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PUBLIC REVIEW DRAFT

Tools for Mechanically Formed Tee Connections in Copper Tubing

IAPMO Standard

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IAPMO PS 85-~~1995~~2019
Tools for Mechanically Formed Tee Connections in Copper Tubing

1 ~~Purpose~~Scope

1.1 General

1.1.1 ~~The purpose of~~ This standard ~~is to establish a generally acceptable standard for~~covers tools for mechanically formed tee connections for installations in copper tubing~~. Its purpose is to serve as a guide for producers, distributors, architects, engineers, contractors, installers, inspectors and users; to promote understanding regarding materials, manufacture and installation; and to provide for inspectable mechanically formed tee connections in copper tubing complying with this standard.~~ and specifies requirements for materials, physical characteristics, performance testing, and markings.

~~2.2~~1.1.2 ~~This standard covers minimum standards for~~Products covered by this Standard include joints created by using a listed tool that mechanically forms tee connections~~ and to prescribe minimum test requirements for the performance of mechanically formed tee connections, together with inspection and identification.~~

1.2 Alternative Materials

The ~~provisions~~ requirements of this standard are not intended to prevent the use of ~~any alternate~~ alternative materials or methods of construction~~,~~ provided ~~any~~ such ~~alternate~~ alternatives meet~~s~~ the intent and requirements of this standard.

1.3 Terminology

In this Standard,

(a) "shall" is used to express a requirement, i.e., a provision that the user is obliged to satisfy to comply with the Standard;

(b) "should" is used to express a recommendation, but not a requirement;

(c) "may" is used to express an option or something permissible within the scope of the Standard; and

(d) "can" is used to express a possibility or a capability.

Notes accompanying sections of the Standard do not specify requirements or alternative requirements; their purpose is to separate explanatory or informative material from the text. Notes to tables and figures are considered part of the table or figure and can be written as requirements.

1.4 Units of Measurement

SI units are the primary units of record in global commerce. In this Standard, the inch/pound units are shown in parentheses. The values stated in each measurement system are equivalent in application, but each unit system is to be used independently. All references to gallons are to U.S. gallons.

1.5 Amendments

Proposals for amendments to this Standard will be processed in accordance with the standards-writing procedures of IAPMO.

~~2 Scope~~

~~**2.1** This standard serves to supplement the provisions of the Uniform Plumbing Code, Section 802 for joints as required on copper tubing.~~

~~**2.2** This standard covers minimum standards for joints created by using a listed tool that mechanically forms tee connections and to prescribe minimum test requirements for the performance of mechanically formed tee connections, together with inspection and identification.~~

~~3~~2 Reference ~~Section~~Publications

This Standard refers to the following publications and, where such reference is made, it shall be to the current edition of those publications, including all amendments published thereto.

~~**3.1** The Copper Tube Handbook Copper Development Association~~

ANSI/ASME B31.5~~c~~	~~Addenda, ANSI/ASME B31.5, Refrigeration Piping~~Refrigeration Piping and Heat Transfer Components
ANSI/AWS A5.8M/A5.8	~~Brazing Filler Metals~~Specification for Filler Metals for Brazing and Braze Welding
ASTM B~~-~~88	~~Seamless Copper Tube~~Standard Specification for Seamless Copper Water Tube

3 Definitions and Abbreviations

This section is reserved for later use.

4 ~~Material~~ General Requirements

4.1 Mechanically formed tee connections covered under this standard shall meet the material requirements of ASME/ANSI B31.5~~c-92~~, ~~Addenda to ASME/ANSI B31.5~~ and the chemical composition requirements of ASTM B~~-~~88.

4.2 Filler metals for brazing tee connections shall meet the material requirements of AWS/A5.8M/A5.8, BCup Series filler metal; and the requirements published by the Copper Development Association, Inc. (CDA) as referenced in Section ~~3~~2.

5 ~~Performance~~ Testing Requirements

5.1 Test Specimen

The test specimens for mechanically formed tee connections covered under this standard shall meet the following physical test requirements using Type M or L or K copper tubing.

~~5.1.1~~5.2 Leakage and Hydrostatic Strength Test~~.~~

5.2.1 Test Specimen

Test samples shall be prepared using copper tubing, consisting of 25.4 mm (1 in~~.~~) or larger tubing having various sizes of smaller branches. On each sample, one branch end shall be brazed to a 12.7 mm (1/2 in~~.~~) NPT threaded adapter, and the remaining open ends capped.

5.2.2 Test Procedure

The leakage and hydrostatic strength test shall be conducted as follows:

(a) The samples shall be filled with water, vented of all air, and individually connected to a source of hydrostatic pressure~~.~~;

(b) Each sample shall be pressurized to 2413 kPa (350 psi~~g~~) and held for ~~one (~~1~~)~~ min~~ute~~ while observations are made for evidence of leakage~~.~~; and

(c) The pressure is then slowly increased until rupture occurs.

5.2.3 Performance Requirements

None of the samples shall leak at 2413 kPa (350 psi~~g~~).

~~5.1.2~~5.3 Flexural Test~~.~~

5.3.1 Test Specimen

Ten test samples shall be fabricated using tubing in 25.4, 38.1, 50.8 and 76.2 mm (1, 1-1/2, 2 and 3 in~~.~~) sizes and branches in sizes 19.05 through 50.8 mm (3/4 through 2 in.).

