

Committee of Experts on the Transport of Dangerous Goods and on the Globally Harmonized System of Classification and Labelling of Chemicals

Sub-Committee of Experts on the Transport of Dangerous Goods

30 November 2012

Forty-second session

Geneva, 3 – 11 December 2012

Item 9 of the provisional agenda

Programme or work for the biennium 2013–2014

Comments on document ST/SG/AC.10/C.3/2012/95 and UN/SCETDG/42/INF.29

Transmitted by the expert from France

1. France welcomes the efforts made by PRBA and RECHARGE to find proper requirements for transporting damaged or defectives batteries. Obviously there is urgent need to define specific requirements for batteries that cannot be transported otherwise.
2. The proposal in document ST/SG/AC.10/C.3/2012/95 has been substantially improved compared to former proposals and takes care of many concerns expressed during the last meeting of the sub-committee.
3. France would be ready to support such proposal for adoption. However we would like to offer two comments for consideration by the sub-committee:
 - The first comment consist in a proposal for minor improvement in the text of the packing instructions
 - The second comment is related to procedures for inerting batteries that should be used in extreme cases.

Comment 1

In instructions P9XX and LP9XX the following section appears:

“Each cell or battery or equipment containing such cells and batteries:

1. *Shall be individually packed in an inner packaging and placed inside of an outer packaging. The inner packaging shall be surrounded by sufficient thermal insulation (e.g., non combustible and non conductive cushioning material) to protect against a dangerous evolution of heat; or*
2. *Shall be individually packed in an inner packaging that is made from non-combustible, non-conductive material and placed inside an outer packaging that is made from non-combustible material.*

Appropriate measures shall be taken to prevent movement of the cells or batteries within the package that may lead to further damage and a dangerous condition during transport. Cushioning material that is non-combustible and non-conductive may also be used to meet this requirement.”

This appears to be taken from standard text in the model rules, but exactly because of that it leads to packing instruction that are actually very basic and do not define sufficiently the additional level of safety needed in this special case.

In particular point 2. allows packaging designs that are far less strong as the examples shown in INF 29 the packing instruction shall in any case ensure:

- Protection against shock, vibration and movement;
- Heat transfer from the outside to the inside (as well as reverse) and from one battery inside the package to another;
- Non combustibility of the material, shall be clearly defined both to ensure the level of safety and to avoid further inspection issues;

This is because the battery is no more proven to resist such abuses (non conformity to a tested design type)

The issue of assessing non combustibility is a little bit complex as there doesn't seem to be an internationally recognized standard. But referring to a standard recognized in the country of packaging should help and be anyway better than assessing this differently depending on the opinion of each local roadside check authority.

Proposal

In each packing instruction replace the above mentioned section by the following text:

“Each cell or battery or equipment containing such cells and batteries:

- 1. Shall be individually packed in an inner packaging and placed inside of an outer packaging made of non-combustible material.*
- 2. Each inner packaging shall be surrounded by sufficient thermal insulation to protect against a dangerous evolution of heat.*
- 3. Appropriate measures shall be taken to minimize the effects of vibrations and shocks, prevent movement of the cells or batteries within the package that may lead to further damage and a dangerous condition during transport. Cushioning material that is non-combustible and non-conductive may also be used to meet this requirement.*
- 4. Non combustibility shall be assessed according to a standard recognized in the country of packing. [(eg. EN 13501 in the European Union)]”*

Comment 2

The requirements proposed in document ST/SG/AC.10/C.3/2012/95 are probably suitable to deal with 80% to 90% of the situations for the transport of defective batteries. However in some extreme case they will probably not suffice. For example if a battery is in such a condition that a violent reaction is highly probable during transport even the packaging defined in the the document would not be able to withstand such reaction. In some emergency cases a battery would need to be evacuated and the required sophisticated packaging would not be immediately available.

Therefore the expert from France recommends to keep the item of defective batteries on the agenda for the next biennium even in case of the adoption of the proposals. This to allow the development of an additional procedure for making a battery electrically inert.

Some manufacturers have already developed in house procedures for their own needs. Unfortunately work is not advanced enough to propose some text ready for adoption by the sub-committee. The expert from France is ready to work on such proposal with the help of the different industry associations involved.

