

## 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

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Item 5 (g) of the provisional agenda

### Miscellaneous proposals for amendments to the Model Regulations on the Transport of Dangerous Goods: packagings

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## Leakproofness testing procedures

### Transmitted by expert from Sweden

### Background

1. At the latest session of the Sub-Committee of Experts on the Transport of Dangerous Goods in June, Sweden presented document 2013/11 concerning inspection and testing of packagings and IBCs in accordance with paragraphs 6.1.1.3 and 6.5.4.4. The document aimed at clarifying how the leakproofness test should be carried out. The discussion from this meeting showed that the procedures approved by different competent authorities varied considerably concerning the leakproofness test carried out on plastics packagings and plastics IBCs for liquids before use and also regarding the two and a half-year periodic inspection of the IBCs.
2. From the discussions (see paragraph 72-73 in ST/SG/AC.10/C.3/86), it was decided that Sweden would collect information and data on the current praxis from both component authorities and industry, and present the result as an informal paper at the session in November. Depending on the outcome of the discussions at the forthcoming session, there might be a need for further work, for example through an informal working group.

### Discussion

3. In September, Sweden sent out a survey containing a number of questions relating to testing procedures and we have received answers from ICPP, Belgium, Finland, Germany, Norway, Switzerland, USA and United Kingdom. Some answers to this issue were sent to us before the survey was sent out. In the annex to this document you will find the detailed answers from the responders.
4. The results from the survey are presented in summarized form in the tables below. It is difficult to draw straightforward conclusions from the answers since it seems that applied test methods, test pressures and durations vary depending on for example properties of packagings and IBCs, and production rate.
5. For metal IBCs, the procedures on leakproofness testing before the first use seem to be reasonably similar and in line with what is stated in 6.5.6.7.3 in the Model Regulations. However, the procedures for composite and rigid plastics IBCs before use differ considerably.

6. Concerning periodic inspection, the methods used for metal IBCs do not differ, while there are minor differences for composite and rigid IBCs.
7. For packagings, no straightforward conclusions can be drawn, because too little information was received, but from the collected information there seems to be some differences.
8. From the information presented in this document, Sweden would appreciate views and advice from the Sub-Committee on how to proceed on this issue. The Sub-Committee should also consider whether amendments to the provisions are needed due to the variety of methods used for leakproofness testing.

## Summary - Leakproofness testing procedures

Country/NGO <sup>*)</sup>	1. IBCs Before 1 <sup>st</sup> use (paragraph 6.5.4.4)					
	a) Metal		b) Composite		c) Rigid plastics	
	kPa	Time	kPa	Time	kPa	Time
<b>ICPP</b>	-	-	?	30-50 sec	?	?
<u>Note:</u> Composite and rigid: Pressure diff. test, sometimes supplemented with water bath test. Test pressure and time depend on IBC volume and design (e.g. wall thickness) and production rate.						
<b>Belgium</b>	20	10 min	3-20	12-75 sec	3-20	12-75 sec
<u>Note:</u> Composite and plastics: Pressure diff. test or water submersion.						
<b>Finland</b>	20	10 min	20	10 min	20	10 min
<u>Note:</u> Metal: All IBCs. Pressure diff. test with soap solution. Composite: All IBCs. Pressure diff. test with soap solution. Rigid: All IBCs. Pressure diff. test with soap solution.						
<b>Germany</b>	20	10 min	5-10 (completed) 20 (inner)	? 30-60 sec	20	10 min
<u>Note:</u> Metal: All IBCs. Pressure diff. test with soap solution/leak detection spray. Composite: Pressure diff. test on completed IBC. Rigid: All IBCs. Pressure diff. test.						
<b>Norway</b>	20	10 min	2-3	90 sec	-	-
<u>Note:</u> Metal: All IBCs. Pressure diff. test with soap solution. Composite: All IBCs. Pressure diff. test.						
<b>Sweden</b>	20	10 min	2-3	60-90 sec	-	-
<u>Note:</u> Metal: All IBCs. Pressure diff. test with soap solution. Composite: All IBCs. Pressure diff. test.						
<b>Switzerland</b>	20	10 min	20	10 min	20	10 min
<u>Note:</u> All IBCs. The manufacturer is responsible for the tests during production.						
<b>United Kingdom</b>	See note		See note		See note	
<u>Note:</u> All IBCs. Each manufacturer uses an appropriate test method (such as pressure diff. test, water submersion, helium leak detection), applied pressures and durations vary according to method used and properties of packaging.						
<b>USA</b>	20	10 min	20	15 sec	20	15 sec
<u>Note:</u> Composite: Variety of methods, but pressure diff. test most common on inner receptacles. Rigid: Variety of methods, but pressure diff. test most common. Time for test on all IBC types depends on the IBC volume and rate of pressurization.						
<sup>*)</sup> NGO = Non-governmental organization						

<b>2. IBCs Periodic inspection</b> (paragraph 6.5.4.4)						
<b>Country/NGO<sup>*)</sup></b>	a) Metal		b) Composite		c) Rigid plastics	
	kPa	Time	kPa	Time	kPa	Time
<b>ICPP</b>	-	-	See note		See note	
<u>Note:</u> Composite and rigid: Inconsistent practices adopted in different countries.						
<b>Belgium</b>	20	10 min	6	5 min	20	10 min
<u>Note:</u> Metal: All IBCs. Composite: Equipment checked with foaming agent +leak detection with pressure drop. Rigid: All IBCs. Pressure diff. test.						
<b>Finland</b>	20	10 min	20	10 min	20	10 min
<u>Note:</u> Metal: All IBCs. Pressure diff. test with soap solution. Composite: All IBCs. Test Pressure diff. test with soap solution. Rigid: All IBCs. Test Pressure diff. test with soap solution.						
<b>Germany</b>	20	10 min	10-20	10 min	20	10 min
<u>Note:</u> Metal: All IBCs. Pressure diff. test with leak detection spray. Composite: Rare case. Most IBCs will be repaired before periodic inspection. If tested, all IBCs. Pressure diff. test. Rigid: All IBCs. Pressure diff. test.						
<b>Norway</b>	20	10 min	20	10 min	20	10 min
<u>Note:</u>						
<b>Sweden</b>	20	10 min	20	10-15 min	-	-
<u>Note:</u> Metal: All IBCs. Pressure diff. test with soap solution. Composite: All IBCs. Rigid: No information.						
<b>Switzerland</b>	20	10 min	20	10 min	20	10 min
<u>Note:</u> All IBCs have to be tested. Leak detection spray.						
<b>United Kingdom</b>	See note		See note		See note	
<u>Note:</u> All IBCs are pressure tested.						
<b>USA</b>	20	5-10 min	20	5-10 min	20	5-10 min
<u>Note:</u> Pressure diff. test with soap over seams method for rigid IBCs.						
<sup>*)</sup> NGO = Non-governmental organization						

