

**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 (c) of the provisional agenda

Explosives and related matters: review of tests in parts I and II of the Manual of Tests and Criteria

Manual of Tests and Criteria

**Recommendations for improvement of Series 1 (a) and 2 (a) Gap Tests
and Series 1 (c) and 2 (c) Time/Pressure Tests**

Transmitted by the Institute of Makers of Explosives (IME)

Introduction

1. At the thirty-ninth session of the UN TDG Sub-committee (TDG), the TDG working group on explosives (EWG) discussed issues of difficulty in conducting tests outlined in the UN Manual of Tests and Criteria (Test Manual), and recommended to the TDG sub-committee¹ that the EWG conduct a review of the tests mentioned in Parts I and II of the manual with a view to:

- (a) Better defining the specifications of the tests,
- (b) Better defining the tolerances associated with those specifications, and
- (c) To remove any unnecessary or over-specifications.

2. The TDG Sub-committee agreed that this work should be carried out².

3. As a first step in this review of the Test Manual, IME carried out a review of Test Series 1 and 2 focusing on the materials specified for carrying out these Tests, since it was shown earlier that some of the materials were difficult to obtain³.

Discussion

4. The 1 (a) and 2 (a) Gap Tests and the 1 (c) and 2 (c) Time/Pressure tests were considered as pairs since for both Test Series 1 and 2 the materials required are the same.

(a) Gap Tests

- i. The steel specification in 11.4.1.2.1 and 12.4.1.2 is: cold-drawn seamless, carbon steel tube with an external diameter of 48 ± 2 mm, a wall thickness of 4.0 ± 0.1 mm and a length of 400 ± 5 mm. The cold-drawn seamless steel is not commonly manufactured, and if available is at a

¹ UN/SCETDG/39/INF.58, para. 13

² ST/SG/AC.10/C.3/78, paras. 24 - 25

³ UN/SCETDG/39/INF.25

premium over, for example, an ANSI Schedule 40 steel tubing that is commonly and readily available. Schedule 40 steel has the following dimensions⁴ (converted from the table): external diameter 48.3 mm and a nominal thickness of 3.8 mm. The diameter fits within the current specification of 48 ± 2 mm while the nominal tubing thickness is 0.1mm less. Wall thicknesses are ‘nominal’ to account for manufacturing tolerances. For the test criterion of fragmentation a thinner walled steel tube would give a conservative result. Conversely, a thicker wall would be conservative for the criterion of puncture of the witness plate. In a survey carried out by IGUS-EPP in 2010 and 2011 respondents questioned the need for the narrow specification on tube thickness in view of the comparatively loose OD specification⁵. To enable easier sourcing for this material it is proposed that the steel tubing specified should be carbon steel with a diameter of 48 ± 2 mm and a nominal thickness of 4 mm.

ii. The booster charge is specified to consist of 160g RDX/Wax (95/5) or PETN/TNT (50/50). The commercially and readily available Pentolite boosters are typically PETN/TNT (60/40). The higher PETN content will be more conservative. It is proposed that the specification be changed to require a minimum of 50% PETN in the PETN/TNT booster.

(b) Time/Pressure tests

i. For the time/pressure test a lead washer is specified in 11.6.1.2.2 and 12.6.1.2.2. The purpose of this washer is to ensure a good seal. Lead is a highly toxic metal and since its sole function is to ensure a good seal, alternate materials available today can be used. The requirement in effect is for a washer made from a deformable material that will provide the required seal.

ii. The ignition system for the time/pressure test consists of an electric fusehead together with a 13mm square piece of primed cambric, as specified in paragraphs 11.6.1.2.5 and 12.6.1.2.5. Primed cambric is only available from the UK. Some test laboratories manufacture their own. It is recommended that an equivalent material to primed cambric be identified, just as the Test Manual states “that fuseheads with equivalent properties may be used.”

Proposals

Section 11

5. Amend 11.4.1.2.1 of the 1(a) test procedure to read:

(a) *The test sample is contained in carbon steel tube with an external diameter of 48 ± 2 mm, a nominal wall thickness of 4 mm and a length of 400 ± 5 mm. For example Schedule 40 steel with a Nominal Diameter of 38 mm (1.5 inches) will be suitable;*

(b) *The booster consists of 160 g RDX/Wax (95/5) or PETN/TNT that has a minimum of 50% PETN in the mixture,*

⁴ http://www.engineeringtoolbox.com/ansi-steel-pipes-d_305.html

⁵ UN/SCETDG/39/INF.25

6. Amend 11.6.1.2.2 of the 1(c) test procedure to read:
 - (a) *A washer of a deformable material is used with both plugs to ensure a good seal.*

Section 12

7. Amend 12.4.1.2 of the 2(a) test procedure to read:
 - (a) *The test sample is contained in carbon steel tube with an external diameter of 48 ± 2 mm, a nominal wall thickness of 4 mm and a length of 400 ± 5 mm. For example Schedule 40 steel with a Nominal Diameter of 38 mm (1.5 inches) will be suitable;*
 - (b) *The booster consists of 160 g RDX/Wax (95/5) or PETN/TNT that has a minimum of 50% PETN in the mixture,*
8. Amend 12.6.1.2.2 of the 2(c) test procedure to read:
 - (a) *A washer of a deformable material is used with both plugs to ensure a good seal.*

Consideration

9. IME recommends that an alternate to primed cambric be sought and welcomes further discussion on this topic at the EWG.
 10. IME remains at the service of the TDG and the EWG to continue to coordinate any future work on the review of Test Series 1 and 2 subject to those groups' desires and instructions.
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