

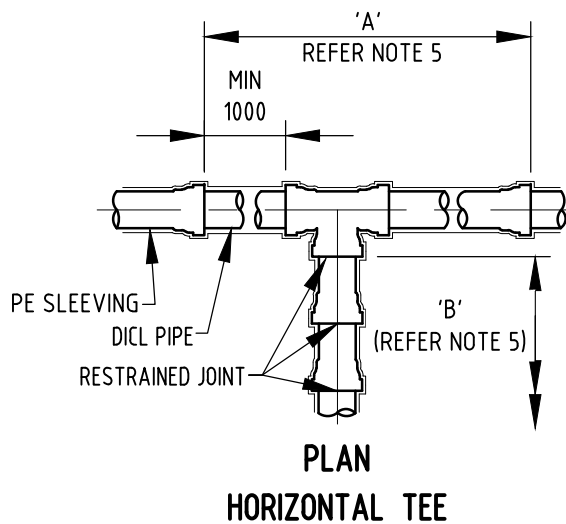
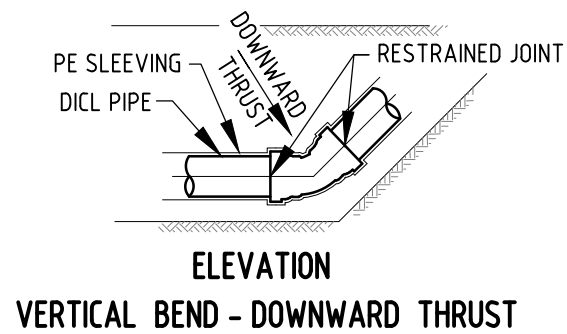
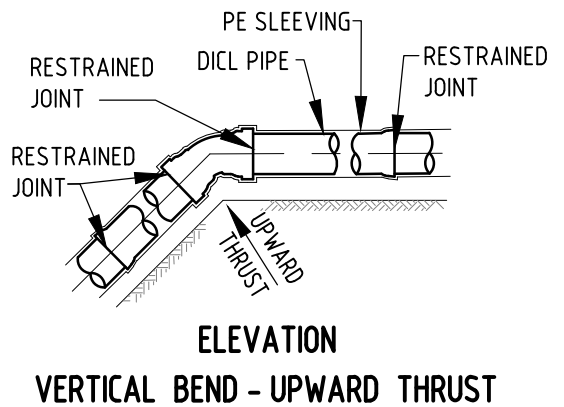
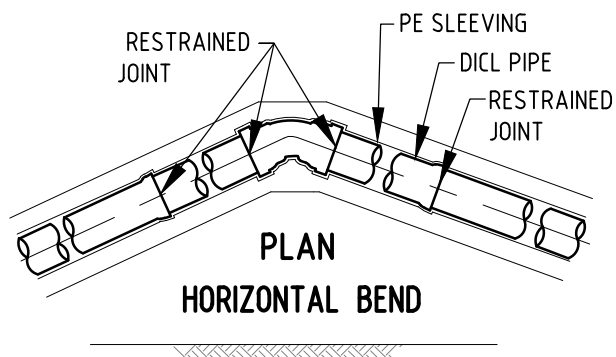
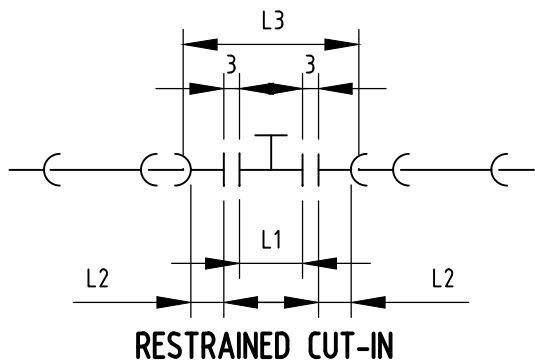
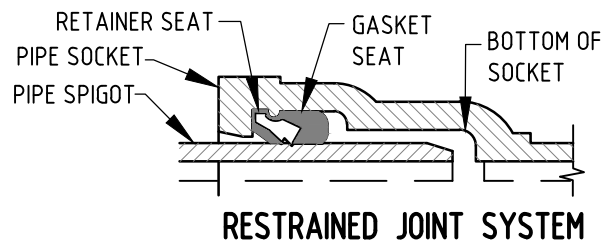
DN	BENDS (REFER NOTE 3)										DEAD ENDS  (m)
	HORIZONTAL				VERTICAL						
					UPWARD THRUST			DOWNWARD THRUST			
	11 ¼° (m)	22½° (m)	45° (m)	90° (m)	11 ¼° (m)	22½° (m)	45° (m)	11 ¼° (m)	22½° (m)	45° (m)	
100	0.8	1.6	3.4	8.1	2.4	4.9	10.2	0.8	1.6	3.4	24.7
150	1.1	2.2	4.6	11.2	3.4	6.9	14.4	1.1	2.2	4.6	34.7
200	1.4	2.8	5.9	14.2	4.4	8.8	18.4	1.4	2.8	5.9	44.4
250	1.6	3.1	6.5	15.8	4.9	9.8	20.5	1.6	3.1	6.5	49.4
300	1.8	3.7	7.7	18.5	5.8	11.7	24.4	1.8	3.7	7.7	58.9