<b>3. Packagings Before 1<sup>st</sup> use</b> (paragraph 6.1.1.3)				
<b>Country/NGO<sup>*)</sup></b>	a) Metal		b) Plastics	
	kPa	Time	kPa	Time
<b>ICPP</b>	-	-	?	?
<u>Note:</u> Composite and rigid: Pressure diff. test. Tests depend on volume, design and production rate. Higher pressure allows shorter test times; larger packaging volumes require longer test times. All test pressures are clearly below the pressure used in the design type.				
<b>Belgium</b>	-	-	?	?
<u>Note:</u> Metal: All packagings tested. Helium leak test. Plastics: Air pressure test installation				
<b>Finland</b>	-	-	-	-
<u>Note:</u>				
<b>Germany</b>	5	10-30 sec	5	10-30 sec
<u>Note:</u> Metal: All packagings. Mainly pressure diff. test, sometimes in combination with soap solution. In some cases helium leak test. Plastics: All packagings. Pressure diff. test.				
<b>Norway</b>	-	-	-	-
<u>Note:</u>				
<b>Sweden</b>	5-6	10 sec	5-6	10 sec
<u>Note:</u> Metal: All packagings. Pressure diff. test. Plastics: All packagings. Pressure diff. test.				
<b>Switzerland</b>	?	?	?	?
<u>Note:</u> All packagings. The manufacturer is responsible for the tests during production.				
<b>United Kingdom</b>				
<u>Note:</u> All packagings. Each manufacturer uses an appropriate test method (such as pressure diff. test, water submersion, helium leak detection), applied pressures and durations vary according to method used and properties of packaging.				
<b>USA</b>	PG I: $\geq 30$ ; PG II & PG III: $\geq 20$	$\geq 5$ min	PG I: $\geq 30$ ; PG II & PG III: $\geq 20$	$\geq 5$ min
<u>Note:</u> All packagings. The package must be retrained under water while an internal air pressure is applied.				
<sup>*)</sup> NGO = Non-governmental organization				

4. Packagings Reconditioned (paragraph 6.1.1.3)				
Country/NGO <sup>*)</sup>	a) metal		b) plastics	
	kPa	Time	kPa	Time
<b>ICPP</b>	-	-	-	-
<u>Note:</u> Not relevant for ICPP which represent manufacturers of new plastics packagings and IBCs.				
<b>Belgium</b>	?	?	-	-
<u>Note:</u> Metal: Pressure diff. test.				
<b>Finland</b>	-	-	-	-
<u>Note:</u>				
<b>Germany</b>	visual 5-10	visual 30 sec	5-10	60 sec
<u>Note:</u> Metal: All packagings. Mostly visual detection through bubble test in water bath (90°C), unknown pressure. Sometimes pressure diff. test. Plastics: All packagings. Pressure diff. test.				
<b>Norway</b>	20	10 min	-	-
<u>Note:</u>				
<b>Sweden</b>	20-30	10 min		
<u>Note:</u> Pressure diff. test and sometimes visual detection with soap solution.				
<b>Switzerland</b>	?	?	?	?
<u>Note:</u> All packagings. The manufacturer is responsible for the tests during production. Various test methods (bubble test, pressure diff. test).				
<b>United Kingdom</b>				
<u>Note:</u> All reconditioned drums are leak tested. Most steel drums are ultrasound tested. The pressure applied and duration varies. A 0.4 mm hole must be detected. Plastics are generally water bath tested.				
<b>USA</b>	48 (PG I) 20 (PG II & PG III)	≥5 min	48 (PG I) 20 (PG II & PG III)	≥5 min
<u>Note:</u> A packaging subject to the leakproofness test at the time of manufacture must be retested without failure using an internal pressure prior to reuse even if that package was not reconditioned. Exceptions from the leakproofness testing are authorized under specific conditions.				
<sup>*)</sup> NGO = Non-governmental organization				

<b>5. Authorization and qualifications</b>					
	<b>IBCs</b>		<b>Packagings</b>		
	a) Before 1 <sup>st</sup> use	b) Periodic inspection	c) Before 1 <sup>st</sup> use	d) Reconditioning	e) Repair (added by Germany (BAM) and UK)
<b>Country/NGO<sup>*</sup></b>	Who / Requirements	Who / Requirements	Who / Requirements	Who / Requirements	Who / Requirements
<b>ICPP</b>	Manufacturers/ Quality assurance program by third party and accreditation given by CA	Different in different countries. In some countries, the manufacturer or the user. In other countries, accreditation systems and defined inspection bodies assigned by the CA.	Manufacturer/ Quality assurance program by third party and accreditation given by CA	-	-
<b>Belgium</b>	Accredited bodies recognized by CA or other bodies or companies recognized by CA/ Quality management program/liability insurance/level of independence. Supervision by recognized body.	Accredited bodies recognized by CA or other bodies or companies recognized by CA/ Quality management program/liability insurance/level of independence. Supervision by recognized body.	Manufacturer and third party inspection by recognized body/ National legislation.	Manufacturer and third party inspection by recognized body/ National legislation.	-
<b>Finland</b>	Inspection bodies recognized by CA (manufacturer can get the status of inspection body). Supervision by CA.	Inspection bodies recognized by CA. Supervision by CA.	Manufacturers/ Certified quality system ISO 9001, Quality assurance program and supervised by CA.	-	-

