



Designation: D4919 – 23

Standard Guide for Testing of Hazardous Materials (Dangerous Goods) Packagings¹

This standard is issued under the fixed designation D4919; 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 reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope*

1.1 This guide identifies the key information required for United Nations (UN) packaging certification to ensure the selected packaging will be certified to the appropriate level for its intended use and provides guidance for locating relevant sections of the United States Department of Transportation Title 49 Code of Federal Regulations (CFR). Consult with a regulatory specialist whenever needed.

1.2 This guide provides assistance in determining the appropriate performance tests required to certify packaging designs to the United States Department of Transportation Title 49 Code of Federal Regulations performance oriented packaging standards based on the United Nations Recommendations on the Transport of Dangerous Goods..

1.3 This guide covers the testing for transportation of hazardous materials (dangerous goods) packagings for net masses not exceeding 400 kg (880 lb) or capacities not exceeding 450 L (119 gal), excepting packagings for infectious substances, radioactive materials, cylinders and other receptacles for gases.

1.4 This guide does not replace domestic or international regulatory requirements for hazardous materials packaging but is strongly recommended to be used in conjunction with those regulations.

1.5 The user of this guide must be trained in accordance with the United States Department of Transportation Title 49 Code of Federal Regulations (49 CFR) as required by 172.700 and should be familiar with other applicable hazardous materials regulations such as: International Civil Aviation Organization (ICAO) Technical Instructions for the Safe Transport of Dangerous Goods by Air, and the International Maritime Dangerous Goods Code (IMDG Code) and carrier rules such as International Air Transport Association (IATA) Dangerous Goods Regulations.

1.6 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.7 *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.*

1.8 *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

- D323 Test Method for Vapor Pressure of Petroleum Products (Reid Method)
- D642 Test Method for Determining Compressive Resistance of Shipping Containers, Components, and Unit Loads
- D685 Practice for Conditioning Paper and Paper Products for Testing
- D996 Terminology of Packaging and Distribution Environments
- D999 Test Methods for Vibration Testing of Shipping Containers
- D4169 Practice for Performance Testing of Shipping Containers and Systems
- D4332 Practice for Conditioning Containers, Packages, or Packaging Components for Testing
- D4359 Test Method for Determining Whether a Material Is a Liquid or a Solid
- D4577 Test Method for Compression Resistance of a Container Under Constant Load

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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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.

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

- D4991** Test Method for Leakage Testing of Empty Rigid Containers by Vacuum Method
- D5276** Test Method for Drop Test of Loaded Containers by Free Fall
- D5570** Test Method for Water Resistance of Tape and Adhesives Used as Box Closure
- D7660** Guide for Conducting Internal Pressure Tests on United Nations (UN) Packagings
- D7790** Guide for Preparation of Plastic Packagings Containing Liquids for United Nations (UN) Drop Testing
- 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
- D8409** Guide for Conducting Stacking Tests on UN Packagings Using Guided or Unguided Loads
- 2.2 *ISO Standard:*
- ISO 535** Determination of Water Absorption of Paper and Board (Cobb Method)³
- 2.3 *United Nations Document:*
- United Nations Recommendations on the Transport of Dangerous Goods, Model Regulations (UN Orange Book)**⁴
- 2.4 *Regulatory Documents:*
- International Air Transport Association (IATA) Dangerous Goods Regulations**⁵
- International Civil Aviation Organization (ICAO) Technical Instructions for the Safe Transport of Dangerous Goods by Air**⁶
- International Maritime Dangerous Goods Code (IMDG Code)**⁷
- 49 CFR United States Department of Transportation Code of Federal Regulations Title 49, Transportation, Parts 100-199**⁸
- 2.5 *Industry Document:*
- Industrial Steel Drum Institute (ISDI) and Reusable Industrial Packaging Association (RIPA) Hazardous Materials Packaging Testing Procedures for Steel Drums**⁹

3. Terminology

3.1 Reference 49 CFR, Section 171.8: *Definitions and Abbreviations*.

³ Available from International Organization for Standardization (ISO), ISO Central Secretariat, Chemin de Blandonnet 8, CP 401, 1214 Vernier, Geneva, Switzerland, <https://www.iso.org>.

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

⁵ Available from International Air Transport Association (IATA), 800 Place Victoria, P.O. Box 113, Montreal, Quebec H4Z 1M1, Canada, <http://www.iata.org>.

⁶ Available from International Civil Aviation Organization (ICAO), 999 University St., Montreal, Quebec, H3C H57, Canada, <http://www.icao.org>.

⁷ Available from International Marine Organization, 4 Albert Embankment, London, SE1 7SR UK, <http://www.imo.org>.

⁸ Available from Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402-9371 (www.phmsa.dot.gov/phmsa-regulations).

⁹ Available from the Industrial Steel Drum Institute (ISDI), P.O. Box 790, Severna Park, MN 21146-0790. www.whysteeldrums.org; and Reusable Industrial Packaging Association (RIPA), 51 Monroe Street Suite 812, Rockville, MD 20850, Tel. 301.577.3786, www.reusablepackaging.org

3.2 Reference 49 CFR, Part 173, Subpart D: *Definitions Classification, Packing Group Assignment and Exceptions for Hazardous Materials other than Class 1 and Class 7* (for example, definition of *flammable liquid*).

3.3 Reference 49 CFR, Sections 178.503-178.523 for Non-bulk packaging standards (for example, 1A1, 1H2, 4G, etc.).

3.4 Reference 49 CFR, Section 178.601(c): *General Requirements, Definitions*.

3.5 The terms *hazardous materials* and *dangerous goods* are considered synonymous.

3.6 Reference Terminology **D996**.

3.7 Other terms may be found in modal specific regulatory documents listed in 2.4.

3.8 *Definitions of Terms Specific to This Standard:*

3.8.1 *Packing Group*—Hazardous Materials are assigned to a Packing Group based on the degree of danger as follows:

3.8.1.1 *Packing Group I*—Substances presenting great danger.

3.8.1.2 *Packing Group II*—Substances presenting medium danger.

3.8.1.3 *Packing Group III*—Substances presenting minor danger.

3.8.2 *Performance Standard*—UN certified Packagings are authorized to transport hazardous materials and are marked to a performance standard as follows:

3.8.2.1 *Performance Standard “X” Packaging*—May be used to transport hazardous materials in Packing Groups I, II, and III.

3.8.2.2 *Performance Standard “Y” Packaging*—May be used to transport hazardous materials in Packing Groups II and III.

3.8.2.3 *Performance Standard “Z” Packaging*—May only be used to transport hazardous materials in Packing Group III.

4. Significance and Use

4.1 The UN performance tests are based on the degree of hazard presented by the proposed hazardous material(s) to be packaged.

4.2 Substances and articles which are hazardous are assigned to a specific packing group as defined in 3.8.1 and may be determined by referencing 49 CFR 172.101 hazardous materials table.

4.3 Only packaging designs that have been successfully tested to the UN performance standards as defined in 3.8.2 may have the UN specification mark applied to the outer packaging. Hazardous Materials may not be transported in a packaging that does not bear the appropriate UN specification markings unless otherwise authorized by the applicable competent authority.

4.4 Packages successfully tested to the UN performance standards may or may not withstand the North American distribution environment. To further evaluate the suitability of the package it is strongly recommended that additional tests as detailed in Practice **D4169** or other carrier specified test requirements be conducted.