STORM DRAIN STANDARD DETAIL INDEX

PLATE NUMBER	TITLE	SIGNATURE DATE	SPEC REF#
D-22	HEADWALL (WEEPHOLES FOR HEADWALLS)	09/28/2023	- - - -
D-1.00	WEEPHOLES FOR HEADWALLS	09/28/2023	305.04.02
D-1.00A	BACKFILL BEHIND WALLS	09/28/2023	305.04.02
D-1.01A	TYPE “A” HEADWALL – CIRCULAR PIPE	09/28/2023	305.04.02
D-1.01B	TYPE “A” HEADWALL – HORIZONTAL ELLIPITCAL CONCRETE PIPE	09/28/2023	305.04.02
D-1.01C	TYPE “A” HEADWALL – METAL PIPE ARCH	09/28/2023	305.04.02
D-1.02	END SUPPORT WALL	09/28/2023	305.04.02
D-1.03	END SUPPORT WALL - TABLE	09/28/2023	305.04.02
D-1.04	END SUPPORT WALL - TABLE	09/28/2023	305.04.02
D-1.05	HEADWALLS – (B-66, B-72, B-78, B-84)	09/28/2023	305.04.02
D-1.06	TYPE “C” ENDWALL – ROUND PIPE - TABLE	09/28/2023	305.04.02
D-1.07A	TYPE “C” ENDWALL – ROUND PIPE - TABLE	09/28/2023	305.04.02
D-1.07B	TYPE “C” ENDWALL – HORIZONTAL ELLIPTICAL PIPE - TABLE	09/28/2023	305.04.02
D-1.08	TYPE “E” ENDWALL	09/28/2023	305.04.02
D-1.09	TYPE “E” ENDWALL - TABLES	09/28/2023	305.04.02
D-1.10	CONCRETE END SECTION – ROUND CONCRETE PIPE	09/28/2023	305.04.02
D-1.11	CONCRETE END SECTION – ROUND CONCRETE PIPE	09/28/2023	305.04.02
D-1.12	METAL END SECTION – ROUND METAL PIPE	09/28/2023	305.04.02
D-1.13	METAL END SECTION – ROUND METAL PIPE	09/28/2023	305.04.02
D-1.16	CONNECTIONS – METAL END SECTIONS	09/28/2023	305.04.02
D-2.00	RECTANGULAR INLETS – GENERAL REQUIREMENTS	09/28/2023	305
D-2.01A	TYPE “A-1” INLET	09/28/2023	305
D-2.01B	TYPE “A-2” INLET	09/28/2023	305
D-2.02A	TYPE “B-1” INLET	09/28/2023	305
D-2.02B	TYPE “B-2” INLET	09/28/2023	305
D-2.03	TYPE “A” AND “B” INLET	09/28/2023	305
D-2.05	TYPE “A” AND “B” INLET – PRECAST TOP SLABS	09/28/2023	305
D-2.06	TYPE “E” INLET	09/28/2023	305
D-2.07	TYPE “E” INLET – COMBINATION INLET	09/28/2023	305
D-2.08	COMBINATION INLET – CURB PIECE	09/28/2023	305
D-2.08A	SUPPORT BEAM FOR FRAMES – ON DOUBLE COMBINATION INLETS	09/28/2023	305
D-2.09	TYPE “E” INLET – FRAME AND GRATE	09/28/2023	305
D-2.09A	CURVED VANE (E-CV) GRATE – CLASS 35 TYPE “E” FRAME	09/28/2023	305
D-2.09B	DOUBLE TYPE “E” INLET – CLASS 35 WITH CURVED VANE (E-CV) GRATE	09/28/2023	305
D-2.10	DOUBLE TYPE “E” INLET – COMBINATION INLET	09/28/2023	305
D-2.12	TYPE “H” COMBINATION INLET – PRECAST STANDARD	09/28/2023	305

PLATE NUMBER	TITLE	SIGNATURE DATE	SPEC REF#
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D-2.14	TYPE “J” INLET – WITH MODIFIED GRATE	09/28/2023	305
D-2.15	SPECIAL TYPE “K” INLET – NON-TRAFFIC AREAS	09/28/2023	305
D-2.16A	TYPE “S” INLET – SINGLE GRATE	09/28/2023	305
D-2.16B	TYPE “S” INLET – SINGLE GRATE – YARD AND MEDIAN APPLICATIONS	09/28/2023	305
D-2.17	TYPE “S” INLET – SINGLE FRAME AND GRATE	09/28/2023	305
D-2.17A	SINGLE TYPE “S” FRAME – CLASS 35 WITH CURVED VANE (S-CV) GRATES	09/28/2023	305
D-2.18	TYPE “S” – COMBINATION INLET	09/28/2023	305
D-2.19A	TYPE “S” INLET – DOUBLE GRATE - NO BEAM SUPPORT	09/28/2023	305
D-2.19B	TYPE “S” INLET – DOUBLE GRATE – YARD AND MEDIAN APPLICATIONS	09/28/2023	305
D-2.20	TYPE “S” COMBINATION INLET – DOUBLE GRATE TANDEM	09/28/2023	305
D-2.21	TYPE “S” INLET AND COMBINATION – FRAME AND GRATE	09/28/2023	305
D-2.21A	CURVER VANE (S-CV) GRATE – FOR TYPE “S” INLET FRAMES	09/28/2023	305
D-2.21B	DOUBLE TYPE “S” FRAME – CLASS 35 WITH CURVED VANE (S-CV) GRATES	09/28/2023	305
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D-2.22B	TYPE “Y-1” INLET - DETAILS	09/28/2023	305
D-2.22C	ALTERNATIVE TYPE “Y-1” INLET	09/28/2023	305
D-2.24A	TYPE “Y-3” INLET – “Y-1” INLET BASE AND BEEHIVE GRATE	09/28/2023	305
D-2.24B	TYPE “Y-3” YARD INLET – “Y-2” BASE AND BEEHIVE GRATE	09/28/2023	305
D-2.25A	TYPE “Y-4” INLET – “Y-1” INLET BASE AND STOOL GRATE	09/28/2023	305
D-2.25B	TYPE “Y-4” INLET – “Y-2” INLET BASE AND STOOL GRATE	09/28/2023	305
D-2.25C	PRECAST “Y-5” YARD INLET	09/28/2023	305
D-2.26	GUTTER DEPRESSION AND FLARE AT “E” AND “S” TYPE INLETS	09/28/2023	305
D-2.46	INLET CAPPING	09/28/2023	305
D-3.00	TYPE “A” MANHOLE – FOR PIPES 15” THRU 36” HORIZONTAL DIAMETER	09/28/2023	305
D-3.01	PRECAST “A” AND “B” MANHOLES - FOR PIPES 15” THRU 24” HORIZONTAL DIAMETER	09/28/2023	305
D-3.02A	PRECAST “C” MANHOLES - FOR PIPES 21” THRU 60” HORIZONTAL DIAMETER	09/28/2023	305
D-3.03	PRECAST “C” MANHOLES – PRECAST REDUCERS	09/28/2023	305
D-3.04	TYPE “B” SHALLOW MANHOLE - FOR PIPES 15” THRU 36” HORIZONTAL DIAMETER	09/28/2023	305
D-3.05	TYPE “C” MANHOLE - FOR PIPES 42” AND LARGER (DEFLECTION LENGTH 4”)	09/28/2023	305
D-3.05A	24” HEAVY TRAFFIC MANHOLE – FRAME AND COVER	09/28/2023	305
D-3.05A	RADIAL GRATE – 24” HEAVY TRAFFIC MANHOLE FRAME	09/28/2023	305

PLATE NUMBER	TITLE	SIGNATURE DATE	SPEC REF#
D-3.05B	STORM DRAIN MANHOLE PLATEN COVER – FOR USE WITH STRAIGHT WALL MANHOLE FRAME	09/28/2023	305
D-3.06	SIDWALK – FRAME AND COVER	09/28/2023	305
D-3.07	PRECAST MANHOLE “DOGHOUSE” – RISER BUILT COVER OVER EXISTING DRAIN (FOR USE WITH PIPES 36” AND SMALLER)	09/28/2023	305
D-3.08	DROP MANHOLE – STANDARD DETAIL	09/28/2023	305
D-3.09A	PRECAST DROP MANHOLE	09/28/2023	305
D-3.09B	PRECAST REDUCERS - WITH DRIP STONE LANDING	09/28/2023	305
D-4.00	CONCRETE COLLAR – 24” DRAIN AND COVER	09/28/2023	305
D-4.01	BEND STRUCTURE	09/28/2023	305
D-4.02	BEND STRUCTURE – TABLE AND DIMENSIONS	09/28/2023	305
D-4.03	TYPE “1” JUNCTION CHAMBER	09/28/2023	305
D-4.04	BRICK “Y” – SINGLE AND DOUBLE	09/28/2023	305
D-4.06	FIELD CONNECTION	09/28/2023	305
D-5.02	CHANNEL – GABION VELOCITY BREAKER	09/28/2023	312
D-5.03	STANDARD CURB OPENING – CURB AND GUTTER SECTION	09/28/2023	609.04.02
D-5.04	STANDARD DITCHES – TOE OF SLOPE	09/28/2023	201
D-5.05	STANDARD DITCHES – TOP OF SLOPE	09/28/2023	201
D-5.06	GABION CHANNEL LINING	09/28/2023	312
D-6.03	PIPE ANCHORS – FOR STEEL PIPES	09/28/2023	- - - -

INLET TYPE	STD. DETAIL	DESIGN PLATE	CURB & GUTTER STREET		ALLEY	OPEN SECTION ROAD		YARD	SWALE	NOTES
			IN SUMP	ON GRADE		ROADSIDE	MEDIAN			
A , B	D–2.00 thru D–2.05	D–11 (sump) SHA 61.1–431.0,1 (on–grade)	●	Note 1		Note 4			Note 7	
E GRATE	D–2.06	D–16			●			●		
E Comb. Inlet Dbl. E Comb.	D-2.07, 9, 10	D–11 ,12, 13	●	●		Note 4			Note 7	
J Inlet Modified Grate	D–2.13,4	Size spillway weirs under grates				Note 3	●		●	
Special K	D–2.15	Size spillway weirs under grates							●	
S Single Grate	D–2.16A, B	D–16			●		●	●	●	
Type S Combination Inlet	D–2.18	D–11 (sump)	●	●		Note 4			Note 7	Note 2
Type S Double Grate Tandem	D–2.19A, B	D–16			●		●	●	●	
Type S Comb. Double Tandem	D–2.20	D–11 ,14, 15	●	●		Note 4			Note 7	Note 2
Y–1	D–2.22A, B	Check Weirs Cap'y. vs Pipe Cap'y.						●		Not for use adjacent to wooded areas. / For use in sump only. / Non–traffic bearing – Not for use on or near road or shoulder.
Y–2	D–2.23	Note 5						●		
Y–3	D–2.24A, B	Q_{max}=3.0 cfs						●		
Y–4	D–2.25A, B	Q_{max}=3.0 cfs						●		
Y–5	D–2.25C	Check Weirs Cap'y. vs Pipe Cap'y.						●		
MD SHA COG	MD SHA 374.51 through MD SHA 374.67	SHA 61.1–431.0								*For use in MD SHA Right–of–Way only.
MD SHA COS		SHA 61.1–431.1								

NOTES:

1. Use curb opening inlets on–grade only where utilities are close to curb to allow placement of a Type E Combination or Type S Combination inlet.
2. Indicated Combination inlets to be depressed per Standard Detail D–2.26 only when so noted on plans.
3. Type J inlets for use in roadside swale only where curb and gutter will not be added later.
4. Set face of inlet curb piece at ultimate location of curb and gutter.
5. Use BPR "Hydraulic capacity of grate inlet in sump"(rev.8/68) with A=2.7 s.f. and P=8.8 ft. assume 50% clogging.
6. The Director of Public Works will consider waiving any requirements hereon for reasonable cause upon receipt of a written request.
7. Where swale is intercepted by road drain system, an opening in the rear wall of the inlet under headpiece or top slab is used to collect swale flow. Show special design on plans.

APPROVAL

DIRECTOR

BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023

DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

HEADWALL

WEEPHOLES FOR HEADWALLS

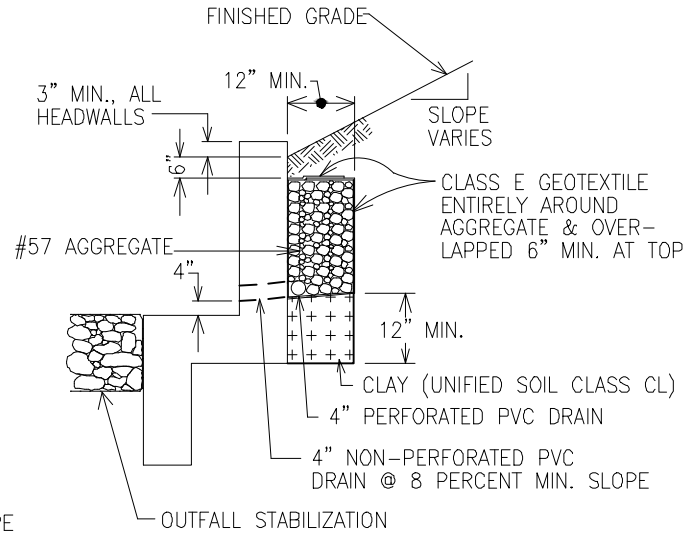
ISSUED: SEPTEMBER 2023

PLATE

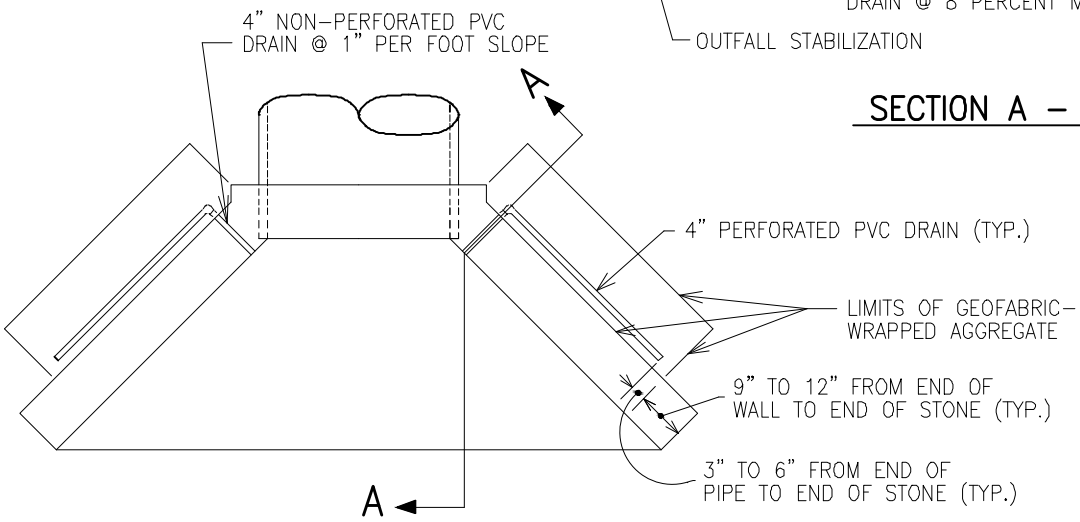
D–22

DATE:08/28/2023

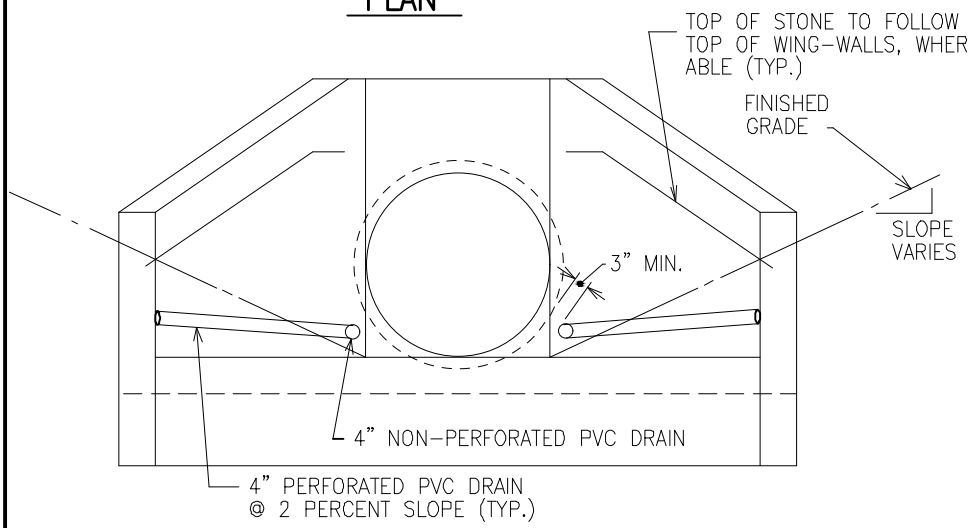
FILE:Drains_Master.DWG



SECTION A – A



PLAN



ELEVATION

PLACEMENT AND CONSTRUCTION OF WEEPHOLES FOR TYPES B, C AND E ENDWALLS SHALL BE SIMILAR TO THAT SHOWN HEREON FOR TYPE A HEADWALLS.

APPROVAL

DIRECTOR

BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023

DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

HEADWALL

WEEPHOLES FOR HEADWALLS

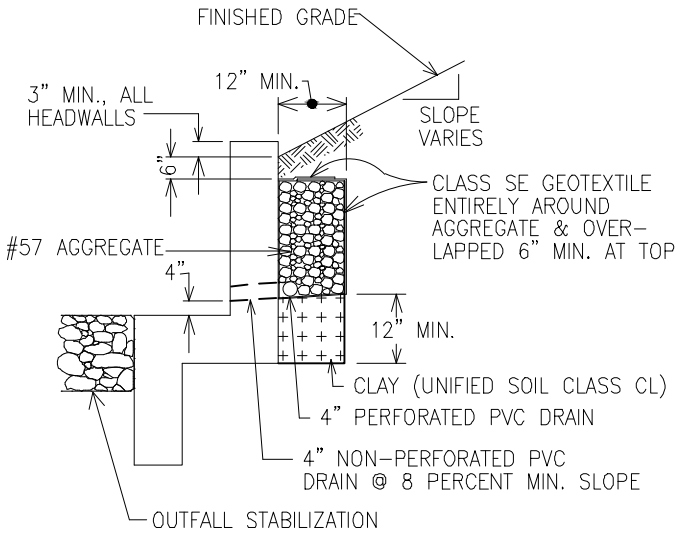
ISSUED: SEPTEMBER 2023

PLATE

D-1.00

DATE: 08/28/2023

FILE: Drains_Master.DWG



SECTION A – A

APPROVAL

DIRECTOR

BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023

DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

BACKFILL BEHIND WALLS

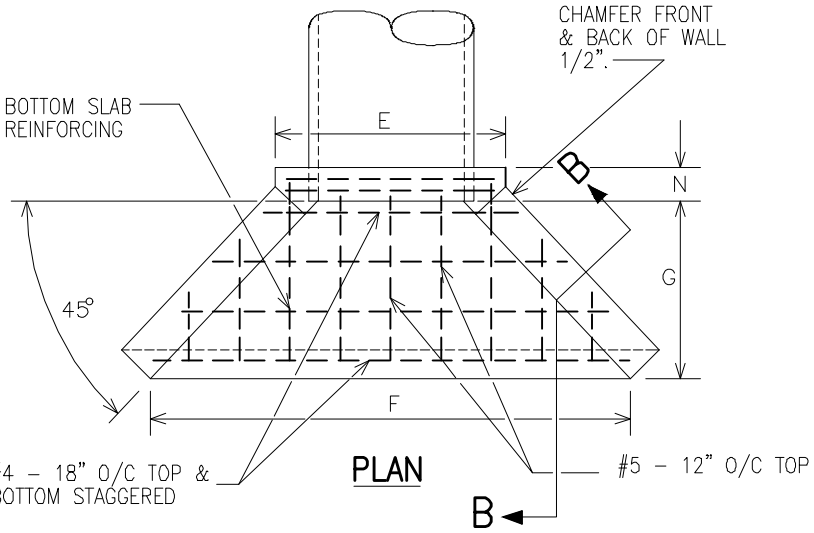
ISSUED: SEPTEMBER 2023

PLATE

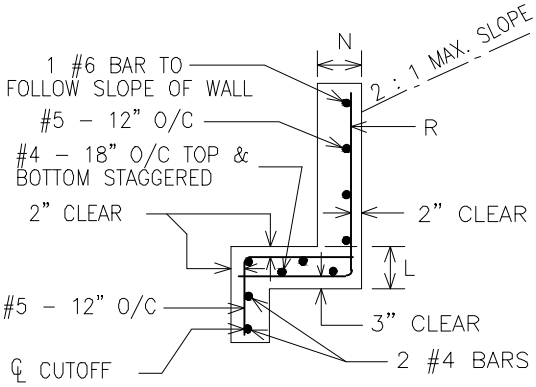
D-1.00A

DATE: 08/28/2023

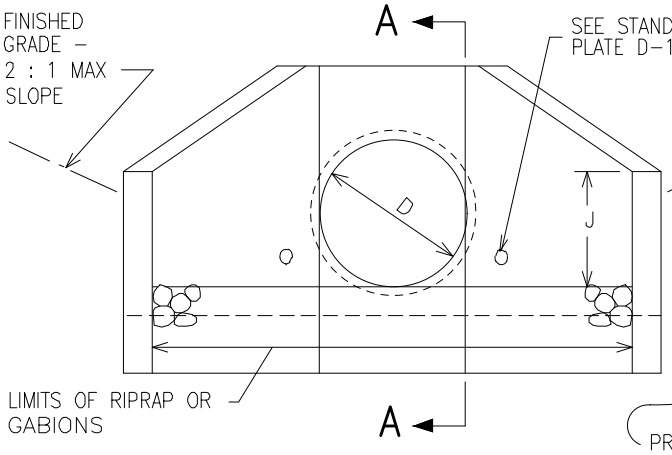
FILE: Drains_Master.DWG



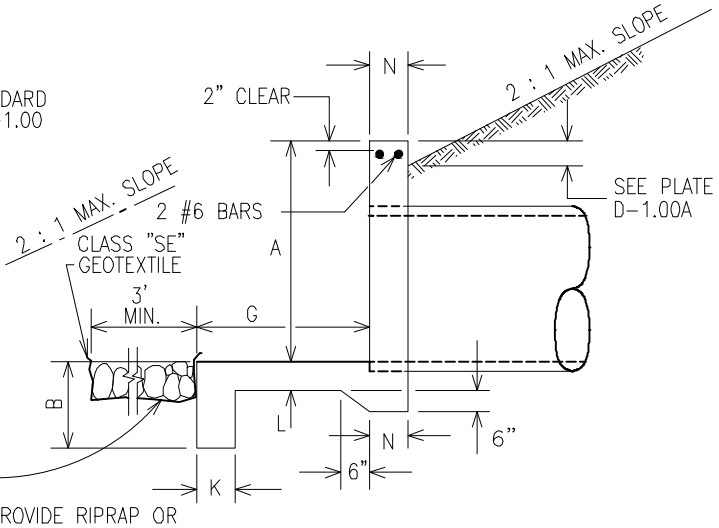
PLAN



SECTION B–B



FRONT ELEVATION



SECTION A–A

D	A	B	E	F	G	J	K	L	N	R	ΔVOL.C.Y.
15",18"	3'–0"	2'–0"	3'–0"	7'–6"	3'–0"	2'–0"	8"	10"	8"	#5–12" O/C	1.70
21'	3'–3"	2'–0"	3'–4"	7'–9"	3'–0"	2'–0"	8"	10"	8"	#5–12" O/C	1.80
24"	3'–6"	2'–0"	3'–8"	8'–0"	3'–0"	2'–0"	8"	10"	8"	#5–12" O/C	1.90
27"	3'–9"	2'–6"	3'–11"	8'–3"	3'–0"	2'–0"	8"	10"	8"	#5–12" O/C	2.1
30"	4'–0"	2'–6"	4'–2"	8'–6"	3'–0"	2'–0"	8"	10"	10"	#5–12" O/C	3.15
36"	4'–6"	3'–0"	4'–8"	10"–0"	3'–6"	2'–3"	9"	10"	10"	#5–12" O/C	3.43
42"	5'–0"	3'–0"	5'–3"	11'–6"	4'–0"	2'–9"	9"	10"	10"	#5–12" O/C	4.19
48"	5'–6"	3'–0"	5'–10"	13'–0"	4'–6"	3'–0"	9"	10"	12"	#5–12" O/C	5.44
54"	6'–0"	3'–0"	6'–5"	14'–6"	5'–0"	3'–3"	9"	12"	12"	#5–12" O/C	6.90
60"	6'–6"	3'–0"	7'–0"	16'–0"	5'–6"	3'–6"	9"	12"	12"	#5–12" O/C	8.42
66"	7'–0"	3'–0"	7'–7"	17'–6"	6'–0"	3'–9"	9"	12"	14"	#5–12" O/C	9.58
72"	7'–6"	3'–0"	8'–2"	19'–0"	6'–6"	4'–3"	9"	12"	14"	#5–12" O/C	11.63

Δ BASED ON 2:1 CHANNEL SIDE SLOPES.

NOTE:

EXPOSED EDGES TO BE CHAMFERED 1" x 1".

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

CONCRETE VOLUME BASED ON 2:1 SIDE SLOPES. TO BE USED FOR ESTIMATING ONLY.

CONCRETE: MIX #3

USE OF METAL PIPE SHALL BE RESTRICTED TO REPAIR AND RE–PLACEMENT ONLY, EXCEPT WITH APPROVAL OF THE DEPARTMENT OF PUBLIC WORKS. ADJACENT METAL PIPE SHALL BE INSPECTED FOR REPLACEMENT PRIOR TO RE–PLACING HEADWALL.

PRECASTING THIS ENDWALL: SEE NOTE 5, PLATE D–1.01B.

BALTIMORE COUNTY MARYLAND

APPROVAL

DIRECTOR

BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023

DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

TYPE A HEADWALL
CIRCULAR PIPE

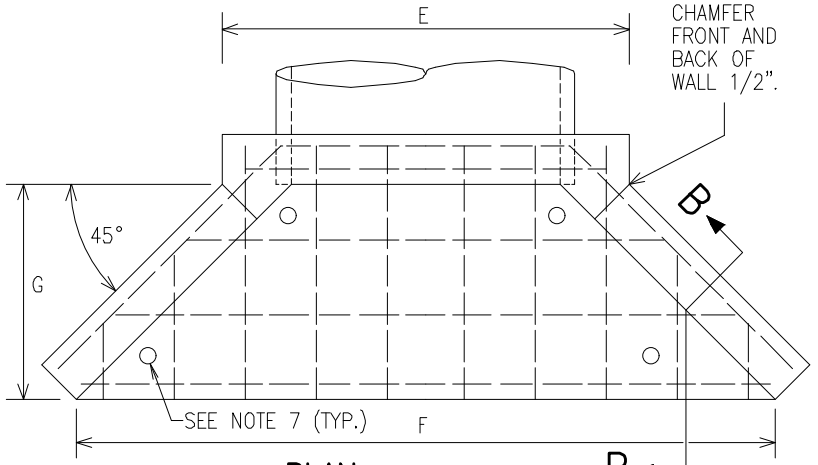
ISSUED: SEPTEMBER 2023

PLATE

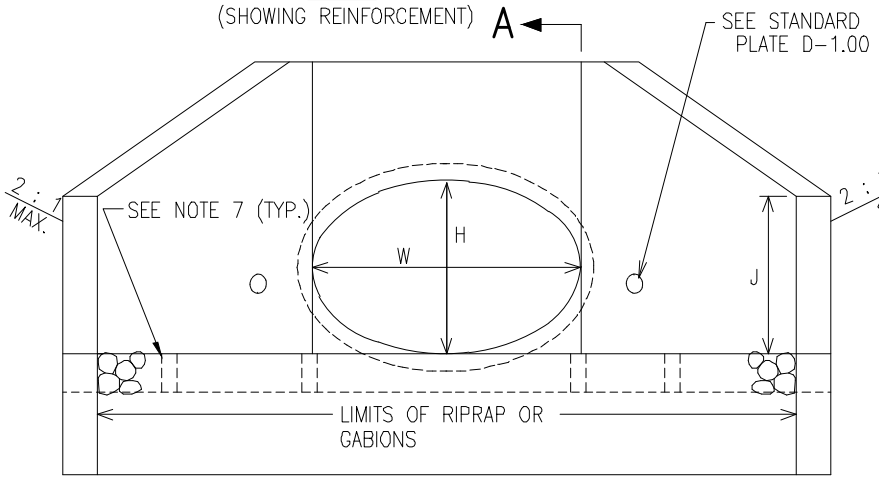
D–1.01A

DATE: 08/28/2023

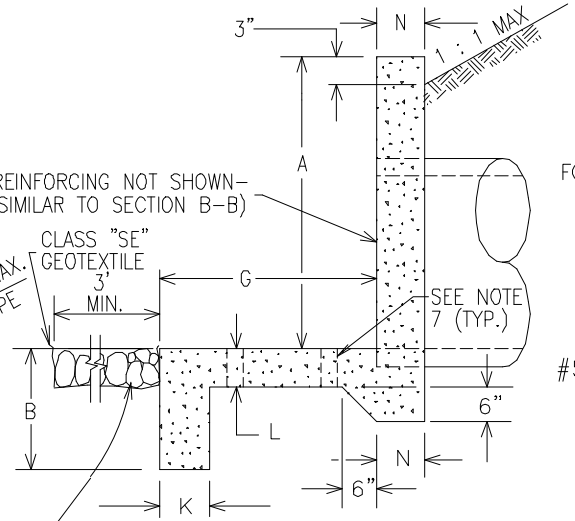
FILE: Drains_Master.DWG



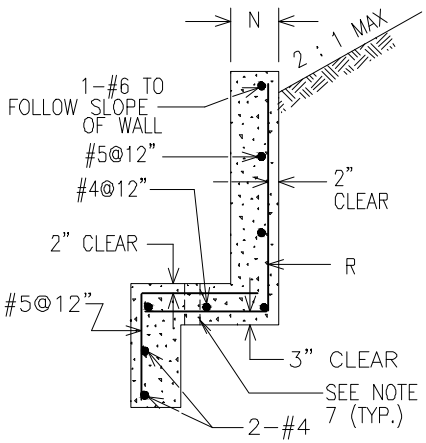
PLAN
(SHOWING REINFORCEMENT)



ELEVATION



SECTION A-A



SECTION B-B

EQ.RD.	W	H	A	B	E	F	G	J	K	L	N	R	Δ VOL. C.Y.
36"	45"	29"	3'-9"	3'-0"	5'-6"	9'-9"	3'-0"	2'-0"	8"	10"	8"	#5@12"	2.17
42"	53"	34"	4'-3"	3'-0"	6'-3"	11'-5"	3'-6"	2'-3"	8"	10"	10"	#5@12"	2.99
48"	60"	38"	4'-8"	3'-0"	7'-0"	12'-4"	3'-8"	2'-6"	8"	10"	10"	#5@12"	3.38
54"	68"	43"	5'-3"	3'-0"	7'-8"	13'-8"	4'-0"	2'-9"	9"	12"	10"	#5@12"	4.53
60"	76"	48"	5'-6"	3'-0"	8'-5"	15'-4"	4'-6"	3'-0"	9"	12"	10"	#5@12"	5.32
66"	83"	53"	6'-0"	3'-0"	9'-1"	17'-0"	5'-0"	3'-3"	9"	12"	12"	#5@12"	7.07
72"	91"	58"	6'-6"	3'-0"	9'-10"	18'-3"	5'-4"	3'-6"	9"	12"	12"	#5@12"	7.88

Δ SEE NOTE 3

PROVIDE RIPRAP OR GABIONS TO PREVENT SCOUR AT TOEWALL (COST SEPARATE)

NOTES:

1. CHAMFER EXPOSED EDGES 1" x 1".
2. MIX NO. 3 CONCRETE
3. CONCRETE QUANTITIES TO BE USED FOR ESTIMATING ONLY.
4. HEADWALL TO BE PARALLEL TO ℄ OF ROADWAY UNLESS OTHERWISE NOTED IN THE CONTRACT DRAWINGS.
5. PRECAST WALL WITH DIMENSIONS AND REINFORCEMENT EQUIVALENT TO CAST IN PLACE WALL SHOWN WILL BE CONSIDERED. PROVIDE SHOP DRAWING SHOWING REINFORCEMENT AND MEANS OF WALL-TO-TOE CONNECTION. LACE ON UNDISTURBED EARTH OR POUR CONCRETE FOOTING TO SAME. PRECAST WALLS THAT ARE CUT OR BROKEN FOR ANY REASON WILL BE REJECTED. PRECAST CONCRETE: 4500 psi MIN.
6. USE OF METAL PIPE SHALL BE RESTRICTED TO REPAIR AND REPLACEMENT ONLY, EXCEPT WITH APPROVAL OF THE DEPARTMENT OF PUBLIC WORKS. ADJACENT METAL PIPE SHALL BE INSPECTED FOR REPLACEMENT PRIOR TO REPLACING HEADWALL.
7. 2 INCH DIAMETER GROUT HOLES REQUIRED FOR PRECAST STRUCTURES.

BALTIMORE COUNTY MARYLAND

APPROVAL

DIRECTOR

BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023
DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

TYPE A HEADWALL
HORIZONTAL ELLIPTICAL CONCRETE PIPE

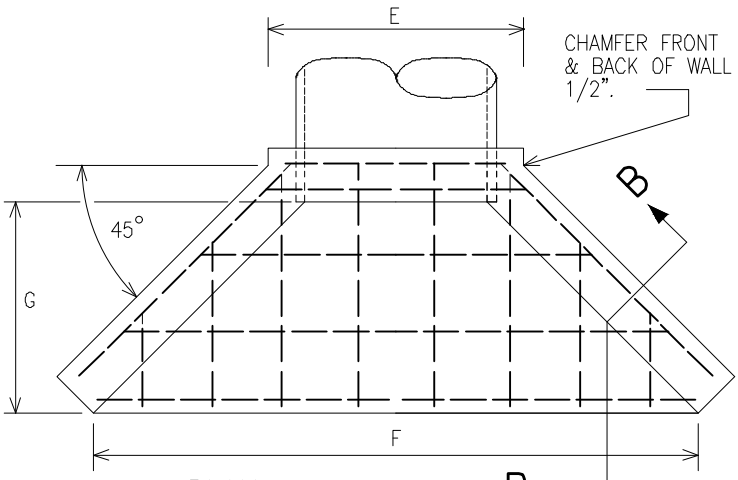
ISSUED: SEPTEMBER 2023

PLATE

D-1.01B

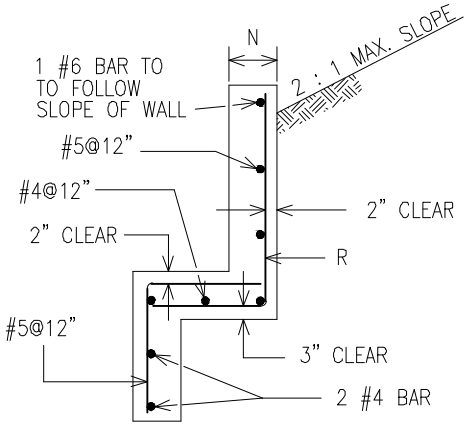
DATE 08/28/2023

FILE Drains_Master.DWG

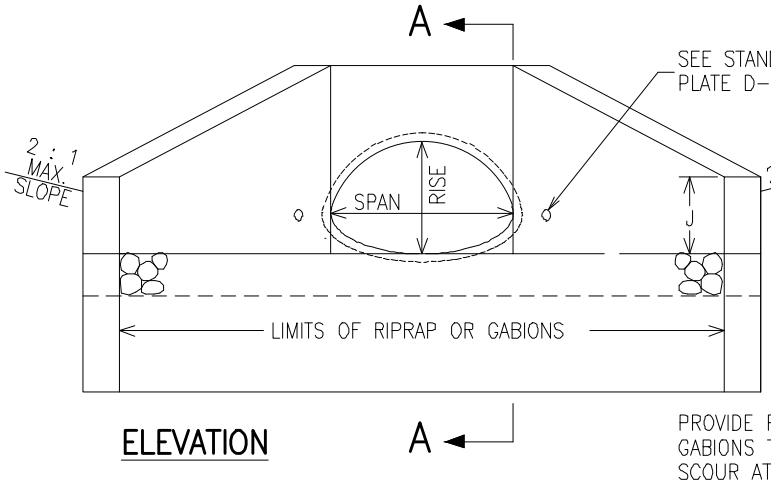


PLAN

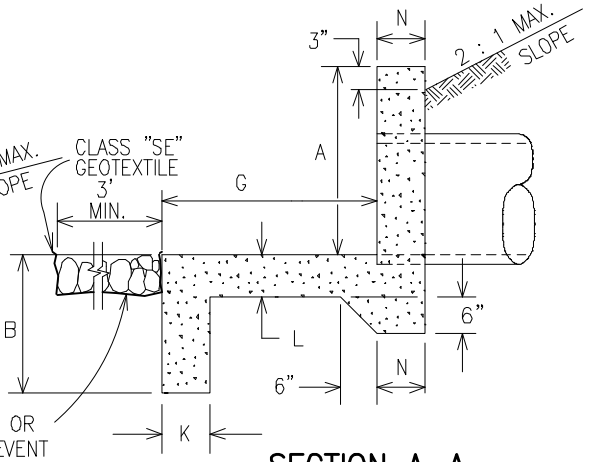
(SHOWING REINFORCEMENT)



SECTION B–B



ELEVATION



SECTION A–A

Δ BASED ON 2:1 CHANNEL SIDE SLOPES. SEE NOTE 2

EQ.RD.	SPAN	RISE	A	B	E	F	G	J	K	L	N	R	Δ CONC. CY
18"	21"	15"	2'–3"	2'–0"	2'–9"	7'–9"	3'–0"	1'–0"	8"	8"	8"	#5@12"	1.12
24"	28"	20"	2'–8"	2'–0"	3'–4"	8'–4"	3'–0"	1'–4"	8"	8"	8"	#5@12"	1.29
30"	35"	24"	3'–0"	2'–0"	3'–11"	8'–11"	3'–0"	1'–4"	8"	8"	8"	#5@12"	1.45
36"	42"	29"	3'–5"	2'–6"	4'–5"	9'–6"	3'–0"	1'–11"	8"	10"	8"	#5@12"	1.86
42"	49"	33"	3'–9"	3'–0"	5'–1"	10'–1"	3'–0"	2'–3"	9"	10"	8"	#5@12"	2.18
48"	57"	38"	4'–2"	3'–0"	5'–9"	11'–9"	3'–6"	2'–5"	9"	10"	8"	#5@12"	2.75
54"	64"	43"	4'–7"	3'–0"	6'–4"	13'–0"	3'–10"	2'–8"	9"	12"	10"	#5@12"	3.83
60"	71"	47"	4'–11"	3'–0"	6'–11"	14'–3"	4'–2"	2'–10"	9"	12"	10"	#5@12"	4.41

NOTES:

1. CHAMFER EXPOSED EDGES 1" x 1".
2. CONCRETE QUANTITIES TO BE USED FOR ESTIMATING ONLY.
3. HEADWALL TO BE PARALLEL TO ℄ OF ROADWAY UNLESS OTHERWISE NOTED ON CONTRACT DRAWINGS.
4. MIX NO. 3 CONCRETE
5. PRECASTING THIS ENDWALL: SEE NOTE 5, PLATE D–1.01B.
6. FOR REPAIR/REPLACEMENT ONLY. INSPECT METAL PIPE FOR REPLACEMENT PRIOR TO REPLACING HEADWALL.

BALTIMORE COUNTY MARYLAND

APPROVAL

DIRECTOR

BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023

DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

TYPE A HEADWALL
METAL PIPE ARCH

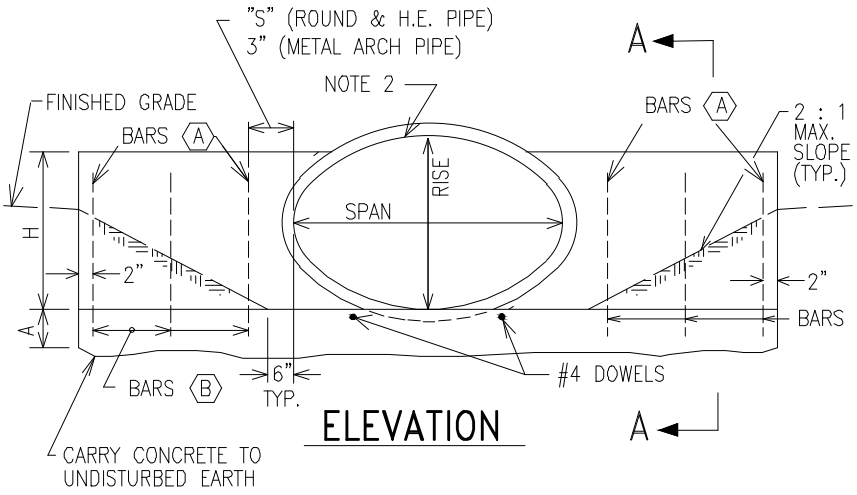
ISSUED: SEPTEMBER 2023

PLATE

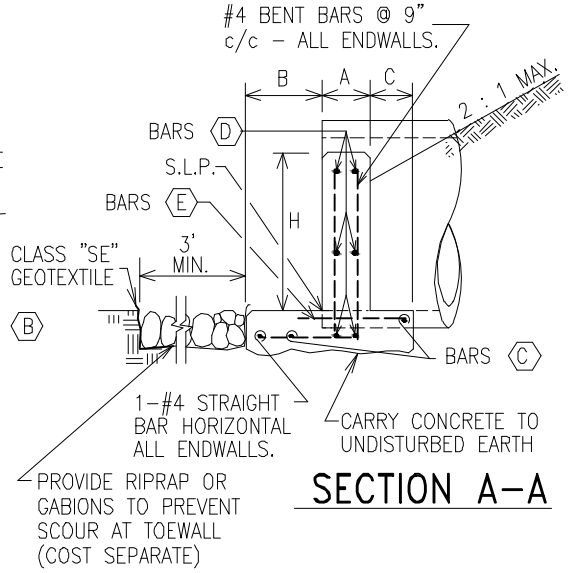
D–1.01C

DATE: 08/28/2023

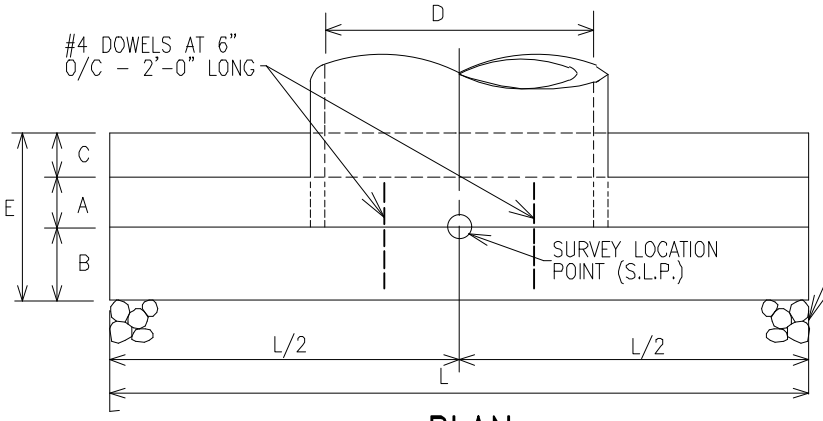
FILE: Drains_Master.DWG



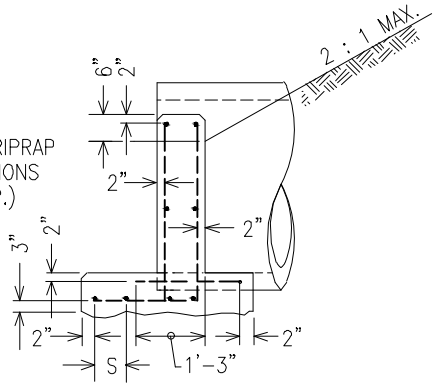
ELEVATION



SECTION A–A



PLAN



DETAIL:
DISPOSITION OF BARS

NOTES:

1. CHAMFER EXPOSED EDGES 1" x 1".
2. HORIZONTAL ELLIPTICAL PIPE SHOWN. SPAN & RISE SIMILAR FOR B.C.C.M. PIPE ARCH. FOR CIRCULAR PIPE, D=SPAN=RISE.
3. HEADWALL TO BE PARALLEL TO ℄ OF ROADWAY UNLESS OTHERWISE NOTED IN THE CONTRACT DRAWINGS.
4. MIX NO. 3 CONCRETE
5. SEE STANDARD PLATE D–1.03 FOR DIMENSIONS & REINFORCING.
6. USE OF CORRUGATED METAL PIPE SHALL BE RESTRICTED TO REPAIR & REPLACEMENT ONLY, EXCEPT WITH APPROVAL OF THE DEPARTMENT OF PUBLIC WORKS. ADJACENT METAL PIPE SHALL BE INSPECTED FOR REPLACEMENT PRIOR TO REPLACING HEADWALL.
7. SUBGRADE DRAINAGE PER PLANS OR AS DIRECTED BY ENGINEER.

BAR	SIZE & SHAPE	NO. BARS	ORIENTATION	LOCATION	SPACING
(A)	#4 STRAIGHT	4	VERTICAL	FRONT FACE	AS SHOWN
(B)	#4 STRAIGHT	VAR.	VERTICAL	FRONT FACE	2'–0" MAX.
(C)	#4 STRAIGHT	2	HORIZONTAL	AS SHOWN	–
(D)	#4 STRAIGHT	VAR.	HORIZONTAL	BOTH FACES	1'–7" c/c MAX.
(E)	#4 STRAIGHT	VAR.	HORIZONTAL	BOTH SIDES OF OPENING	1'–0" c/c MAX.

* BOTTOM BARS TO BE FULL LENGTH

PRECAST WALL WITH DIMENSIONS AND REINFORCING EQUIVALENT TO CAST IN PLACE WALL SHOWN WILL BE CONSIDERED. PROVIDE SHOP DRAWING SHOWING REINFORCEMENT AND MEANS OF WALL–TO–TOE CONNECTION. PLACE ON UNDISTURBED EARTH OR POUR CONCRETE FOOTING TO SAME. PRECAST WALLS THAT ARE CUT OR BROKEN FOR ANY REASON WILL BE REJECTED. PRECAST CONCRETE: 4500 psi MIN.

APPROVAL

DIRECTOR

BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023

DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

END SUPPORT WALL

ISSUED: SEPTEMBER 2023

PLATE

D–1.02

DATE: 08/28/2023

FILE: Drains_Master.DWG

△ CONCRETE VOLUME & LBS. STEEL FOR ESTIMATING ONLY

CIRCULAR PIPE:

OPENING		DIMENSIONS							△ VOLUME CONCRETE CY.	STEEL LBS. △	REINFORCING BARS APPLICATIONS				
DIAM.	AREA SQ.FT	A	B	C	E	H	L	S			BAR Ⓐ	BAR Ⓑ	BAR Ⓒ	BAR Ⓓ	BAR Ⓔ
12"	.79	9"	6"	6"	1-9"	0'-10"	4'-0"	4"	.27	24	●			●	●
15"	1.23	9"	6"	6"	1'-9"	1'-0 1/2"	4'-9"	4"	.34	26	●			●	●
18"	1.79	9"	6"	6"	1'-9"	1'-3"	5'-6"	4"	.42	29	●			●	●
21"	2.40	9"	6"	6"	1'-9"	1'-5"	6'-3"	4"	.49	33		●		●	●
24"	3.14	9"	14"	6"	2'-5"	1'-6"	7'-0"	6"	.69	38		●		●	●
30"	4.91	9"	14"	6"	2'-5"	1'-9"	8'-6"	6"	.88	53		●		●	●
36"	7.07	12"	16"	10"	3'-2"	2'-0"	10"-0"	6"	1.73	85		●	●	●	●
42"	9.62	12"	16"	10"	3'-2"	2'-3"	11'-6"	8"	2.07	96		●	●	●	●
48"	12.57	12"	16"	10"	3'-2"	2'-6"	13'-0"	8"	2.44	106		●	●	●	●
54"	15.90	12"	20"	12"	3'-8"	2'-9"	14'-6"	8"	3.08	121		●	●	●	●
60"	19.64	12"	20"	12"	3'-8"	3'-0"	16'-0"	8"	3.50	143		●	●	●	●

BITUMINOUS COATED CORRUGATED METAL PIPE ARCH:

OPENING			DIMENSIONS							△ VOLUME CONCRETE CY.	STEEL LBS △	REINFORCING BARS APPLICATIONS				
EQ.DIA	SIZE	AREA SQ.FT	A	B	C	E	H	L	S			BAR Ⓐ	BAR Ⓑ	BAR Ⓒ	BAR Ⓓ	BAR Ⓔ
24"	28" x 20"	2.2	9"	14"	6"	2'-5"	1'-2"	5'-11"	6"	0.56	33		●		●	●
30"	35" x 24"	4.4	9"	14"	6"	2'-5"	1'-5"	7'-5"	6"	0.69	37		●		●	●
36"	42" x 29"	6.4	12"	16"	10"	3'-2"	1'-8"	8'-10"	6"	1.40	54		●		●	●
42"	49" x 33"	8.7	12"	16"	10"	3'-2"	1'-11"	10'-4"	8"	1.70	77		●	●	●	●
48"	57" x 38"	11.4	12"	16"	10"	3'-2"	2"-2"	12'-1"	8"	2.07	90		●	●	●	●
54"	64" x 43"	14.3	12"	20"	12"	3'-8"	2'-6"	13'-7"	8"	2.70	102		●	●	●	●
60"	71" x 47"	17.6	12"	20"	12"	3'-8"	2'-9"	15'-1"	8"	3.08	112		●	●	●	●

HORIZONTAL ELLIPTICAL REINFORCED CONCRETE PIPE:

OPENING			DIMENSIONS							△ VOLUME CONCRETE CY.	STEEL LBS △	REINFORCING BARS APPLICATIONS				
EQ.DIA	SIZE	AREA SQ.FT	A	B	C	E	H	L	S			BAR Ⓐ	BAR Ⓑ	BAR Ⓒ	BAR Ⓓ	BAR Ⓔ
18"	23" x 14"	1.8	9"	14"	6"	2'-5"	1'-2"	5'-11"	6"	0.54	33	●			●	●
24"	30" x 19"	3.3	9"	14"	6"	2'-5"	1'-5"	7'-5"	6"	0.70	47		●		●	●
27"	34" x 22"	4.1	12"	16"	10"	3'-2"	1'-7"	8'-2"	6"	1.30	57		●		●	●
30"	38" x 24"	5.1	12"	16"	10"	3'-2"	1'-8"	8'-10"	6"	1.42	64		●		●	●
33"	42" x 27"	6.3	12"	16"	10"	3'-2"	1'-10"	9'-7"	6"	1.57	72		●	●	●	●
36"	45" x 29"	7.4	12"	16"	10"	3'-2"	1'-11"	10'-4"	8"	1.72	77		●	●	●	●
39"	49" x 32"	8.8	12"	16"	10"	3'-2"	2'-1"	11'-3"	8"	1.92	85		●	●	●	●
42"	53" x 34"	10.2	12"	20"	12"	3'-8"	2'-2"	12'-1"	8"	2.31	90		●	●	●	●
48"	60" x 38"	12.9	12"	20"	12"	3'-8"	2'-6"	13'-7"	8"	2.70	102		●	●	●	●
54"	68" x 43"	16.6	12"	20"	12"	3'-8"	2'-8"	14'-6"	8"	2.91	118		●	●	●	●

BALTIMORE COUNTY MARYLAND

APPROVAL

DIRECTOR

BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023

DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

END SUPPORT WALL TABLES

ISSUED: SEPTEMBER 2023

PLATE

D-1.03

DATE: 08/28/2023

FILE: Drains_Master.DWG

△ CONCRETE VOLUME & LBS. STEEL FOR ESTIMATING ONLY

CIRCULAR PIPE:

OPENING		DIMENSIONS							△ VOLUME CONCRETE CY.	STEEL LBS. △	REINFORCING BARS APPLICATIONS				
DIAM.	AREA SQ.FT	A	B	C	E	H	L	S			BAR Ⓐ	BAR Ⓑ	BAR Ⓒ	BAR Ⓓ	BAR Ⓔ
12"	.79	9"	6"	6"	1-9"	0'-10"	4'-0"	4"	.27	24	●			●	●
15"	1.23	9"	6"	6"	1'-9"	1'-0 1/2"	4'-9"	4"	.34	26	●			●	●
18"	1.79	9"	6"	6"	1'-9"	1'-3"	5'-6"	4"	.42	29	●			●	●
21"	2.40	9"	6"	6"	1'-9"	1'-5"	6'-3"	4"	.49	33		●		●	●
24"	3.14	9"	14"	6"	2'-5"	1'-6"	7'-0"	6"	.69	38		●		●	●
30"	4.91	9"	14"	6"	2'-5"	1'-9"	8'-6"	6"	.88	53		●		●	●
36"	7.07	12"	16"	10"	3'-2"	2'-0"	10"-0"	6"	1.73	85		●	●	●	●
42"	9.62	12"	16"	10"	3'-2"	2'-3"	11'-6"	8"	2.07	96		●	●	●	●
48"	12.57	12"	16"	10"	3'-2"	2'-6"	13'-0"	8"	2.44	106		●	●	●	●
54"	15.90	12"	20"	12"	3'-8"	2'-9"	14'-6"	8"	3.08	121		●	●	●	●
60"	19.64	12"	20"	12"	3'-8"	3'-0"	16'-0"	8"	3.50	143		●	●	●	●

BITUMINOUS COATED CORRUGATED METAL PIPE ARCH:

OPENING			DIMENSIONS							△ VOLUME CONCRETE CY.	STEEL LBS △	REINFORCING BARS APPLICATIONS				
EQ.DIA	SIZE	AREA SQ.FT	A	B	C	E	H	L	S			BAR Ⓐ	BAR Ⓑ	BAR Ⓒ	BAR Ⓓ	BAR Ⓔ
24"	28" x 20"	2.2	9"	14"	6"	2'-5"	1'-2"	5'-11"	6"	0.56	33		●		●	●
30"	35" x 24"	4.4	9"	14"	6"	2'-5"	1'-5"	7'-5"	6"	0.69	37		●		●	●
36"	42" x 29"	6.4	12"	16"	10"	3'-2"	1'-8"	8'-10"	6"	1.40	54		●		●	●
42"	49" x 33"	8.7	12"	16"	10"	3'-2"	1'-11"	10'-4"	8"	1.70	77		●	●	●	●
48"	57" x 38"	11.4	12"	16"	10"	3'-2"	2"-2"	12'-1"	8"	2.07	90		●	●	●	●
54"	64" x 43"	14.3	12"	20"	12"	3'-8"	2'-6"	13'-7"	8"	2.70	102		●	●	●	●
60"	71" x 47"	17.6	12"	20"	12"	3'-8"	2'-9"	15'-1"	8"	3.08	112		●	●	●	●

HORIZONTAL ELLIPTICAL REINFORCED CONCRETE PIPE:

OPENING			DIMENSIONS							△ VOLUME CONCRETE CY.	STEEL LBS △	REINFORCING BARS APPLICATIONS				
EQ.DIA	SIZE	AREA SQ.FT	A	B	C	E	H	L	S			BAR Ⓐ	BAR Ⓑ	BAR Ⓒ	BAR Ⓓ	BAR Ⓔ
18"	23" x 14"	1.8	9"	14"	6"	2'-5"	1'-2"	5'-11"	6"	0.54	33	●			●	●
24"	30" x 19"	3.3	9"	14"	6"	2'-5"	1'-5"	7'-5"	6"	0.70	47		●		●	●
27"	34" x 22"	4.1	12"	16"	10"	3'-2"	1'-7"	8'-2"	6"	1.30	57		●		●	●
30"	38" x 24"	5.1	12"	16"	10"	3'-2"	1'-8"	8'-10"	6"	1.42	64		●		●	●
33"	42" x 27"	6.3	12"	16"	10"	3'-2"	1'-10"	9'-7"	6"	1.57	72		●	●	●	●
36"	45" x 29"	7.4	12"	16"	10"	3'-2"	1'-11"	10'-4"	8"	1.72	77		●	●	●	●
39"	49" x 32"	8.8	12"	16"	10"	3'-2"	2'-1"	11'-3"	8"	1.92	85		●	●	●	●
42"	53" x 34"	10.2	12"	20"	12"	3'-8"	2'-2"	12'-1"	8"	2.31	90		●	●	●	●
48"	60" x 38"	12.9	12"	20"	12"	3'-8"	2'-6"	13'-7"	8"	2.70	102		●	●	●	●
54"	68" x 43"	16.6	12"	20"	12"	3'-8"	2'-8"	14'-6"	8"	2.91	118		●	●	●	●

BALTIMORE COUNTY MARYLAND

APPROVAL

DIRECTOR

BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023
DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

END SUPPORT WALL TABLES

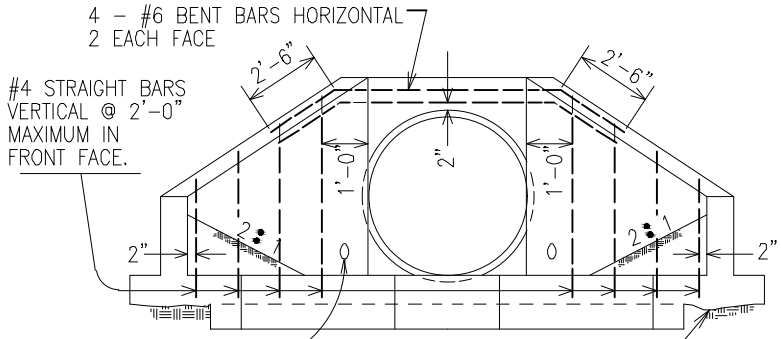
ISSUED: SEPTEMBER 2023

PLATE

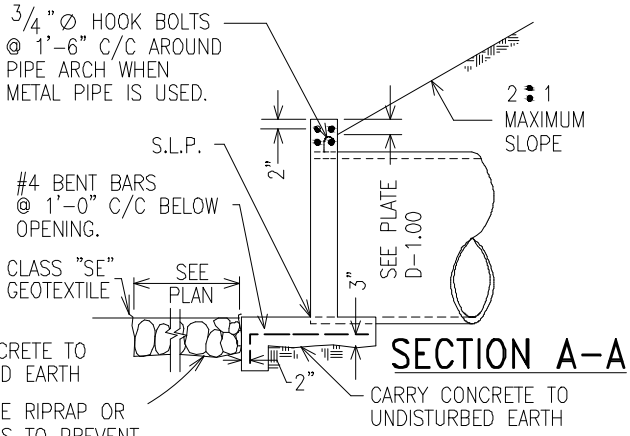
D-1.04

DATE: 08/28/2023

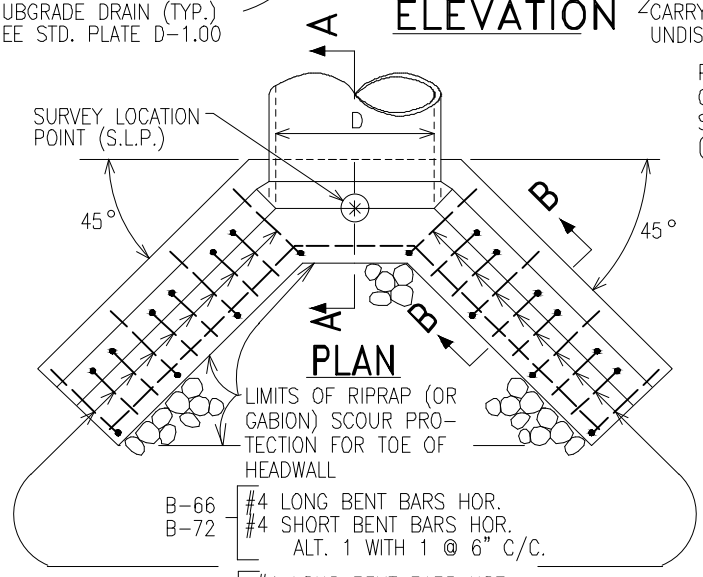
FILE: Drains_Master.DWG



ELEVATION

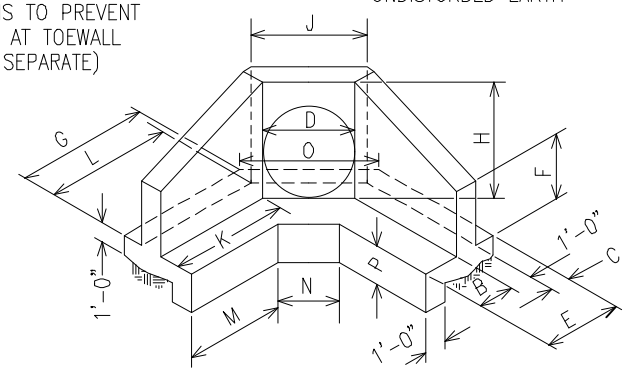


SECTION A–A



PLAN

B–66 B–72	#4 LONG BENT BARS HOR. #4 SHORT BENT BARS HOR. ALT. 1 WITH 1 @ 6" C/C.
B–78 B–84	#4 LONG BENT BARS HOR. #4 SHORT BENT BARS HOR. ALT. 1 WITH 2 RESP. @ 4" C/C.



ISOMETRIC VIEW

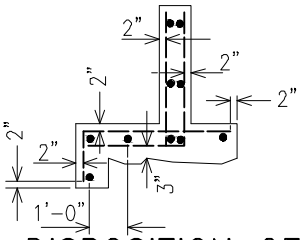
GENERAL NOTES :

CONCRETE: MIX #3

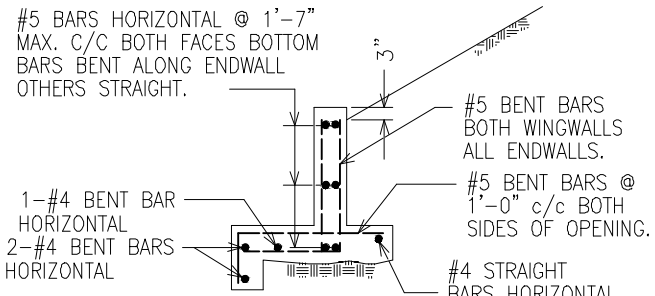
CHAMFER: ALL EXPOSED EDGES 1" x 1" OR AS DIRECTED.

SUBGRADE DRAINAGE: PER STD. PLATE D–1.00 OR AS DIRECTED.

PRECAST WALL WITH DIMENSIONS AND REINFORCING EQUIVALENT TO CAST IN PLACE WALL SHOWN WILL BE CONSIDERED. PROVIDE SHOP DRAWING SHOWING RE–INFORCEMENT AND MEANS OF WALL–TO–TOE CONNECTION. PLACE ON UNDISTURBED EARTH OR POUR CONCRETE FOOTING TO SAME. PRECAST WALLS THAT ARE CUT OR BROKEN FOR ANY REASON WILL BE REJECTED. PRECAST CONCRETE: 4500 psi MIN.



DISPOSITION OF BARS DETAIL



SECTION B–B

CORRUGATED METAL PIPE USE IS RESTRICTED TO REPAIR & REPLACEMENT EXCEPT WITH D.P.W. APPROVAL. INSPECT ADJACENT METAL PIPE FOR REPLACEMENT BEFORE REPLACING HEADWALL.

OPENING		DIMENSIONS													VOL. CONC. C. Y.	STEEL LBS.
D INCHES	AREA SQ. FT.	B	C	E	F	G	H	J	K	L	M	N	O	P		
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"	3'–0"	10.5	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"	3'–0"	11.8	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"	3'–0"	13.8	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"	3'–0"	15.2	984

QUANTITIES IN TABLE TO BE USED FOR ESTIMATING ONLY.

