

## 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

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Item 6(a) of the provisional agenda

### LISTING, CLASSIFICATION, AND PACKING

Comments on ST/SG/AC.10/C.3/2005/46

Use of Watt-hours in place of equivalent lithium content for lithium ion batteries

Transmitted by the expert from the United States of America

1. ST/SG/AC.10/C.3/2005/46 submitted by PRBA contains 3 proposals: (1) to replace the term “Equivalent Lithium Content” with “Watt-hours”; (2) to amend the fourth revised edition of the Test Manual in Section 38.3.1, 38.3.2.2 and 38.3.3; and (3) to require marking of Watt-hour (Wh) on the outside case of a lithium ion battery (or cell).
2. The expert from the United States of America opposes the use of Watt-hour (Wh) instead of Equivalent Lithium Content (ELC) as a measure of the size or quantity in relation to lithium ion cells or batteries. The measurement unit of Wh does not directly reflect the capacity to generate electrical current (i.e., electrical hazard) of a lithium battery (see the U.S. comments to ST/SG/AC.10/C.3/2005/43).
3. The use of ELC was developed on the basis of a scientifically supported technical justification. To derive the ELC consider that 1 mol of lithium (equates to 6.941 grams) can produce 1 mol of electrons (equates to 26.802 ampere hour, Ah) theoretically. Therefore, it will require 0.25897 grams of lithium to produce 1 Ah of electricity. Considering the 16% safety margin previously determined by the Sub-Committee in the development of the use of ELC, the ELC equates to 0.3 g of lithium per 1.0 Ah as prescribed in Special Provision 188 of the UN Model Regulations.
4. For a battery, the use of aggregate lithium content or aggregate ELC properly reflects the maximum capacity of electrical current that can be generated by a battery. In ST/SG/AC.10/C.3/2005/46 PRBA used the term “Erroneous Battery ELC” (last row of the table in page 3 of ST/SG/AC.10/C.3/2005/46) to demonstrate the inappropriateness of using aggregate ELC for a lithium ion battery. This table applies an incorrect interpretation of SP 188 on how to calculate ELC for a battery. As described in 38.3.2.2 of the UN Test Manual under the definition of “Lithium-equivalent content”, the aggregate lithium content or ELC is the sum of the grams of lithium content or equivalent lithium content contained by the cells comprising a battery. It is not appropriate to use the 0.3 x Ah conversion factor based on the Ah of a battery.

5. Using Wh will introduce more confusion into the regulatory system. There are two situations created by using Wh as the lithium ion cell or battery size measurement. One is when a lithium ion cell or battery has a higher current/lower voltage and the other one is when the lithium ion cell or battery has a lower current/higher voltage. A higher current battery is more dangerous in terms of short circuit which will generate more heat. In normal use, the battery will release heat and the amount of heat generated is governed by  $I^2R$ . Therefore, a higher current battery has the potential to release more heat. A higher voltage battery is more dangerous in terms of electric shock to persons handling the battery.
  
  6. The expert from the United States of America supports the idea of marking a lithium cell or battery to indicate its lithium content or ELC, as appropriate, in grams. Such a marking would directly reflect the size of a cell or a battery in terms of its capacity to generate electrical current. In addition, lithium content is used as the basis for how the battery is regulated for transport. As such indicating the lithium content on the battery would aid in ensuring the battery is appropriately classified, packaged, marked, labeled and described on the transport document. We believe such a marking would enhance compliance and transport safety removing any confusion that might exist today. If the Sub-Committee agrees to consider such a requirement, the U.S. would be willing to submit a formal proposal to the December session.
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