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**COMMITTEE OF EXPERTS ON THE  
TRANSPORT OF DANGEROUS GOODS**  
**Sub-Committee of Experts on the**  
**Transport of Dangerous Goods**  
**(Seventeenth session,**  
**Geneva, 6-17 December 1999,**  
**agenda item 3 (c))**

**TRANSPORT IN BULK IN PORTABLE TANKS AND FREIGHT CONTAINERS**

**New provisions for the transport of solid substances in bulk in freight containers**

**Amendment to 1.2.1, 4.3 and 6.8**

**Transmitted by the expert from Germany**

**1. INTRODUCTION**

At the twentieth meeting of the Committee of Experts on the Transport of Dangerous Goods, the expert from Germany announced that he would transmit a proposal for the transport of solids and articles in bulk containers to be included in the UN Model Regulations for the transport of dangerous goods (see ST/SG/AC.10/25, page 29, para. 141(e)). Accordingly, an item in this respect was put on the agenda for the work on the UN Recommendations for the years 1999/2000.

At the sixteenth session of the Sub-Committee of Experts on the Transport of Dangerous Goods (Geneva, 5 – 14 July 1999), the expert from Germany said that he would transmit this proposal for the seventeenth session of the Sub-Committee of Experts on the Transport of Dangerous Goods scheduled to take place in December 1999 (see ST/SG/AC.10/C.3/1999/CRP.1/Add.1, page 2, paras. 21 and 22).

**2. GENERAL**

No regulations for the transport of solid dangerous goods in bulk have so far been included in the UN Recommendations. Although the European regulations which are applicable to inland modes of transport (ADR/RID) include relevant provisions, these do not, in the opinion of Germany, take sufficiently into consideration the transport needs and current knowledge of safety.

If we leave aside the regulations for the transport of dangerous goods in bulk by sea, provisions for the carriage of certain dangerous goods in bulk relating only to individual cases are included in the European regulations for inland modes. Only few technical requirements have been laid down in this connection.

Owing to new production processes, but also for reasons of waste management, it has become necessary to develop a concept both with regard to the substances which are suitable for this method of carriage and, in particular, also with regard to the technical requirements for special bulk containers.

Germany, therefore, suggests developing multimodal regulations for the transport of dangerous goods in bulk containers for incorporation into the UN Recommendations.

### **3. PROPOSALS**

3.1 A proposal taking into account the structure of the UN Recommendations is attached to this document as Annex 1. The proposed amendments or additions relate to the following chapters and sections:

#### **1.2.1 Definitions**

4.3 Carriage of dangerous goods in bulk,

4.3.1 General provisions,

4.3.2 General provisions for the use of bulk containers,

4.3.3 Provisions for the individual classes,

4.3.4 Provisions for bulk goods of classes 4.1, 4.3, 5.1, 6.1, 8 and 9,

4.3.5 Special provisions for substances of class 4.2,

4.3.6 Special provisions for substances of class 7;

6.8 Requirements for the design, construction, testing and certification of bulk containers,

6.8.1 Application and general provisions,

6.8.2 Requirements for the design, construction, testing and certification of bulk containers,

6.8.3 General construction requirements,

6.8.4 Service equipment,

6.8.5 Design type test,

6.8.6 Certification,

6.8.7 Initial and periodic testing,

6.8.8 Marking.

3.2 Annex 2 to this document shows, as an example from the dangerous goods list: of chapter 3.2, a number of substances or articles which may be carried in bulk in bulk containers. The approved types of bulk container are indicated in a new column 12. The substances which may not be carried in bulk are marked with the symbol "-".

Germany is prepared to transmit a complete list of substances after the proposal has been accepted.

## **Annex 1**

### **1.2.1 Definitions**

*Bulk goods* are solid dangerous goods (substances and articles) including empty uncleaned packagings and intermediate bulk containers (IBCs) which are in direct contact with the inner wall of a bulk container.

The transport of solids in tank containers in accordance with part 4, chapter 4.2 shall not be considered to be transport in bulk.

*Bulk containers* are multimodal containers, other than packagings, intermediate bulk containers (IBCs) and large packagings, intended for the shipment of dangerous goods in bulk, that are:

- (a) of a permanent character and accordingly strong enough to be suitable for repeated use;
- (b) specially designed to facilitate the carriage of goods by one or more means of transport without breakage of load;
- (c) fitted with devices permitting its ready handling, particularly when being transloaded from one means of transport to another;
- (d) so designed as to be easy to fill and empty, and
- (e) have a capacity of not less than 3 m<sup>3</sup>.

Bulk containers are e. g.:

Roller containers, trough-shaped containers, swap bodies, CSC containers.

## **4.3 Transport of dangerous goods in bulk**

### **4.3.1 General provisions**

- 4.3.1.1 This section contains general provisions applicable to the carriage of dangerous goods of classes 4.1 (with the exception of self-reactive substances and explosive substances in non-explosive state), 4.2, 4.3, 5.1, 6.1, 7, 8 and 9 in bulk. In addition, the general provisions for the use of bulk containers, the operating requirements and the requirements for the design, construction, equipment, testing and certification in accordance with chapter 6.8 shall be complied with. The dangerous goods in the above classes included in the list of dangerous goods may be transported in the bulk containers shown in column 12 and described in chapter 6.8 (codes B1 to B4).

