United Nations ST/SG/AC.10/C.3/2019/12

Secretariat

Distr.: General
3 April 2019

Original: English

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

Fifty-fifth session
Geneva, 1-5 July 2019
Item 2 (c) of the provisional agenda
Explosives and related matters:
review of tests in parts I, II and III of the Manual of Tests and Criteria

Aligning the assessment with the purpose of Test Series 4(b)(ii)

Transmitted by the Sporting Arms & Ammunition Manufacturers' Institute (SAAMI)*

Introduction

1. Test Series 4(b)(ii) is the twelve metre drop test in the Manual of Tests and Criteria that determines if an explosive as presented for classification "can withstand a free-fall impact without producing any significant fire or explosion hazard."[1] If the explosive is found to have a significant hazard, then the product is considered too dangerous for transport.

2. The test assessment in section 14.5.2.4 of the Manual omits the word "significant." An insignificant result could forbid transport and prevent placement on the market. The purpose and criteria should be consistent.

3. Low hazard explosives exist in abundance which may ignite when dropped from twelve metres, resulting in an insignificant effect. This is not surprising, as some small explosives are designed to be initiated by low-energy impacts. A thorough review of the package destroyed by the fall may be necessary to ascertain whether an initiation occurred.

* In accordance with the programme of work of the Sub-Committee for 2019-2020 approved by the Committee at its ninth session (see ST/SG/AC.10/C.3/108, paragraph 141 and ST/SG/AC.10/46, paragraph 14).

1 Manual of Tests and Criteria, section 14, paragraph 14.5.2.1.

4. Test Series 4(b)(ii) is used at the discretion of competent authorities, and it may not be used with the same frequency as Test Series 6(a) and 6(c). Also, authorities may not consider a small and non-propagating initiation to be an explosion. Classifications may vary depending on whether the test is performed and how it is interpreted.

5. SAAMI seeks to ensure consistent and realistic classifications by adding clarity and aligning the test criteria with the purpose of the test. In keeping with the purpose of the test, we believe that a non-significant initiation should be considered a negative result, and the explosive should proceed to classification for transport. We think that this would be commensurate with other dangerous goods not subject to the test which could result in equally hazardous effects if subjected to a twelve metre fall.

Description of relevant low hazard explosives

6. Sensitive low hazard explosives have the following design and safety characteristics:

(a) They are not designed to function by detonation:

Explosive articles are often designed with a two-stage ignition process. For low hazard explosives, impact is often used for initiation. The ignition charge may consist of a small amount of primary[2] explosive, for example lead styphnate, measured in milligrams, which is ignitable by impact. This charge is too small to detonate, and is used to deflagrate the main charge of secondary explosive, measured in grams, which is less sensitive. Such explosive articles perform work using a deflagrating propellant as the main charge, producing a consistent physical force (not a detonation). Sometimes the required force is so low that only the ignition charge is used, with no main charge.

(b) Classification typically results in 1.4S:

In some cases, these explosives that could fail the 12 metre drop test are of such a low hazard that they have been removed from Class 1 by UN number assignment or in accordance with the criteria of paragraph 2.1.3.6.4 of the Model Regulations, but most are assigned a classification of 1.4S because they are not encased in devices. They are explosives which are “so packed or designed that any hazardous effects arising from accidental functioning are confined within the package unless the package has been degraded by fire, in which case all blast or projection effects are limited to the extent that they do not significantly hinder or prohibit fire fighting or other emergency response efforts in the immediate vicinity of the package.”[3]

7. Explosives designed to be initiated by impact which are also classified as 1.4S, or outside of Class 1, rely on strong off-setting safety factors. Often they are comprised of a high percentage of inert and rigid material which effectively prevents propagation between explosive articles. Packaging is frequently used to mitigate any remaining effects. These explosive articles are acceptable for use by personnel untrained in explosives safety. They include electrical circuit breakers, fixing cartridges, fire extinguisher squibs, small arms ammunition and other types of power device cartridges based on cap-type primer technology.

[2] Please see the definitions of primary and secondary explosives in the glossary (Model Regulations, appendix B).

[3] Model Regulations, Chapter 2.1, paragraph 2.1.2.1.1.

The test assessment

8. The test assessment in section 14.5.2.4 of the Manual of Tests and Criteria states:

> "14.5.2.4 *Test criteria and method of assessing results*
>
> The test result is considered "+" and the packaged substance or article(s) too dangerous to transport if a fire or explosion resulted from impact. Rupture of the package or article casing alone is not considered a "+" result. The result is considered "-" if no fire or explosion occurred in any of the three drops."

9. SAAMI believes there are some ambiguities in the text that could be improved to provide greater consistency of implementation, specifically in the phrase "significant fire or explosion":

> (a) The word "significant" is used in the introducing the purpose of the test, but is not defined. The word "significant" is omitted from the test assessment. Therefore, a classifier using the assessment text alone might use the occurrence of any explosion to assess a "+", which would prevent transport. Some authorities do not consider small initiations to be explosions, but others might, no matter how small.
>
> (b) The noun "explosion" is not defined, but the verb "explode" is defined in the glossary of the Model Regulations: "Explode - The verb used to indicate those explosive effects capable of endangering life and property through blast, heat and projection of missiles. It encompasses both deflagration and detonation." SAAMI believes that an effect consistent with classification as 1.4S is not an "explosion" capable of the above effects, and is especially not a "significant explosion."

10. The phrase "rupture of the package or article casing alone" in the test assessment refers to physical damage incurred by impact alone, and not explosive energy. It does not relate to the assessment of fire or explosion, and is only guidance to disregard physical effects of the drop itself. Therefore, this statement is not relevant to the assessment of small initiations which rupture or open the article casing.

11. SAAMI proposes to include the term "significant" in the test assessment, and link this to effects which are consistent with a 1.4S classification.

12. In the course of this work we note the absence of a definition for the noun "explosion", but as mentioned, the verb "explode" is already defined. We propose adding a definition to the glossary for "explosion". It might be possible to combine the definitions of the verb and noun. Note that "explosion" is also used for non-explosives, e.g. for a rupture of a gas under pressure, so we have used the words "an event" rather than a "chemical reaction". We added the word "instantaneous", as heat alone is not evidence of an explosion.

Proposals

13. Modify the last sentence of paragraph 14.5.2.4 of the Manual of Tests and Criteria as follows (new text is <u>underlined</u>):

> "The result is considered "-" if no <u>significant</u> fire or explosion occurred in any of the three drops."

14. Add a definition of explosion to the glossary of terms in Appendix B of the Model Regulations:

"***Explosion***

An event having effects capable of endangering life and property through instantaneous blast, heat and projection of missiles. It encompasses both deflagration and detonation. An initiation without blast, heat and projection of missiles is not considered an explosion."