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

21 June 2021

Sub-Committee of Experts on the Transport of Dangerous Goods

Fifty-eighth session
Geneva, 28 June-2 July 2021
Item 2 of the provisional agenda
Explosives and related matters

Report of the Working Group on Explosives

Transmitted by the Chair of the Working Group

Introduction

1. Due to continuing travel restrictions related to the COVID-19 pandemic, the working group met via web conference on 14 – 16 and 18 June 2021 to conclude its business prior to and in support of the fifty-eighth session of the TDG Sub-Committee. Participation in this meeting of the working group included 52 experts from Belgium, Canada, Finland, France, Germany, Japan, Republic of Korea, Netherlands, New Zealand, Poland, Spain, Sweden, United Kingdom (UK), United States of America (USA), Association of European Manufacturers of Sporting Ammunition (AFEMS), Australasian Explosives Industry Safety Group (AEISG), Council on Safe Transportation of Hazardous Articles (COSTHA), European Association of Automotive Suppliers (CLEPA), European Chemical Industry Council (CEFIC), Institute of Makers of Explosives (IME), Responsible Packaging Management Association of Southern Africa (RPMASA), and Sporting Arms and Ammunition Manufacturers' Institute (SAAMI). Annex 1 of this report provides a list of participants[1]. The group discussed technical matters related to official papers and informal papers as time allowed. Mr. Ed de Jong (Netherlands) served as chair and Mr. David Boston (IME) as secretariat.

2. Throughout this report, the following abbreviations may be used:

- EWG – Working Group on Explosives
- GHS – Globally Harmonized System
- ICG – Informal Correspondence Group
- MR – Model Regulations
- MTC – Manual of Tests and Criteria
- TDG – Transport of Dangerous Goods

3. As described below, the following documents identified in agenda items 2, 3, and 6(d) of the revised provisional agenda for the 58th session[2] were considered for discussion.

Document	Title	Paragraph
Agenda Item 2(a)	Review of Test Series 6	
ST/SG/AC.10/C.3/2021/14 (SAAMI)	*Report of the 6d-ICG*	*6*
UN/SCETDG/58/INF.10 (SAAMI)	*Report of the 6d-ICG Meeting of 20 May 2021 related to ST/SG/AC.10/C.3/2021/14*	
ST/SG/AC.10/C.3/2021/15 (IME, COSTHA, & SAAMI)	*Exit from Class 1 for Very Low Hazard Energetics*	*7*
ST/SG/AC.10/C.3/2021/19 (CHINA)	*Revision of Section 16.6.1.4.8 of Manual of Tests and Criteria*	*8*

1 It is recognized that some experts only participated in part(s) of the session.

2 ST/SG/AC.10/C.3/115/Add.1

Document	Title	Paragraph
Agenda Item 2(b)	Improvement of Test Series 8	
UN/SCETDG/58/INF.8 (IME)	*Recommendations on Test Series 8: Applicability of Test Series 8 (d)*	*9*
Agenda Item 2(c)	Review of tests in parts I, II and III of the Manual of Tests and Criteria	
No document		
Agenda Item 2(d)	"UN" standard detonators	
No document		
Agenda Item 2(e)	Review of packing instructions for explosives	
ST/SG/AC.10/C.3/2021/13 (United Kingdom)	*Amendment to PP70 in packing instruction P137*	*10*
Agenda Item 2(f)	Energetic samples	
No document		
Agenda Item 2(g)	Issues related to the definition of explosives	
UN/SCETDG/58/INF.12 (Sweden)	*Continuation of work on definition of explosive and definition of Class 1*	*11*
Agenda Item 2(h)	Review of packaging and transport requirements for ANEs	
No document		
Agenda Item 2(i)	Miscellaneous	
UN/SCETDG/58/INF.17 (United Kingdom)	*Review of 2.1.3.5.5 Default firework classification table in relation to new and novel firework compositions*	*12*
UN/SCETDG/58/INF.21 (CEFIC)	*Introduction of a new entry for 5-Trifluoromethyltetrazole, sodium salt (TFMT-Na) in acetone as a desensitized explosive in the Dangerous Goods List of the Model Regulations*	*13*
Agenda Item 3	Listing, classification, and packing	
ST/SG/AC.10/C.3/2021/21 (Spain)	*Transport conditions for UN 2426 ammonium nitrate*	*14*
ST/SG/AC.10/C.3/2021/27 (COSTHA)	*Fire suppression devices that contain a pyrotechnic material*	*15*
Agenda Item 6(d)	Miscellaneous proposals for amendments to the Model Regulations on the Transport of Dangerous Goods: other miscellaneous proposals	
ST/SG/AC.10/C.3/2021/25 (COSTHA)	*Interpretation problem in ADR 7.5.2.3*	*16*
UN/SCETDG/58/INF.13 (COSTHA)	*Interpretation problem in sub-section 7.5.2.3*	

