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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

Twenty-ninth session
Geneva, 3-12 (a.m.) July 2006
Item 4(b) of the provisional agenda

PACKAGINGS (INCLUDING IBCS AND LARGE PACKAGINGS)

Vibration test for design types of IBC intended for the transport of dangerous goods

Transmitted by the experts from France and the United States of America

Background

1. During the previous session of the Sub-Committee it was agreed that a proposal concerning vibration testing for IBCs could be considered under the following conditions (see ST/SG/AC.10/C.3/56, para. 38):

   (a) Appropriate justification must be provided, bearing in mind that a broad consensus was necessary for introducing additional requirements that would significantly affect the packaging industry, while the case of packagings other than IBCs should not be addressed;

   (b) The issues mentioned in para. 10 of the report of the working group (INF.5) must be resolved;

(c) Account must be taken of the availability and cost of test equipment worldwide, particularly with a view to the effective possibility of applying this test in developing countries.

2. As many delegations supported the idea of introducing such a vibration test both during the Sub-Committee session and the working group held in Paris, the United States of America and France have worked together in order to develop such a proposal.

3. The test method has been developed on the basis of the "ASTM D999-1 fixed frequency test", because the equipment needed for this method seems to be the most available. Additionally, the proposed method satisfies the condition prescribed in the third indent of the Sub-Committee's report, paragraph 38 concerning the wide availability and current use of the test method and therefore reduced cost impact to industry.

4. The test procedure has been slightly modified in order to clarify the way the shim/plate shall be inserted under the IBC to assess that the appropriate vibration level has been achieved. There was some room for interpretation in ASTM D999-1 that lead to different results for tests conducted in different places. The modification presented in this proposal ensures better reproducibility between testing facilities. In addition, the proposed test method clarifies that the test shall be carried out with water for IBCs intended for liquids and that resonance shall be avoided. These modifications further clarify the test method and ensure that the severity level of the test is commensurate to transport conditions.

5. It is proposed the test be performed first in the test sequence: as vibration is part of the normal stress in transport, the IBC should be able to withstand other performance tests after having been subject to vibration (except for the drop test where note e applies).

6. The pass/fail criteria have been drafted in a way that refers as much as possible to observable facts. In addition, if obvious reasons for rejecting the design type are not observed, but the IBC's performance is affected by other less observable deteriorations, a failure during the other tests required in sequence will reveal any such deterioration. Thus, in our view, it is not necessary to define more specific pass/fail criteria than that specified in the proposed 6.5.6.13.4.1.

7. Based on data from test laboratories used to perform these vibration tests it appears appropriate to include IBCs intended for solids in the vibration test.

8. Points 3 to 7 above take into account most of the comments mentioned in para. 10 of informal document INF.5 from the last session (report of the Paris working group). We do not feel it is appropriate to define a cut-off value for the size of IBCs being tested because size is irrelevant for the vibration test. We also do not believe it is necessary to modify test conditions according to the expected service life of the IBC, especially in light of the fact that the Sub-Committee did not endorse the concept of "single trip IBC".

9. The overall justification for introducing a vibration test for IBCs is supported by the following points:

(a) Many lightweight IBCs have shown failures during vibration testing even under the lowest vibration profiles;

(b) Although the Sub-Committee has decided not to endorse the concept of "single trip IBC", many IBCs on the market today are designed as such, and, even when poorly built, they pass the current tests and are approved IBCs. Concern has been expressed by many delegates about such poorly designed IBCs;

(c) The fixed frequency vibration test proposed to be included in the test sequence is effective in discriminating between acceptable and unacceptable designs;

(d) IBCs pose a significant risk in transport due to the quantity of materials authorized;

(e) At several occasions, comments have been made on the fact that the current tests do not take care of dynamic stresses during transport. The vibration test is a way to include these stresses in the performance tests.

10. In order to allow industry enough time to comply with the new requirements we propose a transition period ending in 2011. A statement has been added to 4.1.1.3 to ensure that IBCs already on the market may be used until the end of their lifetime.

