



**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-THIRD SESSION**

(Geneva, 30 June-4 July 2003)

Addendum 1

Annex 2

Report of the Working Group on Explosives

1. The Working Group on Explosives met from 1-3 July 2003 under the chairmanship of Mr. A. Johansen (Norway).
2. The Working Group session was attended by experts from Australia, Canada, China, France, Germany, India, Japan, Netherlands, Norway, Spain, Sweden, United Kingdom and United States of America, an observer from Switzerland and representatives from the European Chemical Industry Council (CEFIC), the International Council of Chemical Associations (ICCA) and the Dangerous Goods Advisory Council (DGAC).

The Working Group was to consider the technical implications of the proposal from Spain in ST/SG/AC.10/C.3/2003/13 to amend the definition in SP309, which pertains to UN3375; to continue the work on a default table for classifying fireworks and to discuss the information from Canada on a minimum burning pressure test.

Ammonium Nitrate Emulsions (ANE), Suspensions (ANS) and Gels (ANG)

Documents: ST/SG/AC.10/C.3/2003/13 (Spain)

Informal documents: INF.12 and INF.32 (Spain)

CEFIC Information paper on Koenen testing
Draft amended provisions for suspensions and gels

3. The meeting commenced with a presentation on documents INF.12 and INF.32 from Spain. There was extensive discussion, the key points of which are summarised below.

4. Several delegates raised the issue of the appropriateness of the tests and also questioned the appropriateness of putting any ANE, S or G into any class other than Class 1. The Chairman reminded delegates that this issue had been decided several years ago and the group needed to try to move forward.

5. General discussion confirmed that typical formulation is a range to limit the types of chemicals and to ensure that inappropriate chemicals are not introduced. Numerous delegates suggested that there needed to be more detail on the types of perchlorates and soluble amine salts. And there was a need to consider the need for soluble flame suppressants for suspensions. An alternative definition was drafted for consideration. (see below).

6. It was suggested that the proposal needed to include requirements for a new UN No with a different set of tank requirements. The Chairman reminded delegates that the current requirement is for T1 and most emulsions are transported in insulated tanks.

7. The following questions were posed to the expert from Spain for future action:

(a) How does the density change through temperature cycles? *Preliminary reply was that crystal growth reduced the sensitivity;*

(b) Will insulated tanks be a requirement? *Preliminary reply was that under temperature recycling some crystal growth may occur. This was not a safety problem but could lead to handling problems. Hence insulated tanks were used for intercontinental transport;*

(c) Review the AN percentages and make them more relevant to the materials tested, and also review the paragraph on the trace flame suppressants;

(d) Rethink the use of the word "unsensitised" in the introduction and the introduction of chemical sensitisers in suspensions and gels;

(e) The expert from the United Kingdom will discuss the issue of thermal cycling directly with the expert from Spain. Others simply wanted information on the densities at the two temperature extremes likely to be encountered in transport;

(f) Have the expert from Spain done any tests on the crystals that appear when the material deteriorates? *Preliminary reply was that suspensions and emulsions have been dried and the crystals were tested (BAM Fallhammer). The result was similar to those from ANFO;*

(g) Were there any problems with compatibility? *The expert from Spain advised that these products have been used extensively for over 40 years with no compatibility problems. Furthermore, the Test 8a (TST) has shown no exothermic reaction at 50K above transport temperatures. The expert from Sweden will also approach the expert from Spain with further questions on compatibility.*

8. On the suggestion of the expert from the United States of America, the expert from Spain indicated that he would put forward a redrafted text in December. This would give delegates time to study all the documentation and also to clarify issues directly with his delegation if necessary.

9. A preliminary draft text was developed in the meeting (see below). Several delegates indicated this was a step forward and encouraged the expert from Spain to submit it as a formal document for the next meeting. The reduction of perchlorate to 5% was to reflect commercial reality and guarantee that the perchlorates remain in the liquid phase. Higher concentrations were to maximise the rigour of the tests. The expert from the United Kingdom suggested that the AN percentage should be reduced to the levels tested.

Draft text:

[The mixture for suspensions and gels typically has the following composition: 60-85% ammonium nitrate; 0-5% sodium or potassium perchlorate; 0-17% hexamine nitrate or MMAN; 5-30% water; 2-15% fuel; 0.5-4% thickening agent; 0-10% soluble flame suppressants; and trace additives. Substances shall satisfactorily pass Test Series 8 of the *Manual of Tests and Criteria*, Part I, Section 18 and be approved by the competent authority.].

10. Delegates also expressed appreciation for the effort and quality of the information from the expert from Spain.

Minimum burning pressure tests

Informal documents: INF.29 (Canada)
INF.32 (Spain)

11. The expert from Canada spoke to his paper and answered questions. Their goal was to try to identify a test that would differentiate materials that would pass and those that would fail the criteria for being an ANE either as a replacement for or supplement to Test Series 8. The expert from Canada will continue with the tests, particularly for materials that may be pumped.

12. Delegates welcomed the work as a modern development beyond the existing tests and encouraged the expert from Canada to continue.

