UN/SCETDG/24/INF.63

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-fourth session
Geneva, 3-10 December 2003
Item 3 of the provisional agenda

UN WORKING GROUP ON EXPLOSIVES.

The working group was tasked to discuss the default list on fireworks, to discuss the Spanish proposal on Ammonium Nitrate Emulsions and to have a first discussion on the information papers with regards to ANE's.

Mr. Johansen (Norway) agreed to chair the WG, Mrs. Mansion (UNECE) assisted the group as secretary. Since the Spanish experts were to arrive only after lunch, it was decided to dedicate the afternoon of Wednesday on ANE's.

A total of 32 experts from authorities, test institutes and industry from Australia, Canada, Germany, France, Japan, the Netherlands, Norway, Spain, Sweden, Switzerland, the UK and the USA participated in the Working Group. The list of participants is included as Annex 1.

Fireworks

Relevant documents:

ST/SG/AC.10/C.3/46/Add.1
INF.32 (UK)
INF.50 (Spain)

The expert from the UK introduced INF.32. The UK expert had reviewed the test data presented at the 21st session and discovered an error in the net explosive quantity reported for the 1.4G entry for ground mines. INF.32 contained the correct values and a further proposal to use the same sizes and percentages as used for spherical shells.
He also mentioned that the UK was going to perform further classification tests on Roman candles, shot tubes and unsticked rockets, as already stated last July. The results would be available in the spring of 2004.

The expert from Spain introduced INF.50 with preliminary results of 6(c) tests on packaged and unpackaged flash bangers. Further tests are anticipated to support the proposals made in INF.50. Several experts mentioned that the tests would also have to include 6(a) and 6(b) tests to have a better insight in the behaviour of these bangers.

The expert from Germany presented 6(b) and 6(c) tests with flash rockets (Super-Blitzknall) in transport packagings each containing 80 rockets. The same articles have been tested before by the UK with 16 rockets per transport unit and no mass explosion had been found then. The German results clearly demonstrated a mass

explosion, both in the 6(b) and in the 6(c) test. The different apparent density per packaging could possibly explain the differences in the UK and German results.
It was decided that all articles with a main charge of flash composition would default to a 1.1G classification.

The expert from the Netherlands proposed to have a general discussion on the need to have a further restriction on the mass of flash composition in the case where a limit on the percentage of flash composition as loose powder and/ or report effects was mentioned, e.g. in the case of shells and rockets.
The value of 25% for shells was extracted from UNSCETDG/21/INF.3 where the smaller shells all had breaking charges with a mass of less than 25% of the total pyrotechnic mass. A number of experts wanted more evidence to support the 25% figure and the Netherlands indicated that tests were anticipated, in the framework of a European research programme, which could be used to contradict or support the 25% limit.

On the other hand, the experts from the UK and France indicated that they have results that indicated that 25% is in the right range, i.e. on the borderline of a 1.3 and a 1.1 classification. The expert from Germany noted that in some cases the articles listed in UNSCETDG/21/INF.3 contained black powder or perchlorate with aluminium and sulphur as a breaking charge and he believed that the percentage should be lower than 25%, based on a comparison between the flash rocket results and an example calculation for a shell.

It was decided to:
- harmonise the percentage, for the time being, on 25% flash composition in shells, rockets and mines;
- put square brackets around this figure; and
- decide at the next Sub-Committee, on the basis of test results, on the acceptable percentage.

It was further decided that changes to the list and the removal of square brackets should be supported by test results.

In NOTE 1, the calculation of the percentages was further clarified by including an example.

The expert from the Netherlands expressed the hope that the test results would be available long enough before the July 2004 meeting, to allow experts to properly consider the data.

Shells

Apart from placing the 25% limit between square brackets, the following changes were made to the entry of shells.
- a further clarification of the largest dimension of cylinder shells was included in both the entry for cylinder shells and for shell in mortar;
- the 1.3G entry for shell in mortar was mistakenly not in square brackets in …/C.3/46/Add.1, this was corrected. The UK tests results on Roman candles and shot tubes can also be used to, possibly, remove the square brackets
- on the proposal of the USA, a 1.4G entry for shell in mortar was introduced between square brackets. The USA indicated to provide tests data to support such an entry.
- the synonym ‘aerial shell kit’ was removed from the shell in mortar listing since it did not represent the same hazard as shell in mortar
- the calibre of 25 mm report shell in the shell of shells listing was changed to 40 mm (in square brackets), since the expert from Japan indicated that the 25 mm was an error. He would provide a written justification for the change.

