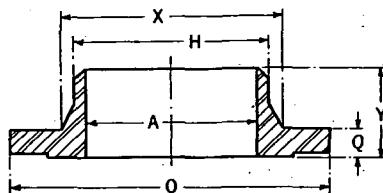


TABLE 10. PROPOSED DIMENSIONS OF STEEL WELDING NECK FLANGES FOR MAXIMUM STEAM SERVICE PRESSURE OF 300 LB PER SQ IN. (GAGE) AT A TEMPERATURE OF 750 F



NOMINAL PIPE SIZE	DIAM. OF FLANGE	THICKNESS OF FLANGE MIN.	DIAM. OF HUB	HUB DIAM. BEGINNING OF CHAMFER	LENGTH THRU HUB	DIAM. FOR STANDARD PIPE	DIAM. FOR EXTRA STRONG PIPE	DIAM. OF BOLT CIRCLE	NO. OF BOLTS	SIZE OF BOLTS
	O	Q	X	H	Y	A	A			
*2	6½	⅞	3⅝	2.38	2¾	2.07	1.94	5	8	⅝
2½	7½	1	3⅝	2.88	3	2.47	2.32	5⅞	8	⅝
3	8¼	1⅛	4⅝	3.50	3½	3.07	2.90	6⅝	8	⅝
3½	9	1⅜	5¼	4.00	3⅝	3.55	3.36	7¼	8	⅝
4	10	1½	5¾	4.50	3¾	4.03	3.83	7⅞	8	⅝
5	11	1⅝	7	5.56	3⅞	5.05	4.81	9¼	8	⅝
6	12½	1⅞	8½	6.63	3⅞	6.07	5.76	10⅝	12	⅝
8	15	2	10½	8.63	4⅞	7.98	7.63	13	12	⅝
10	17½	2⅛	12⅝	10.75	4⅞	10.02	9.75	15¼	16	1
12	20½	2½	14¾	12.75	5⅞	12.00	11.75	17¾	16	1⅝
14 O. D.	23	2⅝	16¾	14.00	5⅞	13.25	-----	20¼	20	1⅝
16 O. D.	25½	2¾	19	16.00	5⅞	15.25	-----	22½	20	1⅝
18 O. D.	28	2⅞	21	18.00	6¼	17.25	-----	24¾	24	1⅝
20 O. D.	30½	2⅞	23⅝	20.00	6⅞	19.25	-----	27	24	1⅝
24 O. D.	36	2¾	27⅞	24.00	6⅞	23.25	-----	32	24	1⅝

*For sizes below 2 inches use dimensions of 600 lb flanges.

All dimensions given in inches.

A raised face of ⅛ in. is included in thickness of flange minimum.

It is recommended that the taper of the hub should not exceed 6 degrees for a reasonable distance back of the chamfer in order to reduce the heat transfer while welding.

expulsion of air from the radiators when the steam pressure rises and, in addition, act as checks to prevent the return of air into the radiator when a vacuum is formed by the condensation of steam after the supply pressure has dropped. Ordinary air valves permit the expulsion of air from the radiator when steam is supplied under pressure, but when the pressure dies down and a vacuum tends to be formed the air is drawn back into the radiator.

A system supplied with vacuum valves will heat more quickly and stay warm longer than one provided with straight pressure air valves; thus it will effect considerable economy of fuel because the idle period during which no heat is delivered is shortened. Automatic air valves are provided with a float to close them in case the radiator becomes flooded with water because it does not drain properly.

CORROSION²

Corrosion is sometimes encountered in heating work on the outside of buried pipes or the inside of steam heating systems; it is seldom experienced in hot water heating systems unless the water is frequently renewed. Piping buried in the ground is quite successfully protected by coatings of the asphaltic type which are usually applied hot and often reinforced with fabric wrappings. Galvanizing by the hot-dip process and painting with specially prepared mixtures also afford some protection.

Internal corrosion in steam heating systems occurs principally in the condensate return pipes and is nearly always caused by oxygen or carbon dioxide, or both, in solution in the condensate. Oxygen may enter the heating system with the steam, owing to its presence in the boiler-feed water, or it may enter as air through small leaks, particularly in systems which operate at sub-atmospheric pressures. When a steam heating system is operated intermittently, air rushes in during each shutdown period and oxygen is absorbed by the condensate which clings to the interior surfaces of the pipes and radiators. The rate of corrosion depends upon the amounts of oxygen and carbon dioxide present in solution, upon the operating temperature, and upon the length of time that the pipe surfaces are in contact with gas-laden condensate.

Another possible cause of corrosion is a flow of electric current sometimes resulting from faulty electrical circuits which should be corrected. Electrolytic corrosion also may occur because of the presence of two dissimilar metals, such as brass and iron, but the condensate in practically all steam heating systems is such a weak electrolyte that this cause of corrosion is very infrequent.

If trouble is experienced from corrosion, oxygen should be eliminated from the feed water by proper deaeration with commercial apparatus. The elimination of the oxygen due to air leakage is more difficult because of the multitude of small leaks which exist around valve stems and in pipe joints. In vacuum systems, however, an attempt should be made to minimize such leakage.

Carbon dioxide in varying amounts is contained in steam produced from the majority of water supplies. It is formed from the breaking down of carbonates and bicarbonates which are present in nearly all natural waters. It can be partly removed by chemical treatment and deaeration, but there is no simple method whereby it can be entirely eliminated.

These gases cause corrosion only when in solution in the condensate; when they are mixed with dry steam their corrosive effect is negligible. The amount of gas in solution depends upon the partial pressure of that gas in the atmosphere above the surface of the solution, in accordance with the well known physical law of Henry and Dalton³. The exact application of this law, however, assumes equilibrium conditions which do not always exist under the flow conditions prevailing in a heating system.

²New Light on Heating System Corrosion, by J. H. Walker (*Heating and Ventilating*, May, 1933).³Some Fundamental Considerations of Corrosion in Steam and Condensate Lines, by R. E. Hall and A. R. Mumford (A.S.H.V.E. TRANSACTIONS, Vol. 38, 1932).