UN/SCETDG/28/INF.5

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-eighth session
Geneva, 28 November – 7 December 2005

REPORT OF THE IBC INFORMAL WORKING GROUP
(Paris, 10-13 October 2005)

Submitted by the expert from Canada on behalf of the informal Working Group

Introduction

1. At its twenty-seventh session, the Sub-Committee discussed formal papers from the Experts from Australia and Austria and informal papers from Canada and ICPP regarding various aspects of the carriage of IBCs. Paragraph 33 of the Report of the twenty-seventh session (ST/SG/AC.10/C.3/54) states that

> "33. The majority of experts acknowledged that there was sufficient concern to warrant examination and the Sub-Committee accepted the proposal by Canada to organize an informal working group which would identify and address issues associated with the carriage of IBCs. The Sub-Committee adopted the terms of reference of this group, which will be convened in Paris from 10-13 October 2005, on the basis of informal document INF.41 (see annex 2).".

2. Annex 1 of this report is the Terms of Reference for the Working Group. Annex 2 is the Agenda. Annex 3 is the list of participants. Annex 4 includes the papers submitted to the Working Group.

3. The meeting was opened by Mr. Pfauvadel who welcomed the participants to Paris.

4. On the suggestion of Mr. Pfauvadel, the Working Group asked Ms. Linda Hume-Sastre (Canada) to chair the meeting.

5. The Chairman called for the adoption of the agenda. The agenda was adopted after a proposal for amendment from Germany and ICPP.

6. **Agenda Item 1** : The Chairman called for the review of existing incident data as a base for further discussion.

The US presented the data on record with the US government. There appears to be no major problems in the US, however, it was noted that the test requirements in the US (eg. vibration test)

may be somewhat different from that in other countries.
Australia indicated that data was difficult to assemble but presented what was available.

There was a brief discussion on the relevance of some US data (valve failure, forkliftpuncture) for the purpose of this meeting.

The Netherlands referred to UN/SCETDG/22/INF.6, "Evaluation of UN Packaging requirements" and confirmed that the main causes of leakage are:

failure of closures
incorrect handling or stowage, or
improper unit loads.

The Netherlands further noted that changes to part 6 may not solve these problems.

ICIBCA presented statistics by cause of incidents (% down in most cases).

Canada stated that the quality of that data available to it was generally very poor and that only about 10% of actual incidents were reported (+ visual presentation). On the visual, notes were made that dunnage and movement prevention were important though no **specific** requirements for IBCs are indicated in the current "orange book" model regulations (though there may be general recommendations).

It was further noted that improper stowage and securing may have been a contributing factor in these incidents. In relation to proper stowage and securing, a reference was made to note 2 of 7.1.1 of the UNMR.

France noted that the terms or reference were primarily on the construction of IBCs and that stowage and securing are independent of the design type and testing.

7. Agenda Item 2, UV/Chemical/Temperature Degradation

This agenda item began with a presentation by ICPP on the intensity and distribution of UV radiation worldwide and on its effect according to location and material. ICPP stated that, in most cases, the material used in rigid plastics and composite IBCs is already UV protected and that, as a result, the cost involved would not be significant. A lengthy discussion took place on the need for clarification of the UV resistance requirements in the Model Regulations to formally recognize current practices.

France noted that there appeared to be a majority of attendees who do not oppose the introduction of requirements on IBCs life/protection. Labeling would be useful if protection is not possible.

DGAC noted that it cannot be said that all IBCs need the same level of protection. If a standard is adopted for UV resistance, a phase-in period may need to be considered.

The Working Group agreed that any recommendation regarding UV resistance for IBCs may lead to consequential changes to other provisions in the regulations.

The Chairman, noted that the opinion of the Working Group seemed to indicate that the Model Regulations need some clarification regarding UV resistance but that chemical and temperature degradation are not issues that the Working Group believed needed to be addressed.

The US and ICPP noted that there is no specific requirement for IBC's to last 5years in the UNMR,

although they were not opposed to improving requirements.
France agreed, however, noted that UV degradation is difficult to determine by visual inspection and could create problems for the users.

The Working Group agreed that a minimum performance level against UV degradation should be included.

The Working Group, based on a proposal from Germany, considered the following text that illustrates how this principle could be applied in the Model Regulations, fully realizing that there may be other provisions in the Model Regulations that may need to be reviewed and amended for consistency.

6.5.5.4 ***Specific requirements for composite IBCs with plastics inner receptacles***

[6.5.5.4.6 The inner receptacle shall be manufactured from suitable plastics material of known specifications and be of adequate strength in relation to its capacity and its intended use. The material shall be adequately resistant to ageing and to degradation caused by the substance contained~~ or, where relevant, by ultraviolet radiation~~. [Additives may be incorporated in the material of the inner receptacle to improve the resistance to ageing or to serve other purposes, provided that these do not adversely affect the physical or chemical properties of the material. These additives shall be compatible with the contents and remain effective throughout the life of the inner receptacle. Changes of additives shall not adversely affect the physical properties of the plastics material.] Low temperature performance shall be taken into account when appropriate. Any permeation of the substance contained shall not constitute a danger under normal conditions of transport.

6.5.5.4.7 ~~Where p~~ Protection against ultraviolet radiation ~~is required~~ shall be provided by the addition of inhibitors, carbon black or other suitable pigments. The materials of an inner receptacle ((and service equipment)) shall be resistant to a radiant exposure of ≥150 kcal/cm², determined in accordance with ISO 877:1994 and using a reduction of initial elongation at break to 50% as the test criterion. This requirement does not apply if the inner receptacle is protected against sunlight. ~~These additives shall be compatible with the contents and remain effective throughout the life of the inner receptacle. Where use is made of carbon black, pigments or inhibitors, other than those used in the manufacture of the tested design type, retesting may be waived if changes in carbon black content, the pigment content or the inhibitor content do not adversely affect the physical properties of the material of construction~~.

6.5.5.4.8 ~~Additives may be incorporated in the material of the inner receptacle to improve the resistance to ageing or to serve other purposes, provided that these do not adversely affect the physical or chemical properties of the material.]~~

8. Agenda Item 3: Lightweight/Single Trip IBCs

This agenda item had a number of questions associated with it. The first question was "Should there be a distinction made between non-reuseable and reuseable IBCs?"

There was a lengthy discussion of this question, and the majority of the Working Group did not support making a distinction in the Model Regulations between non-reusable and reuseable IBCs but that there should be one testing standard for all IBCs. The agreement on this question eliminated the need to discuss the other questions in this agenda item (e.g., should there be a unique mark for non-reuseable IBCs? Should there be restrictions as to the dangerous goods that can be carried in a non-reuseable IBC?)

9. Agenda Item 4, Existing test protocols/ requirements/acceptance criteria (how does an IBC pass a test) (Review stacking test, leakproof test, drop test (using incident data and experience)

The first day of the meeting ended with a preliminary discussion of Agenda Item 4.

At the beginning of the meeting on Tuesday, the Chairman was asked if the Terms of Reference precluded discussion of tests not listed in the agenda. The Chairman referred to the Terms of Reference and concluded that the terms were broad enough to allow the Working Group to consider the other tests required for IBCs. The Working Group agreed with the Chairman's interpretation. The UK then suggested that the tests in 6.5.6 be considered in sequence and the Working Group agreed to proceed in this manner.

(Note: The terms of reference include a review of test protocols and test acceptance criteria)

The first test to be considered was the Bottom Lift Test, 6.5.6.4.

There was some discussion as to whether the Working Group should consider clarification to the methodology of a test or just consider clarification of the criteria of a test. While there was some differences of opinion, the Working Group agreed to consider clarification of methodology as well as criteria.

After a lengthy discussion, the Working Group considered the following proposal form the UK and Australia as an illustration of how the text of the bottom lift test could be clarified in the Model regulations. The United Kingdom, at the suggestion of CEPE, agreed to provide diagrams as further assistance in performing the test:

[6.5.6.4 Bottom lift test

6.5.6.4.1 *Applicability*

For all fibreboard and wooden IBCs, and for all types of IBC which are fitted with means of lifting from the base, as a design type test.

6.5.6.4.2 *Preparation of the IBC for test*

The IBC shall be filled. A load shall be added and evenly distributed. The mass of the filled IBC and the load shall be 1.25 times the maximum permissible gross mass.

6.5.6.4.3 *Method of testing*

The IBC shall be raised and lowered twice by a lift truck with the forks centrally positioned and spaced with their outside edges at three quarters of the dimension of the forklift aperture of the pallet face on the side of entry. Where the IBC design does not permit significant variation in fork spacing, the minimum possible fork spacing shall be used. The forks shall penetrate to three quarters of the direction of entry. The test shall be repeated from each possible direction of entry.

Note: the forklift aperture of the pallet face is to be measured to the outer limits of the aperture not the pallet.

6.5.6.4.4 *Criteria for passing the test*

The IBC remains safe for normal conditions of transport, there is no observable permanent deformation of the IBC, including the base pallet, if any, and no loss of contents.

Note: Observable permanent deformation is a distortion of the external dimensions of the IBC, or its fixtures and fittings, exceeding [0.5%].]

The next test to be considered was the Top Lift Test, 6.5.6.5. The Working Group discussed this test at length. The Working Group participants were of differing opinions as to what level, if any, of deformation should be tolerated. After a lengthy discussion, the Working Group considered the following proposal by the UK and Australia as an illustration of how the text of the bottom lift test could be clarified in the Model regulations.:

Revised 6.5.6.5.1

6.5.6.5.1 *Applicability*

For all types of IBC which are designed to be lifted from the top, or are equipped to be lifted from the top, and for flexible IBCs designed to be lifted from the top or the side, as a design type test.

Revised 6.5.6.5.5

6.5.6.5.5 Criteria for passing the test

(a) Metal, rigid plastics and composite IBCs: The IBC remains safe for normal conditions of transport, there is no observable permanent deformation of the IBC, including the base pallet, if any, and no loss of contents;

(b) Flexible IBCs: no damage to the IBC or its lifting devices which renders the IBC unsafe for transport or handling and no loss of contents;

Note: Observable permanent deformation is a distortion of the external dimensions of the IBC, or its fixtures and fittings, exceeding [0.5%].

The Working Group then considered the stacking test, 6.5.6.6. There was considerable discussion on this test with attendees reviewing papers submitted by various participants. Some participants felt that the test needed to be clarified while other participants believed that it would be more practical to change the marking to provide information to shippers.

The Chairman summarized the discussion as being divided into three categories based on the papers and the discussion: deformation, maximum stacking load and FIBCs.

The Working Group agreed to consider the Belgian proposal to exempt FIBCs from the stacking test. The Working Group agreed, in principle, that FIBCs should not be subject to the stacking test, under certain conditions. The following proposal from Belgium illustrates how this could be achieved in the Model regulations:

Change 6.5.6.6.1 as follows:

"6.5.6.6.1 Applicability

For all types of IBC which are designed to be stacked on each other, as a design type test.

Flexible IBCs are exempted from the stacking test if the superimposed test load, as calculated according to 6.5.6.6.4, is lower than six times their maximum permissible gross mass."

It was noted that this proposed change could create questions regarding the stacking load to be marked on FIBCs. Belgium agreed to review this issue and present a paper to the Sub-Committee regarding any subsequent changes that may be required.

The following proposals on the stacking test were presented to the Working Group and incorporated the discussion on the issue of deformation as well as proposals from papers presented to the Working Group:

Revised 6.5.6.6.5

6.5.6.6.5 *Criteria for passing the test*

(a) All types of IBCs other than flexible IBCs: The IBC remains safe for normal conditions of transport, there is no observable permanent deformation of the IBC, including the base pallet, if any, and no loss of contents;

Note: Observable permanent deformation is a distortion of the external dimensions of the IBC, or its fixtures and fittings, exceeding[0.5%].

(b) Flexible IBCs: no deterioration of the body which renders the IBC unsafe for transport and no loss of contents.

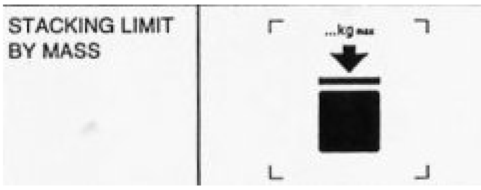
(c) For all rigid IBCs no deformation greater than [3%] of the initial external dimensions of the IBC during the stacking period before removing the stacking load."

While some Working Group members felt that a limit on the allowable level of deformation should be included in the provisions, the US and ICCP expressed their disagreement with this concept given that not enough information was available to establish such a limit. The Working Group agreed, in principle, that the content of the above proposals illustrate how the provisions for this test could be improved but considered that the text would have to be refined. The Working group also underlined the importance of 7.1.1.8 as the basis for further discussion.

