

## **Committee of Experts on the Transport of Dangerous Goods and on the Globally Harmonized System of Classification and Labelling of Chemicals**

17 June 2015

### **Sub-Committee of Experts on the Transport of Dangerous Goods**

#### **Forty-seventh session**

Geneva, 22 – 26 June 2015

Item 2 (c) of the provisional agenda

**Explosives and related matters: review of tests in parts I and II of the Manual of Tests and Criteria**

## **Supporting material for the new design proposal for the standard detonator in the UN Manual of Tests and Criteria**

**Transmitted by the expert from Germany**

### **Introduction**

1. In document ST/SG/AC.10/C.3/2015/26 presented for the 47th session of the Sub-Committee of Experts on the Transport of Dangerous Goods an amended design for the standard detonator (European type) has been proposed. A standard detonator is frequently referenced in the UN Manual of Tests and Criteria (UN-MTC) and is required for various tests. The current design, however, is not state of the art in several areas (safety, environmental). It was announced that a thorough revision would be undertaken, in which each reference to detonator or standard detonator within the UN-MTC would be examined.

### **Discussion**

2. The wording in the UN-MTC around "detonator" is not completely consistent. It was considered a good idea check on every mentioning the exact purpose of the detonator in the context of the test, and to propose only two kinds of references to detonator:

- Where a detonator is only needed to initiate a booster charge, or an otherwise cap-sensitive explosive, the wording should only make reference to detonator without specialised characteristics. A frequent (and adequate) wording is, that the "detonator should be of sufficient strength to reliably initiate the charge". Here the purpose of the detonator is purely technical.
- Where a substance shall be subjected to a defined stimulus with the aim to examine, whether or not it is of particular sensitivity to shock and will possibly undergo a detonation, there shall be made exact reference to the "standard detonator" as defined in Appendix 1 to the UN-MTC

3. The complete list of references to detonator in the UN-MTC and eventual amendments in the text is given in the Annex to this document.

4. In order to check the comparability of the amended design with the previous design, the historical record of calibration shots with lead blocks for the Trauzl test was inspected at BAM (Federal Institute for Materials Research and Testing, Germany). Since the year

2000 for every new batch of lead blocks 10 cm<sup>3</sup> of crystallized picric acid are initiated as described in section 26.4.3.2.2 and the volume is determined. Volumes obtained with detonator caps to the original design ranged between 287 ml and 296 ml. The average was 290 ml with a standard deviation of 3 ml. Recent tests with detonators to the new design gave for manufacturer 1 an average of 295 ml and for manufacturer 2 a volume of 296 ml.

## **Proposal**

5. The working group is asked to consider the consequential changes as given in the Annex and to decide on their incorporation into the UN-MTC.

## Annex

### Occurrences of "detonator" in the UN-MTC

1. The following Table lists all occurrences of a detonator in the UN-MTC, describes the context, and suggests, whether to keep or change the wording. Within a chapter or sub-chapter (column 2) the word "detonator" may occur several times. The proposal (column 4) is meant to take effect over all occurrences within the chapter number given in column 2. In order to make the proposed changes more visible, red printing has been used to indicate changes.

2. In addition, and beyond the issue of correct mentioning of the standard detonator, in several occasions a general purpose detonator is used to initiate a booster charge, but is not mentioned in the section on needed materials. A suggestion for improving the text is included and marked in green.

3. A search through the UN-MTC delivers far more hits of the word "detonator". Only those occurrences are listed here, where the text addresses the use of a detonator. Where the text mentions detonators not related to "apparatus and materials" needed for the conduction of the test (e. g. as samples), these occurrences have been ignored.

<i>No.</i>	<i>chapter</i>	<i>context</i>	<i>proposal</i>
<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>
01	10.4.3.5	The mentioning is in relation to the detonator used in the 6(a) test, i. e. as given there.	No change necessary, since the 6(a) test does not require a standard detonator.
02	Figure 10.7	Belongs to a set of example test reports referred to in section 10.5	No change necessary, since the 6(a) test does not require a standard detonator.
03	11.3.5	A "standard No. 8 detonator (see Appendix 1)" is mentioned in reference to test F.3. Since F.3 uses the European type, the reference to "No.8" could be confusing and should be removed.	Change to "standard detonator (see Appendix 1)".
04	11.4.1.3.2 and Figure 11.4.1.1	The detonator mentioned here is used to initiate a booster charge for the 1(a) gap test.	No change in 11.4.1.3.2 necessary, since no standard detonator is required. <b>Remark:</b> In <i>Apparatus and materials</i> of 11.4.1 only the booster charge is mentioned and specified. Consistency of the text could be improved by mentioning among the materials also a "detonator suitable to initiate the booster charge".
05	12.3.4	A "standard No. 8 detonator (see Appendix 1)" is mentioned in reference to test F.3.	In order to harmonise the wording change to "standard detonator (see Appendix 1)"

