

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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Item 2 (a) of the provisional agenda

Explosives and related matters: tests and criteria for flash compositions

Revised proposals on US- and HSL Flash Composition Tests (ST/SG/AC.10/C.3/2014/72)

Transmitted by the expert from Japan

Introduction

1. At the 45th session of the Sub-Committee, Japan provided technical information on the apparatus, materials and appropriate criteria of US- and HSL tests in UN/SCETDG/45/INF.19. The Working Group on Explosives (EWG) generally supported the proposals in INF.19 and concluded to ask Japan to prepare a formal proposal.
2. Japan submitted formal document ST/SG/AC.10/C.3/2014/72 to the 46th session of the Sub-Committee. However, several experts thought that the document should be considered by the EWG before any decision was taken. The document was placed on the agenda of the 47th session.
3. The purpose of this informal document is to invite the sub-committee and its EWG to consider revised proposals that took account of comments given at the 46th session of Sub-Committee and discussion at IGUS meeting in Republic of Chile on March 2015.

Reconsideration of proposals in ST/SG/AC.10/C.3/2014/72

4. As for HSL test, the proposal to change criterion from 6 ms to 4 ms was withdrawn taking account of a concern raised at 46th session that the impact of such change has not been thoroughly assessed. The proposal to insert “at least” before “0.2 mm” in section 2.2 was also omitted considering that the bursting disc material was not limited to aluminium.
5. As for the proposals of US test, following items were withdrawn to avoid excessive complexity;
 - (a) Inclusion of size distribution achieved during transport in the recommendation of final condition of the pyrotechnic substance described in “3. Procedure”,
 - (b) Additional illustration to the Figure A7.10, and
 - (c) Adding note to “4. Test criteria and method of assessing results” to introduce optional 17 mm criterion of indentation depth.

Revised proposals

6. All proposed amendments are combined and shown below.

Proposed amendments to the Manual of Tests and Criteria

Rename the title of Appendix 7 to read "**FLASH COMPOSITION TESTS**"

Insert a new subsection heading "**A. HSL Flash Composition Test**" at the beginning.

Insert underlined words in 2.2 as follows,

"2.2 The end of the pressure vessel furthest from the side-arm is closed with a cone in firing plug which is fitted with two electrodes, one insulated from, and the other earthed to, the plug body. The other end of the pressure vessel is closed by an aluminium bursting disc 0.2 mm thick (bursting pressure approximately 2 200 kPa) held in place with a retaining plug which has a 20 mm bore. A soft lead washer or a washer of a suitable deformable material (for example, polyoxymethylene) is used with both plugs to ensure a good seal."

Amend **Examles of result** as follows ,

“ **Examples of results:**

Substance	Maximum pressure rise (kPa)	<u>Minimum</u> Mean time for a pressure rise from 690 to 2070 kPa (ms)	Result
1	> 2 070	0.70	Flash composition
2	> 2 070	4.98	Flash composition
4	> 2 070	1.51	Flash composition
5	> 2 070	0.84	Flash composition
6	> 2 070	11.98	Not flash composition

“

Add the following new procedure at the end:

“**B. US Flash Composition Test**

1. Introduction

This test may be used to determine if pyrotechnic substances in powder form or as pyrotechnic units as presented in fireworks that are used to produce an aural effect or used as a bursting charge or propellant charge, may be considered a “flash composition” for the purposes of the default fireworks classification table in 2.1.3.5.5 of the Model Regulations.

2. Apparatus and materials

The experimental set up consists of:

A cardboard or fibreboard sample tube with a minimum inside diameter of 25 mm and a maximum height of 154 ~~150~~ mm with a maximum wall thickness of 3.8 mm, closed at the base with a thin cardboard or paperboard disk, plug or cap just sufficient to retain the sample;

A 1.0 mm thick 160 × 160 mm steel witness plate consisting of steel conforming to specification S235JR (EN10025) or ST37-2 (DIN17100) or SPCC (JIS G 3141) or equivalent having a stretch limit (or rupture strength) of 185-355 N/mm², an ultimate tensile strength of 336-379 N/mm² and a percentage elongation after fracture of 26-46% Steel ST37 or Steel S235JR having a density of 7850 Kg/m³, a stretch limit of 185-355 N/mm², an ultimate strength of 340 N/mm² and a break limit of 26%, or equivalent;

An electric igniter, e.g. a fuse head, with lead wires of at least 30 cm in length;

A mild steel confinement sleeve (weighing approximately 3 kg) having an outside diameter of 63 mm and a minimum length of 165 mm with a flat-bottomed round bore whose interior dimensions for diameter and depth are 38 mm and 155 mm, respectively, and which is bored from a solid billet approximately 1 mm deeper than the overall sample tube length and having an inside diameter of 38 mm, an outside diameter of 63 mm and a height of 165 mm with a notch or groove cut into one radius of the open end sufficient to allow the igniter lead wires to pass through (the steel sleeve might be provided with a rugged steel handle for easier handling);

A steel ring of approximately 50 mm height with an inner diameter of approximately 95 mm; and

A solid metal base, e.g. a plate of approximately 25 mm in thickness and 150 mm square.

3. Procedure

3.1 Prior to testing, the pyrotechnic substance is stored for at least 24 hours in a desiccator at a temperature of 20 - 30 °C. Twenty-five (25) g net mass of the pyrotechnic substance to be tested as a loose powder or granulated or coated onto any substrate, is pre-weighed and then poured carefully into a fibreboard sample tube with the bottom end closed with a cardboard or paperboard disk, cap or plug. After filling, the top cardboard or paperboard disk, cap or plug might be inserted lightly to protect the sample from spillage during transport to the test stand. The height of the sample substance in the tube will vary depending on its density. The sample should be first consolidated by lightly tapping the tube on a non-sparking surface. The final density of the pyrotechnic substance in the tube should be as close as possible to the density achieved when contained in a fireworks device.

