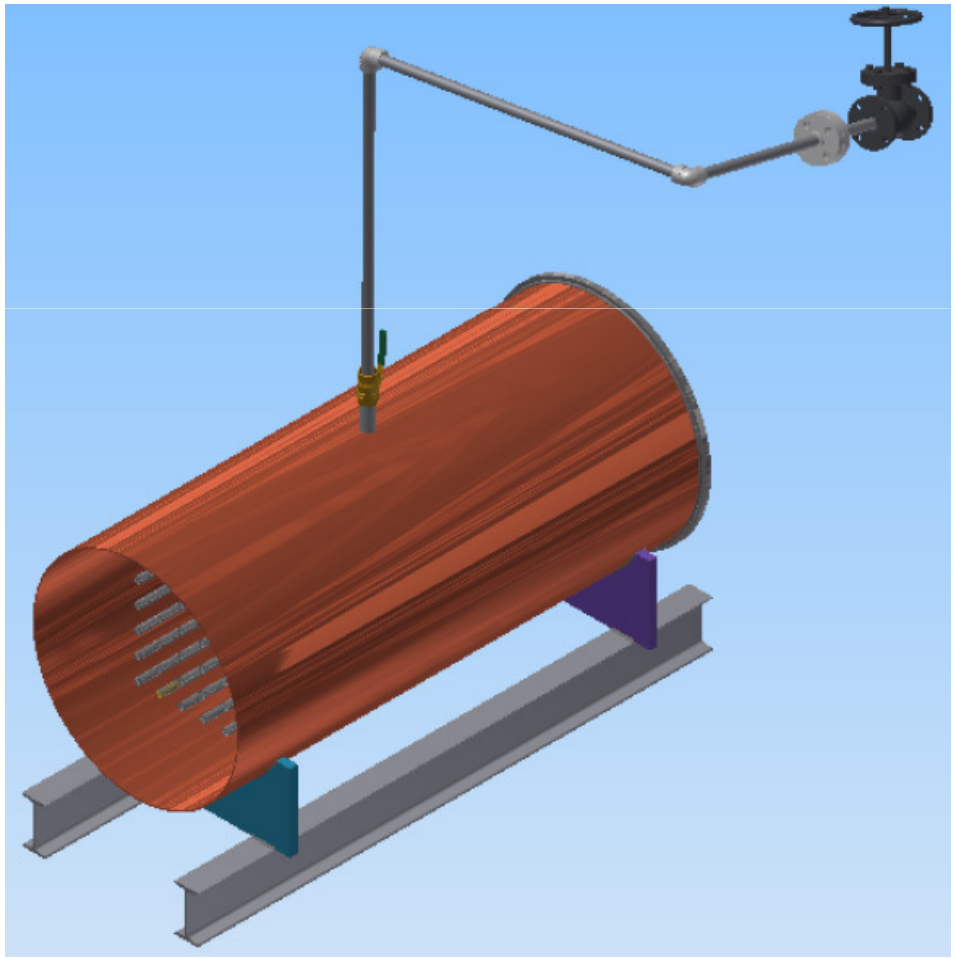
STANDARD PIPES

PIPE DRAWING



Years ago water was the only important fluid that was conveyed from one point to another in pipes. Today almost every conceivable fluid is handled in pipes during its production, processing, transportation, or utilization. The age of nuclear power and space flight has added fluids such as liquid metals, oxygen, and nitrogen to the list of more common fluids—oil, water, gases, and acids—that are being transported in pipes. Nor is the transportation of fluids the only phase of hydraulics that warrants attention now. Hydraulic and pneumatic mechanisms are used extensively for the control of machinery and numerous other types of equipment. Piping is also used as a structural element in columns and handrails. It is for these reasons that drafters and engineers should become familiar with pipe drawings.

Ref.: Engineering Drawing and Design, Jensen, Helsel, Short

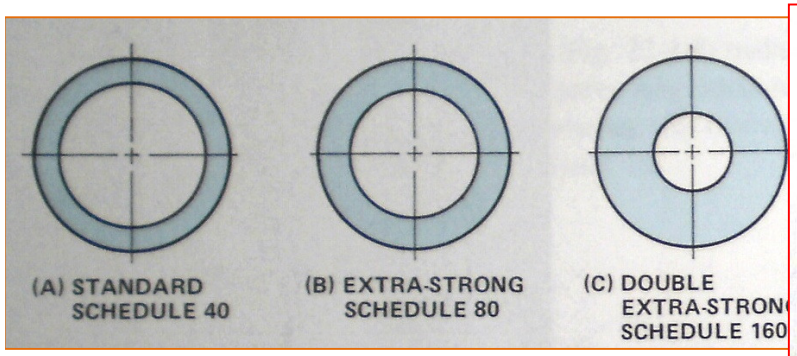
Nominal Size (mm)		D_{out} (mm)	t (mm)	D_{in} (mm)
1/2″	DN 15	21,3	2,8	15,7
3/4″	DN 20	26,9	2,9	21,1
1″	DN 25	33,7	3,4	26,9
1 1/4″	DN 32	42,4	3,6	35,2
1 1/2″	DN 40	48,3	3,7	40,9
2″	DN 50	60,3	3,9	52,5
2 1/2″	DN 65	73.0	5.20	62,6
3″	DN 80	88,9	5,5	77,9
4″	DN 100	114,3	6	102,3
5″	DN 125	141.0	6,6	127,8
6″	DN 150	168,3	7,1	154,1
8″	DN 200	219,1	8,18	202,74
12″	DN 300	323	9,5	304
16″	DN 400	406	9,5	387
18″	DN 450	470	9,5	451

NPS[5]	DN [2]	OD [in (mm)]	Wall thickness [in (mm)]											
			SCH 5	SCH 10s/10	SCH 20	SCH 30	SCH 40s/40 /STD	SCH 60	SCH 80s/80 /XS	SCH 100	SCH 120	SCH 140	SCH 160	XXS[5]
4	100	4.500 (114.30)	0.083 (2.108)	0.120 (3.048)	—	0.188 (4.775)	0.237 (6.020)	0.281 (7.137)	0.337 (8.560)	—	0.437 (11.100)	—	0.531 (13.487)	0.674 (17.120)
4½	115	5.000 (127.00)	—	—	—	—	0.247 (6.274)	—	0.355 (9.017)	—	—	—	—	0.710 (18.034)
5	125	5.563 (141.30)	0.109 (2.769)	0.134 (3.404)	—	—	0.258 (6.553)	—	0.375 (9.525)	—	0.500 (12.700)	—	0.625 (15.875)	0.750 (19.050)
6	150	6.625 (168.28)	0.109 (2.769)	0.134 (3.404)	—	—	0.280 (7.112)	—	0.432 (10.973)	—	0.562 (14.275)	—	0.719 (18.263)	0.864 (21.946)
7[5]	—	7.625 (193.68)	—	—	—	—	0.301 (7.645)	—	0.500 (12.700)	—	—	—	—	0.875 (22.225)
8	200	8.625 (219.08)	0.109 (2.769)	0.148 (3.759)	0.250 (6.350)	0.277 (7.036)	0.322 (8.179)	0.406 (10.312)	0.500 (12.700)	0.593 (15.062)	0.719 (18.263)	0.812 (20.625)	0.906 (23.012)	0.875 (22.225)
9[5]	—	9.625 (244.48)	—	—	—	—	0.342 (8.687)	—	0.500 (12.700)	—	—	—	—	—

Kinds of Pipes

Steel and Wrought-Iron Pipe

Steel or wrought-iron pipes carry water, steam, oil, and gas and are commonly used where high temperatures and pressures are encountered. Standard steel and cast-iron pipe is specified by the nominal diameter, which is always less than the actual inner diameter (ID) of the pipe. This pipe was available up to recent times in only three wall thicknesses—standard, extra-strong, and double extra-strong (Fig. 24-1 on the next page). In order to use common fittings with these different wall thicknesses of pipe, the outer diameter (OD) of each remained the same, and the extra metal was added to the ID to increase the wall thickness of the extra-strong and double extra-strong pipe.



The nominal size of pipe is given in inch sizes, but the inside and outside diameters and wall thicknesses are given in millimeter sizes in the metric system.

Because of the demand for a greater variety of pipe for increased pressure and temperature uses, ANSI has made available 10 different wall thicknesses of pipe, each designated by a **schedule number**. Standard pipe is now referred to as *schedule 40 pipe*, and extra-strong pipe as *schedule 80*. Pipe over 12 in. is referred to as *OD pipe*, and the nominal size is the OD of the pipe.

SN- Schedule Number

Cast-Iron Pipe

Cast-iron pipe is often installed underground to carry water, gas, and sewage. It is also used for low-pressure steam connections. Cast-iron pipe joints are normally of the flanged type or the bell-and-spigot type.

Seamless Brass and Copper Pipe

These types of pipe are used extensively in plumbing because of their ability to withstand corrosion. They have the same nominal diameter as steel or iron pipe, but they have thinner wall sections.

