

## 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

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### EXPLOSIVES, SELF-REACTIVE SUBSTANCES AND ORGANIC PEROXIDES

#### Classification criteria for fireworks

Transmitted by the expert from the United Kingdom

#### **1. Introduction**

At the last meeting of the explosives working group (December 2003), the Expert from the United Kingdom said he was carrying out a number of firework trials to help in developing the classification criteria for fireworks (see ST/SG/AC.10/C.3/48/Add.1, ST/SG/AC.10/C.3/2004/45). The United Kingdom is carrying out Test Series 6 trials involving Roman candles and rockets without sticks but the results are not yet available for the 6(c) tests. The Expert hopes to have these results by the time of the working group meeting. The expert from the United Kingdom has further proposals for the default firework table.

#### **2. Shells**

The default table does not include "peanut shells" which are used by professional firework display operators. These are Peanut Shells consisting of two spherical aerial shells in a common wrapper propelled by the same lift charge with separate external time fuses. When packed in transport cartons, these shells should give the same Test Series 6 results similar to individual shells. The United Kingdom expert suggests the classification of the "peanut shell" will be based on the most hazardous shell in this firework.

The tests have been carried out on shell in mortar and have shown small shells (2.5") give 1.2G effects (UN/SCETDG/21/INF.21). The United Kingdom expert suggests that the 1.4G entry for shell in mortar is deleted from the default fireworks list because test data has not been presented to justify this entry. The calibre/mass criteria for a 1.3G shell in mortar should be "Colour shell:  $\leq 50$  mm or  $\leq 60$  g pyrotechnic composition with  $> 2\%$  flash composition as report effects".

The United Kingdom's default classification list is similar to the draft UN default firework list. United Kingdom importers of fireworks have asked whether the dimension applies to the shell or bag mine, or the mortar from which the shell is designed to be propelled. It is suggested that a further note be added to the default fireworks list to ensure that the dimension applying to shells and bag mines is to the dimension of the mortar used to fire the firework.

#### **3. Roman Candles**

The United Kingdom expert has presented test results on Roman candles (ST/SG/AC.10/C.3/2004/45) and shot tube fireworks (UN/SCETDG/21/INF.21) and it is hoped that further test results on shot tube fireworks

will be available for the working group meeting. Based on the tests carried out so far, the United Kingdom

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, >1g or < 10 g of flash composition or containing > 25 g of pyrotechnic composition and transmitting fuse and lifting charge per pyrotechnic unit	1.3G
			Inner diameter of tube ≤ 30 mm. ≤1g of flash composition or containing ≤ 25 g of pyrotechnic composition and transmitting fuse and lifting charge per pyrotechnic unit	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. ≤1g of flash composition or containing ≤ 25 g of pyrotechnic composition and transmitting fuse and lifting charge	1.4G

expert proposes the following criteria for the 1.3G and 1.4G Roman candle and shot tube fireworks:

### 3. Rockets

In order to simplify the table, the United Kingdom expert proposes to remove the 1.1G entry for "flash composition effects only" as this will be covered by the second entry dealing with rockets with more than 25% flash composition. This is also relevant for the "rocket without stick(s)" entry for 1.1G.

The definition for "rockets" and "rockets without stick(s)" may need to be amended. Rockets with stabilising fins are likely to have a greater explosive packing density per transport pack compared with rockets equipped with sticks. The United Kingdom does not have any test data on fin stabilised rockets but suggests their behaviour in Test Series 6 would be similar to fireworks falling into the "rockets without stick(s)" entry.

