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this way**

The world needs concrete solutions

Curved Alignment and Radius Pipe

A Straightforward Application for a Curved Product

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Underground sewer lines can bend and curve as much as the road structure above it so the need to achieve a curved alignment exists. Radius Reinforced Concrete Pipe offers an ideal solution for curved gravity sewer lines with the added benefits of:

- Allowing for sewer lines with tighter curves.
- Potentially reducing the need for additional manhole structures.
- Maintaining the hydrostatic resistance of the joints.

Many municipalities install sewer pipe around existing infrastructure which can greatly limit the designer's options for moving the location of the sewer line. It may not be practical or economical to use a series of manhole structures to generate a segmented curve. There are two methods to consider to achieve a curved sewer alignment:

Method 1 – Pulling Joints of Regular RCP

The idea of deflected pipe alignment is to let each pipe connection contribute to a portion of the total radius. The manufacturing standard for reinforced concrete pipe, ASTM C76, allows for a maximum joint gap of 13mm (1/2 ") between pipe segments. The joints are still water-tight in this alignment and a gradual curve may be achieved.

The biggest advantage to this method is the lower manufacturing cost as all standard RCP can be used in the configuration. It's ideal for gradual curves but could be insufficient if a tighter radius is required.

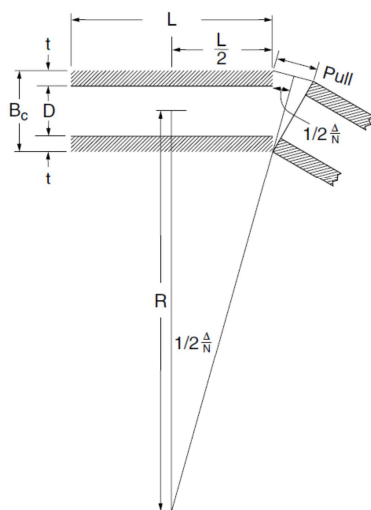


Figure 1- Deflecting Standard RCP (ACPA, 2007)

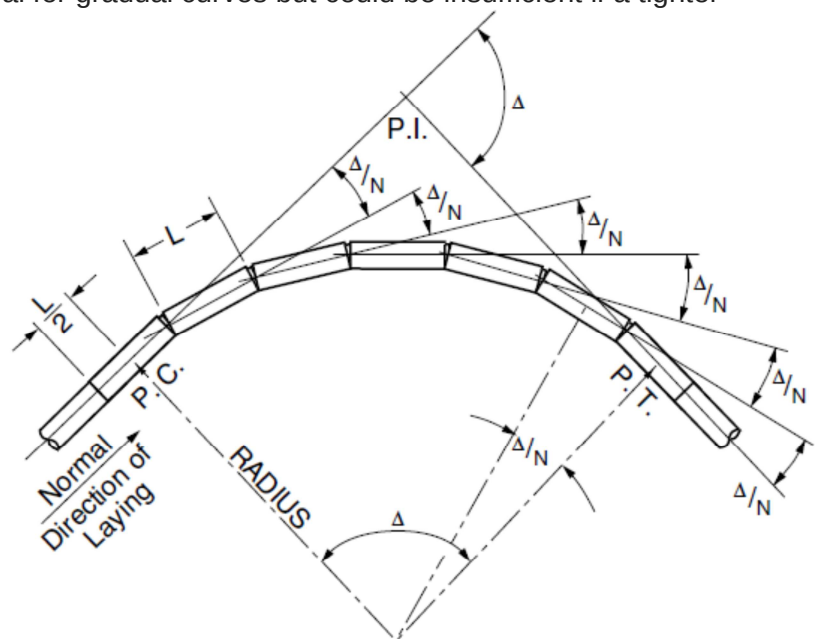


Figure 2 - Curved Alignment Using Deflected Straight Pipe (ACPA, 2007)

Method 2 – Using Radius RCP

Radius RCP enables a tighter-curved sewer alignment than simply pulling standard RCP; this is due to its manufacturing process where one edge of the joint form is dropped while casting the concrete. When the form is stripped, the finished product is a pipe segment with an angled joint. From each drop at the pipe connection, a portion of curvature can be achieved. Beyond being able to achieve a smaller radius for a sewer line, radius pipe can be installed with no joint gaps.

