

Pipes and pipe fittings

Objectives : At the end of this lesson you shall be able to

- state the uses of pipes
- name the common types of pipes
- identify the standard pipe fittings and state their uses.

Various types of pipes and tubes are used for the following purposes.

- Domestic hot and cold water supplies.
- Waste water outlets.
- High pressure steam supplies.
- Hydraulic oil supplies.
- Lubricating oil supplies.
- Special fluid and gases for industrial processes.
- Pneumatic systems.
- Refrigeration systems.
- Fuel oil supplies.

The common types of pipes classified according to material are:

- galvanized iron pipes
- mild steel pipes
- cast iron pipes
- C.I. soil pipes
- copper pipes
- aluminium pipes
- brass pipes
- lead pipes
- P.V.C. pipes
- rubber pipes
- plastic pipes
- stoneware pipes.

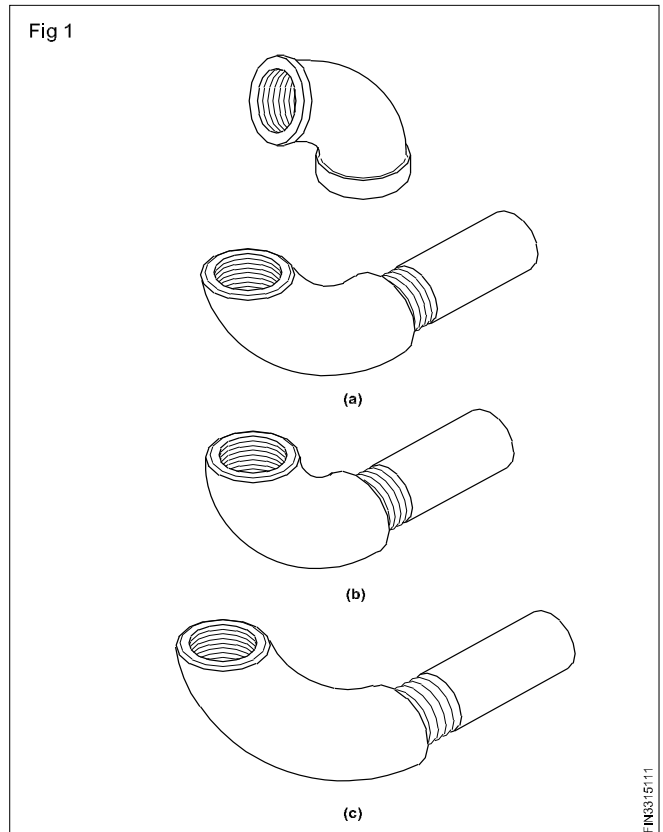
Standard pipe fitting

'Pipe fittings' are those fittings that may be attached to water pipes in order to:

- change the direction of the pipe
- connect a branch with a main water supply pipe
- connect two or more pipes of different sizes
- close the pipe ends.

Standard pipe fittings

Elbows (Fig 1)



Elbows and bends provide deviations of 90° and 45° in pipe work systems.

Long radius elbows have a radius equal to 1½ times the bore of the pipe. (Fig 1a)

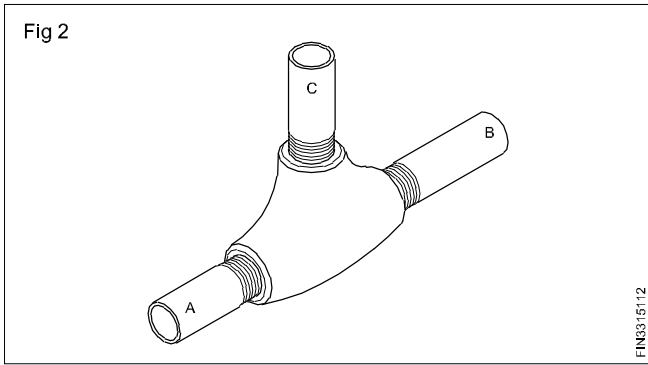
Short radius elbows have a radius equal to the bore of the pipe. (Fig 1b)

