

PLOTTED: Tuesday, August 26, 2014 10:24:45 AM
FILE PATH: Z:\STANDARD DETAILS\2014\WATER\FINAL SHEET\SWA\STD-DET-2014-SIGNED.DWG

WATER STANDARD DETAIL

Reinforcing Schedule for Concrete Vaults

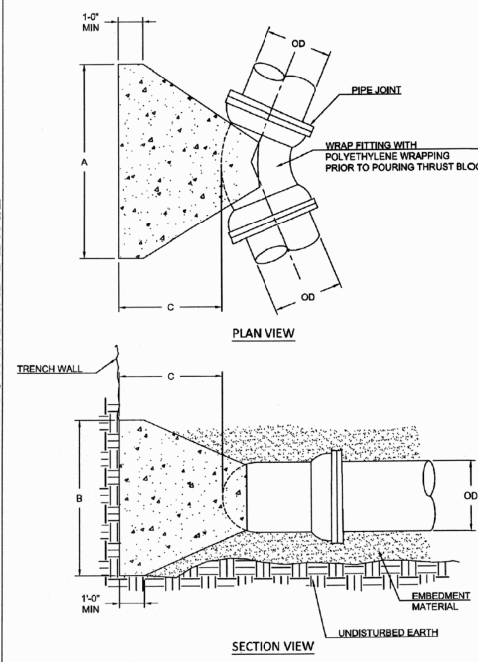
Member	By-Prod. Size	Design No.	Depth (feet)	Horizontal Bars		Vertical Bars		Top Bars	
				A	B	Size	Spacing	Size	Spacing
6"	3"	13	5	15'-0"	9'-6"	10	4	12	8
				15'-0"	9'-6"	8	4	12	8
8"	4"	14	6	15'-0"	9'-6"	10	5	12	8
				15'-0"	9'-6"	8	5	12	8
10"	6"	15	7	17'-0"	11'-0"	10	6	12	8
				17'-0"	11'-0"	8	6	12	8
12"	8"	16	8	17'-0"	11'-0"	10	7	12	8
				17'-0"	11'-0"	8	7	12	8

- NOTES:
 1. ALL REINFORCING BARS SHALL BE GRADE 60.
 2. TOP BARS SHALL BE PLACED IN TWO MATS. BAR SIZE, BAR SIZE, AND SPACING SHALL IN EACH MAT OF STEEL.
 3. ALL REINFORCING BARS SHALL BE PLACED IN TWO MATS. BAR SIZE, BAR SIZE, AND SPACING SHALL IN EACH MAT OF STEEL.
 4. WALL, FLOOR AND TOP THICKNESS ARE IN INCHES. STEEL REINFORCEMENT SPACING IS IN INCHES.

FIRE FLOW METER VAULT INSTALLATION 5 OF 5

APPROVED BY: *[Signature]* DATE: 8/7/14
 ERIC J. WENGER, P.E., CITY ENGINEER
 MARSHA W. SLAUGHTER, P.E., UTILITIES DIRECTOR
 OKLAHOMA CITY UTILITIES DEPARTMENT

WATER STANDARD DETAIL



HORIZONTAL THRUST BLOCK - BENDS 1 OF 3

APPROVED BY: *[Signature]* DATE: 8/7/14
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WATER STANDARD DETAIL

Area of Thrust Block (sf)

Pipe Dia (in)	90 Deg Bend	22.5 Deg Bend	11.25 Deg Bend
4	6.60	3.46	1.77
6	13.22	7.15	3.65
8	22.74	12.31	6.27
10	34.21	18.52	9.44
12	48.38	26.18	13.35
14	65.90	35.13	17.93
16	84.97	45.50	23.19
18	105.59	57.14	29.13
20	128.85	70.11	35.74
24	184.84	100.03	51.00
30	284.34	153.89	78.45

Volume of Thrust Block (cy)

