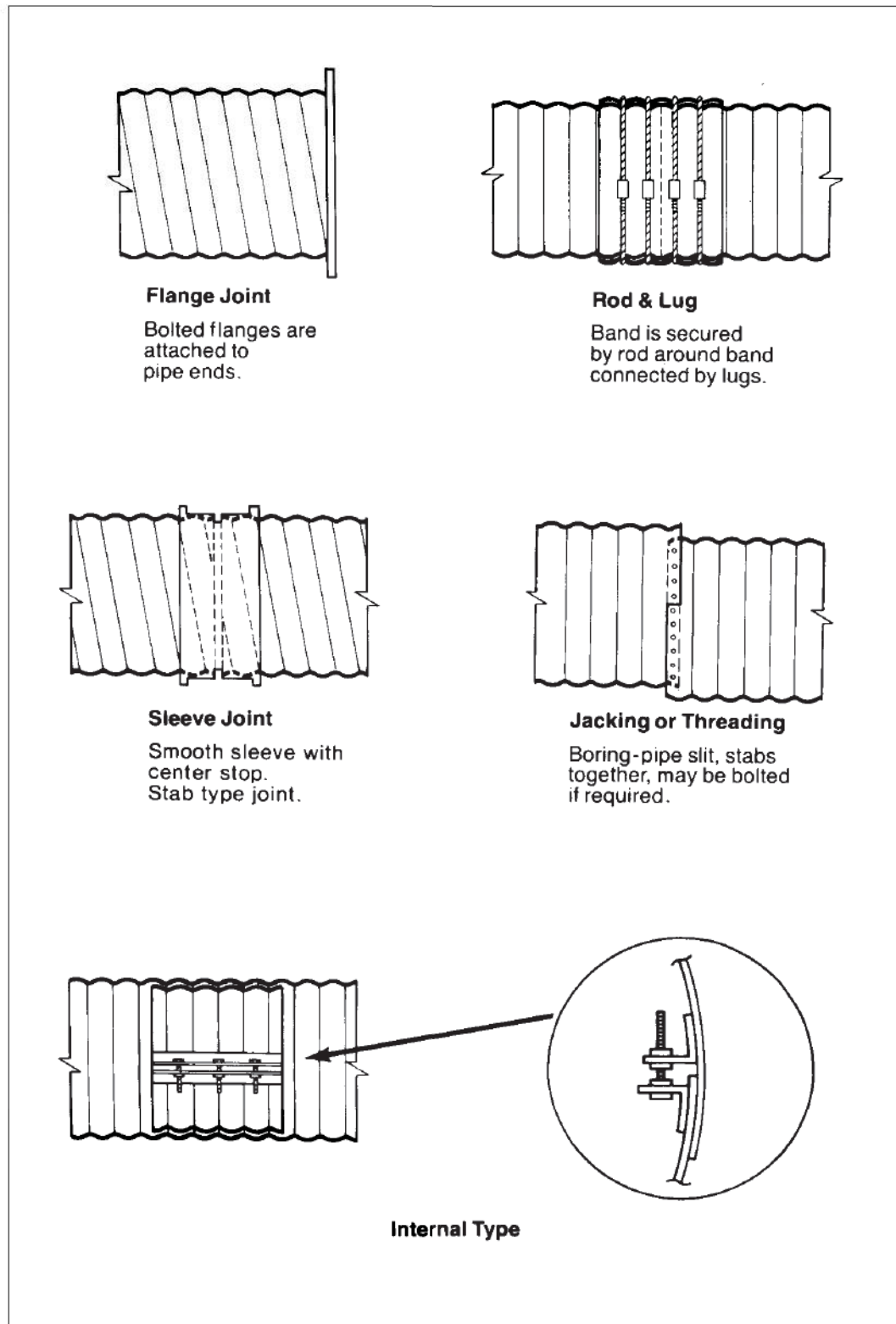




■ Corrugated steel pipe band connectors.

CSP Field Joints

For unusual conditions, such as high pressures, extreme disjuncting forces, threading pipe inside existing pipe, jacking or boring pipe, and deep vertical drop inlets, a variety of special designs are available. New joints can be readily designed by manufacturers to meet particular requirements.

