

## **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

24 October 2014

### **Forty-sixth session**

Geneva, 1 – 9 December 2014

Item 2 (c) of the provisional agenda

### **Recommendations made by the Sub-Committee on its forty-third, forty-fourth and forty-fifth sessions and pending issues: electric storage systems**

## **Report on the third meeting of the informal working group on testing large lithium batteries**

### **Transmitted by the expert from France (in his capacity as Chairman of the informal working group), PRBA, RECHARGE and COSTHA**

1. The informal working group (WG) meeting was held in Washington, DC on 29 September – 2 October 2014. It was co-organized by PRBA, RECHARGE and COSTHA. A total of 30 participants from both the Sub-Committee of Experts on the Transport of Dangerous Goods and industry attended the meeting. The expert from France, Claude Pfauvadel, chaired the meeting.

2. A detailed report of the discussions, proposals and list of participants are available on PRBA's website:

<http://www.prba.org/laws-regulations/un-wg-meeting-on-large-lithium-batteries-september-2014/>

3. Below is a summary of the proposed changes to the Manual of Tests and Criteria that were agreed to during the WG meeting for consideration by the Sub-Committee. These changes are also reflected in Annex 1 to this document. A presentation will be made on the proposed changes to the T4 Shock test and T5 short circuit test during the Sub-Committee meeting in order to better explain the rationale behind these changes. In addition, Annex 2 contains a list of issues related to lithium battery test in the UN Manual that were prepared by the WG for the Sub-Committee's consideration during the next biennium. The WG generally agreed that some of these issues could be addressed through a correspondence working group but that one or two WG meetings may be necessary during the next biennium.

4. The Sub-Committee is invited to check the possibility of adopting the proposed changes in Annex 1 and provide comments on the list of issues in Annex 2 that could be considered by the WG during the next biennium.

The WG had time to draft amendments in both English and French in order to facilitate translations by the secretariat

### **Definitions**

5. The WG discussed DGAC's paper ST/SG/AC.10/C.3/2014/90 on lithium battery definitions and spent a significant amount of time discussing the benefits of harmonizing the definitions in the Manual of Tests and Criteria with IEC lithium battery standards. IEC, Envites Energy and RECHARGE presented materials on definitions and the need to more

closely harmonize with other international standards and consider new cell and battery designs coming on the market. The WG concluded the definitions previously adopted at the 45th session should be adopted into the Manual of Tests and Criteria as proposed, but the issue should be included as terms for reference for a battery WG or through correspondence during the next biennium.

## **T4 shock test**

6. The T4 shock testing requirements for large lithium batteries and how to calculate a reasonable acceleration and pulse duration for these batteries in accordance with the T4 test were discussed at length on the first, second and third day of the meeting. COSTHA proposed a set of equations to calculate the appropriate acceleration and pulse duration for large format batteries. The United States presented results from their lithium battery drop tests and proposed the incorporation of such a test in place of the current T.4 shock test. After very extensive formal and informal discussions, the WG agreed to a combined approach presented by the US and COSTHA and developed text which provides two (2) options for the Subcommittee to consider:

- (a) A rationalized approach to adjust acceleration based on constant energy and pulse duration for all batteries (PROPOSAL 4 - OPTION 1); or
- (b) A rationalized approach to adjust acceleration based on constant energy and pulse duration for large batteries only (PROPOSAL 4 - OPTION 2).

The proposed text is included in Annex I.

In addition, text related to the T.4 test was proposed for the note in 38.3.2.2. to clarify changes that might be considered to differ from a design type. (Proposal 1)

*“f) For batteries which are to be tested according to T.4 with a peak acceleration less than 150 gn, a change in the mass which could adversely impact the result of the T.4 test and lead to a failure. “*

## **Large battery and battery assembly testing**

7. RECHARGE proposed extending the definition of large batteries to batteries which are constructed of large cells. Several members of the WG voiced concern over the concept of applying the large battery requirements to small batteries constructed of large cells. However, the WG concluded that changing the word “shall” to “may” in the T.4 Test, para. 38.3.4.4.2 Test procedure would address the concerns raised by RECHARGE

8. Discussion of UN 38.3.3(f). RECHARGE proposed to eliminate the cycling requirements for battery assemblies based on the fact that the cells and batteries that are assembled to form the battery assemblies have already been subject to the cycling requirement in the UN Manual. The WG agreed and the last sentence of paragraph (f) related to cycling was proposed to be removed. (Proposal 2)

9. Germany explained that the existing language in para. 38.3.3(f) and para. 38.3.3(g) is still complicated and should be improved for clarity including the removal of “single cell battery.” After some discussion, Germany proposed to remove “single cell battery” from these provisions and the WG agreed to the change.

