OPTIONS:

1. For deflections past higher risk structures such as barrel drains, waterways, major roads and rail lines, welded mains are required. Refer to MRWA-W-210 and MRWA-W-211 for details.
2. Cold bending of PVC mains is not permitted.
3. Optimise risk and construction cost by:
   - 3.1. Minimizing the number of joints. Full length pipes preferred to cut pipes which if necessary should be of maximum possible length.
     For multiple cut pipe situations, the minimum cut pipe length is ½ normal pipe length.
   - 3.2. Minimiising the amount of excavation required. Vertical deflections over longer distances will require significant extra excavation.
   - 3.3. Minimising the number of concrete thrust blocks required, especially vertical thrust blocks.
   - 3.4. Only switching between pipe types (from RRJ main to a welded main and back again) where strictly necessary.
4. Bends: Usually enable longer pipe lengths to be predominantly used. Variety of angles available, providing flexibility.
   Enable deflections to occur over a short distance, potentially reducing excavation & disruption to other services.
   Socketed bends may require concrete blocking, which could be a problem in tight situations.
   Often not practical in horizontal curved alignments as bends will often encroach on the alignment of neighboring services.
   Sockets shall be offset so that they are not directly below obstructions.
   Restrained joint vertical bends are preferred to socketed bends.
5. Pipe socket deflections: Limited deflections possible.
   Do not usually require blocking (DI pipe may at larger angles).
   Low joint numbers, especially with full length pipes.
   Vertical deflections occur over a long distance, increasing excavation.
6. Double socket connectors: When used in numbers with short pipes, joint numbers will be high.
   Only suitable for shorter curves / deflections.
   Pretapped connectors are equivalent to double socket connectors in their deflection capability.
7. Change to PE: Requires specialist welding skills to construct and careful thrust restraint at ends, but may significantly reduce the number of unrestrained joints, especially for long curves.
   PE shall be bent in accordance with PIPA guideline POP202.

TABLE 212-A: HORIZONTAL DEVIATION PREFERENCES

PREFERENCE	< 4 PIPE LENGTHS	≥ 4 PIPE LENGTHS
1	FABRICATED BENDS, or PIPE SOCKET DEFLECTIONS	FABRICATED BENDS (for multiple sharper deflections), or PIPE SOCKET DEFLECTIONS (for longer radius curves), or CHANGE TO PE (for shorter radius curves)
2	DOUBLE SOCKET CONNECTORS, or PRE-TAPPED CONNECTORS	
3	CHANGE TO PE	

HIGHER PREFERENCE OPTIONS SHALL BE USED WHENEVER PRACTICABLE.

TABLE 212-B: VERTICAL DEVIATION PREFERENCES

PREFERENCE	JOINTING SYSTEM
1	UNBLOCKED PIPE SOCKET DEFLECTIONS, or WELDED BENDS (PE or MSCL)
2	FLANGED BENDS

HIGHER PREFERENCE OPTIONS SHALL BE USED WHENEVER PRACTICABLE.

