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
(Twenty-third session, 30 juin-4 July 2003
Agenda item 3)

Working Group on ANE, testing and Fireworks
01-03 July 2003

The meeting opened at 0930, chaired by Mr A Johansen. The participants are listed in Attachment 1.

The working group was to consider the technical implications of the proposal from Spain in Document 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.

1. Ammonium Nitrate Emulsions, Suspensions and Gels.

Documents considered:
ST/SG/AC.10/C.3/2003/13
UN/SCETDG/23/INF.12
UN/SCETDG/23/INF.32
Orica Information paper on Koenen testing.
Draft amended provisions for suspensions and gels.
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.

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 chair reminded delegates that this issue had been decided several years ago and we needed to try to move forward.

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).

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

Questions posed to the Spanish delegate for future action were:

1. How does the density change through temperature cycles? *Preliminary reply was that crystal growth reduced the sensitivity.*
2. 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.*
3. Review the AN percentages and make them more relevant to the materials tested, and also review the paragraph on the trace flame suppressants.
4. Rethink the use of the word "unsensitised" in the introduction and the introduction of chemical sensitisers in suspensions and gels.

5. UK will discuss the issue of thermal cycling directly with Spain. Others simply wanted information on the densities at the two temperature extremes likely to be encountered in transport.
6. Have they 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.*
7. Were there any problems with compatibility? *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. Sweden will also approach the Spanish delegate with further questions on compatibility.*

On the suggestion of the USA, the Spanish delegate indicated that they 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 the Spanish delegation if necessary.

A preliminary draft text was developed in the meeting (see below). Several delegates indicated this was a step forward and encouraged 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. UK suggested that the AN percentage should be reduced to the levels tested.

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

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.].

2. Minimum Burning Pressure tests.

UN/SCETDG/23/INF.29
UN/SCETDG/23/INF.32

The Canadian delegate 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. Canada will continue with the tests, particularly for materials that may be pumped.
Delegates welcomed the work as a modern development beyond the existing tests and encouraged Canada to continue.

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

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.

3. Fireworks

The working group then commenced discussing the outstanding issues in square brackets from document -42/Add.2 as instructed by the Chairman of the Subcommittee.

Additional documents considered:
ST/SG/AC.10/C.3/2003/14 Netherlands
ST/SG/AC.10/C.3/2003/20 USA
UN/SCETDG/23/INF.25 UK

The unchanged text from document -42/Add.2 has been retained in this paper so it may be used as a basis for future work.

Roman Candles

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 USA table. Experts indicated they would review their existing test data and the UK 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:

1. Remove square brackets from 1.1 and 1.2G
2. Keep square brackets around 1.3G and 1.4G
3. Leave the 30 mm and 25 g criteria and
4. Insert "?g" for the flash composition

For 1.3G Roman Candles, it was agreed that the calibre should be less than 50 mm because the Netherlands had done tests that showed 50 mm Roman Candles were Hazard Division 1.2G. The mass of flash composition had to be limited to less than 10 g.

Rockets

Discussion centred on the US proposal for rockets. Tentative definitions were drafted and all are to remain in square brackets pending more test results.

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."

For Hazard Division 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.

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

Germany agreed to present test results on flash report rockets and report to the working group.

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

Mines

For Hazard Division 1.4G the criteria are to be "Less than or equal to 80 g pyrotechnic composition containing [≤ 3%?] flash composition."

The Hazard Division 1.3G criteria would be "more than 80g up to [1kg] total, pyrotechnic composition containing [≤ 3%?] flash composition.

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

Discussion on Bag Mines was deferred until experts had done more research on the subject.

Firecrackers

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 USA was used as the draft text.

Sparklers

The criteria for 1.3G were to be: "Pyrotechnic composition for each item ≥100g, or >10g 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 <100g, or <10g if perchlorate or chlorate composition is present, and not more than 10 items per pack.

Shell in Mortar

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

General

Add a new note
"Flash composition" in this document refers to pyrotechnic compositions containing an oxidiser 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 annexed to this report.

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: ≥ 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 ≤ 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 ≤ 2% flash 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: ≥ 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

Type	**Includes: / Synonym:**	**Definition**	**Calibre /Weight**	*HD*
	shell of shells (spherical) *(Reference to percentages for shell of shells are to the gross mass of the fireworks article)*	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 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]**

Type	**Includes: / Synonym:**	**Definition**	**Calibre /Weight**	*HD*
			[Inner diameter of tube to be ≤ 30 mm. Maximum of 25 g total per tube, and of that ≤ ?g 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.**	**1.1G**
			Pyrotechnic composition > 20 g per rocket and flash composition ≤ 40 g. Total flash composition is < 20% of the total pyrotechnic composition.	**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**	**1.1G**
			Coloured star effect	**1.3G**
			Coloured star effect	**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	**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**
			≤ 80 g pyrotechnic composition containing [≤ 3%?] flash composition.	**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	≥ 1 kg pyrotechnic composition	1.3G
			< 1 kg pyrotechnic composition	1.4G

Type	**Includes: / Synonym:**	**Definition**	**Calibre /Weight**	*HD*
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 for each item ≥ 100 g, or > 10 g if flash composition is present or > 10 items per pack]**	1.3G
			[Pyrotechnic composition for each item to be < 100 g, or ≤ 10g if flash composition is present, or > 10 items per pack]	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
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% flash composition as report effects	1.3G
			pyrotechnic composition per item ≤ 20 g, containing ≤ 3% flash 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

Type	**Includes: / Synonym:**	**Definition**	**Calibre /Weight**	*HD*
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	
[Firecracker	**Bangers, ladycrackers, flashbangers, banger batteries, flashbanger batteries.**	**Devices consist of paper-wrapped or cardboard-tube containing report effect intended to produce noise and flash of light.**	**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 document refers to pyrotechnic compositions containing an oxidiser and a metal powder fuel that are used to produce an aural report effect or are used as a bursting charge in fireworks devices.

Attachment 1

Name	Organisation
Mr A Johansen (Chair)	Norway
Mr K Price (Sec)	ICCA
Dr J Conkling	USA
Dr C Ke	USA
Mr D Boston	DGAC
Dr L Kurth	Germany
Mr K Jarnryd	Sweden
Dr M Marriott	UK
Dr T Smith	UK
Dr N Nakashima	Japan
Dr H Tsugane	Japan
Mr R Clifford	Australia
Dr S Jain	India
Mr J J Montoro	Spain
Dr JR Quintana	Spain
Dr F Beitia	Spain
Dr J L Amigo	Spain
Mr J M Zapardiel	Spain
Ms P Iribas Forcat	Spain
Dr A Filip	Switzerland
Dr E de Jong	Netherlands
Dr P Huurdeman	Netherlands
Ms H P de Wijs	Netherlands
Dr Yu QuinLi	China
Dr C Michot	France
Dr C Watson	Canada
Mr B Hueber	CEFIC