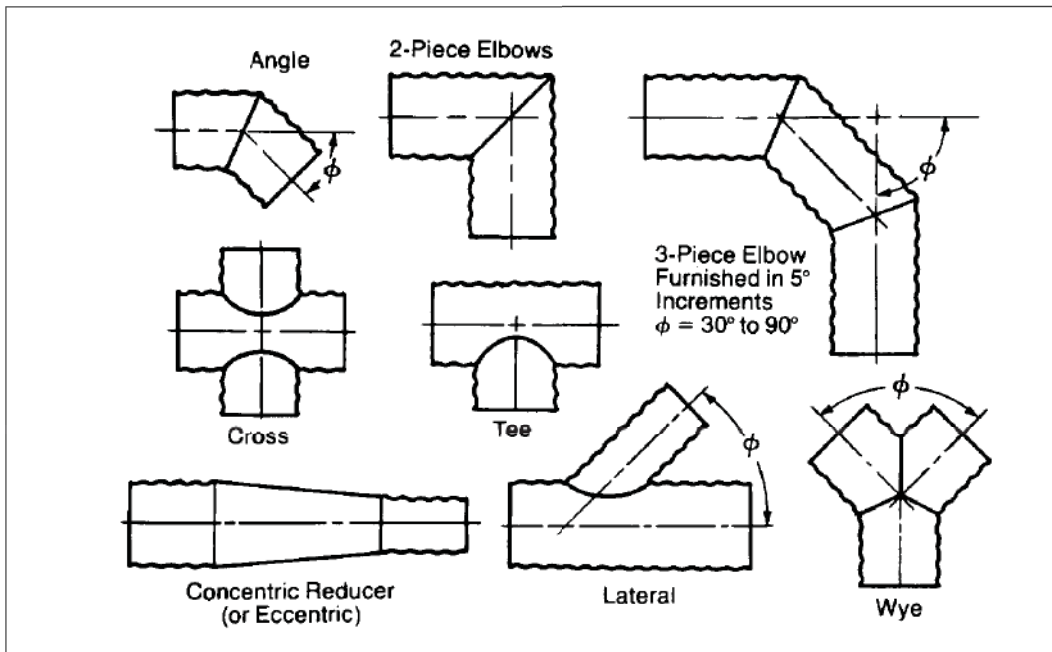


■ **Figure 2.22** Special connectors.

Fittings

One of the benefits of corrugated steel pipe is that it can be easily and economically fabricated into an assortment of fittings. Table 2.54 provides minimum dimensions for CSP elbows (round pipe). Table 2.55 provides minimum dimensions for CSP tees, crosses, laterals and wyes (round pipe).

Structural plate fittings are shop cut from curved corrugated plates and welded together. These structures are usually assembled and bolted in the shop in a trial fit to assure that all parts mate properly. The parts are then clearly marked for field assembly.



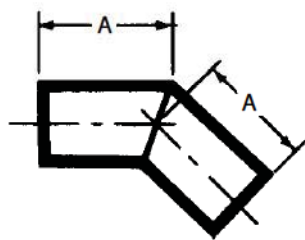
■ **Figure 2.23** Shop fittings for corrugated steel pipe and pipe arch. Shop fabricated fittings are available for a wide variety of conditions.



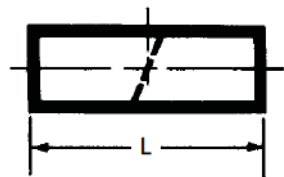
■ Moderate horizontal curvature in a culvert or sewer can be achieved with ordinary couplings. Greater changes in alignment will require fabricated fittings.

Table 2.54

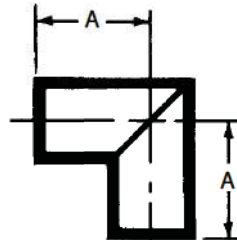
Minimum dimensions for elbows for round CSP — all corrugations



