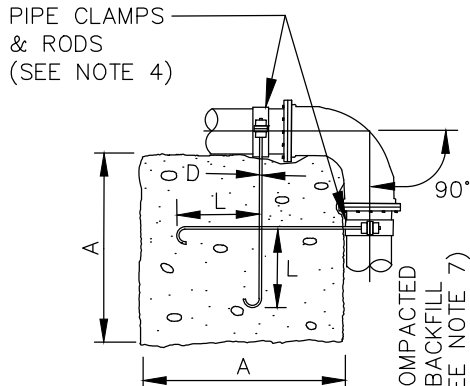
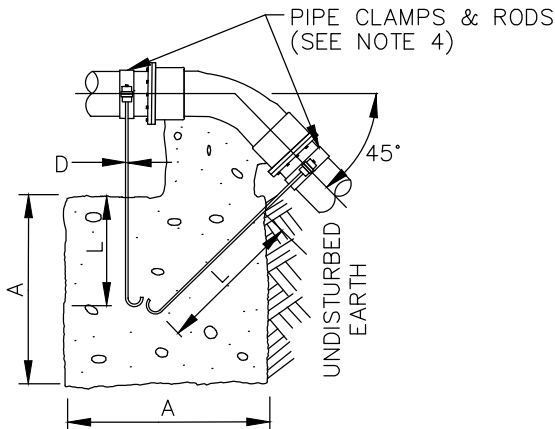


**VERTICAL BLOCKING  
11 1/4° & 22 1/2° BENDS**



**VERTICAL BLOCKING  
FOR 90° BENDS**

(SEE NOTE 6)



**VERTICAL BLOCKING  
FOR 45° BENDS**

VERTICAL BLOCKING SIZE W/RESTRAINED JOINTS SOIL TYPE = COHESIVE GRANULAR [GC+SC] SAND, GRAVEL, CLAY MIXTURE					
PIPE SIZE	V B	CU FT	A	D	L
4"	11 1/4°	8	2.0'	3/4"	1.5'
	22 1/2°	11	2.2'	3/4"	2.0'
	45°	30	3.1'	3/4"	2.0'
	90°	16	2.5'	3/4"	2.0'
6"	11 1/4°	11	2.2'	3/4"	2.0'
	22 1/2°	25	2.9'	3/4"	2.0'
	45°	68	4.1'	3/4"	2.0'
	90°	43	3.5'	3/4"	2.0'
8"	11 1/4°	16	2.5'	3/4"	2.0'
	22 1/2°	47	3.6'	3/4"	2.0'
	45°	123	5.0'	3/4"	2.0'
	90°	86	4.4'	3/4"	2.0'
12"	11 1/4°	32	3.2'	3/4"	2.0'
	22 1/2°	88	4.5'	7/8"	3.0'
	45°	232	6.1'	3/4"	2.5'
	90°	206	5.9'	1 1/8"	4.0'
16"	11 1/4°	70	4.1'	7/8"	3.0'
	22 1/2°	184	5.7'	1-1/8"	4.0'
	45°	478	7.8'	1-1/8"	4.0'

\* 90° BENDS SHALL BE RESTRAINED JOINT AND JOINTS SHALL RESTRAINED 36 FEET ON EACH SIDE OF THE BEND.

**NOTES:**

- NO CHANGE IN PIPE DIRECTION OR DIAMETER SHALL OCCUR WITHIN 36 FEET OF THE VERTICAL BEND.
- CONCRETE BLOCKING SIZES BASED ON:
  - THRUST BLOCK AREAS BASED ON SAFE BEARING LOAD OF 1,000 PSF.
  - 2,500 PSI CONCRETE.
  - MINIMUM 3 FEET OF COVER.
  - PIPE THRUST BASED ON 200 PSI PRESSURE.
  - PIPE ENCASED IN POLYETHYLENE.
  - VERTICAL BLOCK SIZE BASED ON 200 PSI PRESSURE.
  - TRENCH CONDITIONS BASED ON FLAT BOTTOM TRENCH WITH LIGHTLY CONSOLIDATED BACKFILL (TYPE 2), PER ANSI/AWWA C150/A21.50.
  - FACTOR OF SAFETY IS 1.5.
  - SOIL FRICTIONAL RESISTANCE BASED ON COHESIVE GRANULAR SOIL TYPE (GC+SC). SAND, GRAVEL, CLAY MIXTURE.
- BLOCKING DESIGN MUST BE ADJUSTED FOR OTHER SIZE PIPE, PRESSURES AND SOIL CONDITIONS.
- PIPE CLAMP (HOT DIPPED GALVANIZED). RODS (STAINLESS STEEL ALL-THREAD 316SS)
- LINE SHALL NOT BE PRESSURIZED UNTIL ALL TRENCHING WITHIN 100 FEET OF VERTICAL BEND IS BACKFILLED AND COMPACTED TO MINIMUM COVER OF 3 FEET OVER PIPE.
- 90° VERTICAL BENDS SHALL ONLY BE INSTALLED WHERE GIVEN PRIOR APPROVAL BY THE UTILITY AND MUST RESTRAINED.
- BACKFILL TRENCH BEYOND 90° VERTICAL BLOCK WITH CRUSHED SURFACING TOP COURSE MATERIAL COMPACTED TO 95% MAXIMUM DENSITY. CRUSHED BACKFILL SHALL EXTEND 20 FEET BEYOND BLOCK OR TO FIRM BEARING TRENCH WALL, WHICHEVER IS LESS.
- LEAVE BLOCK OPEN OR SHEETED 24 HOURS MINIMUM.

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**VERTICAL  
CONCRETE BLOCKING**

PLOTTING DATE JAN 2016	DRAWN QD	CHECKED SS	APPROVED	DATE APPROVED
SCALE NTS	FILE NAME R:\cad\detail\autocad\WD90\WATER\1-2_vert_blocking.dwg			

**WATER DISTRICT NO. 90**  
DWG. NO. 1-2