## Single cell batteries

10. The WG discussed how single cell batteries should be considered under Special Provision 188 in the Model Regulations. The WG agreed that single cell batteries should be considered cells for transport. The WG also agreed to propose inclusion of the note in the definition for Single Cell Batteries in SP188 in the Model Regulations to clarify that single cell batteries are cells for purposes of quantities permitted per package and for hazard communication. Draft language was reviewed and proposed in Annex I. (Proposal 6)

## T.5 Short Circuit Test

11. The WG reviewed the last sentence of 38.3.4.5.2 and the language proposed during the last WG session. There were lengthy discussions about the benefits of the language but concerns were expressed about the need for such language. The Chairman clarified the conditions defined in the test are simply to identify final parameters for test completion and provide a practical solution for test completion. The WG was not in favor of editing the previously recommended language in the last sentence of 38.3.4.5.2. However, the Chairman explained that the Subcommittee rejected adoption of the language at the 45th Session and the WG must provide a better way to explain the need for the language to the Subcommittee. The UK suggested the WG could discuss this situation later in the session or at a future meeting. After further discussion, the WG felt the language previously proposed is valuable to describe the conditions of test completion although opinions were not unanimous. The WG concluded that the previously proposed language could be eliminated and replaced with clarifying language that the test could conclude as long as the temperature does not increase more than ½ of the observed maximum temperature for large batteries. Draft text was reviewed and proposed in Annex I. (PROPOSAL 5)

## Battery Assembly Testing

12. BMW/Daimler/Ford explained that the removal of the term “battery assembly” from UN 38.3 as agreed to at the last WG meeting has created some confusion in the industry. Specifically, the language in 38.3.3(g) leads to the interpretation that batteries contained within an assembled battery must prevent short circuits between batteries within the assembly. To rectify this situation, the WG agreed that the two conditions should be separated into different subparagraphs, and subparagraph (iii) was proposed. Further, the WG suggested an editorial amendment to replace the term “never” with “not”. Draft text was reviewed and proposed in Annex I.

13. The WG recognized the issue of assembled batteries composed of single cell batteries may need to be further reviewed. However, the issue is beyond the terms of reference for this WG.

## Battery Management Systems

14. JARI explained that typical electric vehicle battery designs are composed of a battery control unit (BCU) or a battery management system (BMS) which controls, manages, detects or calculates electric and thermal functions. JARI proposed changing the term “system” to “function” in 38.3.3(g)(i) to generalize the requirement without requiring a specific system. The Chairman further questioned the use of the term “system” in the subparagraphs, suggesting that battery designs can prevent short circuits and over discharge without having a specific system installed. The WG concluded paragraph (g) needed to refer to the design type function and not require a specific system be required. The

language was edited to reflect the conclusions and the intention of the paragraph. Draft text was reviewed and proposed in Annex I. (Proposal 3)

### **Standard Testing Verification Documentation**

15. PRBA explained that shippers are experiencing an increase in requests for documentation verifying cells/batteries have successfully passed the UN38.3 test criteria. A discussion ensued on whether a 1-2 page standardized document could be developed to satisfy any such requests, outside of a competent authority inquiry. PRBA would oppose a requirement for a 3rd party certification, but instead proposed an example form which industry could use to communicate verification.

Sample documents were presented. The WG discussed the benefits and drawbacks of such a document and how it would be handled. The WG considered using a rationalized approach to developing guidance on such a document but noted the issue is beyond the terms of reference for this WG. Therefore, the WG concluded the issue should be referred to the Subcommittee for assignment to a future Lithium Battery Working Group.