11. In view of the foregoing, the conditions stipulated in para. 38 of the report of the last session are viewed as fulfilled. Therefore we propose the following text for adoption in the 15th revised edition of the Model Regulations.

Proposal

Use of IBCs: Chapter 4.1

4.1.1.3: Add the following paragraph:
"However, IBCs manufactured before 1 January 2011 and conforming to a design type which have not passed the vibration test of 6.5.6.13 may still be used."

IBCs: Chapter 6.5

6.5.6.2.1: Replace 6.5.6.12 by 6.5.6.13.
6.5.6.2.3: Replace 6.5.6.13 by 6.5.6.14.
6.5.6.3.5 *Design type tests required and sequential order*.
Replace the existing table by the following:

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Type of IBC	Vibration	Bottom lift	Top lift[a]	Stacking[b]	Leak-proofness	Hydraulic pressure	Drop	Tear	Topple	Righting[c]
Metal:										
11A, 11B, 11N	1st	2nd	3rd	-	-	-	4th[e]	-	-	-
21A, 21B, 21N	1st	2nd	3rd	4th	5th	-	6th[e]	-	-	-
31A, 31B, 31N	1st	2nd	3rd	4th	5th	6th	7th[e]	-	-	-
Flexible[d]	-	x[c]	x	-	-	-	x	x	x	x
Rigid Plastics:										
11H1, 11H2	1st	2nd	3rd	-	-	-	4th	-	-	-
21H1, 21H2	1st	2nd	3rd	4th	5th	-	6th	-	-	-
31H1, 31H2	1st	2nd	3rd	4th	5th	6th	7th	-	-	-
Composite:										
11HZ1, 11HZ2	1st	2nd	3rd	-	-	-	4th[e]	-	-	-
21HZ1, 21HZ2	1st	2nd	3rd	4th	5th	-	6th[e]	-	-	-
31HZ1, 31HZ2	1st	2nd	3rd	4th	5th	6th	7th[e]	-	-	-
Fibreboard	1st	-	2nd	-	-	-	3rd	-	-	-
Wooden	1st	-	2nd	-	-	-	3rd	-	-	-

[a] *When IBCs are designed for this method of handling.*
[b] *When IBCs are designed to be stacked.*
[c] *When IBCs are designed to be lifted from the top or the side.*
[d] *Required test indicated by x; an IBC which has passed one test may be used for other tests, in any order.*
[e] *Another IBC of the same design may be used for the drop test”.*

Replace 6.5.6.13 by 6.5.6.14 and insert the following 6.5.6.13:

"6.5.6.13 Vibration test

6.5.6.13.1 *Applicability*: For all IBCs other than flexible, as a design type test, as from 1 January 2011.

6.5.6.13.2 *Preparation of the IBC for test*

6.5.6.13.2.1 IBCs intended for liquids shall be filled with water to 98% of their overflow capacity.

6.5.6.13.2.2 IBCs intended for solids shall be filled to their maximum permissible gross mass with fine dry powdered material or with material closely simulating the dangerous goods for which the IBC is designed.

6.5.6.13.3 *Test method and duration*:

6.5.6.13.3.1 The IBC shall be placed in the center of the test machine platform with a vertical sinusoidal, double amplitude (peak-to peak displacement) of 25 mm. If necessary, restraining devices shall be attached to the platform to prevent the specimen from moving horizontally off the platform without restricting vertical movement.

6.5.6.13.3.2 The test shall be conducted for one hour at a frequency that causes the IBC to be raised from the vibrating platform to such a degree that a piece of material can be completely inserted at any point between the IBC and the test platform. The material used for this test shall be at least 1.6 mm thick, 50 mm wide, and be of sufficient length to be inserted between the IBC and the test platform a minimum of 100 mm to perform the test.

Note: The frequency may need to be adjusted after the initial set point to maintain lift off or to prevent the packaging from going into resonance. This adjustment shall not lead to a decrease in the vibration stress level.

6.5.6.13.4 *Criteria for passing the test:*

6.5.6.13.4.1 No leakage, break, or tear shall be observed. The IBC shall not exhibit any damage liable to affect safety during transport.

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