<b>5. Authorization and qualifications</b>					
	<b>IBCs</b>		<b>Packagings</b>		
<b>Germany</b>	Manufacturers and remanufacturers/ Recognized quality assurance program valid for 3 yrs. Yearly third part monitoring.	1) Inspection bodies (remanufacturing) 2) Test bodies (2½ yrs)/ 1) Recognized by BAM 2) Technical experts authorized by the management company	Manufacturers and remanufacturers/ Recognized quality assurance program valid for 3 yrs. Yearly third part monitoring.	Companies performing the reconditioning/ Recognized quality assurance program valid for 3 yrs. Yearly third part monitoring.	<i>Companies performing the repair/ Recognized quality assurance program valid for 3 yrs. Yearly third part monitoring.</i>
<b>Norway</b>	Manufacturers/ Quality assurance program	Certified IBC inspectors/ Training. CA recognizes the trainer.	Manufacturers/ Quality assurance program	-	-
<b>Sweden</b>	Manufacturers/ Quality assurance program recognized by third party.	Certified IBC inspectors/ Training. CA recognizes the trainer.	Manufacturers/ Quality assurance program recognized by third party.	Companies approved by third party/ Quality assurance program recognized by third party.	-
<b>Switzerland</b>	CA or authorized inspection bodies/ Specialists and inspectors.	CA or authorized inspection bodies/ Specialists and inspectors.	Manufacturers/ Recognized quality assurance program, valid for 3 years.	Manufacturers/ Recognized quality assurance program, valid for 3 years.	-
<b>United Kingdom</b>	Manufacturers/ Quality assurance program.	Anyone who is prepared to take the responsibility/ Inspections and test reports are required.	Manufacturers/Quality assurance program.	Manufacturers/ Yearly third part monitoring.	<i>Owners of the IBCs may perform the repair as well as the testing.</i>

<b>5. Authorization and qualifications</b>					
	<b>IBCs</b>		<b>Packagings</b>		
<b>USA</b>	Manufacturers and Approved 3rd party test labs/ Test reports are required. Subject to inspection and demonstration of competence.	Anyone who is prepared to take the responsibility/ Test reports are required. Subject to inspection and demonstration of competence	Manufacturers and Approved 3rd party test labs/ Test reports are required. Subject to inspection and demonstration of competence	Anyone who is prepared to take the responsibility/ Test reports are required. Subject to inspection and demonstration of competence	Anyone who is prepared to take the responsibility/ Test reports are required. Subject to inspection and demonstration of competence
<sup>*)</sup> NGO = Non-governmental organization					

## Annex 1

### Leakproofness testing procedures –Detailed responses

#### Questions on leakproofness testing procedures

##### ICPP (International Confederation of Plastics Packaging Manufacturers)

**1. Which testing procedures are used for the leakproofness test carried out on the below mentioned IBCs before their first use (e.g. test pressures, how long is the test pressure held, description of the test in the production line, if a statistical sample of IBCs is tested or all)?**

Basically the pressure differential test is adopted for the leakproofness test of composite IBCs and rigid IBCs, if necessary supplemented by a water bath test with a water level above the upper edge of the valve. Test time and test pressure are subject to the volume of the IBC (range between 400 l and 3.000 l), the output per time unit and the design of the IBC (e.g. wall thickness). The tests have to be run within the cycle times of production and often are 30-50 sec for typical composite IBCs. The test procedure during production as well as the statistical tests are part of the quality assurance program and confirmed in accordance with chapter 6.5.4.1 by the competent authority.

**2. Which testing procedures are used for the leakproofness test carried out on the below mentioned IBCs every two and a half years (the periodic inspection) (e.g. test pressures, how long is the test pressure held, is a statistical sample of IBCs tested or all)?**

The experience of ICPP regarding composite IBCs including rigid plastic IBCs shows very inconsistent practices adopted in the different countries. Examples are: a stand test with water over a period of 24 hours, a stand test with low surface tension water over 24 hours, a test at 0,1 bar with soap solution and a specific surface tension (used in Germany) or the same tests conditions as for a new manufactured IBC (used in France).

**3. Which testing procedures are used for the leakproofness test carried out on the below mentioned packagings before their first use (e.g. test pressures, how long is the test pressure held, description of the test in the production line, if a statistical sample of packagings is tested or all)?**

The pressure differential test is almost exclusively used as test method. The leakproofness test for plastics packaging depends on a number of factors, in particular on volume and design of the packaging and output per time unit in the production unit. The test time is subject to the adopted test pressure and the volume of the packaging. Higher pressure allows shorter test times; higher volume of the packaging requires longer test times. The big range of plastics packaging (ranging from 1 l bottles over jerrycans to 220 l drums) also leads to a big range of test times and test pressures, e.g. test times of 1 sec for 1 l bottles and 30 sec or more for drums. Test pressures are considerably varying from design to design type, from company to company; however all test pressures are clearly below the test pressure used in the design type test. All packagings are tested as described, in many countries there are additional statistical tests as part of the QMP.

The test procedure during production as well as the statistical tests are part of the quality assurance program and confirmed in accordance with chapter 6.1.1.4 by the competent authority.

**4. Which testing procedures are used for the leakproofness test carried out on the below mentioned packagings after they have been reconditioned (e.g. test pressures, how long is the test pressure held, description of the test in the production line, is a statistical sample of packagings tested or all) ?**

ICPP does not want to answer this question as ICPP represents the interests of the manufacturers of new plastics packagings and IBCs.

**5. Who is authorized to perform leakproofness tests on packagings and IBCs? Which proficiency requirements (e.g. training, exam, accreditation, etc.) are in force in national legislation for the persons carrying out the tests in the below mentioned cases?**

In order to answer this question it is necessary to make a clear difference between leakproofness tests before the first use of packagings and IBCs and leakproofness tests every two and a half year as periodic inspection for IBCs. Leakproofness tests on packaging and IBCs before their first use are run in many countries and especially in Europe on the basis of a quality assurance program of the manufacturer and regular manufacturing site audit/surveillance done by a third party and accreditation given by the competent authority. The quality assurance program is authorized by the competent authority according to chapter 6.1.1.4. and 6.5.4.1. In this quality assurance program there is also a list of the persons who are responsible for the tests, and their qualification.

For the two and a half year inspection for IBCs there is a wide range of the authorization of persons qualified to run this test. In some countries there are no specific regulations and the manufacturer or user of the IBC can run the tests independently. In other countries, for example Germany or France, there is an accreditation system and only defined inspection bodies are assigned by the competent authority to run the two and a half year inspection.

## Questions on leakproofness testing procedures

### Belgium

1. Which testing procedures are used for the leakproofness test carried out on the below mentioned IBCs before their first use (e.g. test pressures, how long is the test pressure held, description of the test in the production line, if a statistical sample of IBCs is tested or all)?

