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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**

**REPORT OF THE SUB-COMMITTEE OF EXPERTS  
ON ITS TWENTY-FIRST SESSION**

(Geneva, 1-10 July 2002)

**Addendum 2**

**Annex 2**

**Report of the Working Group on the classification of fireworks (1-3 July 2002)  
(as transmitted by the Chairman of the Working Group to the Sub-Committee)**

1. The Working Group session was attended by experts from Australia, Canada, China, France, Germany, Italy, Japan, Netherlands, Norway, Sweden, United Kingdom, United States of America, observers of Namibia, Portugal and Switzerland, and the representatives from the International Council of Chemical Associations (ICCA).

2. Mr. P. Huurdeman (Netherlands) chaired the Working Group.

3. The following documents were discussed:

ST/SG/AC.10/C.3/40, paras. 75-80 (report of the Sub-Committee on its twentieth session),  
ST/SG/AC.10/C.3/2002/1 (report of the informal working group, 16-18 October 2001),  
ST/SG/AC.10/C.3/2002/20 (United States of America),  
ST/SG/AC.10/C.3/2002/38 (Japan),  
UN/SCETDG/21/INF.3 (Netherlands),  
UN/SCETDG/21/INF.21 (United Kingdom),  
UN/SCETDG/21/INF.44 (Italy),  
UN/SCETDG/21/INF.52 (Germany),  
Working paper No.13 (Chairman).

At the beginning of the meeting, working papers Nos. 14 (United States of America), 15 (Japan) and 16 (Japan) were distributed.

4. The Chairman recalled that the mandate of the Working Group was to develop a default classification system with the annex to the report ST/SG/AC.10/C.3/2002/1 (result of the meeting in October 2001 in The Hague) as a starting point for further discussion and to end up with a finalized default table on the basis of test results of test series 6 of the UN Test Manual, and to stay on the safe side (“worst case”-principle) with respect to assignment of types of fireworks to hazard divisions in the default table.

5. The expert of the Netherlands explained his working paper No. 13, to provide some guidance in order to facilitate the discussion in the Working Group: the importance to have a common basis for the judgement of test results. The paper gives information including practical experiences of the Netherlands during classification trials on the judgement of test results.

## **GENERAL**

6. Before entering into the details of the default table, the Chairman proposed to have some general discussion on the aspects mentioned below:

### *Assignment to hazard division 1.1*

7. Some misunderstanding was raised on whether assignment to division 1.1 should be made in the default table: it is clear for the Working Group that fireworks can be assigned to division 1.1 as demonstrated by tests.

### *Assignment to hazard division 1.2*

8. The question was raised by the expert from the United States of America as to whether division 1.2 should be included in the default table. In his view, there was no practical need to have division 1.2 in the default table.

9. The expert from the Netherlands remarked that hazards from non-metallic projections should also be considered as a criterion for assignment to division 1.2 (see footnote to figure 16.6.1.1 in 16.6.1.5 of the Manual of Tests and Criteria).

10. Several experts were of the opinion that division 1.2 should not be excluded from the default table because the intention of the Manual of Tests and Criteria is that the projection hazard effect should be taken care of, whether caused by metallic fragments or non-metallic fragments.

11. The Working Group agreed to come back on this question when discussing the relevant fireworks in the default table.

### *Assignment to hazard division 1.4*

12. The Chairman pointed out that inclusion of the hazard division 1.4 could be difficult because apparently a large amount of parameters (like composition, weight, kind of packaging) will influence the assignment.

13. Several experts found it too difficult to include division 1.4 in the default table, especially because a well defined typing of certain fireworks is needed, and representative tests should be done, to be sure that fireworks will not be classified in a lower division than based on real tests. The expert from Germany could not support 1.4 classification by default in any case; also articles containing flash composition should not be classified by default in another division than 1.1.

14. Several other experts had the view that excluding 1.4 would mean that the default table was incomplete, and they were of the opinion that it was essential to include 1.4 in the table, based on the mandate and on actual tests done.