## **Annex 1**

### **Proposal to amend the Manual of tests and criteria and the Model rules**

**The proposals are presented in the following bi column table providing proposals in both English and French languages**

**PROPOSAL 1**

38.3.2.2 Note

Add the following text

“f) For batteries which are to be tested according to T.4 with a peak acceleration less than 150 gn, a change in the mass which could adversely impact the result of the T.4 test and lead to a failure. ”

**PROPOSAL 2**

38.3.3(f) modify as follows:

“When testing a battery in which the aggregate lithium content of all anodes, when fully charged, is not more than 500 g, or in the case of a lithium ion battery, with a nominal energy in Watt-hour of not more than 6 200 Wh, that is assembled from batteries ~~or single cell batteries~~ that have passed all applicable tests, one assembled battery in a fully charged state shall be tested under T.3, T.4 and T.5, and, in addition, test T.7 in the case of a rechargeable battery. ~~A rechargeable battery shall have been cycled at least 25 cycles.”~~

**PROPOSAL 3**

38.3.3(g) Modify the last paragraph as follows:

When batteries ~~or single cell batteries~~ that have passed all applicable tests are electrically connected to form a battery in which the aggregate lithium content of all anodes, when fully charged, is more than 500 g, or in the case of a lithium ion battery, with a Watt-hour rating of more than 6 200 Wh, the assembled battery does not need to be tested if the battery type has been verified as preventing:

~~(i) It is designed with a battery management system that has been~~

**PROPOSITION 1**

38.3.2.2. Note

Ajouter le texte suivant:

« f) Pour les batteries qui ont été testées selon le test T.4 avec une accélération de pointe inférieure à 150 gn, une modification de la masse qui pourrait impacter négativement les résultats du test T.4. et conduire à un échec du test. »

**PROPOSITION 2**

38.3.3. (f) modifier comme suit

« S’il s’agit d’une batterie dans laquelle le contenu total de lithium de l’ensemble des anodes à l’état complètement chargé n’est pas supérieur à 500 g, ou, dans le cas de batteries au lithium-ion, ayant une énergie nominale en ~~wattheures~~ Watt heure ne dépassant pas 6 200 Wh, qui est composée de piles ~~ou d’une seule pile~~ qui ont passé toutes les épreuves applicables, une seule batterie assemblée à l’état complètement chargé subira les épreuves T.3, T.4 et T.5, ainsi que l’épreuve T.7 dans le cas d’une batterie rechargeable. ~~Une batterie rechargeable doit avoir subi au moins 25 cycles de charge et de décharge.»~~

**PROPOSITION 3**

38.3.3 (g) Modifier le dernier paragraphe comme suit:

Lorsque des batteries ~~ou des batteries à une seule pile~~ qui ont passé toutes les épreuves applicables sont électriquement reliées pour former une batterie dans laquelle le contenu total de lithium de l’ensemble des anodes à l’état complètement chargé est supérieur à 500 g, ou, dans le cas de batteries au lithium-ion, ayant une énergie nominale en Watt heure dépassant 6 200 Wh, la batterie assemblée n’a pas besoin d’être éprouvée si le type de batterie a été vérifié comme protégeant contre :

~~i) — elle est conçue pour fonctionner avec un système de gestion~~

~~demonstrated to ensure that the battery will never be subject to overcharge; and~~

~~(ii) — The assembled battery is equipped with a system capable of preventing short circuits or over discharge between the batteries.”~~

- ~~i. Overcharge;~~
- ~~ii. Short circuits; and~~
- ~~iii. Over discharge between the batteries.~~

#### **PROPOSAL 4. OPTION 1.**

*Modify as follows:*

“38.3.4.4 *Test T.4: Shock*

38.3.4.4.1 Purpose

This test ~~simulates possible~~ assesses the robustness of cells and batteries against cumulative shocks ~~during transport~~.

38.3.4.4.2 Test procedure

Test cells and batteries shall be secured to the testing machine by means of a rigid mount which will support all mounting surfaces of each test battery.

