SECTION III

DRAINAGE

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DRAINAGE FACILITIES

D-99	12”-60” HDPE or Polypropylene Pipe Soil-Tight Grouted Manhole Connection
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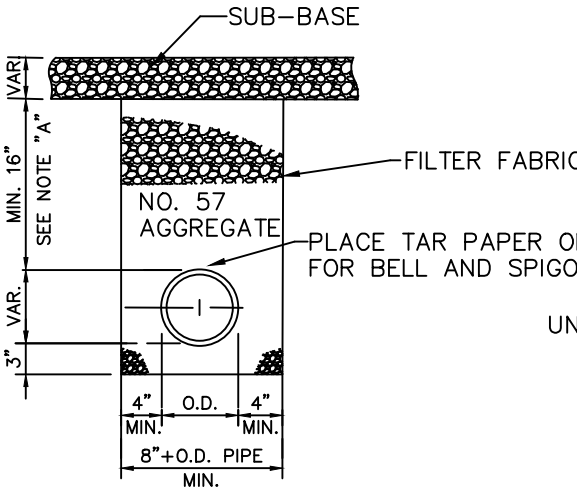
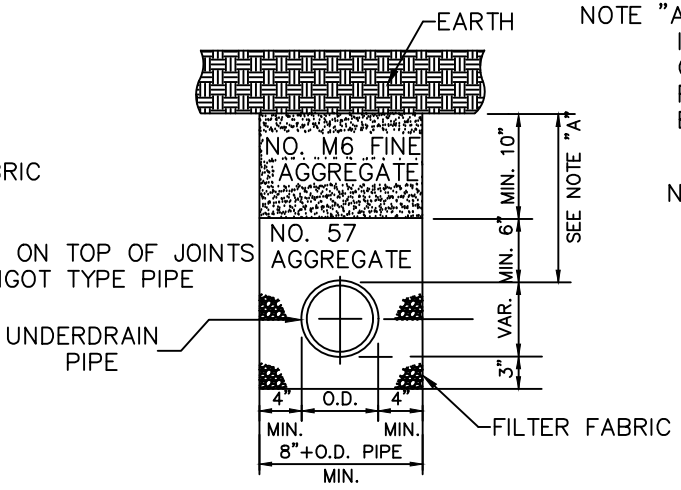


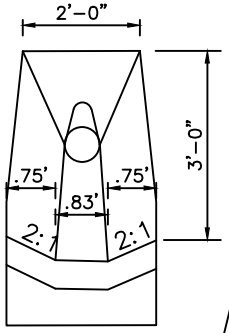
SUB-BASE DRAINAGE DITCH SECTION

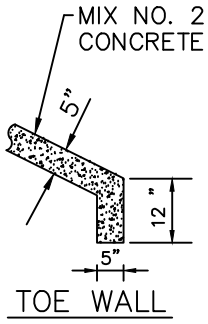


SUB SURFACE DRAINAGE DITCH SECTION

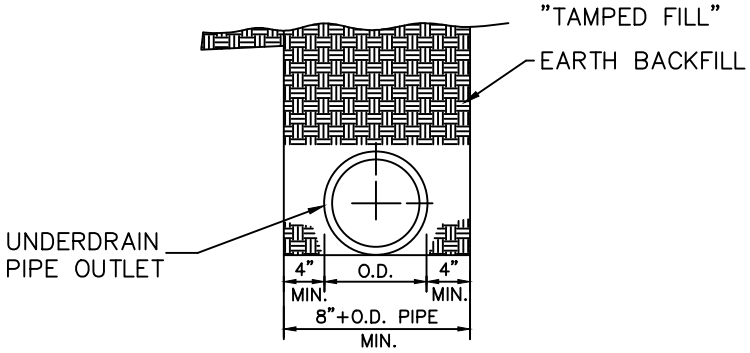
NOTE "A": WHERE UNDERDRAIN IS OUTLETTED INTO AN INLET, OR WHERE ANY OTHER UNUSUAL CONDITIONS PREVAIL, THESE DIMENSIONS MAY BE VARIED AS DIRECTED.

NOTE: UNDERDRAIN TO BE LAID ON A MINIMUM OF 0.5% GRADE UNLESS OTHERWISE DIRECTED.

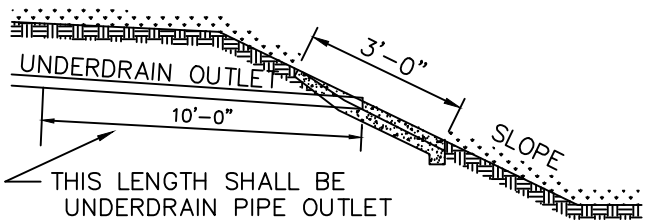




TOE WALL



OUTLET DITCH SECTION



THIS LENGTH SHALL BE UNDERDRAIN PIPE OUTLET OF SPECIFIED SIZE IN ALL CASES. TO BE MEASURED AND PAID FOR AT CONTRACT UNIT PRICE FOR UNDERDRAIN OUTLET.

5" CONCRETE GUTTER FOR UNDERDRAIN OUTLET

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS STANDARD UNDERDRAINS	REVISED 04/2024	D 1

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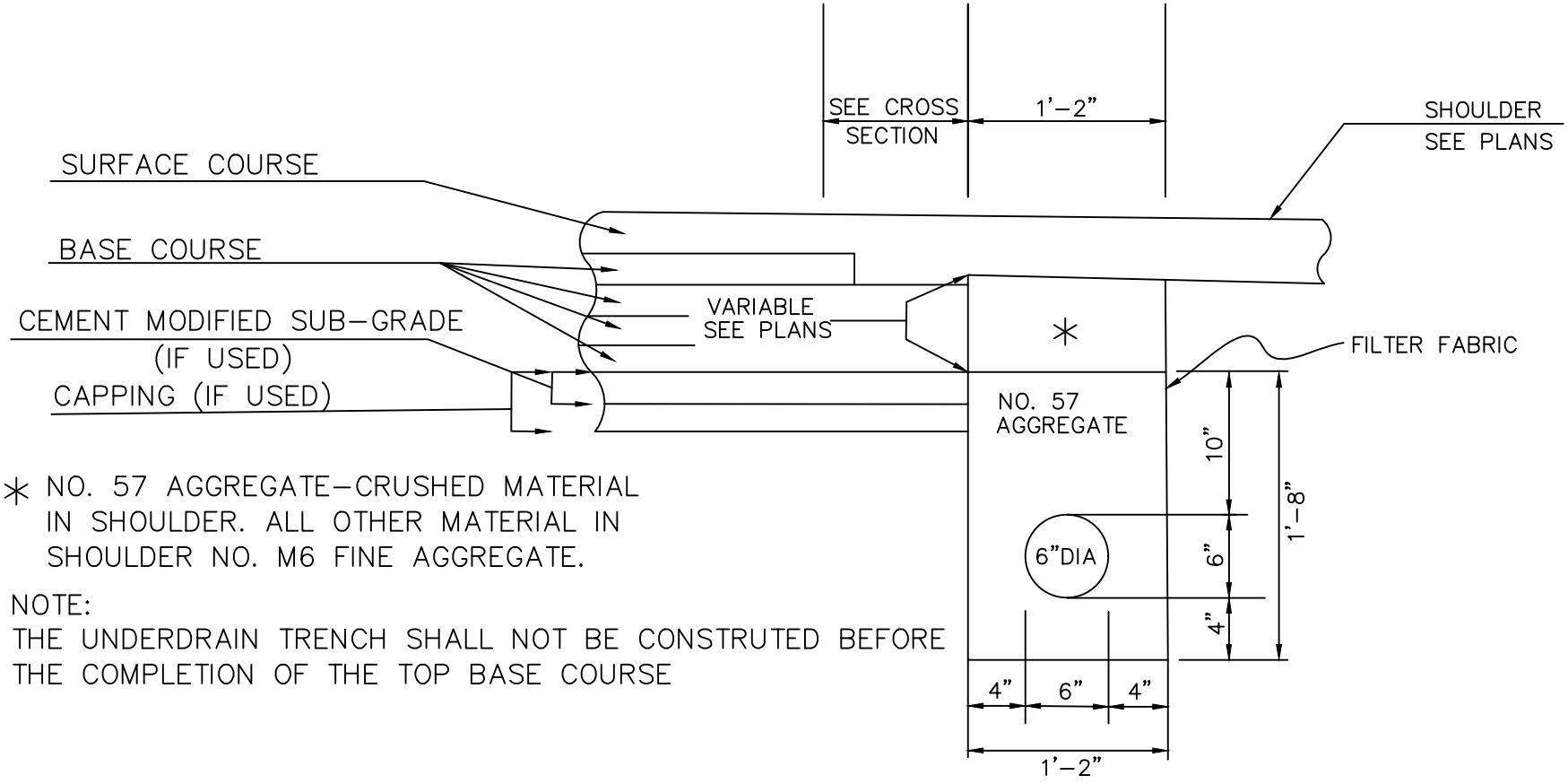

* NO. 57 AGGREGATE–CRUSHED MATERIAL IN SHOULDER. ALL OTHER MATERIAL IN SHOULDER NO. M6 FINE AGGREGATE.

NOTE:
THE UNDERDRAIN TRENCH SHALL NOT BE CONSTRUTED BEFORE THE COMPLETION OF THE TOP BASE COURSE

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS LONGITUDINAL UNDERDRAIN FOR FLEXIBLE PAVING	REVISED 04/2024	D 2

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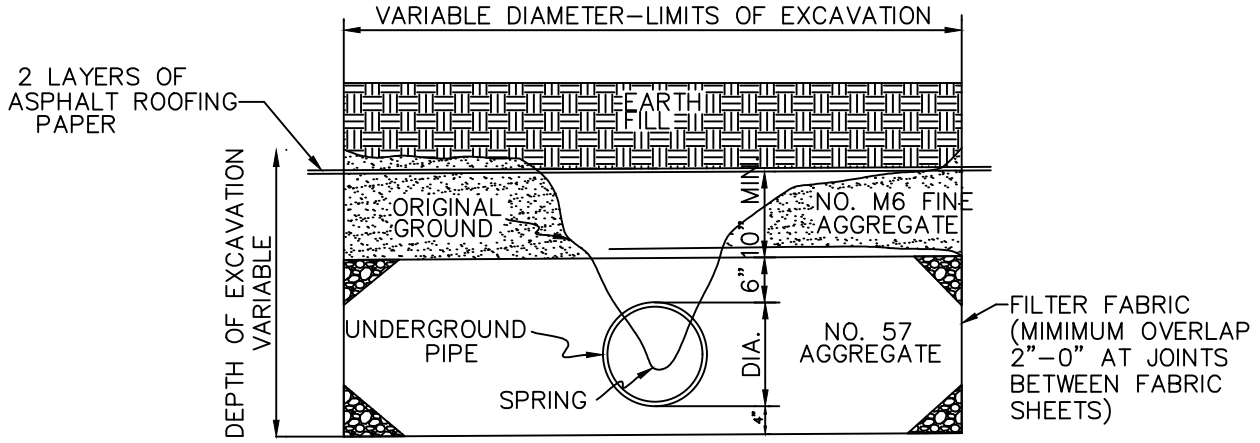
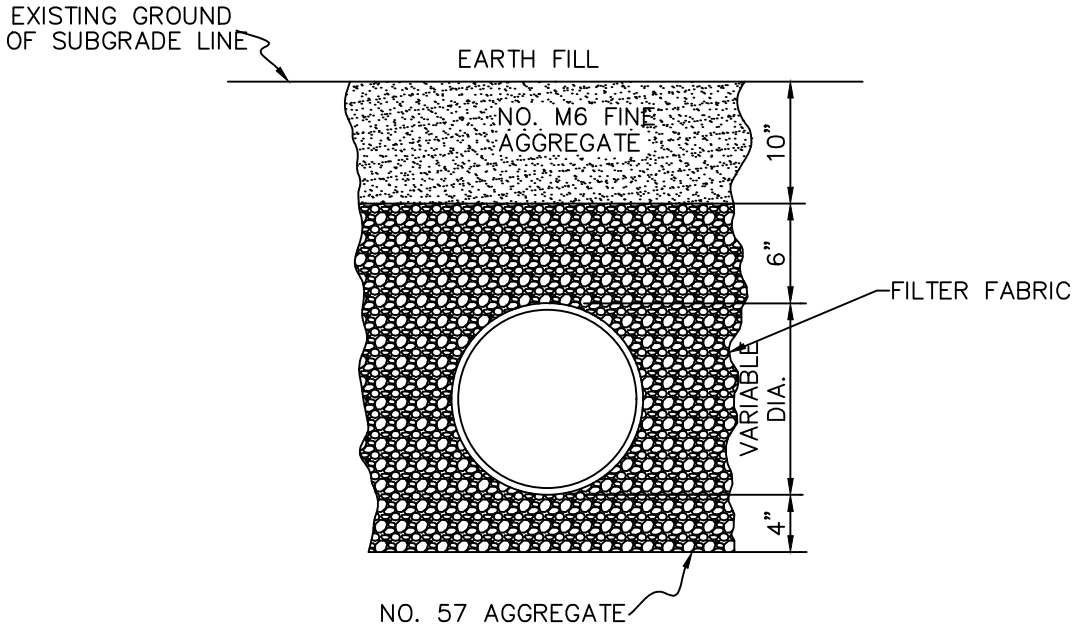


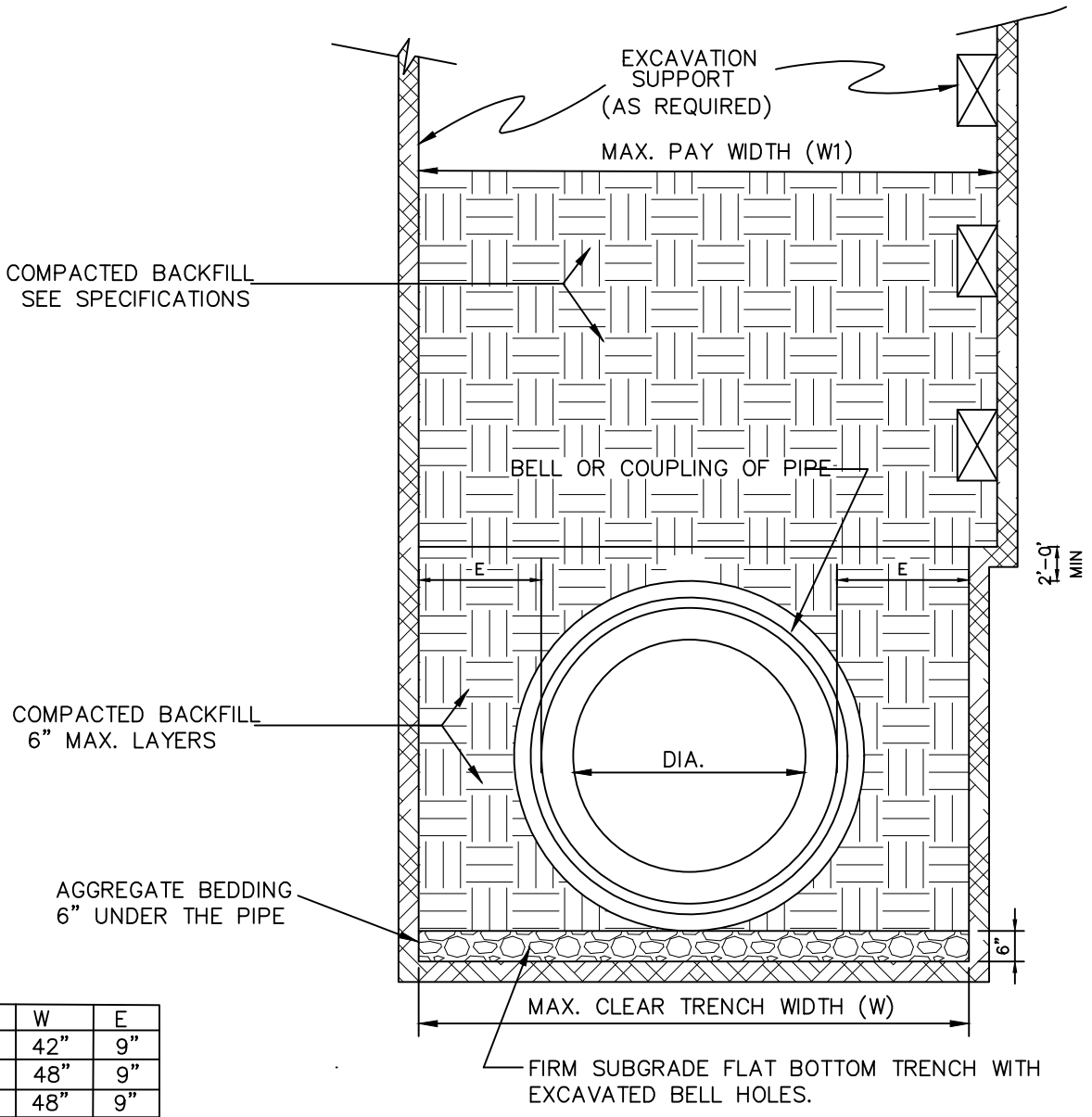
CIRCULAR PLAN VIEW NOT SHOWN TO BE USED WHERE NOTED ON PLANS.

TWO LAYERS OF THREE PLY ASPHALT ROOFING PAPER. COST OF PAPER AND INSTALLATION MUST BE INCLUDED IN THE CONTRACT PRICE FOR AGGREGATE BACKFILL FOR UNDERDRAIN.



ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS SPRING CONTROL METHOD & DETAIL	REVISED 04/2024	D 3

2/2018



D	W	E
12"	42"	9"
15"	48"	9"
15"	48"	9"
21"	48"	9"
24"	60"	9"
27"	60"	12"
30"	76"	12"
33"	76"	12"
36"	76"	12"
42"	88"	15"
48"	96"	15"
54"	104"	15"
60"	114"	15"
66"	126"	15"
72"	132"	15"
78"	144"	15"

NOTES:

1. MAXIMUM CLEAR TRENCH WIDTH AND PAY WIDTH TO 1' OVER OUTSIDE DIAMETER OF PIPE SHALL BE 2E+ OUTSIDE DIAMETER OF PIPE.
2. MAXIMUM PAY WIDTH FROM 1' ABOVE OUTSIDE DIAMETER OF PIPE TO EXISTING SURFACE OR FINISHED GRADE SHALL BE W1.
3. FOR PIPE ARCH AND ELLIPTICAL PIPE SPANS USE NEXT HIGHER TABLE VALUE FOR E. SEE DETAIL D/5 FOR W1 VALUE.
4. UNLESS OTHERWISE DIRECTED IN SPECIFICATIONS PROVIDED 95% COMPACTION IN ROADWAY AREAS AND 92% COMPACTION IN UNPAVED AREAS.

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS TRENCH DETAILS	REVISED 04/2024	D 4

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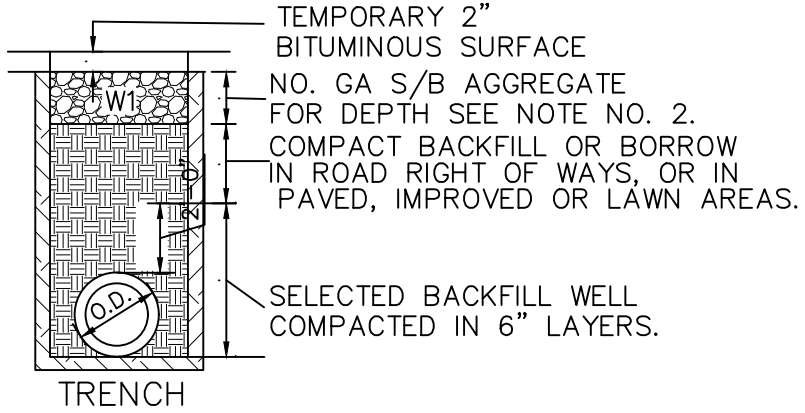
NOTES:

1. TEMPORARY SURFACE TO BE MAINTAINED AT CONTRACTORS EXPENSE.
2. AGGREGATE QUANTITIES ARE BASED ON: DEPTH–6" FOR DIROADS,SHOULDERS,DRIVEWAYS,SIDEWALKS,ETC. 12" FOR PAVED ROADS AND SHOULDERS. WEIGHT–130 LBS. PER CUBIC FOOT.
3. FOR MAXIMUM CLEAR TRENCH WIDTH SEE DETAIL D/4.
4. SEE DETAIL D/6 FOR METHOD OF CUTTING & REPAIRING OPENINGS IN COUNTY ROADWAYS.
5. UNLESS OTHERWISE DIRECTED IN SPECIFICATIONS PROVIDED 95% COMPACTION IN ROADWAY AREAS AND 92% COMPACTION IN UNPAVED AREAS.



TRENCH

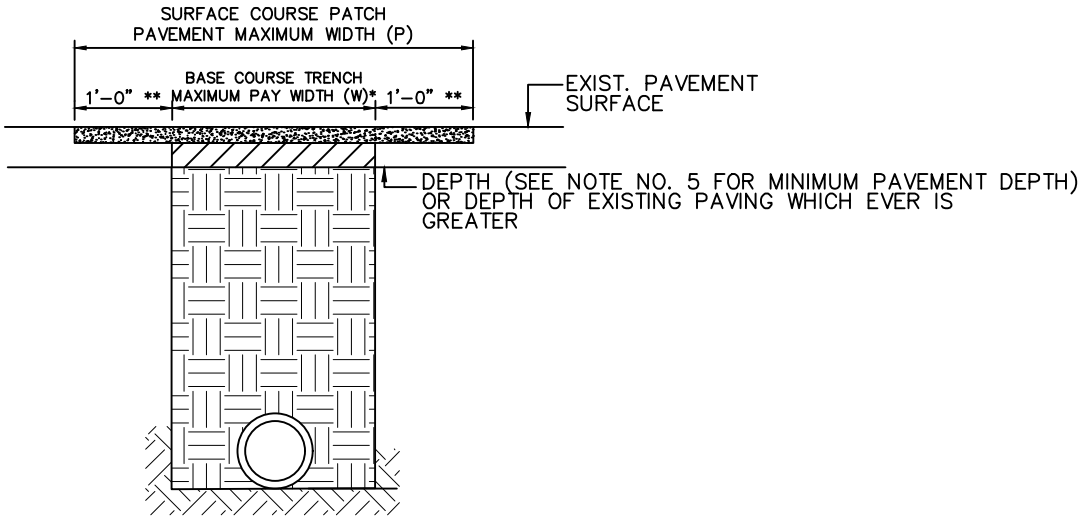
TRENCHES IN ROADS OTHER THAN STATE ROADS

CIRCULAR				ARCH				ELLIPTICAL			
SIZE	W1	GA S/B 6"	GA S/B 12"	SIZE	W1	GA S/B 6"	GA S/B 12"	SIZE	W1	GA S/B 6"	GA S/B 12"
12"	42"	0.114	0.228	14" x 9"	48"	0.130	0.260				
15"	48"	0.130	0.260	17" x 13"	48"	0.130	0.260				
18"	48"	0.130	0.260	21" x 15"	48"	0.130	0.260	23" x 14"	48"	0.130	0.260
21"	48"	0.130	0.260	24" x 18"	48"	0.130	0.260				
24"	60"	0.162	0.324	28" x 20"	60"	0.162	0.324	30" x 19"	60"	0.162	0.324
27"	60"	0.162	0.324					34" x 22"	76"	0.205	0.411
30"	76"	0.205	0.411	35" x 24"	76"	0.205	0.411	38" x 24"	76"	0.205	0.411
33"	76"	0.205	0.411					42" x 27"	88"	0.238	0.476
36"	76"	0.205	0.411	42" x 29"	88"	0.238	0.476	45" x 29"	88"	0.238	0.476
42"	88"	0.238	0.476	49" x 33"	96"	0.260	0.520	53" x 34"	96"	0.260	0.520
48"	96"	0.260	0.520	57" x 38"	104"	0.281	0.562	60" x 38"	104"	0.281	0.562
52"	104"	0.281	0.562	64" x 43"	114"	0.308	0.617	68" x 43"	114"	0.308	0.617
60"	114"	0.308	0.617	71" x 47"	126"	0.341	0.682	76" x 48"	132"	0.357	0.715
66"	126"	0.341	0.682	77" x 52"	132"	0.357	0.715	83" x 53"	144"	0.390	0.780
72"	132"	0.357	0.715	83" x 57"	144"	0.390	0.780	91" x 58"	150"	0.406	0.812

GA S/B = GRADED AGGREGATE FOR SUBBASE IN TONS PER LINEAR FOOT, FOR ESTIMATING ONLY

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS TEMPORARY PAVEMENT DETAIL AND CRUSHER RUN STONE PAYMENT QUANTITIES	REVISED 04/2024	D 5

2/2018



NOTES:

1. TEMPORARY SURFACE(EITHER GRADE AGGREGATE OR BITUMINOUS CONCRETE) TO BE INSTALLED AND MAINTAINED AT THE CONTRACTORS EXPENSE.
2. CONTRACTOR IS RESPONSIBLE FOR TRENCH SUPPORT.
3. AGGREGATE SUB-BASE SHALL BE CLEANED AND THOROUGHLY COMPACTED PRIOR TO PLACING PERMANENT PAVEMENT MATERIAL.
4. TRENCH SUPPORT MATERIAL TO BE REMOVED IN SUCH A MANNER THAT BACKFILL MATERIAL FOR FIRST TWO FEET ABOVE PIPE WILL BE COMPACTED AGAINST UNDISTURBED EARTH.
5. MINIMUM PAVED QUANTITIES BASED ON : DEPTH 1 1 / 2 " BITUMINOUS CONCRETE SURFACE COURSE (SC) AND 5" BITUMINOUS CONCRETE BASE COURSE (BE PLACED IN TWO LAYERS) WEIGHT 150 LBS. PER CUBIC FOOT.
6. FOR COMPACTION AND AGGREGATE DETAILS AND TRENCH PAY WIDTHS QUANTITIES SEE STD. PLATES D/4 AND D/5 RESPECTIVELY.
7. AREA TO BE MILLED TO A DEPTH OF 1 1 / 2 " TO ACCOMODATE PLACEMENT OF THE BITUMINOUS CONCRETE SURFACE COURSE.
8. SURFACE COURSE PATCH PAVING SHALL EXTEND A MINIMUM DISTANCE OF 1'-0" BEYOND ANY DISTURBED SURFACE PAVEMENT INDEPENDENT OF THE SURFACE COURSE PATCH PAVEMENT MAXIMUM PAY WIDTH.
9. REQUIRED THAT FLOWABLE FILL BE USED IN TRENCHES IN ROADS CLASSIFIED AS ARTERIAL OR ANY ROAD WHOSE PAVEMENT IS CUT WITHIN FIVE (5) YEARS OF THE ROAD BEING CONSTRUCTED OR RESURFACED SEE PLATE D/6A.
10. UNLESS OTHERWISE DIRECTED IN SPECIFICATIONS PROVIDED 95% COMPACTION IN ROADWAY AREAS AND 92% COMPACTION IN UNPAVED AREAS.

DETAIL OF CUTTING & REPLACING PAVEMENT IN ROADWAYS OTHER THAN STATE ROADS

(BITUMINOUS CONCRETE FOR SURFACE COURSE AND BASE COURSE IN TONS PER LINEAR FOOT ARE FOR ESTIMATING ONLY)

CIRCULAR					ARCH					ELLIPTICAL				
SIZE	P	BIT. CONC. SURF. COURSE TONS PER LIN. FT.	W1	BIT. CONC. SURF. COURSE TONS PER LIN. FT.	SIZE	P	BIT. CONC. SURF. COURSE TONS PER LIN. FT.	W1	BIT. CONC. SURF. COURSE TONS PER LIN. FT.	SIZE	P	BIT. CONC. SURF. COURSE TONS PER LIN. FT.	W1	BIT. CONC. SURF. COURSE TONS PER LIN. FT.
12"	66"	0.051	42"	0.108	14" x 9"	72"	0.056	48"	0.123					
15"	72"	0.056	48"	0.123	17" x 13"	72"	0.056	48"	0.123					
18"	72"	0.056	48"	0.123	21" x 15"	72"	0.056	48"	0.123	23" x 14"	72"	0.056	48"	0.123
21"	72"	0.056	48"	0.123	24" x 18"	72"	0.056	60"	0.123					
24"	84"	0.065	60"	0.154	28" x 20"	84"	0.065	60"	0.154	30" x 19"	84"	0.065	60"	0.154
27"	84"	0.065	60"	0.154						34" x 22"	100"	0.077	76"	0.195
30"	100"	0.077	76"	0.195	35" x 24"	100"	0.077	76"	0.195	38" x 24"	100"	0.077	76"	0.195
33"	100"	0.077	76"	0.195						42" x 27"	112"	0.086	88"	0.226
36"	100"	0.077	76"	0.195	42" x 29"	112"	0.086	88"	0.226	45" x 29"	112"	0.086	88"	0.226
42"	112"	0.086	88"	0.226	49" x 33"	120"	0.093	96"	0.247	53" x 34"	120"	0.093	96"	0.247
48"	120"	0.093	96"	0.247	57" x 38"	128"	0.099	104"	0.267	60" x 38"	128"	0.099	104"	0.267
54"	128"	0.099	104"	0.267	64" x 43"	138"	0.106	114"	0.293	68" x 43"	138"	0.106	114"	0.293
60"	138"	0.106	114"	0.293	71" x 47"	150"	0.116	126"	0.324	76" x 48"	158"	0.120	132"	0.339
66"	150"	0.116	126"	0.324	77" x 52"	156"	0.120	132"	0.339	83" x 53"	168"	0.129	144"	0.370
72"	156"	0.120	132"	0.339	83" x 57"	168"	0.129	144"	0.370	91" x 58"	174"	0.134	150"	0.386

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS PAYMENT QUANTITIES FOR REPAVING TRENCHES	REVISED 04/2024	D 6

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FIGURES SHOWN IN TABLE ARE MEASURED FROM INVERT OF PIPE TO GRADE

PIPE DIA.	REINFORCED CONCRETE PIPE ASTM-C-76									
	CLASS I		CLASS II		CLASS III		CLASS IV		CLASS V	
	MIN. DEPTH	MAX. DEPTH	MIN. DEPTH	MAX. DEPTH	MIN. DEPTH	MAX. DEPTH	MIN. DEPTH	MAX. DEPTH	MIN. DEPTH	MAX. DEPTH
12"					4'	7'	3'	14'	3'	ALL PIPES CAN BE USED OVER 30 FEET DEPTH
14"										
15"					4'	11'	3'	22'	3'	
16"										
18"					4'	12'	3'	23'	3'	
20"										
21"					4'	12'	3'	24'	3'	
24"					5'	13'	4'	25'	4'	
27"					5'	13'	4'	20'	4'	
30"					5'	13'	4'	21'	4'	
36"			6'	9'	5'	14'	5'	22'	5'	
42"			6'	9'	5'	14'	5'	21'	5'	
48"			6'	10'	6'	15'	6'	22'	6'	
54"			6'	11'	6'	16'	6'	23'	6'	
60"			7'	12'	7'	17'	7'	23'	7'	
66"	8'	10'	7'	13'	7'	17'	7'	24'	7'	
72"	8'	11'	8'	13'	8'	17'	8'	25'	8'	

PIPE SHALL NOT BE USED WHERE THERE ARE BLANK SPACES IN THE TABLE. MINIMUM AND MAXIMUM ALLOWABLE PIPE DEPTH MUST BE VERIFIED WITH DESIGN TRAFFIC LOADINGS AND SOILS.

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS PERMISSIBLE DEPTH TABLE CONCRETE PIPE	REVISED 04/2024	D 7

2/2018

BASIC TABLE

DEAD LOAD AT 110 LBS. PER CU. FT. AND KP. = 0.130, ORDINARY MAXIMUM FOR CLAY
LIVE LOAD H= 20 LOADING WITHOUT IMPACT

SIZE PIPE	TRENCH WIDTH	DEPTH OF COVER											
		1 FT.		2 FT.		3 FT.		4 FT.		5 FT.		6 FT.	
		DEAD	LIVE	DEAD	LIVE	DEAD	LIVE	DEAD	LIVE	DEAD	LIVE	DEAD	LIVE
12"	3.0'			613	1460	881	788	1138	448	1287	320	1534	224
15"	3.0'	313	3760	613	1946	881	1088	1138	666	1287	448	1534	324
18"	3.42'	359	4058	693	2208	1014	1258	1309	778	1566	534	1823	374
21"	3.70'	393	4146	771	2384	1134	1376	1436	858	1754	582	2026	416
24"	4.0'	426	4380	827	2586	1214	1524	1566	960	1901	650	2218	464
27"	4.82'	518	4476	1035	2748	1477	1648	1919	1050	2323	720	2702	512
30"	5.08'	540	4576	1052	2896	1577	1770	2046	1136	2501	784	2984	560
36"	5.67'	607	4678	1176	3126	1748	1984	2331	1296	2825	906	3284	650
42"	6.75'	737	4784	1428	3296	2155	2170	2757	1450	3408	1014	4010	768
48"	7.33'	799	4828	1597	3440	2277	2320	3034	1578	3726	1136	4555	832
54"	7.92'	862	4988	1723	3520	2481	2442	3240	1690	4067	1232	4825	916
60"	8.5'	944	5088	1788	3584	2662	2538	3576	1792	4371	1306	5160	992
66"	9.08'	998	5196	1951	3632	2859	2608	3766	1878	4674	1392	5581	1060
72"	9.67'	1059	5302	2056	3670	3084	2666	4009	1930	4934	1462	6064	1104
		7 FT.		10 FT.		15 FT.		20 FT.		25 FT.		30 FT.	
12"	3.0'	1732	165	2208		2792		3152		3386		3564	
15"	3.0'	1732	240	2208		2792		3152		3386		3564	
18"	3.42'	2028	278	2631		3337		3761		4223		4467	
21"	3.70'	2268	314	2948		3780		4385		4805		5141	
24"	4.0'	2464	346	3256		4224		4928		5456		5808	
27"	4.82'	3080	384	4040		5429		6565		7322		7903	
30"	5.08'	3325	420	4272		5912		6821		7844		8526	
36"	5.67'	3708	544	5050		6816		8122		9182		10135	
42"	6.75'	4511	560	6165		8521		10375		11878		13281	
48"	7.33'	5087	628	6803		9465		11653		13427		15083	
54"	7.92'	5514	694	7444		10339		12890		15302		16543	
60"	8.50'	6000	752	8106		11127		14067		16292		18438	
66"	9.08'	6443	890	8712		12161		15246		17887		20147	
72"	9.67'	6835	864	11615		13157		16549		19221		21894	

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS

APPROVED

CHIEF ENGINEER

DESIGN ENGINEER

DATE:

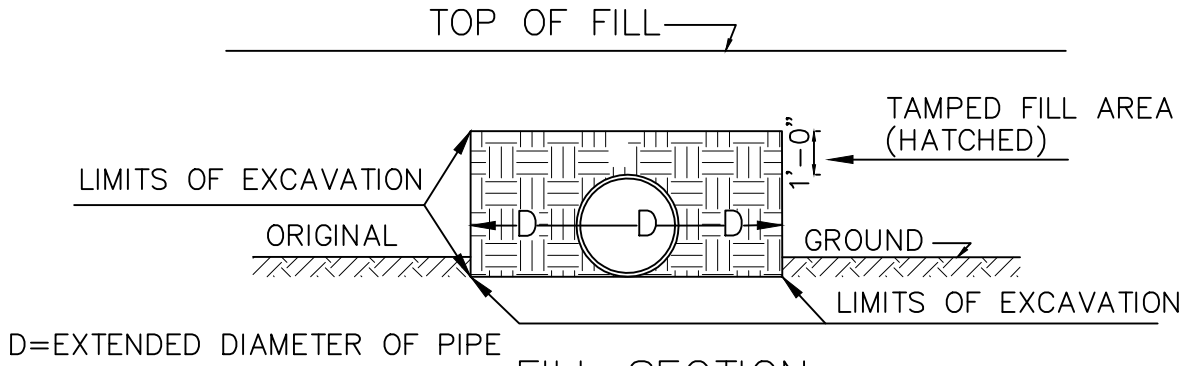
STANDARD DRAINAGE DETAIL

COMPUTED LOADS ON CONDUITS IN POUNDS PER LINEAR FOOT

REVISED
04/2024

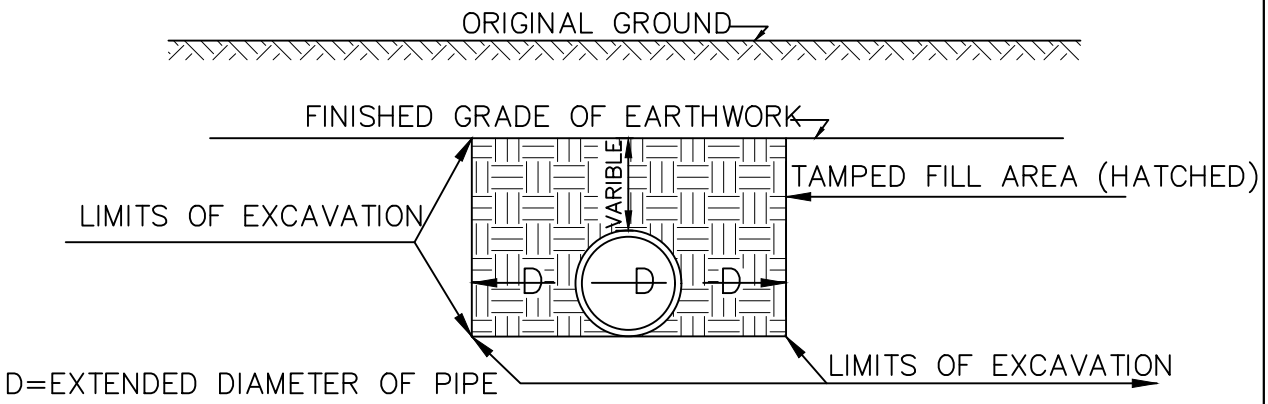
D
8

3/2018



FILL SECTION

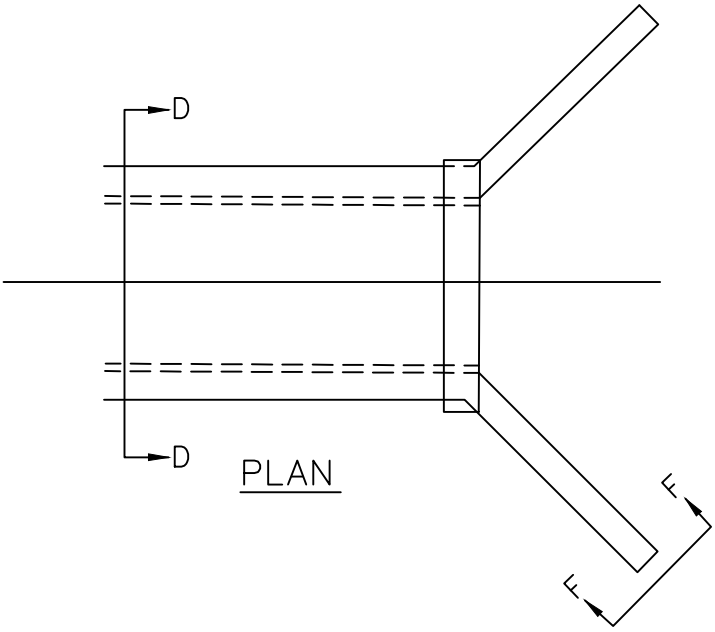
IN THE CASE OF PIPE, FOR PIPE CULVERTS, THE YARDAGE OF TAMPED FILL TO BE INCLUDED, SHALL BE BOUNDED BY VERTICAL PLANES. EQUI-DISTANT FROM THE CENTER LINE OF THE PIPE AND SEPARATED BY A DISTANCE OF NOT MORE THAN THREE TIMES THE EXTERAL DIAMETER OF THE BODY OF THE PIPE. THE UPPER PAY LIMIT, IN FILL SECTIONS, SHALL CONSIST OF A HORZONAL PLANE ONE FOOT ABOVE THE TOP OF THE PIPE. IN THE EVENT THAT THE PIPE IS IN A CUT SECTION, THE PAY LIMITS SHALL BE EXTENTED TO A HORIZONAL PLANE AT THE ELEVATION OF THE FINISHED GRADE OF THE EARTHWORK. IN EITHER CASE A DEDUCTION SHALL BE MADE FOR THE AREA OCCUPIED BY THE PIPE.



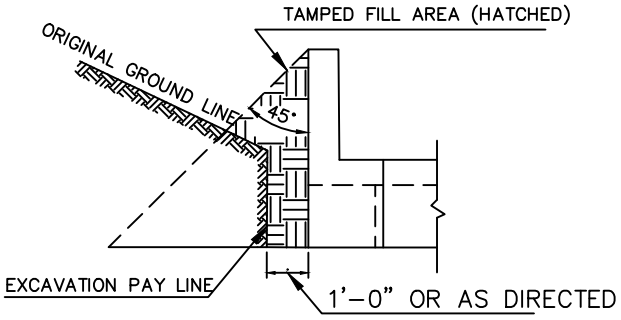
CUT SECTION

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS STANDARD LIMITS OF TAMPED FILL OVER PIPE CULVERTS	REVISED 04/2024	D 9

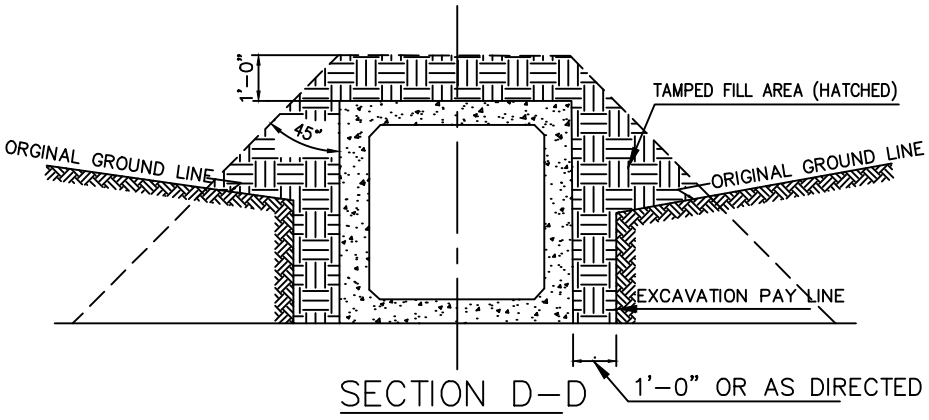
2/2018



PLAN



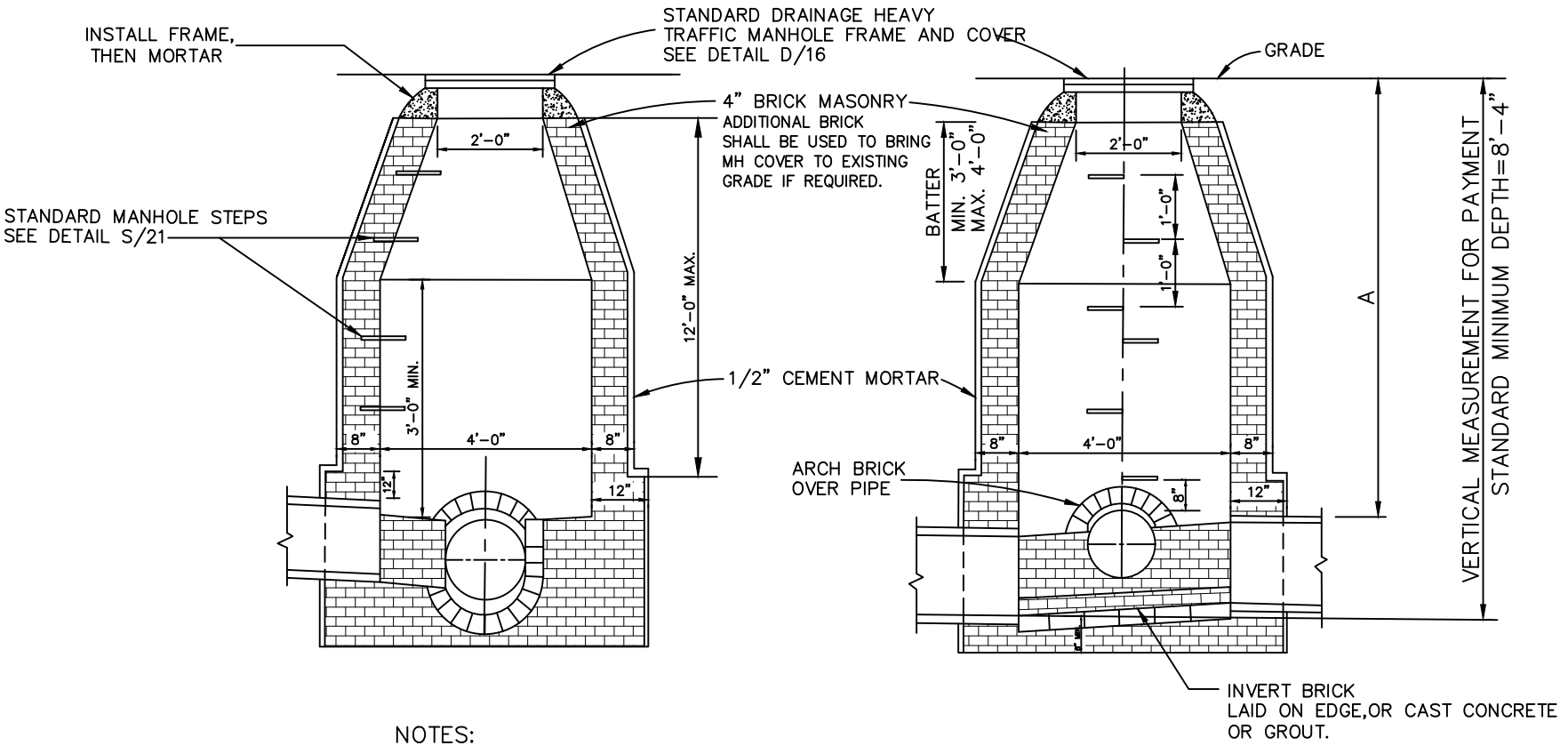
SECTION F–F



SECTION D–D

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS STANDARD LIMITS OF TAMPED FILL OVER BOX CULVERTS	REVISED 04/2024	D 10

3/2018

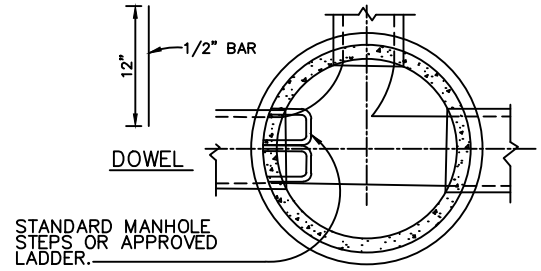


NOTES:

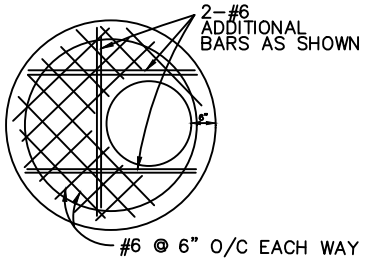
1. MANHOLE SHALL BE BRICK OR MIX NO. 3 CONCRETE POURED IN PLACE UNLESS OTHERWISE NOTED.
2. WHERE A (COVER) IS LESS THAN 6'-9" USE TYPE "B" MANHOLE (FOR PIPES 36" AND SMALLER).
3. FOR PIPE SIZES 42" AND LARGER USE TYPE "C" MANHOLE.
4. PRECAST CONCRETE MANHOLES ARE ACCEPTABLE. REFER TO SPECIFICATIONS.

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS TYPE A–1 MANHOLE (FOR NORMAL DEPTHS)	REVISED 04/2024	D 11

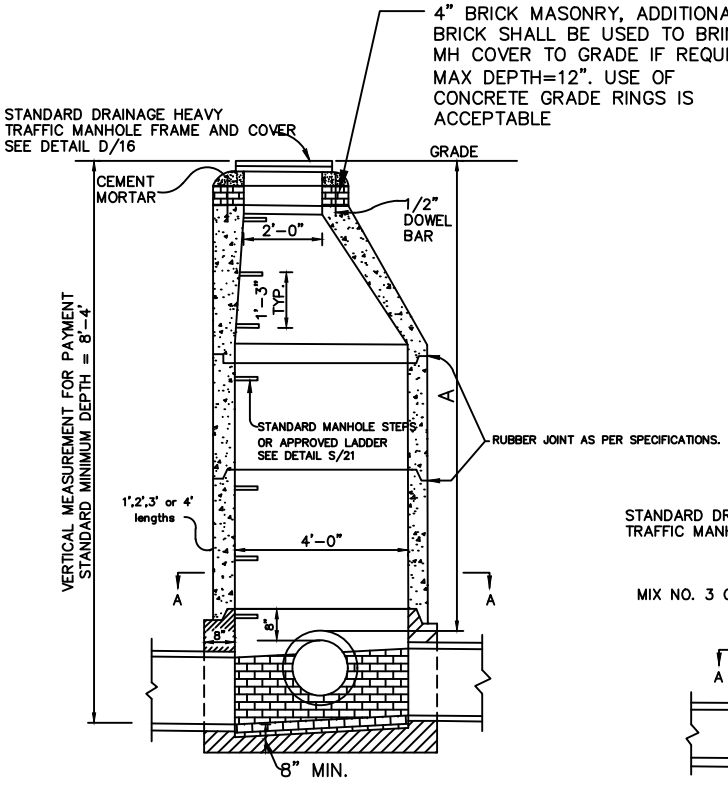
3/2018



SECTION A–A

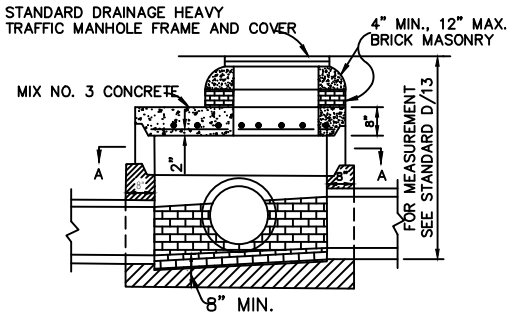


SLAB REINFORCING
TYPE A–3



SECTIONAL ELEVATION
TYPE A–2

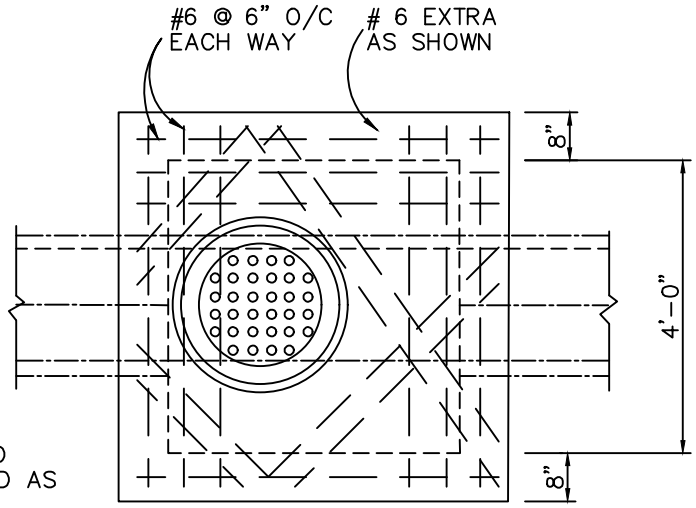
1. PRECAST REINF. CONC MANHOLE SHALL BE FURNISHED IN ACCORDANCE WITH ASTM DESIGNATION C478.
2. MANHOLE BOTTOM SHALL BE BRICK INVERTS ONLY.
3. FOR PIPE SIZES 42" AND LARGER USE TYPE C MANHOLE.
4. WHERE A (COVER) IS MORE THAN 6'–9" USE TYPE A–2 MANHOLE; 6'–9" OR LESS USE TYPE A–3 MANHOLE.
5. OTHER TYPES OF PRECAST MANHOLES MAY BE USED IF APPROVED BY D.P.W.



SECTIONAL ELEVATION
TYPE A–3

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS TYPE A–2 AND A–3 PRECAST MANHOLE	REVISED 04/2024	D 12

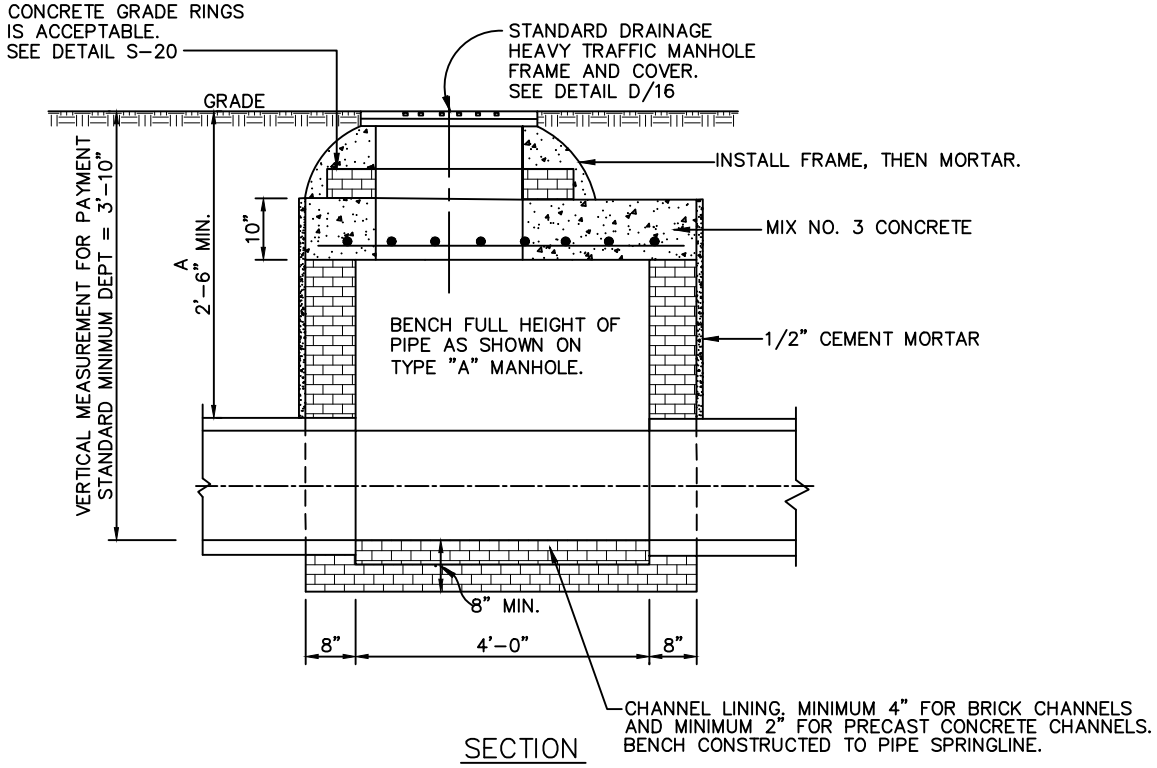
2/2018



NOTE:
MANHOLE FRAME AND COVER TO BE PLACED AS SHOWN.

PLAN

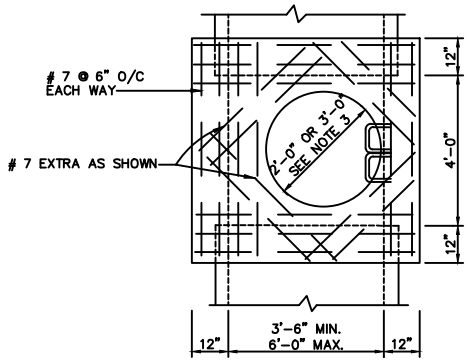
1. WALLS AND BASE SLAB SHALL BE BRICK OR PRECAST CONCRETE.
2. WHERE A(COVER) IS GREATER THAN 6'-9" USE TYPE "A" MANHOLE.
3. FOR PIPE SIZES 42" AND LARGER USE TYPE "C" MANHOLE.
4. OTHER TYPES OF PRECAST MANHOLES MAY BE USED IF APPROVED BY D.P.W.



SECTION

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS TYPE "B" MANHOLE (SHALLOW)	REVISED 04/2024	D 13

2/2018



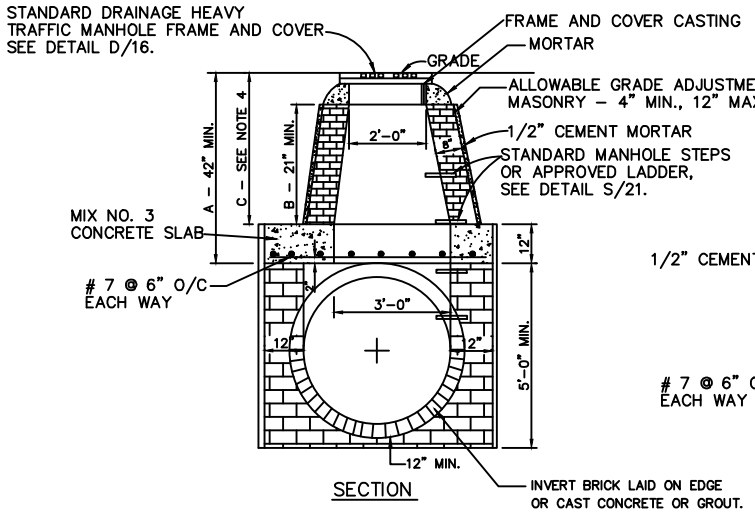
TOP SLAB

BASIS OF PAYMENT

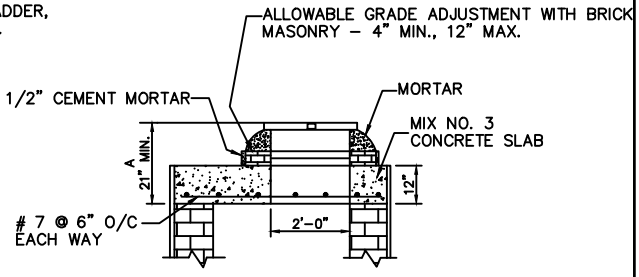
STORM DRAIN MANHOLE TYPE "C" SHALL BE PAID FOR ON THE BASIS OF THE LUMP SUM PRICE BID FOR EACH SIZE MANHOLE COMPLETED AND IN PLACE. NO ADDITIONAL PAYMENT WILL BE MADE FOR LINEAR FEET OF VERTICAL DEPTH.

NOTES

1. WALLS AND BASE SLAB SHALL BE BRICK OR MIX NO. 3 CONCRETE POURED IN PLACE.ALLOW USE OF PRECAST AS PER SPECS.
2. FOR PIPES 36" OR SMALLER USE TYPE "A" OR TYPE "B" MANHOLE. USE TYPE "B" WHERE "A" COVER IS LESS THAN 6'-9".
3. WHERE "A" IS LESS THAN 3'-6" USE ALTERNATE MANHOLE STACK.
4. WHERE "C" IS LESS THAN 12' USE 8" WALL, WHERE GREATER THAN 12' USE 12" WALL.



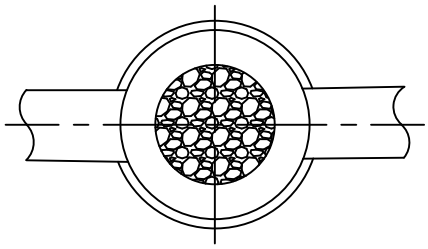
SECTION



ALTERNATE MANHOLE STACK
(SEE NOTE 3)

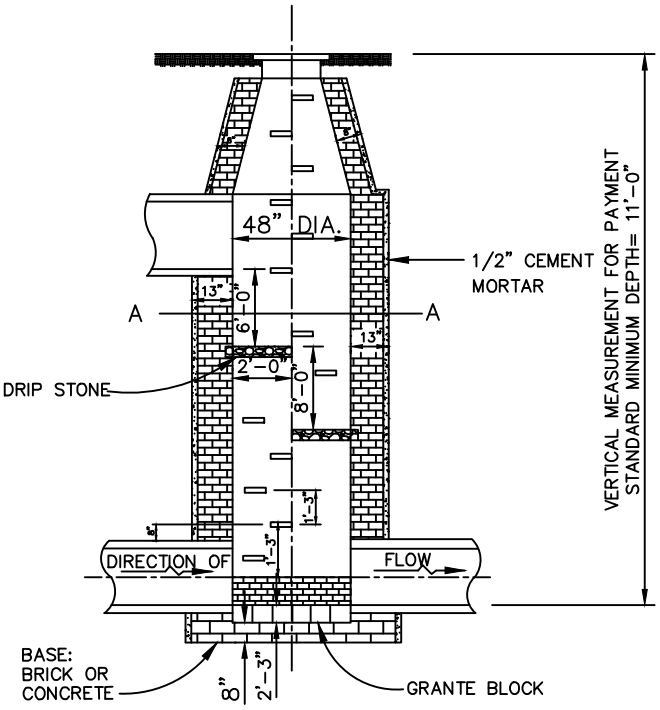
ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS TYPE "C" MANHOLE 42" & LARGER PIPES	REVISED 04/2024	D 14

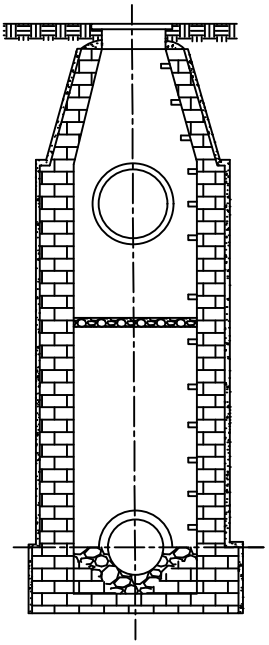
2/2018



SECTION A–A

GRANITE DRIP STONES ARE PREFERABLE BUT IF NOT AVAILABLE SOME OTHER APPROVED TYPE MAY BE USED.





WALL THICKNESS
8" TO DEPTH OF 12'–0"
13" BELOW DEPTH OF 12'–0"
TO DEPTH OF 24'–0"

NOTE: LOCATION OF DRIP STONES MAY BE ADJUSTED TO MEET THE REQUIREMENTS OF EACH BASE BUT NORMALLY SHALL BE 6' APART.

BASE THICKNESS
8" WALL – 12" BASE
13" WALL – 16" BASE

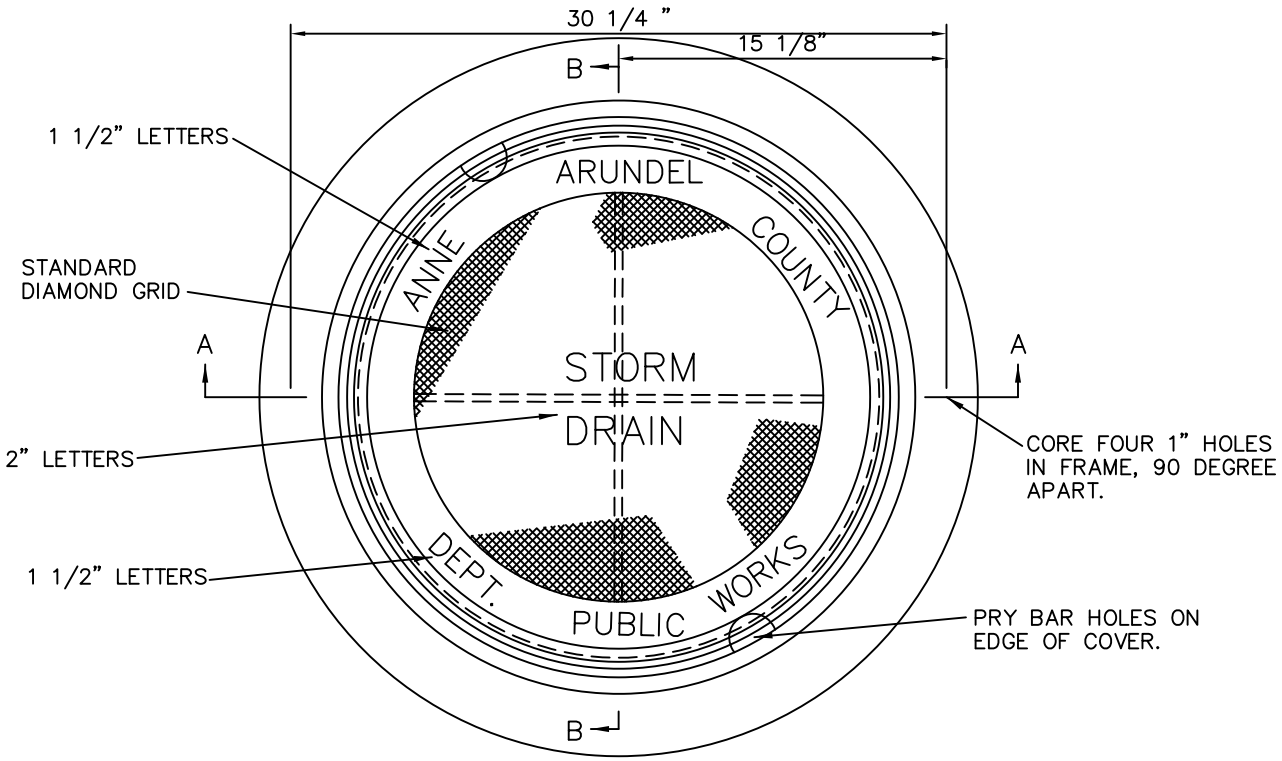
COMPLY WITH THE REQUIREMENTS IN MD 383.11 STANDARD DROP MANHOLE OF MDSHA BOOK OF STANDARDS FOR PRECAST CONCRETE MANHOLE.

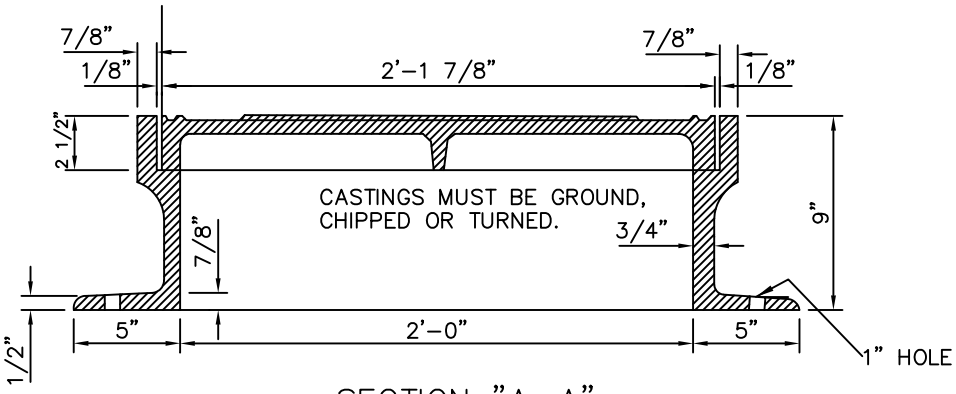
NOTES

1. FOR DETAILS NOT SHOWN ON THIS SHEET SEE STANDARD DETAIL D–11.
2. ALLOW USE OF PRECAST MANHOLES AND METHOD TO ATTACH DRIP STONE WHEN PRECAST IS USED.