TEES (REFER NOTE 5)				
MAIN PIPE DN	BRANCH PIPE DN	MIN. DISTANCE BETWEEN JOINTS 'A'		
		2 m RESTRAINED LENGTH 'B' (m)	5.5 m RESTRAINED LENGTH 'B' (m)	11 m RESTRAINED LENGTH 'B' (m)
100	100	20.6	13.4	2.2
150	100	17.4	7.0	0.2
	150	30.5	23.2	11.6
200	100	14.8	1.1	0.2
	150	28.0	18.4	3.3
	200	40.2	32.8	21.1
250	100	10.6	0.2	0.2
	150	23.1	11.3	0.2
	200	34.5	25.3	10.9
	250	45.1	37.6	25.8
300	100	8.0	0.2	0.2
	150	20.9	6.6	0.2
	200	32.2	21.2	3.8
	250	42.8	33.7	19.5
	300	54.6	46.9	34.9
375	100	REFER TO MANUFACTURER		
	150			
	200			
	250			

RESTRAINT LENGTH OF TEE BRANCH IS NOT PROPORTIONAL TO PRESSURE AND MUST BE CALCULATED FOR EACH INTERNAL PRESSURE SITUATION

DN	RESTRAINED CUT-IN		
	INSERT L1	CONNECTOR L2	OVERALL L3
100	356	110	582
150	406	135	682
200	484	135	760
250	534	155	850
300	610	170	956
375	REFER TO MANUFACTURER		

TAPERS (REFER NOTE 6)			
LARGE PIPE DN	SMALL PIPE DN	MIN. LENGTH OF SMALL PIPE FOR ONE RESTRAINT (m)	MIN. LENGTH OF LARGE PIPE FOR FULL RESTRAINT (m)
150	100	25.8	18.2
200	100	59.1	32.2
200	150	24.0	18.6
250	100	91.0	40.4
250	150	48.2	30.5
250	200	20.6	16.9
300	100	137.6	51.6
300	150	81.3	43.4
300	200	46.7	32.3
300	250	21.8	18.4
375	100	REFER TO MANUFACTURER	
375	150		
375	200		
375	250		
375	300		