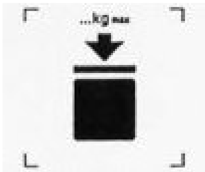
The WG discussed the need for additional handling marks to indicate the permissible stacking load. ICPP proposed that in paragraph 6.5.2.1.1(g), the maximum permissible stacking load rather than the stacking test load should be indicated on the identification plate. However, the Working Group did not want to change the UN marking string due to the large number of IBCs already in service. Consequently, the Working Group considered that the use of the following symbols taken from the UK paper as an additional mark could be a reasonable compromise The following proposal was agreed, in principle, by the WG althought some participants expressed reservations since the same symbols are used on packages that do not contain dangerous goods:

Add to 6.5.2.2

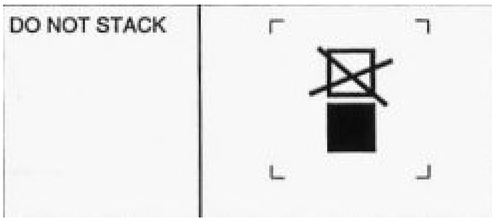
"The following figure shows the symbol to be used when the IBC can be stacked during transport. The stacking mass to be shown above the symbol must not exceed "superimposed test load (see 6.5.6.6.4) ÷ 1.8"



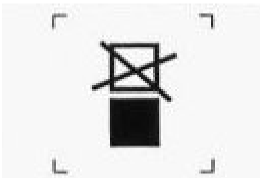
OR



The following figure shows the symbol to be used when the IBC cannot be stacked during transport..



OR



The symbols shall be at least 100 mm high. The symbols shall be shown on a contrasting background on the outermost layer of the IBC."

10. <u>The Working Group next considered the vibration test</u>.

France addressed this issue and expressed their concerns that no provision is made for a vibration test in the prototype test procedure for IBCs.

France has provided much data on vibration testing in documents ST-SG-AC10-C3-2004/88 and add 1 to 3 to the UNSCETDG.

According to 4.1.1.1.the packagings (in this case, IBCs) used for dangerous goods shall be able to resist to vibration encountered under normal conditions of transport. Therefore, France stated that it seems strange that no provision is made for a vibration test in the prototype test procedure for IBCs.

The experiments described in the above-mentioned document show that the addition of a vibration test would add to safety.

France explained that there are basically two kinds of vibration tests:

- fixed frequency test such as in ASTM D 999
- random frequency such as in ISO 13355

France stated their opinion that a vibration test should be included for the qualification of a design type And that the testing procedure should refer to ISO 13355.

France recognized, however, that this might be a problem because of the availability of this equipment for the random vibration test and for places that are already using fixed frequency procedure on a larger scale. France proposed referring to fixed frequency methods as an alternative and recognized that ASTM D 999 is a good basis for that but that the procedure should be slightly modified to ensure better reliability throughout all the different testing bodies.

The US indicated that, although the vibration design in the fixed-frequency vibration test does not mirror the actual vibrations encountered in transport it was effective in discriminating between acceptable and unacceptable IBC designs and for determining whether IBCs could withstand vibration encountered in transport. This was supported by a visual presentation by ICPP on road transport in Europe. Further, US has successfully used this test in the United States for many years and should continue to be authorized. The US stated that the fixed frequency test has shown that IBCs that pass the test will survive road vibrations. A major question would be, if a vibration test is recommended, where in the IBC test sequence such a test would fit.

The UK stated that they would prefer the US test but that equipment might not be available for IBCs over a certain size. Other delegations supported the fixed frequency test but raised issues that need to be resolved.

Visual presentations were made to the Working Group by ICPP and the US and a portion of a video provided by Bayer was played for the Working Group.

The WG agreed that a vibration test should be introduced into the Model Regulations for IBCs and a majority of the Working Group agreed a required prototype test rather than a capability requirement. Of the two available tests the majority of the Working Group favoured the fixed frequency test in ASTM D 999. Several issues were raised during discussion that need to resolved including:

. clarifying the methodology of the fixed frequency test (for example, see also ICPP paper in Annex 4)
. the place in the sequence of tests for the vibration test
. should there be a cut-off for the size of IBC to be tested
. reproducibility of the test between testing facilities
. should IBCs for solid cargoes be tested
. the relationship between the life time of the IBC and the test duration
. how should IBCs rated for high density substances be tested
. what are the acceptance criteria for the test

France and the United States agreed to lead a correspondence group to draft amendments to chapter 6.5 to resolve those outstanding issues. The United States agreed to inform the Working Group of work being undertaken by ASTM to further refine the test method provided in ASTM D999.

11. Leakproofness test

The Working Group had a lengthy discussion on the leakproofness test. The Working Group considered a proposal by Belgium for revising the test procedure that was based on Belgium's and France's papers submitted to the Working Group and the subsequent discussions in the Working Group.

The Working Group agreed that the following text illustrates how the leakprooness test provisions could be improved.

"6.5.4.4 *Inspection and testing*:

………

6.5.4.4.2 Every metal, rigid plastics and composite IBC for liquids, or for solids which are filled or discharged under pressure, shall undergo a suitable leakproofness test at least equally effective as the test prescribed under 6.5.6.7.3 and and be capable of meeting the test level indicated in 6.5.6.7.3:

(a) before it is first used for transport;
(b) at intervals of not more than two and a half years.

For this test the IBC needs to be fitted with the primary bottom closure. ~~not have its closures fitted~~. The inner receptacle of a composite IBC may be tested without the outer casing, provided that the test results are not affected.

6.5.6.7 *Leakproofness test*

……..

6.5.6.7.3 *Method of testing and pressure to be applied*

The test shall be carried out for a period of at least 10 minutes using air at a gauge pressure of not less than 20 kPa (0.2 bar). The air tightness of the IBC shall be determined by a suitable method such as by air-pressure differential test or by immersing the IBC in water or, for metal IBCs, by coating the seams and joints with a soap solution. In the latter case a correction factor shall be applied for the hydrostatic pressure. ~~Other methods at least equally effective may be used.~~

6.5.6.7.4 *Criterion for passing the test*

No leakage of air and no permanent deformation greater than [3%]of the initial external dimensions."

It was noted that the Working Group agreed that the change regarding the testing of the IBC with the primary bottom closure fitted was necessary. In addition, the working Group agreed that the design type test must be conducted at 20 kPa. An equivalent alternate test would only be allowed for periodic testing, after repair and during manufacture. The Working Group was divided on the other issues.

The US and ICPP stated that if the acceptance criteria in the above proposal was approved, most designs of composite plastics IBCs would no longer be authorized. The US indicated that the WG should focus on identitying the problems before attempting to propose amendments to existing text. As a result, the Working Group could not reach a decision on this issue.

Germany emphasized that limitations on permanent deformation under the leakproofness test are more related to the pressure design of IBCs and should rather be dealt with under the hydraulic test requirements. Germany also stated that it would prepare a proposal for future consideration to have a new requirement for the deformation of an IBC as part of a revised hydraulic pressure test.

12. <u>The Working Group considered the drop test, 6.5.6.9.</u>

The Working Group considered proposals from France, Australia, the US and Canada. A number of issues were identified for future consideration, but not resolved, including the angle of drop, the ISO standard 2248 for the characteristics of the impact surface, verification for leaks after the drop test after the internal pressure has returned to equilibrium with outside pressure and leakage through stitching and closures.

Considering the proposals by France with regard to the acceptance criteria for the drop test, the Working Group agreed that the following is an illustration of how the provisions of this test could be improved.

"Add the following paragraph (d) to 6.5.6.9.5

(d) All IBCs, no damage which renders the IBC unsafe for transport, for salvage or for disposal, and no loss of contents. In addition, the IBC shall be capable of being lifted by an appropriate means until clear of the floor for five minutes."

The Working Group noted the paper from Argentina for December UNSCETDG meeting ST/SG/AC.10/C.3/2005/57, and was of the opinion that the above would address Argentina's concerns.

14. <u>Other Business</u>

Working Group members identified issues that they felt needed to be resolved including

- the sequence in which the IBC tests are conducted
- range of validity for design type tests (what changes to design types would require new testing)
- design and construction requirements
- protection for the bottom discharge valve on IBCs
- securing the secondary closure to the IBC
- requirements for vacuum relief devices
- necessity of an interlay between the wooden pallet and the bottom of an IBC's plastic bottle
- adequacy of wooden pallets for composite IBCs
- permanence of primary UN markings and additional markings, including pictogrammes for stacking loads

There was not sufficient time to address these issues in detail but there was support to amend the model regulations regarding protection for the bottom discharge valve on IBCs.

Transition period

The Working Group agreed that, taking account of the foregoing discussions and proposals in this report, a substantial transition period would be required to implement new design type tests, and a grandfathering period for IBCs existing when the new tests protocols come into force. The Working Group agreed that this decision should be made at the level of the UN Sub-Committee (UNSCETDG).

Annex 1

Terms of reference of the informal working group on IBC performance tests

(Paris, 10-13 October 2005)

Scope: UN IBC test protocols using the official and informal documents discussed at the twenty-seventh session of the Sub-Committee, and verbal comments, as a starting point for discussion.

Objectives:

1. Review the test protocols and test acceptance criteria in the current UN Recommendations to ensure that IBCs that meet the stated minimum requirements are strong enough to survive real transport and handling conditions;

2. Consider recent reported performance experience of "lightweight" IBCs and whether specific marking and test protocols should be developed and prescribed in the Model Regulations;

3. Consider clarifying requirements in light of current compliance/interpretation testing practices (e.g., leakproofness test);

4. Propose appropriate changes to the test protocols and IBCs' markings that are deemed necessary as a result of this review;

5. Changes to tests, acceptance criteria or new tests may be considered as appropriate.

Time line: Prepare an interim progress report as an informal document for presentation at the Sub-Committee's twenty-eighth session (December 2005).

If appropriate, prepare a formal proposal to the Sub-Committee for considerationnot later than its twenty-ninth session (July 2006).

Annex 2

IBC MEETING
Paris, 10-14 October

ISSUES/AGENDA

1. Review of current incident data, experience, documented with statistics, pictures, emegency response reports etc.

2. UV/Chemical/Temperature Degradation

Documents: Australia, ST-SG-AC10-C3-2005/2
Canada, INF. 13
ICPP, INF 25

- Should requirements be in Part 4
- Should requirements apply to all plastic means of containment

3. Lightweight/Single Trip IBCs

Documents: Australia, ST-SG-AC10-C3-2005/4
Canada, INF. 14
ICPP, INF. 26

- Should there be a distinction made between non-reuseable and reuseable IBCs
- Should there be a unique mark for non-reuseable IBCs
- Should there be restrictions as to the dangerous goods that can be carried in a non-reuseable IBC

4. Existing test acceptance criteria (how does an IBC pass a test)

Review stacking test, leakproof test, drop test (using incident data and experience)

5. Changes to test protocols – new tests

Changes to existing test procedures (stacking test, leakproofness test, drop test)
Consider proposals for new tests – e.g. vibration test (see St-SG-AC10-C3-2004/88 and add 1 to 3 – parts concerning IBCs)

6. Marking

- Marking issues related to the above mentioned points especially 2 and 3

7. Any other business

According to papers submitted to the working group within the frame of the mandate.

Annex 3

Informal Working Group on IBC Performance
Paris (France) 10 – 13 October 2005

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ANNEX 4

PAPERS SUBMITTED TO THE WORKING GROUP

Comments prepared by the expert from Belgium

TEST REQUIREMENTS FOR FLEXIBLE IBCs

1. Background

In the preparation phase for its accreditation in accordance with ISO 17025, the *Belgian Packaging Institute* undertook an extensive series of comparative tests on flexible IBCs. These tests showed that the stacking test according to 6.5.6.6 never gave a negative result if :
- the top lift test according to 6.5.6.5.2 was passed successfully, and
- the superimposed test load for the stacking test was lower than the test load for the top lift test.

Due to its long duration (24 hours) and the massive equipment (up to 10 tons) needed for it, the stacking test is the determining factor that limits the capacity of a given test facility. Avoiding this test when its results bring no added value, is therefore in the interest of everybody.

In order to do this, Belgium proposes to exempt flexible IBCs from the stacking test if the superimposed test load needed for it (calculated according to 6.5.6.6.4) is lower than the load needed for the top lift test (equal to six times the maximum permissible gross mass of the IBC).

2. Proposal

Change 6.5.6.6.1 as follows :

6.5.6.6.1 *Applicability*

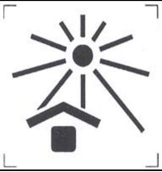
For all types of IBC which are designed to be stacked on each other, as a design type test.

