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**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

Thirtieth session
Geneva, 4-12 (a.m.) December 2006
Item 2(a) of the provisional agenda

**PROPOSALS OF AMENDMENTS TO THE RECOMMENDATIONS
ON THE TRANSPORT OF DANGEROUS GOODS**

Model Regulations on the Transport of Dangerous Goods

Note 2 to 2.1.3.5.5 Firework classification

Transmitted by the expert from the United Kingdom

Introduction

1. The expert from United Kingdom has noticed a change in some pyrotechnic compositions in fireworks manufactured in Asia. At the explosives working group during the July session the United Kingdom presented, UN/SCETDG/29/INF.33, which reported the preliminary results of the time pressure tests (Series 2(c)) carried out at the Health and Safety Laboratory (HSL) to the Working Group on explosives. This Working Group considered the test results contained in UN/SCETDG/29/INF.33 and gave general support for the performance based approach for the definition of flash compositions, see paragraph.15 of the report, UN/SCETDG/29/INF.65). Further test data (see informal document UN/SCETDG/30/INF.3) was obtained by HSL on a range of pyrotechnic compositions and units, and these were communicated to the experts on the Working Group for their comments.

Discussion

2. The time/pressure test was carried out on the following pyrotechnic compositions
flash compositions and black powder
whistles
sparklers
stars
fountains

Some of the pyrotechnic compositions included: commercial black powder, "home made" compositions, compositions taken from fireworks used in the EU funded CHAF project (www.chaf.info) and consumer fireworks.

3. The typical flash composition (sample AB) is covered by the present Note 2 definition and gave a minimum pressure/time rise of 0.64 milliseconds (ms) for a 0.5g sample and the commercial black powder (Henry Krank Fine, HKF) gave a minimum value of 3.76ms. The United Kingdom expert has been asked by firework importers whether bursting charges consisting of mixtures of black powder and a small quantity of flash composition would be considered to be flash composition. Tests on these mixtures of black powder/flash composition in the ratios 80:20, 60:40 and 50:50 gave a minimum time/pressure values of 1.78, 0.93 and 0.85ms respectively. These values show the influence of a small amount of flash composition with other pyrotechnic compositions dramatically affects the speed of reaction.

4. Alternative report effects, and bursting charges, found in fireworks which do not meet the definition of flash composition include powdered whistle composition. Whistle compositions are made from an oxidiser (potassium perchlorate) and an organic fuel, and 0.5g of powdered whistle (sample AB) gave a minimum time/pressure value of 1.74ms. This value is significantly faster than black powder burst charges (cf. sample E, 8.26ms). It was also found that particle size of the pyrotechnic composition is also a significant factor in the speed of reaction with powdered whistle composition giving a value of 1.74ms while the whistle pellet (sample AR) gave a value of 7.84ms.

5. Fountain compositions gave a wide range of values depending on the pyrotechnic composition. A traditional fountain composition (sample O) gave a minimum time/pressure value of 44.8ms while the waterfall fountain composition (sample M) gave a minimum value of 2.03ms. This waterfall fountain was used in the CHAF project as a candidate for tests on 1.4G fireworks which may show 1.3G effects in large scale trials. According to Note 2, the waterfall pyrotechnic composition would not be considered to be a flash composition because it does not produce report effects or act as a bursting charge. In the CHAF trial the waterfall firework mass exploded with a TNT equivalence estimated at 1.29 at 200m.
[www.chaf.info, video page and report at <http://www.chaf.info/d9-3-4.pdf>].

6. The test results demonstrate the current definition of "flash composition" based on the current chemical description does not restrict the recently introduced novel compositions, nor the reduction in the particle size of the pyrotechnic composition, now found in fireworks. These changes to pyrotechnic compositions will have a significant effect on those fireworks classified under the UN default table in 2.1.3.5.5.

Proposal

7. The United Kingdom expert believes the definition in Note 2 to 2.1.3.5.5 is inadequate. Fireworks drawings seen in classification applications in the United Kingdom have shown a trend for the bursting charges or report effects to be altered so they no longer meet the definition in Note 2. Under the current definition these pyrotechnic compositions, such as oxidiser and organic compounds, would not be considered as flash composition and this could result in the firework classifications based on table in 2.1.3.5.5 being wrongly assigned.

8. The United Kingdom expert has consulted with other experts about the test results together with a proposal to amend Note 2 and has received many helpful comments. Taking these comments into account the UK proposes the current Note 2 to 2.1.3.5.5 should be replaced by the following:

"Flash composition" in this table refers to pyrotechnic compositions in powder form or as pyrotechnic units as presented in the fireworks which give a minimum time/pressure value of 4ms for 0.5g of pyrotechnic composition in Test Series 2(c)(i) "Time pressure test".