Each cell ~~or battery~~ shall be subjected to a half-sine shock of peak acceleration of 150 g<sub>n</sub> and pulse duration of 6 milliseconds. Alternatively, large cells may be subjected to a half-sine shock of peak acceleration of 50 g<sub>n</sub> and pulse duration of 11 milliseconds. ~~Each cell or battery shall be subjected to three shocks in the positive direction followed by three shocks in the negative direction of three mutually perpendicular mounting positions of the cell for a total of 18 shocks.~~

~~However, large cells and large batteries shall be subjected to a half-sine shock of peak acceleration of 50 g<sub>n</sub> and pulse duration of~~

~~garantissant que la batterie ne sera jamais en état de surcharge; et~~

~~ii) — elle est munie d'un système capable de prévenir les courts-circuits, ou la décharge excessive entre les batteries.»~~

- ~~i. la surcharge ;~~
- ~~ii. les court-circuits ; et~~
- ~~iii. la décharge excessive entre les batteries.~~

#### **PROPOSITION 4. OPTION 1.**

*Modifier comme suit :*

« 38.3.4.4 *Épreuve T.4 : Choc*

38.3.4.4.1 Objet

Cette épreuve ~~vérifie la robustesse des piles et des batteries à des chocs cumulatifs. simule les chocs qui pourraient se produire au cours du transport.~~

38.3.4.4.2 Mode opératoire

Les piles et les batteries sont fixées sur l'appareil d'essai de choc au moyen d'un support rigide qui maintient toutes les surfaces de fixation de chaque batterie.

Chaque pile ~~ou batterie~~ est soumise à une impulsion semi-sinusoidale avec une accélération de pointe de 150 g<sub>n</sub> pendant 6 ms. Subsidiairement les grandes piles peuvent être soumises à une impulsion semi-sinusoidale de 50 g<sub>n</sub> pendant 11 millisecondes. ~~Chaque pile ou batterie est soumise à trois impulsions dans le sens positif suivie de trois impulsions dans le sens négatif des trois positions de montage perpendiculaires entre elles de la pile, soit au total 18 chocs. Toutefois, les grandes piles et les grandes batteries sont soumises à une impulsion semi-sinusoidale avec une accélération de pointe de~~

~~11 milliseconds. Each cell or battery is subjected to three shocks in the positive direction followed by three shocks in the negative direction of each of three mutually perpendicular mounting positions of the cell for a total of 18 shocks.~~

Each battery shall be subjected to a half-sine shock of peak acceleration depending on the mass of the battery. The pulse duration shall be 6 milliseconds for small batteries and 11 milliseconds for large batteries. The formulas below are provided to calculate the appropriate minimum peak accelerations.

Battery	Minimum peak acceleration	Pulse duration
Small batteries	150 g <sub>n</sub> or result of formula $Acceleration (g_n) = \sqrt{\left(\frac{100\ 850}{mass}\right)}$ whichever is smaller	6 milliseconds
Large batteries	50 g <sub>n</sub> or result of formula $Acceleration (g_n) = \sqrt{\left(\frac{30\ 000}{mass}\right)}$ whichever is smaller	11 milliseconds

- Mass is expressed in kilograms.

Note: IEC Standard 60068-2-27 (Fourth Edition 2008-02): Environmental testing-Part 2-27: Tests – Test Ea and guidance: Shock provides guidance on tolerance for acceleration and pulse duration.

The relationship between minimum peak acceleration and mass is illustrated in Figure 1 for small batteries and Figure 2 for large batteries.

[figures will be transmitted in a separate document]

~~50 g<sub>n</sub> pendant une durée de 11 ms. Chaque pile ou batterie est soumise à trois impulsions dans le sens positif suivies de trois impulsions dans le sens négatif de chacune des trois positions de montage perpendiculaires entre elles de la pile, soit au total 18 chocs.~~

Chaque batterie est soumise à un choc semi-sinusoïdal d'accélération de pointe dépendant de la masse de la batterie. La durée de l'impulsion est de 6 millisecondes pour les petites batteries et de 11 millisecondes pour les grandes batteries. Les formules définies ci-dessous permettent de calculer l'accélération de pointe minimum appropriée.