4. The EWG also discussed:

- Document ST/SG/AC.10/C.4/2021/6 (Sweden, Alignment of Chapter 2.17 with Chapter 2.1 – correction to GHS Rev. 9) for the 40th Session of the GHS Sub-Committee (see para. 17); and
- Miscellaneous issues that were called to the attention of the EWG during the meeting (see para. 18).

5. There are two annexes to this report:

- Annex 1 – List of Participants
- Annex 2 – Changes for the *Manual of Tests and Criteria* (7th Revised Edition)

Agenda Item 2(a) – Review of Test Series 6

6. **Subject.** Improvement of the 6(d) test

Document: *ST/SG/AC.10/C.3/2021/14 (SAAMI)*

Informal document: *UN/SCETDG/58/INF.10 (SAAMI)*

Discussion: SAAMI reported on the ICG's meeting during which it was agreed that the 6(d) test is intended to identify hazardous effects outside of the package resulting from an accidental initiation but that the current criteria may be identifying any effects rather than just hazardous effects. Clear guidance is desired as to what hazardous effects the 6(d) test is meant to identify, and then the criteria should be reviewed and updated so that they relate solely to hazardous effects as opposed to effects in general. The principal questions are for low-energy ruptures or projections in criteria (c) and (d).

The EWG agreed with the ICG finding that the purpose of the 6(d) test is to protect people, and that this protection applies to first responders or transportation workers in normal (street) clothing and is not limited to fire fighters with protective clothing and equipment.

The EWG discussed if this level of protection also sufficiently protects objects. While it was generally agreed that this level of protection would do so, USA questioned whether that level of protection would also totally prevent any hazard that might lead to propagation to other packages. An example was given where thermal flux occurring slowly over a long period eventually set the package on fire. This should determine whether it is acceptable for the package to burn or not. There was no consensus on if the protection of people in normal clothing would also result in protection to adjacent objects.

Germany noted that the 6(d) test may also apply to limited quantities of energetics and not just 1.4S and that this should be remembered when considering revisions to the criteria of the 6(d) test.

Sweden stated that there are no criteria for hazardous fumes/smokes. USA pointed out that some understand "no hazardous effects" to encompass a low hazard effect, and that this should be resolved before assessing the criteria. Sweden appreciated looking back at the 1.4S definition and use of "no hazardous effect" in other test criteria. SAAMI noted that an approach of eliminating all hazard is beyond the intent of the test. Resolution is critical to the continuation of the work.

SAAMI noted that it is difficult to initiate these articles as intended in the package. It was noted that, in the Series 6 classification tests, risk of initiation is not a factor, and that initiation is assumed.

AEISG supported the work of the ICG. They further emphasized the need for consistency in test interpretation and that clear and appropriate assessment criteria would greatly contribute to a successful outcome.

Conclusion: The Sub-Committee is requested to consider the points reported above and to provide further any guidance it deems appropriate before the next steps in the review process commence. It should be noted that SAAMI may develop a formal proposal for the 59th Session.

7. **Subject.** Exit from Class 1

Document: *ST/SG/AC.10/C.3/2021/15 (IME, COSTHA, & SAAMI)*

Informal document: *None submitted*

Discussion: As discussed in ST/SG/AC.10/C.3/2021/15, it is desirable to classify very low hazard energetic articles outside of Class 1 to better facilitate their transportation. Presently these devices are classified in Class 1. That classification, including the safest classification (1.4S), often results in impediments to transport from carriers, facilities, and competent authorities. Therefore, IME,

COSTHA, and SAAMI are seeking to establish a classification and criteria system commensurate with the very low hazard posed. As claimed in ST/SG/AC.10/C.3/2021/15, the EWG considered and was sympathetic to the premise that no "… quantifiable, scientific method exists for classifying very low hazard energetic articles outside of Class 1, but still within the scope of the UN Model Regulations, when they are not directly intended to function as life-saving devices in transport conveyances."