- (a) Metal IBCs (steel, aluminum or other metal)

Circulaire 30 requires conformity with 6.5.6.7.3 of ADR, meaning 20 kPa for 10 minutes on all IBC's. Prototype testing is also done under these conditions. In practice, a study has shown that various methods are currently used in the production line by manufacturers (see below).

- (b) Composite IBCs

see a)

- (c) Rigid plastics IBCs

see a)

OVERVIEW different leaktest systems in use by Belgian Companies (situation 4<sup>th</sup> of May 2004 – data provided for Paris Working Group 2005)

R = reconditioner

P = producer

#### Lekdichtheid meetssystemen overzicht

r = reconditionneur  
p = producent

company	Type of device	test pressure	measuring time	rejection criteria	Delta P	Delta P in %	pre-press	time v-P
A	R Manometer resol. 5 mbar	100 mbar	5 minutes	pressure drop below 80 mbar	20 mbar	20		
B	R Leaktester	60 mbar	35 sec	minimum pressure drop 40% => reject delta P > 7 mbar	24 mbar	40	40 mbar	10 sec
C	R Leaktester	50 mbar	2 minutes	=> reject	7 mbar	14		
D	R Leaktester	60 mbar	70 sec	minimum pressure drop 40% => reject	24 mbar	70	40 mbar	20 sec
E	P Manometer?	1 bar ( ? )	100 sec	?				
F	P	30 mbar	1 min 15sec					
G	P submersion water	200 mbar	12 sec	air bubbles => reject				
H	P submersion water	200 mbar	20 sec	air bubbles => reject				
I	P Leaktester	40 mbar	15 sec	minimum pressure drop + 8% => reject		40	8 mbar	15 sec
J	P	200 mbar	45 sec	terugval onder 120 mbar	80 mbar	40		

2. Which testing procedures are used for the leakproofness test carried out on the below mentioned IBCs every two and a half years (the periodic inspection) (e.g. test pressures, how long is the test pressure held, is a statistical sample of IBCs tested or all)?

- (a) Metal IBCs (steel, aluminum or other metal)

Circulaire 30 requires conformity with 6.5.6.7.3 of ADR, meaning 20 kPa for 10 minutes on all IBC's.

- (b) Composite IBCs

Type 31HZ IBCs may be leakproofness tested at 60 mbar for 5 minutes + check of equipment with foaming agent + leak detection with pressure drop less than 2 mbar after 150 seconds.

This was done in particular in response to two major foreign IBC manufacturers so called light weight IBC's.

- (c) Rigid plastics IBCs

Circulaire 30 requires conformity with 6.5.6.7.3 of ADR, meaning 20 kPa for 10 minutes on all IBC's.

3. Which testing procedures are used for the leakproofness test carried out on the below mentioned packagings before their first use (e.g. test pressures, how long is the test pressure held, description of the test in the production line, if a statistical sample of packagings is tested or all)?

- (a) Metal packagings (steel, aluminum or other metal)

Metal drums 1A1; 1A2 etc.... are "in line" ALL tested, mostly in the classic Helium (He) – tester installation

The imposed "own" production control, after fresh production, happens on a statistical basis, according to national instructions

- (b) Plastics packagings

Plastic HDPE cans and drums 1H1; 3H1 etc....are "in line" ALL tested, mostly in the classic air pressure – tester installation

The imposed "own" production control, after every "new" production, happens on a statistical basis, according to national instructions

4. Which testing procedures are used for the leakproofness test carried out on the below mentioned packagings after they have been reconditioned (e.g. test pressures, how long is the test pressure held, description of the test in the production line, is a statistical sample of packagings tested or all) ?

- (a) Metal packagings (steel, aluminum or other metal)

For metal drums: all drums are in line subjected to visual inspection + leakproofness test via pressure differential setup. Additionally, under supervision of a recognized accredited body, annual statistical samples subjected to hydraulic pressure testing + drop testing + any additional testing demanded by the recognized body.

- (b) Plastics packagings no relevant data

5. Who is authorized to perform leakproofness tests on packagings and IBCs? Which proficiency requirements (e.g. training, exam, accreditation, etc.) are in force in national legislation for the persons carrying out the tests in the below mentioned cases?

- (a) Before IBCs are first used

For prototype testing, only an accredited body recognized by the competent authority in accordance with Royal Decree 28/6/2009 may perform prototype testing. These bodies may of course also perform initial, periodic and exceptional inspections. For initial and periodic inspection of IBCs, other bodies or companies recognized by the competent authority may also perform these tests. These companies must fulfill the requirements set out in the Royal Decree 28/6/2009 (eg. Quality management program, liability insurance, level of independence (IS-body),

testing manual, ...) and are under supervision by an accredited recognized body via annual audits. These audits are reported annually to the competent authority.

(b) Every two and a half year for IBCs

see a)

(c) Before packagings are first used

Construction, reconstruction or reconditioning of packagings is regulated in the Annex of Royal Decree 28/6/2009. It consists of an first party inspection done by the manufacturer and a third party inspection done by an accredited recognized body. The first party inspection is done on all packagings in accordance with national instructions, third party inspection is done on a representative sample and also concerns the annual supervision of the first party inspection.

(d) Reconditioning of packagings

see c)

## Questions on leakproofness testing procedures

### Finncont Oy (Finland)

1. Which testing procedures are used for the leakproofness test carried out on the below mentioned IBCs before their first use (e.g. test pressures, how long is the test pressure held, description of the test in the production line, if a statistical sample of IBCs is tested or all)?

- (a) Metal IBCs (steel, aluminum or other metal)

All containers are tested with air pressure of 0.2bar at least 10minutes with steady pressure. In the beginning pressure need to raised couple of times to get it steady. When pressure is steady starts 10minute period of following pressure gauge and all couplings and welds are checked with soap liquid through.

- (b) Composite IBCs

All containers are tested with air pressure of 0.2bar at least 10minutes with steady pressure. In the beginning pressure need to raised couple of times to get it steady. When pressure is steady starts 10minute period of following pressure gauge and all couplings and mould lines are checked with soap liquid through.

- (c) Rigid plastics IBCs

All containers are tested with air pressure of 0.2bar at least 10minutes with steady pressure. In the beginning pressure need to raised couple of times to get it steady. When pressure is steady starts 10minute period of following pressure gauge and all couplings and mould lines are checked with soap liquid through.