15. The Chairman concluded that a further decision on including 1.4 in the default table should be done case-by-case when looking further in detail at the default table.

#### *Relevance of dimensions, weight, composition as parameters*

16. There was general understanding in the Working Group on the point that, apart from dimensions of fireworks, other parameters could be relevant as well and should be taken into account during the discussion where necessary.

17. The expert from the Netherlands explained their view on using an “overarching” parameter like size for certain fireworks, because of the benefits of easy enforcement, representing the worst case situation.

18. The expert from the United Kingdom was of the opinion that for articles with flash effect, apart from the physical dimensions, the weight could be relevant as well.

19. The expert from Japan explained in their working papers Nos. 15 and 16, the system used in Japan on how to handle toy fireworks and fireworks for professional needs. The importance of weight and composition was stressed.

20. The Chairman concluded that a further decision on this should be made when looking into the default table in more detail.

### **LOOKING INTO THE TABLE IN DETAIL**

21. The Working Group considered the default table (Annex of document ST/SG/AC.10/C.3/2002/1) in more detail.

#### *Shells*

22. It was recognized that the flash composition and report effects should be taken into account with respect to the assignment of colour shells < 200 mm because of the danger of reaction as division 1.1. The default table was amended accordingly. The expert from Germany did not agree with the 25% of flash composition for 1.3 classification.

23. Based on a test done (see UN/SCETDG/21/INF.21) and demonstrated by the United Kingdom, it was found acceptable to the Working Group that division 1.4 G could be introduced in the default table for colour shells  $\leq 50$  mm or the 60 g limit (as used in the default system in the United States of America), provided that the total percentage of report components in the shell be limited to 2%. (This low limit was found necessary based on experiences in the United States of America and Germany). The default table was amended accordingly.

24. It was recognized by the Working Group that cylindrical shells could not be handled in the same way as spherical shells, because of the variation in the length of the cylindrical shell. Two options of coping with this matter were given: the longest dimension of the cylindrical shell determines the borderline for classification, or the equivalence volume. Erring on the safe side of classification and easier enforceability, the Working Group decided that the longest dimension should determine the borderline for classification. An entry for cylindrical shells and the criteria for calibre was included in the table.

#### *Shells in mortar*

25. Based on tests done (see UN/SCETDG/21/INF.21), the expert from the United Kingdom said it was wrong to assign colour shells  $< 200$  mm in mortar to division 1.3 in the default table, based on the demonstrated kinetic energy values and velocity of the projected shell. The other experts of the Working Group shared this view and accepted the proposal of the Netherlands to put them in division 1.2. The default table was amended accordingly.

#### *Shell of shells*

26. The expert from Japan explained his proposal (ST/SG/AC.10/C.3/2002/38) to introduce a new type, "shell of shells" (having a double shell structure) in the default table. He demonstrated the test results on the report and colour shells.

27. The Working Group was of the opinion that the results of the tests performed by Japan were convincing but that the description of the "shell of shells" was too general. The expert of the United Kingdom offered to assist in drafting a more specific description. The revised proposal was subsequently approved by the Working Group.

#### *Roman candles*

28. A long discussion took place on whether or not small Roman candles should be assigned to division 1.4 in the default table.

29. The expert from the United Kingdom demonstrated that Roman candles of 29 mm diameter could be classified as 1.4G and that previous 6 (c) tests by the United Kingdom had demonstrated that small Roman candles could be classified as 1.4G. The expert from the Netherlands explained that many tests (see UN/SCETDG/21/INF. 3) have been done by the Netherlands with the aim of establishing the lower limit for 1.3 classification. It was found that a Roman candle with an inner diameter of 9 mm and 4 g of pyrotechnic material did not meet the requirements for 1.4 classification (fiery projections thrown more than 15 m according to the Manual of Tests and Criteria). It was therefore not possible to find the borderline.