The group considered whether the exclusion provisions found in MR 2.1.3.6.4 could be adapted with additional criteria for the new system. The existing exclusion provisions are used to exit Class 1. It was discussed that, once excluded, there is often no other applicable hazard class, in which case the product is no longer a dangerous good.

Many of the group felt that the issue described in ST/SG/AC.10/C.3/2021/15 was less of a classification issue, but was partially one of perception. Some in the group felt that this could be addressed by education rather than by creating a new entry for the Dangerous Goods List or by modifying current exclusion provisions. SAAMI commented that this had been tried extensively, but that prohibitions often do not differentiate between the varying hazard levels of different divisions within Class 1.

The group discussed putting such devices into Class 9; however, opinions were divided on this possibility. The USA cautioned that this may create more problems and suggested an additional division within Class 1 with various additional distinctions. Germany suggested a new specific entry (new UN number) might be of assistance. It was pointed out that any solution that retained the subject articles in Class 1 may not resolve the automatic prohibitions described above.

AEISG supported the possibility of revising MR 2.1.3.6.4 so that it addresses both classification into another dangerous goods class and exclusion outside of the dangerous goods regime. Any effort to that end must support safety but should not unnecessarily impede commerce.

Conclusion: There was support for continuing the work; however, opinions were divided on possible solutions. IME, COSTHA, and SAAMI will consider the comments of the working group as it considers a way forward.

8. **Subject.** Thermal flux calculation in the 6(c) test

Document: *ST/SG/AC.10/C.3/2021/19 (CHINA)*

Informal document: *None submitted*

Discussion: The EWG confirmed that the errors reported in ST/SG/AC.10/C.3/2021/19 should be corrected, that option 2 was preferred, and that all language versions of the MTC should be checked for correctness. It was observed that, despite the errors noted, practical experience indicates that the thermal flux calculation, when used, was being interpreted correctly. The group noted that there are instances in the MR and the MTC where the unit of measure "metre" was sometime spelled "meter" and recommended a review of both documents to ensure consistent and correct spelling throughout.

Conclusion: Amend the description of parameters for the thermal flux calculation following MTC Table 16.2 as described in Option 2 (para. 5) of ST/SG/AC.10/C.3/2021/19 (see Annex 2, Amendment 1). Confirm correctness throughout all language versions of the MTC. Confirm correct spelling of the unit of measure "metre" (as specified in Table 1.2.2.1 of the MR) throughout the MR and the MTC.

Agenda Item 2(b) – Improvement of Test Series 8

9. **Subject.** Waiver of 8(d) test when UN 3375 assigned using 8(e) test

Document: *None submitted*

Informal document: *UN/SCETDG/58/INF.8*

Discussion: IME gave a prepared presentation on modeling work and full-scale events which support its proposal to waive the 8 (d) vented pipe Tests when UN 3375 ANEs are classified using the 8 (e) CanmetCERL Minimum Burning Pressure (MBP) test. This additional information using numerical modeling was offered to illustrate the heat and mass transport phenomena that take place within a tank containing an ANE that is subject to an external fire. The modeling is based on heat/fluid flow determined experimentally from truck tire and diesel fuel scenarios. Results from the modeling support observations in the field.

IME responded to several technical questions from participants.

- The Chair questioned if these calculations were run with much lower water content and the response was: No, but it would be possible if the physical characteristics of those products were known. The material parameters for the model were from peer reviewed published sources.

- United Kingdom asked if the tank degradation or contamination was modeled. The response was: No; steel tanks were modeled as rigid and inert.

- Sweden noted that violent ruptures occurred in steel tanks in the Kuosanen tests performed in 2007, but it was pointed out that the emulsion formulation used in those tests was Ammonium Nitrate-Sodium Nitrate which would result in a different and much lower minimum burning pressure.

