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Committee of Experts on the Transport of Dangerous Goods and on the Globally Harmonized System of Classification and Labelling of Chemicals

Sub-Committee of Experts on the Transport of Dangerous Goods

Thirty-seventh session
Geneva, 21–30 June 2010
Item 5 of the provisional agenda
Miscellaneous proposals of amendments to the Model Regulations on the Transport of Dangerous Goods

Possible use of flexible bulk containers (FBCs) for the transport of dangerous goods

Transmitted by the International Dangerous Goods and Containers Association (IDGCA)[1]

Introduction

1. At the thirty-first and thirty-fifth sessions of the Sub-Committee, IDGCA informed the Sub-Committee of the successful exploitation of the MK-14-10 flexible bulk container (FBC) for many years (ST/SG/AC.10/C.3/2007/31 and ST/SG/AC.10/C.3/2009/27). IDGCA proposed to revise section 1.2.1 of the Model Regulations with the purpose of increasing the maximum allowed capacity of Intermediate Bulk Containers (IBCs) to more than 3 m^3 (3000 litres) for dry solids of packing group III.

2. Most experts considered that such big bags should not be treated as IBCs and recommended the development of a comprehensive proposal, e.g. inclusion of a new type of bulk containers (FBC), that could be named BK3, with appropriate provisions in section 1.2.1 and chapters 3.2, 4.3 and 6.8 of the Model Regulations (see also ST/SG/AC.10/C.3/62, paras 66-68 and ST/SG/AC.10/C.3/70, paras 50-52).

3. At the thirty-sixth session, documents ST/SG/AC.10/C.3/2009/51 and informal documents INF.3 and INF.39 were presented. Some experts gave a positive assessment of the work and supported the idea to include the results into the standard procedures. But at

[1] In accordance with the programme of work of the Sub-Committee for 2009-2010 approved by the Committee at its fourth session (refer to ST/SG/AC.10/C.3/68 para. 118(b) and ST/SG/AC.10/36, para. 14).

the same time they mentioned the necessity to limit the upper FBC ceiling, to systematize terminology, and to clarify FBC stability issues. Delegations were urged to provide written comments to the IDGCA representative so that he could submit a new proposal that would be discussed at the beginning of the next session, so as to make it possible for a lunchtime working group to enter into detailed discussions during the session (see ST/SG/AC.10/C.3/72, paras 63-65).

4. The use of FBCs solves both environmental and economic problems as it eliminates the need of expensive utilization of flexible IBCs (primarily with the capacity of 1000 kg) that are disposed of after each shipment of dangerous goods. FBCs provides for multimodal transport of dangerous goods without spills and soaking in hard climatic conditions. FBC service life is 5-6 years.

5. FBC capacity and correspondingly its freightage predetermine environmental and economic feasibility of bulk dangerous goods transport. Thus, for instance FBCs are used for transport of various materials, with bulk density of 600-2500 kg/m^3. Railway car capacity is fully used when these cars are exploited for transport of FBCs filled with goods the bulk density of which is over 1000 kg/m^3. However, the weight of completely filled FBCs for transport of goods with a bulk density significantly less than 1000 kg/m^3 is unfeasibly small as compared to the established FBC capacity leading to incomplete railway car loading and consequently to economic losses.

6. In this context an increase in FBC volume with preservation of their maximum permissible gross mass up to 14000kg is an acute issue. A solution to this issue would facilitate reduction of empty car runs, increase of cargo traffic and decrease of the time required for dangerous goods transport including their utilization. Moreover an increase in FBCs volume would facilitate reduction of vessel downtime during FBC loading and unloading, and compact FBC stockpiling in the port and on berth.

7. FBCs have the following volumes:

- 3-12 m^3 for dry solids, packing group III;
- 3-10 m^3 for dry solids, packing group II.

