



# Standard Test Method for Expansion (Pin Test) of Copper and Copper-Alloy Pipe and Tubing<sup>1</sup>

This standard is issued under the fixed designation B 153; 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.

*This standard has been approved for use by agencies of the Department of Defense.*

## 1. Scope\*

1.1 This test method establishes the requirements for the expansion pin test for copper and copper-alloy pipe and tubing with an inside diameter of 0.125 in. (3.2 mm) and greater or an outside diameter up to and including 4 in. (102 mm).

NOTE 1—For tubes of sizes with an inside diameter less than 0.125 in. (3.2 mm), a substitute test method must be agreed upon between the manufacturer and purchaser.

NOTE 2—For tubes of sizes greater than 4 in. (102 mm) in outside diameter, a test method must be agreed upon between the manufacturer and purchaser. The flattening test, as described in the various pipe and tube specifications, is recommended as a substitute for the expansion pin test.

1.2 *Units*—The values stated in inch-pound units are regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information purposes only and are not considered 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*:<sup>2</sup>

**B 846** Terminology Relating to Copper and Copper Alloys

## 3. Terminology

3.1 For definitions of terms related to copper and copper alloys, refer to Terminology **B 846**.

## 4. Summary of Test Method

4.1 The prepared test specimen is expanded over a conical pin inserted at a uniform speed or pressure. The expansion of

the test specimen shall be measured on the outside of the tube diameter and shall conform to the product specification.

## 5. Significance and Use

5.1 When properly performed and interpreted, the expansion pin test will provide information with regard to the capacity of a tube for expansion and to reveal surface defects. Expansion pin test may provide data for research and development, engineering design, quality control, and acceptance or rejections in specifications.

## 6. Apparatus

6.1 *Pin*—The conical pin shall have an included angle of 60°, unless provided otherwise in the product specification. The pin shall be made of carbide or tool steel that has been hardened and ground to the prescribed angle and shall have a smooth, polished surface. The size of the pin at the base shall be suitable for the size of tubing being tested.

6.2 *Testing Machine*—Any type of testing machine, either hydraulically or mechanically operated, that will exert pressure to expand the pipe and tubing on the pin at a uniform rate.

## 7. Sampling and Test Specimen Preparation

7.1 The test specimen shall be prescribed in the specification for the material being tested. In the event that a test specimen size is not prescribed in the pipe or tube specification, the specimen shall be of suitable length so that it can be expanded to the required amount. Both ends shall either be faced square to the longitudinal axis in a lathe, or suitably prepared so as to have a smooth surface free from scratches or burrs, which might interfere with the test.

## 8. Procedure

8.1 The test specimen shall be wiped clean to remove any loose chips or dirt from the inside surface. The specimen shall be well lubricated (**Note 3**) on the inside surface. The pin (**6.1**) for use in the test, as prescribed in the specifications for the material being tested, shall be wiped clean and free from dirt, grit, or chips, and coated with lubricant.

NOTE 3—No. 1 lard oil or any extreme pressure lubricating oil is recommended as a lubricant.

<sup>1</sup> This test method is under the jurisdiction of ASTM Committee B05 on Copper and Copper Alloys and is the direct responsibility of Subcommittee B05.06 on Methods of Test.

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<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.



8.2 The test specimen shall be expanded over the pin to the amount prescribed in the specification. During the expansion the testing machine shall be operated at a uniform speed or pressure. The longitudinal axes of the test specimen and the pin shall coincide. The expanded tube shall be examined with the unaided eye to determine conformance with the product specification. Expansion shall be measured on the outside diameter of the tube.

8.3 Subject to agreement by the manufacturer and the purchaser, the test specimen may be expanded by hand-hammering or by manually or mechanically pressing the pin, except that in case of dispute another test specimen shall be expanded as described in 8.2.

8.4 In case there is an indication that the specimen was not properly prepared or tested, a new specimen from the same sample shall be selected and tested.

## **9. Retests**

9.1 In case of failure of any specimen a retest shall be allowed in accordance with the requirements of the specification.

## **10. Precision and Bias**

10.1 No statement is made about either the precision or bias of this test method since the result merely states whether there is conformance to the criteria for success specified in the procedure.

## **11. Keywords**

11.1 copper; copper alloy; expansion; expansion test; pin test; pipe; tube

## **SUMMARY OF CHANGES**

Committee B05 has identified the location of selected changes to this standard since the last issue (B 153 – 91 (2003)<sup>e1</sup>) that may impact the use of this standard. (Approved Oct. 1, 2005.)

(1) Changed Scope (1.1) to include a minimum inside diameter.

(2) Changed **Note 1** to give guidance to the manufacturer and purchaser for tube sizes under the minimum inside diameter.

(3) Changed **Note 2** to reflect the new wording for Pipe and Tube with an outside diameter greater than 4 in.

(4) Added Section 2, Referenced Documents.

(5) Added Section 3, Terminology.

(6) Added Section 4, Summary of Test Method.

(7) Changed Section 7 on Test Specimen to Sampling and Test Specimen Preparation.

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