

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

3 June 2022

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

#### Sixtieth session

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Item 2 (g) of the provisional agenda

#### Explosives and related matters: issues related to the definition of explosives

### Issues related to definition of Class 1

#### Transmitted by Sweden on behalf of the informal working group on the review of the definition of Class 1

### Definition of Class 1

1. Questions concerning the definition of Class 1 in 2.1.1.1 in the UN Model Regulations (UNMR) have been raised from time to time to the Explosive Working Group (EWG) of the Sub-Committee of Experts on the Transport of Dangerous Goods (TDG). After discussions of the three documents submitted to the fifty-fifth session of TDG (ST/SG/AC.10/C.4/2019/7, informal documents INF.10 (55<sup>th</sup> session) and INF.35 (55<sup>th</sup> session)), EWG decided to establish an intersessional correspondence group (ICG) to review the matter and to report back to the EWG (see paragraph 10 in informal document INF.55 (55<sup>th</sup> session)).
2. The work has been delayed as was described in informal document INF.12 (58<sup>th</sup> session). During that meeting, EWG again discussed the issue and concluded, as reported in paragraph 11 of informal document INF.23 (58<sup>th</sup> session): “Much of the group was of the opinion that the definition provided in Model Regulations Chap. 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’”.
3. The normal procedure to determine whether a product shall be assigned to Class 1 is to follow the test scheme for Class 1 outlined in the Manual of Tests and Criteria (MTC), instead of using the definition in 2.1.1.1. Therefore, an attempt was made to follow the test scheme step by step to determine which products are Class 1 and in this way the definition of Class 1 embedded in the test scheme was extracted.
4. Running the test scheme for Class 1 by following Figures 10.2 and 10.3 in MTC, considering particularly the procedure to exclude an article from Class 1 described in MTC 16.6.1.4.7, the following products named a, b, c, and d listed in paragraphs 6 to 9 are determined to be included in Class 1.
5. Note in paragraphs 6 to 9 below that the text in the parentheses shows the test or procedure which leads to the conclusion. Note also that “substance” should read “substance or mixture of substances” and TS is the abbreviation of Test Series.

### Products in Class 1 as determined by MTC

6. Product (a): Substances manufactured with the view to producing a practical explosive or pyrotechnic effect, except:
  - those which are too dangerous to transport (as determined by TS 3 or TS 4).

7. Product (b): Provisional explosive substances (substances which have no explosive properties, as determined by the screening procedure in Appendix 6 in MTC, are excluded from Class 1 without further testing), except:

- those which are too insensitive for acceptance into Class 1 (as determined by TS 2), or
- those which are too dangerous to transport (as determined by TS 3 or TS 4), or
- those packaged substances which do not cause hazardous effects outside the package (as determined by TS 6), or
- those where the predominant hazard is appropriate to another class.

8. Product (c): Explosive articles, except:

- those which are too dangerous to transport (as determined by TS 4), or
- devices containing substances in such quantity or of such a character that their inadvertent or accidental ignition or initiation during transport shall not cause any effect external to the device either by projection, fire, smoke, heat or loud noise (see Model Regulations 2.1.3.6).

9. Product (d): Articles manufactured with the view to producing a practical explosive or pyrotechnic effect, except:

- those which are too dangerous to transport (as determined by TS 4), or
- devices containing substances in such quantity or of such a character that their inadvertent or accidental ignition or initiation during transport shall not cause any effect external to the device either by projection, fire, smoke, heat or loud noise (see UNMR 2.1.3.6).

10. In Model Regulations 2.1.1.1 (c), products “articles manufactured with the view to producing a practical explosive or pyrotechnic effect” are mentioned but no further explanation is given. However, a closer look at products (c) and (d) in paragraphs 8 and 9 above shows that the test scheme does not treat this kind of articles differently from explosive articles. Therefore, from the test scheme point of view, it is redundant to have both product (c) and product (d). They can be combined into one.