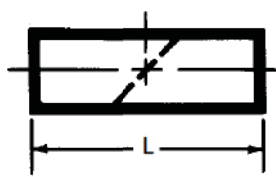
2 Piece



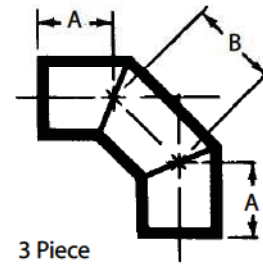
10° - 45° Elbow



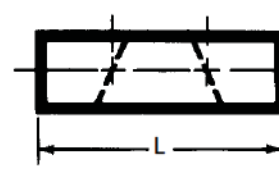
2 Piece



46° - 90° Elbow



3 Piece



46° - 90° Elbow

Pipe Diameter (in.)	A (ft)	Total Length (ft)	Pipe Diameter (in.)	A (ft)	Total Length (ft)	Pipe Diameter (in.)	A (in.)	B (in.)	C (in.)	Total Length (ft)
6-18	1	2	6-10	1	2	6	13 1/2	8	8	2
21-48	2	4	12-27	2	4	8	14	9	7 1/2	2
54-96	3	6	30-42	3	6	10	14	10	7	2
			48-66	4	8	12	25 1/2	11	18 1/2	4
			72-84	5	10	15	26 1/2	12	18	4
			90-96	6	12	18	27	14	17	4
						21	27	15	16 1/2	4
						24	27 1/2	16	16	4
						27	27 1/2	17	15 1/2	4
						30	40	19	26 1/2	6
						33	40	20	26	6
						36	40 1/2	21	25 1/2	6
						42	41	23	24 1/2	6
						48	53 1/2	26	35	8
						54	54	28	34	8
						60	54 1/2	31	32 1/2	8
						66	54	33	31 1/2	8
						72	67 1/2	36	42	10
						78	68	39	40 1/2	10
						84	68 1/2	41	39 1/2	10
						90	70	46	37	10
						96	82	46	49	12

Notes: The total length (ft) and pipe diameter (in.) listed are minimum requirements for fitting fabrication. Fittings with other dimensions to satisfy specific needs are also available. All dimensions are nominal.

Table 2.55

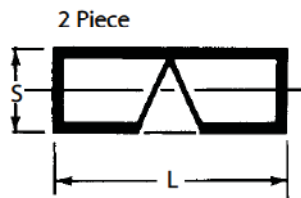
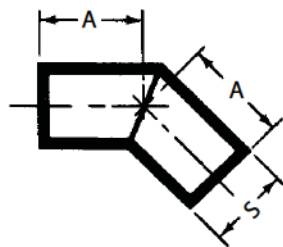
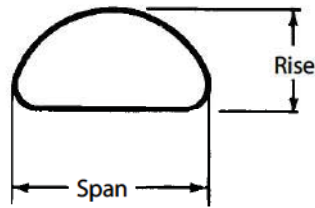
Minimum dimensions for CSP round fittings

Main Diam. (in.)	Stub Same or Smaller Than Main Diameter												
	Tee			Cross			45° Lateral				45° Wye		
	A	B	TL	A	B	TL	A	B	C	TL	A	B	TL
	(ft-in.)	(ft-in.)	(ft-in.)	(ft-in.)	(ft-in.)	(ft-in.)	(ft-in.)	(ft-in.)	(ft-in.)	(ft-in.)	(ft-in.)	(ft-in.)	(ft-in.)
6	2-6	1-3	3-9	2-6	1-3	5-0	2-9	1-6	1-2	4-3	1-1	1-3	3-7
8	2-8	1-4	4-0	2-8	1-4	5-4	3-0	1-8	1-2	4-8	1-2	1-4	3-10
10	2-10	1-5	4-2	2-10	1-5	5-8	3-2	1-10	1-2	5-0	1-2	1-5	4-0
12	3-0	1-6	4-6	3-0	1-6	6-0	3-5	2-0	1-3	5-5	1-3	1-6	4-3
15	3-3	1-8	4-11	3-3	1-8	6-6	3-9	2-3	1-3	6-0	1-3	1-8	4-7
18	3-6	1-9	5-3	3-6	1-9	7-0	4-2	2-6	1-4	6-8	1-4	1-9	4-10
21	3-9	1-11	5-10	3-9	1-11	7-6	4-6	2-9	1-4	7-3	1-4	1-11	5-2
24	4-0	2-0	6-0	4-0	2-0	8-0	4-10	3-0	1-5	7-10	1-5	2-0	5-5
27	4-3	2-2	6-5	4-3	2-2	8-6	5-2	3-3	1-6	8-5	1-5	2-2	5-9
30	4-6	2-3	6-9	4-6	2-3	9-0	5-6	3-6	1-6	9-0	1-6	2-3	6-0
33	4-9	2-5	7-2	4-9	2-5	9-6	5-11	3-9	1-7	9-8	1-7	2-4	6-3
336	5-0	2-6	7-6	5-0	2-6	10-0	6-3	4-0	1-8	10-3	1-8	2-6	6-8
42	5-6	2-9	8-3	5-6	2-9	11-0	7-0	4-6	1-9	11-6	1-9	2-9	7-3
48	6-0	3-0	9-0	6-0	3-0	12-0	7-8	5-0	1-10	12-8	1-10	3-0	7-10
54	6-6	3-3	9-9	-	-	-	8-4	5-6	1-11	13-10	1-11	3-3	8-5
60	7-0	3-6	10-6	-	-	-	9-1	6-0	2-0	15-1	2-0	3-6	9-0
66	7-6	3-9	11-3	-	-	-	9-9	6-6	2-2	16-3	2-2	3-9	9-8
72	8-0	4-0	12-0	-	-	-	10-6	7-0	2-3	17-6	2-3	4-0	10-3
78	8-6	4-3	12-9	-	-	-	11-2	7-6	2-4	18-8	2-4	4-3	10-10
84	9-0	4-6	13-6	-	-	-	11-11	8-0	2-5	19-11	2-5	4-6	11-5
90	9-6	4-9	14-3	-	-	-	12-8	8-6	2-7	21-2	2-7	4-9	12-1
96	10-0	5-0	15-0	-	-	-	13-4	9-0	2-8	22-4	2-8	5-0	12-8

