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**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****Fifty-ninth session**

Geneva, 29 November – 8 December 2021

Item 4 (e) of the provisional agenda

**Electric storage systems: sodium-ion batteries****Sodium-ion batteries: Assignment of a dedicated UN number  
and related special provisions – Follow-up on document  
ST/SG/AC.10/C.3/2020/45/Rev.1****Transmitted by the expert from France\*****Introduction**

1. As indicated in the report of the Sub-Committee of Experts on the Transport of Dangerous Goods on its fifty-seventh session (ST/SG/AC.10/C.3/114), the Sub-Committee welcomed the updated information contained in informal document INF.50 of that session on a set of proposals to introduce new provisions on sodium-ion batteries and any consequent amendments in both the Model Regulations and the Manual of Tests and Criteria. Many delegations supported the principle of regulating sodium-ion batteries in the same way as lithium-ion (Li-ion) batteries. However, some experts felt that it was premature to adopt the proposals at that stage. Finally, it was agreed to defer consideration of this subject to the next biennium.
2. The expert from France invited the competent authorities to consider, in the meantime, exemptions based on multilateral agreements, and to collect additional data on the transport of sodium ion batteries.
3. The basic documents that must be taken into account when considering this question are the following:
  - official document ST/SG/AC.10/C.3/2020/45/Rev.1,
  - informal document INF.9 (fifty-seventh session), and
  - informal document INF.50 (fifty-seventh session), containing additional proposals to document ST/SG/AC.10/C.3/2020/45/Rev.1 that were received between the deadline for submission and the December 2020 meeting of the Sub-Committee).
4. These documents contain the basic proposals contained in this document and the associated technical justifications.

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\* A/75/6 (Sect.20), par. 20.51

5. The purpose of this document is to share with the Sub-Committee the progress of the topic, as agreed.

### New information on exemptions based on multilateral agreements

6. A multilateral agreement on the transport of sodium-ion batteries containing an organic electrolyte was proposed for signature by the contracting states/parties of the RID and the ADR (RID 06/2021 and ADR M340). This multilateral agreement is based on proposals 1 to 4 of informal document INF.50 (fifty-seventh session), which reproduces the proposals contained in document ST/SG/AC.10/C.3/2020/45/Rev.1 and introduces the comments received between its publication and the meeting of the Sub-Committee in December 2020.

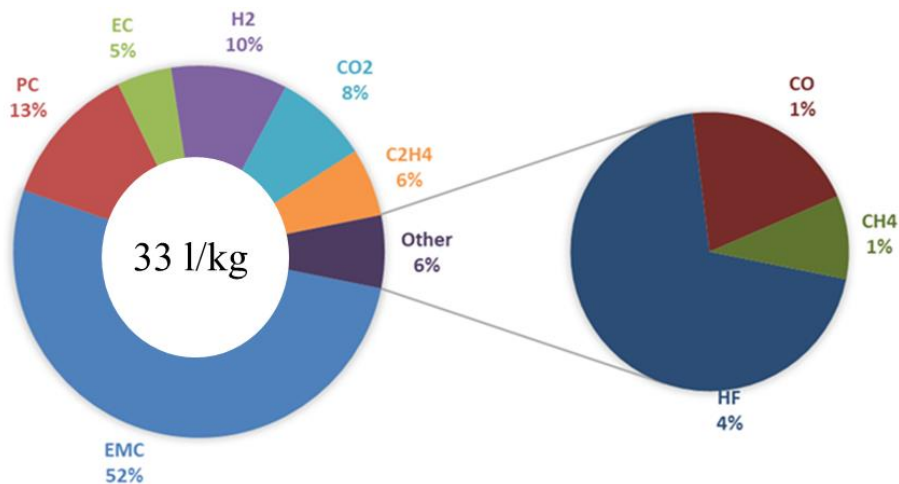
7. The multilateral agreement contains, however, a slight amendment concerning the exemption of Na-ion batteries containing a short-circuited organic electrolyte. It is conditioned on the fact that the quantities of dangerous goods contained in each cell do not exceed the limited quantities defined in Chapter 3.2, Table A, Column 7a.

8. As of 1 September 2021, four countries (Belgium, France, Germany and the United Kingdom) signed the multilateral agreement.

