



Standard Practice for Conditioning Containers, Packages, or Packaging Components for Testing¹

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1. Scope

1.1 This practice provides for standard and special conditioning and testing atmospheres that may be used to simulate particular field conditions that a container, package, or packaging component may encounter during its life or testing cycle.

1.2 This practice describes procedures for conditioning these containers, packages, or packaging components so that they may reach equilibrium with the atmosphere to which they may be exposed.

1.3 *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 and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:²

D 685 Practice for Conditioning Paper and Paper Products for Testing

D 996 Terminology of Packaging and Distribution Environments

E 41 Terminology Relating To Conditioning

E 171 Specification for Atmospheres for Conditioning and Testing Flexible Barrier Materials

E 337 Test Method for Measuring Humidity with a Psychrometer (the Measurement of Wet- and Dry-Bulb Temperatures)

2.2 ISO Standard:

2233 Packaging—Complete, Filled Transport Packages: Conditioning for Testing³

2.3 Forest Products Laboratory:

Moisture Content vs. Relative Humidity Chart Content vs.

Relative Humidity Chart⁴

3. Terminology

3.1 Terms and definitions used in this practice may be found in Terminology **D 996**, Terminology **E 41**, or Specification **E 171**.

4. Significance and Use

4.1 Many materials from which containers and packages are made, especially cellulosic materials, undergo changes in physical properties as the temperature and the relative humidity (RH) to which they are exposed are varied. Therefore, the package should be placed and kept in a specified atmosphere for a length of time such that subsequent measurements of physical properties will be meaningful and reproducible.

4.2 The conditions described in this practice are either historically accepted standard conditions or special laboratory conditions chosen to represent particular phases of the distribution environment. These special conditions do not necessarily duplicate actual field conditions, but tend to simulate them and have effects on packages and materials which may be related to their field performance.

5. Atmospheric Conditions

5.1 *Preconditioning Atmosphere*—20 to 40°C (68 to 104°F) and 10 to 35 % relative humidity.

5.2 *Standard Conditioning Atmosphere*—23 ± 1°C (73.4 ± 2°F) and 50 ± 2 % relative humidity.

NOTE 1—Average values must fall within these limits. Short-term fluctuations and measurement limitations may cause individual measurements to vary up to ±2°C (±3.6°F) and ±5 % relative humidity without significant impairment of test precision.

NOTE 2—The standard conditioning in the United States is different than in many other countries that use the ISO **2233** preferred conditions (G) of 20°C (68°F) and 65 % relative humidity.

5.3 *Special Atmospheres*—The special standard atmospheric conditions shown in **Table 1** may be selected when appropriate.

NOTE 3—Temperature and humidity tolerances of ±1°C (±1.8°F) and ±2 % relative humidity are desirable but not always attainable.

⁴ Available from Forest Products Laboratory, One Gifford Pinchot Dr., Madison, WI 53726.

¹ This practice is under the jurisdiction of ASTM Committee D10 on Packaging and is the direct responsibility of Subcommittee D10.23 on Natural Environment Test Methods.

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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 American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.

TABLE 1 Special Atmospheres

| Environment (ISO 2233 Condition) | Temperature, °C (°F) | Relative Humidity, % |
|----------------------------------|----------------------|----------------------|
| Cryogenic (A) | -55 ± 3 (-67 ± 6) | ... |
| Frozen food storage (C) | -18 ± 2 (0 ± 4) | ... |
| Refrigerated storage (D) | 5 ± 2 (41 ± 4) | 85 ± 5 |
| Temperate high humidity (F) | 20 ± 2 (68 ± 4) | 90 ± 5 |
| Tropical (L) | 40 ± 2 (104 ± 4) | 90 ± 5 |
| Desert | 60 ± 2 (140 ± 4) | 15 ± 2 |

NOTE 4—In the absence of a specific requirement for a particular atmospheric condition, use the conditioning atmosphere given in 5.2.