BALTIMORE COUNTY MARYLAND

APPROVAL

DIRECTOR

BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023

DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

HEADWALLS B–66, B–72, B–78 & B–84

ISSUED: SEPTEMBER 2023

PLATE

D–1.05

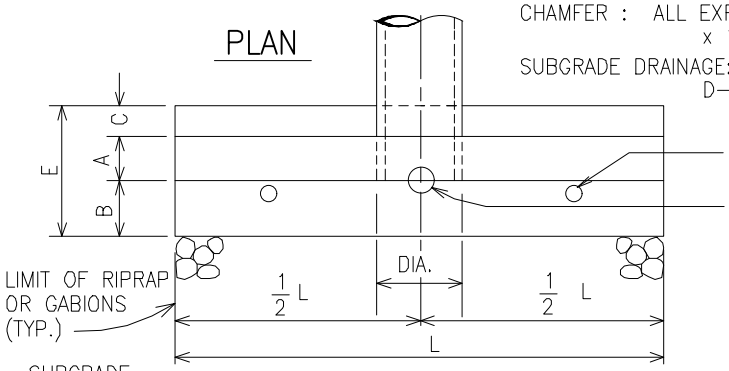
DATE: 08/28/2023

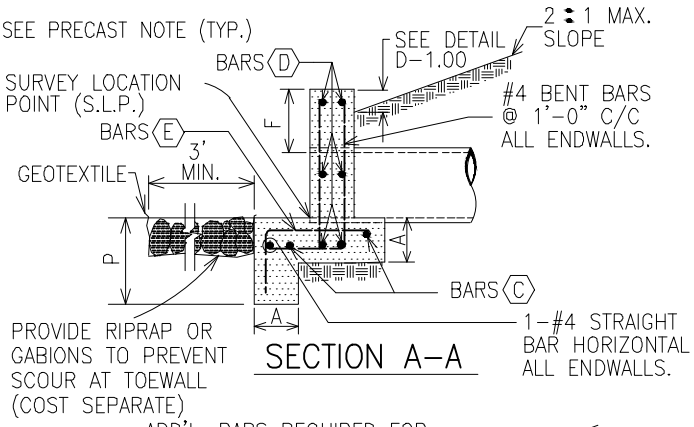
FILE: Drains_Master.DWG

CONCRETE : MIX # 3
CHAMFER : ALL EXPOSED EDGES 1" x 1" OR AS DIRECTED.
SUBGRADE DRAINAGE: PER STD. PLATE D-1.00 OR AS DIRECTED.

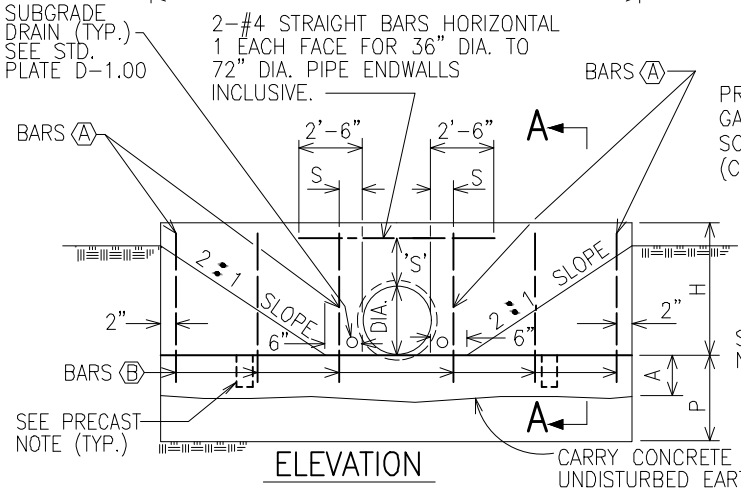
CORRUGATED METAL PIPE: USE FOR REPAIR, REPLACEMENT ONLY, EXCEPT WITH D.P.W. APPROVAL. ADJACENT METAL PIPE TO BE INSPECTED FOR REPLACEMENT PRIOR TO HEADWALL REPLACEMENT.

PLAN

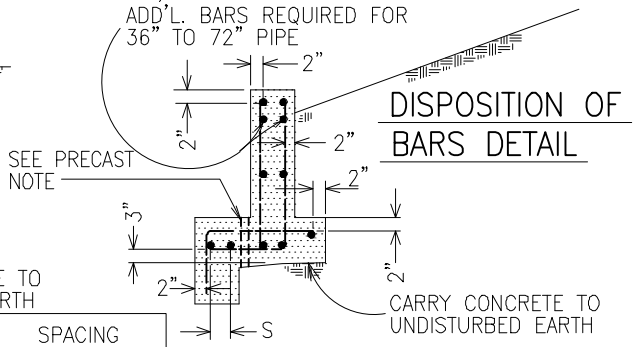




SECTION A-A



ELEVATION



DISPOSITION OF BARS DETAIL

BAR	SIZE & SHAPE	NO. BARS	ORIENTATION	LOCATION	SPACING
Ⓐ	#4 STRAIGHT	4	VERTICAL	FRONT FACE	AS SHOWN
Ⓑ	#4 STRAIGHT	VAR.	VERTICAL	FRONT FACE	2'-0" MAX.
Ⓒ	#4 STRAIGHT	2	HORIZONTAL	AS SHOWN	–
Ⓓ *	#4 STRAIGHT	VAR.	HORIZONTAL	BOTH FACES	1'-7" c/c MAX.
Ⓔ	#4 BENT	VAR.	HORIZONTAL	BOTH SIDES OF OPENING	1'-0" c/c MAX.

* TOP & BOTTOM BARS TO BE FULL LENGTH

PRECAST WALL WITH DIMENSIONS AND REINFORCING EQUIVALENT TO CAST IN PLACE WALL SHOWN WILL BE CONSIDERED. PROVIDE SHOP DRAWING SHOWING REINFORCEMENT AND MEANS OF WALL-TO-TOE CONNECTION. PLACE ON UNDISTURBED EARTH OR POUR CONCRETE FOOTING TO SAME. PRECAST WALLS THAT ARE CUT OR BROKEN FOR ANY REASON WILL BE REJECTED. PRECAST CONCRETE: 4500 psi MIN. 2 INCH DIAMETER GROUT HOLES REQUIRED FOR PRECAST ENDWALL WITH PIPE DIAMETER 'D' ≥ 24".

OPENING		DIMENSIONS									QUANTITIES†		REINFORCING BARS APPLICATIONS				
D	AREA																
INCHES	SQ. FT.	A	B	C	E	F	H	L	P	S	CONC. C. Y.	STEEL LBS.	BAR Ⓐ	BAR Ⓑ	BAR Ⓒ	BAR Ⓓ	BAR Ⓔ
12	0.79	9"	6"	6"	1'-9"	9"	1'-9"	6'-6"	1'-6"	4"	0.8	46	●			●	●
15	1.23	9"	6"	6"	1'-9"	9"	2'-0"	7'-9"	1'-6"	4"	1.0	53	●			●	●
18	1.78	9"	6"	6"	1'-9"	9"	2'-3"	9'-0"	1'-6"	4"	1.2	61	●			●	●
21	2.40	9"	6"	6"	1'-9"	9"	2'-6"	10'-3"	2'-0"	6"	1.5	78	●			●	●
24	3.14	9"	14"	6"	2'-5"	9"	2'-9"	11'-6"	2'-0"	6"	2.0	89		●		●	●
27	3.98	9"	14"	6"	2'-5"	9"	3'-0"	12'-10"	2'-0"	6"	2.3	98		●		●	●
30	4.91	9"	14"	10"	2'-9"	12"	3'-6"	14'-2"	2'-0"	6"	2.7	111		●		●	●
36	7.07	12"	16"	10"	3'-2"	12"	4'-0"	16'-8"	2'-6"	6"	5.1	200		●	●	●	●
42	9.62	12"	16"	10"	3'-2"	12"	4'-6"	19'-2"	2'-6"	8"	6.2	229		●	●	●	●
48	12.57	12"	16"	10"	3'-2"	12"	5'-0"	21'-8"	3'-0"	8"	7.7	292		●	●	●	●
54	15.90	12"	20"	12"	3'-8"	12"	5'-6"	24'-2"	3'-0"	8"	9.4	330		●	●	●	●
60	19.64	12"	20"	12"	3'-8"	12"	6'-0"	26'-8"	3'-0"	8"	10.8	360		●	●	●	●
72	28.27	12"	20"	12"	3'-8"	12"	7'-0"	31'-8"	3'-0"	9"	13.8	449		●	●	●	●

†FOR ESTIMATING PURPOSES ONLY

APPROVAL
DIRECTOR
BUR. OF ENGINEERING/CONSTRUCTION
SEPTEMBER 28, 2023
DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION
STORM DRAINAGE DETAILS

TYPE C ENDWALL
ROUND PIPE

ISSUED: SEPTEMBER 2023

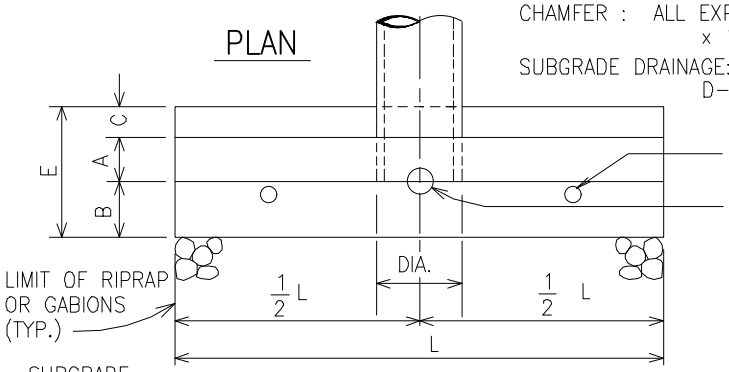
PLATE
D-1.06

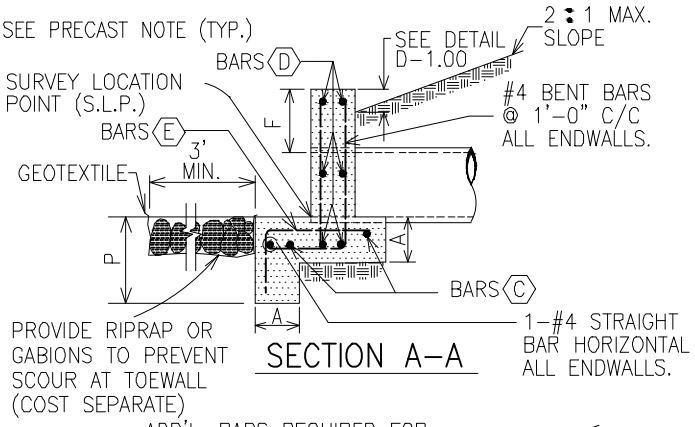
DATE: 08/28/2023
FILE: Drains_Master.DWG

CONCRETE : MIX # 3
CHAMFER : ALL EXPOSED EDGES 1" x 1" OR AS DIRECTED.
SUBGRADE DRAINAGE: PER STD. PLATE D-1.00 OR AS DIRECTED.

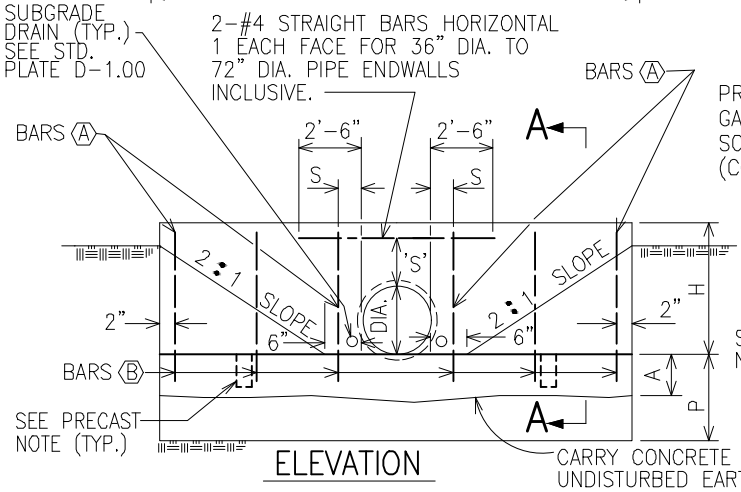
CORRUGATED METAL PIPE: USE FOR REPAIR, REPLACEMENT ONLY, EXCEPT WITH D.P.W. APPROVAL. ADJACENT METAL PIPE TO BE INSPECTED FOR REPLACEMENT PRIOR TO HEADWALL REPLACEMENT.

PLAN

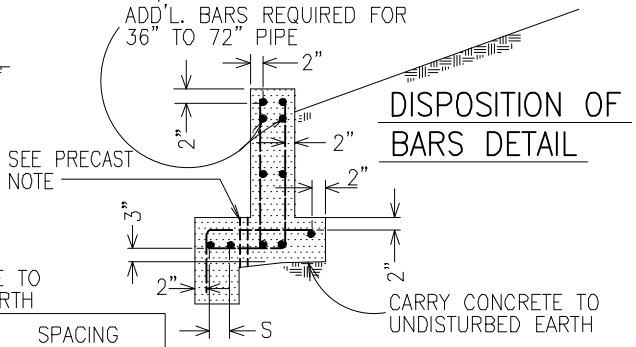




SECTION A-A



ELEVATION



DISPOSITION OF BARS DETAIL

BAR	SIZE & SHAPE	NO. BARS	ORIENTATION	LOCATION	SPACING
Ⓐ	#4 STRAIGHT	4	VERTICAL	FRONT FACE	AS SHOWN
Ⓑ	#4 STRAIGHT	VAR.	VERTICAL	FRONT FACE	2'-0" MAX.
Ⓒ	#4 STRAIGHT	2	HORIZONTAL	AS SHOWN	–
Ⓓ *	#4 STRAIGHT	VAR.	HORIZONTAL	BOTH FACES	1'-7" c/c MAX.
Ⓔ	#4 BENT	VAR.	HORIZONTAL	BOTH SIDES OF OPENING	1'-0" c/c MAX.

* TOP & BOTTOM BARS TO BE FULL LENGTH

PRECAST WALL WITH DIMENSIONS AND REINFORCING EQUIVALENT TO CAST IN PLACE WALL SHOWN WILL BE CONSIDERED. PROVIDE SHOP DRAWING SHOWING REINFORCEMENT AND MEANS OF WALL-TO-TOE CONNECTION. PLACE ON UNDISTURBED EARTH OR POUR CONCRETE FOOTING TO SAME. PRECAST WALLS THAT ARE CUT OR BROKEN FOR ANY REASON WILL BE REJECTED. PRECAST CONCRETE: 4500 psi MIN. 2 INCH DIAMETER GROUT HOLES REQUIRED FOR PRECAST ENDWALL WITH PIPE DIAMETER 'D' ≥ 24".

OPENING		DIMENSIONS									QUANTITIES†		REINFORCING BARS APPLICATIONS				
D	AREA																
INCHES	SQ. FT.	A	B	C	E	F	H	L	P	S	CONC. C. Y.	STEEL LBS.	BAR Ⓐ	BAR Ⓑ	BAR Ⓒ	BAR Ⓓ	BAR Ⓔ
12	0.79	9"	6"	6"	1'-9"	9"	1'-9"	6'-6"	1'-6"	4"	0.8	46	●			●	●
15	1.23	9"	6"	6"	1'-9"	9"	2'-0"	7'-9"	1'-6"	4"	1.0	53	●			●	●
18	1.78	9"	6"	6"	1'-9"	9"	2'-3"	9'-0"	1'-6"	4"	1.2	61	●			●	●
21	2.40	9"	6"	6"	1'-9"	9"	2'-6"	10'-3"	2'-0"	6"	1.5	78	●			●	●
24	3.14	9"	14"	6"	2'-5"	9"	2'-9"	11'-6"	2'-0"	6"	2.0	89		●		●	●
27	3.98	9"	14"	6"	2'-5"	9"	3'-0"	12'-10"	2'-0"	6"	2.3	98		●		●	●
30	4.91	9"	14"	10"	2'-9"	12"	3'-6"	14'-2"	2'-0"	6"	2.7	111		●		●	●
36	7.07	12"	16"	10"	3'-2"	12"	4'-0"	16'-8"	2'-6"	6"	5.1	200		●	●	●	●
42	9.62	12"	16"	10"	3'-2"	12"	4'-6"	19'-2"	2'-6"	8"	6.2	229		●	●	●	●
48	12.57	12"	16"	10"	3'-2"	12"	5'-0"	21'-8"	3'-0"	8"	7.7	292		●	●	●	●
54	15.90	12"	20"	12"	3'-8"	12"	5'-6"	24'-2"	3'-0"	8"	9.4	330		●	●	●	●
60	19.64	12"	20"	12"	3'-8"	12"	6'-0"	26'-8"	3'-0"	8"	10.8	360		●	●	●	●
72	28.27	12"	20"	12"	3'-8"	12"	7'-0"	31'-8"	3'-0"	9"	13.8	449		●	●	●	●

† FOR ESTIMATING PURPOSES ONLY

APPROVAL
DIRECTOR
BUR. OF ENGINEERING/CONSTRUCTION
SEPTEMBER 28, 2023
DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION
STORM DRAINAGE DETAILS

TYPE C ENDWALL
ROUND PIPE

ISSUED: SEPTEMBER 2023

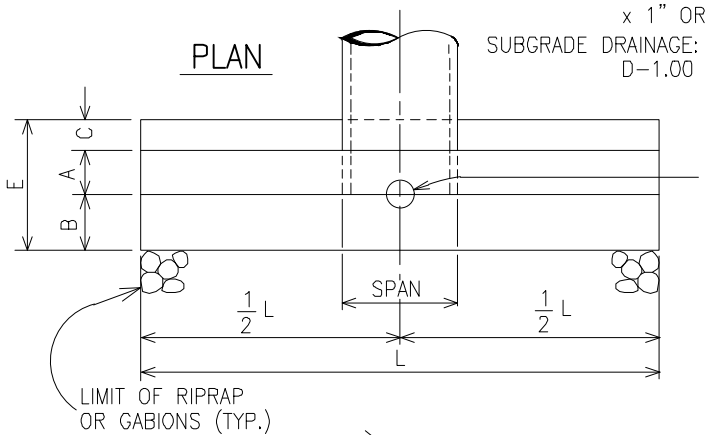
PLATE
D-1.07A

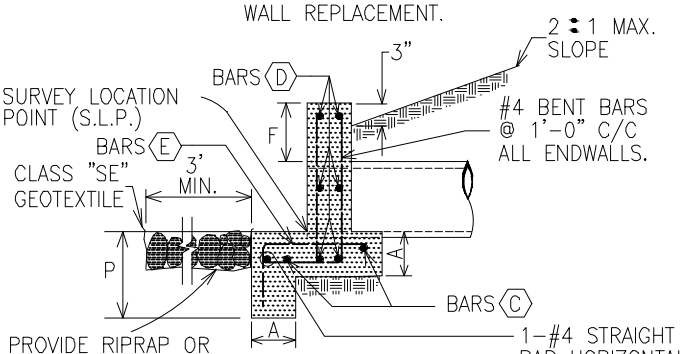
DATE: 08/28/2023
FILE: Drains_Master.DWG

CONCRETE : MIX # 3
CHAMFER : ALL EXPOSED EDGES 1" x 1" OR AS DIRECTED.
SUBGRADE DRAINAGE: PER STD. PLATE D-1.00 OR AS DIRECTED.

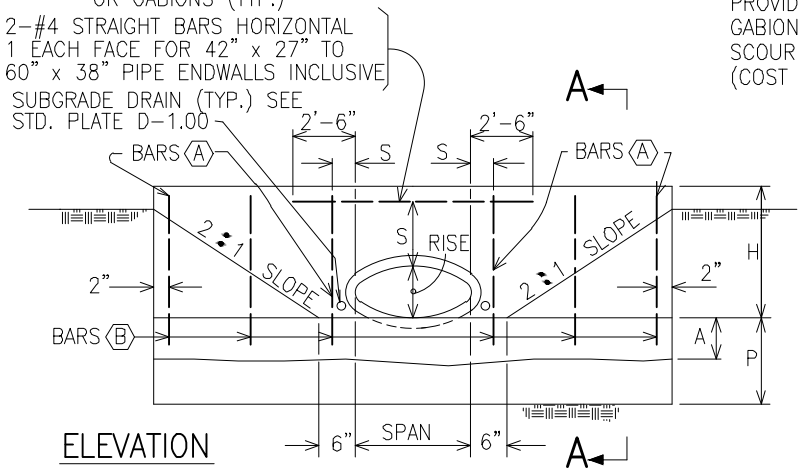
CORRUGATED METAL PIPE: USE FOR REPAIR, REPLACEMENT ONLY, EXCEPT WITH D.P.W. APPROVAL. ADJACENT METAL PIPE TO BE INSPECTED FOR REPLACEMENT PRIOR TO HEADWALL REPLACEMENT.

PLAN

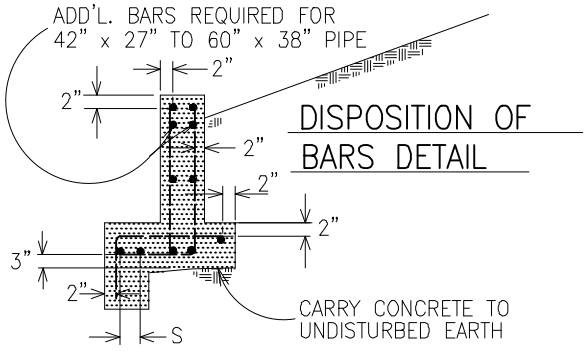




SECTION A-A



ELEVATION



DISPOSITION OF BARS DETAIL

BAR	SIZE & SHAPE	NO. BARS	ORIENTATION	LOCATION	SPACING
(A)	#4 STRAIGHT	4	VERTICAL	FRONT FACE	AS SHOWN
(B)	#4 STRAIGHT	VAR.	VERTICAL	FRONT FACE	2'-0" MAX.
(C)	#4 STRAIGHT	2	HORIZONTAL	AS SHOWN	–
(D) *	#4 STRAIGHT	VAR.	HORIZONTAL	BOTH FACES	1'-7" c/c MAX.
(E)	#4 BENT	VAR.	HORIZONTAL	BOTH SIDES OF OPENING	1'-0" c/c MAX.

* TOP & BOTTOM BARS TO BE FULL LENGTH

PRECAST WALL WITH DIMENSIONS AND REINFORCING EQUIVALENT TO CAST IN PLACE WALL SHOWN WILL BE CONSIDERED. PROVIDE SHOP DRAWING SHOWING REINFORCEMENT AND MEANS OF WALL-TO-TOE CONNECTION. PLACE ON UNDISTURBED EARTH OR POUR CONCRETE FOOTING TO SAME. PRECAST WALLS THAT ARE CUT OR BROKEN FOR ANY REASON WILL BE REJECTED. PRECAST CONCRETE: 4500 psi MIN.

OPENING		DIMENSIONS									QUANTITIES†		REINFORCING BARS APPLICATIONS				
D	AREA																
INCHES S x R	SQ. FT.	A	B	C	E	F	H	L	P	S	CONC. C. Y.	STEEL LBS.	BAR (A)	BAR (B)	BAR (C)	BAR (D)	BAR (E)
23 x 14	1.8	9"	6"	6"	1'-9"	9"	2'-3"	9'-6"	2'-0"	6"	1.4	87	●			●	●
30 x 19	3.3	9"	14"	6"	2'-5"	14"	3'-2"	13'-8"	2'-0"	6"	2.5	145		●		●	●
34 x 22	4.1	9"	14"	6"	2'-5"	12"	3'-2"	13'-8"	2'-0"	6"	2.5	145		●		●	●
38 x 24	5.1	12"	14"	6"	2'-5"	9"	3'-2"	13'-8"	2'-6"	6"	3.4	144		●		●	●
42 x 27	6.3	12"	16"	10"	3'-2"	10"	3'-6"	17'-11"	2'-6"	6"	5.2	212		●	●	●	●
45 x 29	7.4	12"	16"	10"	3'-2"	14"	3'-11"	17'-11"	2'-6"	8"	5.4	217		●	●	●	●
49 x 32	8.8	12"	16"	10"	3'-2"	10"	4'-0"	17'-11"	2'-6"	8"	5.4	217		●	●	●	●
53 x 34	10.2	12"	20"	12"	3'-8"	14"	4'-9"	21'-9"	3'-0"	8"	8.0	284		●	●	●	●
60 x 38	12.9	12"	20"	12"	3'-8"	10"	4'-9"	21'-9"	3'-0"	8"	7.9	284		●	●	●	●

† FOR ESTIMATING PURPOSES ONLY

APPROVAL
DIRECTOR
BUR. OF ENGINEERING/CONSTRUCTION
SEPTEMBER 28, 2023
DATE

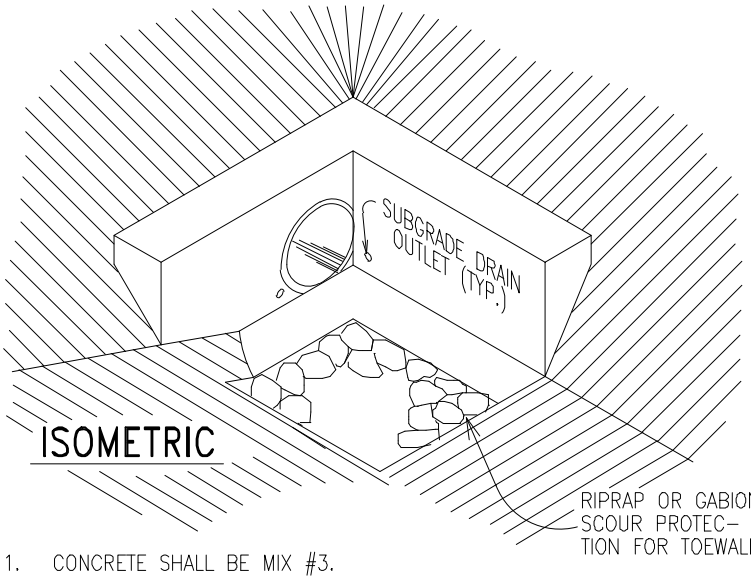
DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION
STORM DRAINAGE DETAILS

TYPE C ENDWALL
HORIZONTAL ELLIPTICAL PIPE

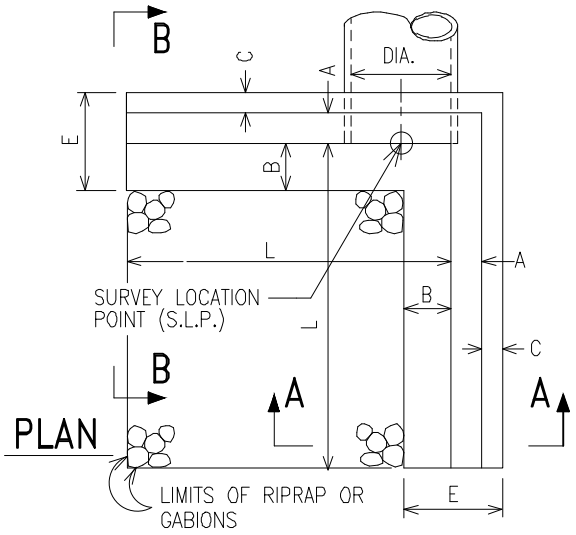
ISSUED: SEPTEMBER 2023

PLATE
D-1.07B

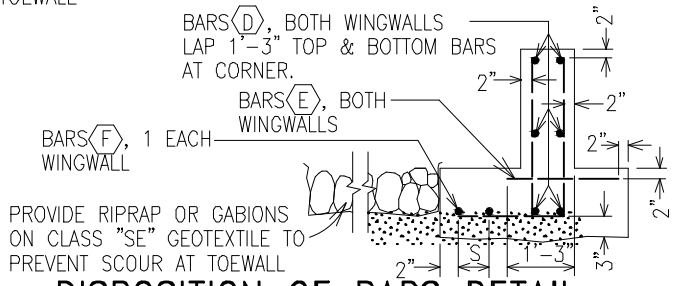
DATE: 08/28/2023
FILE: Drains_Master.DWG



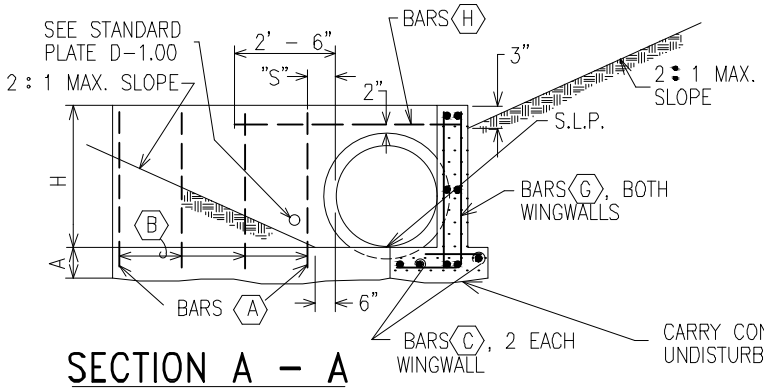
ISOMETRIC



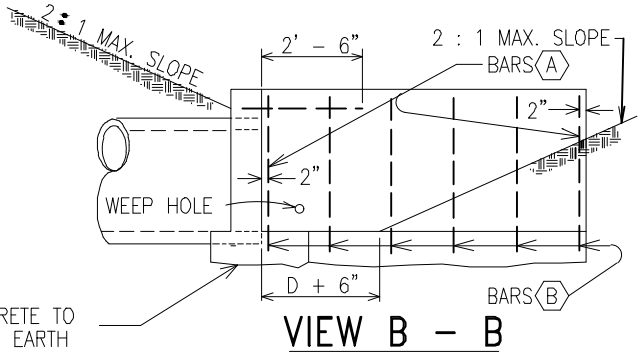
1. CONCRETE SHALL BE MIX #3.
2. CHAMFER ALL EXPOSED EDGES 1" x 1" OR AS DIRECTED.
3. SUBGRADE DRAINAGE PER PLATE D-1.00 OR AS DIRECTED.
4. CIRCULAR PIPE SHOWN. DETAIL ALSO APPLICABLE TO HORIZONTAL ELLIPTICAL & CORRUGATED METAL ARCH PIPE. CORRUGATED METAL PIPE SHALL NOT BE USED WITHOUT DPW APPROVAL, EXCEPT FOR REPLACEMENT.
5. SEE PLATE D-1.09 FOR DIMENSIONS & REINFORCEMENT.
6. ONE WINGWALL SHALL BE PARALLEL TO ℄ OF ROAD, UNLESS OTHERWISE NOTED ON CONTRACT DRAWINGS.



DISPOSITION OF BARS DETAIL



SECTION A - A



VIEW B - B

BAR	SIZE & SHAPE	NO. BARS	ORIENTATION	LOCATION	SPACING
A	#4 STRAIGHT	4	VERTICAL	FRONT FACE	AS SHOWN
B	#4 STRAIGHT	VAR.	VERTICAL	FRONT FACE	2'-0" MAX
C	#4 STRAIGHT	4	HORIZONTAL	AS SHOWN	-
D *	#4 STRAIGHT	VAR.	HORIZONTAL	BOTH FACES	1'-7" c/c MAX.
E	#4 STRAIGHT	VAR.	HORIZONTAL	BOTH SIDES OF OPENING	1'-0" c/c
F	#4 STRAIGHT	2	HORIZONTAL	AS SHOWN	AS SHOWN
G	#4 BENT	VAR.	VERTICAL	AS SHOWN	1'-0" c/c
H	#4 BENT	2	HORIZONTAL	1 EACH FACE	1'-0" c/c

* TOP & BOTTOM BARS TO BE FULL LENGTH

PRECAST WALL WITH DIMENSIONS AND REINFORCING EQUIVALENT TO CAST IN PLACE WALL SHOWN WILL BE CONSID- ERED. PROVIDE SHOP DRAWING SHOWING REINFORCEMENT AND MEANS OF WALL- TO-TOE CONNECTION. PLACE ON UNDIS- TURBED EARTH OR POUR CONCRETE FOOTING TO SAME. PRECAST WALLS THAT ARE CUT OR BROKEN FOR ANY REASON WILL BE REJECTED. PRECAST CONCRETE: 4500 psi MIN.

APPROVAL
DIRECTOR
BUR. OF ENGINEERING/CONSTRUCTION
SEPTEMBER 28, 2023
DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION
STORM DRAINAGE DETAILS
TYPE E ENDWALL

ISSUED: SEPTEMBER 2023

PLATE
D-1.08

DATE: 08/28/2023
FILE: Drains_Master.DWG

CIRCULAR PIPE

OPENING		DIMENSIONS							QUANTITIES †		REINFORCING BARS APPLICATIONS							
DIA.	AREA								CONC.	STEEL								
INCHES	SQ. FT.	A	B	C	E	H	L	S	C. Y.	LBS.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	Ⓔ	Ⓕ	Ⓖ	Ⓗ
12	0.79	9"	6"	6"	1'-9"	1'-9"	3'-6"	4"	0.7	55	●			●	●	●	●	
15	1.23	9"	6"	6"	1'-9"	2'-0"	4'-3"	4"	0.9	61	●			●	●	●	●	
18	1.77	9"	6"	6"	1'-9"	2'-3"	5'-0"	4"	1.1	68	●			●	●	●	●	
21	2.40	9"	6"	6"	1'-9"	2'-6"	5'-9"	4"	1.4	77	●			●	●	●	●	
24	3.14	9"	14"	6"	2'-5"	2'-9"	6'-6"	6"	1.8	106		●		●	●	●	●	
30	4.91	9"	14"	6"	2'-5"	3'-6"	8'-0"	6"	2.6	140		●		●	●	●	●	
36	7.07	12"	16"	10"	3'-2"	4'-0"	9'-6"	6"	5.0	235		●	●	●	●	●	●	●
42	9.62	12"	16"	10"	3'-2"	4'-6"	11'-0"	8"	6.1	303		●	●	●	●	●	●	●
48	12.57	12"	16"	10"	3'-2"	5'-0"	12'-6"	8"	7.3	341		●	●	●	●	●	●	●
54	15.90	12"	20"	12"	3'-8"	5'-6"	14'-0"	8"	9.2	438		●	●	●	●	●	●	●
60	19.64	12"	20"	12"	3'-8"	6'-0"	15'-6"	8"	10.6	496		●	●	●	●	●	●	●
72	28.27	12"	20"	12"	3'-8"	7'-0"	17'-0"	8"	12.7	597		●	●	●	●	●	●	●

METAL PIPE ARCH

OPENING		DIMENSIONS							QUANTITIES †		REINFORCING BARS APPLICATIONS							
D	AREA								CONC.	STEEL								
INCHES S x R	SQ. FT.	A	B	C	E	H	L	S	C. Y.	LBS.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	Ⓔ	Ⓕ	Ⓖ	Ⓗ
17 x 13	1.1	9"	6"	6"	1'-9"	1'-7"	3'-9"	4"	0.7	53	●			●	●	●	●	
21 x 15	1.6	9"	6"	6"	1'-9"	2'-2"	5'-10"	4"	1.3	75	●			●	●	●	●	
24 x 18	2.2	9"	6"	6"	1'-9"	2'-2"	5'-10"	4"	1.3	75	●			●	●	●	●	
28 x 20	2.8	9"	6"	6"	1'-9"	2'-2"	5'-10"	6"	1.3	74	●			●	●	●	●	
35 x 24	4.4	9"	14"	10"	2'-9"	3'-2"	8'-6"	6"	2.8	118		●		●	●	●	●	
42 x 29	6.4	9"	14"	10"	2'-9"	3'-2"	8'-6"	6"	2.7	117		●		●	●	●	●	
49 x 33	8.7	12"	16"	10"	3'-2"	3'-11"	11'-3"	8"	5.8	271		●	●	●	●	●	●	●
57 x 38	11.4	12"	16"	10"	3'-2"	3'-11"	11'-3"	8"	5.7	261		●	●	●	●	●	●	●
64 x 43	14.3	12"	20"	12"	3'-8"	4'-8"	13'-9"	8"	8.2	366		●	●	●	●	●	●	●
71 x 47	17.6	12"	20"	12"	3'-8"	4'-8"	13'-9"	8"	8.1	355		●	●	●	●	●	●	●

HORIZONTAL ELLIPTICAL R. C. PIPE

OPENING		DIMENSIONS							QUANTITIES †		REINFORCING BARS APPLICATIONS							
D	AREA								CONC.	STEEL								
INCHES S x R	SQ. FT.	A	B	C	E	H	L	S	C. Y.	LBS.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	Ⓔ	Ⓕ	Ⓖ	Ⓗ
23 x 14	1.8	9"	6"	6"	1'-9"	2'-2"	5'-10"	6"	1.3	75	●			●	●	●	●	
30 x 19	3.3	9"	14"	6"	2'-5"	3'-2"	8'-6"	6"	2.6	118		●		●	●	●	●	
34 x 22	4.1	9"	14"	6"	2'-5"	3'-2"	8'-6"	6"	2.6	118		●		●	●	●	●	
38 x 24	5.1	12"	14"	6"	2'-8"	3'-2"	8'-6"	6"	3.7	118		●		●	●	●	●	
42 x 27	6.3	12"	16"	10"	3'-2"	3'-6"	11'-3"	6"	5.5	265		●	●	●	●	●	●	●
45 x 29	7.4	12"	16"	10"	3'-2"	3'-11"	11'-3"	8"	5.9	271		●	●	●	●	●	●	●
49 x 32	8.8	12"	16"	10"	3'-2"	4'-0"	11'-3"	8"	5.9	273		●	●	●	●	●	●	●
53 x 34	10.2	12"	20"	12"	3'-8"	4'-8"	13'-9"	8"	8.4	366		●	●	●	●	●	●	●
60 x 38	12.9	12"	20"	12"	3'-8"	4'-8"	13'-9"	8"	8.3	366		●	●	●	●	●	●	●

† QUANTITIES FOR ESTIMATING ONLY.

BALTIMORE COUNTY MARYLAND

APPROVAL

DIRECTOR

BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023

DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

TYPE E ENDWALL TABLES

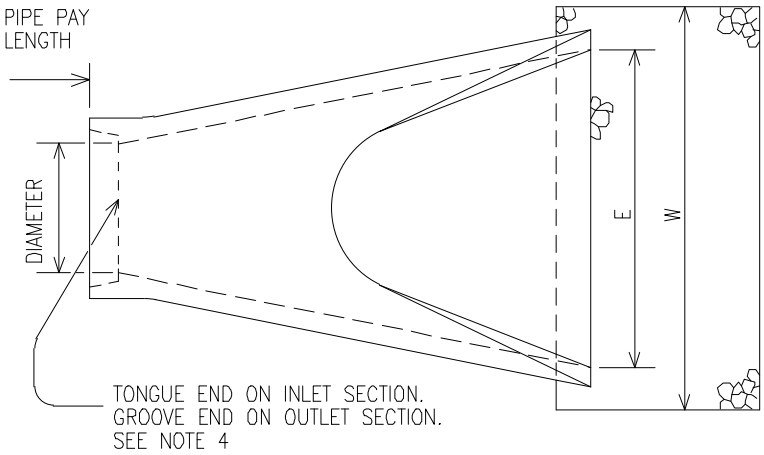
ISSUED: SEPTEMBER 2023

PLATE

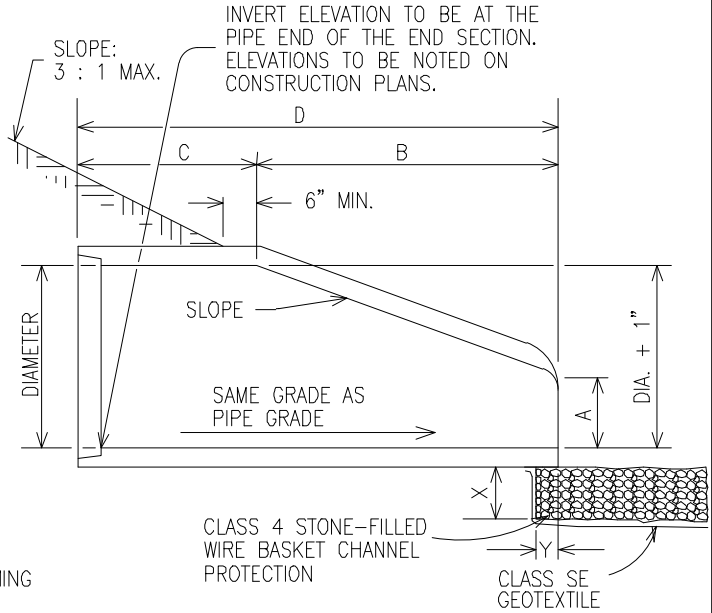
D-1.09

DATE: 08/28/2023

FILE: Drains_Master.DWG



PLAN



LONGITUDINAL SECTION

NOTES

1. END SECTIONS MUST BE REINFORCED TO CONFORM WITH CLASS III PIPE.
2. PREFERRED USE: OUTFALLS ONLY. EXTRA CARE MUST BE TAKEN TO PROTECT ADJACENT SLOPES FROM EROSION WHEN USED IN LIEU OF A HEADWALL AT THE INLET END OF A PIPE.
3. CONCRETE FOOTER SHALL BE AS SHOWN ON STD. PLATE D-1.11. SEE NOTE 2 ON THAT PLATE.
4. CONTRACTOR HAS OPTION OF FURNISHING END SECTIONS CONFORMING TO THIS STANDARD PLATE OR TO STANDARD PLATE D-1.11.

TABLE OF DIMENSIONS

CONCRETE END SECTION							CONCRETE FOOTER (SEE NOTE 3)		
DIAMETER	SLOPE	A	B	C	D	E	W	X	Y
15"	3:1	6 1/2"	2'-4"	3'-10"	6'-2"	2'-6"	3'-6"	12"	9"
18"	3:1	10 1/4"	2'-2"	4'-0"	6'-2"	3'-0"	4'-0"	12"	9"
24"	3:1	11"	3'-7"	2'-8"	6'-3"	4'-0"	5'-0"	15"	9"
30"	3:1	1'-1"	4'-5"	1'-10"	6'-3"	5'-0"	6'-0"	15"	9"
36"	3:1	1'-3 1/2"	5'-3"	3'-1"	8'-1 1/2"	6'-0"	7'-3"	15"	9"
42"	3:1	1'-9 1/4"	5'-5"	2'-10"	8'-3"	6'-6"	7'-9"	15"	9"
48"	3:1	2'-1"	6'-0"	2'-2"	8'-2"	7'-0"	8'-6"	18"	12"
54"	2.4:1	2'-5"	5'-2"	2'-10"	8'-0"	7'-6"	9'-0"	18"	12"
60"	2:1	2'-7"	4'-11"	3'-8 1/2"	8'-7 1/2"	8'-0"	9'-6"	18"	12"
66"	2:1	2'-4"	6'-6"	1'-9"	8'-3"	8'-6"	10'-0"	18"	12"
72"	2:1	2'-10"	6'-6"	1'-9"	8'-3"	9'-0"	10'-9"	18"	12"

BALTIMORE COUNTY MARYLAND

APPROVAL

DIRECTOR

BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023
DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

CONCRETE END SECTION
ROUND CONCRETE PIPE

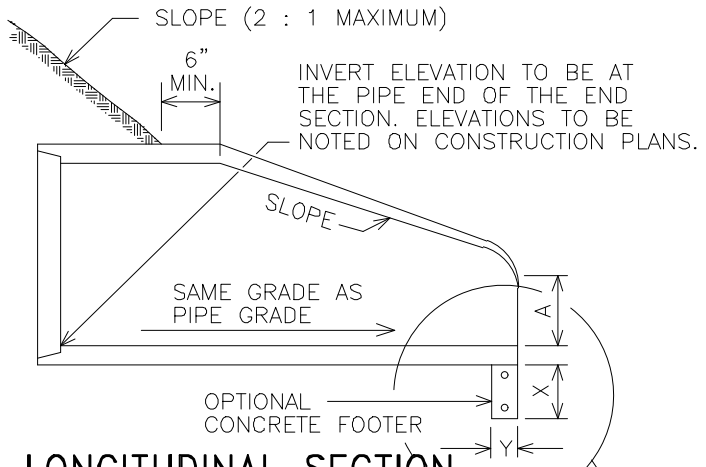
ISSUED: SEPTEMBER 2023

PLATE

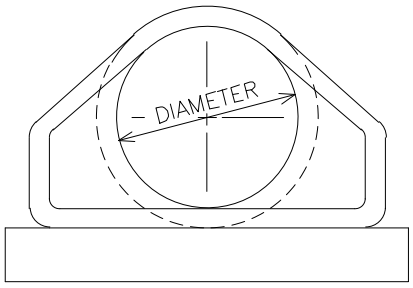
D-1.10

DATE: 08/28/2023

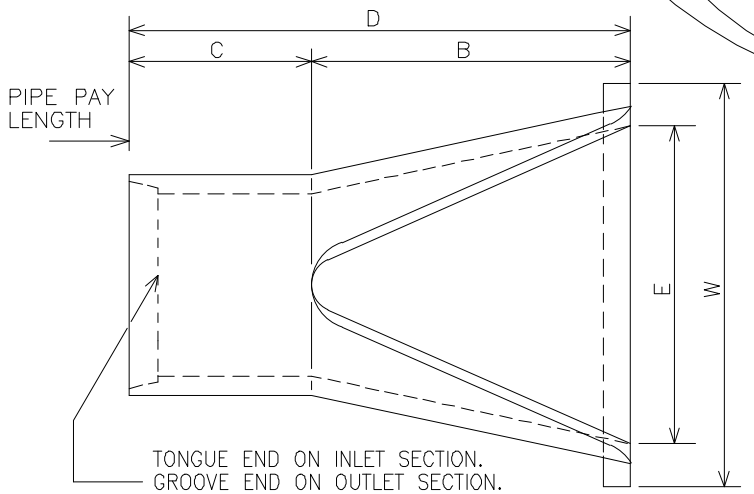
FILE: Drains_Master.DWG



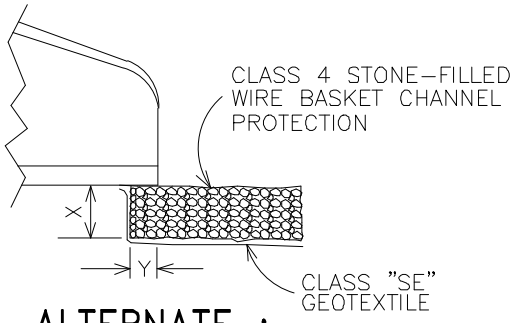
LONGITUDINAL SECTION



END VIEW



PLAN



ALTERNATE : GABION AT OUTFALL

NOTES

1. END SECTIONS MUST BE REINFORCED TO CONFORM WITH CLASS IV PIPE.
2. CONCRETE FOOTER SHALL BE USED WHEN SPECIFIED ON THE PLANS. COST OF CONCRETE FOOTER TO BE PAID PER CUBIC YARD OF MIX NO. 2 CONCRETE FOR MISCELLANEOUS STRUCTURES. REINFORCEMENT TO BE #4 BARS.
3. PREFERRED USE: OUTFALLS ONLY. EXTRA CARE MUST BE TAKEN TO PROTECT ADJACENT SLOPES FROM EROSION WHEN USED IN LIEU OF A HEADWALL AT THE INLET END OF A PIPE.

TABLE OF DIMENSIONS

CONCRETE END SECTION							CONCRETE FOOTER		
DIAMETER	SLOPE	A	B	C	D	E	W	X	Y
12"	3:1	4"	2'-0"	4'-0 7/8"	6'-0 7/8"	2'-0"	3'-0"	12"	9"
15"	3:1	6"	2'-3"	3'-10"	6'-1"	2'-6"	3'-6"	12"	9"
18"	3:1	9"	2'-3"	3'-10"	6'-1"	3'-0"	4'-0"	12"	9"
21"	3:1	9"	3'-0"	3'-1 1/2"	6'-1 1/2"	3'-6"	4'-6"	12"	9"
24"	3:1	9 1/2"	3'-7 1/2"	2'-6"	6'-1 1/2"	4'-0"	5'-0"	15"	9"
27"	3:1	10 1/2"	4'-1 1/2"	2'-0"	6'-1 1/2"	4'-6"	5'-6"	15"	9"
30"	3:1	1'-0"	4'-6"	1'-7 3/4"	6'-1 3/4"	5'-0"	6'-0"	15"	9"
36"	3:1	1'-3"	5'-3"	2'-10 3/4"	8'-1 3/4"	6'-0"	7'-3"	15"	9"
42"	3:1	1'-6" OR 1'-9"	5'-3"	2'-11"	8'-2"	6'-6"	7'-9"	15"	9"
48"	3:1	2'-0"	6'-0"	2'-2"	8'-2"	7'-0"	8'-6"	18"	12"
54"	2.4:1	2'-3"	5'-5"	2'-9 1/4"	8'-2 1/4"	7'-6"	9'-0"	18"	12"

NOTE: CONTRACTOR HAS OPTION OF FURNISHING END SECTIONS CONFORMING TO DETAILS ON THIS SHEET OR END SECTIONS CONFORMING TO DETAILS ON PLATE D-1.10

BALTIMORE COUNTY MARYLAND

APPROVAL

DIRECTOR

BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023
DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

CONCRETE END SECTION
ROUND CONCRETE PIPE

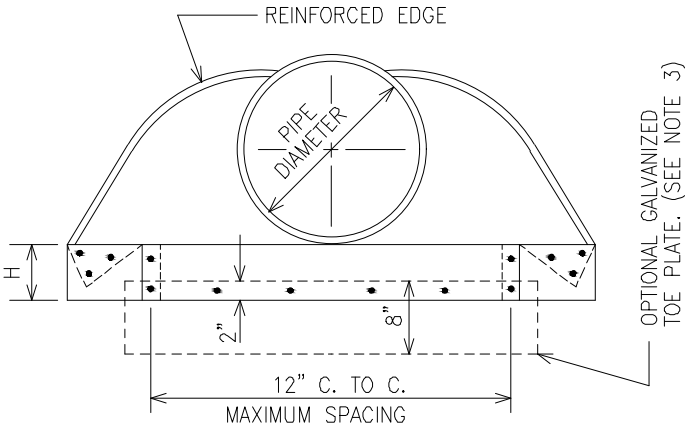
ISSUED: SEPTEMBER 2023

PLATE

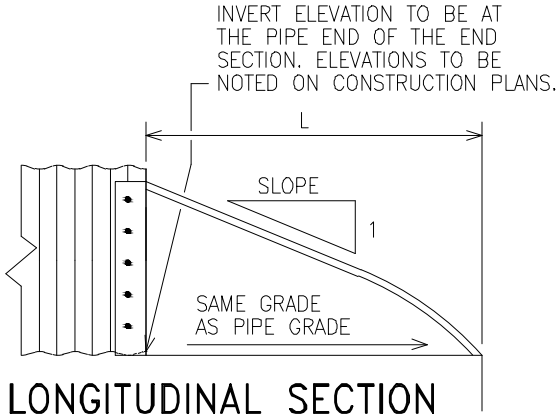
D-1.11

DATE: 08/28/2023

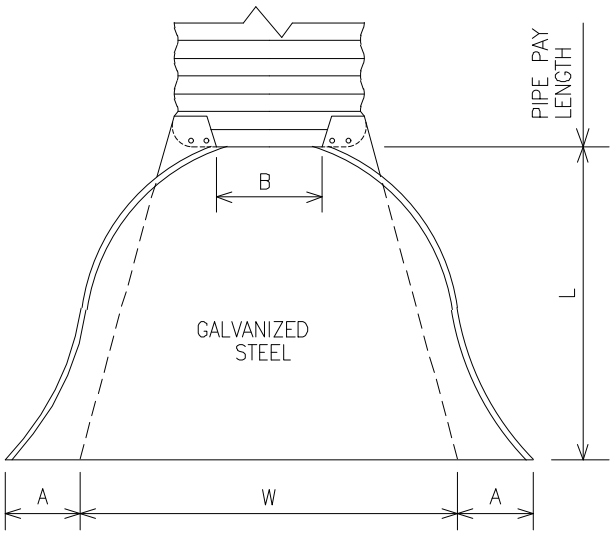
FILE: Drains_Master.DWG



END VIEW



LONGITUDINAL SECTION



PLAN

NOTES:

1. ALL 3 PIECE BODIES TO HAVE 12 GA. SIDES AND 10 GA. CENTER PANELS. WIDTH OF CENTER PANELS TO BE GREATER THAN 20 % OF THE PIPE PERIPHERY. MULTIPLE PANEL BODIES TO HAVE LAP SEAMS WHICH ARE TO BE TIGHTLY JOINED BY 3/8 " DIAMETER 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 " – 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 " DIA. 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 CONNECTOR SECTION. THE CONNECTOR SECTION WILL BE ATTACHED TO THE END SECTION BY GALVANIZED RIVETS OR BOLTS.
5. FOR REPLACEMENT USE ONLY. APPROVAL OF DEPARTMENT OF PUBLIC WORKS REQUIRED. ALSO SEE NOTE 4, STD. PLATE D–1.10.
6. SEE ALSO STANDARD PLATE D–1.13 .

TABLE OF DIMENSIONS

PIPE DIA.	GAUGE	A (1" ±)	B MAX.	H (1" ±)	L (1 ½" ±)	W (2" ±)	SLOPE (APPROX.)	BODY
12"	14	6"	6"	6"	21"	24"	2 ½ : 1	1 PC.
15"	14	7"	8"	6"	26"	30"	2 ½ : 1	1 PC.
18"	14	8"	10"	6"	31"	36"	2 ½ : 1	1 PC.
21"	14	9"	12"	6"	36"	42"	2 ½ : 1	1 PC.
24"	14	10"	13"	6"	41"	48"	2 ½ : 1	1 PC.
30"	14	12"	16"	8"	51"	60"	2 ½ : 1	1 PC.
36"	14	14"	19"	9"	60"	72"	2 ½ : 1	2 PC.
42"	12	16"	22"	11"	69"	84"	2 ½ : 1	2 PC.
48"	12	18"	27"	12"	78"	90"	2 ¼ : 1	2 PC.
54"	12	18"	30"	12"	84"	102"	2 : 1	2 PC.
60"	12	18"	33"	12"	87"	114"	1 ¾ : 1	3 PC.
66"	12	18"	36"	12"	87"	120"	1 ½ : 1	3 PC.
72"	12	18"	39"	12"	87"	126"	1 ⅓ : 1	3 PC.
78"	12	18"	42"	12"	87"	132"	1 ¼ : 1	3 PC.
84"	12	18"	45"	12"	87"	138"	1 ⅙ : 1	3 PC.

APPROVAL

DIRECTOR

BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023

DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

METAL END SECTION
ROUND METAL PIPE

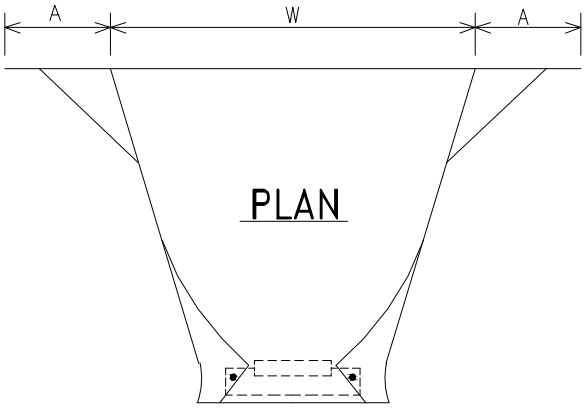
ISSUED: SEPTEMBER 2023

PLATE

D–1.12

DATE: 08/28/2023

FILE: Drains_Master.DWG

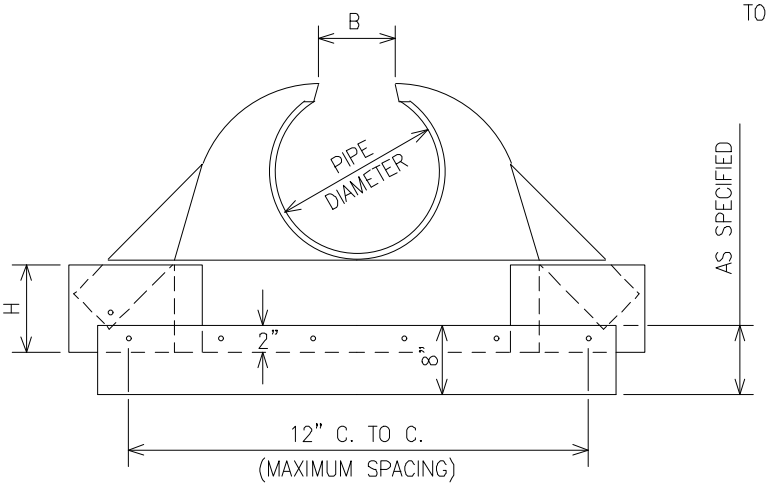


PLAN

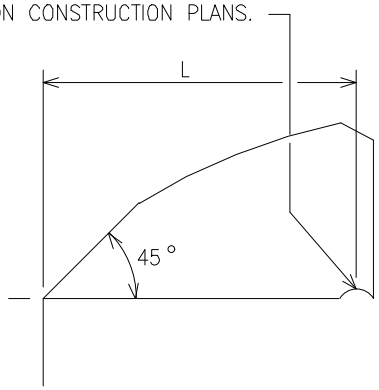
NOTES :

1. ALL RODS, BOLTS, NUTS, ETC. TO BE HOT DIP GALVANIZED, ELECTROGALVANIZED OR CADMIUM PLATED.
2. SPECIFICATION: A.A.S.H.T.O. DESIGNATION M 36–57.
3. END SECTIONS TO BE SHIPPED WITH TOP FINISHING PIECE BOLTED IN PLACE AND CONNECTION PIECE ASSEMBLED IN PLACE.
4. FOR REPLACEMENT USE ONLY. APPROVAL OF DEPARTMENT OF PUBLIC WORKS REQUIRED. PREFERRED USE: OUTFALLS ONLY. EXTRA CARE MUST BE TAKEN TO PROTECT ADJACENT SLOPES FROM EROSION WHEN USED IN LIEU OF A HEAD–WALL AT THE INLET END OF A PIPE
5. SEE ALSO STANDARD PLATE D–1.12 .

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



ELEVATION



TYPICAL CROSS SECTION

PIPE DIAMETER	GAUGE	DIMENSION					BODY
		A (1"±)	B	H	L (1½"±)	W (2"±)	
12"	14	7 ½"	6"	6"	21"	24"	1 PC.
15"	14	8 5/8"	8"	6"	26"	30"	1 PC.
18"	14	9 ¼"	9"	6"	31"	36"	1 PC.
21"	14	9 7/8"	11"	6 ¼"	36"	42"	1 PC.
24"	14	11 ¼"	12"	6"	42"	48"	1 PC.
30"	14	13"	15"	7 ½"	52 ½"	60"	2 PC.
36"	12	14"	18"	8"	63"	72"	2 PC.
42"	12	16 ¾"	21"	10 ½"	73 ½"	84"	2 PC.
48"	12	18 ¼"	27"	12"	84"	90"	2 PC.

BALTIMORE COUNTY MARYLAND

APPROVAL

DIRECTOR

BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023

DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

METAL END SECTION
ROUND METAL PIPE

ISSUED: SEPTEMBER 2023

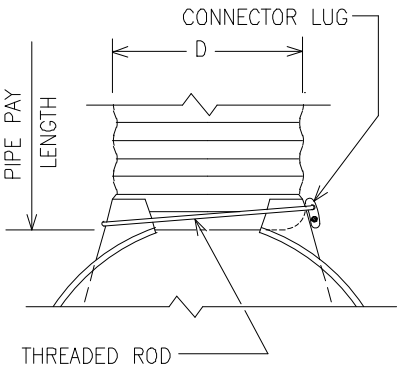
PLATE

D–1.13

DATE: 08/28/2023

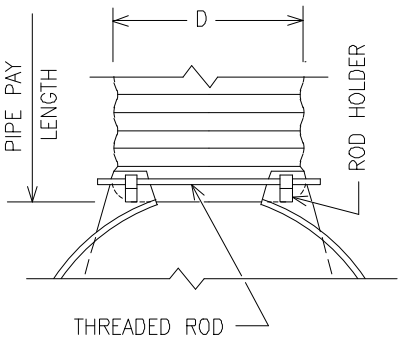
FILE: Drains_Master.DWG

CONNECTIONS FOR ROUND PIPE



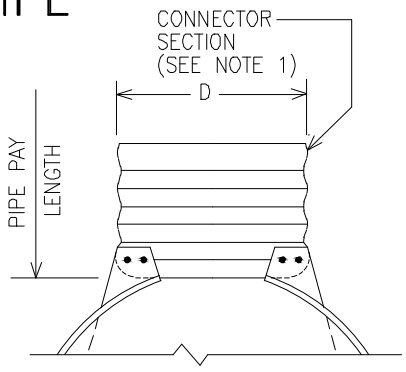
TYPE 1

(D = 12" THROUGH 24" ONLY)



TYPE 2

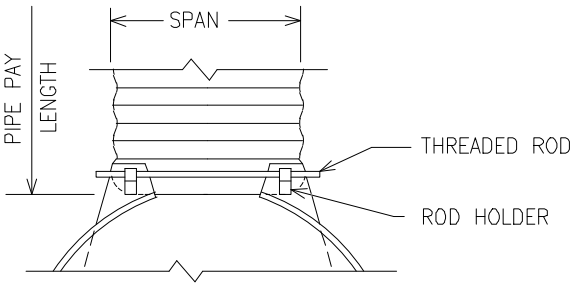
(D = 30" THROUGH 36" ONLY)



TYPE 3

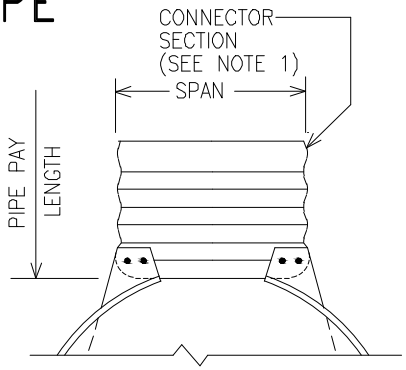
(D = 42" THROUGH 84" ONLY)

CONNECTIONS FOR ARCH PIPE



TYPE 2

(SPAN = 17"x13" THROUGH 57"x38" ONLY)



TYPE 3

(SPAN = 64"x43" THROUGH 83"x57" ONLY)

NOTES :

1. TYPE 3 CONNECTION INCLUDES ONE FOOT OF THE PIPE LENGTH FOR 64" x 43" THROUGH 83" x 57" ARCH SIZES AND 42" THROUGH 84" ROUND 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 ARCH PIPE 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 ARCH PIPE.
3. CORRUGATED METAL PIPE, ARCH PIPE, METAL END SECTIONS, STRUCTURAL PLATE PIPE & STRUCTURAL PLATE ARCH PIPE SHALL BE USED FOR REPLACEMENT IN KIND ONLY, SUBJECT TO APPROVAL BY THE BUREAU OF ENGINEERING & CONSTRUCTION.

BALTIMORE COUNTY MARYLAND

APPROVAL

DIRECTOR

BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023

DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

CONNECTIONS

METAL END SECTIONS

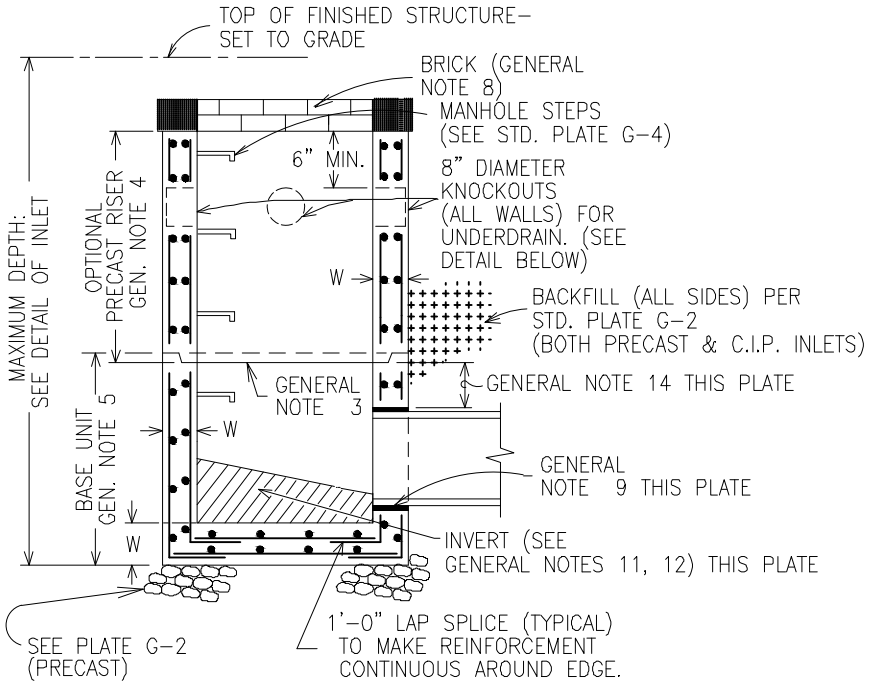
ISSUED: SEPTEMBER 2023

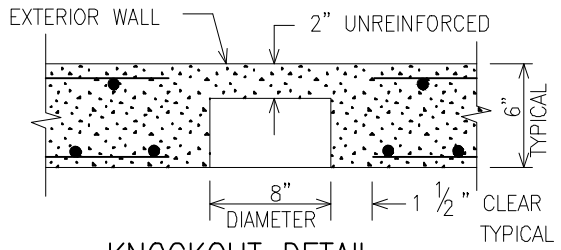
PLATE

D-1.16

DATE: 08/28/2023

FILE: Drains_Master.DWG





KNOCKOUT DETAIL

NOTES: 1. KNOCKOUTS MAY BE PLACED IN BASE UNIT ABOVE CENTER OF OUTLET PIPE.