- Belgium noted that thermal diffusivity is important, but is not measured in the 8(e) test. Belgium suggested a modification of the 8(d) test to better account for real scenarios or that product properties might be an alternative solution to waving the test. IME responded that thermal diffusivity does play a role, but the important measure is the minimum burning pressure. It was also noted that modifying the test would be a very intensive undertaking.

USA voiced support for further discussions, but did not agree with all assumptions in the model and would like to see further experimental validation of the model. Also noted was that modeling work from US testing laboratories has shown differing results to those from IME. USA is not opposed to the proposal if more work can be done in support.

The option to modify the 8 (d)(ii) test to closer reflect a transport fire scenario was discussed. AEISG noted that no consistency exists between 8 (d)(i) and 8 (d)(ii). It was acknowledged that the 8 (d)(i) and 8 (d)(ii) tests have different specifications and the results of either test are still considered acceptable.

Conclusion: IME will incorporate feedback moving forward.

Agenda Item 2(e) – Review of packing instructions for explosives

10. **Subject.** PP70 of P137

Document: *ST/SG/AC.10/C.3/2021/13 (United Kingdom)*

Informal document: *None submitted*

Discussion: Referring to the variety of packaging orientations that are used when packaging shaped charges under Packing Instruction P137, the UK is seeking to add clarity to PP70, which specifies when package orientation marks are required. Opinions were divided as to whether additional clarity was needed since no specific issues in the packaging shaped charges have been identified. It was pointed out that competent authorities will often include notes in explosives approval documents that describe the packaging, including orientation marks if required. However, in the UK, the

packaging competent authority is not the same as the competent authority for classifying explosives and the former is not as familiar with explosives and desires more clarity.

As the proposed amendment to PP70 is quite detailed and lengthy, it was suggested that a simpler amendment might be desirable. In response, the USA offered the following that could be added to the end of PP70:

> *"Paired charge configurations may have both charges in the same or in separate inner packagings, as long as every charge in the configuration has their cone oriented toward the cone of a second charge to mitigate the jetting effect."*

Conclusion: While there was some support in principle for improvement of PP70, no consensus was reached as to what that improved wording might be. The UK advised they would consider the group's comments as they work on an improved proposal.

Agenda Item 2(g) – Issues related to the definition of explosives

11. **Subject.** Definition of explosives

Document: *None submitted*

Informal document: *UN/SCETDG/58/INF.12 (Sweden)*

Discussion: INF.12 reports on the progress of the work of an ICG (ICG-definition) assigned the task of evaluating the need for improvements to the definition of explosives and of Class 1 and development of proposals to address any issues identified. Little work has been done to date because the project was deferred until completion of the development of the new GHS chapter 2.1 (explosives). That project is now complete, and the review reported in INF.12 is restarting.

Based on recent correspondence within the ICG-definition, members' opinions are divided regarding the continuation of the work. Some indicated that there is no need to continue the work, while some indicated that there are still issues to clarify. The leader of ICG-definition believed it was necessary to bring back the issue to EWG and ask EWG's opinion whether or how the work in ICG-definition should continue.

Much of the group was of the opinion that the definition provided in MR 2.1.1.1 is generally informative, but there are issues to clarify, correct, or amend, especially the hesitation with sub-paragraph (c) and understanding what is meant by "practical explosive or pyrotechnic effect". A number of members cautioned to be very careful with changes in the definition as the current definition is used in various regulations and any amendment made will impact those regulations as well. The leader of the former GHS Chapter 2.1 ICG advised that this work will likely have impact upon GHS chapter 2.1 and that it therefore should be considered to submit future papers also to the GHS Sub-Committee.

Conclusion: The working group supported continuation of the work of ICG-definition. Sweden is willing to continue leading the ICG.

Agenda Item 2(i) – Miscellaneous

12. **Subject.** Novel pyrotechnic formulations for fireworks

Document: *None submitted*

Informal document: *UN/SCETDG/58/INF.17 (United Kingdom)*

Discussion: The United Kingdom has seen an increase in approval applications containing new and novel firework compositions. These applications seek to apply the default fireworks classification table found in MR 2.1.3.5.5 to these compositions, which have a potential increase in the energetic

performance compared to more traditional compositions. In INF.17, the UK is seeking input from others that may be having the same issues. The working group offered the following observations:

- In the USA, the American Pyrotechnics Association has a standard approved chemical list. Further, the UN default table has percent composition requirements, but these are probably based on traditional formulations and the new formulations potentially have greater energy content.

