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AND LABELLING OF CHEMICALS

Sub-Committee of Experts on the
Transport of Dangerous Goods
(Twenty-first session, 1-10 July 2002
agenda item 6 (b))

PACKAGINGS (including IBCs and large packagings)

Vibration test

Transmitted by the expert from the United States of America

The following are proposed amendments to the US proposal ST/SG/AC.10/C.3/2002/17 (the amendments are shown in bold and strikeout respectively):

In 4.1.1.1 add a new third sentence as follows:

"In respect to shock and vibration, packaging design types shall be capable* of withstanding the test requirements of 6.1.5.7.

***Note: "Capable" means that the packaging is able to successfully pass the indicated test. Where the term is mentioned, conducting the specified test is not a condition of certifying each design type as a UN packaging provided it is determined through other means (e.g. through analogy on the basis of related design types known to pass the test) that the packaging is able to meet the specified requirements.**

A 2 year transitional provision will be proposed for incorporation in the Model Regulations to allow time for the affected industries to comply with the new capability requirement. The exact text will be provided as a formal proposal for the next session of the Sub-Committee.

5. It is proposed that the existing text in 6.1.5.7 be replaced with the following:

Vibration test

6.1.5.7 All packaging design types shall be ~~subjected to a vibration test.~~ **capable of successfully passing the following test:**

6.1.5.7.1 *Number of test samples:* Three sample packagings, selected at random, shall be filled and closed as for transport including the configuration of inner packagings and articles and the tightening of closures. All packagings shall be prepared for testing as specified in 6.1.5.2. For packages intended for the transport of solid materials the packaging shall be filled to not less than 95% of their intended capacity with a substance of relative density 1 (e.g a mixture of sand and plastics granules). Packagings intended to be used for the transport of liquids shall be filled to not less than 98% of their maximum capacity with water.

6.1.5.7.2 *Test method:* Test specimens may be tested together or individually. ~~The packagings may be tested in a unit load or palletized configuration if they are transported in such a configuration; if a unit load or palletized configuration is tested, three complete unit loads or pallets must be tested.~~ **The platform shall be a rigid, flat and horizontal surface.** The specimen(s) shall be placed on the test machine platform in the normal transport orientation. The test shall be conducted with a machine that produces a vertical or rotary motion vibration resulting in double amplitude (peak to peak displacement) of approximately $25\text{mm} \pm 5\%$ **that causes the test specimen to vibrate in the vertical direction.** The specimen(s) shall be restrained horizontally to prevent them from falling off the platform, but shall be left free to move vertically. Restraining devices may be used to prevent the specimens from moving horizontally off the platform and to restrict excessive rocking. Fences, barricades and other restraints shall be adequately secured to protect the safety of the operator. The restraining devices shall in no case restrict vertical movement. The restraining devices shall not restrict the free horizontal movement to less than $10\text{ mm} \pm 5\%$ in any horizontal direction from the initial placement of the specimen on the platform.

The initial frequency should be approximately 2 Hz and shall be steadily increased until the test specimen(s) repeatedly leaves the test surface. To ensure that the specimen is subjected to constant repetitive shock a steel shim $50\text{ mm} \pm 5\%$ wide and $1.6\text{mm} \pm 5\%$ in thickness (e.g. a piece of steel strapping) shall be passed between the specimen and the platform over the full length of the specimen. The specimen(s) shall be vibrated at this frequency for a minimum of one hour duration. After the completion of the test the specimens shall be removed from the platform, turned on its side for a minimum duration of five minutes and inspected for damage and any leakage of the test medium from the package(s). Packages tested in a palletized or unit load configuration would need to be removed from the unit load or pallet prior to inspection. The inspection shall include an examination of any articles, inner packagings and their closures. Any damage, deterioration or leakage shall be recorded.

6.1.5.7.3 *Criterion for passing the test:* There shall be no rupture or leakage from the packaging. No test sample should show any deterioration or any distortion liable to reduce packaging strength that could adversely affect transport safety. No test sample shall show any indication of leakage of the test medium from the inner or outer packaging or from an article. Any leakage shall be considered a failure.

6.1.5.7.4 *Use of other equivalent tests:* Other test methods, at least equally effective, may be used, if approved by the competent authority.

6. It is proposed that the existing text in 6.5.4.13 and 6.5.4.14 be numbered as 6.5.4.14 and 6.5.4.15 respectively and that a new 6.5.4.13 be inserted as follows:

6.5.4.13 Vibration test

6.5.4.13.1 **All IBC design types shall be subjected to a vibration test. capable of successfully passing the following test: IBCs except FIBCs, as a design type test.**

Comment: Through experience testing FIBCs in the United States we have determined that the test is not necessary for flexibles IBCs.

6.5.4.13.2 *Preparation of the IBC for testing:* A sample IBC shall be selected at random and shall be filled and closed as for transport. IBCs shall be filled to not less than 98% of their maximum capacity for liquids. or 95% for solids. For IBCs intended to be used for the transport of liquids water may be used as the test medium. For solids the IBC shall be filled to its maximum gross mass.