8. FBCs manufactured in the Russian Federation by CJSC New Technology in Transportation (MK-14-10) are designed for transport and temporary storage of bulk dangerous goods, packing group III and have the safety factor of 8:1. FBCs may be used for transport both of hydrophobic and non-hydrophobic bulk dangerous goods, as well as non-hazardous goods. FBCs are containers for multimodal transport, they are transported by rail, road, sea and inland waterways. FBCs are used for repeated transport in road motor vehicles of bulk solids in mass and industrial volumes.

9. The construction of waterproof FBCs made of textile with two-sided rubber cover promotes safety and effective transport. The composition of the textile cover provides dependability and longevity of the construction giving it a resistance to abrasion, punctures, ozone, acids, alkalis, low and high temperatures, eliminating the accumulation of static electricity. The MK-14-10 FBCs have been operated accident free in the Russian Federation and neighbouring countries for many years. There are often used for multimodal transport of sulphur (class 4.1, UN 1350,), coal-pitch (class 9, UN 3077), ammonium nitrate (class 5.1, UN 1942), ammonium nitrate based fertilizers (class 5.1, UN 2067) and other cargoes.

Proposal

10. According to the recommendations made by the Sub-Committee, IDGCA proposes to allow a new type of bulk containers named BK3 which can be used among other things for the transport of dangerous goods, with appropriate provisions in section 1.2.1 and chapters 3.2, 4.3 and 6.8 of the Model Regulations. The following amendments are proposed.

11. In Chapter 1.2, section 1.2.1 "Definitions", at the end of definition of “bulk container” add: "and flexible bulk containers (FBCs)".

12. Add a code “BK3” similar to «BK1» code for the following UN numbers in column 10 of the dangerous goods list of Chapter 3.2.

UN No.	Name and description	Class or division	UN packing group
1	2	3	4
1334	NAPHTALENE, CRUDE or NAPHTALENE, REFINED	4.1	III
1350	SULPHUR	4.1	III
1454	CALCIUM NITRATE	5.1	III
1474	MAGNESIUM NITRATE	5.1	III
1486	POTASSIUM NITRATE	5.1	III
1498	SODIUM NITRATE	5.1	III
1499	SODIM NITRATE AND POTASSIUM NITRATE MIXTURE	5.1	III
1942	AMMONIUM NITRATE, with not more than 0.2% total combustible material, including any organic substance, calculated as carbon to the exclusion of any other added substances	5.1	III
2067	AMMONIUM NITRATE BASED FERTILIZER	5.1	III
2213	PARAFORMALDEHYDE	4.1	III
3377	SODIUM PERBORATE MONOHYRATE	5.1	III
3378	SODIUM CARBONATE PEROXYHYDRATE	5.1	III

13. Add a code “BK3” similar to «BK2» code for the following UN numbers in column 10 of the dangerous goods list of Chapter 3.2.

UN No.	Name and description	Class or division	UN packing group
1	2	3	4
1408	FERROSILICON with 30% or more but less than 90% silicon	4.3	III
2969	CASTOR BEANS or CASTOR MEAL or CASTOR POMANCE or CASTOR FLAKE	9	II
3077	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S.	9	III

14. In Chapter 4.3 (Use of bulk containers), 4.3.1.1, insert the following, after the description of the meaning of BK1 and BK2:

"BK3: the transport in flexible bulk containers is permitted".

15. In Chapter 4.3, add a new 4.3.1.16 to read:

"4.3.1.16 Before a flexible bulk container is filled it shall be visually examined to ensure it is structurally serviceable, its textile slings, load-bearing structure straps, body fabric, lock device parts including metal and textile parts are free from protrusions or damages and that any inner liners or substance retaining equipment are free from rips, tears or any damage that would compromise its cargo retention capabilities. Major defects include:

(a) Rupture of the handling slings and the handling device textile strap;

(b) Ruptures of the body rubberized cloth, the body waterproof failure; or

(c) Locking arms operation failure.".