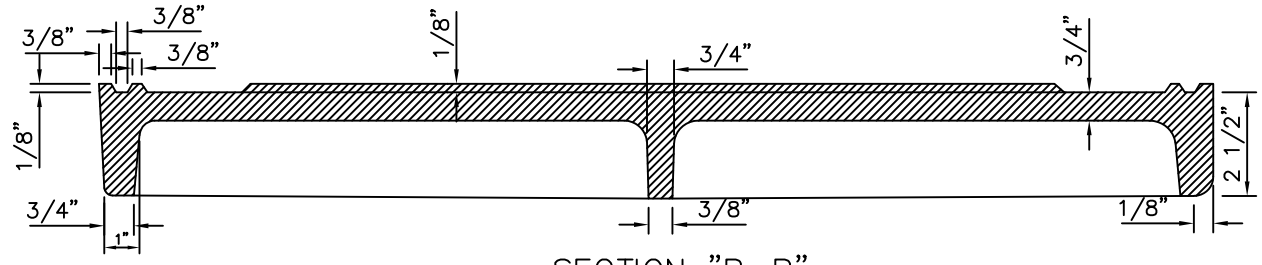
ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS STANDARD DROP MANHOLE	REVISED 04/2024	D 15

2/2018





SECTION "A-A"

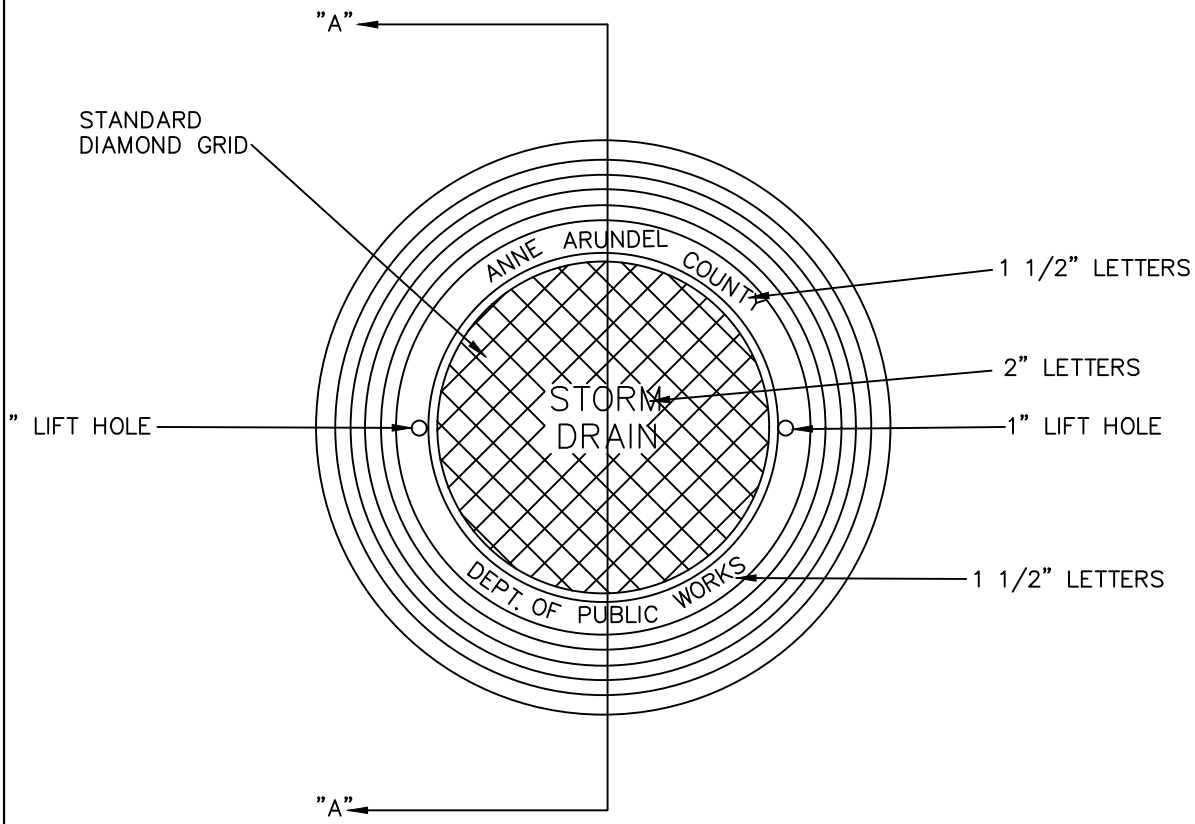


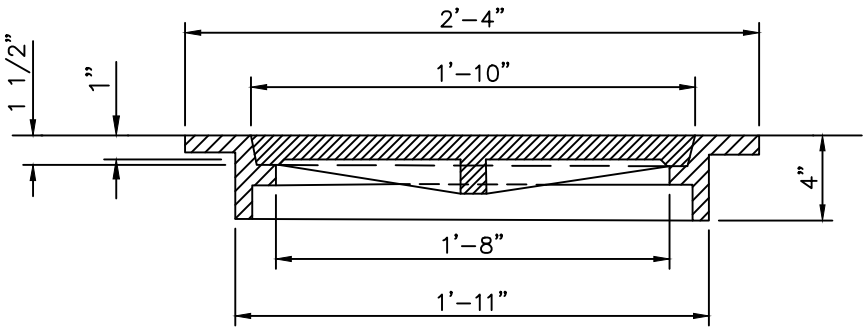
SECTION "B-B"

TOTAL WEIGHT 420 LBS.

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS HEAVY TRAFFIC MANHOLE FRAME AND COVER	REVISED 04/2024	D 16

2/2018



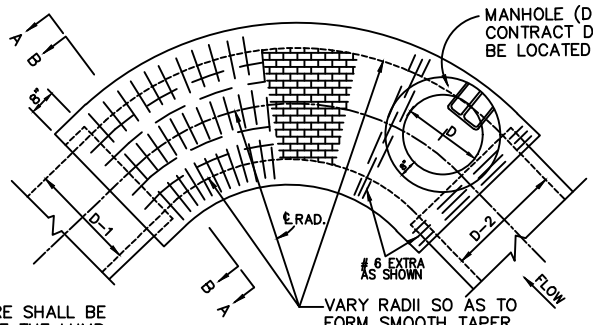


SECTION "A" – "A"

WEIGHT 185 LBS.

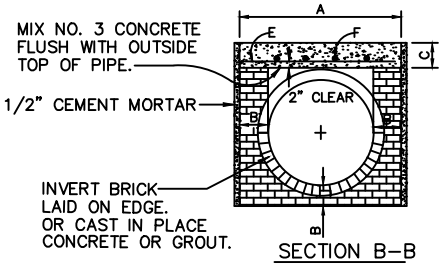
ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS SIDEWALK FRAME AND COVER	REVISED 04/2024	D 17

2/2018



PLAN

BASIS OF PAYMENT:
STANDARD BEND STRUCTURE SHALL BE PAID FOR ON THE BASIS OF THE LUMP SUM PRICE BID FOR EACH BEND STRUCTURE. PRICE BID SHALL INCLUDE THE COST OF THE MANHOLE STACK.



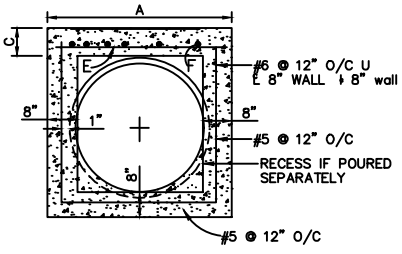
SECTION B-B

NOTES:

1. MATERIAL WALL AND BASE SHALL BE BRICK OR MIX NO. 3 CONCRETE SEE SECTION E-E (WHERE 12" THICKNESS IS REQUIRED 8" REINFORCED CONCRETE MAY BE SUBSTITUTED, SEE SECTION R-R).
2. LOADS SUPERLOAD = A.A.S.H.T.O. H-20 FILL LOAD = 0 TO 15 FT. EARTH.
3. MANHOLE DETAILS STEPS, FRAME, COVER, WALLS AND MAX. BATTER SHALL BE AS SHOWN ON CONTRACT DRAWINGS OR STANDARD MANHOLE TYPE "A".
4. BEND DATA CENTERLINE RADIUS, B, C AND REINFORCEMENT SHALL BE BASED UPON D-1 OR D-2 WHICHEVER IS SMALLER.
5. MANHOLE OPENING "D" SHALL BE BASED ON DOWNSTREAM PIPE SIZE D-1.
6. FRAME AND COVER FOR MANHOLE ON 54" AND LARGER BENDS SHALL BE 2'-6" WITH LETTERING AND HOLES AS SHOWN FOR 2'-0" FRAME.
7. MIN. LENGHT OF CURVE IS 4'-0" FOR TYPE "C" MANHOLE STACK.
8. MANHOLE STACK SHALL CONFORM TO THAT OF TYPE "C" MANHOLE (D-14).

PIPE DIA.	℄ RADIUS	A	B	C	BARS E ℄SPACING	BARS F	D [A]
30"	5'-0"	3'-10"	8"	8"	#5 @ 6" O/C	3-# 5	2'- 6"
33"	6'-0"	4'-1"	8"	8"	#5 @ 6" O/C	3-# 5	2'- 6"
36"	6'-0"	4'-4"	8"	8"	#5 @ 6" O/C	3-# 5	3'- 0"
42"	7'-0"	4'-10"	8"	10"	#5 @ 6" O/C	4-# 5	3'- 0"
48"	8'-0"	5'-4"	8"	10"	#5 @ 6" O/C	4-# 5	3'- 0"
54"	9'-0"	[X] 6'-6"	[X]12"	10"	#5 @ 6" O/C	5-# 5	3'- 0" +
60"	10'-0"	[X] 7'-0"	[X]12"	12"	#6 @ 8" O/C	6-# 5	3'- 0" +
66"	11'-0"	[X] 7'-6"	[X]12"	12"	#6 @ 8" O/C	7-# 5	3'- 0" +
72"	12'-0"	[X] 8'-0"	[X]12"	12"	#6 @ 8" O/C	7-# 5	3'- 0" +

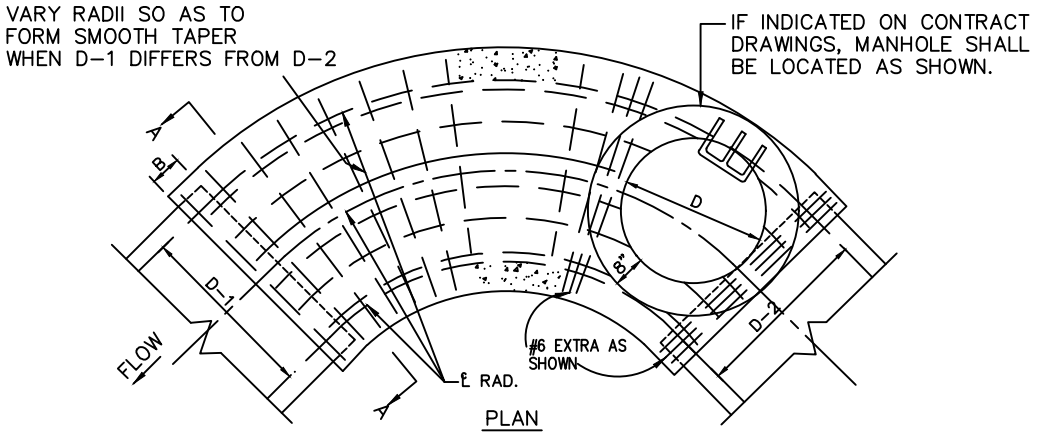
(x) SEE NOTE # 1, (*) SEE NOTE # 4, (A) SEE NOTE # 5 AND # 8.
(+) SPECIAL COVER SEE NOTE # 6.



SECTION A-A

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS BEND STRUCTURE CIRCULAR PIPE	REVISED 04/2024	D 18

2/2018



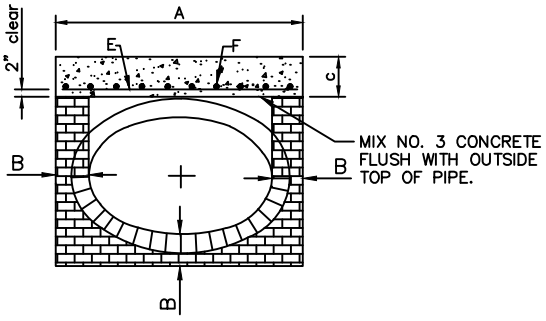
PLAN

BASIS OF PAYMENT:
STANDARD BEND STRUCTURE SHALL BE PAID FOR ON THE BASIS OF THE LUMP SUM PRICE BID FOR EACH BEND STRUCTURE. PRICE BID SHALL INCLUDE THE COST OF THE MANHOLE STACK.

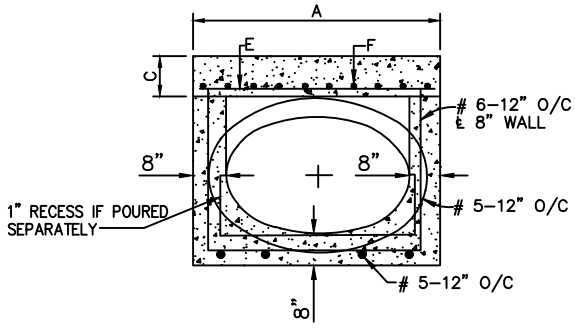
NOTES:
1. WALLS AND BOTTOM SHALL BE BRICK OR MIX NO. 3 CONCRETE WHERE 12" BRICK THICKNESS IS REQUIRED, 8" REINFORCED CONCRETE MAY BE SUBSTITUTED.
2. LOADS SUPERLOAD=A.A.S.H.T.O. H–20 FILL LOAD=0 TO 15' EARTH.
3. BEND DATA, CENTRELINE RAD. B, C AND REINFORCING SHALL BE BASED UPON D–1 OR D–2 WHICHEVER IS SMALLER.
4. MANHOLE OPENING "D" SHALL BE BASED ON DOWNSTREAM PIPE SIZE (D–1).
5. MANHOLE DETAILS SHALL BE SHOWN ON CONTRACT DRAWINGS OR USE STANDARD TYPE "A–1" MANHOLE (D–11).
6. MIN. LENGTH OF CURVE IS 4'–0" FOR TYPE "C" MANHOLE STACK.
7. MANHOLE STACK SHALL CONFORM TO THAT OF TYPE "C" MANHOLE (D–14).
8. FOR CMPA. DIMENSION A WILL BE HORIZONAL DIMENSION OF ARCH PLUS 2B.

EQ. RD.	PIPE DIMEN.	℄ RAD.	A	B	C	BARS E SPACING	BARS F SPACING	D (A)
30"	38" x 24"	6'–0"	4'–6"	8"	10"	# 5 @ 6"	# 5 @ 8"	3'–0"
33"	38" x 27"	7'–0"	4'–10"	8"	10"	# 5 @ 6"	# 5 @ 8"	3'–0"
36"	45" x 29"	8'–0"	5'–1"	8"	10"	# 5 @ 6"	# 5 @ 8"	3'–0"
42"	53" x 34"	9'–0"	5'–9"	8"	10"	# 5 @ 6"	# 5 @ 8"	3'–0"
48"	60" x 38"	10'–0"	6'–4"	8"	12"	# 6 @ 8"	# 6 @ 10"	3'–0"
54"	68" x 43"	11'–0"	7'–8"	12"	12"	# 6 @ 8"	# 6 @ 10"	3'–0"
60"	76" x 48"	12'–0"	8'–4"	12"	12"	# 6 @ 8"	# 6 @ 10"	3'–0"
66"	83" x 53"	13'–0"	8'–11"	12"	12"	# 6 @ 8"	# 6 @ 10"	3'–0"
72"	91" x 58"	14'–0"	9'–7"	12"	12"	# 6 @ 8"	# 6 @ 10"	3'–0"

(A) SEE NOTES 6 AND 7.



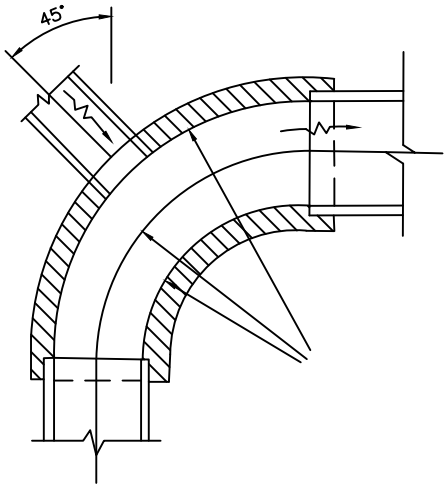
SECTION A–A (BRICK)

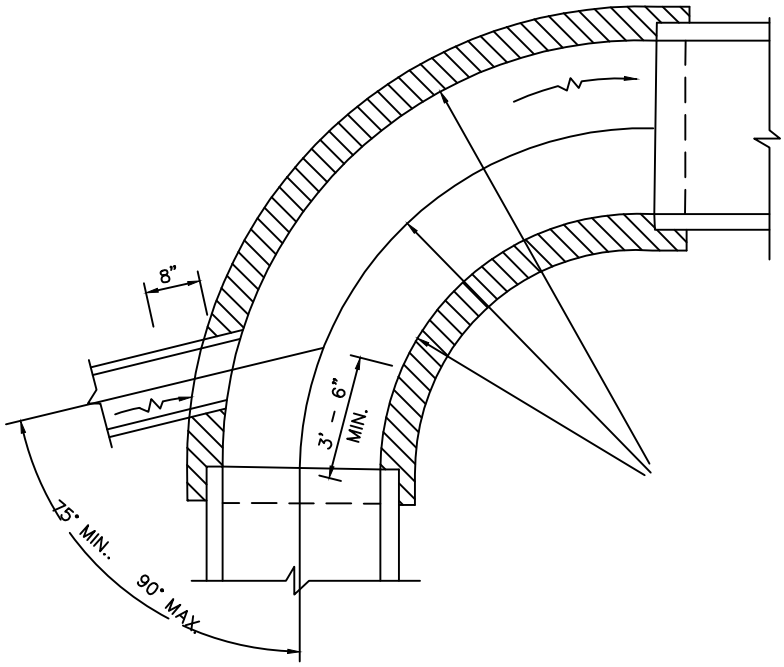


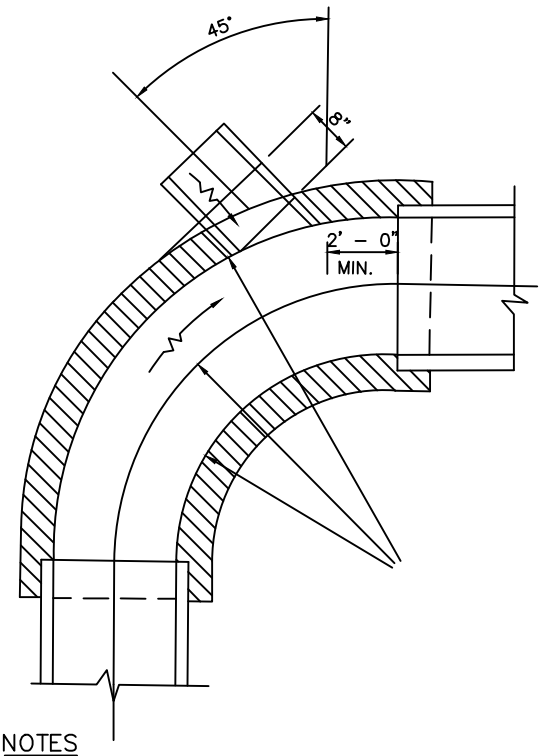
SECTION A–A (CONCRETE)

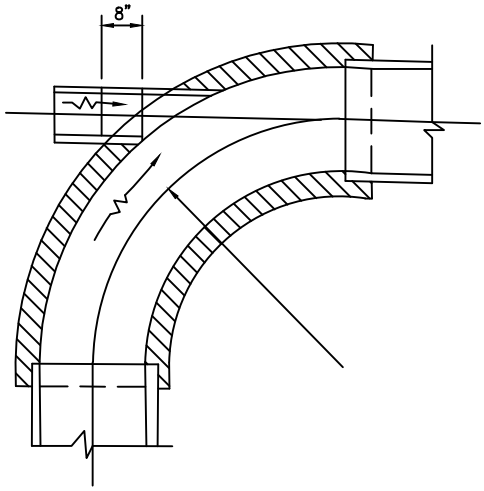
ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS BEND STRUCTURE ELLIPTICAL PIPE	REVISED 04/2024	D 19

2/2018





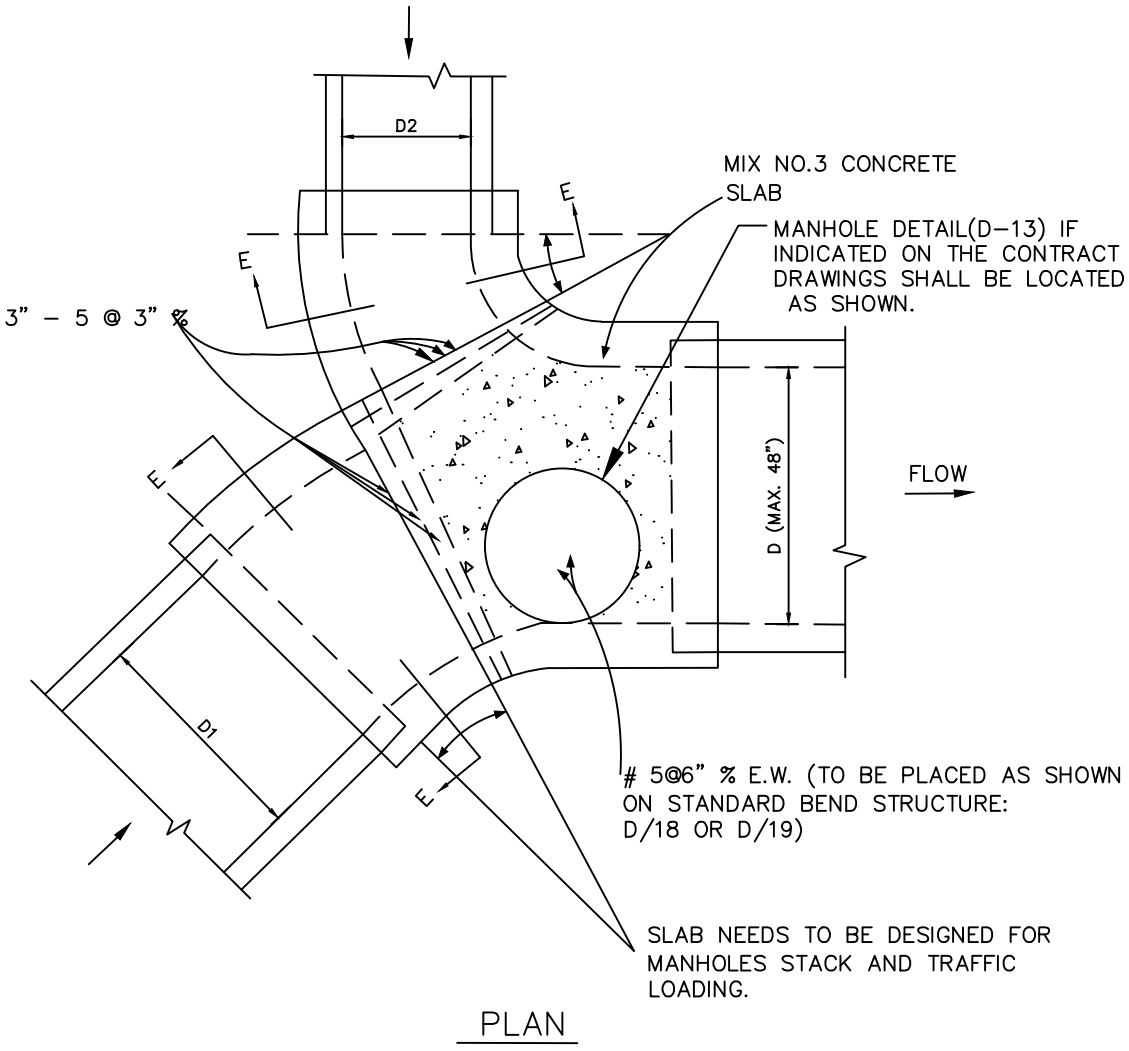




NOTES

MANHOLE LOCATION, SIZE AND DETAILS, CONCRETE AND REINFORCING STEEL REQUIREMENTS, CENTER LINE RADIUS AND OTHER DETAILS SHALL BE IN ACCORDANCE WITH BEND STRUCTURE DETAILS D/18 OR D/19

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS CONNECTION LOCATIONS TO BEND STRUCTURES	REVISED 04/2024	D 20



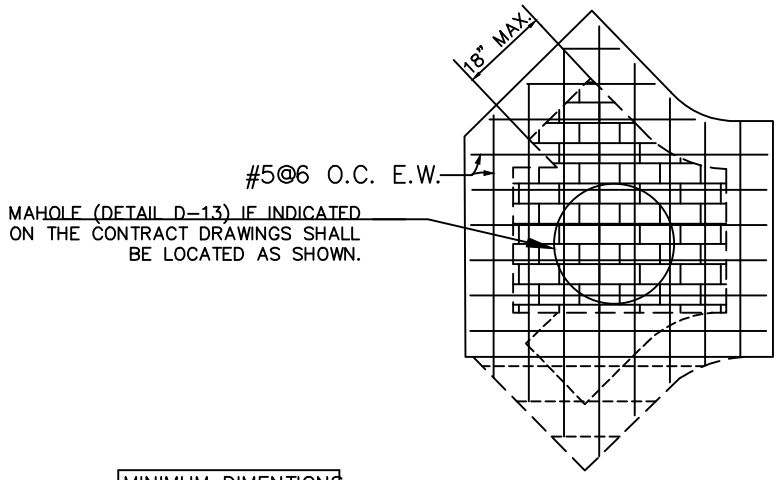
PLAN

NOTES –

1. SECTIONS E–E (BETWEEN LIMITS SHOWN) SHALL CONFORM TO STANDARD BEND STRUCTURE (D/18 OR D/19).
2. MANHOLE SHOULD BE MANDATORY FOR INSPECTION AND MAINTENANCE.
3. MANHOLE SHOULD BE PROVIDED FOR INSPECTION AND MAINTENANCE(AS INDICATED ON CONTRACT DRAWINGS), AND MANHOLE LOCATION AND EXTRA REINFORCING SHALL BE AS SHOWN ON STANDARD BEND STRUCTURE D/18 OR D19.
4. WALLS AND BASE SHALL CONFORM TO STANDARD BEND STRUCTURE D/18 OR D/19.
5. MANHOLE STACK SHALL CONFORM TO THAT OF TYPE "C" MANHOLE D/14.
6. APPLY DAMP–PROOFING ON EXTERIOR SURFACES.
7. BASIS OF PAYMENT: STANDARD JUNCTION CHAMBER SHALL BE PAID ON THE BASIS OF THE LUMP SUM PRICE BID FOR EACH JUNCTION CHAMBER. PRICE BID SHALL INCLUDE THE PRICE OF THE MANHOLE STACK WHERE REQUIRED.

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS TYPE I JUNCTION CHAMBER TOP SLAB REINFORCING	REVISED 04/2024	D 21

2/2018



PLAN OF ROOF SLAB REINFORCING

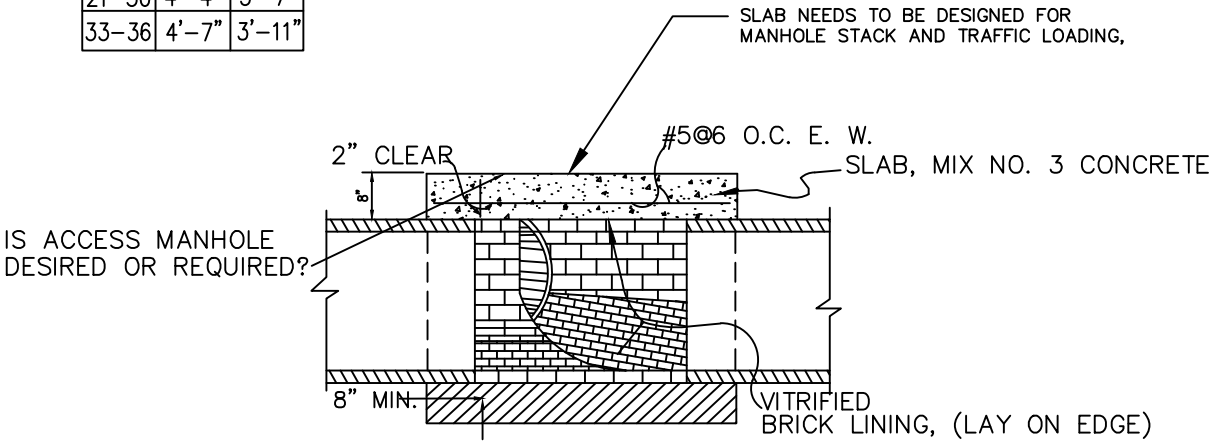
NOTES

1. WALLS AND BASE SHALL BE BRICK OR MIX NO. 3 CONCRETE
2. SUPERLOAD = A.A.S.H.T.O.-20 EARTH LOAD = 0' TO 12'.
3. MANHOLE SHOULD BE PROVIDED FOR INSPECTION AND MAINTENANCE.

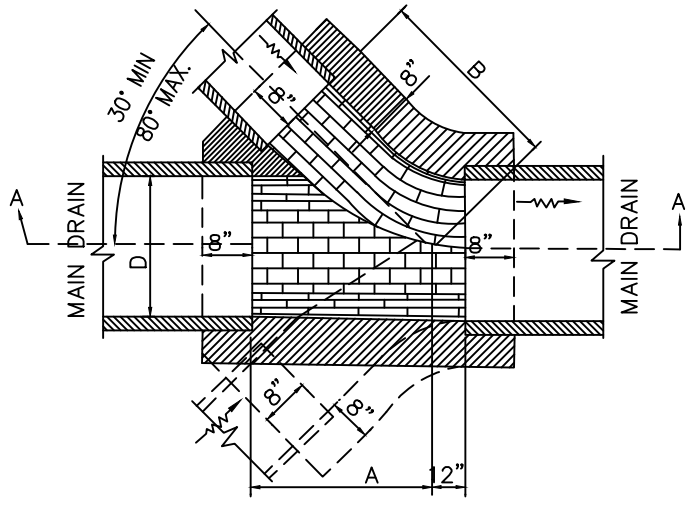
BASIS OF PAYMENT

STADARD SINGLE OR DOUBLE BRICK "Y" SHALL BE PAID FOR ON THE BASIS OF THE LUMP SUM BID FOR EACH TYPE "Y" STRUCTURE.

MINIMUM DIMENTIONS		
D	A	B
15-18	3'-9"	2'-9"
21-30	4'-4"	3'-7"
33-36	4'-7"	3'-11"



SECTION A-A



PLAN

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS STANDARD BRICK "Y" SINGLE & DOUBLE	REVISED 04/2024	D 22

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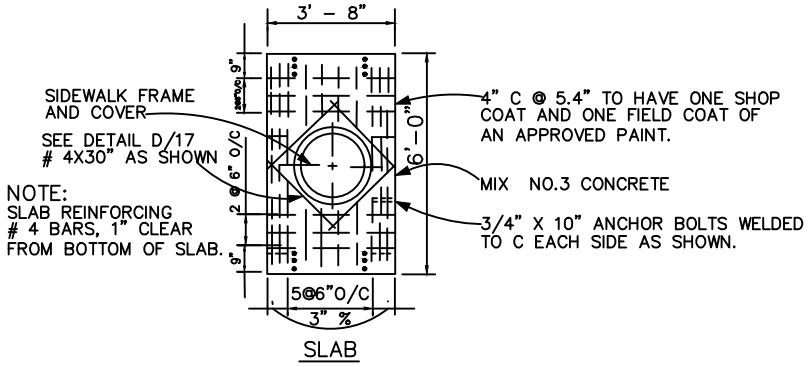
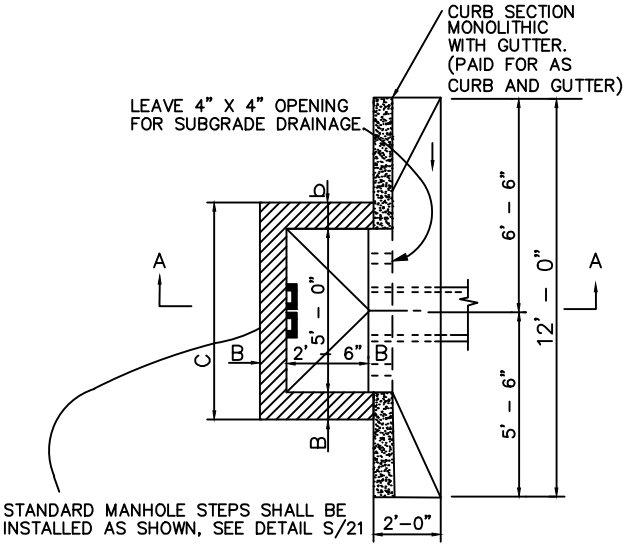


SLAB



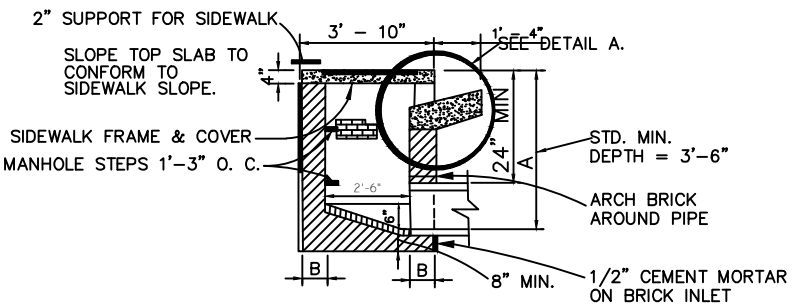
PLAN BELOW SLAB

NOTES

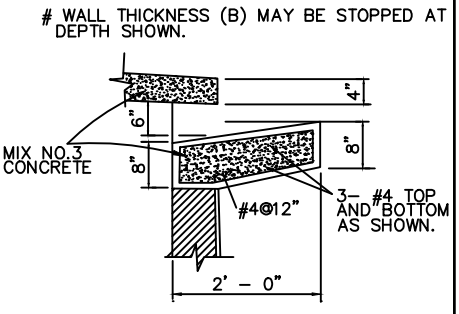
1. INVERT SHALL BE BRICK LAID ON EDGE
2. BASE SHALL BE BRICK OR MIX NO. 3 CONCRETE.
3. WALLS SHALL BE BRICK (BR.), MIX NO. 3 CONCRETE (PC.) OR REINFORCED CONCRETE (RC.) SEE TABLE FOR DIMENSIONS.

A	B	C	WALLS
< 6'	8"	6' – 4"	BR. OR P.C.
6' TO 10'	12"	7'– 0"	BR. OR P.C.
6' TO 15'	8"	6'– 4"	R.C.*

4. *REINFORCING– *4@10" O/C E.W. IN I OF WALLS REINFORCING CONTINUOUS AT CORNERS. ALL LAPS 1'–
5. ALLOWABLE GRADE ADJUSTMENT WITH BRICK MASONRY – 4" MIN., 12" MAX.
6 PRECAST INLET SHALL MEET THE REQUIREMENTS OF AASHTO M 199.



SECTION A–A



DETAIL "A"

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS TYPE A–1 INLET	REVISED 04/2024	D 23

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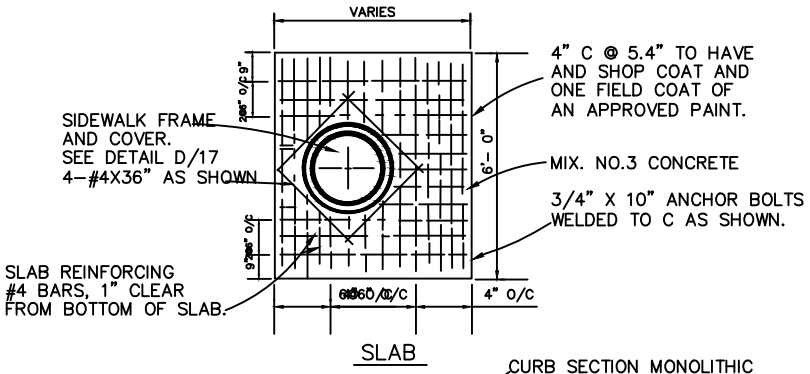

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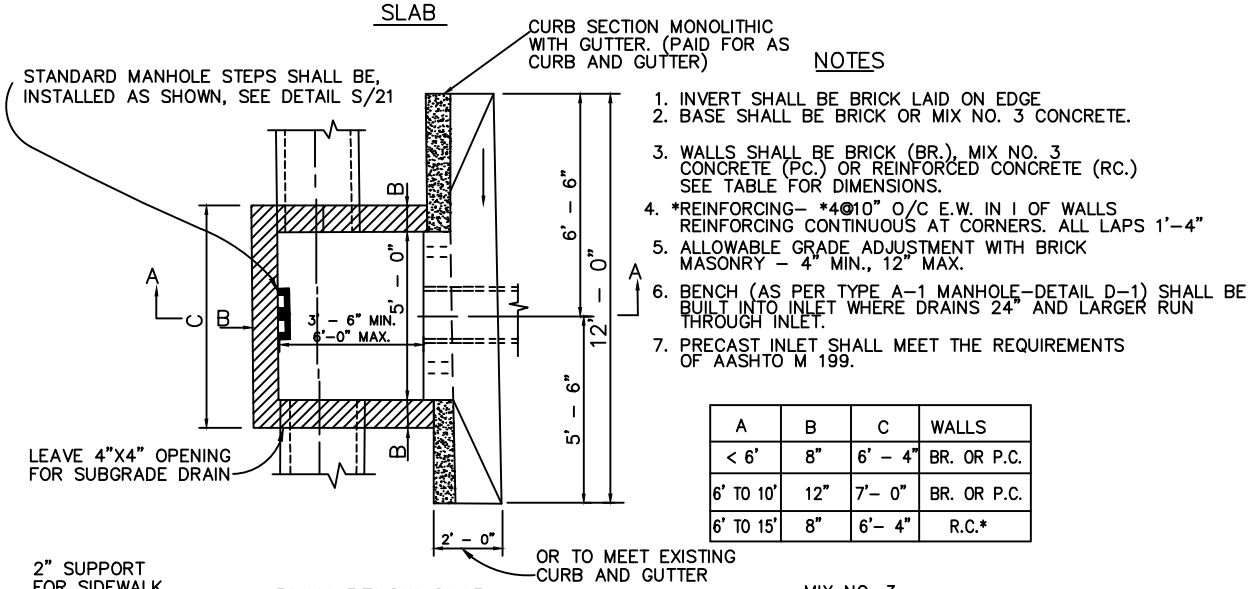
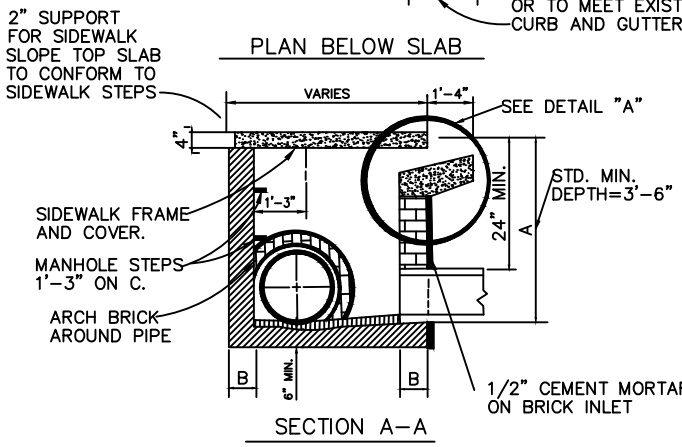


NOTES

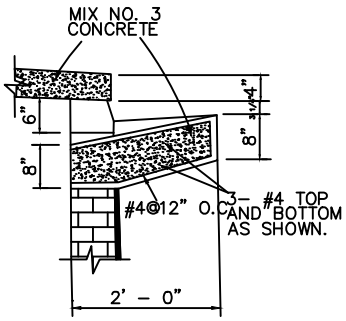
1. INVERT SHALL BE BRICK LAID ON EDGE
2. BASE SHALL BE BRICK OR MIX NO. 3 CONCRETE.
3. WALLS SHALL BE BRICK (BR.), MIX NO. 3 CONCRETE (PC.) OR REINFORCED CONCRETE (RC.) SEE TABLE FOR DIMENSIONS.
4. *REINFORCING- *4@10" O/C E.W. IN I OF WALLS REINFORCING CONTINUOUS AT CORNERS. ALL LAPS 1'-4"
5. ALLOWABLE GRADE ADJUSTMENT WITH BRICK MASONRY - 4" MIN., 12" MAX.
6. BENCH (AS PER TYPE A-1 MANHOLE-DETAIL D-1) SHALL BE BUILT INTO INLET WHERE DRAINS 24" AND LARGER RUN THROUGH INLET.
7. PRECAST INLET SHALL MEET THE REQUIREMENTS OF AASHTO M 199.

A	B	C	WALLS
< 6'	8"	6' - 4"	BR. OR P.C.
6' TO 10'	12"	7'- 0"	BR. OR P.C.
6' TO 15'	8"	6'- 4"	R.C.*

PLAN BELOW SLAB



SECTION A-A



DETAIL "A"

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS TYPE A-2 INLET	REVISED 04/2024	D 24

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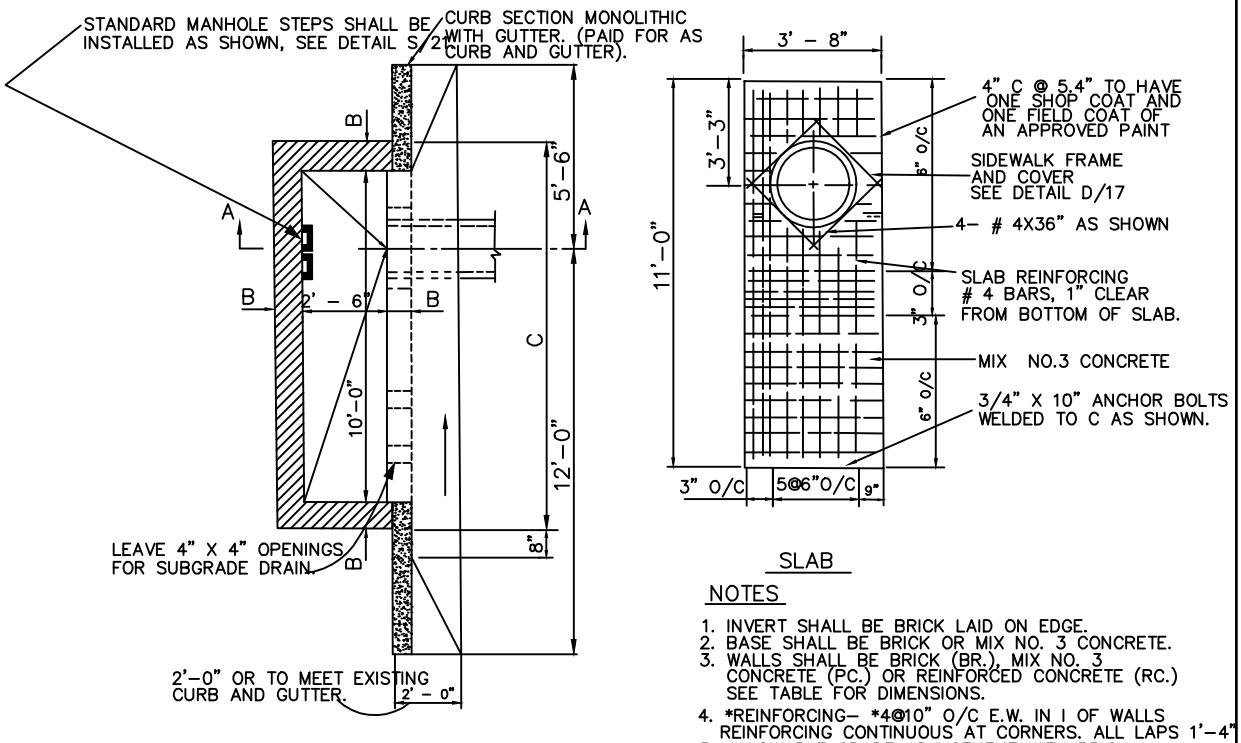
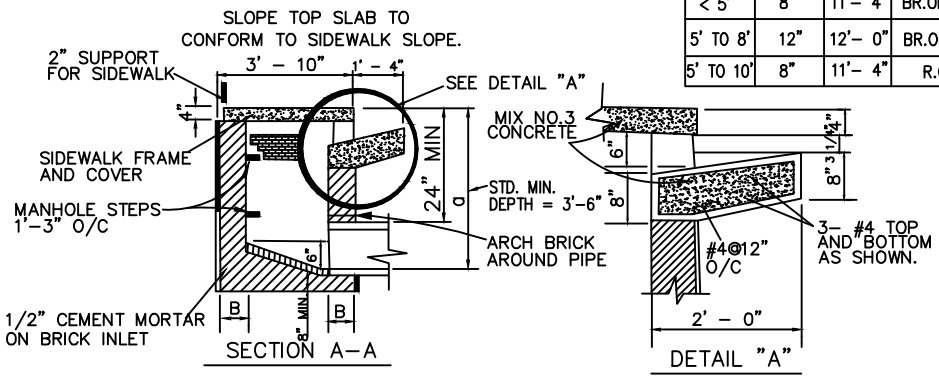


NOTES

1. INVERT SHALL BE BRICK LAID ON EDGE.
2. BASE SHALL BE BRICK OR MIX NO. 3 CONCRETE.
3. WALLS SHALL BE BRICK (BR.), MIX NO. 3 CONCRETE (PC.) OR REINFORCED CONCRETE (RC.) SEE TABLE FOR DIMENSIONS.
4. *REINFORCING- *4@10" O/C E.W. IN I OF WALLS REINFORCING CONTINUOUS AT CORNERS. ALL LAPS 1'-4"
5. ALLOWABLE GRADE ADJUSTMENT WITH BRICK MASONRY - 4" MIN., 12" MAX.
6. PRECAST INLET SHALL MEET THE REQUIREMENTS OF AASHTO M 199.

WALL THICKNESS (B) MAY STOPPED AT DEPTHS SHOWN.

A	B	C	WALLS
< 5'	8"	11'- 4"	BR.OR P.C.
5' TO 8'	12"	12'- 0"	BR.OR P.C.
5' TO 10'	8"	11'- 4"	R.C.*



ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS TYPE B-1 INLET	REVISED 04/2024	D 25

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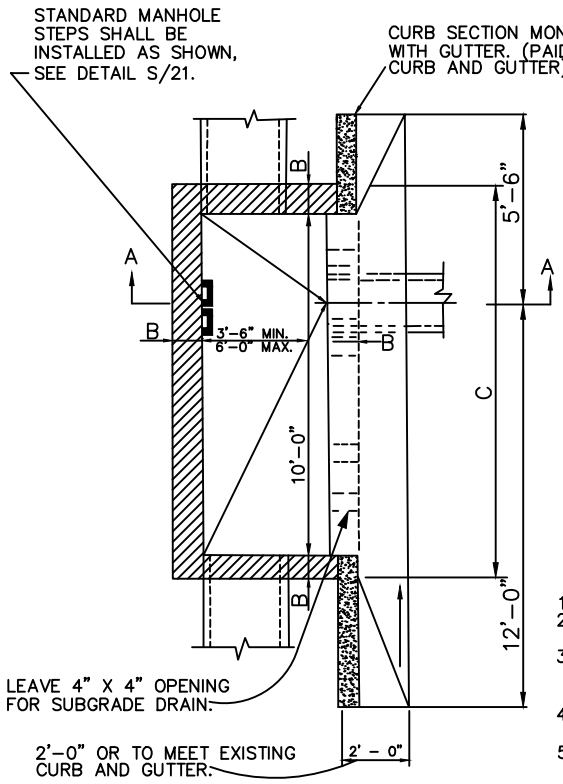
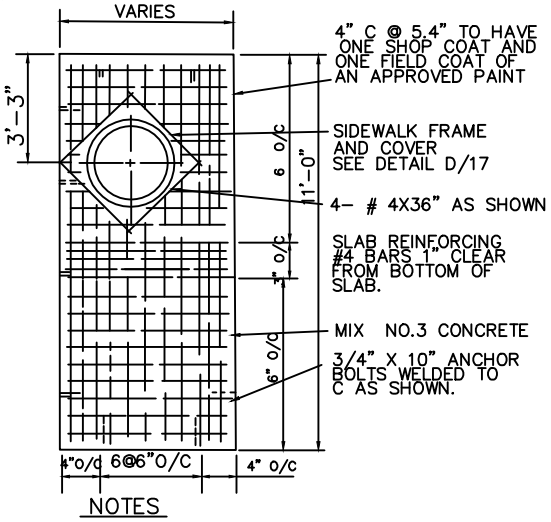


PLAN BELOW SLAB

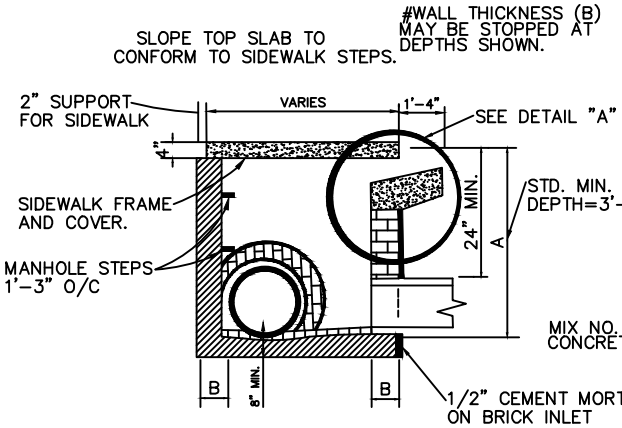


NOTES

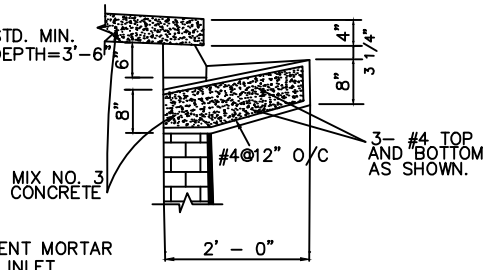
1. INVERT SHALL BE BRICK LAID ON EDGE.
2. BOTTOM SLAB SHALL BE BRICK OR MIX NO. 3 CONCRETE.
3. WALLS SHALL BE BRICK (BR.), MIX NO. 3 CONCRETE (P.C.) OR REINFORCED CONCRETE (R.C.) SEE TABLE FOR DIMENSIONS
4. ALLOWABLE GRADE ADJUSTMENT WITH BRICK MASONRY – 4" MIN., 12" MAX.
5. *REINFORCING– *4@10" O/C E.W. IN I OF WALLS REINFORCING CONTINUOUS AT CORNERS. ALL LAPS 1–4"
6. BENCH (AS PER TYPE A–1 MANHOLE– DETAIL D–1) SHALL BE BUILT INTO INLET WHERE DRAINS 24" AND LARGER RUN THROUGH INLET.
7. PRECAST INLET SHALL MEET THE REQUIREMENTS OF AASHTO M 199.

#WALL THICKNESS (B) MAY BE STOPPED AT DEPTHS SHOWN.

A	B	C	WALLS
< 6'	8"	6' – 4"	BR. OR P.C.
6'TO 10'	12"	7'– 0"	BR. OR P.C.
6'TO 15'	8"	6'– 4"	R.C.*



SECTION A–A



DETAIL "A"

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS TYPE B–2 INLET	REVISED 04/2024	D 26

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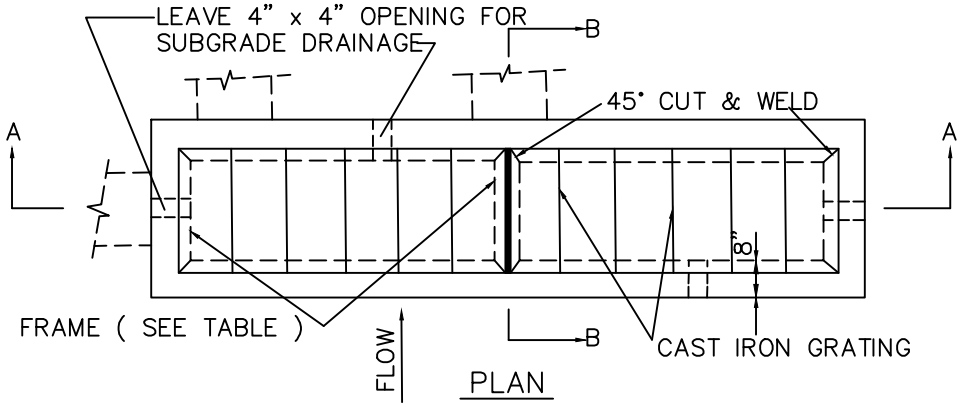
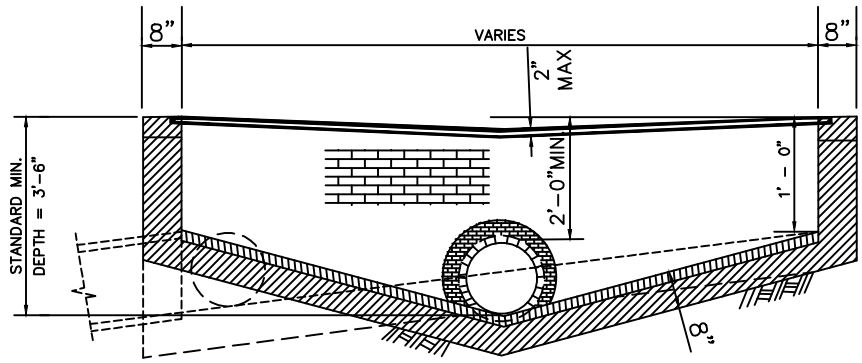
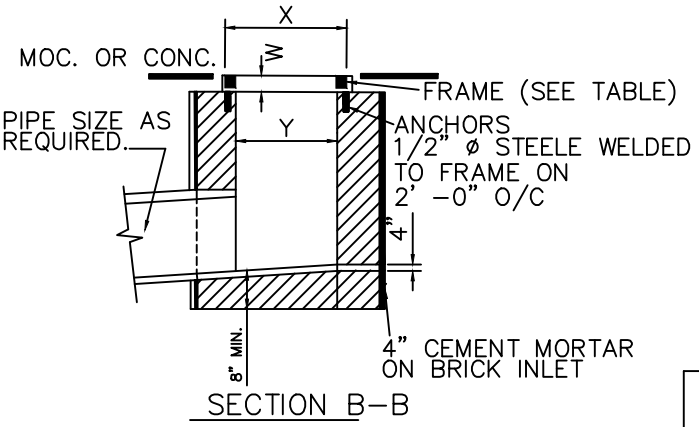


PLAN



SECTION A–A



SECTION B–B

NOTES:

1. BASE AND WALLS SHALL BE BRICK OR MIX NO.3 CONCRETE.
2. MAXIMUM DEPTH OF WALL SHALL BE 3'–6" WHERE OUTLET PIPE REQUIRES GREATEST DEPTH, DROP SECTION SHALL BE FORMED AROUND PIPE.
3. INVERT SHALL BE BRICK LAID ON EDGE.
4. ALLOWABLE GRADE ADJUSTMENT WITH BRICK MASONRY 4" MIN, 12" MAX.
5. PRECAST INLET SHALL MEET THE REQUIREMENTS OF AASHTO M 199.

FRAME DIMENSION TABLE

W	X	Y	FRAME ANGLES
S 3"	2'–9"	2'–7"	3 1/2"x2 1/2"x3/8"
A 2–1/2"	2'–2"	1'–9"	3"x2 1/2"x3/8"
B 1–3/4"	1'–5"	1'–0"	2"x2 1/2"x3/8"

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS TYPE "C" INLET	REVISED 04/2024	D 27

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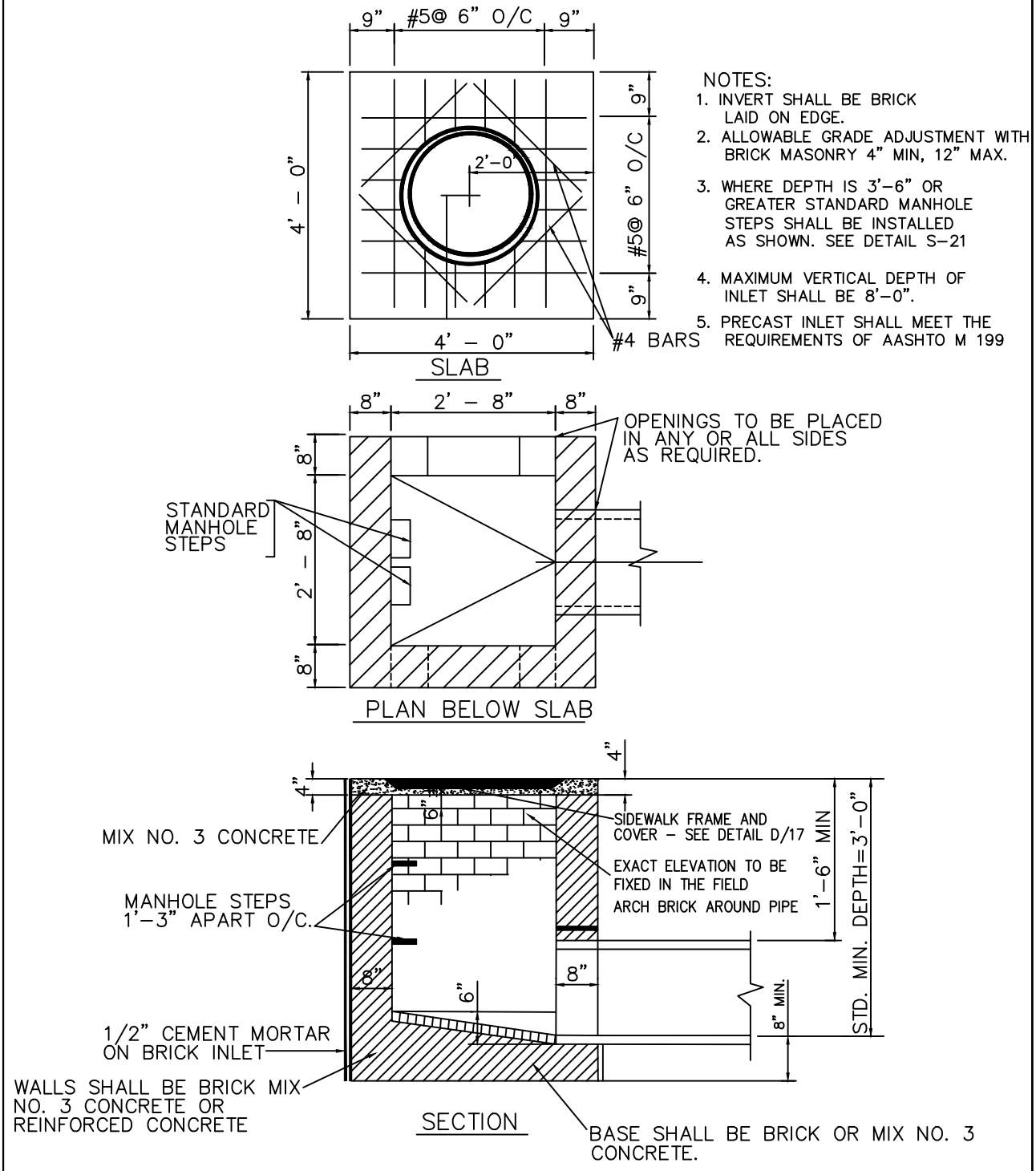

NOTES:

1. INVERT SHALL BE BRICK LAID ON EDGE.
2. ALLOWABLE GRADE ADJUSTMENT WITH BRICK MASONRY 4" MIN, 12" MAX.
3. WHERE DEPTH IS 3'–6" OR GREATER STANDARD MANHOLE STEPS SHALL BE INSTALLED AS SHOWN. SEE DETAIL S–21
4. MAXIMUM VERTICAL DEPTH OF INLET SHALL BE 8'–0".
5. PRECAST INLET SHALL MEET THE REQUIREMENTS OF AASHTO M 199

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS TYPE "D" INLET	REVISED 04/2024	D 28

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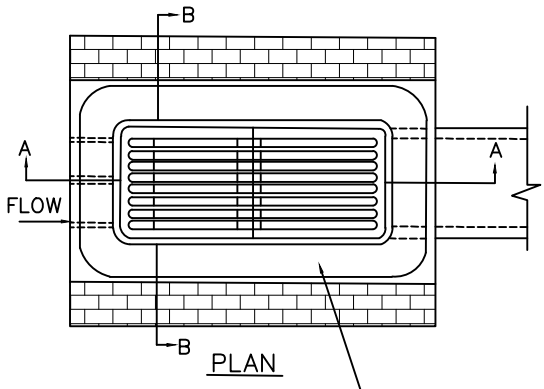
NOTES:

1. BASE SHALL BE BRICK OR MIX NO.3 CONC. INVERT SHALL BE BRICK LAID ON EDGE.
2. WALLS SHALL BE BRICK (BR) MIX NO.3 CONC. (PC) OR REINFORCED MIX NO.3 CONC. (RC) SEE TABLE BELOW FOR DIMENSIONS.
3. * REINFORCING =*4 to 10" O/C E.W. IN C OF WALLS. REINFORCING CONTINUOUS AT CORNERS. ALL LAPS 1'-4".
4. TOP 4" OF WALLS SHALL BE BRICK MASONRY. ADDITIONAL BRICK SHALL BE USED TO BRING COVER TO EXISTING GRADE IF REQUIRED.
5. BENCH (AS PER TYPE "A-1" MANHOLE- DETAIL D-11) SHALL BE BUILT INTO INLET WHERE DRAINS 24" AND LARGER RUN THROUGH INLET
6. STANDARD MANHOLE STEPS SHALL BE INSTALLED AS SHOWN, SEE DETAIL S/21
7. PRECAST INLET SHALL MEET THE REQUIREMENTS OF AASHTO M 199.
8. USE TYPE E COMBINATION REPLACEMENT RETICULAR GRATE IN ROAD RIGHT OF WAY. SEE DETAIL D-31.



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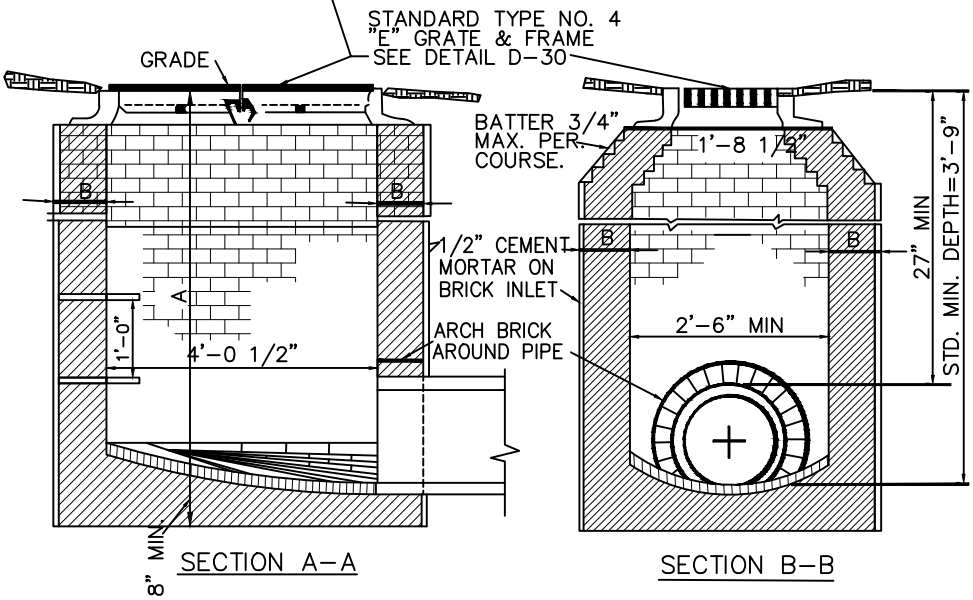

SECTION A-A

SECTION B-B

A	B	WALLS
< 6'	8"	BR. OR PC
6' TO 10'	12"	BR. OR PC
6' TO 15'	8"	R.C. *

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS TYPE "E" INLET	REVISED 04/2024	D 29

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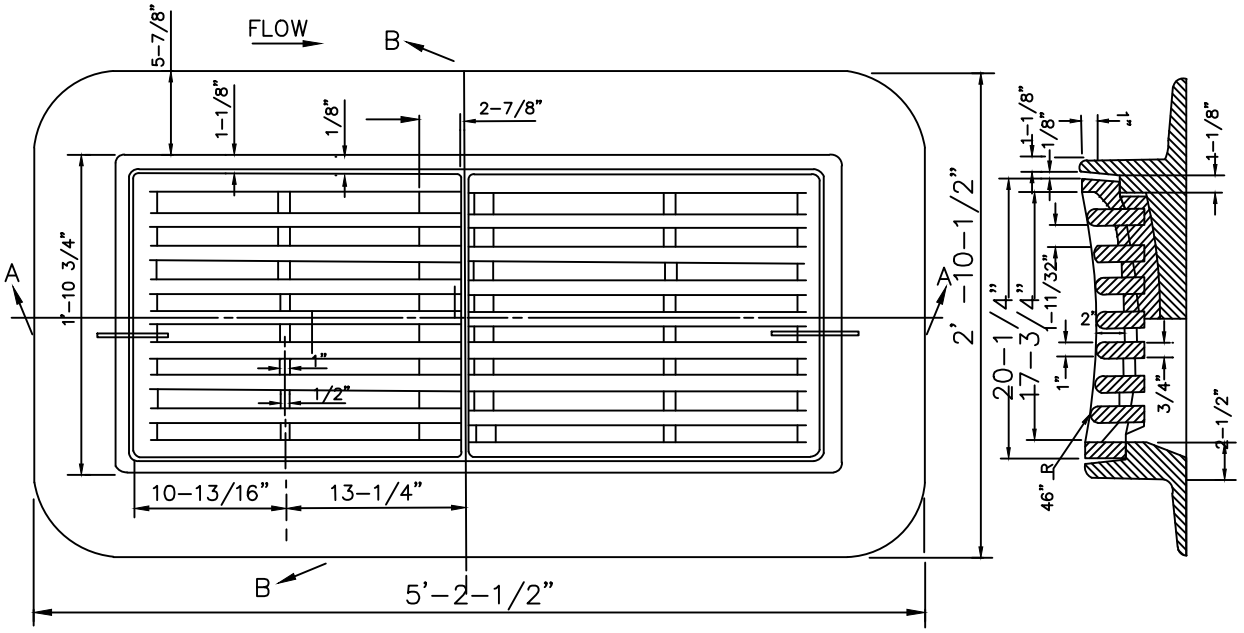
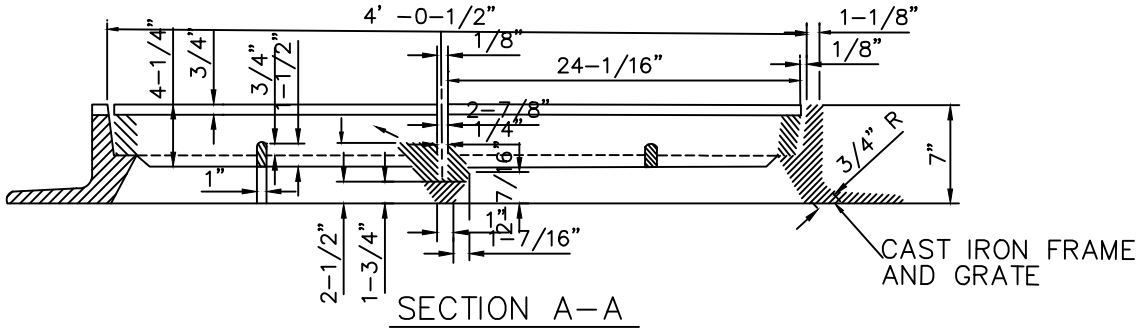


PLAN

SECTION B–B



SECTION A–A

NOTE

1. APPROXIMATE WEIGHTS:
   EA. GRATE – 2.16 lbs.
   FRAME (FULL FLANGE) – 668 lbs.
2. END AND/OR SIDE FLANGES MAY BE OMITTED IF NECESSARY.

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS TYPE NO. 4 "E" GRATE	REVISED 04/2024	D 30

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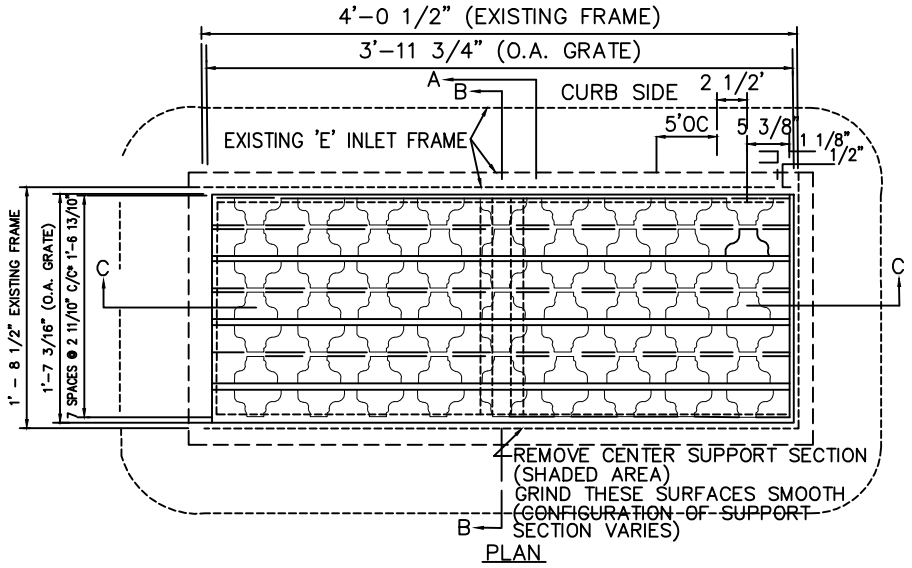
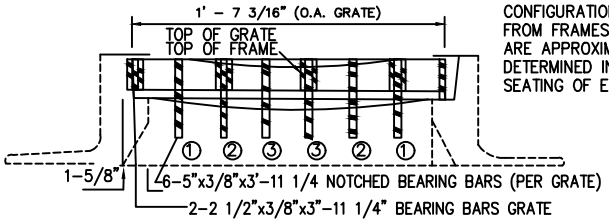
ANY DEVIATIONS FROM THE RETICULAR DESIGN AS SHOWN. MUCH BE APPROVED BY THE ENGINEER.

