1. The Working Group on Explosives met from 1-3 July 2003 under the chairmanship of Mr. A. Johansen (Norway).

2. The Working Group session was attended by experts from Australia, Canada, China, France, Germany, India, Japan, Netherlands, Norway, Spain, Sweden, United Kingdom and United States of America, an observer from Switzerland and representatives from the European Chemical Industry Council (CEFIC), the International Council of Chemical Associations (ICCA) and the Dangerous Goods Advisory Council (DGAC).

The Working Group was to consider the technical implications of the proposal from Spain in ST/SG/AC.10/C.3/2003/13 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.
Ammonium Nitrate Emulsions (ANE), Suspensions (ANS) and Gels (ANG)

Documents: ST/SG/AC.10/C.3/2003/13 (Spain)

Informal documents: INF.12 and INF.32 (Spain)

CEFIC Information paper on Koenen testing
Draft amended provisions for suspensions and gels

3. 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.

4. 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 Chairman reminded delegates that this issue had been decided several years ago and the group needed to try to move forward.

5. 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).

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

7. The following questions were posed to the expert from Spain for future action:

   (a) How does the density change through temperature cycles? Preliminary reply was that crystal growth reduced the sensitivity;

   (b) 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;

   (c) Review the AN percentages and make them more relevant to the materials tested, and also review the paragraph on the trace flame suppressants;

   (d) Rethink the use of the word "unsensitised" in the introduction and the introduction of chemical sensitisers in suspensions and gels;

   (e) The expert from the United Kingdom will discuss the issue of thermal cycling directly with the expert from Spain. Others simply wanted information on the densities at the two temperature extremes likely to be encountered in transport;

   (f) Have the expert from Spain 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;

   (g) Were there any problems with compatibility? The expert from 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. The expert from Sweden will also approach the expert from Spain with further questions on compatibility.
8. On the suggestion of the expert from the United States of America, the expert from Spain indicated that he 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 his delegation if necessary.

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

   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.]

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

Minimum burning pressure tests

Informal documents: INF.29 (Canada) INF.32 (Spain)

11. The expert from Canada 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. The expert from Canada will continue with the tests, particularly for materials that may be pumped.

12. Delegates welcomed the work as a modern development beyond the existing tests and encouraged the expert from Canada to continue.

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

14. 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.

Fireworks


Informal document: INF.25 (United Kingdom)

15. The Working Group then commenced discussing the outstanding issues in square brackets from document ST/SG/AC.10/C.3/42/Add.2 as instructed by the Sub-Committee.
Roman candles

16. 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 table presented by the expert from the United States of America. Experts indicated they would review their existing test data and the expert from the United Kingdom 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:

(a) Remove square brackets from 1.1 and 1.2G;
(b) Keep square brackets around 1.3G and 1.4G;
(c) Leave the 30 mm and 25 g criteria; and
(d) Insert "?g" for the flash composition.

17. For 1.3G roman candles, it was agreed that the calibre should be less than 50 mm because the expert from the Netherlands had done tests that showed 50 mm roman candles were 1.2G. The mass of flash composition had to be limited to less than 10 g.

Rockets

18. Discussion centred on the proposal by the expert from the United States of America for rockets. Tentative definitions were drafted and all are to remain in square brackets pending more test results.

19. 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."

20. For 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.

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

22. The expert from Germany agreed to present test results on flash report rockets and report to the Working Group.

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

Mines

24. For 1.4G, the criteria are to be "Less than or equal to 80 g pyrotechnic composition containing \[\leq 3\%\] flash composition."

25. The 1.3G criteria would be "more than 80g up to [1kg] total, pyrotechnic composition containing \[\leq 3\%\] flash composition.

26. 1.1G would apply to anything larger than [1kg] or containing more than [3\%?] flash composition.

27. Discussion on bag mines was deferred until experts had done more research on the subject.
**Firecrackers**

28. 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 the expert from the United States of America was used as the draft text.