The 45° elbows allow pipe deviation of 45°. (Fig 1c)

Tee branch

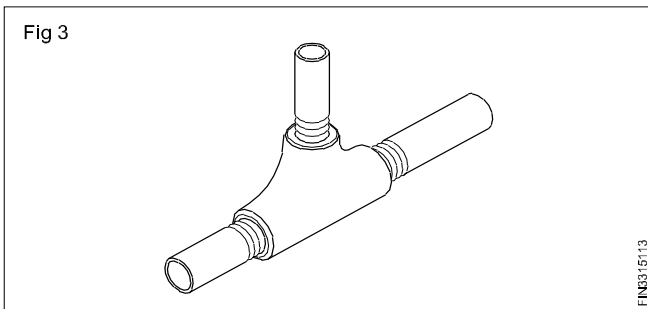
A tee joint helps the pipe line to branch off at 90°. The branches may be equal in diameter or there may be one reducing branch.

The dimensions of a branch are always quoted as A x B x C. (Fig 2)



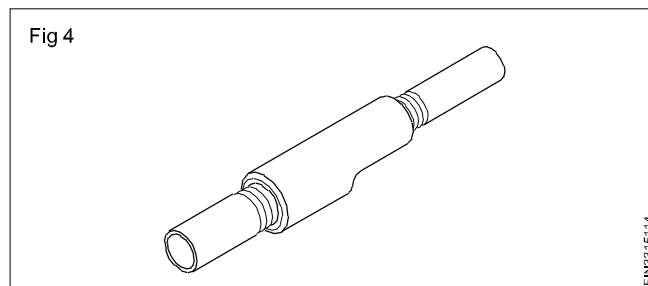
Reducing tee branch

Reducers are fitted where a change in pipe diameter is required.(Fig 3)



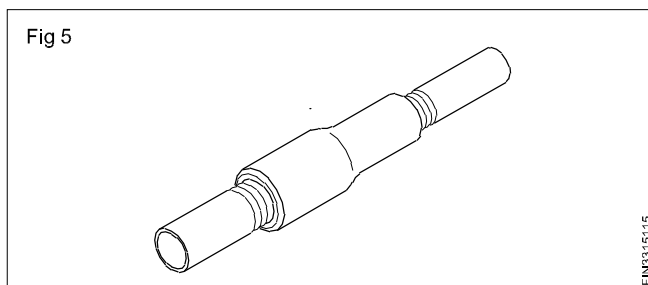
Eccentric reducer

Used mainly in horizontal position.(Fig 4)



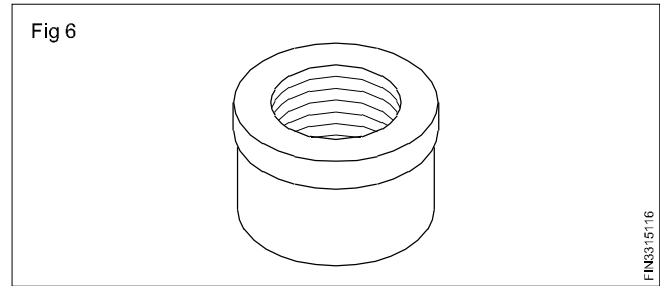
Concentric reducer

Used mainly in vertical position. (Fig 5)



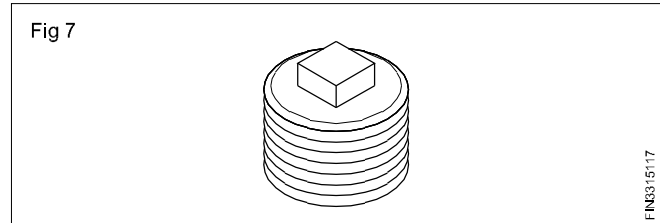
Caps

Caps are used for closing the end of a pipe or fitting which has an external thread. (Fig 6)