2. Which testing procedures are used for the leakproofness test carried out on the below mentioned IBCs every two and a half years (the periodic inspection) (e.g. test pressures, how long is the test pressure held, is a statistical sample of IBCs tested or all)?

See point 1a-c, it's the same.

- (a) Metal IBCs (steel, aluminum or other metal)  
 (b) Composite IBCs  
 (c) Rigid plastics IBCs

3. Which testing procedures are used for the leakproofness test carried out on the below mentioned packagings before their first use (e.g. test pressures, how long is the test pressure held, description of the test in the production line, if a statistical sample of packagings is tested or all)?

- (a) Metal packagings (steel, aluminum or other metal)  
 (b) Plastics packagings

4. Which testing procedures are used for the leakproofness test carried out on the below mentioned packagings after they have been reconditioned (e.g. test pressures, how long is the test pressure held, description of the test in the production line, is a statistical sample of packagings tested or all) ?

- (a) Metal packagings (steel, aluminum or other metal)  
 (b) Plastics packagings

5. Who is authorized to perform leakproofness tests on packagings and IBCs? Which proficiency requirements (e.g. training, exam, accreditation, etc.) are in force in national legislation for the persons carrying out the tests in the below mentioned cases?

Requirements for authorized personnel are just the same for all below mentioned leakproofness tests for IBCs. TUKES supervises packaging manufacturers and they need to have certified quality system ISO9001. Leakproofness and final tests need to be included to quality system. Manufacturer has to keep record of their personnel who is authorized to make tests and ensure they got needed skills by training.

- (a) Before IBCs are first used
- (b) Every two and a half year for IBCs
- (c) Before packagings are first used
- (d) Reconditioning of packagings

Comments from Sweden: Finland submitted additional information to the draft, which has been included in the different tables in the initial pages above and the paragraph below:

In Finland we have **3 inspection bodies**, that can perform these Before 1<sup>st</sup> use and periodic tests to IBCs and packagings. These bodies are recognized by CA (Tukes (Finnish Safety and Chemicals Agency)). We also have **19 other bodies** (recognized by Tukes (Finnish Safety and Chemicals Agency)) that can do before first use and periodic inspections to IBCs. One of the IBC manufacturers (Finncont, you got their answer earlier) also have a status of inspection body (only inspections, not the approvals) and they do inspections for IBCs before first use, according ADR.

VTT is one of the inspection bodies and carries out the leakproofness test according to ADR 6.5.6.7, based on at 20 kPa air pressure (packing group I products 30 kPa) and at least 10 minutes. IBCs in Finland are tested according to ADR 6.5.6.7.

Manufacturers can perform inspections before first use to packagings, they have a quality assurance program (ADR 6.1.1.4), which is recognized and supervised by CA.

## Questions on leakproofness testing procedures

### Federal Institute for Materials Research and Testing (BAM), Berlin, Germany

1. Which testing procedures are used for the leakproofness test carried out on the below mentioned IBCs before their first use (e.g. test pressures, how long is the test pressure held, description of the test in the production line, if a statistical sample of IBCs is tested or all)?

- (a) Metal IBCs (steel, aluminum or other metal)

procedure: pressure differential test in combination with soap solution/ leak detection spray, test pressure: 20 kPa, test duration: 10 min, all IBCs are tested

- (b) Composite IBCs

note: the following is also valid for repaired composite IBCs procedure: pressure differential test on the completed IBC, sometimes discharge tap of the inner receptacle is tested in a water bath, test pressure: 5 - 10 kPa (completed IBC), about 20 kPa for inner receptacle, test duration: 30 - 60 s, all IBCs are tested

- (c) Rigid plastics IBCs

note: in most cases these are mobile gas stations (roto-moulded IBC with long production cycles) procedure: pressure differential test, test pressure: 20 kPa, test duration: 10 min, all IBCs are tested

2. Which testing procedures are used for the leakproofness test carried out on the below mentioned IBCs every two and a half years (the periodic inspection) (e.g. test pressures, how long is the test pressure held, is a statistical sample of IBCs tested or all)?

- (a) Metal IBCs (steel, aluminum or other metal)

procedure: pressure differential test with leak detection spray, test pressure: 20 kPa, test duration: 10 min, all IBCs are tested

- (b) Composite IBCs

Note: this is a rare case, most composite IBC will be repaired before 2 ½ years (inner receptacle exchanged) procedure: pressure differential test, discharge tap in water bath (10 kPa), test pressure: 10 - 20 kPa, test duration: 10 min, all IBCs are tested

- (c) Rigid plastics IBCs

note: in most cases these are mobile gas stations (roto-moulded IBC with long production cycles) procedure: pressure differential test, test pressure: 20 kPa, test duration: 10 min, all IBCs are tested

3. Which testing procedures are used for the leakproofness test carried out on the below mentioned packagings before their first use (e.g. test pressures, how long is the test pressure held, description of the test in the production line, if a statistical sample of packagings is tested or all)?

- (a) Metal packagings (steel, aluminum or other metal)

procedure: mainly pressure differential test, sometimes in combination with soap solution method, in some cases helium leak test, test pressure: about 5 kPa, test duration: 10 - 30 s, all packagings are tested

- (b) Plastics packagings

procedure: pressure differential test, test pressure: about 5 kPa, test duration: 10 - 30 s, all packagings are tested

4. Which testing procedures are used for the leakproofness test carried out on the below mentioned packagings after they have been reconditioned (e.g. test pressures, how long is the test pressure held, description of the test in the production line, is a statistical sample of packagings tested or all) ?

(a) Metal packagings (steel, aluminum or other metal)

procedure: in most cases bubble test in a water bath (90 °C) incl. closures, sometimes pressure differential test, test pressure: unknown for bubble test, 5 - 10 kPa for pressure differential test, test duration: about 30 s, all packagings are tested

(b) Plastics packagings

procedure: pressure differential test, test pressure: 5 - 10 kPa, test duration: about 60 s, all packagings are tested.

5. Who is authorized to perform leakproofness tests on packagings and IBCs? Which proficiency requirements (e.g. training, exam, accreditation, etc.) are in force in national legislation for the persons carrying out the tests in the below mentioned cases?