- The European fireworks standards have additional requirements for nitrocellulose and oxidizers for indoor fountains, but this requirement does not apply to outdoor fountains. In the ongoing reviews of the European standards, it was decided to make a general requirement for nitrocellulose content instead of additional testing for nitrocellulose stability or nitrogen content.

- SAAMI noted that any list of substances for fireworks should take into consideration age, as nitrocellulose (NC) has aging and stability issues. So stabilized NC should be required, and a stability test should be prescribed in Appendix 10. SAAMI also noted that, since this is in relation to new energetic materials, the default table may not be appropriate and full classification testing should be required instead. Perhaps later, when enough data is developed through that testing, new inclusions could be made into the default tables.

- Canada commented that their testing of fireworks includes chemical analysis. Canada has come across formations, like those noted in the proposal, which were declared as black powder, but chemical analysis has shown to contain nitrocellulose and perchlorates. Canada also conducts heat stress tests and the only product known to have failed contained nitrocellulose. Canada voiced desire to participate in this work.

- CEFIC commented that nitrocellulose should be stabilized, but perhaps this is not sufficient as other chemical components could still negatively interact with it. CEFIC further recommended analysis should include not just the stability of nitrocellulose, but also the stability of the entire formulation.

Conclusion: There was no opposition of the group to proceed with this work and there was a number of delegates interested in participating. Others interested in participating in the work should contact the expert from the UK.

13. **Subject.** New entry for 5-Trifluoromethyltetrazole, sodium salt (TFMT-Na) in acetone as a desensitized explosive

Document: *None submitted*

Informal document: *UN/SCETDG/58/INF.21 (CEFIC)*

Discussion: INF.21 was briefly introduced by CEFIC during which they pointed out that toxicity testing was difficult due to the fact that test institutes are not equipped to handle explosives or have no corresponding permits. Comments were invited intersessionially, especially guidance on assessing biological hazards of similar substances is sought. Other comments are welcome as well.

Conclusion: Members of the working group were invited to provide comments directly to CEFIC, especially with respect to experiences in toxicity testing of explosives or guidance how to proceed in such cases.

Agenda Item 3 – Listing, classification and packing

14. **Subject.** Transport conditions for UN 2426 ammonium nitrate

Document: *ST/SG/AC.10/C.3/2021/21 (Spain)*

Informal document: *None submitted*

Discussion: At a recent meeting of WP.15/AC.1, Spain was invited to submit a proposal to the TDG Sub-Committee to see if additional amendments were needed to harmonize the transport conditions multimodally, specifically on the maximum temperature during transport and the water contents (see report ECE/TRANS/WP.15/AC.1/160, para. 23). Although ST/SG/AC.10/C.3/2021/21 contains some proposals, Spain is presently seeking comments prior to development of a formal proposal. In response to Spain's request:

- IME commented that the proposal adds clarification and noted that upper threshold needs to be reviewed as well as the pH. IME suggested that a pH limit of 4-7 versus the paper's 5-7.

- Germany recommended more review and suggested that more requirements may need to be defined.

- USA stated that, if conditions are important across all modes, then they should be in one place together in the MR; however, if the conditions are modal specific requirements, they should not be placed within the MR. The USA supported IME's recommendation to review the various threshold limits.

- Since it views this as an issue mostly about the chemical, and not about transport, the requirements should be together in one place in the MR.

- AIESG had no problems with the proposal if it provides consistency in movement of the product.

Conclusion: There was no opposition to the proposal in para. 22 of ST/SG/AC.10/C.3/2021/21. Those members of the working group with an interest in the topic were invited to provide further comments to Spain.