<u>Flexible IBCs are exempted from the stacking test if the superimposed test load, as calculated according to 6.5.6.6.4, is lower than six times their maximum permissible gross mass.</u>

Comments prepared by the expert from France

<u>ISSUE 2 - UV degradation</u>

The issue of UV degradation could be solved in an easy way by requiring a marking provided in ISO standards as showed below:

Symbole n°	Instruction/ Informations	Symbole	Signification	Référence/Remarques
4	CONSERVER À L'ABRI DE LA LUMIÈRE DU SOLEIL/Keep away from sunlight		L'emballage d'expédition ne doit pas être exposé à la lumière du soleil	ISO 7000, n° 0624

The packages bearing the marking would not be allowed in non closed transport units, appropriate measures should be taken during handling and storage to protect them from excessive exposure to sunlight.

<u>ISSUES 3</u>

France is not in favour of introducing a new category of IBCs such as “lightweight” or “single-trip”.
In practice it creates more problems than it solves. Especially it will be very difficult to check that these IBC are not reused.
Furthermore all IBCs used for the carriage of dangerous goods should be able to survive the normal conditions of transport so that, at the end of the trip they are still suitable for transport.
The problem raised by the expert from Australia in document 2005/4 should be addressed by improving the performance tests, in particular France has proposals on that issue under agenda item 4 and 5.

<u>ISSUE 4 acceptance criteria</u>

1. Stacking test

<u>Proposal</u>

We propose to change the acceptance criteria in the stacking test as follows:

add a new paragraph (c) to 6.5.6.6.5.

“(c) For all IBCs used for liquids no deformation greater than [3% - *to be discussed*] of the initial external size (length or width) of IBC during the stacking period before removing the stacking load.”

A similar criteria could also be added to the leakproofness test.

<u>Justification</u>

This criteria would ensure that the IBC is strong enough to avoid bulging out as shown is document 2005/4 from Australia

2. Leakproofness test

A similar criteria than in point 1 above could also be added to the leakproofness test.

3. Drop test

Proposal

In 6.5.6.9.5. add the following pass criteria:

(d) After the drop, the IBC shall be able to be lifted by one of the means of lifting defined in the design type until clear of the floor during five minutes. No leakage shall occur during this period

ISSUE 5 Changes to test protocol – new tests

1. Drop test

Change the requirements for the drop surface:

6.5.6.9.3

"The IBC shall be dropped on its base onto a surface conforming to ISO 2248,…*rest unchanged*..

Justification

The surface is an important factor influencing the result of the test. This definition shall ensure better quality of the IBC and better reliability of the test.

2. Vibration test

France has provided many data on vibration testing in documents ST-SG-AC10-C3-2004/88 and add1 to 3 to the UNSCETDG.

According to 4.1.1.1.the packagings used for dangerous goods shall be able to resist to vibration encountered under normal conditions of transport. Therefore it seems strange that not test for that is defined in the approval procedure for IBC.

The experiments described in the above mentioned document show that the addition of a vibration test would add a lot to safety. There are basically two kind of vibration tests available:

- fixed frequency test such as in ASTM D 999
- random frequency such as in ISO 13355.

The random frequency test have been developed more recently and are the best available technology in that field.

Especially ISO 13355 has been developed from measurements taken on real road trips and is probably the most accurate in simulating real world conditions.
The only problem is that the apparatus required for these tests is more sophisticated so more expensive.

The only advantage of fixed frequency method is that the apparatus is less expensive. But the test condition are not close to reality, and the way the test is described in ASTM D 999 provides room for interpretation that makes it possible to get different results in different testing places. We are of the opinion that a vibration test should be included as a design type. The testing procedure should refer to ISO 13355.

We recognize however that this might be a problem for places that are already using fixed frequency procedure on a lager scale. So we propose to refer to fixed frequency methods as alternatives. ASTM D 999 is a good basis for that but the procedure shall be slightly modified to ensure better reliability throughout all the different testing bodies.

Comments prepared by the expert from Germany

Suggestions, submitted by the German delegation

Foreword

Germany was among the initiators of the IBC packaging category, starting from positive experiences based on national exemptions. Those national exemptions were first dedicated to so-called “cubic tank containers” and later extended to rigid plastics IBC’s and composite IBC’s with a plastics inner receptacle.

On the event of the establishment of international provisions on IBC’s and thereafter some major decisions were taken, opening significant margins of optimisation, both, technical and economical ones on comparison with the metallic and plastics “cubic tank containers”:

- establishment of the new category of “composite IBC’s” ;
- restriction of the drop test on the weakest part of the flat base (not of the entire IBC) ;
- omitted minimum discharge pressures for pressure relief devices for rigid plastics IBC’s and combination IBC’s with plastics inner receptacles;
- optional performance of the leak test without the outer (rigid) packaging;
- deleted need for approval of venting devices in case of toxic, flammable or otherwise dangerous vapours/gases.

Experiences and conclusions

Despite the large number of IBC being produced, used and re-used within Germany or being exported by German companies, they are very rarely involved in spillages.

Occasionally, IBC’s are subject of accident/incident reports, which are regularly and officially valuated. However, based on this stock of experience, there was no reason to question the performance requirements in general.

It’s envisaged, that the high level of safety recognised in Germany may also be related to the fact that users and shippers really take responsibility for the good quality of IBC’s, also in case of re-used ones, or those put on the market after repair and remanufacturing. It may also be the result of good practises of load securing.

Germany is aware that the good performance of design types approved in its country may also be based on proofs to comply with CFR-rules on vibration resistance, which is an indispensable presupposition for by the exporting industry. However, whatever test procedure for vibration/repetitive shock testing is discussed, experience shows that such requirements shall meet both, reproducibility and universal applicability.

If other nations have reason to question the performance level of composite IBC’s on their markets this may be caused by factors which are not found in the regulations. Experiences of companies with a global scope clearly indicate the following factors, as examples, responsible for different levels of performance:

- Non-compliances with the testing and approval requirements;
- Vague description of testing procedures and acceptance criteria;
- Inexperienced test and approval houses without an organised exchange experience exchange;
- Unspecified quality data of design types;
- No effective quality management to guarantee the compliance of IBC’s manufactured in series with the design type;

- Neglected responsibilities of users and shippers to care about the quality of packaging and load securing.

Proposals

The following proposals are based on the following principles:

- Priority for compliance efforts (let's first comply with the existing regulations and agree on common interpretations);
- Restriction of amendments on deficiencies with statistical relevant background;
- Alignment of regulations with the state of the art of good engineering practise;
- Preference for built-in requirements rather than to-do/not to do-requirements.

1. UV protection

It's proposed to require a single minimum level of protection as a material property, similar to the water resistance requirement for fibreboard. Resistance to a radiant exposure of 150 klys (kilo-langley) is considered to be an acceptable minimum and state of the art for most IBC's.

Justification:

The positive experiences also include the aspect of UV-protection. State of the art in Germany is, that all plastics and composite IBC's with plastic inner receptacles and larger plastics packagings are equipped with UV-protection to the extent, that usual exposure times and radiation levels, including those of the mediterranean region and a period of use of 5 years are covered. However, state of the art is also that packagings and IBC's are stored under sunlight protection.

2. Non-pressurised IBC's

It's proposed to interpret composite IBC's with inner plastics receptacle as non-pressurised IBC's. This amended definition may make the present differentiation between rigid and flexible inner receptacles obsolete. Non-pressurised IBC's shall comply with the design and testing requirements for composite IBC'S which should be amended to the effect, that no permanent deformation shall occur under normal conditions of transport, either by imposing the need for a venting device or by the requirement to withstand a specified MAWP (maximum allowable working pressure), not below 10 kPa. without gas leakage. In addition, the dangerous goods list need to be amended in order to assign liquids with allows for the application of vents (no toxic, acid vapours/gases) or with vapour pressures below a specified limit.

The option of pressurised composite IBC's shall be kept open. However, design principles for such design are not known up to now.

Justification

Rather more from a theoretical point of view it is realised, that the pressure design requirements are unsuited for prismatic shaped IBC types for liquids, being filled/emptied or shipped under pressure. It is obvious that the requirements allow for the use of pressurized composite IBC's without giving clear limits for material stresses or other technical criteria for <u>normal</u> conditions of use. The given criterion for the test condition (beyond normal conditions) "*no permanent deformation which would render the IBC unsafe for transport*" does not allow for a conclusion of limits for normal conditions of transport – it is not operable. Test houses have interpreted this test criterion so as to be capable to be removed without falling apart.

As a consequence, users are persuaded to believe, that prismatic composite IBC's could really be used for substances creating internal pressure. This is backed up back packing instruction IBC02, which includes composite IBC's and is related for substances with vapour pressures ≤ 110 kPa at 50°C or ≤ 130 kPa at 55°C. However, composite IBC's under discussion start to deform permanently at pressures differentials of about 10 kPa. To prevent permanent deformations, vents are applied, releasing possibly dangerous vapours and gases.

3. Reuse

Except for distribution chains controlled by the consignor of the product the reuse of plastics IBC's and IBC's with plastic inner receptacles should no longer be allowed.

Justification

The use of plastics for the shipment of liquid chemicals most often results in its weakening or altering of its properties. Reference is made in this context to the specific testing requirements. The use of virgin plastics packagings and IBC's is controllable with the help of information provided by the manufacturer in context with its order. Any safe reuse by a second user (outside a closed product circle or after remanufacturing/ routine maintenance/ repair) is dependent on whether or not information on the history and impact of previous usages is available. Within a legal live-span of 5 years multitudes of users are possible with an uncontrollable chain of information links. Except for distribution chains controlled by the consignor of the product the reuse of plastics packagings and IBC's is therefore questioned.

It is recognised, that the new provisions on re-use, repair and remanufacturing are, to some extent, misused by non-approved companies, putting "wild" combination of inner receptacles and outer casings on the market, which is difficult to be controlled by the authorities.

4. Vacuum devices

A requirement should be added to the effect that non-pressurised IBC need to be equipped with a device to prevent internal pressures below ambient.

Justification

Composite IBC's are not only vulnerable to internal overpressure but also to pressures below ambient. This may be the result of changes of ambient conditions (temperatures and pressures) or of warm/hot filling temperatures. In case of design types with mechanical links between outer casing and plastic inner receptacle under-pressure may lead to permanent deformation and loss of stacking capability. Vacuum devices or bi-directional vents are used to prevent this effect. A provision is missing on this behalf.

5. Wooden pallets

A construction requirement for an inlet between wooden pallet and plastic inner receptacle should be added to the construction requirements for composite IBC's.

Justification

Wood as a construction material in the sensitive area of dangerous goods packaging should deserve specific attraction. It's inhomogeneous (the validity of a few design type tests for the design type are put in question), has properties dependent from temperature and humidity and is vulnerable to biological degradation. Overloaded, it will fail in a brittle manor; in case of composite IBC's it may perforate the plastic inner receptacle.

6. Marking of inner receptacles

The marking requirements should be amended, so as the marking of inner receptacles shall also be visible or shall be repeated on the outside.

Justification

Visibility of the required marking of plastic inners in case of complete outer faces is not given.
Users and Re-users of these types of IBC's are therefore hindered to check the information/markings of the inner receptacle in accordance with 6.5.2.2.3.

* * * * *

Comments prepared by the expert from the United Kingdom

United Kingdom position paper on IBCS

1. The UK recognizes that there are some aspects of current IBC manufacturing quality and usage that give rise to concern about their safety in transport. We believe that there is a case to review some aspects of the requirements concerning the testing and use of IBCs.

Agenda Item 1.Review of incident data etc

5. While a key feature behind UNSCoE paper ST/SG/AC.10/C.3/2005/4 which prompted this meeting was reports of incidents involving IBCs, information on such incidents appears to be mostly anecdotal: there is a lack of data revealing the scale of a problem. We have sought information from industry sources in a position to monitor incidents in their sector, and this has revealed no significant incident data. Furthermore, many of the incidents portrayed as evidence of a safety problem were not caused by the IBC itself but by human failure in the transport chain, for example in not securing the container properly.

6. We would remind the meeting that during the last biennium following another Australian paper to the Sub Committee, the UK proposed amendments to part 7.1.1 to address the safe loading of transport units with packaged dangerous goods; this of course includes IBCs. This text will only enter into the modal regulations in 2007, so it is not possible to assess the effect of this change.

Agenda Item 2.UV/Chemical/Temperature Degradation

5. We believe that the text of 6.5.3 should be amended to reflect the fact that *some degree* of UV protection is always required. However, we do not believe that the *level* of protection should be specified (and correspondingly, there should be no specific testing on UV resistance). The protective pigments are expensive, and stipulating a high level for a global text could be an unnecessary burden to manufacturers whose IBCs are not going to be subject to the particularly high UV intensity found in, for example, Australia

6. Regarding chemical degradation--and compatibility--UNSCoE paper ST/SG/AC.10/C.3/2004/95 may be relevant to note. That is, this issue is already being addressed by the Sub-Committee, and is not a problem peculiar to IBCs. In fact, the UK did encourage the Netherlands to return to the subject in this biennium, in particular using the papers they presented to the ICAO Dangerous Goods Panel--see Annex 2.