## NOTES:



- REFER 4005-30002-01 & 4005-30002-02 FOR GENERAL NOTES.
- ALL RESTRAINED LENGTHS ARE APPLICABLE FOR BURIED PIPELINES ONLY.
- THE LENGTH OF RESTRAINT REQUIRED IS THE AMOUNT OF PIPELINE THAT MUST BE RESTRAINED EITHER SIDE OF THE FITTING, INCLUDING THE FITTING JOINTS.
- IF THE DESIGNATED RESTRAINED LENGTH FOR A FITTING ENCLOSES, OR OVERLAPS THE DESIGNATED RESTRAINED LENGTH FOR ANOTHER FITTING, SPECIAL CONSIDERATION IS REQUIRED. IN THIS CASE REFER TO MANUFACTURER OR DESIGNER.
- THE LENGTH OF RESTRAINT REQUIRED FOR TEES APPLIES TO 'B' (BRANCH) ONLY. THE MINIMUM DISTANCE 'A' BETWEEN JOINTS IS THE MINIMUM DISTANCE BETWEEN THE NEAREST UNRESTRAINED JOINT EITHER SIDE OF THE TEE, NOT INCLUDING THE TEE. RESTRAINT IS NOT REQUIRED IN THE MAIN LINE SOCKETS OR MECHANICAL COUPLINGS, UNLESS ENCLOSED (REFER NOTE 4).
- FOR TAPERS, IF THE MINIMUM LENGTH OF THE ADJACENT SMALL PIPE SIZE OCCURS, WITHOUT ENCLOSED ANOTHER FITTING'S RESTRAINT, THEN ONLY ONE RESTRAINED JOINT IS REQUIRED IN THE LARGE SOCKET OF THE TAPER. IF THE MINIMUM LENGTH OF SMALL PIPE DOES NOT OCCUR THEN, FULL RESTRAINT IS REQUIRED.
- TREAT FLUSHING BENDS AS A DEAD END.
- 90 DEGREE VERTICAL BENDS REQUIRE SPECIAL DESIGN. REFER 4005-30003-06.
- PLACE MARKING TAPE FOR IDENTIFICATION OF RESTRAINED SECTIONS OF THE PIPELINE ALONG THE TOP OF THE RESTRAINED PIPE LENGTHS AND FASTEN TO THE PIPE AT NOT LESS THAN 3 m CENTRES. MARKING TAPE TO BE PINK COLOURED POLYETHYLENE TAPE APPROXIMATELY 100 WIDE, WITH THE INSCRIPTION: 'WARNING - RESTRAINED PIPELINE - USE RESTRAINED FITTINGS ONLY'.
- WHEN MAINTAINING OR CUTTING RESTRAINED SECTIONS OF PIPELINE IT IS REQUIREMENT THAT EFFECTIVE LENGTHS OF FITTINGS BE MEASURED ON SITE TO CONFIRM THEIR COMPLIANCE WITH THIS DRAWING.
- RESTRAINED JOINTS MAY BE ASSUMED TO ACT THE SAME AS A FLANGED JOINT.
- WHERE THE RESTRAINED JOINTING SYSTEM IS USED THE SPECIALLY MARKED "RESTRAINED JOINT SYSTEM" MARKING TAPE SHALL BE USED.
- LENGTH SPECIFIED ON THE DRAWING IS NOT APPROPRIATE FOR VERY SOFT, SOFT OR FIRM CLAY, LOOSE CLEAN SAND, UNCOMPACTED FILL OR REFUSE (REFER 4005-30003-05). A GEOTECHNICAL ASSESSMENT AND INDIVIDUAL DESIGN SHALL BE UNDERTAKEN FOR THESE SOILS.
- THE MINIMUM OF PIPELINE REQUIRED TO BE RESTRAINED IS CALCULATED FROM THE PIPE DIAMETER, FITTING TYPE, STANDARD TRENCH CONDITIONS AND A PIPELINE PRESSURE OF 122 m.
- HYDRANT TEES AND OTHER NON-THRUST BEARING FITTINGS DO NOT REQUIRE RESTRAINT.
- FOR DETAILED CALCULATIONS, REFER TO: THRUST RESTRAINT DESIGN FOR DUCTILE IRON PIPE BY DIPRA.
- ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE NOTED.

## ASSEMBLY:

- JOINTING SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS.
- RESTRAINT VIA LOCKING GASKETS SHALL ONLY TO BE USED WITH DI PIPES AND FITTINGS FEATURING THE AUTHORISED SOCKET PROFILE. DO NOT USE WITH OTHER DI SOCKET PROFILES OR OTHER PIPE MATERIALS.
- IF MAXIMUM JOINT DEFLECTION IS DESIRED, PUSH THE SPIGOT TO THE FIRST WITNESS MARK ONLY AND THEN DEFLECT THE JOINT. THE JOINT WILL NOT DEFLECT AFTER INSERTING THE SPIGOT ALL THE WAY HOME.

## DISASSEMBLY:

- JOINTS TO BE DISASSEMBLED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.
- DO NOT REUSE RESTRAINED JOINT GASKETS.

REVISION PANEL					DESIGN PANEL			<div><div></div><div><div>This drawing is the property of the SOUTH AUSTRALIAN WATER CORPORATION and shall not be copied or modified in part or in whole without authorization.</div></div></div> <th colspan="2">SA WATER STANDARD DRAWINGS WATER SUPPLY CONSTRUCTION MANUAL</th> <th>A3 SHT SIZE</th> <th></th> <th>1 REVISION</th>		SA WATER STANDARD DRAWINGS WATER SUPPLY CONSTRUCTION MANUAL		A3 SHT SIZE		1 REVISION
REV	DATE	DRN	DETAILS	APR	CURRENT REV	DESIGNED:	AUTHORISED:	RESTRAINED DUCTILE IRON JOINT SYSTEM		TOTAL SHEETS:				
					AUTHORISED:	RJP	T.GALEK			SUPERSEDES: 02-0295-01 (B9)				
					SIGNATURE:	DRAWN: 16/11/15	SIGNATURE:			DRAWING NUMBER				
						MS				4005-30003-08				
						REVIEWED: 21/03/16				PREFIX				
1	31/03/16	MS	2016 STANDARDS REVIEW	TG		TG				NUMBER				
										SHEET				



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