### New information on the collection of additional data

9. Tests on the quantity and nature of gases emitted during the thermal runaway of Na-ion batteries were conducted at the French National Institute for Industrial Environment and Risks (Ineris). The cells tested are of type 18650 and NVPF/hard-carbon chemistry and their capacity is about 700 mAh. Thus, additional data on gas emissions and their comparison with those of lithium-ion batteries are available.

10. During the thermal runaway of the cells, no flame was observed. The observed gas mixture is described in the diagram below. It contains a potentially toxic and flammable mixture.



11. To ease the comparison with Li-ion technology, the table below lists the results of the Na-ion cell tests presented above, the results of the Li-ion cell tests NMC (Nickel-Manganese-Cobalt pouch cell) also performed at Ineris and results on Li-ion LFP cells (Lithium-Iron-Phosphate pouch cell) are available in the literature<sup>1</sup>. These elements of comparison were chosen because the reactions of the Li-ion cells concerned led to a thermal runaway without the emission of flames. Flame production, which is sometimes observed,

<sup>1</sup> Fernandes, Y., Bry, A. & de Persis, S. Identification and quantification of gases emitted during abuse tests by overcharge of a commercial Li-ion battery. *Journal of Power Sources* **389**, 106-119 (2018).

strongly affects the volume and composition of the gases emitted, making the results more difficult to compare.

Gas	Na-ion (NVPF)	Li-ion (LFP)	Li-ion (NMC)
	Mole percent		
Organic carbonates	70	59	20
H <sub>2</sub>	10	9	17
CO <sub>2</sub>	8	18	30
CO	1	2	25
CH <sub>4</sub>	1	1	4
C <sub>2</sub> H <sub>4</sub>	6	4	1
Fluorinated gases	4	4	0.4
Others	0	3	3
Specific volume in L/kg	<b>33</b>	<b>22</b>	<b>80</b>

12. Analysis of the results presented in the table above shows that, in the case of thermal runaway of the Na-ion cells, the gas emissions are relatively close to those which can be observed on the LFP Li-ion cells. Thus, to a certain extent, Na-ion batteries have more similarities with certain Li-ion ones than some Li-ion chemistries have among other Li-ion ones. These elements support the principles of the proposals contained in the annex which aim to treat sodium-ion batteries on the basis of their electrochemical hazards in a similar way to lithium-batteries while adapting those depending on their specific properties.

## Other information

13. An increase in the production of sodium-ion batteries is expected in the near future, as several industries (large groups or start-ups) have expressed their intention to start mass production by 2023<sup>2</sup>.

## Conclusion

14. This topic has been on the Sub-Committee's agenda for more than two biennia. In view of the large amount of technical information provided in the past in support of the proposals debated on one side, and the confirmation by the signature of the corresponding multilateral agreements on the other, the provisions contained in these proposed amendments constitute a good solution for the transport of these batteries, for which industrial production at large scale has been announced. We believe that the proposals contained in informal document INF.50 are sufficient to be considered by the Sub-Committee for adoption at this biennium.

15. Finally, France would like to propose to the Sub-Committee the proposals contained in the annexes of this document. An additional paragraph (f) has been added to special provision XXX of proposal 4 to reflect the additional provision in the Multilateral Agreement referred to in paragraph 4 above that was deemed necessary by some countries. This text appears in square brackets.

<sup>2</sup> <https://www.reuters.com/business/energy/catls-new-sodium-ion-battery-help-ease-lithium-shortages-2021-08-03/>

<https://www.pv-magazine.com/2021/07/29/catl-claims-to-have-made-sodium-ion-batteries-a-commercial-reality/>

<https://www.catl.com/en/news/665.html>

## Annex

### Proposals

#### Proposal 1

1. In 3.2.2 change the proper shipping name of UN 3292 to read:

“BATTERIES CONTAINING METALLIC SODIUM OR SODIUM ALLOY or CELLS CONTAINING METALLIC SODIUM OR SODIUM ALLOY”

#### Consequential amendments for proposal 1

2. In the Alphabetical Index of Substances and Articles:

Amend the following entries to read as follows:

“BATTERIES, CONTAINING METALLIC SODIUM OR SODIUM ALLOY” 4.3 3292

“CELLS, CONTAINING METALLIC SODIUM OR SODIUM ALLOY” 4.3 3292

And, insert the following new entry:

“Batteries, sodium nickel chloride, see” 4.3 3292

*COMMENT – this last addition is proposed in relation to a comment from the expert from Switzerland during the July online discussions concerning the appropriate UN entry for sodium nickel chloride batteries.*