(a) before IBCs are first used

manufacturers and remanufacturers requirements: recognition of the quality assurance programme (valid for 3 years) issued by BAM, yearly third party monitoring by BAM or a BAM recognized monitoring body

(b) Every two and a half year for IBCs

1. BAM recognized (valid for 3 years, then reaudit) inspection bodies (tests and inspections according to ADR 6.5.4.4.1 a))
2. Test bodies (technical experts, authorized by the management of the company, technical education, experiences by practice or training courses, not monitored by BAM) (tests and inspections according to ADR 6.5.4.4.1 b))

(c) Before packagings are first used

manufacturers and remanufacturers requirements: recognition of the quality assurance programme (valid for 3 years) issued by BAM, yearly third party monitoring by BAM or a BAM recognized monitoring body

(d) Reconditioning of packagings

companies performing the reconditioning requirements: recognition of the quality assurance programme (valid for 3 years) issued by BAM, yearly third party monitoring by BAM or a BAM recognized monitoring body

(e) Repairing of IBCs (added by BAM)

companies performing the repair requirements: recognition of the quality assurance programme (valid for 3 years) issued by BAM, yearly third party monitoring by BAM or a BAM recognized monitoring body

## Questions on leakproofness testing procedures

### Norway (Directorate of civil protection (DSB))

1. Which testing procedures are used for the leakproofness test carried out on the below mentioned IBCs before their first use (e.g. test pressures, how long is the test pressure held, description of the test in the production line, if a statistical sample of IBCs is tested or all)?

- (a) Metal IBCs (steel, aluminum or other metal)

As stated in 6.5.6.7.3, during a period of at least 10 minutes using air pressure of not less than 0.2 bar. The air tightness of the IBC is determined by coating the seams and joints with a soap solution.

- (b) Composite IBCs Air-pressure differential test, test pressure of 0.02-0.03bar, 90 sec. Every IBC is tested.
- (c) Rigid plastics IBCs

2. Which testing procedures are used for the leakproofness test carried out on the below mentioned IBCs every two and a half years (the periodic inspection) (e.g. test pressures, how long is the test pressure held, is a statistical sample of IBCs tested or all)?

- (a) Metal IBCs (steel, aluminum or other metal)
- (b) Composite IBCs
- (c) Rigid plastics IBCs

To do the inspections (two and a half year and five year) the person need to be an approved IBC inspector. This certificate is given after passed IBC-control course. DSB has accepted NET (Nordisk Emballasje Testing), SP in Sweden and DGM in Sweden to run these courses. At NET all IBC controllers are told to take the leakproofness test according to 6.5.6.7.3.

3. Which testing procedures are used for the leakproofness test carried out on the below mentioned packagings before their first use (e.g. test pressures, how long is the test pressure held, description of the test in the production line, if a statistical sample of packagings is tested or all)?

- (a) Metal packagings (steel, aluminum or other metal)As far as we know as stated in 6.5.6.7.3, during a period of at least 10 minutes using air pressure of not less than 0.2 bar. The air tightness of the IBC is determined by coating the seams and joints with a soap solution.
- (b) Plastics packagings

4. Which testing procedures are used for the leakproofness test carried out on the below mentioned packagings after they have been reconditioned (e.g. test pressures, how long is the test pressure held, description of the test in the production line, is a statistical sample of packagings tested or all) ?

- (a) Metal packagings (steel, aluminum or other metal)
- (b) Plastics packagings

5. Who is authorized to perform leakproofness tests on packagings and IBCs? Which proficiency requirements (e.g. training, exam, accreditation, etc.) are in force in national legislation for the persons carrying out the tests in the below mentioned cases?

(a) Before IBCs are first used

In principal all with the IBC controller certificate. But the leakproofness test is taken at the manufacturing site. Not aware of internal requirements at each manufacture.

(b) Every two and a half year for IBCs Certified IBC controller.

(c) Before packagings are first usedd) reconditioning of packagings

Comment from Sweden: Norway submitted additional information to the draft, which has been included in the different tables in the initial pages above.

## Questions on leakproofness testing procedures

### Sweden

(information received from Swedish companies on current praxis)

1. Which testing procedures are used for the leakproofness test carried out on the below mentioned IBCs before their first use (e.g. test pressures, how long is the test pressure held, description of the test in the production line, if a statistical sample of IBCs is tested or all)?

(a) Metal IBCs (steel, aluminum or other metal)

Pressure differential test in combination with soap solution, test pressure: 20 kPa, test duration: 10 min, all IBCs are tested.

(b) Composite IBCs

Pressure differential test on the inner receptacle as well as completed IBC, test pressure: 2 - 3 kPa (inner receptacle and completed IBC), test duration: 60 - 90 s, all IBCs are tested.

Statistical sample test frequency 1 IBC per month, internal pressure (hydraulic) test with a pressure of 100 kPa, test duration: 10 min.

(c) rigid plastics IBCs

No information

2. Which testing procedures are used for the leakproofness test carried out on the below mentioned IBCs every two and a half years (the periodic inspection) (e.g. test pressures, how long is the test pressure held, is a statistical sample of IBCs tested or all)?

(a) Metal IBCs (steel, aluminum or other metal)

Pressure differential test in combination with soap solution, test pressure: 20 kPa, test duration: 10 min, all IBCs are tested.

(b) Composite IBCs

Pressure differential test pressure: 20 kPa test duration: 10-15 min, all IBCs are tested.

(c) Rigid plastics IBCs

No information

3. Which testing procedures are used for the leakproofness test carried out on the below mentioned packagings before their first use (e.g. test pressures, how long is the test pressure held, description of the test in the production line, if a statistical sample of packagings is tested or all)?

(a) Metal packagings (steel, aluminum or other metal)

Pressure differential test, test pressure: 5- 6 kPa, test duration: 10 s, all packagings are tested.

(b) Plastics packagings

Pressure differential test, test pressure: 5- 6 kPa, test duration: 10 s, all packagings are tested.

4. Which testing procedures are used for the leakproofness test carried out on the below mentioned packagings after they have been reconditioned (e.g. test pressures, how

long is the test pressure held, description of the test in the production line, is a statistical sample of packagings tested or all) ?

- (a) Metal packagings (steel, aluminum or other metal)

Pressure differential test, test pressure: 20- 30 kPa, test duration: 10 min, all packagings are tested.

