



## 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

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

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<sup>ε1</sup> NOTE—Paragraph 1.2 was updated editorially in January 2004.

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### 1. Scope

1.1 This test method establishes the requirements for the expansion pin test for copper and copper-alloy pipe and tubing in sizes up to and including 4 in. (102 mm) in outside diameter.

NOTE 1—For tubes of sizes greater than 4 in. in outside diameter, the following flattening test, as described in the various pipe and tube specifications, is recommended as a substitute for the pin expansion test. For pipe and tubes over 4 in. in outside diameter in the annealed condition, a 4-in. long shall be cut from the end of one of the tubes. This 4-in. long sample shall be flattened so that a gage set at three times the wall thickness will pass over the pipe freely throughout the flattened part. The pipe or tube so tested shall develop no cracks or flaws visible to the unaided eye as a result of this test. In making the flattening test, the elements shall be slowly flattened by one stroke of the press.

NOTE 2—The term “unaided eye,” as used herein, permits the use of corrective lenses necessary to obtain normal vision.

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. Significance and Use

2.1 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.

### 3. Apparatus

3.1 *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.

3.2 *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.

### 4. Test Specimen

4.1 The specimen of pipe or tubing to be tested 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.

### 5. Procedure

5.1 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 (3.1) 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.

5.2 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 (Note 2) to determine conformance with the product specification. Expansion shall be measured on the outside diameter of the tube.

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<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.

Current edition approved Apr. 10, 2003. Published June 2003. Originally approved in 1941. Last previous edition approved in 1996 as B 153 – 91 (1996)<sup>ε1</sup>.

5.3 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 5.2.

5.4 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.

## 6. Retests

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

## 7. Precision and Bias

7.1 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.

## 8. Keywords

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

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