- 4.3.1.2 Bulk containers shall be so closed as to prevent any leakage of contents from a bulk container prepared for transport such as might be caused in normal conditions of carriage, particularly by vibration, changes in temperature, humidity or pressure.
- 4.3.1.3 Bulk goods shall be so loaded into bulk containers as not to be liable to change their position in a dangerous manner in normal conditions of transport.
- 4.3.1.4 Bulk containers which have to be vented shall be so equipped as to ensure sufficient ventilation.
- 4.3.1.5 In the case of hygroscopic substances and substances having a melting point below 45 °C, appropriate measures shall be taken to ensure that there will be no leakage of liquefied substances from the bulk.

#### **4.3.2 General provisions for the use of bulk containers**

- 4.3.2.1 Bulk containers may only be filled with dangerous goods for which they have been approved. Bulk goods shall not react dangerously with the material of the bulk container, gaskets, equipment including lids and tarpaulins and with protective coatings which are in contact with the contents to form hazardous products or significantly weaken them.
- 4.3.2.2 Before being filled and offered for transport, each bulk shall be inspected to ensure that they are free from any deficiencies liable to affect their use.
- 4.3.2.3 Transport, loading or discharge of bulk containers under pressure is not allowed.
- 4.3.2.4 During transport, no dangerous substances shall adhere to the outer surfaces of bulk containers.
- 4.3.2.5 If several closing systems are fitted in series, the system which is located nearest to the substance to be carried shall be closed first before filling.
- 4.3.2.6 During transport, empty uncleaned bulk containers shall be as tightly closed as bulk containers which have been filled.
- 4.3.2.7 If bulk containers are used for the carriage of bulk goods liable to cause a dust explosion, measures shall be taken to prevent dangerous electrostatic discharge during filling and discharging.

#### **4.3.3 Provisions for individual classes**

- 4.3.3.1 The following dangerous goods may be carried in bulk:
  - Solids of classes 4.1 (with the exception of self-reactive substances and explosive substance in non-explosive state), 4.3, 5.1, 6.1, 8 and 9, packaging group II;
  - Solids of classes 4.1, 4.2, 4.3, 5.1, 6.1, 8 and 9, packaging group III;

- The following radioactive materials:
  - (a) UN 2912 radioactive material, low specific activity (LSA-I), non fissile or fissile-excepted,
  - (b) UN 2913 radioactive material, surface contaminated objects (SCO-I), non fissile or fissile-excepted;
- Empty uncleaned packagings having contained substances and mixtures (e.g. preparations, formulations and wastes) or articles of packaging groups II and III may be carried in bulk containers in accordance with the criteria applicable to solids .

4.3.3.2 Substances and articles of different classes which may react dangerously with one another and also substances and articles of different classes and goods not subject to the UN Recommendations, which are liable to react dangerously with one another shall not be loaded together in the same bulk container. Dangerous reactions are:

- (a) combustion and/or evolution of considerable heat,
- (b) emission of flammable and/or toxic gases,
- (c) formation of corrosive liquids, or
- (d) formation of unstable substances.

#### **4.3.4 Provisions for bulk goods of classes 4.1, 4.3, 5.1, 6.1, 8 and 9**

Open top bulk containers (code B1), closed bulk containers (code B2), vented bulk containers (code B3) and hermetically closed bulk containers (code B4) may be used.

#### **4.3.5 Special provisions for bulk goods of class 4.2**

Closed bulk containers (code B2) and hermetically closed bulk containers (code B4) may be used.

#### **4.3.6 Special provisions for bulk goods of class 7**

- (a) UN 2912 radioactive material, low specific activity (LSA-I), non fissile or fissile-excepted. All materials, other than ores, may be transported in closed bulk containers (code B2) and hermetically closed bulk containers (code B4); in addition, the special provisions "Exclusive use of the conveyance" and "No loss of shielding under routine conditions" shall be applied.
- (b) UN 2912 radioactive material, low specific activity (LSA-I), non fissile or fissile-excepted. Ores only containing naturally occurring radioactive isotopes may be transported in open top bulk containers (code B1), closed bulk containers (code B2), vented bulk containers (code B3) and hermetically closed bulk containers (code B4); in addition, the special provision "Exclusive use of the conveyance" shall be applied.

- (c) UN 2913 radioactive material, surface contaminated objects (SCO-I), non fissile or fissile-excepted. Only SCO-I may be carried in bulk. SCO-I may be carried in closed bulk containers (code B2) and hermetically closed bulk containers (code B4); in addition the special provisions "Exclusive use of the conveyance" and "No loss of shielding under routine conditions" shall be applied.
- (d) UN 2913 radioactive material, surface contaminated objects (SCO-I or SCO-II), non fissile or fissile-excepted. Only SCO-I may be carried in bulk. SCO-I contaminated on accessible and inaccessible surfaces to a level not exceeding 4 Bq/cm<sup>2</sup> for all alpha emitters may be transported in closed bulk containers (code B2) and hermetically closed bulk containers (code B4); in addition the special provision "No loss of shielding under routine conditions" shall be applied.
- (e) UN 2913 radioactive material, surface contaminated objects (SCO-I or SCO-II), non fissile or fissile-excepted. Only SCO-I may be carried in bulk. SCO-I on which the non-fixed contamination on inaccessible surfaces is suspected to be in excess of 4 Bq/cm<sup>2</sup> for beta and gamma emitters and low toxicity alpha emitters, or 0,4 Bq/cm<sup>2</sup> for all other alpha emitters be may be transported in closed bulk containers (code B2) and hermetically closed bulk containers (code B4); in addition, the special provisions "Exclusive use of the conveyance", "No loss of shielding under routine conditions" and "No release into the conveyance" shall be applied.