Batteries	Accélération de pointe minimale	Durée de l'impulsion
Petites batteries	150 g <sub>n</sub> ou résultat de la formule $Accélération (g_n) = \sqrt{\left(\frac{100\ 850}{masse}\right)}$ la valeur la plus faible étant retenue	6 millisecondes
Grandes batteries	50 g <sub>n</sub> ou résultat de la formule, $Accélération (g_n) = \sqrt{\left(\frac{30000}{mass}\right)}$ la valeur la plus faible étant	11 millisecondes

t exprimée en kilogrammes

Nota: La Norme CEI 60068-2-27 (Quatrième édition 2008-02) : Essais Fondamentaux Climatiques et de Robustesse mécanique. Partie 2-27 : Essais – Essai Ea et guide: chocs, fournit des lignes directrices pour la tolérance sur l'accélération et la durée de l'impulsion.

La relation entre l'accélération de pointe minimale et la masse est illustrée dans la Figure 1 pour les petites batteries et la Figure 2 pour les grandes batteries.



Each cell or battery shall be subjected to three shocks in the positive direction and by three shocks in the negative direction of three mutually perpendicular mounting positions of the cell or battery for a total of 18 shocks.

#### 38.3.4.4.3 Requirement

Cells and batteries meet this requirement if there is no mass loss, no leakage, no venting, no disassembly 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 related to voltage is not applicable to test cells and batteries at fully discharged states.

### **PROPOSAL 4. OPTION 2.**

*Modify as follows:*

“38.3.4.4 Test T.4: Shock

#### 38.3.4.4.1 Purpose

This test ~~simulates possible~~ assesses the robustness of cells and batteries against cumulative shocks ~~during transport~~.

#### 38.3.4.4.2 Test procedure

Test cells and batteries shall be secured to the testing machine by means of a rigid mount which will support all mounting surfaces of each test battery. Each cell or battery shall be subjected to a half-sine shock of peak acceleration of 150 g<sub>n</sub> and pulse duration of 6 milliseconds.

[Les figures seront transmises dans un document séparé]

Chaque pile ou batterie est soumise à trois impulsions dans le sens positif et à trois impulsions dans le sens négatif de chacune des trois positions de montage perpendiculaires entre elles de la pile ou la batterie, soit au total 18 chocs.

#### 38.3.4.4.3 Critère d'épreuve

Les piles et batteries satisfont à l'épreuve si elles ne présentent pas de fuite, d'évacuation de gaz, d'éclatement, de rupture ou d'inflammation et si la tension à vide de chaque pile ou batterie après l'épreuve n'est pas inférieure à 90 % de sa tension mesurée immédiatement avant l'épreuve. Le critère relatif à la tension ne s'applique pas aux piles et batteries éprouvées à l'état complètement déchargé.

### **PROPOSITION 4. OPTION 2**

*Modifier comme suit :*

38.3.4.4 Épreuve T.4 : Choc

#### 38.3.4.4.1 Objet

Cette épreuve vérifie la robustesse des piles et des batteries à des chocs cumulatifs. ~~simule les chocs qui pourraient se produire au cours du transport.~~

#### 38.3.4.4.2 Mode opératoire

Les piles et les batteries sont fixées sur l'appareil d'essai de choc au moyen d'un support rigide qui maintient toutes les surfaces de fixation de chaque batterie. Chaque pile ou batterie est soumise à une impulsion semi-sinusoidale avec une accélération de pointe de 150 g<sub>n</sub> pendant 6 ms.

Alternatively, large cells ~~and large batteries shall~~ may be subjected to a half-sine shock of peak acceleration of 50 g<sub>n</sub> and pulse duration of 11 milliseconds. ~~Each cell or battery shall be subjected to three shocks in the positive direction and three shocks in the negative direction of three mutually perpendicular mounting positions of the cell or battery for a total of 18 shocks.~~

~~However, large cells and large batteries shall be subjected to a half sine shock of peak acceleration of 50 g<sub>n</sub> and pulse duration of 11 milliseconds. Each cell or battery is subjected to three shocks in the positive direction followed by three shocks in the negative direction of each of three mutually perpendicular mounting positions of the cell for a total of 18 shocks.~~

However, large batteries shall be subjected to a half-sine shock of peak acceleration depending on the mass of the battery. The pulse duration shall be 11 milliseconds. The formula below is provided to calculate the appropriate minimum peak acceleration.

$$\text{Acceleration } (g_n) = \sqrt{\left(\frac{30\,000}{\text{mass}}\right)}$$

- Mass is expressed in kilograms.