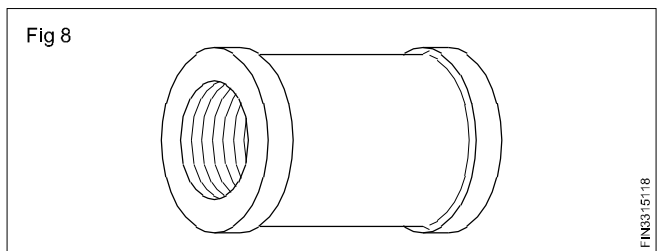
Plug

A plug is used for closing a pipeline which has an internal thread.(Fig 7)



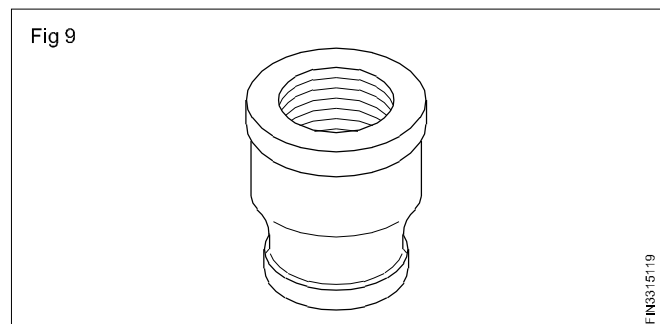
Coupling (Fig 8)




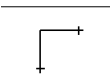






A coupling is used to connect two pipes. Couplings have internal threads at both ends to fit the external threads on pipes.



Reducer (Fig 9)

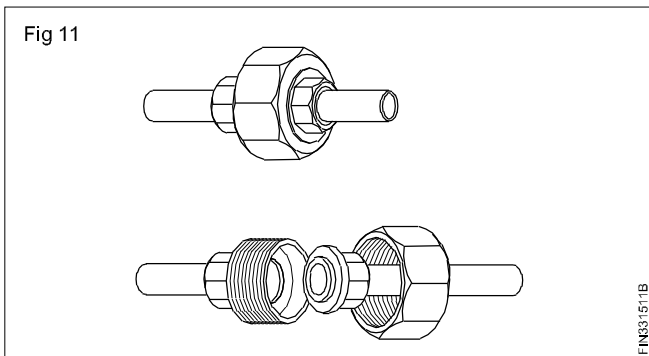
A reducer coupling is used to connect two pipes with different diameters.



Fitting	Symbol
Bend 90 degrees	
Bend 45 degrees	
Cross	
Elbow 90 degrees	
Elbow 45 degrees	
Tee	
Reducer concentric	
Union screwed	
Plug or cap	
Joint/socket	

Union

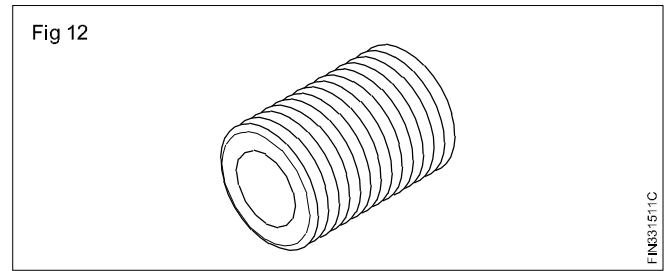
A device used to connect pipes. Unions are inserted in a pipe-line to permit connections with little change to the position of the pipe. (Fig 10)



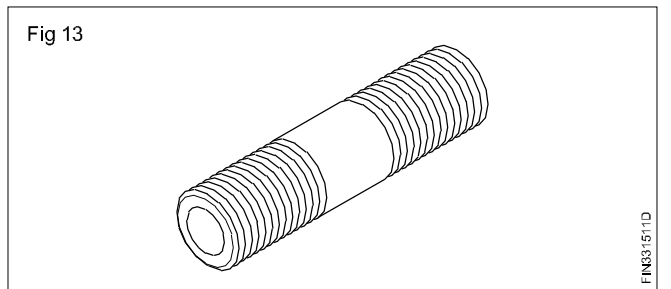
Pipe nipples

Pipe nipples are tubular pipe fittings used to connect two or more pipes of different sizes.