## **6.8 Requirements for the design, construction, testing and certification of bulk containers**

### **6.8.1 Application and general requirements**

6.8.1.1 The requirements of this chapter apply to containers for the transport of solid dangerous goods of classes 4.1, 4.2, 4.3, 5.1, 6.1, 7, 8 and 9 in bulk, by all modes of transport.

6.8.1.2 In recognition of the scientific and technological advances, the technical requirements of this chapter may be varied by alternative arrangements. These alternative arrangements shall offer a level of safety not less than that given by the requirements of this chapter. For international transport, alternative arrangement bulk containers shall be approved by the applicable competent authorities.

6.8.1.3 When a substance is not assigned a bulk container type in Column 12 of the Dangerous Goods List in Chapter 3.2, interim approval for transport may be issued by the competent authority of the country of origin. The approval shall be included in the documentation of the consignment and contain, as a minimum, the information normally provided in the bulk container instruction and the conditions under which the substance shall be transported. Appropriate measures shall be initiated by the competent authority to include the assignment in the Dangerous Goods List.

### **6.8.2 Requirements for the design, construction, testing and inspection**

#### **6.8.2.1 Definitions**

For the purposes of this section:

*Bulk containers* means a multimodal containers, except packagings, intermediate bulk containers and large packagings for the shipment of solid dangerous goods in bulk, that are

- (a) of a permanent character and accordingly strong enough to be suitable for repeated use;
- (b) especially designed to facilitate the transport of goods by one or more modes of transport without intermediate reloading;
- (c) designed to be secured and readily handled when full by means of its structural equipment;
- (d) designed to be readily filled and discharged and
- (e) have a capacity of more than 3.0 m<sup>3</sup>;

*Closed bulk container* means a bulk container with permanent firm walls on all sides without permanent openings and which complies with the weatherproofness test in accordance with 6.8.2.6.13;

*Hermetically closed bulk container* means a closed bulk container which complies with the airtightness test in accordance with 6.8.2.6.14;

*Maximum gross mass* means the mass of the bulk container and its service, structural and the operational equipment and the maximum permissible load;

*Open top bulk container* means a bulk container with rigid side walls and no permanent firm roof;

*Operational equipment* means items such as bulkheads, inliners and sealing members added temporarily to the container for the proper functioning as a bulk container;

*Service equipment* means filling, and discharge devices, venting devices, safety devices, heating and heat-insulating devices as well as measuring instruments;

*Structural equipment* means reinforcing, handling, fastening, protective and stabilising members permanently and firmly attached to the container;

*Vented bulk container* means a closed bulk container equipped with venting openings to allow for the release of vapours and gases and prevent the release of solid contents as well as the penetration of water.

#### **6.8.2.2 Code for designating types of bulk container**

The following table indicates the codes to be used for designating types of bulk container:

<b>Types of bulk container</b>	<b>Code</b>
Open top bulk container	B1
Closed bulk container	B2
Vented bulk container	B3
Hermetically closed bulk container	B4

#### **6.8.2.3 General design and construction requirements**

6.8.2.3.1 Bulk containers shall be made of suitable materials. The connections shall be skilfully made and afford complete safety.

6.8.2.3.2 The material of the bulk containers including their gaskets, operational and service equipment shall be compatible with the contents and shall avoid any dangerous reactions which may be:

- (a) combustion and/or evolution of considerable heat;
- (b) evolution of flammable, toxic or asphyxiant gases;
- (c) the formation of corrosive substances; or
- (d) the formation of unstable substances.

6.8.2.3.3 When bulk containers are lined or equipped with an inliner, the lining and inliner shall be capable of withstanding, without loss of contents, the static, dynamic and thermal loads during normal conditions of handling and transport.



6.8.2.3.4 Contact between dissimilar metals which could result in damage by galvanic action shall be avoided.

6.8.2.3.5 Bulk containers, including their service, structural and operational equipment, shall be designed to withstand, without loss of contents, the static, thermal and dynamic loads during normal conditions of handling and transport. The design shall demonstrate that the effects of fatigue, caused by repeated application of these loads through the expected life of the bulk container, have been taken into account.

6.8.2.3.6 Bulk containers including their fastenings to the conveyance shall, under the maximum gross mass, be designed to withstand the test requirements as specified in 6.8.2.6.1.

6.8.2.2.7 Bulk containers, which are designed to be bottom lifted, shall be equipped with fork-lift pockets, grab edges or other suitable lifting points.

