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Lithium Battery Informal Working Group - **Minutes**

Kyoto, 9 - 11 November 2009

### 1. US Proposal on Clarifying Cell and Battery Testing

Dr. Ke, on behalf of the US, made the following proposal for additional wording.



US Proposal - Clarif  
on cell and battery te

The group further developed a test matrix to try to clarify the requirements for testing. While no decisions were made, an ad hoc group, led by Dr. Ke will make some proposals to the group on how to incorporate the test matrix.



Matrix Table.docx

<p><b>Decision</b> <b>#1</b></p>	<ul style="list-style-type: none"><li>• Add the following language to the Scope (38.3.2):</li></ul> <p>All cell types shall be subjected to T.1 to T.6 and T.8 tests. All non-rechargeable battery types, including those composed of previously tested cells, shall be subjected to T.1 to T.5.</p> <p>All rechargeable battery types, including those composed of previously tested cells, shall be subjected to T.1 to T.5 and T.7.</p>
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	<ul style="list-style-type: none"> <li>• Editorial comment: Be consistent with “T.1 to T.8” vs. “Test 1 to Test 8” throughout the document.</li> <li>• Delete first sentence of 38.3.4 Each cell and battery type must be subjected to tests 1 to 8.</li> </ul>
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## 2. Battery Assembly (US)

Dr. Ke, on behalf of the United States, made the following proposal for modification to the definition of battery.



US Proposal -  
Battery def.doc

<p><b>Decision #2</b></p>	<p>Modify the definition to:</p> <p><i>Battery</i> means two or more cells which are electrically connected together <del>by permanent means, including case, terminals, and marking</del> fitted with devices necessary for use, for example, case, terminals, marking and protective devices. A battery containing only one cell (single cell battery) is considered a <del>“battery”</del> “cell” and shall be tested according to the testing requirements for “cells” for the purposes of the Model Regulations and this Manual. (See also the definition for “cell”).</p>
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## 3. State of Charge for Lithium Ion Batteries (BAJ)

The Battery Association of Japan made the proposal attached below discussing varying watt-hour levels of batteries to be shipped as non-dangerous goods provided the batteries are held at our below specified states of charge.

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Watt Hour Level	State of Charge At or Below
200	50%
300	10%
400	0%



Proposal of Li-Ion  
battery's transportati

<b>Decision #3</b>	No decision. The item was reviewed without decision.
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#### 4. T2 Test

Mr. Boolish, on behalf of the T2 Ad Hoc team made the following presentation covering:

- Considerations for modification of the mass loss table
- Increase of the temperature transition time from 30 to 60 minutes
- Change the maximum temperature from 75 to 70°C.
- Clarify the number of cycles is 10 and not 11.
- No extra test time for large cells and batteries

The group agreed to three of the proposals shown in the decision below to help avoid nuisance problems during testing.



T2 Ad Hoc Team  
Proposal.ppt



T2 Ad Hoc 2nd  
Submission 1 October

<b>Decision #4</b>	<ul style="list-style-type: none"> <li>• Adopt “alternate consideration 2”</li> </ul>	
	<b>Mass M of cell or battery</b>	<b>Mass loss limit</b>
	M < 1 g	0.5%
	1 g ≤ M < 75 g	0.2%
	M ≥ 75 g	0.1%
	<ul style="list-style-type: none"> <li>• Change the maximum temperature from 75 ± 2° to 72 ± 2°C.</li> <li>• Agree to the wording change to clarify 10 cycles.</li> </ul>	

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	The other proposals were not accepted, but the ad hoc team is invited generate additional data on changing the temperature transition time by measuring temperatures during testing.
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The new wording for the T.2 test will then be:

38.3.4.2	Test 2: Thermal test
38.3.4.2.1	Purpose
	This test assesses cell and battery seal integrity and internal electrical connections. The test is conducted using rapid and extreme temperature changes.
38.3.4.2.2	Test procedure
	Test cells and batteries are to be stored for at least six hours at a test temperature equal to $72 \pm 2$ °C, followed by storage for at least six hours at a test temperature equal to $-40 \pm 2$ °C. The maximum time interval between test temperature extremes is 30 minutes. This procedure is to be repeated until 10 total cycles are complete, after which all test cells and batteries are to be stored for 24 hours at ambient temperature ( $20 \pm 5$ °C.). For large cells and batteries the duration of exposure to the test temperature extremes should be at least 12 hours.
38.3.4.2.3	Requirement
	Cells and batteries meet this requirement if there is no mass loss, no leakage, no venting, no disassembly, no rupture and no fire and if the open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure. The requirement relating to voltage is not applicable to test cells and batteries at fully discharged states.