#### Proposal 2

3. In 3.2.2, add two entries in the dangerous goods list as follow:

UN No.	Name and description	Class or division	Subsidiary hazard	UN packing group	Special provisions	Limited quantities	Packaging and IBCs	
							Packing instruction	Special packing provisions
XXXX	SODIUM ION BATTERIES USING ORGANIC ELECTROLYTE	9			188 230 310 348 376 377 384 XXX YYY ZZZ	0	P903 P908 P909 P910 P911 LP903 LP904 LP905 LP906	
XXXY	SODIUM ION BATTERIES USING ORGANIC ELECTROLYTE CONTAINED IN EQUIPMENT or SODIUM ION BATTERIES USING ORGANIC ELECTROLYTE PACKED WITH EQUIPMENT	9			188 230 310 348 360 376 377 384 XXX YYY ZZZ	0	P903 P908 P909 P910 P911 LP903 LP904 LP905 LP906	

### Proposal 3

4. In Chapter 2.9, add a new 2.9.5 as follows:

**“2.9.5 Sodium Ion batteries using organic electrolyte**

Cells and batteries, cells and batteries contained in equipment, or cells and batteries packed with equipment containing sodium ion, which are a rechargeable electrochemical system where the positive and negative electrode are both intercalation or insertion compounds, constructed with no metallic sodium (or sodium alloy) in either electrode and using an organic non aqueous compound as electrolyte, shall be assigned to UN Nos. XXXX or XXXY as appropriate.

NOTE1: intercalated sodium exists in an ionic or quasi-atomic form in the lattice of the electrode material.

[NOTE2: In these regulations the words ‘sodium ion cells or batteries’ refer to sodium ion using organic electrolyte cells or batteries.] ”

They may be transported under these entries if they meet the following provisions:

(a) Each cell or battery is of the type proved to meet the requirements of applicable tests of the Manual of Tests and Criteria, part III, sub-section 38.3.

(b) Each cell and battery incorporates a safety venting device or is designed to preclude a violent rupture under conditions normally encountered during transport:

(c) Each cell and battery is equipped with an effective means of preventing external short circuits:

(d) Each battery containing cells or a series of cells connected in parallel is equipped with effective means as necessary to prevent dangerous reverse current flow (e.g., diodes, fuses, etc.):

(e) Cells and batteries shall be manufactured under a quality management program as prescribed under 2.9.4 (e) i to ix

(f) Manufacturers and subsequent distributors of cells or batteries shall make available the test summary as specified in the Manual of Tests and Criteria, Part III, sub-section 38.3, paragraph 38.3.5.”

### Consequential amendments for proposals 2 and 3

5. Following the adoption of the two new entries related to sodium ion batteries, consequential amendments would be necessary to Chapter 2.9, some special provisions in Chapter 3.3, packing instructions in section 4.1.4 and the Manual of Tests and Criteria section 38.3 concerning testing.

#### Amendments to part 2

6. In 2.9.2, Assignment to Class 9, after the sentence for AMMONIUM NITRATE BASED FERTILIZERS add the following:

“XXXX SODIUM ION BATTERIES USING ORGANIC ELECTROLYTE

XXXY SODIUM ION BATTERIES USING ORGANIC ELECTROLYTE  
CONTAINED IN EQUIPMENT or SODIUM ION BATTERIES USING ORGANIC  
ELECTROLYTE PACKED WITH EQUIPMENT”

#### Amendments to special provisions

7. In Chapter 3.3, amend the special provisions in 3.3.1 as follows:

188 “(a) For a lithium metal or lithium alloy cell, the lithium content is not more than 1 g, and for a lithium ion or sodium ion [using organic electrolyte] cell, the Watt-hour rating is not more than 20 Wh”

“(b) For a lithium metal or lithium alloy battery the aggregate lithium content is not more than 2 g, and for a lithium ion or sodium ion battery, the Watt-hour rating is not more than 100 Wh. Lithium ion and sodium ion [using organic electrolyte] batteries subject to this provision shall be marked with the Watt-hour rating on the outside case, except ~~these lithium ion batteries~~ manufactured before 1 January 2009;”

*COMMENT – Sodium ion batteries were not commercially manufactured prior to 2009 so it is not necessary to specify a date after which the requirement for the Watt-hour rating applies.*

“(c) Each lithium cell or battery meets the provisions of 2.9.4 (a), (e), (f) if applicable and (g) or for sodium ion [using organic electrolyte] cells or batteries, the requirements of 2.9.5 (a), (e) and (f).”