“Inerting” means that a battery is discharged in such a way that all risks of thermal and electrical runaway are eliminated. At this stage the battery can no more be charge again and used. (in principle under a certain voltage a battery cannot be charged again anymore and is therefore no more liable to create any reaction)

At least two types of procedures could be envisaged:

1. “Inerting” through immersion:

In this case the procedure shall define:

- The type of conductive solution (electrolyte, concentration...)
- The duration
- The expected result after immersion: voltage at the terminal of elements in the battery.

2. “Inerting” through discharge with an external load.

- In this case the procedure shall define:
 - the way the discharge takes place;
 - the tension of each element at the end of the discharge;

To illustrate what is could be achieved a procedure established by “Saft” is annexed to this document as an example.

The expert from France wishes to express his special thanks to “Saft” for this help.



FICHE D'INSTRUCTIONS

Annexe 1 à NS 1 001 105 o

OPERATIONS :

N° FI: **575536**

Inertage des éléments, modules et batteries Li-Ion:

INDICE N°:

SECTION N°: **X6**

RIKS APPROPRIATE WITH THE OPERATION



ELECTRICAL HAZARD



EXPLOSIVE GAZ RELEASE



ENVIRONNEMENT HAZARD

CAUTIONS TO BE TAKEN INTO ACCOUNT



NO SMOKING



NO FLAME

MANDATORY PROTECTIONS FOR THE OPERATION



SAFETY SHOES



ELECTRICAL PROTECTION GLASSES



COAT



GLOVES



CONSIGNES PARTICULIERES :

See in the text of the work instruction.

ELECTRICAL HANDLING AUTHORIZATION/CERTIFICATION

	FICHE D'INSTRUCTIONS	Annexe 1 à NS 1 001 105 o	
	OPERATIONS :	N° FI:	575536
	Inertage des éléments, modules et batteries Li-Ion:	INDICE N°:	
		SECTION N°:	X6

1. Purpose





The procedure defined in this document must be used to inert the lithium ion cells, modules and batteries electrically, in order to be allowed to consider them as waste.

This inerting is definitive. It is not possible anymore to use a battery which has been submitted to this procedure.



It is highly recommended to read the inerting procedure in its whole before proceeding to the start of any operation.

2. Definitions / Rules

	According to the maximal voltage which can be present between the battery terminals, some steps of this procedure must be done by people who have got the legal authorizations to work on such voltages. These steps are marked with the symbol "electric hazard" in the column "Hazards". Each person working on the batteries must check if they have the legal authorizations.
	Some steps of this procedure can create gas exhaust, which can be explosive. These steps are marked with the symbol "Burst hazard" in the column "Hazards".
	Because some steps of this procedure can create gas exhaust, which can be explosive, no source of ignition must be present.
	Some steps of the procedure are related to the protection against environmental hazard.
Battery	For practical purpose, the wording "battery" in the text of this work instruction means one or several lithium ion cell, module, battery or battery system.

3. Needed equipment

Before using this procedure, check that the following equipment is available:

#	Equipment	Quantity
1	Inerting box	In accordance with the quantity of products to be inerted. This box must be large enough to contain the products completely immersed.
2	Tap water	Enough to allow the filling of the box.
3	Salt	Not less than 10g per liter
4	Protections	Gloves, glasses with a peak, work cloth, safety shoes



FICHE D'INSTRUCTIONS

OPERATIONS :

Inertage des éléments, modules et batteries Li-Ion:

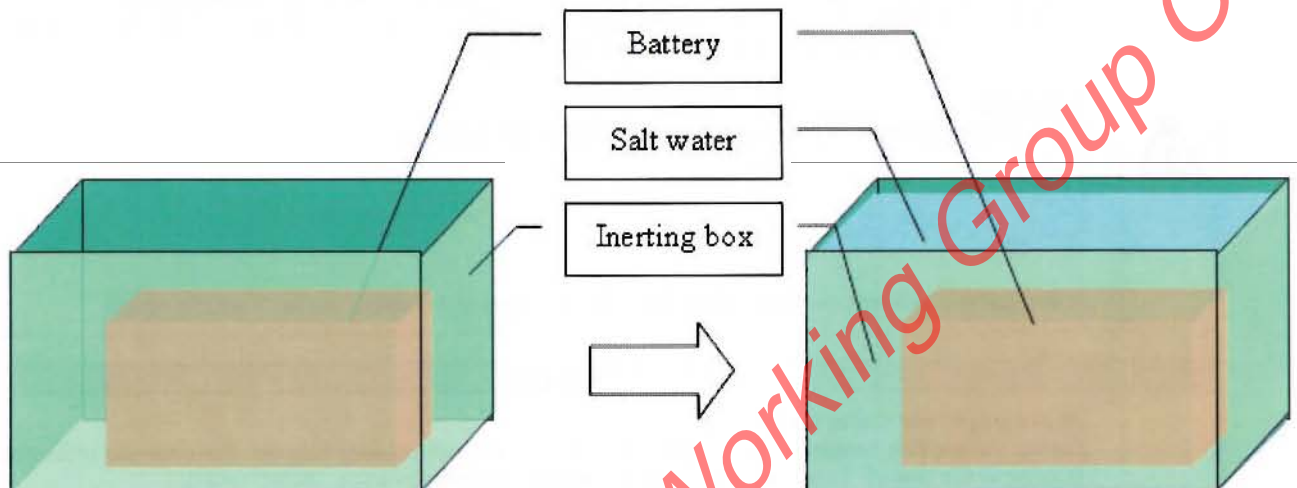
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4. System schematic



5. Batteries inerting

Hazard	#	Step
Inerting setting up		
-	1	Place the inerting box on an aired and rain-protected area.
	2	Check that there is some voltage between the terminals of the battery that are in contact with the liquid or that the electrical circuit is fully in contact with the liquid. In case there is no voltage and the liquid has no access to the electrical circuit of the battery (it may be the case of a watertight battery) some access of the liquid to the electrical circuit must be made. This may be performed by opening the case of the battery for example. In case of doubt on the way to process Saft must be contacted.
	3	Put the battery into the inerting box
-	4	Add salt in the bottom of the inerting box. The minimum quantity of salt must be 10g per liter of water to be added (cf. step 5).
Inert the battery		
 	5	Fill in the inerting box with cold tap water. The battery must be completely immersed into the water; no part of the battery must remain outside of the water. Some gas bubbles can be seen on the terminals. Exhausting gas are: - Hydrogen on the anode (negative terminal). Be careful, this gas may cause an explosion if there is a spark of a flame. - Oxygen on the cathode (positive terminal).
	6	Wait for the end of the inerting. The inerting is finished when the gas formation stops. The time length for the inerting operation may vary according to the type of battery and the time length for discharge. A battery inerting can last between 24 hours and 1 week.

	FICHE D'INSTRUCTIONS		Annexe 1 à NS 1 001 105 o	
	OPERATIONS :		N° FI:	575536
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Hazard	#	Step
Check the inerting		
		<p>Remove the battery from water and check the voltage between the terminals of the battery. The voltage between the terminals of an inerted cell is below 0.5V. The voltage between the terminals of a battery containing N inerted cells in series is below 0.5 x N.</p> <p>Example : For a battery containing 2 branches in parallel of 7 cells in series : $N = 7$ $\Leftrightarrow 0.5 * N = 3.5$ $\Rightarrow U_{inerting} < 3.5V$</p> <p>If the voltage between the terminals of the battery is above this value, restart from the step 5.</p>
		Recycle
		<p>Recycling of the water for inerting During the inerting operation, some leakage of chemical products may happen. (for example presence of fluorine in the water). That's why water disposal must be done in a specialized facility.</p>
	7	<p>May appear too :</p> <ul style="list-style-type: none"> - A coloration of the water (for example in blue due to the occurrence of reactions on copper parts of the battery), - Visualization of deposits (for example in white by precipitation of aluminum oxide due to the occurrence of reactions on aluminum parts of the battery)
	8	
	9	<p>Recycling of the products Batteries must be recycled. Please refer to Saft site for any information related to this matter.</p> <p>http://www.saftbatteries.com/TheSaftGroup/Environment/tabid/98/Language/en-US/Default.aspx</p>