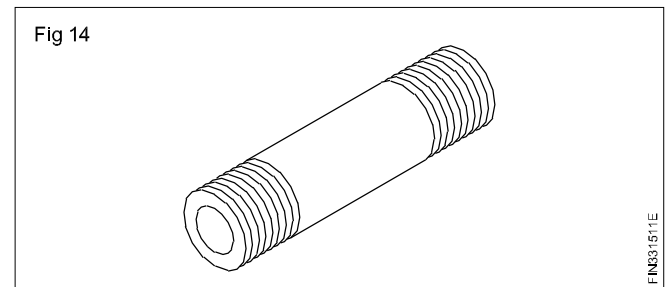
1 Close nipple (Fig 11)



2 Short nipple (Fig 12)

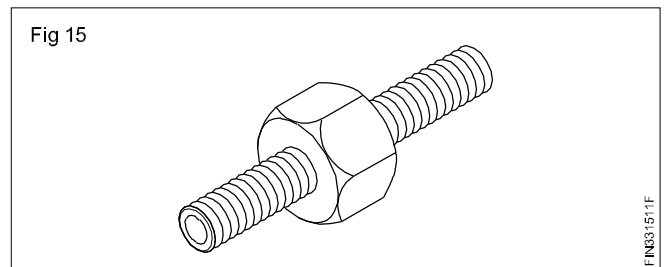


3 Long nipple (Fig 13)



The hexagonal nut

The hexagonal nut in the centre of the nipple is for tightening with a spanner or wrench. (Fig 14)



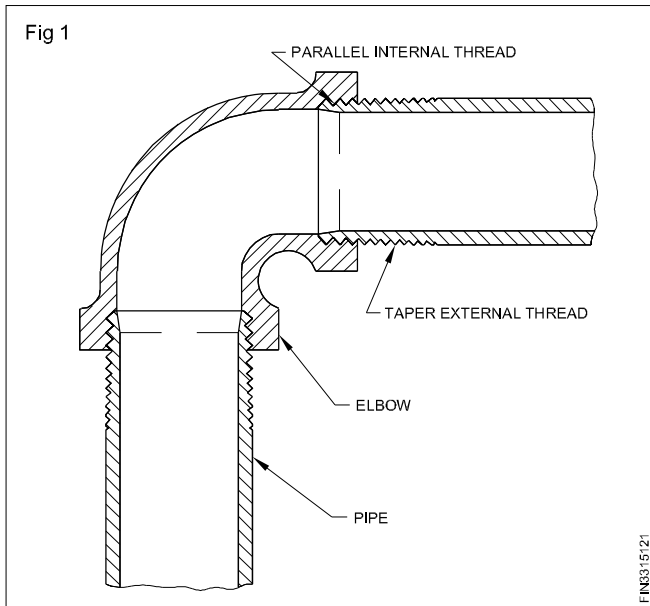
British standard pipe threads

Objectives : At the end of this lesson you shall be able to

- state parallel and taper pipe threads
- determine the wall thickness and threads per inch TPI of BSP threads
- state the method of sealing pipe joints
- determine blank sizes for threading as per B.S 21-1973 and I.S.2643-1964.