“(f) Each package shall be marked with the appropriate lithium or sodium ion [using organic electrolyte] battery mark, as illustrated at 5.2.1.9;”

In the penultimate sentence of the final paragraph of (f) amend as:

“When packages are placed in an overpack, the lithium or sodium ion [using organic electrolyte] battery mark shall either be clearly visible or be reproduced on the outside of the overpack and the overpack shall be marked with the word “OVERPACK”.

In the third to last paragraph of special provision 188, amend to read as follows:

“As used above and elsewhere in these Regulations, “lithium content” means the mass of lithium in the anode of a lithium metal or lithium alloy cell. As used in this special provision “equipment” means apparatus for which the ~~lithium~~ cells or batteries will provide electrical power for its operation.”

*COMMENT– ‘Lithium’ is deleted as the definition of “equipment” in this special provision applies to both lithium and sodium ion batteries.*

230 “Lithium cells and batteries may be transported under this entry if they meet the provisions of 2.9.4. Sodium ion [using organic electrolyte] cells and batteries may be transported under this entry if they meet the provisions of 2.9.5.”

296 “d) Electric storage batteries (Class 8) and lithium or sodium ion [using organic electrolyte] batteries (Class 9);”

328 In the last paragraph: “When lithium metal, ~~or lithium,~~ ion or sodium ion [using organic electrolyte] batteries are contained in the fuel cell system, the consignment shall be consigned under this entry and under the appropriate entries for UN 3091 LITHIUM METAL BATTERIES CONTAINED IN EQUIPMENT, ~~or~~ UN 3481 LITHIUM ION BATTERIES CONTAINED IN EQUIPMENT or UN XXXX SODIUM ION BATTERIES USING ORGANIC ELECTROLYTE CONTAINED IN EQUIPMENT”

360 In the first sentence: “Vehicles only powered by lithium metal batteries, ~~or~~ lithium ion batteries or sodium ion [using organic electrolyte] batteries shall be classified under the entry UN 3171 battery-powered vehicle.”

348 “Lithium ~~B~~batteries manufactured after 31 December 2011 and sodium ion [using organic electrolyte] batteries manufactured after 31 December [2023/5] shall be marked with the Watt-hour rating on the outside case.”

376 “Lithium ion or sodium ion [using organic electrolyte] cells or batteries and lithium metal cells or batteries identified as being damaged or defective such that they do not conform to the type tested according to the applicable provisions of the Manual of Tests and Criteria shall comply with the requirements of this special provision.”

In the third paragraph after the NOTE, amend to read as follows:

“Cells and batteries shall be transported according to the provisions applicable to UN 3090, UN 3091, UN 3480, ~~and~~ UN 3481, or UN XXXX and UN XXXY as

appropriate, except Special Provision 230 and as otherwise stated in this special provision.”

- 377 “Sodium ion [using organic electrolyte], ~~L~~ithium ion and lithium metal cells and batteries and equipment containing such cells and batteries transported for disposal or recycling, either packed together with or packed without non-lithium or non-sodium batteries, may be packaged in accordance with packing instruction P909 of 4.1.4.1.

These cells and batteries are not subject to the requirements of section 2.9.4. or 2.9.5. Additional exemptions may be provided under the conditions defined by modal transport regulations.

Packages shall be marked “LITHIUM BATTERIES FOR DISPOSAL”, “SODIUM ION BATTERIES FOR DISPOSAL”, ~~or~~ “LITHIUM BATTERIES FOR RECYCLING” or “SODIUM ION BATTERIES FOR RECYCLING”.

## Amendments to Packing Instructions

8. Amend the following packing instructions in 4.1.4 as follows:

### P903

“This instruction applies to UN Nos. 3090, 3091, 3480, ~~and 3481, XXXX and XXXY.~~

For the purpose of this packing instruction, “equipment” means apparatus for which the ~~lithium~~ cells or batteries will provide electrical power for its operation.”