15. **Subject.** Exit from Class 1: Pyrotechnic articles

Document: *ST/SG/AC.10/C.3/2021/27 (COSTHA)*

Informal document: *None submitted*

Discussion: Containing no proposal, ST/SG/AC.10/C.3/2021/27 provides examples of devices that would be described in ST/SG/AC.10/C.3/2021/15. The devices are described as fire suppression safety devices that are used in many applications including vehicles, power generation plants, energy storage systems, and aircraft unit load devices, to name a few. Presently there is no clear indication in the MR as to how these devices are to be classified leading to inconsistencies in classification. In ST/SG/AC.10/C.3/2021/27, COSTHA is seeking input from the EWG as it seeks to develop some guidance for inclusion in the MR to ensure consistency in their classification.

The group acknowledged that classification of these devices should be clarified in the MR and suggested solutions such as use of an appropriate existing UN number, creation of a new UN number, and application of Class 1 exclusion criteria in MR 2.1.3.6.4. Regarding use of an appropriate existing UN number, CLEPA expressed the opinion that UN 3268 is for automotive devices and that they do not support adding other types of products to that entry. COSTHA agreed that UN 3268 was inappropriate and a new entry that addresses issues beyond UN 3268 safety devices is needed. SAAMI advised that the work described in ST/SG/AC.10/C.3/2021/15 is intended to provide a comprehensive solution, but that project will likely not be completed this biennium and an immediate need exists for the devices described in ST/SG/AC.10/C.3/2021/27 that should be addressed sooner.

Conclusion: No conclusion was reached by the EWG. COSTHA will consider the comments provided by the group and will likely return with an updated proposal.

Agenda Item 6(d) – Miscellaneous proposals for amendments to the Model Regulations on the Transport of Dangerous Goods: other miscellaneous proposals

16. **Subject.** Clarification of Section 7.5.2.3 of the ADR

Document: *ST/SG/AC.10/C.3/2021/25 (COSTHA)*

Informal document: *UN/SCETDG/58/INF.13 (COSTHA)*

Discussion: COSTHA introduced a set of proposals intended to clarify a perceived contradiction in Section 7.5.2.3 of the Agreement concerning the International Carriage of Dangerous Goods by Road (*ADR*) regarding mixed loading. This potential inconsistency was brought about by the combination of language in separate sections from a previous revision of the document.

After extensive discussion, the group could not agree whether this was an issue to be solved by the Sub-Committee or if it should be solved by WP.15. As to whether the EWG can evaluate the risk of self-reactive substances (HD 4.1) and organic peroxides (HD 5.2) with subsidiary hazard label 1 when transported as described in ST/SG/AC.10/C.3/2021/25 and INF.13, specific examples and data are needed.

Conclusion: The general consensus was that the text could use clarification as evidenced by diverging interpretations and debate. While the question at hand was made clear during the discussion, a recommendation was not decided upon. The EWG requested additional explanatory material or examples be prepared to support the proposal. COSTHA will work with interested parties through an informal working group.

40th GHS Sub-Committee session, Agenda Item 2(i) – Other matters

17. **Subject.** Corrections to GHS Chapter 2.17 (desensitized explosives)

Document: *ST/SG/AC.10/C.4/2021/6 (Sweden)*

Informal document: *None submitted*

Discussion: While only submitted to the GHS Subcommittee, the EWG discussed GHS document 2021/6, where Sweden seeks to make a few consequential amendments to GHS Chapter 2.17 (Desensitized Explosives) necessitated, but overlooked, by the rewrite of Chapter 2.1 (Explosives):

- Update/correct the Chapter 2.1 reference in the parenthetical text of paragraph 2.17.1.1.
- Remove and replace a reference to “Unstable explosives” in footnote 1 to paragraph 2.17.1.1 with corrected references to relevant Chapter 2.1 terms.
- Replace a reference to Division 1.1 in decision logic 2.17.1 with “Sub-category 2A”.

It was noted that these amendments are intended to be treated as corrections to the 9th Rev. of the GHS, and that they do not change the classification of desensitized explosives.

Conclusion: There was very wide support within the EWG for the proposals in GHS ST/SG/AC.10/C.3/2021/6 as summarized above.

Miscellaneous issues

18. **Subject.** Miscellaneous issues

(a) Correction to Koenen Tests. Specification of silicone oil in the Koenen test. Currently the density specification given for the silicone oil is without units (apparent density 0.96 ± 0.02). It

was agreed to amend the specification to: "~~apparent~~ density 0.96 ± 0.02 g/cm^3. This applies to test 1(b), test 2(b), test 8(c), test E.1 and test series H (see Annex 2, Amendment 2).

