



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 4 (a) of the provisional agenda

Electric storage systems:

Testing of lithium batteries

UN 38.3 Lithium battery testing and amendments to the T.5 external short circuit test

Transmitted by PRBA – The Rechargeable Battery Association*, **

I. Introduction

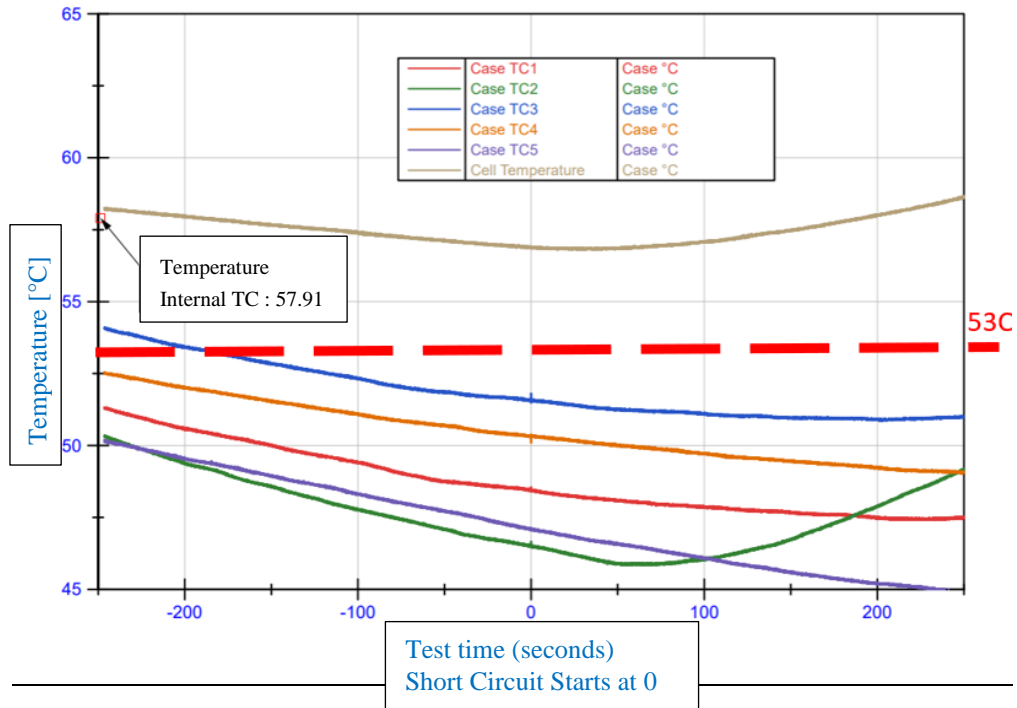
1. According to the *Manual of Tests and Criteria* section 38.3.4.5.2, the Test T.5 External short circuit procedure requires the battery to be stabilized at 57 ± 4 °C, measured on the external case. The battery at 57 ± 4 °C must then be subjected to one short circuit condition with a total external resistance of less than 0.1 ohm. This short circuit condition must be continued for at least one hour after the cell or battery external case temperature has returned to 57 ± 4 °C, or in the case of large batteries, the external case temperature has decreased by half of the maximum temperature increase observed during the test and remains below that value.
2. The battery temperature in the T.5 procedures explicitly references the external battery case for pre-heating and short circuit end condition. The step for starting the short circuit only references measuring battery temperature. Battery case is not mentioned for the start condition.
3. Since the procedure initially references temperature “measured on external case” there is confusion with test laboratories if it is acceptable to start the short circuit when the internal cell temperatures remain above 53 °C but the external case temperature drops below 53 °C.
4. Large batteries often need to be removed from a thermal chamber prior to short circuit conditions due to safety concerns with conducting the short circuit test in a chamber. Batteries with a metal case have difficulties maintaining the temperature at 57 ± 4 °C prior to short circuit test start when removed from the thermal chamber. Once a battery is removed from the thermal chamber, it generally takes 5 to 10 minutes to set-up the short circuit equipment and data-logging before the test can begin. The external metal casing temperature drops

* A/78/6 (Sect. 20), table 20.5.

** The document was submitted late to the conference services for processing without the explanation required under paragraph 8 of General Assembly resolution 53/208 B.



rapidly as it equilibrates with ambient lab temperature. However, the internal cell temperature is rather stable during this test setup period (reference Figure).



Figure

Example of plot illustrating metal case temperature vs. internal cell temperature

5. The internal cell temperature is the critical temperature for performing the short circuit test faithfully. It is believed that as long as the cell temperature is 57 ± 4 °C the intent of the test is met.
6. PRBA therefore proposes a change to the text of the T.5 test procedure to clarify the temperature measuring point.

II. Proposal

7. The Sub-Committee is invited to amend 38.3.4.5.2 of the *Manual of Tests and Criteria* as follows (new text is underlined, deleted text in ~~strike through~~):

“The cell or battery to be tested shall be heated for a period of time necessary to reach a homogeneous stabilized temperature of 57 ± 4 °C, measured on external case or an internal cell. This period of time depends on the size and design of the cell or battery and should be assessed and documented. If this assessment is not feasible, the exposure time shall be at least 6 hours for small cells and small batteries, and 12 hours for large cells and large batteries. Then the cell or battery at 57 ± 4 °C shall be subjected to one short circuit condition with a total external resistance of less than 0.1 ohm.

This short circuit condition is continued for at least one hour after the cell or battery ~~external case~~ temperature has returned to 57 ± 4 °C, or in the case of the large batteries, has decreased by half of the maximum temperature increase observed during the test and remains below that value.”