Pipe Dia (in)	90 Deg Bend	45 Deg Bend	22.5 Deg Bend	11.25 Deg Bend
4	0.07	0.03	0.01	0.00
6	0.30	0.09	0.03	0.01
8	0.42	0.15	0.07	0.02
10	0.84	0.30	0.13	0.05
12	1.50	0.55	0.21	0.08
14	2.25	0.95	0.33	0.12
16	3.26	1.32	0.51	0.17
18	4.24	1.86	0.72	0.24
20	5.41	2.41	0.95	0.33
24	8.27	4.22	1.58	0.57
30	14.49	7.32	3.01	1.06

Thrust Force (Tons)

Pipe Dia (in)	90 Deg Bend	45 Deg Bend	22.5 Deg Bend	11.25 Deg Bend
4	0.02	2.80	1.32	0.67
6	9.32	5.37	2.74	1.37
8	17.06	9.33	4.71	2.36
10	26.64	13.80	7.08	3.64
12	36.79	19.64	10.01	5.03
14	48.75	26.38	13.65	6.76
16	63.05	34.12	17.60	8.74
18	79.17	42.86	21.85	10.98
20	97.17	52.59	26.81	13.47
24	138.63	75.02	38.25	19.22
30	213.25	115.41	58.84	29.56

NOTES:
 * SIZING OF THRUST BLOCK BASED ON THE FOLLOWING CONDITIONS:
 SOIL BEARING: 1500 PSI
 WORKING PRESSURE: 150 PSI
 TOTAL DESIGN PRESSURE: 300 PSI
 FACTOR OF SAFETY: 1.5
 THRUST BLOCK CONCRETE TO BE 3000 PSI 7 DAY HIGH EARLY STRENGTH CONCRETE.
 WRAP FITTINGS AND PIPE WITH 8 MIL POLYETHYLENE WRAPPING PRIOR TO POURING THRUST BLOCK. IF FILL IS REQUIRED, 95% COMPACTION IS REQUIRED FOR FILL MATERIAL. THRUST BLOCK TO BE POURED AGAINST UNDISTURBED EARTH. IF FILL IS REQUIRED, 95% COMPACTION IS REQUIRED FOR FILL MATERIAL. SHOWN ON DRAWINGS TAKE PRECEDENCE OVER THIS PLAN. MAINTAIN THE SURFACE AREA FOOTPRINT AGAINST THE SOIL. FITTINGS GREATER THAN 3-INCH REQUIRE CALCULATIONS FROM ENGINEER TO BE SUBMITTED FOR REVIEW.

HORIZONTAL THRUST BLOCK - BENDS 2 OF 3

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WATER STANDARD DETAIL

Dimension 'A' (ft)

Pipe Dia (in)	90 Deg Bend	45 Deg Bend	22.5 Deg Bend	11.25 Deg Bend
4	3.75	2.75	1.75	1.25
6	5.25	3.50	2.50	1.50
8	7.50	5.00	3.50	2.00
10	10.00	6.75	4.50	2.50
12	12.75	8.75	6.00	3.00
14	15.75	10.75	7.50	3.50
16	18.75	12.75	9.00	4.00
18	21.75	14.75	10.50	4.50
20	24.75	16.75	12.00	5.00
24	34.50	22.50	16.50	6.75
30	44.25	29.25	22.50	9.00

Dimension 'B' (ft)

Pipe Dia (in)	90 Deg Bend	45 Deg Bend	22.5 Deg Bend	11.25 Deg Bend
4	1.75	1.25	1.00	0.75
6	2.50	2.00	1.50	1.00
8	3.50	2.50	2.00	1.25
10	4.50	3.00	2.25	1.50
12	5.50	3.50	2.50	1.75
14	6.50	4.00	2.75	2.00
16	7.50	4.50	3.00	2.25
18	8.50	5.00	3.25	2.50
20	9.50	5.50	3.50	2.75
24	12.50	7.25	4.25	3.00
30	16.50	9.75	5.75	4.00

Dimension 'C' (ft)

