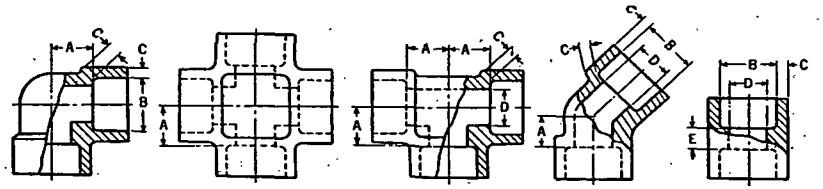
For piping which is to be operated at pressures in excess of 15 lb per square inch, rules for fusion welding of pipe joints and the qualification of welders and welding procedures as contained in the *American Standard Code for Pressure Piping* should be observed. For pressures 15 lb per square inch or below, the foregoing rules or those set forth in the *Standard Manual on Pipe Welding* of the *Heating, Piping and Air Conditioning Contractors National Association* should be followed to insure a satisfactory welded joint.

A complete line of manufactured steel welding fittings is now available and a dimensional standard has been prepared under the procedure of the

TABLE 10. PROPOSED AMERICAN STANDARD DIMENSIONS OF SOCKET-WELDING ELBOWS, TEES, CROSSES, 45-DEG ELBOWS, AND COUPLINGS



Nominal Pipe Size	Minimum Depth of Socket	Center to Bottom of Socket: 90-Deg Ells, Tees, Crosses		Center to Bottom of Socket: 45-Deg Ells		Couplings Distance Between Bottom Sockets	Bore Diameter of Socket, Minimum	Minimum Socket Wall Thickness			Bore Diameter of Fittings		
		Sched. 40 & 80	Sched. 160	Sched. 40 & 80	Sched. 160			Sched. 40	Sched. 80	Sched. 160	Sched. 40	Sched. 80	Sched. 160
		A		A		E	B	C[a]			D		
¼	5/16	11/16	.....	5/8	.....	¼	0.555	0.156	0.156	.....	0.364	0.302	.....
3/8	5/16	11/16	.....	5/8	.....	3/8	0.690	0.156	0.158	.....	0.493	0.423	.....
½	3/8	3/4	.....	3/4	½	½	0.855	0.156	0.184	0.234	0.622	0.546	0.466
¾	½	7/8	15/16	7/8	15/16	¾	1.065	0.156	0.193	0.273	0.824	0.742	0.614
1	½	1	1 1/16	1	1 1/16	1	1.330	0.166	0.224	0.313	1.049	0.957	0.815
1¼	½	1 1/16	1 1/4	1 1/16	1 5/16	1¼	1.675	0.175	0.239	0.313	1.380	1.278	1.160
1½	½	1¼	1 1/2	1 5/16	1 5/8	1½	1.915	0.181	0.250	0.351	1.610	1.500	1.338
2	½	1½	1 5/8	1	1 1/4	2	2.406	0.193	0.273	0.429	2.067	1.939	1.689
2½	½	1 5/8	2 1/4	1 1/4	1 1/4	2½	2.906	0.254	0.345	0.469	2.469	2.323	2.125
3	½	2¼	2½	1½	1 5/8	3	3.535	0.270	0.375	0.546	3.068	2.900	2.626

All dimensions are given in inches.

[a] Dimension C is 1¼ times the nominal pipe thickness, minimum, but not less than 1/16 in.

Reducing sizes have same center to bottom of socket dimension as the largest size of reducing fitting.

American Standards Association to unify heretofore divergent dimensions for the same type welding fittings as produced by different manufacturers. Standard dimensions for steel butt-welding elbows, tees, caps, and lapped-joint stub ends are given in Table 8. Dimensions for eccentric and concentric reducers, and 180-deg return bends are not shown in Table 8 but are included in the American Standard. Larger sizes also are available in some types of fittings. The welding bevel which is a straight 37½-deg V for wall thicknesses ¾ in. and below, and a U-bevel for thicknesses heavier than ¾ in., conforms to the recommended practice of *A.S.A.* Standard B16e-1939, American Standard for Steel Pipe Flanges and Flanged Fittings. The latter also contains dimensions for steel welding neck flanges for pressures up to 2500 lb per square inch, and slip-on

welding flanges for 150 and 300 lb per square inch. Table 9 gives these dimensions for welding-neck and slip-on welding flanges suitable for 150 lb per square inch gage pressure.

Socket-welding fittings also are commercially available. These fittings have a machined recess for inserting the pipe which is attached by a fillet weld between the pipe wall and socket end. Use of socket-welding fittings generally is restricted to nominal pipe sizes 3 in. and smaller in which range commercial fittings are available. This type of fitting has gained rapid acceptance owing to its ease of installation, low cost, and ability to make a pressure tight joint without weakening the pipe as is the case with threading. Dimensions for socket-welding fittings as offered by most manufacturers of the product are given in Table 10.

VALVES

Valves are made with both threaded and flanged ends for screwed and bolted connections just as are pipe fittings.

The material used for valves of small size is generally brass or bronze for low pressures and forged steel for high pressures, while in the larger sizes either cast-iron, cast-steel or some of the steel alloys are employed. Practically all iron or steel valves intended for steam or water work are bronze-mounted or trimmed.

Brass, bronze, and iron valves are generally designed for standard or extra heavy service, the former being used up to 125 lb and the latter up to 250 lb saturated steam working pressure, although most manufacturers also make valves for medium pressure up to 175 lb steam working pressure. The more common types are gate valves or straightway valves, globe valves, angle valves, check valves and automatic valves, such as reducing and back-pressure valves.

Gate valves are the most frequently used of all valves since in their open position the resistance to flow is a minimum, but they should not be used where it is desired to throttle the flow; globe valves should be used for this purpose. These valves may be secured with either a rising or a non-rising stem, although in the smaller sizes the rising stem is more commonly used. The rising stem valve is desirable because the positions of the handle and stem indicate whether the valve is open or closed, although space limitations may prevent its use. The globe valve is less expensive to manufacture than the gate valve, but its peculiar construction offers a high resistance to flow and may prevent complete drainage of the pipe line. These objections are of particular importance in heating work.

An American Standard, *A.S.A.* B16.10-1939, has been prepared giving the face-to-face dimensions of ferrous flanged and welding-end valves. The following types are covered: wedge gate, double disc gate, globe and angle, and swing check. One purpose of establishing these dimensions is to insure that gate valves of a given rating and flange dimension of either the wedge or double disc design will be interchangeable in a pipe line. Contact surface to contact surface dimensions of cast-iron and steel flanged-wedge-gate valves are given in Table 11. End-to-end dimensions for steel butt-welding valves in sizes up to 8 in., inclusive, are the same as those given in Table 11 for steel valves.

Check valves are automatic in operation and permit flow in only one