13. Informal document INF.32 from the expert from Spain showed good correlation between the Australian modification of the VPT (which had standardised heating conditions) and the Koenen test.

14. The discussion then turned to the Modified Vented Pipe Test, the origin of which was to give more reliable correlation between the behaviour of materials in the Koenen test and bulk tankers. Delegates encouraged industry to continue to develop tests and to explore the VPT further with a view correlating with small scale tests.

Fireworks

Documents: ST/SG/AC.10/C.3/2003/14 (Netherlands)
ST/SG/AC.10/C.3/2003/20 (United States of America)

Informal document: INF.25 (United Kingdom)

15. The Working Group then commenced discussing the outstanding issues in square brackets from document ST/SG/AC.10/C.3/42/Add.2 as instructed by the Sub-Committee.

Roman candles

16. For 1.4G roman candles, there was extensive discussion on whether there should be a limitation of 0.13g per report effect, as currently required in the table presented by the expert from the United States of America. Experts indicated they would review their existing test data and the expert from the United Kingdom would also perform a test on candles with flash composition greater than 2g and report back to the working group. On that basis it was agreed to:

- (a) Remove square brackets from 1.1 and 1.2G;
- (b) Keep square brackets around 1.3G and 1.4G;
- (c) Leave the 30 mm and 25 g criteria; and
- (d) Insert "?g" for the flash composition.

17. For 1.3G roman candles, it was agreed that the calibre should be less than 50 mm because the expert from the Netherlands had done tests that showed 50 mm roman candles were 1.2G. The mass of flash composition had to be limited to less than 10 g.

Rockets

18. Discussion centred on the proposal by the expert from the United States of America for rockets. Tentative definitions were drafted and all are to remain in square brackets pending more test results.

19. For 1.4G rockets, the criteria are to be: "Pyrotechnic composition not more than 20 g per rocket and not more than 0.13g flash composition per report. Total flash composition is less than 10 % of the total pyrotechnic composition."

20. For 1.3G, the criteria are to be: Pyrotechnic composition exceeds 20 g per rocket and flash composition not more than 40g. Total flash composition is less than 20% of the total pyrotechnic composition.

21. Where the flash composition is greater than 40g or greater than 20% of the pyrotechnic composition the rocket is to be 1.1G.

22. The expert from Germany agreed to present test results on flash report rockets and report to the Working Group.

23. New criteria for rockets without sticks were added from INF 25. These are retained in square brackets.

Mines

24. For 1.4G, the criteria are to be "Less than or equal to 80 g pyrotechnic composition containing [$\leq 3\%$] flash composition."

25. The 1.3G criteria would be "more than 80g up to [1kg] total, pyrotechnic composition containing [$\leq 3\%$] flash composition."

26. 1.1G would apply to anything larger than [1kg] or containing more than [3%] flash composition.

27. Discussion on bag mines was deferred until experts had done more research on the subject.

Firecrackers

28. It was decided to include firecrackers in square brackets pending clarification of some of the definitions such as batteries and strings of items. The proposal from the expert from the United States of America was used as the draft text.

Sparklers

29. The criteria for 1.3G were to be: "Pyrotechnic composition for each item $\geq 100\text{g}$, or $>10\text{g}$ if perchlorate or chlorate composition is present, or more than 10 items per pack".
The criteria for 1.4G were to be: Pyrotechnic composition for each item to be $<100\text{g}$, or $<10\text{g}$ if perchlorate or chlorate composition is present, and not more than 10 items per pack.

Shell in mortar

30. Criteria similar to those for roman candles for 1.3G were added and 1.2G were changed to be in line with the criteria for roman candles.

General

31. Add a new note:

"Flash composition" in this table refers to pyrotechnic compositions containing an oxidizing substance and a metal powder fuel that are used to produce an aural report effect or are used as a bursting charge in fireworks devices."

In discussing the options for package sizes, the Working Group reaffirmed the limitation on packaging types for inclusion in the default table is fibreboard boxes. This matter needs further discussion because the current 400 kg permissible mass limit for packages is considered to be too dangerous.

The revised text and table are reproduced in the appendix to this report (refer also to ST/SG/AC.10/C.3/42/Add.2; changes are indicated in bold).

Appendix

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 Nos. 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 shall 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 packed 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/mass 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 /Mass	Classification	
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: ≥ 200 mm	1.1G	
			colour shell: < 200 mm with $> 25\%$ flash composition, as loose powder and/ or report effects	1.1G	
			colour shell: < 200 mm with $\leq 25\%$ flash composition, as loose powder and/ or report effects	1.3G	
			colour shell: ≤ 50 mm or ≤ 60 g pyrotechnic composition with $> 2\%$ flash composition as report effects	1.3G	
			colour shell: ≤ 50 mm or ≤ 60 g pyrotechnic composition with $\leq 2\%$ flash composition as report effects	1.4G	
			as for spherical shells, longest dimension determines the classification		
			all report shells		1.1G
			colour shell: ≥ 200 mm		1.1G
			colour shell ≥ 50 mm, < 200 mm		1.2G
Colour shell, > 30 mm and < 50 mm and < 10 g of flash composition		1.3G			
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	assembly comprising a shell inside a mortar from which the shell is designed to be projected		
aerial shell kit, preloaded mortar, shell in mortar					