16. Amend 4.3.2.2 to read as follows:

"4.3.2.2 Bulk goods of Division 4.3

Closed bulk containers (code BK2) ***and flexible bulk containers (code BK3)*** may be used. These goods shall be transported in bulk containers which are waterproof.".

17. In section 6.8.1, add the following definition:

"Flexible bulk container means a waterproof, sealed container for bulk cargoes with a capacity of 3-12 m^3 and with a soft body, handling devices and service equipment including a loading sleeve being locked by folding and a discharging sleeve with two contours preventing inadvertent discharging.

18. In the table of 6.8.2.3, add the following line:

"Flexible bulk container BK3".

19. Add a new paragraph 6.8.3.3.3 to read:

"6.8.3.3.3 Flexible bulk containers shall be manufactured and tested under a quality assurance programme which satisfies the competent authority, in order to ensure that each manufactured flexible bulk container meets the requirements of this Chapter.".

20. At the end of the title of section 6.8.4.1, add "***and flexible bulk containers (FBCs)***".

21. Add a new section 6.8.5 to read as follows:

"6.8.5 Requirements for the design, construction, inspection and testing of flexible bulk containers.

6.8.5.1 Design and construction requirements.

6.8.5.1.1 Flexible bulk containers shall be waterproof.

6.8.5.1.2 Flexible bulk containers shall be provided with sufficient ventilation to preclude dangerous accumulation of flammable, corrosive or toxic gaseous emissions.

6.8.5.1.3 Flexible bulk containers shall be capable of being completely closed to prevent the release of contents as well as the penetration of rain and water under normal conditions of transport.

6.8.5.1.4 Flexible bulk containers shall be sift proof.

6.8.5.1.5 When liners are used in flexible bulk containers, they shall be of a material and design that corresponds to the flexible bulk container's capacity and intended application.

6.8.5.1.6 Flexible bulk containers shall be fitted with a handling device in the form of lifting straps (slings) integral to the strength of the body of the container.

6.8.5.1.7 Flexible bulk containers structure should be adapted for the safety coefficient periodic inspection performance possibility without its integrity and strength failure. Handling slings FBC structure should provided with the backup patch details taking an active part in the FBC operation, should be used during testing and can be cut out in case of safety coefficient periodic inspection, at the same moment the detectors cutting should not lead to the safety coefficient decrease because of this.

6.8.5.2 Service equipment and handling device.

6.8.5.2.1 Filling and discharge devices shall be so constructed as to be protected against damage during transport and handling. The filling and discharge devices shall be capable of being secured against unintended opening.

6.8.5.2.2 Slings of the flexible bulk container, if fitted, should withstand pressure and dynamic forces which can appear in normal conditions of handling and transportation.

6.8.5.2.3 The handling devices shall be strong enough to withstand repeated use.

6.8.5.3 Inspection and testing.

6.8.5.3.1 Each flexible bulk container design type shall successfully pass the tests prescribed in this Chapter before being used. Each design type shall be retested at least once in 5 years.

6.8.5.3.2 Tests shall also be repeated after each modification which alters the design, material or manner of construction of a flexible bulk container.

6.8.5.3.3 Each flexible bulk container shall be inspected for waterproofing once every 1.5 years in accordance with 6.8.5.3.11. Skeleton grid straps shall be checked once every 3 years in accordance with 6.8.5.3.12.

6.8.5.3.4 Tests shall be carried out on flexible bulk containers prepared as for transport. Flexible bulk containers shall be filled to the maximum mass at which they may be used and the contents shall be evenly distributed. The substances to be transported in the flexible bulk container may be replaced by other substances except where this would invalidate the results of the tests. When another substance is used it shall have the same physical characteristics (mass, grain size, etc.) as the substance to be carried. It is permissible to use additives, such as bags of lead shot, to achieve the requisite total package mass, so long as they are placed so that the test results are not affected.