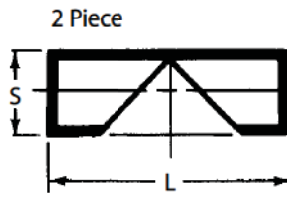
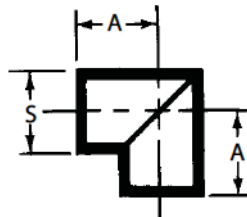
Notes: 12 in. minimum stub dimension to allow for use of 12 in. wide connecting band.
 TL - total net length needed to fabricate fitting.

Table 2.56

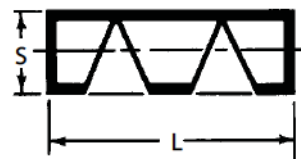
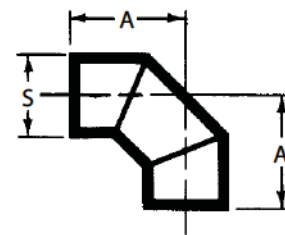
Minimum dimensions for CSP pipe arch fittings



10° - 45° Elbow



50° - 90° Elbow



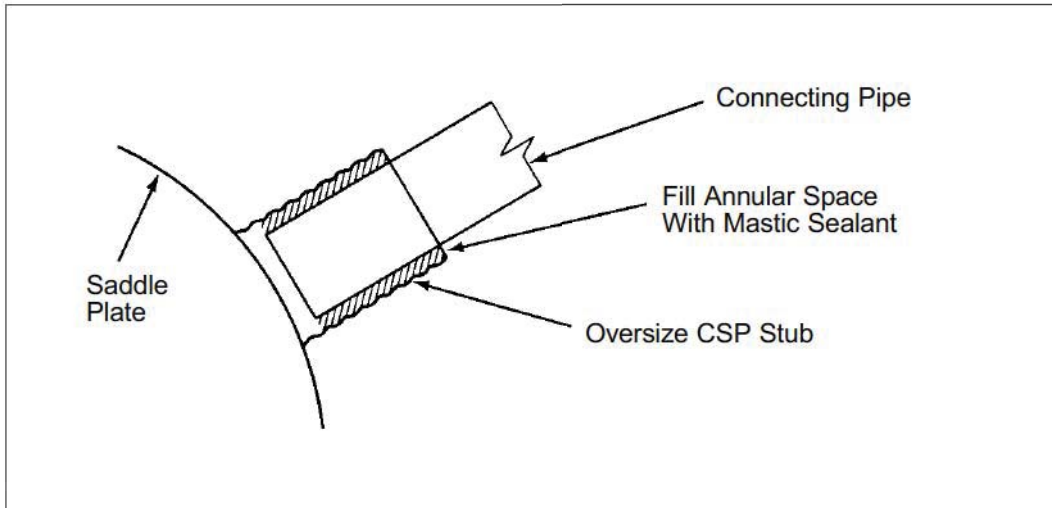
90° Elbow

Equivalent Round Diameter (in.)	Span S (in.)	Rise R (in.)	45° Elbow 2 Piece		90° Elbow 2 Piece		90° Elbow 3 Piece	
			A (in.)	L (ft)	A (in.)	L (ft)	A (in.)	L (ft)
15	17	13	20	4	27	6	31	6
18	21	15	20	4	25	6	30	6
21	24	18	19	4	24	6	29	6
24	28	20	18	4	34	8	28	6
30	35	24	16	4	30	8	38	8
36	42	29	27	6	38	10	35	8