11. From a technical point of view, product (d) is redundant, too, as shown below.

12. The term “explosive article” is defined in Model Regulations 2.1.1.3 to be “an article containing one or more explosive substances”. In analogy to this definition, “article manufactured with the view to producing a practical explosive or pyrotechnic effect” should mean “an article containing one or more substances manufactured with the view to producing a practical explosive or pyrotechnic effect”. Since substances manufactured with the view to producing a practical explosive or pyrotechnic effect are explosive substances, “article manufactured with the view to producing a practical explosive or pyrotechnic effect” is an “explosive article”. In other words, the concept of “explosive article” includes “article manufactured with the view to producing a practical explosive or pyrotechnic effect”.

13. After omitting product (d), the outcome of the test scheme regarding the definition of Class 1 is:

### **The new definition of Class 1 according to MTC**

14. Class 1 comprises:

Product (a). Substances manufactured with the view to producing a practical explosive or pyrotechnic effect, except:

- those which are too dangerous to transport;

Product (b). Explosive substances, except:

- those which are too insensitive for acceptance into Class 1,
- those which are too dangerous to transport,
- those packaged substances which do not cause hazardous effects outside the package, and
- those where the predominant hazard is appropriate to another class; and

Product (c). Explosive articles, except:

- those which are too dangerous to transport, and
- devices containing substances in such quantity or of such a character that their inadvertent or accidental ignition or initiation during transport shall not cause any effect external to the device either by projection, fire, smoke, heat or loud noise (see Model Regulations 2.1.3.6).

15. It has to be acknowledged that if a substance is too dangerous to transport (fails TS 3), it doesn't mean the substance is excluded from Class 1 and subjected to other hazard class definitions (Class 2-9). Rather it means the substance must be modified or packaged to reduce the sensitivity and then re-tested to verify if it is still too dangerous to transport. If the sensitivity cannot be reduced sufficiently, the substance will remain to be too dangerous to transport and shall not be transported.

16. Paragraph 14 states the definition of Class 1 according to the test scheme in MTC which is applied in the practice to classify Class 1. Compared this "applied definition" in MTC with the "legal definition" in Model Regulations 2.1.1.1, the discrepancies become obvious, as explained in the following paragraph.

17. Compared to the "applied definition" in MTC, the following exceptions are missing in the "legal definition" of Class 1 in UNMR 2.1.1.1:

- "those which are too dangerous to transport" for substances manufactured with the view to producing a practical explosive or pyrotechnic effect;
- "those which are too insensitive for acceptance into Class 1" and "those packaged substances which do not cause hazardous effects outside the package" for explosive substances; and
- "those which are too dangerous to transport" for explosive articles.

18. We believe that replacing the definition of Class 1 in UNMR 2.1.1.1 with the "applied definition" described in paragraph 14 above, the definition of Class 1 will be consistent with the definition embedded in the test scheme which has always been applied for classification of products into Class 1.

19. The ICG has identified further issues related to the definition of Class 1.

### **The definition of pyrotechnic substance (UNMR 2.1.1.3)**

20. One issue is the definition of "pyrotechnic substance" in UNMR 2.1.1.3. This definition refers only to the design of the substance, not to the properties of the substance. This defect can be remedied by re-defining the "pyrotechnic substance" based on the fact that a pyrotechnic substance is a subset of explosive substance and is designed for specific purposes. The proposed new definition is "Pyrotechnic substance is an explosive substance designed to produce an effect by heat, light, sound, gas or smoke or a combination of these as the result of non-detonative self-sustaining exothermic chemical reactions".

### **The definition of explosive effect**

21. Another issue is the phrase "a practical explosive or pyrotechnic effect" in Model Regulations 2.1.1.1 (c). Since this phrase is not defined or explained, it has caused confusions

in understanding and applying the definition of Class 1. From time to time, questions arise concerning the origin or the necessity of this phrase.