2. MINIMUM DEPTH: 3' FROM TOP OF CURB TO TOP OF KNOCKOUT. MIN. 6" FROM EDGE OF KNOCKOUT TO EDGE OF PRECAST UNIT.

3. DESIGN HYDRAULIC GRADIENT IN STORM DRAIN SYSTEM MUST BE 6" BELOW KNOCKOUT INVERT.

GENERAL NOTES

1. UNDERDRAIN SHALL BE GROUTED IN PLACE IN THE PROVIDED KNOCKOUT OR 4"x4" HOLES (C.I.P.).

2. LIFT HOLES TO BE PROVIDED FOR HANDLING PRECAST RISER(S) AND BASE. HOLES TO BE FILLED WITH MIX #3 CONCRETE UPON INSTALLATION.

3. PRECAST JOINTS – MANUFACTURER SHALL FORM MALE AND FEMALE ENDS OF JOINTS USING THEIR OWN DESIGN. JOINTS SHALL BE SEALED & MADE WATERTIGHT BY THE CONTRACTOR USING THE MANUFACTURER'S RECOM–MENDED ASTM OR AASHTO–APPROVED SEALANT.

4. (PRECAST RISER SECTION): 8 FT. MAXIMUM HEIGHT, 1 FT. MINIMUM .

5. (PRECAST BASE): 8 FT. MAXIMUM HEIGHT
MINIMUM HEIGHT – AS NECESSARY TO PROVIDE INDICATED CLEARANCES.

6. PIPE OPENINGS TO BE PROVIDED AS REQUIRED. FOR SIZE, LOCATION AND INVERT ELEVATIONS, REFER TO PLANS.

7. PLACEMENT OF SUBGRADE DRAINAGE WILL BE AS DIRECTED BY THE ENGINEER OR AS NOTED ON PLANS.

8. PRECAST WALLS: USE CAST–IN–PLACE MIX #3 CONCRETE OR BRICK TO GRADE– 2 COURSES MINIMUM, 6 COURSES MAXIMUM. INSTALL BRICK FLUSH WITH INTERIOR OF PRECAST WALL.

   PRECAST STRUCTURES MAY NOT BE BROKEN TO MEET GRADE.

   CAST–IN–PLACE WALLS: TOP 4" OF WALLS SHALL BE BRICK MASONRY.

9. GROUT AROUND ALL PIPES USING NON–SHRINK GROUT JOINT FILLER PER ASTMC1107

10. NO PART OF PIPE SHALL PASS THROUGH ANY STRUCTURE CORNER AS DEFINED BY PROJECTION OF INTERIOR WALLS. SEE PLATE G–1. CENTER LINE PIPE ALLOWABLE RANGE: ± 30° FROM PERPENDICULAR.

11. INVERT SHALL HAVE A BENCH SIMILAR TO A TYPE A MANHOLE WHERE PIPE 24" & LARGER RUNS THROUGH INLET. SEE STD. PLATE D–3.00.

12. INVERT SHALL BE APPROVED PRECAST, PLAIN MIX #3 CONCRETE OR BRICK LAID ON EDGE. INVERT TO SLOPE DOWN TOWARD OUTLET AT THE RATE OF 2" PER FOOT, OR AS SHOWN ON SPECIFIC PLATE OR AS DIRECTED. INVERT BRICK SHALL BE IN ACCORDANCE WITH STD. SPECIFICATION 903.01

13. CAST–IN–PLACE REINFORCEMENT: SIZE & PLACEMENT AS SHOWN ON SPECIFIC DETAIL PLATES; 16" BAR LAPS; REINFORCEMENT CONTINUOUS AROUND ALL EDGES.

14. CAST–IN–PLACE STRUCTURE: 6" MIN.
PRECAST STRUCTURE: 2" MIN.

BALTIMORE COUNTY MARYLAND

APPROVAL

DIRECTOR

BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023
DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

RECTANGULAR INLETS
GENERAL REQUIREMENTS

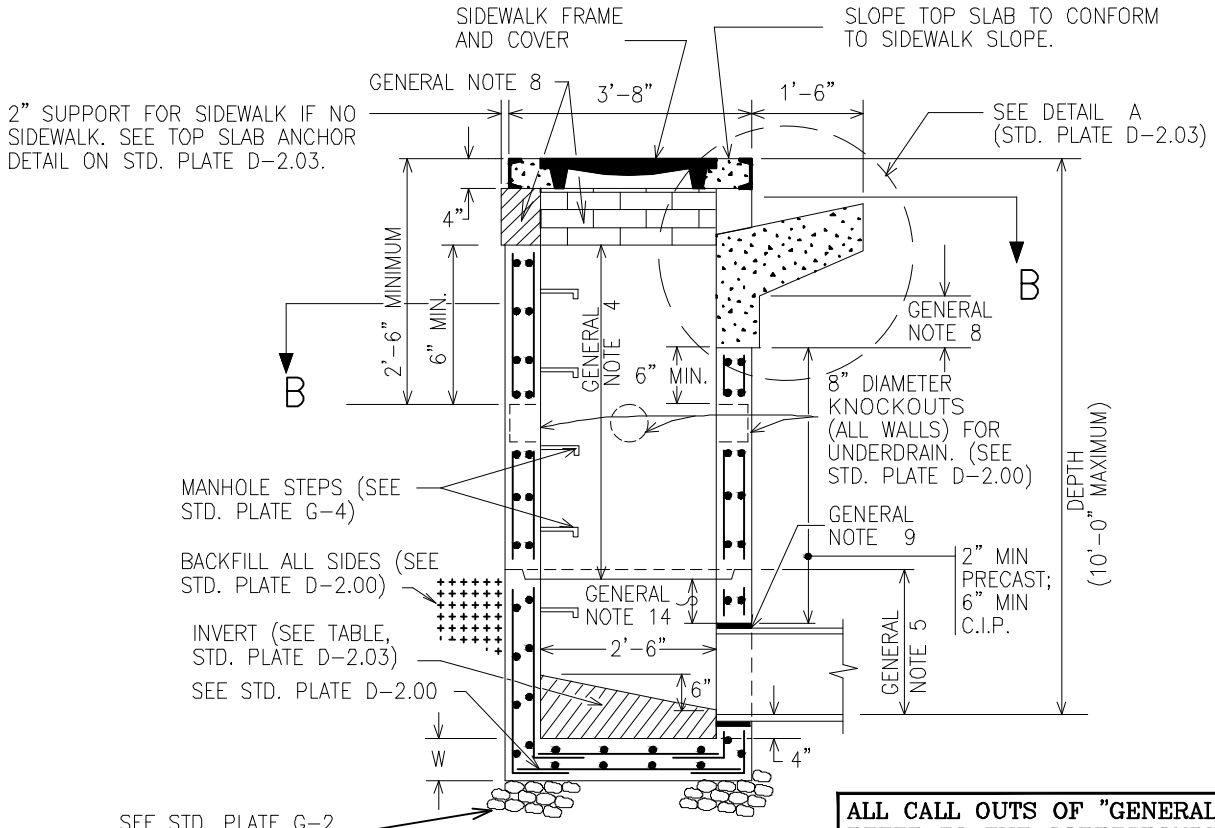
ISSUED: SEPTEMBER 2023

PLATE

D–2.00

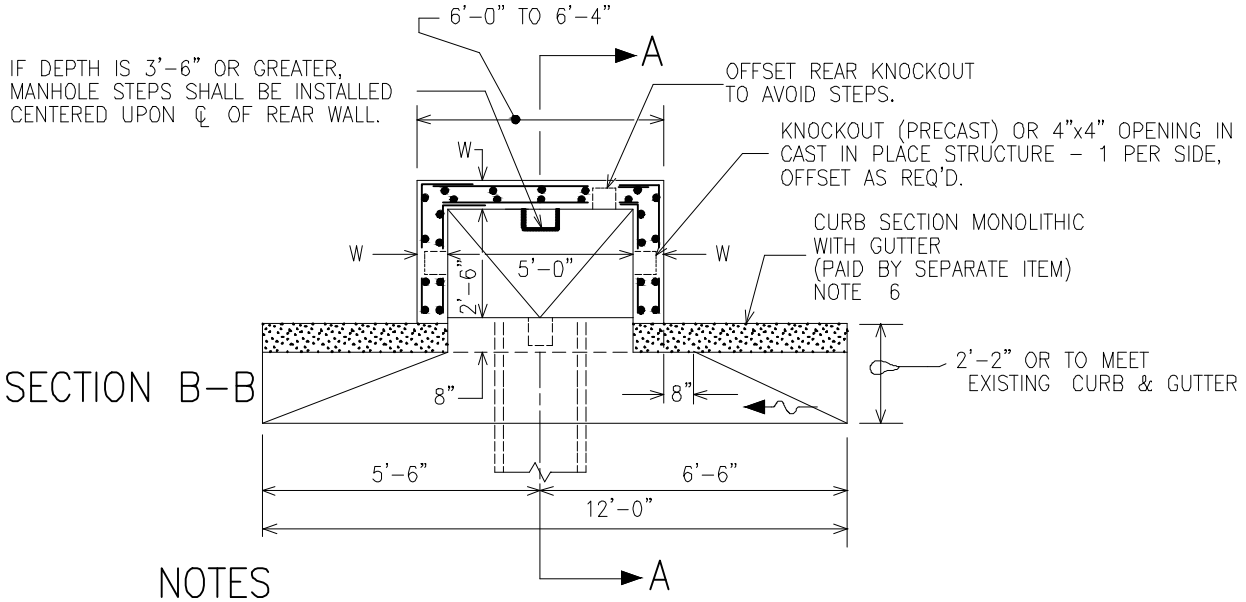
DATE 08/28/2023

FILE: Drains_Master.DWG



SECTION A-A

ALL CALL OUTS OF "GENERAL NOTE <#>" REFER TO THE CORRESPONDING GENERAL NOTE, ON PLATE D-2.00



SECTION B-B

NOTES

1. SEE STD. PLATE D-2.00 FOR GENERAL NOTES.
2. SEE STD. PLATE D-2.05 FOR PRECAST TOP SLAB.
3. DRAWING SHOWS PRECAST INLET. CAST-IN-PLACE INLET PER TABLE, STD. PLATE D-2.03.
4. PREVIOUSLY STD. PLATE D-2.00.
5. DEVELOPMENT PROJECTS: CURB SECTION PAID FOR BY THE HIGHWAY CONTRACT.

APPROVAL

DIRECTOR

BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023

DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

TYPE A-1 INLET

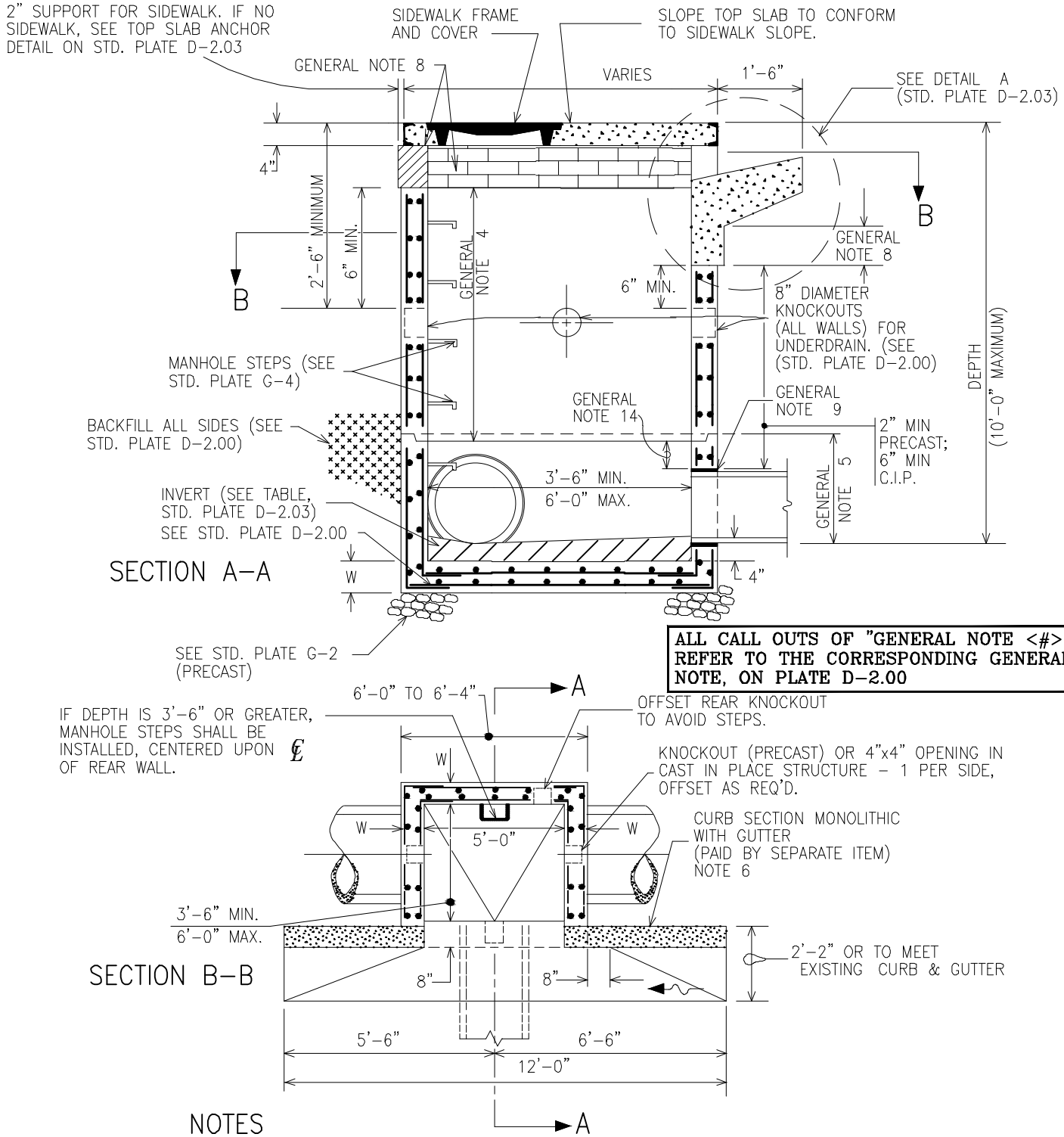
ISSUED: SEPTEMBER 2023

PLATE

D-2.01A

DATE: 08/28/2023

FILE: Drains_Master.DWG



ALL CALL OUTS OF "GENERAL NOTE <#>" REFER TO THE CORRESPONDING GENERAL NOTE, ON PLATE D-2.00

NOTES

1. SEE STD. PLATE D-2.00 FOR GENERAL NOTES.
2. SEE STD. PLATE D-2.05 FOR PRECAST TOP SLAB.
3. DRAWING SHOWS PRECAST INLET. CAST-IN-PLACE INLET PER TABLE, STD. PLATE D-2.03.
4. PREVIOUSLY STD. PLATE D-2.01.
5. DEVELOPMENT PROJECTS: CURB SECTION PAID FOR BY THE HIGHWAY CONTRACT.

BALTIMORE COUNTY MARYLAND

APPROVAL

DIRECTOR

BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023

DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

TYPE A-2 INLET

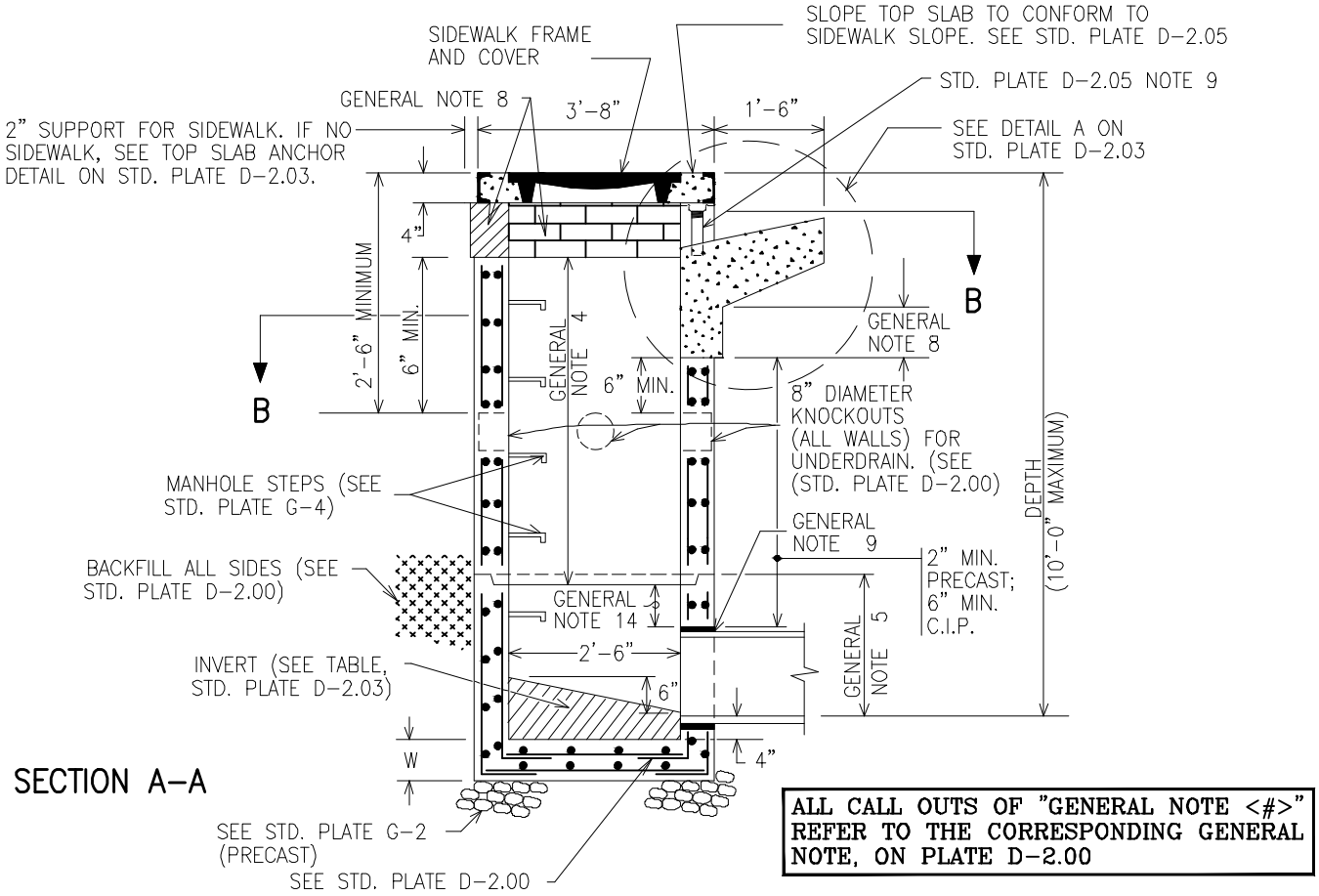
ISSUED: SEPTEMBER 2023

PLATE

D-2.01B

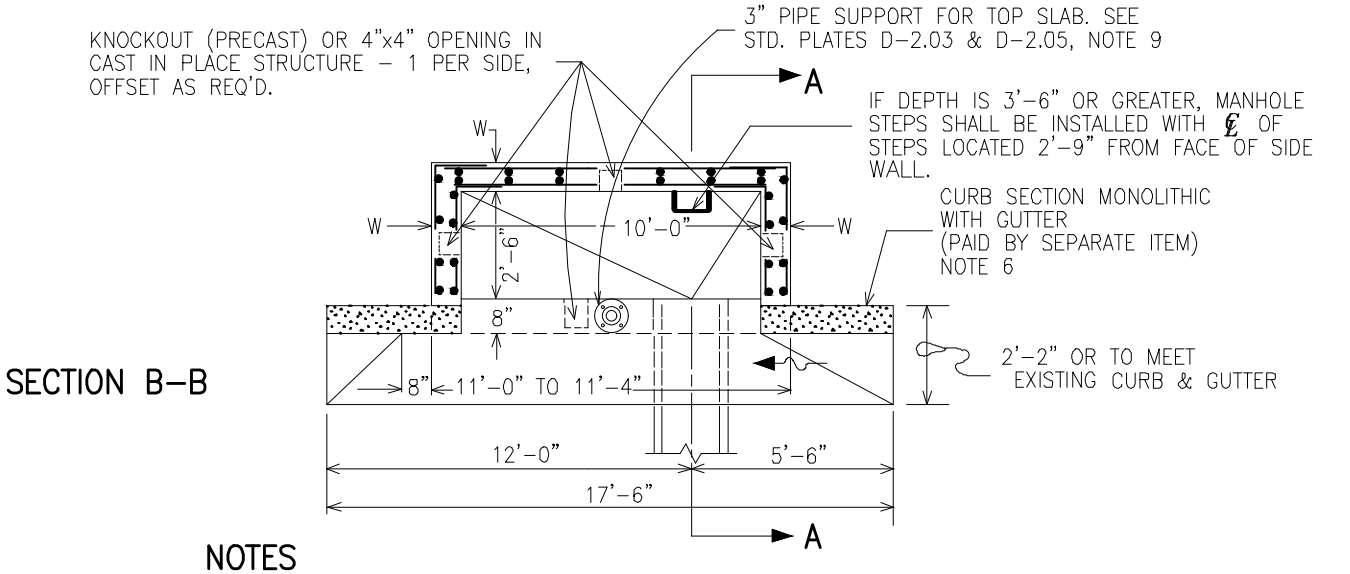
DATE: 08/28/2023

FILE: Drains_Master.DWG



SECTION A-A

ALL CALL OUTS OF "GENERAL NOTE <#>" REFER TO THE CORRESPONDING GENERAL NOTE, ON PLATE D-2.00



SECTION B-B

NOTES

1. SEE PLATE D-2.00 FOR GENERAL NOTES.
2. SEE PLATE D-2.05 FOR PRECAST TOP SLAB.
3. DRAWING SHOWS PRECAST INLET. CAST-IN-PLACE INLET PER TABLE, STD. PLATE D-2.03.
4. PREVIOUSLY STD. PLATE D-2.02
5. DEVELOPMENT PROJECTS: CURB SECTION PAID FOR BY THE HIGHWAY CONTRACT.

BALTIMORE COUNTY MARYLAND

APPROVAL

DIRECTOR

BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023

DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

TYPE B-1 INLET

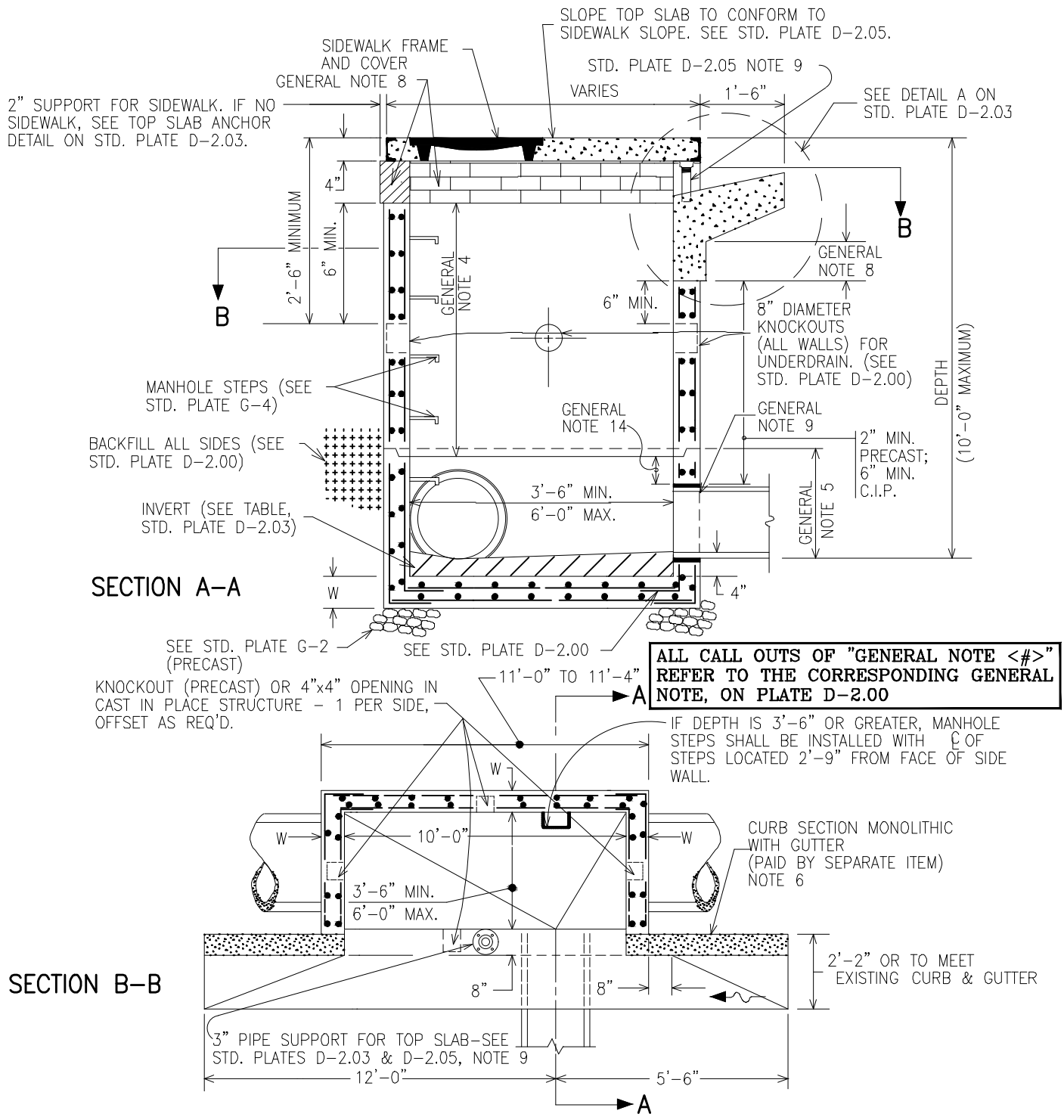
ISSUED: SEPTEMBER 2023

PLATE

D-2.02A

DATE: 08/28/2023

FILE: Drains_Master.DWG



NOTES

1. SEE PLATE D-2.00 FOR GENERAL NOTES.
2. SEE PLATE D-2.05 FOR PRECAST TOP SLAB.
3. DRAWING SHOWS PRECAST INLET. CAST-IN-PLACE INLET PER TABLE, STD. PLATE D-2.03.
4. PREVIOUSLY STD. PLATE D-2.03.
5. DEVELOPMENT PROJECTS: CURB SECTION PAID FOR BY THE HIGHWAY CONTRACT.

APPROVAL

DIRECTOR

BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023

DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

TYPE B-2 INLET

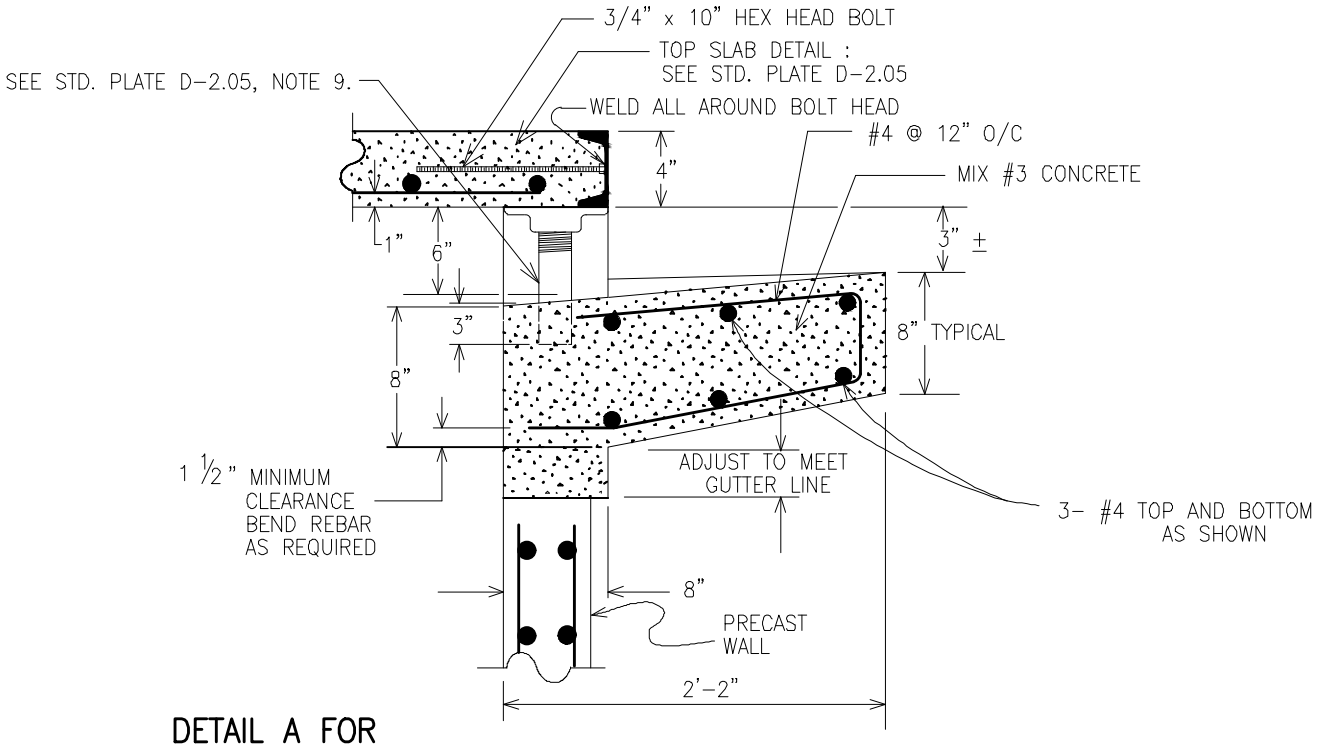
ISSUED: SEPTEMBER 2023

PLATE

D-2.02B

DATE: 08/28/2023

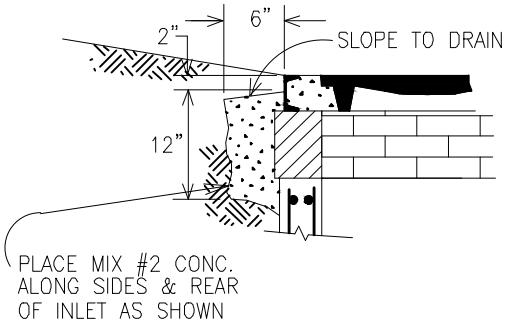
FILE: Drains_Master.DWG



DETAIL A FOR PRECAST A AND B INLETS

(SEE STD. PLATES D-2.01A & B, D-2.02 A & B)

ALL CALL OUTS OF "GENERAL NOTE <#>" REFER TO THE CORRESPONDING GENERAL NOTE, ON PLATE D-2.00



TOP SLAB ANCHOR DETAIL

(NO SIDEWALK)

	PRECAST	CAST-IN-PLACE (CIP)
W	6" MIN.	8" WIDE TO 7' DEPTH; 12" WIDE, 7' TO 10' DEPTH
REINF.	2 LAYERS- 4x4 W4.0 x W4.0- WWF	#4 @ 9" O/C E.W. IN BOTH FACES; 16" BAR LAPS; CONTIN-UOUS AT CORNERS
REINF.COVER	1.5 INCH MIN.	1.5 INCH MIN.
INVERT	APPROVED PRECAST, PLAIN MIX #3 CONCRETE OR BRICK	PLAIN MIX #3 CONCRETE OR BRICK
SUBGRADE OPENING	SEE PLATE D-2.00	4" x 4" OPENINGS OR AS DIRECTED.
CONCRETE	4,500 PSI	MIX NO. 3

APPROVAL

DIRECTOR

BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023

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DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

TYPE A & B INLET

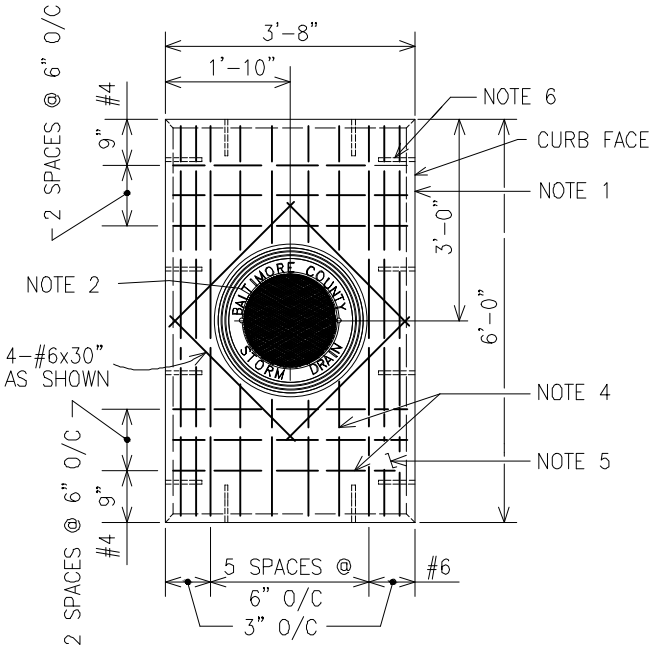
ISSUED: SEPTEMBER 2023

PLATE

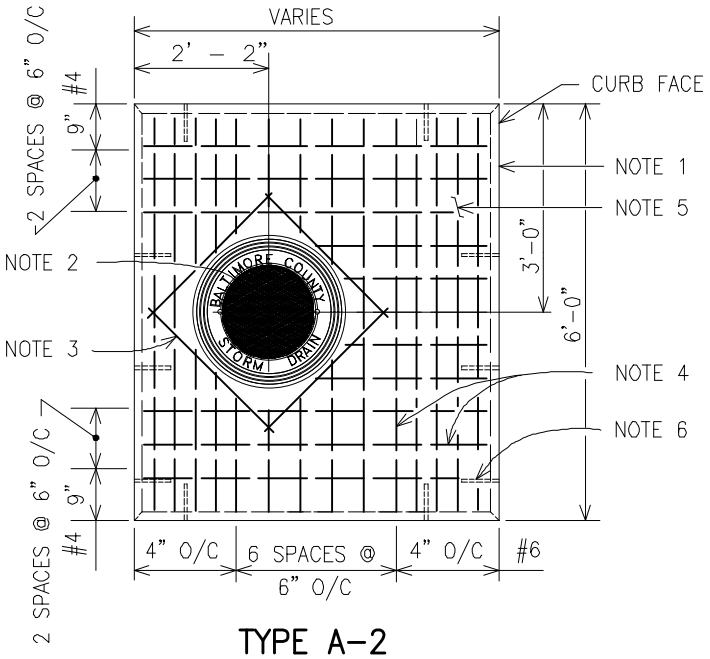
D-2.03

DATE: 08/28/2023

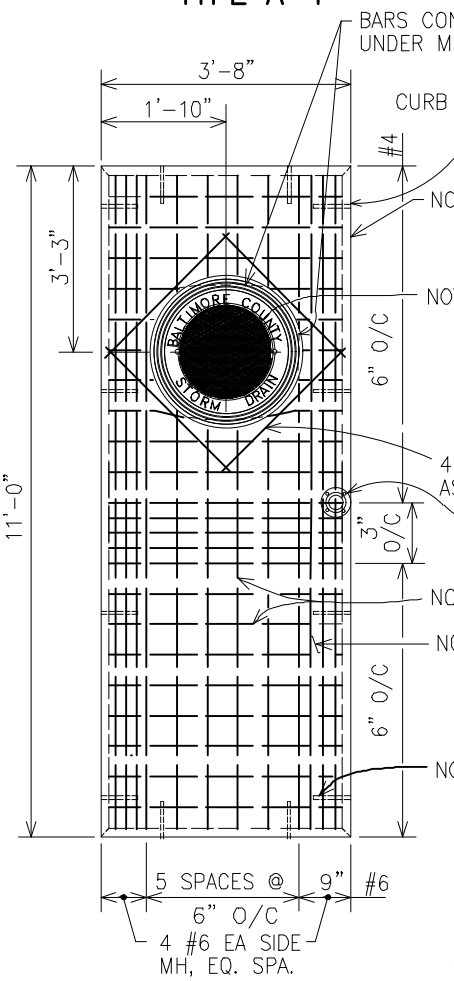
FILE: Drains_Master.DWG



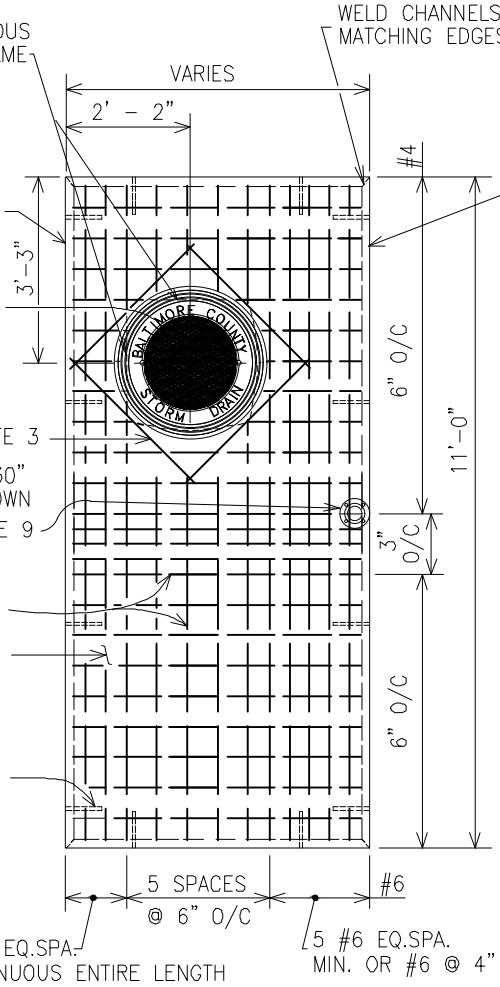
TYPE A-1



TYPE A-2



TYPE B-1



TYPE B-2

NOTES :

1. 4" ⊏ @ 7.25 LBS. (ALL 4 SIDES OF SLAB) TO BE PRIMERED AND PAINTED WITH AN APPROVED PAINT PRIOR TO DELIVERY, WITH AN ADDITIONAL FIELD COAT APPLIED AFTER INSTALLATION.
2. SIDEWALK FRAME AND COVER - SEE STD. PLATE D-3.06
3. 4-#6 x 36" AS SHOWN.
4. SLAB REINFORCING #6 BARS, 1" CLEAR FROM BOTTOM OF SLAB. #4 BARS OVER #6 BARS.
5. MIX NO. 3 CONCRETE.
6. ¾" x 10" HEX HEAD BOLTS WELDED TO ⊏ AS SHOWN ON STD. PLATE D-2.03.
7. SEE STD. PLATE D-2.03 FOR SECTIONAL VIEW OF TOP SLAB.
8. SLAB THICKNESS = 4"
9. 3" SCH. 40 PIPE W/THREADED END INTO 8" C.I. FLANGE @ TOP & EMBEDDED OR CORED 3" INTO GUTTER AT BOTTOM.

BALTIMORE COUNTY MARYLAND

APPROVAL

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BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023

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DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

TYPE A & B INLET PRECAST TOP SLABS

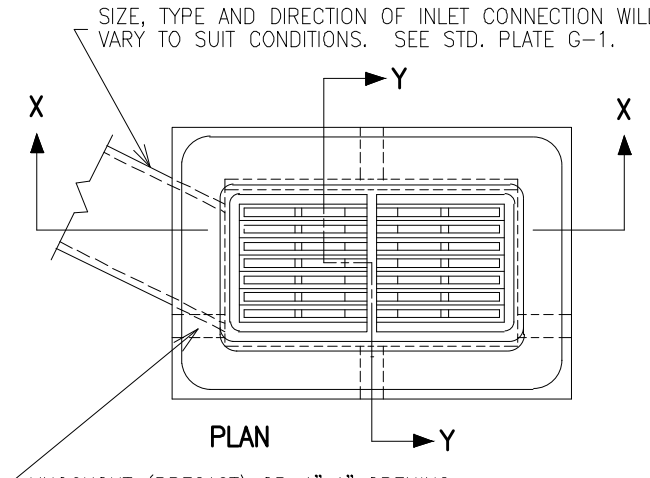
ISSUED: SEPTEMBER 2023

PLATE

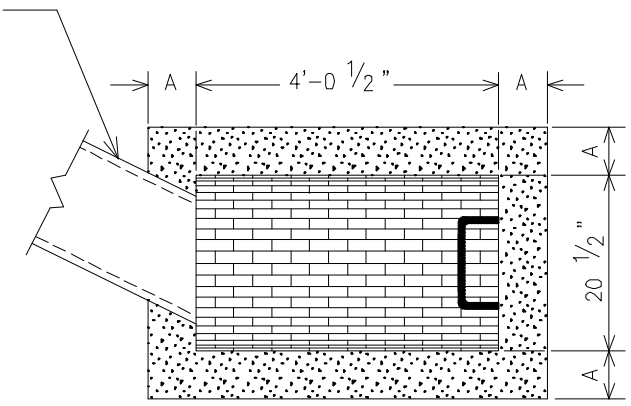
D-2.05

DATE: 08/28/2023

FILE: Drains_Master.DWG



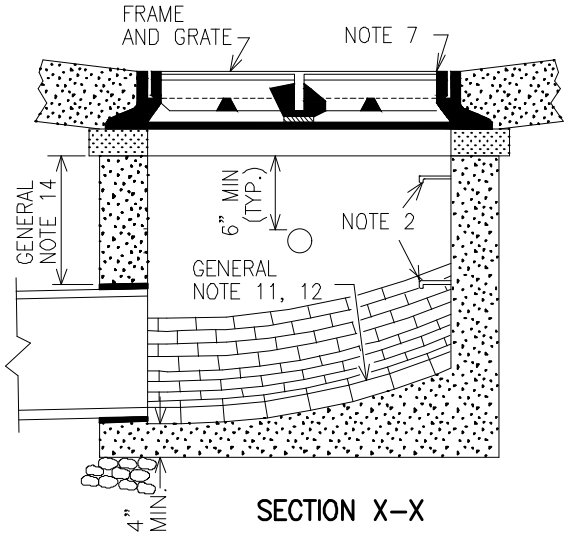
PLAN



PLAN OF INVERT

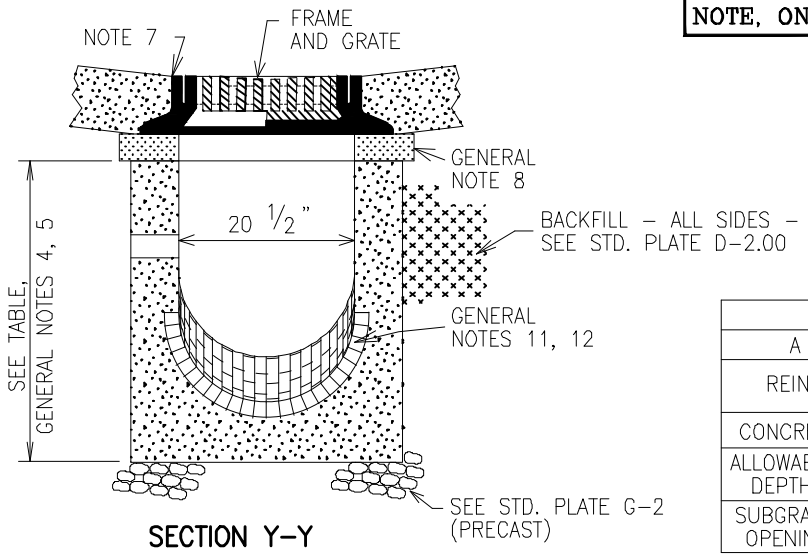
NOTES :

1. SEE STANDARD PLATE D–2.00 FOR GENERAL NOTES.
2. MANHOLE STEPS – SEE PLATE G–4.
3. PLACE 1/4" EXPANSION MATERIAL OF SAME TYPE APPROVED FOR PAVEMENT AT LOCATIONS SHOWN ON STD. PLATE D–2.26.
4. USE COMBINATION INLET IN SUMPS IN ROAD. SEE STANDARD PLATE D–2.07.
5. SUBGRADE DRAINAGE – 1 EACH WALL, OFFSET AS REQUIRED TO AVOID STEPS, PIPES. SEE TABLE.
6. CAST–IN–PLACE REINFORCEMENT REQUIRED ON OUTSIDE, AS WELL AS INSIDE, OF WALLS BELOW 7'–0" WHEN "H" IS GREATER THAN 7'–0". SPACING IS SAME AS FOR INSIDE OF WALL.
7. USE APPROVED BICYCLE SAFE GRATE (STD. PLATE D–2.09A) WITHIN ALLEYS AND PUBLIC ROAD RIGHT–OF–WAY. GRATE SHOWN SHALL BE USED ONLY OUTSIDE OF THESE AREAS.



SECTION X–X

ALL CALL OUTS OF "GENERAL NOTE <#>" REFER TO THE CORRESPONDING GENERAL NOTE, ON PLATE D–2.00



SECTION Y–Y

	PRECAST	CAST–IN–PLACE
A	6" MIN.	8 1/2 "
REINF.	2 LAYERS– 4x4 W4.0 x W4.0– WWF	#4 BARS @ 6"C/C EW 2" COVER (NOTE 6)
CONCRETE	4,500 PSI	MIX NO. 3
ALLOWABLE DEPTH	B.C.B.E/C APPROVAL REQUIRED OVER 10'	
SUBGRADE OPENING	AS SHOWN SEE PLATE D–2.00	4" x 4" OPENINGS OR AS DIRECTED.

BALTIMORE COUNTY MARYLAND

APPROVAL

DIRECTOR

BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023

DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

TYPE E INLET

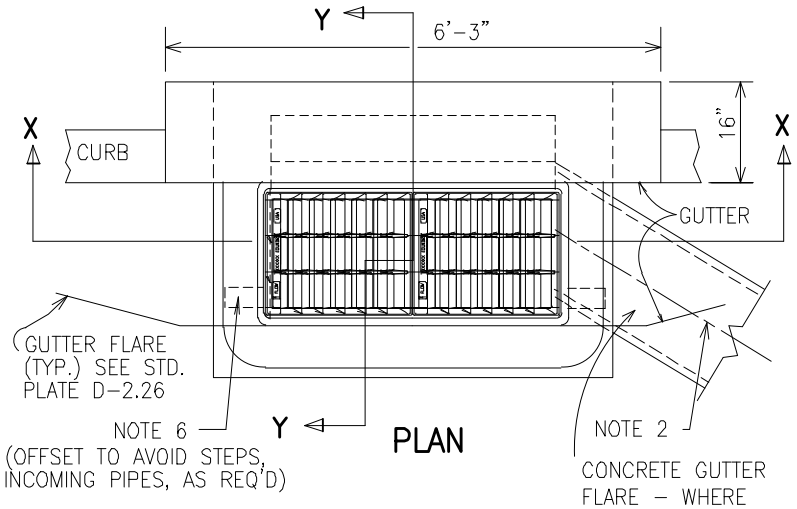
ISSUED: SEPTEMBER 2023

PLATE

D–2.06

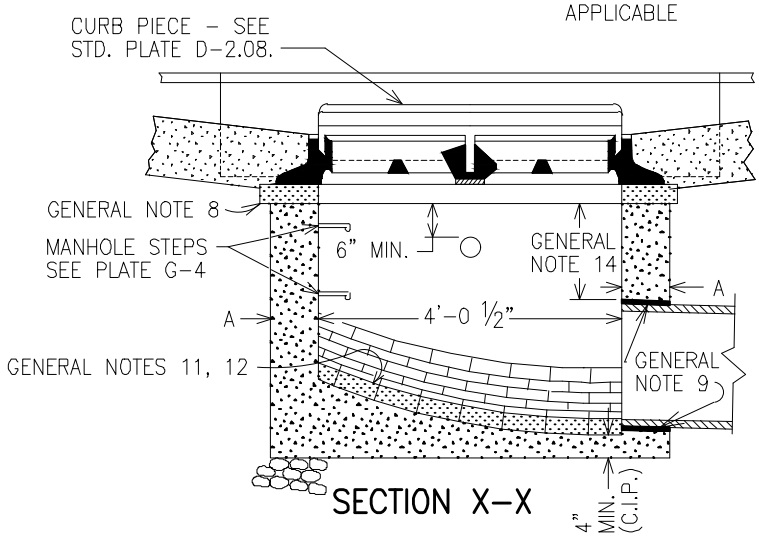
DATE: 08/28/2023

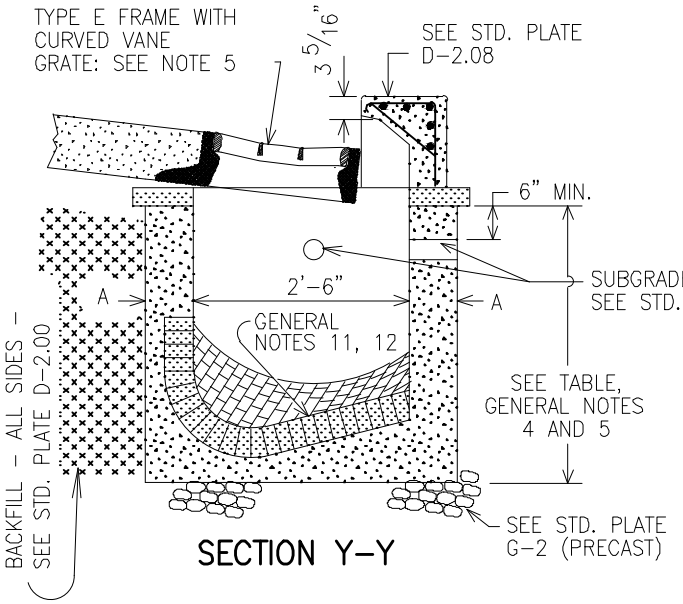
FILE: Drains_Master.DWG



NOTES :

1. SEE PLATE D-2.00 FOR GENERAL NOTES.
2. INLET MAY BE CONSTRUCTED OF REINFORCED OR PRECAST CONCRETE. SIZE, TYPE AND DIRECTION OF INLET CONNECTION WILL VARY TO SUIT CONDITIONS. SEE STD. PLATE G-1.
3. CAST-IN-PLACE REINFORCEMENT REQUIRED ON OUTSIDE, AS WELL AS INSIDE, OF WALLS BELOW 7'-0" WHEN 'H' IS GREATER THAN 7'-0". SPACING IS SAME AS FOR INSIDE OF WALL.
4. PLACE 1/4" EXPANSION MATERIAL OF SAME TYPE APPROVED FOR PAVEMENT AT LOCATIONS SHOWN ON PLATE D-2.26.
5. USE APPROVED BICYCLE-SAFE GRATE (PLATE D-2.09A, SHOWN) WITHIN RIGHT-OF-WAY.
6. SUBGRADE DRAINAGE - 1 EACH WALL - OFFSET AS REQUIRED. SEE TABLE.





ALL CALL OUTS OF "GENERAL NOTE <#>" REFER TO THE CORRESPONDING GENERAL NOTE, ON PLATE D-2.00

	PRECAST	CAST-IN-PLACE
A	6" MIN.	8 1/2 "
REINF.	2 LAYERS- 4x4 W4.0 x W4.0- WWF	#4 BARS @ 6"O/C E.W. 2" COVER (NOTE 3)
CONCRETE	4,500 PSI	MIX NO. 3
ALLOWABLE DEPTH	B.C.B.E/C APPROVAL REQUIRED OVER 15'	
SUBGRADE OPENING	SEE PLATE D-2.00	4" x 4" OPENINGS OR AS DIRECTED.

BALTIMORE COUNTY MARYLAND

APPROVAL

DIRECTOR

BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023

DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

TYPE E COMBINATION INLET

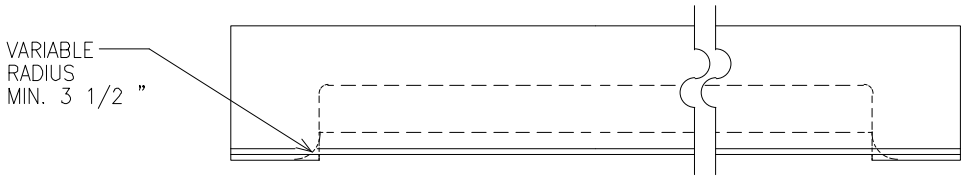
ISSUED: SEPTEMBER 2023

PLATE

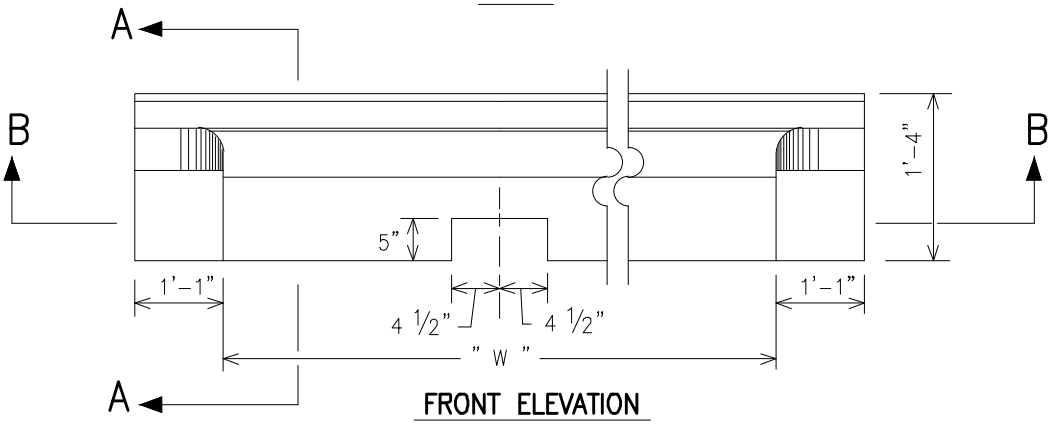
D-2.07

DATE: 08/28/2023

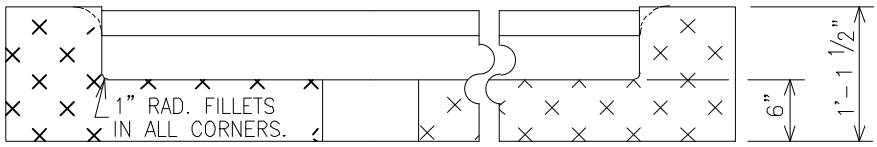
FILE: Drains_Master.DWG



PLAN

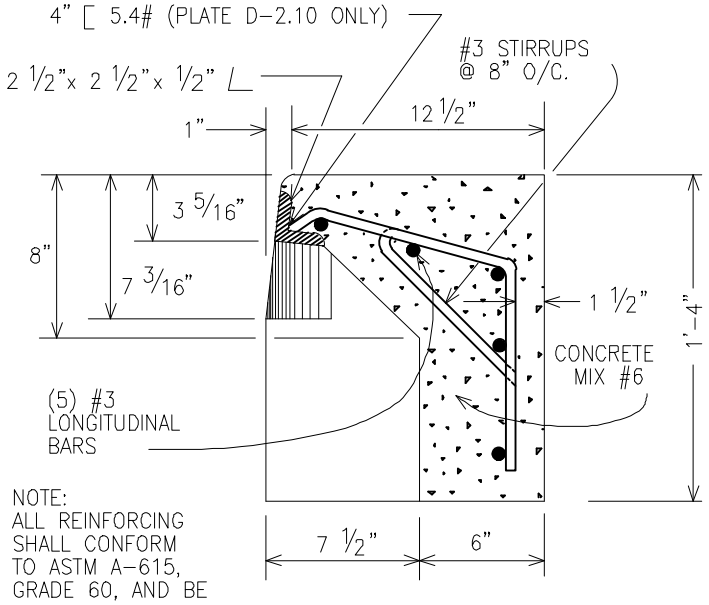


FRONT ELEVATION



SECTION B–B

#3 x 10" BENT BARS WELDED TO ∟ @ 16" O/C (SHOWN)
OR
4" [5.4# (PLATE D–2.10 ONLY)



NOTE:
ALL REINFORCING SHALL CONFORM TO ASTM A–615, GRADE 60, AND BE RUST–FREE AT WELDS.

SECTION A–A

SPECIAL PREFAB CURB DETAIL

NOTE: FOR STATE HIGHWAYS USE APPROPRIATE CURB PIECE FROM MdSHA DETAILS.

INLET TYPE	PLATE	THROAT WIDTH " W "	SUPPORT BEAM NOTCH
E COMB. †	D–2.07	4'–1"	OMIT
Dbl. E COMB. ‡	D–2.10	8'–2"	REQUIRED
S COMB. †	D–2.18	4'–1" *	OMIT
Dbl. S COMB. †	D–2.20	5'–6 1/2"	REQUIRED

* FOR S COMBINATION MODIFY FOR LEFT OR RIGHT INLET OFFSET. SEE PLAN AND SECTION "B–B" ON PLATE D–2.18.

† EXPOSED ANGLES TO BE GALVANIZED IN ACCORDANCE WITH A.S.T.M. A–123 EXCEPT FOR ADHERENCE WHICH SHALL BE IN ACCORDANCE WITH A.S.T.M. A–153.

‡ EXPOSED CHANNEL TO BE PRIMERED & PAINTED WITH APPROVED PAINT PRIOR TO DELIVERY.

BALTIMORE COUNTY MARYLAND

APPROVAL
DIRECTOR
BUR. OF ENGINEERING/CONSTRUCTION
SEPTEMBER 28, 2023
DATE

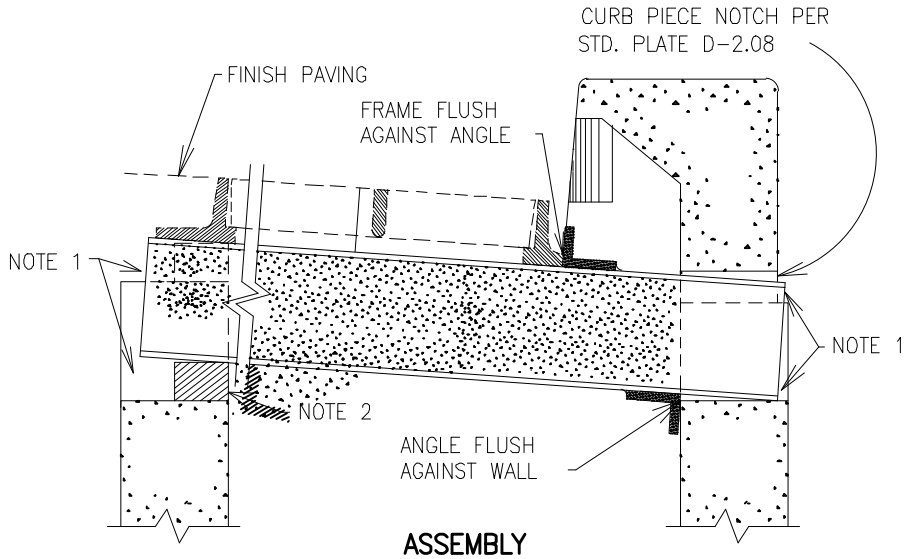
DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION
STORM DRAINAGE DETAILS

COMBINATION INLET
CURB PIECE

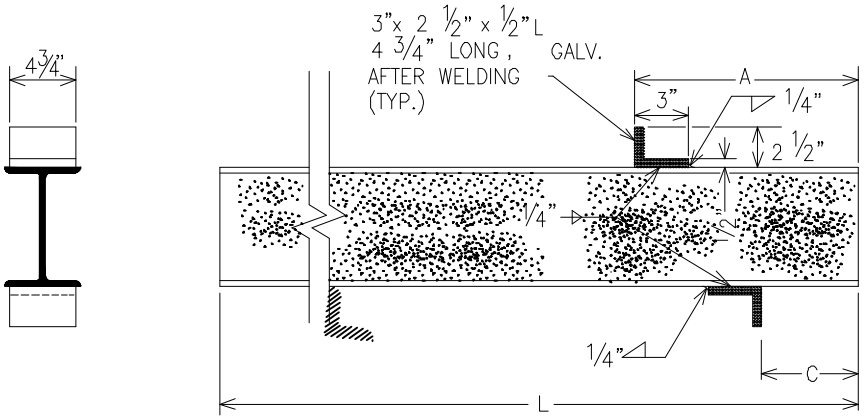
ISSUED: SEPTEMBER 2023

PLATE
D–2.08

DATE: 08/28/2023
FILE: Drains_Master.DWG



ASSEMBLY



END VIEW SIDE VIEW

SUPPORT BEAM

NOTES

1. OPENINGS IN FRONT AND REAR WALLS FOR BEAM SHALL BE FILLED WITH MIX #3 CONCRETE OR BRICK (MORTARED AND SEALED ON BOTH SIDES).
2. PROVIDE DURABLE, NON-DETERIORATING SUPPORT PIECE TO ADJUST SUPPORT BEAM AND FRAME TO STREET GRADE. USE OF WOOD IS FORBIDDEN.
3. SUPPORT BEAMS SHALL BE GALVANIZED AFTER FABRICATION.

