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TUBE AND HEADER DIMENSIONS FOR FIRED  
HEATERS FOR REFINERY SERVICES

1961

(Reaffirmed 1975)

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# TUBE AND HEADER DIMENSIONS FOR FIRED HEATERS FOR REFINERY SERVICES

1961

(Reaffirmed 1975)



AMERICAN PETROLEUM INSTITUTE

Refining Department

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# TUBE AND HEADER DIMENSIONS FOR FIRED HEATERS FOR REFINERY SERVICES

## GENERAL

### 1. Scope

a. This standard establishes certain standard dimensions for heater tubes and for cast or wrought headers.

b. For tubes, standard sizes and lengths are established. Tube wall thickness is not within the scope of this standard.

c. For headers, only center-to-center dimensions and tubeseat details are established. These dimensions are applicable only to manufacturers' standard header pressure ratings not exceeding 850 lb nominal.

d. For tubes, tolerances for size and length are not included herein, but shall be specified by the purchase order. This may be done by reference to an ASTM \* or other applicable specification. If a tube for rolled attachment to a header is purchased with size (outside diameter) tolerance as ordinarily applicable to pipe (as by reference to an ASTM specification for "pipe"), the user is cautioned that difficulty may be experienced in properly fitting the tube into the header.

e. For headers, tolerances on center-to-center and for tubeseat bore and depth of groove are included. Other tolerances shall be the manufacturer's standard.

### 2. Definitions

Terms used herein are defined as follows:

a. **Header:** Generally a fitting used for connecting the ends of two adjacent tubes, but also may be a similar terminal or other special fitting for one or more tube ends. (The header may be attached to the tubes by rolling or welding.)

b. **Heater:** A fired heater within which oil or other fluid is heated as part of an oil refinery process.

c. **Nominal pipe size.** The size by which "pipe" is designated, per ASA † B36.10 for steel and wrought-iron pipe.

d. **Tube:** A straight piece of round tubing, as installed in a heater, for conveying oil or other fluid within the heater; also other products normally designated as "pipe" and used for the same purpose.

e. **Tube length:** The overall length, end-to-end, regardless of type of end (square cut or otherwise).

f. **Tube size:** The nominal outside diameter, in inches.

g. **Tubeseat:** The grooved surface of a rolled-on header, into which a tube is rolled.

\* American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa.

† American Standards Association, 10 East 40th St., New York 16, N.Y.—ASA B36.10, Wrought-Steel and Wrought-Iron Pipe.

## TUBE DIMENSIONS

### 3. Tube Length

A tube longer than 24 ft shall have a length which is a multiple of 2 ft; a tube shorter than 24 ft shall have a length which is a multiple of 1 ft.

### 4. Tube Size

Tube size shall be selected from Table 1. First preference shall be given to a primary size shown. A secondary size may be selected if approved by the user.

TABLE 1—Tube Size and Header Center-to-Center

Tube Size (Outside Diameter, in Inches)		Header Center-to-Center <sup>1</sup>	
Primary <sup>1</sup>	Secondary	Group A (Inches)	Group B (Inches)
2.375	...	4.00 <sup>2,4</sup>	4.75
2.875	...	5.00 <sup>2,4</sup>	5.25
3.50	...	6.00 <sup>4</sup>	...
4.00	...	7.00 <sup>5</sup>	6.50
4.50	...	8.00 <sup>5</sup>	7.25
...	5.00	9.00	7.75
5.563	...	10.00 <sup>5</sup>	8.50
...	6.00	11.00	9.00
6.625	...	12.00 <sup>5</sup>	10.00
...	7.625	14.00	12.00
8.625	...	16.00 <sup>5</sup>	14.00

<sup>1</sup> These sizes equal the nominal outside diameter of certain nominal pipe sizes.

<sup>2</sup> Tolerance on c-to-c:

a.  $\pm \frac{1}{8}$  in. for a wrought header.

b.  $\pm \frac{1}{4}$  in. for a cast header. (For a multihole header, this tolerance is not cumulative; hence it is applicable to c-to-c between any two tube holes.)

<sup>4</sup> This c-to-c equals two times the corresponding nominal pipe size, in inches, and equals the c-to-c for wrought welding returns per MSS<sup>5</sup> SP59-1959.