30. Experts from Canada, France, United Kingdom and United States of America were of the view that these products did not represent the typical 1.3 hazard and could therefore be assigned to division 1.4.

31. The expert from the United States of America expressed the view that a weight borderline (20 g,

possibly only for single shot candles) instead of a diameter would be more suitable for a borderline between division 1.3 and 1.4. Other experts also saw the possibilities of an assignment of Roman candles to division 1.4 in the default table.

32. Several other experts expressed the opinion that assignment to division 1.4 in a default table should be avoided because of the tests done. The borderline between division 1.3 and 1.4 should be well defined to avoid a lower classification than on the basis of the Manual of Tests and Criteria.

33. The Chairman concluded that the Working Group could not agree on assignment to division 1.4 in the default table. Based on the discussion held, he also concluded that it was not within the mandate of the Working Group to change the classification criteria (15 m throw out) and the definition of division 1.4, for the benefit of assignment to division 1.4 in the default table.

34. The classification by default of Roman candles shall be maintained between square brackets.

#### *Rockets*

35. The expert from the United Kingdom made a presentation on experiments with flash rockets. A full Tests Series 6 has been performed with 2 types of rockets containing 18.6 and 37 g flash powder. No mass explosion was found. The expert from the Netherlands presented Danish experiments with boxes with rockets with 14 g flash powder bursting charge which led to a mass explosion in a container. However, the tests performed in Denmark were not UN tests. The expert from Germany noted that the configuration in the packaging had an influence on the classification. The Working Group agreed to not set a borderline yet for the amount of flash composition to distinguish between division 1.1 and 1.3 as proposed by the United Kingdom (see UN/SCETDG/21/INF.21) since the expert from the United Kingdom has the intention to do further investigation on this subject.

36. The borderline between 1.3 and 1.4 has been maintained between square brackets for the same reason (projection distance larger than 15 m in the 6(c) test) as for the Roman candles (see paras. 28-34).

#### *Mines*

37. To avoid confusion with other firework types (like shells) the definitions of a pot-a-feu/ ground mine and bag mine/ cylinder mine has been amended.

#### *Pot-a-feu/ground mine*

38. Based on tests (see UN/SCETDG/21/INF.21) done by the United Kingdom, the Working Group found a maximum of 90 g pyrotechnic composition acceptable for assignment to division 1.4 with a limitation of the flash component. The borderline between division 1.1 and 1.3 with respect to flash composition could not yet be established on the basis of the test results done up till now.

#### *Bag mine (cylinder mine)*

39. The Working Group was of the opinion that, on the basis of the tests done, no clear borderlines could be established for the different hazard divisions. The expert from the United Kingdom would be willing to do further tests to try to make the borderlines clear.

#### *Fountains*

40. A mass of 1 kg pyrotechnic composition based on the information given in

UN/SCETDG/21/INF.3, as proposed in document UN/SCETDG/21/INF.21 (United Kingdom), was accepted by the Working Group as a borderline between division 1.3 and 1.4, provided that:

- the composition is pressed or consolidated;
- some specific articles are excluded (like "falls", "rains" etc.) from the second column.

The default table was amended accordingly.

#### *Sparklers*

41. The Working Group maintained the borderline of 10 g pyrotechnic composition between divisions 1.3 and 1.4, because of experiences shown and the aspect of heat radiation. The expert of the United States of America withdrew his proposal to settle a borderline on 100 g for sparklers not containing perchlorate or chlorate (see ST/SG/AC.10/C.3/2002/20).

#### *Low hazard fireworks and novelties*

42. On the basis of document ST/SG/AC.10/C.3/2002/20 (United States of America) and a draft CEN-standard, as referred to by the expert from the United Kingdom, weight limitations were established for certain substances.

#### *Spinners*

43. Limitations were established for report effects.

#### *Wheels*

44. Since fountains are frequently used as drivers, a borderline of 1 kg pyrotechnic compositions was found acceptable to distinguish between division 1.3 and 1.4, provided that report effects are excluded and the mass of whistle effects is restricted. The default table was amended accordingly.