Combinations and batteries

Banger batteries and flash banger batteries were moved from the firecracker entry and included in this listing.

Roman candles

The square brackets remain awaiting the UK test results.

A lengthy discussion took place on the need to include a separate entry for single shot Roman candles, in Europe also known as 'shot tubes'. It was decided to introduce such an entry, in square brackets with the same criteria as Roman candles, since the UK experiments would also involve such articles.

Rockets

The square brackets around the whole rocket entry, sticked or unsticked, could be removed, only the 20 g and 25% were placed in square brackets. The borderline of 40 g flash composition was removed as a consequence of the decision to default articles with flash composition as a main charge to 1.1G.

As already indicated, the UK is going to perform tests with unsticked rockets. Until those results are available, the 1.3G and 1.4G entry is placed in square brackets.

Mines

The proposal in INF.32 of the UK was adopted with the 150 g and 25% limits between square brackets for the time being.

At the request from the expert from Sweden, a mass limitation on whistle elements was introduced, since these can be rather energetic.

Sparklers

It appeared that there were differences in the understanding of what was meant by the term 'sparkler'. The numbers included in ST/SG/AC.10/C.3/46/Add.1 were based on the USA proposal, but would apply only to what was also known as Bengal sticks. It was decided:

- to introduce an entry for Bengal sticks with the limits included in ST/SG/AC.10/C.3/46/Add.1 for sparklers;
- to place both entries between square brackets to allow the expert of the USA to check the changes;
- to remove the reference to flash composition from the sparkler entry;
- to provisionally set the limit on 15 g pyrotechnic composition per item for sparklers; and
- to maintain the distinction in the number of items per inner packaging.

Low hazard fireworks and novelties

The limits on specific substances for various fireworks types were extended and clarified.

Spinners

A mass limitation on whistle elements was included here as well.

Firecrackers

Introducing a separate entry for bangers solved the possible confusion on what exactly are firecrackers. The limit for firecrackers of 50 mg of report effect was raised to 140 mg based on Netherlands test results with crackers containing chlorate, aluminium and sulphur.

The proposal from Spain in INF.50 was included in the banger entry, between square brackets, with the amendment that a mass for black powder was also included, but not yet specified.

The revised version of the default list is included in this report as Annex 2.

Ammonium nitrate emulsions

Relevant documents:

ST/SG/AC.10/C.3/2003/31 (Spain);
INF.18 (Spain);
INF.28 (Norway);
INF.37 (Canada);
INF.44 (Australia);
INF.45 (Australia);
INF.52 (Spain);
INF.54 (UK); and
INF.59 (Spain)

Document …/C.3/2003/31 was presented by Spain. The expert from Spain proposed to postpone decisions to the July 2004 meeting, since a large number of late INF documents were submitted and most experts did not have had sufficient time to properly consider these documents. The chairman reminded the group of the instruction of the Sub-Committee chairman to only have a first discussion amongst experts on the subject.

INF.18 contained direct answers from Spain to the specific questions from the last WG meeting. The specific answers were dealt with one by one. There was no comment on the answers (a) to (d).

The UK has performed preliminary tests on thermal cycling (related to answer (e)) where some crystal growth was found. The tests are still continuing and the results will be presented in a document for the July 2004 meeting.

With regards to answer (f) the expert from France mentioned that his experience with gels containing perchlorates was that the sensitiveness to impact of the dried substance was considerably higher than the results mentioned in INF.18, which gives a result for one emulsion only. In addition he mentioned the high sensitiveness of monomethyl amine nitrate needle crystals which may form during the drying of substances containing this sensitizer.

The expert from Sweden apologised for not sending the data of compatibility tests to Spain. He will try to correct this and the Spanish delegation agreed to consider the procedure set out in this information.

Dr. Kennedy (Australia, ORICA) presented a summary of the observed behaviour of emulsions and suspensions in the Modified Vented Pipe Test. The presentation contained a mix of observations in numerous trials, deductions and implications. The work included results from pure ammonium nitrate, ammonium nitrate emulsions, chemically sensitised emulsions and chemically sensitised suspensions. It showed that the sensitised suspensions behave differently in the modified vented pipe test than the emulsions and pure AN, resulting in shorter times between start of a accidental fire and a reaction of the substance.

The expert from Sweden made a statement that included a recall of the early work on ANE's and the viewpoint that they opposed the inclusion of substances known as chemical sensitisers for ammonium nitrate in suspensions. Sweden does not agree to add sodium perchlorate and the two other mentioned organic nitrates and any other change to SP 309.