## 5. Proposal on Modifying Definition of Rated Capacity

Mr. Kerchner, on behalf of PRBA made the attached proposal.



PRBA Proposal on  
Def. of Rated Capacity

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<b>Decision #5</b>	<ul style="list-style-type: none"> <li>• Hold on a decision until the group is able to see the exact text.</li> <li>• If adopted, add the standard date so the group is aware of changes.</li> </ul>
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**6. US Proposal on Battery Assembly**

Dr. Ke, on behalf of United States, made the attached proposal.



US Proposal - Battery Assembly.doc


<b>Decision #6</b>	No decision was made on this item. The Group is invited to develop proposals on this issue.
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**7. Observation After Testing (T.3, T.5, T.6, T.7 and T.8) - Germany**

Mr. Doering made a presentation regarding observation timing once tests are completed.



Germany Observation of Tests

<b>Decision #7</b>	<ul style="list-style-type: none"> <li>• Germany to draft the addition of the 7 day waiting period after the complete test sequence (T.1 to T.5) instead of just after T.3. This new language would be part of 38.3.3 (b).</li> </ul> <div style="text-align: center;">         Germany_Observation_of_Tests_During_a     </div> <ul style="list-style-type: none"> <li>• The group agreed to changing the requirements language for T.5 to T.8 to:</li> </ul>
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	<p>“Cells and batteries meet this requirement if their external temperature does not exceed 170 °C and there is no disassembly, no rupture and no fire during the test and within six hours of after this test.”</p> <p>After reviewing the revised proposal from Germany embedded above:</p> <ul style="list-style-type: none"> <li>Accepted - Amend the first sentence under 38.3.4.3.3 to read as follows:  “Cells and batteries meets this requirement if there is <del>no mass loss,</del> no leakage, no venting, no disassembly, no rupture and no fire <b>during the test and after observing seven days after the test</b> and if the open circuit voltage of each test cell or battery <b>directly</b> after testing <b>in its third perpendicular mounting position</b> is not less than 90% of its voltage immediately prior to this procedure.”</li> <li>For the proposal on a 7 day waiting period after the T.1 to T.5 sequence, Germany and UK to draft a proposal for the next meeting.</li> </ul>
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**8. Testing of Large Batteries on T.3 – COSTHA**

Mr. Ferguson made a presentation on issues with the T.3 test for large format battery types.



COSTHA  
UN-SCETDG-T3- Vibra

<p><b>Decision #8</b></p>	<ul style="list-style-type: none"> <li>The group agreed to the proposal as shown below for subcommittee review.</li> </ul> <p>Cells and batteries are firmly secured to the platform of the vibration machine without distorting the cells in such a manner as to faithfully transmit the vibration. The vibration shall be a sinusoidal waveform with a logarithmic sweep between 7 Hz and 200 Hz and back to 7 Hz traversed in 15 minutes. This cycle shall be repeated 12 times for a total of 3 hours for each of three mutually perpendicular mounting positions of the cell. One of the directions of vibration</p>
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	<p>must be perpendicular to the terminal face.</p> <p>The logarithmic frequency sweep shall differ for cells and batteries up to 12 kg (cells and small batteries), and for batteries 12 kg and greater (large batteries).</p> <p>For cells and small batteries: from 7 Hz a peak acceleration of 1 <math>g_n</math> is maintained until 18 Hz is reached. The amplitude is then maintained at 0.8 mm (1.6 mm total excursion) and the frequency increased until a peak acceleration of 8 <math>g_n</math> occurs (approximately 50 Hz). A peak acceleration of 8 <math>g_n</math> is then maintained until the frequency is increased to 200 Hz.</p> <p>For large batteries: from 7 Hz to a peak acceleration of 1 <math>g_n</math> is maintained until 18 Hz is reached. The amplitude is then maintained at 0.8 mm (1.6 mm total excursion) and the frequency increased until a peak acceleration of 2 <math>g_n</math> occurs (approximately 25 Hz). A peak acceleration of 2 <math>g_n</math> is then maintained until the frequency is increased to 200 Hz.</p>
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## 9. T.6 – Ad Hoc Group Proposal