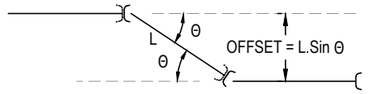


FIGURE 212-A: 1 PIPE DEFLECTION OFFSET

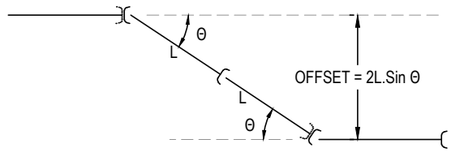


FIGURE 212-B: 2 PIPE DEFLECTION OFFSET

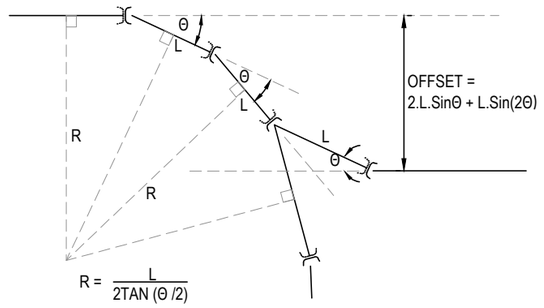


FIGURE 212-C: 3 PIPE DEFLECTION OFFSET or CURVED MAIN

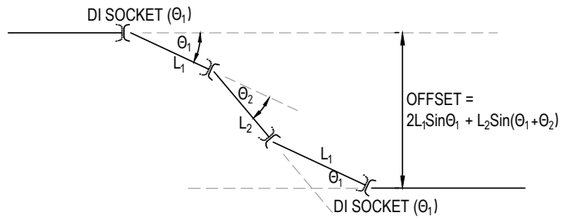


FIGURE 212-D: 3 PIPE DEFLECTION OFFSET WITH Di AND PVC SOCKETS

TABLE 212-C: DEFLECTIONS

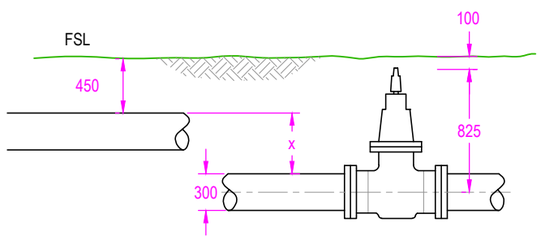
	PIPE / JOINT TYPE			
	TYPICAL RETIC PVC PIPE	TYPICAL RETIC DI PIPE	TYPICAL PVC PIPE + DOUBLE SOC CONNECTOR [6]	COMMENTS
TYPICAL FULL LENGTH FOR L (m)	6	5.5	6 (PVC)	
TYPICAL MINIMUM LENGTH FOR L (m)	3	2.75	3 (PVC)	
TYPICAL Θ MAX (degrees)	1	3.5	7	VARIES DEPENDING ON MANUFACTURER
MAX 1 PIPE MAX OFFSET (mm) [1]	105	340	730 [7]	HORIZONTAL OR VERTICAL DEFLECTION
1 PIPE OFFSET (mm)- 1 x ½ PIPE	53	138	365	2 or 3 PIPE HORIZONTAL DEFLECTION USUALLY NOT PREFERRED ALONG STRAIGHT ROADS DUE TO DISRUPTION OF OTHER ASSETS
MAX 2 PIPE MAX OFFSET (mm) [1]	210	670 [7]	1460 [7]	
MAX 3 PIPE MAX OFFSET (mm) [1]	350	1115 [7]	2425 [7]	
3 PIPE OFFSET (mm)- 3 x ½ PIPE	210	455 [7]	1212 [7]	
TYPICAL MIN R (m)- WHOLE PIPE	344	90	49	
TYPICAL MIN R (m)- 1/2 PIPE	172	45	25	
VERTICAL BLOCKING REQUIREMENTS	NO THRUST BLOCK REQUIRED	THRUST CALCULATION REQUIRED [2]	THRUST CONTROL REQUIRED [3]	VERTICAL BLOCKS REQUIRE WATER AGENCY APPROVAL [5]
HORIZONTAL BLOCKING REQUIREMENTS	NO THRUST BLOCK REQUIRED	THRUST CALCULATION REQUIRED [2]	THRUST BLOCK REQUIRED [4]	

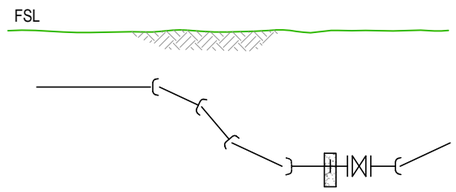
NOTES Regarding Table 212-C:

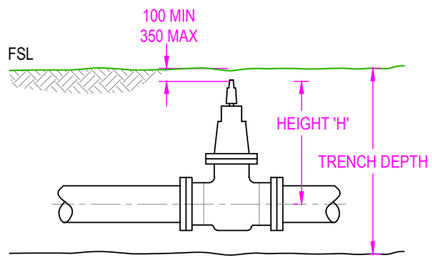
1. Max offsets calculated using full length pipes and no fittings.
2. Thrust control requirements need to be calculated as per the method described in MRWA-W-204.
3. Block as per Table 205A-A using ½ of the mass volume of the 11.25° bend.
4. Block as per 6° bends of MRWA-W-204.
5. Flanged or welded bends preferred to vertical blocks.
6. Pre-tapped connectors provide the same amount of joint deflection as a double socket connector.
7. For larger defections, it is often better to use bends to reduce excavation depths and / or limit disruption to horizontal alignments.

Θ_1 = DI pipe socket angle of deflection (~3.5°), or Double socket angle of deflection (~7°)

Θ_2 = PVC pipe socket angle of deflection (~1°), or Double socket angle of deflection (~7°)







VERTICAL DEFLECTION TO A VALVE

EXAMPLE:

VERTICAL OFFSET REQUIRED = VALVE HEIGHT (H) + SPINDLE COVER - ½ MAIN OD - MINIMUM PIPE COVER
= 825 + 100 - 150 - 450 = 325

TABLE 212-D: VALVE HEIGHTS

NOMINAL DIAMETER (DN)	MAXIMUM VALVE HEIGHT 'H' (mm) (PER AS 2638)
100	450
150	520
225	660
300	825
375	985
450	1145
500	1270
600	1560
750	1900

REV	DESCRIPTION	DATE	APPROVED
3	MINOR ADDITIONS TO NOTES / TABLE	1/12/2016	RJ / CP / JT
2	PUBLISHED FIRST ISSUE	23/03/12	R. JAGGER
1	PRE PUBLISHED DRAFT FOR COMMENT	12/07/11	R. JAGGER

	NAME	DATE
DESIGNED	R. JAGGER	DATE: 10/07/2011
DRAWN:	D. TOLENTINO	DATE: 10/07/2011
CHECKED: ☒ CWW	C. RIVETTE	23/03/12
☒ SEWL	C.PAXMAN	23/03/12
☒ YVW	K. DAWSON	23/03/12
APPROVED: ☒ CWW	R. CARRUTHERS	23/03/12
☒ SEWL	G. REYNOLDS	23/03/12
☒ YVW	A COSHAM	23/03/12

MELBOURNE RETAIL WATER AGENCIES

City West Water™ · South East Water · Yarra Valley Water

MRWA WATER SUPPLY STANDARDS

CURVES AND DEFLECTIONS (VERTICAL & HORIZONTAL)

NOT TO SCALE

MRWA-W-212

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