TYPE OF INLET	STD. PLATE	CONSTRUCTION METHOD	BEAM	L	A	C
DBL E COMB.	D-2.10	PRECAST	W 5 x 19	3'-10"	1'-3"	7-1/2"
DBL E COMB.	D-2.10	CAST IN PLACE	W 5 x 19	3'-10"	1'-3"	7-1/2"
DBL S COMB.	D-2.20	PRECAST	W 8 x 21	4'-6"	1'-3"	7-1/2"
DBL S COMB.	D-2.20	CAST IN PLACE	W 8 x 21	4'-6"	1'-3"	7-1/2"

APPROVAL

DIRECTOR

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SEPTEMBER 28, 2023

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DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

SUPPORT BEAM FOR FRAMES ON DOUBLE COMBINATION INLETS

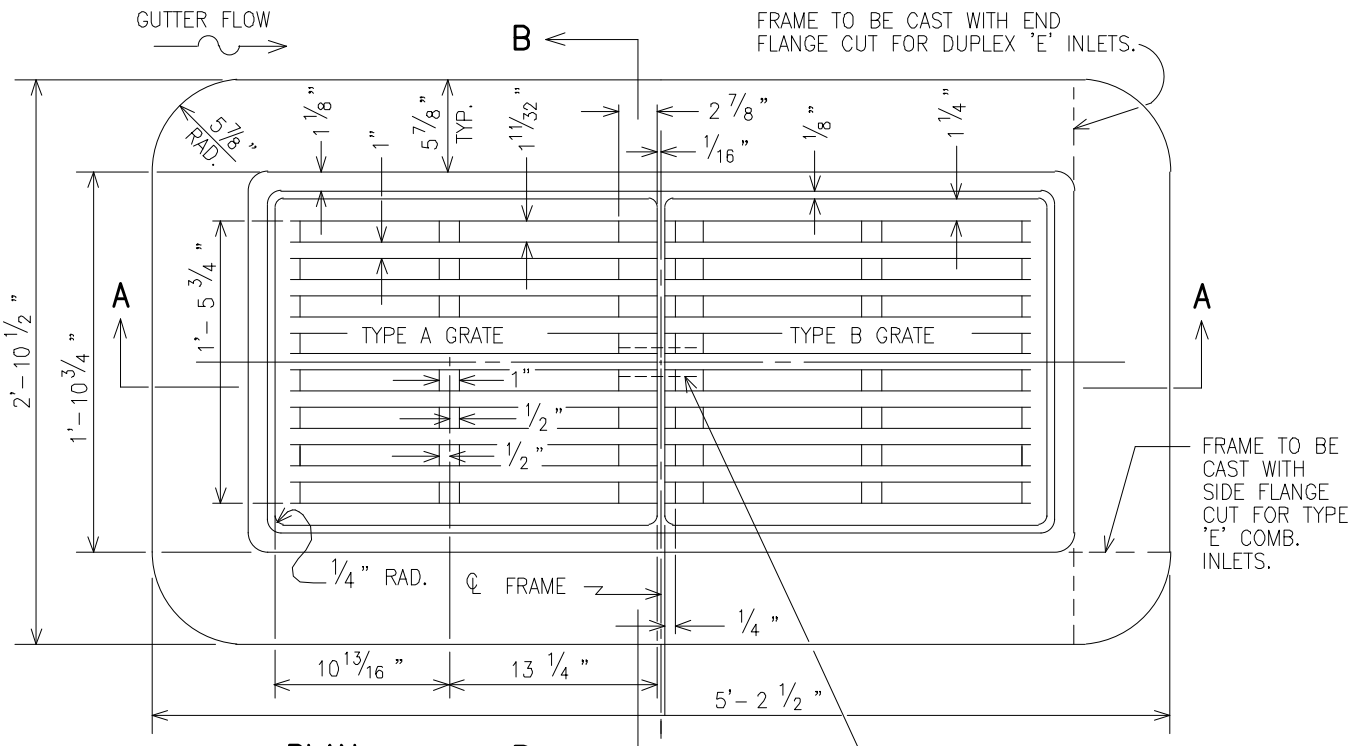
ISSUED: SEPTEMBER 2023

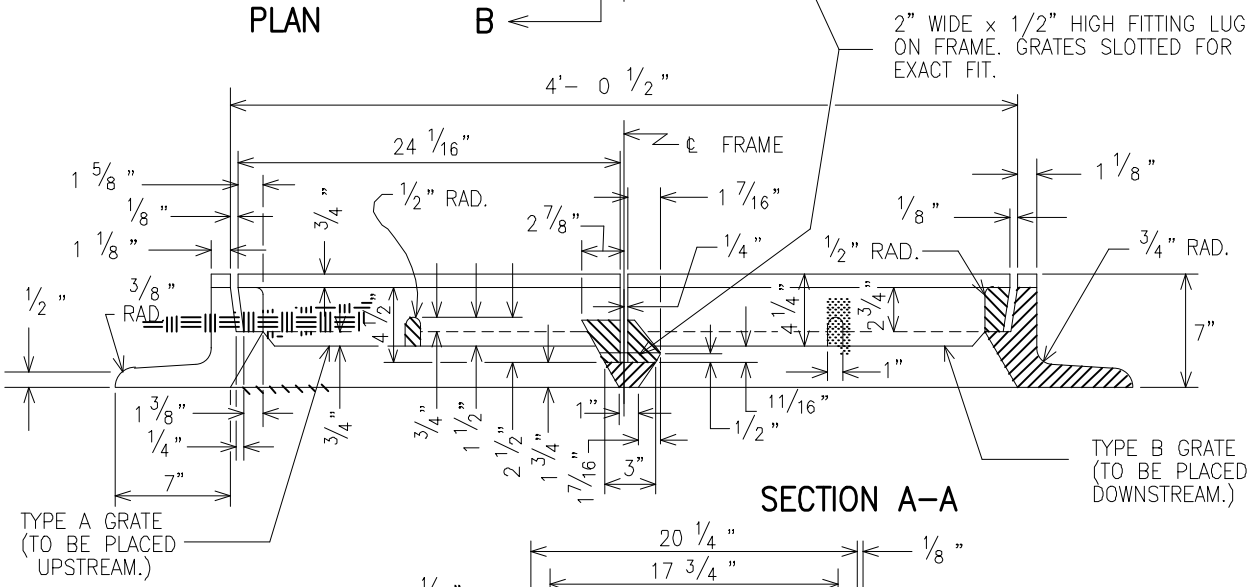
PLATE

D-2.08A

DATE: 08/28/2023

FILE: Drains_Master.DWG



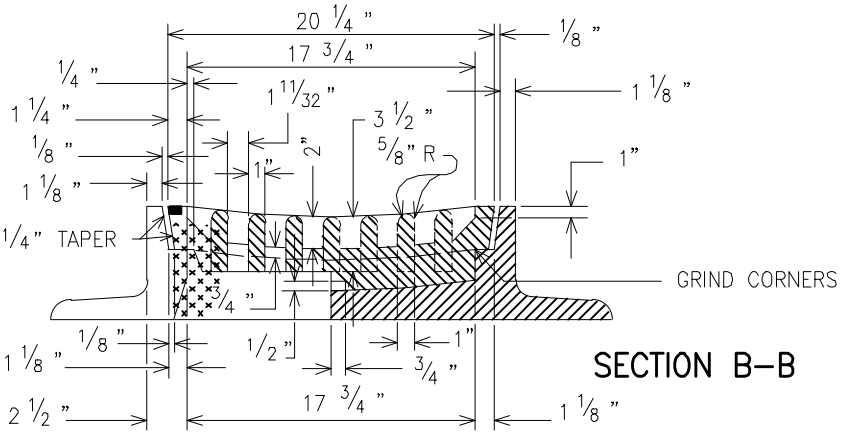


NOTE :

GRATE SHOWN SHALL BE USED ONLY FOR INLETS LOCATED OUTSIDE OF PUBLIC ROAD R/W. USE CURVED VANE GRATE OR OTHER APPROVED BICYCLE-SAFE GRATE WITHIN RIGHT-OF-WAY.

CASTING MATERIALS SHALL BE GREY IRON.

APPROXIMATE WEIGHTS EACH
GRATE- 216 Lbs.
FRAME (FULL FLANGE)-
668 Lbs.



APPROVAL

DIRECTOR

BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023
DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

TYPE E INLET
FRAME AND GRATE

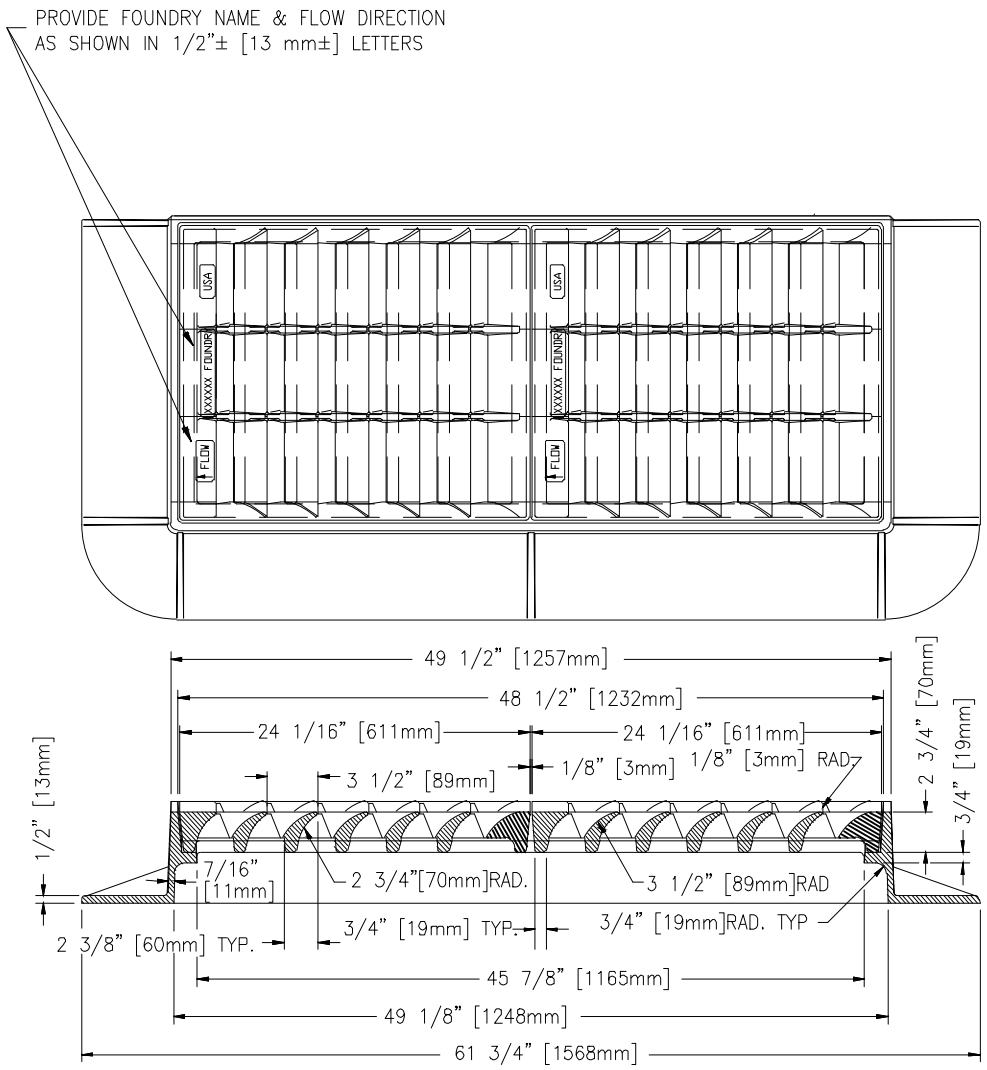
ISSUED: SEPTEMBER 2023

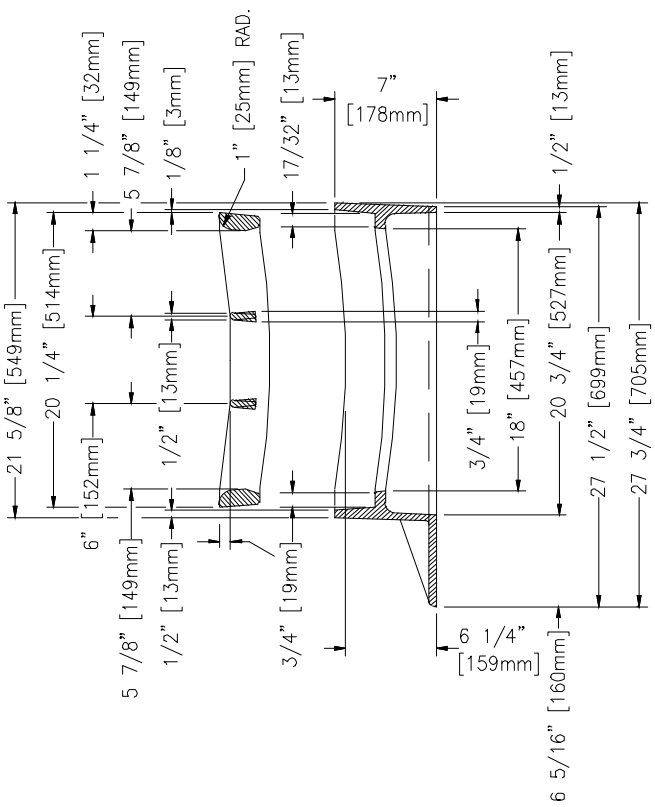
PLATE

D-2.09

DATE: 08/28/2023

FILE: Drains_Master.DWG





NOTE: ALL DIMENSIONS ARE SHOWN IN ENGLISH AND [METRIC].

MATERIAL: CAST GRAY IRON ASTM A-48, CLASS 35B

WEIGHT: GRATE APPROX. 230#

GRATE SHALL SIT SQUARE UPON FRAME SUPPORTS WITHOUT ROCKING OR SHIFTING UNDER LOAD. GRATE SHALL MEET OR EXCEED AASHTO M 306 PROOF LOAD REQUIREMENTS.

FRAME: PER THIS DETAIL OR PER DETAIL D-2.09

APPROVAL

DIRECTOR

BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023

DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

CURVED VANE (E-CV) GRATE WITH CLASS 35 TYPE E FRAME

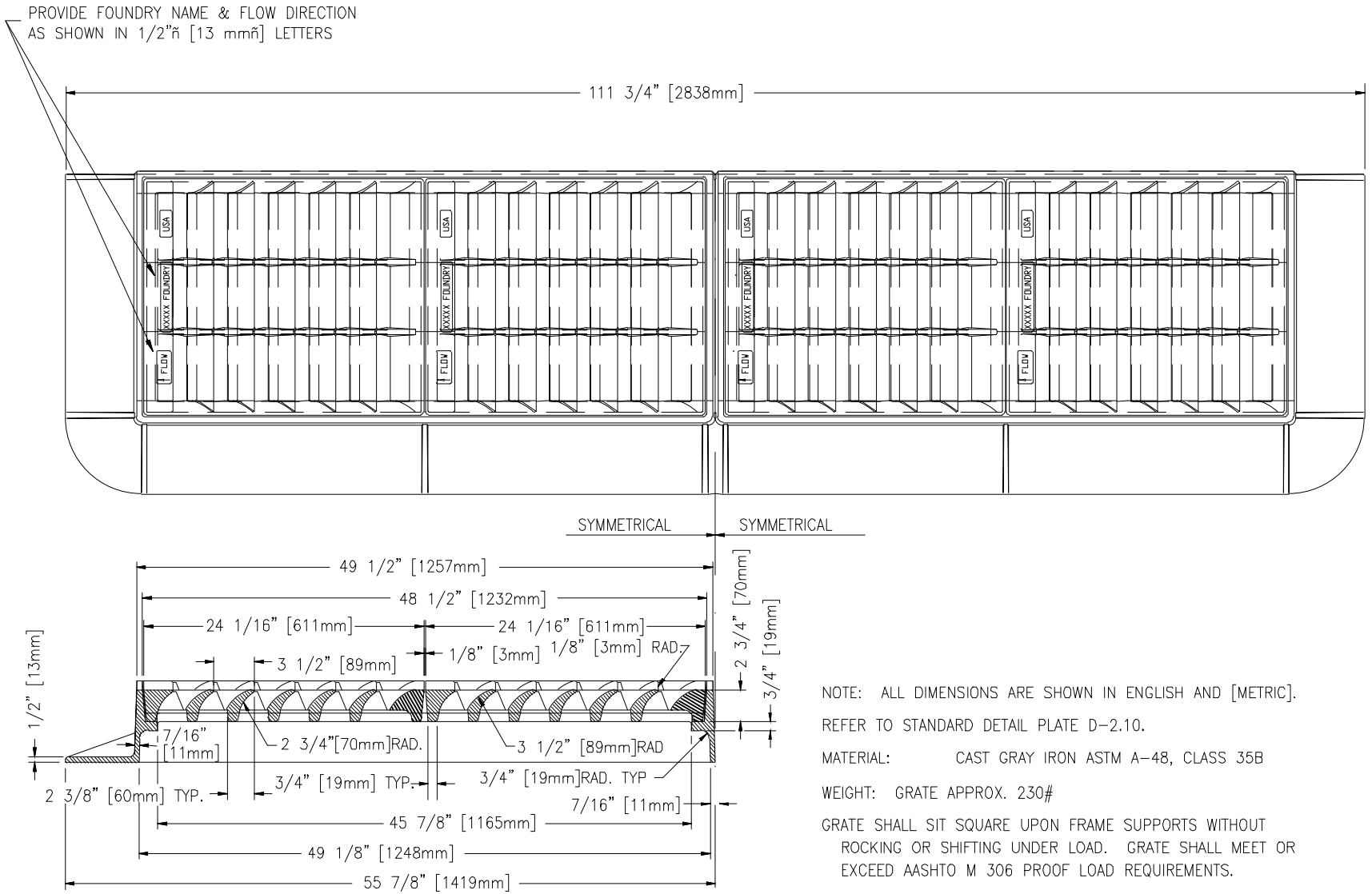
ISSUED: SEPTEMBER 2023

PLATE

D-2.09A

DATE 08/28/2023

FILE: Drains_Master.DWG



NOTE: ALL DIMENSIONS ARE SHOWN IN ENGLISH AND [METRIC].

REFER TO STANDARD DETAIL PLATE D-2.10.

MATERIAL: CAST GRAY IRON ASTM A-48, CLASS 35B

WEIGHT: GRATE APPROX. 230#

GRATE SHALL SIT SQUARE UPON FRAME SUPPORTS WITHOUT ROCKING OR SHIFTING UNDER LOAD. GRATE SHALL MEET OR EXCEED AASHTO M 306 PROOF LOAD REQUIREMENTS.

FRAME: PER THIS DETAIL OR PER DETAIL D-2.09

BALTIMORE COUNTY MARYLAND

APPROVAL

DIRECTOR

BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023

DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

DOUBLE TYPE E INLET

CLASS 35 FRAME WITH CURVED VANE (E-CV) GRATE

ISSUED: SEPTEMBER 2023

PLATE

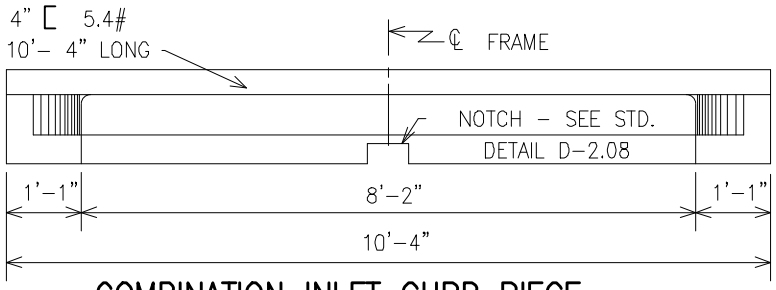
D-2.09B

DATE:08/28/2023

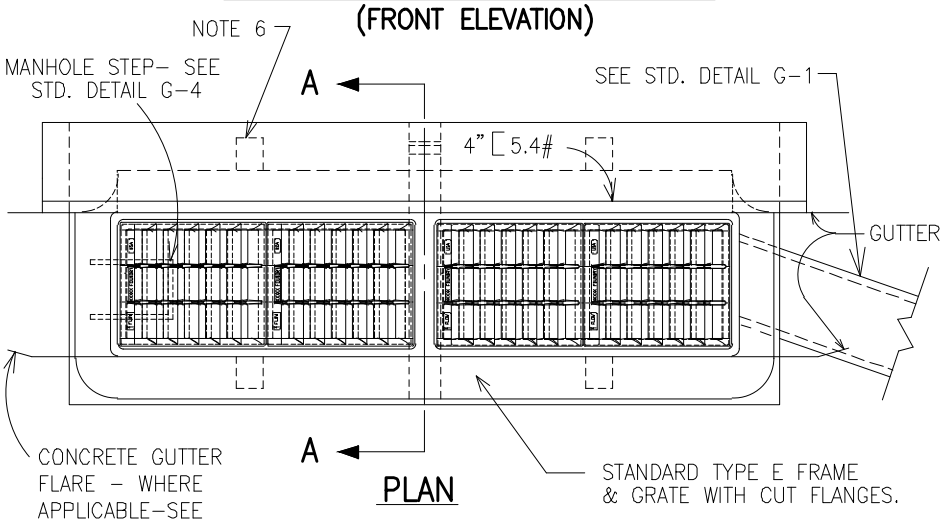
FILE:Drains_Master.DWG

NOTES

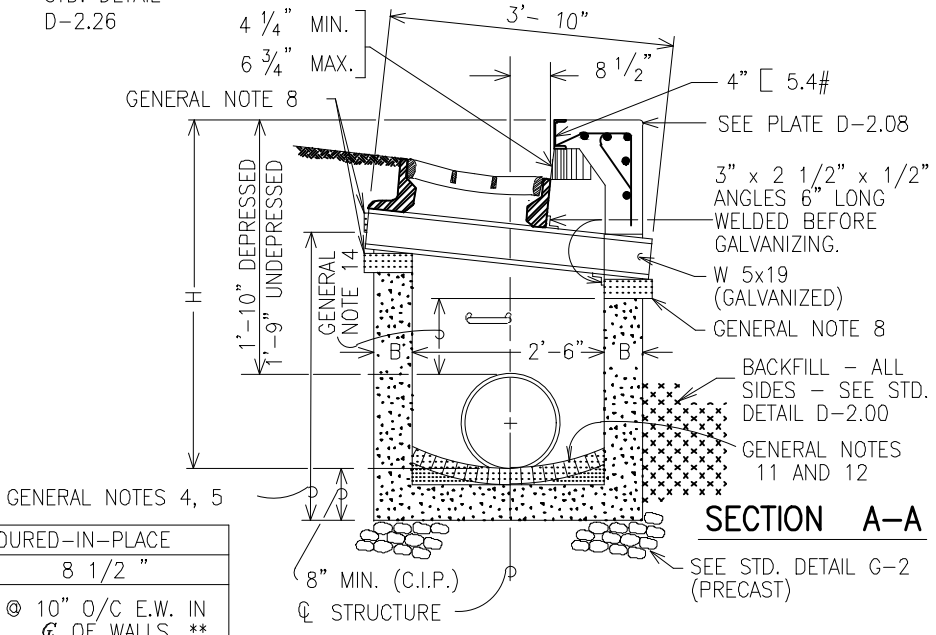
1. SEE STD. DETAIL D–2.00 FOR GENERAL NOTES.
2. INLET MAY BE CONSTRUCTED OF REINFORCED OR PRECAST CONCRETE. SIZE, TYPE & DIRECTION OF INLET CONNECTIONS WILL VARY TO SUIT CONDITIONS. SEE DETAIL G–1.
3. USE CURVED VANE GRATE (D–2.09B) AS SHOWN WITHIN ROAD RIGHT–OF–WAY.
4. PLACE 1/4" EXPANSION MATERIAL OF SAME TYPE APPROVED FOR PAVEMENT AT LOCATIONS SHOWN ON DETAIL D–2.26.
5. MIN. 6" CLEAR BETWEEN SUPPORT BEAM & PIPES IN FRONT OR REAR WALL.
6. SUBGRADE DRAINS – 2 EA. IN FRONT & REAR WALL – SEE TABLE
7. INLET FRAME SUPPORT BEAMS – SEE STD. DETAIL D–2.08A



COMBINATION INLET CURB PIECE (FRONT ELEVATION)



PLAN



SECTION A–A

	PRECAST	POURED–IN–PLACE
B	8" MIN.	8 1/2 "
REINF.	2 LAYERS– 4x4 W4.0 x W4.0– WWF	#4 @ 10" O/C E.W. IN ℄ OF WALLS. **
CONCRETE	4,500 PSI	MIX NO. 3
ALLOWABLE DEPTH	B.C.B.E/C APPROVAL REQUIRED IF H > 12'	
SUBGRADE OPENING	SEE DETAIL D–2.00	4" x 4" OPENINGS OR AS DIRECTED.

** REINFORCING CONTINUOUS AT CORNERS. ALL LAPS 1' – 4".

APPROVAL

DIRECTOR

BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023

DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

DOUBLE TYPE E COMBINATION INLET

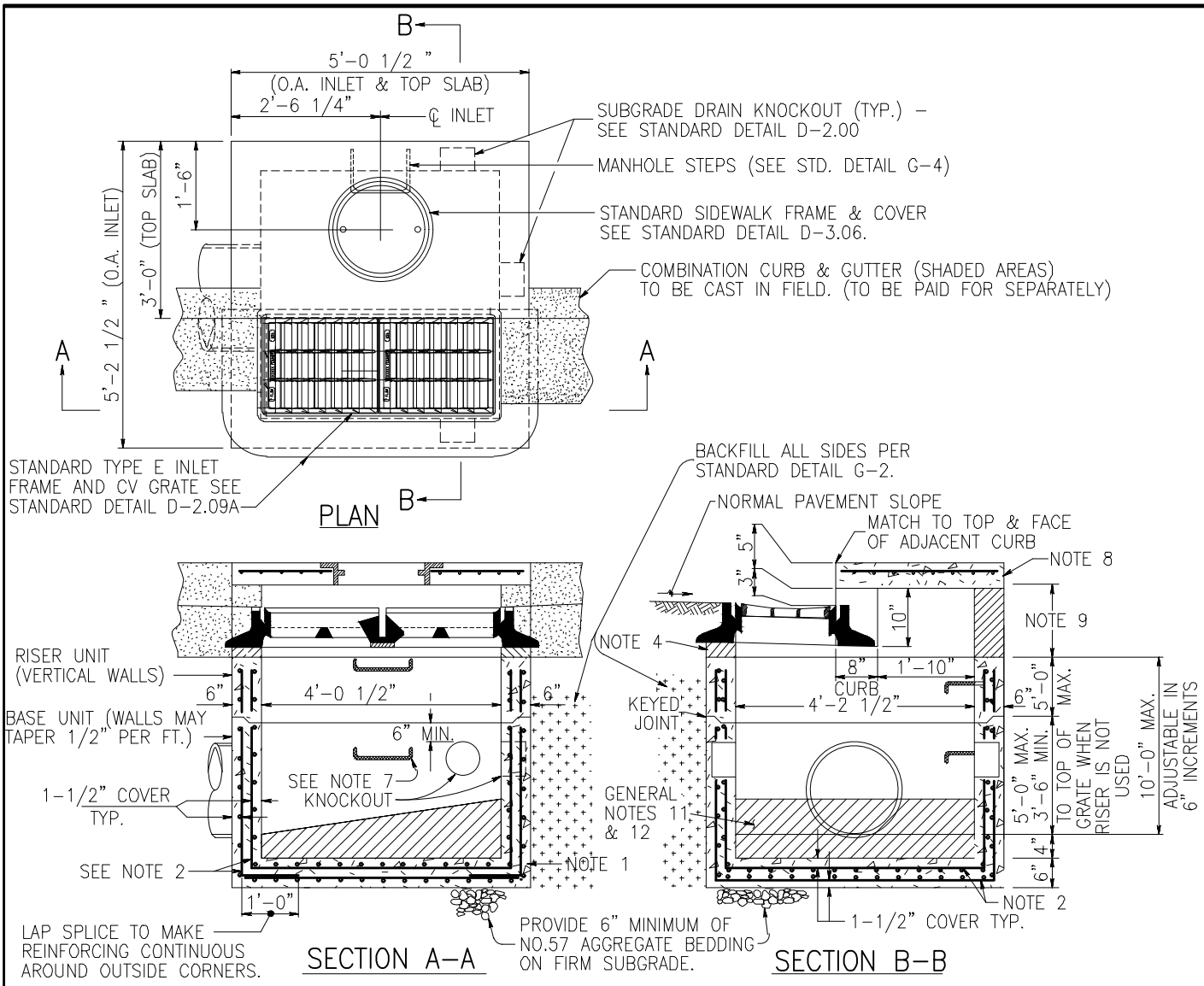
ISSUED: SEPTEMBER 2023

PLATE

D–2.10

DATE: 08/28/2023

FILE: Drains_Master.DWG



NOTES

1. CONCRETE TO BE 4500 PSI.
2. REINFORCING–2 LAYERS OF 4x4–W4.0xW4.0 WELDED WIRE FABRIC.
3. THREADED PLASTIC INSERTS TO BE PROVIDED FOR HANDLING.
4. GRADE AND SLOPE ADJUSTMENTS TO BE COMPLETED IN THE FIELD USING CONCRETE MIX NO.6.
5. PIPE OPENINGS TO BE PROVIDED AS REQUIRED. FOR SIZE, LOCATION, AND INVERT ELEVATIONS REFER TO THE PLANS.
6. PLACEMENT OF SUBGRADE DRAINAGE WILL BE AS DIRECTED BY THE ENGINEER OR AS NOTED ON THE PLANS.
7. MANHOLE STEPS SHALL BE IN ACCORDANCE WITH STANDARD DETAIL G-4.
8. 5" THICK PRECAST TOP SLAB, CONCRETE TO BE 4500 PSI. PLACE LAYER OF 4x4–W4.0x W4.0 WELDED WIRE FABRIC OR NO.4 DEFORMED BARS 6" C/C 2 WAYS.
9. FIELD–CONSTRUCT THIS PORTION OF INLET USING BRICK MASONRY OR REINFORCED CONCRETE MIX #6. REINFORCE WITH TWO LAYERS OF 4x4–W4.0xW4.0 WELDED WIRE FABRIC OR NO. 4 DEFORMED BARS 6" C/C EACH WAY.
10. SEE STANDARD DETAIL D–2.00 FOR GENERAL NOTES.

BALTIMORE COUNTY MARYLAND

APPROVAL

DIRECTOR

BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023

DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

TYPE H COMBINATION INLET PRECAST STANDARD

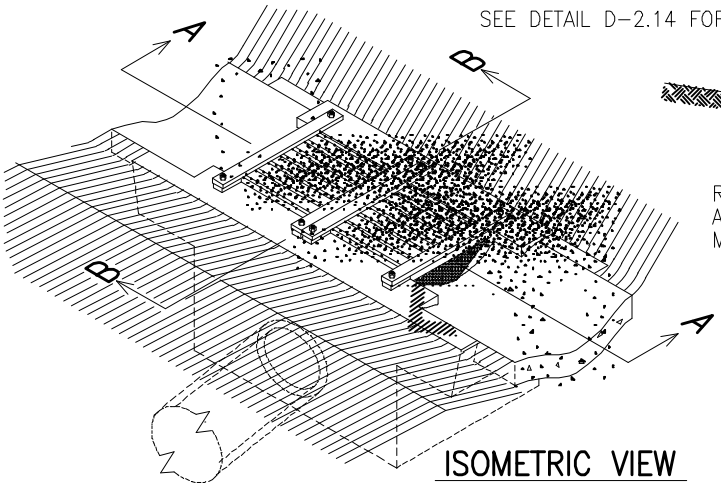
ISSUED: SEPTEMBER 2023

PLATE

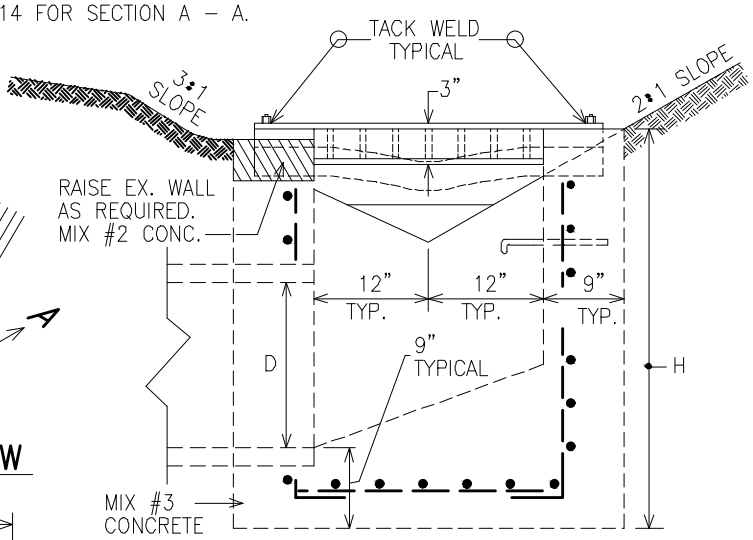
D–2.12

DATE: 08/28/2023

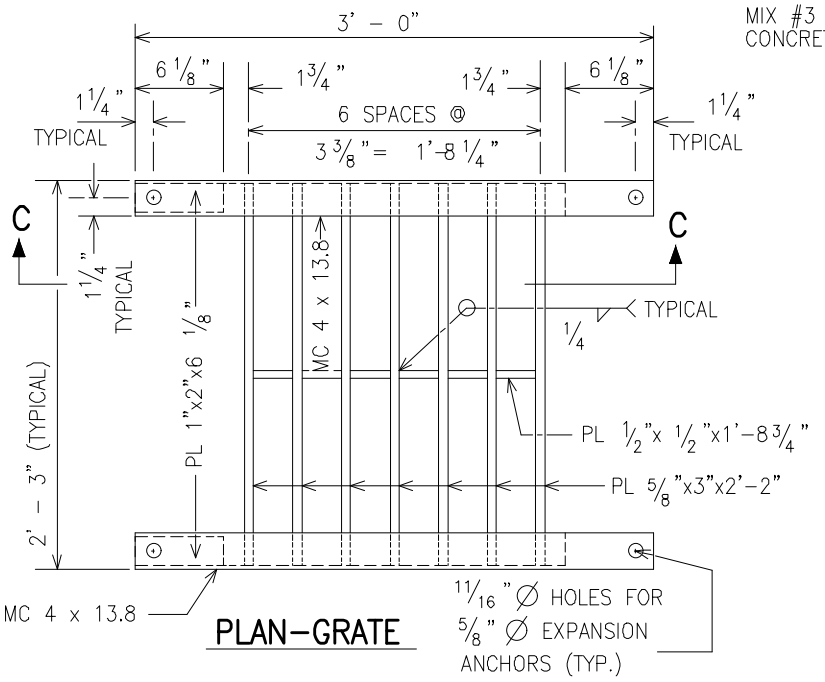
FILE: Drains_Master.DWG



ISOMETRIC VIEW

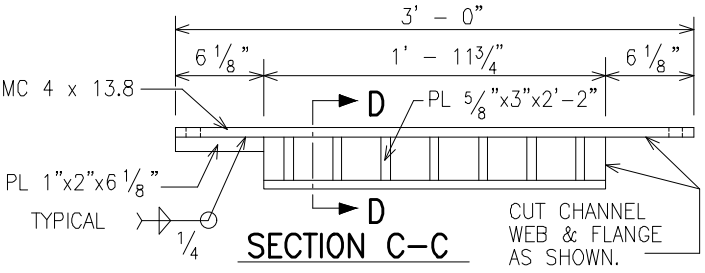


SECTION B-B

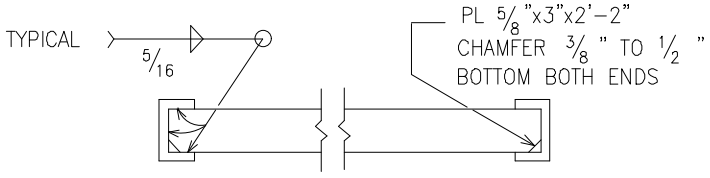


PLAN-GRATE

DIMENSIONS		
D	L	H
12"	4'-0"	2'-10"
15"	4'-0"	3'-1"
18"	4'-0"	3'-4"
21"	4'-0"	3'-7"
24"	5'-0"	3'-10"
30"	6'-0"	4'-4"
36"	6'-0"	4'-10"



SECTION C-C



SECTION D-D

NOTES :

1. GRATE 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. A-153 .
2. GRATE TO BE OF STEEL CONSTRUCTION AND SHALL BE SQUARE, FLAT AND TRUE.
3. INSTALL FOUR 5/8 " DIA. CONCRETE EXPANSION ANCHORS WITH FOUR 5/8 " DIA. HEX. HEAD BOLTS. (GALVANIZED)
4. WHEN INLETS ARE ON GRADE, OMIT CONCRETE GUTTER ON ONE SIDE AND BUILD UP WALL TO CLOSE END.
5. WHEN TRIPLE GRATE IS REQUIRED, SEE SPECIAL PROVISIONS. CONTACT DPW-ENGINEERING AND CONSTRUCTION.

APPROVAL

DIRECTOR

BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023
DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

TYPE J INLET
PRECAST STANDARD

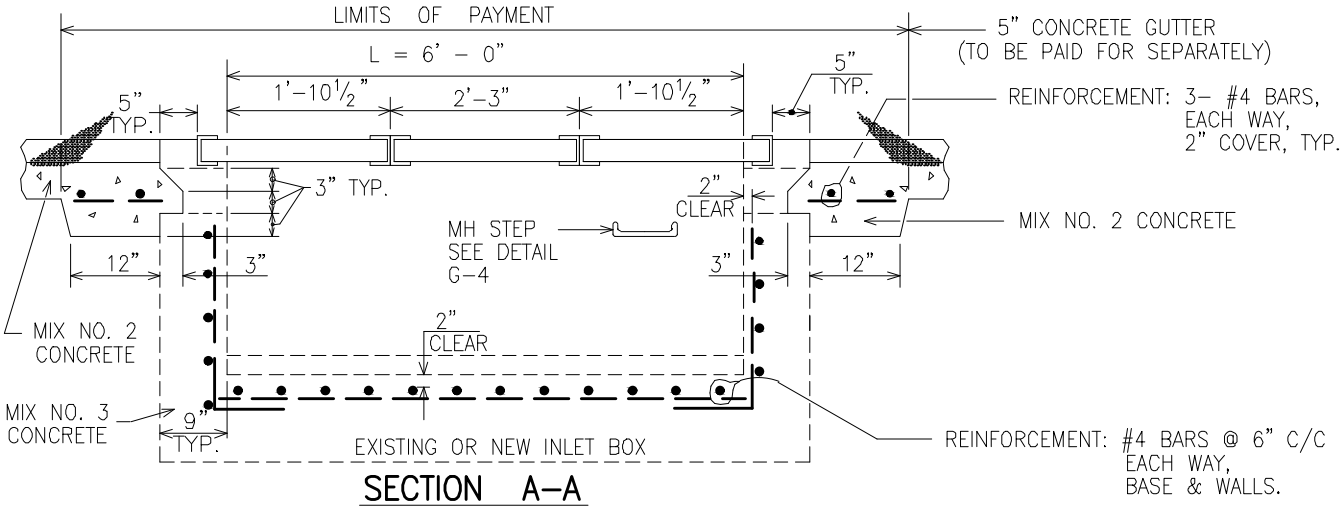
ISSUED: SEPTEMBER 2023

PLATE

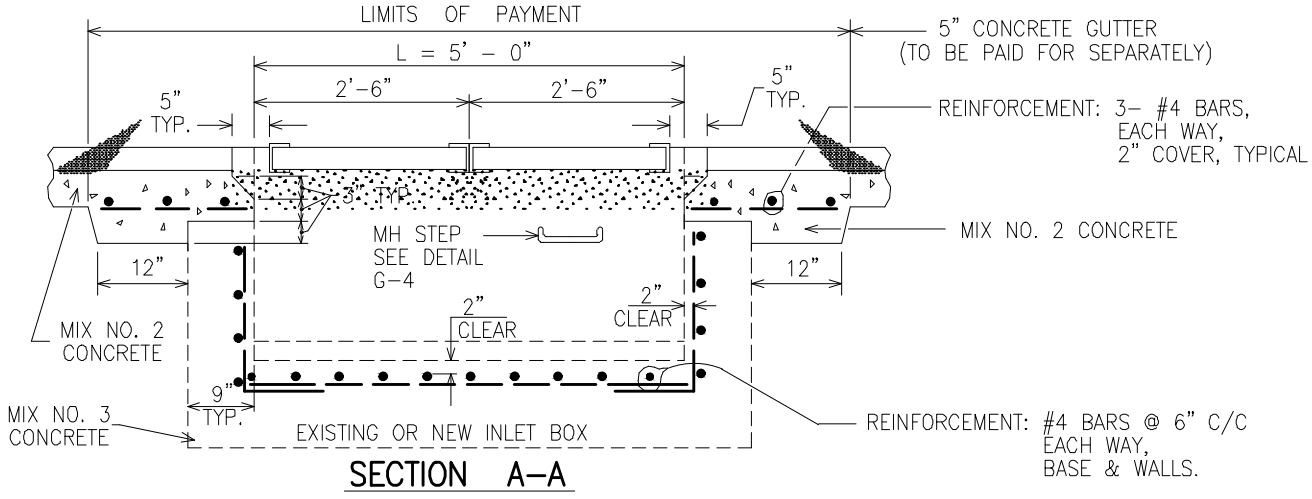
D-2.13

DATE: 08/28/2023

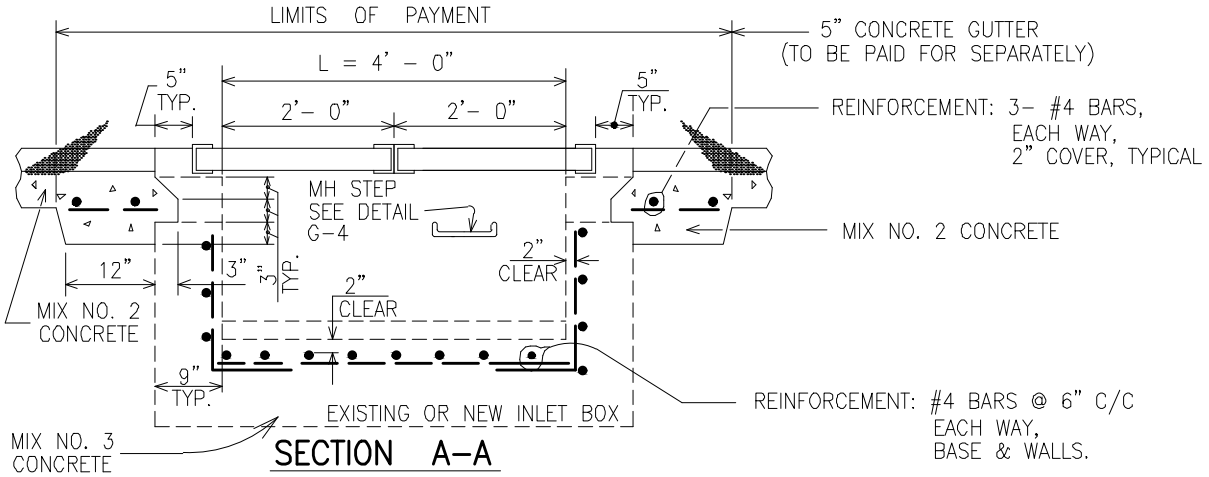
FILE: Drains_Master.DWG



SECTION A-A



SECTION A-A



SECTION A-A

SEE DETAIL D-2.13 FOR OTHER VIEWS AND FOR GRATE DETAILS.

APPROVAL

DIRECTOR

BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023

DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

TYPE J INLET WITH MODIFIED GRATE

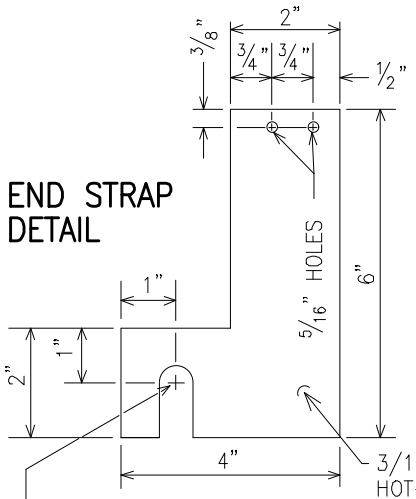
ISSUED: SEPTEMBER 2023

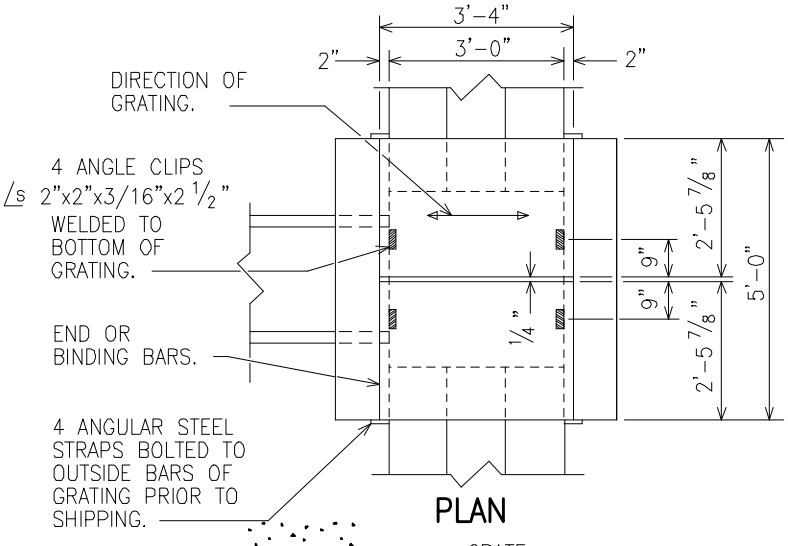
PLATE

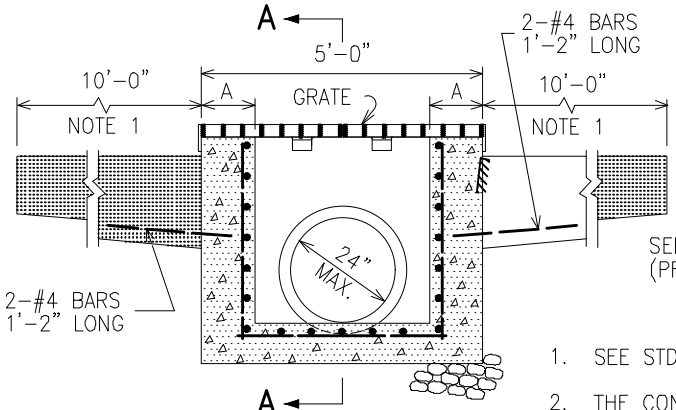
D-2.14

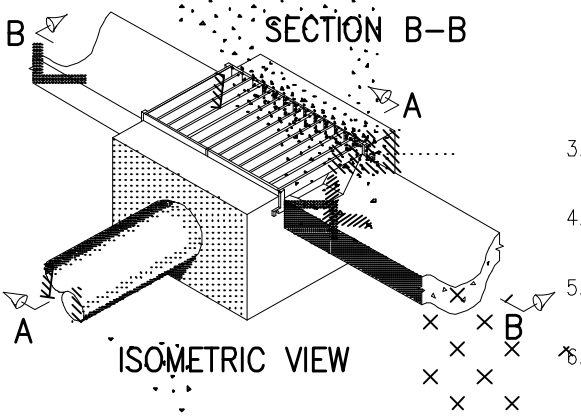
DATE: 08/28/2023

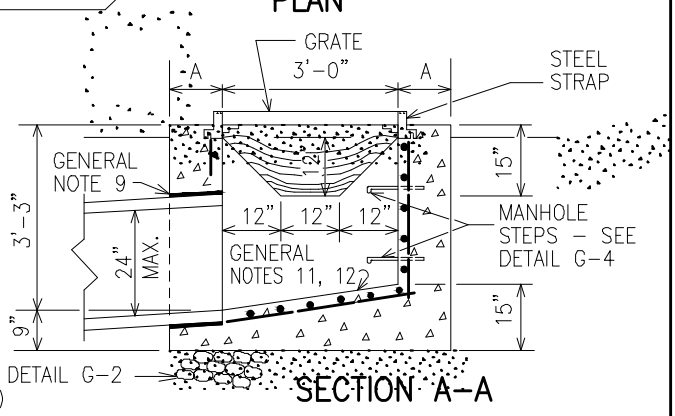
FILE: Drains_Master.DWG











NOTES :

1. SEE STD. DETAIL D-2.00 FOR GENERAL NOTES.
2. THE CONCRETE VALLEY GUTTER 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 FEET FROM THE INLET. VALLEY GUTTER PAVING WITHIN TEN FEET OF THE INLET TO BE INCLUDED IN THE UNIT PRICE BID FOR THE INLET.
3. PIPE OUTLETS AND GUTTER APPROACHES CAN BE REVISED TO MEET EXISTING CONDITIONS.
4. THIS TYPE OF INLET SHALL NOT BE USED IN MEDIANS OR IN OTHER AREAS TRAVERSED BY VEHICLES.
5. THIS INLET MAY BE USED WITH A SINGLE OPENING AT ONE END.
6. GRATINGS ARE SUBJECT TO APPROVAL FOR EACH JOB. ANY TYPE OF SUBSTANTIAL TRANSVERSE BARS MAY BE USED WHICH WILL SUPPORT A MINIMUM UNIFORM LOAD OF 150 LBS./SQ.FT. THE TRANSVERSE BARS SHALL BE HELD RIGID BY SPACER BARS. AREA TO BE MADE UP OF TWO EQUAL WIDTH PANELS ARRANGED FOR BOLTING TOGETHER IN THE FIELD. ALL MATERIAL TO BE HOT-DIP GALVANIZED.
7. SUBGRADE OPENINGS PER PLANS OR AS DIRECTED BY ENGINEER.

	PRECAST	CAST-IN-PLACE
A	6" MIN.	12"
REINF.	2 LAYERS- 4x4 W4.0 x W4.0- WWF	#4 BARS @ 6" C/C E.W. 2" COVER (AS SHOWN)
CONCRETE	4,500 PSI	MIX NO. 3
ALLOWABLE DEPTH	AS SHOWN	

APPROVAL
DIRECTOR
BUR. OF ENGINEERING/CONSTRUCTION
SEPTEMBER 28, 2023
DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

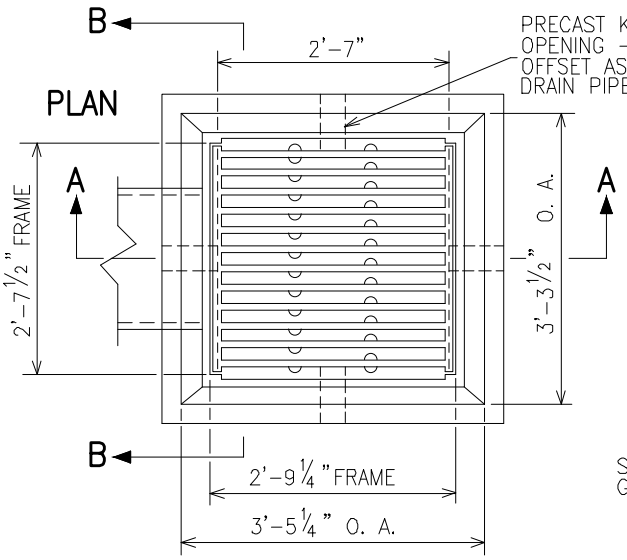
SPECIAL TYPE K INLET
NON-TRAFFIC AREAS

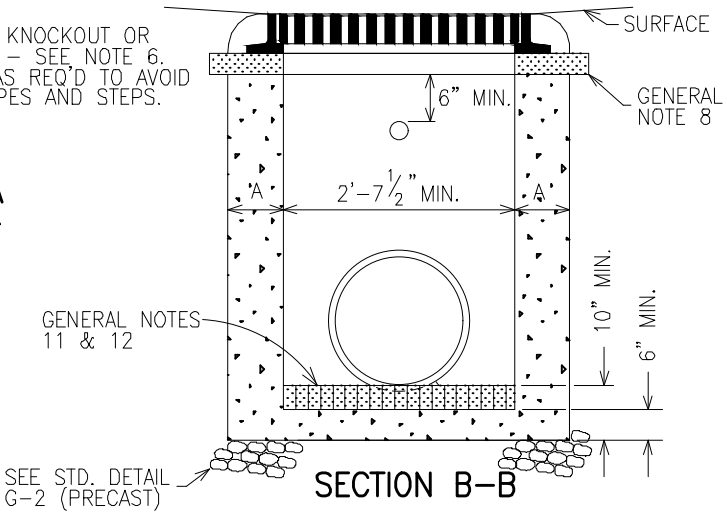
ISSUED: SEPTEMBER 2023

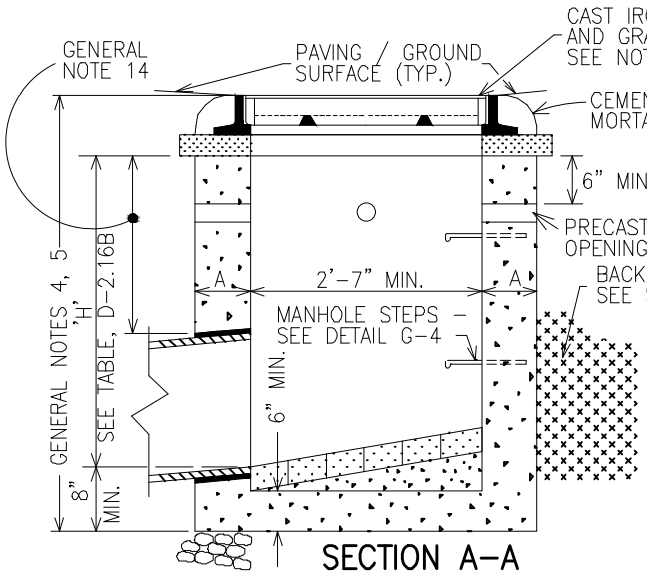
PLATE
D-2.15

DATE: 08/28/2023

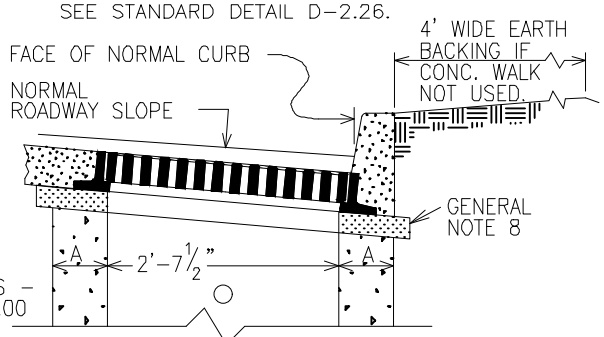
FILE: Drains_Master.DWG

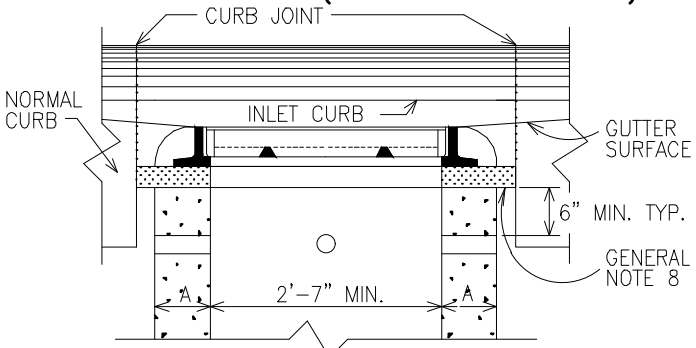






FOR UNDEPRESSED INLETS, USE NORMAL PAVEMENT SLOPE. FOR DEPRESSED INLETS. SEE STANDARD DETAIL D-2.26.





NOTES

1. SEE STD. DETAIL D–2.00 FOR GENERAL NOTES. SEE TABLE ON STD. DETAIL D–2.16B FOR INFORMATION REGARDING CONCRETE, REINFORCING, ALLOWABLE DEPTH AND SUBGRADE OPENINGS FOR PRECAST & CIP INLETS.
2. INLET MAY BE CONSTRUCTED OF PRECAST OR REINFORCED CONCRETE (SEE TABLE, DETAIL D–2.16B). SIZE, TYPE AND DIRECTION OF INLET CONNECTION WILL VARY TO SUIT CONDITIONS. SEE STD. DETAIL G–1.
3. THIS INLET SHALL NOT BE USED IN ROADWAY SUMPS. USE EQUIV–ALENT (D–2.18) OR LARGER COMBINATION INLET AT A SUMP WITHIN ROAD RIGHT–OF–WAY.
4. PLACE APPROVED 1/4" EXPANSION MATERIAL FOR PAVEMENT AT LOCATIONS SHOWN ON DETAIL D–2.26.
5. INLET MAY BE USED IN MEDIAN DITCHES OR AS A YARD INLET, WITH OR WITHOUT A CONCRETE COLLAR. SEE STD. DETAIL D–2.16B. PARALLEL BAR GRATE (STD. DETAIL D–2.17) SHALL BE USED IN THESE APPLICATIONS, UNLESS OTHERWISE DIRECTED ON PLANS OR BY THE ENGINEER.
6. SUBGRADE DRAINAGE – 1 EACH WALL. OFFSET AS REQUIRED TO AVOID STEPS, PIPES. SEE TABLE ON STANDARD DETAIL D–2.16B.
7. CAST–IN–PLACE REINFORCEMENT REQUIRED ON OUTSIDE & INSIDE OF WALLS BELOW 7'–0" WHEN 'H' IS GREATER THAN 7'–0". SPACING IS SAME AS FOR INSIDE OF WALL.
8. USE APPROVED BICYCLE–SAFE GRATE (SEE DETAIL D–2.21A) WITHIN ALLEYS & PUBLIC ROAD R/W.

BALTIMORE COUNTY MARYLAND

APPROVAL

DIRECTOR

BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023

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STORM DRAINAGE DETAILS

TYPE S INLET
SINGLE GRATE

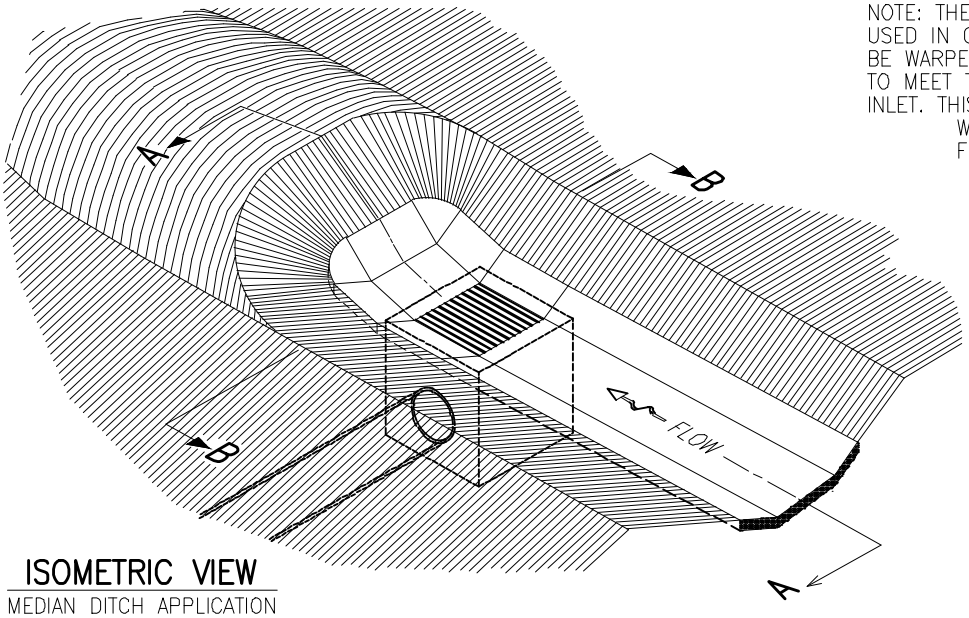
ISSUED: SEPTEMBER 2023

PLATE

D–2.16A

DATE: 08/28/2023

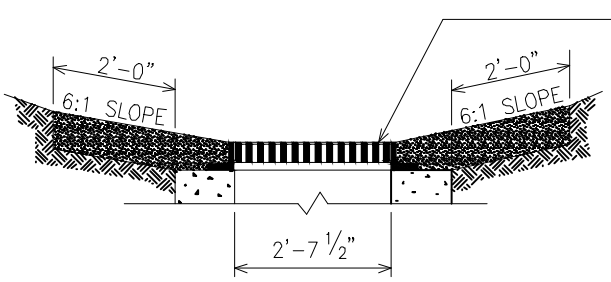
FILE: Drains_Master.DWG



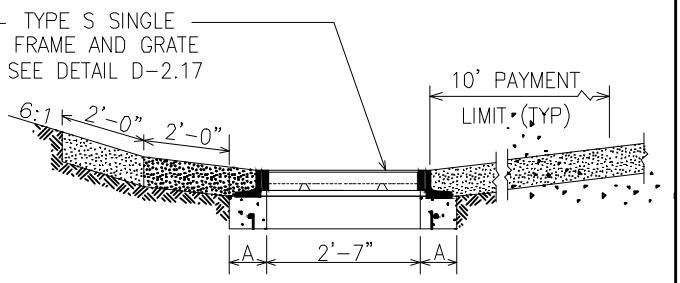
NOTE: THE CONCRETE MEDIAN DITCH TO BE USED IN CONNECTION WITH THIS INLET WILL BE WARPED FROM THE STANDARD SECTION TO MEET THE SECTION AT THE END OF THE INLET. THIS TRANSITION WILL TAKE PLACE WITHIN A DISTANCE OF TEN FEET FROM THE INLET. PAVING WITHIN TEN FEET OF THE INLET TO BE INCLUDED IN THE UNIT PRICE BID FOR THE INLET.

FOR INLET IN SUMP, MODIFY SLOPES AS SHOWN IN THE ISOMETRIC VIEW ON DETAIL PLATE D-2.19B

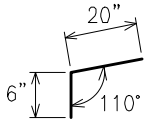
ISOMETRIC VIEW
MEDIAN DITCH APPLICATION



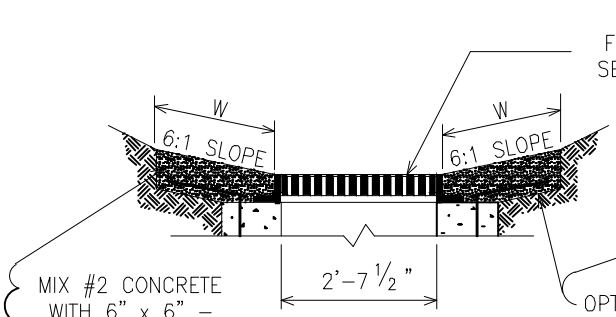
SECTION B-B
MEDIAN DITCH APPLICATION



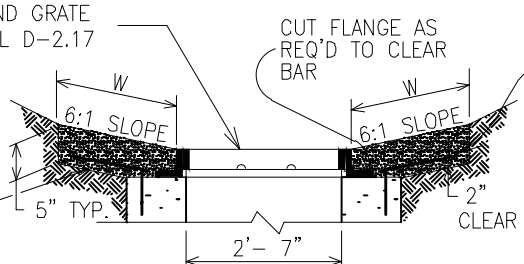
SECTION A-A
MEDIAN DITCH APPLICATION



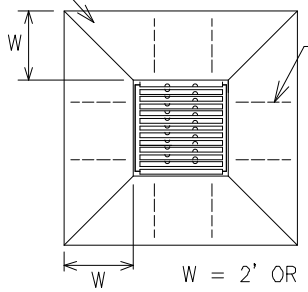
#4 BAR



SECTION B-B
YARD INLET APPLICATION



SECTION A-A
YARD INLET APPLICATION



PLAN VIEW
OPTIONAL CONCRETE COLLAR

W = 2' OR AS SHOWN ON PLANS

REFER TO NOTES 1 THROUGH 7 ON DETAIL D-2.16A.