### 4. Mines

The United Kingdom expert proposes a simplification of the entry for mines by changing the definition for these fireworks. The existing calibre/mass criteria are essentially the same for both pot-a-feu and bag mine and the following is suggested as a replacement for the existing entry:

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 <u>or</u> 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
			≤ 150g pyrotechnic composition, containing ≤ 5% flash composition as report effects. Each report effect < 2g ; each whistle, if any, ≤ 3 g	1.4G

## 5. Wheels

There are two entries for wheels which have a limit of 5g per whistle effect on the wheel. The calibre/mass criteria does not impose a limit for the number of whistles on a wheel. The United Kingdom firework display industry have commented this criteria for whistles and have suggested changes to the entry. Tests are being carried out on whistle elements but the results are not complete. The United Kingdom proposes to amend the entries for the 1.3G and 1.4G wheels to the following:

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) ≤ 25 g and < 50g whistle composition per wheel	1.3G
			< 1 kg total pyrotechnic composition, no report effect, each whistle (if any) ≤ 5 g and < 10g whistle composition per wheel	1.4G

## 6. Default table

The amended default table is at Annex 1.

**Annex 1**

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: $\geq 200$ mm or $\geq 2100$ g pyrotechnic composition	1.1G
			colour shell: $< 200$ mm or $< 2100$ g pyrotechnic composition with $> 25\%$ flash composition, as loose powder and/ or report effects	1.1G
			colour shell: $< 200$ mm or $< 2100$ g pyrotechnic composition with $\leq 25\%$ flash composition, as loose powder and/ or report effects	1.3G
			colour shell: $\leq 50$ mm or $\leq 60$ g pyrotechnic composition with $> 2\%$ flash composition as report effects	1.3G
			colour shell: $\leq 50$ mm or $\leq 60$ g pyrotechnic composition with $\leq 2\%$ flash composition as report effects	1.4G
peanut shell		device two or more spherical aerial shells in a common wrapper propelled by the same lift charge with separate external time fuses	the most hazardous spherical aerial shell determines the classification	
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: $\geq 200$ mm	1.1G
			colour shell: $\geq 50$ mm and $< 200$ mm	1.2G
			colour shell: $\leq 50$ mm or $\leq 60$ g pyrotechnic composition with $\leq 2\%$ flash composition as report effects	1.3G

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
combination /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	
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, >1g or < 10 g of flash composition or containing > 25 g of pyrotechnic composition and transmitting fuse and lifting charge per pyrotechnic unit	1.3G
			Inner diameter of tube ≤ 30 mm. ≤1g of flash composition or containing ≤ 25 g of pyrotechnic composition and transmitting fuse and lifting charge per pyrotechnic unit	1.4G

Type	Includes: / Synonym:	Definition	Calibre /Mass	Classification
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 $\leq$ 30 mm. $\leq$ 1g of flash composition or containing $\leq$ 25 g of pyrotechnic composition and transmitting fuse and lifting charge	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 stabilization of flight, and designed to be propelled into the air	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 $\leq$ [20] g per rocket and $\leq$ 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 $>$ 25% of the pyrotechnic composition	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 or 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
			$\geq$ 200mm and $\leq$ 25% flash composition, as loose powder and/ or report effects	1.1G
			$<$ 200mm and $\leq$ 25% flash composition, as loose powder and/ or report effects	1.3G
			$\leq$ 150g pyrotechnic composition, containing $\leq$ 5% flash composition as report effects. Each report effect $<$ 2g ; each whistle, if any, $\leq$ 3 g	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

Type	Includes: / Synonym:	Definition	Calibre /Mass	Classification
[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 $\geq 15$ g or $> 10$ items per pack	1.3G
			Pyrotechnic composition for each item $< 15$ g or $\leq 10$ 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 $\geq 100$ 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 $\leq 5$ g if flash composition is present or $\leq 10$ items per pack	1.4G]
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 $\leq 3\%$ flash composition as report effects	1.3G
			pyrotechnic composition per item $\leq 20$ g, containing $\leq 3\%$ flash composition as report effects, or whistle composition $\leq 5$ 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	$\geq 1$ kg total pyrotechnic composition, no report effect, each whistle (if any) $\leq 25$ g and $< 50$ g whistle composition per wheel	1.3G
			$< 1$ kg total pyrotechnic composition, no report effect, each whistle (if any) $\leq 5$ g and $< 10$ g whistle composition per wheel	1.4G

Type	Includes: / Synonym:	Definition	Calibre /Mass	Classification
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	
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

NOTE 3: References to the diameter of shells and mines refers inner diameter of the mortar tube from which they are designed to be propelled.