42	49	33	25	6	35	10	45	10
48	57	38	24	6	43	12	42	10
54	64	43	34	8	52	14	52	12
60	71	47	33	8	60	16	62	14
66	77	52	43	10	56	16	60	14
72	83	57	42	10	56	18	70	16

Notes: All dimensions are nominal.
L—length for fabrication

Saddle Branch

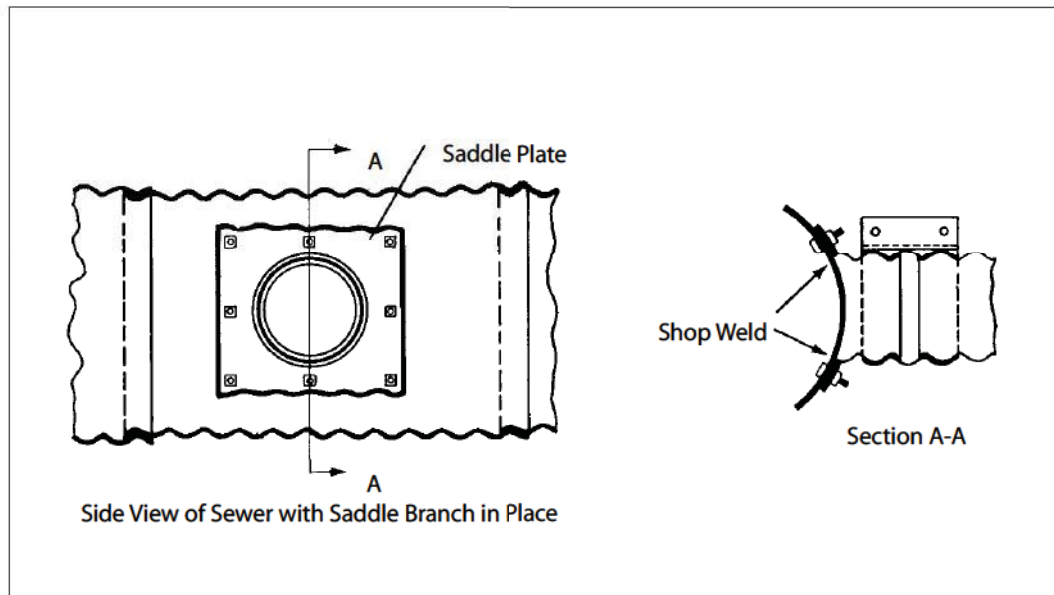
Saddle branches are used to connect small branch lines to the main. Saddles make it practical to tie in connections accurately after the main line is laid, or, new connections can be made effectively on old lines with saddles. Saddles can be used to connect almost any type of pipe to a CSP main. A common universal type of saddle branch stub is shown below.



■ **Figure 2.24** Universal connection detail using saddle branch.



■ **Figure 2.25** Typical pre-fabricated CSP saddle branch fitting.