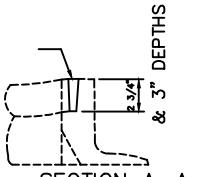


NOTE IF AFTER SEATING GRATE THE OUTSIDE VOID, BETWEEN THE FRAME AND GRATE EXCEEDS 1/2" A FILLER BAR 1/2" (DEPTH)X THICKNESS VARIES X 3'–11 3/4" LONG SHALL BE THICK WELDED TO THE OUTSIDE EDGE OF GRATE AS SHOWN. TOUCH UP RACK WELDS WITH ZINC RICH PAINT.



SECTION B–B

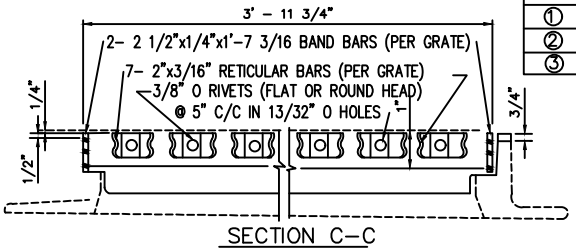
*DUE TO THE VARIABLE TOLERANCE AND CONFIGURATION FOUND IN EXISTING CAST FROM FRAMES THE DIMENSIONS SHOWN ARE APPROXIMATE AND SHALL BE DETERMINED IN THE FIELD TO ASSURE PROPER SEATING OF EACH REPLACEMENT GRATE



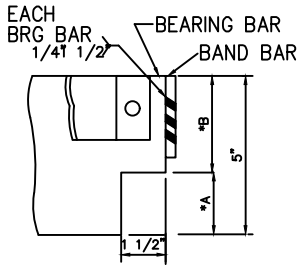
SECTION A–A
(GRATE NOT SHOWN)

GENERAL NOTES
1. GRATES TO BE SQUARE, FLAT & TRUE.
2. STRUCTURAL STEEL SHALL BE A.S.T.M. DESIGNATION A/36
3. GRATES TO BE GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH A.S.T.M DESIGNATION A/123

BRG. BARS	DIMENSIONS *A	*B
①	2 1/4"	2 3/4"
②	2"	3"
③	1 3/4"	3 1/4"



SECTION C–C



GRATING DETAIL

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS TYPE E&H INLET COMBINATION RETICULAR REPLACEMENT GRATE	REVISED 04/2024	D 31

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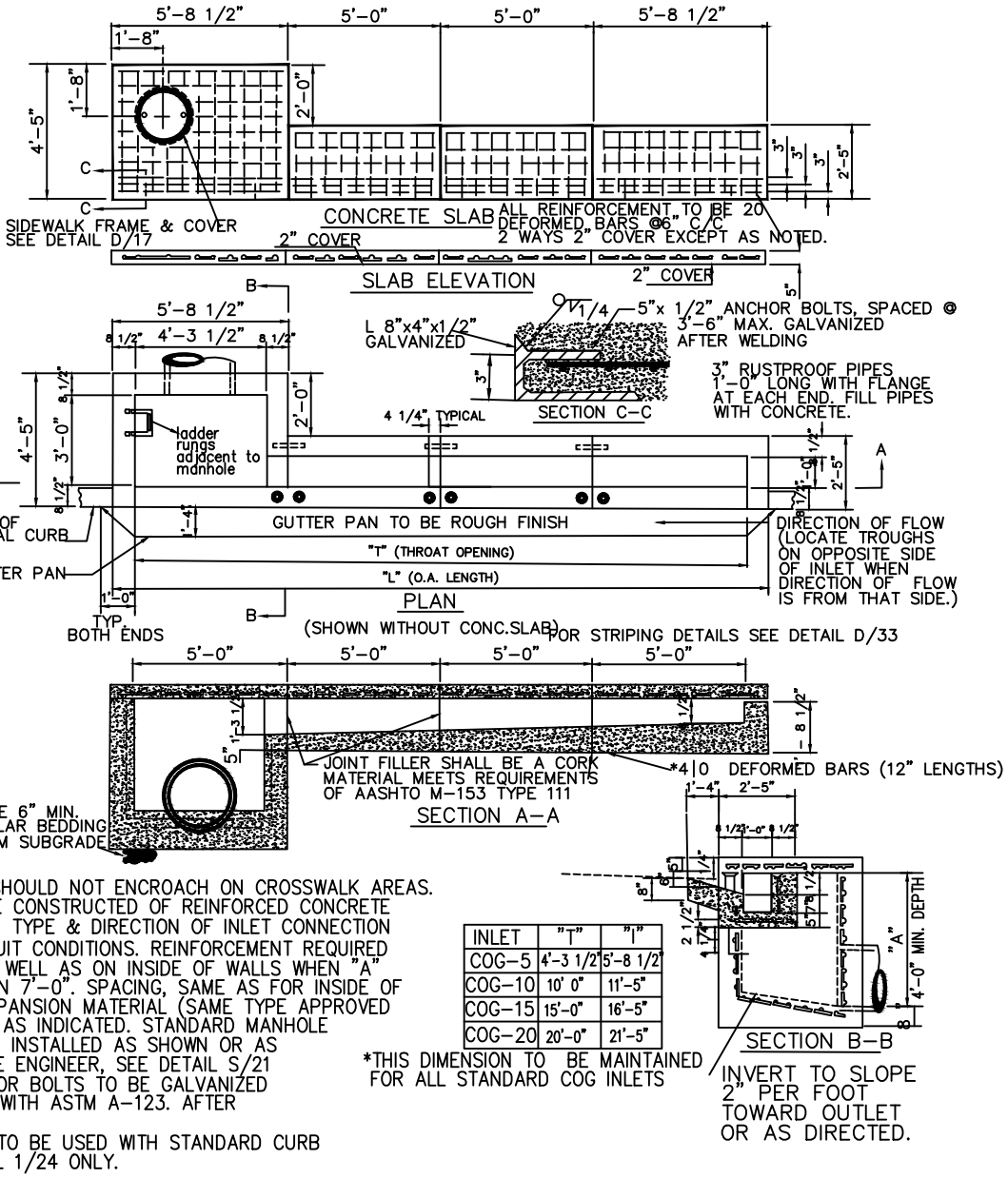

NOTE:
CURB OPENING SHOULD NOT ENCROACH ON CROSSWALK AREAS. INLETS SHALL BE CONSTRUCTED OF REINFORCED CONCRETE (MIX NO.2). SIZE, TYPE & DIRECTION OF INLET CONNECTION WILL VARY TO SUIT CONDITIONS. REINFORCEMENT REQUIRED ON OUTSIDE, AS WELL AS ON INSIDE OF WALLS WHEN "A" IS GREATER THAN 7'-0". SPACING, SAME AS FOR INSIDE OF WALL. PLACE EXPANSION MATERIAL (SAME TYPE APPROVED FOR PAVEMENT) AS INDICATED. STANDARD MANHOLE STEPS SHALL BE INSTALLED AS SHOWN OR AS DIRECTED BY THE ENGINEER, SEE DETAIL S/21 ANGLES & ANCHOR BOLTS TO BE GALVANIZED IN ACCORDANCE WITH ASTM A-123. AFTER WELDING.
THIS STANDARD TO BE USED WITH STANDARD CURB & GUTTER DETAIL 1/24 ONLY.

INLET	"T"	"I"
COG-5	4'-3 1/2"	5'-8 1/2"
COG-10	10' 0"	11'-5"
COG-15	15'-0"	16'-5"
COG-20	20'-0"	21'-5"

*THIS DIMENSION TO BE MAINTAINED FOR ALL STANDARD COG INLETS

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS STANDARD COG INLETS 5', 10', 15', & 20'	REVISED 04/2024	D 32

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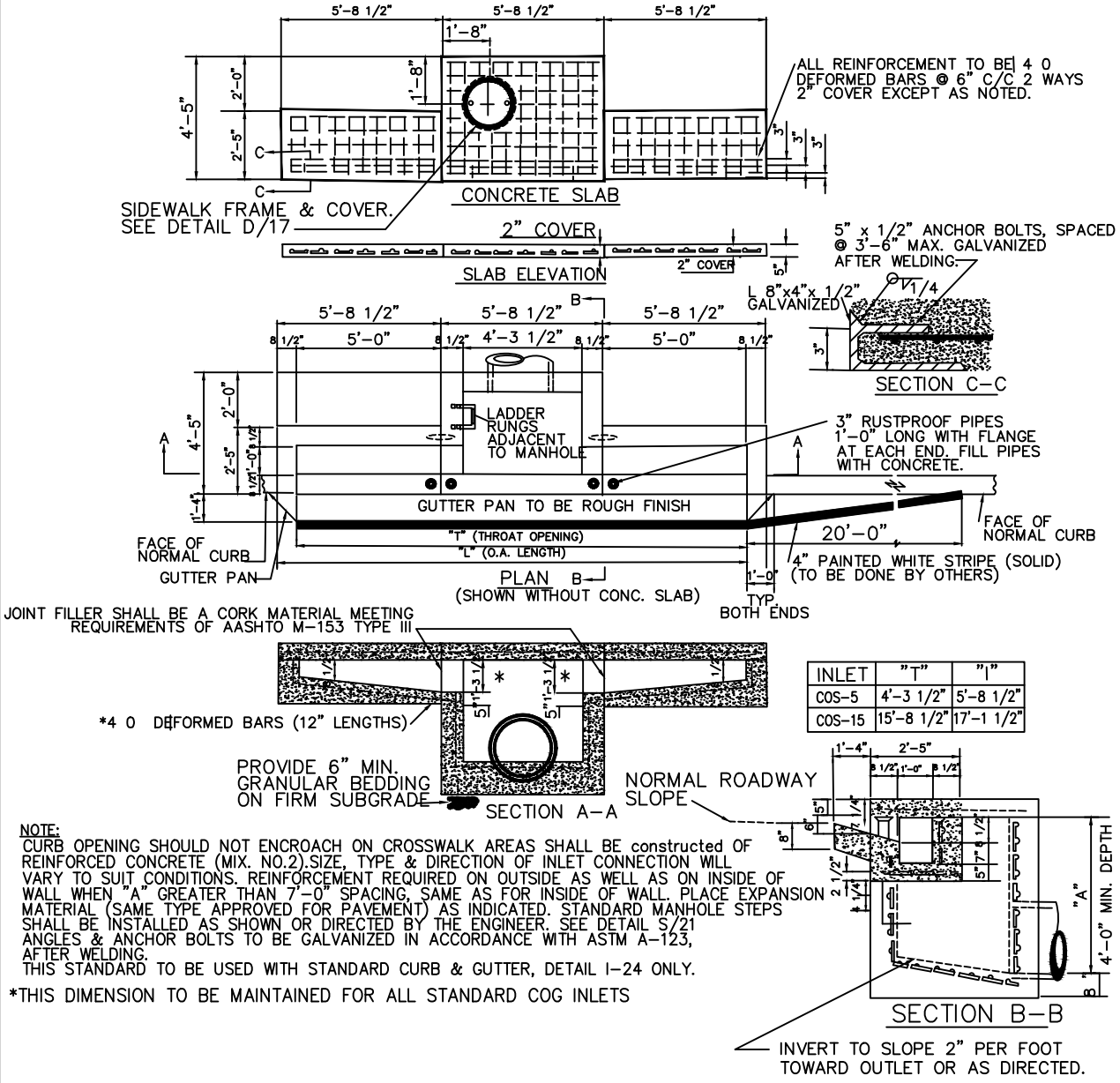


INLET	"T"	"I"
COS-5	4'-3 1/2"	5'-8 1/2"
COS-15	15'-8 1/2"	17'-1 1/2"

NOTE:
CURB OPENING SHOULD NOT ENCROACH ON CROSSWALK AREAS SHALL BE constructed OF REINFORCED CONCRETE (MIX. NO.2).SIZE, TYPE & DIRECTION OF INLET CONNECTION WILL VARY TO SUIT CONDITIONS. REINFORCEMENT REQUIRED ON OUTSIDE AS WELL AS ON INSIDE OF WALL WHEN "A" GREATER THAN 7'-0" SPACING, SAME AS FOR INSIDE OF WALL. PLACE EXPANSION MATERIAL (SAME TYPE APPROVED FOR PAVEMENT) AS INDICATED. STANDARD MANHOLE STEPS SHALL BE INSTALLED AS SHOWN OR DIRECTED BY THE ENGINEER. SEE DETAIL S/21
ANGLES & ANCHOR BOLTS TO BE GALVANIZED IN ACCORDANCE WITH ASTM A-123, AFTER WELDING.
THIS STANDARD TO BE USED WITH STANDARD CURB & GUTTER, DETAIL I-24 ONLY.

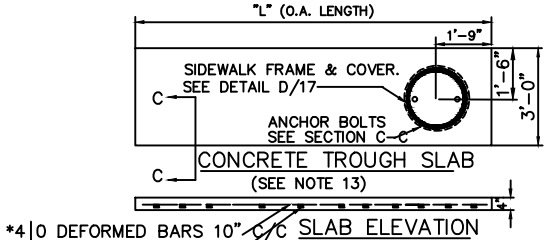
*THIS DIMENSION TO BE MAINTAINED FOR ALL STANDARD COG INLETS

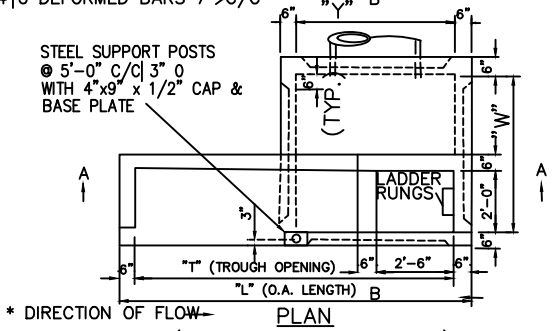
ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS STANDARD COS INLETS 5'&15'	REVISED 04/2024	D 33

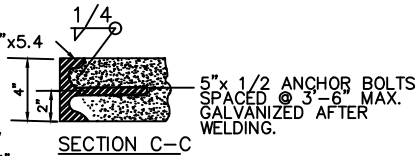
4/2018

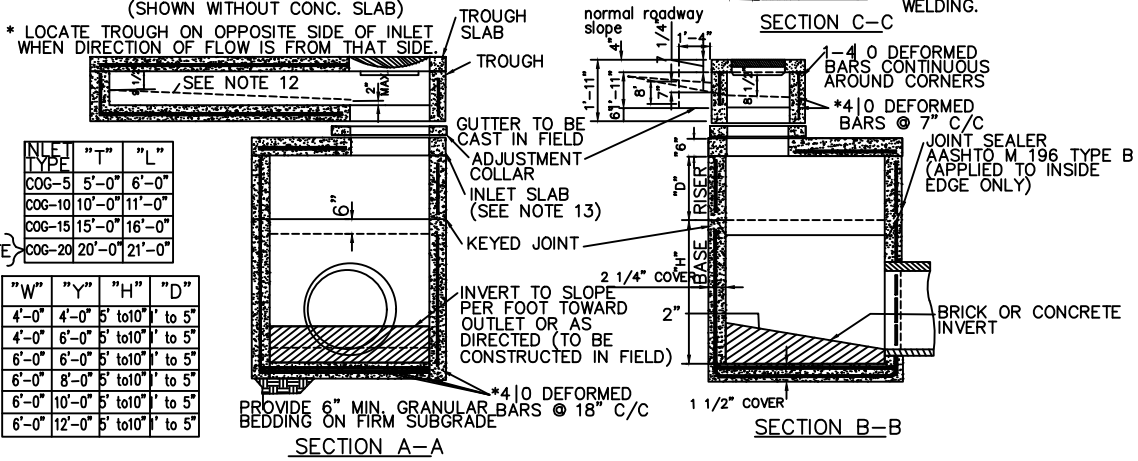
GENERAL NOTES

1. CURB OPENING SHOULD NOT ENCROACH ON CROSSWALK AREAS.
2. CONCRETE TO BE MIX NO. 6 (4500 PSI).
3. THREADED PLASTIC INSERTS TO BE PROVIDED FOR HANDLING.
4. THREADED PLASTIC INSERTS TO BE PROVIDED FOR HANDLING PLANS.
5. INLET INVERTS TO BE PROVIDED IN THE FIELD AS REQUIRED.
6. GRADE AND SLOPE ADJUSTMENT COMPLETED IN THE FIELD AS REQUIRED.
7. WHERE PIPE INVERT ARE ABOVE BOTTOM OF BOX PROVIDE CONCRETE OR BRICK CHANNEL TO MEET PIPE INVERT.
8. STANDARD MANHOLE STEPS SHALL BE INSTALLED AS SHOWN OR AS DIRECTED BY THE ENGINEER, SEE DETAIL S/21
9. CHANNELS AND ANCHOR BOLTS TO BE GALVANIZED IN ACCORDANCE WITH ASTM A 123, AFTER WELDING.
10. PIPE KNOCKOUT, HORIZONTALLY ARE CONTIGENT UPON THE SIZE OF THE PIPE CONNECTED. A 6" THICKNESS. HOWEVER MUST BE MAINTAINED AROUND THE PERIMETER OF THE WALL.
11. FOR CONFIGURATION OF GUTTER PAN AND STRIPPING DETAILS REFER TO SEE DETAIL D/33
12. SLOPED TROUGH FLOOR TO BE CONSTRUCTED IN THE FIELD USING BRICK OR CONCRETE AND USED ONLY WHEN ROAD GRADE IS 1.5% OR LESS. WHEN SLOPED TROUGH FLOOR IS USED. ROUGHEN PRECAST TROUGH FLOOR.
13. REFER TO DETAIL D/34A FOR DETAILS OF COG-20 PRECAST CONCRETE TROUGH SLAB, ALSO DETAILS FOR ADJUSTMENT COLLARS AND INLET SLABS FOR OTHER COG INLETS.









INLET TYPE	"T"	"L"
COG-5	5'-0"	6'-0"
COG-10	10'-0"	11'-0"
COG-15	15'-0"	16'-0"
COG-20	20'-0"	21'-0"

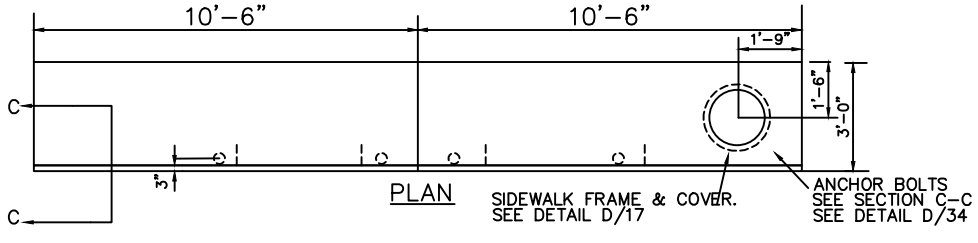
SEE NOTE 13

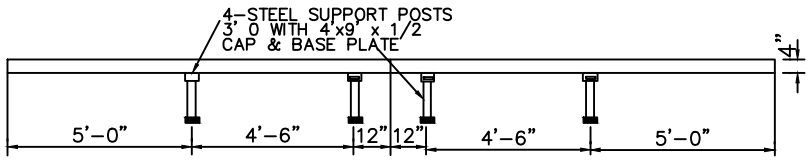
"W"	"Y"	"H"	"D"
4'-0"	4'-0"	5' to10"	1' to 5"
4'-0"	6'-0"	5' to10"	1' to 5"
6'-0"	6'-0"	5' to10"	1' to 5"
6'-0"	8'-0"	5' to10"	1' to 5"
6'-0"	10'-0"	5' to10"	1' to 5"
6'-0"	12'-0"	5' to10"	1' to 5"

THIS STANDARD TO BE USED WITH COMBINATION CURB & GUTTER, SEE DETAIL 1/24

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS PRECAST SQUARE AND RECTANGULAR COG INLETS 5',10',15',&20'	REVISED 04/2024	D 34

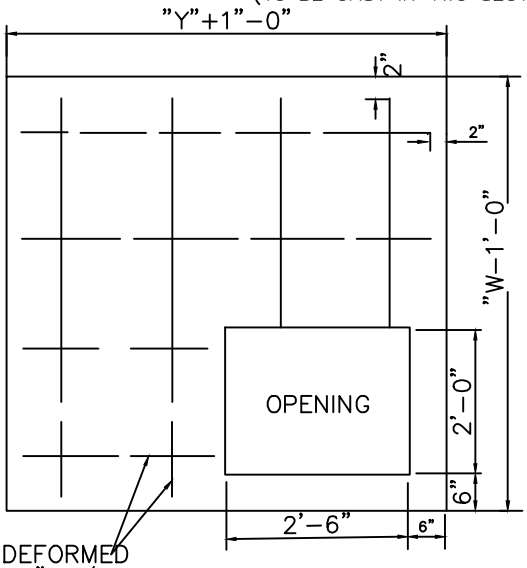
4/2018



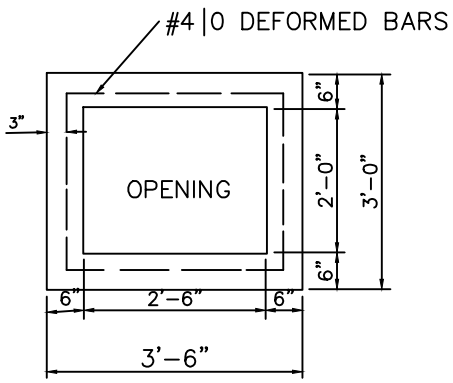


ELEVATION

COG–20 THROUGH SLAB
(TO BE CAST IN TWO SECTIONS)



CONCRETE INLET SLAB
(6" THICK)



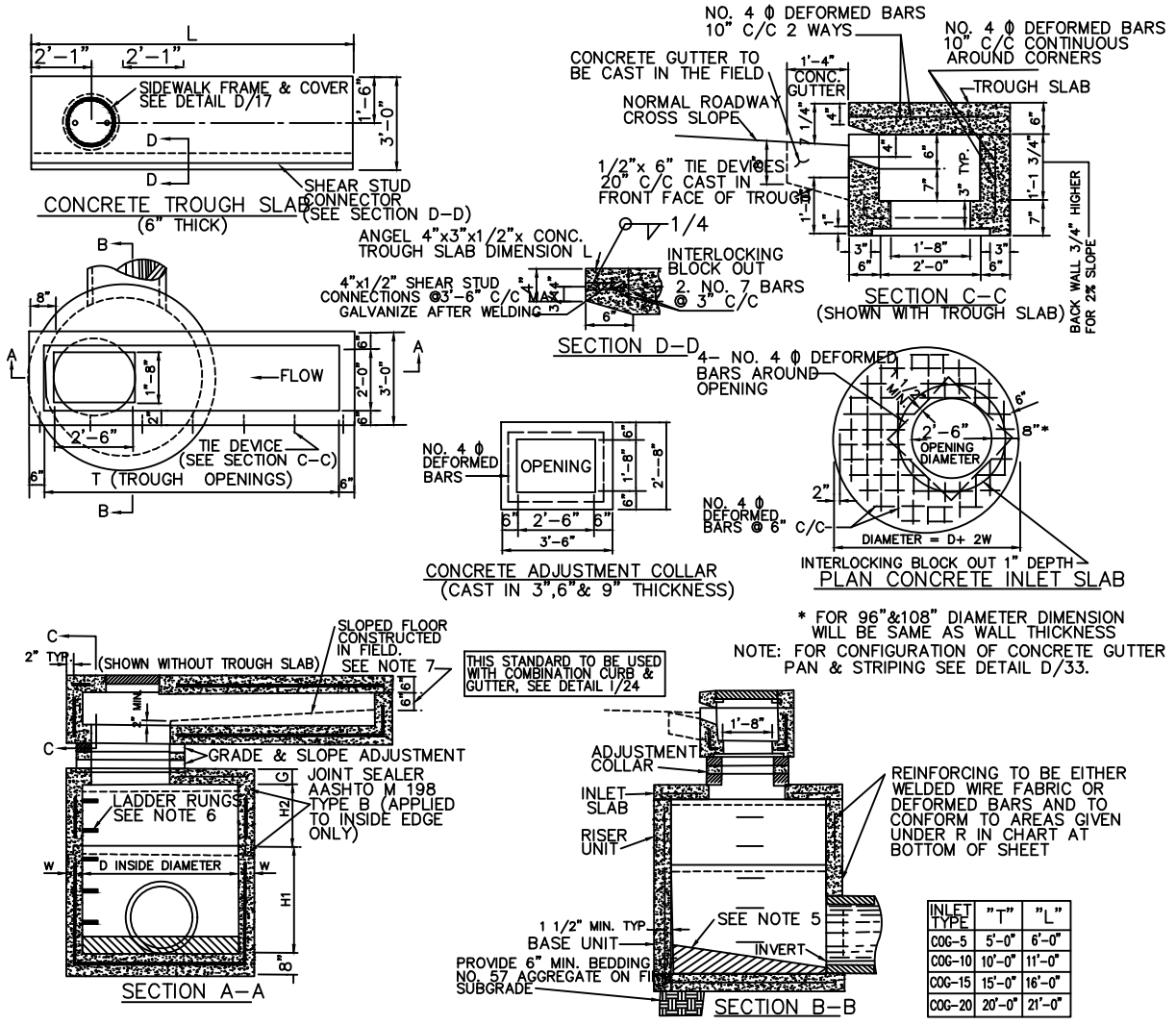
CONCRETE ADJUSTMENT COLLAR
(3",6", & 9" THICKNESS)

NOTES:

1. CONCRETE TO BE MIX NO. 6 (4500 PSI).
2. SEE DETAILS D/34 FOR COG INLET DETAILS,. Y & W DIMENSIONS ETC.
3. THE CONCRETE INLET SLAB AND CONCRETE ADJUSTMENT COLLAR ARE FOR ALL COG INLETS.

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS DETAILS FOR PRECAST CONCRETE COG–20TROUGH SLABS & DETAILS FOR ADJUSTMENT COLLARS AND INLET SLABS	REVISED 04/2024	D 34A

4/2018



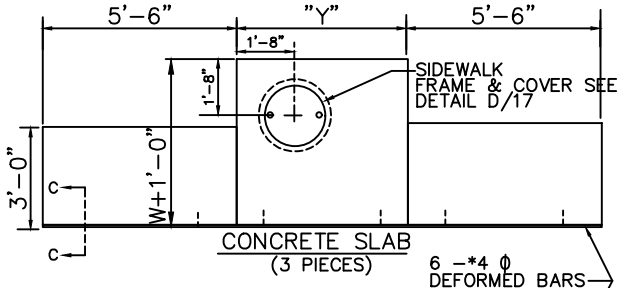
INLET TYPE	"T"	"L"
COG-5	5'-0"	6'-0"
COG-10	10'-0"	11'-0"
COG-15	15'-0"	16'-0"
COG-20	20'-0"	21'-0"

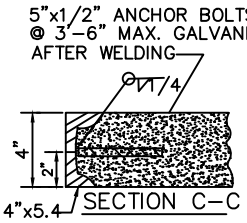
NOTES:
1. CURB OPENING SHOULD NOT ENCROACH ON CROSSWALK AREAS.
2. CONCRETE TO BE MIX NO. 6 (4500 PSI).
3. ANGLES AND ANCHOR BOLTS TO BE GALVANIZED AFTER WELDING IN ACCORDANCE WITH ASTM A 123.
4. GRADE AND SLOPE ADJUSTMENTS SHALL BE COMPLETED IN THE FIELD USING PRECAST. ADJUSTMENT COLLAR AND MORTAR.
5. A CONCRETE OR BRICK CHANNEL SHALL BE PROVIDED IN THE FIELD AND SHALL SLOPE 2" PER FT. TOWARD OUTLET.
6. STANDARD MANHOLE STEPS SHALL BE INSTALLED AS SHOWN OR AS DIRECTED BY THE ENGINEER, SEE DETAIL S/21
7. SLOPED TROUGH FLOOR TO BE CONSTRUCTED IN THE FIELD USING BRICK OR CONCRETE AND USED ONLY WHEN ROAD GRADE IS 1.5% OR LESS WHEN SLOPED TROUGH FLOOR IS USED ROUGHEN PRECAST TROUGH FLOOR.
8. SEE DETAIL D/35B FOR ALTERNATE PRECAST TROUGH FLOOR.

CIRCULAR BASE AND RISER UNIT DIMENSIONS				INLET SLAB	R-REIN. SQ. IN. PER FT.
H1	H2	W	D	G	
1'TO 4'	1'TO 4'	4"	36"	NOT USED	.09
1'TO 5'	1'TO 5'	5"	48"	6"	.12
1'TO 6'	1'TO 6'	6"	60"	8"	.15
1'TO 7'	1'TO 7'	7"	72"	8"	.18
1'TO 8'	1'TO 8'	8"	84"	8"	.21
1'TO 8'	1'TO 8'	9"	96"	8"	.24
1'TO 8'	1'TO 8'	4"	106"	8"	.27

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS PRECAST CIRCULAR 5',10',15' &20'	REVISED 04/2024	D 34B

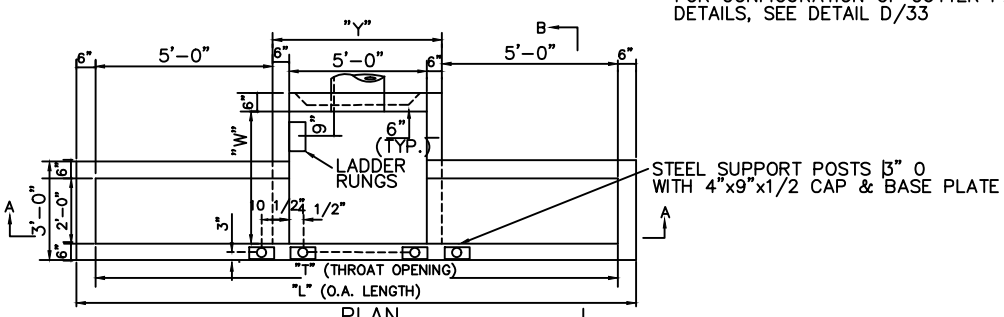
4/2018

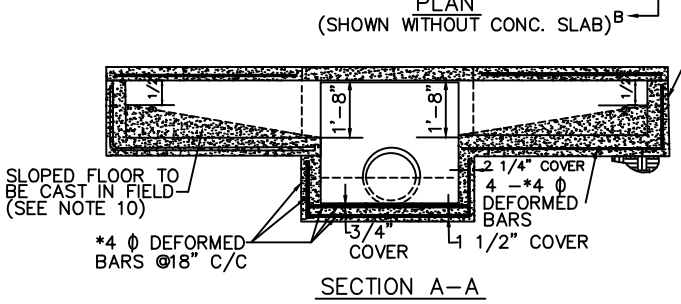


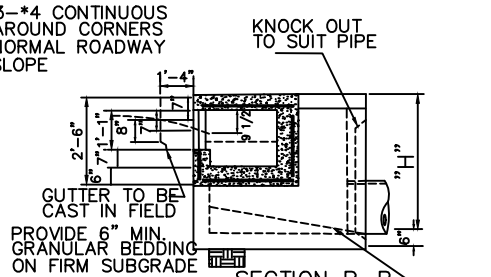


INLET	"T"	"I"
COS-5	5'-0"	6'-0"
COS-15	16'-0"	17'-0"

FOR CONFIGURATION OF GUTTER PAN & STRIPING DETAILS, SEE DETAIL D/33







BRICK OR CONCRETE INVERT TO SLOPE 2" PER FOOT TOWARD OUTLET OR AS DIRECTED (TO BE CONSTRUCTED IN FIELD)

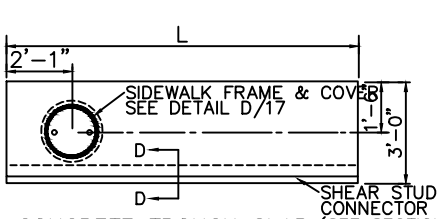
GENERAL NOTES

1. CURB OPENING SHOULD NOT ENCROACH ON CROSSWALK AREAS.
2. CONCRETE TO BE MIX NO. 6
3. THREADED PLASTIC INSERTS TO BE PROVIDED FOR HANDLING.
4. PIPE KNOCKOUTS 4.5' VERTICALLY, TO BE PROVIDED AS SHOWN ON PLAN
5. INLET INVERTS TO BE PROVIDED IN FIELD AS REQUIRED.
6. WHERE PIPE INVERTS ARE ABOVE BOTTOM OF BOX PROVIDED CONCRETE OR BRICK CHANNEL TO MEET PIPE INVERT.
7. STANDARD MANHOLE STEPS SHALL BE INSTALLED AS SHOWN OR AS DIRECTED BY THE ENGINEER, SEE DETAIL S/21.
8. CHANNELS AND ANCHOR BOLTS TO BE GALVANIZED IN ACCORDANCE WITH ASTM A-123, AFTER WELDING.
9. PIPE KNOCKOUTS, HORIZONTALLY ARE CONTIGENT UPON THE SIZE OF THE PIPE CONNECTED. A 6" THICKNESS, HOWEVER MUST BE MAINTAINED AROUND THE PERIMETER OF THE WALL.
10. SLOPED TROUGH FLOOR TO BE CONSTRUCTED IN THE FIELD USING BRICK OR CONCRETE AND USED ONLY WHEN ROAD GRADE IS 1.5% OR LESS, WHEN SLOPED TROUGH FLOOR IS USED ROUGHEN PRECAST TROUGH FLOOR.
11. THIS STANDARD TO BE USED WITH STANDARD COMBINATION CURB AND GUTTER, DETAIL I/24 ONLY.

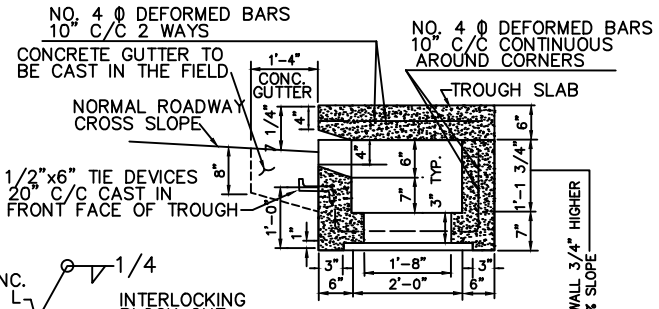
"W"	"Y"	"H"
6'-0"	6'-0"	4'TO 8'
8'-0"	6'-0"	4'TO 8'
10'-0"	6'-0"	4'TO 8'
12'-0"	6'-0"	4'TO 8'

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS PRECAST SQUARE AND RECTANGULAR COS INLETS 5' & 15'	REVISED 04/2024	D 35

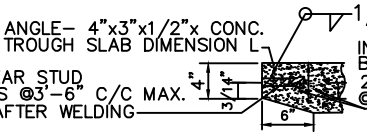
4/2018



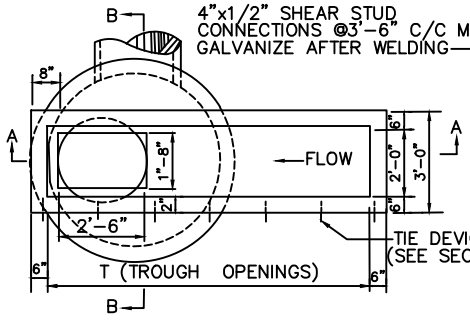
CONCRETE TROUGH SLAB (SEE SECTION D–D)
(6" THICK)

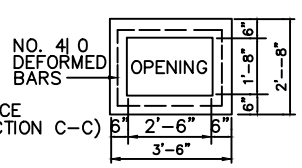


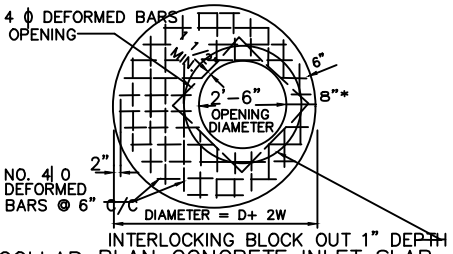
SECTION C–C
(SHOWN WITH TROUGH SLAB)



SECTION D–D

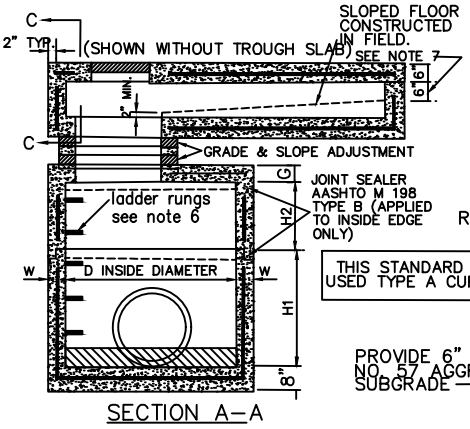




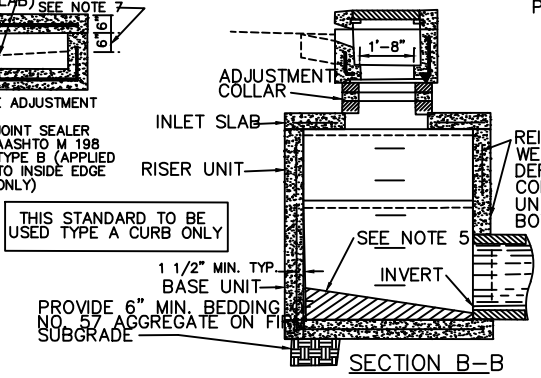


CONCRETE ADJUSTMENT COLLAR PLAN CONCRETE INLET SLAB
(CAST IN 3",6"& 9" THICKNESS) *FOR 96"&108" DIAMETER DIMENSION WILL BE SAME AS WALL THICKNESS

NOTE: FOR CONFIGURATION OF CONCRETE GUTTER PAN & STRIPING DETAIL D/33.



SECTION A–A



SECTION B–B

INLET TYPE	"T"	"L"
COG-5	5'-0"	6'-0"
COG-10	10'-0"	11'-0"
COG-15	15'-0"	16'-0"
COG-20	20'-0"	21'-0"

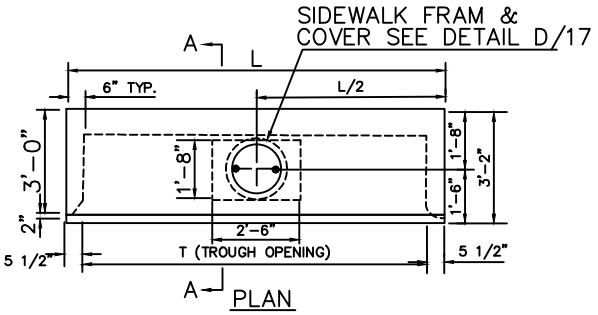
NOTES:
1. CURB OPENING SHOULD NOT ENCROACH ON CROSSWALK AREAS.
2. CONCRETE TO BE MIX NO. 6 (4500 PSI).
3. ANGLES AND ANCHOR BOLTS TO BE GALVANIZED AFTER WELDING IN ACCORDANCE WITH ASTM A 123.
4. GRADE AND SLOPE ADJUSTMENTS SHALL BE COMPLETED IN THE FIELD USING PRECAST. ADJUSTMENT COLLAR AND MORTAR.
5. A CONCRETE OR BRICK CHANNEL SHALL BE PROVIDED IN THE FIELD AND SHALL SLOPE 2" PER FT. TOWARD OUTLET.
6. STANDARD MANHOLE STEPS SHALL BE INSTALLED AS SHOWN OR AS DIRECTED BY THE ENGINEER, SEE DETAIL S/21.
7. SLOPED TROUGH FLOOR TO BE CONSTRUCTED IN THE FIELD USING BRICK OR CONCRETE AND USED ONLY WHEN ROAD GRADE IS 1.5% OR LESS WHEN SLOPED TROUGH FLOOR IS USED TO ROUGHEN PRECAST TROUGH FLOOR.
8. SEE DETAIL D/35B FOR ALTERNATE PRECAST TROUGH FLOOR.

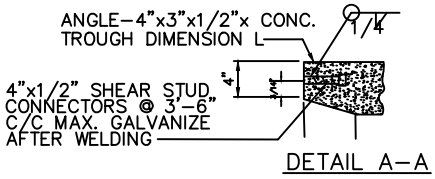
CIRCULAR BASE AND RISER UNIT DIMENSIONS				INLET SLAB	R–REIN. SQ. IN. PER FT.
H1	H2	W	D	G	
1'TO 4'	1'TO 4'	4"	36"	NOT USED	.09
1'TO 5'	1'TO 5'	5"	48"	6"	.12
1'TO 6'	1'TO 6'	6"	60"	8"	.15
1'TO 7'	1'TO 7'	7"	72"	8"	.18
1'TO 8'	1'TO 8'	8"	84"	8"	.21
1'TO 8'	1'TO 8'	9"	96"	8"	.24
1'TO 8'	1'TO 8'	10"	108"	8"	.27

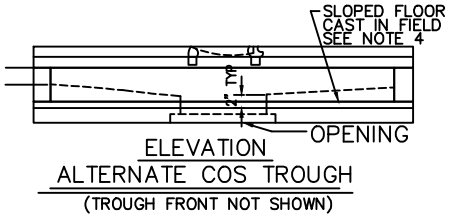
THIS STANDARD TO BE USED WITH COMBINATION CURB & GUTTER, SEE DETAIL 1/24

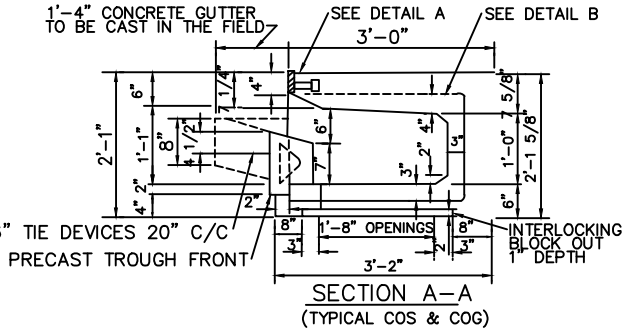
ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS PRECAST CIRCULAR COS INLETS, 5',10',15',&20'	REVISED 04/2024	D 35A

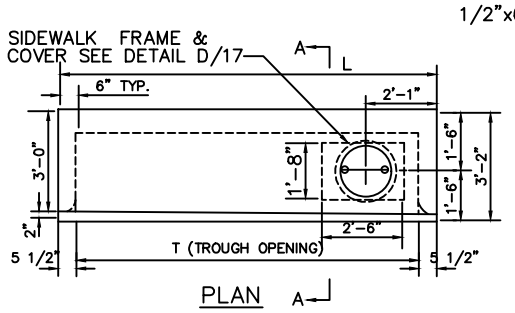
4/2018

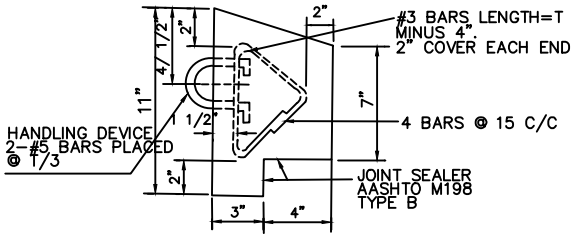


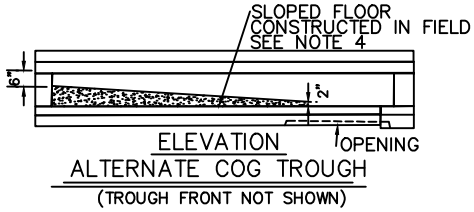


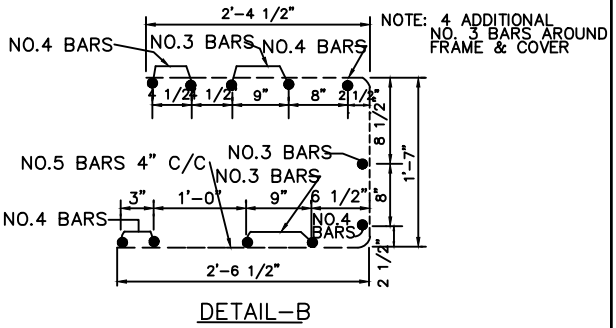












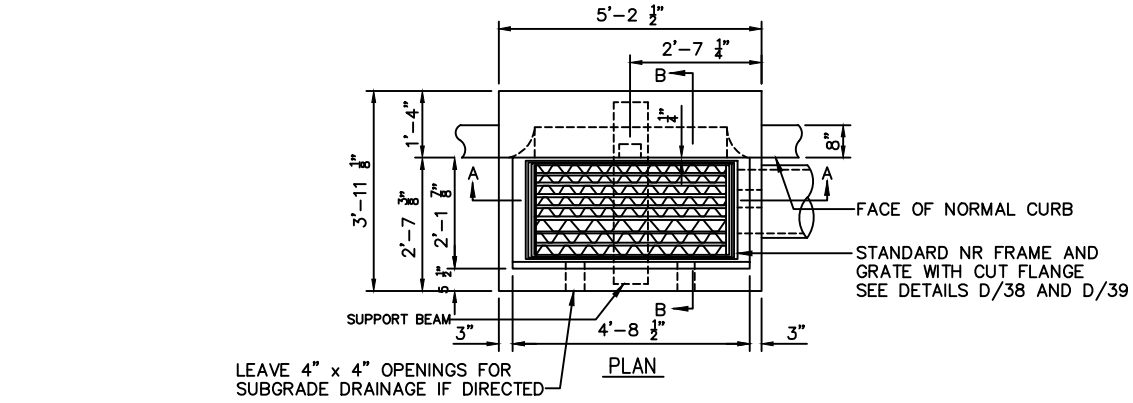
NOTES:

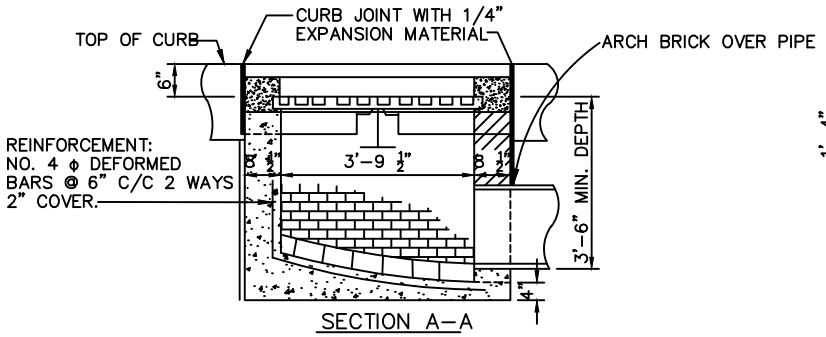
1. CONCRETE TO BE MIX NO. 6(4500 PSI)
2. ASTM A 615 GRADE 60 STEEL
3. SEE DETAIL D/34B FOR PRECAST CIRCULAR COG INLET DETAILS AND DETAIL D/35A FOR PRECAST CIRCULAR COG INLET DETAILS.
4. SLOPED TROUGH FLOOR TO BE CONSTRUCTED IN THE FIELD USING BRICK OR CONCRETE AND USED ONLY WHEN ROAD GRADE IS 1.5% OR LESS. WHEN SLOPED TROUGH FLOOR IS USED. ROUGHEN PRECAST TROUGH FLOOR.

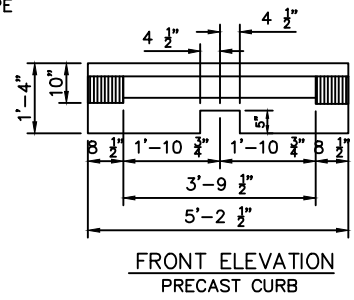
INLET TYPE	T	L
COG-5	5'-0"	6'-0"
COG-10	10'-0"	11'-0"
COG-15	15'-0"	16'-0"
COG-20	20'-0"	21'-0"
COG-5	5'-0"	6'-0"
COG-10	10'-0"	11'-0"
COG-15	15'-0"	16'-0"
COG-20	20'-0"	21'-0"

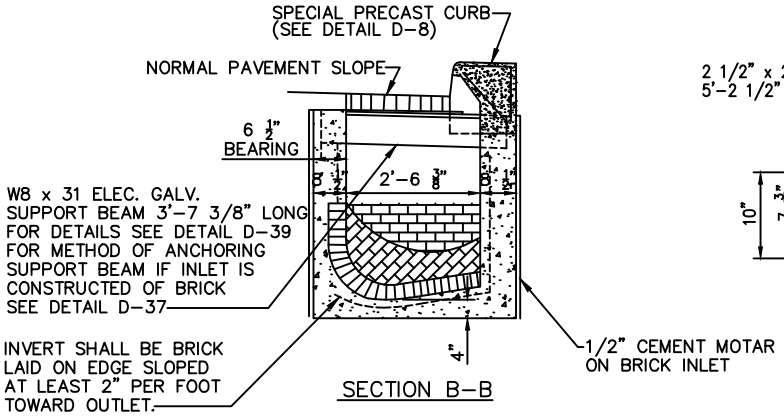
ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS ALTERNATE PRECAST TROUGHS FOR PRECAST CIRCULAR COG & COS INLETS	REVISED 04/2024	D 35B

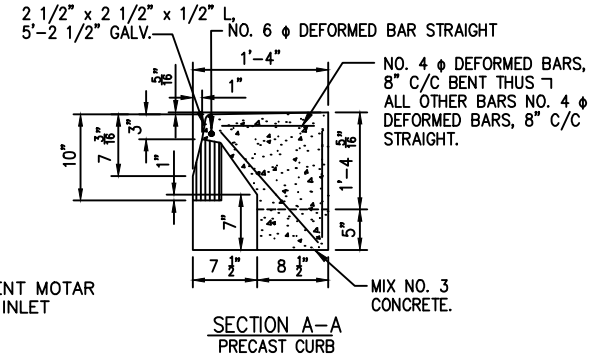
4/2018









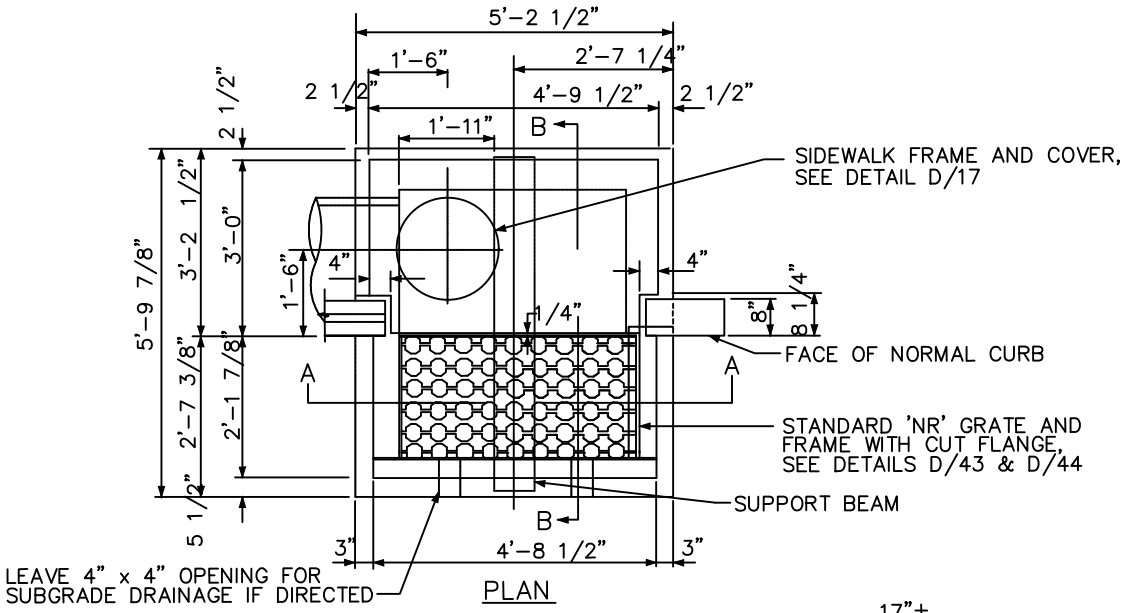


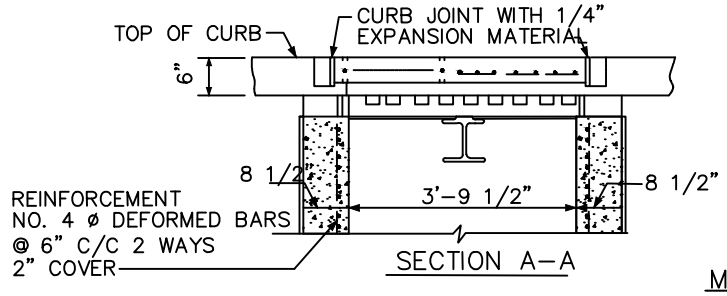
NOTES:

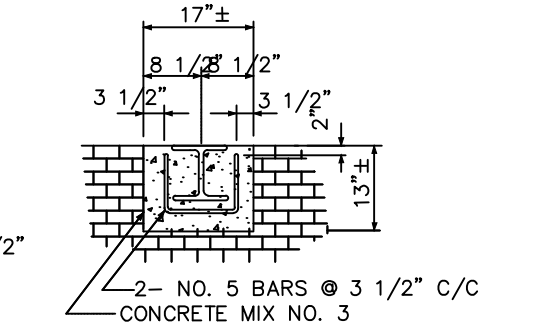
1. BASE SHALL BE BRICK OR MIX NO. 3 CONCRETE.
2. WALLS SHALL BE BRICK, MIX NO. 3 CONCRETE OR REINFORCED MIX NO. 3 CONCRETE.
   DEPTH < 6', WALL 8" BRICK OR CONCRETE
   6' TO WALL 12" BRICK OR CONCRETE
   6' TO WALL 15" WALL 8" REINFORCED CONCRETE
3. *REINFORCING – #4 @ 6" O/C E.W.C. OF WALLS REINFORCING CONTINUOUS AT CORNERS. MINIMUM LAP 1'-4".
4. ALLOWABLE GRADE ADJUSTMENT WITH BRICK MASONRY 4" MIN., 12" MAX.
5. STANDARD MANHOLE STEPS SHALL BE INSTALLED (DETAIL S/21).
6. SIZE, TYPE AND DIRECTION OF OUTLET PIPE WILL VARY TO SUIT EACH CASE AND THE INVERT ALTERED ACCORGINGLY.
7. PRECAST INLET SHALL MEET THE REQUIREMENTS OF AASHTO M 199.

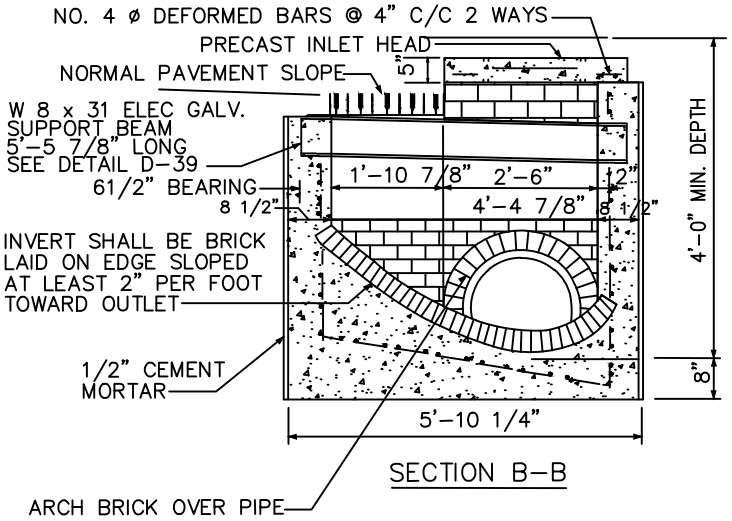
ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS STANDARD NR INLET	REVISED 04/2024	D 36

4/2018





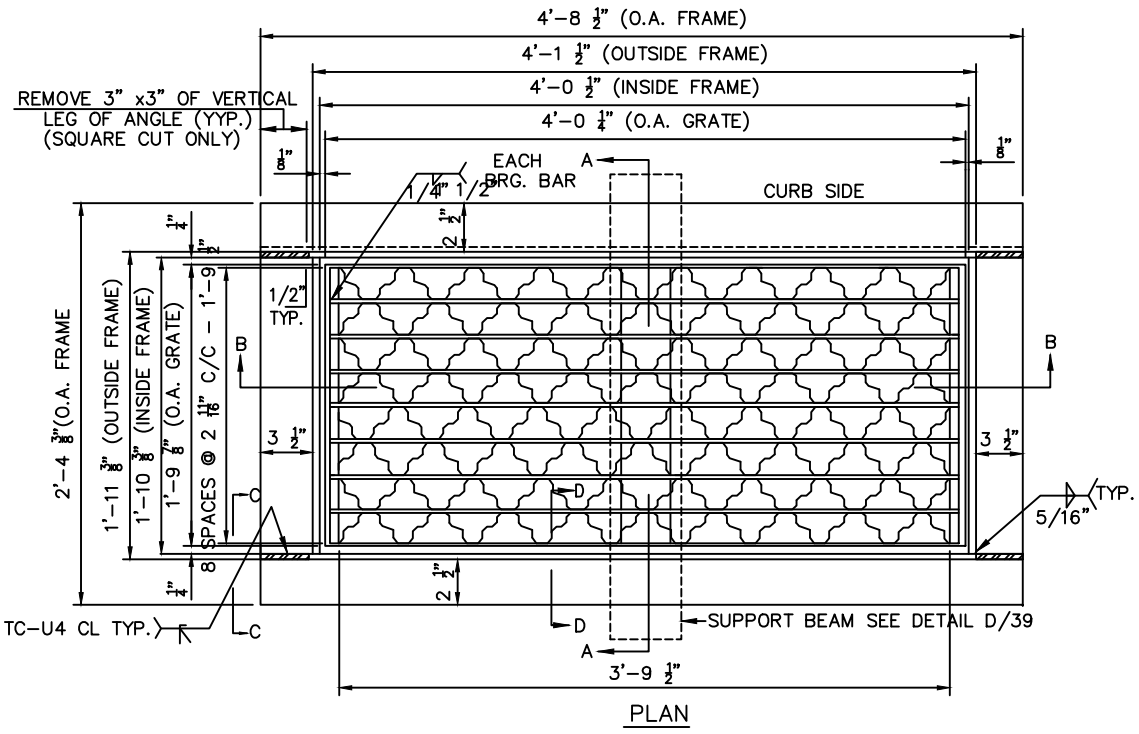


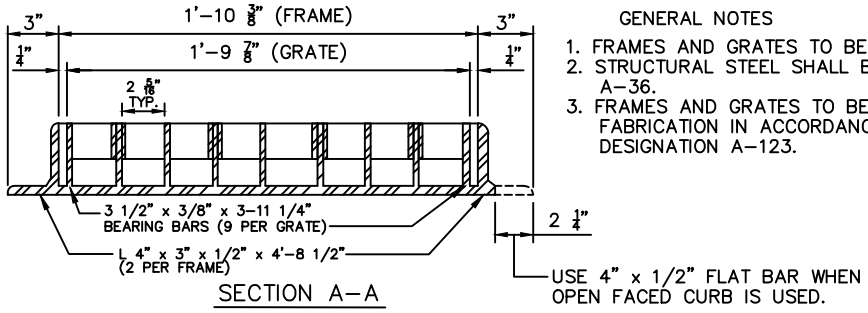


NOTES:

1. BASE SHALL BE BRICK OR MIX NO.3 CONCRETE.
2. WALLS SHALL BE BRICK, MIX NO. 3 CONCRTE, OR REINFORCED MIX NO.3 CONCRETE.
   DEPTH≤6' WALL-
   6' TO 10' WALL-12" BRICK OR CONCRETE
   6' TO 15' WALL-8" REINFORCED CONCRETE
3. * REINFORCING - 4@ 6"O/C E.W.T. OF WALLS REINFORCING CONTINUOUS AT CORNERS MINIMUM LAP 1'-4".
4. ALLOWABLE GRADE ADJUSTMENT WITH BRICK MASONARY 4" MIN. 12" MAX.
5. STANDARD MANHOLE STEPS SHALL BE INSTALLED. SEE DETAIL S/21.
6. SIZE,TYPE AND DIRECTION OF OUTLET PIPE WILL VARY TO SUIT EACH CASE AND INVERT ALTERED ACCORDINGLY.
7. PRECAST INLET SHALL MEET THE REQUIREMENTS OF AASHTO M199.

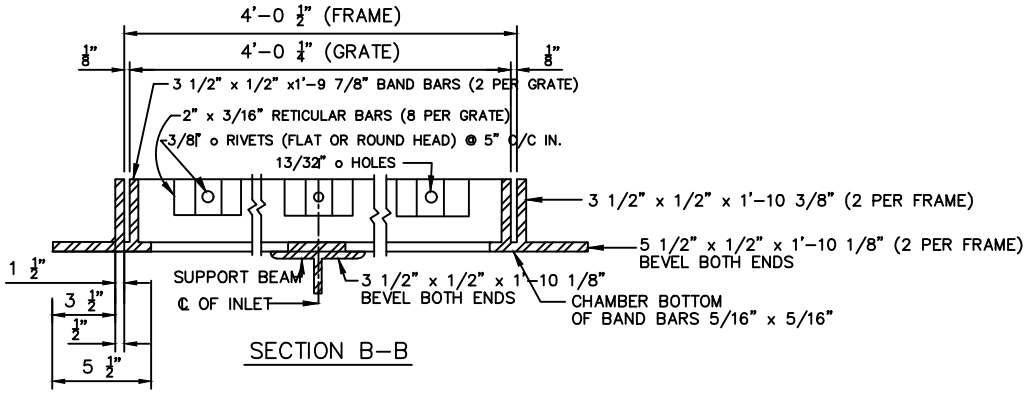
ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS STANDARD NRM INLET	REVISED 04/2024	D 37





GENERAL NOTES

1. FRAMES AND GRATES TO BE SQUARE FLAT AND TRUE.
2. STRUCTURAL STEEL SHALL BE A.S.T.M. DESIDNATION A-36.
3. FRAMES AND GRATES TO BE GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH A.S.T.M. DESIGNATION A-123.



ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS STANDARD NR INLET FRAME AND GRATE	REVISED 04/2024	D 38

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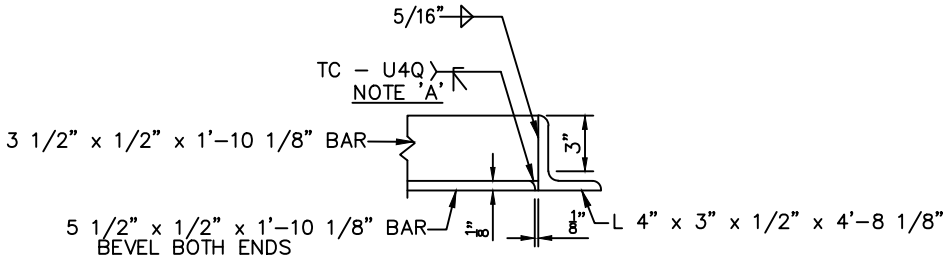
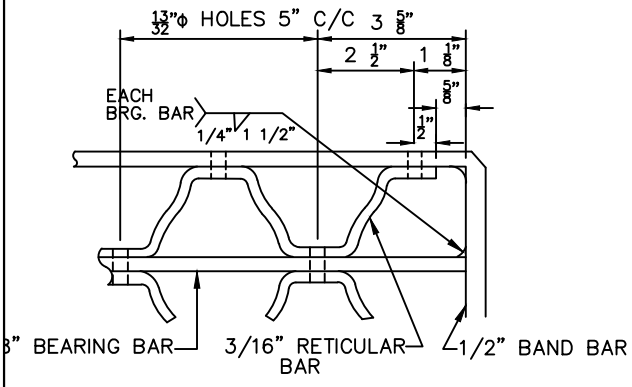
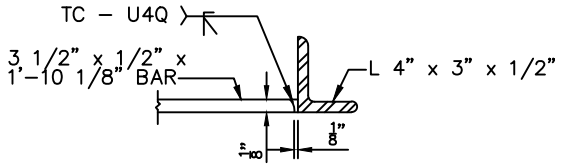
NOTE 'A':
WELD 5 1/2" x 1/2" BAR TO 4" x 3" x1/2" L
BEFORE WELDING 3 1/2" x 1/2" BAR



SECTION C–C

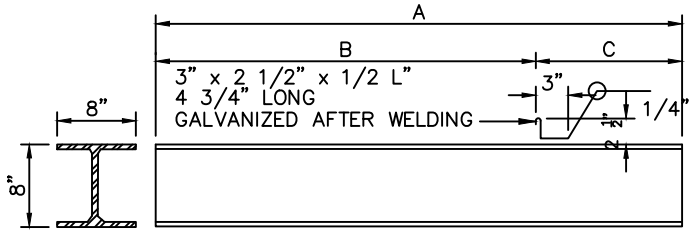


GRATING DETAIL



SECTION D–D
(GRATE NOT SHOWN)

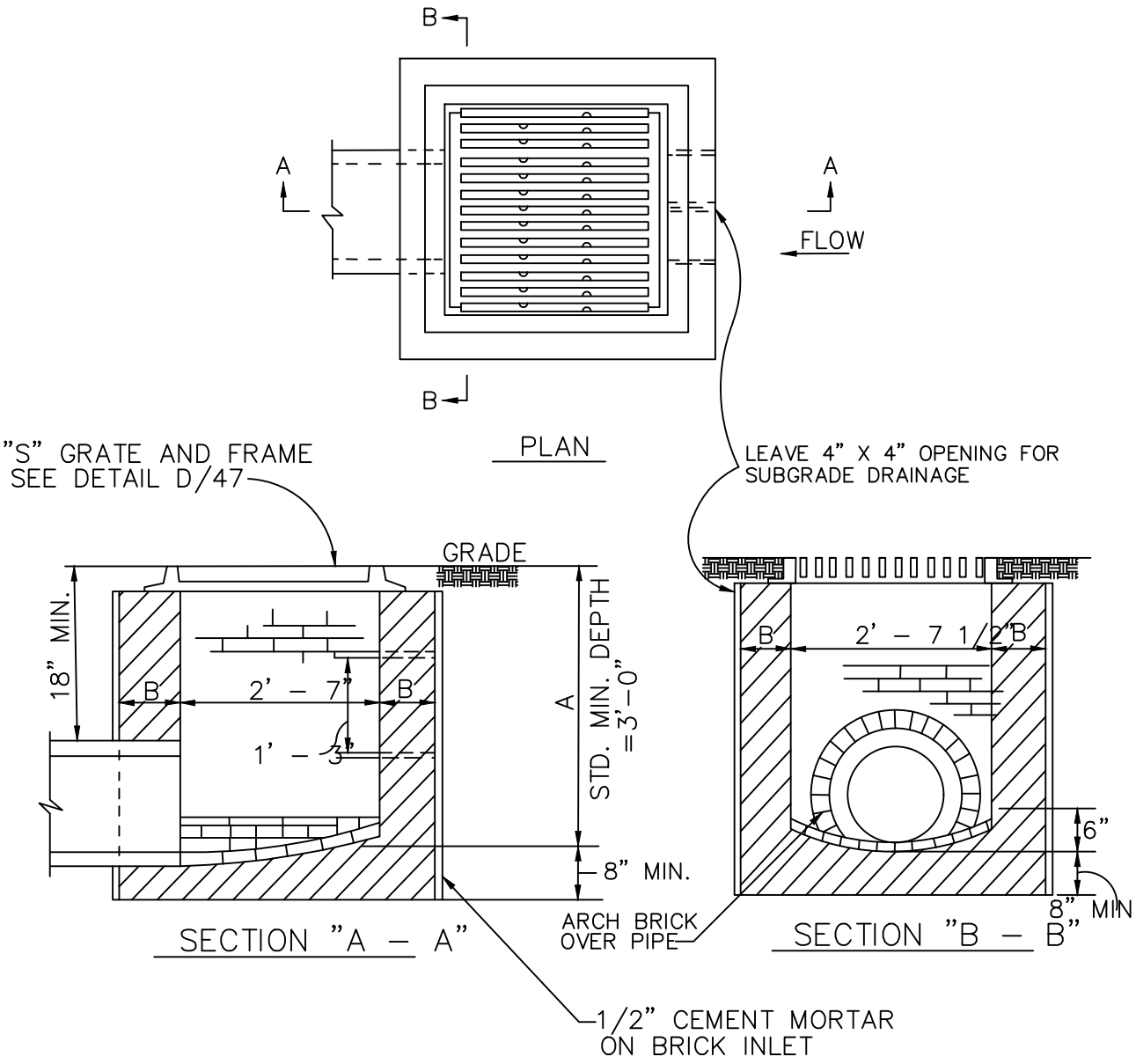
INLET TYPE	DIMENSIONS		
	A	B	C
NR	3'–7 3/8"	2'–5 5/8"	1'–1 3/4"
NRM	5'–5 7/8"	2'–5 5/8"	3'–0 1/4"



SUPPORT BEAM
W8 x 31 ELEC. GALV.