Copper Tubing

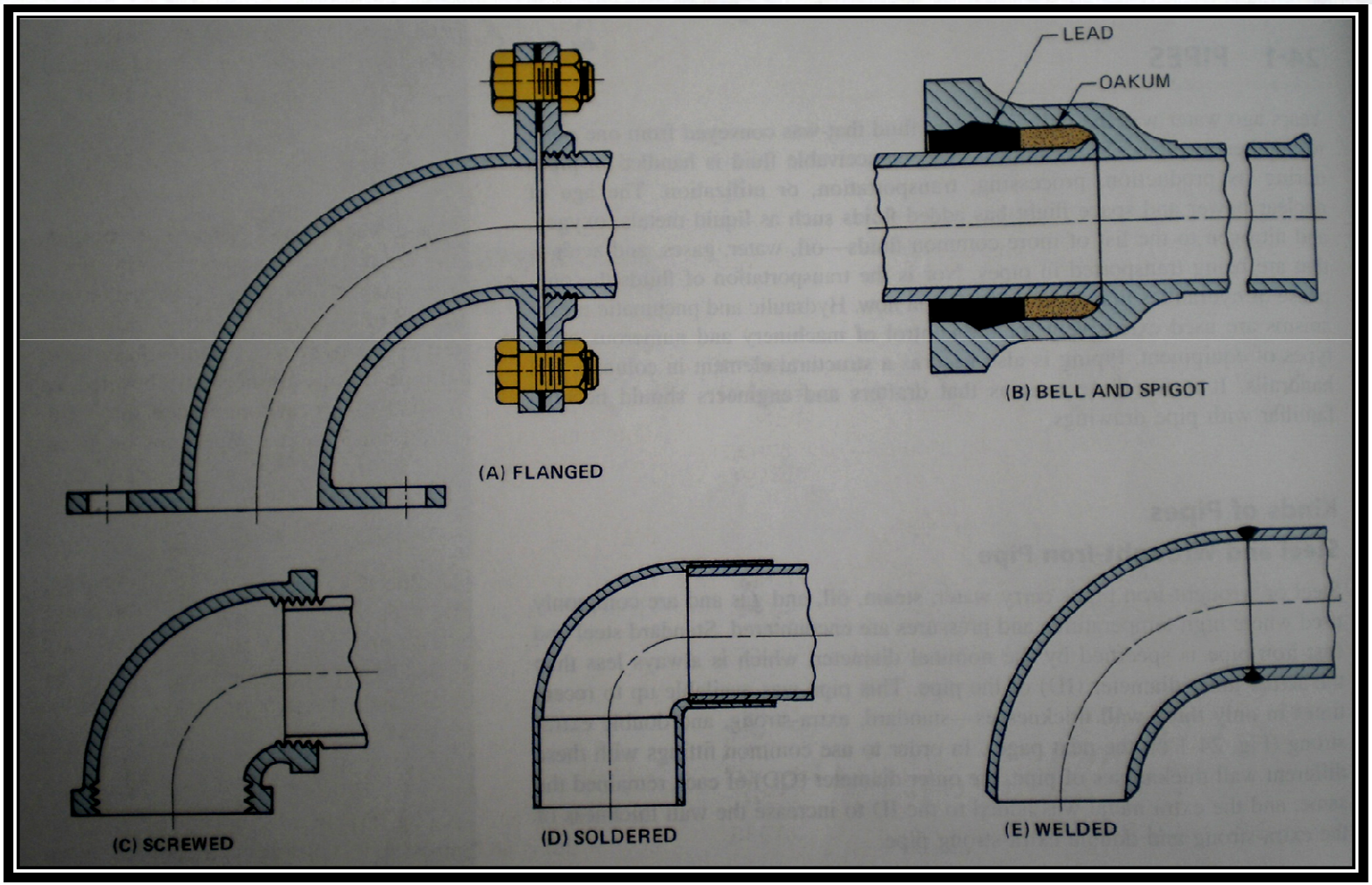
This pipe is used in plumbing and heating and where vibration and misalignment are factors, such as in automotive, hydraulic, and pneumatic designs.

Plastic Pipe

This pipe or tubing, because of its corrosion and chemical resistance, is used extensively in the chemical industry. It is flexible and readily installed, but it is not recommended where heat or pressure is a factor.

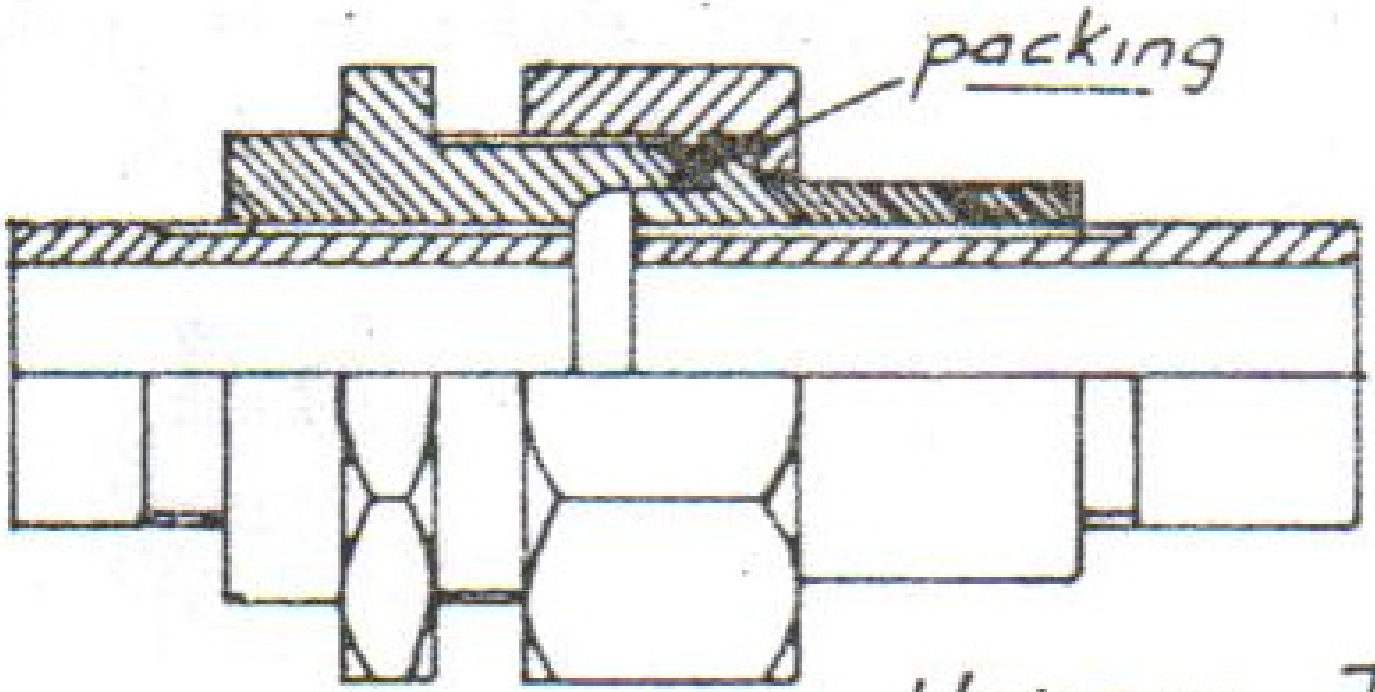
Pipe Joints and Fittings

Parts that are used to join pipe are called **fittings**. They may be used to change size or direction and to join or provide branch connections. They fall into three general classes:



Common Types of Pipe Joints

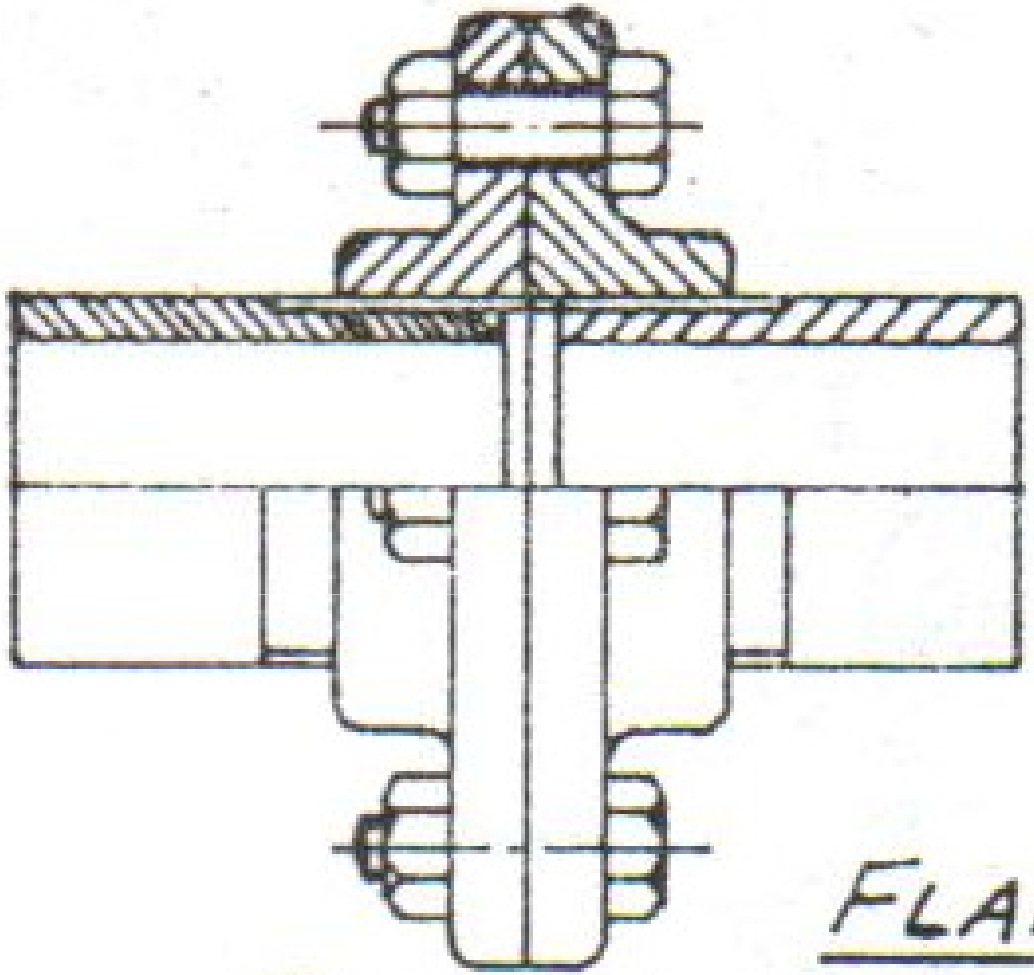
Pipe Connections



UNION JOINT

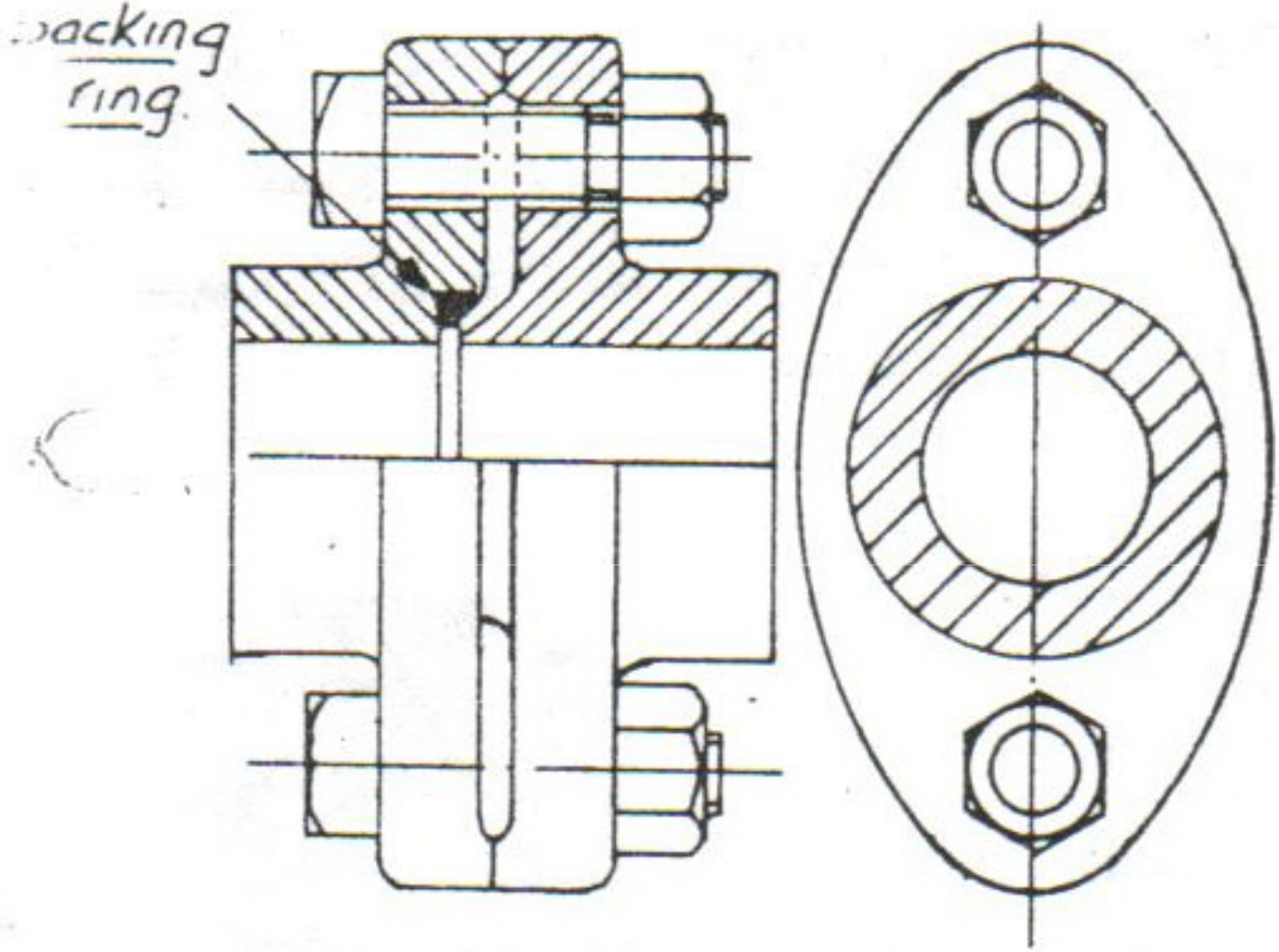
Used on small steam pipe connections

Screwed coupling easily disconnected



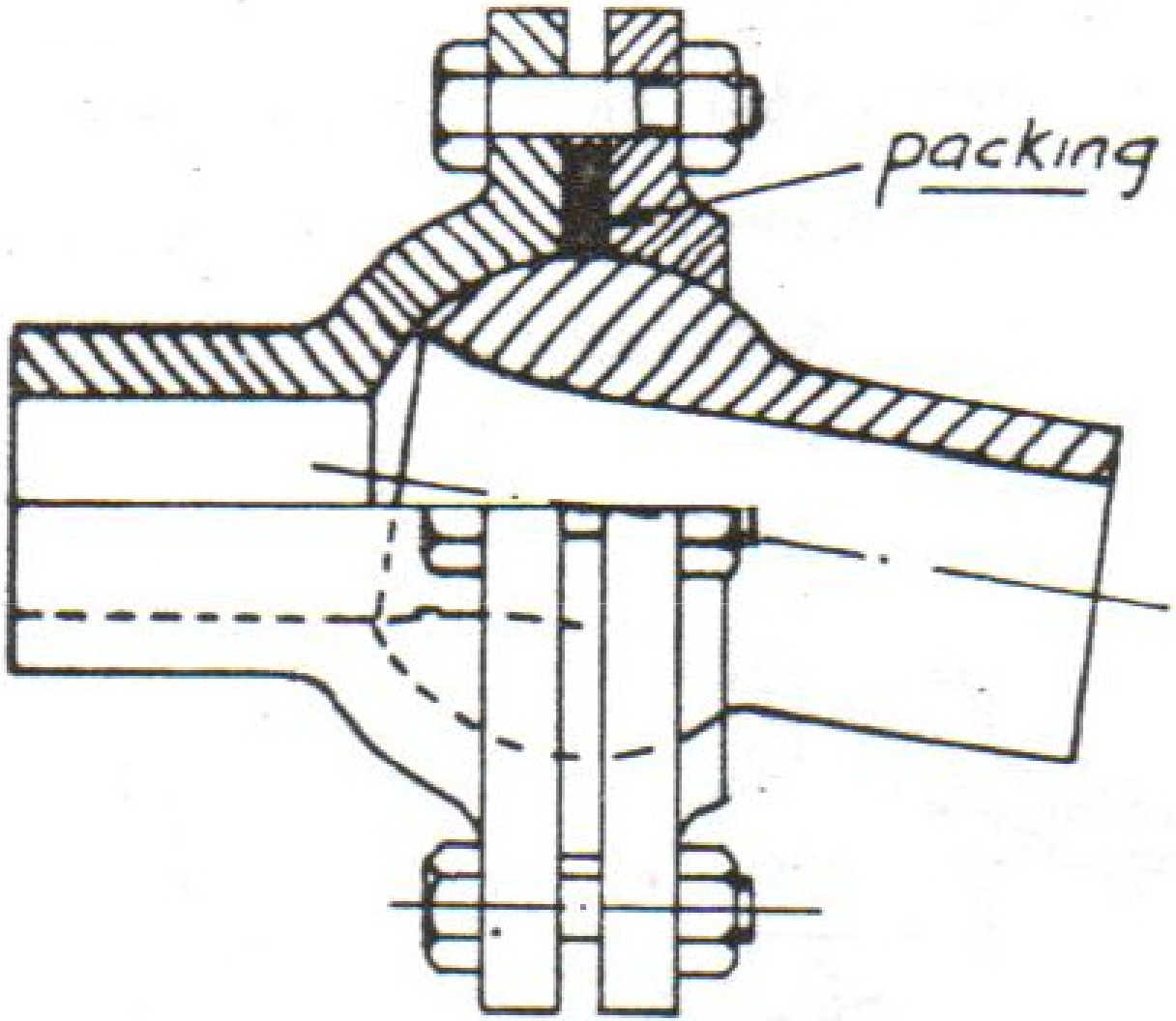
FLANGE JOINT

Threaded W.I pipes and flanges are SCREWED together and bolted

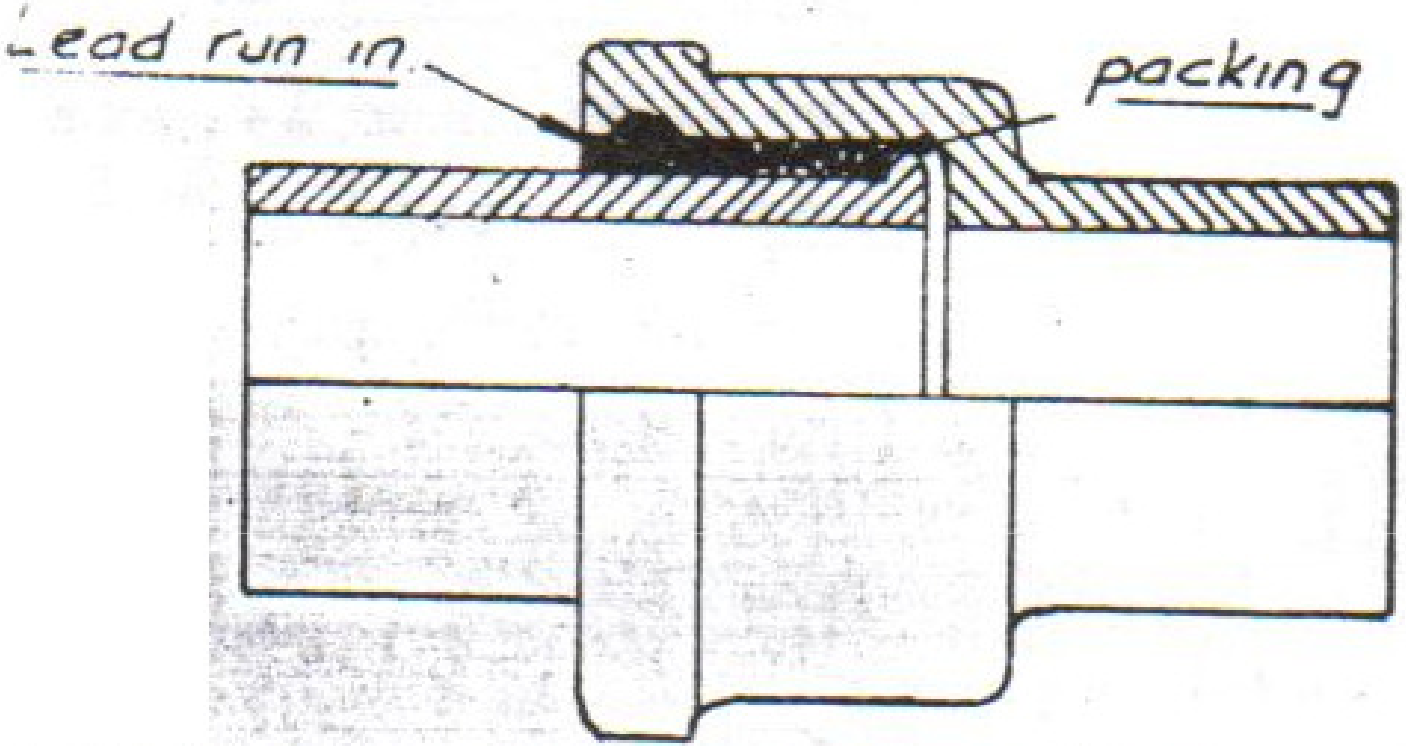


HYDRAULIC PIPE JOINT

Used for high pressures

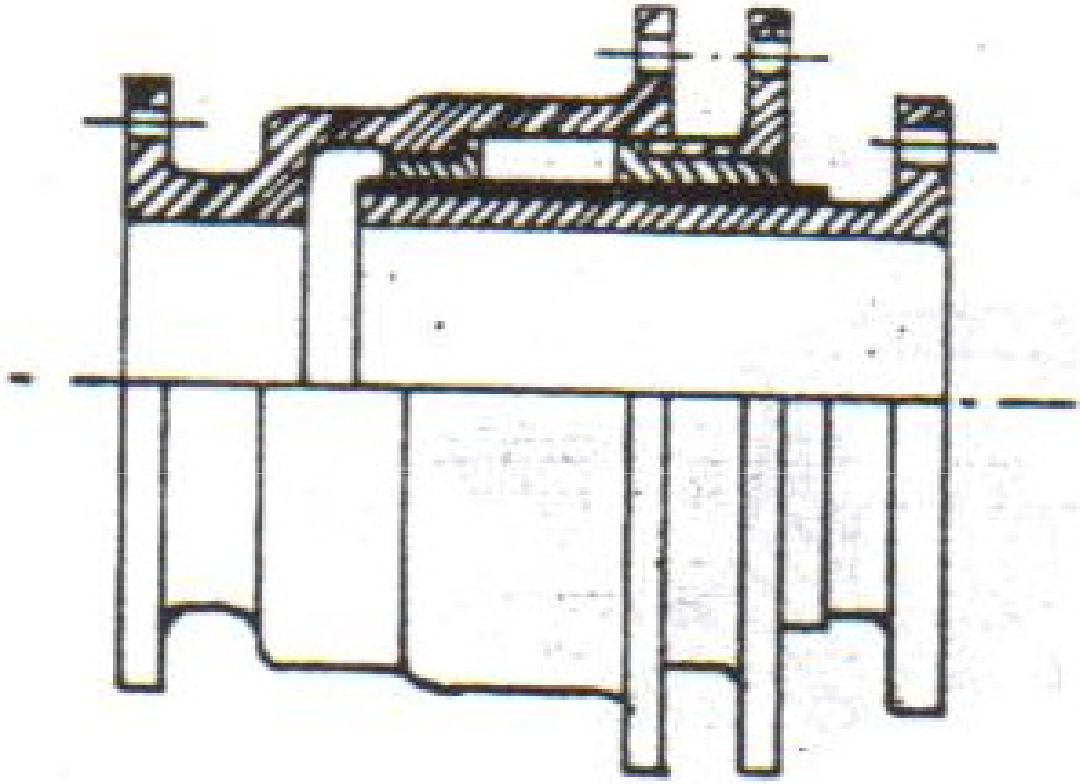


FLEXIBLE BALL JOINT