- (b) Plastics packagings

No information

5. Who is authorized to perform leakproofness tests on packagings and IBCs? Which proficiency requirements (e.g. training, exam, accreditation, etc.) are in force in national legislation for the persons carrying out the tests in the below mentioned cases?

- (a) Before IBCs are first used

manufacturers

requirements: recognition of quality assurance program recognized by third party and yearly third party monitoring assurance program of the by a third party.

- (b) Every two and a half year for IBCs

Certified IBC inspectors

Requirements: Training and test by a trainer that is recognized by the Swedish Civil Contingencies Agency (Competent authority).

- (c) Before packagings are first used

manufacturers

requirements: recognition of quality assurance program recognized by third party and yearly third party monitoring assurance program of the by a third party.

- (d) Reconditioning of packagings

companies

requirements: recognition of quality assurance program recognized by third party and yearly third party monitoring assurance program of the by a third party.

## Questions on leakproofness testing procedures

### Switzerland - Federal Inspectorate of Dangerous Goods (EGI)

1. Which testing procedures are used for the leakproofness test carried out on the below mentioned IBCs before their first use (e.g. test pressures, how long is the test pressure held, description of the test in the production line, if a statistical sample of IBCs is tested or all)?

Before the first use:

- (a) Design type test: as described in the regulations
- (b) During the production: responsibility of the manufacturer → RID/ADR:

#### 6.5.2.3 *Conformity to design type*

The marking indicates that IBCs correspond to a successfully tested design type and that the requirements referred to in the certificate have been met.

The manufacturer has to perform appropriate tests during the production to assure that each IBC fulfills the requirements in the regulations.

By affixing the marking the manufacturer declares the conformity.

- (a) Metal IBCs (steel, aluminum or other metal)
- (b) Composite IBCs
- (c) Rigid plastics IBCs

All IBCs have to be tested before the first use.

It's the same procedure for each design type (metal, composite, ...).

2. Which testing procedures are used for the leakproofness test carried out on the below mentioned IBCs every two and a half years (the periodic inspection) (e.g. test pressures, how long is the test pressure held, is a statistical sample of IBCs tested or all)?

- (a) Metal IBCs (steel, aluminum or other metal)
- (b) Composite IBCs
- (c) Rigid plastics IBCs

All IBCs have to be tested.

Test pressure is 0,2 bar, test time is at least 10 minutes

It's the same procedure for each design type (metal, composite, ...).

3. Which testing procedures are used for the leakproofness test carried out on the below mentioned packagings before their first use (e.g. test pressures, how long is the test pressure held, description of the test in the production line, if a statistical sample of packagings is tested or all)?

Before the first use:

- (a) Design type test: as described in the regulations
- (b) During the production: responsibility of the manufacturer → RID/ADR:

**6.1.3.14** *Certification*

By affixing marking in accordance with 6.1.3.1, it is certified that mass-produced packagings correspond to the approved design type and that the requirements referred to in the approval have been met.

The manufacturer has to perform appropriate tests during the production to assure that each packaging fulfills the requirements in the regulations.

By affixing the marking the manufacturer declares the conformity.

- (a) Metal packagings (steel, aluminum or other metal)
- (b) Plastics packagings

All packagings have to be tested during the production.

It's the same procedure for each design type.

4. Which testing procedures are used for the leakproofness test carried out on the below mentioned packagings after they have been reconditioned (e.g. test pressures, how long is the test pressure held, description of the test in the production line, is a statistical sample of packagings tested or all) ?

- (a) Metal packagings (steel, aluminum or other metal)
- (b) Plastics packagings

Before the first use:

- 1. As described in the regulations
- 2. Responsibility of the manufacturer → RID/ADR 6.1.3.8

- (j) The year of reconditioning; the letter "R"; and, for every packaging successfully passing the leakproofness test in 6.1.1.3, the additional letter "L".

6.1.1.3 Every packaging intended to contain liquids shall successfully undergo a suitable leakproofness test, and be capable of meeting the appropriate test level indicated in 6.1.5.4.3:

- (a) Before it is first used for carriage;
- (b) After remanufacturing or reconditioning, before it is re-used for carriage;

It's the same procedure for each design type (metal, plastics).

5. Who is authorized to perform leakproofness tests on packagings and IBCs? Which proficiency requirements (e.g. training, exam, accreditation, etc.) are in force in national legislation for the persons carrying out the tests in the below mentioned cases?

- (a) Before IBCs are first used

Design type tests: accredited test laboratories.

Inspections: At the moment only

- EGI or
- by the EGI authorized inspection bodies.

(First inspection according to RID/ADR 6.5.4.4.1 a))

Because of the small number of produced IBCs in Switzerland it is possible to perform the tests with all IBCs.

(b) Every two and a half year for IBCs

At the moment only

- EGI or
- by the EGI authorized inspection bodies.

(c) Before packagings are first used

Design type tests: accredited test laboratories.

Production: manufacturer.

(d) Reconditioning of packagings

Design type tests: accredited test laboratories.

Production: manufacturer.

Training:

EGI:

- specialists, qualified as inspectors
- ongoing internal training
- external training with certification

by the EGI authorized inspection bodies:

- specialists, qualified by EGI-trainings

Comment from Sweden: Switzerland submitted additional information to the draft, which has been included in the different tables in the initial pages above.

## Questions on leakproofness testing procedures

### United Kingdom (Department for Transport)

1. Which testing procedures are used for the leakproofness test carried out on the below mentioned IBCs before their first use (e.g. test pressures, how long is the test pressure held, description of the test in the production line, if a statistical sample of IBCs is tested or all)?

(a) Metal IBCs (steel, aluminum or other metal)

(b) Composite IBCs

(c) Rigid plastics IBCs

We do not have a breakdown by these types of IBC. Statistical sampling for new manufacture testing is not permitted. Each manufacturer uses an appropriate test method, applied pressures and durations vary according to method used and properties of packaging

2. Which testing procedures are used for the leakproofness test carried out on the below mentioned IBCs every two and a half years (the periodic inspection) (e.g. test pressures, how long is the test pressure held, is a statistical sample of IBCs tested or all)?

(a) Metal IBCs (steel, aluminum or other metal).

(b) Composite IBCs

(c) Rigid plastics IBCs

UK policy is that all IBCs are pressure tested at the required intervals. Details of the methods of testing and duration of tests are not available. A detailed explanation is given at the end.