6.8.2.2.8 Lifting points shall to be designed to withstand the lifting forces as provided by the test requirements specified in 6.8.2.6.1 and 6.8.2.6.2.

6.8.2.2.9 Bulk containers, which are intended to be stacked, shall be designed to withstand the stacking load as provided by the test requirement specified in 6.8.2.6.3.

6.8.2.2.10 Bulk containers of types B2, B3 and B4 shall be so closed that the penetration of splash and rain water is prevented as to be demonstrated by the weatherproofness test in accordance with 6.8.2.6.13.

6.8.2.2.11 Hermetically closed bulk containers of type B4 shall be constructed to prevent changes of air in excess of air per hour based on the total volume of the bulk container as to be demonstrated by the airtightness test in accordance with 6.8.2.6.14.

6.8.2.2.12 Rigid roofs of bulk containers accessible to persons shall withstand the test loads as specified in 6.8.2.6.11.

6.8.2.2.13 Any removable roof or roof section shall be fitted with locking devices with securing devices designed to show the locked state to an observer at ground level.

6.8.2.2.14 The floor of bulk containers accessible to powered industrial trucks or similar devices shall be designed to withstand the concentrated dynamic loading as imposed by the floor strength test in accordance with 6.8.2.6.12.

6.8.2.2.15 Bulkheads as part of the operational equipment shall be designed to withstand, without significant deformation, the end wall test in accordance with 6.8.2.6.4.

6.8.2.2.16 Bulk containers of the design type codes indicated in the table below, designed, constructed and tested in accordance with one of the following codices and standards may comply with the requirements of this chapter, provided that the additional requirements indicated thereafter are met:

- (a) "General cargo containers for general purposes" according to ISO 1496-1:1987, if provided with a suitable operational equipment, e.g. bulkhead, inliner;
- (b) "Tank containers for liquids, gases and pressurised dry bulk" according to ISO 1496-3: 1991;
- (c) "Non-pressurised containers for dry bulk" according to ISO 1496-4: 1991;
- (d) Containers according to UIC-Codices 591 (edition 01.01.1992), 592-2 (edition 01.07.1996) and 592-4 (edition 01.07.1995) of the International Railway Federation, if provided with a suitable operational equipment, e.g. bulkhead, inliner.

Standard/ Codex	Design type code	Open top bulk container Type B1	Closed bulk container Type B2	Vented bulk container Type B3	Hermetically closed bulk container Type B4
ISO 1496-1	00 to 04		x		
	10, 11, 13, 15, 17			x	
	50 to 53	x			
ISO 1496-3	70 to 79				x
ISO 1496-4	20, 80		x		
	21, 22, 81, 82			x	
	23, 83				x
UIC-Codex 591		x	x	x	x
UIC-Codex 592-2		x	x	x	
UIC-Codex 592-4		x	x	x	x

#### 6.8.2.4 *Service equipment*

6.8.2.4.1 Filling and discharge devices shall be so constructed and arranged as to be protected against the risk of being wrenched off or damaged during transport and handling. The filling and discharge devices shall be capable of being secured against unintended opening. The open and closed position and direction of closure shall be clearly indicated.

6.8.2.4.2 Seals of openings shall be so arranged as to avoid any damage by the operation, filling and emptying of the bulk container.

6.8.2.4.3 Bulk containers shall be fitted with a manhole or other inspection openings of a suitable size to allow for internal inspection and adequate access for maintenance and repair.

6.8.2.4.4 Vented bulk containers (type B3) shall be equipped with means of air exchange, either by natural convection, e.g. by openings, or active elements, e.g. fans. The venting shall be designed to prevent negative pressures in the container at all times. Venting elements of bulk containers for the transport of flammable substances or substances emitting flammable gases or vapours shall be designed to prevent ignition.

#### **6.8.2.5    *Operational equipment***

6.8.2.5.1 The operational equipment shall be designed and manufactured according to a quality assurance programme under the responsibility of the shipper in order to ensure that each manufactured item of equipment meets the requirements of this chapter.

6.8.2.5.2 Sufficient documentation on the design, used materials and manner of construction shall be available to the competent authority.

#### **6.8.2.6    *Design type testing***

6.8.2.6.1. The design type of each bulk container shall be tested as required in this section and in accordance with procedures established by the competent authority. Testing of the design of for all types of bulk containers may be performed by the manufacturer.

6.8.2.6.2 The design type of a bulk container is defined by the design, dimensions, volume, material and thickness, manner of construction and type and arrangement of the structural and service equipment, but may include various operational equipments.

6.8.2.6.3 The competent authority may permit the selective testing of bulk containers which differ only in minor respects from a tested type, e.g., reduced length of the container.

6.8.2.6.4 The ability of a bulk container to withstand the test loads in accordance with 6.8.2.6.6 may also be demonstrated analytically by stress analysis or other procedures, acceptable to the competent authority. However, stress analyses shall be subject to the agreement by the competent authority.

6.8.2.5.5 The Tests shall be performed on bulk containers as prepared for transport. The bulk load shall be representative for the dangerous substances to be carried with respect to its physical characteristics (mass, particle size etc.). It is permissible to use additives, such as scrap iron, to achieve the required maximum gross mass, so long as they are placed and distributed so that the test results are not affected.

