



Designation: D 2684 – 95

Standard Test Method for Permeability of Thermoplastic Containers to Packaged Reagents or Proprietary Products¹

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1. Scope

1.1 This test method covers procedures for determining the permeability of thermoplastic containers to packaged reagents or proprietary products under specified conditions of exposure. The exposures used are intended to simulate the normal and elevated temperature-storage conditions that might be encountered in end-use application.

1.2 This test method is applicable only to those types of containers designed to allow positive, leakproof closure.

1.3 Two procedures are provided:

1.3.1 *Procedure A* is specific to testing only with a standard design container. This procedure provides for determinations of rate of weight loss (or gain) and for calculation of a permeability factor.

1.3.2 *Procedure B* applies to tests of all other container designs. Permeability data by this procedure are expressed only in terms of rate of weight loss (or gain) for the particular container tested.

1.4 The values stated in SI units are to be regarded as the standard.

NOTE 1—There is no similar or equivalent ISO 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 and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:

D 618 Practice for Conditioning Plastics and Electrical Insulating Materials for Testing²

D 1248 Specification for Polyethylene Plastics Molding and Extrusion Materials²

D 1505 Test Method for Density of Plastics by the Density-Gradient Technique²

E 145 Specification for Gravity-Convection and Forced-Ventilation Ovens³

3. Terminology

3.1 Definitions:

3.1.1 *permeability factor, P_t* —the permeability of a given plastic to a given product at temperature t , in degrees Celsius, expressed in units of $\text{g}\cdot\text{cm}/\text{day}\cdot\text{m}^2$, as determined by Procedure A. The permeability factor under 23°C test conditions, for example, is signified by the notation P_{23} .

3.1.2 Determination of P_t is based on an averaged wall thickness over the entire area of the container and an assumption that permeation rate is inversely proportional to the thickness. Precaution in the extent of allowable variations of these factors is recommended, and use of P_t should take into consideration that wall thickness of the containers varies, that the estimate of average thickness from density, area, and weight is not exact, and that permeability of the product through the plastic material may not be directly proportional to the thickness.

4. Summary of Test Method

4.1 Test bottles are filled with the test product and, after sealing, are exposed at 23°C (73.4°F) and 50°C (122°F) conditions for 28 days or longer. Measurements of weight are made at intervals to determine the average rate of weight change.

5. Significance and Use

5.1 With the proper precautions and background experience, results can be useful for estimation of the loss of a packaged product through the walls of a container during shelf storage. The test is also useful for isolating the effects of a container design and materials, and is applicable for development and research and for specification purposes.

5.2 In the absence of adequate supporting data, extrapolations or correlations of results to conditions beyond those of the test are not recommended because of possible product alteration, solvency, or chemical effects on the plastic, etc.

5.3 Before proceeding with this test method, reference should be made to the specification of the material being tested. Any test specimen preparation, conditioning, dimensions, or testing parameters, or combination thereof, covered in the materials specification shall take precedence over those mentioned in this test method. If there are no material specifications, then the default conditions apply.

¹ This test method is under the jurisdiction of ASTM Committee D-20 on Plastics and is the direct responsibility of Subcommittee D20.20 on Plastic Products.

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² *Annual Book of ASTM Standards*, Vol 08.01.

³ *Annual Book of ASTM Standards*, Vol 14.02.