Australia is also of the opinion not to include energetic substances and/ or chemical sensitisers in the definition in SP309. The question was raised what classification is to be given to those substances manufactured for use as explosives that are excluded from Class 1 by Test Series 2 but that fail to make it to the UN3375 using Test Series 8.

Norway introduced INF.28 that also raised concerns about the inclusion of chemical sensitisers in SP309.

The expert from Canada stated that initially, he also had doubts about the inclusions of perchlorates and amine nitrates, but that the results provided by Spain demonstrated that suspensions, even those containing these substances are generally less sensitive than unsensitised emulsions. He is of the opinion that the test results should prevail over the definition.

The possibility was raised to have a separate UN number for suspensions with perchlorates and amine nitrates in Division 5.1. A number of experts supported this possibility but other experts stated that this would not be very meaningful, since the classification and transport conditions would be the same for both types of substances.

The expert from the Netherlands shared the views of Canada and further stated that the Australian work showed that suspensions may react more quickly in a fire situation, which would give emergency response efforts less time to react but that this was not a classification issue and that he saw no reason to treat emulsions different than suspensions.

A number of experts raised the issue of improving Test Series 8. Australia has concerns about false negatives and false positives in the Koenen test and the Netherlands expressed doubts about the thickness of the witness plates in the ANE Gap Test. It might be worthwhile to have the improvement of Test Series 8 on the work programme of the Sub-Committee and, while this work was ongoing, not to accept proposals to exclude substances from Class 1 until a good test regime was established.

Spain recalled that at the July 2003 meeting the working group was reminded that the appropriateness of the tests and of putting ANE into Class 5.1 had been decided by the Committee and we now needed to move forward.

Finally, the expert from Australia presented the conditions to consider when revising the modified vented pipe test, based on the observations made in a large number of trials of the behaviour in a fire. One of the main issues is to have full insight in typical fires to which the tanks may be exposed, both duration and heat flux in order to be able to design the test properly and to establish meaningful criteria. It was remarked that it might not be so easy to find this data.

The chairman anticipated that a decision on the Spanish proposal would have to be made at the July 2004 meeting.

ANNEX 1

List of participants to the Working Group on explosives; 3, 4 and 5 December 2003

Arne JOHANSEN	Norway, chairman
Sabrina MANSION	UNECE, secretariat
Raymond CLIFFORD	Australia
Paul HARRISON	Australia (ORICA)
Alex MANDL	Australia(DYNO Nobel)
David KENNEDY	Australia (ORICA)
Ken PRICE	Australia (ICCA)
Chris WATSON	Canada (NRCAN)
Christian MICHOT	France (INERIS)
Alexander VON OERTZEN	Germany (BAM)
Lutz KURTH	Germany (BAM)
Kai BALLENTIN	Germany (VPI)
Noriaki NAKASHIMA	Japan (Ajase)
Shuji HATANAKA	Japan (BPI)
Hideki TSUGANE	Japan (METI)
Jan VISSER	Netherlands
Paul HUURDEMAN	Netherlands
Ed DE JONG	Netherlands (TNO)
Bjorn PETTERSEN	Norway (DYNO Nobel)
José ZAPARDIEL	Spain
Paloma IRIBAS	Spain
Jesus GARCIA GARZÓN	Spain (LOM)
Josep PASCUAL PUIG	Spain (Fireworks association)
Kenneth JARNRYD	Sweden
Bertil LINDEBERG	Sweden
Alexander FILIP	Switzerland
Stephan ENGLER	Switzerland
Ron RAPLEY	UK (EIG)
Michael MARRIOTT	UK
Charles KE	USA
Walter SUDWEEKS	USA (DYNO Nobel)
Noel HSU	USA (ORICA)

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, aerial shell kit	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, aerial shell kit	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 (height or diameter) determines the calibre	
	preloaded mortar, shell in mortar	assembly comprising a spherical or cylindrical shell inside a mortar from which the shell is designed to be projected; for cylindrical shells, the longest dimension (height or diameter) determines the calibre	all report shells	1.1G
			colour shell: ≥ 200 mm	1.1G
			colour shell: ≥ 50 mm and < 200 mm	1.2G
			[Colour shell: > 30 mm and < 50 mm and < 10 g of flash composition	1.3G]
			[to be determined	1.4G]