7. We note that "temperature" is also a parameter for consideration in this Agenda item. Temperature will affect the performance of most IBCs but especially those manufactured from plastics material. It is a requirement that consignors of dangerous goods take temperature effects into account when consigning dangerous goods (4.1.1.1). The UN tests provide for a cold drop test (-18ºC) to check embrittlement of plastics packagings and a hot stacking test (40ºC) for IBCs made entirely of plastics material. We do not believe that the current temperature set for cold conditioning in Chapter 6.5 should be reduced further as the figure was selected intentionally to recognise that there is a wide range of different temperatures that will be encountered during transport around the world. Similarly, whilst the temperature in some freight containers will exceed 40ºC in some parts of the world, this figure was selected as a compromise on the same basis as the temperature for the cold drop test.

8. The Agenda asks whether requirements for these criteria should be in Part 4. We believe that they should. The requirements are addressed in general terms in 4.1.1 already, and Chapter 4.1 cross-refers to the appropriate chapters in Part 6.

Agenda Item 3.Lightweight/single trip IBCs

5. This meeting arose out of a number of papers including one specifically highlighting concerns with "lightweight" or "single-trip" IBCs (ST/SG/AC10/C.3/2005/4). Neither of these terms is defined anywhere in the Model Regulations. Is it possible to talk about solutions for a phenomenon lacking adequate definition? On the other hand how should such terms be defined: is an IBC still on its 'single trip' if it spends some time in a warehouse en-route to its final destination? Would 'single-fill' be a more appropriate description?

6. What is "lightweight"? How should it be defined?

7. These terms have been developed by the industry over recent years without considering what the rules actually say. In the view of the UK, these terms would be very difficult to define in the context of the Model Regulations. This is an issue that manufacturers need to address in their sales terminology. Trade associations should be asked to facilitate such action.

Agenda Item 4./5. Existing test acceptance criteria/ Changes to test protocols

The stack test and its applicability in transport

8. The IBC failures that were shown to delegations during the July Sub-Committee seem to be attributable to failure of the frame of the composite IBCs (ie the type of metal and welding) rather than defects in the inner receptacle itself. However, only the inner receptacle is currently subject to the full effects of testing.

9. IBCs are subject to a stacking test, but like packagings it is only a static test. However in transport the stack load is affected by the action of the transport unit (typically from pitching on a ship).

10. Packagings are tested to the load equivalent of 3 metres' stack of the total weight of identical packages which might be stacked on it during transport (6.1.5.6.2); apart from bags, there are no exceptions to this provision, even though in practice many packagings may not be intended to be stacked (let alone actually stacked) at all. IBCs are only tested to the stack height they are designed for, which is 1.8 times the combined maximum permitted mass (6.5.6.6.4). However, IBCs may not be designed for stacking, in which case the approval mark shows "0" at the appropriate point (see below). When the IBC is designed for stacking, the manufacturer decides what load it is capable of withstanding. The '1.8 times the maximum permitted mass' may not provide a sufficient safety factor, especially when the effects of acceleration generated from high seas or rough roads is taken into account

11. To solve these problems the UK would like the working group to consider the following:

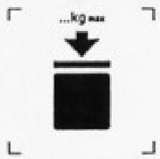
(1) Where an IBC is intended to be stacked the load should be 1.8 times the maximum permitted mass and not less than 3 metres in height

and /or

(2) At present a typical mark for a composite IBC is:

u n 31HA1/Y/05 01D/Muller 1683/10800/1200

The stack load shown is 10800kg, but it is very unlikely that many loaders of transport units would know or be able to identify this information, because these marks can be displayed in many different ways. A loader needs a simple guide. The marks below are taken from ISO780:1999 and are in common use in the freight world. For example, you see such markings on boxes for many types of domestic and industrial electrical equipment.

13	STACKING LIMIT BY MASS		Indicates the maximum stacking load permitted on the transport package.	ISO 7000, No. 0630
14	STACKING LIMIT BY NUMBER		Maximum number of identical packages which may be stacked on one another, where "n" is the limiting number.	See 2.4.4 ISO 7000, No. 2403
15	DO NOT STACK		Stacking of the transport package is not allowed and no load should be placed on the transport package.	ISO 7000, No. 2402

A new requirement could be added to 6.5.2.2 that a plate on a clearly contrasting background display the appropriate symbol and the maximum stacking load to be applied.

Vibration test

12. The UK has in the past opposed vibration testing for all packagings on the ground that there has been no substantial evidence that packagings were regularly failing in transport as a result of the effects of vibration. Having seen the photographs circulated by the Canadian delegation in July, and in discussions with the UK IBC and chemical industry, we believe that there may now be a role for vibration testing, in the specific context of IBCs for liquids.

13. We understand that the average tare mass of the most common composite IBCs (so-called "lightweight"/"single-trip" – see below) has fallen from about 80kg to 60kg; and that most of this reduced weight is the result of a change from steel bar for the outer casings to rolled steel tube.

14. There is reasonable evidence that there may be concerns over the ability of such IBCs to continue being of adequate strength when used for the transport of liquids.

15. The UK would only apply such a test to IBCs for liquids, as we do not believe that there would be any significant benefit for IBCs containing solids.

16. IBCs failing the vibration test would be prohibited from stacking, and would have to be marked accordingly (as proposed above).

17. We believe that the most appropriate vibration test would be the US DOT 49 CFR requirement (178.819) (see Annex 1). Although the US test does not fully reflect the vibration stresses actually found during transport, it is in our view a very effective method of identifying any packaging that is likely to have problems during transport. In addition, the equipment required to perform the test is less expensive than other vibration methods; and as more and more of the composite type IBCs are being made in countries without sophisticated test facilities, the Sub-Committee should address the need to ensure that all countries can carry out the required tests. It would be likely to increase the cost of initial IBC testing by 12%

(approximately €1000).

18. The application of the vibration test to IBCs raises the problem of testing. Chapter 6.5 permits IBCs to be a maximum size of $3m^3$ (3000kg), and we are very doubtful that there are many test houses (possibly only military research sites) anywhere in the world that could test IBCs exceeding 1500kg. The UK has approved a 2000kg IBC, and it would have proved difficult to carry out vibration testing on it.

Agenda Item 6.Marking

19. See 4/5 above.

Agenda Item 7.Any other business

Transitional arrangements

20. If this working group decides to produce draft text for the recommendations, we believe that IBCs currently in service should not be affected by any new provisions. Given that IBCs can be repaired and maintained for long periods, and metal IBCs especially have a lifetime of decades, transitional periods would have to take the lifespan of IBCs into account.

Extending discussions to other packaging types

21. The mandate from the Sub-Committee was to consider the various problems with IBCs. The UK does not believe that it is part of that mandate to consider other packagings as an issue. The UK recognises that as IBCs are packagings, there may have to be some consequential changes to Chapters 6.1, 6.3 and 6.6. However, we do not believe separate new discussions on packagings from these chapters are within the remit of this group. Any proposals for changes to the other packaging chapters should await a revised mandate from the Sub-Committee.

Annex 1 US Vibration Test

"§178.819 Vibration test

(a) General. The vibration test must be conducted for the qualification of all rigid IBC design types. Flexible IBC design types must be capable of withstanding the vibration test.

(b) Test method

(1) A sample IBC, selected at random, must be filled and closed as for shipment

(2) The sample IBC must be placed on a vibrating platform that has a vertical double-amplitude (peak-to-peak displacement) of one inch. The IBC must be constrained horizontally to prevent it from falling off the platform, but must be left free to move vertically and bounce.

(3) The test must be performed for one hour at a frequency that causes the package to be raised from the vibrating platform to such a degree that a piece of material of approximately 1.6-mm (0.063-inch) thickness (such as steel strapping or paperboard) can be passed between the bottom of the IBC and the platform. Other methods at least equally effective may be used (see § 178.801(i)).

(c) Criteria for passing the test. An IBC passes the vibration test if there is no rupture or leakage."

Annex 2 Dutch papers on chemical compatibility

DGP-WG/03-WP/56
13/3/03

DANGEROUS GOODS PANEL

Dubai, 31 March to 4 April 2003

Agenda Item 3: Resolution, where possible, of the non-recurrent work items identified by the (ANC) or the panel
3.1: Packing Instructions

REFORMATTING OF PACKING INSTRUCTIONS - COMPATIBILITY

(Presented by D. Raadgers)

1. BACKGROUND

1.1 The first version of the proposed modifications was presented by the working group Packing Instructions during the meeting in Frankfurt of the Working Group of the Whole in September 2002. At this meeting of the working group, different members gave their comments on this first version. The Dutch delegation has made a restriction on the subject of compatibility and said they would comment on this subject after advice from the Netherlands Packaging Authority (NPA).

2. INTRODUCTION

2.1 Packing Instructions for classes 3, 4 and 5 have existed for years and the historical information for this detailed division was unknown. In many cases it seemed that the detailed division was based on the then exiting state of knowledge of the compatibility of the chemicals with the packing material. Important to the considerations to come to the adaptation of these detailed Packing Instructions, is that in the present Packing Instructions the compatibility of packaging is an important part of the detailed division. Also the compatibility is still a very actual and relevant safety item.

2.2 In the concept proposals of the working group on the Packing Instructions, it is proposed to include the requirements of compatibility only in the general requirements of the Packing instructions of the classes involved. Also, the whole requirements are laid down at the shipper's responsibilities.

2.3 The Netherlands Packaging Authority (NPA) has examined this part of the proposals. The proposals are a strong simplification of the actual detailed Packing Instructions, so that's why it is necessary to take more detailed obliged conditions in the general requirements. These detailed obliged conditions can give the shipper a legal frame to which at least must be complied with the considerations of the compatibility of chemicals and packaging. The Dutch delegation introduces the following amendment.

3. PROPOSAL

3.1 The Dutch delegation is looking for consensus on the proposals made by the working group Packing Instructions. This is the reason we propose to the working group Packing Instructions and the DG panel to incorporate the next text in the definitive proposals of the working group Packing Instructions as presented in working paper 51, Dubai.

3.2 The interaction between the packed chemical substance and the packaging material can influence the mechanical properties and thus the performance of the packaging. This can lead to failure of the packaging under certain conditions. This interaction often is a complex process which is influenced by a number of parameters like physical and chemical properties of the packed substance, temperature and duration of the interaction process (and thus the duration of the transport). The exact composition of the product must thus be known for the evaluation of the interaction process.

3.3 Further it is emphasised that the interaction not only takes place between the chemical substance and the material of the packaging itself, but also between the chemical substance and other parts of the packaging like the closure and its gaskets.

There are basically two ways to approach the problem of this interaction process:

1. Testing of the package filled with the dangerous product as prepared for transport. In this procedure the package is stored for a time period and at conditions representative for the transport. In some cases the storage period can be decreased by accelerating the process by increasing the temperature. After the storage the package is evaluated visually and/or by testing the mechanical performance.

2. Using the knowledge which has been built up on the interaction of the substance concerned or on similar substances with the same or a similar packaging. This knowledge, which can also have been gained by transport experience, may be available at the producer of the chemical substance, the shipper, the manufacturer of the packaging or at test institutes.

In order to judge if problems by interaction can be expected, the following guidelines are of importance:

1. For glass, all substances containing the element fluorine can lead to chemical attack of the packaging material by the substance. These combinations must thus be avoided.

2. Metals like steel and aluminium are susceptible to corrosion. Substances with corrosive properties against such materials (generally classified in class 8), including acids and alkaline substances, should not be packed in metal packaging and it is recommended not to do thieven when a protective coating is present. Further investigations are necessary when a substance containing water is packed in a metal packaging.

3. Relevant interactions for widely used polymer materials like polyethylene and polypropylene are swelling, chemical degradation and environmental stress cracking. Further investigation is deemed necessary when the swelling rate is higher than 1%, as is the case for many organic substances. In this case permeation of the substance through the packaging material can also be expected, which can lead to dangerous situations in practice. Chemical degradation can occur by interaction with highly oxidizing acids like nitric acid and further investigations are deemed necessary for these substances. For organic liquids with low swelling rates (less than 4%) environmental stress cracking is a potential problem.

— END —

DGP/19-WP/48
2/10/03

DANGEROUS GOODS PANEL (DGP)

NINETEENTH MEETING

Montreal, 27 October to 7 November 2003

Agenda Item 3: Resolution, where possible, of the non-recurrent work items identified by the Commission or the panel
3.1: Principles governing the transport of dangerous goods on cargo only aircraft

REFORMATTING OF PACKING INSTRUCTIONS - COMPATIBILITY

(Presented by D. Raadgers)

1. BACKGROUND

1.1 The first version of the proposed modifications was presented by the working group on Packing Instructions at DGP-WG02. At this meeting, several comments were received and it was agreed there should be further discussion on the subject of compatibility. A proposal to develop for additional text regarding compatibility, as presented by the Netherlands in DGP-WG03-WP/56, was agreed. This working paper provides such a proposal.