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS STANDARD NR INLET FRAME AND GRATE	REVISED 04/2024	D 39

4/2018



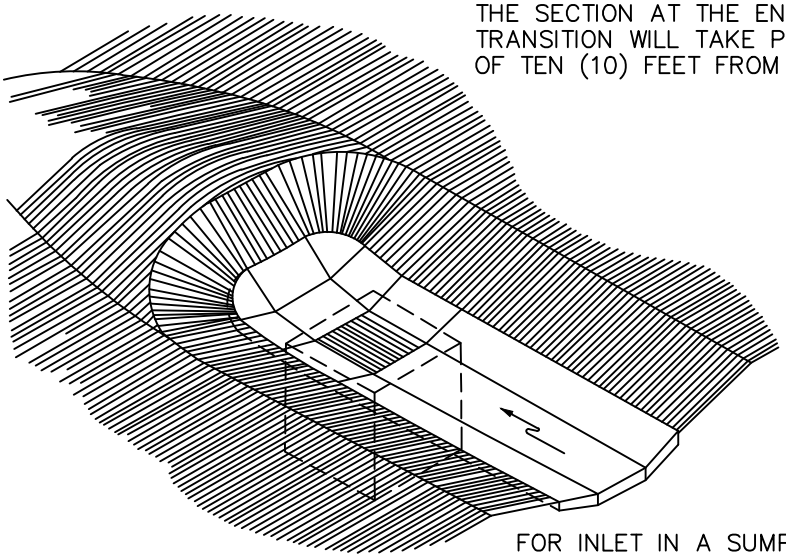
NOTES :

1. WALL AND BASE SHALL BE BRICK OR MIX No. 3 CONCRETE
2. B = 8" WHERE A IS LESS THAN 8'
   B = 12" WHERE A IS 8' TO 14'
3. ALLOWABLE GRADE ADJUSTMENT WITH BRICK MASONRY 4" MIN., 12" MAX.
4. INVERT SHALL BE BRICK LAID ON EDGE.
5. BENCH (AS PER TYPE A MANHOLE) SHALL BE BUILT INTO INLET WHERE DRAINS 24" AND LONGER RUN THROUGH INLET.
6. WHERE A IS 3' – 6" OR GREATER STANDARD MANHOLE STEPS SHALL BE INSTALLED AS SHOWN. SEE DETAIL S/21.
7. PRECAST INLETS SHALL MEET THE REQUIREMENTS OF AASHTO M199

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS TYPE "S" INLET	REVISED 04/2024	D 40

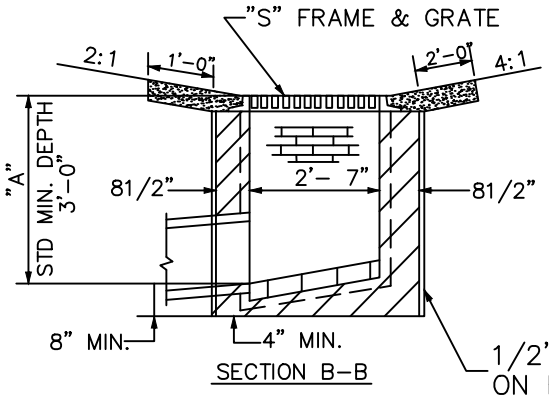
4/2018

NOTE: THE CONCRETE MEDIAN DITCH TO BE USED IN CONNECTION WITH THIS INLET WILL BE WARPED FROM THE STANDARD SECTION TO MEET THE SECTION AT THE END OF THE INLET. THIS TRANSITION WILL TAKE PLACE WITHIN A DISTANCE OF TEN (10) FEET FROM THE INLET.

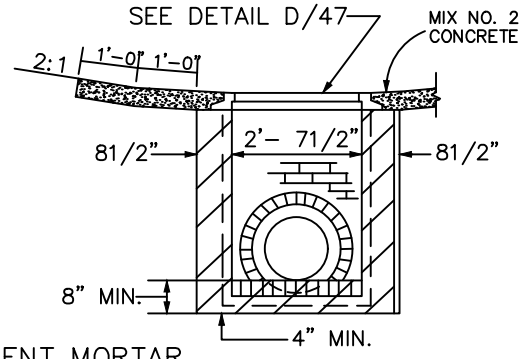


ISOMETRIC VIEW

FOR INLET IN A SUMP.
SEE GUTTER DETAILS AS SHOWN IN THE ISOMETRIC VIEW ON STD. D/43



SECTION B–B



SECTION A–A

1/2" CEMENT MORTAR ON BRICK INLET

NOTES:

1. BASE SHALL BE PLAIN MIX NO. 3 CONCRETE OR BRICK. INVERT SHALL BE BRICK LAID ON EDGE. INVERT TO SLOPE DOWN TOWARD OUTLET AT THE RATE OF TWO (2) INCHES PER FOOT, OR AS DIRECTED.
2. WALLS SHALL BE CONSTRUCTED OF REINFORCED MIX NO. 3 CONCRETE OR BRICK. SIZE, TYPE & DIRECTION OF INLET CONNECTION WILL VARY TO SUIT CONDITIONS,
3. REINFORCEMENT NO. 4 (1/2"D) DEFORMED BARS AT 6"C. TO C., 2" COVER.
4. REINFORCEMENT REQUIRED ON OUTSIDE, AS WELL AS ON INSIDE, OF WALLS BELOW 7'–0", WHEN "A" IS GREATER THAN 7'–0" SPACING SAME AS FOR INSIDE OF WALL.
5. ALLOWABLE GRADE ADJUSTMENT WITH BRICK MASONRY 4" MIN., 12" MAX.
6. STANDARD MANHOLE STEPS SHOULD BE INSTALLED, SEE DETAIL S/21.
7. PRECAST INLETS SHALL MEET THE REQUIREMENTS OF AA SHTO M 199.

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS TYPE SD INLET SINGLE GRATE	REVISED 04/2024	D 41

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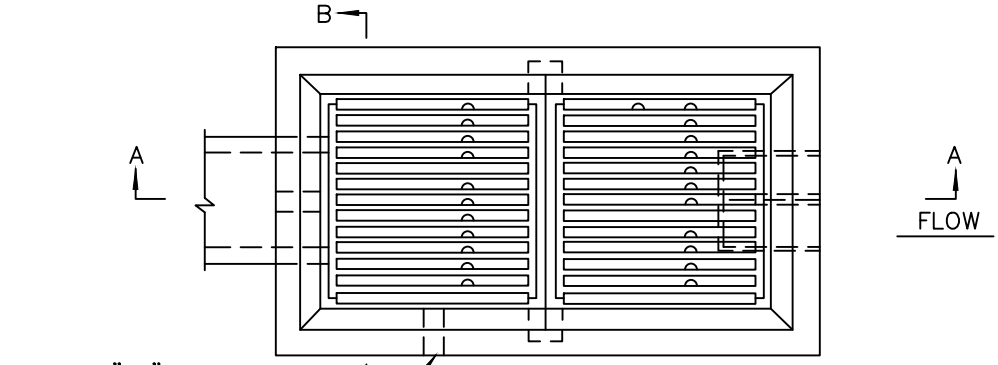
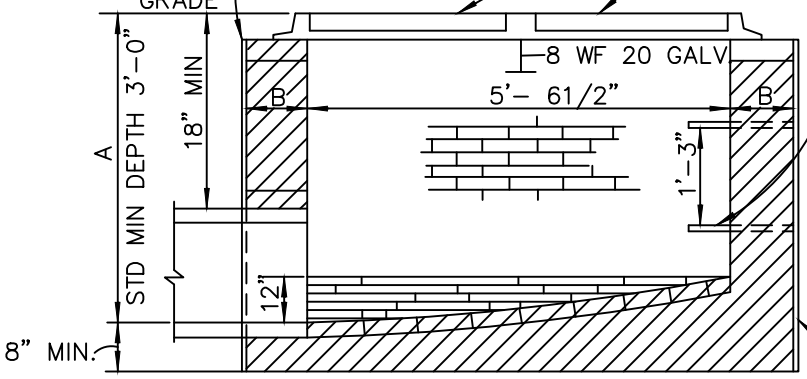


PLAN

LEAVE 4"x4" OPENING FOR SUBGRADE DRAINAGE.

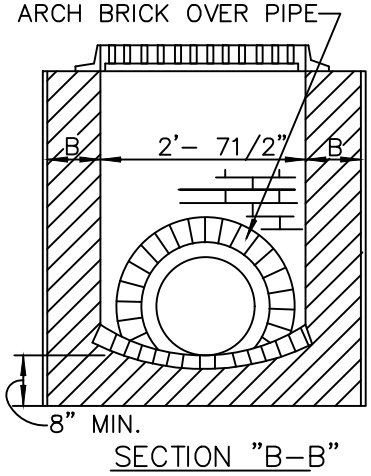
"S" GRATE & FRAME WITH CUT FLANGES SEE DETAILS D/47



WHERE A IS 3'-6" OR GREATER STANDARD MANHOLE STEPS SHALL BE INSTALLED AS SHOWN. SEE DETAIL S/21.

1/2" CEMENT MORTAR ON BRICK INLET

SECTION "A-A"



SECTION "B-B"

NOTES:

1. BASE SHALL BE BRICK OR MIX NO. 3 CONCRETE.
2. WALLS SHALL BE BRICK (8R.) MIX NO. 3 CONCRETE (P.C.) OR REINF. MIX NO. 3 CONC.(R.C.) SEE TABLE FOR DIMENSIONS.
3. "REINFORCING = "4@10"% E.W. IN ℄ OF WAALS. REINFORCING CONTINUOUS AT CORNERS. ALL LAPS 1'-4"
4. ALLOWABLE GRADE ADJUSTMENT WITH BRICK MASONRY 4 4" MIN., 12" MAX.
5. INVERT SHALL BE BRICK LAID ON EDGE.
6. BENCH (AS PER TYPE A MANHOLE) SHALL BE BUILT INTO INLET WHERE DRAINS 24" AND LARGER RUN THROUGH INLET.
7. PRECAST INLETS SHALL MEET THE REQUIREMENTS OF AASHTO M199

A	B	WALLS
< 6'	8"	BR.OR P.C.
6'TO10'	12"	BR.OR P.C.
6'TO15'	8"	R. C.

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS DOUBLE TYPE "S" INLET	REVISED 04/2024	D 42

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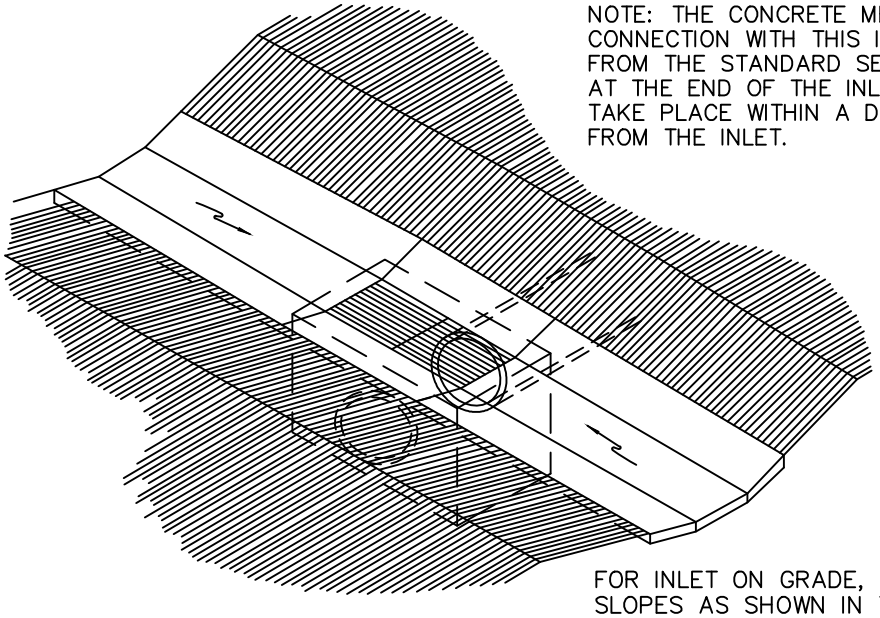
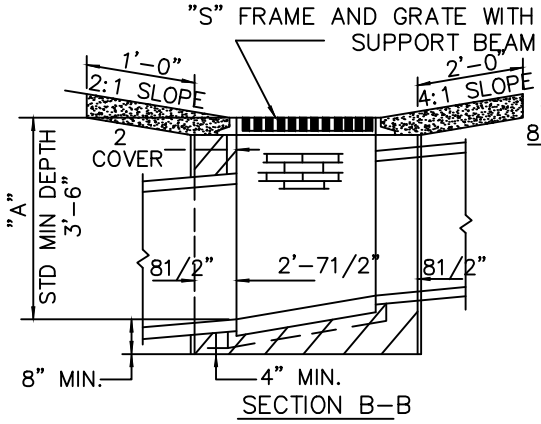
NOTE: THE CONCRETE MEDIAN DITCH TO BE USED IN CONNECTION WITH THIS INLET WILL BE WARPED FROM THE STANDARD SECTION TO MEET THE SECTION AT THE END OF THE INLET. THIS TRANSITION WILL TAKE PLACE WITHIN A DISTANCE OF TEN (10) FEET FROM THE INLET.

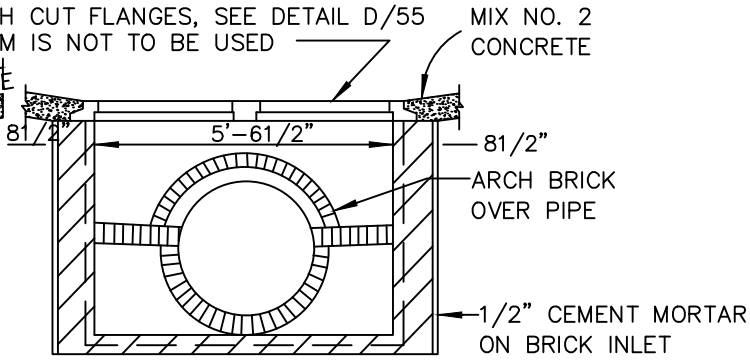


ISOMETRIC VIEW

FOR INLET ON GRADE, MODIFY SLOPES AS SHOWN IN THE ISOMETRIC VIEW ON STD D/41



SECTION B–B



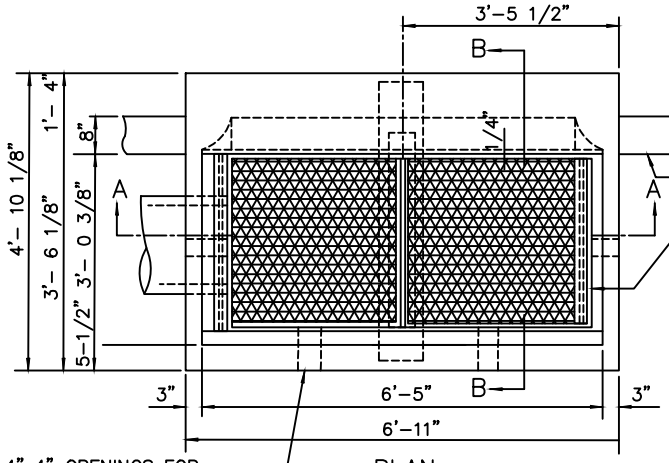
SECTION A–A

NOTES:

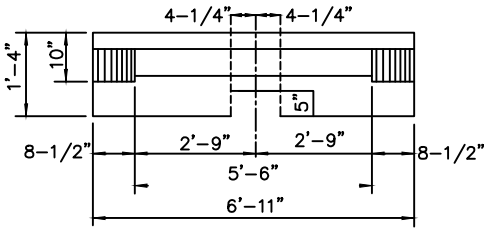
1. BASE SHALL BE PLAIN MIX NO. 3 CONCRETE OR BRICK. INVERT SHALL BE BRICK LAID ON EDGE. INVERT TO SLOPE DOWN TOWARD OUTLET AT THE RATE OF TWO (2) PER FOOT, OR AS DIRECTED.
2. WALLS SHALL BE CONSTRUCTED OF REINFORCED MIX NO. 3 CONCRETE OR BRICK. SIZE, TYPE & DIRECTION OF INLET WILL VARY TO SUIT CONDITIONS.
3. REINFORCEMENT NO. 4 (1/2" D) DEFORMED BARS AT 6"C. TO C., 2" COVER.
4. REINFORCEMENT REQUIRED ON OUTSIDE, AS WELL AS ON INSIDE, OF WALLS BELOW 7'–0" WHEN "A" IS GREATER THAN 7'–0" SPACING, SAME AS FOR INSIDE OF WALL.
5. ALLOWABLE GRADE ADJUSTMENT WITH BRICK MASONRY 4" MIN., 12" MAX.
6. STANDARD MANHOLE STEPS SHOULD BE INSTALLED, SEE DETAIL S/21.
7. PRECAST INLETS SHALL MEET THE RQUIREMENTS OF AASHTO M199.

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS TYPE STD INLET DOUBLE GRATE TANDEM	REVISED 04/2024	D 43

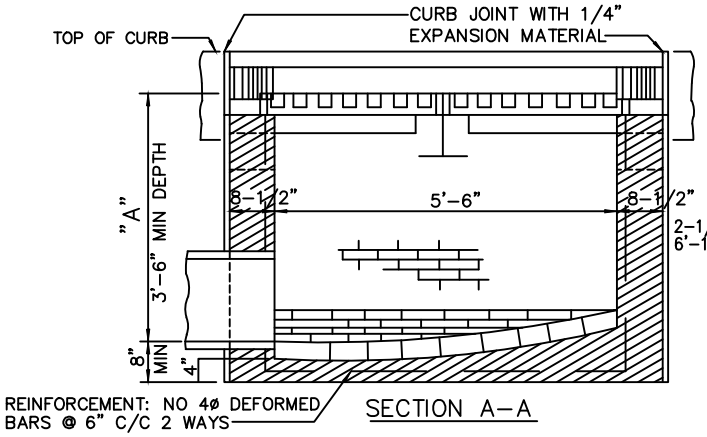
4/2018



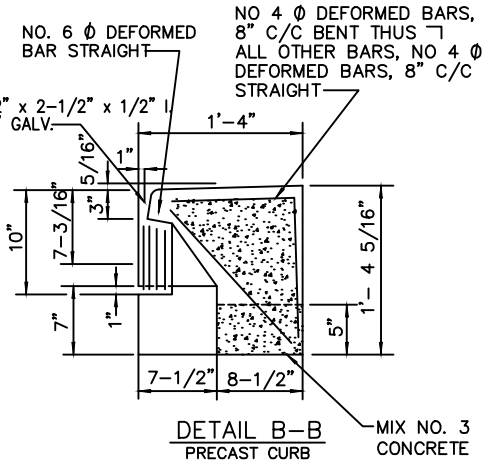
PLAN



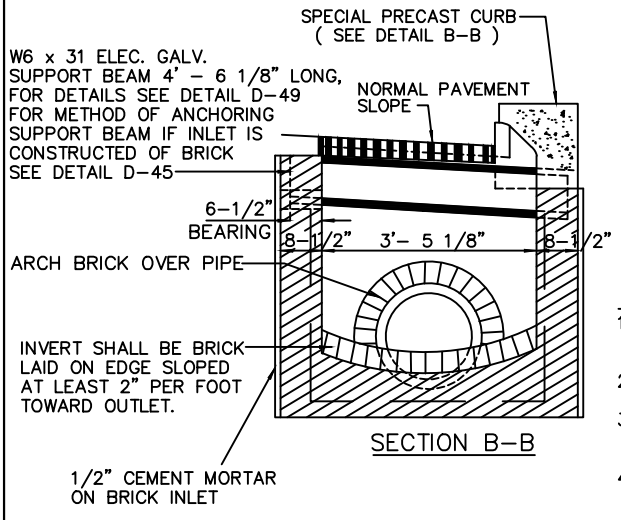
FRONT ELEVATION
PRECAST CURB



SECTION A-A



DETAIL B-B
PRECAST CURB



SECTION B-B

NOTES

1. INLET MAY BE CONSTRUCTED OF REINFORCED CONCRETE (MIX NO. 3) OR BRICK. SIZE, TYPE & DIRECTION OF INLET CONNECTION WILL VARY TO SUIT CONDITIONS.
2. ALLOWABLE GRADE ADJUSTMENT WITH BRICK MASONRY 4" MIN., 12" MAX.
3. REINFORCEMENT REQUIRED ON OUTSIDE, AS WELL AS ON INSIDE, OR WALLS BELOW 7'-0" WHEN "A" IS GREATER THAN 7'-0". SPACING, SAME AS FOR INSIDE OF WALL.
4. PLACE EXPANSION MATERIAL OF SAME TYPE APPROVED FOR PAVEMENT BETWEEN THE FRAME & ABUTTING RIGID PAVEMENT & BETWEEN ENDS OF INLET CURB & NORMAL CURB.
5. FOR UNDEPRESSED INLETS, USE NORMAL PAVEMENT SLOPE, FOR DEPRESSED INLETS SEE DETAIL D-51.
6. PRECAST INLETS SHALL MEET THE REQUIREMENTS OF AASHTO M199.
7. STANDARD MANHOLE STEPS SHALL BE INSTALLED @ 1'-3" o/c, SEE DETAIL S/21.

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS STANDARD WR INLET	REVISED 04/2024	D 44

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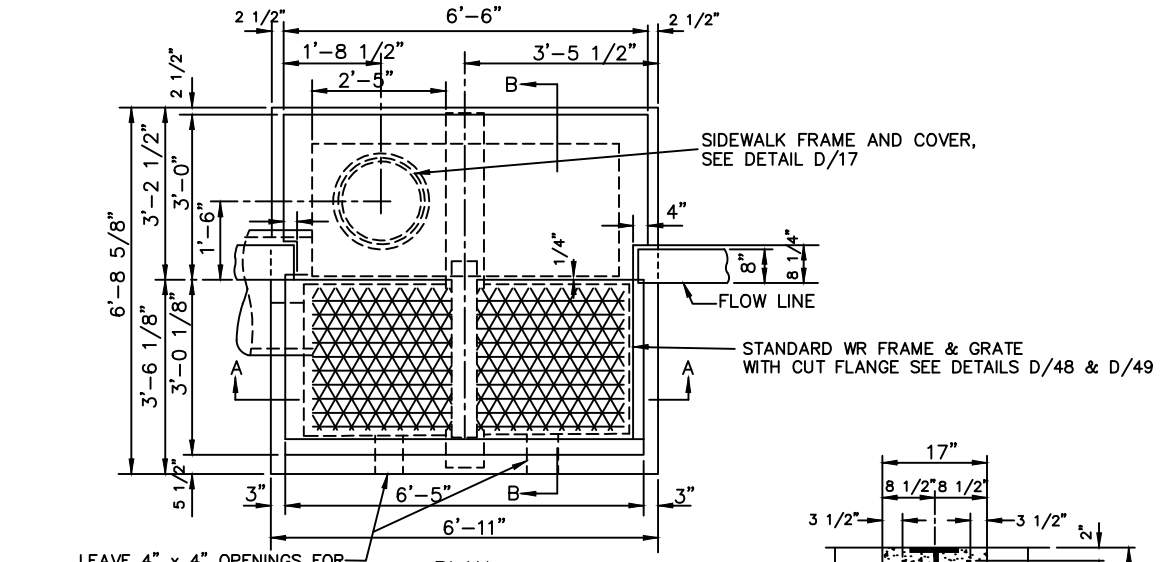
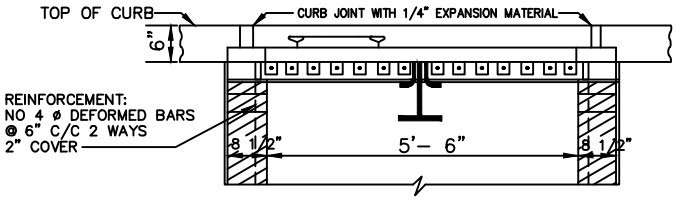
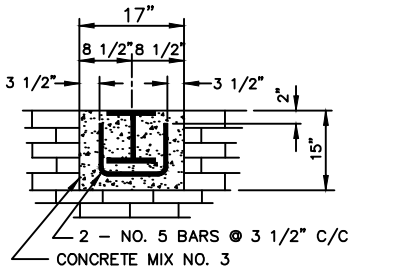
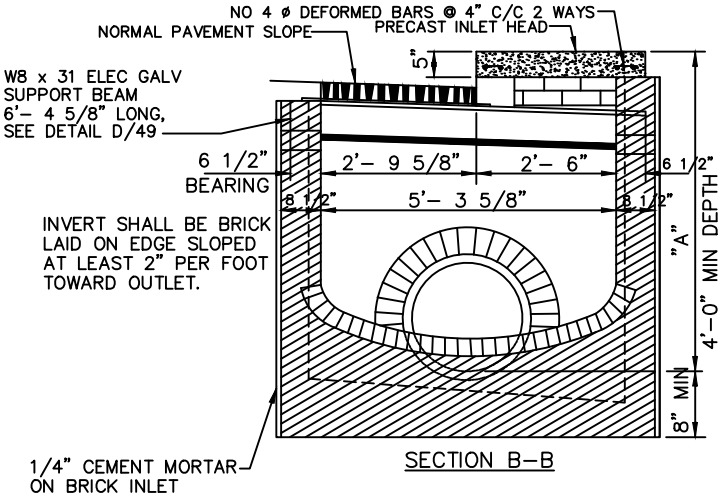




SECTION A–A



METHOD OF ANCHORING SUPPORT BEAM
IF INLET IS CONSTRUCTED OF BRICK



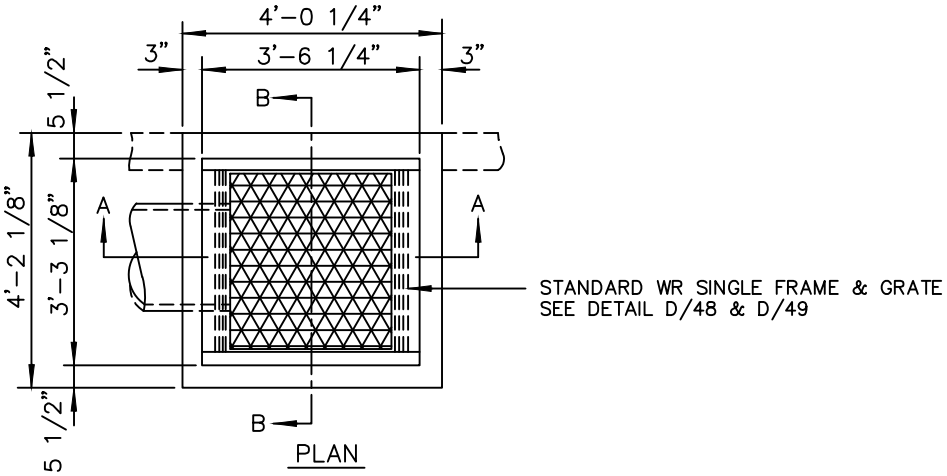
SECTION B–B

NOTES:

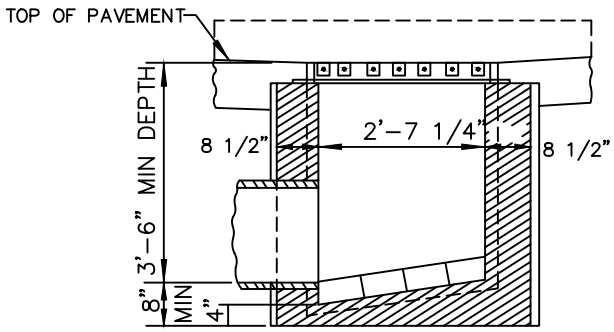
1. INLET MAY BE CONSTRUCTED OF REINFORCED CONCRETE (MIX NO. 3) OR BRICK, SIZE, TYPE & DIRECTION OF INLET CONNECTION WILL VARY TO SUIT CONDITIONS.
2. ALLOWABLE GRADE ADJUSTMENT WITH BRICK MASONRY 4" MIN., 12" MAX.
3. REINFORCEMENT REQUIRED ON OUTSIDE, AS WELL AS INSIDE, OF WALL BELOW 7'–0" WHEN "A" IS GREATER THAN 7'–0". SPACING SAME AS FOR INSIDE OF WALL.
4. PLACE EXPANSION MATERIAL OF SAME TYPE APPROVED FOR PAVEMENT BETWEEN ENDS OF INLET CURB & NORMAL CURB.
5. FOR UNDEPRESSED INLETS, USE NORMAL PAVEMENT SLOPE, FOR DEPRESSED INLETS, SEE DETAIL D/51.
6. PRECAST INLET SHALL MEET THE REQUIREMENTS OF AASHTO M199.
7. STANDARD MANHOLE STEPS SHALL BE INSTALLED @ 1'–3" o/c, SEE DETAIL S/21.

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS STANDARD WRM INLET	REVISED 04/2024	D 45

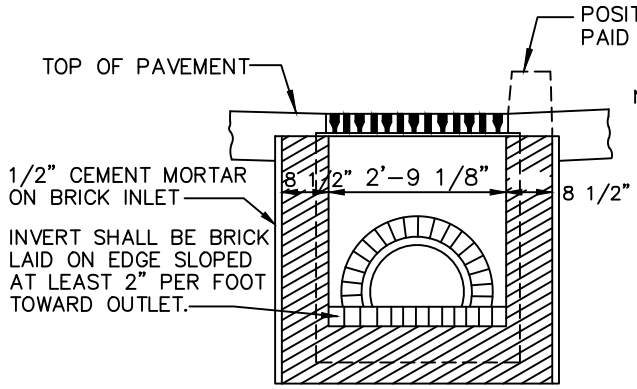
2/2018



PLAN



SECTION A–A



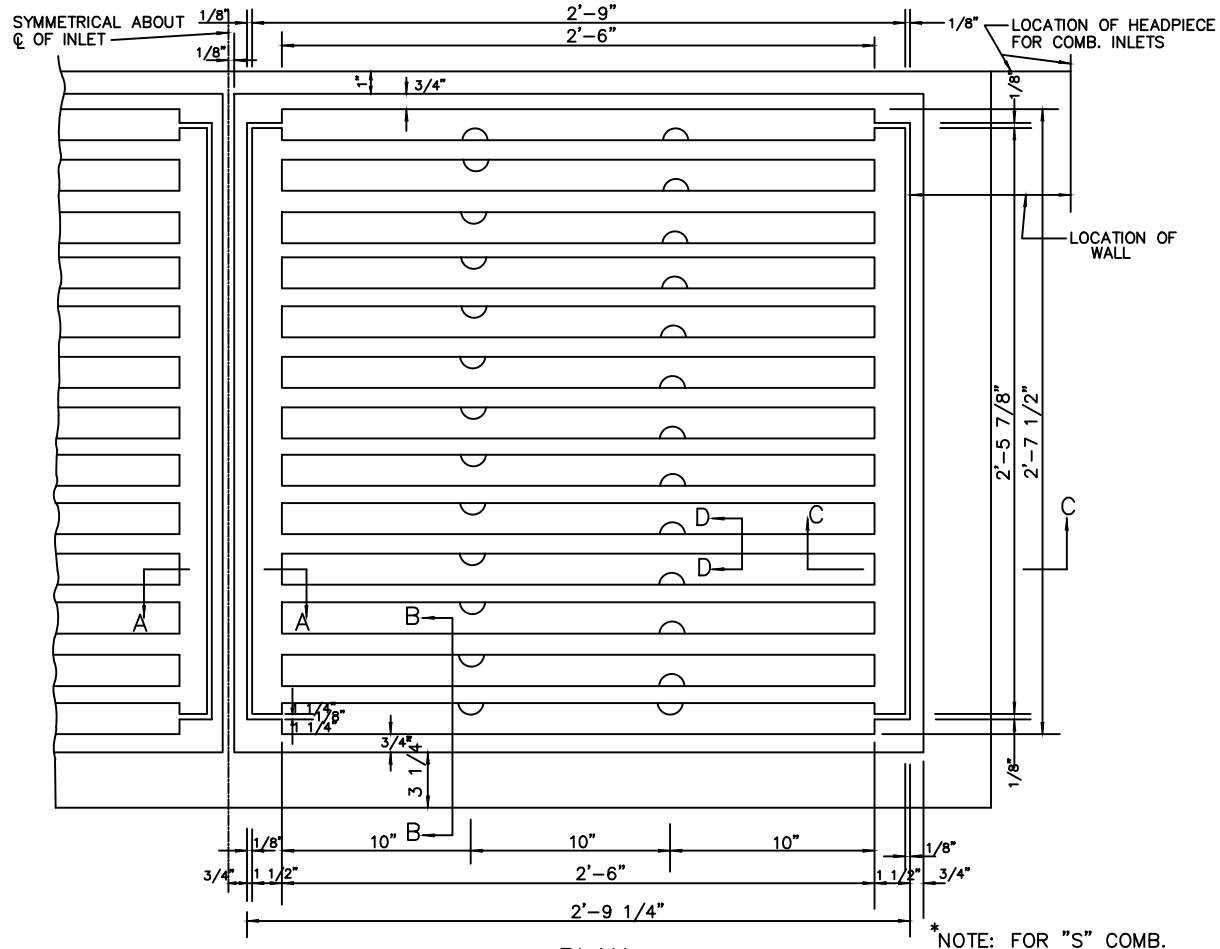
SECTION B–B

NOTES:

1. BASE SHALL BE BRICK OR MIX NO. 3 CONCRETE.
2. WALLS SHALL BE BRICK, MIX NO. 3 CONCRETE, OR REINFORCED MIX NO. 3 CONCRETE:
   DEPTH: <6', WALL 8" BRICK OR CONCRETE
   6' TO 10', WELL 12" BRICK OR CONCRETE
   6' TO 15', WELL 8" REINFORCED CONCRETE
3. REINFORCING 4 @ 10" lp/c E.W. C OF WALLS REINFORCING CONTINUOUS AT CORNERS MINIMUM LAP 1'-4"
4. ALLOWABLE GRADE ADJUSTMENT WITH BRICK MASONRY 4" MIN., 12" MAX.
5. STANDARD MANHOLE STEPS SHALL BE INSTALLED, SEE DETAIL S/21
6. SIZE, TYPE AND DIRECTION OF OUTLET PIPE WILL VARY TO SUIT EACH CASE AND THE INVERT ALTERED ACCORDINGLY.
7. PRECAST INLET SHALL MEET THE REQUIREMENT OF AASHTO M199.

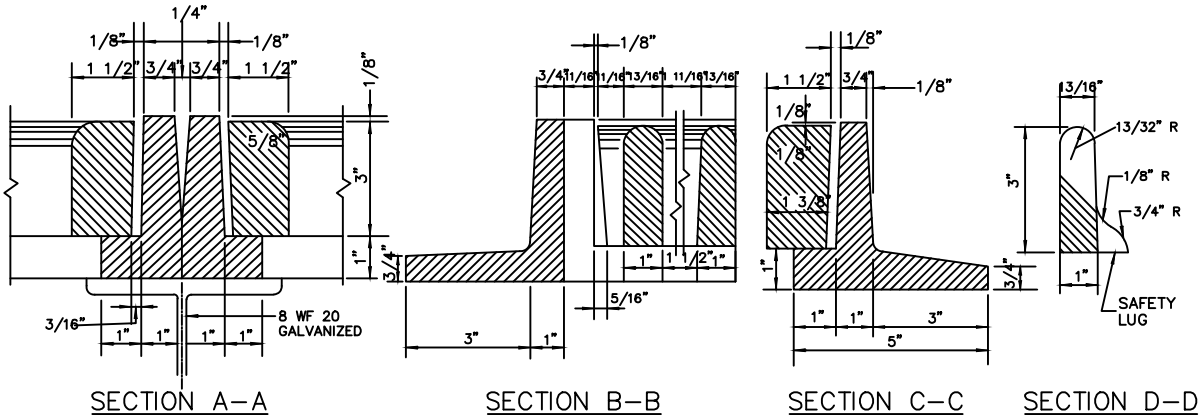
ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS STANDARD WR INLET	REVISED 04/2024	D 46

2/2018



PLAN

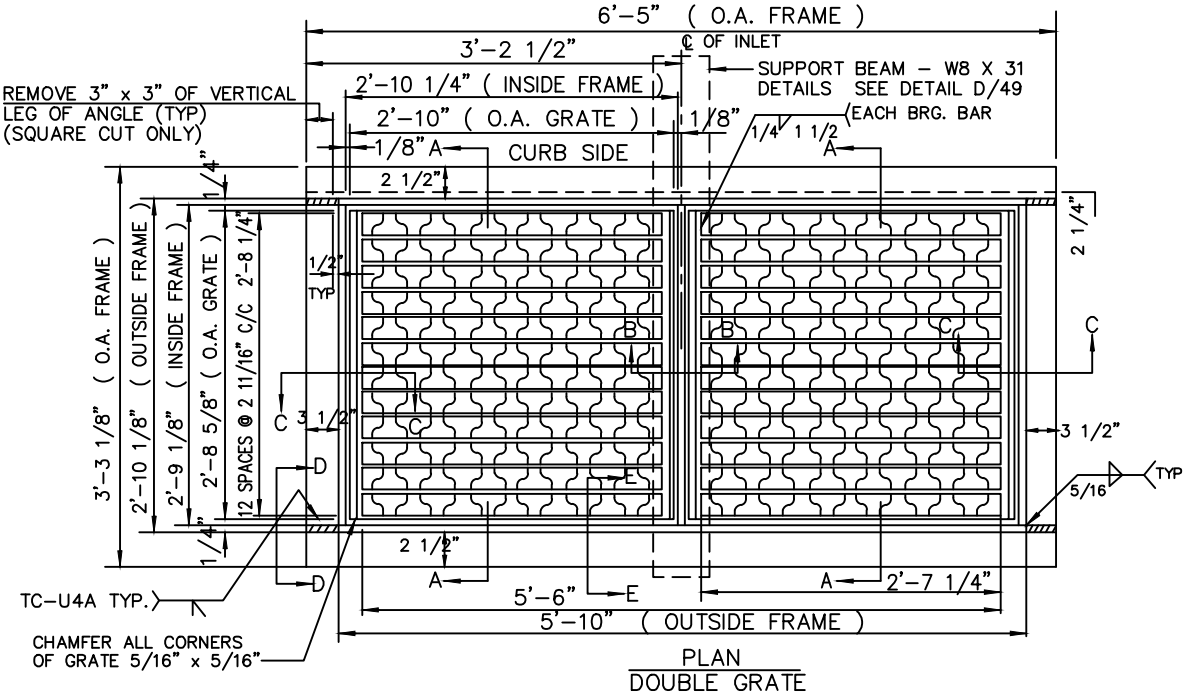
DOUBLE "S" COMB. COMBINATION INLET*



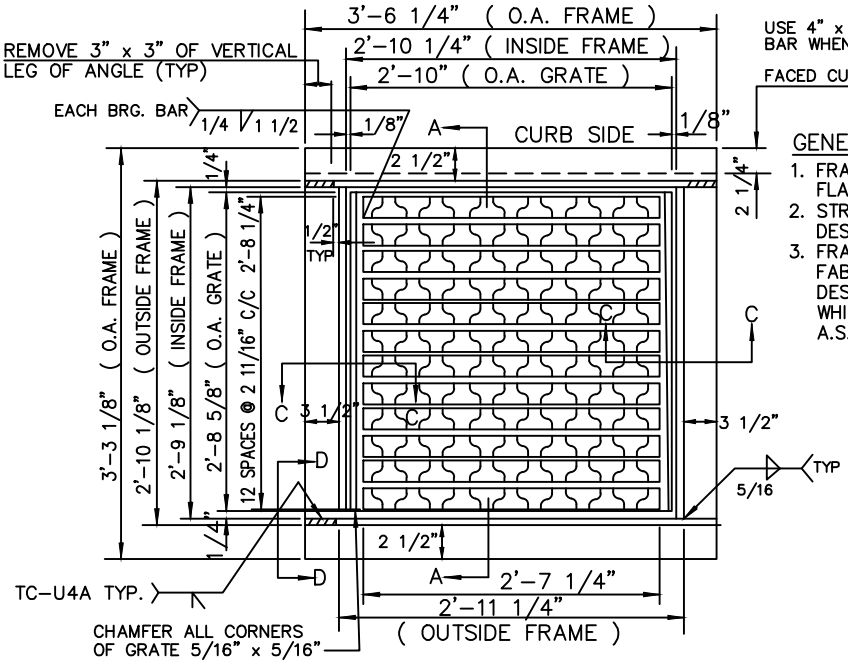
SECTION A–A | SECTION B–B | SECTION C–C | SECTION D–D

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS "S" GRATE DETAILS	REVISED 04/2024	D 47

2/2018



PLAN
DOUBLE GRATE



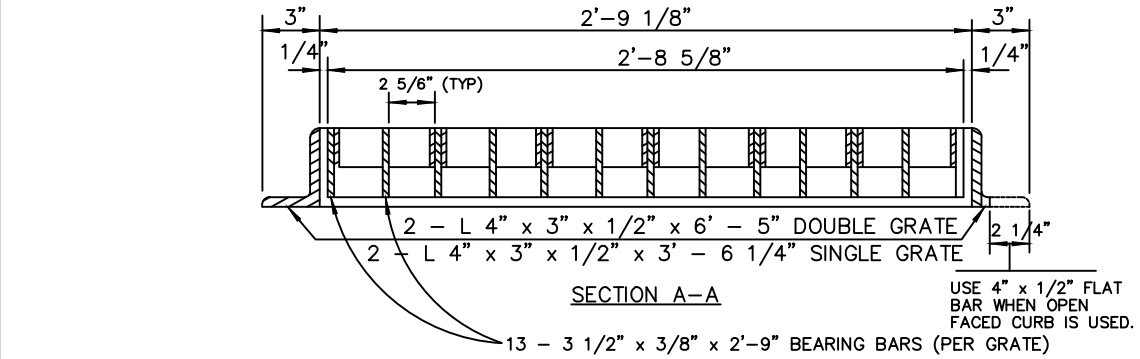
PLAN
SINGLE GRATE

GENERAL NOTES

1. FRAMES & GRATES TO BE SQUARE FLAT AND TRUE.
2. STRUCTURAL STEEL SHALL BE A.S.T.M. DESIGNATION A\36.
3. FRAMES & GRATES TO BE GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH A.S.T.M. DESIGNATION A\123 EXCEPT FOR ADHERENCE WHICH SHALL BE IN ACCORDANCE WITH A.S.T.M. DESIGNATION A\153.

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS STANDARD WR INLET FRAME & GRATE	REVISED 04/2024	D 48

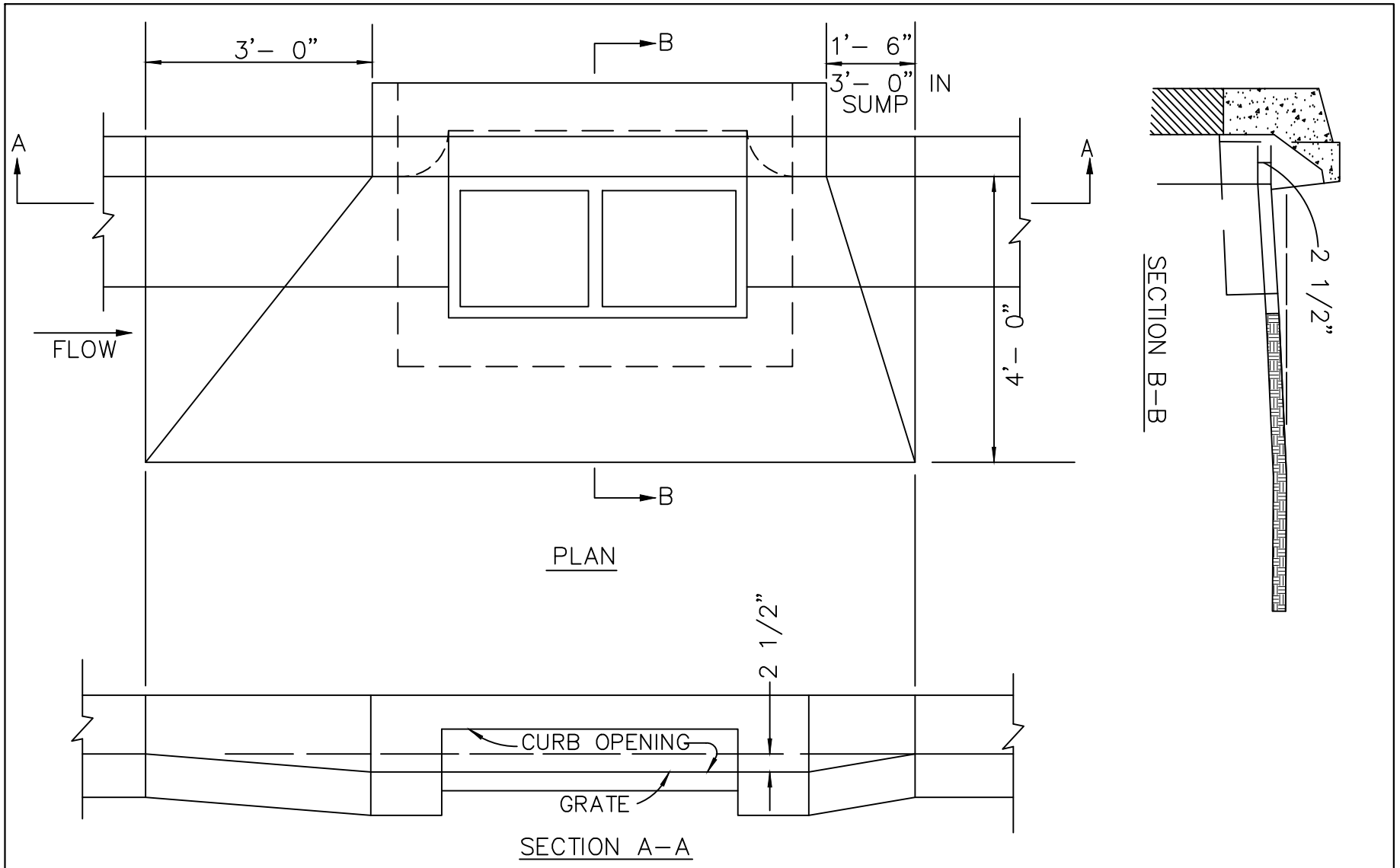
2/2018



INLET TYPE	DIMENSIONS		
	A	B	C
WR	4'–6 1/8"	3'–4 3/8"	1'–1 3/4"
WRM	6'–4 5/8"	3'–4 3/8"	3'–0 1/4"

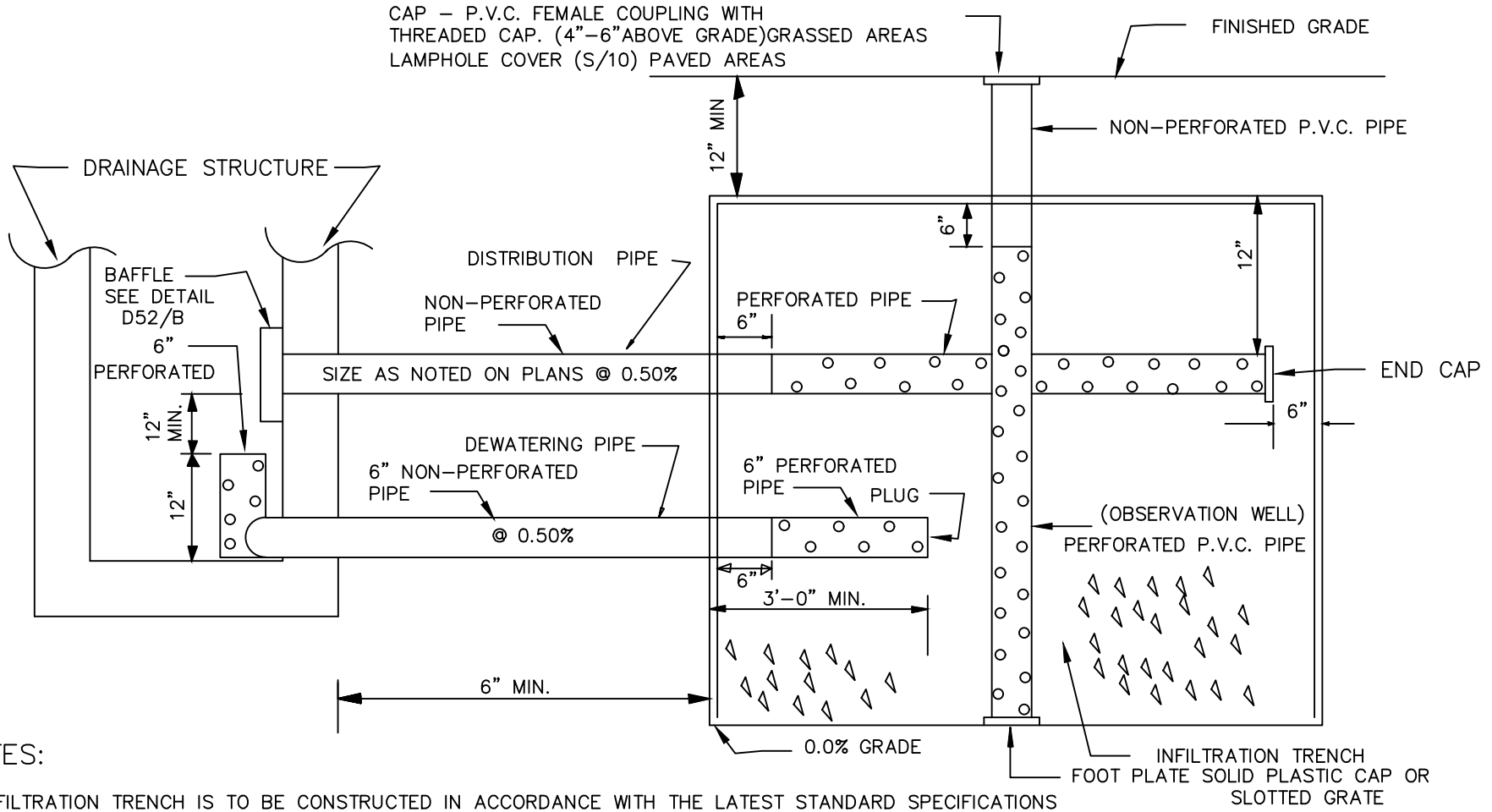
ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS STANDARD WR INLET FRAME & GRATE	REVISED 04/2024	D 49

2/2018



ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS INLET DEPRESSION DETAIL	REVISED 04/2024	D 51

2/2018

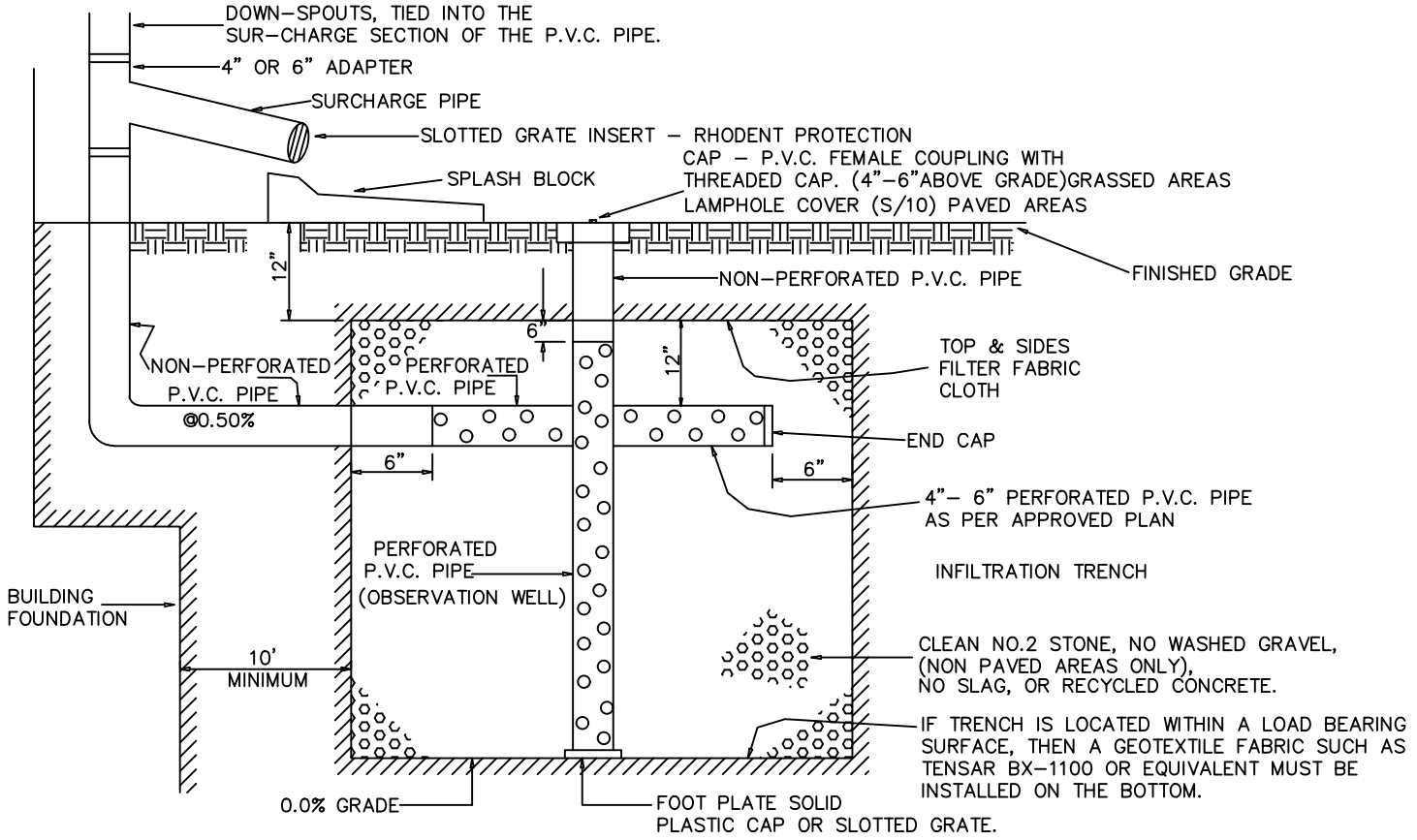


NOTES:

1. INFILTRATION TRENCH IS TO BE CONSTRUCTED IN ACCORDANCE WITH THE LATEST STANDARD SPECIFICATIONS AND AS SHOWN ON THE PLANS.
2. FILTER CLOTH SHALL BE PLACED ON THE SIDES AND TOP OF THE TRENCH. OVERLAP FILTER CLOTH: TOP – 6 INCHES, SIDE – 2 FEET
3. COURSE FABRIC WITH (1/2" to 1") MESH TO BE PLACED AT BOTTOM OF TRENCH.
4. TRENCH SHALL BE THE SIZE NOTED ON THE PLANS.
5. DISTRIBUTION PIPE SHALL BE SET (1'–0" MIN) BELOW THE LOWEST INVERT OF THE DRAINAGE STRUCTURE OUTLET PIPES (EXCLUDING DEWATERING PIPE).
6. CLEANOUT AT THE END OF DISTRIBUTION PIPE SIMILIAR TO DETAIL (S/18) SHALL BE PROVIDED WHERE NOTED ON THE PLANS OR FOR SYSTEMS REQUIRING MORE THAN 100' OF DISTRIBUTION PIPE.

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS TYPICAL INFILTRATION STRUCTURE (FROM DRAINAGE STRUCTURE)	REVISED 04/2024	D 52

2/2018

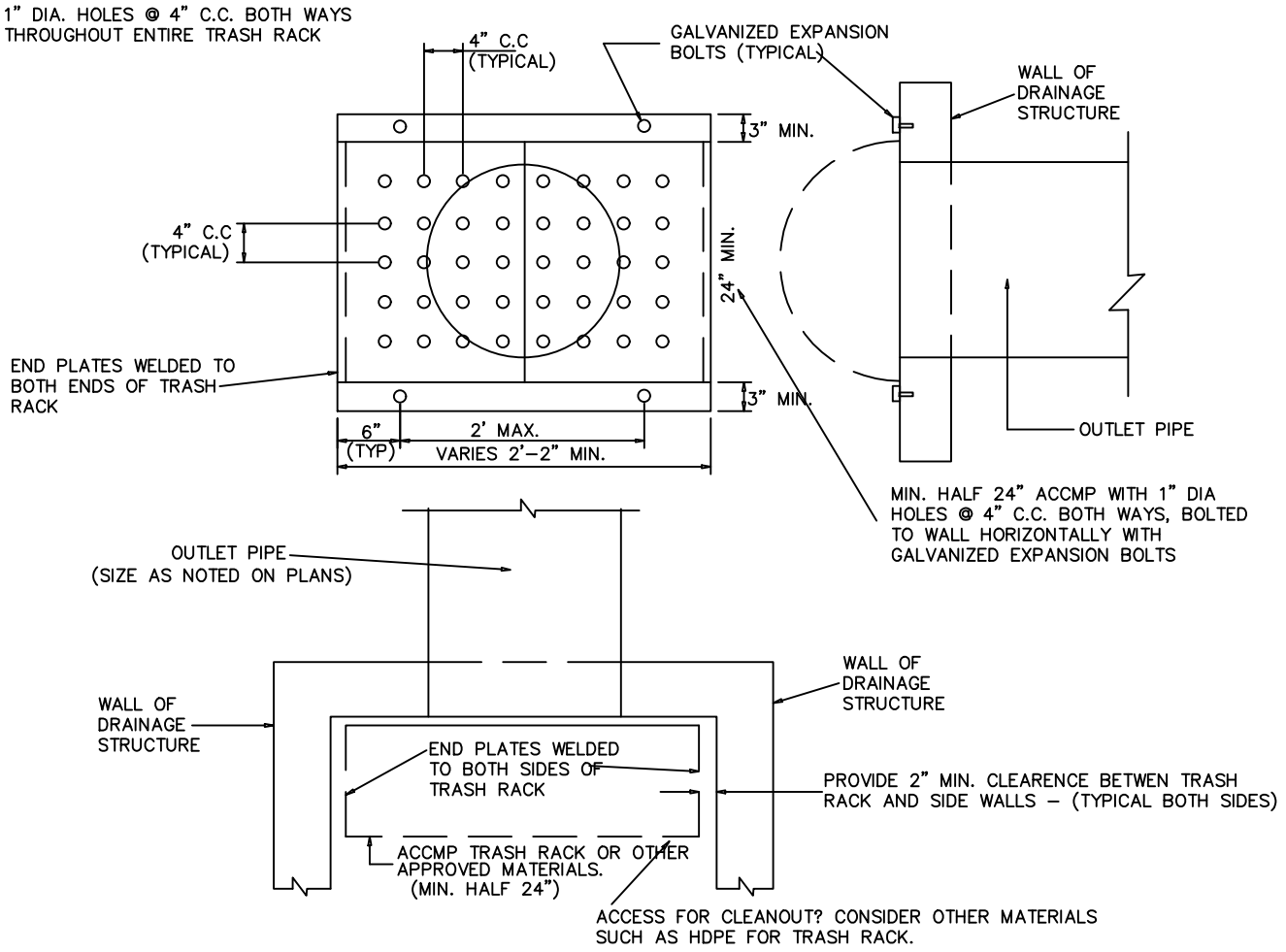


NOTES:

1. INFILTRATION TRENCH IS TO BE CONSTRUCTED IN ACCORDANCE WITH THE LATEST STANDARD SPECIFICATIONS AND AS SHOWN ON THE PLANS.
2. FILTER CLOTH SHALL BE PLACED ON THE SIDES AND TOP OF THE TRENCH. OVERLAP FILTER CLOTH: TOP – 6 INCHES, SIDE – 2 FEET
3. LOAD BEARING SURFACE: PARKING LOTS, SIDEWALKS DRIVEWAYS USE SCH 40 P.V.C. PIPE
4. NON–LOAD BEARING SURFACE: USE S.D.R.–35 OR SCH 40 OR P.V.C. PIPE STAMPED WITH 3,000 LBS.–CRUSH
5. 4" OR 6" P.V.C. PIPE USED AS –PER APPROVED PLANS
6. TRENCH SHALL BE THE SIZE NOTED ON THE PLANS.
7. ALL DOWN–SPOUTS FROM SITE HAVE TO BE HOOKED–UP TO THE S.W.M. DEVICE

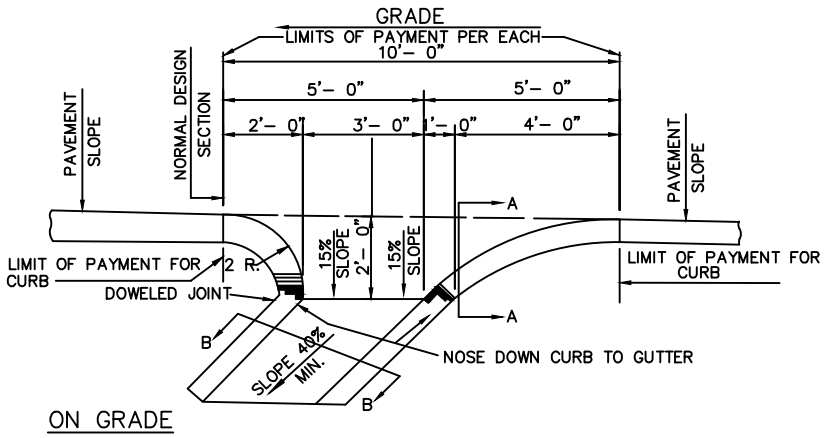
ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS TYPICAL INFILTRATION STRUCTURE (FROM ROOF LEADERS OF BUILDING)	REVISED 04/2024	D 52A

2/2018

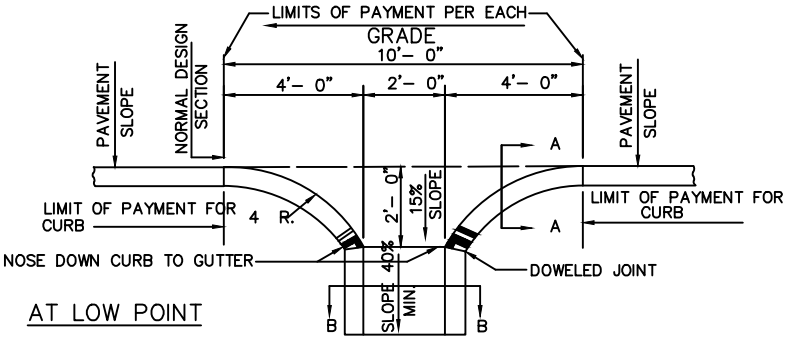


ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS TYPICAL INFILTRATION STRUCTURE (BAFFEL)	REVISED 04/2024	D 52B

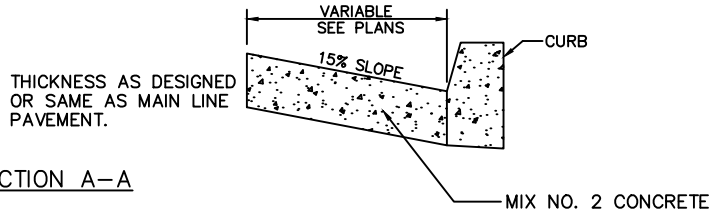
2/2018



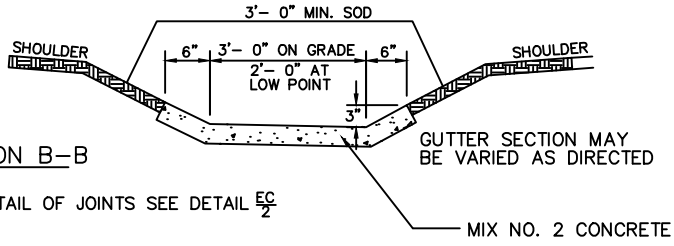
ON GRADE



AT LOW POINT



SECTION A–A

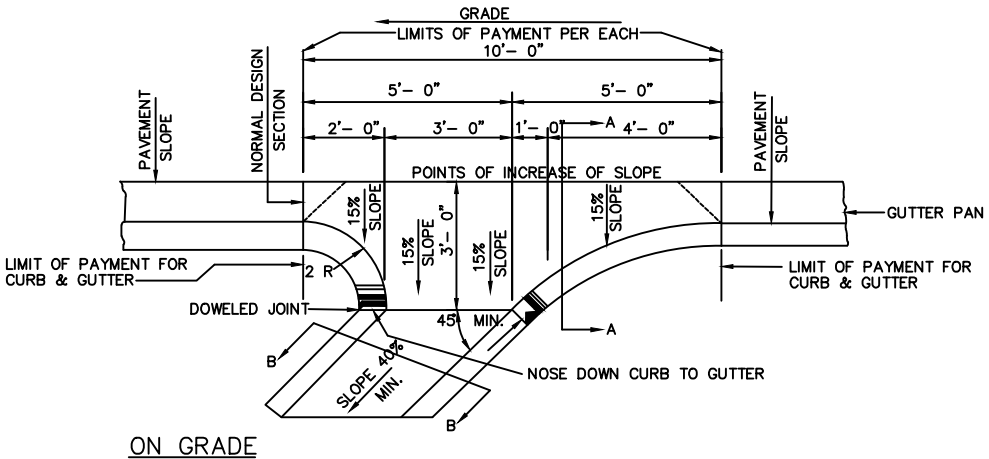


SECTION B–B

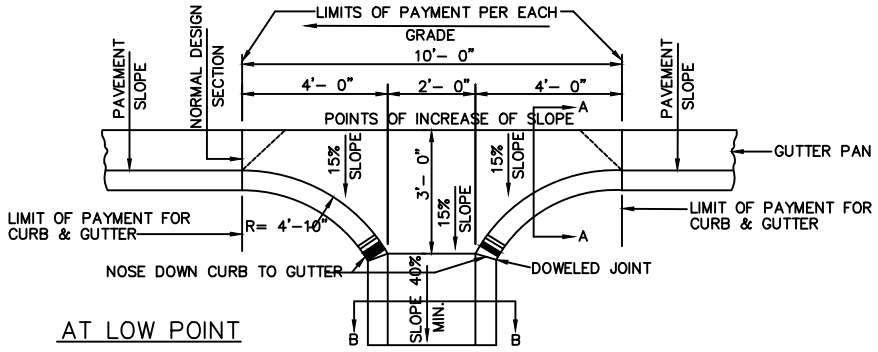
NOTE: FOR DETAIL OF JOINTS SEE DETAIL $\frac{EC}{2}$

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS STANDARD CURB OPENING DETAIL CURB SECTION	REVISED 04/2024	D 53

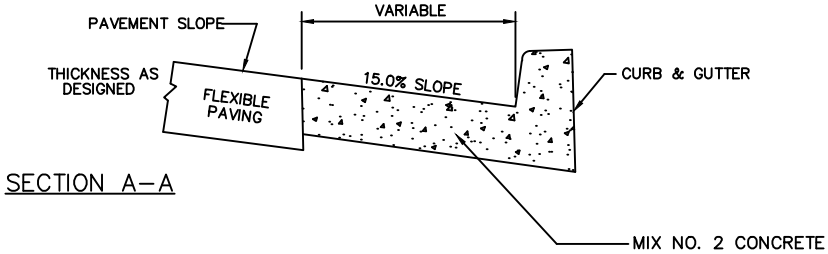
3/2018



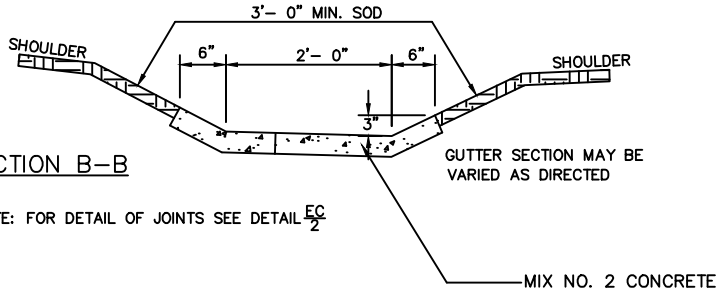
ON GRADE



AT LOW POINT



SECTION A–A

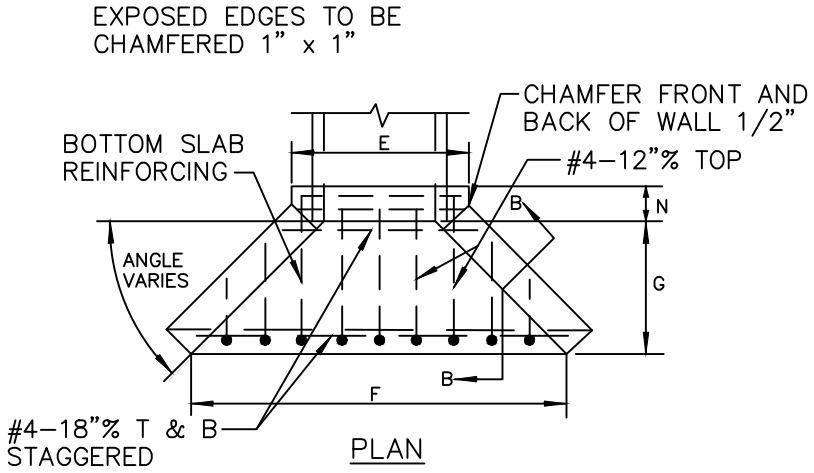


SECTION B–B

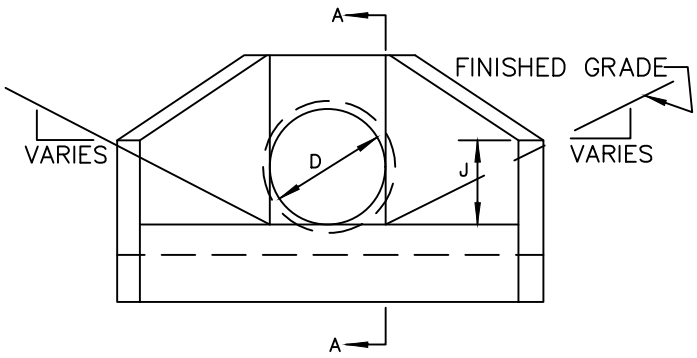
NOTE: FOR DETAIL OF JOINTS SEE DETAIL $\frac{EC}{2}$

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS STANDARD CURB OPENING DETAIL CURB & GUTTER SECTION	REVISED 04/2024	D 54

3/2018



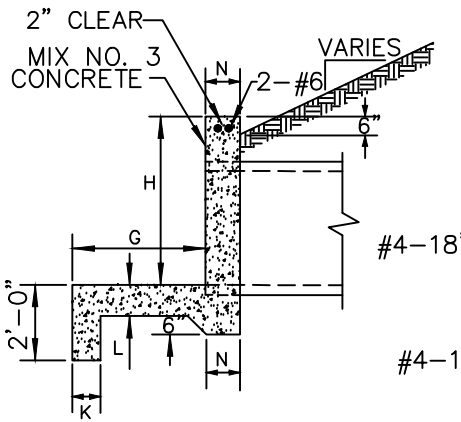
PLAN



FRONT ELEVATION

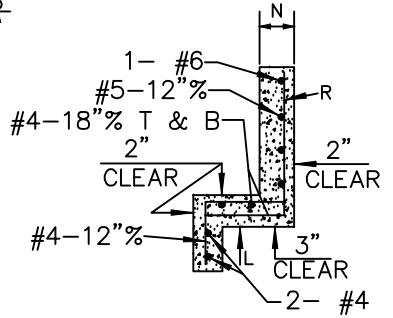
D	E	F	G	H	J	K	L	N	R	VOL CY
18"	3'-0"	7'-6"	3'-0"	3'-0"	2'-0"	8"	8"	8"	#5-12"%	1.70
21"	3'-4"	7'-9"		3'-3"	2'-0"					1.80
24"	3'-8"	8'-0"	3'-0"	3'-6"	2'-0"	8"	8"	8"	#5-12"%	1.90
27"	3'-11"	8'-3"		3'-9"	2'-0"					2.00
30"	4'-2"	8'-6"	3'-0"	4'-0"	2'-1"	8"	8"	10"	#5-12"%	2.85
36"	4'-8"	10'-0"	3'-6"	4'-6"	2'-3"	8"	10"	10"	#5-12"%	3.15
42"	5'-3"	11'-6"	4'-0"	5'-0"	2'-9"	8"	10"	10"	#5-12"%	3.87
48"	5'-10"	13'-0"	4'-6"	5'-6"	3'-0"	8"	10"	12"	#5-12"%	5.08
54"	6'-5"	14'-6"	5'-0"	6'-0"	3'-3"	9"	12"	12"	#6-8"%	6.50
60"	7'-0"	16'-0"	5'-6"	6'-6"	3'-6"	9"	12"	12"	#6-8"%	7.98
66"	7'-7"	17'-6"	6-0"	7'-0"	3'-9"	9"	12"	14"	#6-8"%	9.14
72"	8'-2"	19'-0"	6-6"	7'-6"	4'-3"	9"	12"	14"	#6-8"%	11.10

BASED ON 2:1 CHANNEL SIDE SLOPES AND 45° ANGLE



SECTION A-A

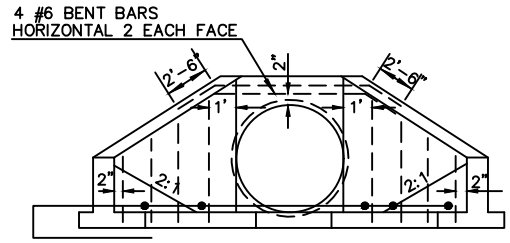
NOTE:
HEADWALL TO BE PARALLEL TO ℄ OF ROADWAY UNLESS OTHERWISE NOTED IN CONTRACT DRAWINGS.