6.5.4.13.3 *Test method:* The IBC shall be placed on the test machine platform in the normal transport orientation. **The platform shall be a rigid, flat and horizontal surface.** The test shall be conducted with a machine that produces a vertical vibration resulting in a double amplitude (peak to peak displacement) of approximately 25 mm \pm 5% **that causes the IBC to vibrate in the vertical direction.** It shall be restrained horizontally to prevent it from falling off the platform, but shall be left free to move vertically. Restraining devices may be used to prevent the IBC from moving horizontally off the platform and to restrict excessive rocking. Fences, barricades and other restraints shall be adequately secured to protect the safety of the operator. The restraining devices shall in no case restrict vertical movement. The restraining devices shall not restrict the free horizontal movement to less than 10 mm \pm 5% in any horizontal direction from the initial placement of the specimen on the platform.

The initial frequency should be approximately 2 Hz and shall be steadily increased until the IBC repeatedly leaves the test surface. To ensure that the specimen is subjected to constant repetitive shock a steel shim 50 mm \pm 5% wide and 1.6mm \pm 5% in thickness (e.g. a piece of steel strapping) shall be passed between the platform and the IBC and verified on each corner or side of the IBC. The IBC shall be vibrated at this frequency for a minimum of one hour duration. After the completion of the test the IBC shall be inspected for damage and any leakage of the test medium. The inspection shall include an examination of all of the IBC components including the body and the closures. Any damage, deterioration or leakage shall be recorded.

6.5.4.13.4 *Criterion for passing the test:* There shall be no rupture or leakage of the test medium from the receptacle, if applicable, or the body of the IBC. No IBC should show any deterioration or any distortion liable to reduce packaging strength that could adversely affect transport safety. Any leakage shall be considered a failure.

6.5.4.13.5 *Use of other equivalent tests:* Other test methods, at least equally effective, may be used, if approved by competent authority.

7. Amend the table in 6.5.4.3.5 as follows:

~~6.5.4.3.5~~ *Design type tests required and sequential order*

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

~~Comment/suggestion: The Sub-Committee should consider changing the order of the required tests by placing the leakproofness test 1st and keeping the order as shown in the above table with vibration second. This would allow testing laboratories to take the empty IBC and conduct the leakproofness test first and then fill the IBC and conduct the remaining test in the order presented. Currently they have to empty the IBC in the middle of the sequence to conduct the leak test and then fill it back up for the hydro test. This takes a considerable amount of time. Conducting the leakproofness test first, will also serve to verify the sealing qualities of the fittings, valves and closures prior to performing the test on a filled IBC.~~

~~————^a———— When IBCs are designed for this method of handling.~~

~~————^b———— When IBCs are designed to be stacked.~~

~~————^c———— When IBCs are designated 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.~~

~~78-~~ Add a new paragraph 6.6.5.3.5 as follows:

6.6.5.3.5 Vibration test

6.6.5.3.5.1 All large packaging design types shall be capable of successfully passing the following test: For all types of large packagings as a design type test.

6.6.5.3.5.2 Preparation of large packaging for testing

The large packaging shall be filled in accordance with 6.6.5.2.1.

6.6.5.3.5.3 *Number of test samples:* one large packaging shall be selected at random, filled and closed as for transport including the configuration of inner packagings or articles.

6.6.5.3.5.4 *Test method:* The large packaging shall be placed on the test machine platform in the normal transport orientation. **The platform shall be a rigid, flat and horizontal surface.** The test shall be conducted with a machine that produces a vertical vibration resulting in a double amplitude (peak to peak displacement) of approximately $25\text{mm} \pm 5\%$ **that causes packaging to vibrate in the vertical direction.** The large packaging shall be restrained horizontally to prevent it from falling off the platform, but shall be left free to move vertically. Restraining devices may be used to prevent the large packaging from moving horizontally off the platform and to restrict excessive rocking. Fences, barricades and other restraints shall be adequately secured to protect the safety of the operator. The restraining devices shall in no case restrict vertical movement. The restraining devices shall not restrict the free horizontal movement to less than $10\text{ mm} \pm 5\%$ in any horizontal direction from the initial placement of the specimen on the platform.

The initial frequency should be approximately 2 Hz and shall be steadily increased until the large packaging repeatedly leaves the test surface. To ensure that the specimen is subjected to constant repetitive shock a steel shim $50\text{ mm} \pm 5\%$ wide and $1.6\text{mm} \pm 5\%$ in thickness (e.g. a piece of steel strapping) shall be passed between the platform and the large packaging and verified on each side or each corner of the large packaging. The large packaging shall be vibrated at this frequency for a minimum of one hour duration. After the completion of the test the large packaging shall be inspected for damage and any leakage of the test medium from the large packaging including from any articles, inner packagings and their closures. Any damage, deterioration or leakage shall be recorded.

6.6.5.3.5.5 *Criterion for passing the test:* There shall be no rupture or leakage of the test medium from the large packaging, inner packagings or articles. No large packaging shall show any deterioration or any distortion liable to reduce packaging strength that could adversely affect transport safety. Any leakage shall be considered a failure.

6.6.5.3.5.6 *Use of other equivalent tests:* Other test methods, at least equally effective, may be used, if approved by the competent authority.
