closure is of similar design (e.g. screw cap, friction lid, etc.);	Batteries will all be rectangular prismatic lead acid batteries.

ADG7	General Provisions of 4.1.1	Comments
(iv)	Sufficient additional cushioning material is used to take up void spaces and to prevent significant movement of the inner packagings; and	Batteries will all be rectangular prismatic lead acid batteries. There should be minimal movement within the UNISEG pallet.
(v)	Inner packagings are oriented within the outer packaging in the same manner as in the tested package.	Batteries are articles, not packagings, however they will be loaded base down, with terminals upwards.
(b)	A lesser number of the tested inner packagings, or of the alternative types of inner packagings identified in (a) above, may be used provided sufficient cushioning is added to fill the void space(s) and to prevent significant movement of the inner packagings.	Batteries will all be rectangular prismatic lead acid batteries. There should be minimal movement.
4.1.1.6	Dangerous goods must not be packed together in the same outer packaging or in large packagings, with dangerous or other goods if they react dangerously with each other.	There should be no other batteries present.
4.1.1.7	The closures of packagings containing wetted or diluted substances must be such that the percentage of liquid (water, solvent or phlegmatizer) does not fall below the prescribed limits during transport.	Not relevant.
4.1.1.7.1	Where two or more closure systems are fitted in series on an IBC, that nearest to the substance being carried must be closed first.	Not relevant
4.1.1.8	Where pressure may develop in a package by the emission of gas from the contents (as a result of temperature increase or other causes), the packaging or IBC, may be fitted with a vent, provided that the gas emitted will not cause danger on account of its toxicity, its flammability, the quantity released, etc.	Not relevant
	A venting device must be fitted if dangerous overpressure may develop due to normal decomposition of substances. The vent must be so designed that, when the packaging or IBC is in the attitude in which it is intended to be transported, leakages of liquid and the penetration of foreign substances are prevented under normal conditions of transport.	Not relevant
4.1.1.8.1	Liquids may only be filled into inner packagings which have an appropriate resistance to internal pressure that may be developed under normal conditions of transport.	Not relevant
4.1.1.8.2	Venting of the package is not permitted for air transport.	Not relevant
4.1.1.9	New, remanufactured or reused packagings, including IBCs and large packagings, or reconditioned packagings and repaired or routinely maintained IBCs must be capable of passing the tests prescribed in 6.1.5, 6.3.2, 6.5.6 or 6.6.5, as applicable. Before being filled and handed over for transport, every packaging, including IBCs and large packagings, must be inspected to ensure that it is free from corrosion, contamination or other damage and every IBC must be inspected with regard to the proper functioning of any service equipment. Any packaging, which shows signs of reduced strength as compared with the approved design type must no longer be used or must be so reconditioned, that it is able to withstand the design type tests.	This does not strictly apply to batteries being transported for disposal, however the principles will be followed: Batteries will be loaded into the UNISEG Pallet by the consignor; The carrier will inspect the UNISEG pallet before loading to ensure that it is free from corrosion, contamination or other damage; If the UNISEG pallet shows any sign of damage or reduced strength it will not be transported.