2. INTRODUCTION

2.1 Packing Instructions for classes 3, 4 and 5 have existed for years; however the historical basis for this detailed division is unknown. In many cases it appears that the detailed division was based on the then existing state of knowledge of the compatibility of the chemicals with the Packing Instructions, so that in the present Packing Instructions the compatibility of packaging is an important part of the detailed division. Also the compatibility is still a very actual and relevant safety item.

2.2 In the proposed amendments by the working group on Packing Instructions, it is proposed to include the requirements of compatibility only in the general requirements of the Packing Instructions of the classes involved. Also, the whole requirements are laid down as being the shipper's responsibilities.

2.3 The National Testing Authority of Packaging in the Netherlands has examined this part of the proposals and said that they are a strong simplification of the actual detailed Packing Instructions. As discussed at the Montreal Meeting. The working group is convinced of need for further specifications as indicated in WP/56. It was agreed further consideration should be given to the best location in the Technical Instructions where this text should be incorporated. In the first proposal in DGP-WG03/WP/56, it was proposed to make further elaboration in the general requirements per class. On the basis of further examination, it is now proposed the best location for placing this text will be Part 4, Chapter 1 under 1.1.3 (general requirements), because in this part and chapter "compatibility" has been named after.

3. PROPOSAL

3.1 Existing text Part 4 Chapter 1,1.1.3

Materials, such as some plastics, which can be significantly softened or rendered brittle or permeable by the temperatures likely to be experienced during transport or because of the chemical action of the contents or the use of a refrigerant, must not be used. Even though certain packagings are specified in individual packing instructions, it is, nevertheless, the responsibility of the shipper to ensure that such packagings are, in every way, compatible with the articles or substances to be contained within such packagings. This particularly applies to corrosivity, permeability, softening, premature aging and embrittlement. Parts of packagings which are in direct contact with dangerous goods:

(a) must not be affected or significantly weakened by those dangerous goods; and

(b) must not cause a dangerous effect, e.g. catalysing a reaction or reacting with the dangerous goods.

Where necessary, they must be provided with a suitable inner coating or treatment.

3.2 Based on the above it is proposed that the existing text regarding compatibility, Part 4 Chapter 1.1.1.3, be modified as shown :

1.1.1.3 The shipper must in all situations where the use of certain inner and outer packagings is sustained, conform the Packing Instructions, or authorized by the competent authority, ensure that such packagings are in every way, compatible with the articles or substances to be contained within such packagings.

The shipper must, in all situations where closures are used, and other parts of the packaging are in contact with the articles or substances to be contained within the packagings, ensure that such closures and such parts of the packagings are in every way compatible with the articles or substances to be contained within such packagings.

The shipper also must ensure that materials, such as some plastics, which can be significantly softened or rendered brittle or permeable by the temperatures likely to be experienced during transport or because of the chemical action of the contents or the use of a refrigerant must not be used.

The shipper also must ensure that, when the following materials are used as packagings closures, or in part of packagings, all measures are taken to avoid that any of the described circumstances can occur during transport.

Glass: all substances containing the element fluorine can lead to chemical attack of the packaging material by the substance. These combinations must thus be avoided.

Metals like steel and aluminium: are susceptible to corrosion. Substances with corrosive properties against such materials (generally classified in class 8), including acids and alkaline substances, should not be packed in metal packaging and it is recommended not to do this even when a protective coating is present.

Investigations are necessary when a substance containing water is packed in a metal packaging.

Polymer materials: Relevant interactions for widely used polymer materials like polyethylene and polypropylene are swelling, chemical degradation and environmental stress cracking.

> Further investigation is deemed necessary when the swelling rate is higher than 1 %, as is the case for many organic substances. In this case permeation of the substance through the packaging material can also be expected, which can lead to dangerous situations during transport.
>
> Chemical degradation can occur by interaction with highly oxidizing acids like nitric acid and further investigations are deemed necessary for these substances. For organic liquids with low swelling rates (less than 4 %) environmental stress cracking is a potential problem.

In carrying out the shippers responsibilities regarding the compatibility the shipper must ensure, that all measures are taken to avoid that examination and if necessary testing are not carried out in accordance with recent generally acknowledged levels of science

The shipper must produce research and/or test reports upon request of the competent authority, to identify that suitable research and/or tests have taken place in order to ensure that the responsibilities regarding compatibility be met.

-END-

International Civil Aviation Organization
WORKING PAPER

DGP/20-WP/34
4/8/05

DANGEROUS GOODS PANEL (DGP)

TWENTIETH MEETING

Montréal, 24 October to 4 November 2005

Agenda Item 2: Development of recommendations for amendments to the Technical Instructions for the Safe Transport of Dangerous Goods by Air (Doc 9284) for incorporation in the 2007-2008 Edition

REFORMATTING OF PACKING INSTRUCTIONS- COMPATIBILITY

(Presented by D. Raadgers)

1. BACKGROUND

The first version of these proposed modifications has been presented in DGP/19-WP/48.

1.1 The meeting agreed that the proposal was potentially a valuable change to the Technical Instructions and indicated that more specified provisions are needed, but felt that this is not a specific airmode issue but a multimodal issue and should therefore be raised at this Sub-Committee level. It was agreed that the proposal should be sent to the UNSCETDG to be discussed.

1.2 A working paper transmitted by the expert from the Netherlands, was raised in the UNSCETDG , during the twenty-sixth session to facilitate a discussion with the aim to have the Sub-Committee's opinion on a further need to specify compatibility testing in the Recommendations or if they wished to leave it up to the modes to specify this further.

1.3 Their decision was to stay with the general provision 4.1.1.2 with regard to compatibility and for plastics packagings general requirements in 6.1.4.8, 6.1.4.13 and 6.1.4.19. They would leave further provisions up to the modes, if the modes wished to extend the general provision with specific provisions, as for example in ADR and RID in 6.1.6.

2. INTRODUCTION

2.1 The requirements of compatibility are laid down in the ICAO-TI as a general requirements of the Packing Instructions of the classes involved. Also, the whole requirements are laid down at the shipper's responsibilities. The current situation may lead to different opinions of this general requirement depending on the knowledge of the shipper.

2.2 The panel agreed that compatibility is an important safety issue, and more specific provisions in the form of guidance material are needed.

2.3 This working paper, based on the investigation of The National Testing Authority of Packaging in the Netherlands, aims to give the shipper more detailed information how to comply with the general requirement of compatibility.

3. PROPOSAL

Based on the above it is proposed that the existing text regarding compatibility be modified.

The existing text in Part 4 Chapter 1,1.1.3 reads as follows:

> Materials, such as some plastics, which can be significantly softened or rendered brittle or permeable by the temperatures likely to be experienced during transport or because of the chemical action of the contents or the use of a refrigerant, must not be used. Even though certain packagings are specified in individual packing instructions, it is, nevertheless, the responsibility of the shipper to ensure that such packagings are, in every way, compatible with the articles or substances to be contained within such packagings. This particularly applies to corrosivity, permeability, softening, premature aging and embrittlement. Parts of packagings which are in direct contact with dangerous goods:
>
> a) must not be affected or significantly weakened by those dangerous goods; and
> b) must not cause a dangerous effect, e.g. catalysing a reaction or reacting with the dangerous goods.
>
> Where necessary, they must be provided with a suitable inner coating or treatment. 3.1

It is proposed it should be modified as shown: Part 4 Chapter 1.1.1.3

<u>1.1.3.1 The shipper must in all situations where the use of certain inner and outer packagings is sustained, conform the Packing Instructions, or authorised by the competent authority, ensure that such packagings are in every way, compatible with the articles or substances to be contained within such packagings.</u>

<u>1.1.3.2 The shipper must, in all situations where closures are used, and other parts of the packaging are in contact with the articles or substances to be contained within the packagings, ensure that such closures and such parts of the packagings are in every way compatible with the articles or substances to be contained within such packagings.</u>

<u>1.1.3.3 The shipper also must ensure that materials, such as some plastics, which can be significantly softened or rendered brittle or permeable by the temperatures likely to be experienced during transport or because of the chemical action of the contents or the use of a refrigerant must not be used.</u>

<u>1.1.3.4 The shipper also must ensure that,when the following materials are used as</u> packagings closures, or in part of packagings, all measures are taken to avoid that any of the <u>described circumstances can occur during transport.</u>

<u>Glass:</u>
<u>all substances containing the element fluorine can lead to chemical attack of the packaging material by the substance. These combinations must thus be avoided.</u>

<u>Metals like steel and aluminium:</u>

are susceptible to corrosion. Substances with corrosive properties against such materials (generally classified in class 8), including acids and alkaline substances, should not be packed in metal packaging and it is recommended not to do this even when a protective coating is present.

Investigations are necessary when a substance containing water is packed in a metal packaging.

Polymer materials :

Relevant interactions for widely used polymer materials like polyethylene and polypropylene are swelling, chemical degradation and environmental stress cracking.

Further investigation is deemed necessary when the swelling rate is higher than 1 percent, as is the case for many organic substances. In this case permeation of the substance through the packaging material can also be expected , which can lead to dangerous situations during transport.

Chemical degradation can occur by interaction with highly oxidising acids like nitric acid and further investigations are deemed necessary for these substances. For organic liquids with low swelling rates (less than 4 percent) environmental stress cracking is a potential problem.

1.1.3.5 In carrying out the shippers responsibilities regarding the compatibility the shipper must ensure, that all measures are taken to avoid that examination and if necessary testing are not carried out in accordance with recent generally acknowledged levels of science.

1.1.3.6 The shipper must produce research and / or test reports upon request of the competent authority, to identify that suitable research and/or tests have taken please in order to ensure that the responsibilities regarding compatibility be met.

* * * * *

Comments prepared by the expert from United States of America

United States of America position paper for the informal IBC Working Group Meeting (10/26/2005)

1. <u>Review of current incident data, experience, documented with statistics, pictures, emergency response reports etc.</u>

In ST/SG/AC.10/C.3/2005/4 submitted by the Expert from Australia, they show a single instance of failure of a composite IBC that was apparently improperly loaded into a Cargo Transport Unit and as a result have indicated that in order to prevent future occurrences of this type of failure changes are required in the model regulations.

In UN/SCETDG/27/INF.26, ICPP, indicates that the failure of the packages in question were a result of improper loading of the packages into a CTU that did not have sufficient width to accommodate the two packages in a side-by-side configuration. Thus the packages were not damaged by normal handling, but by mishandling of the packagings.

We agree that failures of intermediate bulk container during transport should be evaluated. On this basis we have conducted a thorough analysis of the incidents involving IBCs in the US over a 5 year period. In the United States if an "incident" leads to a release of dangerous goods from a package the shipper is required to file an incident report with the U.S. Department of Transportation. For the years 2000 -2004 there were a total of 80,373 incidents that were reported to the US Department of Transportation. In that same period of time 447 of those incidents, less than 0.56%, were attributed to all types of intermediate bulk containers. Of the 447 IBC failures, 142, less than 0.18% of the total number of incidents, were attributable to UN31HA1 composite intermediate bulk containers. The UN31HA1 was the IBC that had the highest number of incidents reported; however, it must also be noted, that it is the most frequently used type of IBC. The second highest number of failures 95 was observed in the UN31A steel IBC.

The data indicated that 30 incidents were due to a crack of the IBC receptacle along the seams.

In descending order the next three most frequently causes of incidents were:

Defective fitting	25
Struck/Rammed (by forklift or other vehicle)	24
Loose fittings	18

These four causes equate to 97 of the 142 (64.8%) reported incidents.

For the purpose of determining an incident rate, U.S. industry estimates on an annual basis there are more than 4 million shipments of dangerous goods made in UN31HA1 IBCs throughout the United States. That would then indicate that during the time period between 2000 and 2004 there were approximately 20 million shipments of dangerous goods in type UN31HA1 IBCs with 142 total incidents; a total incident rate of (142/20,000,000)*100 = 0.007%. If the rate of incidents due to failure of the inner receptacle is calculated the failure rate is reduced even lower to a rate of 0.0015%.

Although not every incident that occurs is reported, based on the data that is available, the indication is that UN31HA1 IBCs are performing as intended and are not posing an undue risk in transportation at least in the United States. We also believe that this low failure rate indicates that the IBC construction and testing requirements in the United States, including a mandatory vibration test, and the fact that we have an aggressive enforcement system ensures that the IBCs perform as intended. With the exception of including a vibration test into the Model Regulations, we do not see a need to substantially modify the current test criteria to accommodate "light weight or single trip" IBCs. We believe that because we have a mandatory vibration test the lower quality IBCs are not being used.