6.8.2.6.6 Tests shall be carried out on bulk container types as indicated in the following table and in accordance with the test requirements of this section.

Tests	Open top bulk container Type B1	Closed bulk container Type B2	Vented bulk container Type B3	Hermetically closed bulk container Type B4
Lifting test with fork-lift <sup>1)</sup>	x	x	x	x
Lifting test with lifting devices <sup>1)</sup>	x	x	x	x
Stacking test <sup>1)</sup>	x	x	x	x
Testing of end walls	x	x	x	x
Testing of side walls	x	x	x	x
External restraint test (longitudinal)	x	x	x	x
Internal restraint test (longitudinal) <sup>2)4)</sup>		x	x	x
Internal restraint test (lateral) <sup>2)4)</sup>		x	x	x
Rigidity testing (longitudinal) <sup>3)</sup>	x	x	x	x
Rigidity testing (transverse) <sup>3)</sup>	x	x	x	x
Roof testing <sup>1)</sup>		x	x	x
Floor testing <sup>1)</sup>	x	x	x	x
Weatherproof-ness test		x	x	x
Airtightness test				x

- 1) For bulk containers which have been designed for this kind of handling.
- 2) Applies only to bulk containers equipped with a complete framework.
- 3) Applies only to bulk containers intended for carriage by sea.
- 4) Applies only to hopper-type containers.

#### 6.8.2.6.1 Bottom lift test with fork-lift

##### 6.8.2.6.1.1 Preparation

The bulk container shall be loaded to 1,25 times its maximum gross mass, the load being evenly distributed.

##### 6.8.2.6.1.2 Method of testing

The bulk container shall be raised and lowered twice, without significant acceleration, by two horizontal bars, each 200 mm wide, projecting  $1828 \pm 3$  mm into the fork-lift pockets, measured from the outside face of the side of the container. The bars shall be centered within the pockets. The test shall be repeated from each possible direction of entry.

##### 6.8.2.6.1.3 Criteria for passing the test

- (a) No permanent deformation which renders the bulk container unsafe for transport;
- (b) No permanent deformation in excess of the tolerances for the dimensional requirements affecting handling, securing and interchange, and
- (c) no loss of contents.

#### **6.8.2.6.2 Lifting test with lifting devices**

##### *6.8.2.6.2.1 Preparation*

The bulk container shall be loaded to twice its maximum gross mass, the load being evenly distributed.

##### *6.8.2.6.2.2 Method of testing*

The bulk container shall be lifted by any set of fittings for lifting, such as top and bottom corner fittings, without significant acceleration, until it is clear of the floor and maintained in that position for a period of five minutes. The lifting devices shall apply the lifting forces vertically or up to an predetermined angle (e.g. max. 60° from the horizontal), as appropriate.

##### *6.8.2.6.2.3 Criteria for passing the test*

- (a) No permanent deformation which renders the bulk container unsafe for transport;
- (b) No permanent deformation in excess of the tolerances for the dimensional requirements affecting handling, securing and interchange, and
- (c) No loss of contents.

#### **6.8.2.6.3 Stacking test**

##### *6.8.2.6.3.1 Preparation*

The bulk container shall be loaded to 1,8 times of its maximum gross mass, the load being evenly distributed.

##### *6.8.2.6.3.2 Method of testing*

The bulk container shall be placed on supports of a rigid nature, forming a horizontal level and adapted in number, shape and dimensions to those parts of the container designed to carry its load. The test load shall be applied without significant acceleration and nonvertical forces or turning moments. The load shall be applied by fittings, representative in shape and dimensions of the intended lifting devices or by a number of containers of the same design stacked on the test sample. The testing period shall be amounting to at least 5 min.

##### *6.8.2.6.3.3 Calculation of the test load*

The load which is applied to the bulk container shall be amount at least to 1,8 times of the maximum stacking load.

##### *6.8.2.6.3.4 Criteria for passing the test*

- (a) No permanent deformation which renders the bulk container unsafe for transport;
- (b) no permanent deformation in excess of the tolerances for the dimensional requirements affecting handling, securing and interchange, and
- (c) no loss of contents.

#### **6.8.2.6.4 Testing of end walls**

##### *6.8.2.6.4.1 Preparation*

The end walls of a bulk container shall be tested. Bulk containers which are not structurally symmetrical shall have both end walls tested. In case of a symmetrical design, one end needs to be tested only.

##### *6.8.2.6.4.2 Method of testing*

The walls shall be subjected to an internal load of 0.4 times the maximum payload and in the case of containers with a ratio of length/width of less than 2.5, of 0.6 times of the maximum payload, the load being evenly distributed and so arranged to allow free deflection of the wall.

##### *6.8.2.6.4.3 Criteria for passing the test*

- (a) No permanent deformation which renders the bulk container unsafe for transport;
- (b) no permanent deformation in excess of the tolerances for the dimensional requirements affecting handling, securing and interchange, and
- (c) no loss of contents.

#### **6.8.2.6.5 Testing of side walls**

##### *6.8.2.6.5.1 Preparation*

The side walls of a bulk container shall be tested. In case of symmetrical construction, one side needs to be tested only.

