



Designation: D8134 – 18 (Reapproved 2023)

Standard Guide for Conducting Internal Hydrostatic Pressure Tests on United Nations (UN) IBC Design Types¹

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1. Scope

1.1 This guide is intended to provide a standardized method and a set of basic instructions for performing hydrostatic pressure testing on Intermediate Bulk Containers (IBCs) designs as required by the United States Department of Transportation Title 49 Code of Federal Regulations (CFR) and the United Nations Recommendations on the Transport of Dangerous Goods (UN).

1.2 This guide focuses on composite and rigid plastic IBCs and is suitable for testing IBCs of any design or material type.

1.3 This guide provides information to help clarify various terms used as part of the United Nations (UN) certification process that may assist in determining the applicable test.

1.4 This guide provides the suggested minimum information that should be documented when conducting pressure testing.

1.5 This guide provides information for recommended equipment and fittings for conducting pressure tests.

1.6 This guide is based on the current information contained in 49 CFR 178.814.

1.7 When testing packaging designs intended for hazardous materials (dangerous goods), the user of this guide shall be trained in accordance with 49 CFR 172.700 and other applicable hazardous materials regulations such as the International Civil Aviation Organization (ICAO) Technical Instructions for the Safe Transport of Dangerous Goods by Air, the International Maritime Dangerous Goods Code (IMDG Code), and carrier rules such as the International Air Transport Association (IATA) Dangerous Goods Regulations.

1.8 *Units*—The values stated in SI units are to be regarded as the standard. No other units of measurement are included in this guide.

1.9 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the*

¹ This guide is under the jurisdiction of ASTM Committee D10 on Packaging and is the direct responsibility of Subcommittee D10.22 on Hazardous Materials.

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responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.

1.10 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 ASTM Standards:²

D4919 **Guide for Testing of Hazardous Materials (Dangerous Goods) Packagings**

D7660 **Guide for Conducting Internal Pressure Tests on United Nations (UN) Packagings**

2.2 Federal Standards:³

U.S. Department of Transportation Code of Federal Regulations Title 49 Transportation (49 CFR) Parts 100-1993

2.3 UN Standard:⁴

United Nations Recommendations on the Transport of Dangerous Goods, Model Regulations

2.4 IMDG Standard:⁵

International Maritime Dangerous Goods Code (IMDG Code)

3. Terminology

3.1 Definitions:

3.1.1 *bar, n*—metric unit of atmospheric pressure equal to 14.50 psi (lb/in.²), 1.02 kg/cm², 29.53 in.-Hg, or 0.9869 atmosphere.

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

³ Available from Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402-9371 (website: phmsa.dot.gov/hazmat).

⁴ Available from the UN Economic Commission for Europe, Information Service, Palais des Nations, CH-1211 Geneva 10 Switzerland (website: <http://www.unece.org/trans/danger/danger.htm>).

⁵ Available from the International Maritime Organization (IMO, 4 Albert Embankment, London, SE1 7SR United Kingdom (website: <http://www.imo.org/>)).

3.1.2 *hydrostatic pressure test, n*—internal pressure test conducted on a container or packaging filled with water and pressurized with water or other suitable means; regulatory reference sections: 49 CFR 178.814, UN 6.5.6.8, and IMDG 6.5.6.8.

3.1.3 *kilopascal, kPa, n*—unit of pressure in the SI system of international units, the primary standard system used by the United Nations (UN) and the U.S. Department of Transportation (DOT) throughout their respective regulations per 49 CFR 171.10.

3.1.3.1 *Discussion*—To convert kPa to psi, multiply by 0.1450377 ($95 \text{ kPa} \times 0.1450377 = 13.8 \text{ psi}$).

3.1.4 *intermediate bulk container (IBC), n*—rigid or flexible portable packaging, other than a cylinder or portable tank, which is designed for mechanical handling (as defined by 49 CFR 171.8).

3.1.5 *pounds per square inch, psi, n*—unit of measure in the inch–pound (English) measurement system.

3.1.5.1 *Discussion*—To convert psi to kPa, multiply by 6.89 ($13.8 \text{ psi} \times 6.89 = 95 \text{ kPa}$).

