

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-ninth session
Geneva, 3-12 (a.m.) July 2006
Item 2 of the provisional agenda

TRANSPORT OF EXPLOSIVES

Note 2 to 2.1.3.5.5

Submitted by the expert from the United Kingdom

Introduction

The expert from the United Kingdom has noticed a recent change in pyrotechnic compositions in fireworks manufactured in Asia. Previously, fireworks which produced report effects were manufactured using flash compositions comprising an oxidising substance (e.g. potassium perchlorate or barium nitrate) and a metal fuel (e.g. aluminium). Recent firework classification applications have shown a trend to compositions which do not meet the definition in Note 2 to 2.1.5.2.2 since the metal powder element has been replaced by energetic organic compounds such as benzoates (Whistle powder), or metal sulfides such as antimony sulfide. Mixtures of potassium perchlorate/benzoates or potassium perchlorate/antimony sulfides have an explosive power similar to, or exceeding that of, traditional barium nitrate/aluminium flash compositions.

The accidents at Enschede, Kolding were, in part, due to the presence of fireworks containing a large proportion of oxidiser/metal flash composition. The recent explosion aboard the Hyundai Fortune off the Dubai coast was reported to have been involved fireworks.

Discussion

Note 2 to Paragraph 2.1.3.5.5 defines flash composition as being

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

Firework articles containing perchlorate/benzoate pyrotechnic composition would not be considered to be flash compositions but could produce explosion effects similar, or greater than, traditional flash compositions.

The expert from the United Kingdom has asked the Health and Safety Laboratory in the United Kingdom to carry out Time/Pressure tests (Test Series C.1) on a range of firework compositions in order to establish whether the new pyrotechnic compositions, designed to avoid being classed as flash compositions, are equivalent or exceed the power of flash compositions conforming to Note 2. Approximately 1g of pyrotechnic composition was used in each test and the results are summarized in the Annex 1 to this paper.

The results show that powdered whistle composition is highly energetic and produces a pressure/time value greater than barium nitrate/Al flash composition. The United Kingdom hopes to have further results to present to the Explosives Working Group.

The expert from the United Kingdom would welcome the views of other experts on the suitability of UN Test C.1 being used to determine the whether certain pyrotechnic compositions could be considered as flash compositions.

If the response of other experts is favorable then the expert from the United Kingdom will consider putting forward a proposal to amend Note 2 to Paragraph 2.1.3.5.5 at the December meeting.

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		Rise time from 670-2070kPa (ms)								Min	Mean	SD	
Composition	Physical form	Source		Run A		Run B		Run C					
		EXS N	Article name	Mass(g)	Time(ms)	Mass(g)	Time(ms)	Mass(g)	Time(ms)				
1	B/p lift charge	Granular	1473/5	WP9 150mm Star burst shell	1.01	7.8	1.00	6.3	1.00	6.1	6.1	6.7	0.9
2	B/p burst charge	Granular	1473/5	WP9 150mm Star burst shell	1.03	6.9	1.00	6.1	1.00	5.1	5.1	6.0	0.9
3	Rocket motor	Powder	1473/5	WP9 Unsticked rocket	0.98	13.7	1.01	14.2	1.03	8.6	8.6	12.2	3.1
4	Flash 1	Powder	1473/1	WP9 Unsticked rocket	1.03	<1	0.93	<1	1.02	<1		<1	
5	Waterfall 1	Powder	1473/2	WP9 connected waterfall	1.09	<1	1.09	<1	1.04	<1		<1	
6	Waterfall 2	Powder	1267	WP6 waterfalls	0.96	4.8	1.04	6.3	1.00	8.2	4.8	6.4	1.7
7	Fountain	Flake	1265	WP6 fountain	1.09	16.4	1.00	32.4	1.00	24.2	16.4	24.3	8.0
8	Star comp	Powder	419	Star composition	1.05	4.3	1.08	3.4	1.02	4.6	3.4	4.1	0.6
9	Star fragment	Chips	1473/5	WP9 150mm Star burst shell	0.98	10.9	1.04	8.2	1.04	8.5	8.2	9.2	1.5
10	Whole star		1473/1	WP9 Unsticked rocket	1.10	8.0	1.11	8.3	1.03	10.9	8.0	9.1	1.6
11	Whistle powder	Powder		Perchlorate:benzoate	0.99	1.7	1.03	1.8	0.99	2.2	1.7	1.9	0.3
12	Perchlorate only	Powder		Potassium perchlorate	1.11	-	0.98	-			-	-	-
13	Flash 2			Barium nitrate:Al	1.00	8.6	1.10	7.7	1.04	7.9	7.7	8.1	0.5
14	Sparkler 1	Powder		Red sparkler									
15	Sparkler 2	Powder		Green sparkler									
16	Sparkler 3	Powder		Silver sparkler									

For details of WP6 and WP9 references see results of tests carried out for the CHAF project (www.chaf.info).