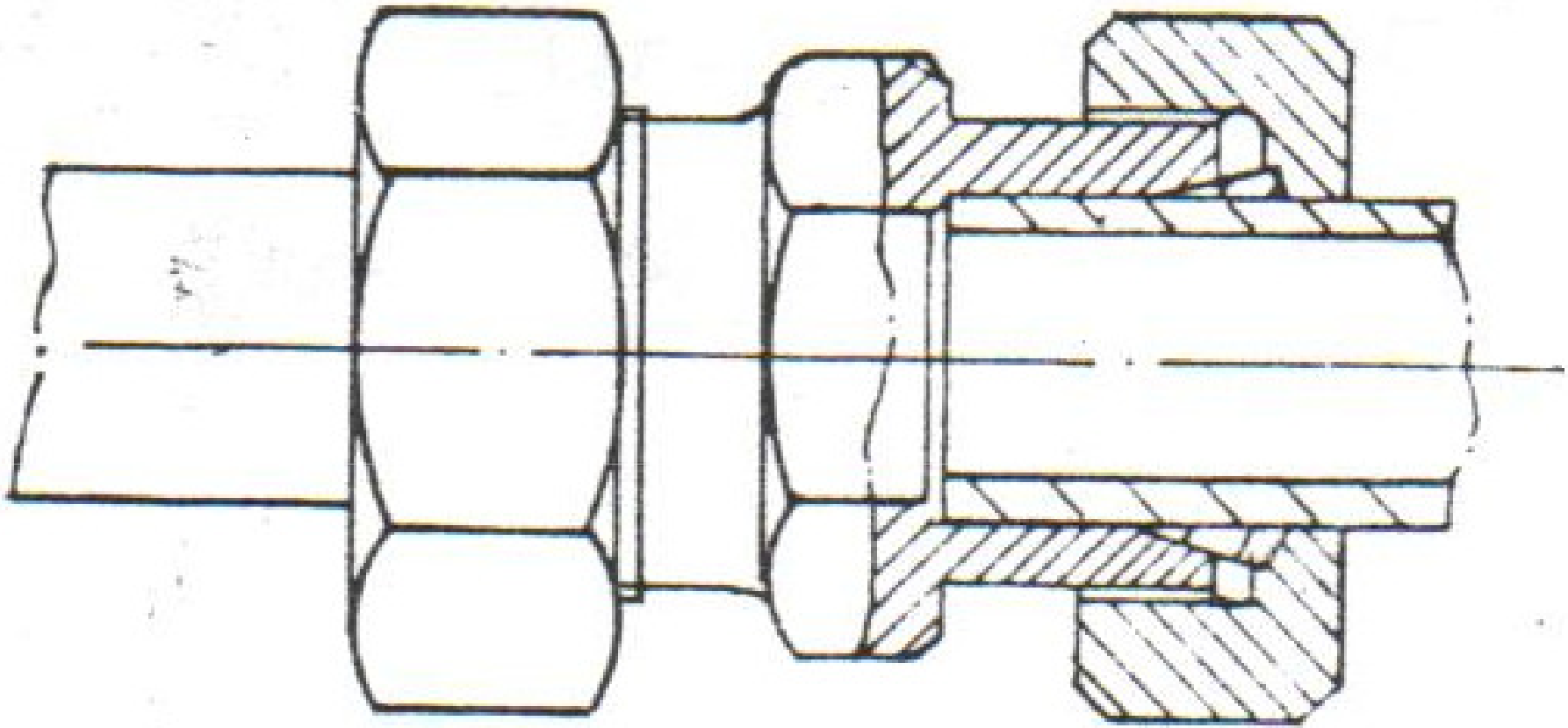
LEADED' SPIGOT & SOCKET JOINT

for C.I, water and gas pipes

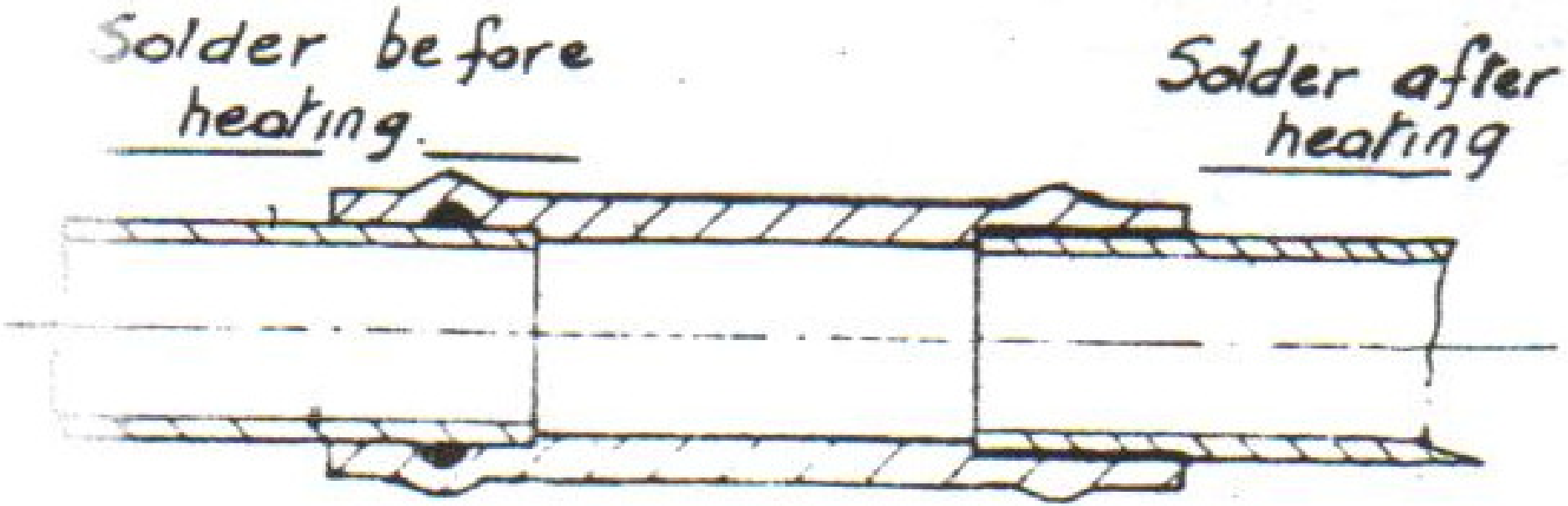


EXPANSION JOINT

for steam pipes



HIGH PRESSURE FITTING

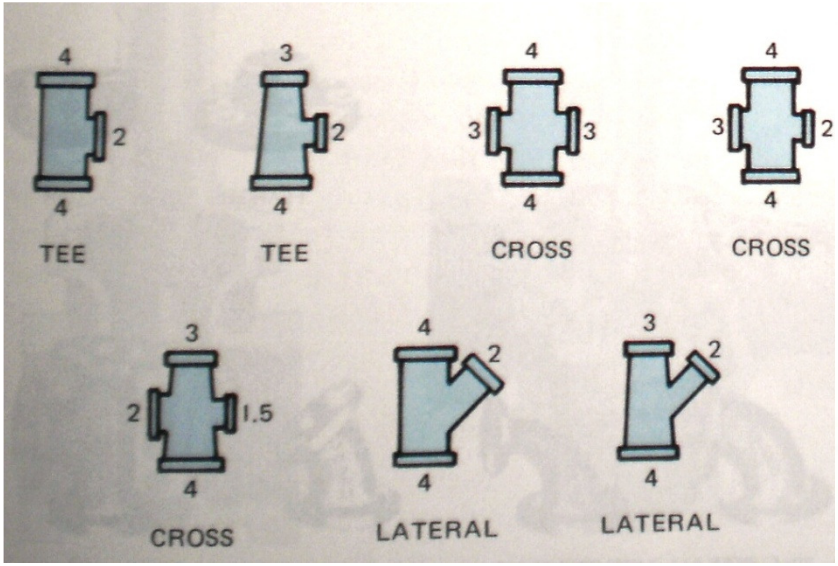


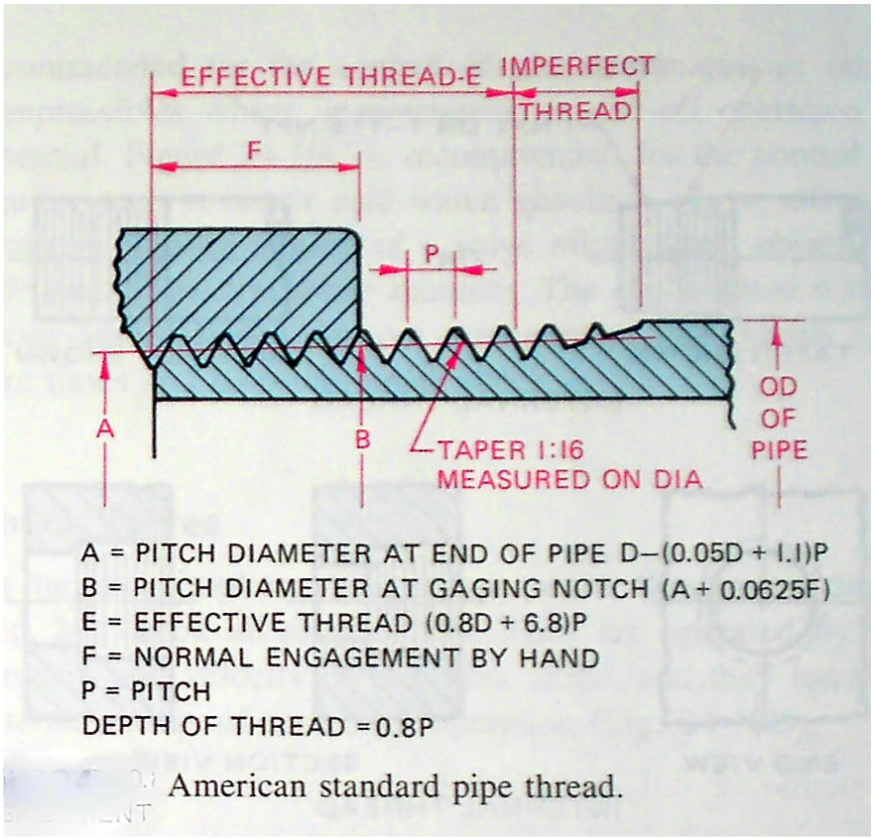
YORKSHIRE FITTING

Screwed Fittings

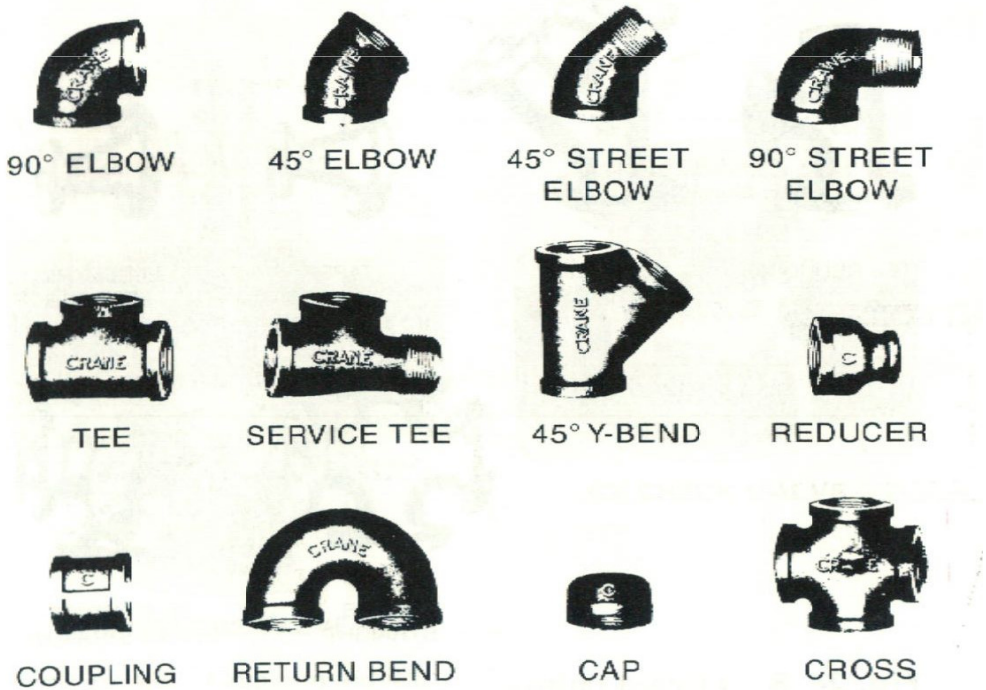
Screwed fittings, as shown in Fig. are generally used on small pipe design of 2.50 in. or less. Common practice is to use a pipe compound (a mixture of lead and oil) on the threaded connection to provide a lubricant and to seal any irregularities.

The American standard pipe thread is of two types—tapered and straight. The tapered thread, which is the more common, employs a 1:16 taper on the diameter of both the external and the internal threads This fixes the distance to which the pipe enters the fitting and ensures a tight joint. Straight threads are used for special applications, which are listed in the ANSI handbook.





American standard pipe thread.



Screwed fittings.