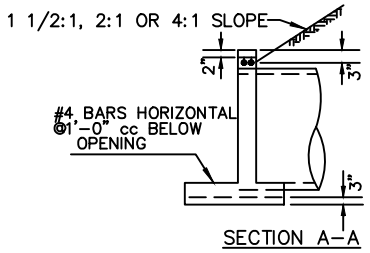
SECTION B-B

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAIL TYPE "A" HEADWALL CIRCULAR PIPE	REVISED 04/2024	D 55

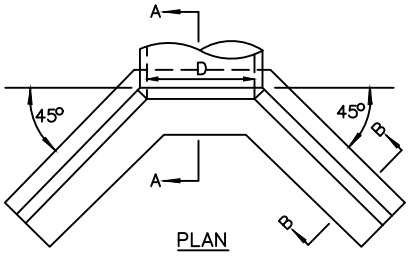
3/2018



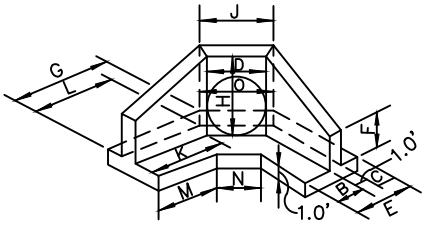
FRONT ELEVATION



SECTION A-A

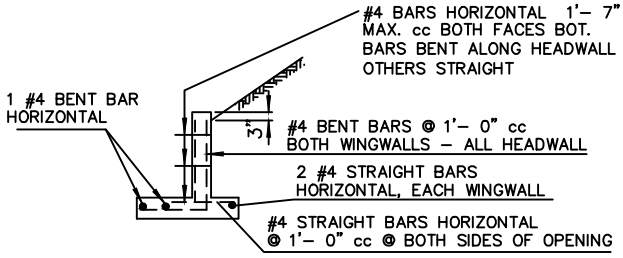


PLAN

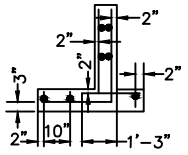


ISOMETRIC VIEW

NOTE: WHENEVER THIS HEADWALL IS USED IN CONJUNCTION WITH A PAVED CHANNEL WITH FOOTING OF THE HEADWALL SHALL BE LOWERED BELOW THE FINISHED GRADE OF THE CHANNEL THE THICKNESS OF THE CHANNEL PAVING IN ORDER THAT THE CHANNEL MIGHT BE BLENDED INTO THE HEADWALL. THE "H" AND "F" DIMENSIONS AND THE STEEL REINFORCING SHALL BE ADJUSTED.



SECTION B-B



DISPOSITION OF BARS DETAIL

GENERAL NOTES

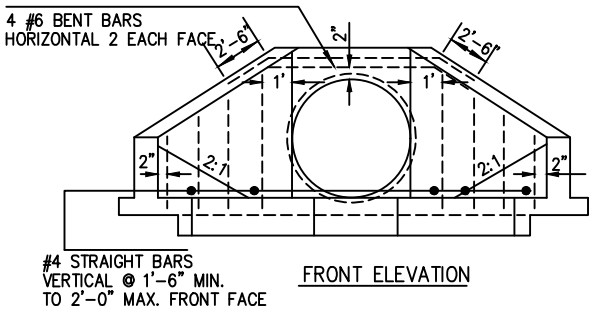
CONCRETE	: MIX NO. 3
REINFORCING	: DEFORMED STEEL BARS #4 & #6
CHAMFER	: ALL EXPOSED EDGES 1" x 1" OR AS DIRECTED

QUANTITIES IN TABLE TO BE USED FOR ESTIMATING ONLY

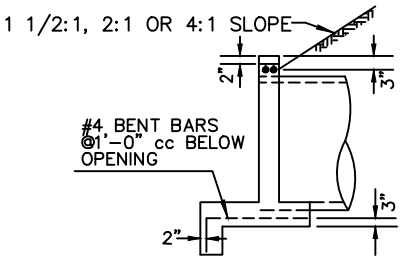
OPENING		DIMENSIONS													VOL.	STEEL
D INCHES	AREA SQ. FT.	B	C	E	F	G	H	J	K	L	M	N	O		CONC. CY.	LBS.
48	12.57	1'- 4"	10"	3'- 2"	2'- 9"	7'-0 3/4"	5'- 0"	4'- 10"	6'-3 1/2"	6'-8 1/2"	5'- 9"	2'-10 3/4"	5'- 6"		4.3	262
54	15.90	1'- 8"	1'- 0"	3'- 8"	3'- 0"	7'-8 1/2"	5'- 6"	5'- 4"	6'-10 1/2"	7'-3 1/2"	6'-2 1/4"	3'-1 1/2"	6'- 2"		5.3	301
60	19.64	1'- 8"	1'- 0"	3'- 8"	3'- 3"	8'- 5"	6'- 0"	5'- 10"	7'-7 1/4"	8'-0 1/4"	6'- 11"	3'-7 1/2"	6'- 8"		6.0	361

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS MODIFIED TYPE A-1 HEADWALL 48", 54", 60"	REVISED 04/2024	D 56

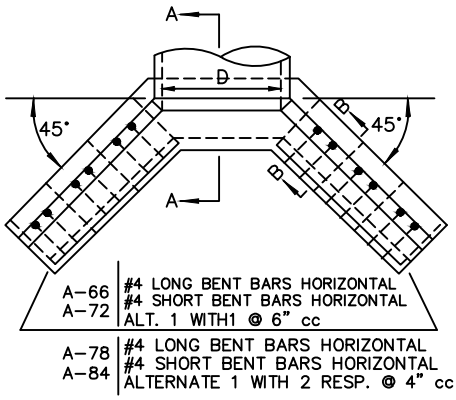
4/2018



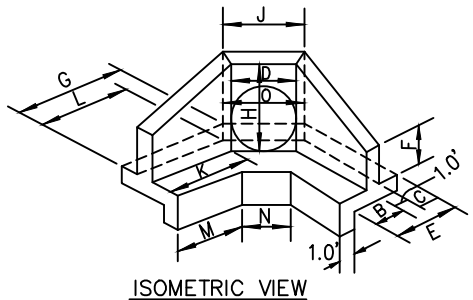
FRONT ELEVATION



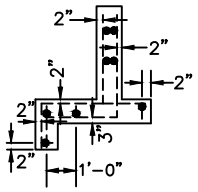
SECTION A-A



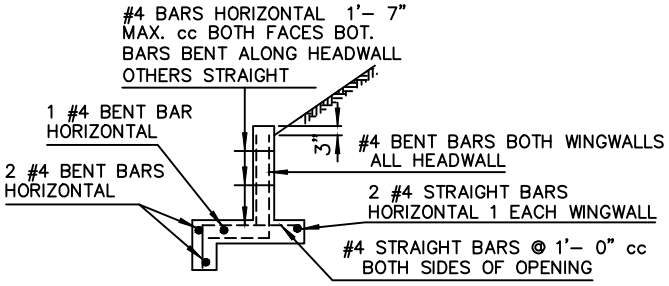
PLAN



ISOMETRIC VIEW



DISPOSITION OF
BARS DETAIL



SECTION B-B

GENERAL NOTES

CONCRETE : MIX NO. 3
REINFORCING : DEFORMED STEEL BARS #4 & #6
CHAMFER : ALL EXPOSED EDGES 1" x 1" OR AS DIRECTED

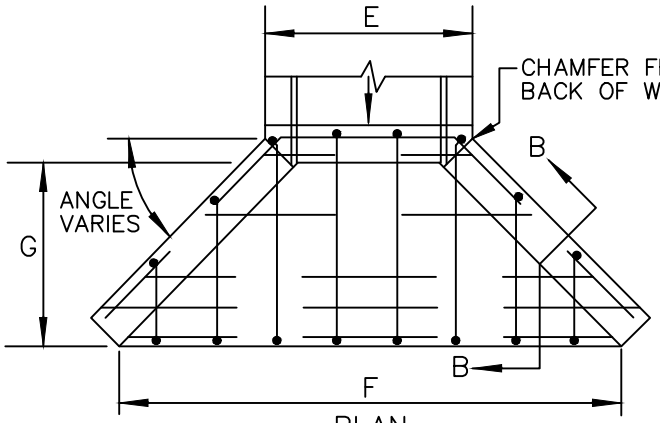
NOTE: WHENEVER THIS HEADWALL IS USED IN CONJUNCTION WITH A PAVED CHANNEL THE FOOTING OF THE HEADWALL SHALL BE LOWERED BELOW THE FINISHED GRADE OF THE CHANNEL. THE THICKNESS OF THE CHANNEL PAVING, IN ORDER THAT THE CHANNEL MIGHT BE BLENDED INTO THE HEADWALL. THE "H" AND "F" DIMENSIONS AND THE STEEL REINFORCING SHALL BE ADJUSTED.

QUANTITIES IN TABLE TO BE USED FOR ESTIMATING ONLY

OPENING		DIMENSIONS												VOL.	STEEL
D INCHES	AREA SQ. FT.	B	C	E	F	G	H	J	K	L	M	N	O	P	CONC. CY.	LBS.
66	23.80	2'- 6"	1'- 3"	4'- 9"	3'- 0"	11'-2 1/2"	6'-8 1/2"	6'- 4"	10'-3 1/4"	10'-8 1/2"	9'- 3"	3'- 5"	7'-4 1/2"	2'- 0"	9.7	585
72	28.27	2'- 6"	1'- 3"	4'- 9"	3'- 3"	12'- 1"	7'- 3"	6'- 10"	11'-1 3/4"	11'-6 3/4"	10'-1 1/4"	3'- 11"	7'-10 1/2"	2'- 0"	10.9	645
78	33.20	3'- 0"	1'- 6"	5'- 6"	3'- 6"	13'-0 1/2"	7'-9 1/2"	7'- 4"	12'- 0"	12'- 5"	10'- 9"	4'- 0"	8'-6 3/4"	2'- 6"	13.3	865
84	38.48	3'- 0"	1'- 6"	5'- 6"	3'- 9"	13'- 10"	8'- 4"	7'- 10"	12'-9 1/2"	13'-2 1/2"	11'-6 1/2"	4'- 6"	9'-0 3/4"	2'- 6"	14.7	984

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS MODIFIED TYPE A-1 HEADWALL 66",72",78",84	REVISED 04/2024	D 57

4/2018

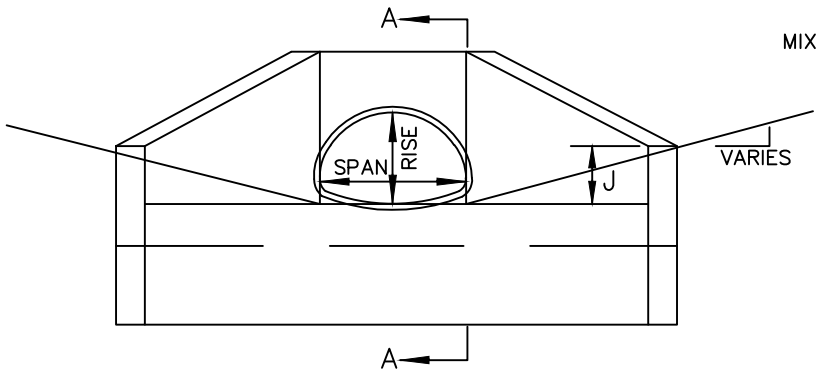


PLAN

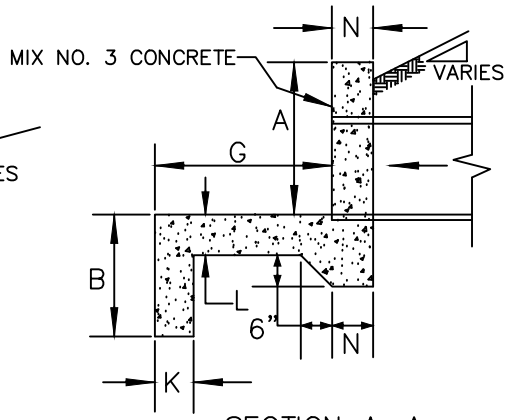
(SHOWING REINFORCEMENT)

OPENING		DIMENSION										QUANT.
D INCHES SXR	AREA SQ. FT.	A	B	E	F	G	J	K	L	N	R	△ CONC. C.Y.
17"x13"	1.1	2"– 1"	2"– 0"	2"– 5"	7"– 5"	3"– 0"	1"– 0"	8"	8"	8"	#5@12"	1.04
21"x15"	1.6	2"– 3"	2"– 0"	2"– 9"	7"– 9"	3"– 0"	1"– 0"	8"	8"	8"	#5@12"	1.12
24"x18"	2.2	2"– 6"	2"– 9"	3"– 0"	8"– 0"	3"– 0"	1"– 0"	8"	8"	8"	#5@12"	1.20
28"x20"	2.9	2"– 8"	2"– 0"	3"– 4"	8"– 4"	3"– 0"	1"– 2"	8"	8"	8"	#5@12"	1.29
35"x24"	4.5	3"– 0"	2"– 0"	3"– 11"	8"– 11"	3"– 0"	1"– 4"	8"	8"	8"	#5@12"	1.45
42"x29"	6.5	3"– 5"	2"– 0"	4"– 6"	9"– 6"	3"– 0"	1"– 11"	8"	10"	8"	#5@12"	1.74
49"x33"	8.9	3"– 9"	2"– 0"	5"– 1"	10"– 1"	3"– 0"	2"– 3"	8"	10"	8"	#5@12"	1.93
57"x38"	11.6	4"– 2"	2"– 0"	5"– 9"	11"– 9"	3"– 6"	2"– 5"	8"	10"	8"	#5@12"	2.46
64"x43"	14.7	4"– 7"	2"– 0"	6"– 4"	13"– 0"	3"– 10"	2"– 8"	9"	12"	10"	#5@12"	3.47
71"x47"	18.1	4"– 11"	2"– 0"	6"– 11"	14"– 3"	4"– 2"	2"– 10"	9"	12"	10"	#5@12"	4.02

△ BASED ON 2:1 CHANNEL SIDE SLOPES AND 45° ANGLE.

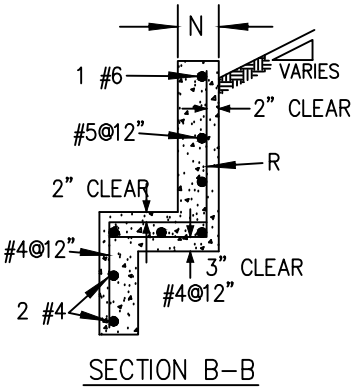


ELEVATION



SECTION A–A

(REINFORCING NOT SHOWN SIMILAR TO B–B)



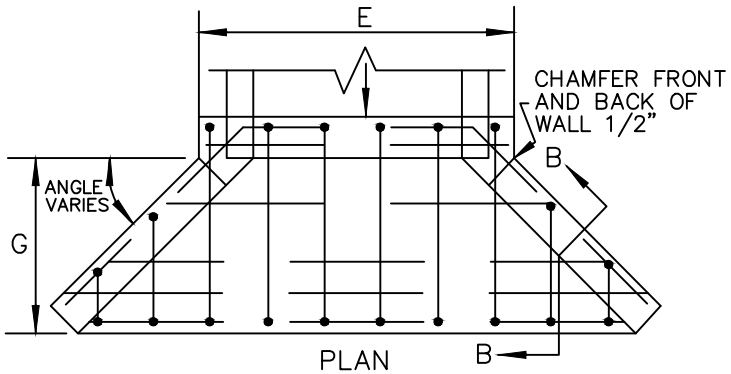
SECTION B–B

NOTE:

1. CHAMFER EXPOSED EDGES 1"x1"
2. CONCRETE QUANTITIES TO BE USED FOR ESTIMATING ONLY.
3. HEADWALL TO BE PARALLEL TO ℄ OF ROADWAY.

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS TYPE "A" HEADWALL METAL PIPE ARCH	REVISED 04/2024	D 58

4/2018

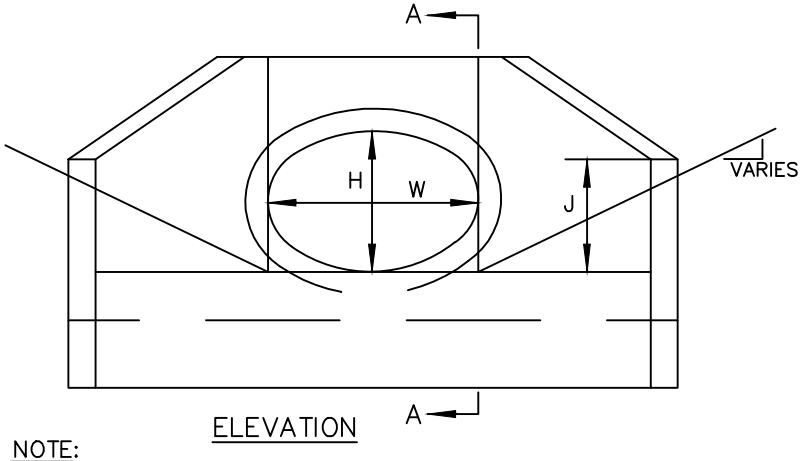


PLAN

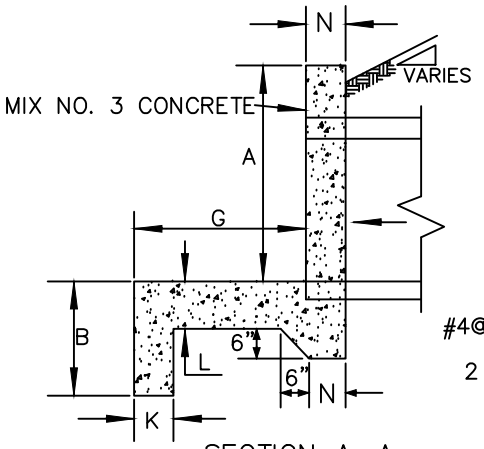
(SHOWING REINFORCEMENT)

EO.RD	W	H	A	B	E	F	G	J	K	L	N	R	△CONC. CY.
36"	45"	29"	3'-9"	2'-0"	5'-6"	9'-9"	3'-0"	2'-0"	8"	10"	8"	#5@12"	2.17
42"	53"	34"	4'-3"	2'-0"	6'-3"	11'-5"	3'-6"	2'-3"	8"	10"	10"	#5@12"	2.99
48"	60"	38"	4'-8"	2'-0"	7'-0"	2'-4"	3'-8"	2'-6"	8"	10"	10"	#5@12"	3.36
54"	68"	43"	5'-1"	2'-0"	7'-8"	3'-8"	4'-0"	2'-9"	9"	12"	10"	#5@12"	4.53
60"	76"	48"	5'-6"	2'-0"	8'-5"	5'-4"	4'-6"	3'-0"	9"	12"	10"	#5@12"	5.32
66"	83"	53"	6'-0"	2'-0"	9'-1"	7'-0"	5'-0"	3'-3"	9"	12"	12"	#6@8"	7.07
72"	91"	58"	6'-6"	2'-0"	9'-10"	18'-3"	5'-4"	3'-6"	9"	12"	12"	#6@8"	7.88

△BASED ON 2:1 CHANNEL SIDE SLOPES AND 45° ANGLE.

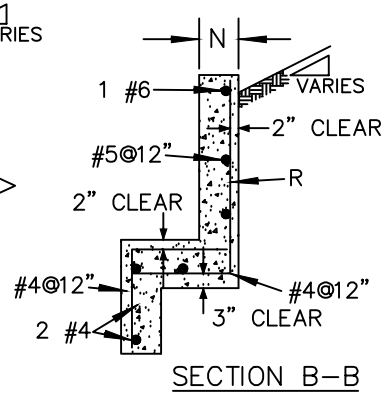


ELEVATION



SECTION A–A

(REINFORCING NOT SHOWN SIMILAR TO B–B)



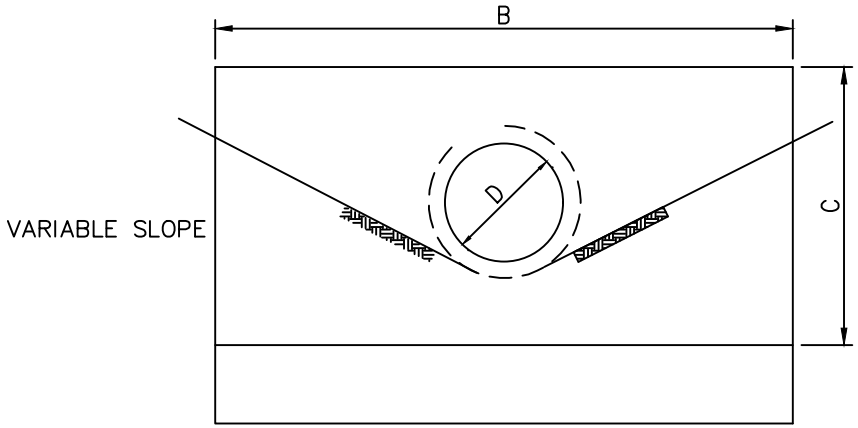
SECTION B–B

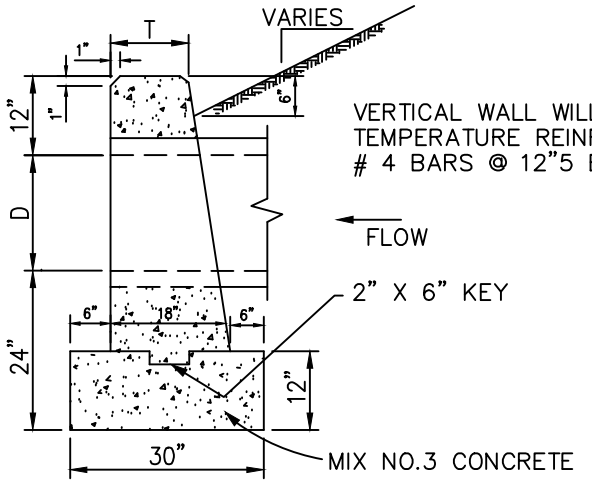
NOTE:

1. CHAMFER EXPOSED EDGES 1"x1"
2. CONCRETE QUANTITIES TO BE USED FOR ESTIMATING ONLY.
3. HEADWALL TO BE PARALLEL TO ℄ OF ROADWAY.

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS TYPE "A" HEADWALL ELLIPTICAL CONCRETE PIPE	REVISED 04/2024	D 59

4/2018





VERTICAL WALL WILL REQUIRE TEMPERATURE REINFORCING– # 4 BARS @ 12"5 E.W., 2" COVER.

FLOW

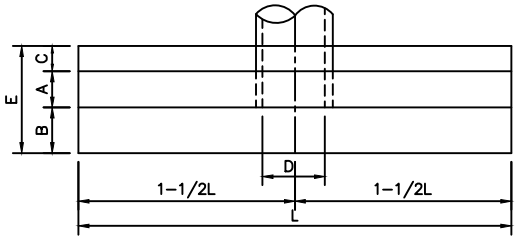
BOTH			1–1/2:1 SLOPE ONLY		2:1 SLOPE ONLY	
D	C	T	B	VOLUME CU. YDS	B	VOLUME CU. YDS
12"	3'–0"	8"	5'–0"	1.02	6'–0"	1.23
15"	3'–3"	8"	5'–6"	1.12	7'–0"	1.47
18"	3'–6"	8"	6'–0"	1.29	8'–0"	1.76
21"	3'–9"	10"	7'–0"	1.60	9'–0"	2.10
24"	4'–0"	10"	8'–0"	1.93	10'–0"	2.47
27"	4'–3"	12"	8'–6"	2.22	11'–0"	3.10
30"	4'–6"	12"	9'–0"	2.35	12'–0"	3.25
36"	5'–0"	12"	10'–6"	2.96	13'–6"	3.95
42'	5'–6"	12"	12'–0"	3.54	15'–0"	4.58

NOTE:

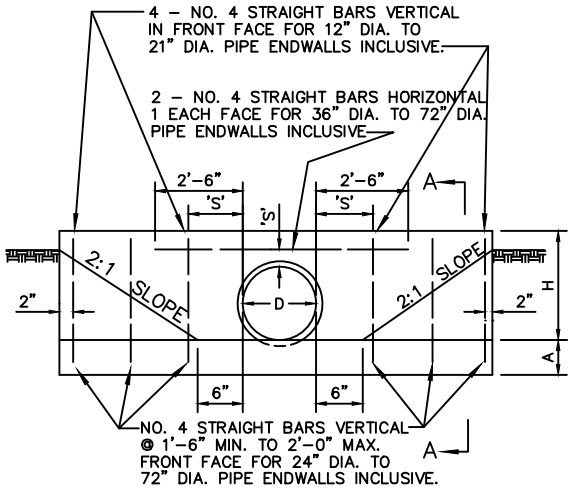
1. HEADWALL CAN BE CONSTRUCTED WITH A 5" CONCRETE APRON, AS SHOWN ON D/81, IF DESIRED.
2. EXPOSED EDGES TO BE CHAMFERED 1" X 1"
3. CONCRETE QUANTITIES TO BE USED FOR ESTIMATING ONLY.
4. HEADWALL TO BE PARALLEL TO & OF ROADWAY.

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS TYPE "B" HEADWALL CIRCULAR PIPE	REVISED 04/2024	D 60

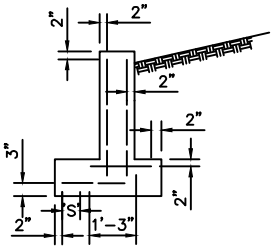
4/2018



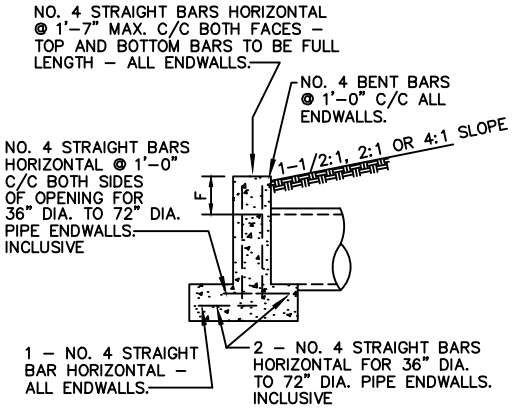
PLAN



ELEVATION



DISPOSITION OF BARS DETAIL



SECTION A–A

QUANTITES FOR ESTIMATING PURPOSES ONLY

OPENING		DIMENSIONS							QUANTITES	
D	AREA	A	B	C	E	F	H	L	CONC. C.Y.	STEEL LBS.
INCHES	SQ. FT									
12	0.79	9"	6"	6"	1'-9"	9"	1'-9"	6'-6"	0.61	41
15	1.23	9"	6"	6"	1'-9"	9"	2'-0"	7'-9"	0.77	47
18	1.77	9"	6"	6"	1'-9"	9"	1'-9"	9'-0"	0.95	54
21	2.40	9"	6"	6"	1'-9"	9"	2'-6"	10'-3"	1.14	70
24	3.14	9"	14"	6"	2'-5"	9"	2'-9"	11'-6"	1.56	80
27	3.98	9"	14"	6"	2'-5"	9"	3'-0"	12'-10"	1.82	88
30	4.91	9"	14"	6"	2'-5"	12"	3'-6"	14'-2"	2.22	98
33	5.94	9"	14"	6"	2'-5"	12"	3'-9"	15'-5"	2.28	105
36	7.07	12"	16"	10"	3'-2"	12"	4'-0"	16'-8"	4.16	182
42	9.62	12"	16"	10"	3'-2"	12"	4'-6"	19'-2"	5.07	206
48	12.57	12"	16"	10"	3'-2"	12"	5'-0"	21'-8"	6.09	244
54	15.90	12"	20"	12"	3'-8"	12"	5'-6"	24'-2"	7.62	275
60	19.64	12"	20"	12"	3'-8"	12"	6'-0"	26'-8"	8.82	304
72	28.27	12"	20"	12"	3'-8"	12"	7'-0"	7'-0"	11.46	377

'S' DISTANCES

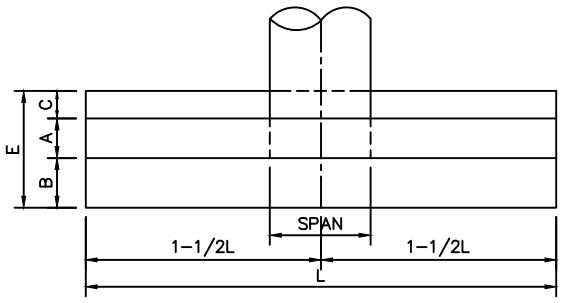
4" FOR 12" DIA. TO 21" DIA. PIPES INCLUSIVE.
6" FOR 24" DIA. TO 36" DIA. PIPES INCLUSIVE.
8" FOR 42" DIA. TO 72" DIA. PIPES INCLUSIVE.

GENERAL NOTES:

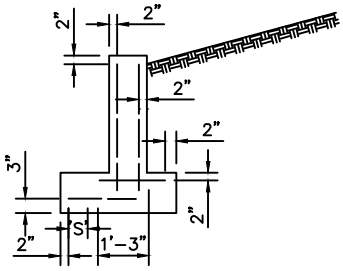
CONCRETE: MIX NO. 3
REINFORCING: DEFORMED STEEL BARS – NO. 4
CHAMFER: ALL EXPOSED EDGES 1" x 1" OR AS DIRECTED.

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS STANDARD TYPE C ENDWALL ROUND PIPE	REVISED 04/2024	D 61

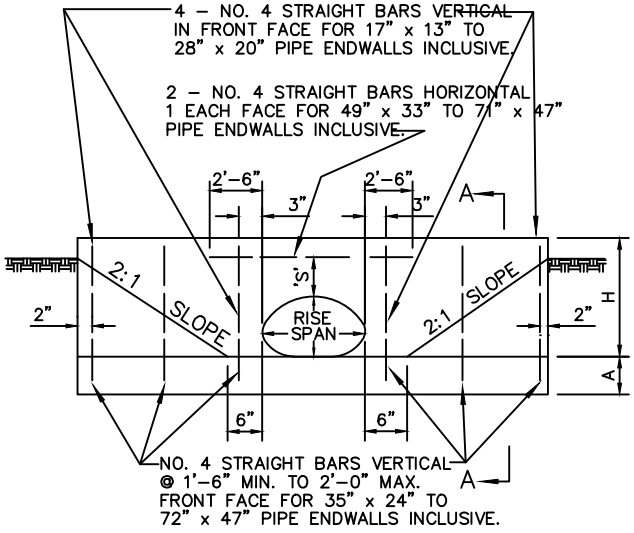
4/2018



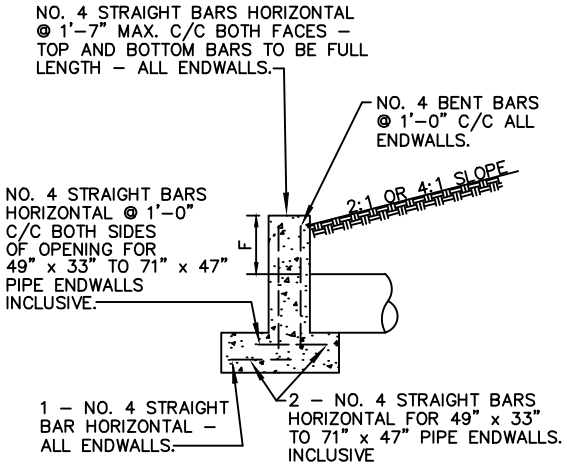
PLAN



DISPOSITION OF BARS DETAIL



ELEVATION



SECTION A-A

QUANTITES FOR ESTIMATING PURPOSES ONLY

OPENING		DIMENSIONS							QUANTITES	
D	AREA	A	B	C	E	F	H	L	CONC. C.Y.	STEEL LBS.
INCHES	SQ. FT									
17 x 13	1.23	9"	6"	6"	1'-9"	6"	1'-7"	6'-3"	0.54	38
21 x 15	1.77	9"	6"	6"	1'-9"	11"	2'-2"	9'-6"	0.98	56
24 x 18	2.40	9"	6"	6"	1'-9"	8"	2'-2"	9'-6"	0.96	55
28 x 20	3.14	9"	6"	6"	1'-9"	9"	2'-3	9'-6"	0.96	55
35 x 24	4.91	9"	14"	6"	2'-5"	14"	3'-2"	13'-8"	1.90	96
42 x 29	7.07	9"	14"	6"	2'-5"	9"	3'-2"	13'-8"	1.92	96
49 x 33	9.62	12"	16"	10"	3'-2"	14"	3'-11"	17'-11"	4.34	186
57 x 38	12.57	12"	16"	10"	3'-2"	10"	4'-0"	17'-11"	4.73	186
64 x 43	15.90	12"	20"	12"	3'-8"	13"	4'-8"	21'-9"	6.27	243
71 x 47	19.64	12"	20"	12"	3'-8"	10"	4'-9"	21'-9"	6.05	243

'S' DISTANCES

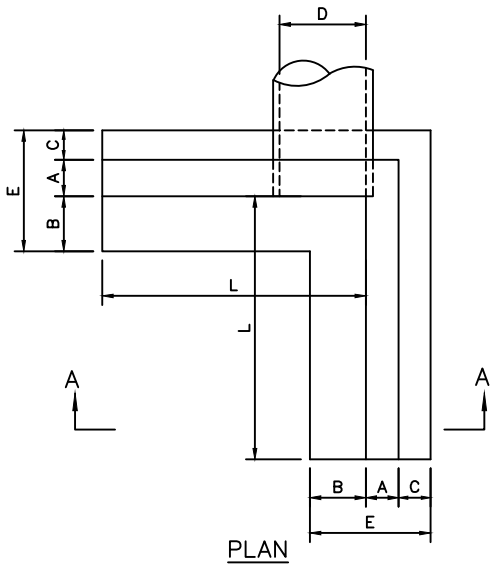
4" FOR 17" x 13" TO 24" x 18" INCLUSIVE.
6" FOR 28" x 20" TO 42" x 29" INCLUSIVE.
8" FOR 49" x 33" TO 71" x 47" INCLUSIVE.

GENERAL NOTES:

CONCRETE: MIX NO. 3
REINFORCING: DEFORMED STEEL BARS - NO. 4
CHAMFER: ALL EXPOSED EDGES 1" x 1" OR AS DIRECTED.

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS STANDARD TYPE C ENDWALL ARCH PIPE	REVISED 04/2024	D 62

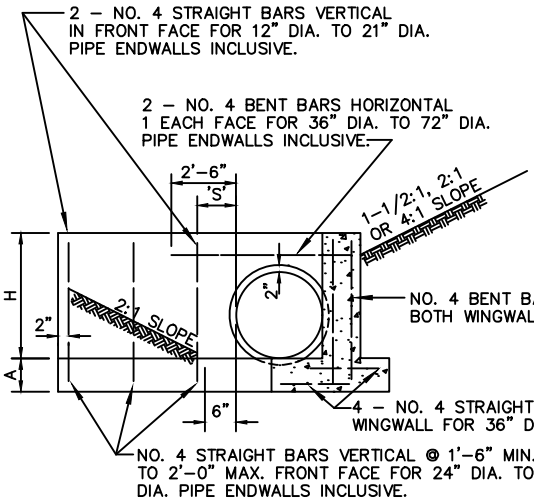
4/2018



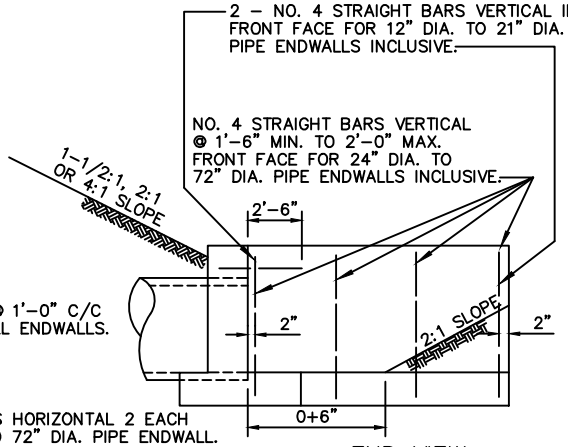
PLAN

QUANTITES FOR ESTIMATING PURPOSES ONLY

OPENING		DIMENSIONS						QUANTITES	
D	AREA	A	B	C	E	H	L	CONC. C.Y.	STEEL LBS.
INCHES	SQ. FT								
12	0.79	9"	6"	6"	1'-9"	1'-9"	3'-6"	0.76	55
15	1.23	9"	6"	6"	1'-9"	2'-0"	4'-3"	0.99	61
18	1.77	9"	6"	6"	1'-9"	2'-3"	5'-0"	0.17	68
21	2.40	9"	6"	6"	1'-9"	2'-6"	5'-9"	0.38	77
24	3.14	9"	14"	6"	2'-5"	2'-9"	6'-6"	1.84	106
27	3.98	9"	14"	6"	2'-5"	3'-0"	7'-3"	2.11	115
30	4.91	9"	14"	6"	2'-5"	3'-6"	8'-0"	2.57	140
33	5.94	9"	14"	6"	2'-5"	3'-9"	8'-9"	2.92	148
36	7.07	12"	16"	10"	3'-2"	4'-0"	9'-6"	4.99	235
42	9.62	12"	16"	10"	3'-2"	4'-6"	11'-0"	6.12	303
48	12.57	12"	16"	10"	3'-2"	5'-0"	12'-6"	7.34	341
54	15.90	12"	20"	12"	3'-8"	5'-6"	14'-0"	9.17	438
60	19.64	12"	20"	12"	3'-8"	6'-0"	15'-6"	10.86	496
72	28.27	12"	20"	12"	3'-8"	7'-0"	17'-0"	12.69	597



SECTION A–A



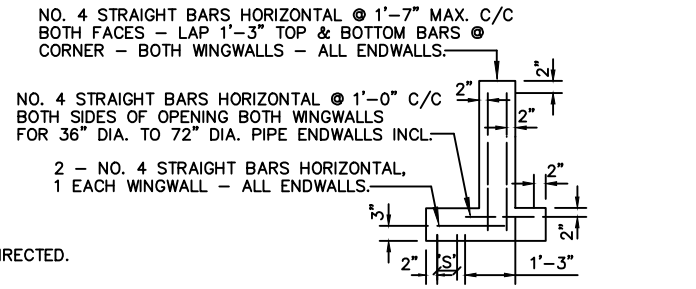
END VIEW

'S' DISTANCES

4" FOR 12" DIA. TO 21" DIA. PIPES INCLUSIVE.
6" FOR 24" DIA. TO 36" DIA. PIPES INCLUSIVE.
8" FOR 42" DIA. TO 72" DIA. PIPES INCLUSIVE.

GENERAL NOTES:

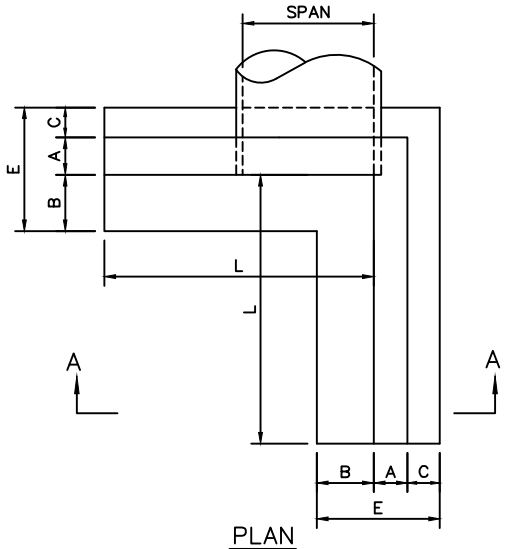
CONCRETE: MIX NO. 3
REINFORCING: DEFORMED STEEL BARS – NO. 4
CHAMFER: ALL EXPOSED EDGES 1" x 1" OR AS DIRECTED.



DISPOSITION OF BARS DETAIL

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS STANDARD TYPE E HEADWALL CIRCULAR PIPE	REVISED 04/2024	D 63

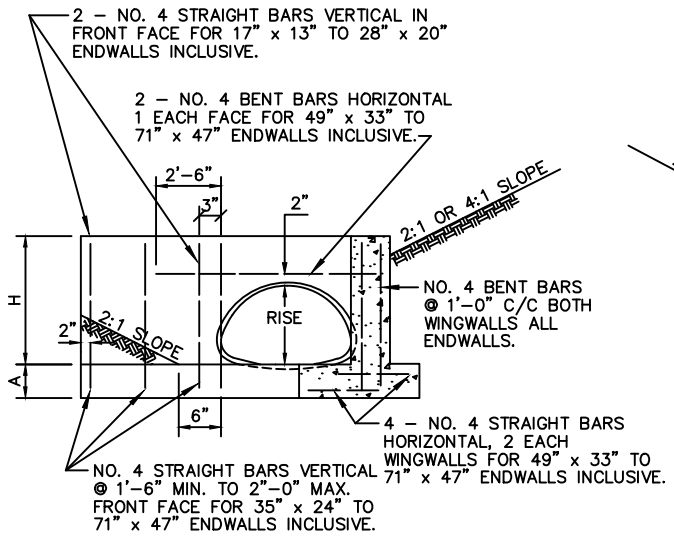
4/2018



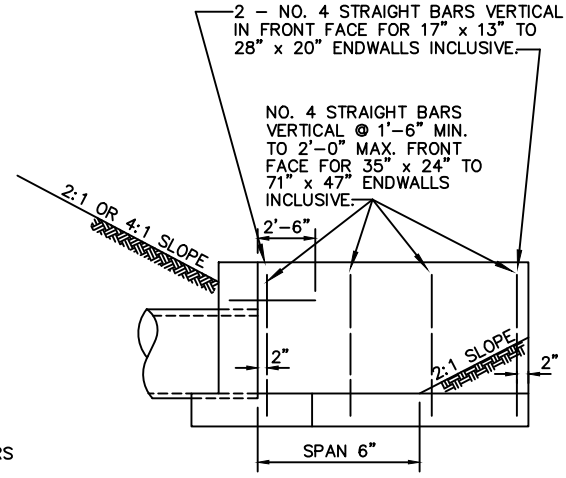
PLAN

QUANTITES FOR ESTIMATING PURPOSES ONLY

OPENING		DIMENSIONS						QUANTITES	
SIZE INCHES S x R	AREA SQ. FT	A	B	C	E	H	L	CONC. C.Y.	STEEL LBS.
17 x 13	1.23	9"	6"	6"	1'-9"	1'-7"	3'-9"	0.73	55
21 x 15	1.77	9"	6"	6"	1'-9"	2'-2"	5'-10"	1.30	75
24 x 18	2.40	9"	6"	6"	1'-9"	2'-2"	5'-10"	1.28	75
28 x 20	3.14	9"	6"	6"	1'-9"	2'-2"	5'-10"	1.26	74
35 x 24	4.90	9"	14"	6"	2'-5"	2'-9"	8'-6"	2.57	118
42 x 29	7.07	9"	14"	6"	2'-5"	3'-0"	8'-6"	2.52	117
49 x 33	9.62	12"	16"	10"	3'-2"	3'-6"	11'-3"	5.80	271
57 x 38	12.57	12"	16"	10"	3'-2"	3'-9"	11'-3"	5.65	261
64 x 43	15.90	12"	20"	12"	3'-8"	4'-0"	13'-9"	8.12	366
71 x 47	19.64	12"	20"	12"	3'-8"	4'-6"	13'-9"	7.98	355



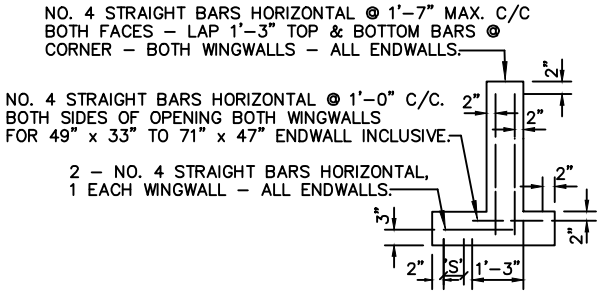
SECTION A–A



END VIEW

'S' DISTANCES

4" FOR 17" x 13" TO 24" x 18" PIPES INCLUSIVE.
6" FOR 28" x 20" TO 42" x 29" PIPES INCLUSIVE.
8" FOR 49" x 33" TO 71" x 47" PIPES INCLUSIVE.



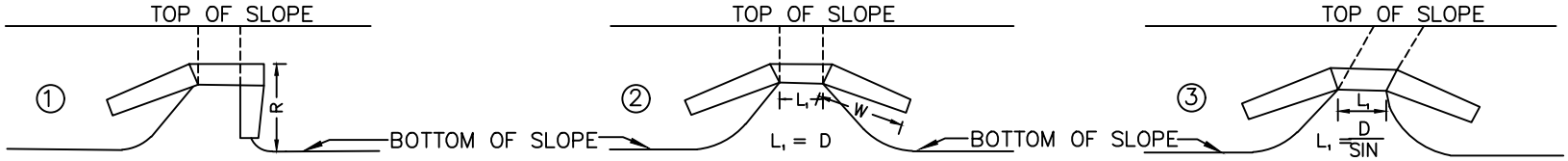
DISPOSITION OF BARS DETAIL

GENERAL NOTES:

CONCRETE: MIX NO. 3
REINFORCING: DEFORMED STEEL BARS – NO. 4
CHAMFER: ALL EXPOSED EDGES 1" x 1" OR AS DIRECTED.

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS STANDARD TYPE E HEADWALL METAL PIPE ARCH	REVISED 04/2024	D 64

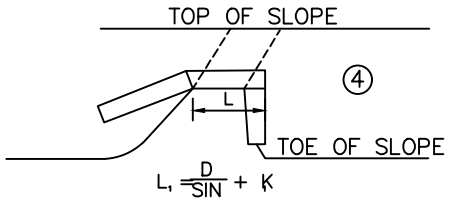
4/2018



CASE 1 STANDARD TYPE "F" HEADWALL

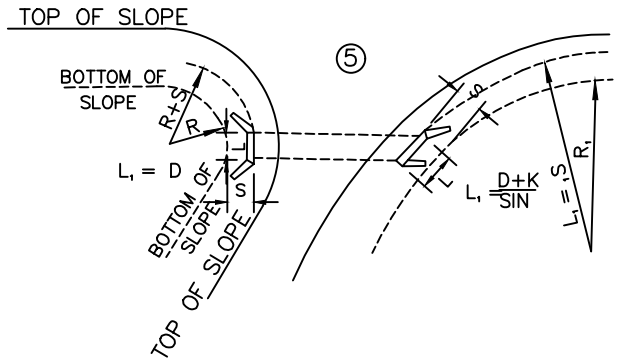
CASE 2
WHEN A WATER COURSE IS PERPENDICULAR OR ASKEW TO THE ℄ L, AND THE SIDEDITCH DRAINAGE IS IN BOTH DIRECTIONS AND IT IS MORE ECONOMICAL OR BETTER PRACTICE TO PLACE THE PIPE AT RIGHT ANGLES TO THE ℄ L, THE "F" HEADWALL CAN BE USED BY MAKING THE SHORTER WING EQUAL IN LENGTH AND ANGLE TO THE LONGER WING.

CASE 3 WHEN THE DRAINAGE CONDITIONS ARE SIMILAR TO CASE 2 BUT IT IS DESIRED TO PLACE THE PIPE ASKEW, THE "F" HEADWALL CAN BE USED. THE WINGS WILL BE PLACED THE SAME AS IN CASE 2, BUT THE LENGTH OF THE HEADWALL WILL BE IN-CREASED DUE TO THE INCREASED AREA OF THE PIPE.



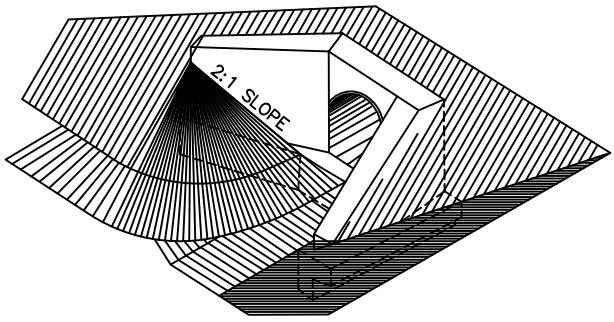
CASE 4 WHEN A PIPE IS PLACED ASKEW TO FOLLOW THE NATURAL WATER COURSE AND THE SIDE DITCH DAINAGE IS IN ONE DIRECTION, THE "F" HEADWALL WILL BE USED WITH THE EXCEPTION THAT THE HEAD-WALL WILL BE LENGTHENED DUE TO THE INCREASED ARE OF THE PIPE.

CASE 5 WHEN AN ASKEW ROAD OR ENTRANCE INTERSECTS THE MAIN LINE AND THE DRAINAGE IS PARALLEL TO THE MAIN LINE AND INTERSECTING ROAD OR ENTRANCE, THE "F" HEADWALL CAN BE USED AS FOLLOWS
A DETERMINE DIRECTION OF PIPE B COMPUTE "S", THEN A LINE WHICH IS PERPENDICULAR TO THE ℄ OF THE PIPE AND TANGENT TO THE ARC WHOSE RADIUS IS R+S DETERMINES THE LOCATIONS OF THE HEADWALL. THE LENGTH OF THE WINGWALLS IS STANDARD BUT THE ANGLE IS SUCH, THAT THE END OF THE WINGWALL IS 6" FROM THE TOE OF THE SLOPE, AS SHOWN: S, IS COMPUTED IN LIKE MANNER AND THE LOCATION OF THE HEADWALL IS THE INTERSECTION OF THE ARC R+S, AND THE ℄ OF THE PIPE. THE WINGS ARE LOCATED AS DESCRIBED ABOVE, OR AS SHOWN.

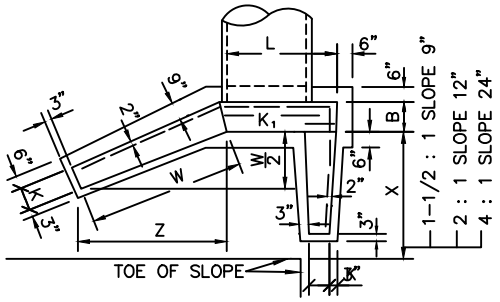


ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS STANDARD TYPE "F" HEADWALL MODIFICATION	REVISED 04/2024	D 65

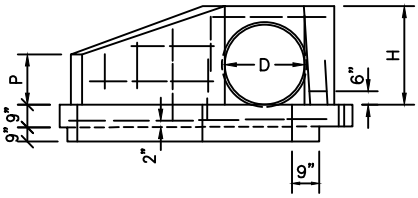
4/2018



ISOMETRIC VIEW



PLAN



ELEVATION

QUANTITIES FOR ESTIMATING PURPOSES ONLY

SLOPE 1–1/2 : 1

OPENING		DIMENSIONS									QUANTITIES	
PIPE DIA.	AREA	ENDWALL			WINGS						1– ENDWALL 2– WINGS	
D	SQ.FT	L	B	H	W	X	Z	K1	K	P	CONC. CU.YDS.	STEEL LBS.
12"	0.79	1'–9"	9"	1'–8"	2'–0"	1'–3"	1'–9"	9"	7"	1'–4"	0.51	38
15"	1.23	2'–0"	9"	2'–0"	2'–4"	1'–9"	2'–0"	9"	7"	1'–5"	0.63	42
18"	1.77	2'–3"	9"	2'–3"	2'–8"	2'–1"	2'–4"	9"	8"	1'–6"	0.77	48
21"	2.40	2'–6"	9"	2'–7"	3'–1"	2'–6"	2'–8"	9"	8"	1'–9"	1.10	61
24"	3.14	2'–11"	12"	2'–11"	3'–6"	2'–11"	3'–0"	12"	11"	2–1"	1.43	73
27"	3.98	3'–3"	12"	3'–3"	3'–11"	3'–4"	3'–4"	12"	11"	2'–3"	1.66	85
30"	4.91	3'–6"	12"	3'–6"	4'–4"	3'–9"	3'–9"	12"	11"	2'–4"	1.88	96
33"	5.94	3'–9"	12"	3'–9"	4'–8"	4'–1"	4'–0"	12"	11"	2'–6"	2.10	107
36"	7.07	4'–0"	12"	4'–0"	5'–0"	4'–6"	4'–4"	12"	11"	2–7"	2.32	118
42"	9.62	4'–6"	12"	4'–7"	5'–9"	5'–4"	5'–0"	12"	11"	2'–11"	2.85	144
48"	12.57	5'–0"	12"	5'–1"	6'–4"	6'–2"	5'–6"	12"	11"	3'–3"	3.37	170

NOTES

CONCRETE: MIX NO. 3
REINFORCING: DEFORMED STEEL BARS

VERTICAL NO. 6 BARS 12" C/C,

HORIZONTAL NO. 4 BARS 12" C/C HOOKED ON ONE END

CHAMFER: ALL EXPOSED EDGES 1" x 1" OR AS DIRECTED.

NOTE: WHENEVER THIS HEADWALL IS USED IN CONJUNCTION WITH A PAVED CHANNEL THE FOOTING OF THE HEADWALL SHALL BE LOWERED BELOW THE FINISHED GRADE OF THE CHANNEL THE THICKNESS OF THE CHANNEL PAVING IN ORDER THAT THE CHANNEL MIGHT BE BLENDED INTO THE HEADWALL. THE "W", "L" AND "P" DIMENSIONS AND THE STEEL REINFORCING SHALL BE ADJUSTED AS REQUIRED.

SLOPE 2 : 1

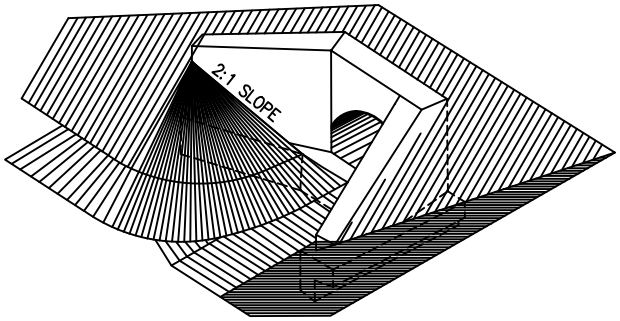
OPENING		DIMENSIONS									QUANTITIES	
PIPE DIA.	AREA	ENDWALL			WINGS						1– ENDWALL 2– WINGS	
D	SQ.FT	L	B	H	W	X	Z	K1	K	P	CONC. CU. YDS	STEEL LBS.
12"	0.79	1'–9"	9"	1'–7"	2'–3"	1'–10"	2'–0"	9"	7"	1'–3"	0.55	38
15"	1.23	2'–0"	9"	1'–11"	2'–6"	2'–6"	2'–2"	9"	8"	1'–5"	0.73	46
18"	1.77	2'–3"	9"	2'–2"	3'–0"	3'–0"	2'–7"	9"	8"	1'–7"	0.89	57
21"	2.40	2'–6"	9"	2'–5"	3'–6"	3'–6"	3'–0"	9"	8"	1'–10"	1.27	70
24"	3.14	3'–0"	12"	2'–9"	4'–0"	4'–0"	3'–5"	12"	11"	2–1"	1.64	82
27"	3.98	3'–3"	12"	3'–0"	4'–4"	4'–6"	3'–9"	12"	11"	2'–3"	1.89	98
30"	4.91	3'–6"	12"	3'–4"	4'–8"	5'–2"	4'–1"	12"	11"	2'–6"	2.14	113
33"	5.94	3'–9"	12"	3'–7"	5'–0"	5'–8"	4'–4"	12"	11"	2'–8"	2.31	123
36"	7.07	4'–0"	12"	3'–10"	5'–4"	6'–2"	4'–7"	12"	11"	2–10"	2.48	132
42"	9.62	4'–6"	12"	4'–5"	6'–4"	7'–4"	5'–6"	12"	11"	3'–2"	3.30	163
48"	12.57	5'–0"	12"	4–11"	7'–0"	8'–4"	6'–1"	12"	11"	3'–6"	3.85	193

SLOPE 4 : 1

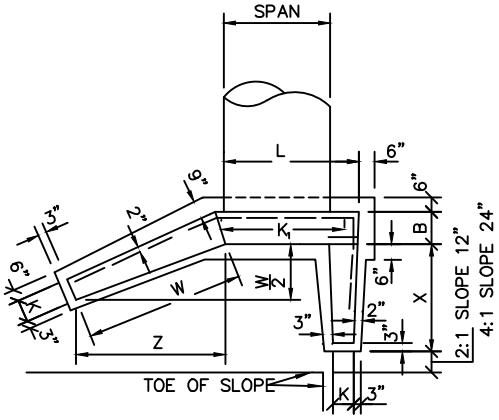
OPENING		DIMENSIONS									QUANTITIES	
PIPE DIA.	AREA	ENDWALL			WINGS						1– ENDWALL 2– WINGS	
D	SQ.FT	L	B	H	W	X	Z	K1	K	P	CONC. CU. YDS	STEEL LBS.
12"	0.79	1'–9"	9"	1'–5"	2'–6"	3'–8"	2'–2"	9"	8"	1'–3"	0.81	45
15"	1.23	2'–0"	9"	1'–9"	3'–0"	5'–0"	2'–7"	9"	8"	1'–5"	1.04	68
18"	1.77	2'–3"	9"	2'–0"	3'–6"	6'–0"	3'–0"	9"	8"	1'–7"	1.26	74
21"	2.40	2'–6"	9"	2'–3"	4'–0"	7'–0"	3'–5"	9"	8"	1'–11"	1.75	89
24"	3.14	3'–0"	12"	2'–6"	4'–6"	8'–0"	3'–11"	12"	11"	2'–2"	2.23	104
27"	3.98	3'–3"	12"	2'–9"	5'–0"	9'–2"	4'–4"	12"	11"	2'–4"	2.64	128
30"	4.91	3'–6"	12"	3'–1"	5'–6"	10'–4"	4'–9"	12"	11"	2'–7"	3.04	147
33"	5.94	3'–9"	12"	3'–4"	6'–0"	11'–4"	5'–2"	12"	11"	2'–9"	3.40	164
36"	7.07	4'–0"	12"	3'–7"	6'–6"	12'–4"	5'–8"	12"	11"	3'–0"	3.75	180
42"	9.62	4'–6"	12"	4'–2"	7'–6"	14'–8"	6'–6"	12"	11"	3'–5"	4.67	218
48"	12.57	5'–0"	12"	4'–8"	8'–3"	16'–8"	7'–2"	12"	11"	3'–10"	5.57	277

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS STANDARD TYPE "F" HEADWALL ROUND PIPE	REVISED 04/2024	D 66

4/2018



ISOMETRIC VIEW

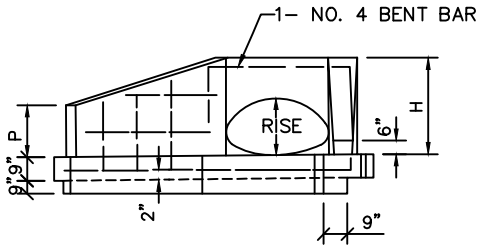


PLAN

QUANTITIES FOR ESTIMATING PURPOSES ONLY

SLOPE 2:1												
opening		dimensions									quantities	
SIZE INCHES S x R	AREA SQ.FT	ENDWALL			WINGS						1– ENDWALL 2– WINGS	
		L	B	H	W	X	Z	K_1	K	P	CONC. CU. YDS	STEEL LBS.
17" x 13"	1.23	2'–2"	9"	1'–9"	2'–3"	1'–10"	2'–0"	9"	7"	1'–3"	0.60	39
21" x 15"	1.77	2'–6"	9"	1'–9"	2'–3"	1'–10"	2'–0"	9"	7"	1'–3"	0.62	40
24" x 18"	2.40	2'–9"	9"	2'–0"	2'–7"	2'–5"	2'–3"	9"	8"	1'–5"	0.80	45
28" x 20"	3.14	3'–1"	9"	2'–4"	3'–0"	3'–0"	2'–7"	9"	8"	1'–7"	0.98	59
35" x 24"	4.91	3'–11"	12"	2'–11"	4'–0"	4'–0"	3'–5"	12"	11"	2'–1"	1.77	85
42" x 29"	7.07	4'–6"	12"	2'–11"	4'–0"	4'–0"	3'–5"	12"	11"	2'–1"	1.82	86
49" x 33"	9.62	5'–1"	12"	3'–6"	4'–8"	5'–2"	4'–1"	12"	11"	2'–6"	2.35	117
57" x 38"	12.57	5'–9"	12"	4'–0"	5'–4"	6'–2"	4'–7"	12"	11"	2'–10"	2.73	185

SLOPE 4:1												
opening		dimensions									quantities	
SIZE INCHES S x R	AREA SQ. FT.	ENDWALL			WINGS						1– ENDWALL 2– WINGS	
		L	B	H	W	X	Z	K1	K	P	CONC. CU. YDS	STEEL LBS.
17" x 13"	1.23	2'–2"	9"	1'–7"	2'–6"	3'–8"	2'–2"	9"	8"	1'–3"	0.86	46
21" x 15"	1.77	2'–6"	9"	1'–11"	3'–0"	5'–0"	2'–7"	9"	8"	1'–5"	1.10	69
24" x 18"	2.40	2'–9"	9"	2'–1"	3'–3"	4'–0"	2'–10"	9"	8"	1'–6"	1.22	72
28" x 20"	3.14	3'–1"	9"	2'–2"	3'–6"	6'–0"	3'–0"	9"	8"	1'–7"	1.34	76
35" x 24"	4.91	3'–11"	12"	2'–8"	4'–6"	8'–0"	3'–11"	12"	11"	2'–2"	2.35	107
42" x 29"	7.07	4'–6"	12"	3'–4"	5'–6"	10'–4"	4'–9"	12"	11"	2'–7"	3.20	150
49" x 33"	9.62	5'–1"	12"	3'–3"	5'–6"	10'–4"	4'–9"	12"	11"	2'–7"	3.23	151
57" x 38"	12.57	5'–9"	12"	3'–9"	6'–6"	12'–4"	5'–8"	12"	11"	3'–0"	3.98	185



ELEVATION

GENERAL NOTES

CONCRETE: MIX NO. 3
REINFORCING: DEFORMED STEEL BARS

VERTICAL NO. 6 BARS 12" C/C,

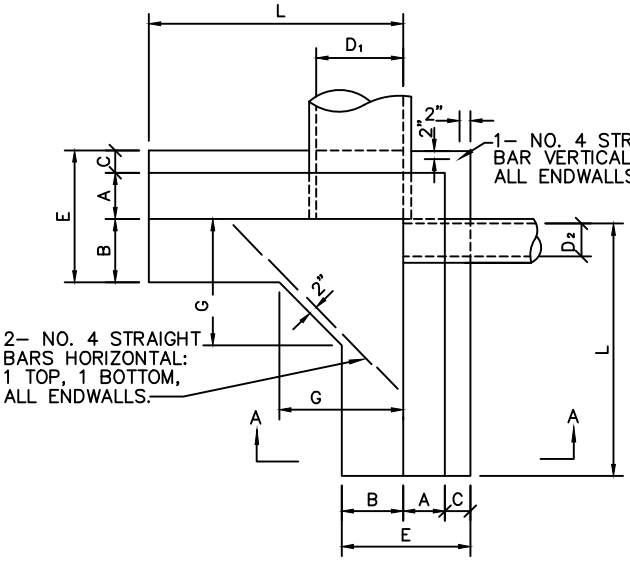
HORIZONTAL NO. 4 BARS 12" C/C HOOKED ON ONE END

CHAMFER: ALL EXPOSED EDGES 1" x 1" OR AS DIRECTED.