#### *Aerial wheels*

45. The borderline of 60 g pyrotechnic composition between division 1.3 and 1.4 was accepted by the Working Group under certain conditions. The default list was amended accordingly.

#### *Selection pack*

46. Based on document UN/SCETDG/21/INF.21 (United Kingdom), it was found acceptable that a pack (which should not necessarily be a box) containing 1.3 and 1.4 fireworks of more than one type could be included in the default table, provided that the most hazardous firework determines the classification. This is in analogy to the description of combinations and batteries.

#### *Firecrackers*

47. Due to a lack of sufficient test results and the wide variety of types of firecrackers, these articles cannot be taken up in the default table. It was remarked that the tightness of rolling the firecrackers could influence the classification.

**INTRODUCTORY TEXT TO THE DEFAULT TABLE**

48. The introductory text to the default table (2.1.3.5.1-2.1.3.5.5) was amended slightly:

49. On the proposal of the expert of France, a new sentence was added to 2.1.3.5.2, indicating that items not specified in the default table should be classified on the basis of test data derived from Test Series 6.

50. In 2.1.3.5.4 the words “new types” were changed to “other types” as proposed by the expert from Australia.

51. On the basis of document UN/SCETDG/21/INF.52 (Germany), it was agreed that the classification shown in the default table in 2.1.3.5.7 applies only to articles packed in fibreboard boxes (4G). Therefore, a new paragraph 2.1.3.5.6 has been inserted. It was not found necessary to restrict the packages to 35 kg.

52. The expert from the United States of America withdrew specific proposal I.1 in document ST/SG/AC.10/C.3/2002/20. The Working Group did not find it necessary to include a provision as in specific proposal I.2, because of the already existing definitions of “fireworks” and “pyrotechnic substances” in the UN Model Regulations on the Transport of Dangerous Goods.

53. The Working Group finalized its work on the introductory text and the default table (2.1.3.5) of document ST/SG/AC.10/C.3/2002/1. The revised text and table will be annexed to this report.

54. The Chairman noted that, in the December meeting of the Sub-Committee, there would not be enough time to have a further discussion on the default table. In his opinion, a logical conclusion would be that the text between square brackets in the default table should be deleted, if no further test data are made available. As a consequence, classification should then be done on the basis of Test Series 6.

55. The Chairman thanked the participants of the Working Group for their contributions and spirit of cooperation during the meeting.

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### Annex

Insert new text as 2.1.3.5 as follows and renumber 2.1.3.5 to 2.1.3.6.

#### **"2.1.3.5     *Assignment of fireworks to Hazard Divisions***

2.1.3.5.1     Fireworks shall normally be assigned to hazard divisions 1.1, 1.2, 1.3, and 1.4 on the basis of test data derived from Test Series 6. However, since the range of such articles is very extensive and the availability of test facilities may be limited, assignment to hazard divisions may also be made in accordance with the procedure in 2.1.3.5.2.

2.1.3.5.2     Assignment of fireworks to UN numbers 0333, 0334, 0335 or 0336 may be made on the basis of analogy, without the need for Test Series 6 testing, in accordance with the default table in 2.1.3.5.6. Such assignment shall be made with the agreement of the competent authority. Items not specified in the default table should be classified on the basis of test data derived from Test Series 6.

2.1.3.5.3     Where fireworks of more than one Hazard Division are packaged in the same package they shall be classified on the basis of the highest Hazard Division unless test data derived from Test Series 6 indicate otherwise.

2.1.3.5.4     The addition of other types of fireworks to column 1 of the default list in 2.1.3.5.6 shall only be made on the basis of full test data submitted to the UN Sub-Committee on the Transport of Dangerous Goods for consideration.

2.1.3.5.5     Test data derived by competent authorities which validates, or contradicts the assignment of Hazard Division to firework types and/or sub-divisions by calibre/weight in column 4 of the table in 2.1.3.5.6 to hazard divisions in column 5 shall be submitted to the UN Sub-Committee on the Transport of Dangerous Goods for information (see also note 3 in 2.1.3.2.3).