90° ELBOW

90° REDUCING ELBOW

90° STRAIGHT ELBOW

TEE STRAIGHT

TEE REDUCING

45° LATERAL STRAIGHT

TAPER REDUCER

ECCENTRIC REDUCER

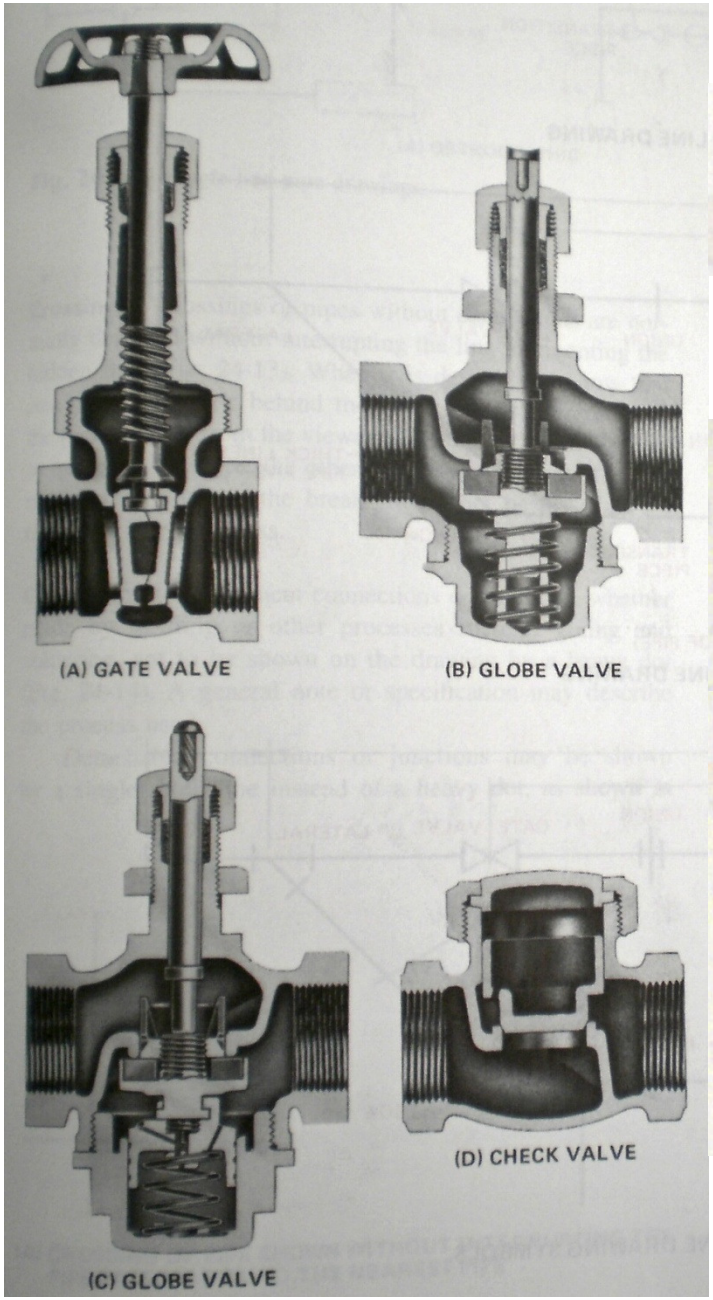
Valves

Valves are used in piping systems to stop or to regulate the

recommended for the control of air, steam, gas, or other compressibles where instantaneous on-and-off operation is essential. is recommended for the control of liquids, such as hot or cold water, gasoline, oil, or solvents, when the sudden closure of a valve might cause objectionable and destructive water hammer. The cap is fitted with a spring-loaded piston dashpot arrangement that retards closure times and helps eliminate shock.

Globe valves are used to control the flow of liquids or gases. The design of the globe valve requires two changes in the direction of flow, which slightly reduces the pressure in the system. The globe valve is installed so that the pressure is on the disk, which assists the spring in the cap to make a tight closure. This type of valve is

Recommended for the control of air, steam, gas, or other comressibles where instantaneous on-and-off operation is essential.



Check Valves

As the name implies, check valves permit flow in one direction, but check all reverse flow.

Piping Drawings

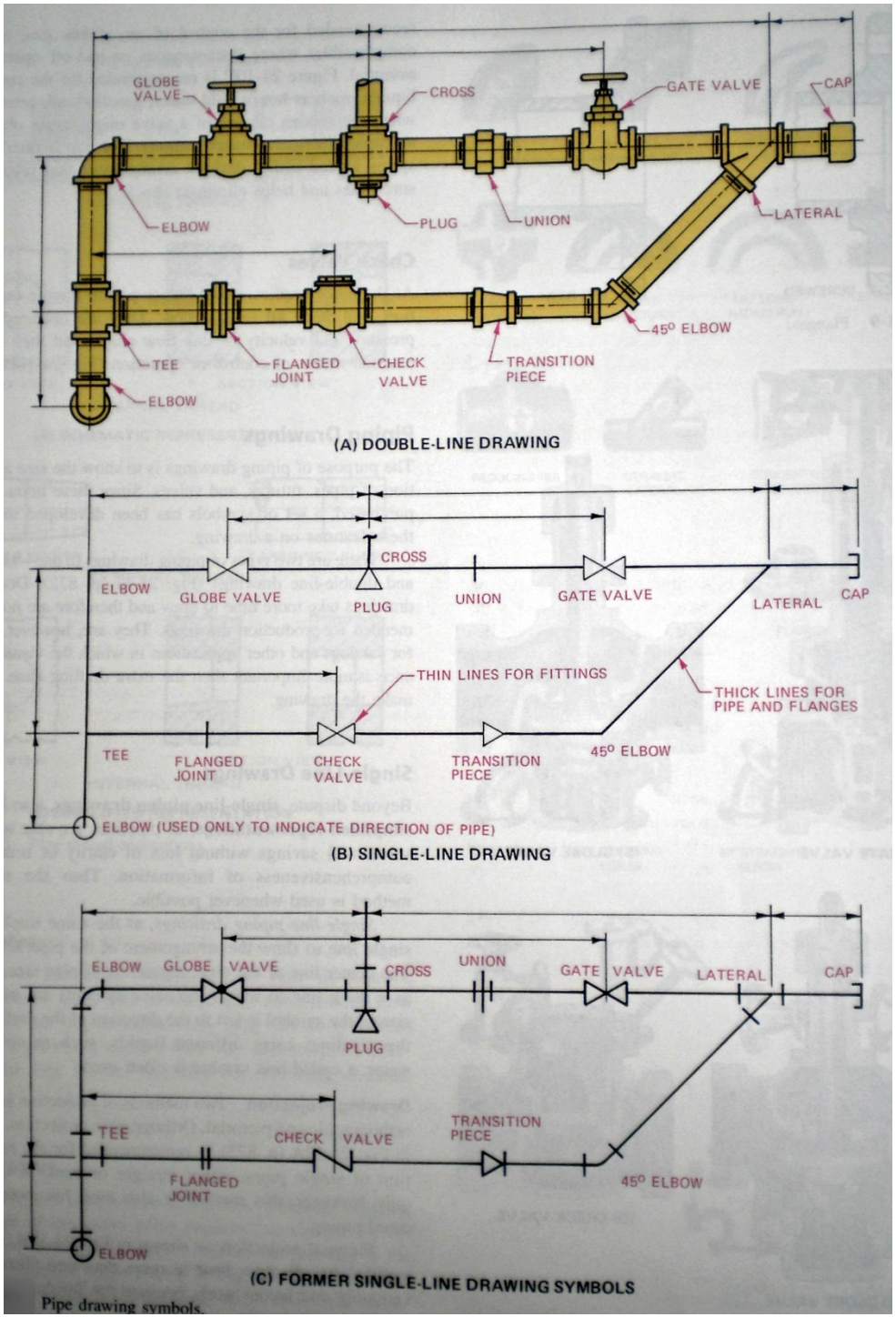
The purpose of piping drawings is to show the size and location of pipes, fittings, and valves. Since these items may be purchased, a set of symbols has been developed to portray these features on a drawing.

There are two types of piping drawings in use—single-line and double-line drawings. Double-line drawings take more time to draw and therefore are not recommended for production drawings. They are, however, suitable for catalogs and other applications in which the visual appearance is more important than the extra drafting time taken to make the drawing.