NOTE 5—Conditioning at the desert condition (Table 1) at a constant temperature of 60°C (140°F) may have effects on some materials that do not relate to effects of cyclical field conditions.

5.3.1 Preferred atmospheres approved by ISO, but not required in this practice are shown in Table 2.

5.4 The measurement of temperature and relative humidity of the conditioning atmosphere shall be made as close to the specimen being exposed as is possible. (See Test Method E 337 for a detailed description of methods.) The temperature and relative humidity indicated at the control point, may not be representative of conditions elsewhere in the conditioned space due to local effects or deficiency in air circulation. Tolerances at the controller usually must be smaller than those at the specimen.

6. Apparatus

6.1 *Room (or Cabinet)* of such size that sample containers or packages may be individually exposed to circulating air at the temperature and relative humidity chosen.

6.1.1 *Control Apparatus* capable of maintaining the room at the required atmospheric conditions within the tolerance limits.

6.2 *Hygrometer*—The instrument used to indicate the relative humidity should be accurate to ±2 % relative humidity. A psychrometer may be used either for direct measurement of relative humidity or for checking the hygrometer (see Test Method E 337).

6.3 *Thermometer*—Any temperature-measuring device may be used provided it can accurately indicate the temperature to within 0.1°C or 0.2°F. The dry-bulb thermometer of the psychrometer may be used either for direct measurement or for checking the temperature-indicating device.

TABLE 2 Preferred Atmospheres Listed in ISO 2233

| Condition | Temperature, °C (F) | Relative Humidity, % |
|-----------|---------------------|----------------------|
| B | -35 ± 3 (-31 ± 6) | not specified |
| E | 20 ± 2 (68 ± 4) | 65 |
| H | 27 ± 2 (81 ± 4) | 65 |
| J | 30 ± 2 (86 ± 4) | 90 |
| K | 40 ± 3 (104 ± 6) | uncontrolled |
| M | 55 ± 2 (131 ± 4) | 30 |

7. Procedure

7.1 Obtain containers, packages, or packaging components in quantity in accordance with the standard governing the test to be performed. Fiberboard containers (and containers fabricated from other materials that are affected by changes in humidities greater than 40 %) may require preconditioning (see Method D 685).

7.2 Containers or packages that are sealed with aqueous adhesives should have all seals made sufficiently prior to preconditioning or conditioning so that the water in the adhesive will not be a factor in preconditioning or conditioning of the package.

7.3 Place the container, package, or packaging component within the conditioning chamber and expose it to the required conditions for an amount of time specified in the particular test procedure. If no time period is specified, a period of at least 72 h or that required to reach equilibrium is recommended. The container, package, or packaging component shall be supported in a manner such that all surfaces have free access to the conditioning atmosphere. Heavier packages may be placed on a pallet or other device that should allow for as much exposure of the bottom surface to the conditioning atmosphere as is possible, so long as the device does not cause a permanent change in the box or affect the final test result.

7.4 Wherever possible, the desired test or measurement should be made at the specified conditioning atmosphere. When this is not possible, the test shall be performed as quickly as possible after the specimen is removed from the conditioning atmosphere.

7.5 Alternatively, the package may be enclosed in a plastic sheet before removal from the conditioning atmosphere, in a manner such that the plastic will not interfere with the particular test, so that the package will neither gain or lose moisture. Here too, the package shall be tested as quickly as possible after removal from the conditioning atmosphere.

8. Report

8.1 The report of the test on the conditioned package shall include the following:

8.1.1 Temperature, relative humidity, and time of exposure.

8.1.1.1 Preconditioning atmosphere and time of exposure when used.

8.1.2 Statement of compliance with this procedure.

8.1.3 Variations from this procedure, including the testing temperature and relative humidity if different from the conditioning atmosphere, the time elapsed, and so forth.

9. Precision and Bias

9.1 A statement of precision and bias is not applicable to this practice.

10. Keywords

10.1 conditioning; conditions; containers; environment; materials; packages

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