

Chapter 6.9

Provisions for the design, construction, inspection and testing of bulk containers

Note: Sheeted bulk containers (BK1) shall not be used for sea transport, except as indicated in 4.3.3.

6.9.1 Definitions

For the purposes of this section:

Closed bulk container means a totally closed bulk container having a rigid roof, sidewalls, end walls and floor (including hopper-type bottoms), including bulk containers with an opening roof, or side or end wall that can be closed during transport. Closed bulk container may be equipped with openings to allow for the exchange of vapours and gases with air and which prevent, under normal conditions of transport, the release of solid contents as well as the penetration of rain and splash water.

Flexible bulk container means a flexible container with a capacity not exceeding 15 m³ and includes liners and attached handling devices and service equipment.

Sheeted bulk container means an open-top bulk container with rigid bottom (including hopper-type bottom), side and end walls and a non-rigid covering.

6.9.2 Application and general provisions

6.9.2.1 Bulk containers and their service and structural equipment shall be designed and constructed to withstand, without loss of contents, the internal pressure of the contents and the stresses of normal handling and transport.

6.9.2.2 Where a discharge valve is fitted, it shall be capable of being made secure in the closed position and the whole discharge system shall be suitably protected from damage. Valves having lever closures shall be able to be secured against unintended opening and the open or closed position shall be readily apparent.

6.9.2.3 Code for designating types of bulk container

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

Types of bulk container	Code
Sheeted bulk container	BK1
Closed bulk container	BK2
Flexible bulk container	BK3

6.9.2.4 In order to take account of progress in science and technology, the use of alternative arrangements which offer at least equivalent safety as provided by the provisions of this chapter may be considered by the competent authority.

6.9.3 Provisions for the design, construction, inspection and testing of freight containers used as BK1 or BK2 bulk containers

6.9.3.1 Design and construction provisions

6.9.3.1.1 The general design and construction provisions in this section are deemed to be met if the bulk container complies with the requirements of ISO 1496-4:1991, *Series 1 freight containers – Specification and testing – Part 4: Non-pressurized containers for dry bulk*, and the container is siftproof.

6.9.3.1.2 Freight containers designed and tested in accordance with ISO 1496-1:1990, *Series 1 freight containers – Specification and testing – Part 1: General cargo containers for general purposes*, shall be equipped with

operational equipment which is, including its connection to the freight container, designed to strengthen the end walls and to improve the longitudinal restraint as necessary to comply with the test requirements of ISO 1496-4:1991, as relevant.

6.9.3.1.3 Bulk containers shall be siftproof. Where a liner is used to make the container siftproof, it shall be made of a suitable material. The strength of the material used for, and the construction of, the liner shall be appropriate to the capacity of the container and its intended use. Joins and closures of the liner shall withstand pressures and impacts liable to occur under normal conditions of handling and transport. For ventilated bulk containers, any liner shall not impair the operation of ventilating devices.

6.9.3.1.4 The operational equipment of bulk containers designed to be emptied by tilting shall be capable of withstanding the total filling mass in the tilted orientation.

6.9.3.1.5 Any movable roof or side or end wall or roof section shall be fitted with locking devices with securing devices designed to show the locked state to an observer at ground level.

6.9.3.2 Service equipment

6.9.3.2.1 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.

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

6.9.3.2.3 Where ventilation is required, bulk containers shall be equipped with means of air exchange, either by natural convection, e.g. by openings, or active elements, e.g. fans. The ventilation shall be designed to prevent negative pressures in the container at all times. Ventilating elements of bulk containers for the transport of flammable substances or substances emitting flammable gases or vapours shall be designed so as not to be a source of ignition.

6.9.3.3 Inspection and testing

6.9.3.3.1 Freight containers used, maintained and qualified as bulk containers in accordance with the requirements of this section shall be tested and approved in accordance with the *International Convention for Safe Containers, 1972* (CSC Convention), as amended.