	PRECAST	CAST-IN-PLACE
A	6" MIN.	8 1/2 "
REINF.	2 LAYERS- 4x4 W4.0 x W4.0- WWF	#4 BARS @ 6" O/C E.W. 2" COVER. SEE NOTE 7 ON DETAIL D-2.16A
CONCRETE	4,500 PSI	MIX NO. 3
ALLOWABLE DEPTH	B.C.B.E/C APPROVAL REQUIRED OVER 15'	
SUBGRADE OPENINGS	SEE DETAIL D-2.00	4" x 4" OPENINGS OR ALTERNATE AS DIRECTED

APPROVAL

DIRECTOR

BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023
DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

TYPE S INLET SINGLE GRATE YARD AND MEDIAN APPLICATIONS

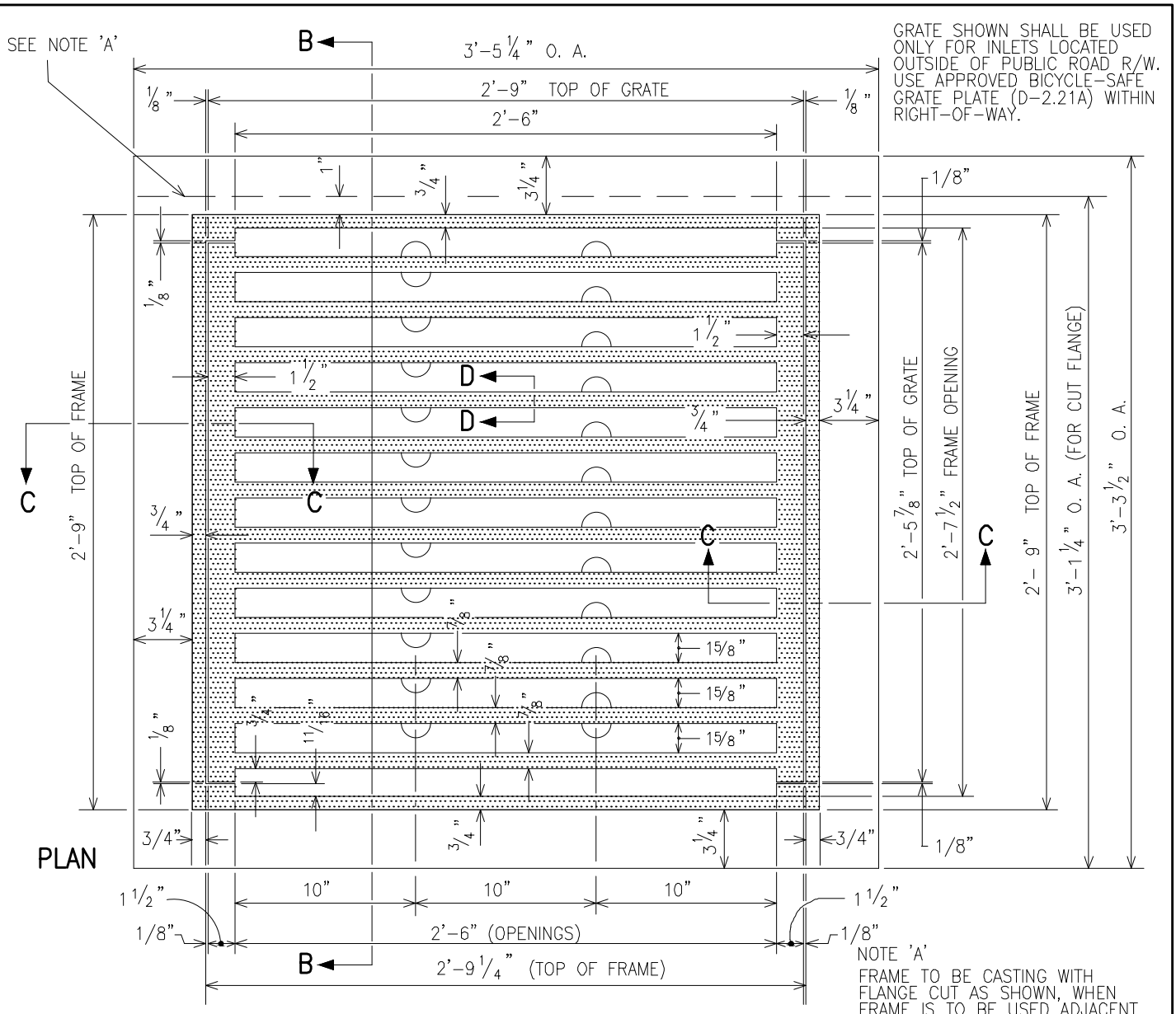
ISSUED: SEPTEMBER 2023

PLATE

D-2.16B

DATE: 08/28/2023

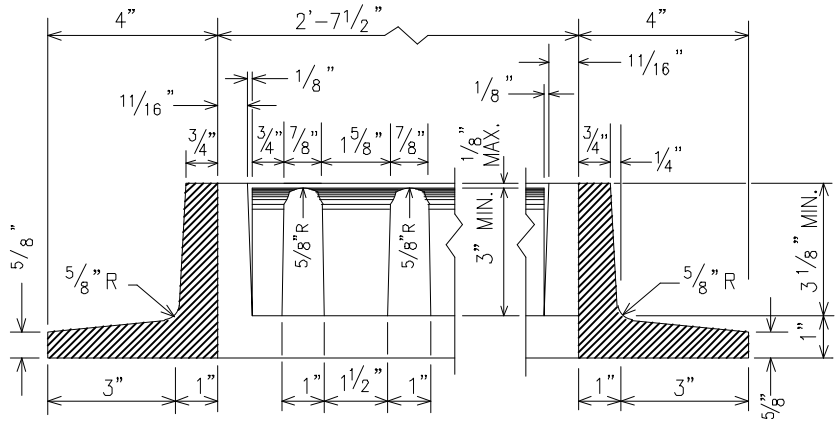
FILE: Drains_Master.DWG



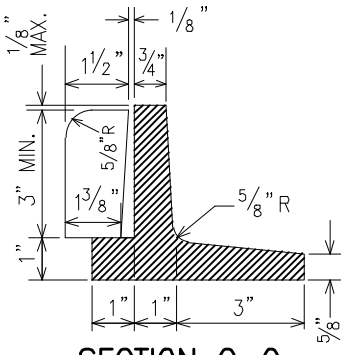
GRATE SHOWN SHALL BE USED ONLY FOR INLETS LOCATED OUTSIDE OF PUBLIC ROAD R/W. USE APPROVED BICYCLE-SAFE GRATE PLATE (D-2.21A) WITHIN RIGHT-OF-WAY.

NOTE 'A'
FRAME TO BE CASTING WITH FLANGE CUT AS SHOWN, WHEN FRAME IS TO BE USED ADJACENT TO CURB OPENING.

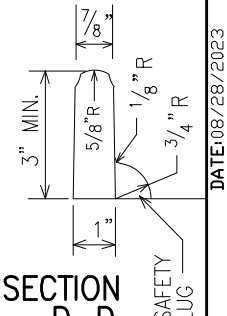
NOTE : CASTING MATERIALS SHALL BE GRAY IRON.



SECTION B-B



SECTION C-C



SECTION D-D

APPROVAL
DIRECTOR
BUR. OF ENGINEERING/CONSTRUCTION
SEPTEMBER 28, 2023
DATE

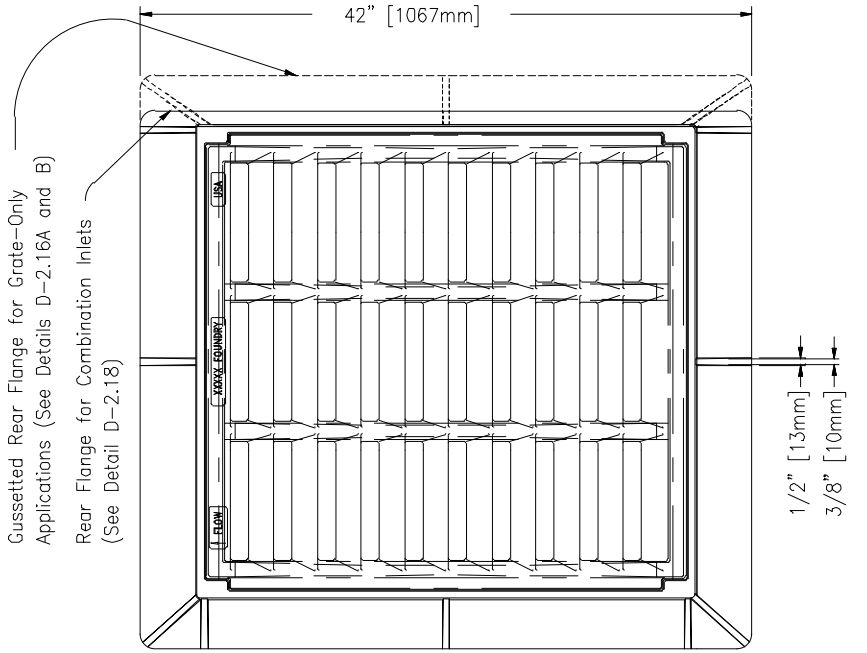
DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION
STORM DRAINAGE DETAILS

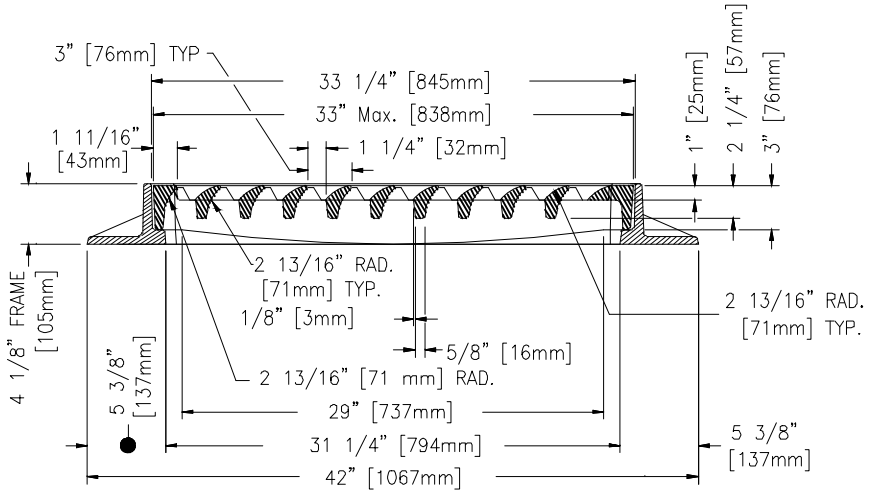
TYPE S INLET
SINGLE FRAME AND GRATE

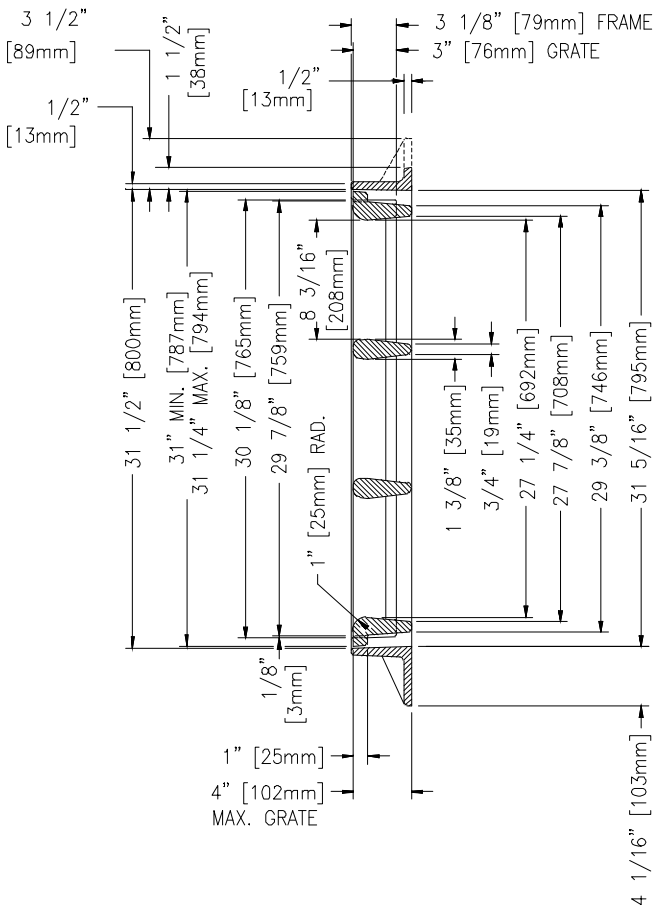
ISSUED: SEPTEMBER 2023

PLATE
D-2.17

DATE: 08/28/2023
FILE: Drains_Master.DWG







NOTE: ALL DIMENSIONS ARE SHOWN IN ENGLISH AND [METRIC].

MATERIAL: CAST GRAY IRON ASTM A-48, CLASS 35B

WEIGHT: GRATE APPROX. 338#/EA., FRAME APPROX. 182#/EA.

FRAME: PER THIS DETAIL OR PER DETAIL D-2.17

APPROVAL

DIRECTOR

BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023

DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

SINGLE TYPE S FRAME (CLASS 35) WITH CURVED VANE (S-CV) GRATES

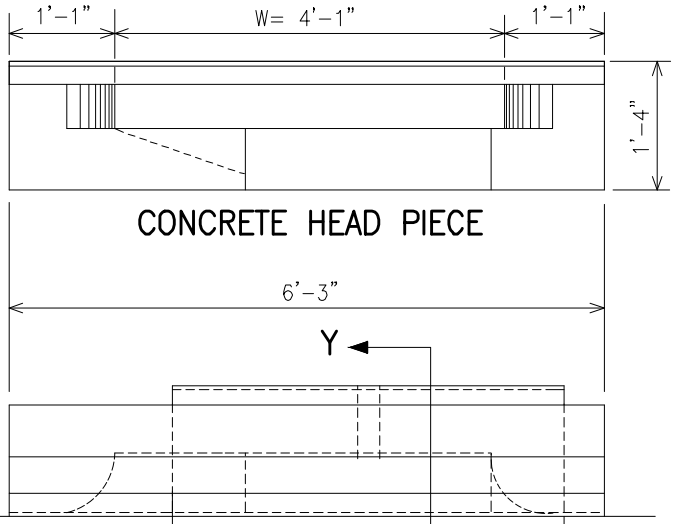
ISSUED: SEPTEMBER 2023

PLATE

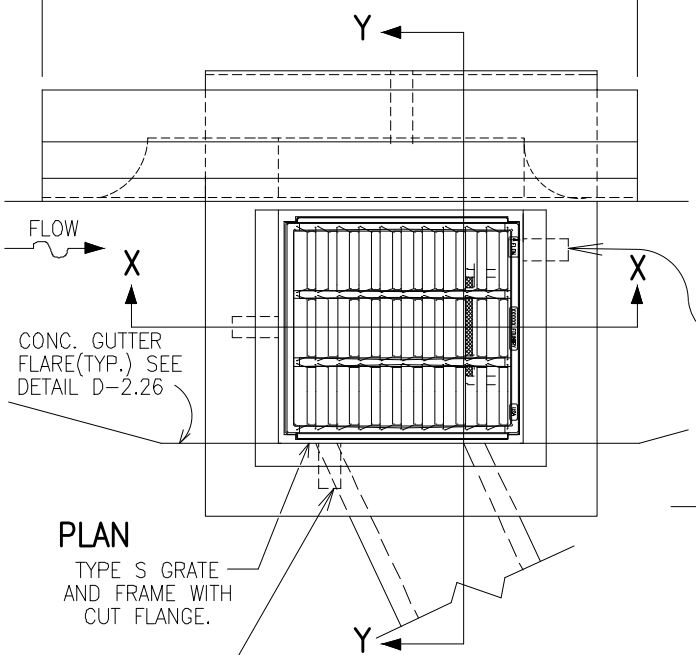
D-2.17A

DATE:08/28/2023

FILE:Drains_Master.DWG



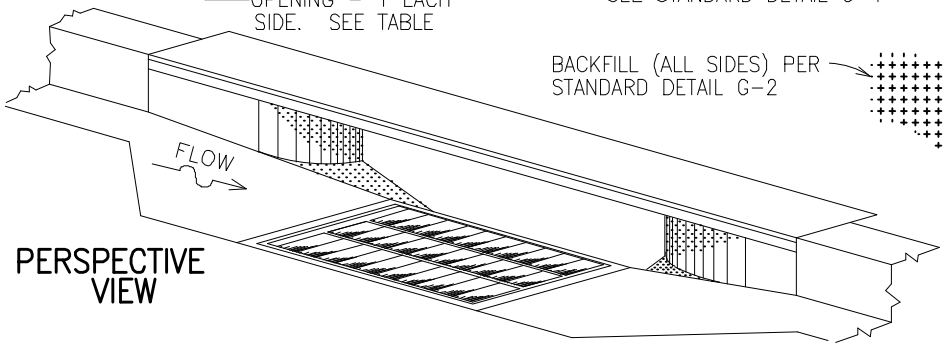
CONCRETE HEAD PIECE



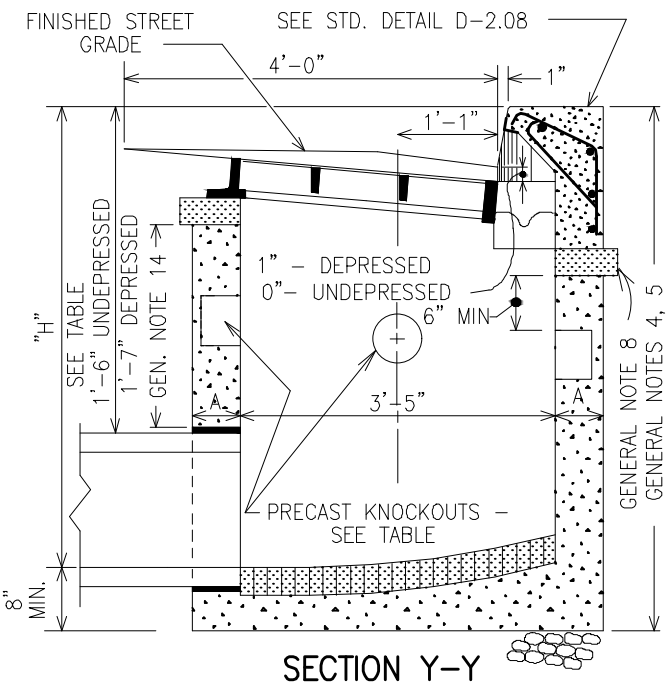
PLAN

TYPE S GRATE AND FRAME WITH CUT FLANGE.

SUBGRADE DRAIN OPENING - 1 EACH SIDE. SEE TABLE

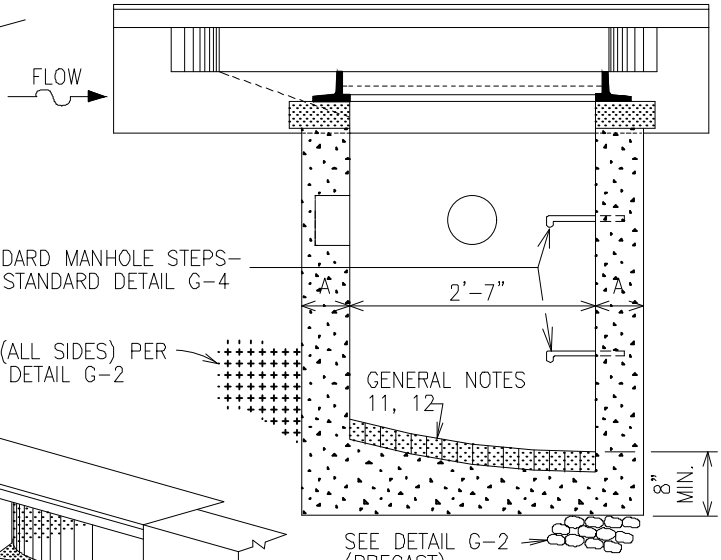


PERSPECTIVE VIEW



SECTION Y-Y

OFFSET SUBGRADE DRAIN OPENING AS REQ'D TO AVOID STEPS, PIPES. MAINTAIN 6" CLEAR TO PIPE, EDGE OF WALL



SECTION X-X

NOTES:

1. SEE STD. DETAIL D-2.00 FOR GENERAL NOTES.
2. SEE NOTES 2 THROUGH 5 AS SHOWN ON STD. DETAIL D-2.19A.

	PRECAST	CAST-IN-PLACE
A	6" MIN.	8 1/2 "
REINF.	2 LAYERS- 4x4 W4.0 x W4.0- WWF	#4 BARS @ 6" C/C E.W. 2" COVER (NOTE 5)
CONCRETE	4,500 PSI	MIX NO. 3
ALLOWABLE DEPTH	B.C.B.E/C APPROVAL REQUIRED OVER 15'	
SUBGRADE OPENING	SEE DETAIL D-2.00	4" x 4" OPENINGS OR AS DIRECTED.

APPROVAL

DIRECTOR

BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023

DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

TYPE S COMBINATION INLET

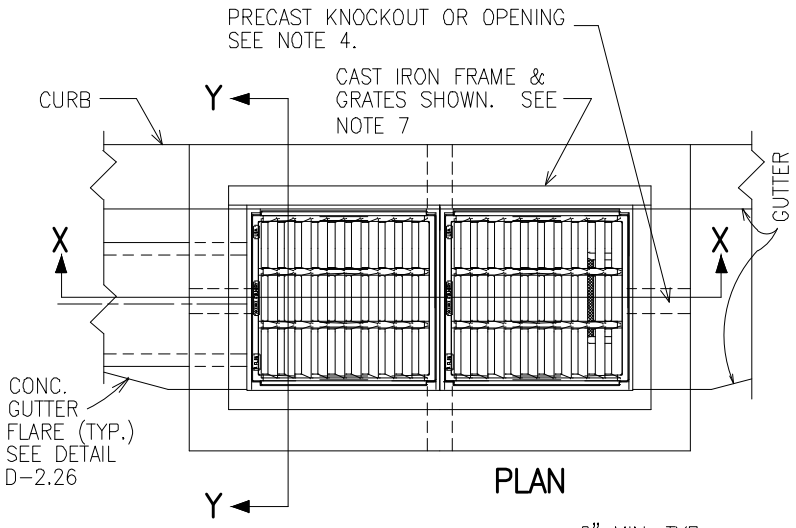
ISSUED: SEPTEMBER 2023

PLATE

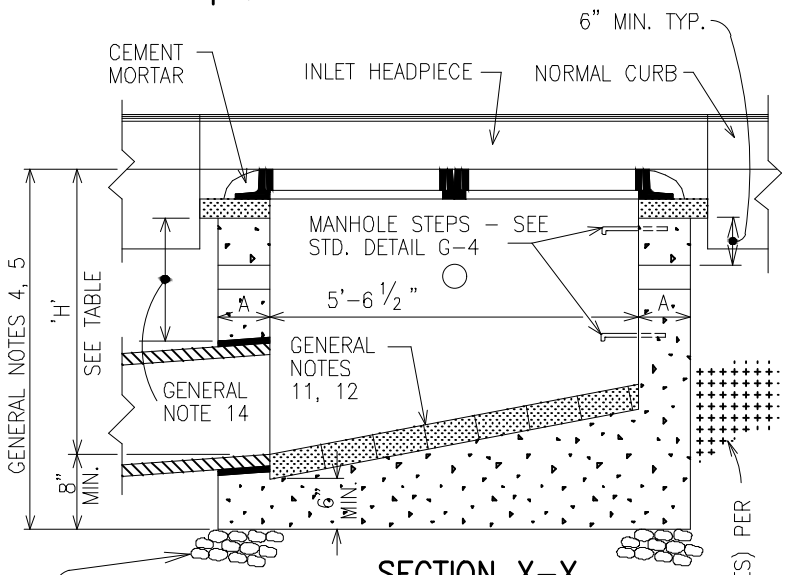
D-2.18

DATE: 08/28/2023

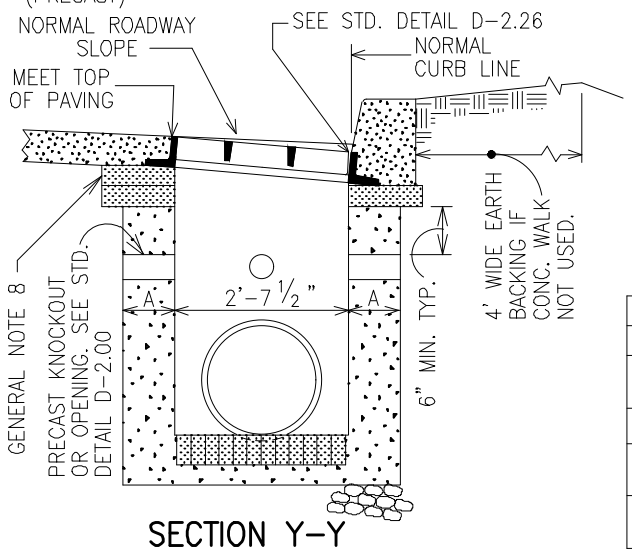
FILE: Drains_Master.DWG



PLAN



SECTION X-X



SECTION Y-Y

NOTES

1. SEE STD. DETAIL D-2.00 FOR GENERAL NOTES.
2. INLET MAY BE CONSTRUCTED OF PRECAST OR REINFORCED CONCRETE. SIZE, TYPE AND DIRECTION OF INLET CONNECTION WILL VARY TO SUIT CONDITIONS. SEE DETAIL G-1.
3. PLACE 1/4" EXPANSION MATERIAL OF SAME TYPE APPROVED FOR PAVEMENT AT LOCATIONS SHOWN ON STD. DETAIL D-2.26, & BETWEEN THE FRAME AND ABUTTING RIGID PAVEMENT.
4. SUBGRADE DRAINAGE - 1 EACH WALL. OFFSET AS REQ'D. TO AVOID STEPS, PIPES. SEE TABLE.
5. CAST-IN-PLACE REINFORCEMENT REQUIRED ON OUTSIDE, AS WELL AS INSIDE, OF WALLS BELOW 7'-0" WHEN 'H' IS GREATER THAN 7'-0". SPACING IS SAME AS FOR INSIDE OF WALL.
6. SUPPORT BEAM SHALL NOT BE USED.
7. USE APPROVED BICYCLE-SAFE GRATE (STD. DETAIL D-2.21A) WITHIN ALLEYS AND PUBLIC ROAD RIGHT-OF-WAY.
8. INLET MAY BE USED IN MEDIAN DITCHES OR AS A YARD INLET, WITH OR WITHOUT A CONCRETE COLLAR. SEE STD. DETAIL D-2.19B. USE PARALLEL BAR GRATE (STD. DETAIL D-2.21) FOR YARD AND MEDIAN INLETS OUTSIDE OF PUBLIC ROAD RIGHT-OF-WAY.
9. TYPE 'S' INLET - DOUBLE GRATE TANDEM MAY BE USED WITH ONE END ADJACENT TO CURB. FRAME WILL BE LAID ON NORMAL SLOPE OF ROADWAY UNLESS NOTED OTHERWISE. ORIENT FRAMES & GRATES AS REQUIRED TO COLLECT RUNOFF. FRAME & GRATE DIMENSIONS SAME AS WHEN SIDE IS ADJACENT TO CURB AS SHOWN ON LEFT.
10. THIS INLET SHALL NOT BE USED IN ROADWAY SUMPS. USE A COMBINATION INLET (STD. DETAIL D-2.20) AT A SUMP WITHIN ROAD RIGHT-OF-WAY.

	PRECAST	POURED-IN-PLACE
A	6" MIN.	8 1/2"
REINF.	2 LAYERS- 4x4 W4.0 x W4.0- WWF	#4 BARS @ 6" C/C E.W. 2" COVER. SEE NOTE 5.
CONCRETE	4,500 PSI	MIX NO. 3
ALLOWABLE DEPTH	B.C.B.E/C APPROVAL REQUIRED OVER 15'	
SUBGRADE OPENINGS	SEE DETAIL D-2.00	4" x 4" OPENINGS OR ALTERNATE AS DIRECTED

APPROVAL
DIRECTOR
BUR. OF ENGINEERING/CONSTRUCTION
SEPTEMBER 28, 2023
DATE

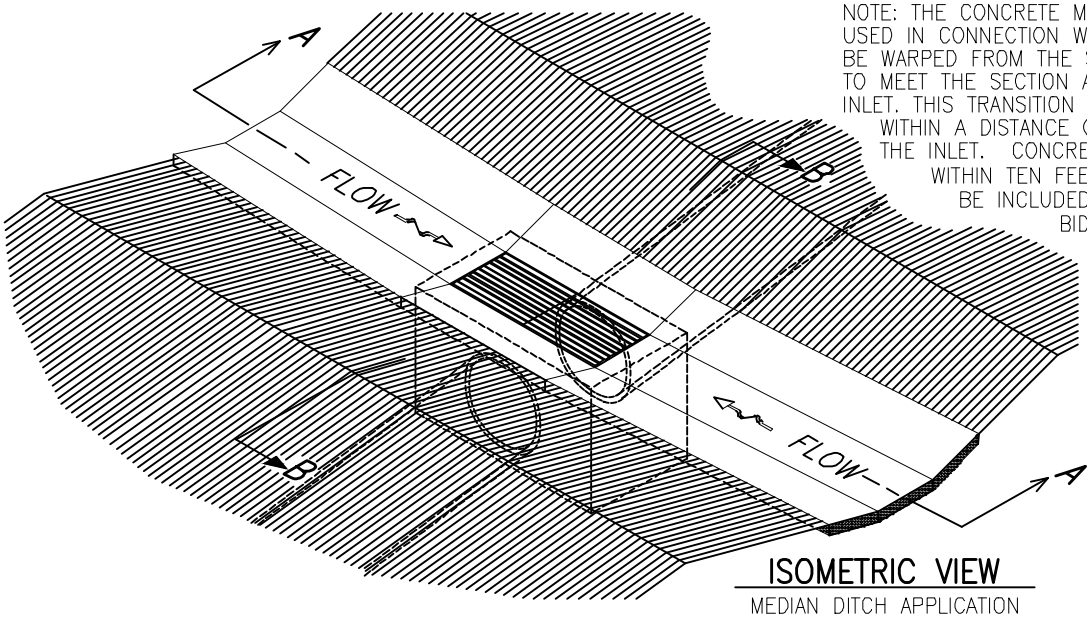
DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION
STORM DRAINAGE DETAILS

TYPE S INLET DOUBLE GRATE (NO BEAM SUPPORT)

ISSUED: SEPTEMBER 2023

PLATE
D-2.19A

DATE: 08/28/2023
FILE: Drains_Master.DWG

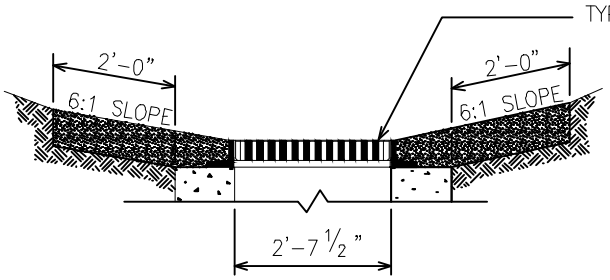


NOTE: THE CONCRETE MEDIAN DITCH TO BE USED IN CONNECTION WITH THIS INLET WILL BE WARPED FROM THE STANDARD SECTION TO MEET THE SECTION AT THE END OF THE INLET. THIS TRANSITION WILL TAKE PLACE WITHIN A DISTANCE OF TEN FEET FROM THE INLET. CONCRETE DITCH PAVING WITHIN TEN FEET OF THE INLET TO BE INCLUDED IN THE UNIT PRICE BID FOR THE INLET.

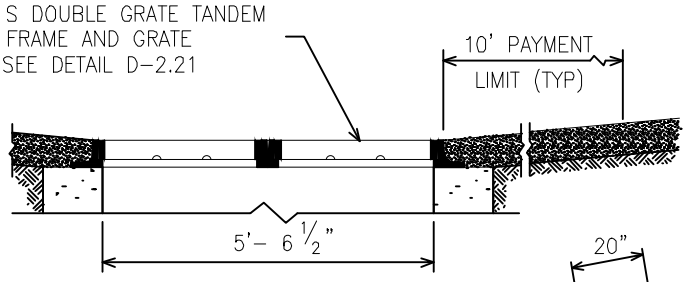
FOR INLET ON GRADE, MODIFY SLOPES AS SHOWN IN THE ISOMETRIC VIEW ON DETAIL PLATE D-2.16B

SUPPORT BEAM IS NOT TO BE USED.

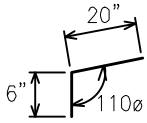
ISOMETRIC VIEW
MEDIAN DITCH APPLICATION

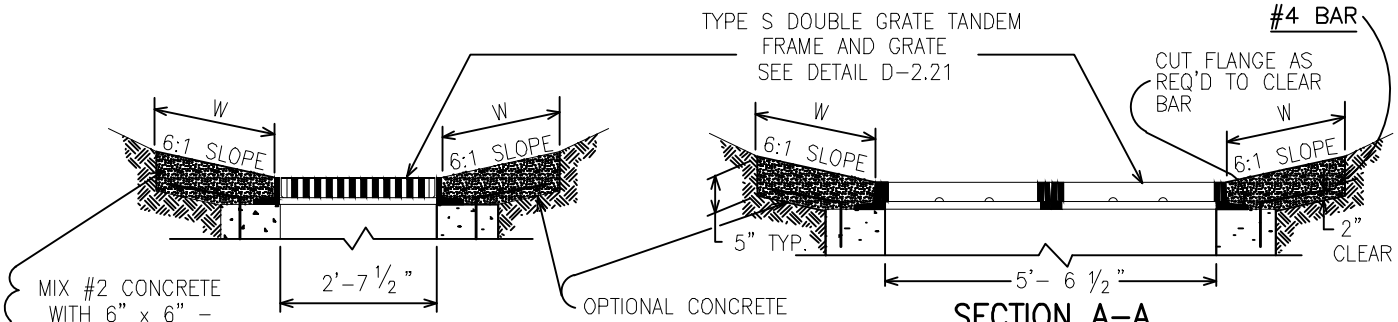


SECTION B-B
MEDIAN DITCH APPLICATION



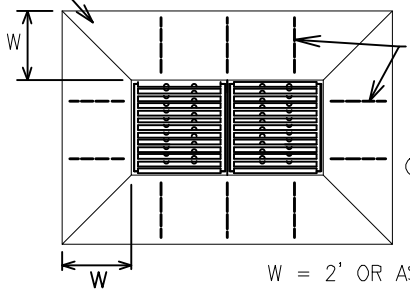
SECTION A-A
MEDIAN DITCH APPLICATION





SECTION B-B
YARD INLET APPLICATION

SECTION A-A
YARD INLET APPLICATION



PLAN VIEW
OPTIONAL CONCRETE COLLARS

W = 2' OR AS SHOWN ON PLANS

REFER TO NOTES 1 THROUGH 8 ON DETAIL D-2.19A.

	PRECAST	POURED-IN-PLACE
A	6" MIN.	8 1/2 "
REINF.	2 LAYERS- 4x4 W4.0 x W4.0- WWF	#4 BARS @ 6" C/C E.W. 2" COVER; SEE NOTE 5 ON STD. DETAIL D-2.19A
CONCRETE	4,500 PSI	MIX NO. 3
ALLOWABLE DEPTH	B.C.B.E/C APPROVAL REQUIRED OVER 15'	
SUBGRADE OPENINGS	SEE DETAIL D-2.00	4" x 4" OPENINGS OR ALTERNATE AS DIRECTED

APPROVAL

DIRECTOR

BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023
DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

TYPE S INLET DOUBLE GRATE
YARD AND MEDIAN APPLICATIONS

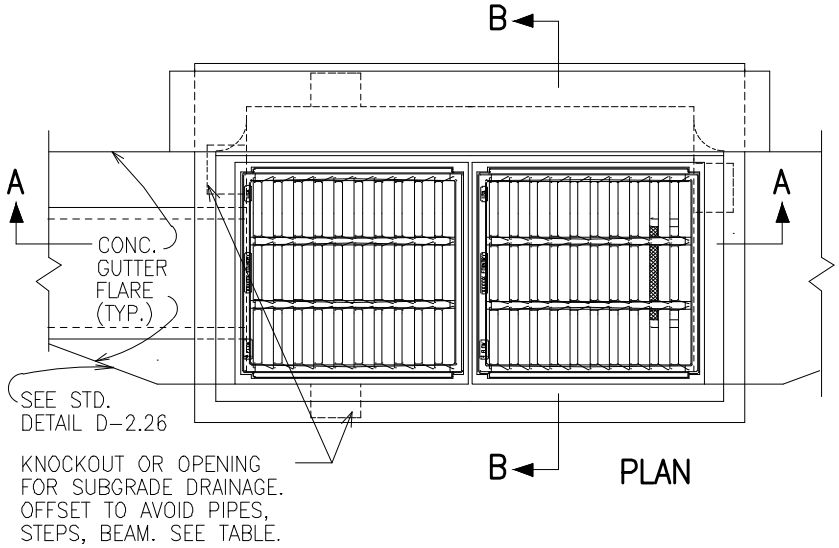
ISSUED: SEPTEMBER 2023

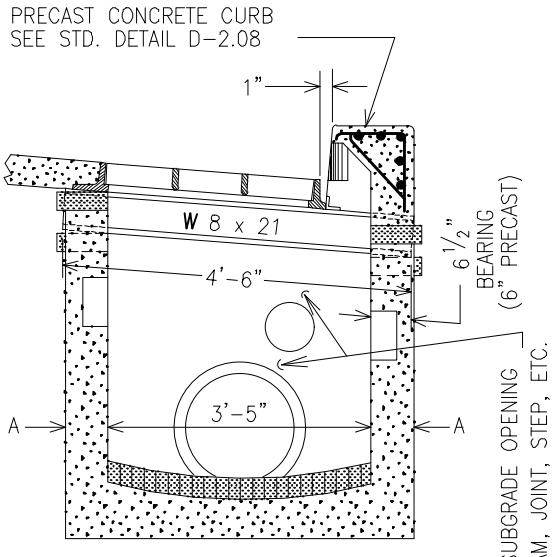
PLATE

D-2.19B

DATE: 08/28/2023

FILE: Drains_Master.DWG

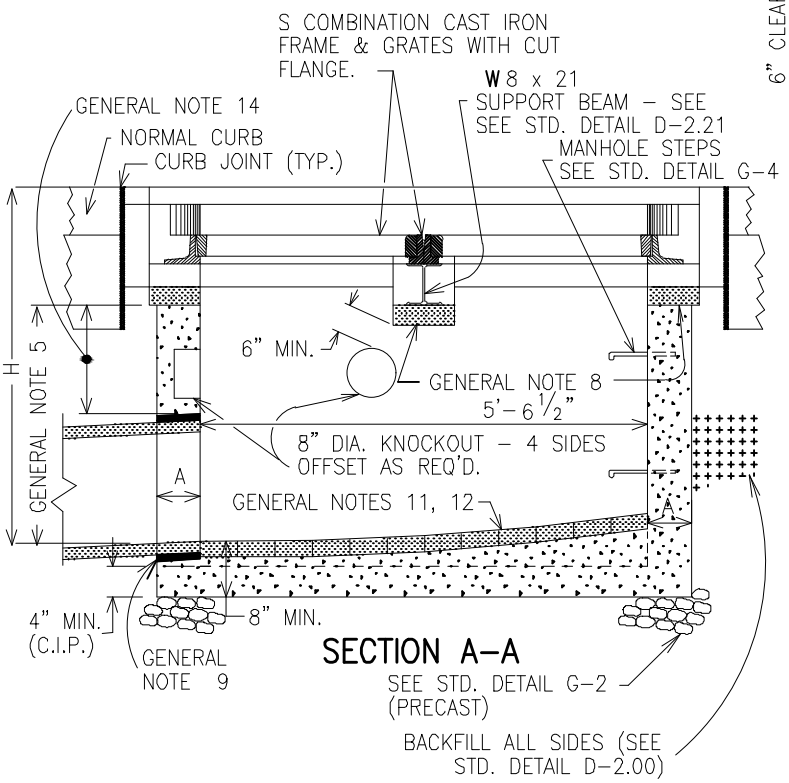




SECTION B-B

NOTES

1. SEE STD. DETAIL D-2.00 FOR GENERAL NOTES.
2. INLET MAY BE CONSTRUCTED OF PRECAST OR REINFORCED CONCRETE. SIZE, TYPE AND DIRECTION OF INLET CONNECTION WILL VARY TO SUIT CONDITIONS. SEE STANDARD DETAIL G-1.
3. CAST-IN-PLACE REINFORCEMENT REQUIRED ON OUTSIDE, AS WELL AS INSIDE, OF WALLS BELOW 7'-0" WHEN 'H' IS GREATER THAN 7'-0". SPACING IS SAME AS FOR INSIDE OF WALL.
4. PLACE 1/4" EXPANSION MATERIAL OF SAME TYPE APPROVED FOR PAVEMENT AT LOCATIONS SHOWN ON STANDARD DETAIL D-2.26, AND BETWEEN FRAME & ABUTTING RIGID PAVEMENT.
5. SUBGRADE DRAINAGE - 1 OPENING PER SIDE. OFFSET AS REQ'D. SEE TABLE.
6. USE APPROVED BICYCLE-SAFE GRATE (STD. DETAIL D-2.21A) WITHIN ROAD RIGHT-OF-WAY.
7. PIPE OPENINGS IN FRONT OR REAR WALL OF INLET SHALL MAINTAIN 6" MINIMUM CLEARANCE TO SUPPORT BEAM.



SECTION A-A

	PRECAST	POURED-IN-PLACE
A	6" MIN.	8 1/2 "
REINF.	2 LAYERS- 4x4 W4.0 x W4.0- WWF	#4 BARS @ 6" C/C E.W. 2" COVER. SEE NOTE 3
CONCRETE	4,500 PSI	MIX NO. 3
ALLOWABLE DEPTH	B.C.B.E/C APPROVAL REQUIRED OVER 15'	
SUBGRADE OPENINGS	SEE DETAIL D-2.00	4" x 4" OPENINGS OR ALTERNATE AS DIRECTED

BALTIMORE COUNTY MARYLAND

APPROVAL

DIRECTOR

BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023

DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

TYPE S COMBINATION INLET
DOUBLE GRATE TANDEM

ISSUED: SEPTEMBER 2023

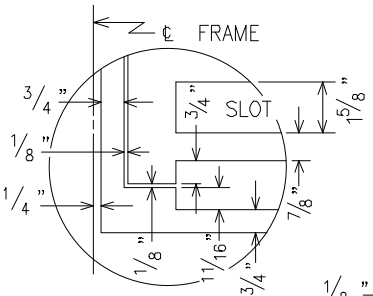
PLATE

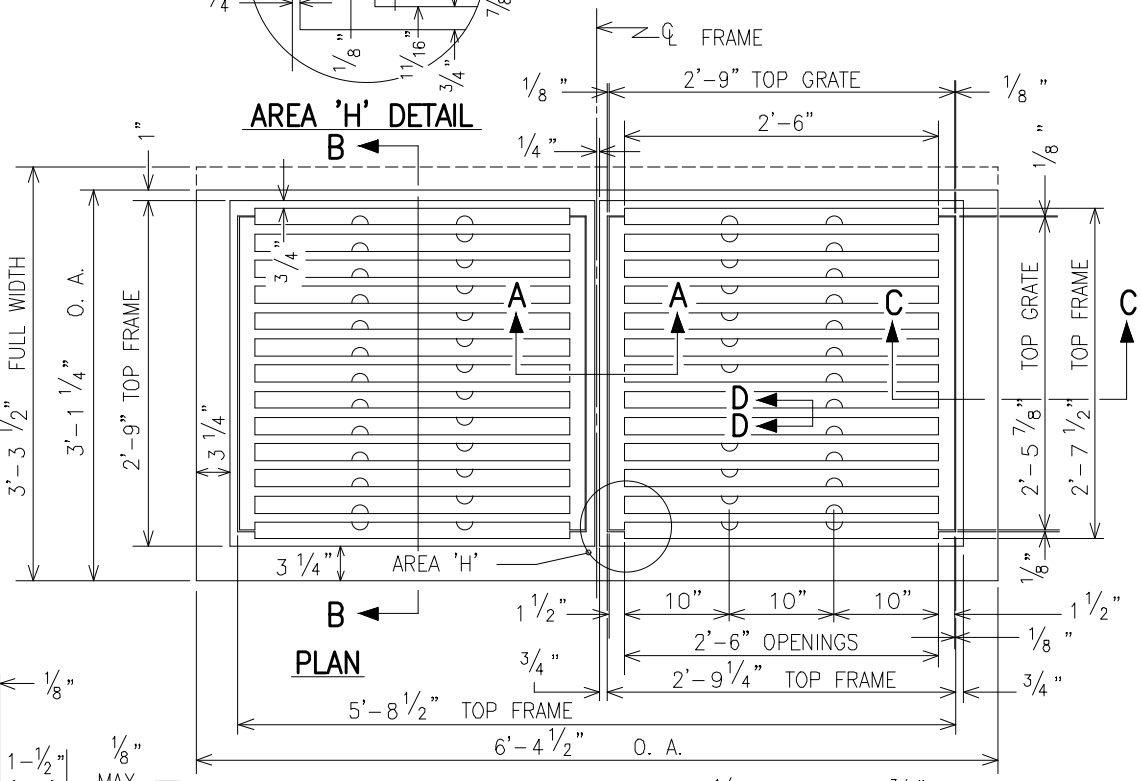
D-2.20

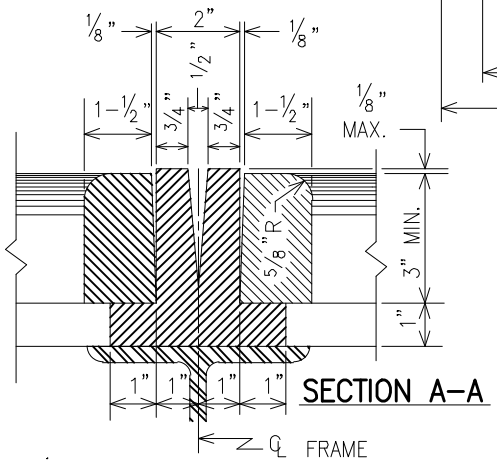
DATE: 08/28/2023

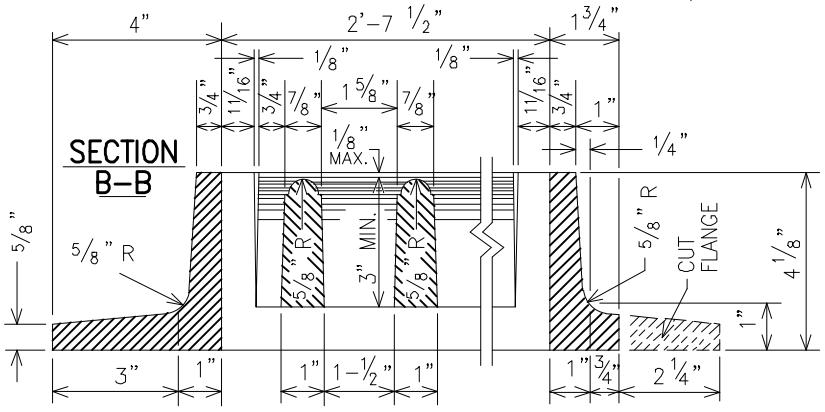
FILE: Drains_Master.DWG

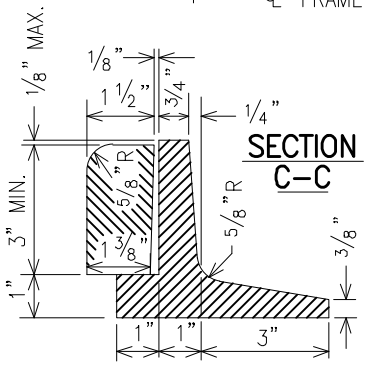
GRATE SHOWN SHALL BE USED ONLY FOR INLETS LOCATED OUTSIDE OF PUBLIC ROAD R/W. USE CURVED VANE GRATE OR OTHER APPROVED BICYCLE-SAFE GRATE WITHIN RIGHT-OF-WAY.

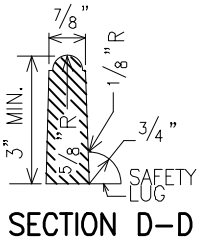












APPROVAL

DIRECTOR

BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023

DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

TYPE S INLET & COMBINATION FRAME AND GRATE

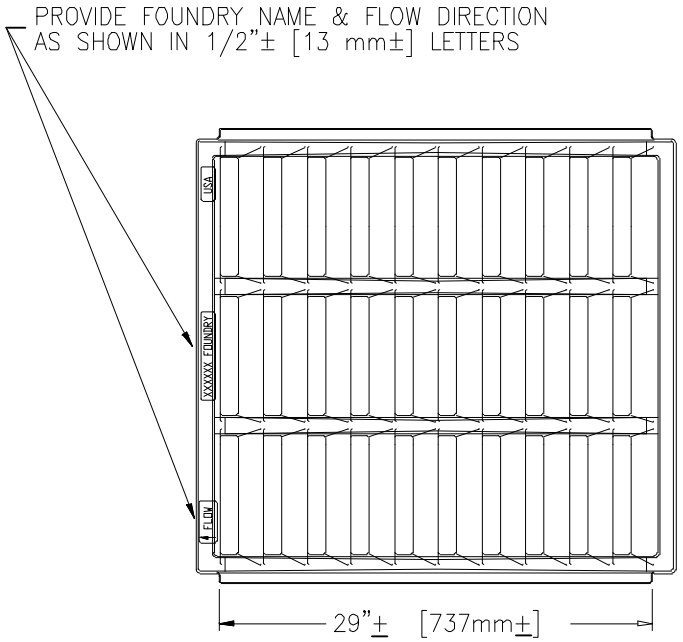
ISSUED: SEPTEMBER 2023

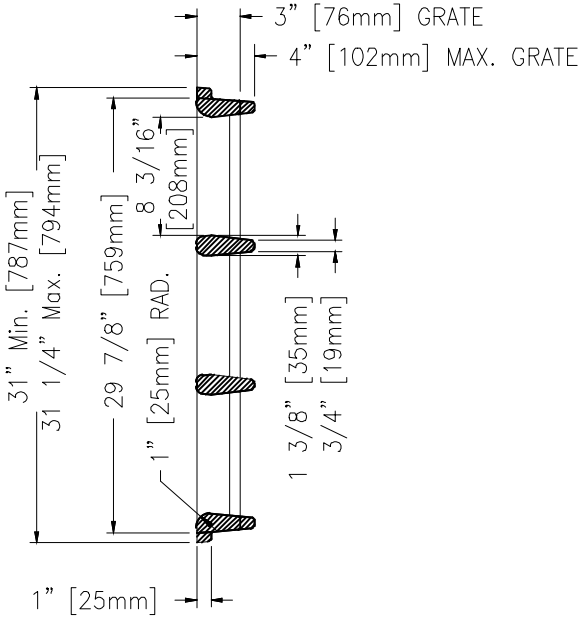
PLATE

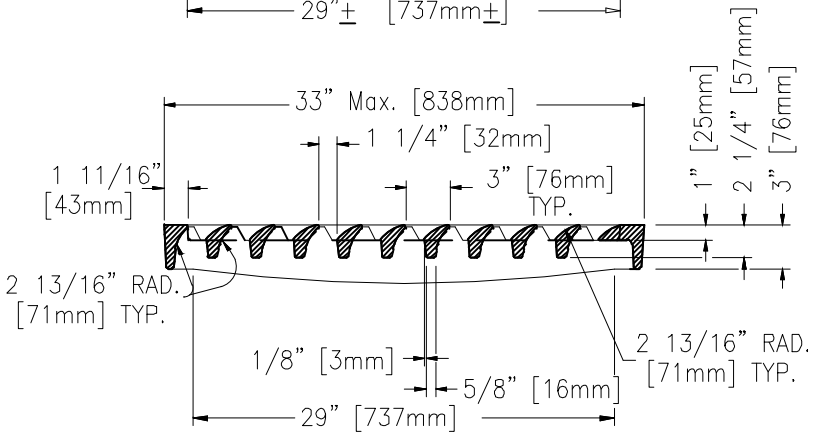
D-2.21

DATE: 08/28/2023

FILE: Drains_Master.DWG







NOTE: ALL DIMENSIONS ARE SHOWN IN ENGLISH AND [METRIC].

MATERIAL: CAST GRAY IRON ASTM A-48, CLASS 35B

WEIGHT: GRATE APPROX. 338#

GRATE SHALL SIT SQUARE UPON FRAME SUPPORTS WITHOUT ROCKING OR SHIFTING UNDER LOAD. GRATE SHALL MEET OR EXCEED AASHTO HS20 LOAD STANDARDS.

FRAME: PER DETAIL D-2.21B OR DETAIL D-2.21

BALTIMORE COUNTY MARYLAND

APPROVAL

DIRECTOR

BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023

DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

CURVER VANE (S-CV) GRATE
FOR TYPE S INLET FRAMES

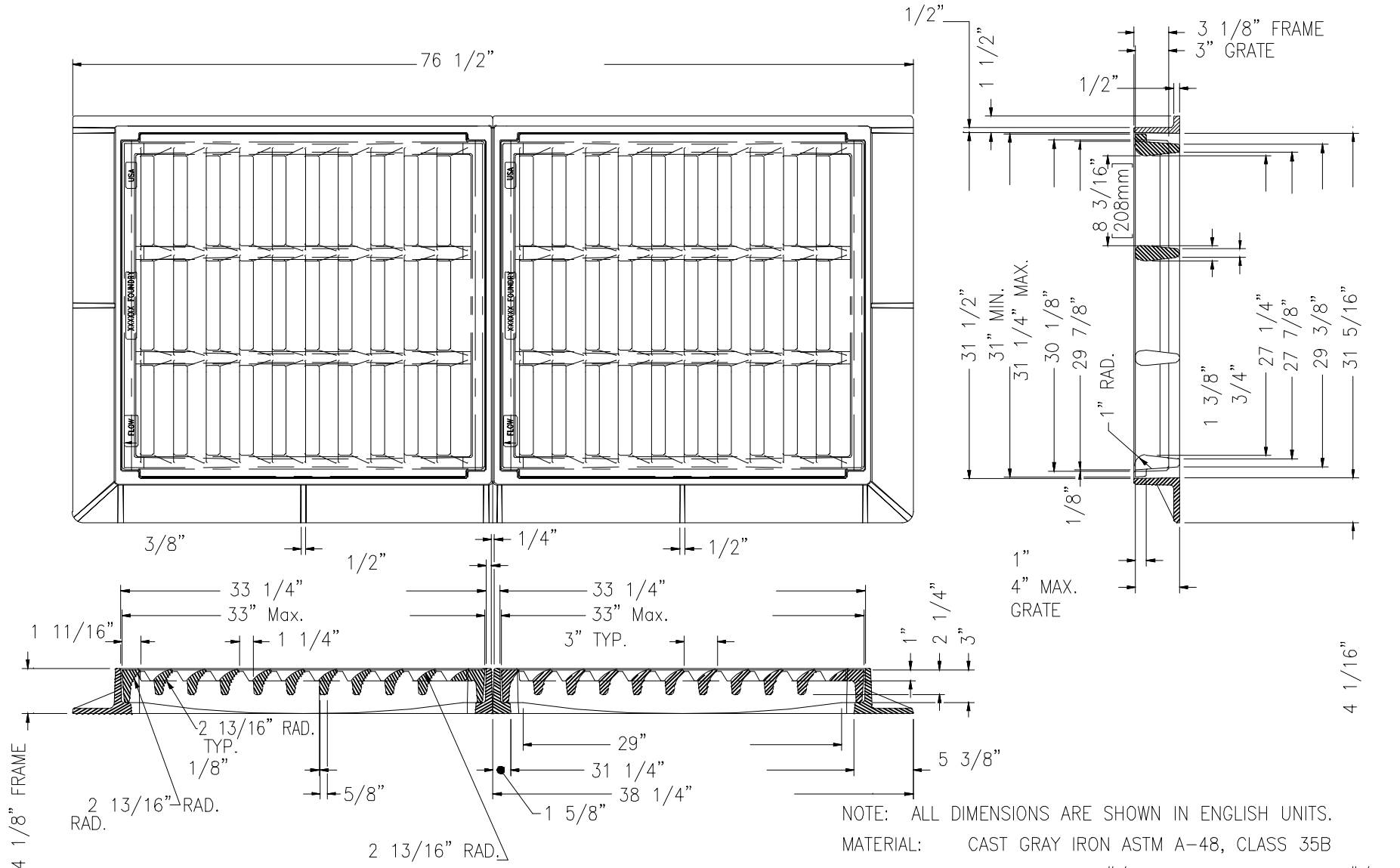
ISSUED: SEPTEMBER 2023

PLATE

D-2.21A

DATE 08/28/2023

FILE: Drains_Master.DWG



NOTE: ALL DIMENSIONS ARE SHOWN IN ENGLISH UNITS.

MATERIAL: CAST GRAY IRON ASTM A-48, CLASS 35B

WEIGHT: GRATE APPROX. 338#/EA., FRAME APPROX. 165#/EA.

APPROVAL

DIRECTOR

BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023

DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

DOUBLE TYPE S FRAME (CLASS 35) WITH CURVED VANE (S-CV) GRATES

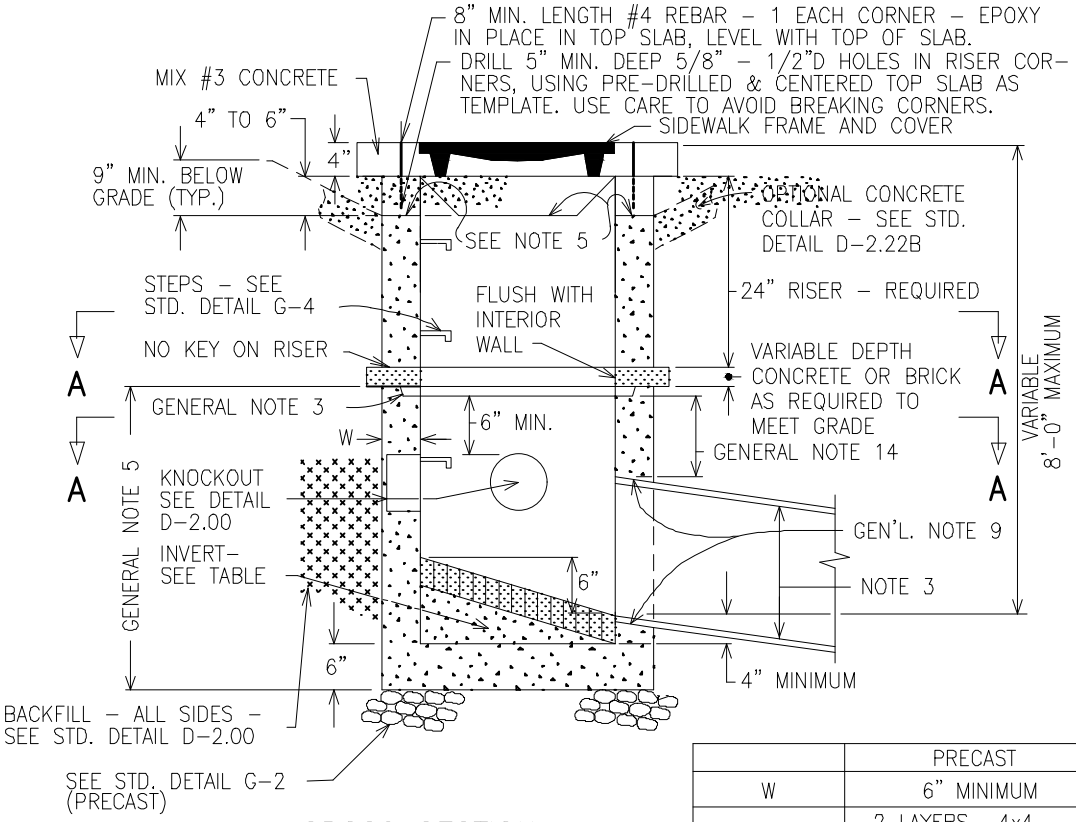
ISSUED: SEPTEMBER 2023

PLATE

D-2.21B

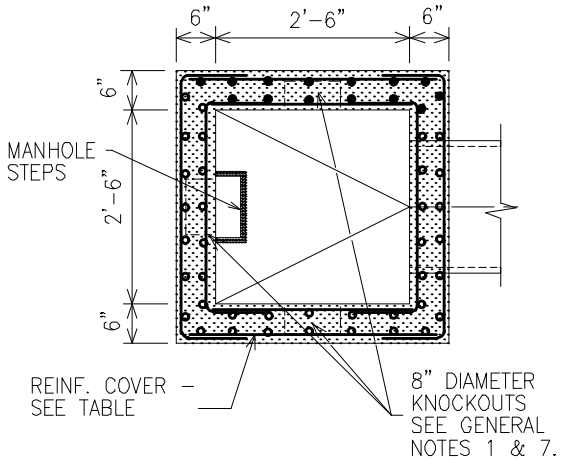
DATE:08/28/2023

FILE:Drains_Master.DWG



CROSS SECTION

	PRECAST	CAST-IN-PLACE (CIP)
W	6" MINIMUM	8" MINIMUM
REINF.	2 LAYERS- 4x4 W4.0 x W4.0- WWF	#4 @ 9" O/C E.W. IN BOTH FACES; 16" BAR LAPS; CONTINUOUS AT CORNERS
REINF.COVER	1.5 INCH MIN.	1.5 INCH MIN.
INVERT	APPROVED PRECAST, PLAIN MIX #3 CONCRETE OR BRICK	PLAIN MIX #3 CONCRETE OR BRICK
SUBGRADE OPENING	SEE DETAIL D-2.00	4" x 4" OPENINGS OR AS DIRECTED.
CONCRETE	4,500 PSI	MIX NO. 3



SECTION A–A

NOTES

1. SEE GENERAL NOTES, STANDARD DETAIL D-2.00.
2. SEE DETAIL D-2.22B FOR PRECAST TOP SLAB AND OPTIONAL CONCRETE COLLAR DETAIL.
3. FOR PIPE SIZE, LOCATION AND INVERT ELEVATIONS, REFER TO PLANS. USE 24" MAXIMUM DIAMETER PIPE OUTFALL WITH STRUCTURE SHOWN. CONSTRUCT INLET HEADPIECE OVER TYPE A MANHOLE STRUCTURE WHERE 27" OR LARGER DRAIN PIPES ARE REQUIRED. SHOW HEADPIECE DETAIL ON PLANS IN THIS CASE.
4. THIS INLET SHALL NOT BE USED ADJACENT TO PUBLIC ROADS OR ALLEYS NOR IN ANY LOCATION WHERE VEHICLES COULD ENCOUNTER IT.
5. OPENINGS TO BE PLACED IN ANY OR ALL SIDES AS DIRECTED BY ENGINEER OR ON PLANS. OPENING LIP ELEVATION TO BE SET IN THE FIELD.
6. PRECAST RISER TO BE REPLACED AT CONTRACTOR'S EXPENSE IF TOP SLAB SUPPORTS ARE BROKEN.

BALTIMORE COUNTY MARYLAND

APPROVAL

DIRECTOR

BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023

DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

TYPE Y-1 INLET

ISSUED: SEPTEMBER 2023

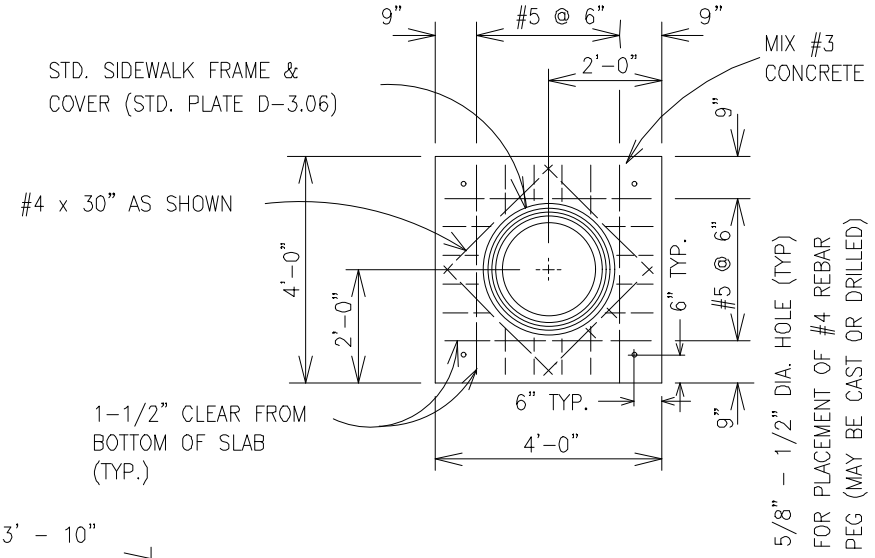
PLATE

D-2.22A

DATE: 08/28/2023

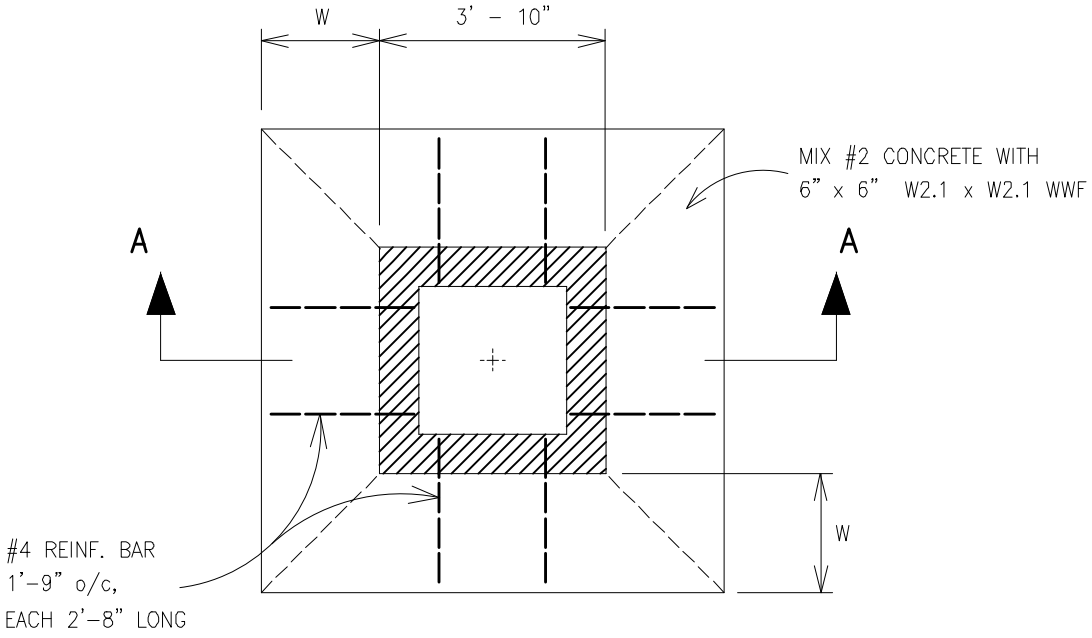
FILE: Drains_Master.DWG

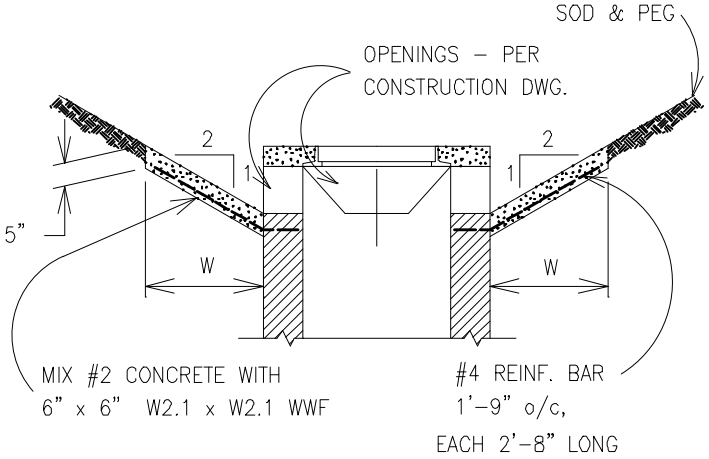
TOP SLAB (PLAN VIEW):



CONCRETE COLLAR (PLAN VIEW):

(IF INDICATED ON PLANS)





W = 2'-0" OR AS INDICATED ON CONSTRUCTION DRAWING.