##### *6.8.2.6.5.2 Method of testing*

The walls shall be subjected to an internal load of 0.6 times of the maximum payload, the load being evenly distributed and so arranged to allow free deflection of the wall.

##### *6.8.2.6.5.3 Criteria for passing the test*

- (a) No permanent deformation which renders the bulk container unsafe for transport;
- (b) No permanent deformation in excess of the tolerances for the dimensional requirements affecting handling, securing and interchange, and
- (c) No loss of contents.

#### **6.8.2.6.6 External restraint test (longitudinal)**

##### *6.8.2.6.6.1 Preparation*

The bulk container shall be loaded up to its maximum gross mass, the load being evenly distributed and secured longitudinally to rigid anchor points through the bottom apertures of the bottom corner fittings at one end of the bulk container.

#### 6.8.2.6.6.2 *Method of testing*

A force which corresponds to 2 times of the maximum gross mass, shall be applied horizontally to the bulk container through the bottom apertures of the other bottom corner fittings, first towards and then away from the anchor points.

#### 6.8.2.6.6.3 *Criteria for passing the test*

- (a) No permanent deformation which renders the bulk container unsafe for transport;
- (b) No permanent deformation in excess of the tolerances for the dimensional requirements affecting handling, securing and interchange, and
- (c) No loss of contents.

#### **6.8.2.6.7 Internal restraint test (longitudinal)**

Testing of internal longitudinal restraint need not be performed if dynamic testing has been performed where end loads equal to, or exceeding, the static test load were achieved.

##### 6.8.2.6.7.1 *Preparation*

The bulk container shall be loaded up to its maximum gross mass. Bulk containers which are not structurally symmetrical shall have both ends tested.

##### 6.8.2.6.7.2 *Methods of testing*

The bulk container shall be positioned with its longitudinal axis vertical (a tolerance of 3° is acceptable). It shall be held in this position for 5 min either

- (a) by means of supports at the lower end of the base structure of the bulk container acting only through the two bottom corner fittings giving both vertical and horizontal securement, and by means of anchor devices acting on the corner fittings at the upper end of the base structure in such a manner as to provide horizontal restraint only; or
- (b) by means of supports under the four downward-facing corner fittings.
- (c) Alternative procedure b) may be used only for those types of bulk container where the hopper is supported solely by the base structure of the bulk container or where, in the opinion of the competent authority, the bulk container has been adequately tested with respect to container-to-framework connections by tests 6.8.3.2.6 and 6.8.3.2.9.

##### 6.8.2.6.7.3 *Criteria for passing the test*

- (a) No permanent deformation which renders the bulk container unsafe for transport;
- (b) No permanent deformation in excess of the tolerances for the dimensional requirements affecting handling, securing and interchange, and
- (c) No loss of contents.

#### **6.8.2.6.8 Internal restraint test (lateral)**

##### *6.8.2.6.8.1 Preparation*

The bulk container shall be loaded to its maximum gross mass.

##### *6.8.2.6.8.2 Methods of testing*

The bulk container shall be positioned with its transverse axis vertical (a tolerance of 3° is acceptable). It shall be held in this position for 5 min either

- (a) by means of supports at the lower end at the base structure of the bulk container acting only through the two bottom corner giving both vertical and horizontal securement, and by means of anchor devices acting through the corner fittings at the upper end of the base structure in such a manner as to provide horizontal restraint only; or
- (b) by means of supports under the four downward-facing corner fittings.

Alternative procedure b) may be used only for those types of bulk containers where the hopper is supported solely by the base structure of the bulk container or where, in the opinion of the competent authority, the bulk container has been adequately tested with respect to container-to-framework connections by tests 6.8.3.2.6 and 6.8.3.2.10.

##### *6.8.2.6.8.3 Criteria for passing the test*

- (a) No permanent deformation which renders the bulk container unsafe for transport;
- (b) No permanent deformation in excess of the tolerances for the dimensional requirements affecting handling, securing and interchange, and
- (c) No loss of contents.

#### **6.8.2.6.9 Rigidity test (longitudinal)**

##### *6.8.2.6.9.1 Preparation*

The empty bulk container shall be placed on four level supports, one under each corner fitting and shall be restrained by means of anchor devices acting through the bottom apertures of the bottom corner fittings to prevent longitudinal and vertical movement. Longitudinal restraint shall be only provided at a bottom corner fitting diagonally opposite to and in the same side frame as the top corner fitting to which force is applied.

##### *6.8.2.6.9.2 Method of testing*

Forces of 75 kN shall be applied either separately or simultaneously to each of the top corner fittings at one end of the bulk container in lines parallel both to the base of the bulk container and to the planes of the sides of the bulk container. The forces shall be applied first towards and then away from the top corner fittings.



In the case of a bulk container with identical sides, only one side need be tested. Where a side is not essentially symmetrical about its own vertical centreline, both ends of the sides shall be tested.

