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

Twenty-seventh session
Geneva, 4-8 July 2005
Item 3 (b) of the provisional agenda

EXPLOSIVES, SELF-REACTIVE SUBSTANCES AND ORGANIC PEROXIDES

Miscellaneous proposals

Aluminium witness screens used in Series 6(c) testing
Comments on ST/SG/AC.10/C.3/2005/5

Transmitted by the expert from the Netherlands

Introduction

1. Document ST/SG/AC.10/C.3/2005/5 from the expert of Australia addresses the specification of the aluminium witness screens used in test 6(c) of Test Series 6. In the years since the revision of the 6(c) test the expert from the Netherlands has heard similar sounds about the (non-) availability of the aluminium quality specified in the Manual of Tests and Criteria. We would like to recall some background information and share the way we have resolved the problem.

Background

2. It may be best to recall the origin of the aluminium quality mentioned in the Manual. Once the discussions for revising test 6(c) started, the Canadian Explosives Research Laboratory (CERL) in Canada performed experiments with several types of material for the witness screens studying the effect of the impact of fragments of different materials and varying kinetic energies of the fragments. From this research, it appeared that only non-deformable fragments of defined size, mass and shape gave reproducible results. A Fragment Simulating Projectiles (FSP) of 1.1 g according to NATO STANAG 2920, Annex A gave the best results.

   Once the borderlines for 1.2 (20 J) and 1.4S (8 J) classification were agreed it appeared that 2 mm thick aluminium plates according to 1100-0 gave penetration at a kinetic energy of 20 J. A kinetic energy of 8 J resulted in an indentation of 4 mm in a reproducible manner. At the time of the informal Working Group on UN Test 6(c), held in Washington D.C., USA 2-6 February 1998 it was believed that this quality was commonly available. The Brinell hardness and tensile strength were given to further specify the material and to give guidance for finding similar material.

3. Faced with the problem of finding the correct quality of aluminium, that gives perforations at 20 J and 4 mm indentation at 8 J, the Netherlands tested the normally used screens in the same way as CERL had established the results. The specifications of the sheets are: “internationally recognised grade EN AW 1050A H14 – 99.50% pure aluminium (Al 99.5) sheet strain hardened to the half-hard temper”. A standard set-up for determining the ballistic resistance of protective equipment with the 1.1 g FSP was used.

4. It appeared that this aluminium gave identical results as the 1100-0 quality. The same procedure was performed with the material of witness plates used by a German research institute and by a French company; all with the same specification and with equal results. One may therefore conclude that aluminium 1050A can be used as a witness screen in the 6(c) test..

5. The reasoning in the Australian document to use witness plates that "… does not have a greater resistance to indentation than 1100-0 aluminium sheets of Brinell hardness 23 and tensile strength of 90 MPa…" seems reasonable.

   However, the Brinell hardness of aluminium 1050A is 35 HB and the tensile strength 100 – 135 MPa and are thus higher than that specified in the Manual for 1100-0 (23 HB and 90 MPa respectively). It therefore seems that selecting a suitable material for witness screens based on these properties alone is not sufficient.

6. A more performance oriented method, like done in Canada and the Netherlands, should be used to select the correct quality of aluminium to guarantee correct results in the 6(c) test, when using witness screens of other material than 1100-0 or 1050A.

_____