3. Which testing procedures are used for the leakproofness test carried out on the below mentioned packagings before their first use (e.g. test pressures, how long is the test pressure held, description of the test in the production line, if a statistical sample of packagings is tested or all)?

(a) Metal packagings (steel, aluminum or other metal)

(b) Plastics packagings

We do not have a breakdown by these types of drums and jerricans. Statistical sampling for new manufacture testing is not permitted. Each manufacturer uses an appropriate test method, applied pressures and durations vary according to method used and properties of packaging

4. Which testing procedures are used for the leakproofness test carried out on the below mentioned packagings after they have been reconditioned (e.g. test pressures, how long is the test pressure held, description of the test in the production line, is a statistical sample of packagings tested or all) ?

(a) Metal packagings (steel, aluminum or other metal)

(b) Plastics packagings

All reconditioned drums for dangerous goods are leak tested. Most steel drums are Ultrasound tested (which includes a pressure drop element). The pressure applied and duration varies from company to company. A 0.4mm hole must be detected. Plastics are generally water bath tested.

5. Who is authorized to perform leakproofness tests on packagings and IBCs? Which proficiency requirements (e.g. training, exam, accreditation, etc.) are in force in national legislation for the persons carrying out the tests in the below mentioned cases?

- (a) Before IBCs are first used
- (b) Every two and a half year for IBCs
- (c) Before packagings are first used
- (d) Reconditioning of packagings

No specific authorisations are given for any of these. All new IBCs and package manufacturers are required to work to an audited quality scheme such as ISO9000. The quality programme will include details of leak equipment, process and authorised operators and will include records of appropriate training. Reconditioners are subject to separate annual audit by VCA on behalf of DfT

No requirements or restrictions are placed on the 2 ½ year test for IBCs. Those undertaking the work have to produce the inspection and test report and are identified as in the report as the responsible party. Only those prepared to take the responsibility will do the work.

In addition to the above there is a requirement for full testing and inspection after an IBC is repaired. In many instances such a repair will be done by the owner of an IBC and then they would test to confirm the repair had been properly done. The UK hold the view that if such parties are competent to do the testing after a repair then they couldn't be deemed incompetent to do the periodic tests if they so wished and the UK had no intention of making every owner who might repair or leak test an IBC register.

Back in 2008 the VCA on behalf of the DfT undertook a survey of leak testing in the UK. The following paragraphs have been extracted from the report:

The majority of production line leak test equipment in use is of the automatic or semi-automatic pressure decay type. Most are purpose built units, supplied by one of four manufacturers who appear to specialise in such equipment. The remainder are either in-house designs or adapted from other equipment.

Two manufacturers use a total immersion (water bath) system similar to the design-type test. Three manufacturing sites use Helium leak detectors, which could be demonstrated to detect holes as small as 25 micron.

Five metal drum manufacturing sites use a soap solution as the sole means of leak detection; one applies solution over the entire surface of the drum under test but the remainder apply it to the side seam and only part of each end seam (the so-called 'T test').

### **Pressure and duration**

The applied pressure varied from 3 to 150 kPa, with the majority falling within the range of 20 - 40 kPa. The duration under pressure ranged from two seconds to three minutes.

As a rule, larger packagings were pressurised to a higher level and for longer than smaller ones but there was no consistent relationship between these parameters and there were a number of notable exceptions.

As a result of the 2008 survey the VCA issued a guidance note on this topic which can be viewed on the following link: <http://www.dft.gov.uk/vca/additional/files/dangerous-goods/newsletters/production-leak-testing-of-un-certified-packaging.pdf>

## USA

Comment from Sweden: Mail response 30 August, before survey was sent out from Sweden. The U.S. submitted additional information to the draft, which has been included in the different tables in the initial pages above.

In response to 2013/11 below is the PHMSA understanding of current industry practice for conducting leakproofness testing com rigid plastic and composite IBCs. I propose sending this information to Sweden so that they have our input for their December paper.

### Introduction

During the June 2013 session the UN Sub-committee of Experts on the Transport of Dangerous Goods discussed the inspection and testing of intermediate bulk containers (IBCs) in accordance with paragraph 6.1.1.3 and 6.5.4.4. This discussion showed that the procedures authorized by different countries for carrying out the leakproofness testing on design types and during the manufacturing IBCs and for the 2.5 year periodic inspection of IBCs varied considerably. Following this discussion, the expert from Sweden agreed to collect information on current leakproofness testing practices from individual countries and industries. Sweden would then present this information at the next session.

### U.S. Requirements

The U.S. hazardous materials regulations require leakproofness testing of IBCs through the provisions of 49 C.F.R. 178.813. In part § 178.813 requires the leakproofness test to be conducted for the qualification of all IBC design types and on all production units intended to contain solids that are loaded or discharged under pressure or intended to contain liquids. The leakproofness test must be carried out for a suitable length of time using air at a gauge pressure of not less than 20 kPa (2.9 psig). Leakproofness of IBC design types must be determined by coating the seams and joints with a heavy oil, a soap solution and water, or other methods suitable for the purpose of detecting leaks. Other methods, if at least equally effective, may be used in accordance with appendix B of part 178, or if approved by the Associate Administrator for hazardous materials safety.

### U.S. Practices

In the U.S., leakproofness testing on intermediate bulk containers may be carried out using a variety of methods. The most common method for production leakproofness testing of composite IBCs utilized in the U.S. is pressure differential using air as the test medium. Fully automated systems have been adopted in order to save labor. The test is conducted prior to mating with the cage to prevent framework deformation. The system pressurizing the IBCs to 20 kPa for a test duration of generally less than 15 seconds. A pressure transducer feeds data to the program logic control for determination of pressure loss that would be indicative of a leak. Pressure differential is accepted by PHMSA has one option for effective leakproofness testing.

For production testing of new rigid IBCs, periodic inspection of rigid and composite IBCs, and qualification and periodic qualification testing of both designs, soap over seams or partial soap over seams is the preferred method for industry in the U.S. For production testing of new rigid IBCs, the test duration is the same as for new composite IBCs. The IBC is pressurized to 20 kPa then the parting seams and fill and discharge valves are coated with solution. The test operator examines the unit for bubbles to identify any leaks. For

partial soap over seams, the unit is restrained so that the discharge valve is under water. The test duration for periodic inspection and qualification testing in the U.S. is typically 5 to 10 minutes at most.

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