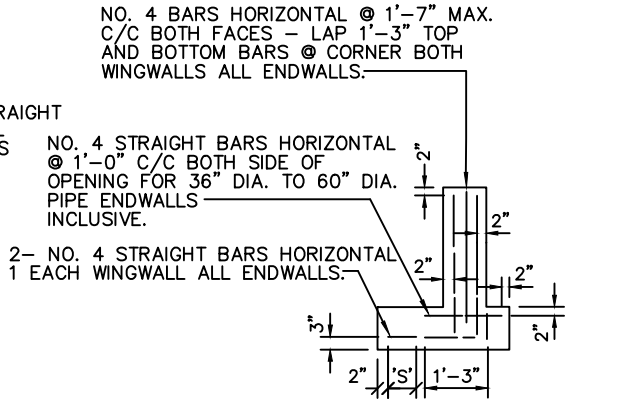
NOTE: WHENEVER THIS HEADWALL IS USED IN CONJUNCTION WITH A PAVED CHANNEL THE FOOTING OF THE HEADWALLSHALL BE LOWERED BELOW THE FINISHED GRADE OF THE CHANNEL THE THICKNESS OF THE CHANNEL PAVING IN ORDER THAT THE CHANNEL MIGHT BE BLENDED INTO THE HEADWALL. THE "W", "L" AND "P" DIMENSIONS AND THE STEEL REINFROCING SHALL BE ADJUSTED AS REQUIRED.

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS STANDARD TYPE "F" HEADWALL ARCH PIPE	REVISED 04/2024	D 67

4/2018



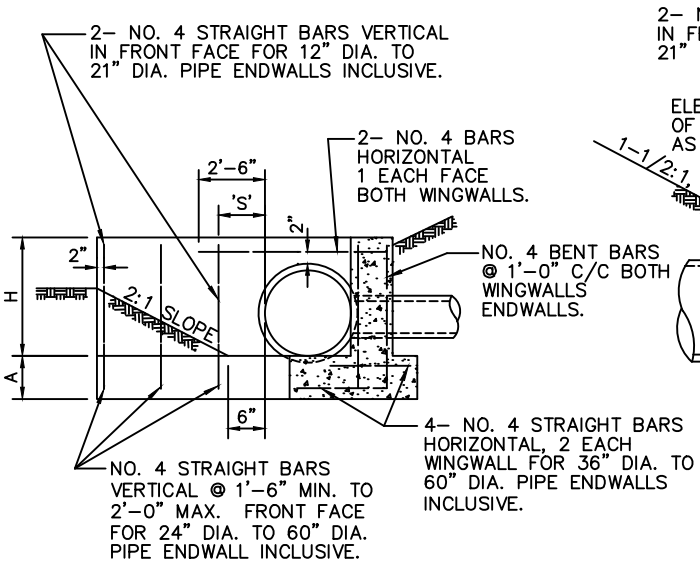
PLAN



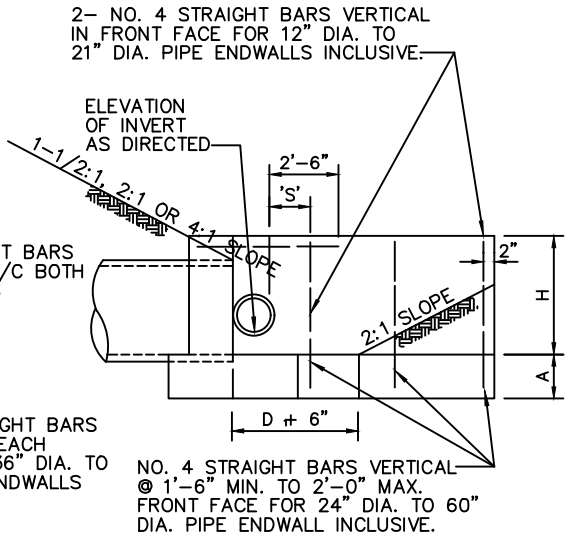
DISPOSITION OF BARS DETAILS

NOTE

FOR DIMENSIONS AND QUANTITIES SEE TABLES ON DETAIL D/68 A.



SECTION A–A



END VIEW

NOTES:

CONCRETE:	MIX NO. 3
REINFORCING:	DEFORMED STEEL BARS NO. 4
CHAMFER:	ALL EXPOSED EDGES 1" x 1" OR AS DIRECTED.
SOD:	PLACE SOD, 3" WIDE, AROUND ENDWALL AS INDICATED ON THE PLANS.

'S' DISTANCES

4" FOR 12" DIA. TO 18" DIA. PIPES INCLUSIVE.
6" FOR 21" DIA. TO 36" DIA. PIPES INCLUSIVE.
8" FOR 42" DIA. TO 60" DIA. PIPES INCLUSIVE.

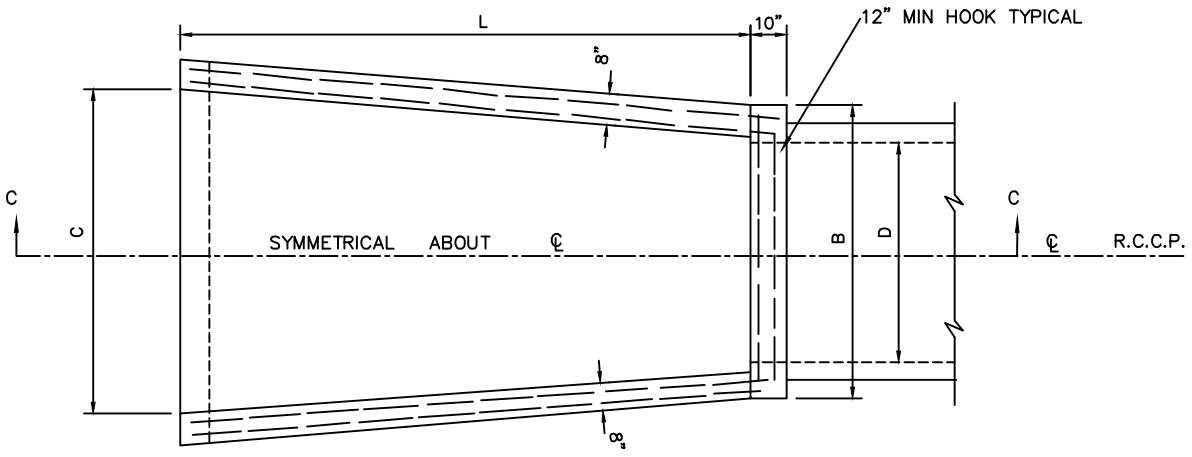
ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS STANDARD TYPE H HEADWALL ROUND PIPE	REVISED 04/2024	D 68

4/2018

COMPLY WITH THE REQUIREMENTS
IN MD 362.01-1 STANDARD TYPE H ENDWALL
DIMENSIONS AND QUANTITIES
OF MDSHA BOOK OF STANDARDS.

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS STANDARD TYPE H ENDWALL ROUND PIPE	REVISED 04/2024	D 68A

4/2018

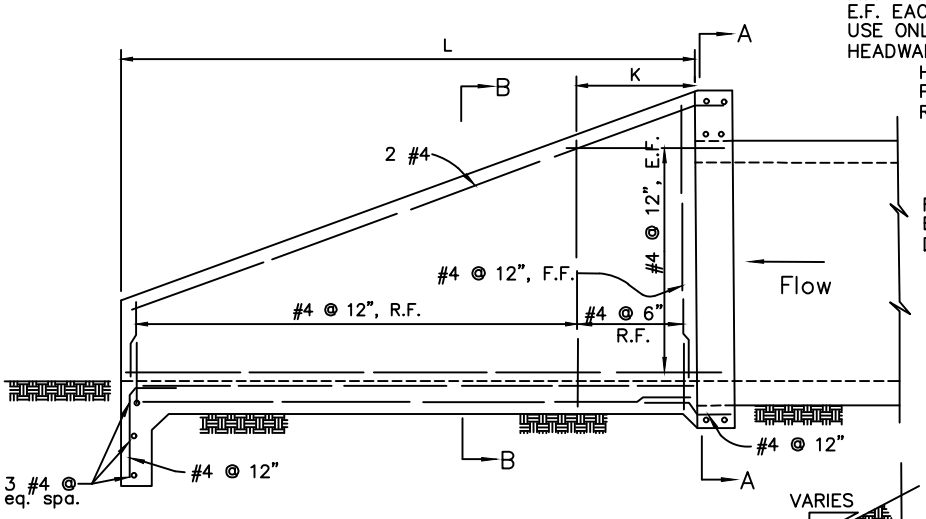


PLAN

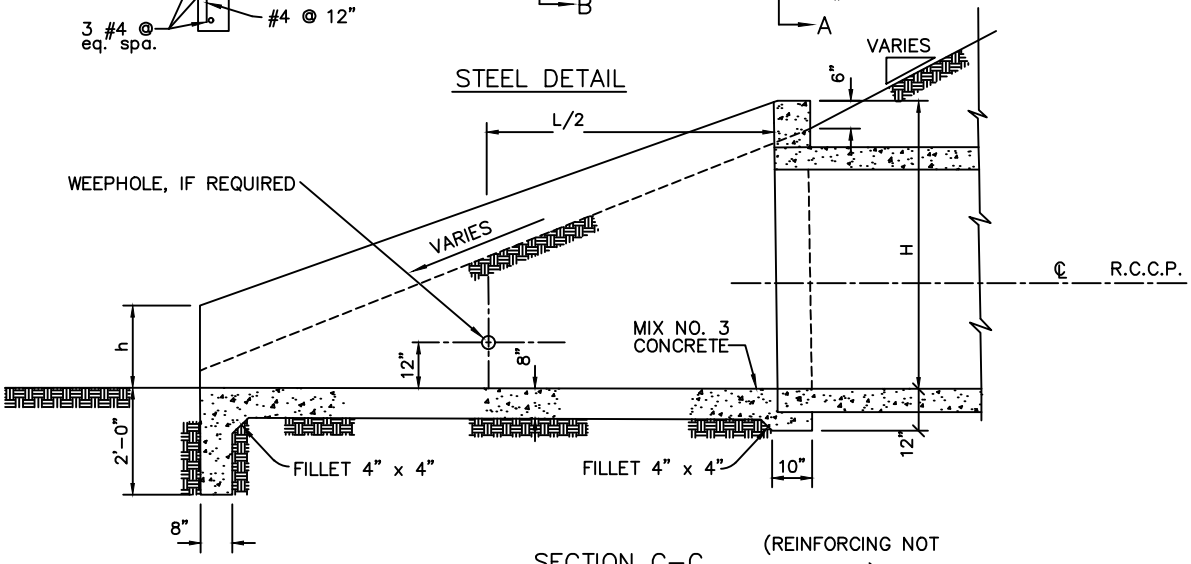
(SHOWING WALL REINFORCEMENT ONLY)

NOTE:

R.F. = REAR FACE
F.F. = FRONT FACE (EXPOSED)
E.F. EACH FACE
USE ONLY WHERE OTHER HEADWALLS CAN NOT BE USED.
HEADWALL TO BE PARALLEL TO C OF ROADWAY.



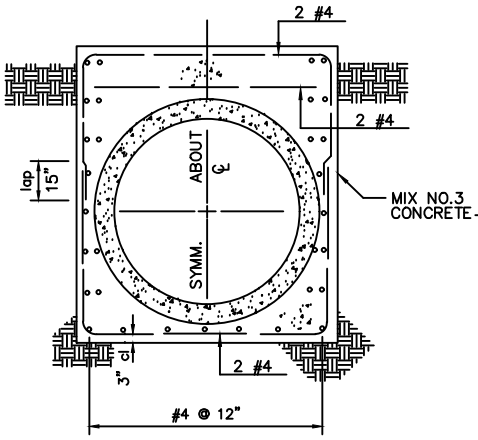
STEEL DETAIL



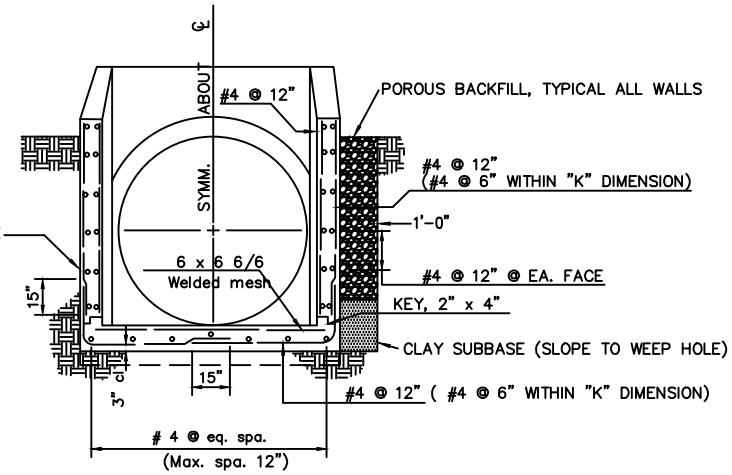
SECTION C–C (REINFORCING NOT SHOWN)

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS TYPE "O" HEADWALL CIRCULAR PIPE	REVISED 04/2024	D 69

4/2018



SECTION A–A



SECTION B–B

NOTE:

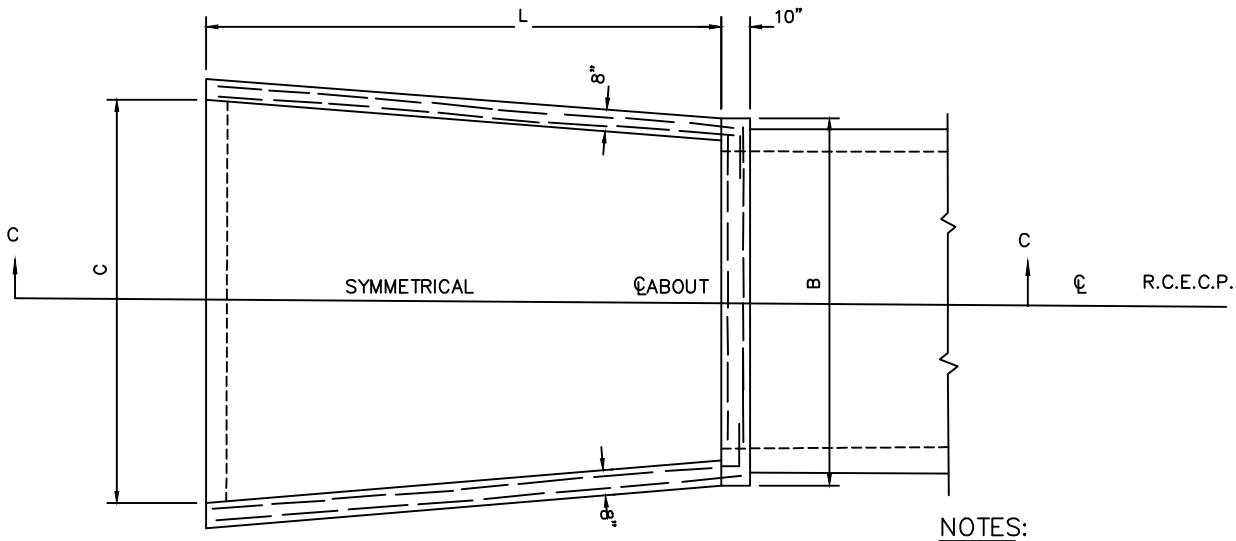
1. STEEL TO BE 2" CLEAR UNLESS OTHERWISE SHOWN.
2. PROVIDE ONE 3" CAST IRON WEEP HOLE IN EACH WINGWALL, AT CENTER, FOR PIPES OVER 36" DIA. PLACE WEEP HOLE AT TOP OF CLAY SUBBASE.
3. USE ONLY WHERE OTHER HEADWALLS CAN NOT BE USED.
4. HEADWALL TO BE PARALLEL TO ℄ OF ROADWAY. FOR PLAN VIEW, STEEL DETAIL AND SECTION C–C, SEE DETAIL D–69

HEADWALLS FOR CIRCULAR PIPE (R.C.C.P.)

DIMENSIONS	DIAMETER – (D)											
	18"	21"	24"	27"	30"	36"	42"	48"	54"	60"	66"	72"
B	2'–10"	3'–1"	3'–4"	3'–7"	4'–2"	4'–8"	5'–2"	5'–8"	6'–2"	6'–10"	7'–6"	8'–0"
C	2'–7"	2'–11"	3'–4"	3'–8"	4'–5"	5'–2"	5'–11"	6'–8"	7'–5"	8'–4"	9'–1"	9'–10"
H	3'–0"	3'–3"	3'–6"	3'–9"	4'–0"	4'–6"	5'–0"	5'–6"	6'–0"	6'–6"	7'–0"	7'–6"
h	1'–0"	1'–0"	1'–0"	1'–0"	1'–3"	1'–6"	1'–9"	2'–0"	2'–3"	2'–6"	2'–9"	3'–0"
L	5'–6"	6'–0"	6'–6"	7'–0"	8'–0"	9'–0"	10'–3"	11'–6"	12'–9"	14'–0"	15'–3"	16'–6"
K	—	—	—	—	—	—	—	—	1'–0"	2'–0"	3'–0"	4'–0"

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS TYPE O HEADWALL CIRCULAR PIPE	REVISED 04/2024	D 70

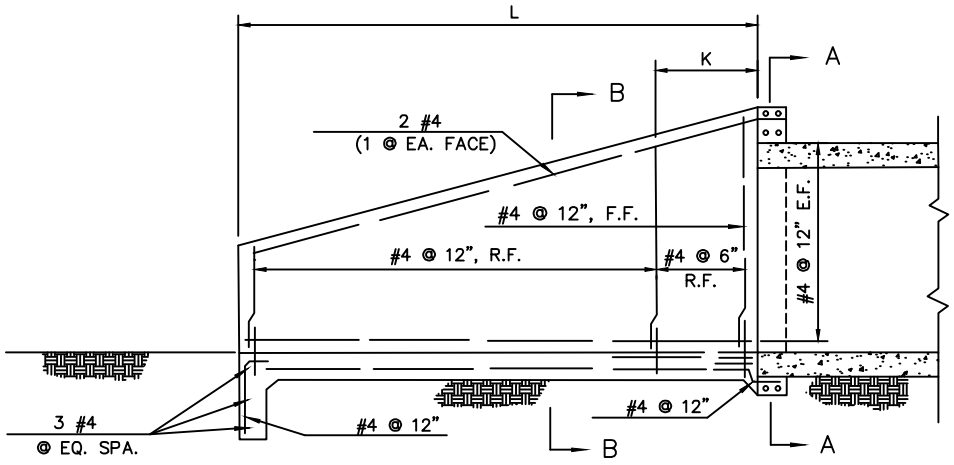
2/2015



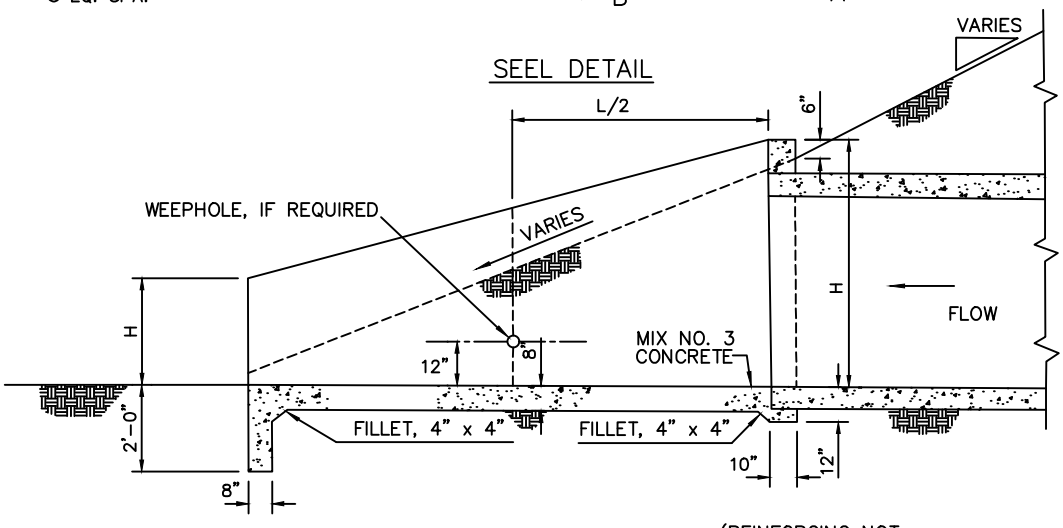
NOTES:

1. R.F. = REAR FACE
2. F.F. = FRONT FACE (EXPOSED)
3. E.F. EACH FACE
4. STEEL TO BE 2" CLEAR UNLESS OTHERWISE SHOWN.
5. HEADWALL TO BE PARALLEL TO ℄C OF ROADWAY.
6. FOR SECTIONS "A–A" AND "B–B", SEE DETAIL D/72

PLAN
(SHOWING WALL REINFORCEMENT ONLY)



SEEL DETAIL

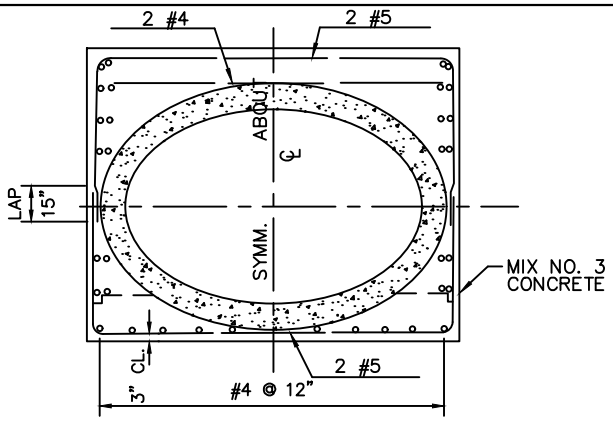


SECTION C–C

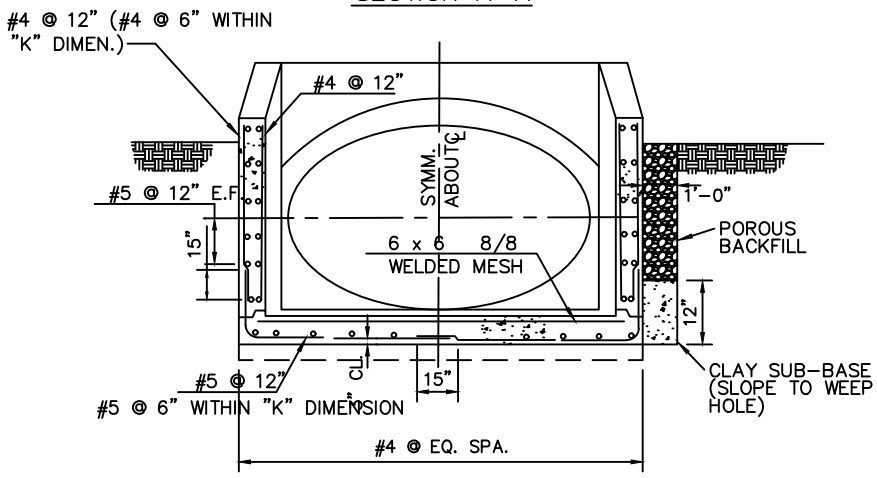
(REINFORCING NOT SHOWN)

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS TYPE "O" HEADWALL ELLIPTICAL PIPE	REVISED 04/2024	D 71

6/2015



SECTION A–A



SECTION B–B

NOTE:

1. PROVIDE ONE 3" CAST IRON PIPE WEEP HOLE IN EACH WING–WALL, AT CENTER, FOR PIPES OVER 60" SPAN. PLACE WEEP HOLE AT TOP OF CLAY SUB–BASE.
2. USE ONLY WHERE OTHER HEADWALLS CAN NOT BE USED.
3. HEADWALL TO BE PARALLEL TO ℄ OF ROADWAY.
4. FOR CMPA DIMENSIONS B AND H SHALL BE BASED UPON HORIZONTAL AND VERTICAL DIMENSIONS OF ARCH.
5. FOR PLAN VIEW, STEEL DETAIL AND SECTION "C–C", SEE DETAIL D/71.

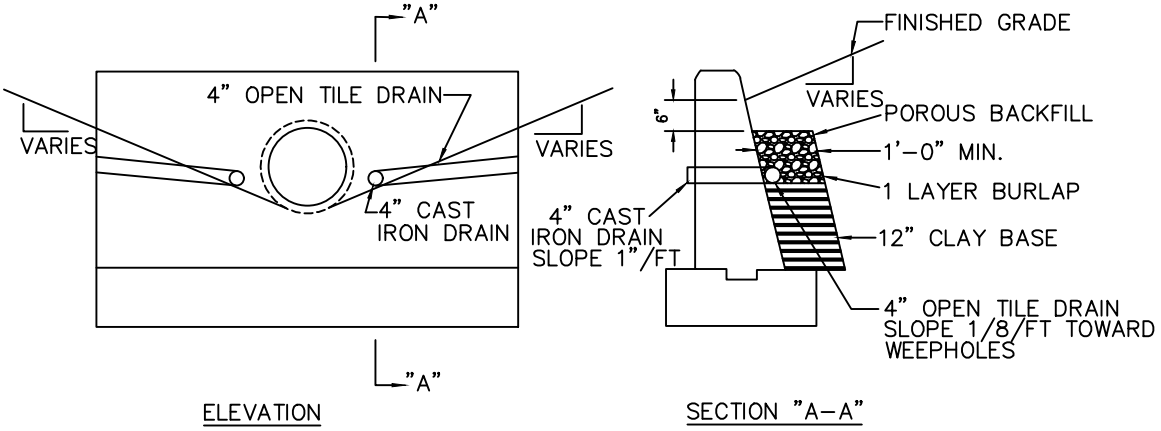
HEADWALLS FOR ELLIPTICAL PIPE (R.C.E.C.P.)

SPAN	RISE	EQUIV. ROUND	B	C	H	H	L	K
23"	14"	18"	3'–5"	2'–11"	2'–5"	1'–0"	4'–3"	—
30"	19"	24"	4'–0"	3'–9"	2'–10"	1'–0"	5'–4"	—
38"	24"	30"	4'–8"	4'–8"	3'–4"	1'–0"	6'–6"	—
42"	27"	33"	5'–0"	5'–1"	3'–7"	1'–3"	7'–2"	—
45"	29"	36"	5'–3"	5'–5"	3'–10"	1'–4"	7'–8"	—
53"	34"	42"	6'–0"	6'–4"	4'–3"	1'–7"	8'–8"	—
60"	38"	48"	6'–8"	7'–1"	4'–8"	1'–9"	9'–6"	—
68"	43"	54"	7'–5"	7'–11"	5'–1"	2'–0"	10'–7"	—

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS TYPE "O" HEADWALL ELLIPTICAL PIPE	REVISED 04/2024	D 72

2/2015

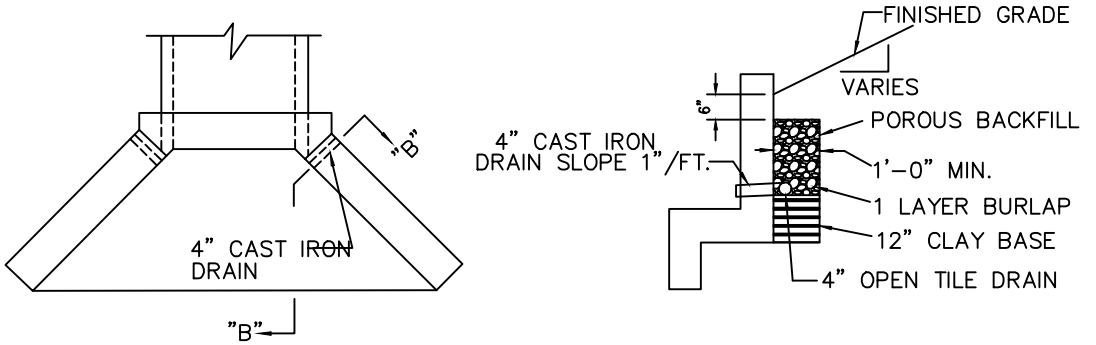
NOTE: DAMP-PROOF REAR FACE OF WALL UP TO 1'-6" BELOW TOP OF WALL



ELEVATION

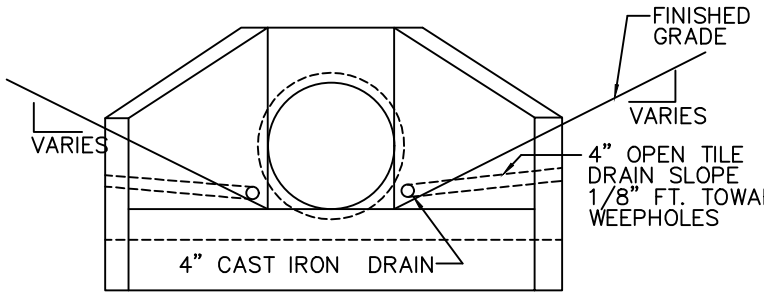
SECTION "A-A"

TYPE "B" HEADWALL



PLAN

SECTION "B-B"



ELEVATION

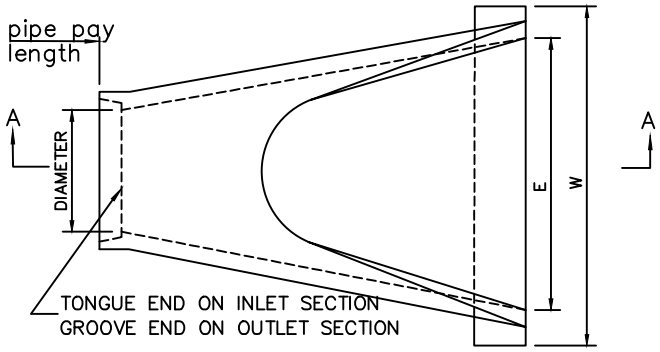
NOTE:

THE PLACEMENT AND CONSTRUCTION OF WEEPHOLES FOR THE TYPE A-1, E, F AND "O" HEADWALLS WILL BE SIMILAR TO THAT SHOWN FOR THE TYPE "A" HEADWALL.

TYPE "A" HEADWALL

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS DETAILS OF WEEPHOLES FOR HEADWALLS	REVISED 04/2024	D 73

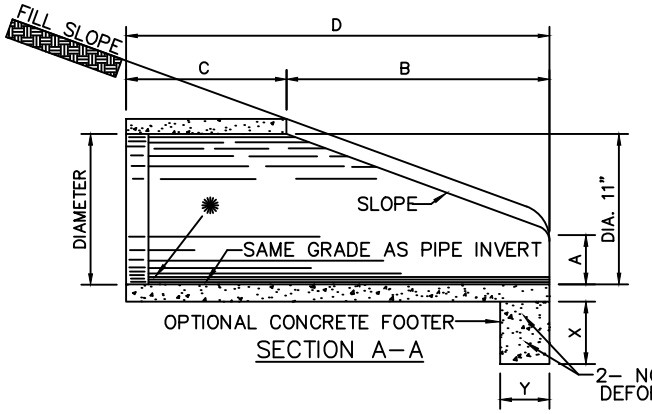
5/2015



PLAN

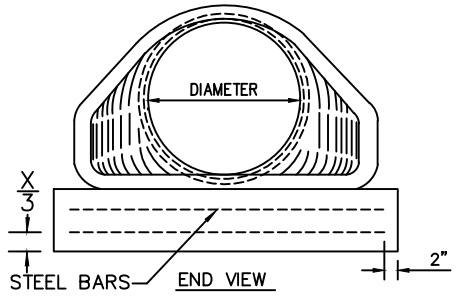
NOTES:

1. CONTRACTOR HAS OPTION OF FINISHING END SECTIONS CONFORMING TO DETAILS ON THIS SHEET OR END SECTIONS CONFORMING TO DETAILSON D/75.
2. END SECTIONS MUST BE REINFORCED TO CONFORM WITH CLASS IV PIPE.
3. CONCRETE FOOTER SHALL BE USED WHEN SPECIFIED ON THE PLANS. COST OF CONCRETE FOOTER TO BE INCLUDED IN PRICE OF END SECTION. CONCRETE TO BE MIX NO.2. REINFORCEMENT TO BE NO. 3 BARS.



SECTION A–A

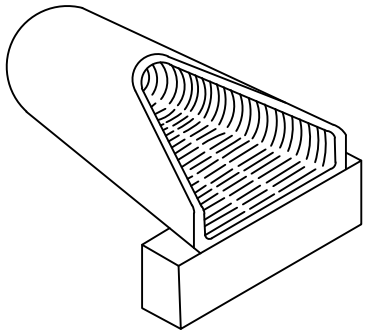
✹INVERT ELEVATION TO BE AT THE PIPE END OF THE STANDARD END SECTION. ELEVATIONS TO BE NOTES ON THE CONSTRUCTION PLANS.



quantities for estimating purposes only

dimensions										quantities	
concrete end section								concrete footer			
dia.	slope	a	b	c	d	e	w	x	y	conc. c.y.	steel lbs
12"	3:1	4"	2'–0"	4' 0–7/8"	6' 0–7/8"	2'–0"	3'–0"	12"	9"	0.08	24.00
15"	3:1	6–1/2"	2'–4"	3'–10"	6'–2"	2'–6"	3'–6"	12"	9"	0.10	28.50
18"	3:1	10–1/4"	2'–2"	4'–0"	6'–2"	3'–0"	4'–0"	12"	9"	0.11	33.00
21"	3:1	9"	3'–0"	3' 1–1/2"	6' 1–1/2"	3'–6"	4'–6"	12"	9"	0.13	37.50
24"	3:1	11"	3'–7"	2'–8"	6'–3"	4'–0"	5'–0"	15"	9"	0.17	42.00
27"	3:1	10–1/2"	4' 1–1/2"	2'–0"	6' 1–1/2"	4'–6"	5'–6"	15"	9"	0.19	46.50
30"	3:1	1'–1"	4'–5"	1'–10"	6'–3"	5'–0"	6'–0"	15"	9"	0.21	51.00
33"	3:1	1'–2"	4'–7"	2'–2"	6'–9"	5'–6"	6'–6"	15"	9"	0.23	55.50
36"	3:1	1' 3–1/2"	5'–3"	3'–1"	8' 1–1/2"	6'–0"	7'–3"	15"	9"	0.25	62.25
42"	3:1	1' 9–1/4"	5'–5"	2'–10"	8'–3"	6'–6"	7'–9"	15"	9"	0.27	66.75
48"	3:1	2'–1"	6'–0"	2'–2"	8'–2"	7'–0"	8'–6"	18"	12"	0.47	73.50
54"	2: 4: 1	2'–5"	5'–2"	2'–10"	8'–0"	7'–6"	9'–0"	18"	12"	0.50	78.00
60"	2:1	2'–7"	4'–11"	3' 8–1/2"	8' 7–1/2"	8'–0"	9'–6"	18"	12"	0.53	82.50
66"	2:1	2'–4"	6'–6"	1'–9"	8'–3"	8'–6"	10'–0"	18"	12"	0.56	87.00
72"	2:1	2'–10"	6'–6"	1'–9"	8'–3"	9'–0"	10"–9"	18"	12"	0.60	93.75

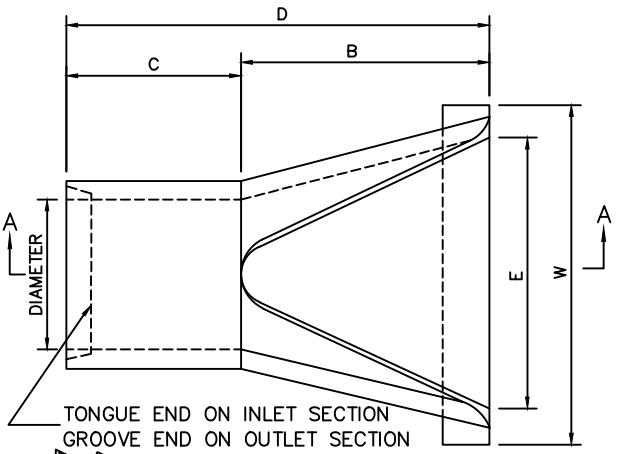
SEE NOTE 3 ABOVE FOR CONCRETE FOOTER



ISOMETRIC VIEW

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS STANDARD CONCRETE END SECTION ROUND CONCRETE PIPE	REVISED 04/2024	D 74

6/2015

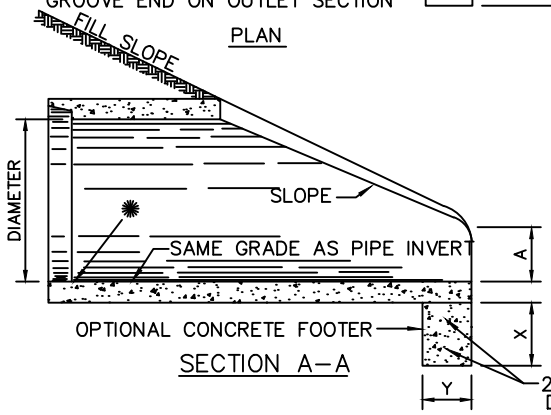


PLAN

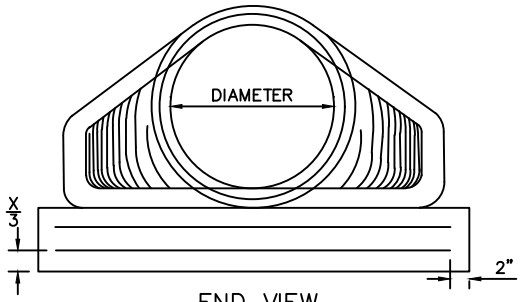
NOTES:

1. CONTRACTOR HAS OPTION OF FURNISHING END SECTIONS CONFORMING TO DETAILS ON THIS SHEET OR END SECTIONS CONFORMING TO DETAILSON D/74.
2. END SECTIONS MUST BE REINFORCED TO CONFORM WITH CLASS IV PIPE.
3. CONCRETE FOOTER SHALL BE USED WHEN SPECIFIED ON THE PLANS. COST OF CONCRETE FOOTER TO BE INCLUDED IN PRICE OF END SECTION. CONCRETE TO BE MIX NO.2. REINFORCEMENT TO BE NO. 3 BARS.

✹INVERT ELEVATION TO BE AT THE PIPE END OF THE STANDARD END SECTION. ELEVATIONS TO BE NOTED ON THE CONSTRUCTION PLANS.



SECTION A–A

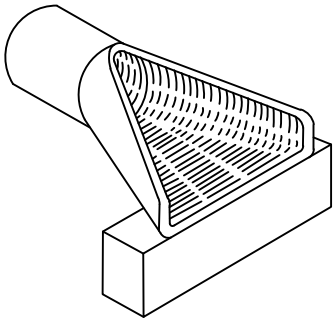


END VIEW

quantities for estimating purposes only

dimensions										quantities	
concrete end section								concrete footer			
dia.	slope	a	b	c	d	e	w	x	y	conc. c.y.	steel lbs
12"	3:1	4"	2'–0"	4' 0-7/8"	6' 0-7/8"	2'–0"	3'–0"	12"	9"	0.08	24.00
15"	3:1	6"	2'–3"	3'–10"	6'–1"	2'–6"	3'–6"	12"	9"	0.10	28.50
18"	3:1	9"	2'–3"	3'–10"	6'–1"	3'–0"	4'–0"	12"	9"	0.11	33.00
21"	3:1	9"	3'–0"	3' 1-1/2"	6' 1-1/2"	3'–6"	4'–6"	12"	9"	0.13	37.50
24"	3:1	9-1/2"	3' 7-1/2"	2'–6"	6' 1-1/2"	4'–0"	5'–0"	15"	9"	0.17	42.00
27"	3:1	10-1/2"	4' 1-1/2"	2'–0"	6' 1-1/2"	4'–6"	5'–6"	15"	9"	0.19	46.50
30"	3:1	1'–0"	4'–6"	1' 7-3/4"	8' 1-3/4"	5'–0"	6'–0"	15"	9"	0.21	51.00
33"	3:1	1'–2"	4'–7"	2'–2"	6'–9"	5'–6"	6'–6"	15"	9"	0.23	55.50
36"	3:1	1'–3"	5'–3"	2' 10-3/4"	8' 1-3/4"	6'–0"	7'–3"	15"	9"	0.25	62.25
42"	3:1	1'–6" or 1'–9"	5'–3"	2'–11"	8'–2"	6'–6"	7'–9"	15"	9"	0.27	66.75
48"	3:1	2'–0"	6'–0"	2'–2"	8'–2"	7'–0"	8'–6"	18"	12"	0.47	73.50
54"	2: 4: 1	2'–3"	5'–5"	2' 9-1/4"	8' 2-1/4"	7'–6"	9'–0"	18"	12"	0.50	78.00

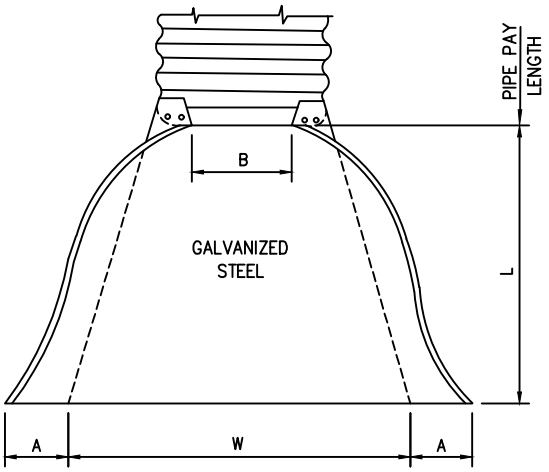
SEE NOTE 3 ABOVE FOR CONCRETE FOOTER



ISOMETRIC VIEW

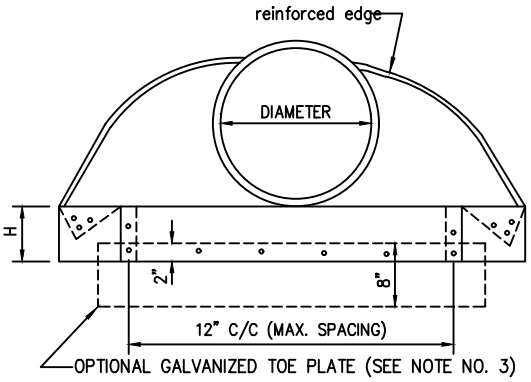
ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS STANDARD CONCRETE END SECTION ROUND CONCRETE PIPE	REVISED 04/2024	D 75

6/2015

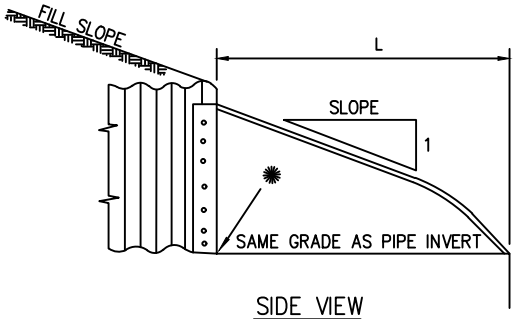


PLAN

DIMENSIONS								
PIPE DIA.	GA.	A 1"±	B MAX.	H 1"±	L 11/2"±	W 2"±	APPROX. SLOPE	UNIT
12"	16	6"	6"	6"	21"	24"	2-1/2	1 PC.
15"	16	7"	8"	6"	26"	30"	2-1/2	1 PC.
18"	16	8"	10"	6"	31"	36"	2-1/2	1 PC.
21"	16	9"	12"	6"	36"	42"	2-1/2	1 PC.
24"	16	10"	13"	6"	41"	48"	2-1/2	1 PC.
30"	14	12"	16"	8"	51"	60"	2-1/2	1 PC.
36"	14	14"	17"	9"	60"	72"	2-1/2	2 PC.
42"	12	16"	22"	11"	69"	84"	2-1/2	2 PC.
48"	12	18"	27"	12"	78"	90"	2-1/4	2 OR 3 PC.
54"	12	18"	30'	12"	84"	102"	2	2 OR 3 PC.
60"	12&10	18"	33"	12"	87"	114"	1-3/4	3 PC.
66"	12&10	18"	36"	12"	87"	120"	1-1/2	3 PC.
72"	12&10	18"	39"	12"	87"	126"	1-1/3	3 PC.
78"	12&10	18"	42"	12"	87"	132"	1-1/4	3 PC.
84"	12&10	18"	45"	12"	87"	138"	1-1/6	3 PC.



END VIEW



SIDE VIEW

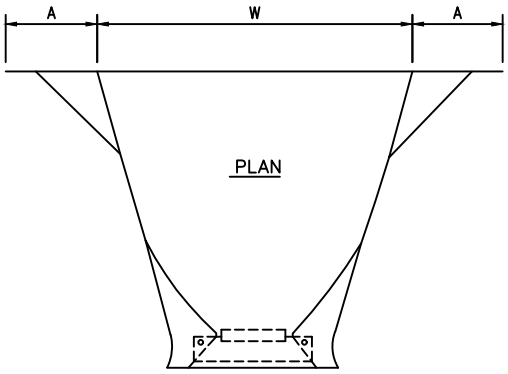
✹ INVERT ELEVATION TO BE AT THE PIPE END OF THE STANDARD END SECTION. ELEVATIONS TO BE NOTED ON THE CONSTRUCTION PLANS.

NOTES:

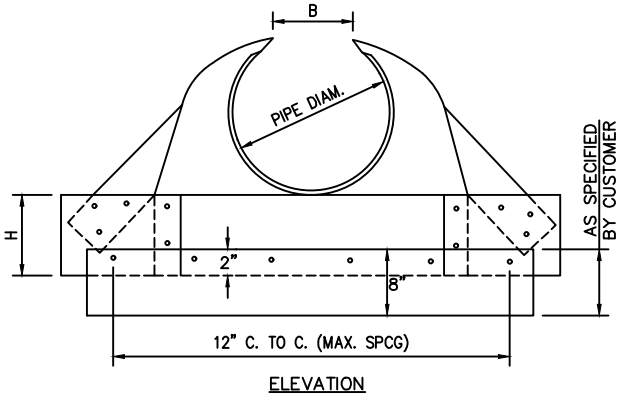
1. ALL 3 PIECE UNITS TO HAVE 12 GA. SIDES AND 10 GA. CENTER PANELS (EXCEPT 48" AND 54" PIPES, ALL PANELS SHALL BE 12 GA.). WIDTH OF CENTER PANELS TO BE GREATER THAN 20% OF THE PIPE PERIPHERY. MULTIPLE PANEL UNITS TO HAVE LAP SEAMS WHICH ARE TO BE TIGHTLY JOINED BY 3/8" GALVANIZED RIVETS OR BOLTS.
2. FOR 60" THRU 84" SIZES, REINFORCED EDGES TO BE SUPPLEMENTED WITH GALVANIZED STIFFENER ANGLES. THE ANGLES WILL BE 2" x 2" x 1/4" FOR 60" THRU 72" DIAMETER AND 2 1/2" x 2 1/2" x 1/4" FOR 78" AND 84" DIAMETER. THE ANGLES TO BE ATTACHED BY 3/8" GALVANIZED NUTS AND BOLTS.
3. TOE PLATE SHALL BE USED WHEN SPECIFIED ON THE PLANS. COST OF TOE PLATE TO BE INCLUDED IN BID PRICE PER EACH OF METAL END SECTION.
4. TYPE 3 CONNECTION INCLUDES ONE FOOT OF PIPE LENGTH FOR 42" THRU 84" DIAMETER AS A CONNECTION SECTION. THE CONNECTOR SECTION WILL BE ATTACHED TO THE END SECTION BY GALVANIZED RIVETS OR BOLTS. SEE DETAIL D/78.
5. WHERE END SECTION IS TO BE APPLIED TO A STRUCTURAL PLATE PIPE, THE END SECTION SHALL BE ORDERED WITHOUT THE ONE FOOT OF PIPE LENGTH AS STIPULATED IN NOTE 4; INSTEAD, DRILL HOLES AND FIELD BOLT THE END SECTION DIRECTLY TO THE STRUCTURAL PLATE PIPE.

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS STANDARD METAL END SECTION ROUND METAL PIPE	REVISED 04/2024	D 76

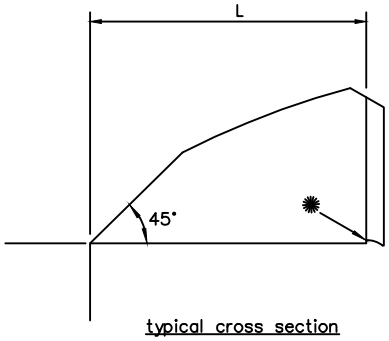
6/2015



PIPE DIAM.	GA.	DIMENSION					BOOT
		A 1"±	B	H	L 1-1/2"±	W 2"±	
12	16	7-1/2	6	6	21	24	1 PC.
15	16	8-3/8	8	6	26	30	1 PC.
18	16	9-1/4	9	6	31	36	1 PC.
21	16	9-7/8	11	6-1/4	36	42	1 PC.
24	14	11-1/4	12	6	42	48	1 PC.
30	14	13	15	7-1/2	52-1/2	60	2 PC.
36	12	14	18	8	63	72	2 PC.
42	12	16-3/4	21	10-1/2	73-1/2	84	2 PC.
48	12	18-1/4	27	12	84	90	2 PC.



ELEVATION



typical cross section

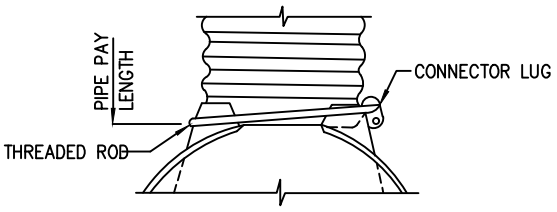
✹ INVERT ELEVATION TO BE AT THE END OF THE STANDARD END SECTION. ELEVATIONS TO BE NOTED ON THE PLANS.

NOTE:

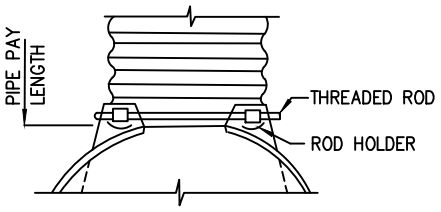
1. RODS, BOLTS, NUTS, ETC. TO BE HOT DIP GALVANIZED, ELECTRO-GALVANIZED OR CADMIUM PLATED.
2. SPECIFICATIONS AASHTO DESIGNATION M 36.
3. END SECTIONS TO BE SHAPED WITH TOP FINISHING PIECE BOLTED IN PLACE AND CONNECTION PIECE ASSEMBLED IN PLACE.

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS STANDARD METAL END SECTION ROUND METAL PIPE	REVISED 04/2024	D 77

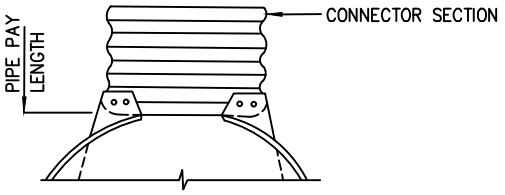
6/2015



TYPE 1
(FOR 12" THRU 24" ONLY)



TYPE 2
(FOR 30" THRU 36" ONLY)

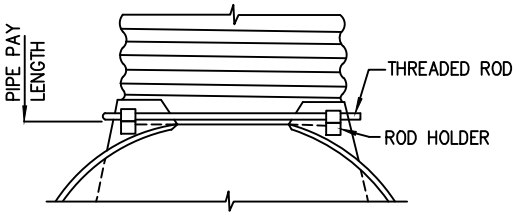


TYPE 3
(FOR 42" THRU 84" ONLY)

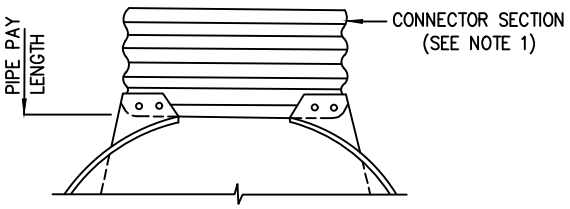
CONNECTIONS FOR ROUND PIPE

NOTES:

1. TYPE 3 CONNECTION INCLUDES ONE FOOT OF THE PIPE LENGTH FOR 42" THRU 84" ROUND SIZES OR FOR 64" x 43" THRU 83" x 57" ARCH SIZES AS A CONNECTOR SECTION. THE CONNECTOR SECTION WILL BE ATTACHED TO THE END SECTION BY GALVANIZED RIVETS OR BOLTS.
2. WHERE END SECTION IS TO BE APPLIED TO A STRUCTURAL PLATE PIPE OR STRUCTURAL PLATE PIPE ARCH THE END SECTION SHALL BE ORDERED WITHOUT THE ONE FOOT OF PIPE LENGTH. INSTEAD, DRILL HOLES AND FIELD BOLT THE END SECTION DIRECTLY. TO THE STRUCTURAL PLATE PIPE OR STRUCTURAL PLATE PIPE ARCH.



TYPE 2
(FOR 17" x 13" THRU 57" x 38" ONLY)



TYPE 3
(FOR 64" x 43" THRU 83" x 57" ONLY)

CONNECTIONS FOR PIPE ARCH

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS STANDARD CONNECTIONS METAL END SECTIONS	REVISED 04/2024	D 78

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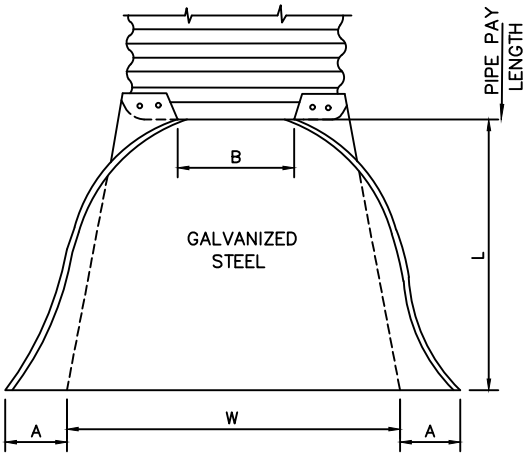
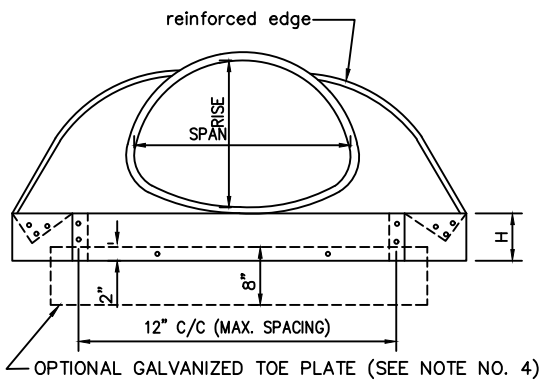
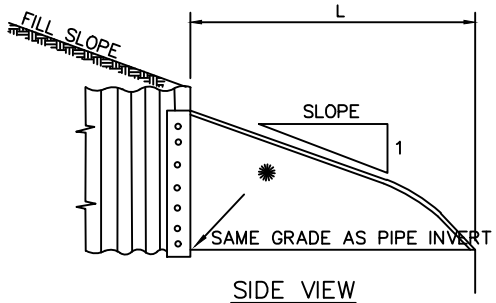


PLAN

DIMENSIONS									
PIPE ARCH DIMENSIONS		GA.	A	B	H	L	W	APPROX.	UNIT
SPAN	RISE		1" ±	MAX.	1" ±	1-1/2" ±	2" ±	SLOPE	
17"	13"	16	7"	9"	6"	19"	30"	2-1/2	1 PC.
21"	15"	16	7"	10"	6"	23"	36"	2-1/2	1 PC.
24"	18"	16	8"	12"	6"	28"	42"	2-1/2	1 PC.
28"	20"	16	9"	14"	6"	32"	48"	2-1/2	1 PC.
35"	24"	14	10"	16"	6"	39"	60"	2-1/2	1 PC.
42"	29"	14	12"	18"	8"	46"	75"	2-1/2	1 PC.
49"	33"	12	13"	21"	9"	53"	85"	2-1/2	2 PC.
57"	38"	12	18"	26"	12"	63"	90"	2-1/2	2 OR 3 PC.
64"	43"	12	18"	30"	12"	70"	102"	2-1/4	2 OR 3 PC.
71"	47"	12	18"	33"	12"	77"	114"	2-1/4	3 PC.
77"	52"	12	18"	36"	12"	77"	126"	2	3 PC.
83"	57"	12	18"	39"	12"	77"	138"	2	3 PC.



END VIEW



SIDE VIEW

✹ INVERT ELEVATION TO BE AT THE PIPE END OF THE STANDARD END SECTION. ELEVATIONS TO BE NOTED ON THE CONSTRUCTION PLANS.

NOTES:

1. ALL 3 PIECE UNITS TO HAVE 12 GA. SIDES AND 10 GA. CENTER PANELS (EXCEPT 57" x 38" AND 64" x 43" PIPES, ALL PANELS SHALL BE 12 GA.). WIDTH OF CENTER PANELS TO BE GREATER THAN 20% OF THE PIPE PERIPHERY. MULTIPLE PANEL UNITS TO HAVE LAP SEAMS WHICH ARE TO BE TIGHTLY JOINED BY 3/8" ø GALVANIZED RIVETS OR BOLTS.
2. FOR THE 77" x 52" AND 83" x 57" SIZES, REINFORCED EDGE TO BE SUPPLEMENTED BY 2" x 2" x 1/4" GALVANIZED ANGLES. THE ANGLES ARE TO BE ATTACHED BY 3/8" ø GALVANIZED NUTS AND BOLTS.
3. ANGLE REINFORCEMENT WILL BE PLACED UNDER THE CENTER PANEL SEAMS ON THE 77" x 52" AND 83" x 57" SIZES.
4. TOE PLATE SHALL BE USED WHEN SPECIFIED ON THE PLANS. COST OF TOE PLATE TO BE INCLUDED IN BID PRICE PER EACH OF METAL END SECTION.
5. TYPE 3 CONNECTION INCLUDES ONE FOOT OF PIPE LENGTH FOR 64" x 43" THRU 83" x 57" DIAMETER AS A CONNECTOR SECTION. THE CONNECTOR SECTION WILL BE ATTACHED TO THE END SECTION BY GALVANIZED RIVETS OR BOLTS. SEE DETAIL D/78.
6. WHERE END SECTION IS TO BE APPLIED TO A STRUCTURAL PLATE PIPE ARCH, THE END SECTION SHALL BE ORDERED WITHOUT THE ONE FOOT OF PIPE LENGTH AS STIPULATED IN NOTE 5; INSTEAD, DRILL HOLES AND FIELD BOLT THE END SECTION DIRECTLY TO THE STRUCTURAL PLATE PIPE ARCH.

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS STANDARD METAL END SECTION ARCH METAL PIPE	REVISED 04/2024	D 79

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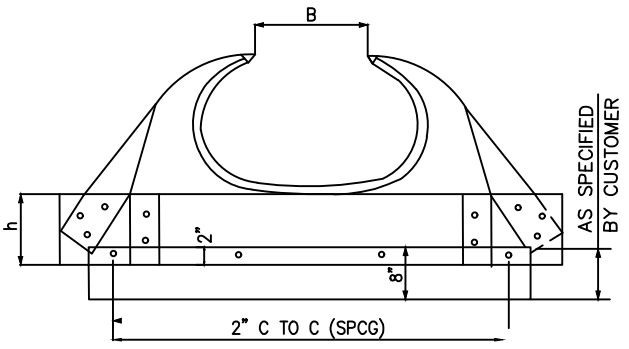
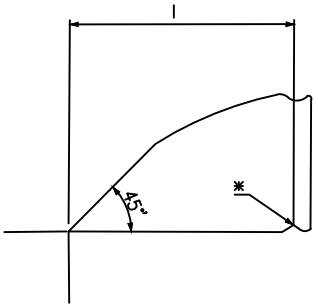
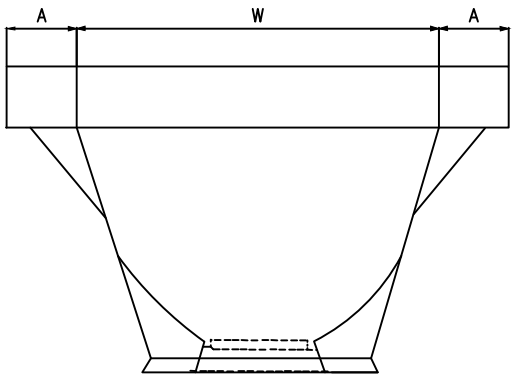


ELEVATION



TYPICAL CROSS SECTIOIN

* NOTE:
INVERT ELEVATION TO BE AT THE PIPE END OF THE STANDARD END SECTION. ELEVATIONS TO BE NOTED ON PLANS.



PLAN

PIPE ARCH		GAGE	DIMENSIONS					BASE
SPAN	RISE		A = 1" INCH	B MAX	H =1"±	L =1 1/2"	W =2"±	
17	13	16	7	9	6	19	30	1 PC
21	15	16	7	10	6	23	36	1 PC
24	18	16	8	12	6	28	42	1 PC
28	20	16	9	14	6	32	48	1 PC
35	24	14	10	18	6	39	60	1 PC
42	29	14	12	21	8	46	75	1 PC
49	33	12	13	26	9	53	85	2 PC
57	38	12	18	30	12	63	90	2 PC
64	43	12	10	33	12	70	102	2 PC
71	47	12	18	36	12	77	114	3PC
77	52	12	18	39	12	77	126	3 PC
83	57	12	18	10	12	77	138	3 PC

NOTES:

1. ALL 3 PIECE UNITS 12 GA. SIDES AND 10 GA. CENTER PANELS (EXCEPT 57"x36" AND 64" x 43" PIPES, ALL PANELS SHALL BE 12 GA.). WIDTH OF CENTER PANELS TO BE GREATER THAN 20% OF o I THE PIPE PERIPHERY. MULTIPE PANEL UNITS TO HAVE LAP SEAMS WHICH ARE TO BE TIGHTY JOINED BY 3/8 GALVANIZED RIVETS OR BOLTS. THE PIPE PERIPHERY. MULTIPE PANEL UNITS TO HAVE LAP SEAMS WHICH ARE TO BE TIGHTY JOINED BY 3/8 o GALVANIZED NUTS AND
2. FOR THE 77" x 52" and 83"x 57" SIZES, REINFORCED EDGE TO BE SUPPLEMENTED BY 2" x 2 " x 1/4" GALVANIZED ANGLES. THE ANGLES ARE TO BE ATTACHED BY 3/8 I BOLTS. ANGLES REINFORCEMENT WILL BE PLACED UNDER THE CENTER PANEL SEAMS ON THE 7.7" x 52" AND 83" x 57" SIZES. 3.
4. TOE PLATE SHALL BE USED WHEN SPECIFIED ON THE PLANS. COST OF TOE PLATE TO BE INCLUDED IN BID PRICE PER EACH OF META L END SECTION. 5. TYPE 3 CONNECTION INCLUDES ONE FOOT OF PIPE LENGTH FOR 64" x 43" THRU 83" x 57" DIAMETER AS A CONNECTOR SECTION. THE CONNECTOR SECTION WILL BE ATTACHED TO THE END SECTION BY GALVANIZED RIVETS OR BOLTS. SEE D / 78. 6. WHERE END SECTION IS TO BE APPLIED TO A STRUCTURAL PLATE PIPE ARCH, THE END SECTION SHALL BE ORDERED WITHOUT THE ONE FOOT OF PIPE LENGTH AS STIPULATED IN NOTE 5; INSTEAD,DRILL HOLES AND FIELD BOLT THE END SECTION DIRECTLY TO THE STRUCTURAL PLATE.

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS STANDARD METAL END SECTION ARCH METAL PIPE	REVISED 04/2024	D 80

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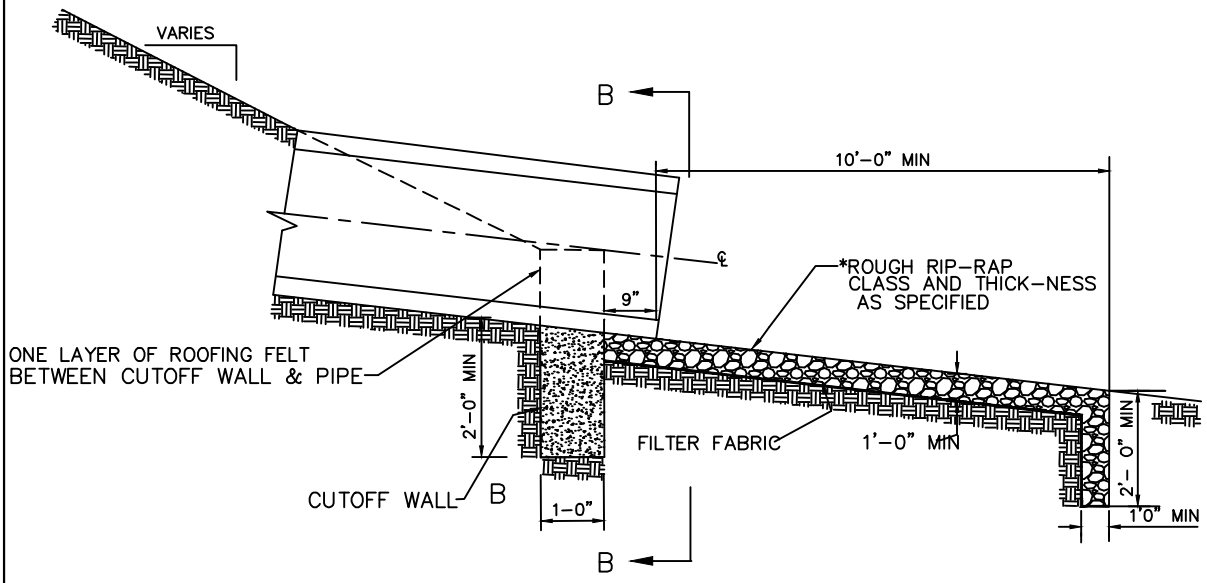
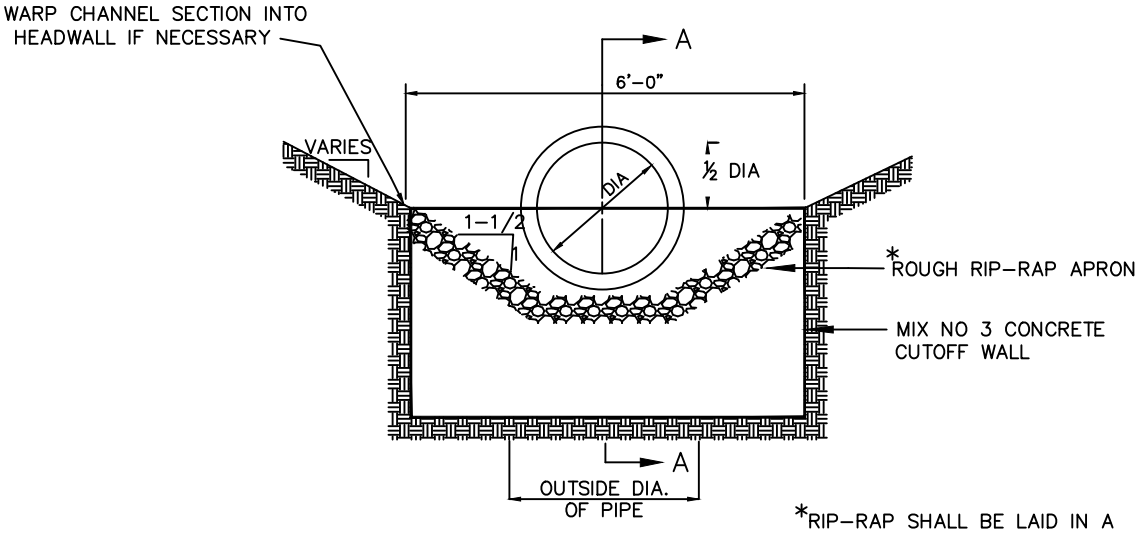
NOTE:
TYPE "B" HEADWALL D/60 CAN BE USED IN PLACE OF CUTOFF WALL IF DESIRED



SECTION A–A



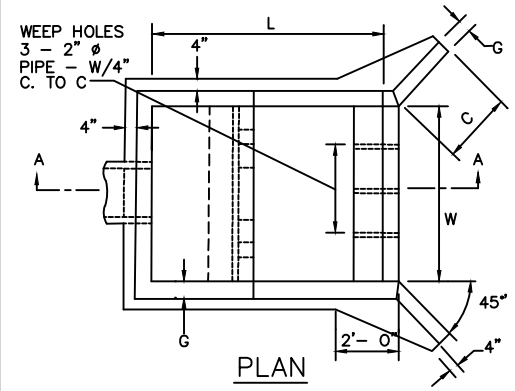
SECTION B–B

CUTOFF WALL TO BE PARALLEL TO ℄ UNLESS OTHERWISE NOTED ON CONTRACT DRAWINGS.