**Sparklers**

29. The criteria for 1.3G were to be: "Pyrotechnic composition for each item $\geq$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**

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

**General**

31. Add a new note:

"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 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 reproduced in the appendix to this report (refer also to ST/SG/AC.10/C.3/42/Add.2; changes are indicated in bold).
Appendix

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 Nos. 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 shall 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 packed 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/mass 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)."
<table>
<thead>
<tr>
<th>Type</th>
<th>Definition</th>
<th>Includes</th>
<th>Synonym</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.3G</td>
<td>Colour shell: &gt; 30 mm and &lt; 50 mm with &gt; 10% Hash composition</td>
<td>Colour shell, &gt; 30 mm and &lt; 50 mm and &gt; 10% Hash composition</td>
<td></td>
</tr>
<tr>
<td>1.2G</td>
<td>Colour shell: &gt; 50 mm and &gt; 200 mm</td>
<td>Colour shell, &gt; 50 mm and &gt; 200 mm</td>
<td></td>
</tr>
<tr>
<td>1.1G</td>
<td>Colour shell: ≥ 200 mm</td>
<td>Colour shell, ≥ 200 mm</td>
<td></td>
</tr>
<tr>
<td>1.1G</td>
<td>Colour shell: &gt; 200 mm with &gt; 25% Flash composition, as loose powder and/or report effects</td>
<td>Colour shell, &gt; 200 mm with &gt; 25% Flash composition, as loose powder and/or report effects</td>
<td></td>
</tr>
<tr>
<td>1.1G</td>
<td>Colour shell: ≤ 200 mm with ≤ 25% Flash composition, as loose powder and/or report effects</td>
<td>Colour shell, ≤ 200 mm with ≤ 25% Flash composition, as loose powder and/or report effects</td>
<td></td>
</tr>
<tr>
<td>1.4G</td>
<td>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</td>
<td>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</td>
<td></td>
</tr>
<tr>
<td>1.4G</td>
<td>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</td>
<td>Cylindrical display shell, aerial shell, colour shell, dye shell, multi-break shell, multi-effect shell, nautical shell, parachute shell, smoke shell, star shell</td>
<td></td>
</tr>
<tr>
<td>1.3G</td>
<td>Colour shell: &gt; 30 mm and &lt; 50 mm and &gt; 25% Flash composition</td>
<td>Colour shell, &gt; 30 mm and &lt; 50 mm and &gt; 25% Flash composition</td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>Definition</td>
<td>Classification</td>
<td></td>
</tr>
<tr>
<td>------</td>
<td>------------</td>
<td>----------------</td>
<td></td>
</tr>
<tr>
<td>1.1G</td>
<td>Device without propellant charge, with delay fuse and bursting charge, containing report shells and/or report units, with ≤ 25% perchlorate/metal pyrotechnic composition and ≥ 60% inert materials and designed to be projected from a mortar</td>
<td>≤ 120 mm</td>
<td></td>
</tr>
<tr>
<td>1.3G</td>
<td>Device without propellant charge, containing colour shells and/or pyrotechnic units and designed to be projected from a mortar</td>
<td>&gt; 300 mm</td>
<td></td>
</tr>
<tr>
<td>1.1G</td>
<td>Device without propellant charge, with delay fuse and bursting charge, containing colour shells and/or pyrotechnic units, with ≤ 25% perchlorate/metal pyrotechnic composition and ≤ 60% pyrotechnic composition and designed to be projected from a mortar</td>
<td>≤ 300 mm</td>
<td></td>
</tr>
<tr>
<td>1.3G</td>
<td>Combination/batteries, barrage, bombardos, cakes, finale box, assembly including several elements, with one or two points of ignition, types of fireworks listed in this table, the most hazardous pyrotechnic type determines the classification</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>Description</td>
<td>Definition</td>
<td></td>
</tr>
<tr>
<td>------</td>
<td>-------------</td>
<td>------------</td>
<td></td>
</tr>
<tr>
<td>1.1G</td>
<td>Coloured star effect</td>
<td>Pyrotechnic composition &gt; 20 g per rocket and flash composition ≤ 40 g. Total flash composition is &lt; 20% of the total pyrotechnic composition.</td>
<td></td>
</tr>
<tr>
<td>1.3G</td>
<td>Coloured star effect</td>
<td>Pyrotechnic composition &gt; 20 g per rocket and flash composition ≤ 20 g. Total flash composition is &lt; 10% of the total pyrotechnic composition.</td>
<td></td>
</tr>
<tr>
<td>1.4G</td>
<td>Contains flash composition effect</td>
<td>Pyrotechnic composition &gt; 20 g per rocket and flash composition ≤ 0.13 g per report. Total flash composition is ≤ 1% of the total pyrotechnic composition.</td>
<td></td>
</tr>
<tr>
<td>1.5G</td>
<td>Rocket</td>
<td>Pyrotechnic composition &gt; 20 g per rocket, not equipped with stick(s).</td>
<td></td>
</tr>
<tr>
<td>1.6G</td>
<td>Exhibition candle, candle, bombettes</td>
<td>Tube containing alternate propellant charge(s), pyrotechnic unit(s) and transmitting fuse(s). Inner diameter of tube ≤ 30 mm. Maximum of 25 g total per tube, and of that ≤ 6.75 g flash composition per tube.</td>
<td></td>
</tr>
<tr>
<td>1.7G</td>
<td>Roman candle, candle, tube containing alternate propellant charge(s), pyrotechnic unit(s), and transmitting fuse(s).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.8G</td>
<td>Includes / Synonym:</td>
<td>Pyrotechnic composition &gt; 20 g per rocket, not equipped with stick(s).</td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>Definition</td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1G</td>
<td>Anything containing &gt; [1kg] total pyrotechnic composition or containing &gt; [3%?] flash composition.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.2G</td>
<td>80 g up to [1kg] total pyrotechnic composition containing ≤ [3%?] flash composition.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.3G</td>
<td>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.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.4G</td>
<td>Containing report effects. Low hazard fireworks and novelties.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.5G</td>
<td>Non-handled sparklers, dipped sticks.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.6G</td>
<td>Aerial spinners, helicoptors, 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.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes:
- Pyrotechnic composition for each item must be ≤ 100 g, or ≤ 10 g if flash composition is present, or > 10 items per pack.
- Sparklers containing up to 1.6 mg of silver fulminate, or up to 16 mg of potassium chlorate/red phosphorous mixture per item.
NOTE 1: References to percentages in the table, unless otherwise stated, are to the mass of the pyrotechnic composition.