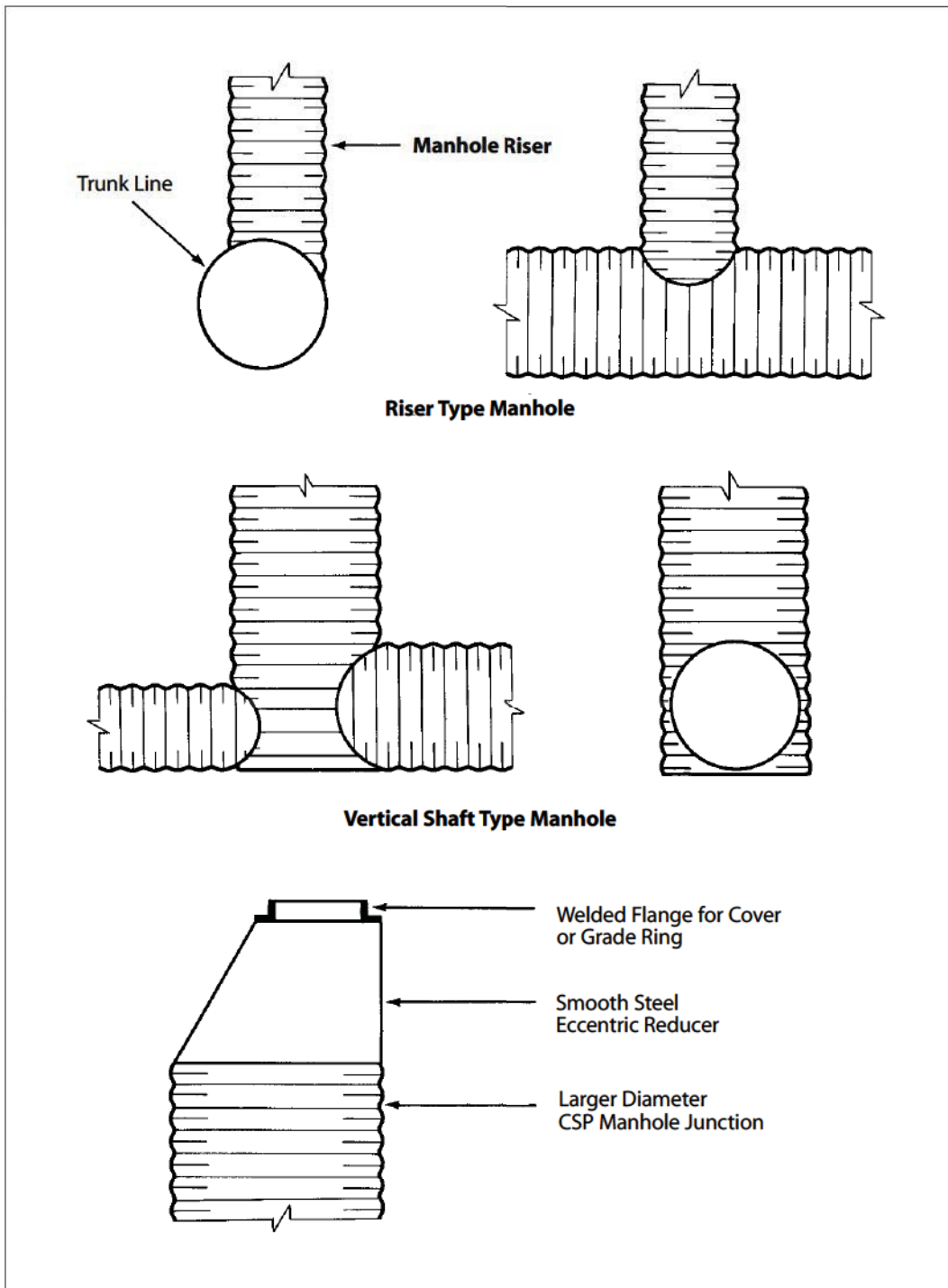


■ **Figure 2.26** Saddle branch.