#### 6.8.2.6.9.3 *Criteria for passing the test*

- (a) No longitudinal deflection of the top of the bulk container with respect to the bottom in excess of 25 mm;
- (b) No permanent deformation which renders the bulk container unsafe for transport; and
- (c) no permanent deformation in excess of the tolerances for the dimensional requirements affecting handling, securing and interchange;

#### 6.8.2.6.10 **Rigidity test (transverse)**

##### 6.8.2.6.10.1 *Preparation*

The empty bulk container shall be placed on four level supports, one under each corner fitting and shall be restrained by means of anchor devices acting through the bottom apertures of the bottom corner fittings to prevent lateral and vertical movement. Lateral restraint shall be provided only at a bottom corner fitting diagonally opposite to and in the same end frame as the top corner fitting to which force is applied.

##### 6.8.2.6.10.2 *Method of testing*

Forces of 150 kN shall be applied either separately or simultaneously to each of the top corner fittings on one side of the bulk container in lines parallel both to the base of the bulk container and to the planes of the sides of the bulk container. The forces shall be applied first towards and then away from the top corner fittings.

In the case of a bulk container with identical ends, only one end need be tested. Where an end is not essentially symmetrical about its own vertical centreline, both sides of that end shall be tested.

##### 6.8.2.6.10.3 *Criteria for passing the test*

- (a) The sideways deflection of the top of the bulk container with respect to the bottom shall not cause changes in length of the two diagonals in excess of 60 mm, if added;
- (b) No permanent deformation which renders the bulk container unsafe for transport; and
- (c) No permanent deformation in excess of the tolerances for the dimensional requirements affecting handling, securing and interchange;

#### 6.8.2.6.11 **Roof testing**

##### 6.8.2.6.11.1 *Method of testing*

A load of 300 kg shall be evenly distributed over an area of 600 x 300 mm. The load shall be located at the weakest area of the rigid roof of the bulk container.

6.8.2.6.11.2 *Criteria for passing the test*

No permanent deformation in excess of the tolerances for the dimensional requirements affecting handling, securing and interchange;

**6.8.2.6.12 Floor testing**

6.8.2.6.12.1 *Preparation*

The bulk container shall be placed on four level supports under its four bottom corner fittings, with its base structure free to deflect.

6.8.2.6.12.2 *Procedure*

The test shall be performed using a test vehicle equipped with tyres with an axle load of 5460 kg, i.e. 2730 kg that on each of two wheels. It shall be so arranged that all points of contact between each wheel and a flat continuous surface lie within a rectangular envelope measuring 185 mm (in a direction parallel to the axle of the wheel) by 100 mm and that each wheel and the surface makes physical contact over an area within this envelope of not more than 142 cm<sup>2</sup>. The test vehicle shall be manoeuvred over the entire floor area of the bulk container.

6.8.2.6.12.3 *Criteria for passing the test*

No permanent deformation in excess of the tolerances for the dimensional requirements affecting handling, securing and interchange.

**6.8.2.6.13 Weatherproofness test**

6.8.2.6.13.1 *Preparation*

The bulk container shall be closed in a normal manner.

6.8.2.6.13.2 *Method of testing*

A stream of water shall be applied to all exterior joints and seams of the bulk container from a nozzle of 12,5 mm inside diameter, at a pressure of about 100 kPa on the upstream side of the nozzle. The nozzle shall be held at a distance of 1,5 m from the container, and the stream shall be traversed at a speed of 100 mm/s.

Procedures involving the use of several nozzles are acceptable, provided that each joint or seam is subjected to a water loading no less than that which would be provided by a single nozzle.

6.8.2.6.13.3 *Criteria for passing the test*

Upon completion of the test, no water shall have leaked into the bulk container.

**6.8.2.6.14 Airtightness test**

This test shall be carried out after all structural tests have been completed.

#### 6.8.2.6.14.1 *Preparation*

The bulk container shall be in its normal operating condition and shall be closed in a normal manner.

#### 6.8.2.6.14.2 *Method of testing Procedure*

Air shall be supplied through a metering device and a suitable manometer shall be connected to the bulk container by a leak-proof connection. The flow-measuring device shall be accurate to  $\pm 3\%$  of the measured flow rate, and the manometer at the bulk container shall be accurate to  $\pm 5\%$ .

Air shall be admitted to the bulk container to raise the internal pressure to  $250 \text{ Pa} \pm 10 \text{ Pa}$  and the air supply regulated to maintain this pressure. Once steady test conditions have been established, the air flow required to maintain this pressure shall be recorded.

#### 6.8.2.6.14.3 *Criteria for passing the test*

The air leakage rate, under standard atmospheric conditions, shall not be in excess of one change of air per hour based on the total volume of the bulk container. once per hour.

### 6.8.2.7 **Test Report**

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

- (a) Name and address of the test facility;
- (b) Name and address of applicant;
- (c) A unique test report identification assigned only once;
- (d) Date of the test report;
- (e) Manufacturer of the bulk container;
- (f) Specifications, including technical drawings of the bulk container design type (e. g. dimensions. materials, thickness, closures), method of manufacture;
- (g) Specifications of the operational equipment tested (if any);
- (h) Maximum bulk load;
- (i) Characteristics of test contents, e. g. particle size, bulk density;
- (j) Test descriptions and results;
- (k) The test report shall be signed with the name and status of the signatory.