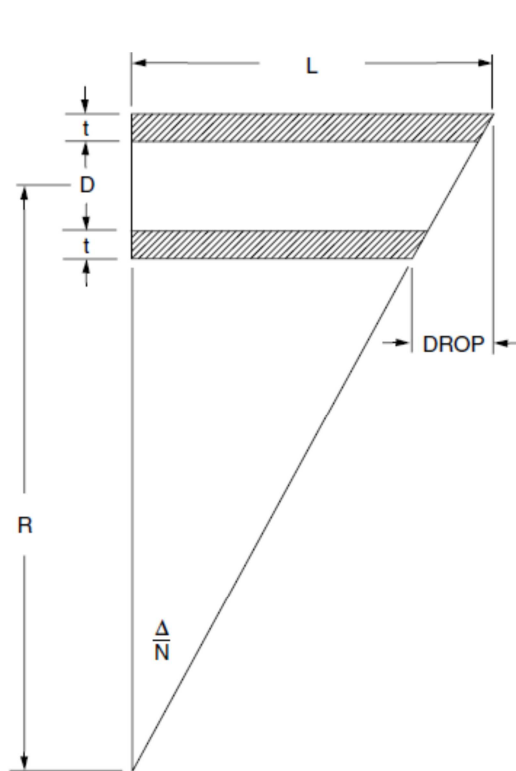


Figure 3 – One Section of a Radius Pipe (ACPA, 2007)

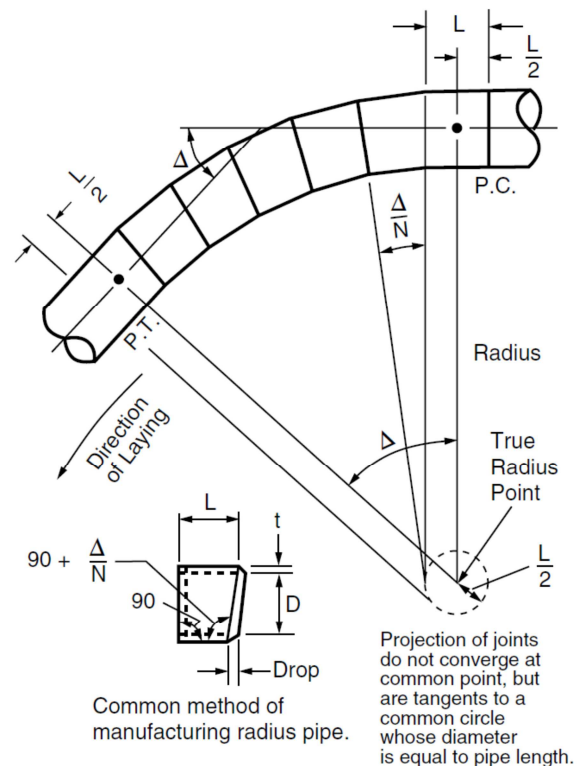


Figure 4 - Curved Alignment Using Radius Pipe (ACPA, 2007)

Method 1 & 2 Combined – Pulling Joints of Radius RCP

Pulling the joints of radius pipe to the maximum allowed 13mm gap enables the tightest possible radius for a curved sewer line. The following table from Inland Pipe's catalogue shows the comparison between these methods:

PIPE LENGTH (mm) STANDARD 2500mm			RADIUS PIPE (mm) MAX DROP 0.75"		DEFLECTED STRAIGHT PIPE (mm) MAX PULL 13mm		
SIZE (mm)	ACTUAL ID (mm)	WALL TYPE	WALL DEPTH (mm)	PIPE OD (mm)	MINIMUM RADIUS ACHIEVABLE (TIGHTEST CURVE)		
					DROP (m)	PULL (m)	COMBO (m)
300	305	C	70	445	58.2	85.5	34.7
375	381	C	76	534	69.7	102.6	41.6
450	457	C	83	622	81.3	119.6	48.5
525	533	C	89	711	92.9	136.7	55.4
600	610	C	95	801	104.7	154.0	62.4
675	686	C	102	889	116.3	171.0	69.4
750	762	C	108	978	127.9	188.1	76.3
900	914	C	121	1155	151.0	222.2	90.1
1050	1067	C	133	1334	174.4	256.5	104.0
1200	1219	C	146	1511	197.6	290.6	117.9
1350	1372	C	159	1690	220.9	324.9	131.8
1500	1524	C	172	1867	244.1	359.0	145.6
1650	1676	C	184	2044	267.3	393.1	159.5
1800	1829	C	197	2223	290.6	427.5	173.4
1950	1981	C	210	2400	313.8	461.6	187.2
2100	2134	C	222	2579	337.1	495.9	201.1
2400	2438	C	248	2933	383.5	564.1	228.8
2700	2748	C	274	3295	430.8	633.7	257.0
3000	3048	B	279	3607	471.5	693.6	281.3

Figure 5 – Curved Alignment Table



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