



Designation: B153 – 11 (Reapproved 2017)

# 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 B153; 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 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, refer to **B968/B968M** for a test method.

1.2 *Units*—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.

1.3 *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.*

1.4 *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>

**B846 Terminology for Copper and Copper Alloys**

**B968/B968M Test Method for Flattening of Copper and Copper-Alloy Pipe and Tube**

<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, 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. Terminology

3.1 For definitions of terms related to copper and copper alloys, refer to Terminology **B846**.

## 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. The expansion pin test may provide data for research and development, engineering design, quality control, and acceptance or rejections in specifications.

5.2 In certain product specifications which establish requirements for tubes of sizes greater than 4 in. (102 mm), the test described in Test Method **B968/B968M** may be allowed as a substitute.

## 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 product 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

\*A Summary of Changes section appears at the end of this standard

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 product 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.

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.

8.2.1 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**.

8.3 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.

8.4 During inspection, the expanded section of the test specimen shall be free of defects, but blemishes of a nature that do not interfere with the intended application are acceptable.

## 9. Retests

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

## 10. Report

10.1 When testing is completed by an independent third-party laboratory, the test report shall include the following information. In-house captive laboratories shall only report **10.1.1**, **10.1.2** and **10.1.5**.

10.1.1 The date of the test,

10.1.2 Sample identification,

10.1.3 Reference to the test method,

10.1.4 The number of replicate test pieces used,

10.1.5 The test results: Pass or Fail (relative to presence of defects) as required above and by the appropriate product specification, and

10.1.6 Any other features of the material noted during the inspection.

## 11. Precision and Bias

11.1 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 acceptance criteria specified in the procedure and the product specification.

## 12. Keywords

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

## SUMMARY OF CHANGES

Committee B05 has identified the principal changes to this standard that have been incorporated since the 2005 issue as follows:

(1) Added references to Test Method **B968/B968M**.

(2) Added a Report section.

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