<sup>5</sup> This c-to-c is inadequate for the tubeseat detail specified by Table 2 of this standard; hence this c-to-c is applicable only to welding-end headers.

<sup>5</sup> Manufacturers Standardization Society of the Valves and Fittings Industry, 420 Lexington Ave., New York 17, N.Y.—MSS SP59-1959, Steel Butt-Welding Short Radius Elbows and Returns

## HEADER DIMENSIONS

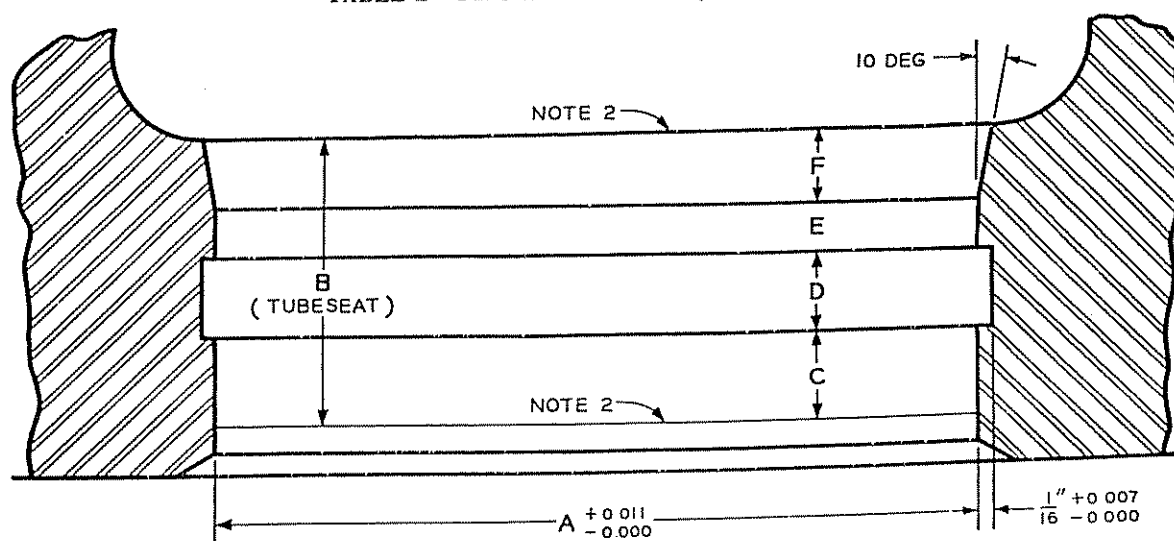
### 5. Header Center-to-Center

Center-to-center dimensions of a header shall be selected from either Group A or Group B of Table 1, corresponding to the tube size.

### 6. Header Tubeseat

Dimensions of the tubeseat shall conform to the details shown in Table 2 for tube wall thickness within the limits shown. Dimensions for a tube wall thinner or thicker than shown in Table 2 are not within the scope of this standard.

TABLE 2—Tubeseat Dimensions (See Note 1)



Tube (Outside Diameter)	A	B	C	D	E	F	Min. Tube Wall	Max. Tube Wall
2.375	2.405	1 1/4	3/8	3/8	1/8	1/8	1/8	7/8
2.875	2.905	1 1/4	3/8	3/8	1/4	1/4	1/8	1/8
3.500	3.530	1 3/8	7/8	7/8	1/4	1/4	1/8	1/8
4.000	4.030	1 1/2	7/8	7/8	1/4	3/8	1/8	1/8
4.500	4.530	1 3/4	7/8	7/8	3/8	3/8	1/8	1/2
5.000	5.030	1 3/4	1	1	3/8	3/8	1/4	1/2
5.563	5.593	1 7/8	9/8	9/8	3/8	3/8	1/4	1/2
6.000	6.030	2	8/8	8/8	3/8	3/8	1/4	9/8
6.625	6.655	2 1/4	1 1/8	1 1/8	3/8	3/4	1/4	9/8
7.625	7.655	2 1/2	3/4	3/4	1/2	1/2	1/4	8/8
8.625	8.655	3	1	1	1/2	1	1/4	1 1/8

Note 1: All dimensions are in inches. Tube wall thicknesses shown in the table are nominal thicknesses.

Note 2: Casting and machining details beyond this line (outside the tubeseat) shall be the manufacturer's standard.