<table>
<thead>
<tr>
<th>Classification</th>
<th>Type Include:</th>
<th>Definition</th>
<th>Synonym:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.3G</td>
<td>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</td>
<td>no report effect, each whistle (if any)</td>
<td>≤ 5 g, ≥ 1 kg total pyrotechnic composition</td>
</tr>
<tr>
<td>1.4G</td>
<td>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</td>
<td>no report effect, each whistle (if any)</td>
<td>≤ 5 g, ≤ 60 g pyrotechnic composition per driver and ≤ 200 g total pyrotechnic composition</td>
</tr>
<tr>
<td></td>
<td>Selection box, display selection box, garden selection box, indoor selection box</td>
<td>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 fireworks type determines the classification.</td>
<td></td>
</tr>
</tbody>
</table>

NOTE 2: "Flash composition" in this table refers to pyrotechnic compositions containing an oxidizing substance and a metal powder and that are used to produce an aural report effect or are used as a bursting charge in fireworks devices.

- Selection box: Each single tube of fireworks held in this no more than one type of fireworks contained in the mass of pyrotechnic composition |
- Pack: Each single tube of fireworks held in this no more than one type of fireworks contained in the mass of pyrotechnic composition |
- 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 fireworks type determines the classification.

Firecracker Bangers, ladycrackers, flashbangers, banger batteries, flashbang batteries. Devices consist of paper-wrapped or cardboard-tube containing report effect intended to produce noise and each single tube of fireworks held in this no more than one type of fireworks contained in the mass of pyrotechnic composition.

- Devices: Fireworks, fireworks, fireworks, fireworks, fireworks.
- Selection box: Each single tube of fireworks held in this no more than one type of fireworks contained in the mass of pyrotechnic composition.
- Pack: Each single tube of fireworks held in this no more than one type of fireworks contained in the mass of pyrotechnic composition.

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 table refers to pyrotechnic compositions containing an oxidizing substance and a metal powder and that are used to produce an aural report effect or are used as a bursting charge in fireworks devices.

- Selection box: Each single tube of fireworks held in this no more than one type of fireworks contained in the mass of pyrotechnic composition.
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- 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 fireworks type determines the classification.

Firecracker Bangers, ladycrackers, flashbangers, banger batteries, flashbang batteries. Devices consist of paper-wrapped or cardboard-tube containing report effect intended to produce noise and each single tube of fireworks held in this no more than one type of fireworks contained in the mass of pyrotechnic composition.

- Devices: Fireworks, fireworks, fireworks, fireworks, fireworks.
- Selection box: Each single tube of fireworks held in this no more than one type of fireworks contained in the mass of pyrotechnic composition.
- Pack: Each single tube of fireworks held in this no more than one type of fireworks contained in the mass of pyrotechnic composition.