We will continue to monitor the number of incidents from all types of IBCs to ensure these packagings continue to perform at an acceptable level and if an unacceptable number of failures is observed, this issue will be raised once again.

The analysis of our incident data is provided as Appendix A of this document.

2. UV/Chemical/Temperature Degradation

UV resistance is a requirement is that is currently addressed in the construction requirements for intermediate bulk containers. There is no prohibition from a manufacturer adding UV stabilizers to an IBC design, if it is needed for the intended logistics cycle of that specific design and is required to meet local environmental needs. Under the Model Regulations it is actually required that an IBC be resistant to ageing and degradation due to UV exposure if it is *relevant to that design type.*

> *6.5.5.3.2 * * * * * The material shall be adequately resistant to ageing and to degradation caused by the substance contained or, where relevant,* ***by ultraviolet radiation****.* * * * * *

Relevant is the critical word for application of this paragraph. Depending upon the use of the IBC, UVC resistance may or may not be a critical performance feature for the design type in question. The usage scenario of the IBC will determine if this is or is not a useful design feature for the IBC. Some of the questions to be considered are:

> How will the IBC be transported?
> Will it be transported in an enclosed vehicle or exposed on a flatbed trailer?
> How will the IBC be stored between fillings? Will be subject to uncontrolled outdoor storage and subsequently uncontrolled UV exposure or will it be stored in a controlled warehouse?

The answers to these types of questions are not the same for all users and the need for UV stabilization is not required for all IBCs. Therefore, the use of UV stabilizers is best handled on a case by case basis in accordance with the requirements of the user of the IBC as only a small percentage of the IBCs will be exposed to sunlight on a continual basis.

Further investigation should be conducted to determine the affect that UV exposure has on the performance of intermediate bulk containers. If a change is to be made to the UN Recommendations, there should be data available to substantiate the need for a change to the document. As of this point no relevant data has been provided indicating that UV exposure is leading to IBC failures. As indicated in the incident data discussed under agenda item 1, in the United States there appears to be no problems related to UV exposure, even though certain areas on the US have levels of UV exposure equal to or exceeding those experienced in Australia.

3. Lightweight/Single Trip IBCs

If a lightweight or single trip standard is pursued, there needs to be a clear definition of what requires an IBC to be limited to a single trip as a non-reusable container as well as appropriate test criteria to distinguish a single trip IBC from a multi-trip IBC. However, it should be noted that all types of IBCs are currently designated as multiple use packagings and there is no designation for a single trip container. We wonder if people are confusing the term "single trip" with those IBCs where the inner receptacle is intended to be replaced after each delivery.

As indicated in the incident data, in the United States there does not appear to be a performance problem related to the use and reuse of UN31HA1 IBCs. Their performance is consistent with that of other IBC design types, particularly with UN31A steel IBCs. Based on that information, we would not see a need to classify these as single trip packages.

4. Existing test acceptance criteria (how does an IBC pass a test)

There is an issue in determining the appropriate pass fail criteria for the test methods that are applicable to intermediate bulk containers, particularly for the drop and stacking tests. We are in support of developing consistent language defining the appropriate level of deformation that is acceptable following each of these tests. The criteria should be based upon what is the appropriate means of handling an IBC after it has been subject to the various test methods. For example in the drop test, the IBC is expected to suffer structural deformation as a result of absorbing the energy of the drop and would not be expected to be capable of being handled by the base pallet, but it would be expected to not leak and be capable of being handled in a way that would allow for the contents to be emptied and disposed.

5. Changes to test protocols – new tests

Inclusion of a Vibration Test

There appears to be a concern with the performance of lightweight IBCs in Europe and in other areas were there is no requirement for a vibration test for intermediate bulk containers and that this is resulting in the marketing and sale of IBCs (especially composite IBCs) that tend to be manufactured with thinner walls and to lighter weights than a corresponding IBCs in the United States. On this basis, the working group should consider proposing that a vibration test(s) be adopted in the UN Model Regulations. To alleviate this concern, the UN Sub-Committee could implement a required vibration test into the Model Regulations. In the US this has been an effective tool for screening IBC designs and ensuring those that are used in the marketplace perform effectively. This has been demonstrated in the analysis of IBC incident data encompassing the last five years where there have been fewer than 500 failures of IBCs in the United States. This data encompasses all types of IBCs and includes all failure modes. Composite IBCs, which are the main concern of this meeting, have seen 142 failures over that same time period.

We were surprised to find that not many incidents involved composite IBCs with flexible inner receptacles but we have been told that not many of these are used in the US and that shippers prefer to use other types.

Based upon the successful use of the vibration test in the United States, the test should be based on use of either the fixed frequency test currently utilized in the US or it could permit testing by either fixed frequency or random vibration. Based upon years of successful test history, a test method should not be implemented that prohibits the use of the method currently utilized in the United States.

6. Defining *the* drop angle for IBCs

In the paragraph 6.5.6.9.3 the drop test for IBCs requires:

> *The IBC shall be dropped on its base onto a rigid, non-resilient, smooth, flat and horizontal surface, in such a manner as to ensure that the point of impact is that part of the base of the IBC considered to be the most vulnerable.*

The wording "the point of impact is that part of the base of the IBC considered to be the most vulnerable" leads to confusion and inconsistent application between test labs. We believe that because there is no clear definition of the angle at which the IBC should be dropped the requirement is not being consistently applied. This has been verified through the random testing of IBCs that we undertake as part of our enforcement efforts. In 6.1.5.3.1 for packagings it states:

For other than flat drops the centre of gravity shall be vertically over the point of impact.

There is no similar provision for IBCs and as a consequence, IBCs can be tested with widely varying drop angles, providing inconsistent test results on identical packages. It is recommended the IBC drop test be amended to state:

The IBC shall be dropped ***at an angle of approximately 10 – 15 degrees*** on its base onto a rigid, non-resilient, smooth, flat and horizontal surface, in such a manner as to ensure that the point of impact is that ***edge*** of the base of the IBC considered to be the most vulnerable.

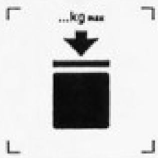
7. Marking

Maximum stacking load.

The existing marking of IBCs as indicated below indicates a maximum permissible stacking load of for the IBC. However, unless a person is knowledgeable of the UN marking requirements, there is the potential to misunderstand the mark and inadvertently subject an IBC to a stacking load in excess of what is permitted

31HA1/Y/05 01D/Muller 1683/10800/1200

In an effort to make the maximum stacking load of an IBC easier to understand an additional mark or label could be added with a pictorial representation of the number of like units that could be stacked on an IBC for transportation.

13	STACKING LIMIT BY MASS		Indicates the maximum stacking load permitted on the transport package.	ISO 7000, No. 0630
14	STACKING LIMIT BY NUMBER		Maximum number of identical packages which may be stacked on one another, where "n" is the limiting number.	See 2.4.4 ISO 7000, No. 2403
15	DO NOT STACK		Stacking of the transport package is not allowed and no load should be placed on the transport package.	ISO 7000, No. 2402

7. Leakproofness test

Addition of a leakproofness testing of IBCs after repair or routine maintenance

As indicated by the Australian papers and as evidenced in our incident data, leaking valves and fittings are two of the most common failure modes on IBCs. The current test and inspection protocol for IBCs does not require the entire IBC including valves and fittings to be leakproofness tested after routine maintenance, defined as: removal and reinstallation or replacement of body closures (including associated gaskets), or of service equipment, conforming to the original manufacturer's specifications; or repair, which includes the replacement of the rigid inner receptacle of a composite IBC with a receptacle conforming to the original manufacturer's specification. Currently the requirements are to verify the leaktightness of an IBC after routine maintenance and to conduct a leakproofness where the IBC need not have its closures fitted after repair of an IBC. The number of incidents related to improper installation of valves and fittings could be reduced if it was clarified that a leakproofness test of the entire IBC with closures and service equipment attached is required to be performed after certain routine maintenance functions (e.g. replacement of bottom outlet valve assemblies) This is currently addressed in paragraph (b) of the definition of routine maintenance of rigid see 1.2.1.

We could also support improving the text that describes how to protect bottom outlets.

We agree with others that where the UN Model Regulations indicate that an IBC must be leakproof that this means it must be shown to be capable of passing the leakproofness test in 6.5.6.7. The working group should attempt to clarify this matter in any proposals developed for consideration by the Sub-Committee.

IBC Data Analysis

An analysis using the Hazardous Material Information System (HMIS) was performed concentrating specifically on IBC packages for the time period of the last five years (2000-2004).

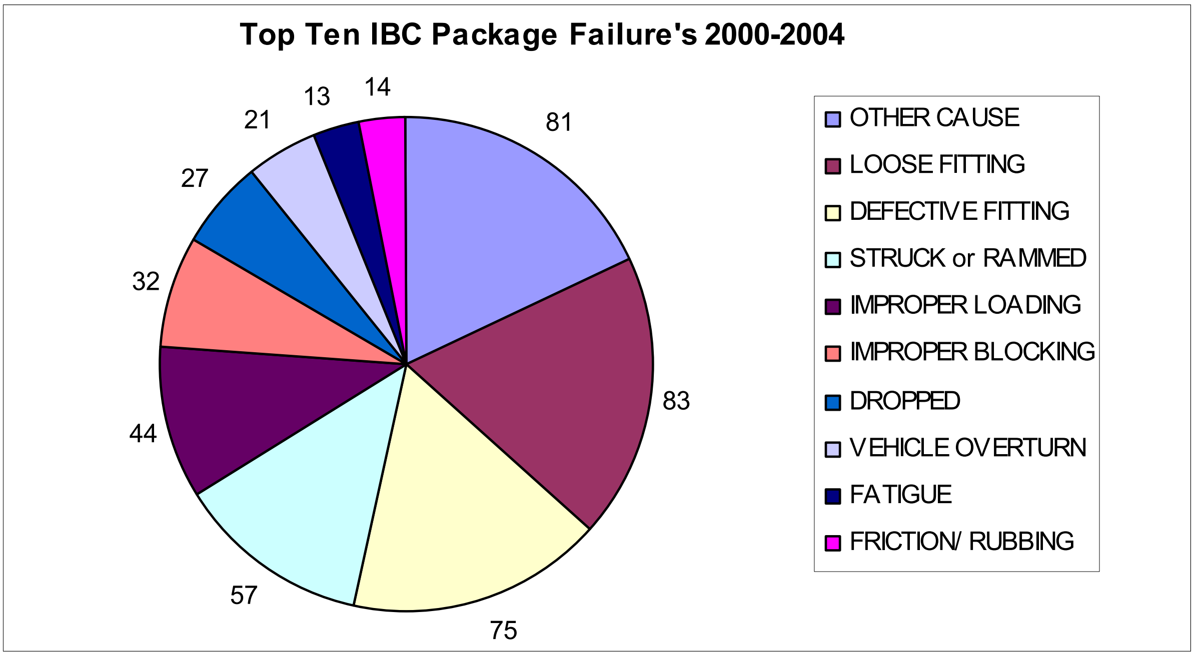


Figure 1

Figure 1 describes the top ten package failure incidents for all types of IBC's. These figures are the total number of container failures that were marked in section VIII *Description of Packaging Failure, block 41, Action contributing to Packaging Failure.* Over the last five years there have been a total of 447 container failures. The top three failures reported are "Loose Fittings", Defective Fittings" and Other Causes" which comprises a mixture of failure types, such as vehicle accidents, splitting of containers, spillage found without being able to determine the reason or other reasons not available to mark on the incident report form. For these incidents the "remarks" section was read to verify the accuracy of the report to ensure the failure mode was properly identified.