Type	Includes: / Synonym:	Definition	Calibre /Mass	*Classification*
	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 ≤ [40] mm and/or report units, with ≤ 33% flash 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% flash composition and ≤ 60% pyrotechnic composition and designed to be projected from a mortar	≤ 300 mm	1.3G
combinatio n/ batteries	barrage, bombardos, cakes, finale box, flowerbed, hybrid, multiple tubes, shell cakes, banger batteries, flash banger batteries.	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 charges, pyrotechnic units and transmitting fuses	≥ 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 ≤ 30 mm. Maximum of 25 g total per tube, and of that ≤ ? g flash composition per tube.	1.4G]
[Shot tube	single shot Roman candle	tube containing a propellant charge and a pyrotechnic unit, with or without a transmitting fuse	Inner diameter of tube ≤ 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 effects only	1.1G
			Flash composition > [25]% of the pyrotechnic composition.	1.1G
			Pyrotechnic composition > [20] g per rocket. Total flash composition is < [25]% of the 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	Flash composition effects only	1.1G
			[Coloured star effect	1.3G]
			[Coloured star effect	1.4G]

ANNEX 2

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	> [25]% flash composition, as loose powder and/ or report effects	1.1G
			≥ 200mm and ≤ [25]% flash composition, as loose powder and/ or report effects	1.1G
			< 200mm and ≤ [25]% flash composition, as loose powder and/ or report effects	1.3G
			≤ [150]g pyrotechnic composition, containing ≤ 5% flash composition as report effects. Each report effect < 2g ; each whistle, if any, ≤ 3 g.	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	> [25]% flash composition, as loose powder and/ or report effects	1.1G
			≥ 200mm and ≤ [25]% flash composition, as loose powder and/ or report effects	1.1G
			< 200mm and ≤ [25]% flash composition, as loose powder and/ or report effects	1.3G
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
[sparklers	handheld sparklers, non-handheld sparklers, wire sparklers	rigid wire partially coated (along one end) with slow burning pyrotechnic composition with or without an ignition tip	Pyrotechnic composition for each item ≥ 15 g or > 10 items per pack	1.3G
			Pyrotechnic composition for each item < 15 g or ≤ 10 items per pack	1.4G]
[Bengal sticks	Dipped stick	wooden stick partially coated (along one end) with slow-burning pyrotechnic composition and designed to be held in the hand	Pyrotechnic composition for each item ≥ 100 g, or > 5 g if flash composition is present or > 10 items per pack	1.3 G
			Pyrotechnic composition for each item < 100 g, or ≤ 5 g if flash composition is present or ≤ 10 items per pack	1.4G]

Type	**Includes: / Synonym:**	**Definition**	**Calibre /Mass**	***Classification***
low hazard fireworks and novelties	table bombs, throw downs, crackling granules, smokes, fog, snakes, glow worm, serpents, snaps, party poppers	device designed to produce very limited visible and/ or audible effect which contains small amounts of pyrotechnic and/ or explosive composition.	Throw downs and snaps may contain up to 1.6 mg of silver fulminate; snaps and party poppers may contain up to 16 mg of potassium chlorate/ red phosphorous mixture; other articles may contain up to 5 g of pyrotechnic composition, but no flash composition	1.4G
spinners	aerial spinners, helicopters, chasers, 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, or whistle composition ≤ 5 g	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	≥ 1 kg total pyrotechnic composition, no report effect, each whistle (if any) ≤ 5 g	1.3G
			< 1 kg total pyrotechnic composition, no report effect, each whistle (if any) ≤ 5 g	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	> 200 g total pyrotechnic composition or > 60 g pyrotechnic composition per driver, ≤ 3% flash composition as report effects, each whistle (if any) ≤ 5 g	1.3G
			≤ 200 g total pyrotechnic composition or ≤ 60 g pyrotechnic composition per driver, ≤ 3% flash composition as report effects, each whistle (if any) ≤ 5 g	1.4G
Selection pack	display selection box, display selection pack, garden selection box, indoor selection box	A pack 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	

Type	**Includes: / Synonym:**	**Definition**	**Calibre /Mass**	***Classification***
[Firecracker	Celebration cracker, celebration roll, string cracker	Assembly of tubes (paper or cardboard) linked by a pyrotechnic fuse, each tube containing report composition intended to produce an aural effect	Each tube may contain not more than 140 mg of report composition.	1.4G]
[Banger	Salute, flash banger, lady cracker	Non-metallic tube containing report composition intended to produce an aural effect	> 40 g flash composition or ? g black powder	1.1G
			> 3 g and ≤ 40 g flash composition; or ? g black powder	1.3G
			≤ 3 g flash composition or ? g black powder	1.4G]

NOTE 1: References to percentages in the table, unless otherwise stated, are to the mass of all pyrotechnic composition (e.g. rocket motors, lifting charge, bursting charge and effect charge).
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 used as a bursting charge in fireworks devices.

ANNEX 2