SAFEGUARDS
SGS CONSUMER TESTING SERVICES

ELECTRICAL & ELECTRONICS NO. 148/10 AUGUST 2010

UPDATE: TRANSPORT TESTS FOR LITHIUM CELLS AND BATTERIES (UN 38.3)

The UN Transport Tests form the basis for many if not all regulations regarding the transportation of Lithium Cells or Batteries. Only if this set of tests has been passed (and if further requirements are fulfilled) the lithium cells or batteries may be offered for transport without the precautions otherwise required for the transportation of dangerous goods (especially for air transport further restriction apply).

With the upcoming Rev 5 of the Recommendation on the transport of dangerous goods, Manual of Test and Criteria some of the requirements have been changed. Most notably, the definition of a "large battery" is changed, the number of samples required to be tested for rechargeable cells and batteries is significantly reduced, the number of load cycles is reduced and a relaxed test requirement is introduced, that allows for a much shortened qualification in certain cases of smaller battery assemblies. As the importance of large rechargeable cells and batteries increases due to e-mobility, it became evident that the old requirements posed a high and costly hurdle.

The following points are the main changes in the new revision. The current requirements stated are based on UN ST/SG/AC.10/11/Rev.4:2003 and UN ST/SG/AC.10/11/Rev.4/Ammend.2:2007. The upcoming requirements are written in *Italics:*

I. Definition of new type of cell or battery that requires a complete re-test:

- Old: A change of more than 0.1g or 20% by mass, whichever is the greater, to the cathode, to the anode, or to the electrolyte.

  A change that would materially affect the test results.

- *New: For primary cells and batteries as the old requirement.*

  For rechargeable cells and batteries, a change in watt-hours of more than 20% or an increase in voltage of more than 20%.

  A change that would materially affect the test results.

II. Definition of large battery:

- Old: For lithium metal battery if aggregate lithium content of all anodes, when fully charged, is more than 500g. For lithium ion battery if the watt-hour rating is more than 6200Wh.

- *New: If gross mass is more than 12kg.*

Remark: Under the old requirements batteries up to very roughly 50kg were regarded as small (since only about 1% of the gross mass of a battery is lithium). In future much smaller batteries will be regarded as large. The main implications for the affected batteries are due to the different test requirements for large batteries (an increased testing time for the thermal test and a reduced requirement for the shock). Additionally the new requirements have an even further reduced number of samples to be tested for large rechargeable batteries (see further down).

III. Total number of samples to be tested for rechargeable cells and batteries:

- Rechargeable cells: old 50 (60 in case of prismatic cells), *new 35 (40 in case of prismatic cells)*
- Small rechargeable batteries: old 24, *new 16* (re-using undamaged samples from Test 1 to 5 for Test 7: old 16, *new 8)*
- Large rechargeable batteries: old 24, *new 8* (re-using undamaged samples from Test 1 to 5 for Test 7: old 16, *new 4)*
- *New: Only fully charged samples are tested. The fully discharged samples have been eliminated.*

IV. Total number of samples to be tested for battery assemblies made up of electrically connected batteries that have passed all applicable tests:

- Old: no tests required if the total aggregate lithium content of all anodes, when fully charged, is more than 500 g and if the assembly is equipped with a system capable of monitoring the battery assembly and preventing short circuits, or over discharge between the batteries in the assembly and any overheat or overcharge of the battery assembly.

  If the above requirement is not met, the battery assembly must be subjected to the full test sequence with the full number of samples.

- *New: As the old requirement for lithium metal batteries. As the old requirement for lithium ion batteries with a watt-hour rating larger than 6200 Wh.*

  If a lithium metal battery assembly has not more than 500 g aggregate lithium content of all anodes, when fully charged or if a lithium ion battery assembly has a watt-hour rating of not more than 6200 Wh, only one sample needs to be tested for only a subset of the tests.

For primary (= not rechargeable) batteries and cells there are no changes in the number of samples to be tested.

V. Number of load cycles required for rechargeable batteries:

- Old: Half of the samples with 1 cycle, the other half with 50 cycles
- *New: for small batteries as the old requirement. For large batteries half of the samples with 1 cycle, the other half with 25 cycles.*

The above information is based on the current draft of Rev 5 of the requirements (UN ST/SG/AC.10/11/Rev.5:Draft 11.2009). Although this has been agreed on in the relevant committee and is destined to become effective in 01.2011 without further changes, last minute amendments can not be ruled out.

A hardcopy of the Rev 5 of the Recommendation on the transport of dangerous goods, Manual of Test and Criteria is available from the UNECE Web page.

At the time of writing this article the requirements for lithium cells and batteries were available for free download from the UNECE web page.

FOR ENQUIRIES:

Global Competences Support Centre: gcsc@sgs.com
US– Jody Leber Tel: +1 858-592-7100 or Jody.Leber@sgs.com
TW– Jockey Huang Tel: +886 2 22993279, 3610 Jockey.Huang@sgs.com
DE– Jochen Beier Tel: +49 89 787475 320 or Jochen.Beier@sgs.com

Asia – Hong Kong. Tel: +852 2334 4481 Fax: +852 2144 7001 mktg.hk@sgs.com
Australasia – Perth. Tel: +61 (0) 3 9790 3418 Fax: +61 (0) 3 9701 0988 au.cts@sgs.com
Europe – London —UK. Tel: +44(0) 20 8991 3410 Fax: +44 (0) 20 8991 3417 gb.cts.sales@sgs.com
Africa & Middle East – Turkey. Tel: +90 212 368 40 00 Fax: +90 212 296 47 82 sgs.turkey@sgs.com
Americas – USA. Tel: +1 973 575 5252 Fax: +1 973 575 7175 uscts.inquiries@sgs.com

www.sgs.com/cts Global Competences Support Centre: gcsc@sgs.com