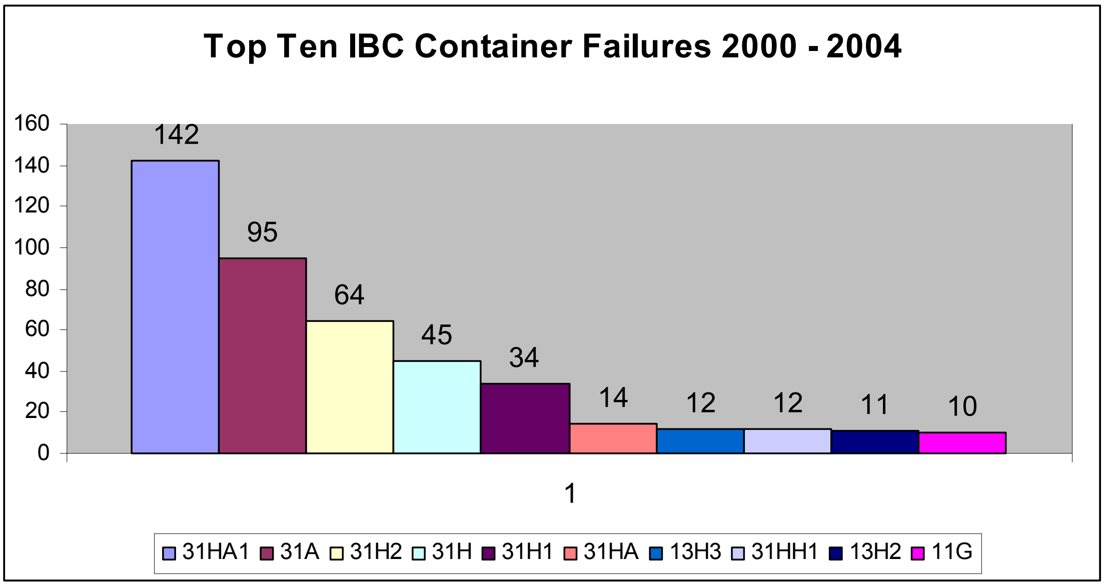
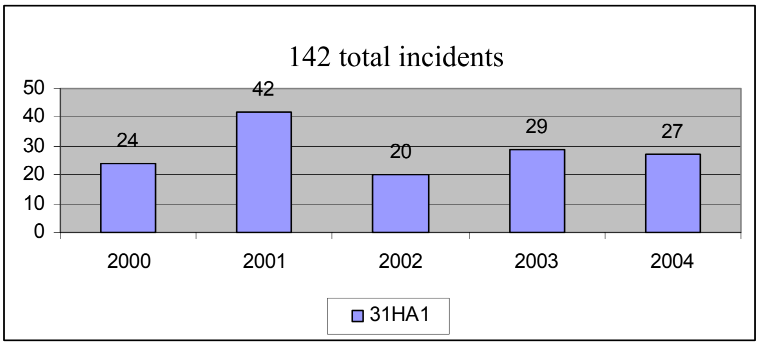


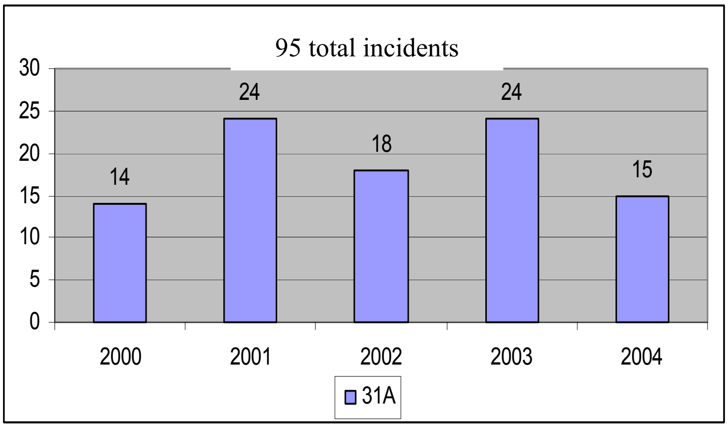
Figure 2

Figure 2 shows a break down of the top ten IBC container's that have been reported over the last five years. The top three IBC's (UN31HA1, UN31A and 31H2) contribute to 68% of the total reported failures.

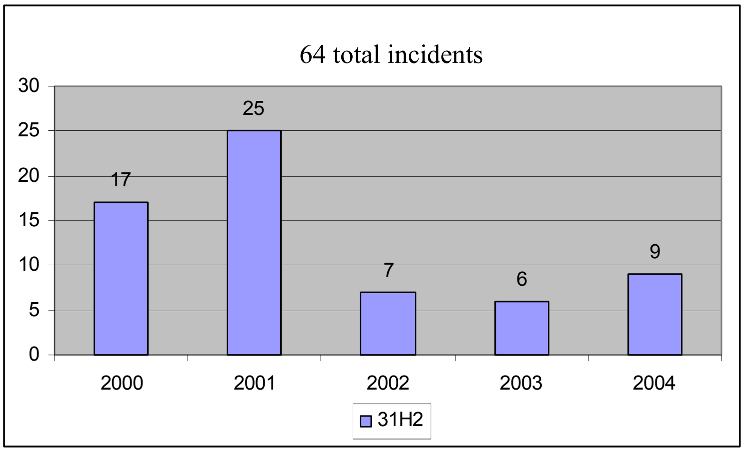
The following are diagrams for the five IBC types that have had the most failures over the five year period. Each IBC is further broken down into number of failures per year with a description of the top types of failures for each IBC. There were no trends on any specific type of failure over this time period.



# Incident	Failure Cause
30	Other Causes (majority stating IBC bladder was cracked along seems.
25	Defective Fitting
24	Struck/ Rammed (by forklift, or other vehicle)
18	Loose fittings



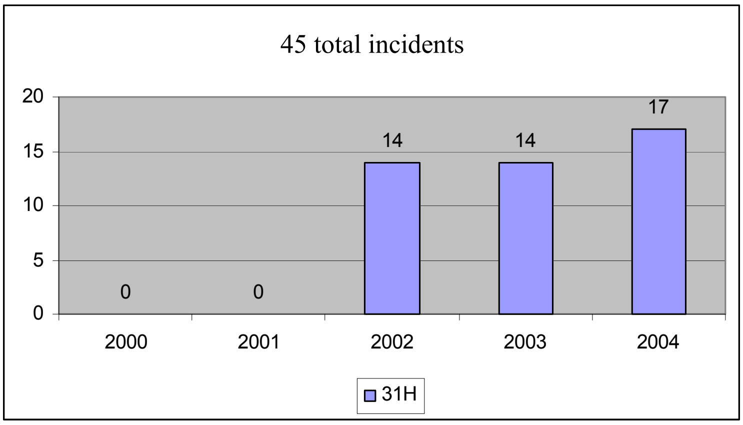
# Incident	Failure Cause
34	Loose fittings
28	Defective fittings
6	Metal fatigue



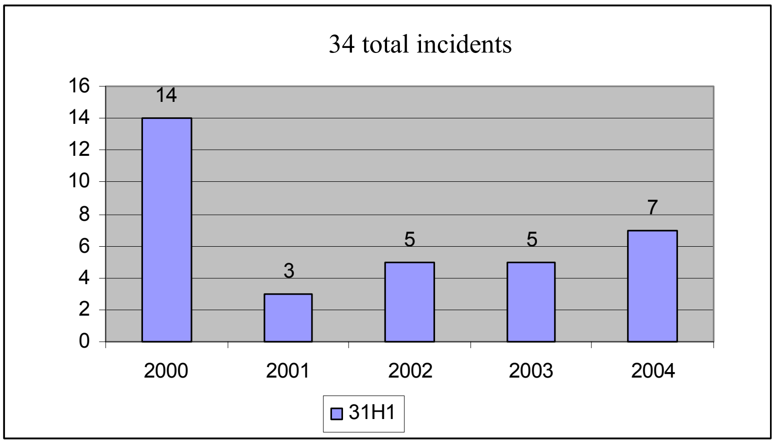
# Incident	Failure Cause
15	Other Causes
12	Dropped
7	Defective fittings
6	Loose fittings

"

Other Causes" are listed as the following: 5 state the container was split, 6 are undetermined, 4 were vehicular accidents of some kind.



# Incident	Failure Cause
17	Loose Fittings
8	Struck
7	Other Causes
5	Improper Loading



# Incident	Failure Cause
8	Struck
6	Defective fittings
6	Improper loading

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INFORMAL WORKING GROUP ON IBC PERFORMANCE TESTS

Paris, 10-13 October 2005

Comments from Sweden

Introduction

1. At the 27th session of the Sub-Committee of Experts Sweden announced interest in participating in the informal working group on IBC performance tests. Unfortunately Sweden is not able to attend the working group meeting in Paris.

However, Sweden is very interested of the work ahead and would like to give some brief comments and thoughts on some of the issues which will be discussed by the working group.

Composite IBCs

2. Composite IBCs are widely used in Sweden and are periodically inspected according to 6.5.4.4 of the Model Regulations. The inspections have shown that certain types of composite IBCs no longer will be suitable for transport of dangerous goods when the leakproofness test according to 6.5.4.4.2 of the Model Regulations have been performed. Not because of leakage of air, which is the criterion for passing the leakproofness test, but because of the inner receptacle expanding “like a balloon”, i.e. a permanent deformation.

The typical characteristic of these types of composite IBCs is their lightweight construction.

3. Although these lightweight types of composite IBCs have been certified according to the applicable specifications of the Model Regulations and they should appear to be in technically good order, their lightweight construction will in some cases lead to an improper IBC condition after the leakproofness test as mentioned above, consequently they will be put out of service and their period of use ends after 2,5 years.

4. In light of this experience Sweden believes it would be more reasonable to revise the criteria for passing tests according to 6.5.6 of the Model Regulations, rather than define new types of IBCs, e.g. “lightweight composite IBC” or “single use composite IBC”.

In this context Sweden also believes it is very important to, as far as possible, apply objective and clear criteria for passing the tests according to 6.5.6 of the Model Regulations. The proposal from Australia concerning the criteria for passing the stacking test (see 3.3.5.1 of Australia Position Paper) is a good example of a criterion which eliminates the risk of subjective judgements.

Report of each inspection and test of composite IBCs

5. A problem which particular concerns composite IBCs and which has been brought to the attention of the competent authority is that the report according to 6.5.4.4.3 of the Model Regulations in several cases is missing, i.e. the report from the tests and inspections. This report shall be kept by the owner of the IBC.

The reason for this is suspected to be that composite IBCs are products which often are offered for sale as IBC with content. If the composite IBC is offered for sale as "single use" because of a lightweight construction, it might be considered from the salesman point of view as unnecessary to provide the required report.

The lack of documentation is of course the responsibility of the manufacturer and owner/user, but it gives an indication of the handling and movement of these types of IBCs.

6. If the working group comes to the conclusion that it is necessary to limit the permitted time of use of composite IBCs, with regard to lightweight constructions, the working group may wish to consider if it is necessary for the owner to keep a report of the inspections and tests carried out before the IBC is first used for transport. This would only be relevant if the periodic inspections and tests according to 6.5.4.4 of the Model Regulations are excluded due to the permitted time of use.

Comments Prepared by the International Confederation of Container Reconditioners (ICCR)

Background

1. The International Confederation of Container Reconditioners (ICCR) represents businesses that reprocess, repair, and remanufacture intermediate bulk containers worldwide, including Japan, Australia, New Zealand, Europe, China, and North America. ICCR estimates that companies that comprise member associations handle over two million composite, rigid plastic, and metallic IBCs annually. The large majority of IBCs handled by ICCR member companies are composite design.

2. ICCR believes it is important for the IBC Working Group to clearly understand the differences between the various types of IBCs that are found in the marketplace. To this end, a general description of these products, some of which has been taken directly from 6.5.1.3, is supplied below. Pictures showing examples of the various IBC design-types are attached in Annex A.

> **Metal IBCs** – Metal IBCs generally are composed of either stainless steel (T-304; 10 gauge) or carbon steel (10 gauge) and are quite expensive, often costing several thousand U.S. dollars or more. These units are commonly purchased with capacities ranging between 1000 liters (approximately 275 U.S. gallons) and 2000 liters (approximately 500 U.S. gallons). They are generally used for specialty products or in refilling are controlled by the IBC owner.
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> **Rigid Plastic IBCs** – All-plastic IBCs are comprised of high density polyethylene (HDPE) and generally are rotationally molded by the manufacturer. Some units sit in a custom-built plastic pallet while others are not palletized. These units generally have a liquid capacity of between 1000 liters and 1,500 liters. While not as expensive as metal IBCs, many rigid plastic IBCs are quite expensive and, consequently, are also used in service systems where empty units are collected by or returned to the owner for refilling and reuse.
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> **Composite IBCs** – Composite IBCs consist of a rigid outer casing, an interior blow-molded HDPE plastic bottle, and a pallet. The outer casing is generally constructed from steel, in the shape of hollow-tubes or a latticed framework. The pallet may be comprised of wood, metal, or plastic. The frame is attached to the bottle to prevent movement. The large majority of these IBCs have a liquid capacity of between 1,000 and 1,500 liters.
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> **Hybrid IBCs** – Experts should be aware that there are a large number of specially designed IBCs that are not easily categorized within the three definitions found in the Model Regulations. Examples of such IBCs include composite-style units comprised of a heavy steel angle iron "cage" and a very heavy HDPE bottle; or, all-metal IBCs with unique designs, which are intended for service in a particular industry or for filling with a specific product.

Issues Considered by the Working Group

1. UV protection. ICCR appreciates the concerns expressed by the Expert from Australia regarding the need for UV-protection in plastics IBCs that are exposed to intense sunlight for long periods of time. However, it is our understanding that polymers used in the manufacture of IBCs may already contain UV protection that is adequate for most transportation environments. We believe in those rare instances where IBCs could be exposed to extreme UV exposure, the shipper and carrier should be instructed to take adequate precautions to limit such exposure. Simply covering the IBCs while in storage or transport can accomplish this goal.