6.8.2.7.2 The test report shall contain a statement that the bulk container as prepared for transport was tested in accordance with the appropriate requirements of this Chapter. A copy of the test report shall be available to the competent authority.

### 6.8.2.7 **Inspection and testing**

6.8.2.7.1 The bulk containers shall be manufactured and tested under a quality assurance programme which satisfies the competent authority, in order to ensure that each manufactured bulk container meets the requirements of this chapter.

6.8.2.7.2 Each bulk container including its service and structural equipment shall be inspected and tested before being put into service for the first time, with regard to:

- (a) conformity to design type including marking;
- (b) internal and external condition;
- (c) proper functioning of service equipment.

6.8.2.7.3 The operational equipment shall be checked for compliance with its specifications under the responsibility of the shipper.

6.8.2.7.4 At intervals not exceeding five years each bulk container including its service and structural equipment shall be reinspected and retested with regard to:

- (a) internal and external condition;
- (b) proper functioning of service equipment;

unless a continuous examination programme in accordance with 6.8.2.6.4 is followed.

6.8.2.7.5 For the purpose of periodic inspection, empty, uncleaned bulk containers may also be carried after the expiry of the date of periodic inspection.

6.8.2.7.6 A report of each inspection shall be kept by the owner of the bulk container at least until the date of the next inspection and be available to the competent authority.


6.8.2.7.7 As an alternative to periodic inspections of bulk containers, a continuous examination programme acceptable to the competent authority may be followed, which is aimed at detecting any defects which would endanger any person and which shall be performed in connection with major repair, refurbishment or on hire/off hire interchange and in no case less than once every 30 months.

6.8.2.7.8 When the structure of an bulk container is impaired as a result of impact, (e.g. accident) or any other cause, it shall be repaired and then subjected to the full testing and inspection as set out in 6.8.2.7.4.

6.8.2.7.9 Bulk containers approved in accordance with the International Convention for Safe Containers (CSC) are considered to comply with the provisions of section 6.8.2.6, except for paragraph 6.8.2.6.3.


## **6.8.2.8 Marking**

6.8.2.8.1 Each bulk container manufactured and intended for use according to these Regulations, shall bear durable and legible markings which are so placed in a location so as to be readily visible. Letters, numerals and symbols shall be at least 50mm high and shall show:

- (a) The United Nations packaging symbol  ;
- (b) The code designating the type of bulk container;
- (c) Country of origin;
- (d) Name or authorised symbol of the manufacturer;
- (e) Month and year of manufacture;

- (f) Serial number
- (g) Maximum bulk load in kg
- (h) Maximum capacity;
- (i) Tare mass in kg
- (j) Maximum stacking load of the bulk container in kg

6.8.2.8.2 Example of marking for a bulk container:

 B2/0089/D/LEU/05 97/649/5000 kg/20 m<sup>3</sup>/2000 kg/0

for a closed bulk container of German origin, manufacturer "Leu", manufactured in may 1997, serial number 649, maximum bulk load 5000 kg, maximum capacity 20 m<sup>3</sup>, tare mass 2000 kg; not stackable.

6.8.2.8.3 Except for marking items (a) and (b), marking items may be replaced by those in accordance with the International Convention for Safe Containers (CSC) or in ISO 6346 *Freight containers – Coding, identification and marking*.

6.8.2.8.4 The marking in accordance with these Regulations may either be permanently applied to containers re permanently intended dedicated for the shipment of dangerous goods in bulk or temporarily for a single shipment as a bulk container in the case of general-purpose containers meeting the relevant requirements and appropriately equipped.

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**Annex 2****DANGEROUS GOODS LIST**

UN No.	Name and description	Class or division	Subsidiary risk	UN packing group	Special provisions	Limited quantities	Packagings and IBCs		Portable tanks		Bulk
							Packing instructions	Special provisions	Portable tank instruction	Portable tank special provisions	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	
2715	ALUMINIUM RESINATE	4.1		III		3 kg	P002 IBC06				B1, B2, B3, B4
2717	CAMPHOR, synthetic	4.1		III		3 kg	P002 IBC06 LP02				B1, B2, B3, B4
2852	DIPICRYL SULPHIDE, WETTED with not less than 10% water, by mass	4.1		I		NONE	P406	PP24			-
2858	ZIRCONIUM, DRY, coiled wire, finished metal sheets, strip (thinner than 254 microns but not thinner than 18 microns)	4.1		III		3 kg	P002 LP02				-
2878	TITANIUM SPONGE GRANULES or TITANIUM SPONGE POWDERS	4.1		III	223	3 kg	P002 IBC08 LP02				B1, B2, B3, B4
2907	ISOSORBIDE DINITRATE MIXTURE with not less than 60% lactose, mannose, starch or calcium hydrogen phosphate	4.1		II	127	NONE	P406 IBC06	PP26 B2			-
2925	FLAMMABLE SOLID, CORROSIVE, ORGANIC, N.O.S.	4.1	8	II	109, 274	500 g	P002 IBC06	B2			B2, B3, B4
		4.1	8	III	109, 223, 274	3 kg	P002 IBC06				B1, B2, B3, B4

- = Transport in bulk prohibited