### P905

“(c) Electric storage batteries (Class 8), ~~and~~ lithium batteries and sodium-ion [using organic electrolyte] batteries (Class 9) shall be disconnected or electrically isolated and secured to prevent any spillage of liquid; and”

### P908

“This instruction applies to damaged or defective ~~lithium ion~~ cells and batteries ~~and damaged or defective lithium metal cells and batteries~~, including those contained in equipment, of UN Nos. 3090, 3091, 3480, ~~and 3481, XXXX and XXXY.~~”

### P909

“This packing instruction applies to UN Nos. 3090, 3091, 3480, ~~and 3481, XXXX and XXXY~~ transported for disposal or recycling, either packed together with or packed without non-lithium or non-sodium batteries:”

“(2) However, lithium ion or sodium ion [using organic electrolyte] cells with a Watt-hour rating of not more than 20 Wh, lithium ion or sodium ion [using organic electrolyte] batteries with a Watt-hour rating of not more than 100 Wh, lithium metal cells with a lithium content of not more than 1 g and lithium metal batteries with an aggregate lithium content of not more than 2 g may be packed in accordance with the following:”

### P910

“This instruction applies to UN Nos. 3090, 3091, 3480, ~~and 3481, XXXX and XXXY~~ production runs consisting of not more than 100 cells or batteries and to pre-production prototypes of cells or batteries when these prototypes are transported for testing.”

### P911

“This instruction applies to damaged or defective cells and batteries of UN Nos. 3090, 3091, 3480, ~~and 3481, XXXX and XXXY~~ liable to rapidly disassemble, dangerously react, produce a flame or a dangerous evolution of heat or a dangerous emission of toxic, corrosive or flammable gases or vapours under normal conditions of transport.”

(2) Amend footnote <sup>a</sup>(b) as follows:

*“The list of hazards expected in case of thermal runaway for the cell or battery type, in the condition it is transported (e.g. usage of an inner packaging, state of charge (SOC), use of sufficient non-combustible, electrically non-conductive and absorbent cushioning material etc.), shall be clearly identified and quantified; the reference list of possible hazards for ~~lithium~~ cells or batteries (e.g. rapidly disassemble, dangerously react, produce a flame or a dangerous evolution of heat or a dangerous emission of toxic, corrosive or flammable gases or vapours) can be used for this purpose. The quantification of these hazards shall rely on available scientific literature;”*

**LP903**

“This instruction applies to UN Nos. 3090, 3091, 3480, ~~and~~ 3481, XXXX and XXXY.”

**LP904**

“This instruction applies to single damaged or defective batteries and to single items of equipment containing damaged or defective cells and batteries of UN Nos. 3090, 3091, 3480, ~~and~~ 3481, XXXX and XXXY.”

**LP905**

“This instruction applies to UN Nos. 3090, 3091, 3480, ~~and~~ 3481, XXXX and XXXY production runs consisting of not more than 100 cells or batteries and to pre-production prototypes of cells or batteries when these prototypes are transported for testing.”

**LP906**

“This instruction applies to damaged or defective batteries of UN Nos. 3090, 3091, 3480, ~~and~~ 3481, XXXX and XXXY liable to rapidly disassemble, dangerously react, produce a flame or a dangerous evolution of heat or a dangerous emission of toxic, corrosive or flammable gases or vapours under normal conditions of transport.”

(2) Amend footnote <sup>a</sup>(b) as follows:

*“The list of hazards expected in case of thermal runaway for the battery type, in the condition it is transported (e.g. usage of an inner packaging, state of charge (SOC), use of sufficient non-combustible, electrically non-conductive and absorbent cushioning material etc.), shall be clearly identified and quantified; the reference list of possible hazards for ~~lithium~~ batteries (e.g. rapidly disassemble, dangerously react, produce a flame or a dangerous evolution of heat or a dangerous emission of toxic, corrosive or flammable gases or vapours) can be used for this purpose. The quantification of these hazards shall rely on available scientific literature;”*

**Consequential amendments to the Manual of Tests and Criteria**

9. Amend Section 38.3 as follows:

**“38.3 Lithium metal, ~~and~~ lithium ion and sodium ion batteries**

**38.3.1 Purpose**

This section presents the procedures to be followed for the classification of lithium metal, ~~and~~ lithium ion and sodium ion cells and batteries (see UN Nos. 3090, 3091, 3480, ~~and~~ 3481, XXXX and XXXY, and the applicable special provisions of Chapter 3.3 of the Model Regulations).