ADG7	General Provisions of 4.1.1	Comments
	Any IBC which shows signs of reduced strength as compared with the tested design type must no longer be used or must be so repaired or routinely maintained that it is able to withstand the design type tests.	
4.1.1.10	Liquids must be filled only into packagings, including IBCs, which have an appropriate resistance to the internal pressure that may develop under normal conditions of transport. Packagings and IBCs marked with the hydraulic test pressure prescribed in 6.1.3.1(d) and 6.5.2.2.1, respectively, must be filled only with a liquid having a vapour pressure:	Does not apply to articles (batteries).
(a)	such that the total gauge pressure in the packaging or IBC (i.e. the vapour pressure of the filling substance plus the partial pressure of air or other inert gases, less 100 kPa) at 55°C, determined on the basis of a maximum degree of filling in accordance with 4.1.1.4 and a filling temperature of 15°C, will not exceed two thirds of the marked test pressure; or	Does not apply
(b)	at 50°C less than four sevenths of the sum of the marked test pressure plus 100 kPa; or	Does not apply
(c)	at 55°C less than two thirds of the sum of the marked test pressure plus 100 kPa.	Does not apply
	IBCs intended for the carriage of liquids must not be used to carry liquids having a vapour pressure of more than 110 kPa (1.1 bar) at 50°C or 130 kPa (1.3 bar) at 55°C.	Does not apply
4.1.1.11	Empty packagings, including IBCs and large packagings, that have contained a dangerous substance, must be treated in the same manner as is required by this Code for a filled packaging, unless adequate measures have been taken to nullify any hazard.	Does not apply
4.1.1.12	Every packaging as specified in Chapter 6.1 intended to contain liquids must successfully undergo a suitable leakproofness test, and be capable of meeting the appropriate test level indicated in 6.1.5.4.3:	Does not apply to articles.
(a)	before it is first used for transport, except as permitted by 4.1.1.12.1;	Does not apply to articles.
(b)	after remanufacturing or reconditioning of any packaging, before it is re-used for transport;	Does not apply to articles.
	For this test the packaging need not have its closures fitted. The inner receptacle of a composite packaging may be tested without the outer packaging, provided the test results are not affected. This test is not necessary for inner packagings of combination packagings or large packagings.	Does not apply to articles.
4.1.1.12.1	Except where tested in accordance with 4.1.1.12, the leakproofness of tinplate cans constructed in accordance with AS 2854 and having a capacity not exceeding 15 L must be assured in accordance with a quality management system that complies with AS/NZS ISO 9001 or equivalent.	Does not apply to articles.
4.1.1.13	Packagings, including IBCs, used for solids which may become liquid at temperatures likely to be encountered during transport must also be capable of containing the substance in the liquid state.	Does not apply to articles.

ADG7	General Provisions of 4.1.1	Comments
4.1.1.14	Packagings, including IBCs, used for powdery or granular substances must be siftproof or must be provided with a liner.	Does not apply to articles.
4.1.1.15	For plastics drums and jerricans, rigid plastics IBCs and composite IBCs with plastics inner receptacles, unless otherwise exempted by the competent authority, the period of use permitted for the transport of dangerous substances is five years from the date of manufacture of the receptacles, except where a shorter period of use is prescribed because of the nature of the substance to be transported.	Does not apply to articles.

General Provisions 4.1.3

ADG7	General Provisions of 4.1.3 concerning Packing Instructions	Comments
4.1.3.1	Packing instructions applicable to dangerous goods of Classes 1 to 9 are specified in 4.1.4 ...	Calls up P801, which is assessed above
4.1.3.2	This is the head of power for P801.	
4.1.3.3	Information for packagings	Not relevant for articles.
4.1.3.4	Prohibition on certain packages where the contents may become liquid.	Not relevant
4.1.3.5	Authority applicable to variations for inners in approved outers	Not relevant
4.1.3.6	Pressure receptacles for liquids and solids	Not applicable
4.1.3.7	Use of alternative packagings	Not applicable
	Packagings or IBCs not specifically authorized in the applicable packing instruction must not be used for the transport of a substance or article unless specifically determined by the competent authority and provided:	Proposed packaging is within the scope of the applicable packing instruction (P801).
(a)	the alternative packaging complies with the general requirements of this Part; and	See General requirements (4.1.1.) above
(b)	when the packing instruction indicated in the Dangerous Goods List so specifies, the alternative packaging meets the requirements of Part 6; and	No requirement in P801
(c)	the competent authority determines that the alternative packaging provides at least the same level of safety as if the substance were packed in accordance with a method specified in the particular packing instruction indicated in the Dangerous Goods List; and	Not an alternative packaging.
(d)	a copy of the competent authority determination accompanies each consignment or the transport document includes all information required under the determination.	Not applicable
	<i>NOTE: The competent authorities making such determinations should take action to amend this Code to include the provisions covered by the determination as appropriate</i>	
4.1.3.8	<Reserved>	
4.1.3.9	Reprocessed steel drums ...	Not applicable

Ken Price
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 23 December 2015

Attachments: Photographs

Typical battery storage pending disposal from mine (Australia)