Type	Includes: / Synonym:	Definition	Calibre /Mass	Classification
		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 \leq 25mm and/or report units, with \leq 33% perchlorate/metal pyrotechnic composition and \geq 60% inert materials and designed to be projected from a mortar	\leq 120 mm	1.3G
combination/ batteries	barrage, bombardos, cakes, finale box, flowerbed, hybrid, multiple tubes, shellleakes	device without propellant charge, with delay fuse and bursting charge, containing colour shells \leq 70mm and/or pyrotechnic units, with \leq 25% perchlorate/metal pyrotechnic composition and \leq 60% pyrotechnic composition and designed to be projected from a mortar	\leq 300 mm	1.3G
		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	

Type	Includes: / Synonym:	Definition	Calibre /Mass	Classification
Roman Candles	exhibition candle, candle, bombettes	tube containing alternate propellant charge(s), pyrotechnic unit(s) and transmitting fuse(s)	≥ 50 mm inner diameter, containing flash composition	1.1G
			≥ 50 mm inner diameter, containing no flash composition	1.2G
			[≥ 30 mm and < 50 mm inner diameter, or containing > 25 g of pyrotechnic composition and < 10 g of flash composition	1.3G]
			[Inner diameter of tube to be ≤ 30 mm. Maximum of 25 g total per tube, and of that ≤ 2g flash composition per tube.]	1.4G
[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	Flash composition > 40 g or > 20% of the pyrotechnic composition. Pyrotechnic composition > 20 g per rocket and flash composition ≤ 40 g. Total flash composition is < 20% of the total pyrotechnic composition.	1.1G 1.3G
			Pyrotechnic composition ≤ 20 g per rocket and ≤ 0.13 g flash composition per report. Total flash composition is < 10% of the total pyrotechnic composition.	1.4G]
[Rocket without stick(s)	avalanche rocket, signal rocket, whistling rocket, bottle rocket, sky rocket, missile type rocket, table rocket	tube containing pyrotechnic composition and/or pyrotechnic units, not equipped with stick(s) for stabilisation of flight	Containing flash composition effect Coloured star effect Coloured star effect	1.1G 1.3G 1.4G]

Type	Includes: / Synonym:	Definition	Calibre /Mass	Classification
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	Anything containing > [1kg] total pyrotechnic composition or containing > [3%?] flash composition	1.1G
			> 80 g up to [1kg] total pyrotechnic composition containing [≤3%?] flash composition	1.3G
fountain	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	≤ 80 g pyrotechnic composition containing [≤ 3%?] flash composition.	1.4G
			containing report effects	1.1G
			[other, to be defined	1.3G]
			[other, to be defined	1.4G]
sparklers	handheld sparklers, non-handheld sparklers, wire sparklers, dipped sticks	non-metallic case containing pressed or consolidated sparks- and flame producing pyrotechnic composition	≥ 1 kg pyrotechnic composition	1.3G
			< 1 kg pyrotechnic composition	1.4G
			[Pyrotechnic composition for each item ≥ 100 g, or > 10 g if flash composition is present or > 10 items per pack]	1.3G
low hazard fireworks and novelties	table bombs, throw downs, crackling granules, smokes, fog, chaser, snakes, glow worm, serpents	rigid wire or thin stick partially coated (along one end) with slow burning pyrotechnic composition with or without an ignition tip	[Pyrotechnic composition for each item to be < 100 g, or ≤ 10g if flash composition is present, or > 10 items per pack]	1.4G
			device designed to produce very limited visible and/ or audible effect which contains small amounts of pyrotechnic and/ or explosive composition.	1.4G
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	articles may contain up to 1.6 mg of silver fulminate, or up to 16 mg potassium chlorate/ red phosphorous mixture	1.4G
			pyrotechnic composition per item > 20 g, containing ≤ 3% flash composition as report effects	1.3G
			pyrotechnic composition per item ≤ 20 g, containing ≤ 3% flash composition as report effects	1.4G

Type	Includes: / Synonym:	Definition	Calibre /Mass	Classification
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
aerial wheels	flying Saxon, UFOs, 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
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	no report effect, each whistle (if any) ≤ 5 g, ≤ 60 g pyrotechnic composition per driver and ≤ 200 g total pyrotechnic composition	1.4G
[Firecracker	Bangers, laddycrackers, flashbangers, banger batteries, flashbanger batteries.	Devices consist of paper-wrapped or cardboard-tube containing report effect intended to produce noise and flash of light.	the most hazardous firework type determines the classification	
			Each single tube of firecracker may contain not more than 50 mg of report effect. A device may be a single tube or a string of multiple tubes (each tube contain not more than 50 mg of report effect) braided together with a primary so designed that each tube is functioned individually in sequence.]	1.4G

NOTE 1: References to percentages in the table, unless otherwise stated, are to the mass of the pyrotechnic composition.

NOTE 2: "Flash composition" in this table refers to pyrotechnic compositions containing an oxidizing substance and a metal powder fuel that are used to produce an aural report effect or are used as a bursting charge in fireworks devices