Mr. Boolish, on behalf of the T.6 Ad Hoc group, made a proposal to:

- Delete the impact test in favor of the crush test for all battery types
- Consider adoption of IEC 62281 (Transportation of Lithium Batteries) as the UN model regulations.



T6 Ad Hoc Team  
Proposal.ppt



T6 Ad Hoc 2nd  
Proposal.doc

The Battery Association of Japan further proposed some language modifications to the Crush test and adoption of the additional crush test details found in IEC 62133.

Dr. Ke proposed adoption of the old T.4 test in place of the current T.6 test.



US Proposal - -  
Impact test.doc

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Mr. Pfauvadel also made a proposal.



France 3rd LiBat WG  
Comment T6.doc

Mr. Ito, on behalf of the Battery Association of Japan made a presentation showing a proposed Japanese short circuit test by introducing a nickel contaminant to a lithium ion battery jellyroll.



LIB Safety  
Standard091111.pdf

<b>Decision</b> <b>#9</b>	<ul style="list-style-type: none"><li>• Work of the Ad Hoc Internal Short circuit team<ul style="list-style-type: none"><li>○ Define standardized contact between the anode and the cathode inside the cell (resistance, i.e. hard short / soft short).</li><li>○ Develop values and testing method(s) (voltage drop, percentage of deformation, pressure of crush, etc).</li><li>○ The method(s) shall be suitable for all sizes and shapes and chemistries. If one method does not cover all cases, suitable equivalent methods may be proposed.</li><li>○ Define appropriate pass/fail criteria.</li></ul></li><li>• Those interested in participating in the Ad Hoc work shall contact Marc Boolish (<a href="mailto:Marck.Booish@energizer.com">Marck.Booish@energizer.com</a>). As of the writing of these minutes, those interested are:</li></ul>														
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**10. Definition of Small Cell/Fire**

The working group reviewed the Paris proposal from China.



China summarization  
of definition.doc

<b>Decision #10</b>	No decision was made on this item and this will be carried for future discussion. China and other interested experts are invited to provide additional information to enable the working group to make a decision.
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**11. Sequence of T.1 to T.5 (China)**

Ms. Vide Feng from China made a proposal to reorder the sequence of the T.1 to T.5 tests.



China proposal -  
sequence of UN testir

Current sequence: T1-T2-T3-T4-T5

Proposed sequence: T3-T4-T2-T1-T5

<b>Decision #11</b>	No decision at this time. The working group is invited to review this item and be prepared to discuss at the next meeting.
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**12. Definition of Rupture (PRB A)**

Mr. Kercher made a proposal discussing the definition of rupture.



Proposal on T2  
Thermal Test and Swr

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<b>Decision #12</b>	No decision at this time. The working group is invited to review this item and be prepared to discuss at the next meeting.
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**13. Quality Certification Program**

<b>Decision #13</b>	<ul style="list-style-type: none"> <li>Members are asked to prepare a summary of the current practices of manufacturers.</li> <li>Members are asked to review the certification requirement item for aerosols. (624221, page 212 of the English Version. 16<sup>th</sup> Revised Edition.) This requirement is only a verification that a quality control system exists.</li> </ul>
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**14. 1.2 Meter Drop Test (China)**

Ms. Feng made the attached proposal.



China  
UN-SCETDG-INF-1[1]

<b>Decision #14</b>	As this is a packaging issue, this proposal should be made at the full subcommittee level where packaging experts are present.
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