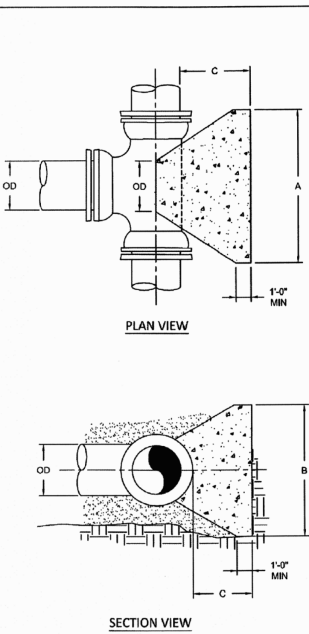
Pipe Dia (in)	90 Deg Bend	45 Deg Bend	22.5 Deg Bend	11.25 Deg Bend
4	0.88	0.63	0.50	0.38
6	1.25	1.00	0.75	0.50
8	1.60	1.25	0.88	0.60
10	2.00	1.50	1.13	0.75
12	2.50	1.75	1.25	0.88
14	2.75	2.13	1.50	1.00
16	3.13	2.38	1.75	1.25
18	3.25	2.75	2.00	1.38
20	3.38	3.00	2.13	1.50
24	3.63	3.38	2.50	1.75
30	4.13	3.75	3.13	2.25

NOTES:
 WRAP FITTINGS AND PIPE WITH 8 MIL POLYETHYLENE WRAPPING PRIOR TO POURING THRUST BLOCK. IF FILL IS REQUIRED, 95% COMPACTION IS REQUIRED FOR FILL MATERIAL. THRUST BLOCK TO BE POURED AGAINST UNDISTURBED EARTH. IF FILL IS REQUIRED, 95% COMPACTION IS REQUIRED FOR FILL MATERIAL. SHOWN ON DRAWINGS TAKE PRECEDENCE OVER THIS PLAN. MAINTAIN THE SURFACE AREA FOOTPRINT AGAINST THE SOIL. FITTINGS GREATER THAN 3-INCH REQUIRE CALCULATIONS FROM ENGINEER TO BE SUBMITTED FOR REVIEW.

HORIZONTAL THRUST BLOCK - BENDS 3 OF 3

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WATER STANDARD DETAIL



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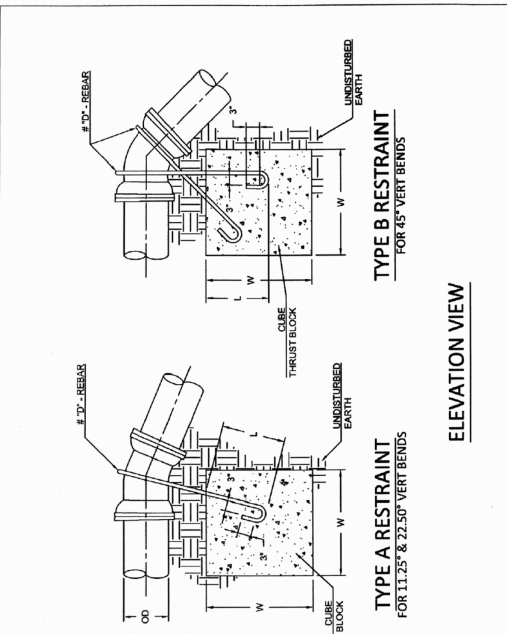
NOTES:
 * SIZING OF THRUST BLOCK BASED ON THE FOLLOWING CONDITIONS:
 SOIL BEARING: 1500 PSI
 WORKING PRESSURE: 150 PSI
 TOTAL DESIGN PRESSURE: 300 PSI
 FACTOR OF SAFETY: 1.5
 THRUST BLOCK CONCRETE TO BE 3000 PSI 7 DAY HIGH EARLY STRENGTH CONCRETE.
 WRAP FITTINGS AND PIPE WITH 8 MIL POLYETHYLENE WRAPPING PRIOR TO POURING THRUST BLOCK. IF FILL IS REQUIRED, 95% COMPACTION IS REQUIRED FOR FILL MATERIAL. THRUST BLOCK TO BE POURED AGAINST UNDISTURBED EARTH. IF FILL IS REQUIRED, 95% COMPACTION IS REQUIRED FOR FILL MATERIAL. SHOWN ON DRAWINGS TAKE PRECEDENCE OVER THIS PLAN. MAINTAIN THE SURFACE AREA FOOTPRINT AGAINST THE SOIL. FITTINGS GREATER THAN 3-INCH REQUIRE CALCULATIONS FROM ENGINEER TO BE SUBMITTED FOR REVIEW.