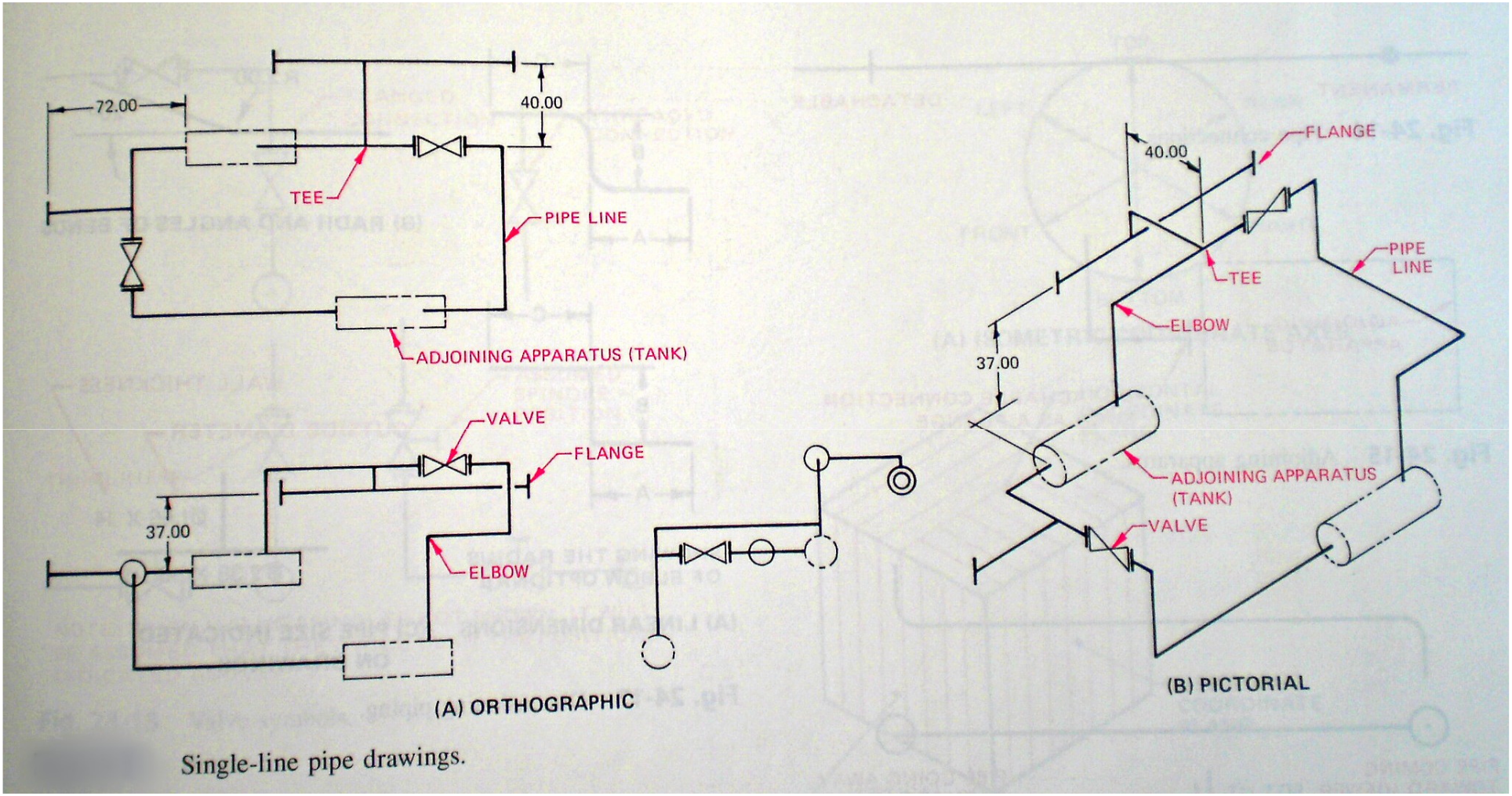
Single-Line Drawings

Beyond dispute, **single-line piping drawings**, also known as **simplified representations**, of pipelines are able to provide substantial savings without loss of clarity or reduction of comprehensiveness of information. Thus the simplified method is used whenever possible.

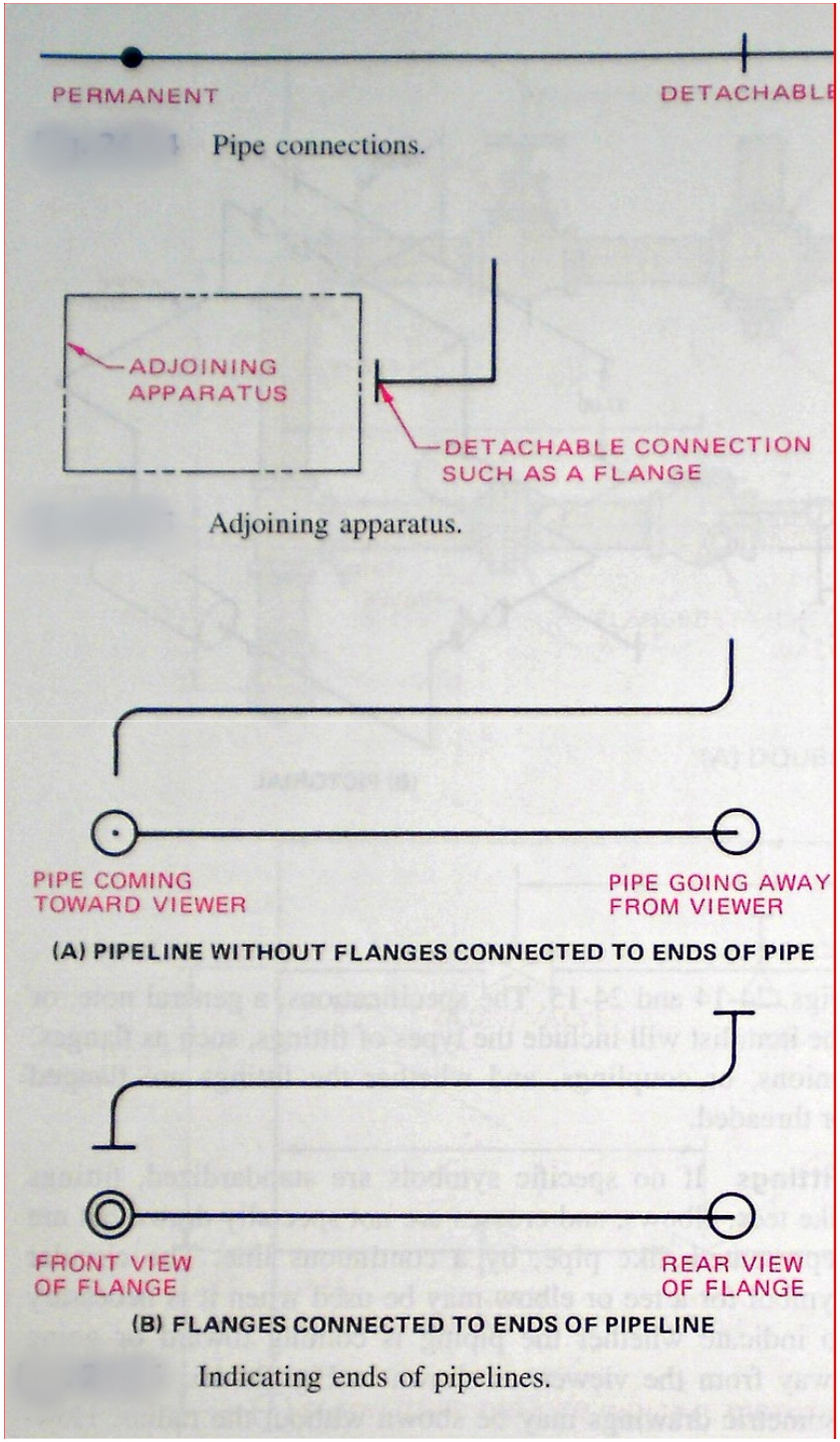
Single-line piping drawings, as the name implies, use a single line to show the arrangement of the pipe and fittings. The center line of the pipe, regardless of pipe size, is drawn as a thick line to which the valve symbols are added. The size of the symbol is left to the direction of the drafter. When the pipelines carry different liquids, such as cold or hot water, a coded line symbol is often used.



Pipe drawing symbols.



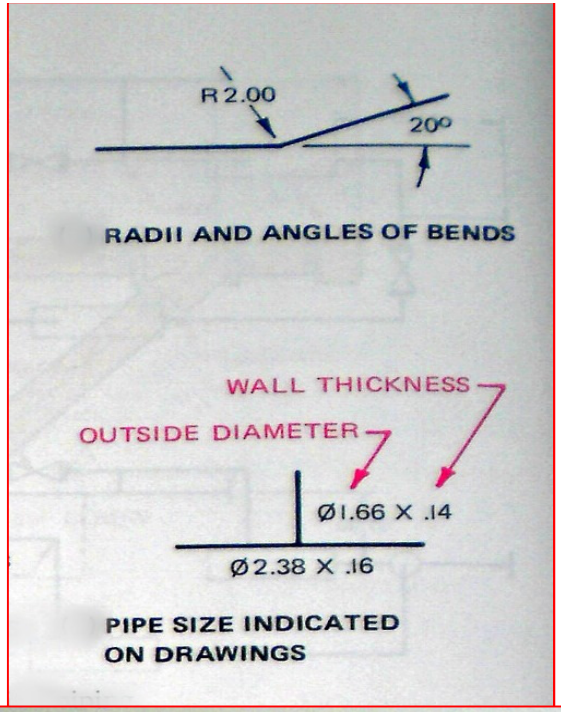
Single-line pipe drawings.

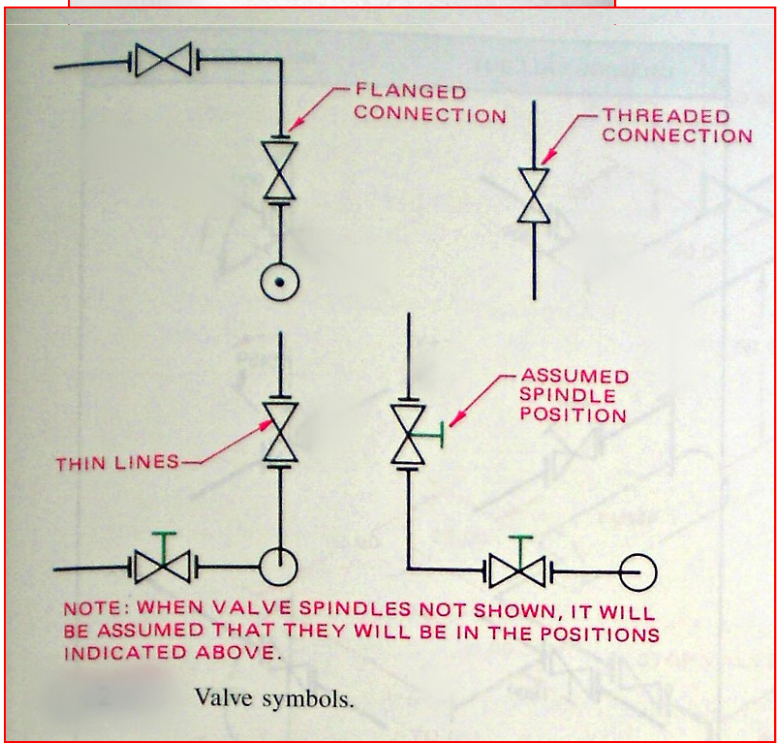


Pipe connections.

