



Designation: D8409 – 21

Standard Guide for Conducting Stacking Tests on UN Packagings Using Guided or Unguided Loads¹

This standard is issued under the fixed designation D8409; 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.

1. Scope

1.1 This guide is intended to provide a standardized method and a set of basic instructions for conducting stacking tests on United Nations (UN) non-bulk, intermediate bulk container (IBC), and Large Packagings. Using guided or unguided loads in accordance with the U.S. Department of Transportation Title 49 Code of Federal Regulations (CFR) and the UN Recommendations on the Transport of Dangerous Goods (“The Orange Book”). The combination or interchange of these regulations will be referred to as the Hazardous Material Regulations (HMR).

1.2 The Dangerous Goods Regulations require performance tests to be conducted on packaging designs prior to being authorized for use. The regulations do not include standardized procedures to accomplish this which can result in differences between testing facilities. The purpose of this document is to provide guidance and to establish a set of common practices for conducting stack testing on packagings undergoing UN certification.

1.3 The user of this guide must be trained in accordance with 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, the International Maritime Dangerous Goods Code (IMDG Code), and carrier rules such as International Air Transport Association (IATA) Dangerous Goods Regulations.

1.4 The values stated in SI units are to be regarded as standard. The values given in parentheses after SI units are provided for information only and are not considered 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 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

- 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
- D4332 Practice for Conditioning Containers, Packages, or Packaging Components for Testing
- D4577 Test Method for Compression Resistance of a Container Under Constant Load
- D4919 Guide for Testing of Hazardous Materials (Dangerous Goods) Packagings

2.2 ISO Standards:³

- ISO 2234 Packaging – Complete, filled transport packages – Stacking tests using static load
- ISO 16495 Packaging – Transport packaging for dangerous goods – Test methods

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.

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>.