Pipe Dia (in)	Thrust (Tons)	Dim 'A' (ft)	Dim 'B' (ft)	Dim 'C' (ft)	Area (sq ft)	Volume (cy)
4	3.4	3.00	1.50	1.00	4.52	0.04
6	7.0	4.25	2.25	1.00	9.35	0.13
8	12.1	5.80	3.00	1.25	16.08	0.21
10	18.1	7.00	3.50	1.50	24.19	0.33
12	25.7	8.00	4.25	1.75	34.21	0.49
14	34.5	9.25	5.00	2.00	45.98	0.63
16	44.6	11.00	5.50	2.25	58.45	0.79
18	56.0	12.00	6.25	2.50	74.86	0.99
20	68.7	14.00	6.50	2.75	91.61	1.21
24	98.0	18.75	7.00	3.25	130.70	1.67
30	150.8	27.00	7.50	3.75	201.06	2.68

HORIZONTAL THRUST BLOCK - TEES, PLUGS, VALVES 2 OF 2

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WATER STANDARD DETAIL



VERTICAL THRUST BLOCK - BENDS 1 OF 2

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 MARSHA W. SLAUGHTER, P.E., UTILITIES DIRECTOR
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WATER STANDARD DETAIL

Type A Restraint

Pipe Dia (in)	Restraint (sq ft)	Bar Dia (in)	Embedment (ft)	Volume (cy)
4	2.00	#5	2.00	0.3
6	2.75	#5	2.00	0.7
8	3.50	#5	2.00	1.4
10	4.25	#5	2.00	2.3
12	5.00	#5	2.00	3.5
14	5.75	#5	2.00	5.0
16	6.50	#5	2.00	6.7
18	7.25	#5	2.00	8.6
20	8.00	#5	2.00	10.8
24	11.25	#5	2.00	16.8
30	16.50	#5	2.00	26.1

Type B Restraint

Pipe Dia (in)	Restraint (sq ft)	Bar Dia (in)	Embedment (ft)	Volume (cy)
4	45.00	#5	2.00	1.3
6	45.00	#5	2.00	2.8
8	45.00	#5	2.00	4.8
10	45.00	#5	2.00	7.5
12	45.00	#5	2.00	10.8
14	45.00	#5	2.00	14.8
16	45.00	#5	2.00	19.8
18	45.00	#5	2.00	25.8
20	45.00	#5	2.00	32.8
24	45.00	#5	2.00	46.8
30	45.00	#5	2.00	67.0

NOTES:
 SOIL BEARING: 1500 PSI
 WORKING PRESSURE: 150 PSI
 TOTAL DESIGN PRESSURE: 300 PSI
 FACTOR OF SAFETY: 1.5
 THRUST BLOCK CONCRETE TO BE 3000 PSI 7 DAY HIGH EARLY STRENGTH CONCRETE.

VERTICAL THRUST BLOCK - BENDS 2 OF 2

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 ERIC J. WENGER, P.E., CITY ENGINEER
 MARSHA W. SLAUGHTER, P.E., UTILITIES DIRECTOR
 OKLAHOMA CITY UTILITIES DEPARTMENT

The City of Oklahoma City
 Utilities Department
 Engineering Division

NO. DATE DESCRIPTION

WATER STANDARD DETAILS

DATE: 08/07/14
 DRAWN BY: JDS
 CHECKED BY: MWS/EJW

SCALE: AS SHOWN

SHEET NUMBER: W-STD-06