<i>No.</i>	<i>chapter</i>	<i>context</i>	<i>proposal</i>
06	12.4.1.3.2 and Figure 12.4.1.1	The detonator mentioned here is used to initiate a booster charge for the 1(a) gap test. <i>(same issue as in row 04)</i>	No change in 12.4.1.3.2 necessary, since no standard detonator is required. <b>Remark:</b> <i>In Apparatus and materials of 12.4.1 only the booster charge is mentioned and specified. Consistency of the text could be improved by mentioning among the materials also a "detonator suitable to initiate the booster charge".</i>
07	15.4.1.2	A "standard detonator (see Appendix 1)" is mentioned.	Context and wording is correct, no change necessary.
08	15.4.1.3 and Figures 15.4.1.1, 15.4.1.2	Mentioning of only "detonator" in the context of the ongoing test description.	No change necessary because the <i>materials</i> require the standard detonator, and the context does not allow for another interpretation than a standard detonator being used here.
09	16.4.1.2	Wording "A detonator to initiate the substance or article" leaves the detonator type open, since the type is specified in the following section(s).	No change necessary.
10	16.4.1.3	Various mentioning of (standard) detonators.	Context and wording is correct, no changes necessary.
11	16.4.1.5	Examples with different initiation systems.	No change necessary.
12	16.5.1	Wording in the context of the 6(b) test is parallel to what is found in 16.4.1 for the 6(a) test.	No change necessary.
13	16.7.1.2	Wording "A detonator to initiate the article". A <i>standard</i> detonator plays only a role in connection with substances.	No change necessary since not a case for the application of a standard detonator.
14	17.5.1.2	The wording "United Nations Standard detonator or equivalent" seems to leave some choice. The test is conducted with a booster. Therefore the mentioning of the <i>standard detonator</i> is not necessary.	<b>Similar to rows 04 and 06 here the detonator specification should be amended to "detonator suitable to initiate the booster charge" and the mentioning of the standard detonator should be removed.</b>
15	17.5.1.3 and Figure 17.5.1.1	The detonator mentioned here is used to initiate a booster charge for the 7(b) gap test.	No change necessary, since no standard detonator is required and the reference of general nature.
16	18.5.1.2.1	The wording "United Nations Standard detonator or equivalent" seems to leave some choice. The test is conducted with a booster. <i>(same issue as in row 14)</i>	<b>Parallel to row 14 the detonator specification should be amended to "detonator suitable to initiate the booster charge" and the mentioning of the standard detonator should be removed.</b>
17	18.5.1.3.1 and Figure 18.5.1.1	The detonator mentioned here is used to initiate a booster charge for the 7(b) gap test.	No change necessary, since no standard detonator is required and the reference of general nature.

<i>No.</i>	<i>chapter</i>	<i>context</i>	<i>proposal</i>
18	21.4.1	In 21.4.1.2 the wording "detonator of sufficient strength to initiate the booster reliably" can be seen as a model for the general purpose detonator	No change necessary.
19	21.4.2.3.1 and Figures 21.4.2.1, 21.4.2.2	The detonator is only mentioned in the procedure with the purpose to initiate a booster charge.	No change in 21.4.2.3.1 necessary. <b>Remark:</b> In <i>Apparatus and materials</i> of 21.4.2 only the booster charge is mentioned and specified. Consistency of the text could be improved by mentioning among the materials also a "detonator suitable to initiate the booster charge".
20	21.4.3.3.2 and Figure 21.4.3.1	The detonator is only mentioned in the procedure with the purpose to initiate a booster charge.	No change in 21.4.3.3.2 necessary. <b>Remark:</b> In <i>Apparatus and materials</i> of 21.4.3 only the booster charge is mentioned and specified. Consistency of the text could be improved by mentioning among the materials also a "detonator suitable to initiate the booster charge".
21	21.4.4.3 and Figure 21.4.4.1	The detonator is only mentioned in the procedure with the purpose to initiate a booster charge.	No change in 21.4.4.3 necessary. <b>Remark:</b> In <i>Apparatus and materials</i> of 21.4.4 only the booster charge is mentioned and specified. Consistency of the text could be improved by mentioning among the materials also a "detonator suitable to initiate the booster charge".
22	22.4.1	The detonator here is needed to initiate the detonating cord; therefore no standard detonator needed	No change necessary.
23	26.3.1	General statement, not specific to detonator.	No change necessary.
24	26.4.1	The detonator is described as "a flat-based aluminium sheathed detonator containing 0.6 g PETN". The standard detonator would match this description. Even more, in 26.4.1.3.2 this detonator is referred to as standard detonator.	It is proposed to mention in 26.4.1.2.3 the "standard detonator (see Appendix 1)". For consistency with other sections it should be sufficient to mention in 26.4.1.3.2 only "detonator".
25	26.4.2	In 26.4.2.2.6 the standard detonator according to Appendix 1 is mentioned. There is no ambiguity.	No change necessary.
26	26.4.3	Parallel case to row 25.	No change necessary.
27	26.4.4.2	The wording "standard No. 8 (USA) detonator (see Appendix 1)" is in line with the figure caption of Appendix 1.	No change necessary.