4. Significance and Use

4.1 Dangerous goods (hazardous materials) regulations require performance tests to be conducted on packaging or IBC designs before being authorized for use. The regulations do not include standardized procedures for conducting performance tests and, because of this, may result in a non-uniform approach and differences in test results between testing facilities.

4.2 The purpose of this standard is to provide guidance and to establish a set of common practices for conducting hydrostatic pressure tests on IBC designs subjected to UN certification testing.

4.3 Intermediate bulk container designs are required to be tested in a sequence. This guide focuses on conducting the hydrostatic pressure test, which is preceded in the test sequence by the leakproofness test. The fittings and adaptors applied to the container for the hydrostatic pressure test may also be used for the leakproofness test.

5. Equipment

5.1 *Recommended Test Equipment:*

5.1.1 *Appropriate Packaging Closing Equipment (Calibrated as Applicable)*—Closing equipment, such as torque wrench, cover/closure crimping tools, and so forth, to prepare the IBC design for transport.

5.1.2 *Water Supply Source:*

5.1.2.1 Water supply source system should be designed to minimize water pressure fluctuations during the test.

5.1.2.2 The water source can be building supplied water provided fluctuations in pressure do not occur during the test.

5.1.2.3 It is recommended to have a separate water supply tank assembly to enable the use of air pressure over the top of the water supply. Air pressure may be used to pressurize the water supply tank to provide adequate water pressure to the test container in a timely fashion. Refer to Fig. 1.

5.1.3 *Regulator Valve*, used to maintain an even pressure throughout the duration of the test and to maintain proper water pressure to test container.

5.1.4 *Pressure Station* to distribute water from water supply source through the regulator to the test container. Refer to items (6) and (7) in Fig. 1.

5.1.5 *Hose or Piping*, as required.

5.1.6 *Pressure Gauge(s)*, psi/kPa dual marked and calibrated (digital preferred).

5.1.6.1 *Gauge*, to monitor water supply pressure.

5.1.6.2 *Gauge*, to monitor pressure inside the test container.

5.1.6.3 All gauges used should be calibrated and have an accuracy in the appropriate range.

5.1.7 *Connections (Fitting/Valves, Adaptors, Gaskets, and Bushings)* or other equally effective means, as needed.

5.1.7.1 *Fitting/Valve*, for water inlet to test container.

5.1.7.2 *Fitting/Valve*, for air release, drainage, and pressure monitoring.

5.1.7.3 *Fitting/Valve*, for pressure monitoring (if this is not combined with air release fitting).

NOTE 1—When combining fittings and valves, take care to make sure the assembly does not interfere with the reading on the gauge. A long extension of the fitting may not provide an accurate pressure reading of the test container. Fittings extending above or beyond the test container should be kept as short as possible to maintain accurate values and stable fittings.

5.1.8 *Drill* and appropriate drill bit.

5.1.9 *Temperature Measuring Device*, appropriately calibrated.

5.1.10 *0 to 60 min Timer with Audible Alarm*.

5.2 *Safety Equipment*, recommended.

5.2.1 *Safety Glasses with Side Shield*.

5.2.2 *Gloves*, fabric leather or rubber slip resistant, as appropriate.

6. Sample Size

6.1 One sample is required for IBC designs. Reference 49 CFR 178.814.

7. Container

7.1 *Selection:*

7.1.1 Randomly select an appropriate container to be tested.

7.1.2 Visually inspect container to verify that all closures, plugs, gasket, accessories, and so forth match the closing instructions and to determine if the container has any blemishes or defects that would affect a proper seal (record any observations). If necessary, clean off gaskets and other closure surfaces to ensure a proper seal is accomplished.

7.2 *Preparation:*

7.2.1 *Location of Fittings and Gauges*—Care should be taken not to attach fittings to container embossments or other geometries that could possibly compromise the integrity of the container or invalidate the test. The report should describe in general how many fittings are used and where fittings and gauges are located. Photo documentation is recommended.

NOTE 2—To reduce the possibility of inconsistent results between test samples, gauges and fittings should be in the same location.