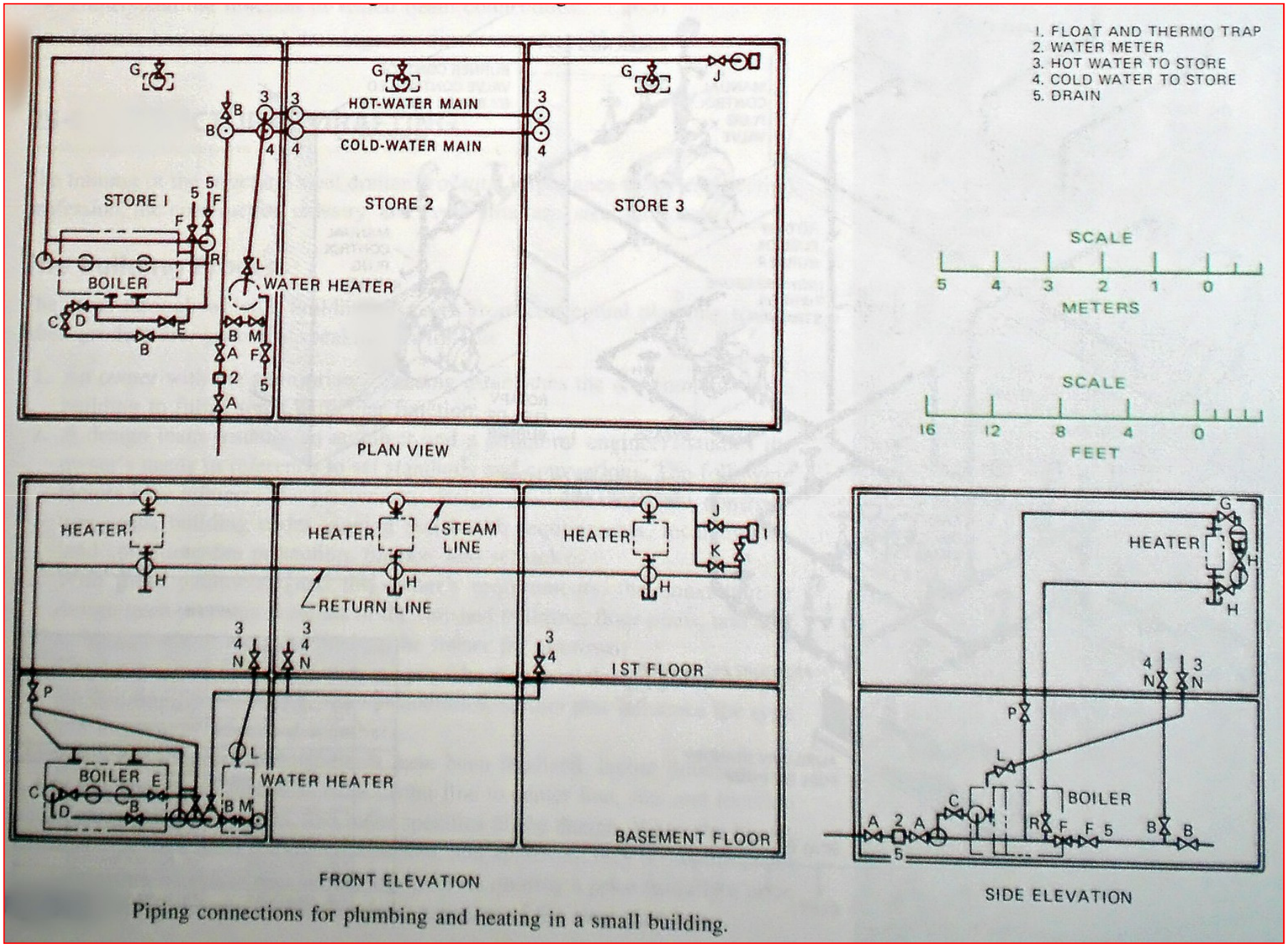
Adjoining apparatus.

Indicating ends of pipelines.

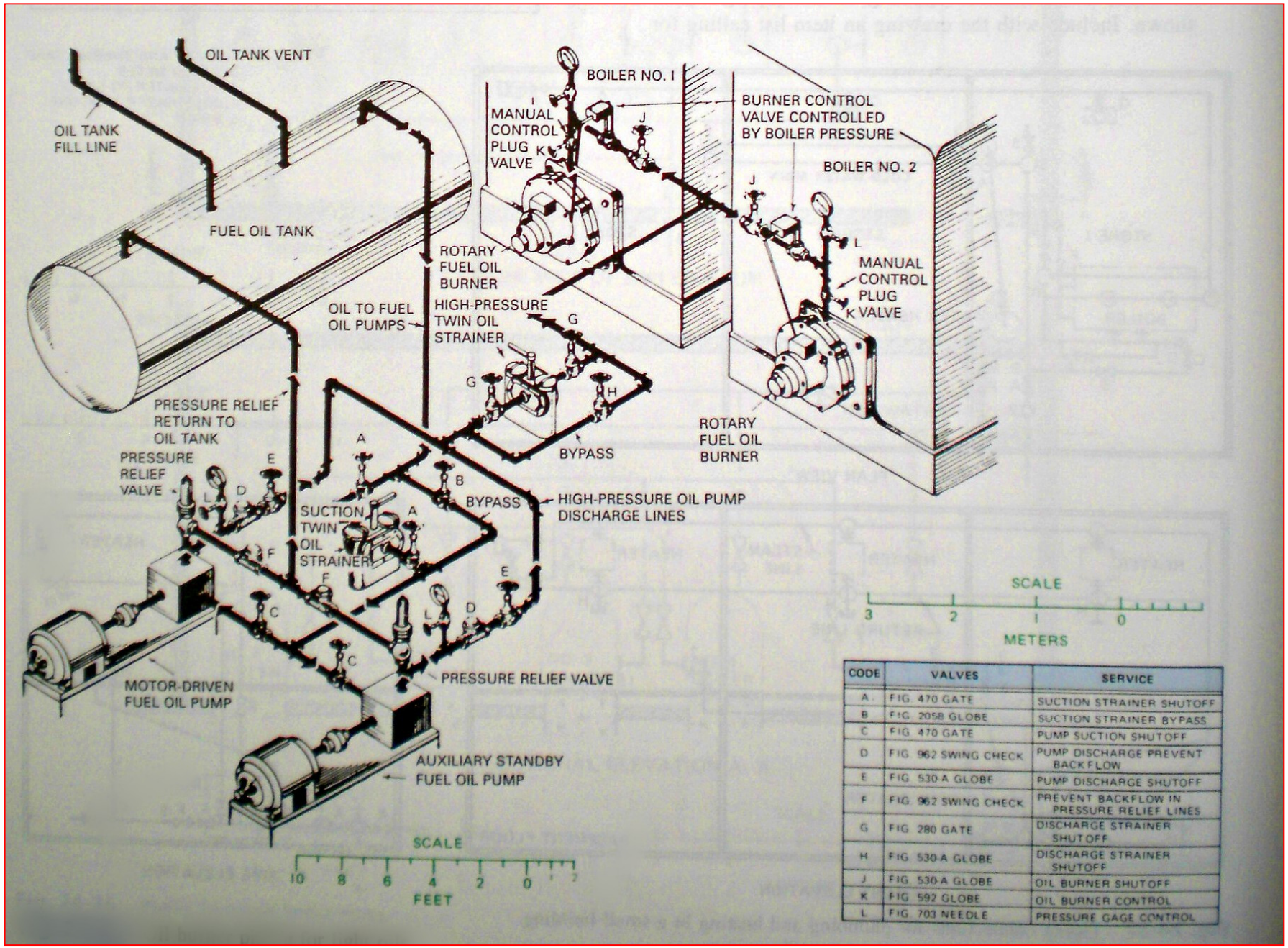




Valve symbols.



Piping connections for plumbing and heating in a small building.



CODE	VALVES	SERVICE
A	FIG. 470 GATE	SUCTION STRAINER SHUTOFF
B	FIG. 2058 GLOBE	SUCTION STRAINER BYPASS
C	FIG. 470 GATE	PUMP SUCTION SHUTOFF
D	FIG. 962 SWING CHECK	PUMP DISCHARGE PREVENT BACKFLOW
E	FIG. 530-A GLOBE	PUMP DISCHARGE SHUTOFF
F	FIG. 962 SWING CHECK	PREVENT BACKFLOW IN PRESSURE RELIEF LINES
G	FIG. 280 GATE	DISCHARGE STRAINER SHUTOFF
H	FIG. 530-A GLOBE	DISCHARGE STRAINER SHUTOFF
J	FIG. 530-A GLOBE	OIL BURNER SHUTOFF
K	FIG. 592 GLOBE	OIL BURNER CONTROL
L	FIG. 703 NEEDLE	PRESSURE GAGE CONTROL