SECTION A - A

APPROVAL

DIRECTOR

BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023

DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

TYPE Y-1 INLET DETAILS

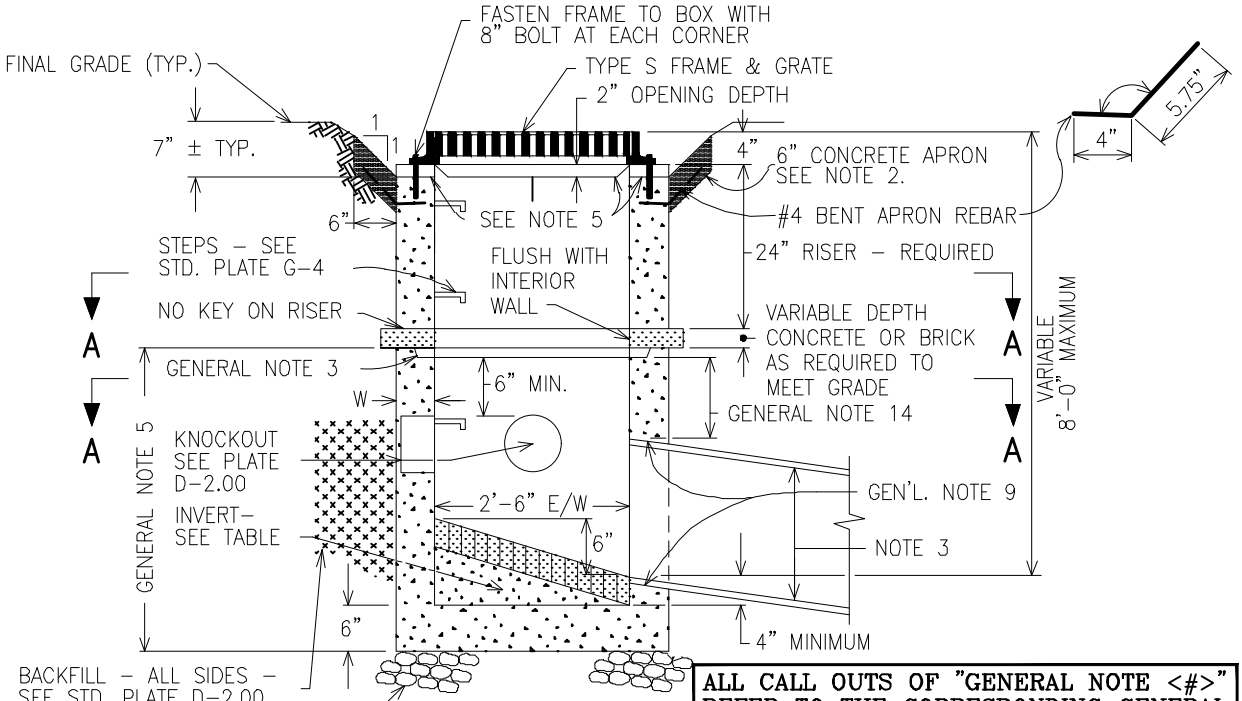
ISSUED: SEPTEMBER 2023

PLATE

D-2.22B

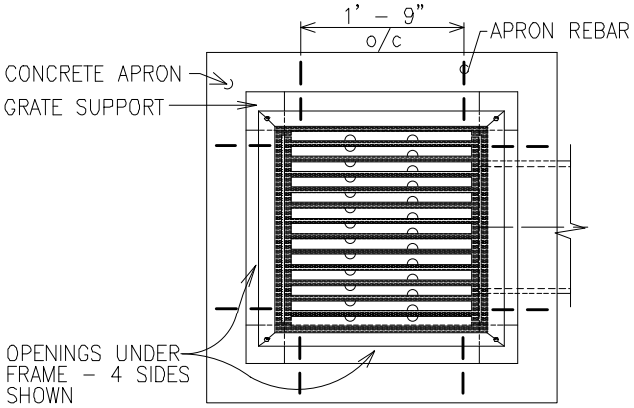
DATE: 08/28/2023

FILE: Drains_Master.DWG

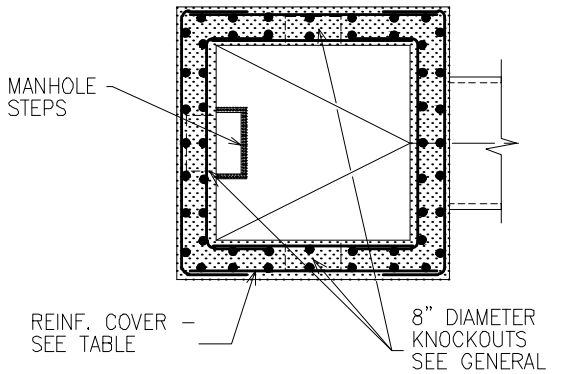


CROSS SECTION

ALL CALL OUTS OF "GENERAL NOTE <#>" REFER TO THE CORRESPONDING GENERAL NOTE, ON PLATE D-2.00



TOP VIEW



SECTION A–A

	PRECAST	CAST–IN–PLACE (CIP)
W	6" MINIMUM	8" MINIMUM
REINF.	2 LAYERS– 4x4 W4.0 x W4.0– WWF	#4 @ 9" O/C E.W. IN BOTH FACES; 16" BAR LAPS; CONTIN–UOUS AT CORNERS
REINF.COVER	1.5 INCH MIN.	1.5 INCH MIN.
INVERT	APPROVED PRECAST, PLAIN MIX #3 CONCRETE OR BRICK	PLAIN MIX #3 CONCRETE OR BRICK
SUBGRADE OPENING	SEE PLATE D–2.00	4" x 4" OPENINGS OR AS DIRECTED.
CONCRETE	4,500 PSI	MIX NO. 3

NOTES

1. SEE GENERAL NOTES, STANDARD PLATE D–2.00.
2. USE MIX #2 CONCRETE FOR CONCRETE APRON.
3. FOR PIPE SIZE, LOCATION AND INVERT ELEVATIONS, REFER TO PLANS. USE 24" MAXIMUM DIAMETER PIPE OUTFALL WITH STRUCTURE SHOWN. CONSTRUCT INLET HEADPIECE OVER TYPE A MANHOLE STRUCTURE WHERE 27" OR LARGER DRAIN PIPES ARE REQUIRED. SHOW HEADPIECE DETAIL ON PLANS IN THIS CASE.
4. PRECAST RISER TO BE REPLACED AT CONTRACTOR'S EXPENSE IF TOP SLAB SUPPORTS ARE BROKEN.
5. OPENINGS TO BE PLACED IN ANY OR ALL SIDES AS DIRECTED BY ENGINEER OR ON PLANS. SUPPORT FRAME ABOVE OPENING ON 2" HIGH CORNER PEDESTALS.
6. CAST IRON CURVED VANE GRATES OR CAST IRON PARALLEL BAR GRATES SHALL BE USED WITH CAST IRON FRAME FOR THIS APPLICATION. SEE STD. PLATES D–2.17, D–2.17A.

APPROVAL

DIRECTOR

BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023

DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

ALTERNATE Y–1 INLET

ISSUED: SEPTEMBER 2023

PLATE

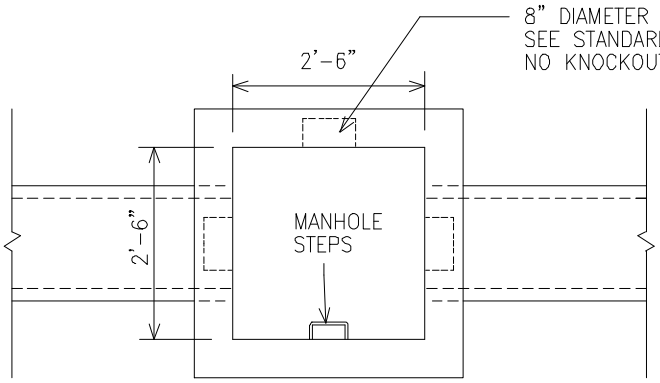
D–2.22C

DATE: 08/28/2023

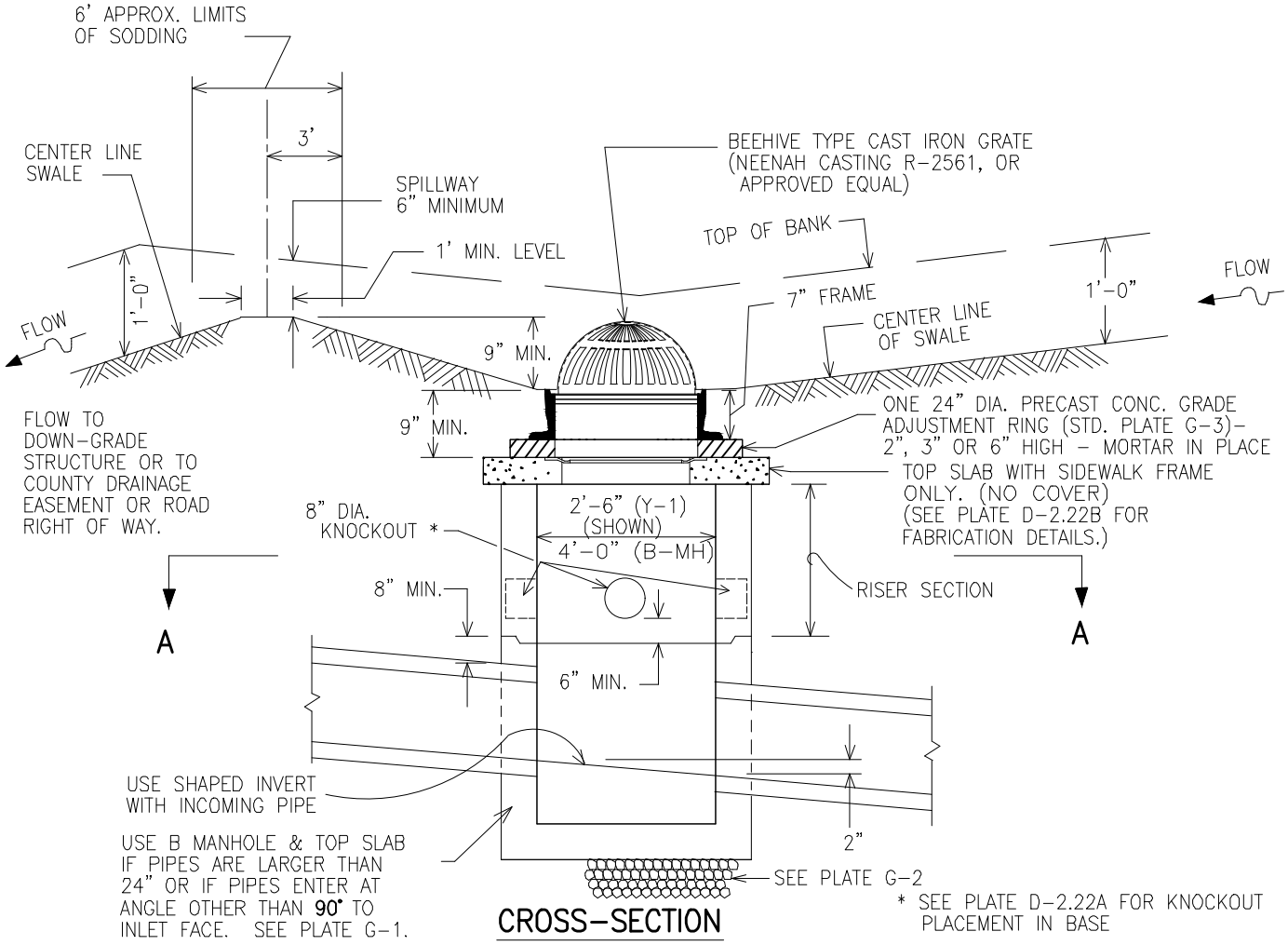
FILE: Drains_Master.DWG

NOTE:

SEE PLATE D-2.22A FOR ALL DATA NOT SHOWN.



SECTION A - A



CROSS-SECTION

NOTE:

INLET TO BE USED IN SUMP. MAXIMUM DESIGN CAPACITY Q= 3.0 CFS. TO BE USED WITH 15" RCCP MINIMUM, 24" RCCP MAXIMUM CONNECTION. NOT TO BE USED IN ROADWAY OR ADJACENT TO PARKING OR DRIVEWAY AREA. NOT FOR USE ADJACENT TO WOODED AREAS DUE TO POSSIBLE DEBRIS BLOCKAGE. USE OF PRECAST OR CAST-IN-PLACE Y-1 INLET (PLATE D-2.22A) IS REQUIRED FOR OTHER SWALE CONDITIONS.

ALL CALL OUTS OF "GENERAL NOTE <#>" REFER TO THE CORRESPONDING GENERAL NOTE, ON PLATE D-2.00

APPROVAL

DIRECTOR

BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023

DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

TYPE Y-3 INLET WITH Y-1 INLET BASE, BEEHIVE GRATE

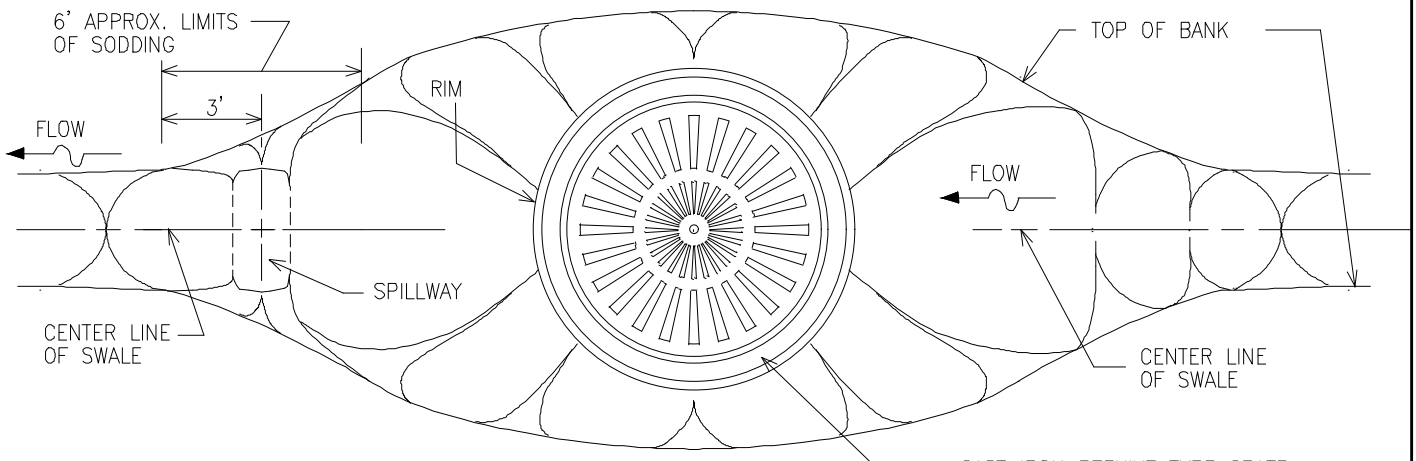
ISSUED: SEPTEMBER 2023

PLATE

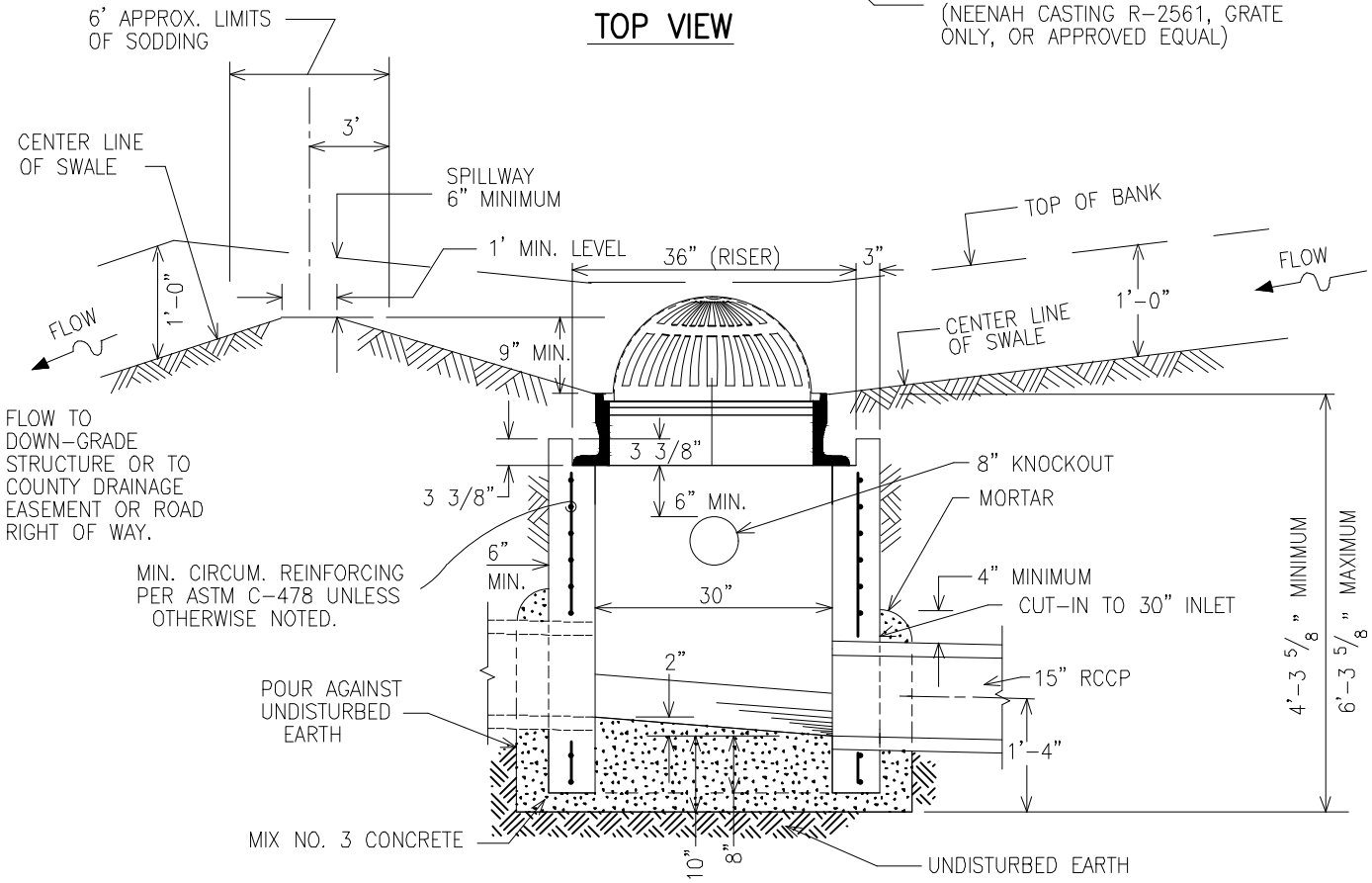
D-2.24A

DATE: 08/28/2023

FILE: Drains_Master.DWG



TOP VIEW



CROSS-SECTION

NOTE:

INLET TO BE USED IN SUMP, MAXIMUM DESIGN CAPACITY Q= 3.0 CFS. TO BE USED WITH 15" RCCP CONNECTION. NOT TO BE USED IN ROADWAY OR ADJACENT TO PARKING OR DRIVEWAY AREAS. CONNECTIONS SHALL BE LIMITED AS SHOWN ON PLATE D-2.23. NOT FOR USE ADJACENT TO WOODED AREAS DUE TO POSSIBLE DEBRIS BLOCKAGE.

APPROVAL

DIRECTOR

BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023

DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

TYPE Y-3 YARD INLET WITH Y-2 BASE, BEEHIVE GRATE

ISSUED: SEPTEMBER 2023

PLATE

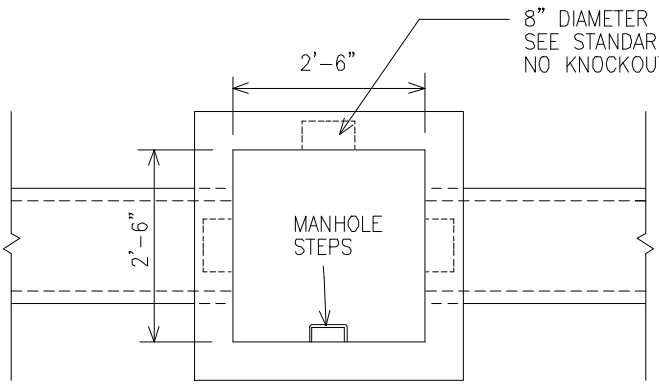
D-2.24B

DATE: 08/28/2023

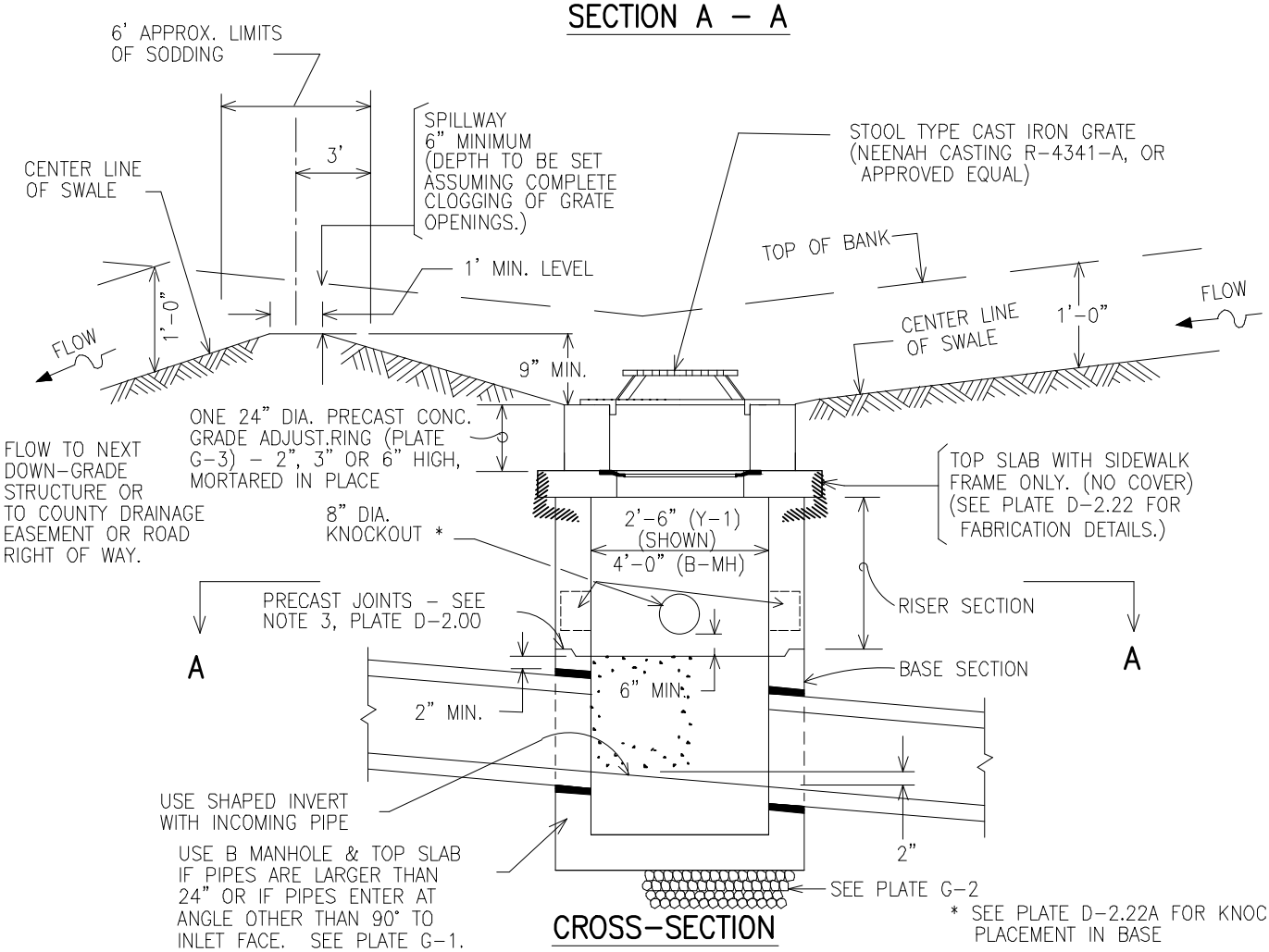
FILE: Drains_Master.DWG

NOTE:

SEE PLATE D-2.22A FOR ALL DATA NOT SHOWN.



SECTION A – A



CROSS-SECTION

NOTE:

INLET TO BE USED IN SUMP. MAXIMUM DESIGN CAPACITY Q= 3.0 CFS. TO BE USED WITH 15" RCCP MINIMUM, 24" RCCP MAXIMUM CONNECTION. NOT TO BE USED IN ROADWAY OR ADJACENT TO PARKING OR DRIVEWAY AREA. NOT FOR USE ADJACENT TO WOODED AREAS DUE TO POSSIBLE DEBRIS BLOCKAGE. USE OF PRECAST OR CAST-IN-PLACE Y-1 INLET (D-2.22A) REQUIRED FOR OTHER SWALE CONDITIONS.

ALL CALL OUTS OF "GENERAL NOTE <#>" REFER TO THE CORRESPONDING GENERAL NOTE, ON PLATE D-2.00

BALTIMORE COUNTY MARYLAND

APPROVAL

DIRECTOR

BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023

DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

TYPE Y-4 INLET WITH Y-1 INLET BASE, STOOL GRATE

ISSUED: SEPTEMBER 2023

PLATE

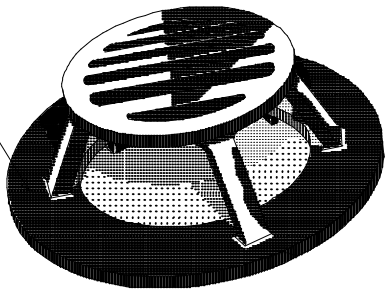
D-2.25A

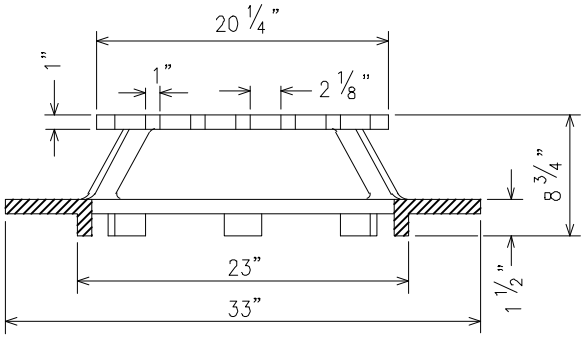
DATE: 08/28/2023

FILE: Drains_Master.DWG

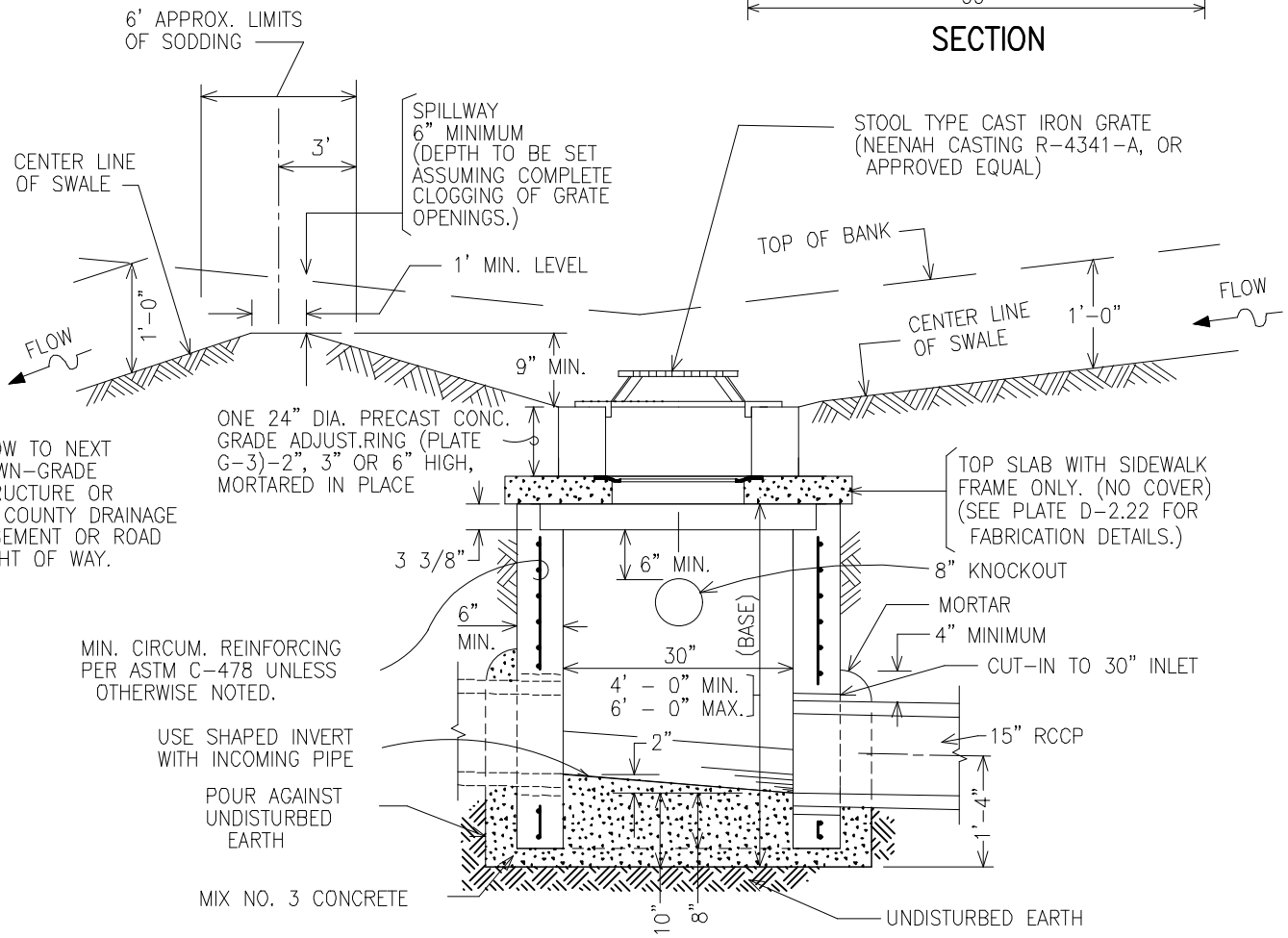
STOOL TYPE GRATE

ISOMETRIC





SECTION



CROSS-SECTION

NOTES:

INLET TO BE USED IN SUMP. MAXIMUM DESIGN CAPACITY Q= 3.0 CFS. TO BE USED WITH 15" RCCP CONNECTION.

NOT FOR USE IN ROADWAY OR ADJACENT TO PARKING OR DRIVEWAY AREA. NOT FOR USE ADJACENT TO WOODED AREAS DUE TO POSSIBLE DEBRIS BLOCKAGE.

CONNECTIONS LIMITED TO ONE INCOMING AND ONE OUTGOING 15" PIPE, WITH HORIZONTAL CONNECTIONS AS SHOWN IN SECTION A-A ON PLATE D-2.23.

A MINIMUM OF 6" OF RISER WALL SHALL BE MAINTAINED BETWEEN PIPE OPENINGS.

30" DIA. RCCP CL3, 4 OR 5 MAY BE SUBSTITUTED FOR BASE SHOWN.

ALL CALL OUTS OF "GENERAL NOTE <#>" REFER TO THE CORRESPONDING GENERAL NOTE, ON PLATE D-2.00

BALTIMORE COUNTY MARYLAND

APPROVAL

DIRECTOR

BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023

DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

TYPE Y-4 INLET WITH Y-2 INLET BASE, STOOL GRATE

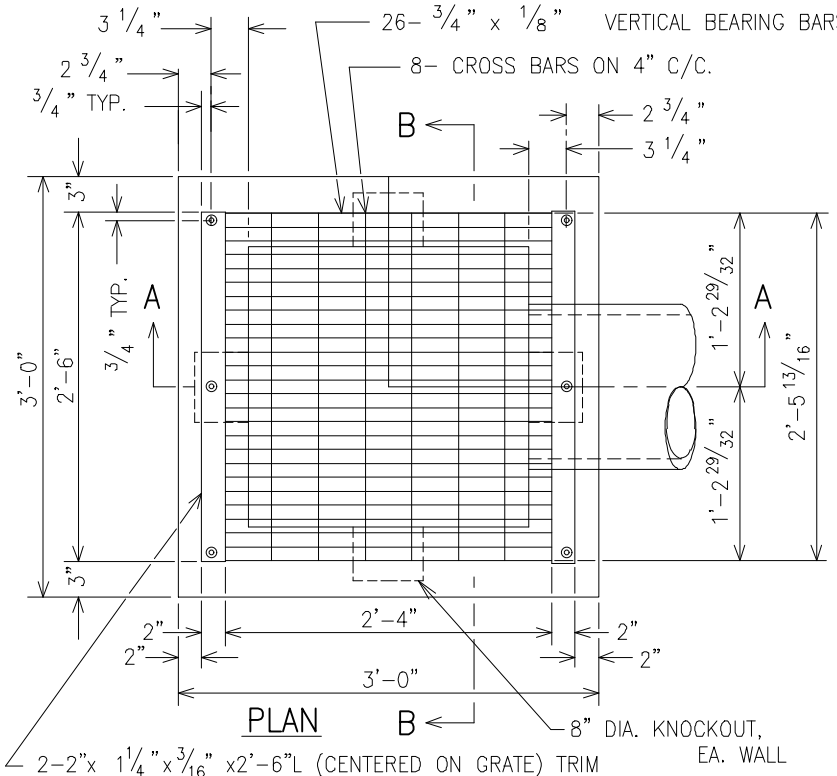
ISSUED: SEPTEMBER 2023

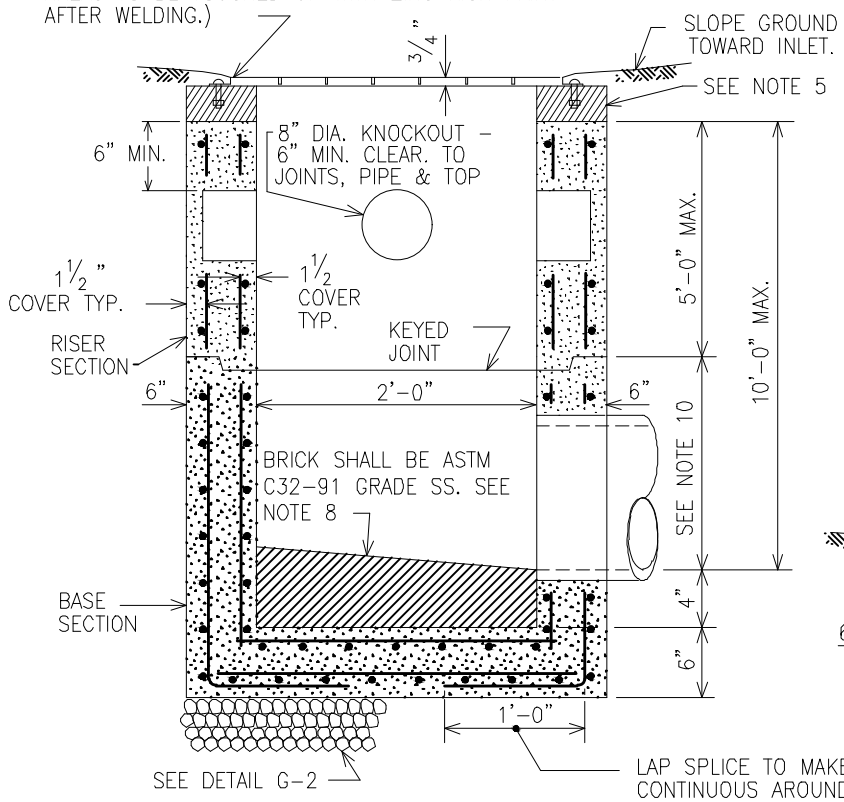
PLATE

D-2.25B

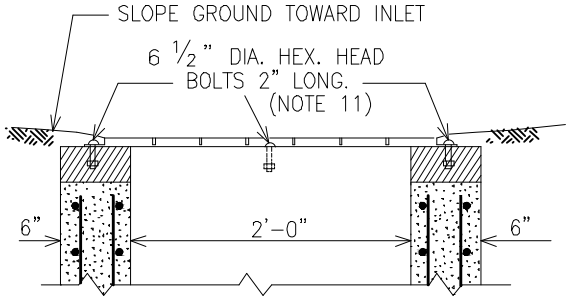
DATE: 08/28/2023

FILE: Drains_Master.DWG





SECTION A-A



SECTION B-B

GENERAL NOTES

1. CONCRETE TO BE 4500 psi PRECAST.
2. REINFORCING- 2 LAYERS OF 4x4- W4.0xW4.0 WELDED WIRE FABRIC.
3. THREADED PLASTIC INSERTS TO BE PROVIDED FOR HANDLING.
4. GRATING SHALL BE STEEL "IRVING X-BAR TYPE AA" OR APPROVED EQUIVALENT. ALL MATERIAL TO BE HOT DIP GALVANIZED PER ASTM A-153.
5. GRADE AND SLOPE ADJUSTMENTS TO BE COMPLETED IN THE FIELD USING CONCRETE MIX NO. 6, BRICK AND MORTAR OR APPROVED GRADE RING. MINIMUM 1 LAYER OF BRICK OR 3" OF CONCRETE.
6. PIPE OPENINGS TO BE PROVIDED AS REQUIRED. FOR SIZE, LOCATION AND INVERT ELEVATIONS REFER TO PLANS.
7. PLACEMENT OF SUBGRADE DRAINAGE WILL BE AS DIRECTED BY THE ENGINEER OR AS NOTED ON THE PLANS.
8. INVERT TO BE CONCRETE OR BRICK AND SHALL SLOPE 2" PER FOOT TOWARD OUTLET OR AS DIRECTED BY THE ENGINEER. (INVERT PROVIDED IN THE FIELD OR AS NOTED ON PLANS.)
9. NOT FOR USE WHERE VEHICLE WHEEL LOADING CAN OCCUR. USE SINGLE "S" INLET WHERE WHEEL LOADS ARE POS-SIBLE.
10. 5'-0" MAX., 3'-6" MIN. DEPTH TO TOP OF GRATE WHEN RISER IS NOT USED.
11. EXPANSION ANCHORS MAY BE USED INSTEAD OF BOLTS.

APPROVAL
DIRECTOR
BUR. OF ENGINEERING/CONSTRUCTION
SEPTEMBER 28, 2023
DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION
STORM DRAINAGE DETAILS

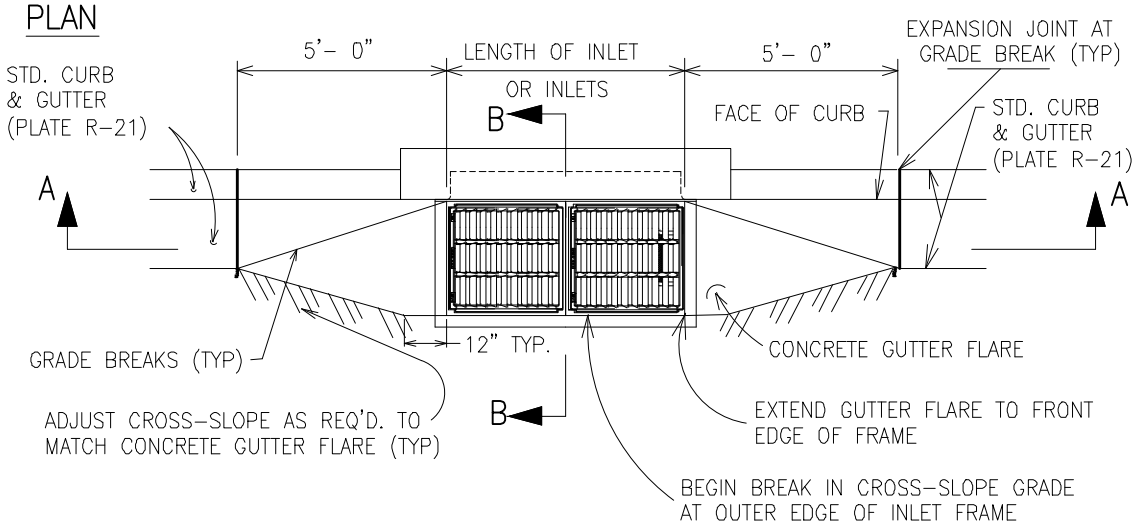
PRECAST Y-5
YARD INLET

ISSUED: SEPTEMBER 2023

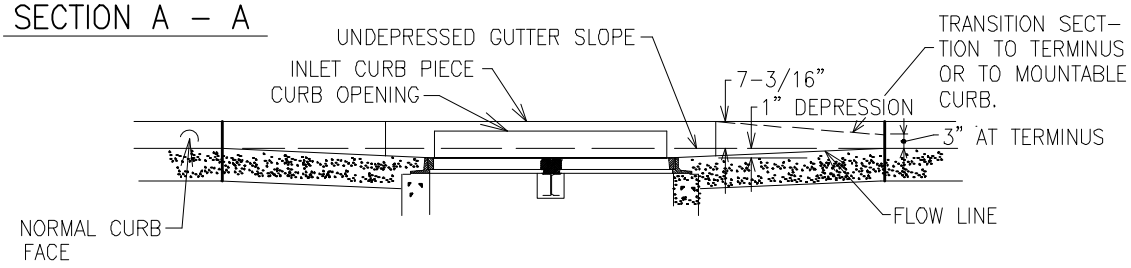
PLATE
D-2.25C

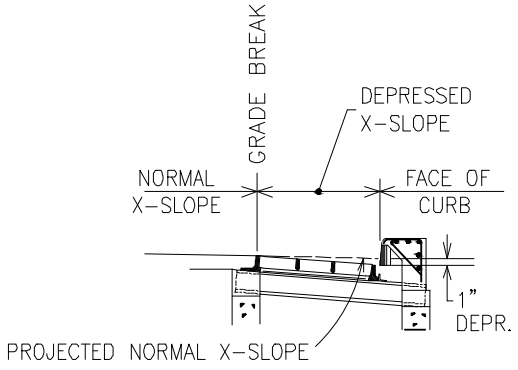
DATE: 08/28/2023
FILE: Drains_Master.DWG

PLAN



SECTION A - A





SECTION B - B

FOR USE ONLY WHERE A PARKING LANE EXISTS. NOT FOR USE ON ROADS WITH MORE THAN 2 LANES.

5'-0" CURB SHALL BE TRANSITION SEC-TION WHERE ADJACENT CURB & GUTTER ISN'T USED OR IS MOUNTABLE (R-21).

SEE STANDARD PLATES D-2.00 THROUGH D-2.03 FOR GUTTER DEPRESSIONS AT TYPE A & B INLETS

APPROVAL

DIRECTOR

BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023

DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

GUTTER DEPRESSION AND FLARE AT E & S INLETS

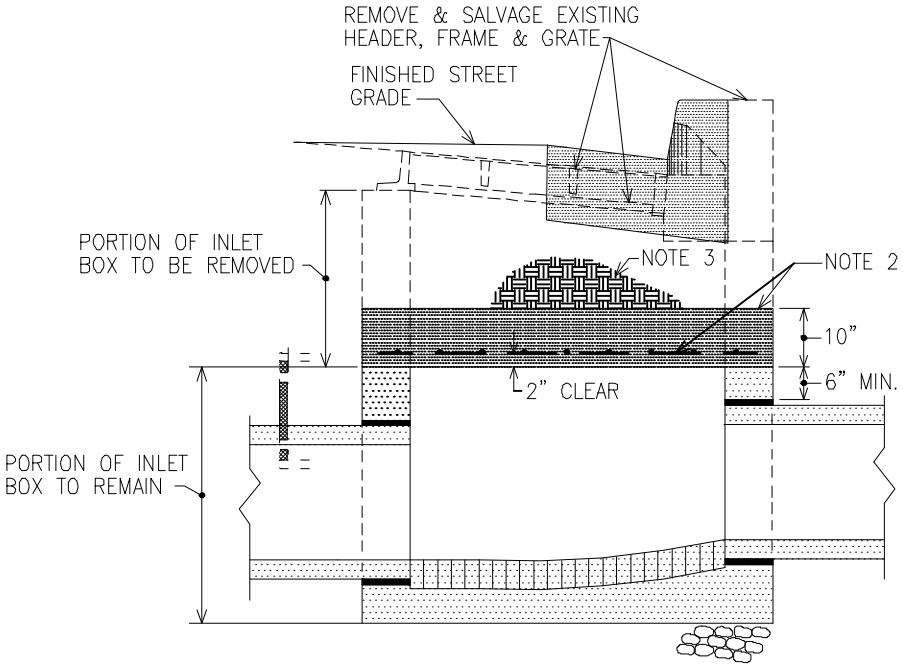
ISSUED: SEPTEMBER 2023

PLATE

D-2.26

DATE: 08/28/2023

FILE: Drains_Master.DWG



CROSS–SECTION

NOTES

1. APPLICABLE TO TYPE E, TYPE S AND DOUBLE TYPE S GRATE & COMBINATION INLETS. DOUBLE TYPE E AND CURB OPENING INLETS REQUIRE A SPECIAL DETAIL.
2. SLAB TO BE OF MIX #3 CONCRETE WITH #5 REBARS @ 6" O/C EACH WAY.
3. BACKFILL OVER SLAB WITH FLOWABLE FILL OR SELECT BORROW AS DIRECTED BY THE ENGINEER. WHERE ACCESS MUST BE MAINTAINED, SET 24" STD. HEAVY TRAFFIC FRAME & COVER TO GRADE ATOP SLAB MODIFIED WITH 24" OPENING.

BALTIMORE COUNTY MARYLAND

APPROVAL

DIRECTOR

BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023

DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

INLET CAPPING

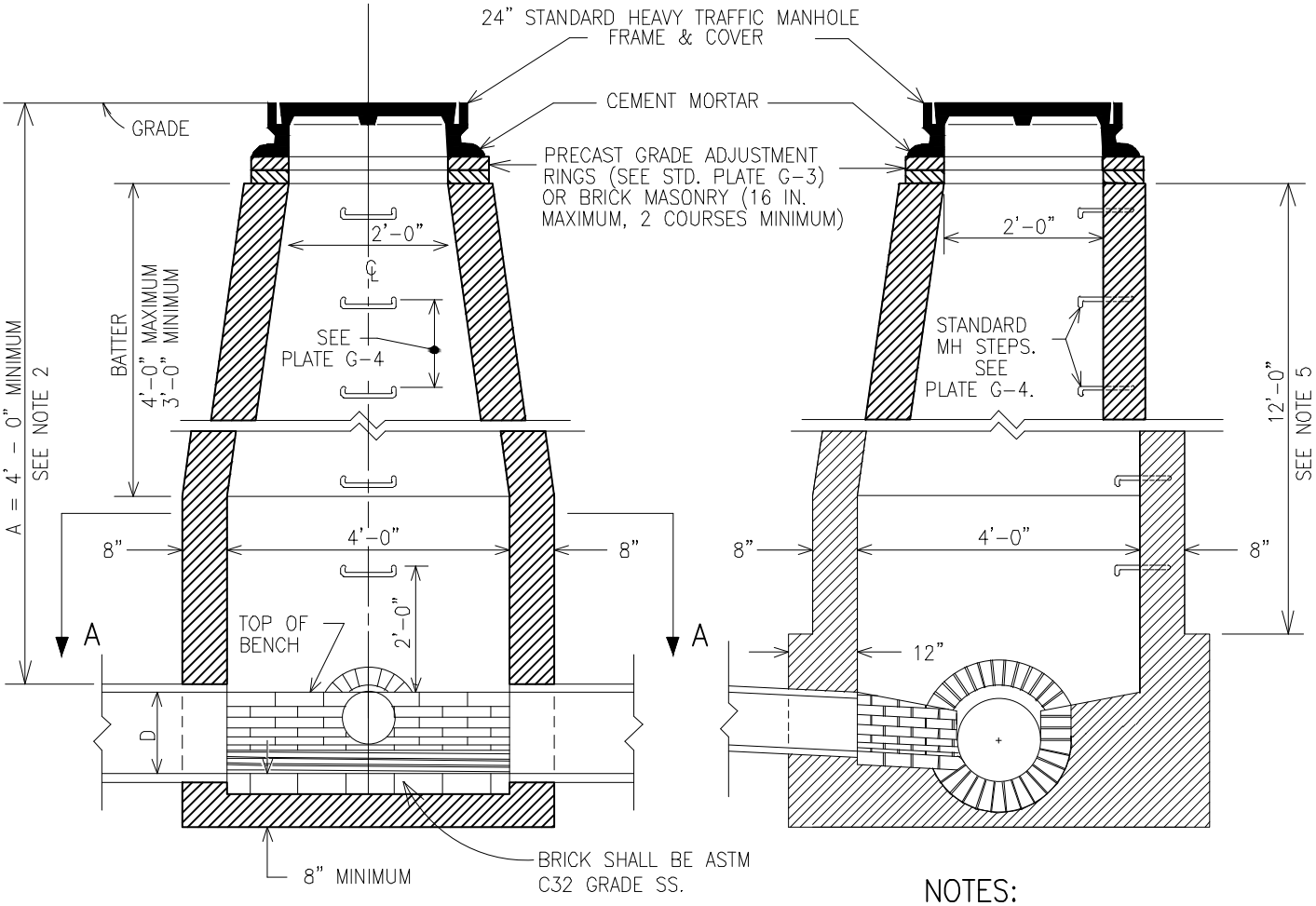
ISSUED: SEPTEMBER 2023

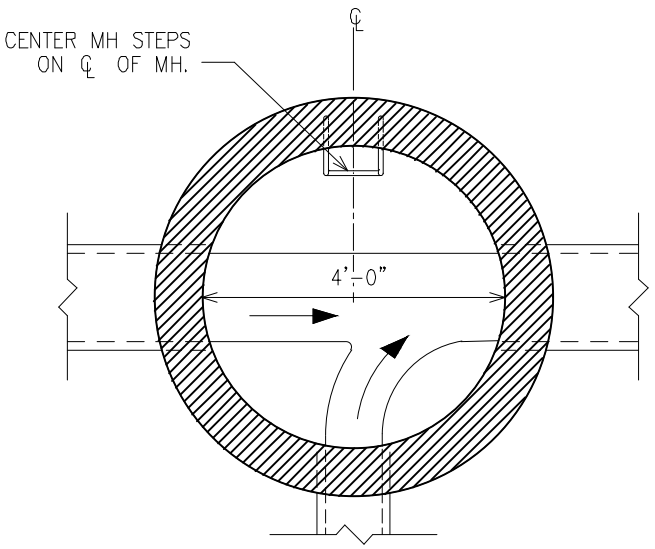
PLATE

D–2.46

DATE: 08/28/2023

FILE: Drains_Master.DWG





SECTION A-A

NOTES:

1. WALLS AND BOTTOM MUST BE BRICK OR PLAIN MIX #3 CONCRETE, POURED IN PLACE. WHERE BRICK IS USED, INVERT MUST BE BRICK LAID ON EDGE.
2. WHERE COVER (A) OVER PIPE IS LESS THAN 4'-0", USE TYPE B SHALLOW MANHOLE (SEE PLATE D-3.03).
3. FOR PIPE 42" AND LARGER IN HORIZONTAL DIAMETER, USE STORM DRAIN TYPE C MANHOLE (SEE PLATE D-3.04).
4. WHERE CENTER LINE OF HORIZONTAL CURVATURE EXCEEDS 4', USE BEND STRUCTURE (SEE PLATES D-4.01 AND D-4.02).
5. THICKNESS OF WALLS TO BE INCREASED TO 12", 12'-0" BELOW UNDERSIDE OF FRAME.
6. SEE PLATE D-3.01 FOR PRECAST ALTERNATIVE MANHOLE.
7. UNLESS OTHERWISE NOTED, MANHOLE TAPERS, RISERS & BASES SHALL BE FURNISHED IN STRICT ACCORD-ANCE WITH A.S.T.M. DESIGNATION C-478 (LATEST) FOR "PRECAST REINFORCED CONCRETE MANHOLE SECTIONS".

APPROVAL

DIRECTOR

BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023

DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

TYPE A MANHOLE FOR PIPES 15" THRU 36" HORIZONTAL DIAMETER

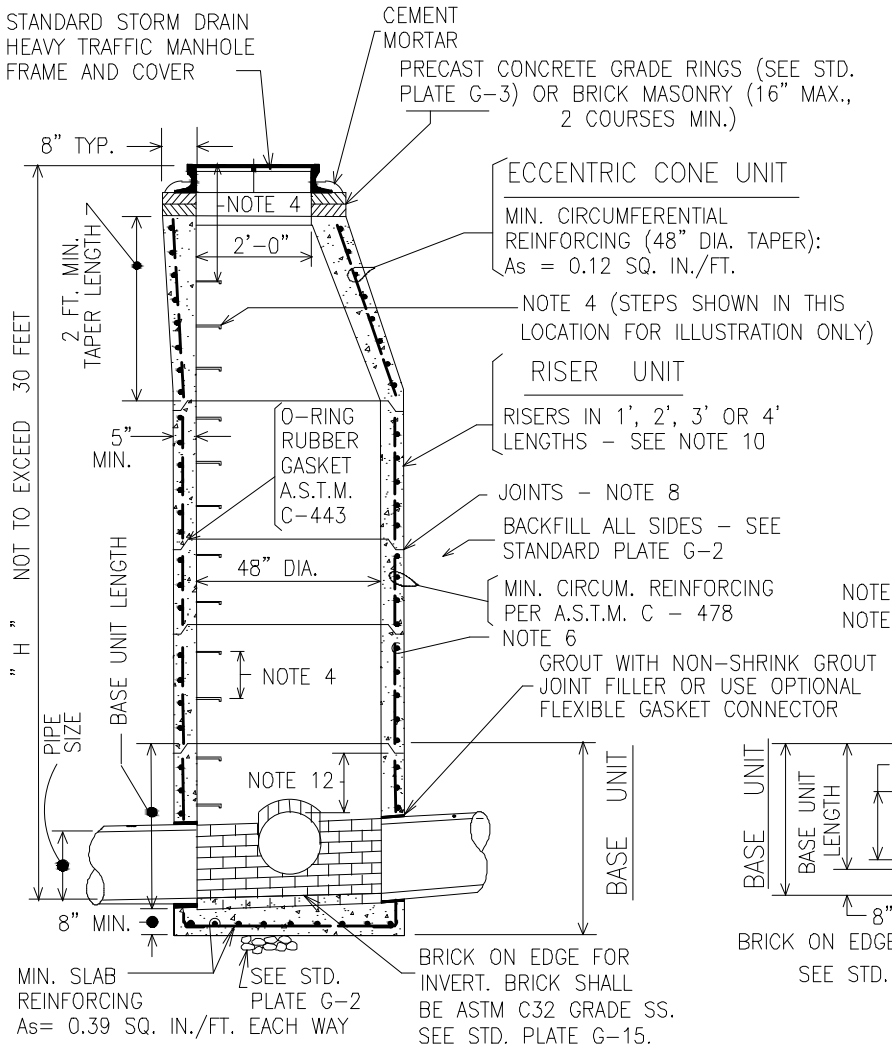
ISSUED: SEPTEMBER 2023

PLATE

D-3.00

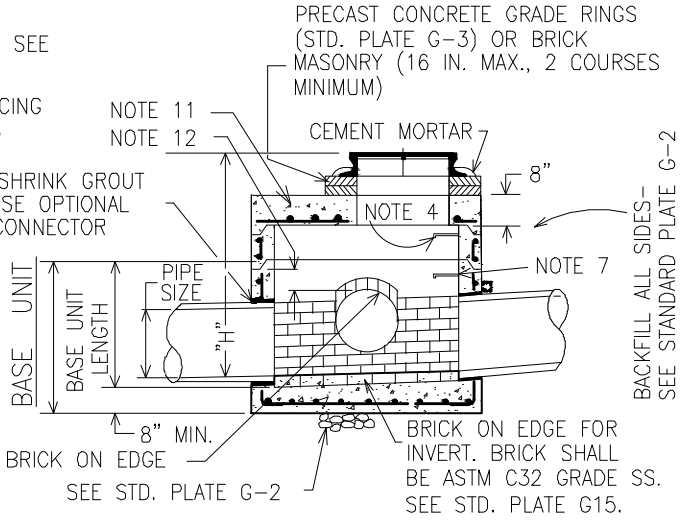
DATE: 08/28/2023

FILE: Drains_Master.DWG



THROUGH PIPE DIA.	LATERAL PIPE DIA.
27" OR LARGER	SEE D-3.02,3
24"	15"
21"	15", 18"
18"	15", 18"
15"	15"

TABLE BASED ON MAINTENANCE OF 6" MINIMUM REINFORCED WALL BETWEEN PIPE OPENINGS, MEASURED ALONG INSIDE WALL.



48" PRECAST MANHOLE TYPE A (STANDARD)

48" PRECAST MANHOLE TYPE B (SHALLOW)

NOTES:

1. UNLESS OTHERWISE NOTED, MANHOLE TAPERS, RISERS AND BASES SHALL BE FURNISHED IN STRICT ACCORDANCE WITH A.S.T.M. DESIGNATION C-478 (LATEST) FOR "PRECAST REINFORCED CONCRETE MANHOLE SECTIONS".
2. ALL CONCRETE SHALL BE 4,500 PSI COMPRESSIVE STRENGTH.
3. REINFORCING FOR TYPE B THE SAME AS FOR TYPE A.
4. SEE STANDARD DETAIL PLATE G-4 FOR MANHOLE STEP SPECIFICATIONS, SPACING AND PLACEMENT. STEP LOCATION SHOWN IS FOR ILLUSTRATION ONLY. LOCATE STEPS 90° FROM MAIN FLOW CHANNEL WITHIN MANHOLE.
5. A PRECAST MANHOLE SECTION MAY BE PLACED OVER EXISTING PIPE. SEE DETAIL FOR PRECAST MANHOLE "DOGHOUSE" RISER, STANDARD DETAIL PLATE D-3.07.
6. MINIMUM CIRCUMFERENTIAL REINFORCEMENT PER A.S.T.M. C 478.
7. USE A MINIMUM OF 1 MANHOLE STEP IN BASE UNIT.
8. PRECAST MANHOLE RISER JOINTS: THE MANUFACTURER SHALL FORM MALE AND FEMALE ENDS OF JOINTS USING THEIR OWN DESIGN. THE JOINTS SHALL BE SEALED BY THE CONTRACTOR AND MADE WATER-TIGHT USING THE MANUFACTURER'S RECOMMENDED ASTM OR AASHTO-APPROVED SEALANT.
9. SEE STANDARD DETAIL PLATE G-3 FOR SPECIFICATIONS & PLACEMENT OF PRECAST CONCRETE GRADE RINGS.
10. USE LARGEST APPLICABLE RISER UNIT LENGTHS. USE A MAXIMUM OF ONE- 1 FOOT LENGTH RISER UNIT PER STRUCTURE, PLACED IMMEDIATELY UNDER ECCENTRIC CONE SECTION.
11. SEE DETAIL PLATE D-3.02B FOR PRECAST TOP SLAB DETAIL FOR SHALLOW MANHOLE.
12. MAINTAIN 2" MIN. FROM PIPE OPENING TO JOINT OR PROVIDE A SPECIAL REINFORCED DESIGN.

BALTIMORE COUNTY MARYLAND

APPROVAL

DIRECTOR

BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023
DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

PRECAST A & B MANHOLES FOR PIPES 15" THRU 24" HORIZONTAL DIAMETER

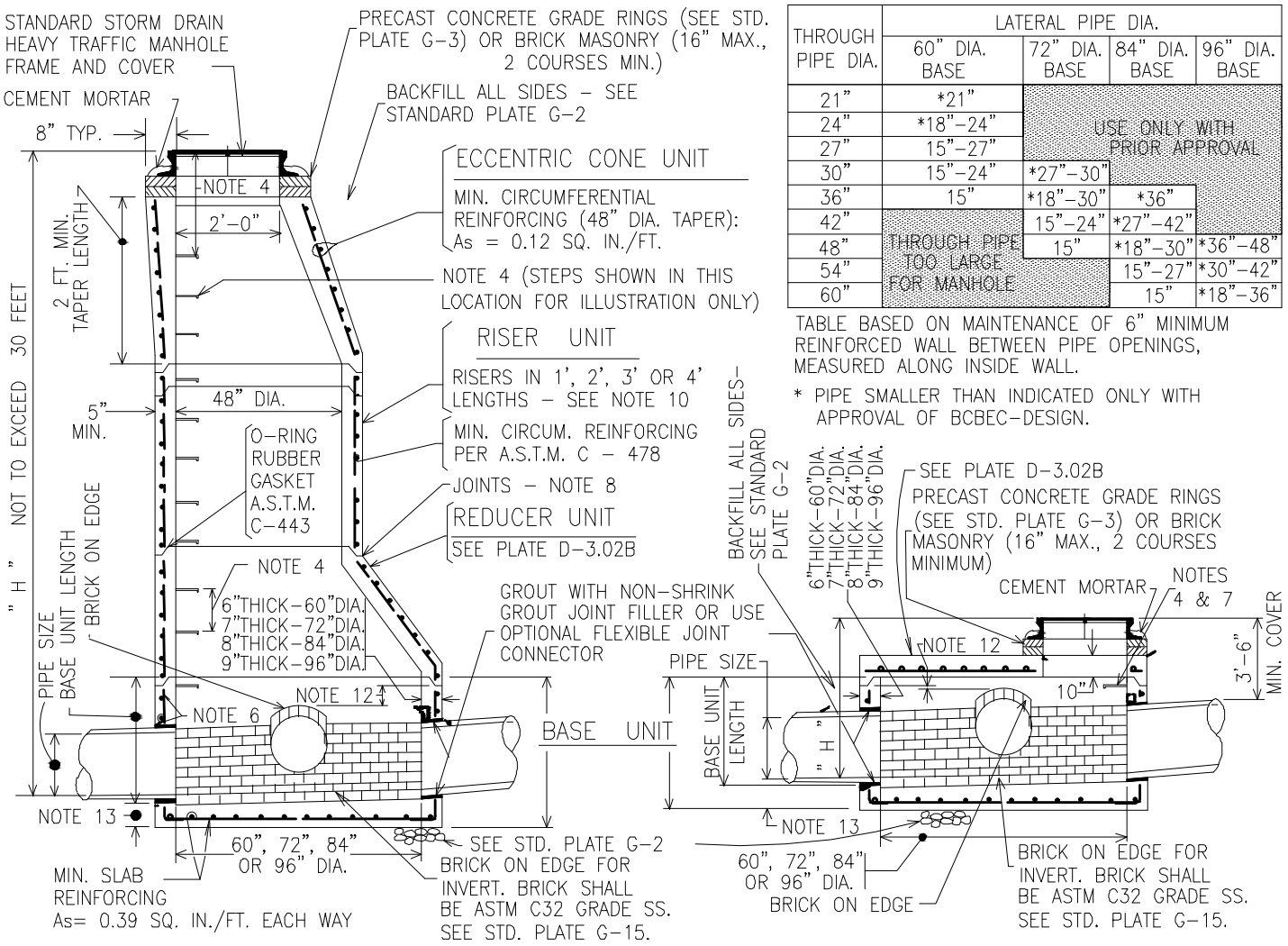
ISSUED: SEPTEMBER 2023

PLATE

D-3.01

DATE: 08/28/2023

FILE: Drains_Master.DWG



THROUGH PIPE DIA.	LATERAL PIPE DIA.			
	60" DIA. BASE	72" DIA. BASE	84" DIA. BASE	96" DIA. BASE
21"	*21"	USE ONLY WITH PRIOR APPROVAL		
24"	*18"-24"			
27"	15"-27"			
30"	15"-24"	*27"-30"		
36"	15"	*18"-30"	*36"	
42"	THROUGH PIPE TOO LARGE FOR MANHOLE	15"-24"	*27"-42"	
48"		15"	*18"-30"	*36"-48"
54"			15"-27"	*30"-42"
60"			15"	*18"-36"

TABLE BASED ON MAINTENANCE OF 6" MINIMUM REINFORCED WALL BETWEEN PIPE OPENINGS, MEASURED ALONG INSIDE WALL.