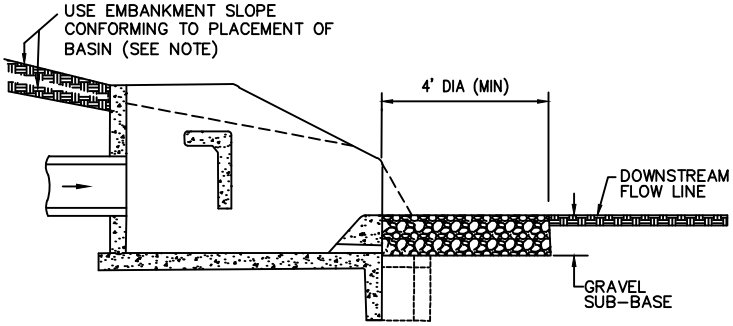
*RIP–RAP SHALL BE LAID IN A FASHION THAT WILL GIVE MAXIMUM ROUGHNESS TO THE SURFACE BY DISPLACEMENT OF THE INDIVIDUAL STONES. ALTERNATELY UP OR DOWN ABOUT ONE INCH AND AS OTHERWISE DIRECTED BY THE ENGINEER.

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS CUTOFF WALL AND OUTLET PAVING	REVISED 04/2024	D 81

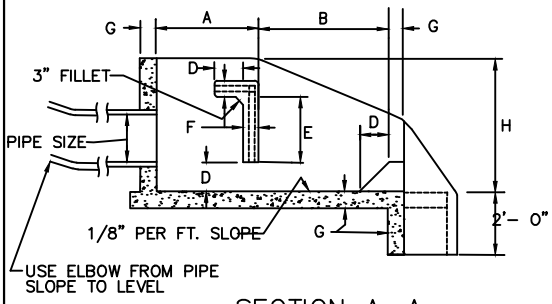
4/2015



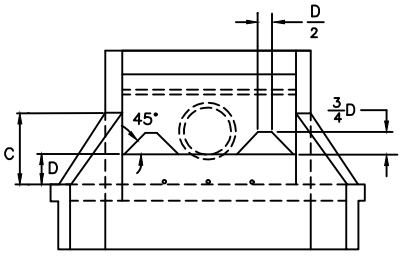
PLAN



SLOPE DETAIL



SECTION A–A



ELEVATION

NOTES :

1. Depth of sub–base against end sill shall be increased for "D"18" to positive drainage of weepholes. Condition illustrated applies only to medium range of "D".
2. In deep gully or ditch outlet embankment slope should intersect top of backwall.
3. In shallow ditch or gully outlet, toe of embankment should intersect normal ground level at "E" minimum above outlet flow line.
4. For outlet at normal ground level, embankment slope intersect 2:1 side slopes of outlet channel at "E" above outlet floe line.
5. Basin dimensions are based on discharge and not pipe size. Dimensions of basin apply only to outlet velocities from 20 to 30 F.P.S.
6. See D/83,84,85 & 86 for additional detail.
7. All concrete shall be Mix No. 3.

pipe size	max dis–charge C.F.S.	basin dimensions										QUANTITIES STEEL	QUANTITIES CONC.
		w	h	l	a	b	c	d	e	f	g	LBS.	CU.YD.
12"	10	4'–3"	3'–2"	5'–8"	2'–7"	3'–1"	1'–10"	0'–8"	1"–8"	0'–6"	0'–6"	264	2.72
18"	21	5'–6"	4'–3	7'–4"	3'–3"	4'–1"	2'–4"	0"–11"	2"–1"	0'–6"	0'–6"	378	3.90
24"	38	6'–9"	5'–3"	9'0"	3'–11"	5'–1"	2'–10"	1'–2"	2"–6"	0'–6"	0'–6"	498	5.52
30"	59	8'–0"	6'–3"	10'–8"	4'–7"	6'–1"	3'–4"	1"–4"	3'–0"	0'–7"	0'–6"	1023	8.53
36"	85	9'–3"	7'–3"	12'–4"	5'–3"	7'–1"	3'–10"	1"–7"	3"–6"	0'–8"	0'–7"	1592	12.98
42"	115	10'–6"	8'–0"	14'–0"	6'–0"	8'–0	4'–5"	1"9"	3"–11"	0'–9"	0'–8"	1926	18.15
48"	151	11'–9"	9'–0"	15'–8"	6'–9"	8'–1"	4'–11"	2"–0"	4'–5"	0'–10"	0'–9"	2365	24.84

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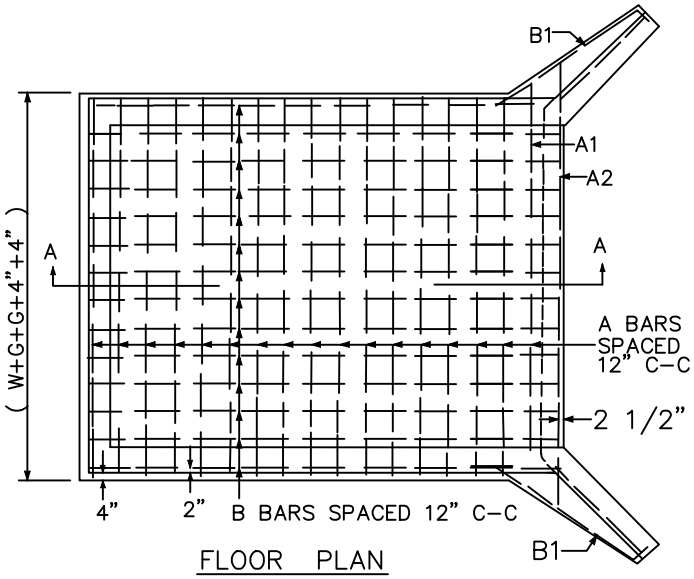
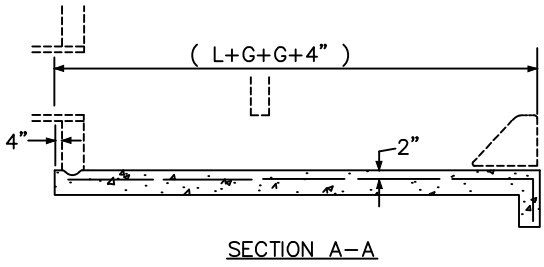
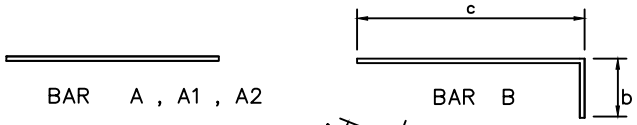


FLOOR PLAN

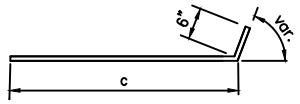


SECTION A-A



BAR A , A1 , A2

BAR B



BAR B1

pipe size	l	w	g	a lgth	a no.	ai lgth	ai no.	A2 lgth	A2 no.	b a	b b	b no.	B1 a	B1 b	B1 no.	lin. ft. NO. 4
12"	5'-8"	4'-3"	6"	5'-8"	7	6'-4"	1	7'-2"	1	6'-6"	1'-7"	5	4'-2"	0'-6"	2	102.9
18"	7'-4"	5'-6"	6"	6'-10"	9	7'-8"	1	8'-6"	1	8"-2"	1'-7"	5	4'-3"	0'-6"	2	135.9
24"	9'-0"	6'-9"	6"	8'-2"	10	8'-10"	1	10'-0"	1	9"-10"	1'-7"	7	4'-7"	0'-6"	2	190.6
30"	10'-8"	8'-0"	6"	9'-6"	12	10'-4"	1	11'-6"	1	11'-7"	1'-6"	9	5'-1"	0'-6"	2	264.8
36"	12'-4"	9'-3"	7	10"-11"	14	11'-10"	1	12"10"	1	13'-4"	1'-5"	11	5'-5"	0'-6"	2	351.6
42"	14-0"	10'-6"	8	12'-4"	15	13'-0"	1	14"4"	1	15'-1"	1'-4"	11	5'-10"	0'-6"	2	405.6
48"	15'-8"	11-9"	9	13'-9"	17	14'-4"	1	15"8"	1	16"-10"	1'-3"	13	6'-2"	0'-6"	2	512.1

NOTE: SEE D/82,84,85,& 86 FOR ADDITIONAL DETAILS

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS ENERGY DISSIPATOR FLOOR	REVISED 04/2024	D 83

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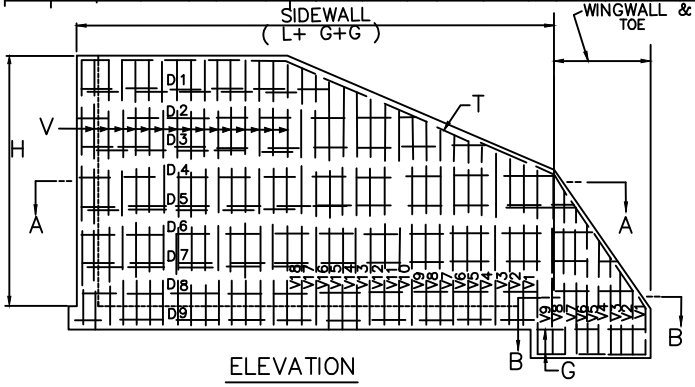
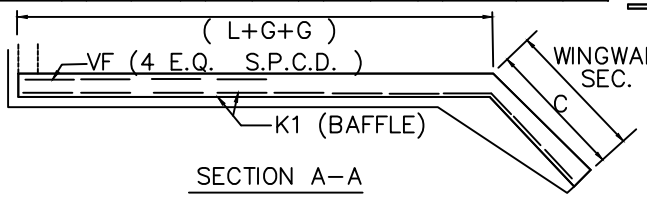
PIPE SIZE	V & VF		V1		V2		V3		V4		V5		V6		V7		V8		V9		V10		V11		V12		V13		V14		V15		V16		V17		V18		lin. ft.	
	LGTH	NO.	LGTH	NO	LGTH	NO	LGTH	NO	LGTH	NO	LGTH	NO	LGTH	NO	LGTH	NO	LGTH	NO	LGTH	NO	LGTH	NO	LGTH	NO	LGTH	NO	LGTH	NO	LGTH	NO	LGTH	NO	LGTH	NO	LGTH	NO	LGTH	NO	NO 4	NO 5
12"	3'-11"	16	2'-8"	2	3'-1"	2	3'-5"	2																															81.0	
18"	5'-0"	16	3'-3"	2	3'-8"	2	4'-1"	2	4'-5"	2	4'-10"	2																											120.5	
24"	6-0"	18	3'-8"	2	4'-2"	2	4'-7"	2	5'=1"	2	5'-6"	2																											154.0	
30"	7'-1"	22	4'-4"	2	4'-8"	2	5'-0"	2	5'-4"	2	5'-8"	2	6'-0"	2	6'-4"	2	6'-8"	2	7'-0"	2																				257.8
36"	8'-3"	32	5'-0"	2	5'-2"	2	5'-5"	2	5'-8"	2	5'-10"	2	6'-1"	2	6'-3"	2	6'-6"	2	6'-9"	2	7'-0"	2	7'-2"	2	7'-5"	2	7'-7"	2	7'-10"	2	8'-1"	2								459.5
42"	9'_1"	36	5'-8"	2	5'-10"	2	6'-1"	2	6'-3"	2	6'-6"	2	6'-8"	2	6'-11"	2	7'-1"	2	7'-3"	2	7'-6"	2	7'-8"	2	7'-11"	2	8'-1"	2	8'-4"	2	8'-7"	2	6'-9"	2						557.1
48"	10'-1"	40	6'-3"	2	6'-6"	2	6'-8"	2	6'-11"	2	7'-1"	2	7'-4"	2	7'-6"	2	7'-9"	2	7'-11"	2	8'-2"	2	8'-5"	2	8'-7"	2	8'-9"	2	9'-3"	2	9'-3"	2	9'-5"	2	9'-8"	2	9'-10"	2		693.4

PIPE SIZE	T				D1			D2			D3			D4			D5			D6			D7			D8			D9		lin. ft.	
	a	b	c	no	a	b	no	a	b	no	a	b	no	a	b	no	a	b	no	a	b	no	a	b	no	a	b	no	a		no 4	no 5
12"	3'-0"	3'-8"	2'-6"	2	5'-10"	0	2	6'-7"	0'-10"	2																			3'-0"	4	56.8	
18"	3'-7"	4'-10"	3'-2"	2	6'-5"	0	2	8'-3"	6'-7"	2	8'-3"	1'-5"	2																3'-7"	4	86.8	
24"	4'-3"	6'-0"	3'-2"	2	6'-10"	0	2	9'-4"	0	2	9'-11"	0'-10"	2	9'-11"	1'-11"	2													4'-3"	4	122.8	
30"	5'-0"	7'-3"	4'-7"	2	7'-8"	0	2	10'-2"	0	2	11'-9"	0'-4"	2	11'-9"	1'-5"	2	11'-9"	2'-6"	2										5'-0"	6		178.3
36"	5'-9"	8'-0"	5'-4"	2	6'-11"	0	2	9'-2"	0	2	11'-6"	0	2	13'-7"	0'-1"	2	13'-7"	1'-1"	2	13'-7"	2'-1"	2	13'-7"	3'-2"	2				5'-9"	8		260.8
42"	7'-5"	9'-2"	6'-2"	2	9'-2"	0	2	11'-9"	0	2	14'-4"	0	2	15'-5"	0'-7"	2	15'-5"	1'-8"	2	15'-5"	2'-8"	2	15'-5"	3'-9"	2				7'-5"	8		316.0
48"	7'-6"	10'-6"	6'-9"	2	9'-11"	0	2	12'-5"	0	2	15'-0"	0	2	17'-3"	0'-1"	2	17'-3"	1'-2"	2	17'-3"	2'-3"	2	17'-3"	3'-4"	2	17'-3"	4'-5"	2	7'-6"	2		379.2

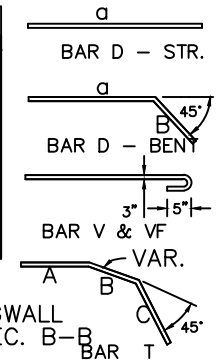


ELEVATION



SECTION A–A

no 4

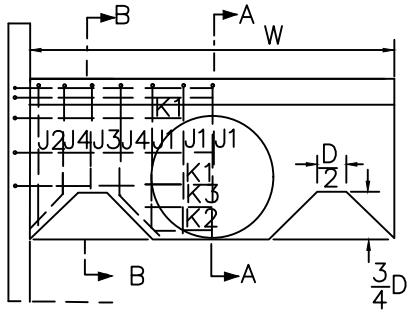


NOTE:
1. V BARS (CULV. SIZE 12" TO 24") S.P.C.D. 12" C – C
2. V BARS (CULV. SIZE 30") S.P.C.D. 9" C – C
3. V BARS (CULV. SIZE 36" TO 48") S.P.C.D. 6" C – C
4. D BARS S.P.C.D. 12" C –C ALL WALLS.
5. SEE D/82,83,,85 & 86 FOR ADDITIONAL DETAILS.

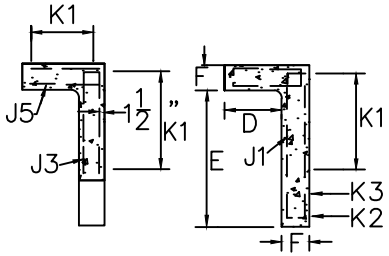
ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS ENERGY DISSIPATOR WALLS	REVISED 04/2024	D 84

5/2015

PIPE SIZE	W			J1			J2			J3			J4			J5			K1			K2		K3		LIN. FT	
	W	E F	D F	a	b	NO.	a	b	NO.	a	b	NO.	a	b	NO.	a	b	NO.	a	b	NO.	a		a	NO.	NO.4	NO.5
12"	4'-3"	2'-2"	1'-2"	1'-10"	0'-3"	1	1'-6"	0'-3"	2				2'-1"	0'-3"	2	1'-8"	0'-3"	5	4'-9"	0'-7"	8	1"-6"	2			87.5	
18"	5'-6"	2'-7"	1'-5	2'-3"	0'-3"	3	1'-11"	0'-3"	2	1'-7"	0'-3"	2				2'-2"	0'-3"	7	6'-0"	0'-7"	8	1"-10"	2			122.3	
24"	6'-9"	3'-0"	1'-8"	2'-8"	0'-3"	3	2'-4"	0'-3"	2	1'-9"	0'-3"	2				2'-7"	0'-3"	7	7'-3"	0'-7"	8	2'-2"	2			143.7	
30"	8'-0"	3'-6"	1'-10"	3'-2"	0'-4"	3	2'-10"	0'-4"	2	2'-2"	0'-3"	2	3'-6"	0'-4"	2	2'-2"	0'-4"	9	8'-8"	0'-7"	8	2'-8"	2				198.5
36"	9'-3"	4'-1"	2'-2"	3'-9"	0'-5"	3	3'-5"	0'-5"	4				4'-4"	0'-5"	4	3'-7"	0'-5"	11	10'-10"	0'-7"	10	3'-0"	2				298.5
42"	10'-6"	4'-7"	2'-5"	4'-3"	0'-6"	3	3'11"	0'-6"	4				4'-10"	0'-6"	4	4'-1"	0'-6"	11	11'-6"	0'-7"	10	3'-6"	2				330.0
48"	11'-9"	5'-2"	2'-9"	4'-10"	0"-7"	5	4'-6"	0'-7"	2	3'-4"	0'-7"	2	5'-5"	0'-7"	4	4'-8"	0'-7"	13	12'_	0'-7"	10	3'-10"	2	5'-4"	2		418.8

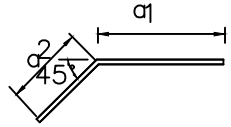


ELEVATION

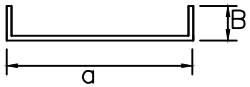


SECTION B–B SECTION A–A

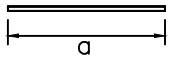
BAR J1,2,3,4,5



$a = a_1 + a_2$ on J4 BARS



BAR K1



BAR K2,3

NOTE: SEE D/82,83,84 & 86 FOR ADDITIONAL DETAILS

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE: 6/2015	STANDARD DRAINAGE DETAILS BAFFLE	REVISED 04/2024	D 85

2/2015

BACKWALL ELEVATION

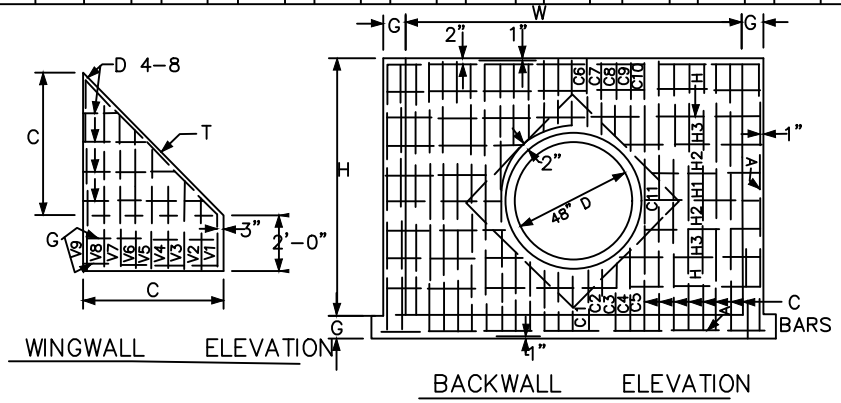
PIPE SIZE	W	H	G	C		C1		C2		C3		C4		C5		C6		C7		C8		C9		C10		C11		H		H1		H2		H3		LIN. FT.	
				LGTH	NO.	LGTH	NO.	LGTH	NO.	LGTH	NO.	LGTH	NO.	LGTH	NO.	LGTH	NO.	LGTH	NO.	LGTH	NO.	LGTH	NO.	LGTH	NO.	LGTH	NO.	LGTH	NO.	LGTH	NO.	LGTH	NO.	LGTH	NO.	NO.4	NO.5
12"	4'-3"	3'-2"	0'-6"	4'-2"	4	1'-5"	1									1'-1"	1											5'-1"	3	1'-10"	2					38.1	
18"	5'-6"	4'-3"	0'-6"	5'-3"	2	1'-9"	1	2'-2"	2							1'-4"	1	1'-11"	2							2'-6"	4	6'-4"	3	1'-11"	2	2'-4"	2			59.3	
24"	6'-9"	5'-3"	0'-6"	6'-3"	4	1'-10"	1	2'-2"	2							1'-7"	1	1'-11"	2							2'-11"	4	7'-7"	3	2'-5"	2	2'-9"	4			86.9	
30"	8'-0"	6'-3"	0'-6"	7'-4"	6	2'-1"	1	2'-3"	2	2'-11"	2					1'-10"	1	2'-0"	2	2'-8"	2					3'-0"	4	9'-0"	3	2'-9"	2	3'-0"	4				124.1
36"	9'-3"	7'-3"	0'-7"	8'-5"	12	2'-2"	1	2'-2"	2	2'-5"	2	2'-11"	2			2'-2"	1	2'-3"	2	2'-6"	2	2'-11"	2			3'-5"	4	10'-5"	4	3'-2"	2	3'-6"	4				211.4
40"	10'-6"	8'-0"	0'-8"	9'-3"	14	2'-7"	1	2'-7"	2	2'-9"	2	3'-2"	2	3'-7"	2	2'-1"	1	2'-2"	2	2'-4"	2	2'-7"	2	3'-2"	2	4'-9"	4	11'-10"	3	3'-7"	2	3'-11"	4	5'-2"	4		276.8
48"	11'-9"	9'-0"	0'-9"	10'-4"	16	2'-10"	1	2'-10"	2	3'-0"	2	3'-3"	2	3'-9"	2	2'-4"	1	2'-4"	2	2'-6"	2	2'-10"	2	3'-3"	2	5'-4"	4	13'-2"	4	4'-1"	2	4'-2"	4	5'-0"	4		336.8

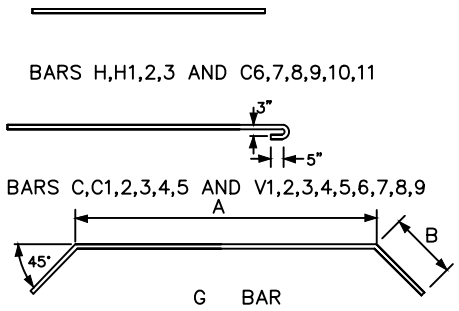
WINGWALL BARS

	C	V1		V2		V3		V4		V5		V6		V7		V8		V9		G BARS A	G BARS B	G BARS LGTH	G BARS NO.	LIN. FT. NO.4	LIN. FT. NO.5
		LGTH	NO	LGTH	NO	LGTH	NO	LGTH	NO	LGTH	NO	LGTH	NO	LGTH	NO	LGTH	NO	LGTH	NO						
12"	1'-10"	2'-6"	2	3'-10"	2															4'-8"	1'-8"	8'-0"	2	26.7	
18"	2'-4"	2'-6"	2	3'-4"	2	4'-4"	2													5'-11"	2'-2"	10'-3"	2	40.8	
24"	2'-10"	2'-6"	2	3'-7"	2	4'-8"	2													7'-2"	2'-8"	12'-6"	2	46.5	
30"	3'-4"	2'-6"	2	3'-3"	2	4'-0"	2	4'-9"	2											8'-7"	3'-2"	14'-11"	2		58.8
36"	3'-10"	2'-6"	2	3'-1"	2	3'-7"	2	4'-2"	2	4'-8"	2	5'-2"	2	5'-9"	2					10'01"	3'-8"	17'-4"	2		82.5
40"	4'-5"	2'-6"	2	3'-0"	2	3'-6"	2	4'-0"	2	4'-8"	2	5'-0"	2	5'-6"	2	6'-0"	2	6'-6"	2	11'-5"	4'-3"	19'-11"	2		120.8
48"	4'-11"	2'-6"	2	3'-1"	2	3'-7"	2	4'-1"	2	4'-8"	2	5'-3"	2	5'-9"	2	6'-3"	2	6'-10"	2	12'-10"	4'-9"	22'-4"	2		

NOTE:

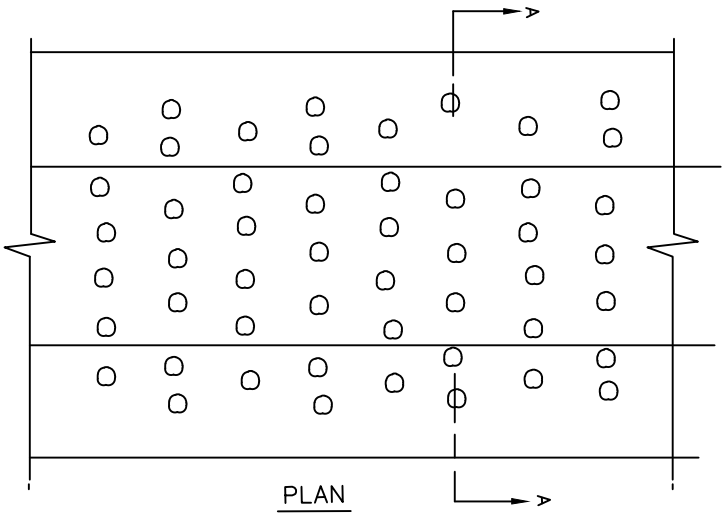
1. H BARS S.P.C.D. 12" C-C ALL WALLS
2. C AND V BARS (CULV. SIZES 12",18",24") S.P.C.D. 12"
3. C AND V BARS (CULV, SIZE 30") S.P.C.D. 9" C-C.
4. C AND V BARS (CULV SIZES 36",42",48") S.P.C.D. 6"
5. SEE D/82,83,84 & 85 FOR ADDITIONAL DETAILS



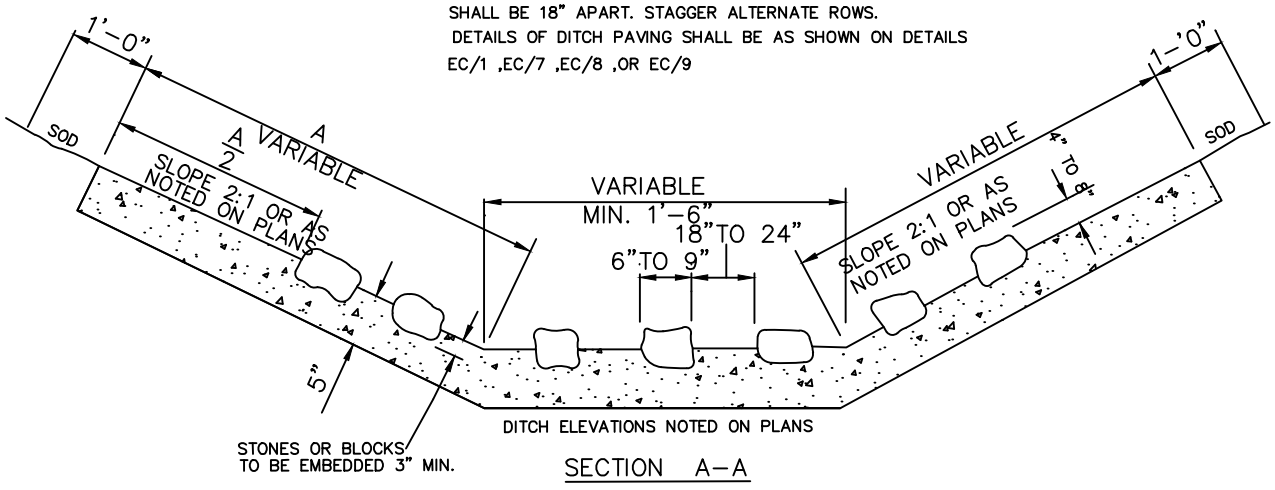


ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE: 6/2015	STANDARD DRAINAGE DETAILS ENERGY DISSIPATOR WING AND BACKWALL	REVISED 04/2024 D / 86

2/2015



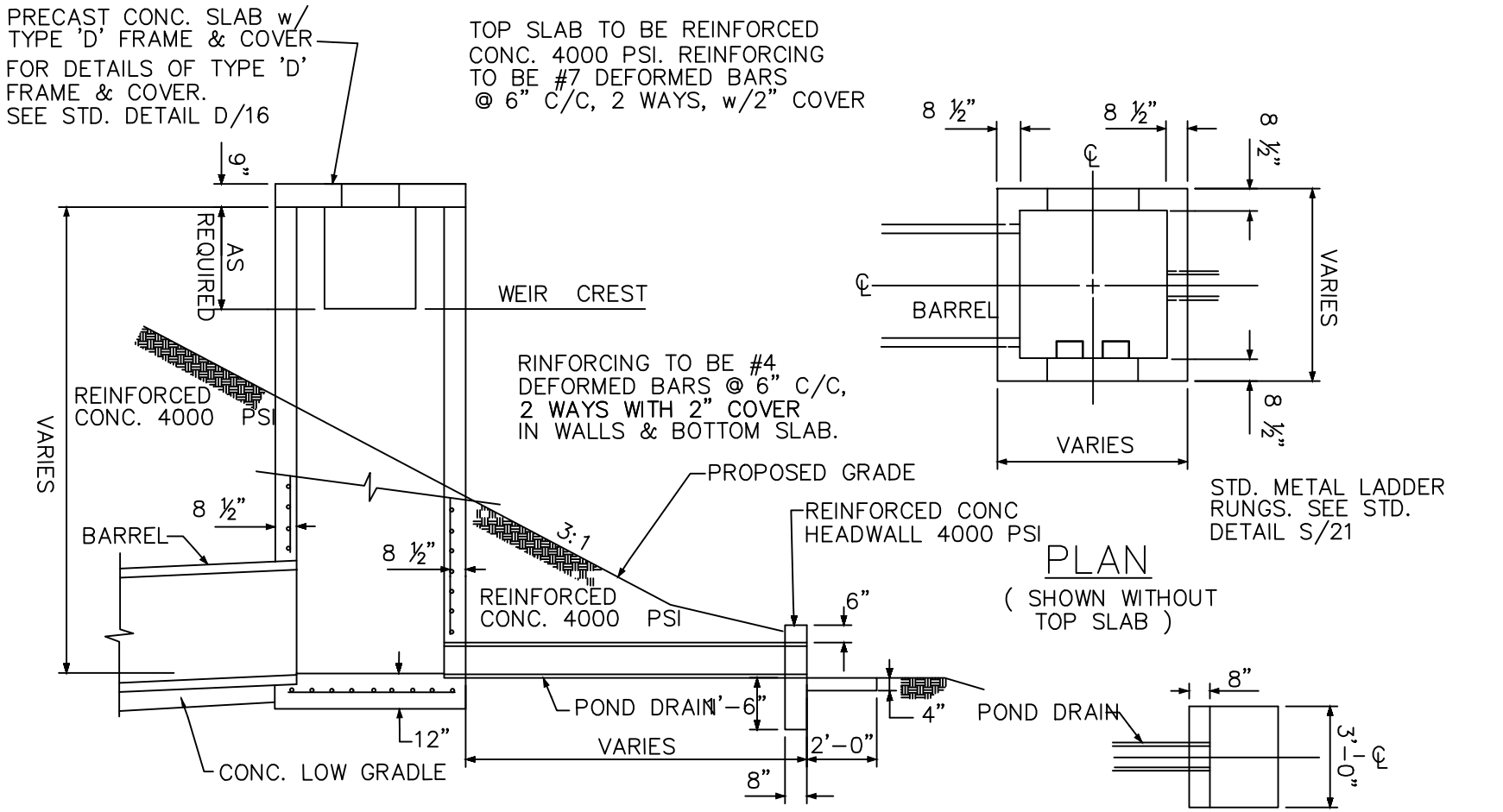
NOTE: ROW OF STONES (AS SHOWN BELOW) OR PRE-CAST BLOCKS (4"x8"x8") SHALL BE 18" APART. STAGGER ALTERNATE ROWS.
DETAILS OF DITCH PAVING SHALL BE AS SHOWN ON DETAILS EC/1 ,EC/7 ,EC/8 ,OR EC/9



SECTION A-A

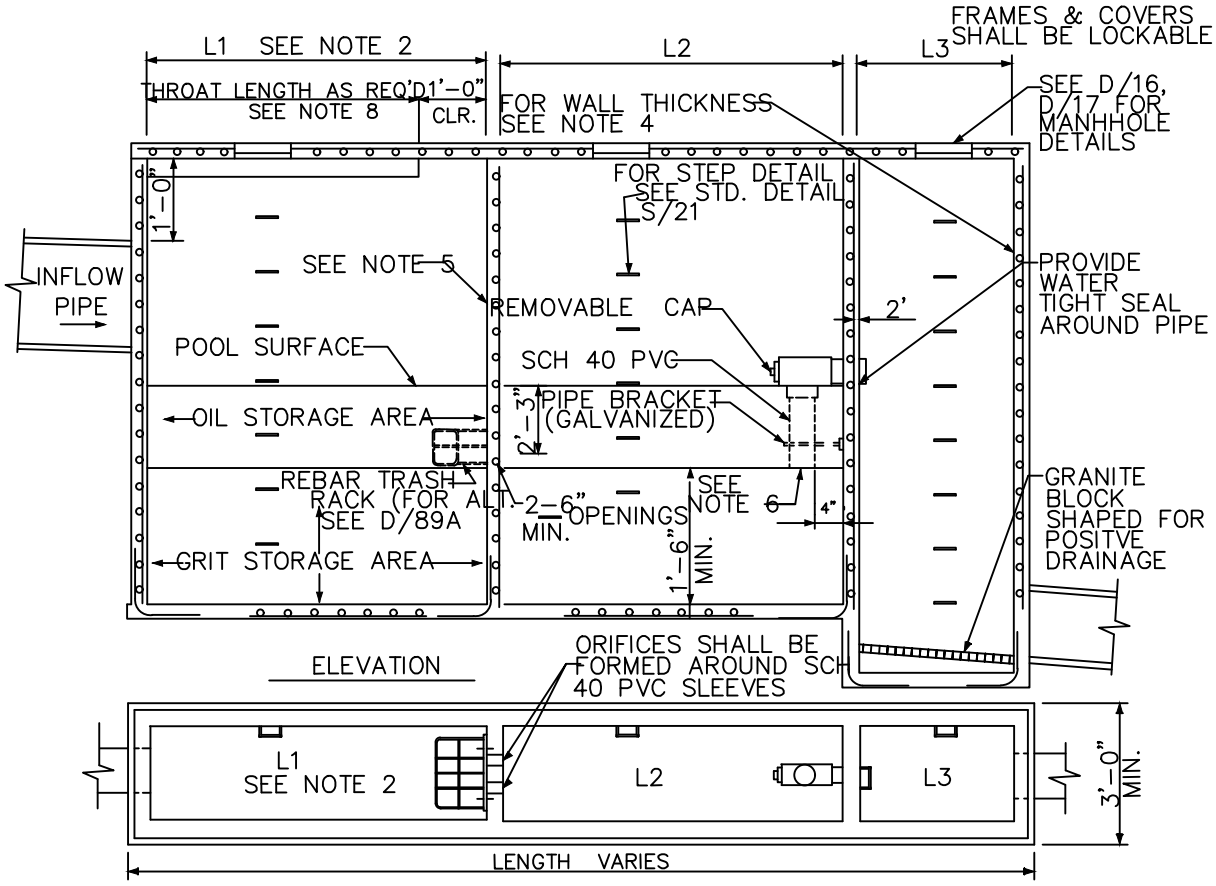
ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS 5" CONCRETE ENERGY DISSIPATING GUTTER	REVISED 04/2024	D 87

2/2015



ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS RISER DETAIL	REVISED 04/2024	D 88

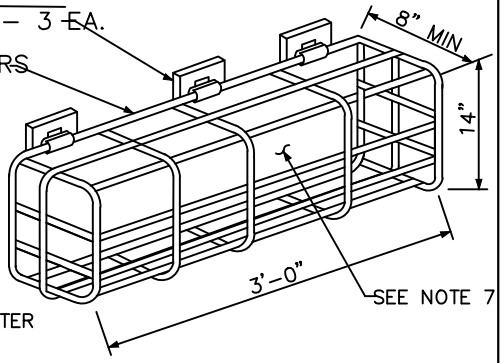
5/2018



PLAN VIEW – TOP SLAB REMOVED

NOTES :

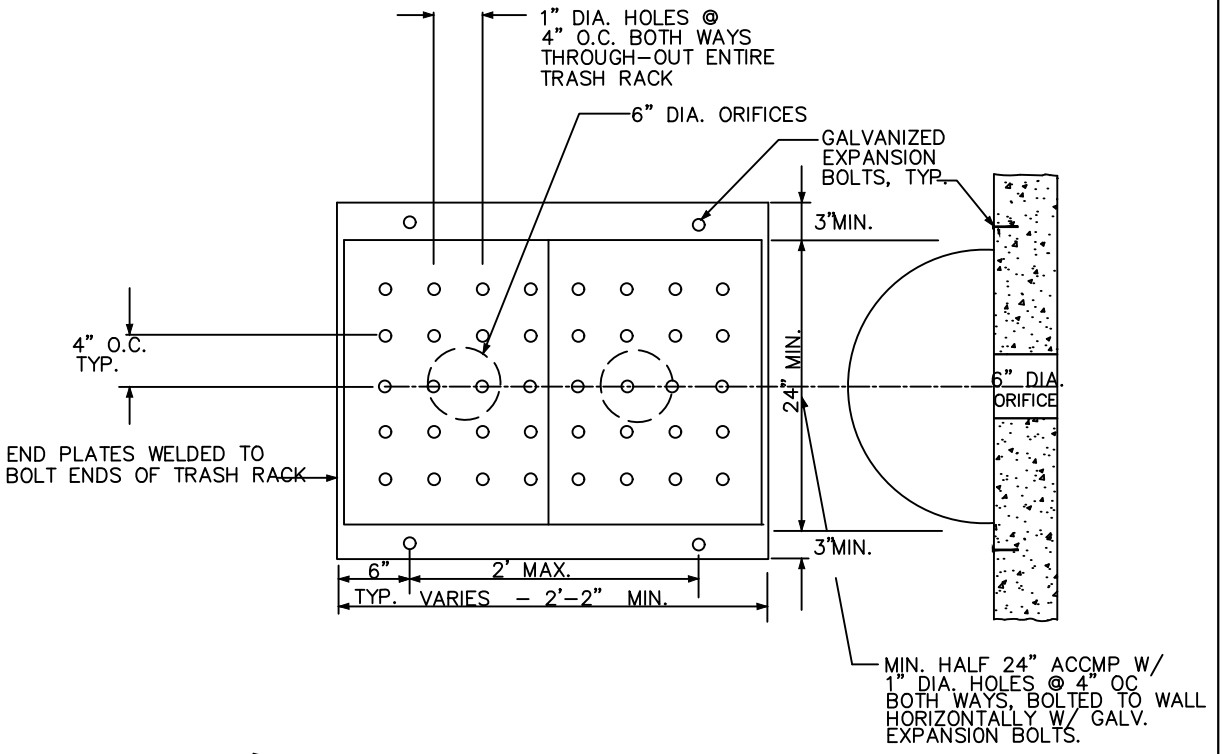
1. TOP BARS SHALL BE DESIGNED TO SUPPORT HS-20 LOADS.
2. L1 SHALL BE GREATER THAN OR EQUAL TO L2
3. STELL REINFORCING SIZES & SPACING SHALL BE SELECTED DURING DESIGN DEPENDING ON SIZE & DEPTH OF STRUCTURE.
4. MINIMUM ACCEPTABLE WALL THICKNESS SHALL BE 8".
5. HORIZONTAL STEEL REINFORCEMENT IN INTERIOR WALLS SHALL BE ANCHORED TO EXTERIOR WALLS.
6. EXTEND TO BOTTOM OF OIL STORAGE VOLUME.
7. TRASH RACK OPENINGS SHALL BE 3x AREA OF ORIFICE OPENINGS.
8. WHERE THE THROAT IS TO BE INCORPORATED INTO A CURB AND GUTTER LOCATION A DEPRESSED CUTTER PAN IS REQUIRED AS SHOWN ON STD. DETAIL D/24.
9. TRASH RACK MATERIAL SHALL BE HOT DIPPED GALVANIZED OR EPOXY COATED.
10. ALL REINFORCING STEEL TO BE ASTM A 615 GRADE 60. & CONCRETE TO BE F'c = 4000 psi @ 28 DAYS.
11. 2" MINIMUM CONCRETE COVER OR REIFOCING STEEL UNLESS SPECIFIED.

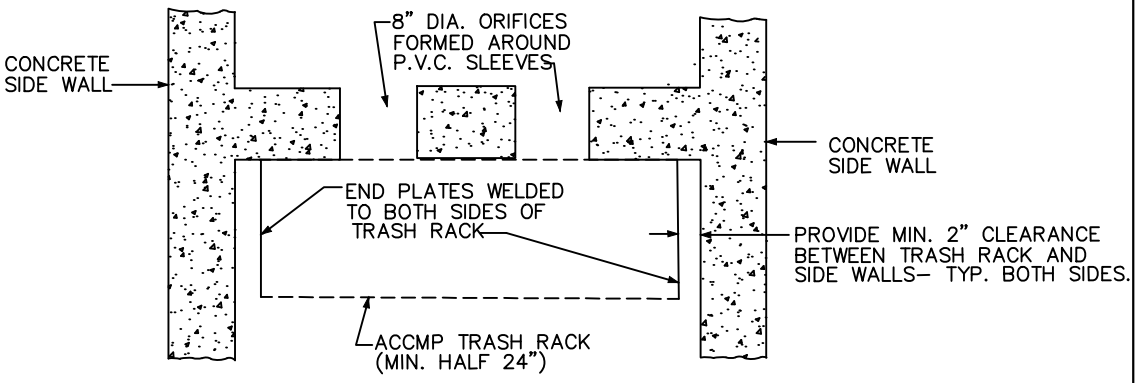


REBAR TRASH RACK ISOMETRIC

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE: 6/2015	STANDARD DRAINAGE DETAILS WATER QUALITY INLET	REVISED 04/2024	D 89

5/2015



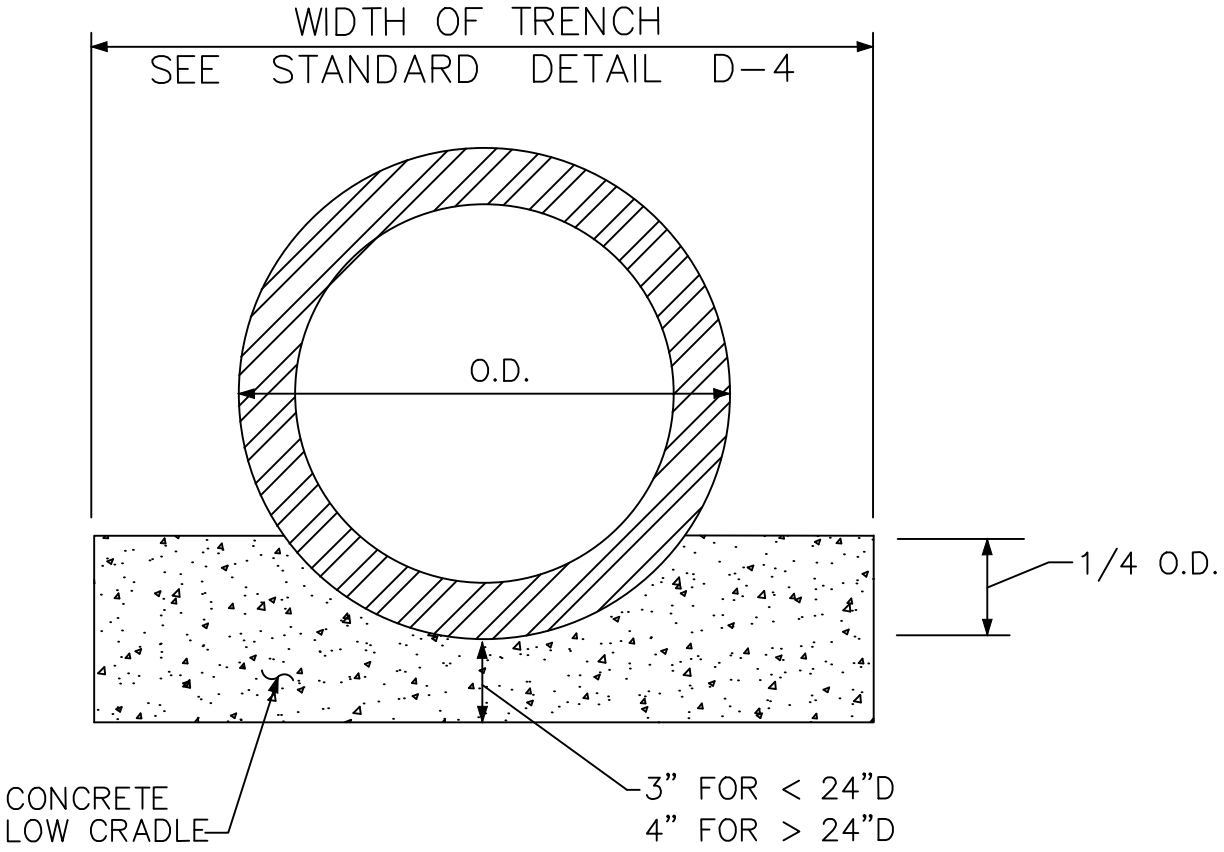


PLAN VIEW

ACCMP TRASH RACK

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE: 6/2015	STANDARD DRAINAGE DETAILS WATER QUALITY INLET	REVISED 04/2024	D 89A

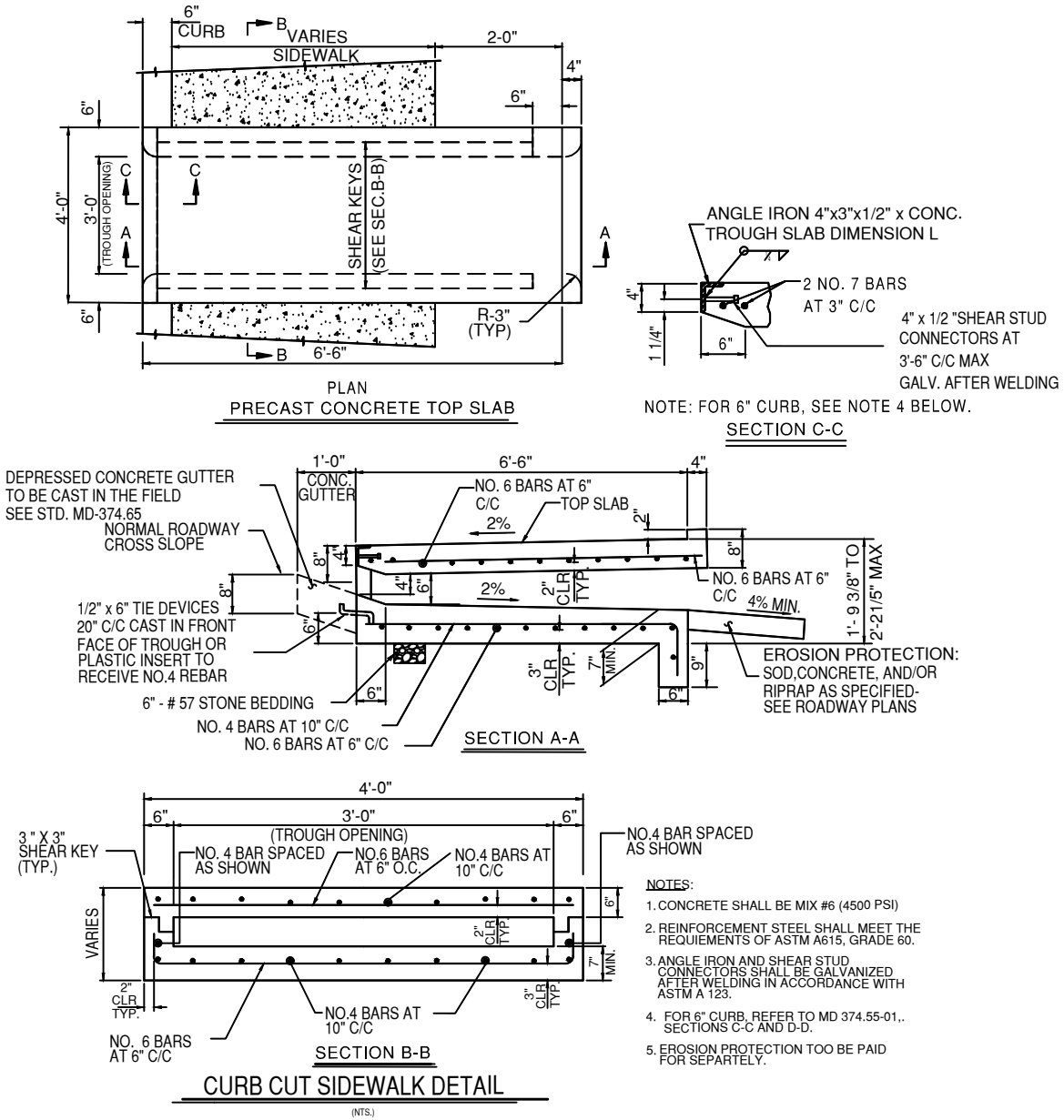
5/2015



F'c = 3000 PSI

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE: 6/2015	STANDARD DRAINAGE DETAILS CONCRETE CRADLE DETAIL	REVISED 04/2024	D 90

5/2018



CURB CUT SIDEWALK DETAIL

(NTS.)

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD PAVING DETAILS CURB CUT SIDEWALK DETAIL	REVISED 04/2024	D 91

MINIMUM COVER REQUIREMENTS FOR POLYPROPYLENE PIPE WITH AASHTO H-250, H-25, OR HL-93 LOAD, FT (m)

PIPE DIAM.	MIN. COVER
12″ (300mm)	1.5′ (0.5m)
15″ (375mm)	1.5′ (0.5m)
18″ (450mm)	1.5′ (0.5m)
24″ (600mm)	1.5′ (0.5m)
30″ (750mm)	1.5′ (0.5m)
36″ (900mm)	1.5′ (0.5m)
42″ (1050mm)	1.5′ (0.5m)
48″ (1200mm)	2′ (0.6m)
60″ (1500mm)	2′ (0.6m)

NOTES:
1. MINIMUM COVER DOES NOT INCLUDE PAVEMENT THICKNESS.
2. MINIMUM COVER DEPTHS ASSUME CLASS III BACKFILL MATERIAL COMPACTED TO 95% STANDARD PROCTOR DENSITY OR CLASS II BACKFILL MATERIAL COMPACTED TO 90% STANDARD PROCTOR DENSITY.

MAXIMUM COVER REQUIREMENTS FOR POLYPROPYLENE PIPE WITH UNIFORM BACKFILL, FT(m)

	CLASS I	CLASS II			CLASS III		CLASS IV
PIPE DIA	COMPACTED	95%	90%	85%	95%	90%	95%
12″ (300mm)	41 (12.5m)	28 (8.5m)	21 (6.4m)	16 (4.9m)	20 (6.1m)	16 (4.9m)	16 (4.9m)
15″ (375mm)	42 (12.8m)	29 (8.8m)	21 (6.4m)	16 (4.9m)	21 (6.4m)	16 (4.9m)	16 (4.9m)
18″ (450mm)	44 (13.4m)	30 (9.1m)	21 (6.4m)	16 (4.9m)	22 (6.7m)	17 (5.2m)	16 (4.9m)
24″ (600mm)	37 (11.3m)	26 (7.9m)	18 (5.5m)	14 (4.3m)	19 (5.8m)	14 (4.3m)	14 (4.3m)
30″ (750mm)	39 (11.9m)	27 (8.2m)	19 (5.8m)	14 (4.3m)	19 (5.8m)	15 (4.6m)	14 (4.3m)
36″ (900mm)	28 (8.5m)	20 (6.1m)	14 (4.3m)	10 (3.0m)	14 (4.3m)	11 (3.4m)	10 (3.0m)
42″ (1050mm)	30 (9.1m)	21 (6.4m)	14 (4.3m)	10 (3.0m)	15 (4.6m)	11 (3.4m)	10 (3.0m)
48″ (1200mm)	29 (8.8m)	20 (6.1m)	14 (4.3m)	9 (2.7m)	14 (4.3m)	10 (3.0m)	10 (3.0m)
60″ (1500mm)	29 (8.8m)	20 (6.1m)	14 (4.3m)	9 (2.7m)	14 (4.3m)	10 (3.0m)	9 (2.7m)

MAXIMUM COVER REQUIREMENTS FOR POLYPROPYLENE PIPE WITH SPLIT BACKFILL, FT(m)

CD	CD	CLASS III	CLASS IV
12″ (300mm)	17 (5.2m)	14 (4.3m)	11 (3.4m)
15″ (375mm)	17 (5.2m)	14 (4.3m)	10 (3.0m)
18″ (450mm)	16 (4.9m)	13 (4.0m)	10 (3.0m)
24″ (600mm)	14 (4.3m)	12 (3.7m)	9 (2.7m)
30″ (750mm)	13 (4.0m)	12 (3.7m)	8 (2.4m)
36″ (900mm)	11 (3.4m)	11 (3.4m)	7 (2.1m)
42″ (1050mm)	11 (3.4m)	11 (3.4m)	7 (2.1m)
48″ (1200mm)	11 (3.4m)	10 (3.0m)	6 (1.8m)
60″ (1500mm)	11 (3.4m)	10 (3.0m)	6 (1.8m)

MINIMUM RECOMMENDED COVER TO PREVENT FLOTATION OF THERMOPLASTIC PIPE

NOMINAL DIAMETER IN. (MM)	MINIMUM COVER IN. (MM)
4 (100)	3 (77)
6 (150)	4 (102)
8 (200)	5 (127)
10 (250)	7 (178)
12 (300)	9 (228)
15 (35)	11 (280)
18 (450)	13 (330)
24 (600)	17 (432)
30 (750)	22 (559)
36 (900)	25 (635)
42 (1050)	29 (737)
48 (1200)	33 (838)
60 (1500)	40 (1016)

ANNE ARUNDEL COUNTY
DEPARTMENT OF PUBLIC WORKS

APPROVED

CHIEF ENGINEER

DESIGN ENGINEER

DATE:

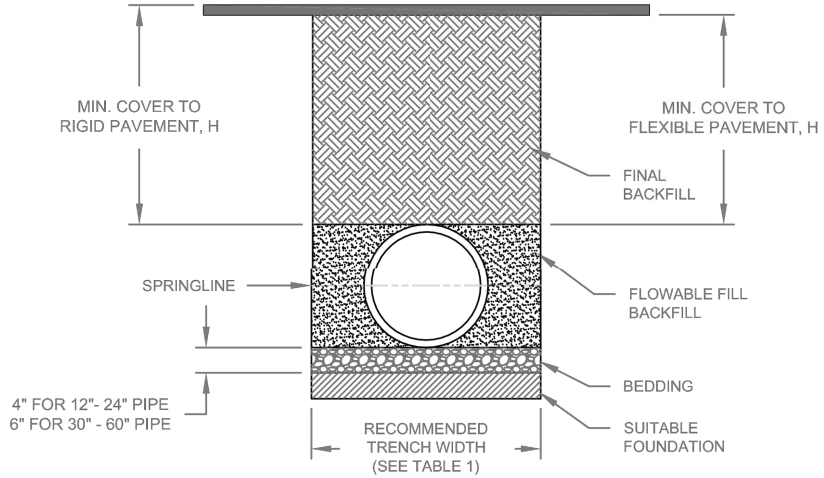
STANDARD
DRAINAGE DETAILS

PERMISSIBLE DEPTH TABLE POLYPROPYLENE PIPE

REVISED
04/2024

D
92

8/2020



NOTES:

1. FLOWABLE FILL SHOULD BE DESIGNED TO PROVIDE ADEQUATE STRENGTH TO CARRY ALL LIVE AND DEAD LOADING BUT ALLOW FOR ANY FUTURE EXCAVATION. TYPICAL 28 DAY COMPRESSIVE STRENGTHS RANGE BETWEEN 50 AND 100 PSI. MIX SHOULD BE OF A CONSISTENCY THAT COMPLETELY FILLS SPACE BETWEEN PIPE AND TRENCH WALLS.

2. IF TRENCH IS EXCAVATED IN ROCK OR HIGH-BEARING STRENGTH SOILS, TRENCH WIDTHS FOR 24" - 60" DIA. MAY BE REDUCED, FROM VALUES IN TABLE 1, TO THE PIPE OD PLUS 12".

3. FLOWABLE FILL SHOULD NOT BE PLACED WHEN TEMPERATURES ARE BELOW 40°F, AGAINST FROZEN TRENCH MATERIAL OR WHEN APPRECIABLE PRECIPITATION IS FORECASTED DURING PLACEMENT.

4. PRECAUTIONS SHALL BE TAKEN TO PREVENT FLOTATION. ANCHORING SYSTEM AND/OR INCREMENTAL LIFTS SHOULD BE UTILIZED TO ENSURE PIPE REMAINS ON GRADE. REFER TO TECHNICAL NOTE 5.02, FLOWABLE FILL FOR THERMOPLASTIC PIPE, FOR EXAMPLES OF ANCHOR TYPES AND INCREMENTAL LIFT RECOMMENDATIONS.

5. FOUNDATION: WHERE THE TRENCH BOTTOM IS UNSTABLE, THE CONTRACTOR SHALL EXCAVATE TO A DEPTH REQUIRED BY THE ENGINEER AND REPLACE WITH SUITABLE MATERIAL AS SPECIFIED BY THE ENGINEER. AS AN ALTERNATIVE AND AT THE DISCRETION OF THE DESIGN ENGINEER, THE TRENCH BOTTOM MAY BE STABILIZED USING A GEOTEXTILE MATERIAL.

6. BEDDING: SUITABLE MATERIAL SHALL BE CLASS I OR II. THE CONTRACTOR SHALL PROVIDE DOCUMENTATION FOR MATERIAL SPECIFICATION TO ENGINEER. UNLESS OTHERWISE NOTED BY THE ENGINEER, MINIMUM BEDDING THICKNESS SHALL BE 4" (100mm) FOR 12"-24" DIAMETER PIPE (300mm-600mm); 6" (150mm) FOR 30"-60" (750mm-1500mm) DIAMETER PIPE. THE MIDDLE 1/3 BENEATH THE PIPE INVERT SHALL BE LOOSELY PLACED.

7. FINAL BACKFILL: FINAL BACKFILL SHALL NOT BE PLACED UNTIL A PENETROMETER READING OF AT LEAST 500 PSI PER ASTM C403 IS MEASURED, THE CRITERIA OF ASTM D 6024 ARE MET, OR OTHER MEANS APPROVED BY THE ENGINEER TO DETERMINE SUITABILITY FOR LOAD APPLICATION ARE SATISFIED.

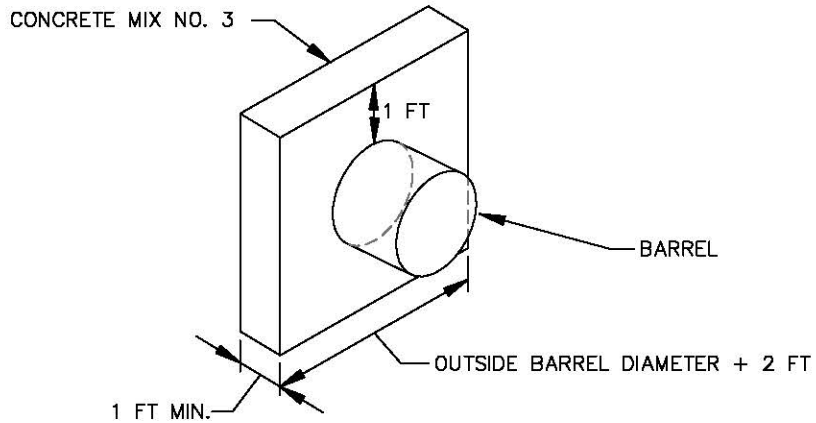
8. MINIMUM COVER: MINIMUM COVER, H, IS18"(457mm) UP TO 48" (1200mm) DIAMETER PIPE AND 24" (600mm) OF COVER FOR 60" (1500mm) DIAMETER PIPE, MEASURED FROM TOP OF PIPE TO BOTTOM OF FLEXIBLE PAVEMENT OR TO TOP OF RIGID PAVEMENT. SHALLOWER COVER MAY BE POSSIBLE AND IS CONTINGENT UPON THE MIX BEING DESIGNED TO CARRY THE ANTICIPATED VEHICULAR LOADS, INCLUDING IMPACTING FORCES.

9. DESIGN ENGINEER OR PROJECT MANAGER SHALL VERIFY ALL REQUIREMENTS WITH MANUFACTURER.

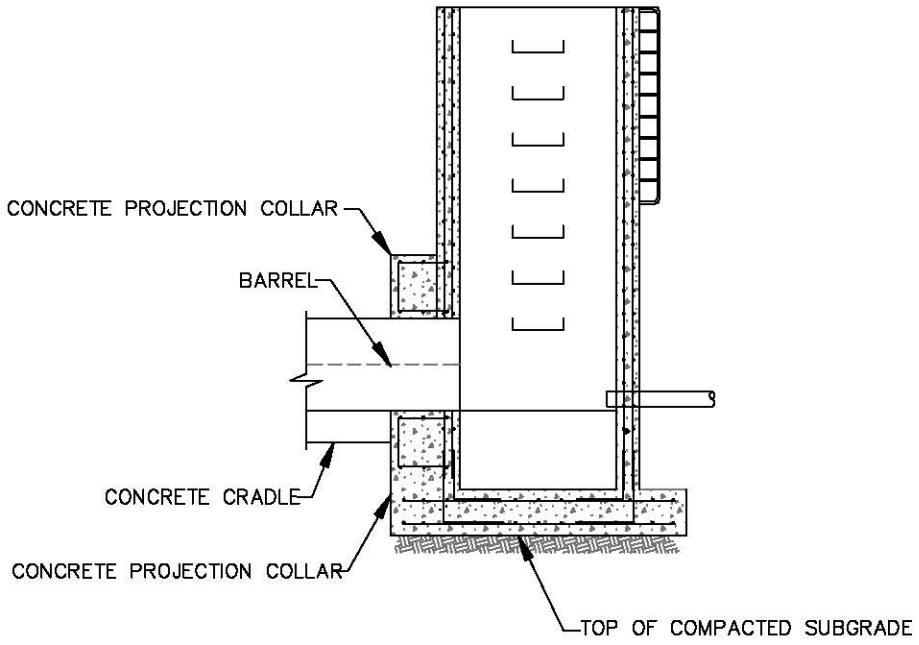
TABLE 1, RECOMMENDED TRENCH WIDTHS

PIPE DIAM.	MIN. TRENCH WIDTH
12" (300mm)	22" (559mm)
15" (375mm)	27" (686mm)
18" (450mm)	33" (838mm)
21" (525mm)	37" (940mm)
24" (600mm)	42" (1067mm)
30" (750mm)	51" (1295mm)
36" (900mm)	59" (1499mm)
42" (1050mm)	66" (1676mm)
48" (1200mm)	74" (1880mm)
54" (1350mm)	82" (2083mm)
60" (1500mm)	90" (2286mm)

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS POLYPROPYLENE PLASTIC PIPE TRENCH INSTALLATION DETAIL (FLOWABLE FILL)	REVISED 04/2024	D 93



CONCRETE COLLAR DETAIL



ELEVATION

CONSTRUCTION SPECIFICATIONS

1. CAST 1 FOOT THICK CONCRETE COLLAR TO OUTLET STRUCTURE WITH FOUR #4 U-SHAPED REBARS.

SOURCE:
1. 2011 MARYLAND STANDARDS AND SPECIFICATIONS FOR SOIL EROSION AND SEDIMENT CONTROL, DETAIL G-2-9
2. U.S. DEPARTMENT OF AGRICULTURE NATURAL RESOURCES CONSERVATION SERVICE
3. MARYLAND DEPARTMENT OF ENVIRONMENT WATER MANAGEMENT ADMINISTRATION

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS CONCRETE PROJECTION COLLAR	REVISED 04/2024	D '94

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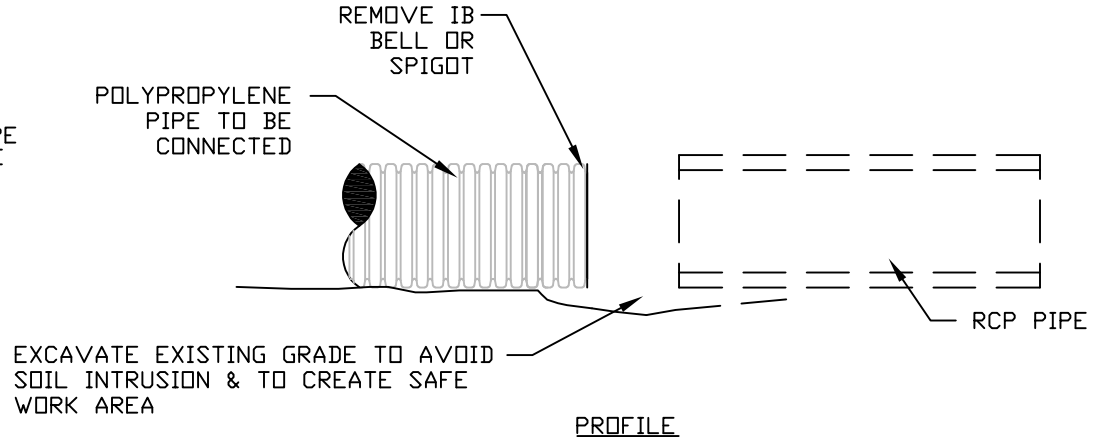
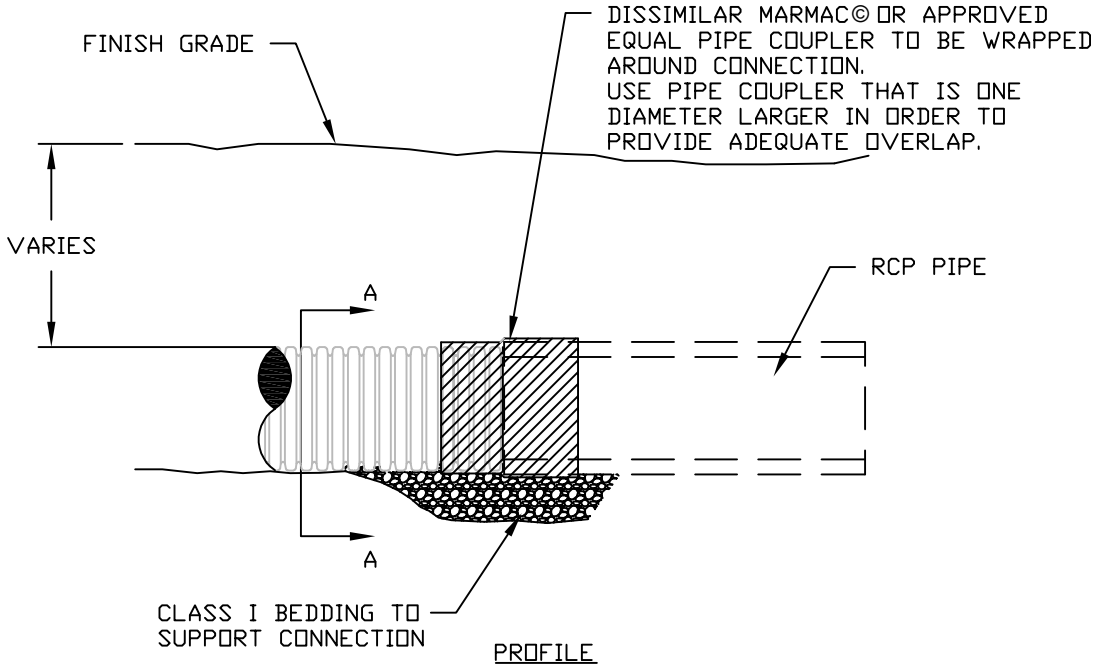
NOTES:

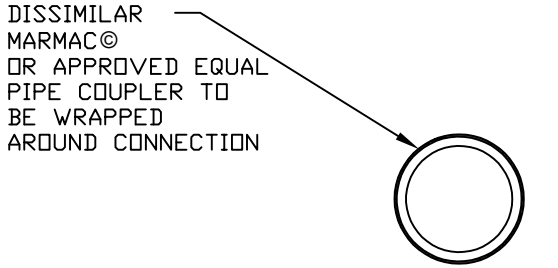
1. CONNECTION AND PIPE TO BE BACKFILLED PER ASTM D2321, LATEST EDITION.
2. AN INTERNAL CYLINDER MAY BE WELDED TO THE PIPE TO BE INSERTED INTO THE ID OF THE EXISTING PIPE AND MINIMIZE JOINT MOVEMENT. HOWEVER, AN INTERNAL CYLINDER IS NOT RECOMMENDED FOR DOWNSTREAM CONNECTIONS.
3. CODES OR PRODUCTS AS SPECIFIED, OR EQUIVALENT.