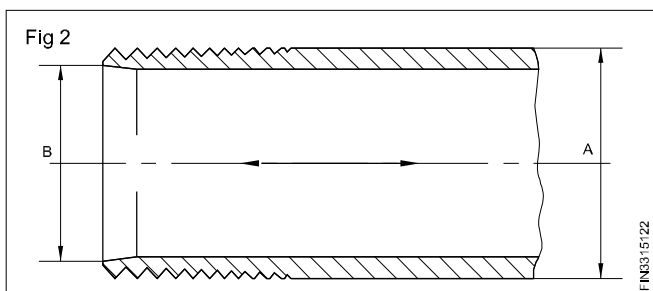
Pipe threads

The standard pipe fittings are threaded to British Standard pipe gauge (BSP). The internal pipe threads have parallel threads whereas the external pipes have tapered threads as shown in Fig 1.



B.S.P. threads

Galvanized iron pipes are available in sizes ranging from 1/2" to 6" in several different wall thicknesses. The table shows outside diameters and threads per inch from 1/2" to 4". (Fig 2)

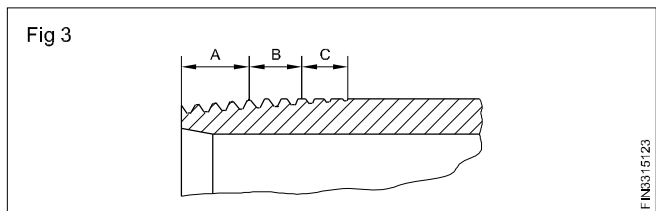


Sealing pipe joint

Fig 3 shows that the pipe has several fully formed threads at the end. (A)

The next two threads have fully formed bottoms but flat tops. (B)

BSP - Pipe sizes or DIN 2999 (inside) (B) +	Threads/ inch	Outside diameter/ mm of the pipe(A)+
1/2"	14	20.955mm
3/4"	14	26.441
1"	11	33.249
1 1/4"	11	41.910
1 1/2"	11	47.803
2"	11	59.614
2 1/2"	8	75.184
3"	8	87.884
4"	8	113.030



The last four threads have flat tops and bottoms. (C)

The pipe joint shown in Fig 4 consists of the following.

- 1 Parallel female thread
- 2 Tapered male thread
- 3 Hemp packing

The hemp packing is used to ensure that any small space between two metal threads (male and female threads) is sealed to prevent any leakage.