* PIPE SMALLER THAN INDICATED ONLY WITH APPROVAL OF BCBEC-DESIGN.

STANDARD PRECAST MANHOLE

SHALLOW PRECAST MANHOLE

NOTES:

1. UNLESS OTHERWISE NOTED, MANHOLE TAPERS, RISERS AND BASES SHALL BE FURNISHED IN STRICT ACCORDANCE WITH A.S.T.M. DESIGNATION C-478 (LATEST) FOR "PRECAST REINFORCED CONCRETE MANHOLE SECTIONS".
2. ALL CONCRETE SHALL BE 4,500 PSI COMPRESSIVE STRENGTH.
3. SHALLOW MH REINFORCEMENT SAME AS STANDARD MH.
4. SEE STANDARD DETAIL PLATE G-4 FOR MANHOLE STEP SPECIFICATIONS, SPACING AND PLACEMENT. STEP LOCATION SHOWN IS FOR ILLUSTRATION ONLY. LOCATE STEPS 90° FROM MAIN FLOW CHANNEL WITHIN MANHOLE.
5. A PRECAST MANHOLE SECTION MAY BE PLACED OVER EXISTING PIPE. SEE DETAIL FOR PRECAST MANHOLE "DOGHOUSE" RISER, STANDARD PLATE D-3.07.
6. MINIMUM CIRCUMFERENTIAL REINFORCEMENT PER A.S.T.M. C 478.
7. USE A MINIMUM OF 1 MANHOLE STEP IN BASE UNIT.
8. PRECAST MANHOLE RISER JOINTS: THE MANUFACTURER SHALL FORM MALE AND FEMALE ENDS OF JOINTS USING THEIR OWN DESIGN. THE JOINTS SHALL BE SEALED BY THE CONTRACTOR AND MADE WATER-TIGHT USING THE MANUFACTURER'S RECOMMENDED ASTM OR AASHTO-APPROVED SEALANT.
9. SEE STANDARD DETAIL PLATE G-3 FOR SPECIFICATIONS & PLACEMENT OF PRECAST CONCRETE GRADE RINGS.
10. USE LARGEST APPLICABLE RISER UNIT LENGTHS. USE A MAXIMUM OF ONE- 1 FOOT LENGTH RISER UNIT PER STRUCTURE, TO BE PLACED IMMEDIATELY BELOW ECCENTRIC CONE SECTION.
11. SEE PLATE D-3.02B FOR PRECAST TOP SLAB DETAIL FOR SHALLOW MH.
12. MAINTAIN 2" MIN. FROM PIPE OPENING TO JOINT OR PROVIDE A SPECIAL REINFORCED DESIGN.
13. BOTTOM SLAB THICKNESS: 8" MIN. (60", 72" & 84" DIA.) 10" MIN. (96" DIA.)

BALTIMORE COUNTY MARYLAND

APPROVAL

DIRECTOR

BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023

DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

PRECAST C MANHOLES FOR PIPES 21" THRU 60" HORIZONTAL DIAMETER

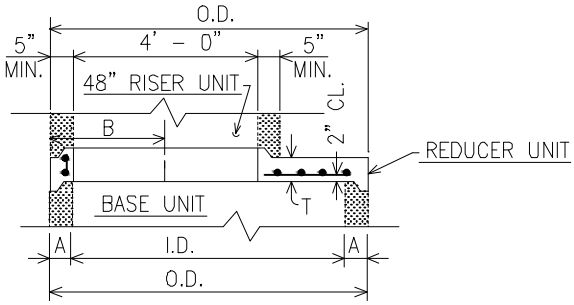
ISSUED: SEPTEMBER 2023

PLATE

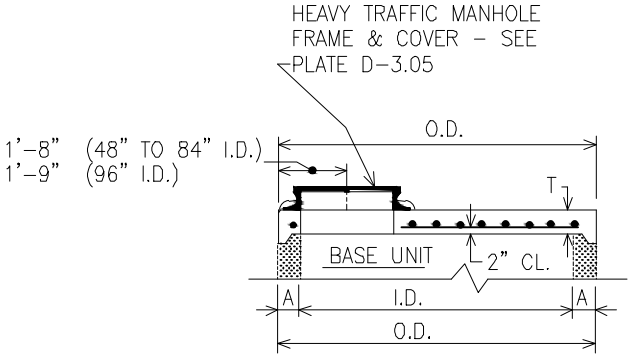
D-3.02A

DATE: 08/28/2023

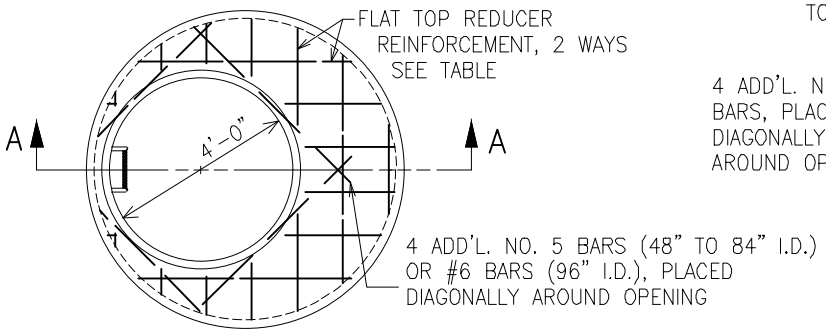
FILE: Drains_Master.DWG



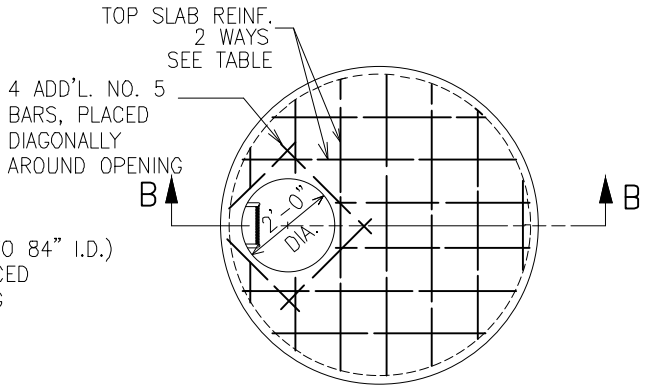
SECTION A - A



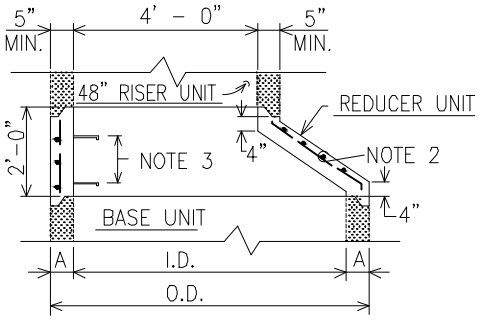
SECTION B - B



FLAT TOP REDUCER



FLAT TOP SLAB
(SHOWN WITHOUT FRAME & COVER)



ECCENTRIC CONE REDUCER

I.D.	A	O.D.	B	T	WALL REINF.	FLAT TOP REDUCER REINF.	TOP SLAB REINF.
48"	5"	58"	–	8"	0.12 SQ.IN./FT (NOTE 2)	–	#5 BARS @ 12" C/C
60"	6"	72"	2'-6"	10"	0.15 SQ.IN./FT (NOTE 2)	#5 BARS @ 10" C/C	#5 BARS @ 10" C/C
72"	7"	86"	2'-7"	10"	0.18 SQ.IN./FT (NOTE 2)	#5 BARS @ 10" C/C	#5 BARS @ 10" C/C
84"	8"	100"	2'-8"	10"	0.21 SQ.IN./FT (NOTE 2)	#5 BARS @ 10" C/C	#5 BARS @ 10" C/C
96"	9"	114"	2'-9"	10"	0.24 SQ.IN./FT (NOTE 2)	#4 BARS (TOP) & #6 BARS (BOTTOM) @ 8" C/C	#5 BARS @ 10" C/C

1. USE 4500 psi CONCRETE.
2. ECCENTRIC CONES, RISERS & BASE UNITS SHALL HAVE WALL REINFORCEMENT (BARS OR WWF) WITH A MINIMUM AREA (SQUARE INCHES PER FOOT) AS SHOWN IN TABLE FOR EACH I.D.
3. SEE PLATE G-4 FOR MANHOLE STEPS.
4. USE GRADE RING ADJUSTERS (PLATE G-3) AS REQUIRED TO BRING MANHOLE FRAME TO GRADE.
5. PRECAST MANHOLE JOINTS: THE MANUFACTURER SHALL FORM MALE & FEMALE ENDS OF JOINTS USING THEIR OWN DESIGN. JOINTS SHALL BE SEALED BY THE CONTRACTOR AND MADE WATER-TIGHT USING THE MANUFACTURER'S RECOMMENDED ASTM OR AASHTO-APPROVED SEALANT.
6. THE BASE SHALL BE CAST MONOLITHIC WITH BASE UNIT OR JOINTED PER MANUFACTURER'S DESIGN.
7. A LARGER DIAMETER UNIT OR SPECIAL DESIGN SHALL BE USED WHEN PIPE OPENINGS HAVE LESS THAN 6" BETWEEN THEM.
8. LIFT HOLES OR EYES SHALL BE PROVIDED IN EACH SECTION FOR HANDLING.
9. DRIP STONE LANDINGS (SEE PLATE D-3.09A) SHALL BE USED ONLY WHEN PIPES ARE CONNECTED THROUGH RISER UNITS.
10. PRECAST UNITS ARE UNACCEPTABLE IF INNER OR OUTER JOINT IS CRACKED OR BROKEN.

APPROVAL
DIRECTOR
BUR. OF ENGINEERING/CONSTRUCTION
SEPTEMBER 28, 2023
DATE

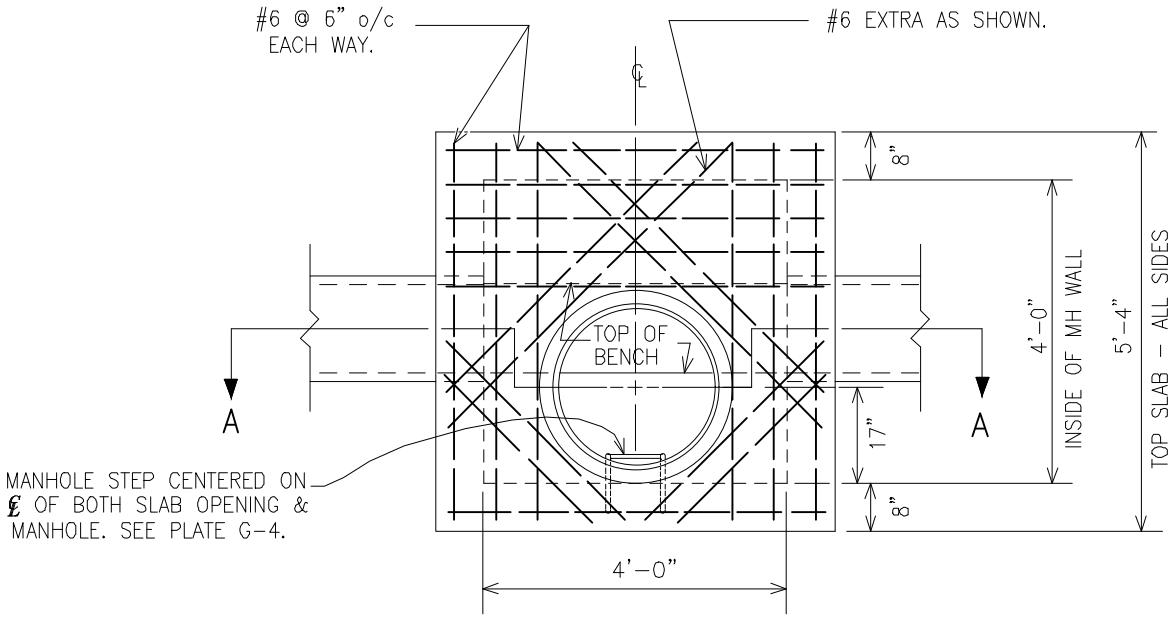
DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION
STORM DRAINAGE DETAILS

TYPE C MANHOLE
PRECAST REDUCERS

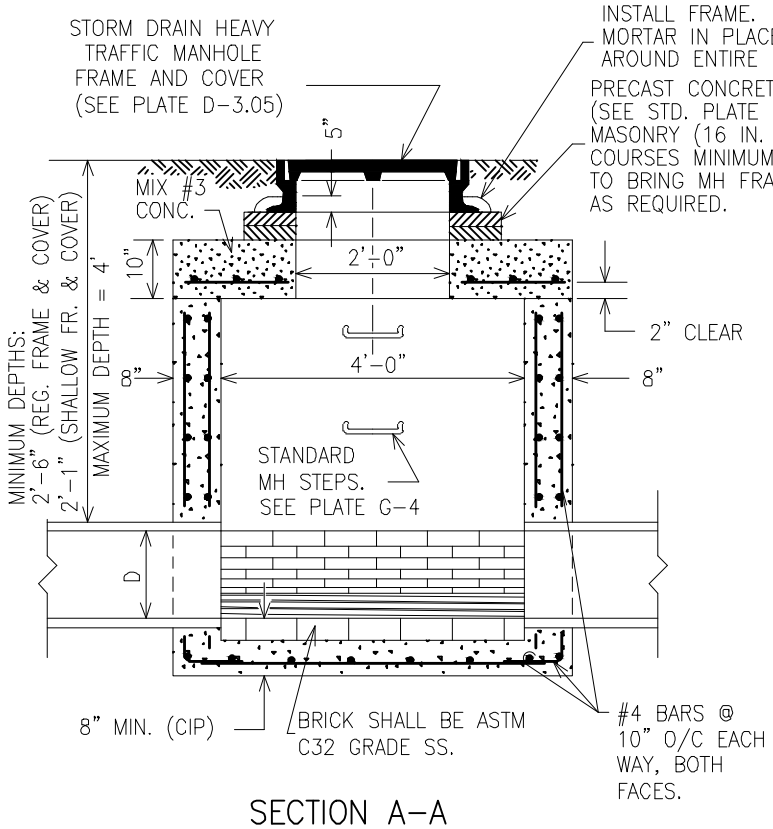
ISSUED: SEPTEMBER 2023

PLATE
D-3.02B

DATE: 08/28/2023
FILE: Drains_Master.DWG



PLAN



SECTION A-A

NOTES :

1. WALLS, BOTTOM SLAB AND INVERT SHALL BE MIX #3 CONCRETE POURED IN PLACE.
2. BENCH FULL HEIGHT OF PIPE AS SHOWN FOR TYPE A MANHOLE ON PLATE D-3.00.
3. WHERE COVER IS GREATER THAN 4', USE TYPE A MANHOLE.
4. FOR PIPE SIZES 42" AND LARGER, USE TYPE C MANHOLE.
5. FOR PIPE 30" HORIZONTAL & LARGER WITH CURVE CENTERLINE LENGTH GREATER THAN 4', USE BEND STRUCTURE. SEE PLATE D-4.01 .
6. USE OF SIDEWALK FRAME AND COVER (SEE PLATE D-3.06) IN PLACE OF HEAVY TRAF-FIC FRAME & COVER SHALL BE LIMITED TO SIDEWALK AREAS EXCEPT WITH PRIOR APPROVAL OF BUREAU OF ENGINEERING.
7. SEE PLATE D-3.01 FOR PRECAST ALTER-NATE SHALLOW MANHOLE.

BALTIMORE COUNTY MARYLAND

APPROVAL

DIRECTOR

BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023
DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

TYPE B SHALLOW MANHOLE FOR PIPES 15" THRU 36" HORIZONTAL DIAMETER

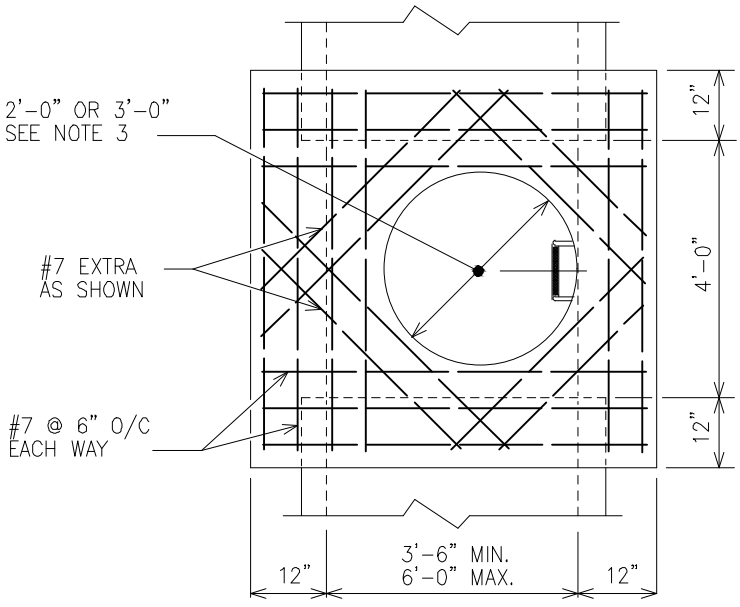
ISSUED: SEPTEMBER 2023

PLATE

D-3.03

DATE: 08/28/2023

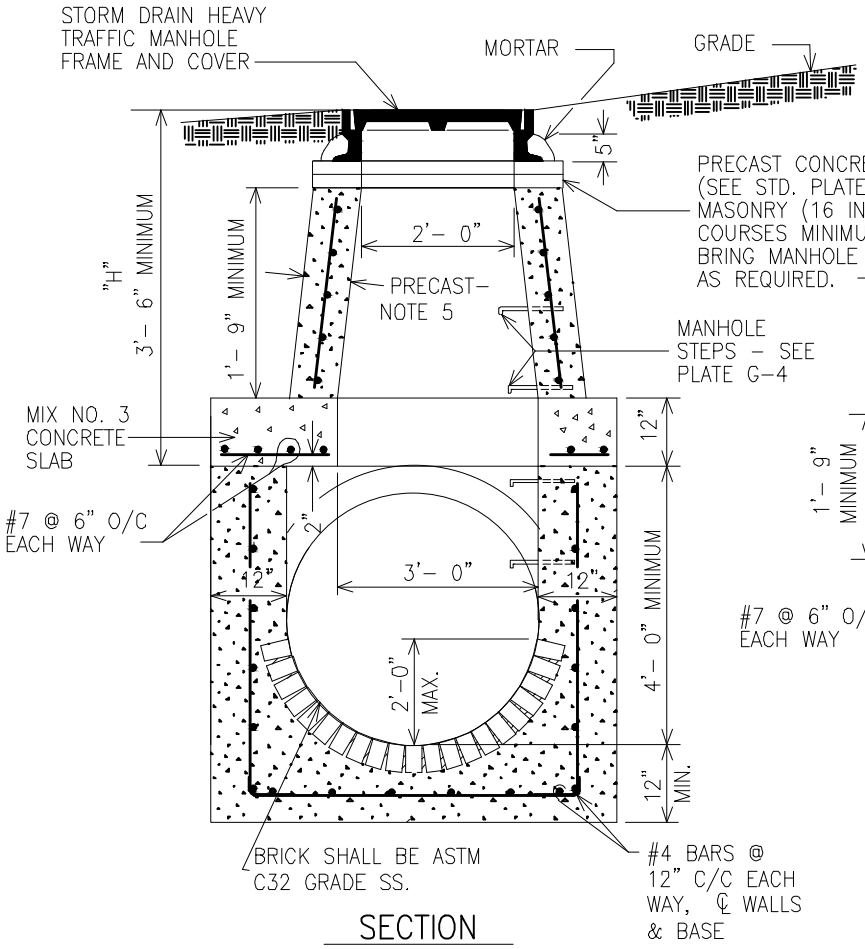
FILE: Drains_Master.DWG



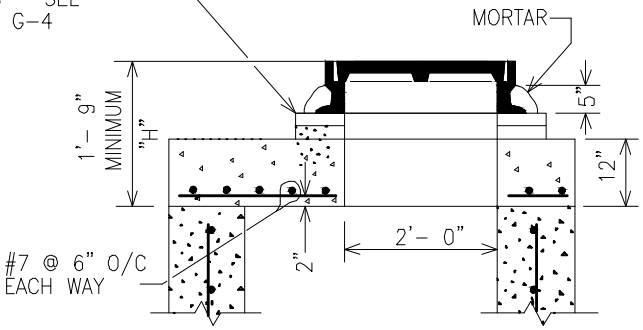
TOP SLAB

NOTES :

1. WALLS, BOTTOM SLAB AND INVERT SHALL BE MIX NO. 3 CONCRETE POURED IN PLACE.
2. FOR PIPES 36" AND SMALLER, USE TYPE A MANHOLE, OR TYPE B MANHOLE WHERE "H" (COVER) IS LESS THAN 3'-6".
3. WHERE "H" IS LESS THAN 3'-6", USE ALTERNATE MANHOLE STACK.
4. FOR CURVE CENTERLINE LENGTH OVER 4 FT., USE BEND STRUCTURE PLATE D-4.01 .
5. UNLESS OTHERWISE NOTED, MANHOLE TAPERS SHALL BE FURNISHED IN STRICT ACCORDANCE WITH A.S.T.M. DESIGNATION C-478 (LATEST) FOR "PRECAST REINFORCED CONCRETE MANHOLE SECTIONS".



SECTION



ALTERNATE MANHOLE STACK

(SEE NOTE 3)

DATE: 08/28/2023

FILE: Drains_Master.DWG

BALTIMORE COUNTY MARYLAND

APPROVAL

DIRECTOR

BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023

DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

TYPE C MANHOLE FOR PIPES 42" AND LARGER (DEFLECTION LENGTH 4")

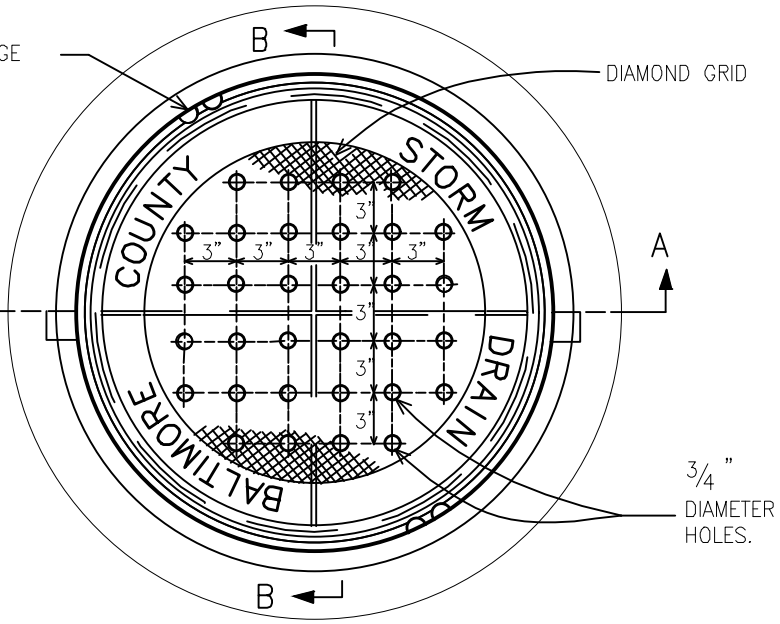
ISSUED: SEPTEMBER 2023

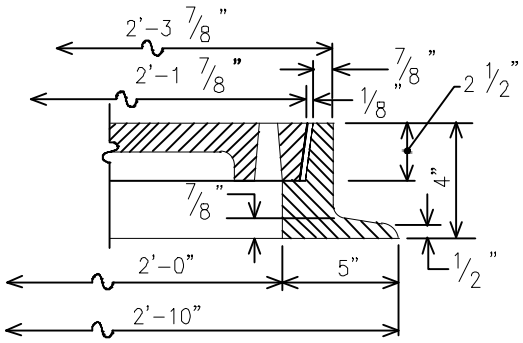
PLATE

D-3.04

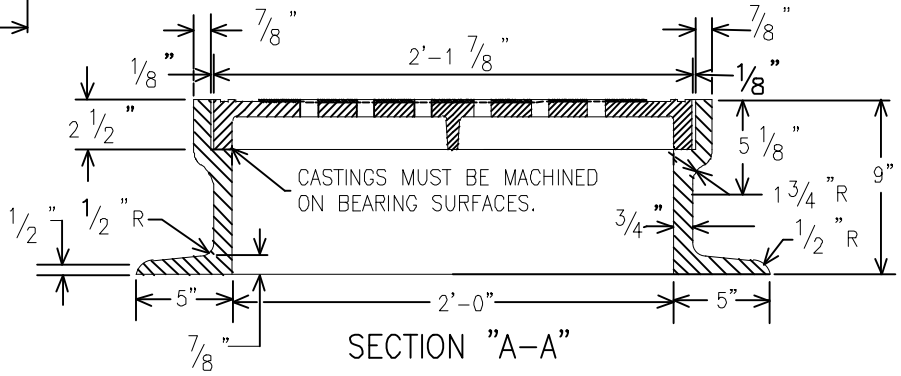
PICK HOLES ON EDGE OF COVER.

WHERE FRAME & COVER IS USED OUTSIDE OF BALTIMORE COUNTY R/W OR EASEMENTS, SUBSTITUTE THE WORDS "PRIVATE STORM DRAIN" FOR "BALTIMORE COUNTY STORM DRAIN" ON THE COVER.

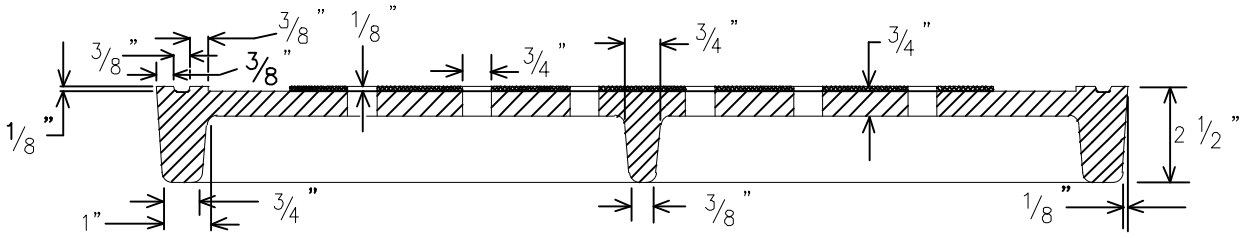




SHALLOW FRAME



SECTION "A-A"



SECTION "B-B"

NOTES :

FRAME AND COVER FOR 54" AND LARGER BENDS AND JUNCTION CHAMBERS SHALL BE 2'-6" WITH LETTERING AND HOLES AS SHOWN FOR 2'-0" FRAME.

CASTING MATERIALS SHALL BE GREY IRON.

USE OF SHALLOW FRAME SHALL BE APPROVED BY ENGINEER.

NOMINAL WEIGHTS

	9" FRAME	4" SHALLOW FRAME
FRAME :	250 Lbs.	165 Lbs.
COVER :	135 Lbs.	135 Lbs.
TOTAL :	385 Lbs.	300 Lbs.

APPROVAL

DIRECTOR

BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023

DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

24" HEAVY TRAFFIC MANHOLE FRAME AND COVER

ISSUED: SEPTEMBER 2023

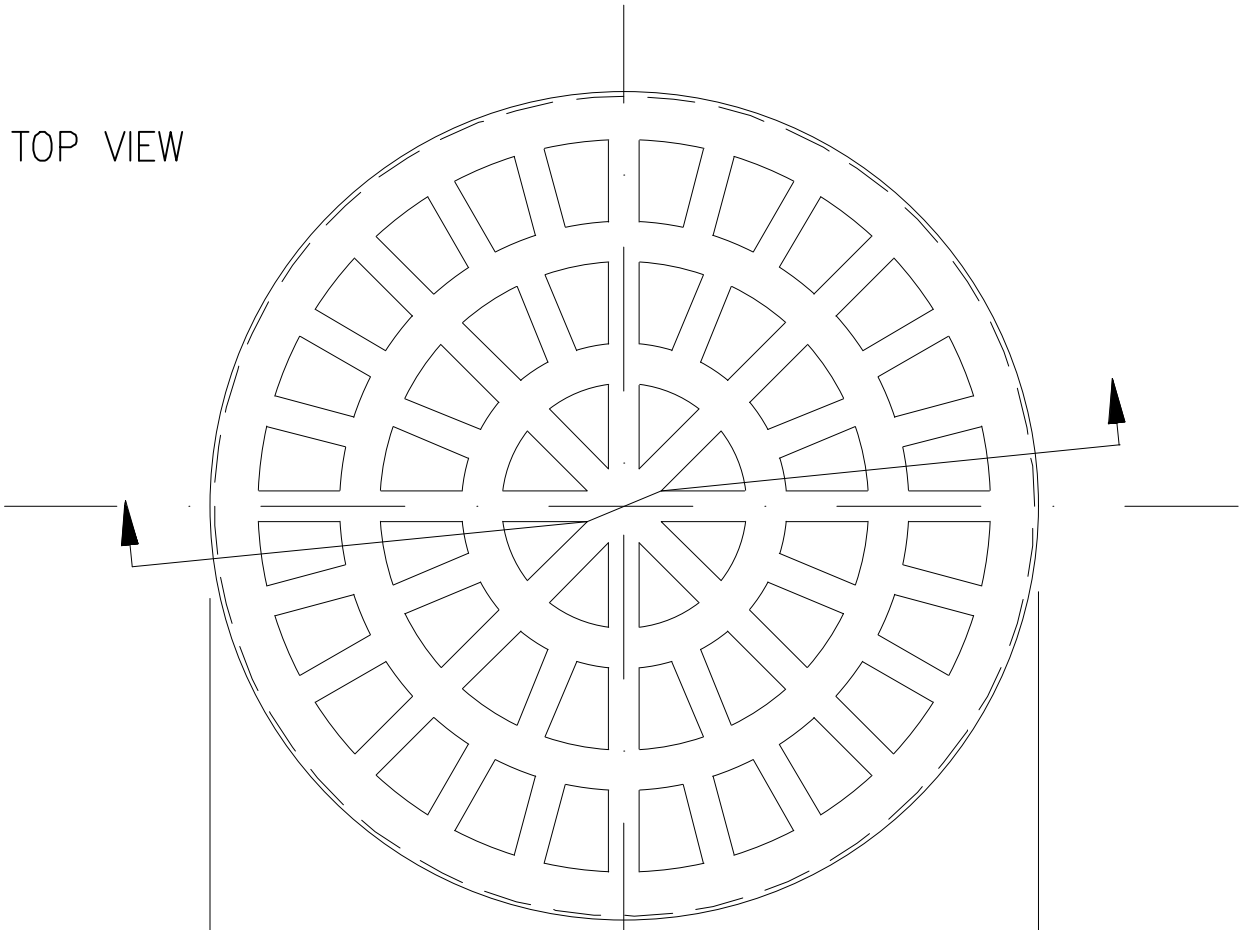
PLATE

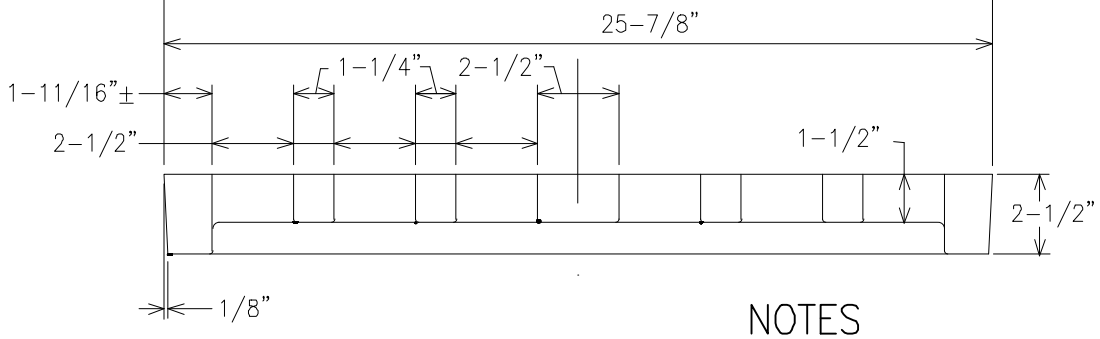
D-3.05

DATE: 08/28/2023

FILE: Drains_Master.DWG

TOP VIEW





SECTION

NOTES

1. MATERIAL – CAST IRON ASTM A-48, CLASS 30
2. MACHINED ON HORIZONTAL BEARING SURFACE
3. LOADING – AASHTO H-20
4. EQUIVALENT DESIGN MAY BE USED WITH APPROVAL OF DEPARTMENT OF PUBLIC WORKS
5. OPENING AREA = 179 SQUARE INCHES

BALTIMORE COUNTY MARYLAND

APPROVAL

DIRECTOR

BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023

DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

RADIAL GRATE
24" HEAVY TRAFFIC MANHOLE FRAME

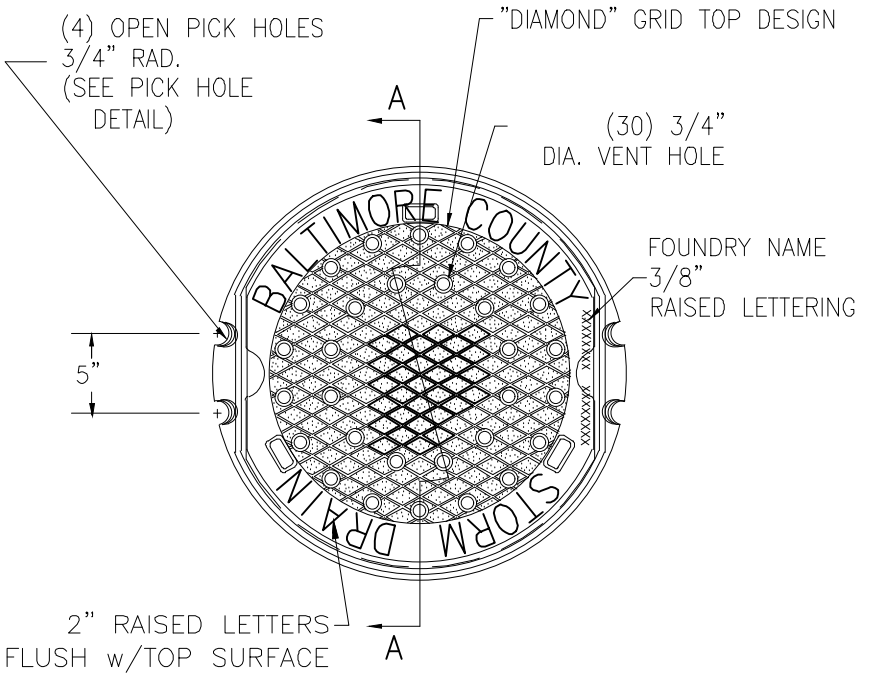
ISSUED: SEPTEMBER 2023

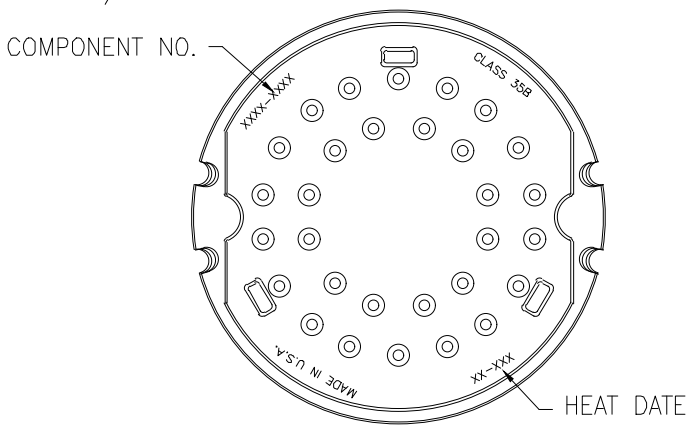
PLATE

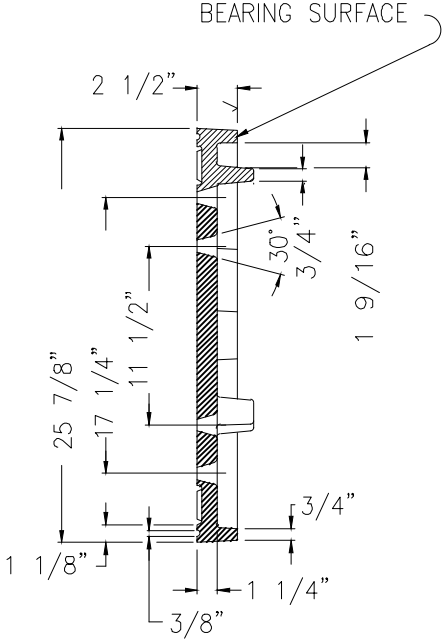
D-3.05A

DATE: 08/28/2023

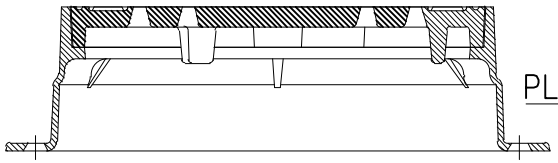
FILE: Drains_Master.DWG



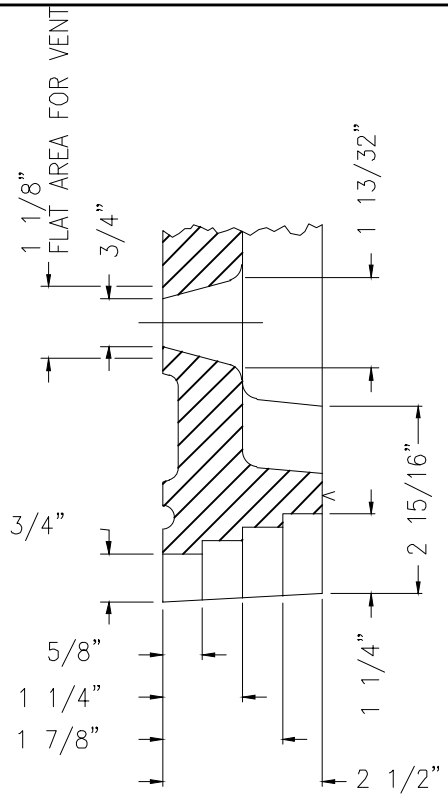




SECTION A–A



PLATEN COVER IN FRAME



PICK HOLE DETAIL

NOTE: MEETS OR EXCEEDS H20 LOADING
MATERIAL: CAST GRAY IRON ASTM A-48, CLASS 35B
FINISH: NO PAINT
WEIGHT: APPROX. 149#
FRAME: SEE PLATE G-14

APPROVAL

DIRECTOR

BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023
DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

STORM DRAIN MANHOLE PLATEN COVER
(FOR USE WITH STRAIGHT WALL MANHOLE FRAME)

ISSUED: SEPTEMBER 2023

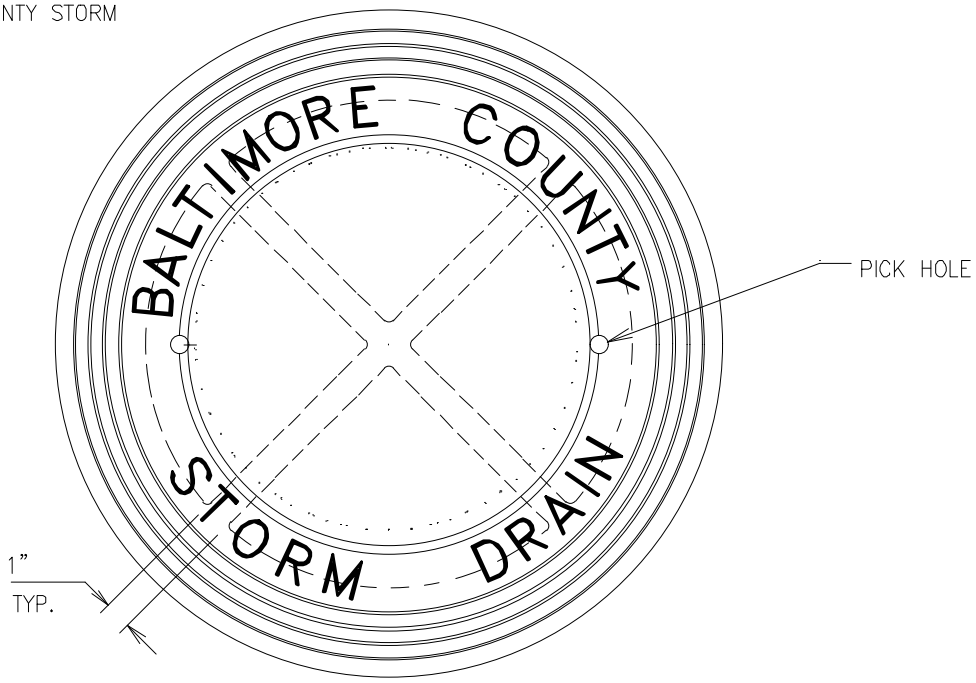
PLATE

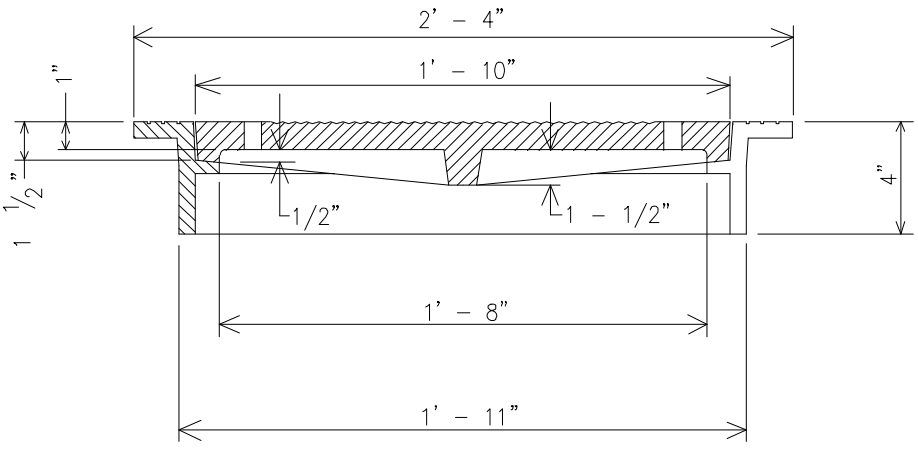
D-3.05B

DATE 08/28/2023

FILE: Drains_Master.DWG

WHERE FRAME & COVER IS USED OUTSIDE OF BALTIMORE COUNTY R/W OR EASEMENTS, SUBSTITUTE THE WORDS "PRIVATE STORM DRAIN" FOR "BALTIMORE COUNTY STORM DRAIN" ON THE COVER.





NOTES

1. MATERIAL SHALL BE GREY IRON CASTING. CASTINGS MUST BE MACHINED ON BEARING SURFACES.

APPROVAL

DIRECTOR

BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023

DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

SIDEWALK FRAME AND COVER

ISSUED: SEPTEMBER 2023

PLATE

D-3.06

DATE: 08/28/2023

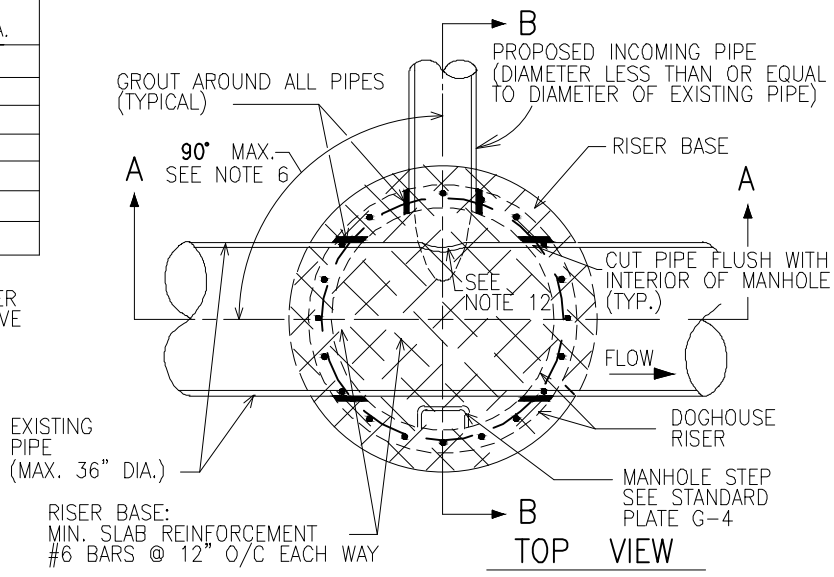
FILE: Drains_Master.DWG

EX. PIPE DIA.	MANHOLE DIA.	MAXIMUM * LATERAL PIPE DIA.	MINIMUM BASE DIA.
42"	72"	24"	84"
30" OR 36"	72"	30"	84"
30"	60"	24"	72"
24" OR 27"	60"	SAME AS EX.	72"
24"	48"	15"	60"
21"	48"	18"	60"
UP TO 18"	48"	SAME AS EX.	60"

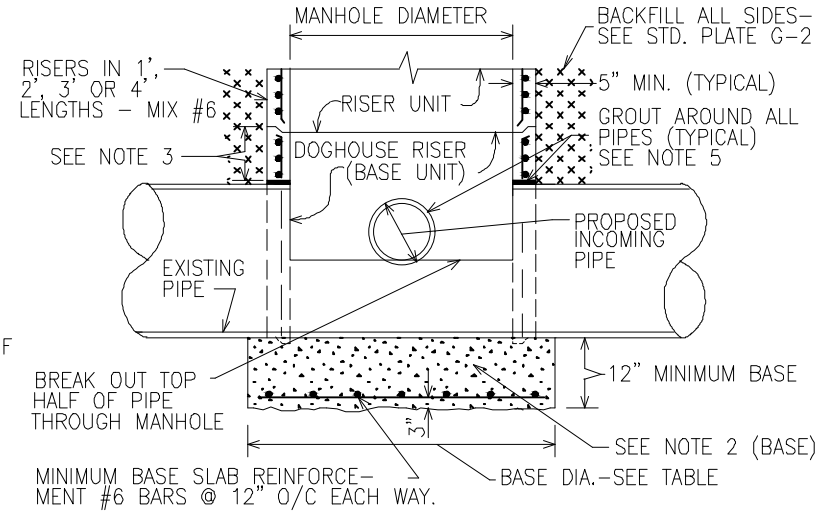
* BASED ON LATERAL PIPE AT 90° TO EXISTING PIPE, WITH ABOUT THE SAME ℄ ELEVATION. OTHER ANGLES & ELEVATIONS MAY BE USED IF POSITIVE FLOW IS MAINTAINED WITHIN MANHOLE AND SIX INCHES OF REINFORCED "DOGHOUSE" WALL IS MAINTAINED BETWEEN PIPE OPENINGS.

NOTES

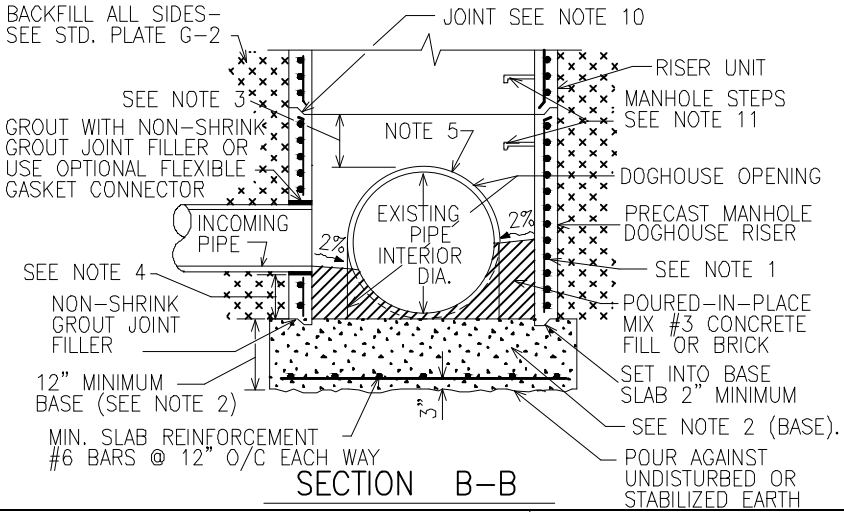
1. MANHOLE TAPERS, RISERS & BASES SHALL BE FURNISHED IN STRICT ACCORDANCE WITH ASTM DESIGNATION C-478 (LATEST) FOR "PRECAST REINFORCED CONCRETE MANHOLE SECTIONS".
2. MANHOLE BASE SHALL BE MIX NO. 3 (3,500 P.S.I.) POURED-IN-PLACE CONCRETE.
3. PROVIDE 12" MINIMUM CLEARANCE FROM INCOMING PIPE & FROM DOGHOUSE OPENING TOP(S) TO UPPER RISER JOINT.
4. PROVIDE 6" MINIMUM CLEARANCE FROM INCOMING PIPE OPENING TO BOTTOM OF DOGHOUSE UNIT.
5. MINIMUM 1" CLEARANCE SHALL BE MAINTAINED BETWEEN PIPES AND PRECAST DOGHOUSE PIPE OPENINGS. OPENINGS SHALL BE GROUTED WITH NON-SHRINK GROUT JOINT FILLER.
6. IN ALL CASES, A MINIMUM 12" WIDE SECTION OF MANHOLE WALL SHALL BE MAINTAINED BETWEEN PIPE OPENINGS IN DOGHOUSE RISER.
7. ALL REINFORCING STEEL SHALL CONFORM TO ASTM A-615, GRADE 60.
8. SEE STANDARD PLATE D-3.01 FOR TYPE A & TYPE B SHALLOW MANHOLE DETAILS FOR USE WITH DOGHOUSE RISER SHOWN HERE. SEE STANDARD PLATE D-3.02 FOR 60" DIA. MANHOLE DETAILS FOR USE WITH DOGHOUSE RISER SHOWN HERE.
9. MAXIMUM MANHOLE HEIGHT SHALL BE 30 FT. WHEN USING PRECAST DOGHOUSE RISER.
10. PRECAST INLET JOINTS: THE MANUFACTURER SHALL FORM MALE AND FEMALE ENDS OF JOINTS USING THEIR OWN DESIGN. THE JOINTS SHALL BE SEALED BY THE CONTRACTOR AND MADE WATER TIGHT USING THE MANUFACTURER'S RECOMMENDED ASTM OR AASHTO APPROVED SEALANT.
11. MANHOLE STEPS SHALL BE PROVIDED IF A RISER IS USED ABOVE THE DOGHOUSE RISER (BASE UNIT). SEE STANDARD DETAIL PLATE G-4.
12. BREAK OUT ADDITIONAL PIPE AS REQUIRED TO PROVIDE POSITIVE FLOW FROM INCOMING PIPE TO CENTER MANHOLE CHANNEL.



TOP VIEW



SECTION A-A



SECTION B-B

APPROVAL

DIRECTOR

BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023

DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

PRECAST MANHOLE "DOGHOUSE" RISER BUILT COVER OVER EXISTING DRAIN (FOR USE WITH PIPES 36 AND SMALLER)

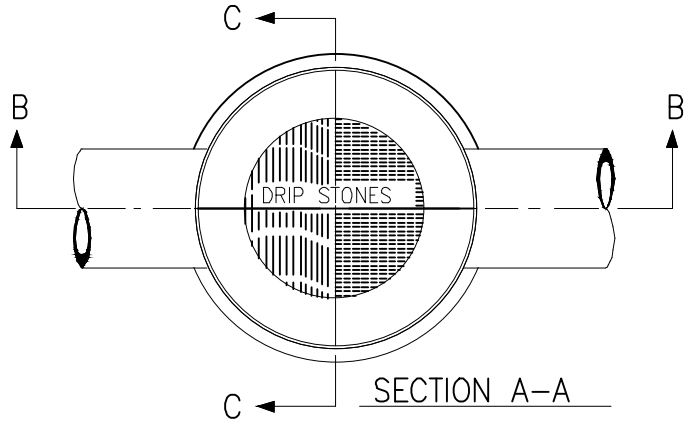
ISSUED: SEPTEMBER 2023

PLATE

D-3.07

DATE: 08/28/2023

FILE: Drains_Master.DWG



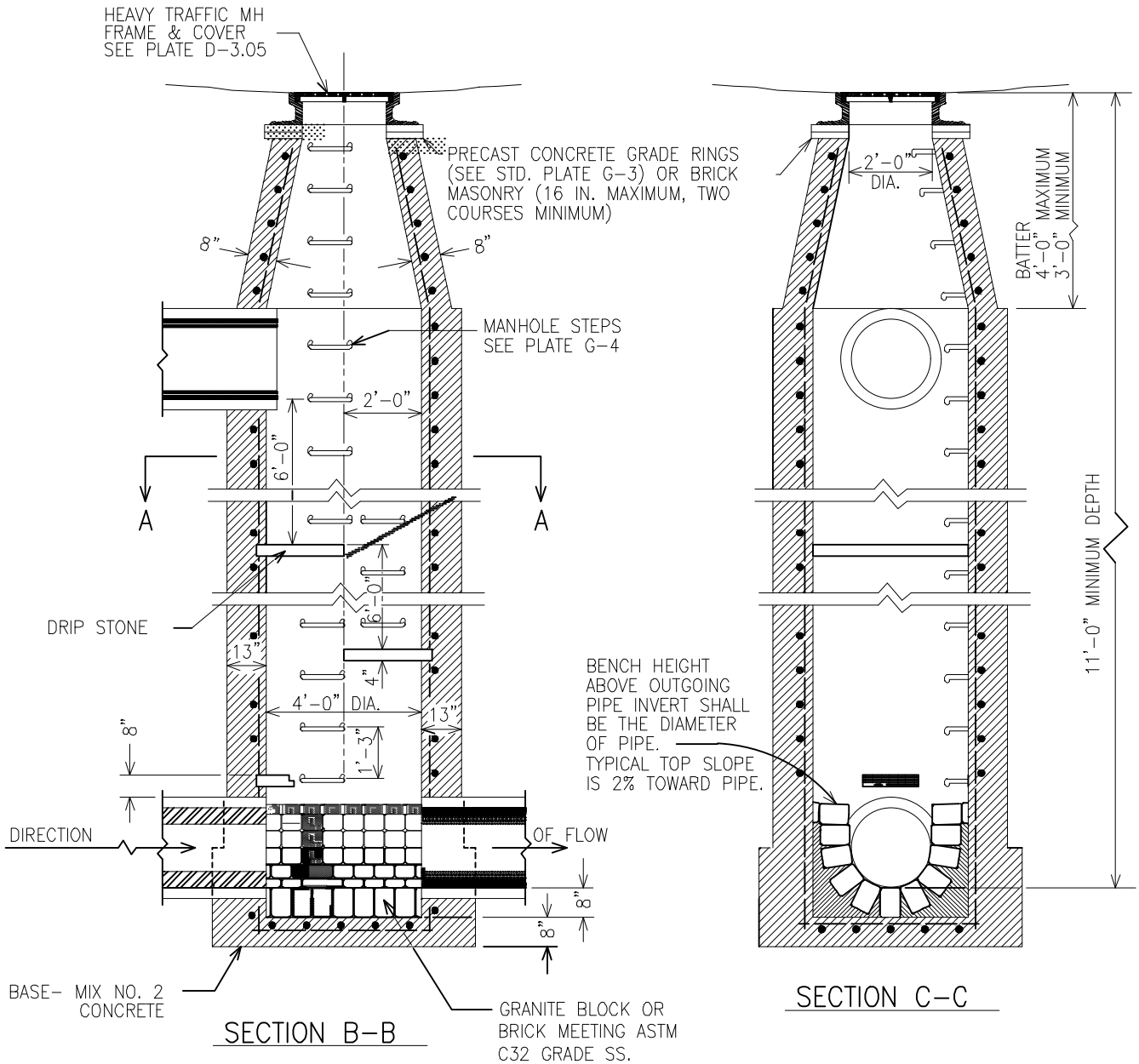
SECTION A–A

GRANITE DRIP STONES ARE PREFERABLE BUT IF NOT AVAILABLE SOME OTHER APPROVED TYPE MAY BE USED. LOCATION OF DRIP STONES MAY BE ADJUSTED TO MEET THE REQUIREMENTS OF EACH CASE BUT NORMALLY SHALL BE 6' APART.

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

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

NOTE: MANHOLE SHALL BE CONSTRUCTED OF REINFORCED CONCRETE (MIX NO. 2). REINFORCING TO BE NO.4 DEFORMED BARS @ 6" C/C, 2 WAYS, 2" COVER.



SECTION B–B

SECTION C–C

APPROVAL

DIRECTOR

BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023
DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

DROP MANHOLE
STANDARD DETAIL

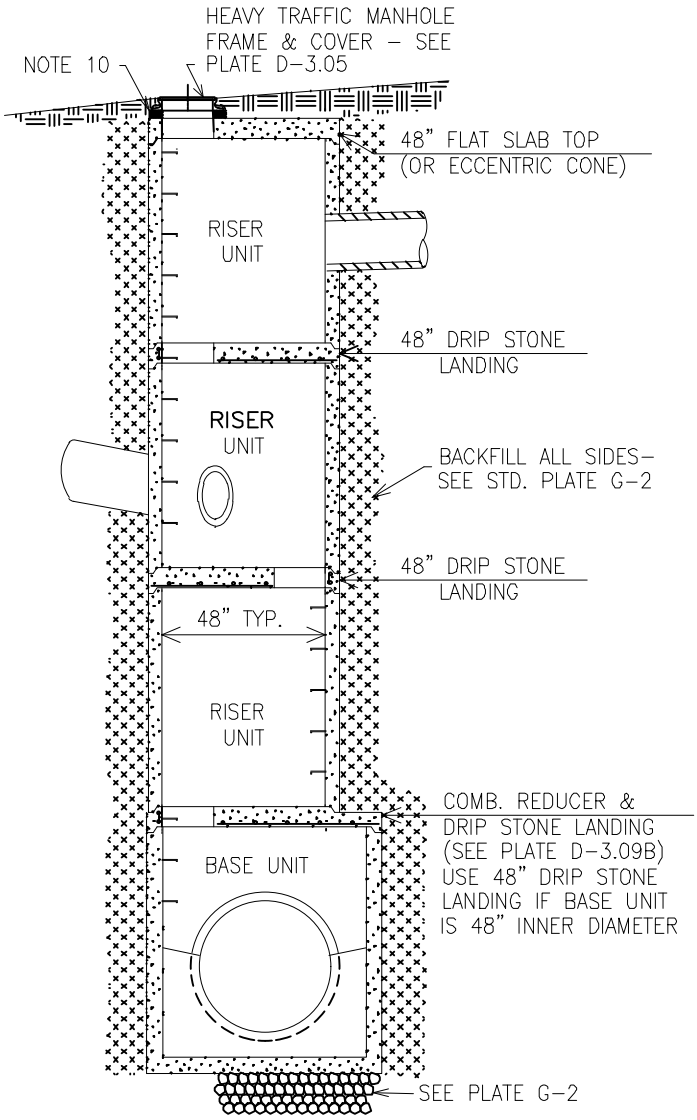
ISSUED: SEPTEMBER 2023

PLATE

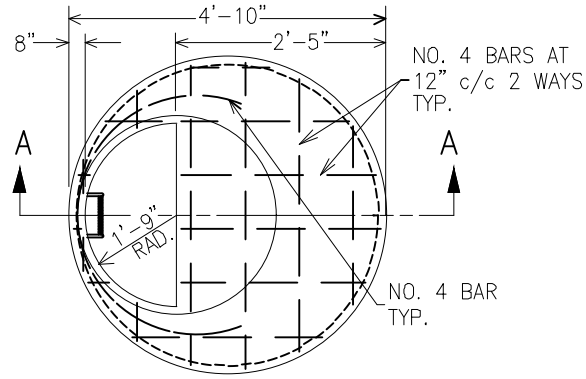
D–3.08

DATE: 08/28/2023

FILE: Drains_Master.DWG

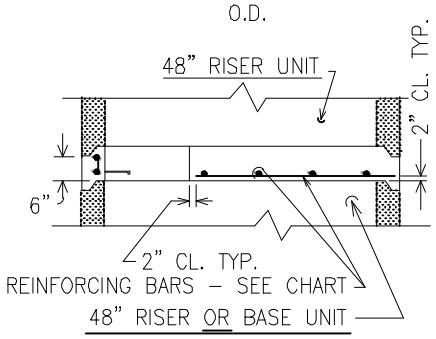


METHOD OF PLACING DRIP STONE LANDINGS



PLAN

O.D.



SECTION A – A

48" DIAMETER DRIP STONE LANDING

1. USE 4500 psi CONCRETE.
2. THE DRIP STONE LANDING SHALL BE USED ONLY WHEN THERE ARE PIPES CONNECTED TO THE RISER UNITS.
3. REINFORCEMENT: ASTM A 615 GRADE 60.
4. COST OF BASE, RISERS, TOP SLAB, FRAME, COVER & DRIP STONE LANDING IS INCIDENTAL TO MANHOLE COST.
5. PRECAST MANHOLE JOINTS: THE MANUFACTURER SHALL FORM MALE & FEMALE ENDS OF JOINTS USING THEIR OWN DESIGN. JOINTS SHALL BE SEALED BY THE CONTRACTOR AND MADE WATER–TIGHT USING THE MANUFACTURER'S RECOMMENDED ASTM OR AASHTO–APPROVED SEALANT.
6. LIFT EYES SHALL BE PROVIDED FOR HANDLING 48" DRIP STONE LANDING.
7. SEE PLATE D–3.01 FOR 48" DIAMETER RISER & BASE UNITS. SEE PLATE D–3.02A FOR LARGER DIAMETER BASE UNITS.
8. MANHOLE STEPS: SEE PLATE G–4.
9. SEE PLATE D–3.09B FOR PRECAST REDUCERS COMBINED WITH DRIP STONE LANDINGS.
10. PRECAST CONCRETE RISER RINGS (SEE STD. PLATE G–3) OR BRICK MASONRY (16 IN. MAXIMUM OR TWO COURSES MINIMUM) SHALL BE USED TO BRING MAN–HOLE FRAME TO GRADE AS REQUIRED.