2.1.3.5.6     The classification shown in the Default table in 2.1.3.5.7 applies only for articles packed in fibreboard boxes (4G)."



## 2.1.3.5.1 Default table

Type	Includes: / Synonym:	Definition	Calibre /Weight	HD
shell, spherical or cylindrical	spherical display shell: aerial shell, colour shell, dye shell, multi-break shell, multi-effect shell, nautical shell, parachute shell, smoke shell, star shell; report shell: maroon, salute, sound shell, thunderclap	device with or without propellant charge, with delay fuse and bursting charge, pyrotechnic unit(s) or loose pyrotechnic composition and designed to be projected from a mortar	all report shells	1.1G
			colour shell: $\geq 200$ mm	1.1G
			colour shell: $< 200$ mm with $> 25\%$ perchlorate/ metal composition, as loose powder and/ or report effects	1.1G
			colour shell: $< 200$ mm with $\leq 25\%$ perchlorate/ metal composition, as loose powder and/ or report effects	1.3G
			colour shell: $\leq 50$ mm or $\leq 60$ g pyrotechnic composition with $> 2\%$ perchlorate/ metal composition as report effects	1.3G
			colour shell: $\leq 50$ mm or $\leq 60$ g pyrotechnic composition with $\leq 2\%$ perchlorate/ metal composition as report effects	1.4G
	cylindrical display shell: aerial shell, colour shell, dye shell, multi-break shell, multi-effect shell, nautical shell, parachute shell, smoke shell, star shell; report shell: maroon, salute, sound shell, thunderclap	device with or without propellant charge, with delay fuse and bursting charge, pyrotechnic unit(s) or loose pyrotechnic composition and designed to be projected from a mortar	as for spherical shells, longest dimension determines the classification	
	aerial shell kit, preloaded mortar, shell in mortar	assembly comprising a shell inside a mortar from which the shell is designed to be projected	all report shells	1.1G
			colour shell: $\geq 200$ mm	1.1G
			colour shell: $< 200$ mm	1.2G

Type	Includes: / Synonym:	Definition	Calibre /Weight	HD
	shell of shells (spherical) <i>(Reference to percentages for shell of shells are to the gross mass of the fireworks article)</i>	device without propellant charge, with delay fuse and bursting charge, containing report shells and inert materials and designed to be projected from a mortar	>120 mm	1.1G
		device without propellant charge, with delay fuse and bursting charge, containing report shells = 25mm and/or report units, with = 33% perchlorate/metal pyrotechnic composition and ≥60% inert materials and designed to be projected from a mortar	=120 mm	1.3G
		device without propellant charge, with delay fuse and bursting charge, containing colour shells and/or pyrotechnic units and designed to be projected from a mortar	>300 mm	1.1G
		device without propellant charge, with delay fuse and bursting charge, containing colour shells = 70mm and/or pyrotechnic units, with = 25% perchlorate/metal pyrotechnic composition and = 60% pyrotechnic composition and designed to be projected from a mortar	=300 mm	1.3G
combination/ batteries	barrage, bombardos, cakes, finale box, flowerbed, hybrid, multiple tubes, shellcakes	assembly including several elements either containing the same type or several types each corresponding to one of the types of fireworks listed in this table, with one or two points of ignition	the most hazardous firework type determines the classification	
[roman candles	exhibition candle, candle, bombettes	tube containing alternate propellant charge(s), pyrotechnic unit(s) and transmitting fuse(s)	≥ 50 mm containing flash composition	1.1G
			≥ 50 mm, containing no flash composition	1.2G
			≥ 25 mm and < 50 mm	1.3G
			< 25 mm	1.4G]