6.8.5.3.5 Drop test

6.8.5.3.5.1 Applicability
For all types of flexible bulk containers, as a design type test.

6.8.5.3.5.2 Preparation for testing
The flexible bulk container shall be filled to its maximum permissible gross mass.

6.8.5.3.5.3 The flexible bulk container shall be dropped onto a rigid, non-resilient, smooth, flat and horizontal surface. Following the drop, the flexible bulk container shall be restored to the upright position for observation.

6.8.5.3.5.4 Drop heights are as follows:

Packing Group II: 1.2 m

Packing Group III: 0.8 m

6.8.5.3.5.5 Criteria for passing the test: There shall be no damage which renders the flexible bulk container unsafe to be transported for salvage or for disposal, and no loss of contents.”

6.8.5.3.6 Top lift test

6.8.5.3.6.1 Applicability
For all types of flexible bulk containers as a design type test.

6.8.5.3.6.2 Preparation for testing
FBCs shall be filled to six times the maximum net mass, the load being evenly distributed.

6.8.5.3.6.3 A flexible bulk container shall be lifted in the manner for which it is designed until clear of the floor and maintained in that position for a period of five minutes.

6.8.5.3.6.4 Other equally effective methods of top lift testing and preparation may be used with approval of the Competent Authority.

6.8.5.3.6.5 Criteria for passing the test: There shall be no permanent damage which renders the flexible bulk container unsafe for transport, and no loss of contents.

6.8.5.3.7 Topple test

6.8.5.3.7.1 Applicability

For all types of flexible bulk containers as a design type test.

6.8.5.3.7.2 Preparation of the FBCs for test
The flexible bulk container shall be filled to its maximum permissible gross mass.

6.8.5.3.7.3 Flexible bulk container shall be toppled onto any part of its top upon a rigid, non-resilient, smooth, flat, and horizontal surface.

6.8.5.3.7.4 For all flexible bulk containers, the topple height is specified as follows:

Packing Group II: 1.2 m

Packing Group III: 0.8 m

6.8.5.3.7.5 Criteria for passing the test: There shall be no loss of contents. A slight discharge (e.g., from closures or stitch holes) upon impact is not considered to be a failure, provided no further leakage occurs.

6.8.5.3.8 Righting test

6.8.5.3.8.1 Applicability
For all types of flexible bulk containers designed to be lifted from the top or side, as a design type test.

.5.3.8.2 Preparation for testing
The flexible bulk container shall be filled to its maximum permissible gross mass.

6.8.5.3.8.3 The flexible bulk container, lying on its side, shall be lifted at a speed of at least 0.1 m/s to an upright position, clear of the floor, by a half of provided lifting devices.

6.8.5.3.8.4 Criteria for passing the test: There shall be no damage to the flexible bulk container or its lifting devices which renders the flexible bulk container unsafe for transport or handling.

6.8.5.3.9 Tear test

6.8.5.3.9.1 Applicability
For all types of flexible bulk containers as a design type test.

6.8.5.3.9.2 Preparation for testing
The flexible bulk container shall be filled to its maximum permissible gross mass.

6.8.5.3.9.3 With the flexible bulk container placed on the ground, a 100-mm cut, completely penetrating the wall of a wide face, is made at a 45^{o} angle to the principal axis of the flexible bulk containers, halfway between the bottom surface and the top level of the contents. The flexible bulk containers shall then be subjected to a uniformly distributed superimposed load equivalent to twice the maximum net mass of the package. The load must be applied for at least five minutes. An flexible bulk container which is designed to be lifted from the top or the side shall, after removal of the superimposed load, be lifted clear of the floor and maintained in that position for a period of five minutes.

6.8.5.3.9.4 Criterion for passing the test: The cut shall not propagate more than 25 percent of its original length.

6.8.5.3.10 Stacking test

6.8.5.3.10.1 Applicability
For all types of flexible bulk containers as a design type test.

6.8.5.3.10.2 Preparation for testing

The flexible bulk container shall be filled to its maximum permissible gross mass.

6.8.5.3.10.3 The flexible bulk container shall be subjected to a force applied to the top surface of the flexible bulk container that is four times the design load-carrying capacity for 24 hours.