BALTIMORE COUNTY MARYLAND

APPROVAL

DIRECTOR

BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023

DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

PRECAST DROP MANHOLE

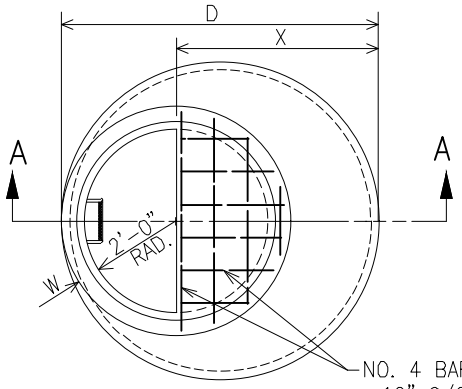
ISSUED: SEPTEMBER 2023

PLATE

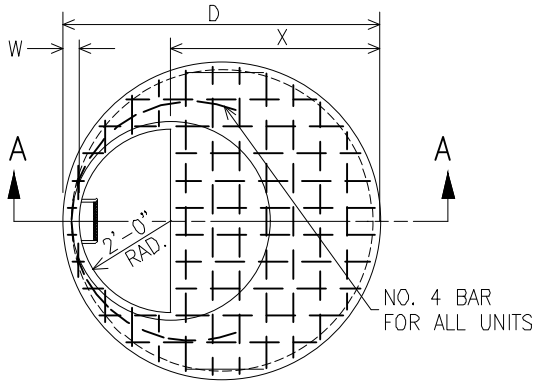
D–3.09A

DATE: 08/28/2023

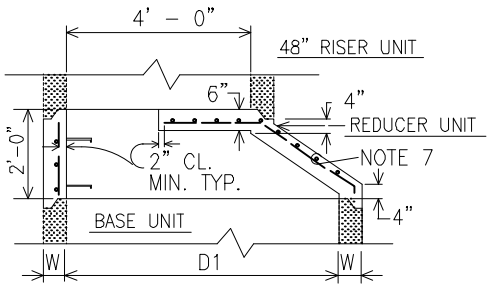
FILE: Drains_Master.DWG



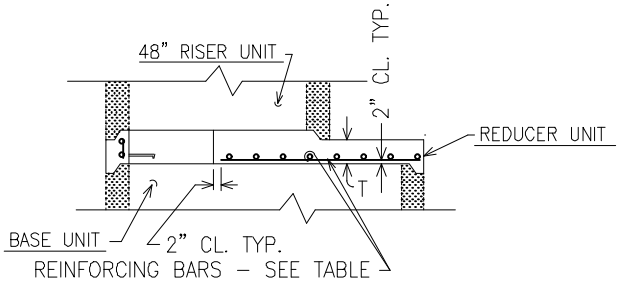
PLAN



PLAN



SECTION A – A



SECTION A – A

PRECAST MANHOLE DIAMETER	DIMENSIONS				REINF.
	D	D1	W	X	IN^2/FT
60"	6'-0"	5'-0"	6"	3'-6"	0.15
72"	7'-2"	6'-0"	7"	4'-7"	0.18

ECCENTRIC CONE REDUCER & DRIP STONE

PRECAST MANHOLE DIAMETER	DIMENSIONS				REINF. BARS PLACED 2 WAYS	
	D	T	W	X	TOP LAYER	BOTTOM LAYER
60"	6'-0"	5"	6"	3'-6"	N/A	NO. 5 AT 10"c/c
72"	7'-2"	6"	7"	4'-7"	N/A	NO. 5 AT 10"c/c
84"	8'-4"	7"	8"	5'-8"	N/A	NO. 5 AT 10"c/c

FLAT TOP REDUCER & DRIP STONE

1. USE 4500 psi CONCRETE.
2. THE COMBINATION REDUCER – DRIP STONE LANDING SHALL BE USED ONLY WHEN THERE ARE PIPES CONNECTED TO THE RISER UNITS. SEE PLATE D-3.09A FOR PLACEMENT.
3. REINFORCEMENT: ASTM A 615 GRADE 60.
4. COST FOR THE COMBINATION REDUCER AND DRIP STONE LANDING IS INCIDENTAL TO MANHOLE COST.
5. PRECAST MANHOLE JOINTS: THE MANUFACTURER SHALL FORM MALE & FEMALE ENDS OF JOINTS USING THEIR OWN DESIGN. JOINTS SHALL BE SEALED BY THE CONTRACTOR AND MADE WATER-TIGHT USING THE MANUFACTURER'S RECOMMENDED ASTM OR AASHTO-APPROVED SEALANT.
6. LIFT EYES SHALL BE PROVIDED FOR HANDLING.
7. ECCENTRIC CONE REINFORCEMENT SHALL BE REINFORCING BARS OR WELDED WIRE FABRIC AS SHOWN IN TABLE
8. MANHOLE STEPS: SEE PLATE G-4.

BALTIMORE COUNTY MARYLAND

APPROVAL

DIRECTOR

BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023

DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

PRECAST REDUCERS WITH DRIP STONE LANDING

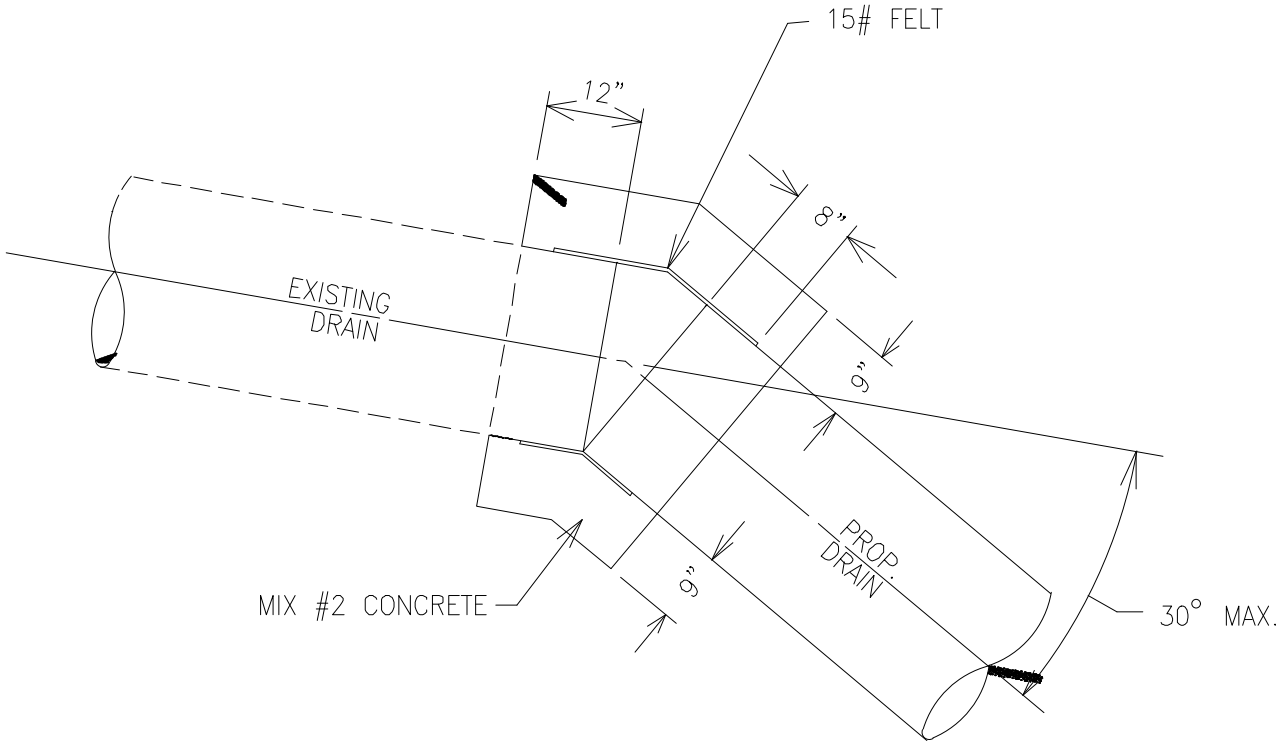
ISSUED: SEPTEMBER 2023

PLATE

D-3.09B

DATE: 08/28/2023

FILE: Drains_Master.DWG



NOTE: FOR DRAINS OVER 24" DIAMETER, USE BRICK BEND OR MANHOLE

MANHOLE REQUIRED IN LIEU OF COLLAR AS DIRECTED BY DEPARTMENT OF PUBLIC WORKS.

APPROVAL

DIRECTOR

BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023

DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

CONCRETE COLLAR
24" DRAIN AND COVER

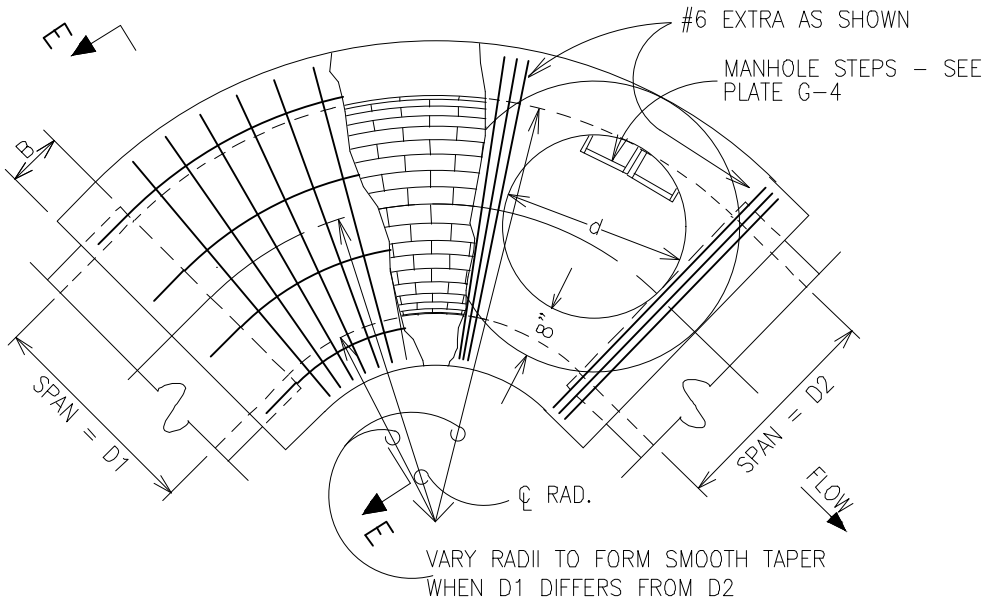
ISSUED: SEPTEMBER 2023

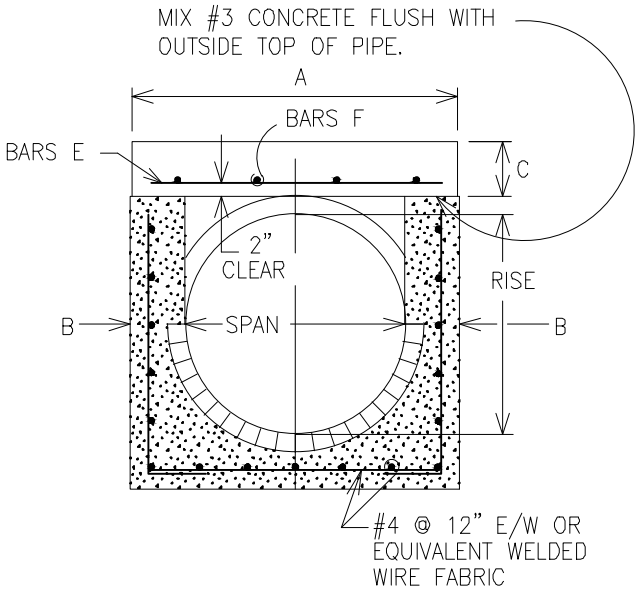
PLATE

D-4.00

DATE: 08/28/2023

FILE: Drains_Master.DWG





SECTION E – E

THIS DETAIL IS APPLICABLE TO HORIZONTAL ELLIPTICAL AND ROUND PIPE (SPAN = RISE = PIPE DIAMETER). SEE CHARTS, PLATE D–4.02.

1. MATERIAL: WALLS AND BOTTOM SHALL BE BRICK OR MIX #3 REINFORCED CONCRETE. SEE SECTION E – E.

2. DESIGN LOADING PER AASHTO H–27, WITH FILL UP TO 15 FEET ALLOWABLE.

3. MANHOLE DETAILS:

STEPS	SEE PLATE G–4
FRAME & COVER	SEE PLATE D–3.05
WALLS & MAX. BATTER	SEE PLATE D–3.00.

4. THE SMALLER OF D1 OR D2 SHALL DETERMINE ℄ RADIUS, DIMENSIONS B & C AND REINFORCEMENT.

5. MANHOLE OPENING d SHALL BE BASED ON DOWN–STREAM PIPE SIZE D2.

6. FRAME & COVER FOR MANHOLE ON 54" & LARGER BENDS SHALL BE 30" WITH LETTERING AND HOLES AS SHOWN FOR 24" FRAME.

7. MINIMUM LENGTH OF CURVE IS 4'–0" FOR USE OF TYPE C MANHOLE STACK. STACK SHALL CONFORM TO THAT SHOWN ON PLATE D–3.04.

8. SEE PLATE D–4.02 FOR TABLES AND DIMENSIONS.

APPROVAL

DIRECTOR

BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023

DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

BEND STRUCTURE

ISSUED: SEPTEMBER 2023

PLATE

D–4.01

DATE: 08/28/2023

FILE: Drains_Master.DWG

CIRCULAR PIPE:

PIPE DIA	℄ RADIUS	A	B	C	BARS E ℄ SPACING	BARS F	d	MASONRY VOLUME (CF/F) BELOW SLAB
30"	5'-0"	3'-10"	8"	8"	#5 @ 6"o/c	3-#5	30"	6.9
33"	6'-0"	4'-1"	8"	8"	#5 @ 6"o/c	3-#5	30"	7.6
36"	6'-0"	4'-4"	8"	8"	#5 @ 6"o/c	3-#5	36"	8.3
42"	7'-0"	4'-10"	8"	10"	#5 @ 6"o/c	4-#5	36"	9.7
48"	8'-0"	5'-4"	8"	10"	#5 @ 6"o/c	4-#5	36"	11.2
54"	9'-0"	6'-6"	12"	10"	#5 @ 6"o/c	5-#5	36"	18.6
60"	10'-0"	7'-0"	12"	12"	#6 @ 8"o/c	6-#5	36"	20.7
66"	11'-0"	7'-6"	12"	12"	#6 @ 8"o/c	7-#5	36"	22.8
72"	12'-0"	8'-0"	12"	12"	#6 @ 8"o/c	7-#5	36"	25.0

HORIZONTAL ELLIPTICAL CONCRETE PIPE:

PIPE DIMEN	℄ RADIUS	A	B	C	BARS E ℄ SPACING	BARS F ℄ SPACING	d	MASONRY VOLUME (CF/F) BELOW SLAB
38"x24"	6'-0"	4'-8"	8"	10"	#5 @ 6"o/c	#5 @ 8"o/c	36"	12.0
42"x27"	7'-0"	4'-10"	8"	10"	#5 @ 6"o/c	#5 @ 8"o/c	36"	13.5
45"x29"	8'-0"	5'-1"	8"	10"	#5 @ 6"o/c	#5 @ 8"o/c	36"	14.7
53"x34"	9'-0"	5'-9"	8"	10"	#5 @ 6"o/c	#5 @ 8"o/c	36"	18.4
60"x38"	10'-0"	6'-4"	8"	12"	#6 @ 8"o/c	#6 @10"o/c	36"	22.1
68"x43"	11'-0"	7'-8"	12"	12"	#6 @ 8"o/c	#6 @10"o/c	36"	33.7
76"x48"	12'-0"	8'-4"	12"	12"	#6 @ 8"o/c	#6 @10"o/c	36"	39.3
83"x53"	13'-0"	8'-11"	12"	12"	#6 @ 8"o/c	#6 @10"o/c	36"	44.1
91"x58"	14'-0"	9'-7"	12"	12"	#6 @ 8"o/c	#6 @10"o/c	36"	50.4

DATE: 08/28/2023

FILE: Drains_Master.DWG

BALTIMORE COUNTY MARYLAND

APPROVAL

DIRECTOR

BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023

DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

BEND STRUCTURE

TABLE AND DIMENSIONS

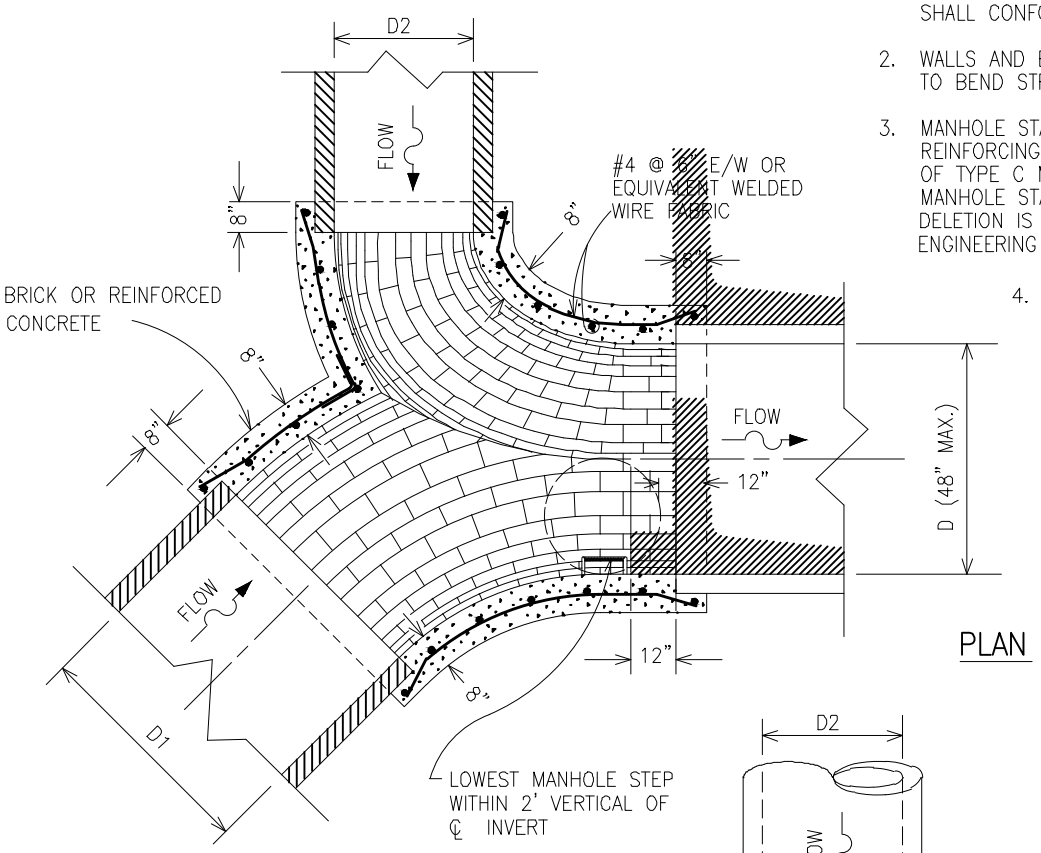
ISSUED: SEPTEMBER 2023

PLATE

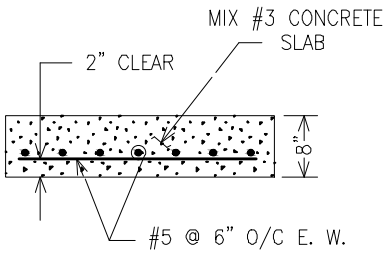
D-4.02

NOTES :

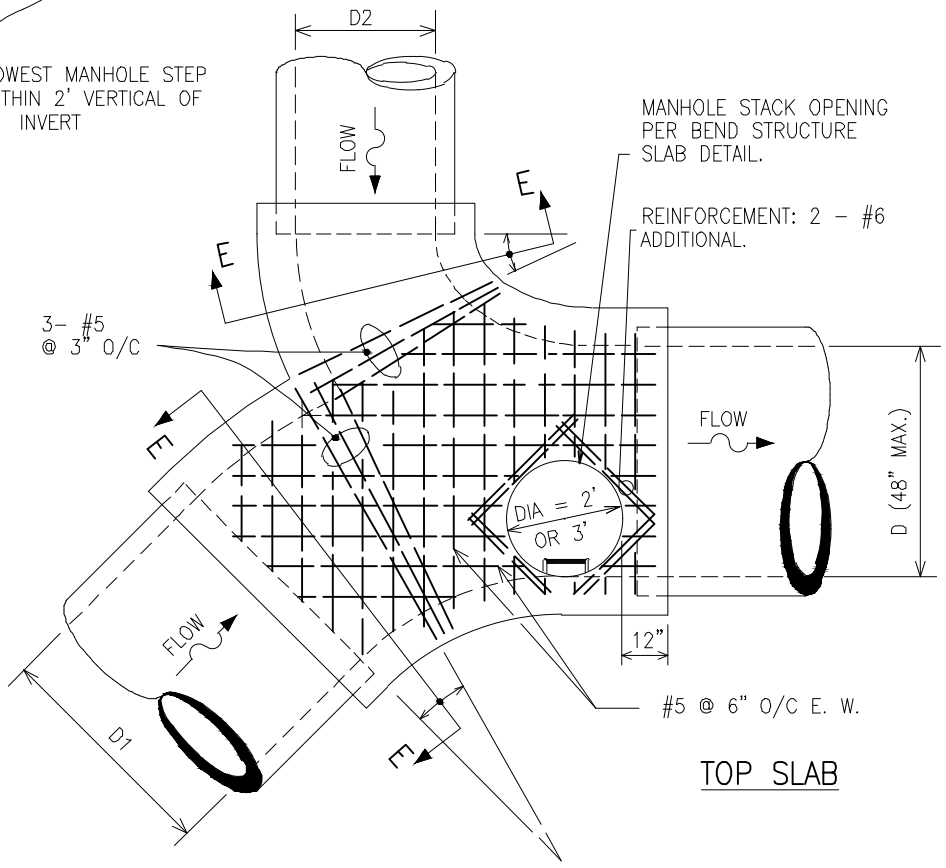
1. SECTION E–E (BETWEEN LIMITS SHOWN) SHALL CONFORM TO BEND STRUCTURE.
2. WALLS AND BOTTOM SHALL CONFORM TO BEND STRUCTURE.
3. MANHOLE STACK AND ADDITIONAL SLAB REINFORCING SHALL CONFORM TO THAT OF TYPE C MANHOLE, PLATE D–3.04. MANHOLE STACK REQUIRED UNLESS DELETION IS APPROVED BY BUREAU OF ENGINEERING AND CONSTRUCTION.
4. SLAB OPENING FOR MANHOLE STACK IS 3' DIA. EXCEPT WHERE FRAME INSTALLED WITHOUT MANHOLE RISER.



PLAN



SECTION E – E

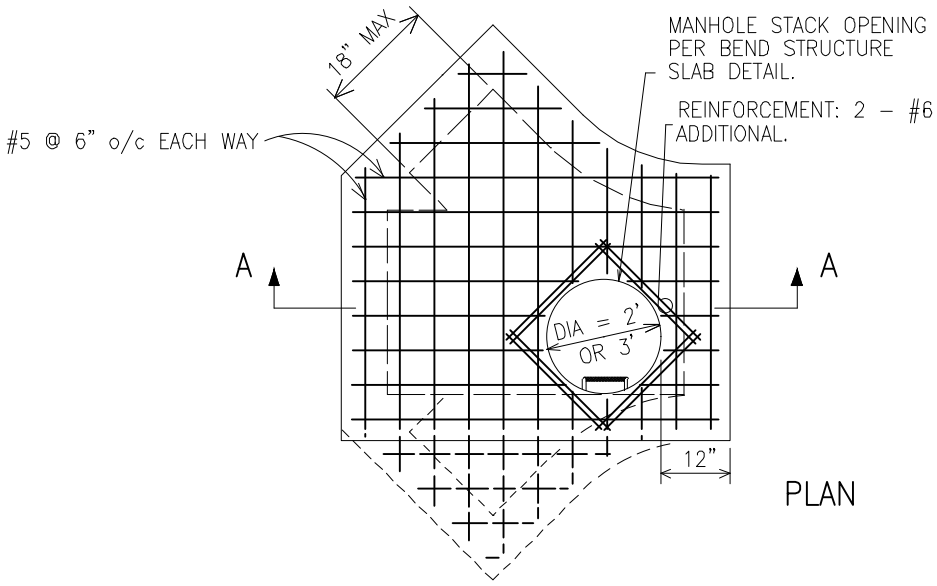


TOP SLAB

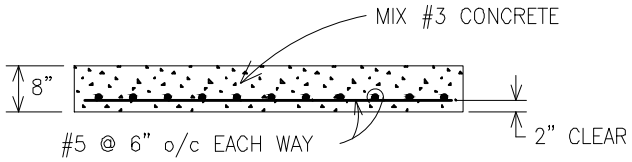
BALTIMORE COUNTY MARYLAND	APPROVAL DIRECTOR BUR. OF ENGINEERING/CONSTRUCTION SEPTEMBER 28, 2023 DATE	DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION STORM DRAINAGE DETAILS TYPE 1 JUNCTION CHAMBER	ISSUED: SEPTEMBER 2023 PLATE D–4.03

DATE: 08/28/2023

FILE: Drains_Master.DWG

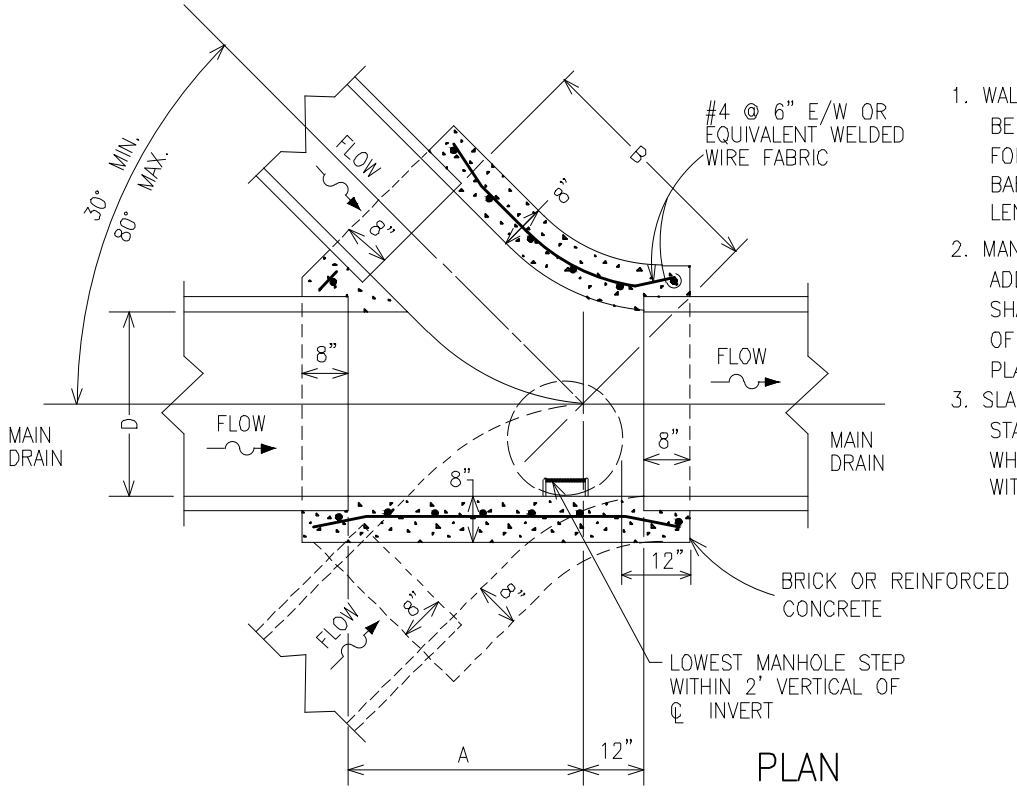


MINIMUM DIMENSIONS		
D	A	B
15"–18"	3'–9"	2'–9"
21"–30"	4'–4"	3'–7"
33"–36"	4'–7"	3'–11"



SECTION A–A

ROOF SLAB REINFORCEMENT



NOTES

1. WALLS AND BOTTOM SHALL BE BRICK OR MIX #3 REINFORCED CONCRETE. USE #4 BARS AT 6" E/W OR EQUIVALENT WELDED WIRE FABRIC.
2. MANHOLE STACK AND ADDITIONAL REINFORCING SHALL CONFORM TO THAT OF TYPE C MANHOLE. SEE PLATE D–3.04.
3. SLAB OPENING FOR MANHOLE STACK IS 3' DIA. EXCEPT WHERE FRAME INSTALLED WITHOUT MANHOLE RISER.

APPROVAL

DIRECTOR

BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023

DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

BRICK Y
SINGLE AND DOUBLE

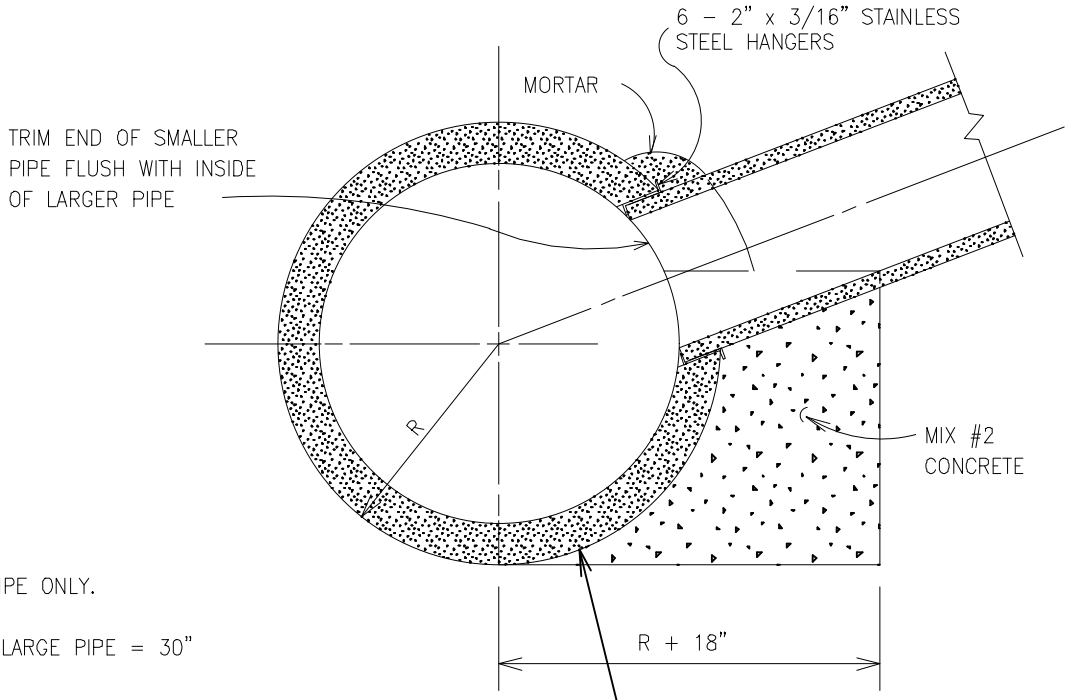
ISSUED: SEPTEMBER 2023

PLATE

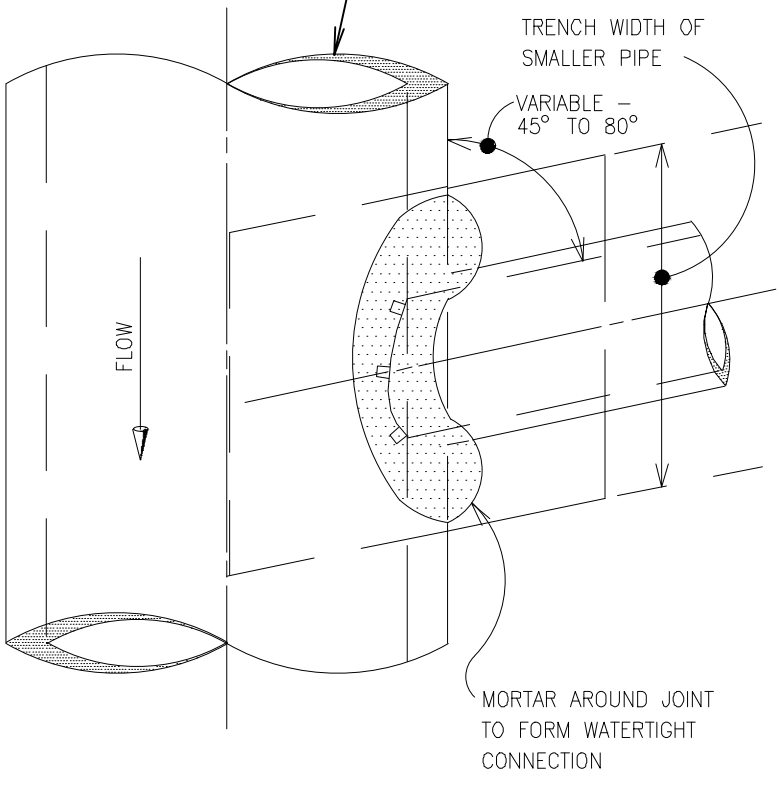
D–4.04

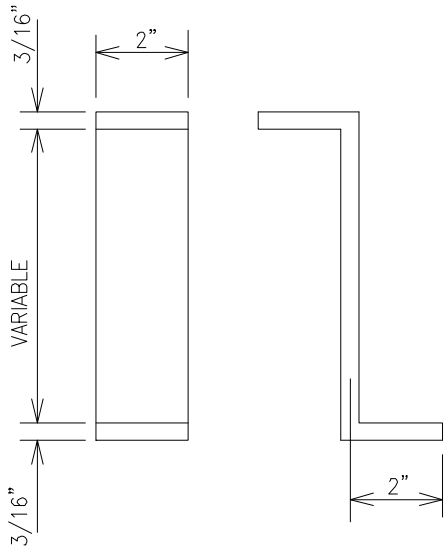
DATE: 08/28/2023

FILE: Drains_Master.DWG



1. USE WITH CONCRETE PIPE ONLY.
2. MINIMUM DIAMETER OF LARGE PIPE = 30"
3. $\frac{\text{SMALL PIPE DIAMETER}}{\text{LARGE PIPE DIAMETER}}$ = 0.45 MAX.
4. ONE FIELD CONNECTION MAXIMUM PER SINGLE LENGTH OF LARGE PIPE





STAINLESS STEEL PIPE HANGER

APPROVAL

DIRECTOR

BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023
DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

FIELD CONNECTION

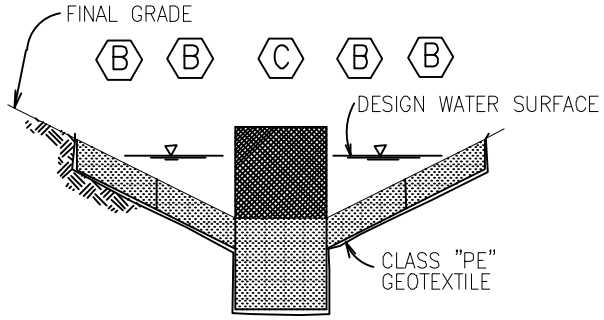
ISSUED: SEPTEMBER 2023

PLATE

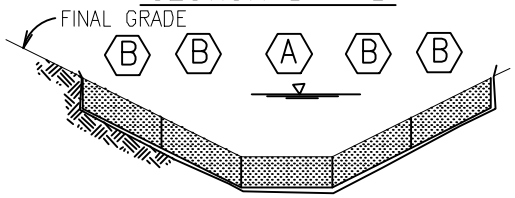
D–4.06

DATE: 08/28/2023

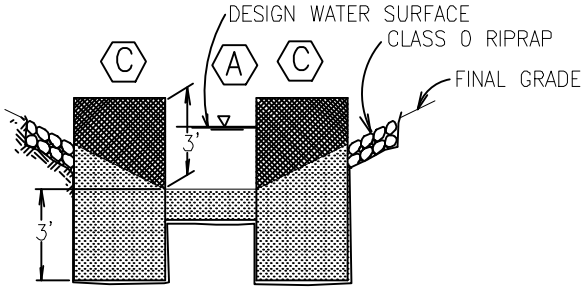
FILE: Drains_Master.DWG



SECTION B – B



SECTION C – C



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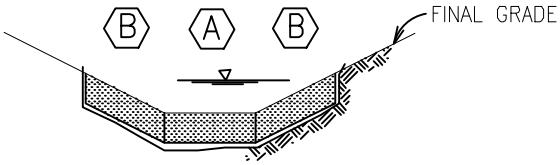

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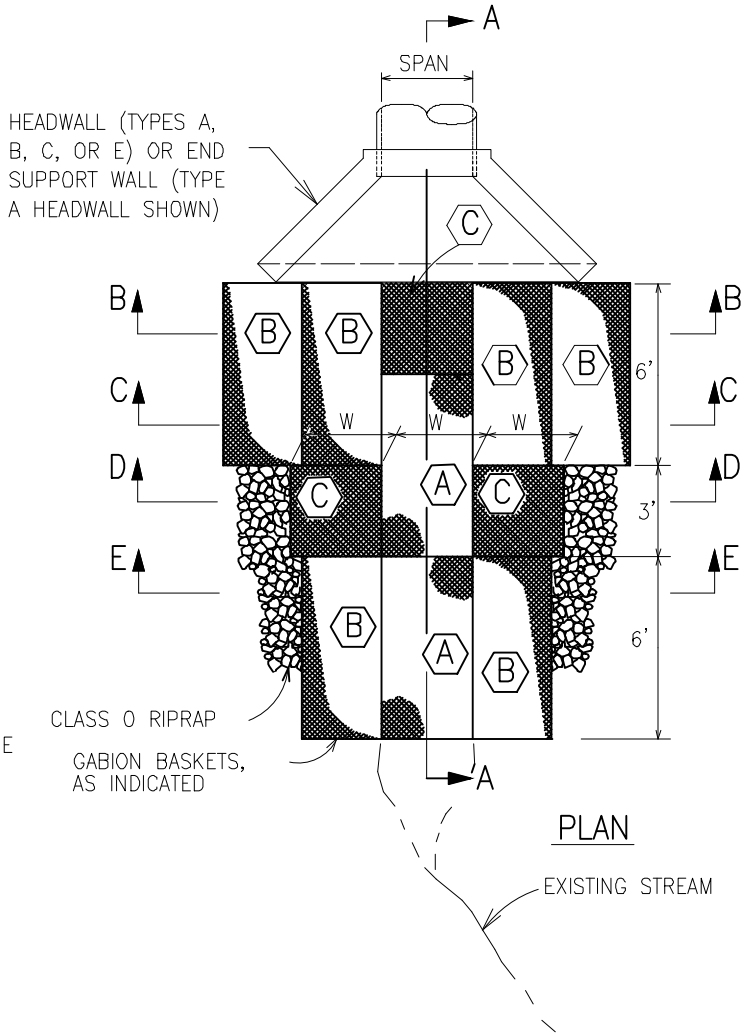


PLAN

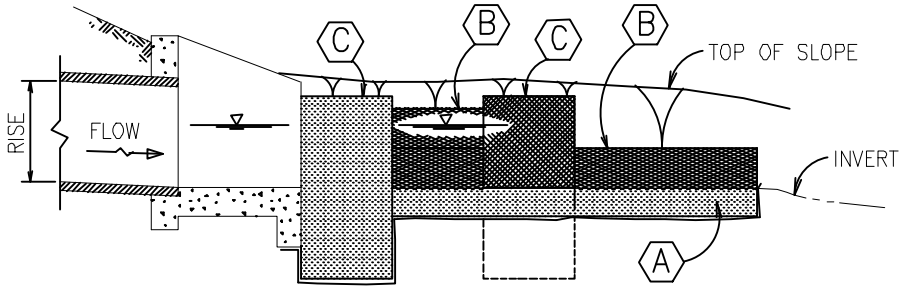
EXISTING STREAM

(A) 6' x 3' x 1' GABION BASKETS, LAID FLAT ALONG OUTFALL INVERT

(B) 6' x 3' x 1' GABION BASKETS, LAID ALONG CHANNEL SLOPES

(C) 6' x 3' x 3' GABION BASKETS, SET ON END, 3 FEET BURIED, 3 FEET MAX. EXPOSED.

SPAN	W
15" – 41"	3'
42" – 54"	6'



SECTION A – A

APPROVAL

DIRECTOR

BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023

DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

CHANNEL
GABION VELOCITY BREAKER

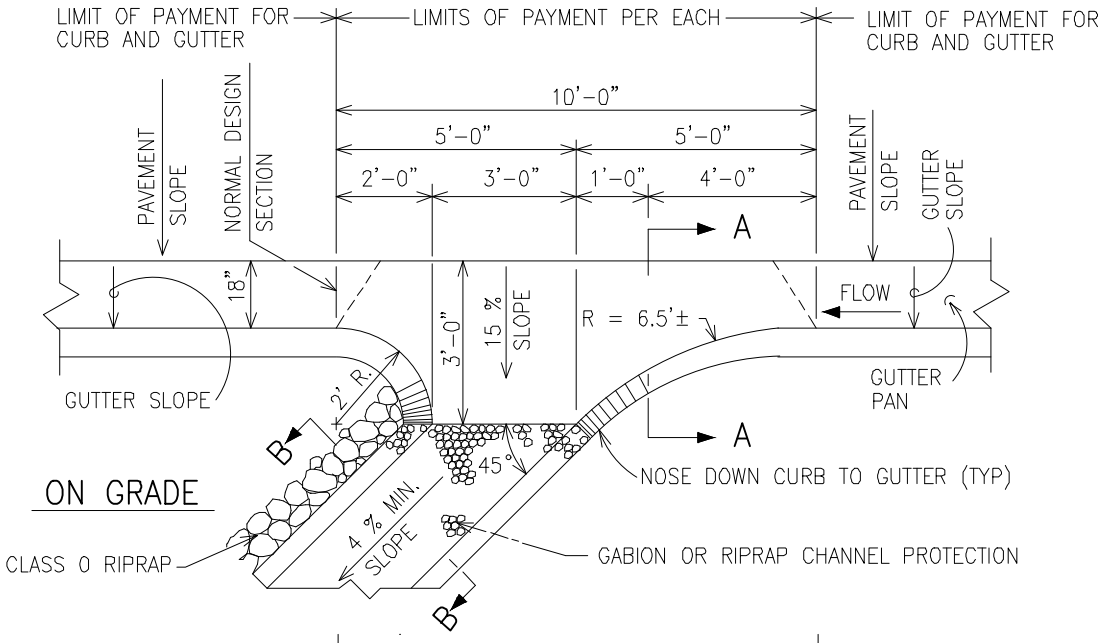
ISSUED: SEPTEMBER 2023

PLATE

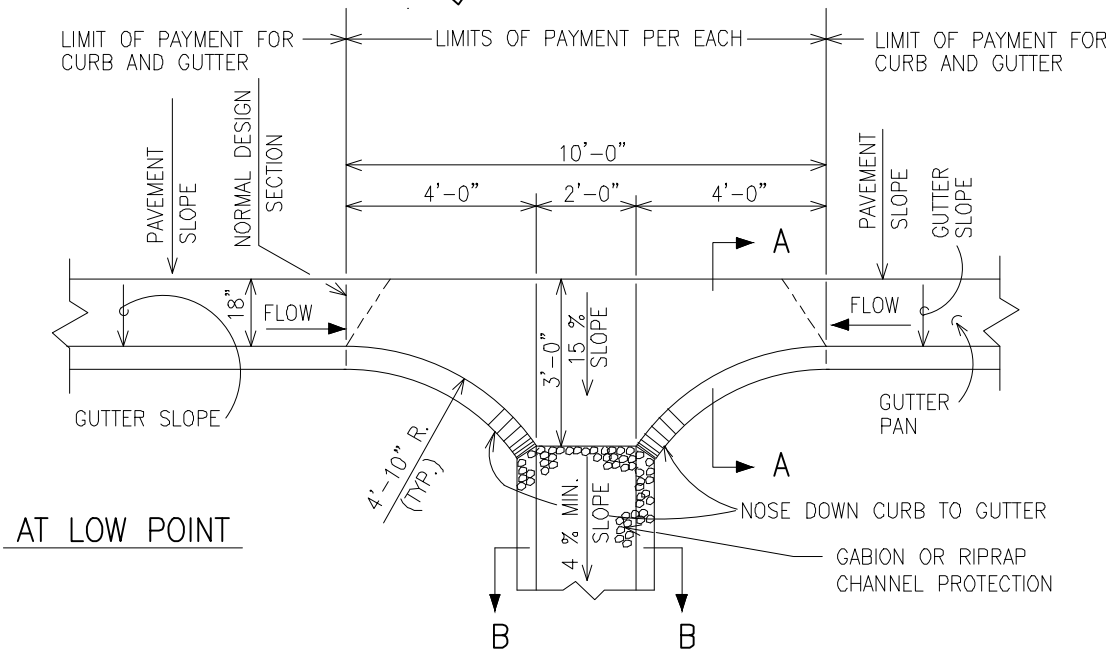
D–5.02

DATE: 08/28/2023

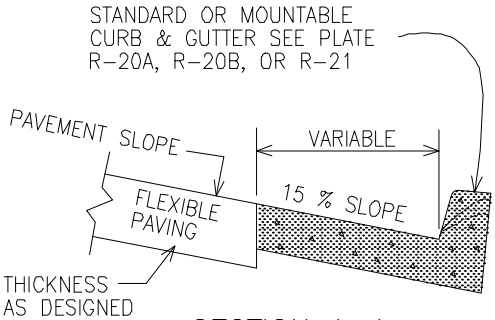
FILE: Drains_Master.DWG



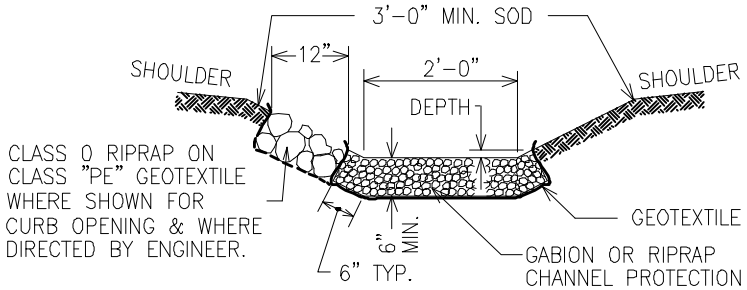
ON GRADE



AT LOW POINT



SECTION A-A



SECTION B-B

APPROVAL

DIRECTOR

BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023

DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

STANDARD CURB OPENING
CURB AND GUTTER SECTION

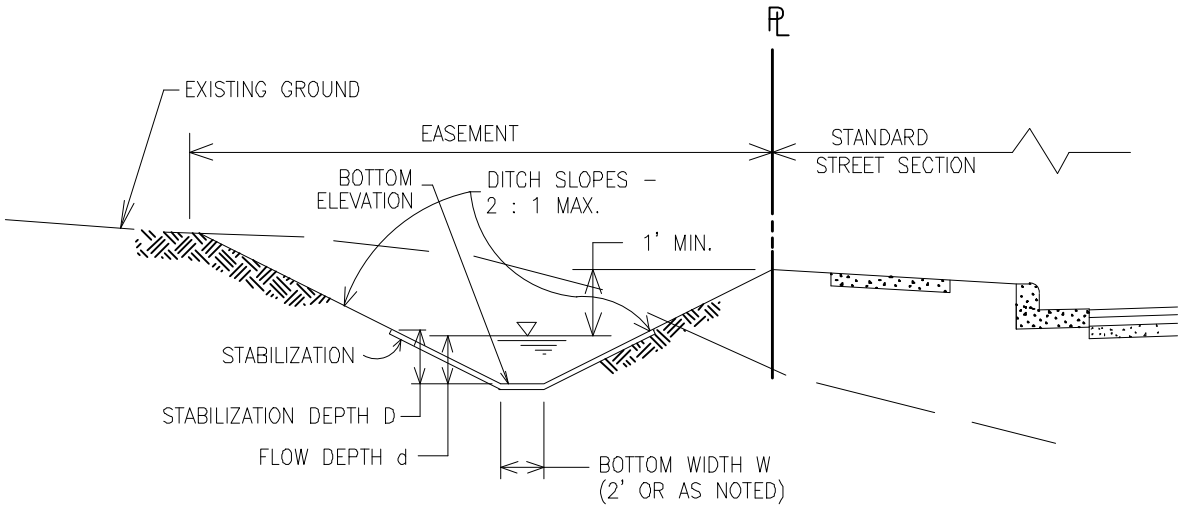
ISSUED: SEPTEMBER 2023

PLATE

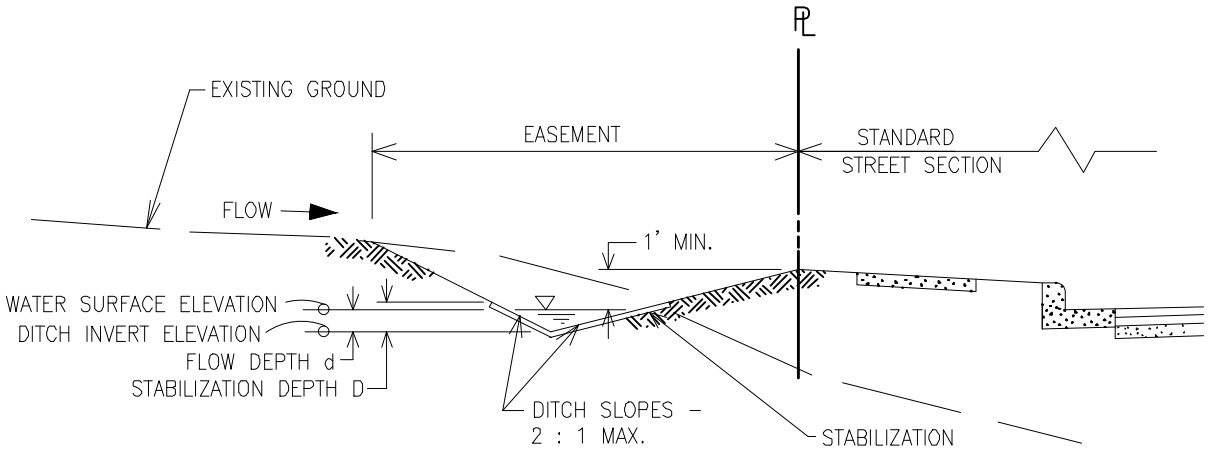
D-5.03

DATE: 08/28/2023

FILE: Drains_Master.DWG



STANDARD SIDE DITCH (SD)



STANDARD SURFACE DRAIN DITCH (SDD)

1. SURFACE DRAIN DITCH TO BE USED TO COLLECT RUNOFF FROM AREAS DRAINING TOWARD ROAD. SIDE DITCH USED WHEN SDD IS INADEQUATE OR TO CARRY WATER ALONG EDGE OF ROAD.

2. STABILIZATION TO BE SEED AND MULCH, PEGGED STABILIZATION FABRIC, SOD, RIP–RAP OR GABIONS AS DIRECTED ON PLANS.

3. STABILIZATION, TYPE OF DITCH (SDD OR SD), BOTTOM WIDTH W, DEPTH OF STABILIZATION D AND INVERT ELEVATION AT CROSS–SECTION INTERVALS AS SHOWN ON PLANS.

4. SIDESLOPES AS SHOWN ON TYPICAL CROSS–SECTION.

BALTIMORE COUNTY MARYLAND

APPROVAL

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DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

STANDARD DITCHES
TOE OF SLOPE

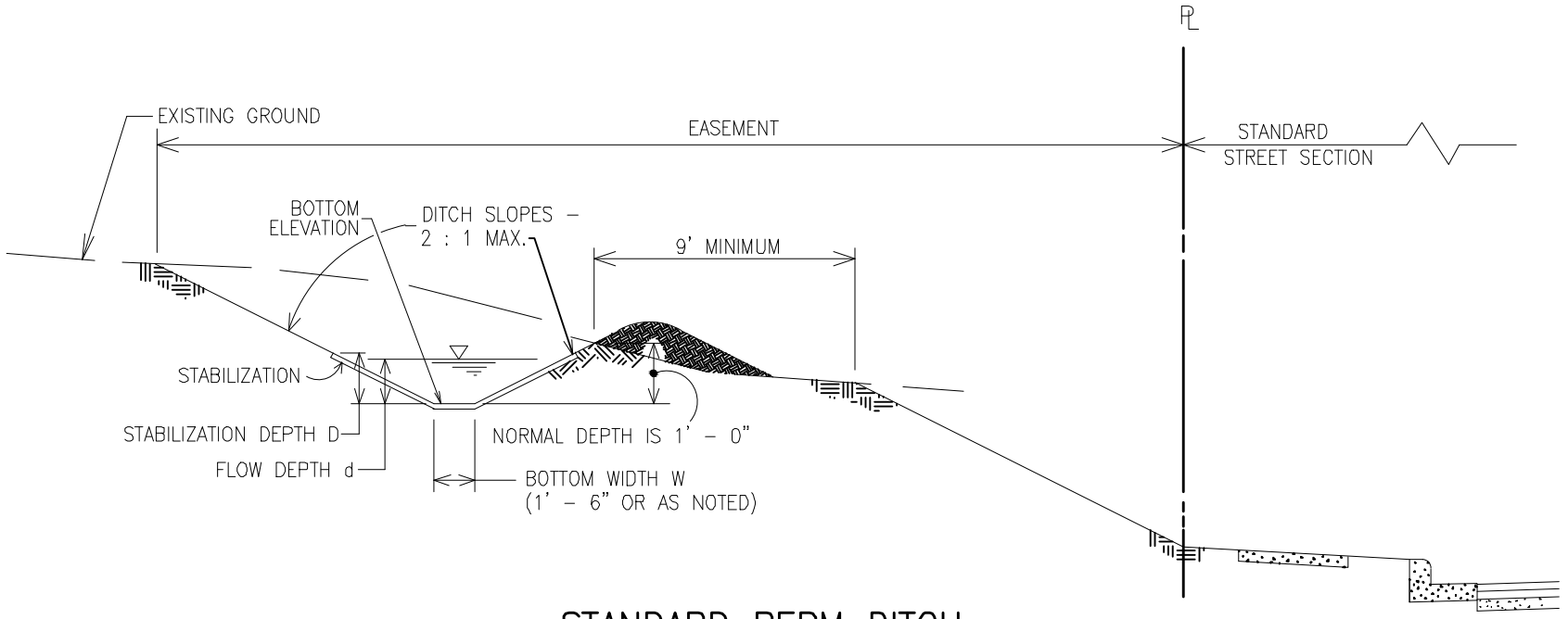
ISSUED: SEPTEMBER 2023

PLATE

D–5.04

DATE: 08/28/2023

FILE: Drains_Master.DWG



STANDARD BERM DITCH

1. STANDARD BERM DITCH TO BE USED TO COLLECT RUNOFF FROM AREAS DRAINING TOWARD TOP OF HIGHWAY CUT SLOPE.

2. STABILIZATION TO BE SEED AND MULCH, PEGGED STABILIZATION FABRIC, SOD, RIP–RAP OR GABIONS AS DIRECTED ON PLANS.

3. STABILIZATION, TYPE OF DITCH (SDD OR SD), BOTTOM WIDTH W, DEPTH OF STABILIZATION D AND INVERT ELEVATION AT CROSS–SECTION INTERVALS AS SHOWN ON PLANS.

4. SIDESLOPES AS SHOWN ON TYPICAL CROSS–SECTION.

BALTIMORE COUNTY MARYLAND

APPROVAL

DIRECTOR

BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023

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DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

STANDARD DITCHES
TOP OF SLOPE

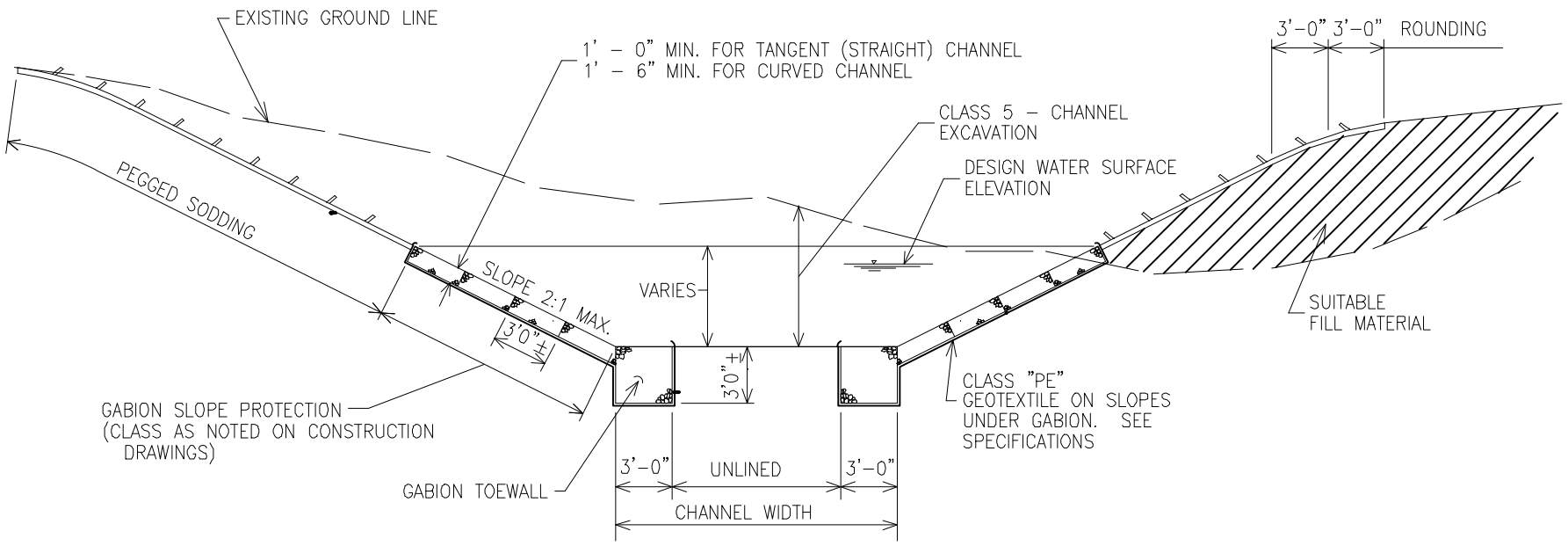
ISSUED: SEPTEMBER 2023

PLATE

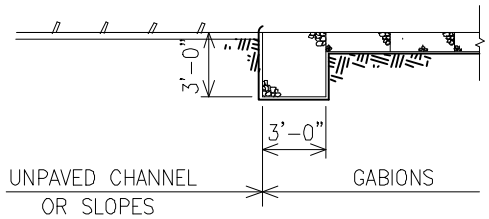
D–5.05

DATE:08/28/2023

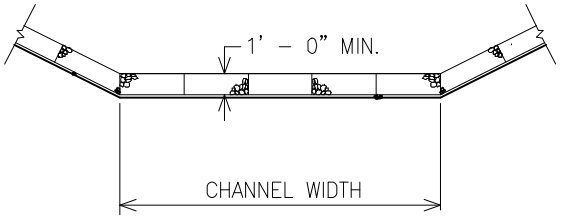
FILE:Drains_Master.DWG



UNLINED INVERT



END TOEWALL DETAIL



LINED INVERT

APPROVAL

DIRECTOR

BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023

DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

GABION CHANNEL LINING

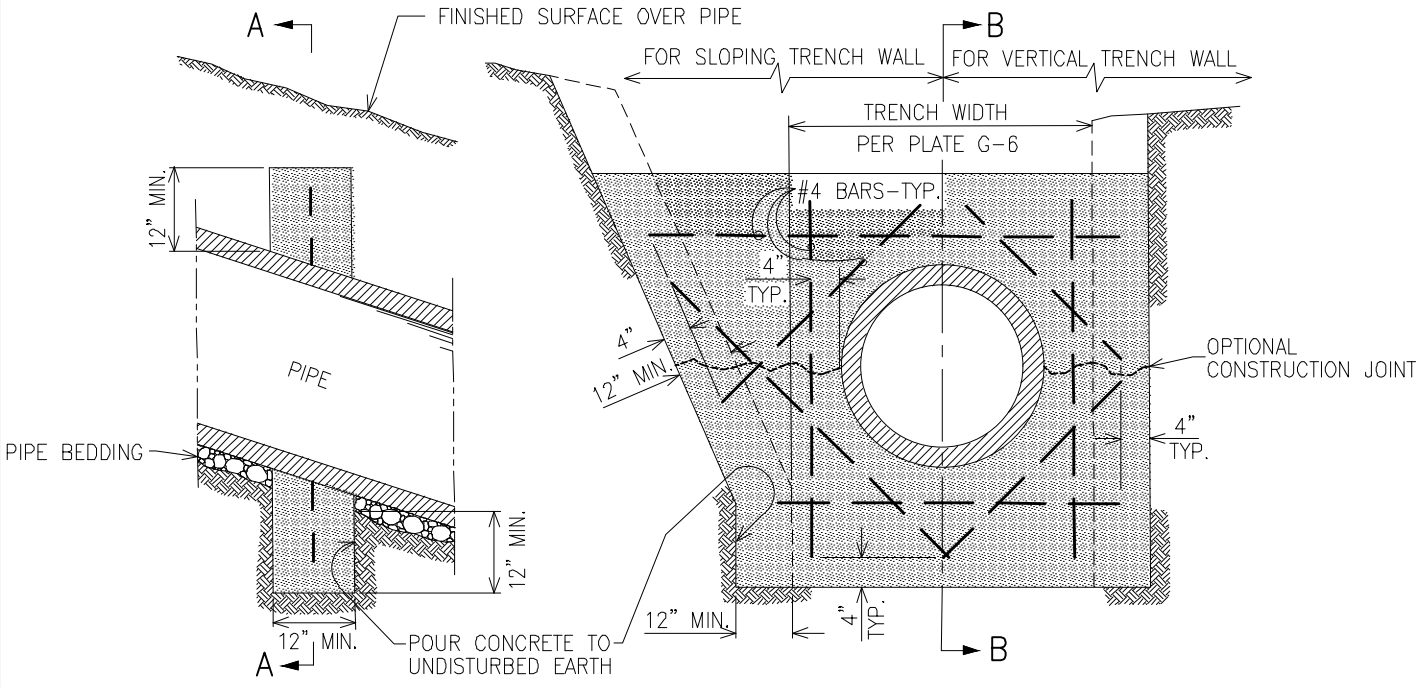
ISSUED: SEPTEMBER 2023

PLATE

D–5.06

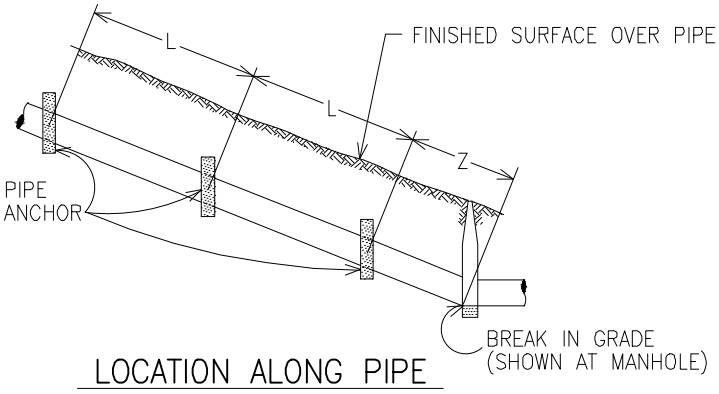
DATE:08/28/2023

FILE:Drains_Master.DWG



SECTION B–B

SECTION A–A



LOCATION ALONG PIPE

TABLE A

PIPE SLOPE	L (MAX.)	Z (MAX.)
100% (1:1)	12'	4'
67% (1.5:1)	14'	8'
50% (2:1)	16'	12'
40% (2.5:1)	18'	18'
33% (3:1)	20'	20'
25% (4:1)	22'	22'
20% (5:1)	24'	24'

NOTES

1. Anchors shall be Mix No. 3 Concrete.
2. Anchors shall not be placed within 6" of a pipe joint.
3. Trench shall be backfilled in accordance with Standard Specifications.
4. Spacing of anchors for pipe slopes between values in Table A may be proportioned.

APPROVAL

DIRECTOR

BUR. OF ENGINEERING/CONSTRUCTION

SEPTEMBER 28, 2023

DATE

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

STORM DRAINAGE DETAILS

PIPE ANCHORS FOR STEEP PIPES

ISSUED: SEPTEMBER 2023

PLATE

D–6.03

DATE: 08/28/2023

FILE: Drains_Master.DWG