Section	Amendment 1 of UN-T 5th ed.	Changes in comparison to UN-T 5th ed.	Impact on BATSO 01:2011-03
38.3.2.1	All cell types shall be subjected to tests T.1 to T.6 and T.8. All non-rechargeable battery types, including those composed of previously tested cells, shall be subjected to tests T.1 to T.5. All rechargeable battery types, including those composed of previously tested cells, shall be subjected to tests T.1 to T.5 and T.7. In addition, rechargeable single cell batteries with overcharge protection shall be subjected to test T.7. A component cell that is not transported separately from the battery it is part of needs only to be tested according to tests T.6 and T.8. A component cell that is transported separately from the battery shall be tested as a cell.	New paragraph, inserted before old section 38.3.2.1 which becomes now 38.3.2.2. Clarification of applicability of test items to cell and battery types. It is clarified that all alternative sources of UN-T 38.3 compliant cells have to be tested during the battery testing. Adding requirements of new battery type "rechargeable single cell batteries".	Major! It is clarified that all alternative sources of UN-T 38.3 compliant cells have to be tested during the battery testing. This concept applies as well in BATSO 01. More details regarding affected battery types and test items described below.
38.3.2.2	(c) A change that would lead to failure of any of the tests, ...	Replacing of text of item "c". Old text: "(c) A change that would materially affect the test results, ..." Clarification of intent - along with below Note.	Major! Examples of the new Note provide a rather clear guidance for cases that require testing of new/modified samples. Almost all modifications will require a complete new testing. This concept applies as well in BATSO 01. Change of sc 3.5 necessary.
	***NOTE**: The type of change that might be considered to differ from a tested type, such that it might lead to failure of any of the test results, may include, but is not limited to:* *(a) A change in the material of the anode, the cathode, the separator or the electrolyte;* *(b) A change of protective devices, including hardware and software;* *(c) A change of safety design in cells or batteries, such as a venting valve;* *(d) A change in the number of component cells; and* *(e) A change in connecting mode of component cells.*	Examples of the new Note provide a rather clear guidance for cases that require testing of new/modified samples. Almost all modifications will require a complete new testing.	See above.

<table>
<tr><th>Section</th><th>Amendment 1 of UN-T 5th ed.</th><th>Changes in comparison to UN-T 5th ed.</th><th>Impact on BATSO 01:2011-03</th></tr>
<tr><td>38.3.2.3</td><td>Battery means two or more cells which are electrically connected together and fitted with devices necessary for use, for example, case, terminals, marking and protective devices. A single cell battery is considered a "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").</td><td>Removal of batteries containing only one cell, which become a "single cell battery" (new defined term, see below).</td><td>Not relevant as LEV batteries are not single cell types.</td></tr>
<tr><td></td><td>Large cell means a cell with a gross mass of more than 500 g.</td><td>Change and simplification of definition.

Old text: " Large cell means a lithium metal cell in which the lithium content of the anode, when fully charged, is more than 12 g, or in the case of a lithium ion cell, means a cell with a Watt-hour rating of more than 150 Wh."</td><td>Typically not relevant as cells for LEV batteries weigh (much) less than 500 g.</td></tr>
<tr><td></td><td>Leakage means the visible escape of electrolyte or other material from a cell or battery or the loss of material (except battery casing, handling devices or labels) from a cell or battery such that the loss of mass exceeds
the values in Table 38.3.1.</td><td>Change and clarification of definition:

Old: " Leakage means the escape of material from a cell or battery."</td><td>Slight revision of definition of compliance criterion (sc 6).</td></tr>
<tr><td></td><td>Mass loss means a loss of mass that exceeds the values in Table 38.3.1 below.

Table 38.3.1: Mass loss limit
<table><tr><th>Mass M of cell or battery</th><th>Mass loss limit</th></tr><tr><td>M < 1 g</td><td>0.5%</td></tr><tr><td>1 g ≤ M ≤ 75 g</td><td>0.2%</td></tr><tr><td>M > 75 g</td><td>0.1%</td></tr></table>NOTE: In order to quantify the mass loss, the following procedure is provided:
$Mass\ loss\ (\%) = \frac{(M_1 - M_2)}{M_1} \times 100$
where M1 is the mass before the test and M2 is the mass after the test. When mass loss does</td><td>Editorial changes (e.g. table reference) and change of mass M values (5 g become 75 g).</td><td>Principally no change necessary, as this concept is included in definition of "no leakage" (sc 6) and the mass change typically not relevant for LEV batteries (hence the general limit of 0.1% remains valid).</td></tr>
</table>