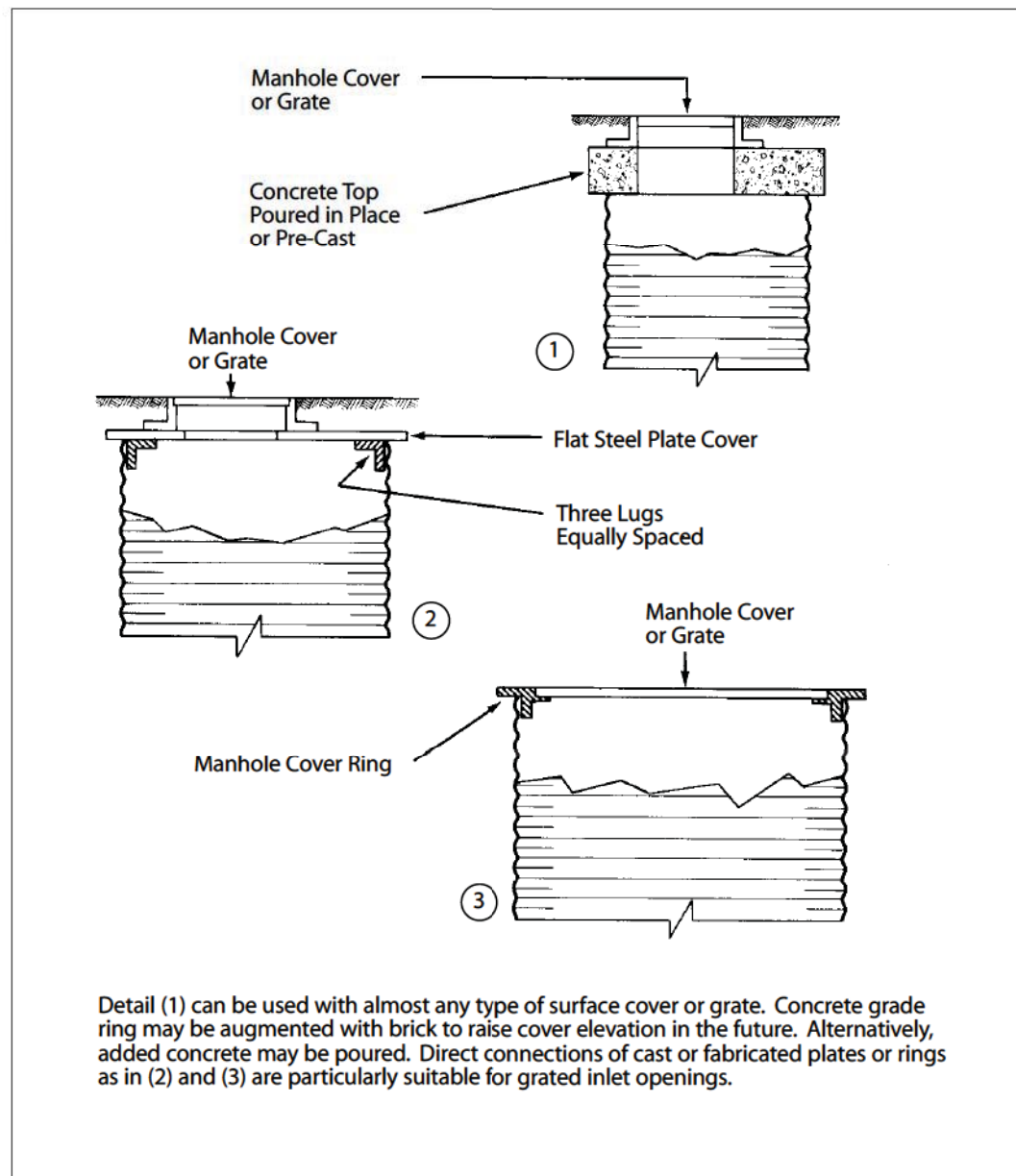
Manholes are available in corrugated steel pipe construction in two basic types as shown in Figure 2.27. The riser type of manhole is the simpler of the two and very economical. It is only feasible for trunk lines with a 36 inch diameter or greater. When junctions of smaller diameters are involved it is possible to use a vertical shaft of larger diameter CSP to connect the sewers. However, when the shaft is greater than 36 inches diameter, some reduction details must be used to suit the cover. Typical reduction details are shown. Larger sizes may require reinforcement.



■ Standard cast iron covers and/or steel grates are used with CSP manholes and catch basins.



■ **Figure 2.27** Manholes and catchbasins.



■ **Figure 2.28** Manhole and catchbasin covers.

The manhole covers shown in Figure 2.28 transfer any load on the cover directly to the manhole riser. For this reason, manhole covers of this type should be placed only where vehicular traffic is not expected. If the manhole will be subjected to wheel loads, the manhole riser should be designed as per Chapter 8 of this manual.



■ Special galvanized steel fitting for lake water intake of power station. Sealant ribbons were used on all seams. Divers made under water bolted connection between sections.



■ King-size wye or lateral for large storm sewer was shop-assembled, then dismantled and shipped to the job site for final erection.

Structural plate fittings are shop cut from curved corrugated plates and bolted or welded together. Such structures are usually assembled and bolted in the shop in a trial fit to assure that all parts mate properly, then are marked clearly for field assembly.