Type	Includes: / Synonym:	Definition	Calibre /Weight	HD
[rocket	avalanche rocket, signal rocket, whistling rocket, bottle rocket, sky rocket, missile type rocket, table rocket	tube containing pyrotechnic composition and/or pyrotechnic units, equipped with stick(s) or other means for stabilisation of flight, and designed to be propelled into the air	report as primary effect, limits to be determined	1.1G
			other	1.3G
			to be defined	1.4G]
mine	pot-a-feu, ground mine	tube containing propellant charge and pyrotechnic units and designed to be placed on the ground or to be fixed in the ground. The principal effect is ejection of all the pyrotechnic units in a single burst producing a widely dispersed visual and/or aural effect in the air	containing [ $> 3\%$ ] perchlorate/ metal composition as report effects	1.1G
			$> 90$ g pyrotechnic composition containing [ $\leq 3\%$ ] perchlorate/ metal composition as report effects	1.3G
			$\leq 90$ g pyrotechnic composition, containing $\leq 3\%$ perchlorate/ metal composition as report effects	1.4G
	bag mine, cylinder mine	cloth or paper bag or cloth or paper cylinder containing propellant charge and pyrotechnic units, designed to be placed in a mortar and to function as a mine	containing report effects	1.1G
			[other, to be defined	1.3G]
			[other, to be defined	1.4G]
fountain	volcanos, gerbs, showers, lances, Bengal fire, flitter sparkle, cylindrical fountains, cone fountains, illuminating torch	non-metallic case containing pressed or consolidated sparks- and flame producing pyrotechnic composition	$\geq 1$ kg pyrotechnic composition	1.3G
			$< 1$ kg pyrotechnic composition	1.4G
sparklers	handheld sparklers, non-handheld sparklers, wire sparklers, dipped sticks	rigid wire or thin stick partially coated (along one end) with slow burning pyrotechnic composition with or without an ignition tip	pyrotechnic composition per item $\geq 10$ g	1.3G
			pyrotechnic composition per item $< 10$ g	1.4G
low hazard fireworks and novelties	table bombs, throw downs, crackling granules, smokes, fog, chaser, snakes, glow worm, serpents	device designed to produce very limited visible and/ or audible effect which contains small amounts of pyrotechnic and/ or explosive composition.	articles may contain up to 1.6 mg of silver fulminate, or up to 16 mg potassium chlorate/ red phosphorous mixture	1.4G

Type	Includes: / Synonym:	Definition	Calibre /Weight	HD
spinners	aerial spinners, helicopters, ground spinners	non-metallic tube or tubes containing gas- or spark-producing pyrotechnic composition, with or without noise producing composition, with or without aerofoils attached	pyrotechnic composition per item > 20 g, containing ≤ 3% perchlorate/ metal composition as report effects	1.3G
			pyrotechnic composition per item ≤ 20 g, containing ≤ 3% perchlorate/ metal composition as report effects	1.4G
wheels	Catherine wheels, Saxon	assembly including drivers containing pyrotechnic composition and provided with a means of attaching it to a support so that it can rotate	no report effect, each whistle (if any) ≤ 5 g, ≥ 1 kg total pyrotechnic composition	1.3G
			no report effect, each whistle (if any) ≤ 5 g, < 1 kg total pyrotechnic composition	1.4G
aerial wheels	flying Saxon, UFO's, rising crown	tubes containing propellant charges and sparks- flame- and/ or noise producing pyrotechnic compositions, the tubes being fixed to a supporting ring	no report effect, each whistle (if any) ≤ 5 g, > 60 g pyrotechnic composition per driver or > 200 g total pyrotechnic composition	1.3G
			no report effect, each whistle (if any) ≤ 5 g, ≤ 60 g pyrotechnic composition per driver and ≤ 200 g total pyrotechnic composition	1.4G
Selection pack	display selection box, display selection pack, garden selection box, indoor selection box	A pack of 1.3G and/ or 1.4G fireworks of more than one type each corresponding to one of the types of fireworks listed in this table	the most hazardous firework type determines the classification	

References to percentages in the table, unless otherwise stated, are to the mass of the pyrotechnic composition.