*NOTE: In this section the words ‘sodium ion cells or batteries’ refer to sodium ion [using organic electrolyte] cells or batteries.*

**“38.3.2 Scope**

38.3.2.1 All lithium cell types shall be subjected to tests T.1 to T.6 and T.8. All non-rechargeable lithium battery types, including those composed of previously tested cells, shall be subjected to tests T.1 to T.5. All rechargeable lithium 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 lithium batteries with overcharge protection shall be subjected to test T.7. A component lithium 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 lithium cell that is transported separately from the battery shall be subjected to tests T.1 to T.6 and T.8. A lithium cell or battery that is an integral part of the equipment it is intended to power that is transported only when installed in the equipment, may be tested in accordance with the applicable tests when installed in the equipment.”

“38.3.2.2 Sodium ion, ~~L~~lithium metal and lithium ion cells and batteries shall be subjected to the tests, as required by special provisions 188 and 230 of Chapter 3.3 of the Model Regulations prior to the transport of a particular cell or battery type. Cells or batteries which differ from a tested type by:”

“38.3.2.3 For the purposes of classification, the following definitions apply:

*Large battery* means a ~~lithium metal battery or lithium ion~~ battery with a gross mass of more than 12 kg.”

Introduce a new definition for Sodium ion cell or battery as follows:

“Sodium ion cell or battery means a rechargeable electrochemical cell or battery where the positive and negative electrode are both intercalation or insertion compounds (intercalated sodium exists in an ionic or quasi-atomic form in the lattice of the electrode material) constructed with no metallic sodium (or sodium alloy) in either electrode and using an organic non-aqueous compound as electrolyte.”

*Small battery* means a ~~lithium metal battery or lithium ion~~ battery with a gross mass of not more than 12 kg.”

Introduce a new heading for sub section 38.3.3 as follows:

**“38.3.3 Number and condition of cells and batteries to be tested**

When a cell or battery type has to be tested under this sub section, the number and condition of cells and batteries of each type to be tested are as follows:”

renumber the current 38.3.3 as

“38.3.3.1 Testing of lithium cells and batteries”

Modify the heading of (a) (b) (c) (d) (e) of the new 38.3.3.1 as follows:

“(a) When testing primary lithium cells and batteries under tests T.1 to T.5 the following shall be tested in the quantity indicated:”

“(b) When testing rechargeable lithium cells and batteries under tests T.1 to T.5 the following shall be tested in the quantity indicated:”

“(c) When testing primary and rechargeable lithium cells under test T.6, the following shall be tested in the quantity indicated:”

“(d) When testing rechargeable lithium batteries or rechargeable single cell lithium batteries under test T.7, the following shall be tested in the quantity indicated:”

“(e) When testing primary and rechargeable lithium cells and component cells under test T.8, the following shall be tested in the quantity indicated:”

Insert the following new paragraph and sub-paragraphs:

“38.3.3.2 Testing of sodium ion cells and batteries:

(a) When testing rechargeable sodium ion cells and batteries under tests T.1 to T.5 the following shall be tested in the quantity indicated:

(i) five cells at first cycle, in fully charged states;

(ii) five cells after 25 cycles ending in fully charged states;

(iii) four small batteries at first cycle, in fully charged states;

(iv) four small batteries after 25 cycles ending in fully charged states;

(v) two large batteries at first cycle, in fully charged states; and

(vi) two large batteries after 25 cycles ending in fully charged states.

(b) When testing for component cells of rechargeable sodium ion batteries under test T.6, three cells at first cycle at 50 % of the design rated capacity and [three] cells after 25 cycles ending at 50 % of the design rated capacity.

(c) When testing rechargeable sodium ion cells or rechargeable single cell sodium ion batteries under test T.6, the following shall be tested in the quantity indicated:

(i) five cells or single cell batteries at first cycle, in fully charged states;

(ii) five cells or single cell batteries after 25 cycles ending in fully charged states; and

(iii) for component cells of rechargeable batteries, five cells at first cycle at 50 % of the design rated capacity and five cells after 25 cycles ending at 50 % of the design rated capacity.

(d) When testing rechargeable sodium ion batteries or rechargeable single cell sodium ion batteries under test T.7, the following shall be tested in the quantity indicated:

(i) four single cell batteries at first cycle, in fully charged states;

(ii) four small batteries at first cycle, in fully charged states;

(iii) four small batteries after 25 cycles ending in fully charged states;

(iv) two large batteries at first cycle, in fully charged states;

(v) two large batteries after 25 cycles ending in fully charged states; and

(vi) batteries or single cell batteries not equipped with battery overcharge protection that are designed for use only as a component in another battery or in equipment, which affords such protection, are not subject to the requirements of this test.