3.2 The witness plate is placed on the supporting ring. If present, the paperboard or cardboard top disk, cap or plug of the fibreboard sample tube is removed and the electric igniter is inserted into the top of the pyrotechnic substance to be tested and visually positioned to an approximate depth of 10 mm. The paperboard or cardboard top disk, cap or plug is then inserted or re-inserted, fixing the igniter's position in the fibreboard sample tube and the depth of its match head. The lead wires are bent over and down along the sidewall and bent away at the bottom. The sample tube is placed vertically and centred on the witness plate. The steel sleeve is placed over the fibreboard sample tube. The igniter lead wires are positioned to pass through the slotted groove in the bottom edge of the steel confining sleeve and will be ready to attach to the firing circuit apparatus. Finally, the alignment of the steel sleeve and the witness plate is corrected so that their centres are aligned with the centre of the steel ring. See Figure A7.10 as an example of the test set-up. The cardboard or paperboard disk, cap or plug at the bottom end of the sample tube should be placed properly to avoid air gap between the witness plate and the bottom end of the substance to be tested.

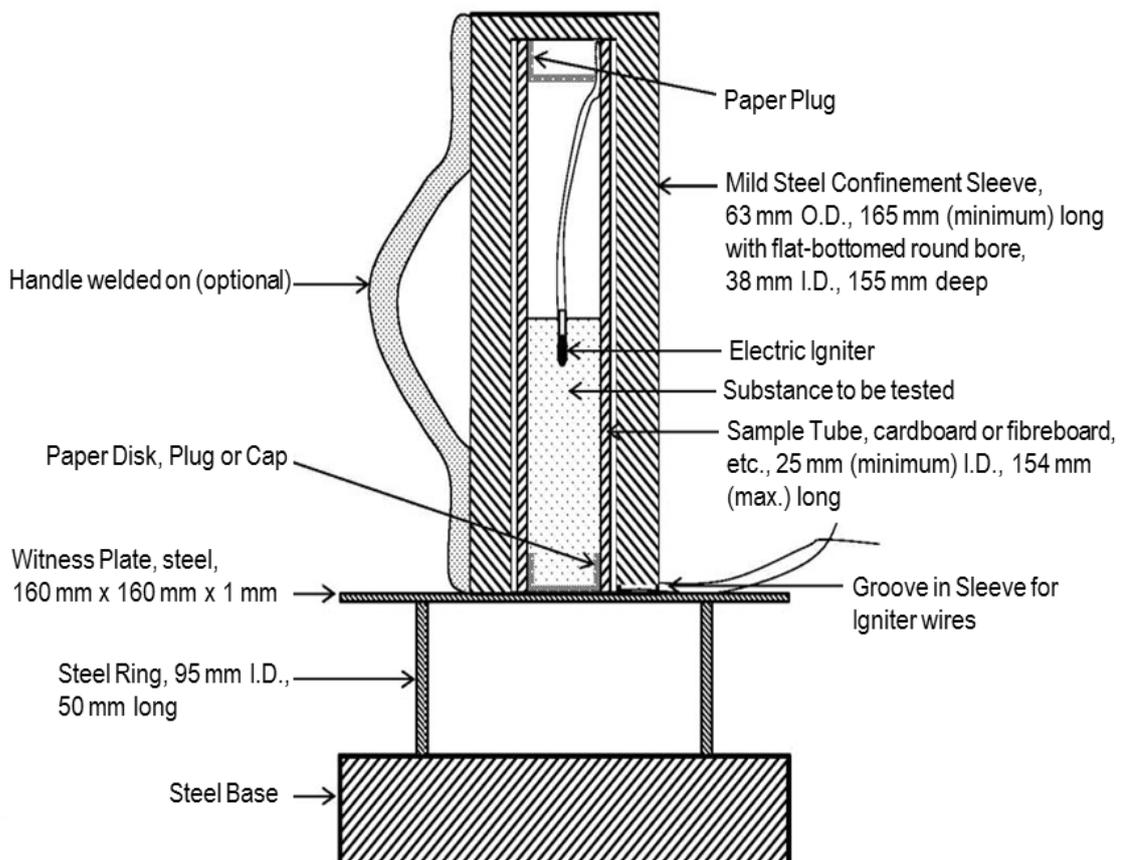
3.3 The electric igniter is then initiated from a safe position. After initiation and a suitable interval the witness plate is recovered and examined. The test should be performed 3 times unless a positive result is obtained earlier.

4. Test criteria and method of assessing results

The result is considered positive “+” and the substance is considered to be a “flash composition” if:

- (a) In any trial the witness plate is torn, perforated, pierced or penetrated; or;
- (b) The average of the maximum depths of indented ~~depth of the indentations from the 1.0 mm thick steel witness plates~~ from all three trials exceeds 15 mm.

Figure A7.10



Proposed amendments to the Model Regulations

Amend Note 2 in 2.1.3.5.5 to read as follows:

“NOTE 2: “Flash composition” in this table refers to pyrotechnic substances in powder form or as pyrotechnic units as presented in the firework that are used to produce an aural effect or used as a bursting charge, or propellant charge unless:

- (a) The pyrotechnic substance gives a negative "-" result in the US Flash Composition Test in Appendix 7 of the Manual of Tests and Criteria; or
- (b) The time taken for the pressure rise is demonstrated to be more than 6 ms for 0.5 g of pyrotechnic substance in the HSL Flash Composition Test in Appendix 7 of the Manual of Tests and Criteria.

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