



Designation: **D951 – 99 (Reapproved 2010) D951 – 17**

## Standard Test Method for Water Resistance of Shipping Containers by Spray Method<sup>1</sup>

This standard is issued under the fixed designation D951; 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 ( $\epsilon$ ) 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 test method covers the determination of the water resistance of shipping containers.

1.2 This test method is frequently used in conjunction with other tests made prior to or after the spray test, such as the drop test, vibration test, inclined impact test, ~~or compression test~~ or the environmental hazard test of Practice [D4169](#), or combinations thereof.

1.3 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.

1.4 *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~~ safety, health, and ~~health~~ environmental practices and determine the applicability of regulatory limitations prior to use.*

1.5 *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:*<sup>2</sup>

[D685 Practice for Conditioning Paper and Paper Products for Testing](#)

[D996 Terminology of Packaging and Distribution Environments](#)

[D4169 Practice for Performance Testing of Shipping Containers and Systems](#)

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

### 3. Terminology

3.1 *Definitions*—For definitions of terms used in this test method, refer to Terminology [D996](#).

### 4. Significance and Use

4.1 This test method is used to determine the water resistance of shipping containers. It can be used to determine the ability of the container to resist deterioration caused by water or the ability of the container to protect the contents from water. It is frequently used in conjunction with other tests made prior to or after the spray test, such as the drop test, inclined impact test, vibration test or compression test.

### 5. Apparatus

5.1 The apparatus, illustrated schematically in [Fig. 1](#), shall consist of the components described in [5.2 – 5.8](#). Modifications are permissible, such as the use of fresh tap water instead of a recirculating system, as long as the specified temperature and spray intensity are achieved.

<sup>1</sup> This test method is under the jurisdiction of ASTM Committee [D10](#) on Packaging and is the direct responsibility of Subcommittee [D10.21](#) on Shipping Containers and Systems - Application of Performance Test Methods.

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<sup>2</sup> 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.

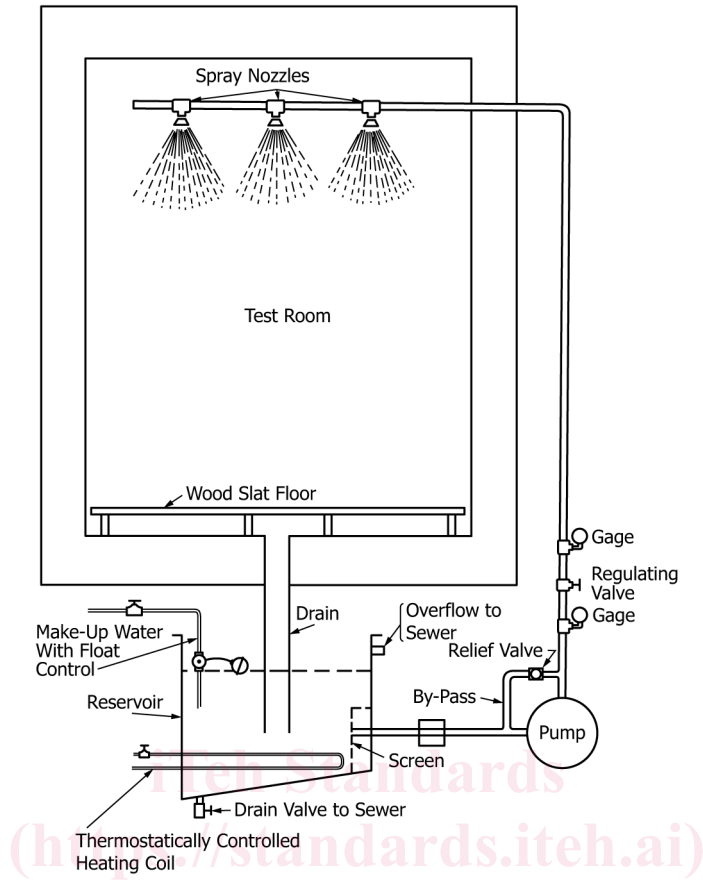


FIG. 1 Schematic Diagram of Spray Apparatus

5.2 *Test Room*—A test room or cabinet shall be of water-resistant construction, insulated and heated when necessary so that proper temperature control can be maintained. The bottom shall be covered with a false floor of slats—wood, plastic, or metal slats, or other perforations, and have an outlet drain.

5.3 *Sprays*—Spray nozzles shall be of such size and so spaced that the specified intensity of spray falls uniformly distributed over the floor area. The spray nozzles shall be so located that the droplets are falling from gravitational force only when they strike the specimens.

5.4 *Flow Control Valves*—Flow control valves, to control the intensity of the spray, are required.

5.5 *Circulating System*—A circulating system shall, where used, consist of a fine-mesh strainer, pump, relief by-pass, gages, and pressure regulating valve, together with the necessary piping between the flow control valves, spray nozzles, and water reservoir.

5.6 *Reservoir*—A reservoir for storage and conditioning of the spray water shall, where used, be equipped with an overflow to a sewer and with a drain to facilitate changing the water at the start of each test. Make-up water, regulated by a float control, shall also discharge into this tank.

5.7 *Water Temperature Control*—A thermostatically controlled means of heating for maintaining the supply water at the desired temperature is required.

5.8 *Conditioning Apparatus*—Adequate facilities shall be provided for conditioning test specimens at proper humidity and temperature prior to test.

**6. Test Specimens**

6.1 Test at least three containers, closed and sealed as for shipping. Select as test specimens samples that are representative of the containers being tested. For some purposes (such as for checking leakage alone) the containers may be tested empty. Normally, however, the containers shall be packed with the contents designed to be shipped in them or with a material of similar character.

**7. Conditioning**

7.1 Condition the test specimens sufficiently, after closing and sealing, so that any adhesives, protective coatings, glued flaps, and the like, will have reached their final normal condition, and shall be at the same temperature as the test room before being placed in it. Condition fibreboard containers in accordance with Practice D685D4332, or other applicable method.