6.9.3.3.2 Freight containers used and qualified as bulk containers shall be inspected periodically according to that Convention.

6.9.3.4 Marking

6.9.3.4.1 Freight containers used as bulk containers shall be marked with a Safety Approval Plate in accordance with the *International Convention for Safe Containers, 1972* (CSC Convention).

6.9.4 Provisions for the design, construction and approval of BK1 or BK2 bulk containers other than freight containers

6.9.4.1 Bulk containers covered in this section include skips, offshore bulk containers, bulk bins, swap bodies, trough-shaped containers, roller containers, and load compartments of vehicles.

6.9.4.2 These bulk containers shall be designed and constructed so as to be strong enough to withstand the shocks and loadings normally encountered during transport, including, as applicable, transshipment between modes of transport.

6.9.4.3 Load compartments of vehicles shall comply with the requirements of, and be acceptable to, the competent authority responsible for land transport of the dangerous goods to be transported in bulk.

6.9.4.4 These bulk containers shall be approved by the competent authority and the approval shall include the code for designating types of bulk containers in accordance with 6.9.2.3 and the provisions for inspection and testing, as appropriate.

6.9.4.5 Where it is necessary to use a liner in order to retain the dangerous goods, it shall meet the provisions of 6.9.3.1.3.

6.9.4.6 The following statement shall be shown on the transport document:

“Bulk container BK(x) approved by the competent authority of ...”.

Note: “(x)” shall be replaced with “1” or “2”, as appropriate.

6.9.5 Requirements for the design, construction, inspection and testing of flexible bulk containers BK3

6.9.5.1 Design and construction requirements

6.9.5.1.1 Flexible bulk containers shall be sift-proof.

6.9.5.1.2 Flexible bulk containers shall be completely closed to prevent the release of contents.

6.9.5.1.3 Flexible bulk containers shall be waterproof.

6.9.5.1.4 Parts of the flexible bulk container which are in direct contact with dangerous goods:

- (a) shall not be affected or significantly weakened by those dangerous goods;
- (b) shall not cause a dangerous effect, e.g. catalysing a reaction or reacting with the dangerous goods; and
- (c) shall not allow permeation of the dangerous goods that could constitute a danger under normal conditions of transport.

6.9.5.2 Service equipment and handling devices

6.9.5.2.1 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.

6.9.5.2.2 Slings of the flexible bulk container, if fitted, shall withstand pressure and dynamic forces which can appear in normal conditions of handling and transport.

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

6.9.5.3 Inspection and testing

6.9.5.3.1 Each flexible bulk container design type shall successfully pass the tests prescribed in this chapter before being used.

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

6.9.5.3.3 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 transported. It is permissible to use additives, such as bags of lead shot, to achieve the requisite total mass of the flexible bulk container, so long as they are placed so that the test results are not affected.

6.9.5.3.4 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.

6.9.5.3.5 *Drop test*

6.9.5.3.5.1 *Applicability*

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

6.9.5.3.5.2 *Preparation for testing*

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

6.9.5.3.5.3 The flexible bulk container shall be dropped onto a target surface that is non-resilient and horizontal. The target surface shall be:

- (a) integral and massive enough to be immovable;
- (b) flat with a surface kept free from local defects capable of influencing the test results;
- (c) rigid enough to be non-deformable under test conditions and not liable to become damaged by the tests; and

(d) sufficiently large to ensure that the test flexible bulk container falls entirely upon the surface.

Following the drop, the flexible bulk container shall be restored to the upright position for observation.

6.9.5.3.5.4 Drop height shall be:

Packing group III: 0.8 m

6.9.5.3.5.5 Criteria for passing the test:

- (a) there shall be no loss of contents. A slight discharge, e.g. from closures or stitch holes, upon impact shall not be considered to be a failure of the flexible bulk container provided that no further leakage occurs after the container has been restored to the upright position;
- (b) there shall be no damage which renders the flexible bulk container unsafe to be transported for salvage or for disposal.