PROFILE



PROFILE

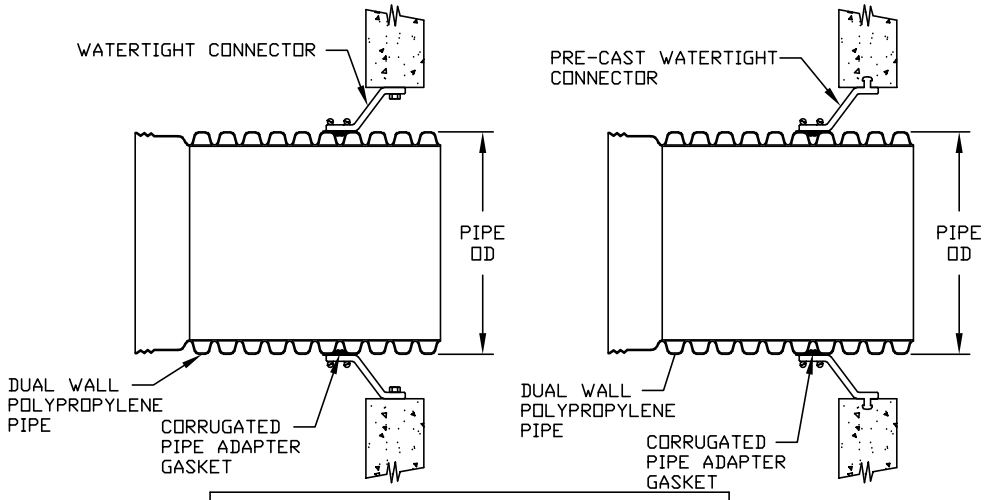


SECTION "A-A"

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS POLYPROPYLENE TO RCP CONNECTION	REVISED 04/2024	D 95

8/2020

12"-60" DUAL WALL POLYPROPYLENE PIPE WATERTIGHT CONNECTION USING A MANHOLE BOOT (CORED HOLE OR PRECAST) W/ CORRUGATED PIPE ADAPTER GASKET



PIPE SIZE	PIPE OD	WATERTIGHT CONNECTOR/ADAPTER GASKET
12" (300mm)	14.5" (368.3mm)	SEE MANUFACTURER STANDARDS
15" (375mm)	17.6" (447.0mm)	
18" (450mm)	21.2" (538.5mm)	
24" (600mm)	28.1" (713.7mm)	
30" (750mm)	35.3" (896.6mm)	
36" (900mm)	41.1" (1043.9mm)	
42" (1050mm)	47.2" (1198.9mm)	
48" (1200mm)	53.8" (1366.5mm)	
54" (1350mm)	N/A	
60" (1500mm)	66.5" (1689.1mm)	

NOTES:

1. PERFORMANCE HIGHLY DEPENDENT ON INSTALLATION. CONTRACTOR MUST ENSURE MANHOLE GASKET IS UNIFORMLY SEATED AROUND STRUCTURE ADAPTER. EXTRA PRECAUTIONS MUST BE TAKEN TO PREVENT DIFFERENTIAL SETTLEMENT BETWEEN THE PIPE AND MANHOLE.

2. SEE STANDARD DETAIL D-108 (STRUCTURE CONNECTION INSTALLATION DETAIL) AND POLYPROPYLENE PIPE MANUFACTURER TECHNICAL NOTES AND RECOMMENDATIONS FOR INSTALLATION OF CONNECTIONS TO MANHOLES AND STRUCTURES.

3. CODES OR PRODUCTS AS SPECIFIED, OR EQUIVALENT.

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS 12"–60" POLYPROPYLENE PIPE MANHOLE BOOT AND CORRUGATED ADAPTER GASKET	REVISED 04/2024	D 96

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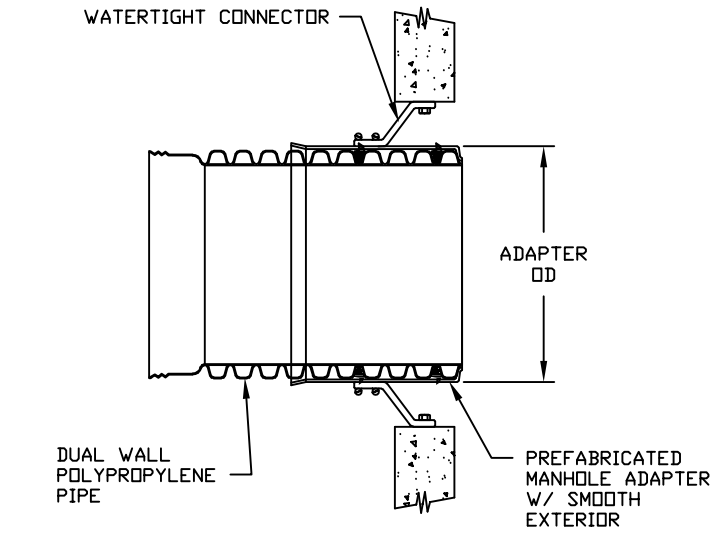
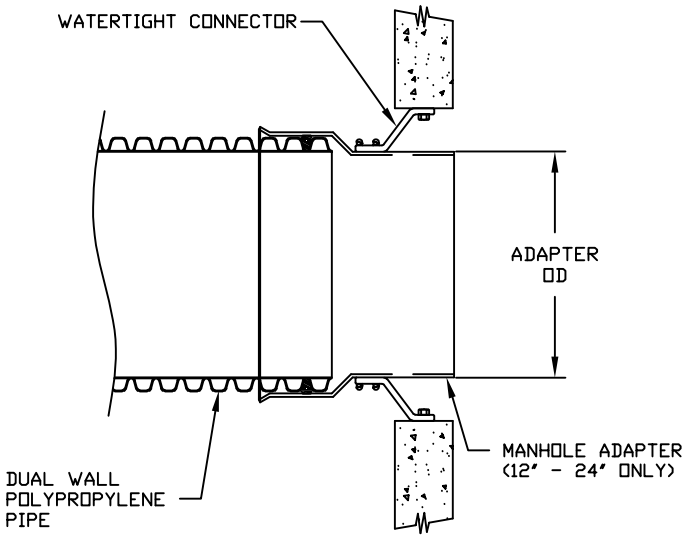
12"-24" DUAL WALL POLYPROPYLENE PIPE
WATERTIGHT CONNECTION USING A MANHOLE BOOT (CORED HOLE OR PRECAST) W/ PREFABRICATED ADAPTER



		PREFABRICATED MANHOLE ADAPTER W/SMOOTH EXTERIOR (3)
PIPE SIZE	ADAPTER OD	PRODUCT CODES
12" (300mm)	15.3" (388.6mm)	SEE MANUFACTURER STANDARDS
15" (375mm)	18.3" (464.8mm)	
18" (450mm)	22.0" (558.8mm)	
24" (600mm)	29.0" (736.6mm)	



	WATERTIGHT CONNECTOR (3)	
PIPE SIZE	ADAPTER OD	PRODUCT CODES
12" (300mm)	12.5" (317.5mm)	SEE MANUFACTURER STANDARDS
15" (375mm)	15.3" (388.6mm)	
18" (450mm)	18.7" (475.0mm)	
24" (600mm)	24.8" (629.9mm)	

NOTES:
1. PERFORMANCE HIGHLY DEPENDENT ON INSTALLATION. CONTRACTOR MUST ENSURE MANHOLE GASKET IS UNIFORMLY SEATED AROUND STRUCTURE ADAPTER. EXTRA PRECAUTIONS MUST BE TAKEN TO PREVENT DIFFERENTIAL SETTLEMENT BETWEEN THE PIPE AND MANHOLE.

2. SEE STANDARD DETAIL D-108 (STRUCTURE CONNECTION INSTALLATION DETAIL) AND TECHNICAL POLYPROPYLENE PIPE MANUFACTURER TECHNICAL NOTES AND RECOMMENDATIONS FOR INSTALLATION OF CONNECTIONS TO MANHOLES AND STRUCTURES.

3. CODES OR PRODUCTS AS SPECIFIED, OR EQUIVALENT.

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS 12"–24" POLYPROPYLENE PIPE MANHOLE BOOT AND FITTING	REVISED 04/2024	D 97

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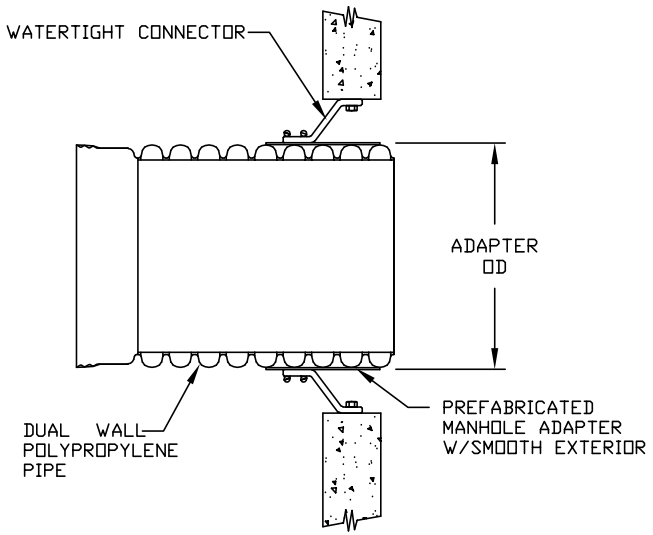
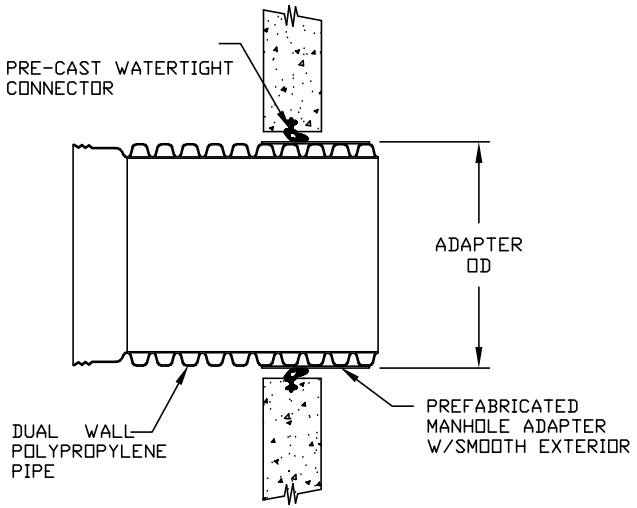
12"-60" DUAL WALL POLYPROPYLENE PIPE WATERTIGHT CONNECTION USING A MANHOLE BOOT (CORED HOLE OR PRECAST) W/ PREFABRICATED ADAPTER





	PREFABRICATED MANHOLE ADAPTER W/SMOOTH EXTERIOR AND WATERTIGHT ADAPTER (3)	
PIPE SIZE	ADAPTER OD	PRODUCT CODE
12″ (300mm)	14.82″ (376.4mm)	SEE MANUFACTURER STANDARDS
15″ (375mm)	18.06″ (458.7mm)	
18″ (450mm)	21.71″ (551.4mm)	
24″ (600mm)	28.72″ (729.5mm)	
30″ (750mm)	36.30″ (922.0mm)	
36″ (900mm)	42.10″ (1069mm)	
42″ (1050mm)	47.95″ (1218mm)	
48″ (1200mm)	54.68″ (1389mm)	
60″ (1500mm)	67.65″ (1718mm)	

NOTES:

1. PERFORMANCE HIGHLY DEPENDENT ON INSTALLATION. CONTRACTOR MUST ENSURE MANHOLE GASKET IS UNIFORMLY SEATED AROUND STRUCTURE ADAPTER. EXTRA PRECAUTIONS MUST BE TAKEN TO PREVENT DIFFERENTIAL SETTLEMENT BETWEEN THE PIPE AND MANHOLE.

2. SEE STANDARD DETAIL D-108 (STRUCTURE CONNECTION INSTALLATION DETAIL) AND POLYPROPYLENE PIPE MANUFACTURER TECHNICAL NOTES AND RECOMMENDATIONS FOR INSTALLATION OF CONNECTIONS TO MANHOLES AND STRUCTURES.

3. CODES OR PRODUCTS AS SPECIFIED, OR EQUIVALENT.

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS 12"–60" POLYPROPYLENE PIPE MANHOLE BOOT OR COMPRESSION GASKET AND FITTING	REVISED 04/2024	D 98

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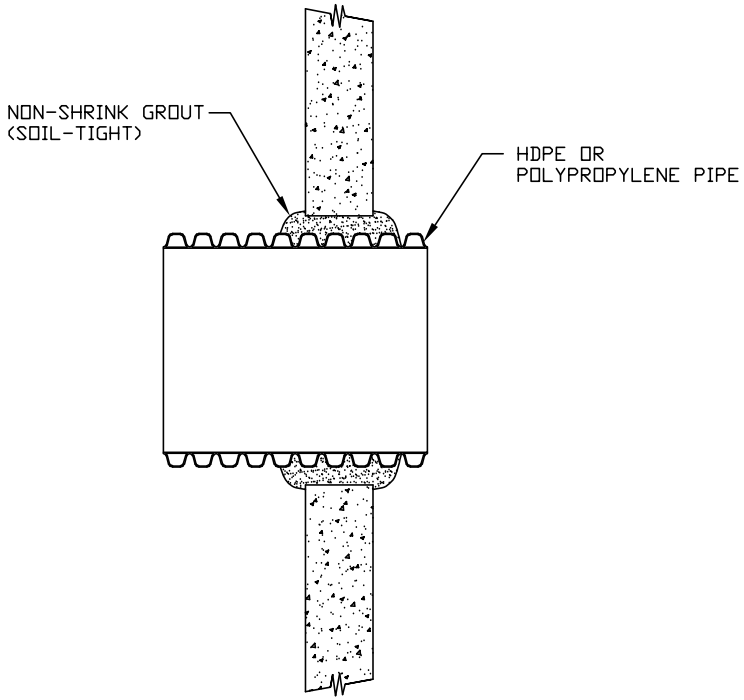
12"-60" HDPE OR POLYPROPYLENE PIPE
SOIL-TIGHT GROUTED MANHOLE CONNECTION



NOTES:

1. SEE STANDARD DETAIL D-108 STRUCTURE CONNECTION INSTALLATION DETAIL) AND TECHNICAL POLYPROPYLENE PIPE MANUFACTURER TECHNICAL NOTES AND RECOMMENDATIONS FOR INSTALLATION OF CONNECTIONS TO MANHOLES AND STRUCTURES.

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS 12"–60" HDPE OR POLYPROPYLENE PIPE SOIL–TIGHT GROUTED MANHOLE CONNECTION	REVISED 04/2024	D 99

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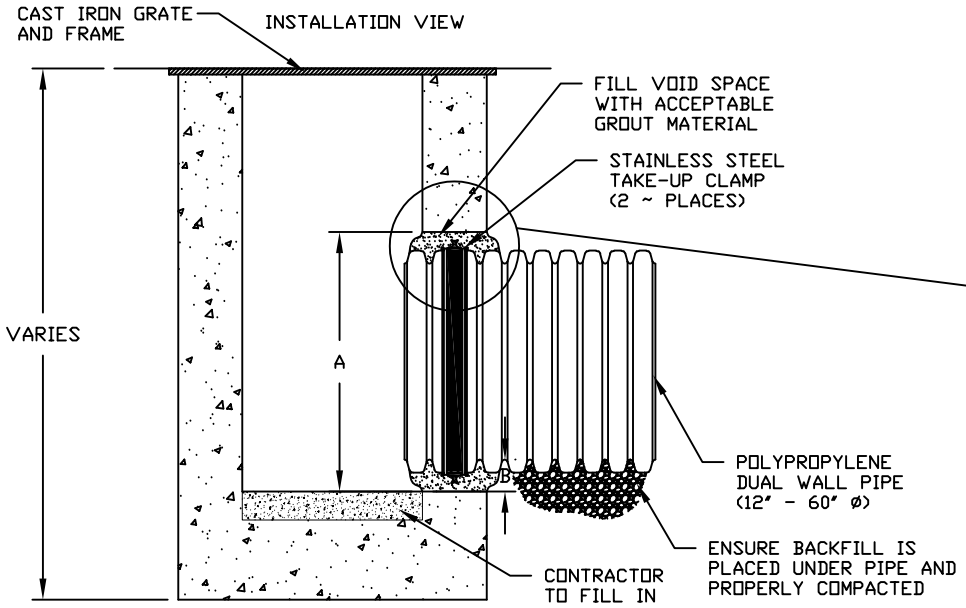
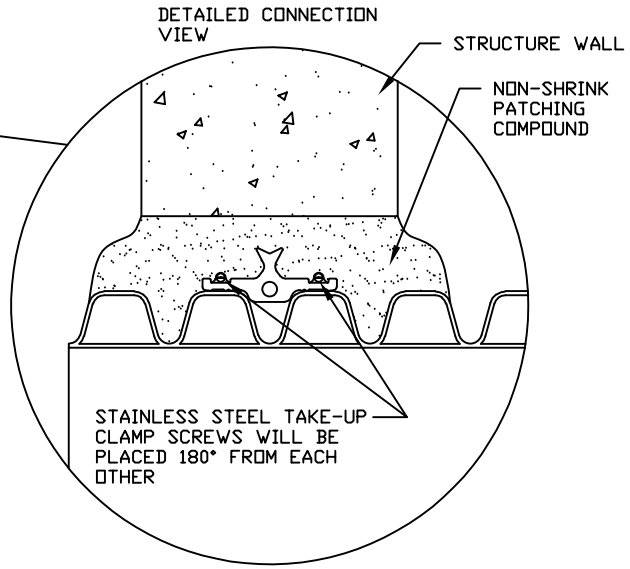
12"-60" POLYPROPYLENE PIPE WATERSTOP GROUTED MANHOLE CONNECTION (DUAL WALL)





PIPE SIZE	PIPE OD	"A" MIN. HOLE ø	"B" MIN. DISTANCE FROM PIPE INVERT TO STRUCTURE INVERT	WATERSTOP CONNECTOR (3)
12" (300mm)	14.5" (368mm)	19.50" (495mm)	3.7" (94mm)	SEE MANUFACTURER STANDARDS
15" (375mm)	17.6" (447mm)	23.00" (584mm)	4.0" (102mm)	
18" (450mm)	21.2" (538mm)	26.50" (673mm)	4.2" (107mm)	
21" (525mm)	24.8" (630mm)	30.25" (768mm)	4.5" (114mm)	
24" (600mm)	27.8" (706mm)	33.25" (845mm)	4.5" (114mm)	
30" (750mm)	35.1" (892mm)	40.50" (1029mm)	5.2" (132mm)	
36" (900mm)	41.1" (1044mm)	47.00" (1194mm)	5.5" (140mm)	
42" (1050mm)	47.7" (1212mm)	53.00" (1346mm)	5.7" (145mm)	
48" (1200mm)	53.6" (1361mm)	59.00" (1499mm)	5.7" (145mm)	
60" (1500mm)	66.3" (1684mm)	72.00" (1829mm)	6.4" (163mm)	

NOTES:

1. PERFORMANCE HIGHLY DEPENDENT ON INSTALLATION. CONTRACTOR MUST ENSURE MANHOLE GASKET IS UNIFORMLY SEATED AROUND STRUCTURE ADAPTER. EXTRA PRECAUTIONS MUST BE TAKEN TO PREVENT DIFFERENTIAL SETTLEMENT BETWEEN THE PIPE AND MANHOLE.

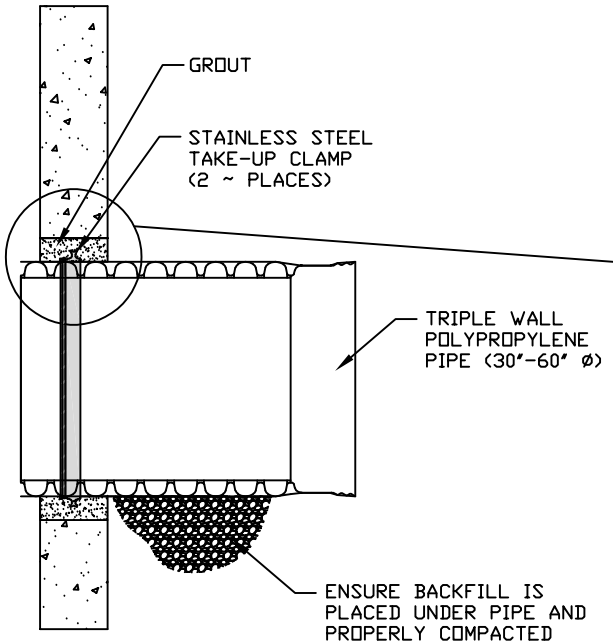
2. SEE STANDARD DETAIL D-108 (STRUCTURE CONNECTION INSTALLATION DETAIL) AND POLYPROPYLENE PIPE MANUFACTURER TECHNICAL NOTES AND RECOMMENDATIONS FOR INSTALLATION OF CONNECTIONS TO MANHOLES AND STRUCTURES.

3. CODES OR PRODUCTS AS SPECIFIED, OR EQUIVALENT.

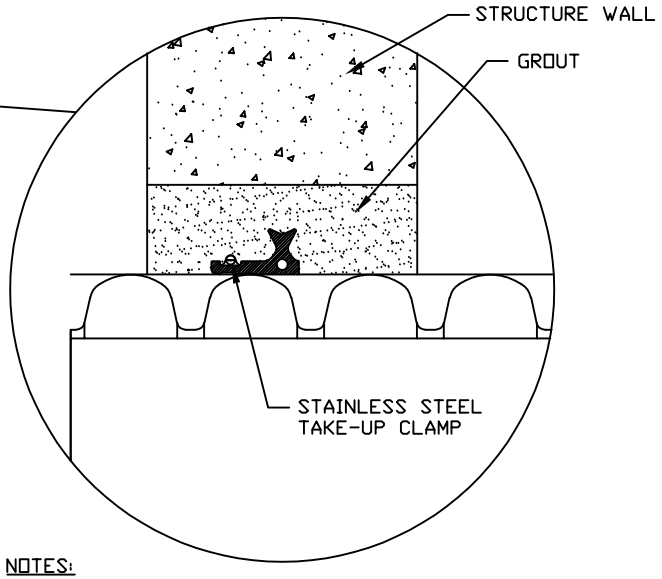
ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS 12"–60" POLYPROPYLENE PIPE MANHOLE GROUTED WATERSTOP	REVISED 04/2024	D 100

8/2020

30"-60" POLYPROPYLENE PIPE WATERSTOP GROUTED MANHOLE CONNECTION (TRIPLE WALL)



DETAILED CONNECTION VIEW



PIPE SIZE	PIPE OD	"A" MIN. HOLE Ø	WATERSTOP PRODUCT CODE (2)
30" (750mm)	35.4" (899mm)	41.5" (1054mm)	SEE MANUFACTURER STANDARDS
36" (900mm)	41.1" (1044mm)	46.0" (1168mm)	
42" (1050mm)	47.2" (1199mm)	52.5" (1334mm)	
48" (1200mm)	53.8" (1367mm)	60.0" (1524mm)	
60" (1500mm)	66.5" (1689mm)	72.5" (1842mm)	

NOTES:

1. PERFORMANCE HIGHLY DEPENDENT ON INSTALLATION. CONTRACTOR MUST ENSURE MANHOLE GASKET IS UNIFORMLY SEATED AROUND STRUCTURE ADAPTER. EXTRA PRECAUTIONS MUST BE TAKEN TO PREVENT DIFFERENTIAL SETTLEMENT BETWEEN THE PIPE AND MANHOLE.

2. CODES OR PRODUCTS AS SPECIFIED, OR EQUIVALENT.

3. SEE STANDARD DETAIL D-108 (STRUCTURE CONNECTION INSTALLATION DETAIL) AND POLYPROPYLENE PIPE MANUFACTURER TECHNICAL NOTES AND RECOMMENDATIONS FOR INSTALLATION OF CONNECTIONS TO MANHOLES AND STRUCTURES.

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS 30"–60" POLYPROPYLENE PIPE TRIPLE WALL MANHOLE GROUTED WATERSTOP	REVISED 04/2024	D 101

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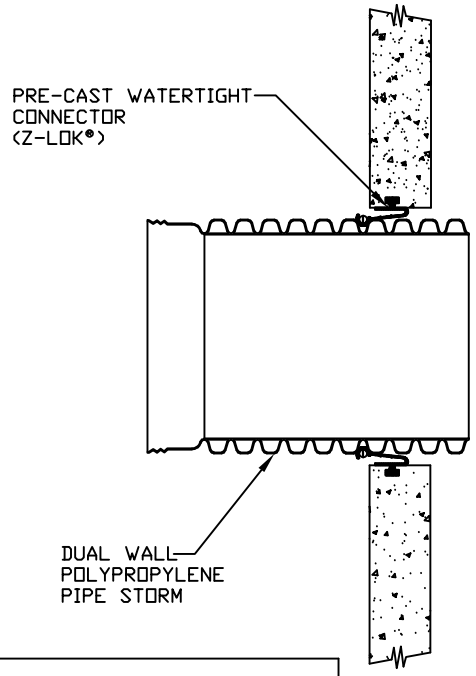
12"-36" DUAL WALL POLYPROPYLENE PIPE MANHOLE CONNECTION WITH Z-LOK BOOT OR PROVIDE FOR EQUIVALENT



PIPE SIZE	PIPE OD	PRECAST WATERTIGHT CONNECTOR (3)
12″ (300mm)	14.5″ (368mm)	SEE MANUFACTURER STANDARDS
15 (375mm)	17.6″ (447mm)	
18″ (450mm)	21.2″ (538mm)	
24″ (600mm)	28.1″ (714mm)	
30″ (750mm)	35.3″ (897mm)	
36″ (900mm)	41.1″ (1044mm)	

NOTES:

1. PERFORMANCE HIGHLY DEPENDENT ON INSTALLATION. CONTRACTOR MUST ENSURE MANHOLE GASKET IS UNIFORMLY SEATED AROUND STRUCTURE ADAPTER. EXTRA PRECAUTIONS MUST BE TAKEN TO PREVENT DIFFERENTIAL SETTLEMENT BETWEEN THE PIPE AND MANHOLE.

2. SEE STANDARD DETAIL D-108 (STRUCTURE CONNECTION INSTALLATION DETAIL) AND TECHNICAL POLYPROPYLENE PIPE MANUFACTURER TECHNICAL NOTES AND RECOMMENDATIONS FOR INSTALLATION OF CONNECTIONS TO MANHOLES AND STRUCTURES.

3. CODES OR PRODUCTS AS SPECIFIED, OR EQUIVALENT.

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS 12"–36" POLYPROPYLENE PIPE MANHOLE MECHANICAL	REVISED 04/2024	D 102

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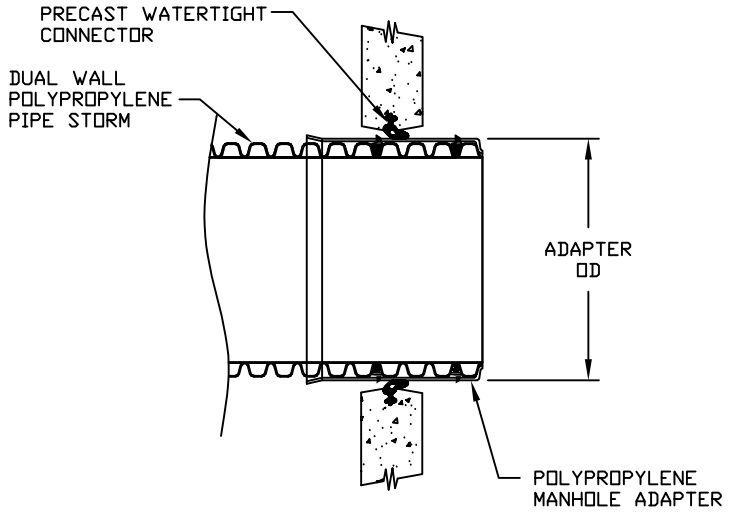
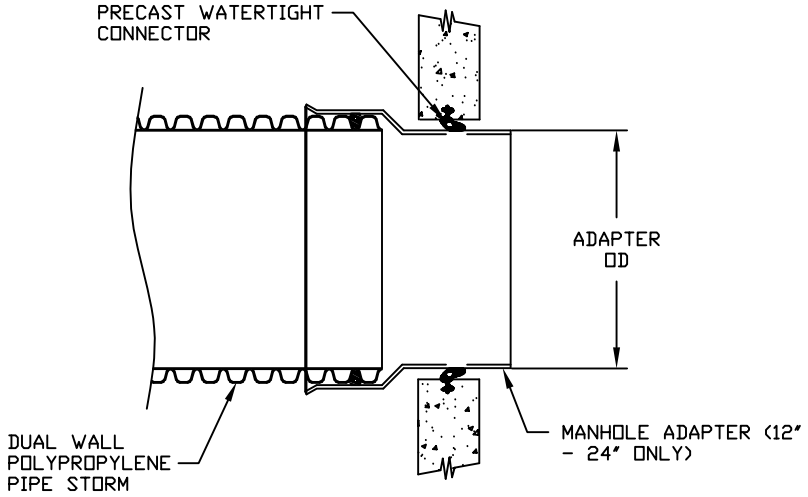




12"-24" DUAL WALL POLYPROPYLENE PIPE WATERTIGHT CONNECTION USING A PRECAST COMPRESSION GASKET

	MANHOLE ADAPTER AND WATERTIGHT CONNECTOR (3)	
PIPE SIZE	ADAPTER OD	PRODUCT CODES
12" (300mm)	15.3" (389mm)	SEE MANUFACTURER STANDARDS
15 (375mm)	18.3" (465mm)	
18" (450MM)	22.0" (559mm)	
24" (600MM)	29.0" (737mm)	

NOTES:

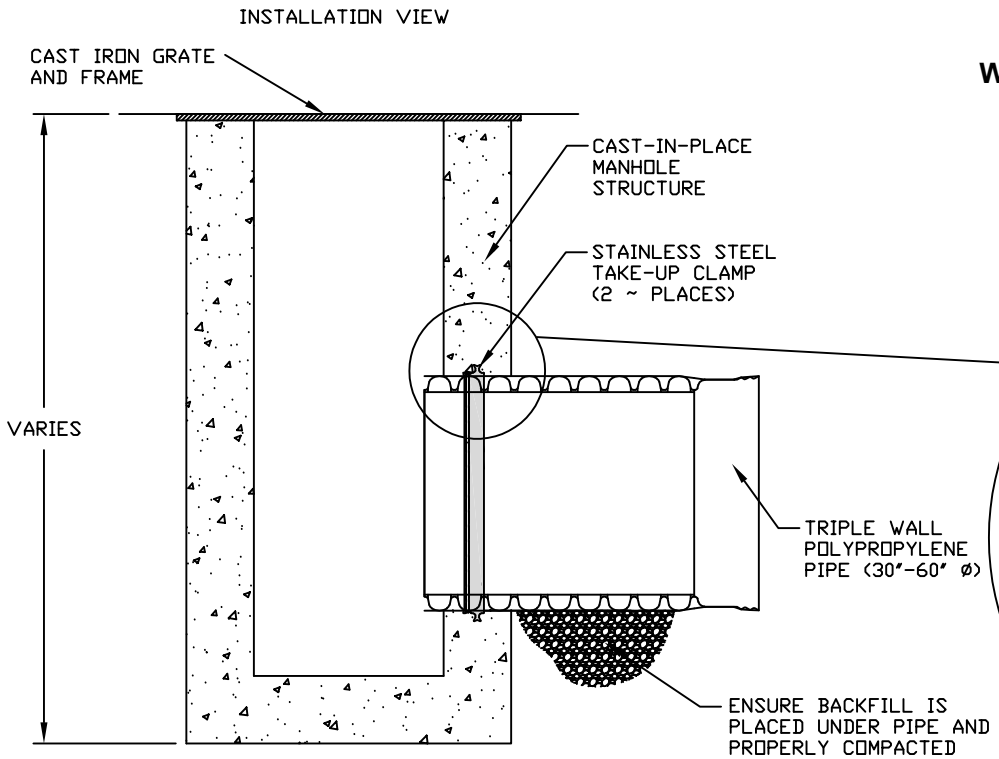
1. PERFORMANCE HIGHLY DEPENDENT ON INSTALLATION. CONTRACTOR MUST ENSURE MANHOLE GASKET IS UNIFORMLY SEATED AROUND STRUCTURE ADAPTER. EXTRA PRECAUTIONS MUST BE TAKEN TO PREVENT DIFFERENTIAL SETTLEMENT BETWEEN THE PIPE AND MANHOLE.

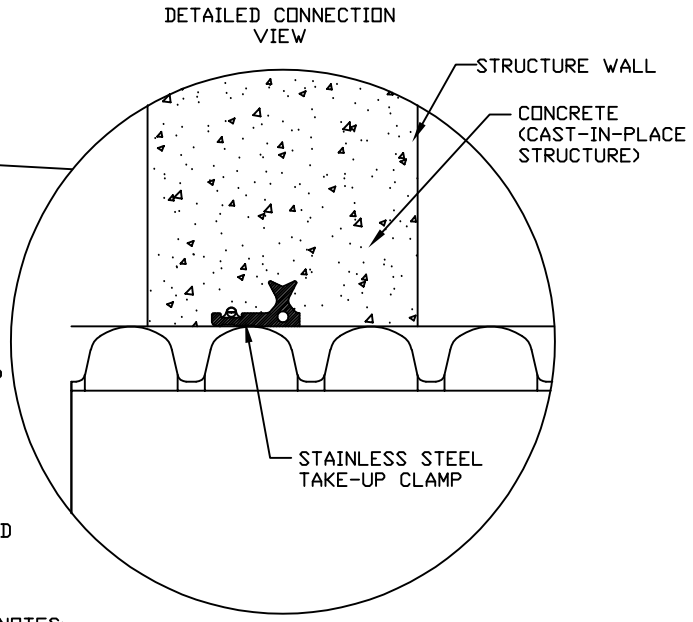
2. SEE STANDARD DETAIL D-108 (STRUCTURE CONNECTION INSTALLATION DETAIL) AND POLYPROPYLENE PIPE MANUFACTURER TECHNICAL NOTES AND RECOMMENDATIONS FOR INSTALLATION OF CONNECTIONS TO MANHOLES AND STRUCTURES.

3. CODES OR PRODUCTS AS SPECIFIED, OR EQUIVALENT.

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS 12"–24" POLYPROPYLENE PIPE MANHOLE PRECAST COMPRESSION GASKET	REVISED 04/2024	D 103

30"-60" POLYPROPYLENE PIPE WATERSTOP MANHOLE CAST-IN-PLACE CONNECTION (TRIPLE WALL)





PIPE SIZE	PIPE OD	WATERSTOP PRODUCT CODE (3)
30" (750mm)	35.4" (899mm)	SEE MANUFACTURER STANDARDS
36" (900mm)	41.1" (1044mm)	
42" (1050mm)	47.2" (1199mm)	
48" (1200mm)	53.8" (1367mm)	
60" (1500mm)	66.5" (1689mm)	

NOTES:

1. PERFORMANCE HIGHLY DEPENDENT ON INSTALLATION. CONTRACTOR MUST ENSURE MANHOLE GASKET IS UNIFORMLY SEATED AROUND STRUCTURE ADAPTER. EXTRA PRECAUTIONS MUST BE TAKEN TO PREVENT DIFFERENTIAL SETTLEMENT BETWEEN THE PIPE AND MANHOLE.

2. SEE STANDARD DETAIL D-108 (STRUCTURE CONNECTION INSTALLATION DETAIL) AND POLYPROPYLENE PIPE MANUFACTURER TECHNICAL NOTES AND RECOMMENDATIONS FOR INSTALLATION OF CONNECTIONS TO MANHOLES AND STRUCTURES.

3. CODES OR PRODUCTS AS SPECIFIED, OR EQUIVALENT.

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS 30"–60" POLYPROPYLENE PIPE TRIPLE WALL MANHOLE WATERSTOP CAST–IN–PLACE	REVISED 04/2024	D 104

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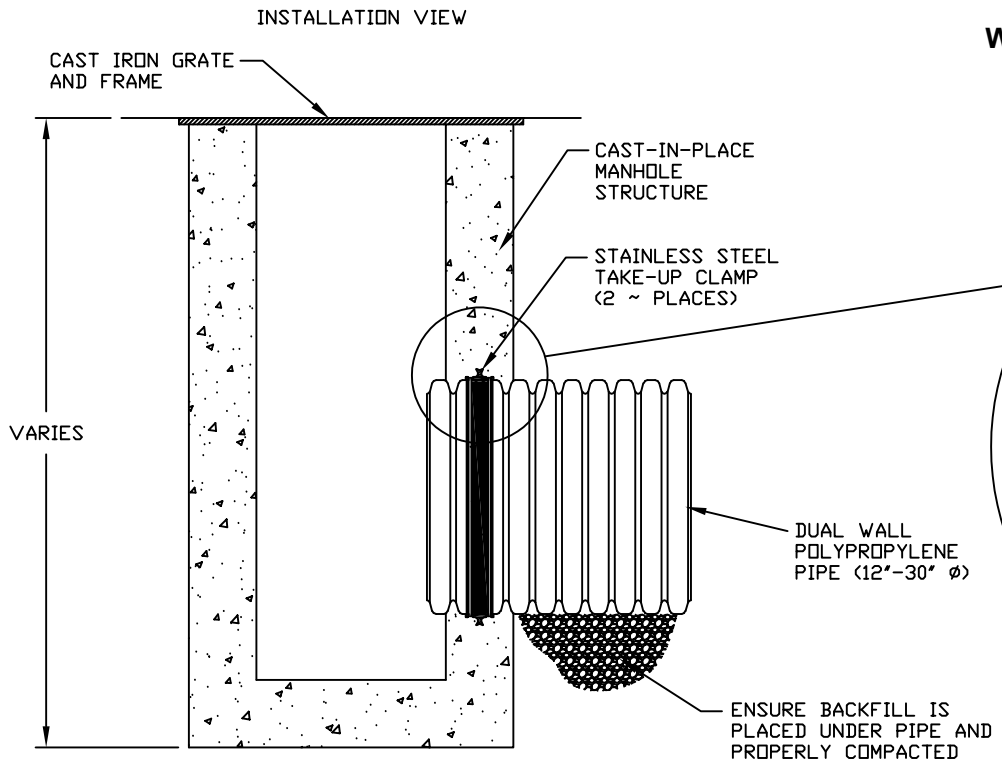
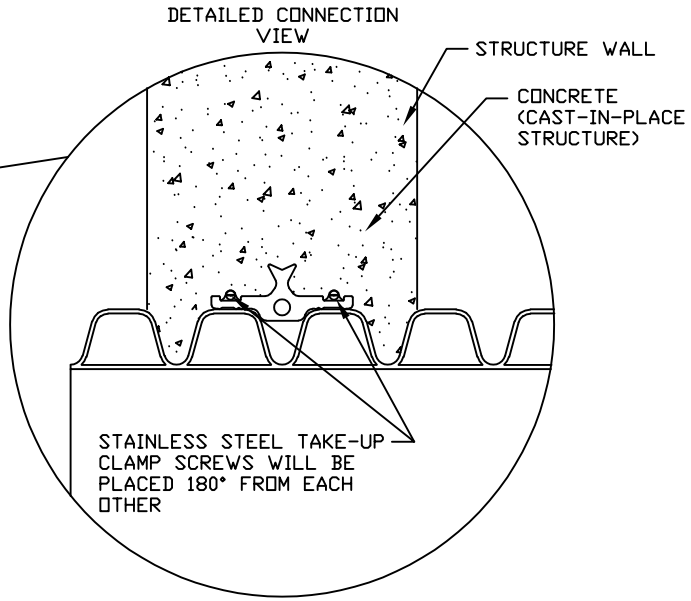
12"-30" POLYPROPYLENE PIPE WATERSTOP MANHOLE CAST-IN-PLACE CONNECTION (DUAL WALL)





PIPE SIZE	PIPE OD	PRODUCT CODE (3)
12" (300mm)	14.5" (368mm)	SEE MANUFACTURER STANDARDS
15" (375mm)	17.6" (447mm)	
18" (450mm)	21.2" (538mm)	
21" (525mm)	24.8" (630mm)	
24" (600mm)	27.8" (706mm)	
30" (750mm)	35.1" (892mm)	

NOTES:

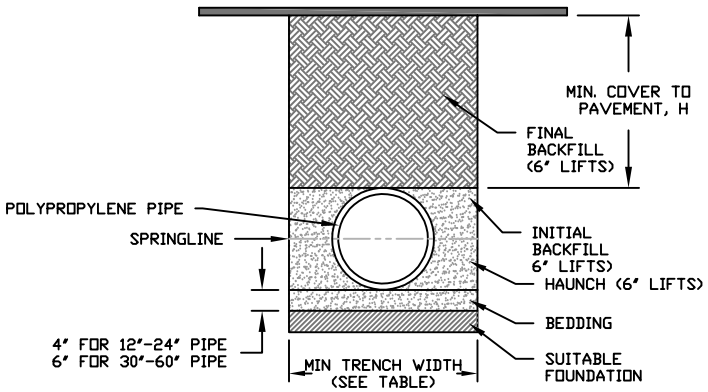
1. PERFORMANCE HIGHLY DEPENDENT ON INSTALLATION. CONTRACTOR MUST ENSURE MANHOLE GASKET IS UNIFORMLY SEATED AROUND STRUCTURE ADAPTER. EXTRA PRECAUTIONS MUST BE TAKEN TO PREVENT DIFFERENTIAL SETTLEMENT BETWEEN THE PIPE AND MANHOLE.

2. SEE STANDARD DETAIL D-108 (STRUCTURE CONNECTION INSTALLATION DETAIL) AND POLYPROPYLENE PIPE MANUFACTURER TECHNICAL NOTES AND RECOMMENDATIONS FOR WATERSTOP INSTALLATION

3. CODES OR PRODUCTS AS SPECIFIED, OR EQUIVALENT.

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS 12"–30" POLYPROPYLENE PIPE MANHOLE WATERSTOP CAST–IN–PLACE	REVISED 04/2024	D 105

POLYPROPYLENE PIPE
TRENCH INSTALLATION DETAIL



NOTES:

1. ALL PIPE SYSTEMS SHALL BE INSTALLED IN ACCORDANCE WITH ASTM D2321, "STANDARD PRACTICE FOR UNDERGROUND INSTALLATION OF THERMOPLASTIC PIPE FOR SEWERS AND OTHER GRAVITY FLOW APPLICATIONS", LATEST ADDITION, WITH THE EXCEPTION THAT THE INITIAL BACKFILL MAY EXTEND TO THE CROWN OF THE PIPE. SOIL CLASSIFICATIONS ARE PER THE LATEST VERSION OF ASTM D2321. CLASS IVB MATERIALS (MH, CH) AS DEFINED IN PREVIOUS VERSIONS OF ASTM D2321 ARE NOT APPROPRIATE BACKFILL MATERIALS.

2. MEASURES SHOULD BE TAKEN TO PREVENT MIGRATION OF NATIVE FINES INTO BACKFILL MATERIAL, WHEN REQUIRED.

3. FOUNDATION: WHERE THE TRENCH BOTTOM IS UNSTABLE, THE CONTRACTOR SHALL EXCAVATE TO A DEPTH REQUIRED BY THE ENGINEER AND REPLACE WITH SUITABLE MATERIAL AS SPECIFIED BY THE ENGINEER. AS AN ALTERNATIVE AND AT THE DISCRETION OF THE DESIGN ENGINEER, THE TRENCH BOTTOM MAY BE STABILIZED USING A GEOTEXTILE MATERIAL.

4. BEDDING: SUITABLE MATERIAL SHALL BE CLASS I, II, III, OR IV. THE CONTRACTOR SHALL PROVIDE DOCUMENTATION FOR MATERIAL SPECIFICATION TO ENGINEER. COMPACTION SHALL BE SPECIFIED BY THE ENGINEER IN ACCORDANCE WITH TABLE 3 FOR THE APPLICABLE FILL HEIGHTS LISTED. UNLESS OTHERWISE NOTED BY THE ENGINEER, MINIMUM BEDDING THICKNESS SHALL BE 4" (100mm) FOR 12"-24" (300mm-600mm) DIAMETER PIPE; 6" (150mm) FOR 30"-60" (750mm-1500mm) DIAMETER PIPE. THE MIDDLE 1/3 BENEATH THE PIPE INVERT SHALL BE LOOSELY PLACED. PLEASE NOTE, CLASS IV MATERIAL HAS LIMITED APPLICATION AND CAN BE DIFFICULT TO PLACE AND COMPACT; USE ONLY WITH THE APPROVAL OF A SOIL EXPERT.

5. INITIAL BACKFILL: SUITABLE MATERIAL SHALL BE CLASS I, II, III, OR IV IN THE PIPE ZONE EXTENDING TO THE CROWN OF THE PIPE. THE CONTRACTOR SHALL PROVIDE DOCUMENTATION FOR MATERIAL SPECIFICATION TO ENGINEER. MATERIAL SHALL BE INSTALLED AS REQUIRED IN ASTM D2321, LATEST EDITION. COMPACTION SHALL BE SPECIFIED BY THE ENGINEER IN ACCORDANCE WITH TABLE 3 FOR THE APPLICABLE FILL HEIGHTS LISTED. PLEASE NOTE, CLASS IV MATERIAL HAS LIMITED APPLICATION AND CAN BE DIFFICULT TO PLACE AND COMPACT; USE ONLY WITH THE APPROVAL OF A SOIL EXPERT.

6. MINIMUM COVER: MINIMUM COVER, H, IN NON-TRAFFIC APPLICATIONS (GRASS OR LANDSCAPE AREAS) IS 12" (305mm) FROM THE TOP OF PIPE TO BELOW PAVEMENT BOX. ADDITIONAL COVER MAY BE REQUIRED TO PREVENT FLOTATION. FOR TRAFFIC APPLICATIONS; CLASS I OR II MATERIAL COMPACTED TO 90% SPD AND CLASS III COMPACTED TO 95% SPD IS REQUIRED. FOR TRAFFIC APPLICATIONS, MINIMUM COVER, H, IS 18" (457mm) UP TO 48" (1200mm) DIAMETER PIPE AND 24" (600mm) OF COVER FOR 60" (1500mm) DIAMETER PIPE, MEASURED FROM TOP OF PIPE TO BOTTOM OF PAVEMENT BOX.

7. SEE POLYPROPYLENE PIPE MANUFACTURER TECHNICAL NOTES AND RECOMMENDATIONS FOR MORE DETAIL ON MINIMUM AND MAXIMUM COVER HEIGHTS FOR PIPE.

8. CODES OR PRODUCTS AS SPECIFIED, OR EQUIVALENT.

TABLE 1, RECOMMENDED MINIMUM TRENCH WIDTHS

PIPE DIAM.	MIN. TRENCH WIDTH
12" (300mm)	30" (762mm)
15" (375mm)	34" (864mm)
18" (450mm)	39" (991mm)
24" (600mm)	48" (1219mm)
30" (750mm)	56" (1422mm)
36" (900mm)	64" (1626mm)
42" (1050mm)	72" (1829mm)
48" (1200mm)	80" (2032mm)
60" (1500mm)	96" (2438mm)

TABLE 2, MINIMUM RECOMMENDED COVER BASED ON VEHICLE LOADING CONDITIONS

	SURFACE LIVE LOADING CONDITION (8)	
PIPE DIAM.	H-25	HEAVY CONSTRUCTION (75T AXLE LOAD) *
12" - 48" (300mm - 1200mm)	18" (457mm)	48" (1219mm)
60" (1500mm)	24" (610mm)	60" (1524mm)

* VEHICLES IN EXCESS OF 75T MAY REQUIRE ADDITIONAL COVER

TABLE 3, MAXIMUM COVER FOR ADS HP STORM PIPE, ft

	CLASS I	CLASS II			CLASS III		CLASS IV (8)
PIPE DIA	COMPACTED	95%	90%	85%	95%	90%	95%
12" (300mm)	41 (12.5m)	28 (8.5m)	21 (6.4m)	16 (4.9m)	20 (6.1m)	16 (4.9m)	16 (4.9m)
15" (375mm)	42 (12.8m)	29 (8.8m)	21 (6.4m)	16 (4.9m)	21 (6.4m)	16 (4.9m)	16 (4.9m)
18" (450mm)	44 (13.4m)	30 (9.1m)	21 (6.4m)	16 (4.9m)	22 (6.7m)	17 (5.2m)	16 (4.9m)
24" (600mm)	37 (11.3m)	26 (7.9m)	18 (5.5m)	14 (4.3m)	19 (5.8m)	14 (4.3m)	14 (4.3m)
30" (750mm)	39 (11.9m)	27 (8.2m)	19 (5.8m)	14 (4.3m)	19 (5.8m)	15 (4.6m)	14 (4.3m)
36" (900mm)	28 (8.5m)	20 (6.1m)	14 (4.3m)	10 (3.0m)	14 (4.3m)	11 (3.4m)	10 (3.0m)
42" (1050mm)	30 (9.1m)	21 (6.4m)	14 (4.3m)	10 (3.0m)	15 (4.6m)	11 (3.4m)	10 (3.0m)
48" (1200mm)	29 (8.8m)	20 (6.1m)	14 (4.3m)	9 (2.7m)	14 (4.3m)	10 (3.0m)	10 (3.0m)
60" (1500mm)	29 (8.8m)	20 (6.1m)	14 (4.3m)	9 (2.7m)	14 (4.3m)	10 (3.0m)	9 (2.7m)

FILL HEIGHT TABLE GENERATED USING AASHTO SECTION 12, LOAD RESISTANCE FACTOR DESIGN (LRFD) PROCEDURE WITH THE FOLLOWING ASSUMPTIONS:
NO HYDROSTATIC PRESSURE
UNIT WEIGHT OF SOIL (γ_s) = 120 PCF

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS TRENCH INSTALLATION DETAIL (POLYPROPYLENE PIPE UNIFORM BACKFILL)	REVISED 04/2024	D 106

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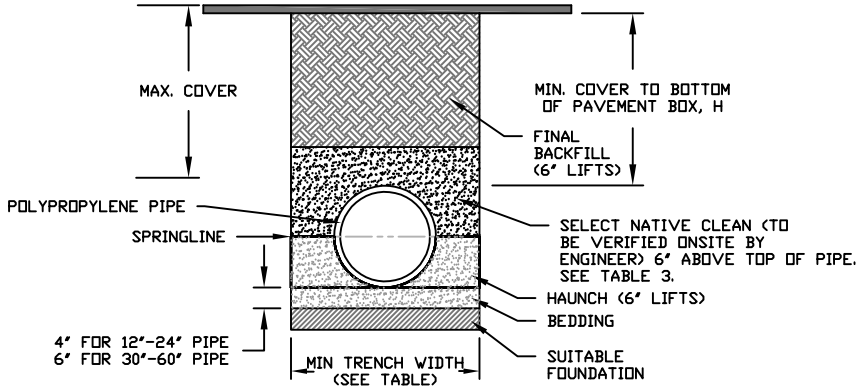
POLYPROPYLENE PIPE
TRENCH INSTALLATION DETAIL



NOTES:

1. ALL PIPE SYSTEMS SHALL BE INSTALLED IN ACCORDANCE WITH ASTM D2321, "STANDARD PRACTICE FOR UNDERGROUND INSTALLATION OF THERMOPLASTIC PIPE FOR SEWERS AND OTHER GRAVITY FLOW APPLICATIONS", LATEST ADDITION, WITH THE EXCEPTION THAT THE INITIAL BACKFILL MAY EXTEND TO THE CROWN OF THE PIPE. SOIL CLASSIFICATIONS ARE PER THE LATEST VERSION OF ASTM D2321. CLASS IVB MATERIALS (MH, CH) AS DEFINED IN PREVIOUS VERSIONS OF ASTM D2321 ARE NOT APPROPRIATE BACKFILL MATERIALS.

2. MEASURES SHOULD BE TAKEN TO PREVENT MIGRATION OF NATIVE FINES INTO BACKFILL MATERIAL, WHEN REQUIRED.

3. FOUNDATION: WHERE THE TRENCH BOTTOM IS UNSTABLE, THE CONTRACTOR SHALL EXCAVATE TO A DEPTH REQUIRED BY THE ENGINEER AND REPLACE WITH SUITABLE MATERIAL AS SPECIFIED BY THE ENGINEER. AS AN ALTERNATIVE AND AT THE DISCRETION OF THE DESIGN ENGINEER, THE TRENCH BOTTOM MAY BE STABILIZED USING A GEOTEXTILE MATERIAL.

4. BEDDING: SUITABLE MATERIAL SHALL BE CLASS I, II, III, OR IV. THE CONTRACTOR SHALL PROVIDE DOCUMENTATION FOR MATERIAL SPECIFICATION TO ENGINEER. COMPACTION SHALL BE SPECIFIED BY THE ENGINEER IN ACCORDANCE WITH TABLE 3 FOR THE APPLICABLE FILL HEIGHTS LISTED. UNLESS OTHERWISE NOTED BY THE ENGINEER, MINIMUM BEDDING THICKNESS SHALL BE 4" (100mm) FOR 12"-24" (300mm-600mm) DIAMETER PIPE; 6" (150mm) FOR 30"-60" (750mm-1500mm) DIAMETER PIPE. THE MIDDLE 1/3 BENEATH THE PIPE INVERT SHALL BE LOOSELY PLACED. PLEASE NOTE, CLASS IV MATERIAL HAS LIMITED APPLICATION AND CAN BE DIFFICULT TO PLACE AND COMPACT; USE ONLY WITH THE APPROVAL OF A SOIL EXPERT.

5. MATERIAL BELOW SPRINGLINE: CLASS 1 MATERIAL USED BELOW SPRINGLINE MUST BE ADEQUATELY "KNIFED" INTO HAUNCH AND BETWEEN CORRUGATIONS. UNLESS OTHERWISE NOTED BY THE ENGINEER, CLASS 1 MATERIAL MUST BE COMPACTED IN 6" LIFTS:

6. MINIMUM COVER: MINIMUM COVER, H, IN NON-TRAFFIC APPLICATIONS (GRASS OR LANDSCAPE AREAS) IS 12" (305mm) FROM THE TOP OF PIPE TO GROUND SURFACE. ADDITIONAL COVER MAY BE REQUIRED TO PREVENT FLOTATION. FOR TRAFFIC APPLICATIONS; CLASS I OR II MATERIAL COMPACTED TO 90% SPD AND CLASS III COMPACTED TO 95% SPD IS REQUIRED. FOR TRAFFIC APPLICATIONS, MINIMUM COVER, H, IS 18" (457mm) UP TO 48" (1200mm) DIAMETER PIPE AND 24" (600mm) OF COVER FOR 60" (1500mm) DIAMETER PIPE, MEASURED FROM TOP OF PIPE TO BOTTOM OF PAVEMENT BOX.

7. SEE POLYPROPYLENE PIPE MANUFACTURER TECHNICAL NOTES AND RECOMMENDATIONS FOR MINIMUM AND MAXIMUM COVER HEIGHTS FOR PIPE.

8. CODES OR PRODUCTS AS SPECIFIED, OR EQUIVALENT.

9. NATIVE BACKFILL: SELECT NATIVE CLEAN BACKFILL SHALL BE WELL PLACED, MODERATELY COMPACTED (85% SPD) CLASS IV OR BETTER PER ASTM D2321 WITH NO FOREIGN DEBRIS INCLUDING ROCKS, LARGE CLUMPS OF ORGANIC OR FROZEN MATERIAL.

10. BACKFILL AND COMPACTION LEVELS NOT SHOWN ON TABLE MAY ALSO BE ACCEPTABLE. CONTACT PIPE MANUFACTURER.

TABLE 1, RECOMMENDED MINIMUM TRENCH WIDTHS

PIPE DIAM.	MIN. TRENCH WIDTH
12" (300mm)	30" (762mm)
15" (375mm)	34" (864mm)
18" (450mm)	39" (991mm)
24" (600mm)	48" (1219mm)
30" (750mm)	56" (1422mm)
36" (900mm)	64" (1626mm)
42" (1050mm)	72" (1829mm)
48" (1200mm)	80" (2032mm)
60" (1500mm)	96" (2438mm)

TABLE 2, MINIMUM RECOMMENDED COVER BASED ON VEHICLE LOADING CONDITIONS

	SURFACE LIVE LOADING CONDITION (8)	
PIPE DIAM.	H-25	HEAVY CONSTRUCTION (75T AXLE LOAD) *
12" - 48" (300mm - 1200mm)	18" (457mm)	48" (1219mm)
60" (1500mm)	24" (610mm)	60" (1524mm)

* VEHICLES IN EXCESS OF 75T MAY REQUIRE ADDITIONAL COVER

TABLE 3, MAXIMUM COVER FOR POLYPROPYLENE PIPE, ft (m)

PIPE DIA	CLASS II	CLASS III	CLASS IV
12" (300mm)	17 (5.2m)	14 (4.3m)	11 (3.4m)
15" (375mm)	17 (5.2m)	14 (4.3m)	10 (3.0m)
18" (450mm)	16 (4.9m)	13 (4.0m)	10 (3.0m)
24" (600mm)	14 (4.3m)	12 (3.7m)	9 (2.7m)
30" (750mm)	13 (4.0m)	12 (3.7m)	8 (2.4m)
36" (900mm)	11 (3.4m)	11 (3.4m)	7 (2.1m)
42" (1050mm)	11 (3.4m)	11 (3.4m)	7 (2.1m)
42" (1050mm)	11 (3.4m)	10 (3.0m)	6 (1.8m)
60" (1500mm)	11 (3.4m)	10 (3.0m)	6 (1.8m)

FILL HEIGHT TABLE GENERATED USING AASHTO SECTION 12, LOAD RESISTANCE FACTOR DESIGN (LRFD) PROCEDURE WITH THE FOLLOWING ASSUMPTIONS:
NO HYDROSTATIC PRESSURE
UNIT WEIGHT OF SOIL (γ_s) = 120 PCF

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS TRENCH INSTALLATION DETAIL (POLYPROPYLENE PIPE SPLIT BACKFILL)	REVISED 04/2024	D 107

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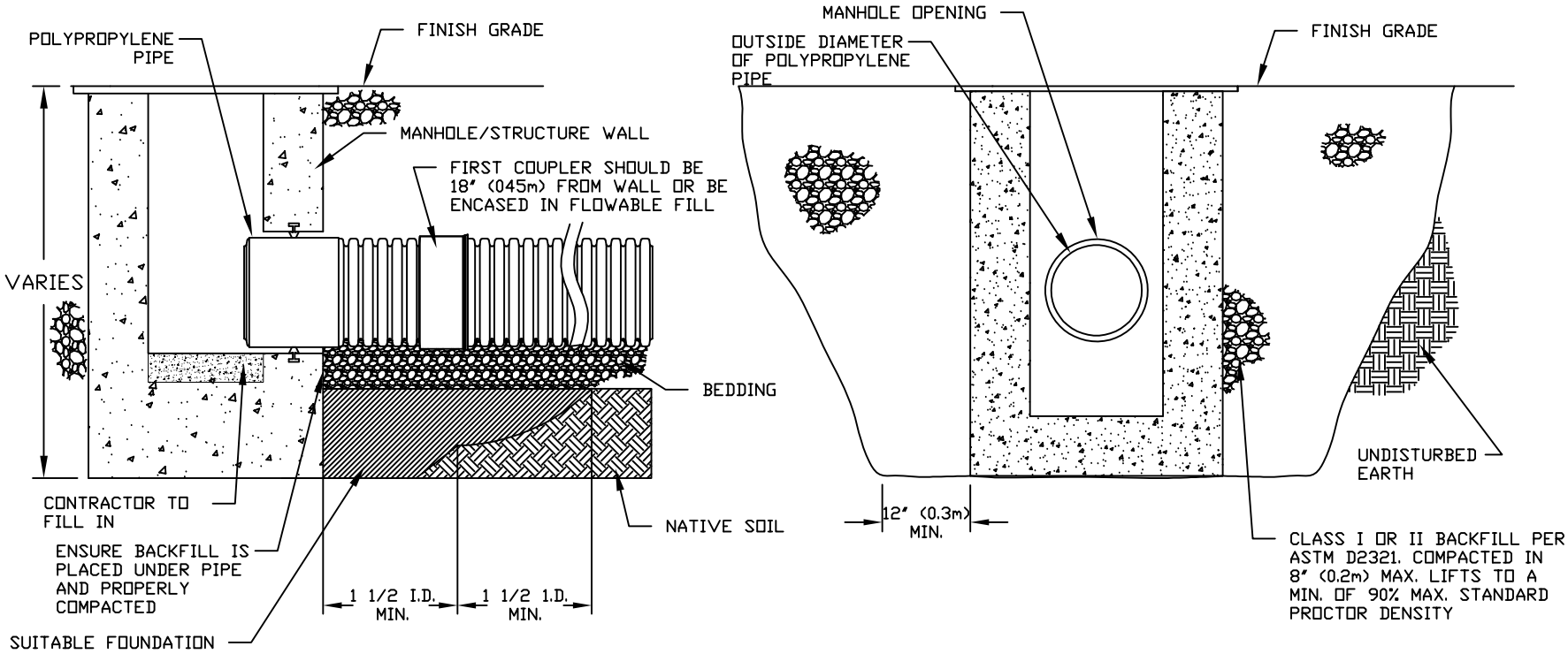

NOTES:

1. MAXIMUM INSERTION ANGLE SHALL NOT EXCEED REQUIREMENTS AS SPECIFIED BY THE MANUFACTURER.

2. SEE STANDARD DETAIL SOIL- OR WATERTIGHT MANHOLE CONNECTION DETAILS (D-96 TO D-105) AND POLYPROPYLENE PIPE MANUFACTURER TECHNICAL NOTES AND RECOMMENDATIONS FOR STRUCTURE CONNECTIONS, PRODUCT INFORMATION, DIMENSIONAL PIPE DATA, AND CONNECTIONS TO MANHOLES AND STRUCTURES.

3. PERFORMANCE HIGHLY DEPENDENT ON INSTALLATION. CONTRACTOR MUST INSURE MANHOLE GASKET IS UNIFORMLY SEATED AROUND STRUCTURE ADAPTER. EXTRA PRECAUTIONSMUST BE TAKEN TO PREVENT DIFFERENTIAL SETTLEMENT BETWEEN THE PIPE AND MANHOLE.

4. PIPE AT AND AROUND STRUCTURE CONNECTION TO BE INSTALLED PER ASTM 2321.

5. CARE SHOULD BE TAKEN TO KNIFE, OR SHOVEL BACKFILL MATERIAL UNDER AND AROUND HAUNCH AREA OF PIPE.

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS STRUCTURE CONNECTION INSTALLATION DETAIL	REVISED 04/2024	D 108

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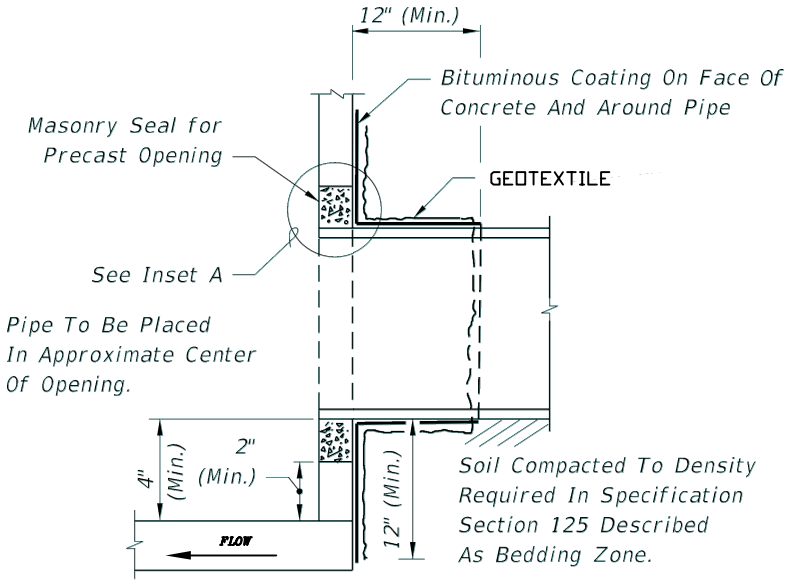
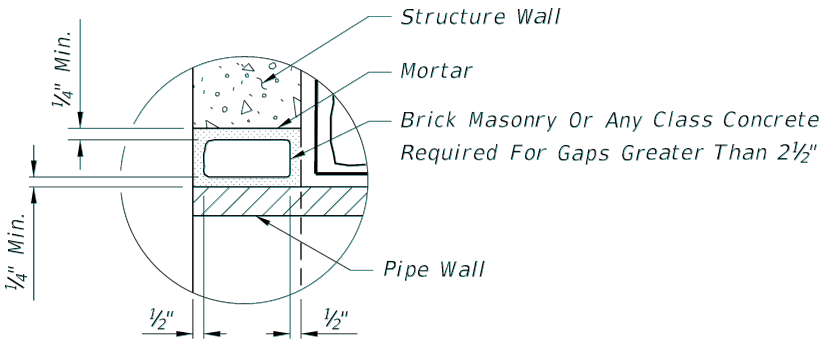


GEOTEXTILE WRAP ON GROUTED PIPE TO STRUCTURE JOINT



INSET A

NOTES:

1. THIS IS APPLICABLE IN INSTANCES WHERE ADDITIONAL PROTECTION AGAINST MOISTURE LEAKAGE IS REQUIRED.

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED CHIEF ENGINEER DESIGN ENGINEER DATE:	STANDARD DRAINAGE DETAILS GEOTEXTILE WRAP ON GROUTED PIPE TO STRUCTURE JOINT	REVISED 04/2024	D 109

8/2020