Section	Amendment 1 of UN-T 5th ed.	Changes in comparison to UN-T 5th ed.	Impact on BATSO 01:2011-03
	not exceed the values in Table 38.3.1, it shall be considered as "no mass loss".		
	Nominal energy or Watt-hour rating, expressed in watt-hours, means the energy value of a cell or battery determined under specified conditions and declared by the manufacturer. The nominal energy is calculated by multiplying nominal voltage by rated capacity expressed in ampere-hours.	Adding "Nominal energy" and rephrasing text.	Editorial change. Corresponding definition in sc 2.1 should be updated.
	Nominal voltage means the approximate value of the voltage used to designate or identify a cell or battery.	Added as missing in earlier version.	Corresponding definition should be added in sc 2.1.
	Open circuit voltage means the voltage across the terminals of a cell or battery when no external current is flowing.	New definition.	Corresponding definition should be added in sc 2.1.
	***NOTE**: The following IEC standards provide guidance and methodology for determining the rated capacity:* *(1) IEC 61960 (First Edition 2003-12) : Secondary cells and batteries containing alkaline or other non-acid electrolytes – Secondary lithium cells and batteries for portable applications;* *(2) IEC 62133 (First Edition 2002-10): Secondary cells and batteries containing alkaline or other non-acid electrolytes – Safety requirements for portable sealed secondary cells, and for batteries made from them, for use in portable applications;* *(3) IEC 62660-1 (First Edition 2011-01): Secondary lithium-ion cells for the propulsion of electric road vehicles – Part 1: Performance testing.*	Reference information for guidance regarding "rated capacity".	Probably not necessary to add this information.
	Single cell battery means a single electrochemical unit fitted with devices necessary for use, for example, case, terminals, marking and protective devices.	New definition.	Not relevant as LEV batteries are not single cell types.
	Small cell means a cell with a gross mass of not more than 500 g.	Change and simplification of definition (linked to the changes of "large cell" above).	No change necessary as BATSO 01 does not split into large and small cells (as typically all cells used in LEV batteries are

Section	Amendment 1 of UN-T 5th ed.	Changes in comparison to UN-T 5th ed.	Impact on BATSO 01:2011-03
		Old text: " *Small cell* means a lithium metal cell in which the lithium content of the anode, when fully charged, is not more than 12 g, or in the case of a lithium ion cell, means a cell with a Watt-hour rating of not more than 150 Wh."	small cells).
	Watt-hour rating, see *Nominal energy*.	Editorial change.	None (see above).
38.3.3	(e) When testing primary and rechargeable cells and component cells under test T.8, the following shall be tested in the quantity indicated: (i) ten primary cells in fully discharged states; (ii) ten primary component cells in fully discharged states; (iii) ten rechargeable cells, at first cycle in fully discharged states; (iv) ten rechargeable component cells, at first cycle in fully discharged states; (v) ten rechargeable cells after 50 cycles ending in fully discharged states; and (vi) ten rechargeable component cells after 50 cycles ending in fully discharged states.	Adding items (ii), (iv) and (vi) for component cells (cells contained in a battery). Rationale for adding this is not clear! Cells are typically tested UN-T 38.3 separately, and not again during the battery approval. Does this now mean that cells must be retested (Test T.8) during the battery approval? My opinion: this change is only editorial, as "component cells" were not shown in "(e)", but in "(c)" which is as well a cell test only (Test T.6).	Unclear! (though I expect no impact) So far does BATSO 01 not contain any cell tests (i.e. UN-T 38.3 Test T.8).
38.3.4	Tests T.1 to T.5 shall be conducted in sequence on the same cell or battery. Tests T.6 and T.8 shall be conducted using not otherwise tested cells or batteries. Test T.7 may be conducted using undamaged batteries previously used in tests T.1 to T.5 for purposes of testing on cycled batteries.	Editorial change.	None.
38.3.4.2.2	Test cells and batteries are to be stored for at least six hours at a test temperature equal to 72 ± 2 °C, ...	Before 75 °C. No background for this change of value.	Change of sc A.5.2 necessary.
38.3.4.3.2	The logarithmic frequency sweep shall differ for cells and batteries with a gross mass of not more than 12 kg (cells and small batteries), and for batteries with a gross mass of more than 12 kg (large batteries). For cells and small batteries: from 7 Hz a peak acceleration of 1 gn is maintained until 18 Hz is reached. The amplitude is then maintained at 0.8	Changed by adding reduced requirements for large batteries.	None (as BATSO 01 specifies a weight limit of 12 kg).

