Fintube, LLC Standard Specification for Electric-Resistance-Welded Studs

1. Scope

1.1 This specification covers round and elliptical external, electric-resistance-welded studs on tubes for use in boilers, economizers, fired heaters and other heat transfer equipment.

1.2 The tube and stud materials specified must be suitable for electric-resistance welding.

1.3 The values stated in inch-pound units or SI units are to be regarded separately as standard. Within the text, the SI units are shown in brackets. The values stated in each system are not exact equivalents, therefore, each system must be used independently of the other.

1.4 Where the term "tube" is used, material normally designated as "pipe" is also included.

2. Manufacture

2.1 The attachment of the studs to the tube will be by the electric-resistance-welding process.

2.2 The studs are considered to be nonpressure-bearing attachments with essentially no load-carrying function welded to a pressure part by an automatic welding process.

2.3 Studded tubes will be supplied in the "as-welded" condition without postweld heat treatment unless specified by the purchaser.

2.4 If post weld heat treatment is specified, studded tubes will be heated to 1325 - 1375 F and held for one (1) hour unless specified otherwise by the purchaser.

3. Chemical Composition

3.1 For tube material supplied by FTI, the chemical composition as shown on the mill test report will conform to the requirements for the grade or type specified.

3.2 The chemical composition of carbon steel studs will conform to A 510 Grade 1006, 1008 or 1010.

3.3 The chemical composition of alloy steel studs will conform to the grade or type specified by the purchaser.

4. Dimensions and Permissible Variations

4.1 To be suitable for studding, the base tube must meet the following additional requirements:

4.1.1 The outside surface of base tubes supplied by the purchaser must be free of any heavy coating or scale and have an average surface roughness not exceeding 500 uin. [12.5 um].

4.1.2 Base tubes supplied by the purchaser must be straight with a maximum deviation of 0.1 in. [3 mm] in any 10 ft. [3 m] section and 0.25 in. [6mm] over the total tube length for tubes under 40 ft. [12 m], 0.38 in. [10 mm] for tubes 40 ft. [12 m] to 60 ft. [18 m] and 0.5 in. [12 mm] for tubes 60 ft. [18 m] and longer.

4.2 Stud Tolerances:

4.2.1 Stud cross-sectional dimensions will be as specified +/- 0.01 in. (0.25 mm).

4.2.2 The stud height after welding, measured perpendicular to the tube surface, will be as specified +/- 0.04 in. (1.0 mm).

4.2.3 The number of rows per unit length of tube will be as specified +/- 2 percent as determined on not less than 2 ft. (0.6 m) of studded tube. The number of studs per row will be as specified.

4.2.4 The studs will be welded to the tube in a position 90 degrees to the tube surface. Inclination of the studs will not exceed 10 degrees from the vertical.

4.3 Studded Tube Tolerances:

4.3.1 Finished studded tubes will be straight with a maximum deviation of 0.25 in. [6 mm] in any 10 ft. [3 m] section of tube.

4.3.2 The location of each end of each studded section on a tube as measured from the starting end of the tube to the outside of the stud will be as specified +/- 0.63 in. [16 mm].

4.3.3 Unless specified otherwise by the purchaser, finished studded tubes will have a length tolerance of +/- 0.25 in. [6 mm].

4.3.4 The total number of studs actually missing from the pattern will not exceed one (1) percent on any one tube.

4.3.5 Stud and tube materials will usually show some oxidation or bluing near the weld and occassionally over the whole surface particularly if post weld heat treatment is specified. Studded tubes may also develop light surface rust before receipt by the purchaser. Either of these conditions is not considered cause for rejection.

4.3.6 After studding, any imperfections on the bare tube surface or variations in the base tube end outside diameter including ovality will not exceed those allowed by the base tube specification.

5. Inspection and Tests

5.1 To verify the quality of the stud-to-tube weld, studs will be subject to a bend test. The bend test is performed using a 20 in. [0.5 m] long 1 in. [25 mm] diameter bar with a hole in the end no more than 0.015 in. [0.4 mm] larger than the stud diameter or thickness. The bar is positioned over the stud to within 0.4 in. [10 mm] of the tube surface. The stud is then bent between 15 and 20 degrees along the axis of the tube and returned to its original position. After bending, the stud-to-tube weld must show no visible sign of fracture or separation.

5.2 The bend test will be performed on one stud on the first and last rows of each tube. In addition, one stud will be bend tested at least every 100 rows.

5.3 Each finished tube shall also be inspected for stud height, number of studs per row, number of rows per unit length, length and location of studded sections and overall length.

6. Product Marking and Packing

6.1 Studded tubes will be identified with weather resistant labels showing the FTI job number, the tube material heat number or code, the purchaser's name, purchase order number and mark number.

6.2 Studded tubes will be shipped separated from each other by wooden blocks in frame type packing unless otherwise specified by the purchaser. When specified, studded tubes will be packed in wooden boxes and/or sprayed with a rust inhibiting coating.