(e) When testing a fully charged sodium ion battery assembly, with a Watt-hour rating of not more than 6 200 Wh, that is assembled from batteries that have passed all applicable tests, one assembled battery in a fully charged state shall be tested under tests T.3, T.4 and T.5, and, in addition, test T.7 in the case of a rechargeable battery.

(f) When sodium ion batteries that have passed all applicable tests are electrically connected to form a fully charged battery, with a Watt-hour rating of more than 6 200 Wh, the assembled battery does not need to be tested if the assembled battery is of a type that has been verified as preventing:

(i) Overcharge;

(ii) Short circuits; and

(iii) Over discharge between the batteries.”

Renumber existing 38.3.3.1 as 38.3.3.3:

“38.3.3.43 Provisions 38.3.2.1, ~~and~~ 38.3.3.1 and 38.3.3.2 are summarized in the following tables.

“Table 38.3.2: Summary table of required tests for lithium primary cells and batteries”

“Table 38.3.3: Summary table of required tests for lithium rechargeable cells and batteries”

Insert a new table in 38.3.3.2 as follows:

**“Table 38.3.4: Summary table of required tests for sodium ion rechargeable cells and batteries**

Rechargeable cells and batteries										
		T.1	T.2	T.3	T.4	T.5	T.6	T.7 <sup>a</sup>	T.8	Sum <sup>d</sup>
Cells not transported separately from a battery	first cycle, 50 % charged state						5			10
	25th cycle, 50 % charged state						5			
Cells	first cycle, fully charged state	5					5			20
	25th cycle, fully charged state	5					5			
Single cell batteries <sup>b</sup>	first cycle, fully charged state	5					5	4		24
	25th cycle, fully charged state	5					5			
Small batteries	first cycle, fully charged state	4						4		16
	25th cycle, fully charged state	4						4		
Large batteries	first cycle, fully charged state	2						2		8
	25th cycle, fully charged state	2						2		
Batteries assembled with tested batteries ≤ 6 200 Wh	fully charged state			1				1		2
Batteries assembled with tested batteries > 6 200 Wh <sup>c</sup>										0

<sup>a</sup> Batteries or single cell batteries not equipped with battery overcharge protection that are designed for use only as a component in another battery or in equipment, which affords such protection, are not subject to the requirements of this test;

<sup>b</sup> Except for the T.7 Overcharge test, a single cell battery containing one tested cell does not require testing unless a change in cell design could result in the failure of any test;

<sup>c</sup> If the assembled battery is of a type that has been verified as preventing:

(i) Overcharge;

(ii) Short circuits; and

(iii) Over discharge between the batteries.

<sup>d</sup> The sum represents the number of tests required, not the number of cells or batteries tested.”

Amend section 38.3.5 as follows:

**“38.3.5 ~~Lithium~~ Cell and battery test summary**

The following test summary shall be made available:

<b><del>Lithium</del> eCell or battery test summary in accordance with sub-section 38.3 of Manual of Tests and Criteria</b>
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(f) Description of cell or battery to include at a minimum:

(i) **Sodium ion, lithium ion or lithium metal cell or battery;**”

## Proposal 4

10. It is proposed to add in 3.3.1 a special provision XXX for the transport of shorted sodium-ion cells and batteries.

“XXX Sodium-ion cells and batteries [using organic electrolyte] and sodium-ion cells and batteries [using organic electrolyte] contained in or packed with equipment, prepared and offered for transport, are not subject to other provisions of these Regulations if they meet the following:

- (a) The cell/battery is short-circuited, in a way that the cell or battery does not contain electrical energy. The short-circuiting of the cell/battery shall be easily verifiable (e.g., busbar between terminals).
- (b) Each cell or battery meets the provisions of 2.9.5 (a), (b), (d), (e) and (f);
- (c) Each package shall be marked according to 5.2.1.9;
- (d) Except when cells or batteries are installed in equipment, each package shall be capable of withstanding a 1.2 m drop test in any orientation without damage to cells or batteries contained therein, without shifting of the contents so as to allow battery to battery (or cell to cell) contact and without release of contents;”.
- (e) Cells and batteries when installed in equipment shall be protected from damage. When batteries are installed in equipment, the equipment shall be packed in strong outer packagings constructed of suitable material of adequate strength and design in relation to the packaging’s capacity and its intended use unless the battery is afforded equivalent protection by the equipment in which it is contained.”
- (f) [Each cell, including when component of a battery, shall only contain dangerous goods that are authorized to be transported in accordance with the provisions of Chapter 3.4, and the quantity of the dangerous goods in the cell shall not exceed the quantity specified in Chapter 3.2 Table A Column 7a.]