Section	Amendment 1 of UN-T 5th ed.	Changes in comparison to UN-T 5th ed.	Impact on BATSO 01:2011-03
	mm (1 6 mm total excursion) and the frequency increased until a peak acceleration of 8 gn occurs (approximately 50 Hz). A peak acceleration of 8 gn is then maintained until the frequency is increased to 200 Hz. For large batteries: from 7 Hz to a peak acceleration of 1 gn 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 gn occurs (approximately 25 Hz). A peak acceleration of 2 gn is then maintained until the frequency is increased to 200 Hz.		
38.3.4.3.3	Cells and batteries meet this requirement if there is no leakage, no venting, no disassembly, no rupture and no fire during the test and after the test and if the open circuit voltage of each test cell or battery directly after testing in its third perpendicular mounting position 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.	Changed. Removal of compliance criterion "no mass loss". Open circuit voltage measurement is to be taken after the final test	None, as sc 5.1.3 a) is BATSO unique.
38.3.4.5.2	The cell or battery to be tested shall be temperature stabilized so that its external case temperature reaches 55 ± 2 °C and then the cell or battery shall be subjected to a short circuit condition with a total external resistance of less than 0.1 ohm at 55 ± 2 °C. This short circuit condition is continued for at least one hour after the cell or battery external case temperature has returned to 55 ± 2 °C.	Minor editorial change.	None.
38.3.4.6	*Test T.6: Impact / Crush*	Change in title, "Crush" added.	None, as only relevant for cells which are not in the scope of BATSO 01.
38.3.4.6.1	These tests simulate mechanical abuse from an impact or crush that may result in an internal short circuit.	Editorial change. Clarification of rationale for test item.	None. Crush test of BATSO 01 (sc 5.2.1) is unique, and has traditionally a more detailed rationale and is partly different in intent.
38.3.4.6.2	Test procedure – Impact (applicable to cylindrical cells greater than 20 mm in diameter)	Extensive modification of old test item, which now only applies to rather large-sized cylindrical	None, as only relevant for cells which are not in the scope of BATSO 01.

Section	Amendment 1 of UN-T 5th ed.	Changes in comparison to UN-T 5th ed.	Impact on BATSO 01:2011-03
	The sample cell or component cell is to be placed on a flat smooth surface. A 15.8 mm ± 0.1mm diameter, at least 6 cm long, or the longest dimension of the cell, whichever is greater, Type 316 stainless steel bar is to be placed across the centre of the sample. A 9.1 kg ± 0.1 kg mass is to be dropped from a height of 61 ± 2.5 cm at the intersection of the bar and sample in a controlled manner using a near frictionless, vertical sliding track or channel with minimal drag on the falling mass. The vertical track or channel used to guide the falling mass shall be oriented 90 degrees from the horizontal supporting surface. The test sample is to be impacted with its longitudinal axis parallel to the flat surface and perpendicular to the longitudinal axis of the 15.8 mm ± 0.1mm diameter curved surface lying across the centre of the test sample. Each sample is to be subjected to only a single impact.	cells only.	
38.3.4.6.3	Test Procedure – Crush (applicable to prismatic, pouch, coin/button cells and cylindrical cells not more than 20 mm in diameter) A cell or component cell is to be crushed between two flat surfaces. The crushing is to be gradual with a speed of approximately 1.5 cm/s at the first point of contact. The crushing is to be continued until the first of the three options below is reached. (a) The applied force reaches 13 kN ± 0.78 kN; Example: The force shall be applied by a hydraulic ram with a 32 mm diameter piston until a pressure of 17 MPa is reached on the hydraulic ram. (b) The voltage of the cell drops by at least 100 mV; or (c) The cell is deformed by 50% or more of its original thickness.	New requirement that applies to certain cell types.	None, as only relevant for cells which are not in the scope of BATSO 01.

Section	Amendment 1 of UN-T 5th ed.	Changes in comparison to UN-T 5th ed.	Impact on BATSO 01:2011-03
	Once the maximum pressure has been obtained, the voltage drops by 100 mV or more, or the cell is deformed by at least 50% of its original thickness, the pressure shall be released. A prismatic or pouch cell shall be crushed by applying the force to the widest side. A button/coin cell shall be crushed by applying the force on its flat surfaces. For cylindrical cells, the crush force shall be applied perpendicular to the longitudinal axis. Each test cell or component cell is to be subjected to one crush only. The test sample shall be observed for a further 6 h. The test shall be conducted using test cells or component cells that have not previously been subjected to other tests.		

Comparison prepared by Ralf Knapp, TUV Rheinland Taiwan (2012-Mar-07)