22. Considering the intrinsic properties of explosive substances and the intention of UNMR 2.1.1.1 (c), “substances manufactured with the view to producing a practical explosive or pyrotechnic effect” in UNMR 2.1.1.1 (c) should mean those substances which:

- are able to maintain self-sustaining exothermic chemical reactions,
- are so insensitive that they can be excluded from Class 1 by Test Series 2, and
- are manufactured with the view to producing a practical explosive or pyrotechnic effect.

23. Therefore, to facilitate the application of the Model Regulations 2.1.1.1 (c) or to eliminate the possibility of misinterpretation, it is proposed to introduce a definition of “explosive effect” when it is used in 2.1.1.1 (c) of the Model Regulations. The proposed definition is: “Explosive effect in the context of 2.1.1.1 means an effect produced by self-sustaining exothermic chemical reactions including blast, projection, heat, light, sound, gas and smoke. Pyrotechnic effect is a kind of explosive effect”.

24. By introducing this definition, the phrase “a practical explosive or pyrotechnic effect” in the Model Regulations 2.1.1.1 (c) and in the “applied definition” of Class 1 in paragraph 14 above can be shortened to “a practical explosive effect”.

### **Remaining issues**

25. Although the proposals presented in paragraphs 14, 20 and 23 above solve much of the confusion related to the definition of Class 1, the ICG has identified some remaining issues to be solved.

26. One of those issues is the possibility for explosive substances to exist in Class 1 by the criterion “those where the predominant hazard is appropriate to another class”. There is no guidance in the Model Regulations or Manual of Tests and Criteria conducive to the application of this exception criterion. Without guidance, this criterion is open to subjective interpretation by each hazard classifier, resulting in a severe lack of international harmonization. Thus, it is important for the EWG to work out a guidance to facilitate the consistent application of this exemption.

27. Another of such issues concerns those products in the Dangerous Goods List which contain explosive substance but are classified to other Classes than Class 1. Their exclusion from Class 1 is not always consistent with the definition of Class 1.

28. In a next step, EWG should continue to work on the remaining issues as described in paragraphs 26 and 27 above.

29. Although the proposals are focused on Class 1, it is recognized that the proposed changes are likely to have immediate consequences to the corresponding definition in Chapter 2.1 of the GHS.

### **Proposals**

30. The EWG is asked to examine the proposals described in paragraphs 14, 20 and 23 above and consider them for adoption. The proposals are presented in total below.

#### **Proposal 1**

31. Replace the definition of Class 1 in UNMR 2.1.1.1 by:

“Class 1 comprises:

- (a). Substances manufactured with the view to producing a practical explosive effect, except:

- those which are too dangerous to transport;
- (b). Explosive substances, except:
- those which are too insensitive for acceptance into Class 1,
  - those which are too dangerous to transport,
  - those packaged substances which do not cause hazardous effects outside the package, and
  - those where the predominant hazard is appropriate to another class; and
- (c). Explosive articles, except:
- those which are too dangerous to transport, and
  - devices containing substances in such quantity or of such a character that their inadvertent or accidental ignition or initiation during transport shall not cause any effect external to the device either by projection, fire, smoke, heat or loud noise (see Model Regulations 2.1.3.6).”

### **Proposal 2**

32. Re-define/amend the term “pyrotechnic substance” in UNMR 2.1.1.3 to read: “*Pyrotechnic substance* is an explosive substance ~~a substance or a mixture of substances~~ designed to produce an effect by heat, light, sound, gas or smoke or a combination of these as the result of non-detonative self-sustaining exothermic chemical reactions”.

### **Proposal 3**

33. Introduce a definition of “explosive effect” in UNMR 2.1.1.3 as point (e) to read as follows: “Explosive effect in the context of 2.1.1.1 means an effect produced by self-sustaining exothermic chemical reactions including blast, projection, heat, light, sound, gas and smoke. Pyrotechnic effect is a kind of explosive effect”.

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