(b) Calculation error. In Appendix 10 A.10.2.3.8 there is a calculation error. The last term in the equation assumes that the mass used is always 1 gram. However, quantities of 2 and 3 gram are also used. The EWG agreed to delete the last part of the equation "= C_{NaOH} x 0.224" (see Annex 2, Amendment 3). As a consequence, the next equation should be amended as well to:

$$V_{NO} = \frac{C_{NaOH} \times 2.24}{m_{NC}}$$

(c) Electronic detonators. IME reported that, despite not being fully implemented worldwide, the new entries for electronic detonators (UN 0511, 0512, and 0513) are being required now by some Competent Authorities. Inconsistent implementation of the new entries causes issues related to existing stocks and transport into countries that have not yet implemented the new entries.

i. USA reported that the new entries have not yet been added to its *Hazardous Materials Regulations*. USA noted that detonators approved as electric detonators cannot simply be updated to electronic detonators without evaluation since the levels of safety are very different; electronic detonators having higher inherent safety.

ii. It was noted that the issue is that certain countries are implementing based on new requirements in the ADR.

iii. UK will continue to use the current UN numbers and will consider the use of the new UN numbers when CAD applications are received. Sweden is permitting a transition period to June 2022 to allow manufacturers to sell out the stocks of electronic detonators labeled with the old UN numbers.

iv. AEISG stated that the Australian states are considering a five-year transitional period.

v. The working group noted that sometimes transitional periods are very short and some suggested that they should be long enough to deal with existing stocks.

Conclusion: The Sub-Committee is invited to consider this issue.

(d) Clarifying slide re. INF.8. IME clarified that the heat flux used for the 24 kW/m^2 case was transient, while that for 80 kW/m^2 was constant and therefore very conservative. Even though the 24 kW/m^2 case was transient, the tire used for the test was a front-end loader tire, which was 413 kg. In contrast, a tractor trailer tire is ~50 kg.

Annex 1

Working Group on Explosives (14 – 16 and 18 June 2021)
List of Participants[3]

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[3] It is recognized that some experts only participated in part(s) of the session.

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Annex 2

Working Group on Explosives (14 – 16 and 18 June 2021)
Changes for the Manual of Tests and Criteria (7th Revised Edition)

Notes: Source of proposed change is indicated by *italicized text (Source: XXX)*
~~Red~~ indicates deleted text
Blue indicates inserted text

Amendment 1.

Section 16.6.1.4.8 – Amend the description of parameters for the thermal flux calculation following Table 16.2 as shown:

F = thermal flux in kW/m^2;
C = constant=0.33;
E = total energy content in kJ~~joules~~;
R = distance from fire to exposed position in meters;
~~T~~t = observed burn time in second

Source: ST/SG/AC.10/C.3/2021/19 (Para. 5) and Para. 8 of this report

Amendment 2.

Koenen tests – In sections 11.5.1.2.2 (1 (b) test), 12.5.1.2.2 (2 (b) test), 18.6.1.2.2 (8 (c) test), 25.4.1.2.2 (test E.1), 25.4.2.2.2 (test E.2), 28.3.6 (test series H), 28.4.2.3.1 (test H.2) amend the specification as shown below:

… ~~apparent~~ density 0.96 ± 0.02 g/cm^3 at 20°C…

Source: Para. 18(a) of this report.

Amendment 3.

Appendix 10 – In A.10.2.3.8, delete the last part of the equation "= C_{NaOH} x 0.224" as shown below:

$$V_{NO} = \frac{c_{NaOH} \times C_{NaOH} \times V_{NO,m}}{m_{NC}} = \frac{C_{NaOH} \times 0.224}{m_{NC}} \text{ ~~} = C_{NaOH} \times 0.224 \text{~~}$$

Replace the next equation as shown below:

~~$V_{NO} = C_{NaOH} \times 2.2$~~ $\qquad V_{NO} = \frac{C_{NaOH} \times 2.24}{m_{NC}}$

Source: Para. 18(b) of this report.