Questions and Answers About Composite Intermediate Bulk Containers (IBCs)

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What is a composite IBC?

Composite intermediate bulk containers (IBCs) are packagings for the transport of mainly liquid and/or viscous products.

The following definition is derived from the United Nations (UN) Model Recommendations and the U.S. Department of Transportation (DOT) Regulations:

"Intermediate bulk container (IBC)" is any rigid or flexible portable packaging, other than those specified in Chapter 6.1 of the UN Model Recommendations and 49 CFR §178.700 of DOT Regulations, that has a capacity of not more than 3m³ for solids and liquids of packaging groups II and III, is designed for mechanical handling and is resistant to the stresses produced in handling and transport as determined by the tests specified in Chapter 6.5 of the UN Model Recommendations and 49 CFR §178.800 of DOT Regulations.

Composite IBCs consist of structural equipment, including a rigid outer casing – a steel or aluminium cage attached to a pallet – enclosing a plastic inner receptacle together with any service equipment. Plastic inner receptacles are typically manufactured of high density polyethylene (HDPE), providing excellent compatibility with most products. Service equipment commonly includes a bottom outlet valve and a top fill port that are fitted into the plastic inner receptacle. In addition, an IBC may also include service equipment such as a pressure relief device, which may be needed for filling substances such as organic peroxides or goods that are filled at an elevated temperature.

For IBCs manufactured in the United States, each IBC design type intended for the transport of dangerous goods (hazardous materials) should be tested for conformance with the requirements of 49 CFR § 178.800 – 815 & 819 and marked in accordance with the specified requirements confirming that the design type, with service equipment included, meets the test requirements. The DOT-authorized "UN mark" certifies that the composite IBC has successfully passed the design type tests. IBCs manufactured outside the United States bear similar markings authorized by other countries.

Completed composite IBCs may be used for storage and transport of liquids, including liquids that meet the criteria for dangerous goods of packing group II or III. The vapour pressure of liquid dangerous goods loaded into IBCs may not exceed 110 kPa at 50°C. Composite IBCs may also be used for solid materials.

Gaskets are required to ensure there is no leakage of liquid IBC contents where service equipment is fitted into the plastic inner receptacle. The needed gaskets are selected based on compatibility with the liquid to be transported and their ability to withstand performance test requirements. Contact the container manufacturer for additional information.

How do you determine the proper IBC for use with your product?

Your supplier can assist in the selection of the proper type of IBC suited to your purposes. Important considerations include:

- Whether regulations authorize the use of the IBC for the material to be transported;
- The chemical compatibility of the product with IBC materials of construction that will contact the material to be carried;
- The physical characteristics of the material, such as specific gravity; and
- The required method of filling, transport, storage and emptying.

The suitability of the composite IBC for the intended filling product is the responsibility of the user. Precise specifications regarding the product you intend to package will enable your supplier to recommend the proper IBC to meet your requirements. Specifying the transport and short term storage conditions is recommended.

If the filling product has a closed cup flashpoint of 60°C/140°F or less, provisions must be taken to prevent dangerous electrostatic discharge. This is also required for IBCs used for powders liable to dust explosion – see UN 4.1.2.1. Electrostatic charging often occurs during quick filling and emptying as well as during stirring and mixing operations.

Special requirements of national and international governmental agencies may be applicable in the case of materials such as food products and primary products of the pharmaceutical industry.

What do the markings on an IBC signify?

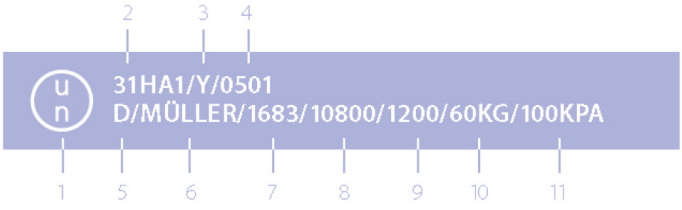
Each composite IBC intended for use according to the DOT Regulations and UN Model Recommendations shall bear markings which are durable, legible and placed in a location so as to be readily visible. If an IBC has a UN certification marking, it must comply with all respects of the DOT and UN requirements irrespective of whether or not hazardous materials are to be transported. These markings are internationally recognized. The marking shall show:

Primary marking:

- The United Nations packaging symbol
- The IBC code
- A capital letter X, Y or Z, designating the packaging group for which the design type has been approved
- The month and year of manufacture
- The state in which the design type was approved
- The name of the manufacturer or other identification of the IBC as specified by the competent authority
- The stacking test load (in kg)
- The maximum permissible gross mass (in kg)