6.9.5.3.6 **Top lift test**

6.9.5.3.6.1 *Applicability*

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

6.9.5.3.6.2 *Preparation for testing*

Flexible bulk containers shall be filled to six times the maximum net mass, the load being evenly distributed.

6.9.5.3.6.3 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.

6.9.5.3.6.4 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, and no loss of contents.

6.9.5.3.7 **Topple test**

6.9.5.3.7.1 *Applicability*

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

6.9.5.3.7.2 *Preparation for testing*

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

6.9.5.3.7.3 A flexible bulk container shall be toppled onto any part of its top by lifting the side furthest from the drop edge upon a target surface that is non-resilient and horizontal. The target surface shall be:

- (a) integral and massive enough to be immovable;
- (b) flat with a surface kept free from local defects capable of influencing the test results;
- (c) rigid enough to be non-deformable under test conditions and not liable to become damaged by the tests; and
- (d) sufficiently large to ensure that the test flexible bulk container falls entirely upon the surface.

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

Packing group III: 0.8 m

6.9.5.3.7.5 Criterion for passing the test: there shall be no loss of contents. A slight discharge, e.g. from closures or stitch holes, upon impact shall not be considered to be a failure of the flexible bulk container provided that no further leakage occurs.

6.9.5.3.8 **Righting test**

6.9.5.3.8.1 *Applicability*

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

6.9.5.3.8.2 *Preparation for testing*

The flexible bulk container shall be filled to not less than 95% of its capacity and to its maximum permissible gross mass.

6.9.5.3.8.3 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 no more than half of the lifting devices.

6.9.5.3.8.4 Criterion 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.

6.9.5.3.9 Tear test

6.9.5.3.9.1 Applicability

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

6.9.5.3.9.2 Preparation for testing

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

6.9.5.3.9.3 With the flexible bulk container placed on the ground, a 300 mm cut shall be made, completely penetrating all layers of the flexible bulk container on a wall of a wide face. The cut shall be made at a 45° angle to the principal axis of the flexible bulk container, halfway between the bottom surface and the top level of the contents. The flexible bulk container shall then be subjected to a uniformly distributed superimposed load equivalent to twice the maximum gross mass. The load must be applied for at least fifteen minutes. A 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 fifteen minutes.

6.9.5.3.9.4 Criterion for passing the test: the cut shall not propagate more than 25% of its original length.

6.9.5.3.10 Stacking test

6.9.5.3.10.1 Applicability

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

6.9.5.3.10.2 Preparation for testing

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

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

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

6.9.5.4 Test report

6.9.5.4.1 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. 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.

6.9.5.4.2 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 containment methods or components may render it invalid. A copy of the test report shall be available to the competent authority.

6.9.5.5 Marking

6.9.5.5.1 Each flexible bulk container manufactured and intended for use according to these provisions shall bear marks that 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, a flexible bulk container, a portable tank or a MEGC complies with the relevant requirements in chapters 6.1, 6.2, 6.3, 6.5, 6.6, 6.7 or 6.9;

- (b) the code BK3;
- (c) a capital letter designating the packing group(s) for which the design type has been approved:
Z for packing group III only;
- (d) the month and year (last two digits) of manufacture;
- △ (e) the character(s) identifying the country authorizing the allocation of the mark; as indicated by the distinguishing signs used on vehicles in international road traffic;*
- (f) the name or symbol of the manufacturer and other identification of the flexible bulk container as specified by the competent authority;
- (g) the stacking test load in kg;
- (h) the maximum permissible gross mass in kg.

Marks shall be applied in the sequence shown in (a) to (h); each mark, 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 are easily identified.

6.9.5.5.2 Example of marking



BK3/Z/11 09
RUS/NTT/MK-14-10
56000/14000



* Distinguishing sign of the State of registration used on motor vehicles and trailers in international road traffic, e.g. in accordance with the Geneva Convention on Road Traffic of 1949 or the Vienna Convention on Road Traffic of 1968.