

## 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  
(2-6 December 2002,  
agenda item 4 (a))

### NEW PROPOSALS

### OUTSTANDING ISSUES

#### Comments on ST/SG/AC.10/C.3/2002/77 (Repetitive shock test)

##### Transmitted by the Expert from Germany

Germany appreciates the revised proposal by the United States as laid down in working paper ST/SG/AC.10/C.3/2002/77, which reflects many of the concerns expressed during the July meeting. However, Germany is still worried by some provisions of the proposal. This concerns the test method, the validity for some types of packagings, IBCs and large packagings containing solid substances or articles, the different character of conformity proofs for packagings and IBCs and the grandfather clause.

Further improvement should additionally be possible for some details, such as the specification of the surface of the shaking table and the transitional provisions. Germany submits in this paper detailed proposed amendments to the US proposal for consideration. The essentials of these amendments are the following:

- **Restriction of the scope to packagings and IBCs containing liquids (and excluding large packagings).**

The justification for that restriction is given by the fact that the typical failure mode due to vibration are fatigue cracks. Through fatigue cracks the complete loss of liquid contents may be expected. However, this is not to be expected in case of solid material or articles and inner packagings.

- **Capability requirement for both, packagings and IBCs.**

No justification can be seen to treat packagings and IBCs differently. As for packagings, it is possible to apply the procedures of a capability proof also to IBCs.

- **Addition of an alternative test method (random vibration test).**

This type of test is considered to be better related to the transport environment and to be state of the art of vibration resistance demonstration. Owing to the fact that the US method is also in use it's proposed to allow either method as agreed.

The method proposed has been taken from a military standard (MIL-STD-810F), which is now publicly available on the internet under <http://www.dtc.army.mil/pdf/810.pdf>. This method is the only available standard with a justified correlation of test and real transport parameters. Both methods are deemed to provide for a comparable level of safety.

- **Amendment to the grandfather clauses for clarification.**

A transitional period for the design type is not necessary since the new requirements will not be implemented into the modal provisions until 1 January 2005. However, clarification with regard to manufacturing and use is needed.

Other proposed amendments are consequences from these major points. Editorial consequences may not be indicated completely.

**Proposed amendments to ST/SG/AC.10/C.3/2002/77:**

1. Amend title and text of new paragraph 6.1.5.8 to read as follows:  
(*The change is proposed because it does not apply to all types of packagings and because of the addition of the alternative random vibration test*).

**"6.1.5.8 Supplementary vibration test for packagings to contain liquids**

Packaging design types other than bags, articles, packagings for solids and combination packagings shall be capable of successfully passing one of the tests specified thereafter:"

2. 6.1.5.8.1: Title should be changed to "*Preparation for testing*" and the first two sentences of 6.1.5.8.2 be added.
3. 6.1.5.8.2: Amend the beginning to read: "*Repetitive shock test method*: The test shall be conducted...."
4. Insert a new paragraph after 6.1.5.8.2 as follows:

"6.1.5.8.2 *Random Vibration Test<sup>1</sup> method*: The specimen(s) shall be placed and tied down as for transport on the platform of a vibration exciter (shaker) with a rigid surface. The shaker used shall provide a vertical motion with randomly distributed frequencies. The instantaneous acceleration shall have a normal (Gaussian) distribution. The acceleration perpendicular vertically and horizontally to the drive axis shall be less than 0.45 times the acceleration or 0.2 times the acceleration spectral density of the basic motion at any frequency.

The acceleration spectral density of the vibration in relation to the frequency shall be characterized by the following figures describing a linear curve in a double logarithmic scaled diagram:

Frequency (Hz)	Acceleration spectral density (g <sup>2</sup> /Hz)
10	0,015
40	0,015
500	0,00015

The initial slope shall be +6 dB/octave. The start frequency shall be either 10 Hz or the lowest, natural frequency of the specimen(s), whichever is lower. The final slope shall be -24 dB/octave. The root mean square value of the described spectrum shall be at least 1.04 g.

The specimen(s) shall be vibrated for a minimum of one hour duration."

5. 6.1.5.8.3 and 6.1.5.8.4. remain unchanged.
6. 6.1.5.8.5 to be amended as follows:

"6.1.5.8.5 Packagings may be manufactured to a design type meeting the requirements of the 12<sup>th</sup> revised edition of these Model Regulations. Packagings manufactured to such a design type may be used".

7. Amend the title of paragraph 6.5.4.13 to read as follows:

"6.5.4.13 Supplementary vibration test for IBCs to contain liquids".

<sup>1</sup> For further details concerning the test method see MIL-STD-810F: <http://www.dtc.army.mil/pdf/810.pdf>

8. Amend 6.5.4.13.1 to read as follows:  
 "6.5.4.13.1 IBC design types other than those for solids shall be capable of successfully passing one of the tests specified thereafter:"
9. 6.5.4.13.2: End paragraph. with "... 98% of their maximum capacity". and delete the rest.
10. 6.5.4.13.3: Amend the beginning to read: "*Repetitive shock test method*: The IBC shall be placed..."
11. Add an additional paragraph after 6.5.4.13.2, as follows:  
 "6.5.4.13.3 Random Vibration Test<sup>2</sup> method: The IBC shall be placed and tied down as for transport on the platform of an vibration exciter (shaker) with a rigid surface. The shaker used shall provide a vertical motion with randomly distributed frequencies. The instantaneous acceleration shall have a normal (Gaussian) distribution. The acceleration perpendicular vertically and horizontally to the drive axis shall be less than 0.45 times the acceleration or 0.2 times the acceleration spectral density of the basic motion at any frequency.

The acceleration spectral density of the vibration in relation to the frequency shall be characterized by the following figures describing a linear curve in a double logarithmic scaled diagram:

Frequency (Hz)	Acceleration spectral density (g <sup>2</sup> /Hz)
10	0,015
40	0,015
500	0,00015

The initial slope shall be +6 dB/octave. The start frequency either shall be 10 Hz or the lowest, natural frequency of the specimen(s), whichever is lower. The final slope shall be -24 dB/octave. The root mean square value of the described spectrum shall be at least 1.04 g.

The IBC shall be vibrated for a minimum of one hour duration."

12. 6.5.4.13.4 remains unchanged.
13. Add an additional paragraph after 6.5.4.13.4 (in line with 6.1.5.7.4) as follows:  
 "6.5.4.13.5 *Demonstration of compliance*: IBCs that vary from a tested design type in only minor respect may be considered as capable of meeting this test. IBCs may also be considered as capable of meeting the test on the basis of engineering analysis."
14. Amend 6.1.5.13.5, as follows:  
 "6.1.5.13.5 IBCs may be manufactured to a design type meeting the requirements of the 12<sup>th</sup> revised edition of these Model Regulations. IBCs manufactured to such a design type may be used."  
 Table in 6.5.4.3.5: No amendment of the existing version required.
15. Section 6.6 on Large packagings: No amendment of the existing version required. (*Fatigue failures without significant effect on dangerous goods release*).

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<sup>2</sup> For further details concerning the test method see MIL-STD-810F: <http://www.dtc.army.mil/pdf/810.pdf>