Note: IEC 60068-2-27 (Fourth Edition 2008-02): Environmental testing-Part 2-27: Tests – Test Ea and guidance: Shock provides guidance on tolerance for acceleration and pulse duration.

The relationship between minimum peak acceleration and mass is illustrated in the Figure 2.

[figures will be transmitted in a separate document]

Each cell or battery shall be subjected to three shocks in the positive direction and by three shocks in the negative direction of three mutually perpendicular mounting positions of the cell or battery for a total of 18 shocks.

~~Subsidiairement, les grandes piles et les grandes batteries sont peuvent être~~ soumises à une impulsion semi-sinusoïdale de 50g<sub>n</sub> pendant 11 millisecondes. ~~Chaque pile ou batterie est soumise à trois impulsions dans le sens positif et à trois impulsions dans le sens négatif des trois positions de montage perpendiculaires entre elles de la pile ou de la batterie, soit au total 18 chocs.~~

~~Toutefois, les grandes piles et les grandes batteries sont soumises à une impulsion semi sinusoïdale avec une accélération de pointe de 50 g<sub>n</sub> pendant une durée de 11 ms. Chaque pile ou batterie est soumise à trois impulsions dans le sens positif suivies de trois impulsions dans le sens négatif de chacune des trois positions de montage perpendiculaires entre elles de la pile, soit au total 18 chocs.~~

Toutefois, les grandes batteries sont soumises à une impulsion semi-sinusoïdale d'accélération de pointe dépendant de la masse de la batterie, pendant une durée d'impulsion de 11 millisecondes. La formule définie ci-dessous permet de calculer l'accélération de pointe minimum appropriée.

$$\text{Accélération } (g_n) = \sqrt{\left(\frac{30000}{\text{masse}}\right)}$$

- Où la masse est exprimée en kilogrammes.

Nota : La Norme CEI 60068-2-27 (Quatrième édition 2008-02) : Essais Fondamentaux Climatiques et de Robustesse mécanique. Partie 2-27 : Essais – Essai Ea et guide: chocs, fournit des lignes directrices pour la tolérance sur l'accélération et la durée de l'impulsion.

La relation entre l'accélération de pointe et la masse est illustrée dans la Figure 2.

[Les figures seront transmises dans un document séparé]

Chaque pile ou batterie est soumise à trois impulsions dans le sens positif et à trois impulsions dans le sens négatif de chacune des trois positions de montage perpendiculaires entre elles de la pile ou de la batterie, soit au total 18 chocs.

#### 38.3.4.4.3 Requirement

Cells and batteries meet this requirement if there is no mass loss, no leakage, no venting, no disassembly 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 related to voltage is not applicable to test cells and batteries at fully discharged states.

#### **PROPOSAL 5. Test T 5.**

*Modify as follows:*

«38.3.4.5.2 – Test Procedure

The cell or battery to be tested shall be heated for a period of time necessary to reach an homogeneous stabilized temperature of stabilized so that its external case temperature reaches  $57 \text{ }^\circ\text{C} \pm 4 \text{ }^\circ\text{C}$ , measured on the external case. This period of time depends on the size and design of the cell or battery. It The time required for achieving to achieve the stabilized temperature shall be assessed and documented. This period of time depends on the size and design of the cell or battery. 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  $57 \text{ }^\circ\text{C} \pm 4 \text{ }^\circ\text{C}$  shall be subjected to a one short circuit condition with a total external resistance of less than 0.1 ohm at  $55 \pm 2 \text{ }^\circ\text{C}$ .

This short circuit condition is continued for at least one hour after the cell or battery external case temperature has returned to  $57 \text{ }^\circ\text{C} \pm 4 \text{ }^\circ\text{C}$ , or in the case of the large batteries, has decreased by half of the maximum temperature increas observed during the test and remains below that value. , provided the temperature during the cooling phase has been steadily decreasing [not re-increased by more than  $5^\circ\text{C}$ ].