And to add a special provision YYY drafted as follows that would be assigned to UN 3292, UN 2795 and the new entries for sodium ion cells and batteries:

“YYY Sodium-ion batteries using an aqueous alkali electrolyte shall be transported as UN 2795 BATTERIES, WET, FILLED WITH ALKALI, electric storage.”

## Consequential amendments for proposal 4

11. To allow appropriate hazard identification, the current “lithium battery mark” should be applicable to sodium ion batteries.

Amend 5.2.1.9 as follows:

“5.2.1.9 Lithium or sodium ion battery mark

5.2.1.9.1 Packages containing lithium or sodium ion [using organic electrolyte] cells or batteries prepared in accordance with special provision 188 shall be marked as shown in Figure 5.2.5.

5.2.1.9.2 The mark shall indicate the UN number, preceded by the letters “UN”, i.e. “UN 3090” for lithium metal cells or batteries, ~~or~~ “UN 3480” for lithium ion cells or batteries, or “UN XXXX” for sodium ion [using organic electrolyte] cells or batteries. Where the ~~lithium~~ cells or batteries are contained in, or packed with, equipment, the UN number, preceded by the letters “UN”, i.e. “UN 3091”, ~~or~~ “UN 3481” or “UN XXXY” as appropriate shall be indicated. Where a package contains ~~lithium~~ cells or batteries assigned to different UN numbers, all applicable UN numbers shall be indicated on one or more marks.

Figure 5.2.5



Lithium or sodium ion battery mark

\* Place for UN number(s)

\*\* Place for telephone number for additional information

The mark shall be in the form of a rectangle or a square with hatched edging. The dimensions shall be a minimum of 100 mm wide × 100 mm high and the minimum width of the hatching shall be 5 mm. The symbol (group of batteries, one damaged and emitting flame, above the UN number(s) for lithium ion or lithium metal batteries or cells) shall be black on white or suitable contrasting background. The hatching shall be red. If the size of the package so requires, the dimensions may be reduced to not less than 100 mm wide × 70 mm high. Where dimensions are not specified, all features shall be in approximate proportion to those shown.”

“5.2.2.1.13.1 Packages containing articles or articles transported unpackaged shall bear labels according to 5.2.2.1.2 reflecting the hazards established according to 2.0.5. If the article contains one or more lithium or sodium ion [using organic electrolyte] batteries with, for lithium metal batteries, an aggregate lithium content of 2 g or less, and for lithium ion or sodium ion [using organic electrolyte] batteries, a Watt-hour rating of 100 Wh or less, the lithium or sodium ion battery mark (Figure 5.2.5) shall be affixed to the package or unpackaged article. If the article contains one or more lithium or sodium ion [using organic electrolyte] batteries with, for lithium metal batteries, an aggregate lithium content of more than 2 g and for lithium ion or sodium ion [using organic electrolyte] batteries, a Watt-hour rating of more than 100 Wh, the lithium battery label (5.2.2.1.2.2 No. 9A) shall be affixed to the package or unpackaged articles.”

*COMMENT – reference to 5.2.2.1.N° 9A in 5.2.2.1.13.1 is probably a mistake and should be corrected although it is not directly related to the subject of sodium ion batteries.*

### Proposal 5

12. If the data allows to make a positive decision in relation to paragraphs 12 and 13 above, it is proposed to adopt a new special provision YYY under new entries XXXX and XXXY prescribing requirements for low energy batteries as follows:

“YYY Sodium ion [using organic electrolyte] cells and batteries that have an energy density of [XX Wh/kg]\* or less and when protected against short circuit shall, if containing a dangerous good, be transported as articles under an appropriate entry for that dangerous good or if not containing any dangerous goods may be transported as not subject to these regulations. Equipment containing either of these types may be transported as not subject to these regulations provided installed batteries are protected against short circuit.”

\* *COMMENT - The value of the energy density must be precisely defined according to test data.*