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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

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Item 2 (a) of the provisional agenda
Explosives and related matters: test series 8

Recommendations for improvement of the Series 8(b) ANE Gap Test and other Gap Tests

Transmitted by the Australian Explosives Industry Safety Group (AEISG)[1]

Introduction

1. In informal document INF.58 (Thirty-ninth session, July 2011), the Working Group on Explosives reported:

> ***Recommendation regarding cold-drawn carbon steel tube.*** *In informal document INF.6, IME recommended that the wall thickness variation amount specified be changed from 10 to 15% and that the specifications at the end of the paragraph be removed. It was suggested that specifying a minimum inside diameter and minimum wall thickness may be more appropriate than specifying a wall thickness variation. It was observed that seamless steel tubing was not readily available as "cold drawn", so the suggestion was made to remove those words from the paragraph. There was no agreement to this suggestion. The group agreed to remove the tensile strength, elongation, and Brinell hardness specifications.*

[1] In accordance with the programme of work of the Sub-Committee for 2011-2012 approved by the Committee at its fifth session (refer to ST/SG/AC.10/C.3/76, para. 116 and ST/SG/AC.10/38, para. 16).

Conclusion. *The working group agreed that specifying a minimum wall thickness and a minimum ID was a way forward and, considering the comments from the working group, IME will prepare a document for consideration in the 41st Session.*

2. Subsequent to the Working Group meeting, IME has submitted document ST/SG/AC.10/C.3/2012/1, which states, in Paragraph 4 of the Annex:

The controlling elements in the effectiveness of a confining tube are in order (1) its inner diameter, (2) the material's shock impedance (namely the product of its density and its speed of sound), and (3) the inertia of the wall (controlled by its density and its wall thickness). It is the shock impedance that controls the initial deflection of the interface between the test substance and the wall upon shock arrival; the inertia only begins to have an influence once there has been time for multiple internal shock reverberations between the inner and outer surfaces of the wall. All grades of steel have similar densities and sound velocities (and hence shock impedances and inertias), so only the inner diameter and the wall thickness need to be specified within suitable tolerances to ensure reproducibility of gap test results.

3. And again in paragraph 11 of the annex:

Price [7] described the results of investigations into the effect of confinement on the results of the NOL LSGT. It was found that confinement had a negligible effect on the results for cast Pentolite, with the length of the critical PMMA gap corresponding to 50% initiation being 67.56 mm for an unconfined test charge and 67.06 mm for a test charge confined in steel – this difference is within experimental scatter for this gap test. The results for cast Composition B did show greater dependence on confinement, with the critical gap increasing from 36.32 mm for an unconfined test charge to 45.47 mm for aluminium confinement and to 51.05 mm for steel confinement. However, increasing the inertia of the confinement further by replacing steel tubing by lead tubing made essentially no further difference, with the critical gap increasing only very slightly to 51.82 mm with the latter. So while the presence of confinement was important for cast Composition B, its specific details were not once a certain level of inertia had been exceeded. It may be inferred that increasing the inertia of the steel confinement by increasing the wall thickness would similarly have made no significant difference to the critical gap.

4. AEISG agrees with the conclusion of the Working Group and the contents of paragraph 4 and 11 of the annex of ST/SG/AC.10/C.3/2012/1. Essentially, as stated in the above extracts, the critical elements of the pipe for the 8 (b) Gap test are the pipe inner diameter and that there is a level of confinement provided by the pipe (wall thickness not particularly critical).

5. The process of drawing the pipe (hot or cold drawn) is irrelevant for the purposes of the test.

6. In clause 8 of ST/SG/AC.10/C.3/2012/1, IME proposed:

Amend 18.5.1.2.1(c) of the 8(b) test procedure to read:

(c) Tubing, steel, cold drawn seamless, with an outer diameter of 95.0 ± 7.0 mm, a wall thickness of 9.75 ± 2.75 mm and an inner diameter of 73.0 ± 7.0 mm, and with a length of 280 mm;

7. AEISG supports the proposal from IME, which has a larger minimum inner diameter than allowed by the existing Manual of Tests, but believes it can be further simplified in line with the decision of the Working Group on explosives to remove any unnecessary or over-specifications.

Proposal

8. In view of the above, AEISG proposes:

9. Amend 18.5.1.2.1 (c) of the 8 (b) test procedure to read:

(c) Tubing, steel seamless, with a minimum inner diameter of 66 mm, a minimum wall thickness of 7 mm, and with a length of 280 mm;