

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

20 May 2014

Sub-Committee of Experts on the Transport of Dangerous Goods

Forty-fifth session

Geneva, 23 June – 2 July 2014

Item 5 (d) of the provisional agenda

Electric storage systems: thermal batteries

New UN number for thermal batteries

Transmitted by the expert from Germany

Introduction

1. The expert from Germany submitted a proposal for a new entry for thermal batteries to the forty-second session (ST/SG/AC.10/C.3/2012/64) which was not discussed due to lack of time. Therefore, the proposal was presented to the forty-third session in document ST/SG/AC.10/C.3/2013/64. The experts who spoke supported the proposal by Germany in principle, but had some comments which should be taken into consideration for a revised proposal.

Background

2. For certain applications lithium batteries are used whose anode consists of lithium powder and silicon powder or lithium powder and aluminium powder and whose cathode consists of iron disulphide. However, the electrolyte, which consists of organic salts with a binder, is in solid form. When the lithium batteries are used, a mixture of iron powder and potassium perchlorate is ignited which generates a temperature that causes the electrolyte to liquefy by way of melting so that a current can flow.

3. These batteries can only be used one time. Therefore, such lithium batteries cannot be tested in accordance with Chapter 38.3 of the Manual of Tests and Criteria.

4. In practice, this means that such batteries are carried without observing dangerous goods regulations although they contain lithium, an explosive actuating device as well as other dangerous goods and despite the danger that they will generate dangerous heat during carriage. As they cannot be carried in accordance with Chapter 38.3 of the Manual of Tests and Criteria because they can only be used once, there is no possibility of legally carrying them under the entries for lithium batteries.

5. For the purpose of adapting the provisions of the UN Model Regulations to the stage of development of lithium batteries, a new UN number for this type of lithium battery should be included in the UN Model Regulations. The provisions should be based on those for UN numbers 3292 BATTERIES, CONTAINING SODIUM and 3356 OXYGEN GENERATORS.

6. Since such lithium batteries can generate and give off considerable heat when used due to the melting of the electrolyte, they are referred to as thermal batteries. They can contain a pyrotechnic actuating device, and it should also be possible to transport them in packaged form when contained in equipment or packed with equipment; this has to be considered in the packing instruction.

7. The solids which serve as a heat source to melt the electrolytes, such as mixtures of potassium perchlorate and iron powder, can have explosive properties. As these properties also depend on the particle size and possibly other factors, it has to be demonstrated that this mixture is not subject to Class 1 by conducting the tests of series 1 and 2 on the mixture itself instead of the article. As the battery has an insulating effect, it is important that no other substances of Class 1 are contained in it besides the explosive actuating device.

8. Cells of these batteries are always component cells without casing which cannot be carried outside of the battery; therefore, the carriage of cells does not need to be described in the packing provision.

9. The proposed Packing Instruction is based on the P500 for oxygen generators (UN 3356) because of the explosive actuating device therein and on P 408 for UN 3292

10. As these batteries are only energised upon actuation, protection from short circuits during transport is not considered necessary.

11. Compared with the previous document, a more general description of the batteries is now proposed and no exemption is provided for. Jerricans and boxes made of expanded plastics are no longer contained in the proposed packing instruction.

Proposal

A new UN number should be created for thermal batteries.

UN No	Name and description	Class									
(1)	(2)	(3)	(4)	(5)	(6)	(7a)	(7b)	(8)	(9)	(10)	(11)
3XXX	THERMAL BATTERIES or THERMAL BATTERIES CONTAINED IN EQUIPMENT	4.3	4.1		3XX	0	E0	P4XX			

Add the following new special provision to Chapter 3.3:

3XX (a) This entry shall apply to batteries for one-time use which contain lithium or lithium alloys and whose electrolyte is in solid form. The batteries are activated by burning a combustible solid which causes the electrolyte to melt. The combustible solid shall not meet the criteria of an explosive substance of class 1. When containing an explosive actuating device batteries shall only be transported under this entry when excluded from Class 1 in accordance with 2.1.1.1 (b) of these Regulations. The batteries shall not contain dangerous goods or other goods which may react dangerously with each other before activation.

(b) Batteries shall consist of hermetically sealed metal casings which fully enclose the dangerous goods and which are so constructed and closed as to prevent the release of the dangerous goods under normal conditions of transport. The contained dangerous goods shall be enclosed in such a manner as to prevent a reaction with air or moisture.

- (c) Batteries, without its packaging, shall be capable of withstanding a 1.8 m drop test onto a rigid, non-resilient, flat and horizontal surface, in the position most likely to cause damage, without loss of its contents and without actuation.
- (d) The actuating device shall have at least two positive means of preventing unintentional actuation.
- (e) These Batteries are not subject to the requirements of 2.9.4.
- f) Batteries shall not be offered for transport at a temperature such that liquid elemental lithium is present in the battery unless approved and under the conditions established by the competent authority.

Add a new packing instruction in 4.1.4.1:

P4xx	PACKING INSTRUCTION	P4xx
This instruction applies to UN No. 3XXX.		
<p>(1) The following packagings are authorized, provided that the general provisions of 4.1.1 and 4.1.3 are met:</p> <p>Drums (1A2, 1B2, 1N2, 1H2, 1D, 1G);</p> <p>Boxes (4A, 4B, 4N, 4C1, 4C2, 4D, 4F, 4G, 4H2);</p> <p>Packagings shall conform to the packing group II performance level.</p> <p>Batteries or batteries in equipment shall be transported in a package which meets the following requirements when one battery in the package is actuated:</p> <p>(a) Other batteries in the package will not be actuated;</p> <p>(b) Packaging material will not ignite; and</p> <p>(c) The outside surface temperature of the completed package shall not exceed 100 °C.</p> <p>(d) There shall be sufficient cushioning material to prevent contact between batteries and the internal surface of the outer packaging and to ensure that no dangerous movement of the batteries within the outer packaging occurs in transport.</p> <p>(2) Batteries in equipment may be transported unpacked or in protective enclosures (e.g. fully enclosed or wooden slatted crates) when the outside surface temperature of the equipment does not exceed 100 °C if at least one battery in the equipment is actuated.</p>		
Additional Requirements		
The terminals shall not support the weight of other batteries or materials packed with the batteries.		