#### 38.3.4.4.3 Critère d'épreuve

Les piles et batteries satisfont à l'épreuve si elles ne présentent pas de fuite, d'évacuation de gaz, d'éclatement, de rupture ou d'inflammation et si la tension à vide de chaque pile ou batterie après l'épreuve n'est pas inférieure à 90 % de sa tension mesurée immédiatement avant l'épreuve. Le critère relatif à la tension ne s'applique pas aux piles et batteries éprouvées à l'état complètement déchargé.

#### **PROPOSITION 5. Test T.5**

*Modifier comme suit:*

« 38.3.4.5.2 Modifier comme suit:

La pile ou batterie à éprouver est chauffée pendant une durée permettant d'atteindre une température stabilisée homogène de stabilisée de manière que la température de son enveloppe externe atteigne  $57 \pm 4 \text{ }^\circ\text{C}$ , mesurée dans son enveloppe externe. Cette durée dépend de la taille et du type de batterie. Le temps nécessaire pour obtenir une température stabilisée doit être Elle sera évaluée et consignée, en fonction de la taille et de la conception de la pile ou de la batterie. Si cette évaluation n'est pas réalisable, la durée d'exposition doit être au moins de 6 heures pour les petites piles et batteries et de 12 heures pour les grandes piles et batteries. La pile ou la batterie à  $57 \pm 4 \text{ }^\circ\text{C}$  est ensuite soumise à un court-circuit avec une résistance externe totale inférieure à 0,1 ohm à la température de  $55 \pm 2 \text{ }^\circ\text{C}$ .

Ce court-circuit est maintenu pendant au moins une heure après que la température de l'enveloppe extérieure de la pile ou de la batterie est revenue à  $57 \pm 4 \text{ }^\circ\text{C}$  ou, dans le cas des grandes batteries, a diminué de moitié par rapport à l'augmentation maximale de température observée pendant l'épreuve et demeure inférieure à cette valeur. à condition que la température ait fortement baissé pendant la phase de refroidissement [et qu'elle n'ait pas réaugmenté de plus de  $5^\circ\text{C}$ ].».

**PROPOSAL 6.**

Proposed Changes to the UN Model Regulations

3.3 – Special Provision 188.

*Add the following paragraph to the end of SP188*

“A single cell battery [as defined in the *Manual of Tests and Criteria Part 3, Section 38.3*] is considered a “cell” and shall be transported according to the requirements for “cells” for the purpose of this special provision.”

**PROPOSITION 6.**

Proposition de modification du Règlement Type.

3.3. Disposition spéciale 188.

*Ajouter le paragraphe suivant à la fin de la Disposition Spéciale 188.*

« Une batterie à une seule pile [telle que définie dans le *Manuel des Tests et Épreuves Partie 3, Section 38.3.*] est considérée comme une « pile » et est transportée selon les exigences des « piles » dans le cadre de cette disposition spéciale. »

## Annex 2

### Remaining Lithium Battery Discussion Points

1. The WG identified a number of issues which remain to be addressed. These items include:

- (a) Consider consistency with IEC Standard definitions of cell and battery
  - i. Reconsider the definitions at the light of the tests requirements.
  - ii. Reconsider the definitions at the light of SP188
- (b) Preparation of a Table Listing Tests requirements based on new definitions.
  - i. Clarify applicability of tests and requirements
- (c) Alignment of definitions with cell design development
  - i. Cells made of several electrochemical units in the same casing will be produced it is necessary to clarify definitions to deal with these new items
- (d) Pending Issue on testing of Large Cells in small batteries.
  - i. Peak acceleration applied to small batteries is higher than the one required for the cells it contains
- (e) Communicate changes in Section 38.3. to WP29 in order to verify if they may be suitable in the context of R100-2.
- (f) Test Report Template
  - i. Initiate work to develop requirements for a standardized tests record.
  - ii. Who is it intended for?
  - iii. List of key information?
  - iv. Consider confidentiality issue.
  - v. Consider 6.1.5.7. as a basis?
- (g) Other Pending Issues ?

If the subcommittee decides to initiate work on these issues experts are invited to add any new issue that they know about and not yet considered by the working group.

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