6.8.5.3.10.4 Criterion for passing the test: There shall be no loss of contents during the test or after removal of the load.

6.8.5.3.11 Waterproofness (Weatherproofness) test

6.8.5.3.11.1 Applicability
For all flexible bulk containers types as a design type test and for periodic testing required by 6.8.5.3.5.

6.8.5.3.11.2 FBC shall be filled with air to 100 kPa

6.8.5.3.11.3 A water jet is discharged from a nozzle (ID 12.5 mm) to all FBC outside welds and grooves, its pressure being approximately 100 kPa. The tip is kept 1.5 m away from the container being tested, and the water jet is moved with 100 mm/ s.

6.8.5.3.11.4 Criterion for passing the test: There shall be no water spots on the internal surface.

6.8.5.3.12 Safety coefficient test

6.8.5.3.12.1 Applicability
For all flexible container types as a test for periodic inspection of used flexible bulk containers

6.8.5.3.12.2 The flexible bulk container shall be disassembled and cleaned

6.8.5.3.12.3 30mm sections of load-bearing straps shall be cut out in three points equally spaced along its circumference. The residual tearing strength of the strap is determined using the tensile-testing machine. The residual tearing strength of the strap is compared to its minimal acceptable value written in the FBC passport.

The minimal acceptable value shall be pre-defined by calculations for each FBC type based on the strength of 6:1.

6.8.5.3.12.4 Criterion for passing the test: The average statistical value of the tearing strength of the strap shall exceed its minimal acceptable value.

6.8.5.3.12.5 Other equally effective methods of safety coefficient testing and preparation may be used with approval of the Competent Authority.

6.8.5.4 Test report

6.8.5.4.1 A test report containing at least the following particulars shall be drawn up and shall be available to the users of the flexible bulk container:

1. Name and address of the test facility;
2. Name and address of applicant (where appropriate);
3. A unique test report identification;
4. Date of the test report;
5. Manufacturer of the flexible bulk container;

6. Description of the flexible bulk container design type (e.g. dimensions, materials, closures, thickness, etc) and/or photograph(s);

7. Maximum capacity/maximum permissible gross mass;

8. Characteristics of test contents, e.g. particle size for solids;

9. Test descriptions and results;

10. The test report shall be signed with the name and status of the signatory.

6.8.5.4.2 The test report shall contain statements that the flexible bulk container prepared as for transport was tested in accordance with the appropriate provisions of this Chapter and that the use of other packaging methods or components may render it invalid. A copy of the test report shall be available to the competent authority.

6.8.5.5 Marking

6.8.5.5.1 Each flexible bulk container manufactured and intended for use according to these Regulations shall bear markings which are durable, legible and placed in a location so as to be readily visible. Letters, numerals and symbols shall be at least 24 mm high and shall show:

(a) The United Nations packaging symbol 

This symbol shall not be used for any purpose other than certifying that a packaging, flexible bulk container, a portable tank or a MEGC complies with the relevant requirements in Chapter 6.1, 6.2, 6.3, 6.5, 6.6, 6.7 or 6.8 ;

(b) The code BK3;

(c) A capital letter designating the packing group(s) for which the design type has been approved:

(i) Y for packing groups II and III;

(ii) Z for packing group III only;

(d) The month and year (last two digits) of manufacture;

(e) The State authorizing the allocation of the mark; indicated by the distinguishing sign for motor vehicles in international traffic;

(f) The name or symbol of the manufacturer and other identification of the FBC as specified by the competent authority;

(g) The maximum permissible gross mass in kg.

Marking shall be applied in the sequence shown in (a) to (g); each element of the marking required in these subparagraphs, shall be clearly separated, e.g. by a slash or space and presented in a way that ensures that all of the parts of the mark may be easily identified.

6.8.5.5.2 Example of marking

BK3/Z/11 09

RUS/NTT/MK-14-10

42000/14000