

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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MISCELLANEOUS PROPOSALS OF AMENDMENTS TO THE MODEL REGULATIONS ON THE TRANSPORT OF DANGEROUS GOODS

Changes to special provision 188 for lithium batteries

Request for comments

Transmitted by the International Electrotechnical Commission (IEC)

Introduction

1. Special Provision 188 (SP 188) in the 1998 UN Recommendations provided an exemption from regulation for lithium-ion batteries with an aggregate equivalent lithium content of 8 g or less. The 1998 UN Recommendations also provided an exemption for lithium-ion batteries containing between 8 g and 25 g of equivalent lithium content if the batteries passed the required tests in the UN Manual of Tests and Criteria. The 2000 UN Recommendations, however, removed the exemption for batteries containing between 8 g and 25 g, therefore requiring these batteries to be shipped as Class 9 dangerous goods.
2. Lithium-ion batteries were first introduced in the marketplace in 1995. In light of the limited experience with the technology, the restrictions described in paragraph 1 necessarily were conservative. In more recent years, additional testing of lithium-ion batteries has been undertaken that allows more accurate determination of conditions that may present concern in transportation. In addition, billions of lithium ion cells and batteries have safely been shipped by ground, air, and sea. According to recent industry data, more than 1.5 billion lithium ion cells are now shipped annually.
3. Since 2000, the aggregate equivalent lithium content of lithium ion cells and batteries used in today's laptops and other portable consumer products has increased significantly in order to meet the rising power consumption demand.¹ The proposal on fuel cells submitted by the Experts from Japan and the United States of America (*See ST/SG/AC.10/C.3/2004/49*) correctly points out that the average power consumption of today's laptops is now 20 Watts. This sharp increase in power consumption was not anticipated in 1999 when SP 188 was developed and the 8 g exemption limit for lithium-ion batteries was established. To meet the power demand, lithium-ion cells and batteries have seen a marked increase in energy density (ampere-hours) and, consequently, equivalent lithium content. In order to continue to meet this rising power demand, eliminate unnecessary transportation restrictions, and promote technical progress on laptops and batteries the IEC recommends the Sub-committee consider raising the 8 g exemption limit on lithium-ion batteries.

¹ 1 PC World, News & Trends, *Top 15 Notebook PCs* (October, 2003)

4. Under the current UN Recommendations, an 8 g lithium-ion battery pack at 100% state of charge (SOC) is equal to a 2 g undischarged lithium metal battery pack. Based on these values and that at 50% SOC, a lithium-ion battery pack contains half the energy and thus half of the equivalent lithium content than a battery at 100% SOC, a lithium-ion battery containing between 8 and 16 grams at 50% SOC (or less) should be eligible for the exemptions contained in SP 188.

5. A report published in 2000 on the accelerating rate calorimetry (ARC) for lithium-ion cells at 100% SOC and 50% SOC clearly shows the differences between lithium-ion cells at different SOC.² For example, the self-heating temperature begins at approximately 80°C when cells are at 100% SOC and approximately 100°C when cells are at 50% SOC. This indicates that the self-heating beginning temperature is lower for cells at 100% SOC. (The self-heating beginning temperature becomes lower when the SOC % value becomes higher from 0% to 100%.) The evolution of the self-heating beginning temperature and the self-heating speed are shown in the table below. Additional test data on the differences in SOC for lithium ion cells also can be made available to the Sub-committee.

SOC (%)	Self-heating beginning temperature (°C)	Self-heating speed (°C /min)		
		100°C	120°C	140°C
100	Approx. 80	Approx. 0.15	Approx. 0.24	Approx. 0.40
50	Approx. 100	Approx. 0.04	Approx. 0.06	Approx. 0.13
0	Approx. 130	–	–	Approx. 0.03

6. Below is the IEC's initial recommendation for changes to SP 188. No formal action by the Sub-Committee is necessary but the IEC welcomes any comments and suggestions on this topic.

Proposal

SP 188 Amend to read as follows:

In 188 (b), add:

“and not more than 16 g when the state of charge is not more than 50% of the design rated capacity” just before the last “;”.

² E. Peter Roth, Electrochemical Society Proceedings Volume 99-25, (2000) 766.