5.3.2 Test Procedure

The flexural test shall be conducted as follows:

(a) The branches shall be individually flexed within the plane formed by the run and branch and perpendicular to that plane~~.~~;

(b) The resultant distorted joints shall be examined for cracking or separation of the brazed surfaces~~.~~;

(c) Prior to bending, eight of the samples shall be pressurized hydrostatically, four at 276 kPa (40 psi~~g~~), and four at 1207 kPa (175 psi~~g).~~); and

(d) Observations shall be made for leakage of the pressurized joints during the test. In all cases, bending of the branch pipe results in kinking of the branch immediately adjacent to the joint and/or in the distortion of the run pipe wall at the joint.

5.3.3 Performance Requirements

The overlapped, brazed surfaces at the joint shall not separate, and no leakage shall occur in the pressurized samples.

5.1.3 5.4 Vibration Test.

5.4.1 Test Specimen

The test sample shall consist of a 457.2 mm (1-1/2 feet ft) long, 25.4 mm (1 in.) copper tubing and a 304.8 mm (1 ft) long, 19.05 mm (3/4 in.) branch tube.

5.4.2 Test Procedure

The vibration test shall be conducted as follows:

(a) A 0.91 Kg (2 lb.) weight shall be rigidly attached to the free end of the branch tube.;

(b) The run tube is then fastened to the mounting plate of a vibration machine.;

(c) A 19.05 mm (3/4 in.) band type pipe hanger shall be installed on the branch line approximately 152.4 mm (6 in.) from the joint.;

(d) The pipe hanger rod shall be affixed to a stationary overhead support.;

(e) The sample shall be subjected to one hundred (100) hours of vibration at 35 Hz with a minimum displacement of 1.6 mm (0.065 in.).;

(f) Upon completion of the vibration exposure, the sample shall be subjected to a visual examination visually inspect the samples for signs of damage and then to the leakage and hydrostatic strength test.; and

(g) Test in accordance with Section 5.2, Leakage and Hydrostatic Strength Test.

5.4.3 Performance Requirements

The visual examination shall reveal no sign of damage. The sample shall withstand pressures of 2413 and 6033 kPa (350 and 875 psig) for one (1) minute without leakage or rupture.

6 Installation and Inspection Requirements

6.1 Mechanically Created Tee Connections. Mechanically extracted collars as created by the proper tool are formed in a continuous operation consisting of drilling a pilot hole and drawing out the tube surface to form a collar having a height of not less than three times the thickness of the branch tube wall so as to comply with the American Welding Society lap joint weld. The collaring device shall be fully adjustable to insure proper tolerance and complete uniformity of the joint. The branch tube is notched to conform with the inner curve of the run tube and have two dimple/depth stops (one 6.4 mm (1/4") atop the other) to insure penetration of the branch tube into the collar is of sufficient depth for brazing and that the branch tube does not obstruct the flow in the main line tube. Dimple/depth stops are in line with the run of the tube. The second dimple is 6.4 mm (1/4") above the first and serves as a visual point of inspection to assure proper alignment of the branch tube to the run tube. All joints are brazed in accordance with the Copper Development Association Copper Tube Handbook using BCuP series filler metal. **NOTE:** Soft soldered joints are not permitted.

~~7~~6 Markings and ~~Identifications~~Accompanying Literature

~~7.1~~6.1 Markings

6.1.1 All tools creating the mechanically formed tee connections in copper tubing shall have the manufacturer's name or trademark.

~~7.2~~6.1.2 All accessories to the tool creating mechanically formed tee connections in copper tubing shall be marked with the nominal size of the tee connection being created.

~~7.3~~6.1.3 All mechanically formed tee connections shall have a dimple/depth stop resting atop the mechanically extracted collar. A second dimple shall be 6.4 mm (1/4~~")~~ in) atop the first dimple for inspection purposes. The dimples shall be in line with the run of the tube. All mechanically formed tee connections as created by the tool shall be brazed. No soft solder allowed.

6.2 Installation ~~and Inspection Requirements~~Instructions

~~6.1 Mechanically Created Tee Connections.~~ Mechanically extracted collars as created by the proper tool are formed in a continuous operation consisting of drilling a pilot hole and drawing out the tube surface to form a collar having a height of not less than three times the thickness of the branch tube wall so as to comply with the American Welding Society lap joint weld. The collaring device shall be fully adjustable to insure proper tolerance and complete uniformity of the joint. The branch tube is notched to conform with the inner curve of the run tube and have two dimple/depth stops (one 6.4 mm (1/4" in) atop the other) to insure penetration of the branch tube into the collar is of sufficient depth for brazing and that the branch tube does not obstruct the flow in the main line tube. Dimple/depth stops are in line with the run of the tube. The second dimple is 6.4 mm (1/4" in) above the first and serves as a visual point of inspection to assure proper alignment of the branch tube to the run tube. All joints are brazed in accordance with the Copper Development Association Copper Tube Handbook using BCuP series filler metal.

NOTE: *Soft soldered joints are not permitted.*