Additional marking:

- Capacity (in litres)
- Tare mass (in kg)
- Test pressure (in kpa)
- Date of the last leakproofness test
- Date of last inspection



According to the UN Model Recommendations and DOT Regulations, an example UN marking for a composite IBC approved for the transport of dangerous goods is as follows:

1. The United Nations packaging symbol
2. The type of IBC: composite IBC for the transport of liquids with rigid plastics inner receptacle and a steel outer casing
3. Packaging group for which the design type is approved:
   - X: for packaging groups I, II and III (IBCs for solids only)
   - Y: for packaging groups II and III
   - Z: for packaging group III only
4. Month and year (last two digits) of manufacture
5. The state authorizing the allocation of the mark (according to the distinguishing sign for motor vehicles in international traffic)
6. The name of the manufacturer or other identification of the IBC as specified by the competent authority

7. The stacking test load in kilograms (kg). For IBCs not designed for stacking, the figure "0" shall be shown
8. The maximum permissible gross mass in kg (composite IBC and content)
9. Capacity in litres at 20°C
10. Tare mass in kg
11. Test (gauge) pressure in kPa or bar, if applicable

The mark should also include the date of the last inspection and date of the last leakproofness test. A date wheel or other means of identifying the month and day of manufacture is required on the inner receptacle. Additional markings must be provided on the inner receptacles of composite IBCs; additional markings are also applicable when an IBCs are repaired or remanufactured.

What is the meaning of the stacking mark?

According to Chapter 6.5.2.2.2. of the UN Model Recommendations and 49 CFR § 178.703 of the DOT Regulations, IBCs must be marked to reflect their suitability or nonsuitability for stacking. The markings reflecting the maximum permitted stacking load applicable when the IBC is in use or the IBCs nonsuitability for stacking shall be displayed by symbols as follows:

The symbol shall be not less than 100 mm x 100 mm, be durable and clearly visible. The mass marked above the symbol shall not exceed the load imposed during the design type test divided by 1.8.

How do I determine if my product is compatible with a composite IBC?

Before an IBC is used for the transport of dangerous goods, its chemical compatibility with the filling substances must be sufficiently verified. Different requirements for verifying compatibility exist in different parts of the world. Under U.S. regulations, chemical compatibility should be verified in accordance with 49 CFR § 173, Appendix B—Procedure for Testing Chemical Compatibility and Rate of Permeation in Plastic Packaging and Receptacles. Gasket compatibility and the compatibility of service equipment also need to be considered.

Depending on the material to be carried, the use of a composite IBC with a permeation resistant barrier layer may be recommended. Permeation defines the temperature-dependent mass transfer through solid material, especially plastic.

A permeation resistant barrier layer can minimize the permeation of the lading or particular product ingredients outward. It may also prevent inward permeation of molecules such as water, oxygen and other gases. Your supplier can provide additional information.

What are the filling procedures for an IBC?

Prior to filling, inspect the composite IBC for any defects that may have occurred and ensure the outlet valve is closed. Fill the product through the top fill port at atmospheric pressure. Maximum filling temperature should not exceed 70°C (~158°F), depending on the design type. Sufficient venting of the polyethylene inner receptacle is required to prevent vacuum deformation during cooling of the lading.

Composite IBCs are not designed for pressurized filling, storage or shipment. The user of the IBC must inspect the IBC prior to filling to ensure it is in good condition (UN Model Regulations Chapter 4.1.1.9 and 49 CFR § 173.24b of the DOT Regulations). For more detailed information regarding filling with hazardous materials and chemical resistance, please contact the IBC's manufacturer or supplier.

How must an IBC be closed?

Under the regulations, manufacturers must provide closure instructions. A shipper must ensure that a filled IBC is closed in accordance with the instructions provided by the manufacturer. Contact the manufacturer for additional information.

What are the proper procedures for handling, transportation and storage of IBCs?

When handling IBCs, full or empty, always use forks which extend completely underneath the pallet, for example:

Hand Pallet Truck

Electro Stacker

(not advised for frame pallets)

Lift Truck

The IBC and service equipment should be protected from impact during handling. Using the ropes attached to the traverses or the cage of the IBC is not recommended. Please contact your supplier for additional information on alternative handling methods.

If the IBC was damaged in handling, it should be removed from service.