



Designation: **D7790–12 D7790–19**

Standard Guide for Preparation of Plastic Packagings Containing Liquids for United Nations (UN) Drop Testing¹

This standard is issued under the fixed designation D7790; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reappraisal. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reappraisal.

1. Scope–Scope*

1.1 This guide ~~intends~~ is intended to provide a standardized method and a set of basic instructions for special preparation conditioning of drop test samples ~~for being subjected to~~ United Nations (UN) performance-oriented packaging certification as required by United States Department of Transportation Title 49 Code of Federal Regulations (49 CFR) and the United Nations Recommendations on the Transport of Dangerous Goods (UN).

1.2 This guide provides guidance on conditioning test samples for drop testing plastic ~~packaging~~ Non-Bulk Packaging, Intermediate Bulk Container (IBC), and Large Packaging designs intended for liquid hazardous materials (dangerous goods) as required by ~~49 CFR §178.603(c)(1) and §178.810(b)(4)~~ §178.603(c)(1), §178.810(b)(4), and §178.965(c), respectively. This guide also provides the minimum information that should be documented when conducting special preparation conditioning.

1.3 The user of this guide shall be trained in accordance with 49 CFR §172.700 and other applicable hazardous materials regulations including: 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.

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

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

1.6 *This international standard was developed in accordance with internationally recognized principles of 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

[D4332 Practice for Conditioning Containers, Packages, or Packaging Components for Testing](#)

[D4919 Guide for Testing of Hazardous Materials \(Dangerous Goods\) Packagings](#)

[D7887 Guide for Selection of Substitute, Non-hazardous, Liquid Filling Substances for Packagings Subjected to the United Nations Performance Tests](#)

[D8135 Guide for Selection of Substitute, Non-hazardous, Particulate Solid Filling Substances for Packagings Subjected to the United Nations Performance Tests](#)

2.2 *Federal Standard:*

[U.S. Department of Transportation Code of Federal Regulations Title 49 \(49 CFR\) Parts 100-185](#)³

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. Current edition approved ~~Nov. 1, 2012~~ [Oct. 1, 2019](#). Published ~~December 2012~~ [November 2019](#). Originally approved in 2012. Last previous edition approved in 2012 as [D7790–12](#). DOI: [10.1520/D7790-12.10.1520/D7790-19](#).

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](#)) ([www.phmsa.dot.gov/phmsa-regulations](#)).

*A Summary of Changes section appears at the end of this standard

2.3 UN Standard:

United Nations Recommendations on the Transport of Dangerous Goods, Model Regulations (UN Orange Book)⁴

2.4 IATA Standard:

International Air Transport Association (IATA) Dangerous Goods Regulations⁵

2.5 ICAO Standard:

International Civil Aviation Organization (ICAO) Technical Instructions for the Safe Transport of Dangerous Goods by Air⁶

2.6 IMDG Standard:

International Maritime Dangerous Goods (IMDG) Code⁷

3. Terminology

3.1 Definitions:

3.1.1 *ambient, adv*—the temperature and humidity of the surrounding environment where sample preparation is conducted.

3.1.2 *conditioning period, n*—minimum time required for test sample(s) and contents to reach the appropriate temperature.

3.1.3 *environmental conditioning chamber(s), n*—compartment, cabinet, or enclosed room that has the ability to achieve low temperatures and maintain those temperatures (or below) during the conditioning period. Examples are *chest, upright freezer*, or *walk-in freezer*.

3.1.4 *mapping, v*—collecting temperature data at multiple interior or exterior locations of a package or inside the chamber to determine the temperature variability range.

3.1.4.1 Discussion—

Units—All temperature readings are in degrees Celsius.

3.1.5 *specific gravity, n*—ratio of the testing substance density to a standard substance (i.e., water) density at a specific temperature and pressure.

3.1.5.1 Discussion—

For solids and liquids, the standard substance is normally water at 4.0°C with a 1.00 kg/L density.

3.1.6 *thermocouple, n*—device for measuring temperature. It consists of two dissimilar metals, joined together at one end. When the junction of the two metals is heated or cooled a voltage is produced that can be correlated back to the temperature. The thermocouple alloys are commonly available as wire.

3.1.7 *water/antifreeze solution, n*—liquid solution with a 0.95 minimum specific gravity at –18°C and does not freeze above –24°C.

3.2 Applicable Packaging Definitions Related to Dangerous Goods Regulations:

3.2.1 *combination package, n*—combination of packagings for transport purposes consisting of one or more inner packagings secured in a non-bulk outer packaging. It does not include a composite packaging.

3.2.2 *composite packaging, n*—packaging consisting of an outer packaging and an inner receptacle so constructed that the inner receptacle and the outer packaging form an integral packaging. Once assembled, it remains thereafter an integrated single unit and it is filled, stored, transported, and emptied as such.

3.2.3 *inner packaging, n*—packaging for which an outer packaging is required for transport. It does not include the inner receptacle of a composite packaging

3.2.4 *package, n*—the completed product; the packaging plus its contents prepared for transport.

3.2.5 *packaging(s), n*—the receptacle(s) (without contents) and any other components or materials necessary for the receptacle(s) to perform their containment function.

3.2.6 *receptacle, n*—containment vessel for receiving and holding substances or articles, including any means of closing.

3.2.7 *single packaging, n*—non-bulk packaging other than combination packaging. A packaging that does not require an inner packaging to be capable of performing its containment function and it includes composite packaging.

3.2.8 *shipper, n*—the company or person providing the packaging and instructions for the substances or articles being transported from one location to another.

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 Air Transport Association (IATA), 800 Place Victoria, PO Box 113, Montreal, Quebec H4Z 1M1 Canada (website: <http://www.iata.org>).

⁶ Available from the International Civil Aviation Organization, (ICAO), 999 University St., Montreal, Quebec H3C 5H7 Canada (website: <http://www.icao.org>).

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