U.S. Department
of Transportation

**Pipeline and
Hazardous Materials Safety
Administration**

400 Seventh Street, S.W.
Washington, D.C. 20590

JUL 11 2006

Ref No.: 05-0193

Mr. Anthony J. Angello
Quality Manger
Mechanical Engineer
Technical Services Labratory
MGA Research Corporation
12790 Main Road
Akron, NY 14001

This is in response to your letter dated June 9, 2005, concerning requirements under the Hazardous Materials Regulations (HMR; 49 CFR Parts 171-180) for testing of lithium ion batteries. The specific requirements you address are contained in Section 38.3 of the United Nations Manual of Tests and Criteria (UN Manual) and are implemented through the provisions of 49 CFR 173.185. Your questions are paraphrased and answered below:

Q1. If one cell or battery of a lot fails a test, should an entire lot be retested, or can a replacement be used in its place?

A1. In accordance with Paragraph 38.3.2.1, if a lithium cell or battery type does not meet one or more of the test requirements, steps shall be taken to correct the deficiency or deficiencies that caused the failure before such cell or battery type is retested. The cells and batteries must be subjected to all tests.

Q2. If a cell or battery fails one test, should the model be retested through all tests, or only the test it failed?

A2. In accordance with Paragraph 38.3.4, each cell and battery type must be subjected to Tests T.1 – T.8. Tests T.1 – T.5 must be conducted in sequence on the same cell or battery, T.7 may be done using undamaged batteries previously used in Tests T.1 – T.5, and Tests T.6 and T.8 should be conducted using not otherwise tested cells or batteries. If a cell or battery fails a test steps shall be taken to correct the deficiency or deficiencies and the battery must be subjected to Tests T.1 – T.8.

Q3. What is the definition of the phrase "solid matter" and term "penetrate" as used in the definition "disassembly" in Paragraph 38.3.2.2 of the UN Manual?

A3. Solid matter is defined as a crystalline material, that is, one in which the constituent atoms are arranged in a three-dimensional lattice, periodic in three independent directions. Penetrate is defined as pass into or through, often by overcoming resistance. The term disassembly, as provided in 38.3.2.2, can be clarified to mean ejection of solid particles at a force that causes them to tear through or pass through a wire mesh screen placed 25 cm away from the cell or battery.

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Q4. Would it be more appropriate to use lead shot or a solid steel bar for impact testing? If a steel bar is used, is any type of dampening material such as rubber, allowed in between the bar and the impact mass?

A4. Paragraph 38.3.4.6.2 of the UN Manual requires a 9.1 kg mass to be dropped on the sample from a height of 61 ± 2.5 cm. In our opinion, the UN Manual uses the phrase "a 9.1 kg mass" to indicate that the material must be a single mass such as the steel bar.

Q5. Can a constant current source be substituted for the 12V D.C. power supply for the Forced Discharge test in Paragraph 38.3.4.8.2?

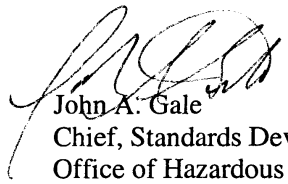
A5. Yes, provided each cell is force discharged for the time interval (in hours) equal to its rated capacity divided by the initial test current (in Ampere).

Q6. Has the Overcharge testing in Paragraph 38.3.4.7 been met if the required overcharge current can be maintained for a period of 24-hours regardless of the charge voltage?

A6. To fulfill the test procedure and requirements, charge voltage must be as specified in 38.3.4.7.2(a) or (b), as applicable. In addition, there must be no disassembly or fire of the rechargeable battery within seven days of the test.

I hope this information is helpful. Please contact us if you require additional assistance.

Sincerely,



John A. Gale
Chief, Standards Development
Office of Hazardous Materials Standards

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Batteries
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-----Original Message-----
From: Anthony Agnello [mailto:anthony.agnello@mgaresearch.com]
Sent: Thursday, June 09, 2005 1:08 PM
To: Shane.Kelley@dot.gov; infocntr@dot.gov
Subject: Questions regarding UN ST-SG-AC10-27a2e rev.4

Please foreward to Charles Key.

Hello Shane,
As we spoke of, I have several questions regarding the UN Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria, Rev. 4, Para 38.3 Lithium Batteries. If you have any questions, or if you need any clarification, please do not hesitate to contact me at (716) 542-5515.

1. If one cell/battery of a lot fails a test, should an entire lot of cells/batteries be retested, or can a replacement be used in its place? (Refer to Para 38.3.2.1)
2. If cells/batteries fails one test, should the model be retested through all tests, or only the test it failed? For example, if cells failed T6, should they be retested T1-T5 as well as T6? I understand that T1-T5 must be conducted in sequence. (Refer to Para 38.3.2.1)
3. Please define the following. (Refer to Para 38.3.2.2, definition for Disassembly)
a. Solid Matter - Is solid matter an internal material the consistency of a wet/moist dirt, baking flour/dust, oil, grease, or is it strictly metal components.
b. Penetrate - Does penetrate mean to pass through the wire mesh screen, or tear through?
4. For impact testing, (Refer to Para 38.3.4.6) would it be appropriate to use a bag of lead shot for a 9.1 kg mass? A bag of lead shot would conform around the cell and bar to disperse the force of the drop to the cell, bar, and table. It would also cover the cell and prevent any disassembly. Would it be appropriate to use a solid steel mass that would directly impact the bar and transmit the entire force of the drop to only the bar? The bar would then transmit the force to the cell. Is any type of dampening material, such as rubber, allowed in-between the bar and the impact mass?
5. For Forced Discharge testing, (Refer to Para 38.3.4.8) can a constant current source be substituted for the 12 VDC power supply?
6. Regarding Overcharge Testing (Refer to Para 38.3.4.7). If the required overcharge current can be maintained for a period of 24-hours regardless of the charge voltage, has the requirement been met?

Regards,
Anthony

Anthony J. Agnello
Quality Manager
Mechanical (Test) Engineer
Technical Services Laboratory
MGA Research Corporation
12790 Main Road
Akron, NY 14001
Phone: (716) 542-5515
Fax: (716) 542-4437
Email: anthony.agnello@mgaresearch.com
Website: http://www.TechnicalServicesLab.com/