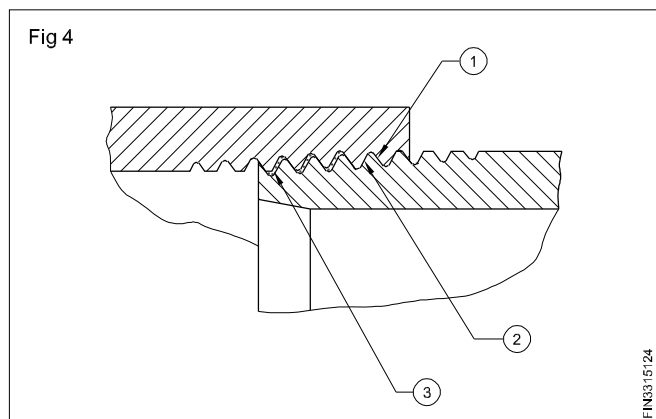


Table-1

Pipe Schedule and Standard size		Nominal pipe size chart - Nominal pipe dimension in Millimeter (mm)																			
DN in	OD	5	5s	10	10s	20	30	40	40s	Std	60	80	80s	XS	100	120	140	160	XXS	DN in mm	
6	10.3			1.24	1.24			1.73	1.73	1.73		2.41	2.41	2.41							
8	13.7			1.65	1.65			2.24	2.24	2.24		3.02	3.02	3.02							
10	17.1			1.65	1.65		1.85	2.31	2.31	2.31		3.20	3.20	3.20							
15	21.3	1.65	1.65	2.11	2.11		2.41	2.77	2.77	2.77		3.73	3.73	3.73				4.78	7.47		
20	26.7	1.65	1.65	2.11	2.11		2.41	2.87	2.87	2.87		3.91	3.91	3.91				5.56	7.82		
25	33.4	1.65	1.65	2.77	2.77		2.90	3.38	3.38	3.38		4.55	4.55	4.55				6.35	9.09		
32	42.2	1.65	1.65	2.77	2.77		2.97	3.56	3.56	3.56		4.85	4.85	4.85				6.35	9.70		
40	48.3	1.65	1.65	2.77	2.77		3.18	3.68	3.68	3.68		5.08	5.08	5.08				7.14	10.16		
50	60.3	1.65	1.65	2.77	2.77		3.18	3.91	3.91	3.91		5.54	5.54	5.54				8.74	11.07		
65	73	2.11	2.11	3.05	3.05		4.78	5.16	5.16	5.16		7.01	7.01	7.01				9.53	14.02		
80	88.9	2.11	2.11	3.05	3.05		4.78	5.49	5.49	5.49		7.62	7.62	7.62				11.13	15.24		
90	101.6	2.11	2.11	3.05	3.05		4.78	5.74	5.74	5.74		8.08	8.08	8.08				16.15			
100	114.3	2.11	2.11	3.05	3.05		4.78	6.02	6.02	6.02		8.56	8.56	8.56		11.13		13.49	17.12		
125	141.3	2.77	2.77	3.40	3.40			6.55	6.55	6.55		9.53	9.53	9.53		12.70		15.88	19.05		
150	168.3	2.77	2.77	3.40	3.40			7.11	7.11	7.11		10.97	10.97	10.97		14.27		18.26	21.95		
200	219.1	2.77	2.77	3.76	3.76	6.35	7.04	8.18	8.18	8.18	10.31	12.70	12.70	12.70	15.09	18.26	20.62	23.01	22.25		
250	273	3.40	3.40	4.19	4.19	6.35	7.80	9.27	9.27	9.27	12.70	15.09	15.09	15.09	18.26	21.44	25.40	28.58	25.40		
300	323.8	3.96	3.96	4.57	4.57	6.35	8.38	10.31	9.53	9.53	14.27	17.48	17.48	17.48	21.44	25.40	28.58	33.32	25.40		
350	355.6	3.96	3.96	6.35	4.78	7.92	9.53	11.13	9.53	9.53	15.09	19.05	12.70	12.70	23.83	27.79	31.75	35.71			
400	406.4	4.19	4.19	6.35	4.78	7.92	9.53	12.70	9.53	9.53	16.66	21.44	12.70	12.70	26.19	30.96	36.53	40.49			
450	457	4.19	4.19	6.35	4.78	7.92	11.13	14.27	9.53	9.53	19.05	23.83	12.70	12.70	29.36	34.93	39.67	45.24			
500	508	4.78	4.78	6.35	5.54	9.53	12.70	15.09	9.53	9.53	20.62	26.19	12.70	12.70	32.54	38.10	44.45	50.01			
550	559	4.78	4.78	6.35	5.54	9.53	12.70	17.48	9.53	9.53	22.23	28.58		12.70	34.93	41.28	47.63	53.98			
600	610	5.54	5.54	6.35	6.35	9.53	14.27	17.48	9.53	9.53	24.61	30.96	12.70	12.70	38.89	46.02	52.37	59.54			
650	660			7.92		12.70				9.53											
700	711			7.92		12.70	15.88			9.53											
750	762			7.92	7.92		15.88			9.53											
800	813			7.92		12.70	15.88	17.48		9.53											
850	864			7.92		12.70	15.88	17.48		9.53											
900	914			7.92		12.70	15.88	19.05		9.53											
950	965									9.53											
1000	1016									9.53											
1050	1067									9.53											
1100	1118									9.53											
1150	1168									9.53											
1200	1219									9.53											
DN in mm	OD	5	5s	10	10s	20	30	40	40s	Std	60	80	80s	XS	100	120	140	160	XXS	DN in mm	

ASME B36.10M-2015: Welded and Seamless Wrought Steel Pipe
ASME B36.19M-2004: Stainless Steel Pipe (For 5S, 10S, 40S and 80S)