The additional cost associated with adding extra UV protection to all IBCs outweighs the benefits in most cases, particularly when the problem is limited and can be addressed by fillers and carriers.

Lastly, we understand that the addition of large amounts of UV protection can negatively affect the physical characteristics of plastics used to manufacture IBCs. We would oppose any requirement that reduces IBC performance safety.

For the reasons noted above, we believe that the UN should not require the use of additional amounts of UV protection in IBCs. We would, however, support a Note in 4.1.3 of the Model regulations (or other suitable location) which states:

> *Note: Rigid plastics or composite IBCs used for extended periods in high-UV transportation environments should, to the extent practicable, be stored and transported under cover. Fillers should ask for additional UV protection if transportation conditions so warrant.*

2. Special Mark for "UV-protected IBCs." In addition to the reasons stated in paragraph one above, ICCR does not believe that manufacturers should be required to add additional amounts of UV protection to plastics used in the manufacture of IBCs, except as a commercial condition.

In addition, a series of marks for various levels of UV protection, such as has been proposed by the Expert from Australia, would significantly increase the amount of storage capacity needed by manufacturers, reconditioners and shippers, thereby increasing cost.

For these reasons, we would not support a unique mark for specially UV-protected IBCs.

3. Chemical/Temperature Degradation. ICCR does recognize that certain chemicals, temperatures and environmental exposure can have a negative impact on plastics used in the manufacture of IBCs. We believe that existing UN requirements, shown below, are sufficient to ensure containment safety, even for periods greater than five years.

Paragraph 6.5.1.5.1 states, "IBCs shall be resistant to or adequately protected from deterioration due to the external environment."

Paragraph 6.5.1.5.3 states, "IBCs and their closures shall be constructed of materials compatible with their contents, or be protected internally, so that they are not liable

(a) To be attacked by the contents so as to make them dangerous;

(b) To cause the contents to react or decompose, or form harmful or dangerous compounds with the IBCs."

4. Reusable vs. non-reusable IBCs. ICCR does not support creating an artificial distinction between "reusable" and "non-reusable" intermediate bulk containers in the Model Regulations. The concept of a "non-reusable" IBC is, to the best of our knowledge, an artificial construct created by one or more IBC manufacturers, probably as a sales and advertising concept designed to differentiate composite IBCs from their sturdier counterparts, or possibly to indicate their desire that reuse should be limited.

It is our understanding that such claims have been made only in the case of certain composite IBCs, and not for rigid all-plastics or metal IBCs. The latter units are, in fact, specifically designed for multiple uses by one or more shippers. Thus, when one sees a reference to a "non-reusable" IBC, it is for all practical purposes a reference to a composite IBC.

Currently, all composite IBCs are capable of being reused, depending on the condition of the unit and its primary component parts, i.e., bottle, cage, pallet, and service equipment. In addition, consistent with many national and international mandates for waste reduction, the reuse of packaging is strongly encouraged. As a consequence, the COE should assume that emptied IBCs in most parts of the world would be used again for the transportation of dangerous goods, regardless of the intentions of the original manufacturers or fillers of those IBCs.

For these reasons, ICCR also does not support the creation of unique marks or other restrictions for "non-reusable" IBCs.

5. Vibration test. ICCR understands that in recent years some IBC manufacturers have been "lightening" their composite IBCs in one or more of the following ways:

- Reducing the thickness of the plastic "walls" of the bottle;

- Reducing the thickness, size and/or shape of the metal bracing which encloses the plastic bottle; and,
- Reducing the weight of the pallet to which the metal bracing of the composite IBC is attached.

Such reductions are largely a normal function of the competitive market, in which manufacturers seek advantage over a competitor by reducing costs through innovation or the development of superior manufacturing techniques.

ICCR would not be concerned with these facts of business life were we discussing the production of benign consumer goods. However, the Working Group is considering evidence that suggests that the number and severity of transportation incidents involving IBCs carrying dangerous goods is increasing. Given that few countries have fully implemented a comprehensive system of incident data collection and retrieval, the actual impact of less sturdy packaging may be yet to fully reveal itself.

ICCR sees no end to commercial pressure to reduce packaging cost and, as a result, manufacturers will likely continue to reduce the amount of material used in the manufacturing process as one means to control such costs.

The job of the Sub-Committee, however, is transportation safety. And, while commercial issues are a legitimate factor to consider in its deliberations, as long as the commercial playing field is not unduly or unnecessarily tilted in favor of one manufacturer or packaging type, safety must be the guiding principle of the Sub-Committee.

Up to this point, IBC reprocessors all over the world have established an enviable safety record with respect to the reuse of IBCs. In North America, approximately one million composite IBCs – most with plastic or metal pallets – are reused annually. When the bottles or cages show signs of degradation, even after just one reuse, they are repaired or remanufactured for reuse. Bottles, cages and pallets too damaged for reuse are cleaned and scrapped.

This system is working very well, but ICCR fears that further "lightening or weakening" of bottles, cages, and pallets may lead to safety problems.

For this reason, ICCR supports a repetitive shock vibration test, possibly based upon the U.S. test, which may be found in 49 CFR Part 173 Appendix C. This test measures the ability of a package to withstand the most common aspect of normal transport, and should be considered for adoption.

6. Unique Mark for Non Reusable IBCs. ICCR does not support a special mark for "non-reusable" IBCs for the reasons stated above.

7. Dangerous Goods Restrictions for "Non-Reusable" IBCs. For the reasons stated above, ICCR does not support restrictions on the types of dangerous goods that may be carried in "non-reusable" IBCs.

8. New Tests for IBCs/Evaluation of Pass – Fail Criteria. As noted in paragraph 5 above, ICCR does support the addition of a vibration test for IBCs. We are open to discussions about additional tests as well, including tests measuring side impact, which measures forces applied to IBCs shipped via ocean and rail. In addition, we support reevaluation of the current UN pass/fail criteria for IBCs, including the possibility that an IBC that is severely damaged in a test could be considered a failure even if it does not release any of its contents to the environment.

Conclusion

ICCR appreciates the efforts of all Working Group members to review safety matters related to intermediate bulk containers. We hope this paper offers beneficial information to the Group, and we look forward to participating in a full discussion of all agenda items in Paris.

ANNEX A

NOTE: Efforts have been made to conceal the names of the manufacturers.

1. Composite IBCs

2. Metal IBC

3. Rigid Plastics IBC

4. "Hybrid" IBC

ICPP Position Paper

Comments and Proposals submitted by the
International Confederation of Plastics Packaging Manufacturers (ICPP)
for the Sub-Committee of Experts on the Transport for Dangerous Goods
Informal Working Group on IBC Performance Tests

Paris 10 – 13 October 2005

Introduction / Market Situation

1.) During the discussion of the ICPP issues on the 17th Session of the UN Sub-Committee ICPP supported the establishment of an Informal Working Group on IBC Performance Tests. With the following comments and proposals ICPP underlines its willingness to constructively contribute to a solution concerning questions on IBC Performance Testing.

2.) The International Confederation of Plastics Packaging Manufacturers (ICPP) represents manufacturers of plastics packaging, rigid plastics and composite IBCs in Europe, North America, China, Japan and Australia. The annual production of composite and rigid plastics IBCs comprises more than 6 million pieces per annum, around 60-70 per cent of which are used for the transport of dangerous goods.
ICPP estimates that more than 12 million of composite and rigid plastics IBCs are currently in worldwide service. This includes repaired, remanufactured and those IBCs which underwent routine maintenance.

Different designs of rigid plastics and composite IBCs

3.) ICPP does not support the tendencies to differentiate composite IBCs in non-reusable and reusable respectively in light-weight and heavy-weight IBCs. All these terms do not exist in the UN Model Regulations and are rather misleading. On the contrary ICPP wants to make clear that the different designs of composite IBCs were developed in accordance with different market needs.

4.) These different market requirements are also reflected by the Model Regulations, especially in the definitions of routine maintenance and repair.

a. IBCs which undergo **cleaning** as the essential operation of ***"routine maintenance"*** are mainly used for alternating filling goods and by the same or different shippers.

b. IBCs which are not suitable for further cleaning or which are damaged undergo the **replacement of the inner receptacle with a receptacle conforming to the original manufacturer's specification** –operation normally to be done by a professional reconditioner – as the essential operation of "***repair***". Those repaired IBCs are also used for alternating filling goods and by the same or different shippers.

c. IBCs which are refilled with the same filling good without cleaning, mostly used over a period of 5 years, are intended for the transport of the same filling good by the same shipper in a regional closed loop system. The market share of those IBCs is estimated to max. 5%.

5.) Taking into account the three operations necessary for the multiple use of IBCs

- routine maintenance (including cleaning)
- repair (including replacement of the rigid inner receptacle conforming to the original manufacturer's specification)
- refill (without cleaning)

the following IBC-designs, corresponding to those mentioned under 4.) a, b, c, reflect the market requirements:

Examples of composite IBCs with different designs according to point 4.) a and 4.) b (see page 1).

Examples of composite IBCs with different designs according to point 4.) c (see above).

<u>Issues according to the agenda of the Working Group</u>

<u>UV-Protection</u>

6.) The ICPP members have always dedicated great attention to the phenomenon of the UV-degradation of HDPE. The material high-molecular HDPE used for the receptacles of IBCs is for the most part already UV-stabilised by the resin manufacturer. Considerable knowledge on UV-stabilisation of plastics material was taken over especially from different applications under extreme exposures, e.g. car industry, heating oil tanks etc. Therefore ICPP does not see any need to prescribe the additional use of UV-stabilizers. On the other hand ICPP could support measures to improve the UV-protection of IBCs in regions with extreme UV-exposure like Australia by other means, e.g. by maintaining IBCs under cover during storage and transport.

ICPP reminds the working group that former proposals to amend the design type test criteria by taking into account extreme climate conditions were rejected. For example proposals to change the temperature of the drop test from –18° to –40°C proposed by Finland, or from –18° to room temperature proposed by New Zealand were not adopted.

7.) To guarantee that UV-stabilized high-molecular HDPE is generally used, ICPP proposes to change the text in the chapters 6.5.5.3.2 and 6.5.5.4.6 accordingly.

ICPP proposes to amend 6.5.5.3.2 (including 6.5.5.3.3) and 6.5.5.4.6 (including 6.5.5.4.7).
The second sentence of the chapters 6.5.5.3.2 and 6.5.5.4.6 would then be as follows: "**The material shall be adequately resistant to aging and to degradation caused by the substance contained or,** ~~where relevant~~**, by ultraviolet radiation."** and
6.5.5.3.3 and 6.5.5.4.7 as follows: "~~where~~ **The protection against UV-radiation** ~~is required, it~~ **shall be provided by the addition of UV-inhibitors, carbon black or other suitable pigments."**

8.) <u>Stacking test</u>

ICPP is in favour of text clarifications for mistakable requirements in the UN-recommendations. Concerning the stacking test it is suggested, with respect to the UN-marking in 6.5.2.1 (g), not to indicate the stacking test load but the maximum permissible load on the identification plate. This would make the UN-marking user-friendly and the application of factor 1,8 would become obsolete.

9.) <u>Vibration test</u>

ICPP supports the idea of the worldwide introduction of a vibration test as design type test under clearly defined conditions.

1.) In the sense of global harmonization only one test method should be adopted. More than one possible test method would lead to incomparable test results in the different countries. This test should be the DOT-test already practised in North America.
2.) The experiences in North America show that the description of the DOT-test is not yet clear enough so that different interpretations are possible. It is necessary that requirements for a concretisation of the DOT-test are considered.

These requirements should be:

- free choice of frequency below the resonance frequency,
- stimulus generated by a sinus node,
- the 1,6 mm thick plate to be put under the IBC should have a surface of 50 x 100 mm,
- this plate with a lateral length of 50 mm should be put under the IBC in a way that the plate is completely covered by the IBC,
- the test is carried out with water and a brimful capacity of 98%,
- the test is carried out without stacking load.

3.) The vibration test as design type test should not have to be carried out for every modification of the design type. ICPP supports the restricted use of the vibration test as design type test according to the oral suggestions made by the expert from Canada on the meeting of the UN Sub-Committee of Experts in December 2004:

- Only one unit should be tested

- A list should be elaborated to specify for which design type alterations a new test would be required

ICPP is of the opinion that a test is necessary in the case of modifications of volume, dimensions, pallets or if the design of the outer casing is changed.

10.) <u>Guideline Stowage / Loading of IBCs</u>

Due to the fact that incidents with IBCs were mostly attributed to incorrect loading or stowing of IBCs, for example in sea containers, ICPP supports the oral proposal from UK on the July meeting to elaborate a special guideline on the stowage and loading of IBCs. ICPP would be prepared to participate in the development of such guideline.