



Standard Test Method for Column Crush Properties of Blown Thermoplastic Containers¹

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1. Scope

1.1 This test method covers the determination of mechanical properties of blown thermoplastic containers when loaded under columnar crush conditions at a constant rate of compressive deflection. Any container, whether blown commercially or in the laboratory, may be used as the test specimen.

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

NOTE 1—There is no similar or equivalent ISO standard.

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:

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

D 1248 Specification for Polyethylene Plastics Molding and Extrusion Materials²

E 4 Practices for Load Verification of Testing Machines³

E 83 Practice for Verification and Classification of Extensometers³

3. Terminology

3.1 Definitions:

3.1.1 *crushing yield load*—the first load at which an increase of deflection occurs with no increase in load in a compressive crushing test. It is expressed in units of kilograms (or pounds) of load.

NOTE 2—In some cases, usually as a result of design or styling features, or both, of a specific container, multiple values of the crushing yield load may be observed, a small deflection may occur with no increase or with a decrease in the crush load, followed by resumption of the normal crush load change with deflection. This phenomenon cannot be ignored in the

evaluation of the column crush properties of a blown thermoplastic container, since it may be a very useful designated failure point for the application under consideration. The load at which this abrupt change occurs may be chosen as a crushing yield load for study. In such a case, the report of results should be accompanied by a proper description of the crushing yield load selected.

3.1.2 *crushing load at failure*—the crushing load applied to a blown thermoplastic container that produces a failure by fracture or parting of the material in any portion of said container. It is expressed in kilograms (or pounds).

3.1.3 *deflection at crushing yield load*—the decrease in length of the container specimen produced at the crushing yield load along the center line of testing (axis of crushing, see Fig. 1). It is expressed in millimetres (or inches).

3.1.4 *apparent crushing stiffness*—the ratio of the crushing load to the corresponding deflection at a point on the linear portion of the crushing load deflection curve. It is expressed in newtons per metre (or pounds per inch).

4. Significance and Use

4.1 Column crush tests provide information about the crushing properties of blown thermoplastic containers when employed under conditions approximating those under which the tests are made.

4.2 The column crush properties include the crushing yield load, deflection at crushing yield load, crushing load at failure, and apparent crushing stiffness. Blown thermoplastic containers made from materials that possess a low order of ductility may fail in crushing by brittle fracture. In such cases, the crushing yield load is equivalent to the crushing load at failure. Blown thermoplastic containers made of ductile materials may not exhibit a crushing load at failure although they will normally provide a crushing yield load value.

4.3 Column crush tests provide a standard method of obtaining data for research and development, applications, design, quality control, acceptance or rejection under specifications, and special purposes. The tests cannot be considered significant for engineering design in applications differing widely from the load - time scale of the standard test. Such applications require additional tests such as impact, creep, and fatigue.

4.4 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

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 03.01.