DRAINAGE

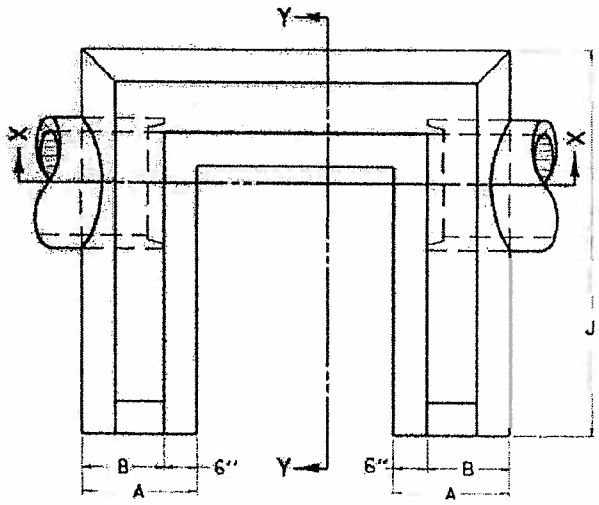
SUBSURFACE

DIMENSIONS AND QUANTITIES

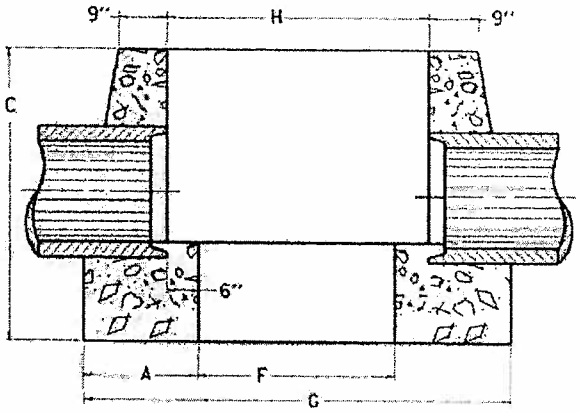
PIPE DIAMETER	HEADWALL DIMENSIONS									CU. YD. CONC. FOR 1 HEADWALL
	A	B	C	D	E	F	G	H	J	
12"	1'-8"	1'-2"	4'-0"	1'-6"	2'-6"	2'-6"	5'-10"	3'-6"	4'-8"	2.07
15"	1'-8"	1'-2"	4'-3"	1'-6"	2'-9"	2'-9"	6'-2"	3'-9"	5'-2"	2.42
18"	1'-9"	1'-3"	4'-6"	1'-6"	3'-0"	3'-0"	6'-6"	4'-0"	5'-9"	2.86
24"	1'-10"	1'-4"	5'-0"	1'-6"	3'-6"	3'-6"	7'-2"	4'-6"	6'-10"	3.75
30"	1'-11"	1'-5"	5'-6"	1'-6"	4'-0"	3'-9"	7'-7"	4'-9"	7'-11"	4.78
36"	2'-0"	1'-6"	6'-6"	2'-0"	4'-6"	4'-0"	8'-0"	5'-0"	9'-0"	6.72

NOTES

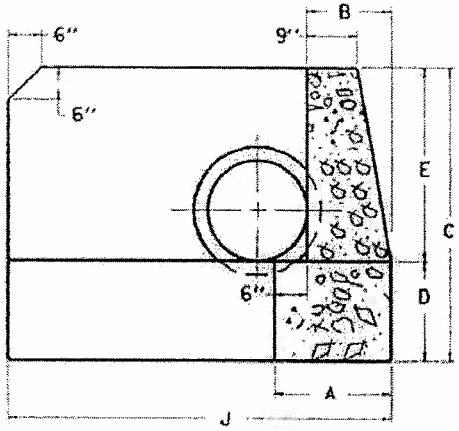
1. VOLUME DISPLACED BY BARREL OF PIPE HAS BEEN COMPUTED USING INSIDE DIAMETER OF PIPE.



PLAN VIEW

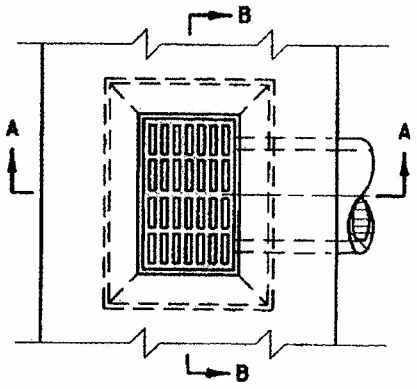


SECTION X-X

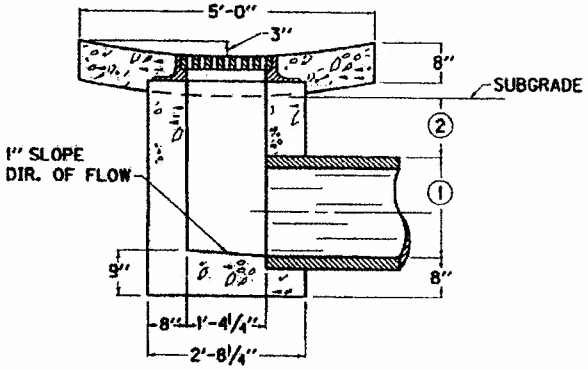


SECTION Y-Y

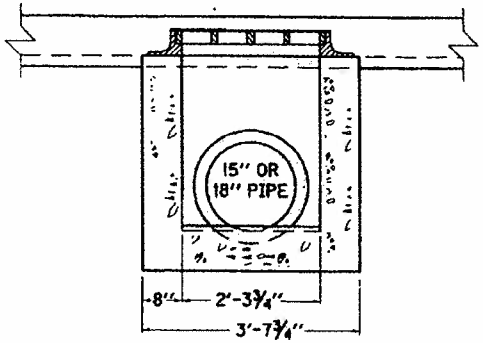
DROPBOXES
AMLSUB 1-1



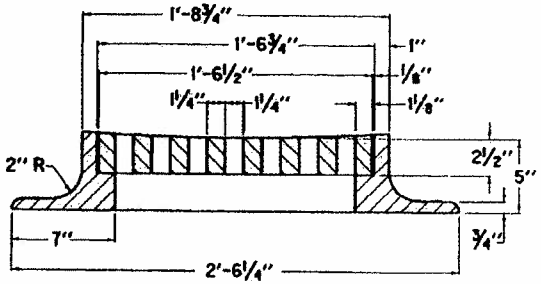
PLAN VIEW

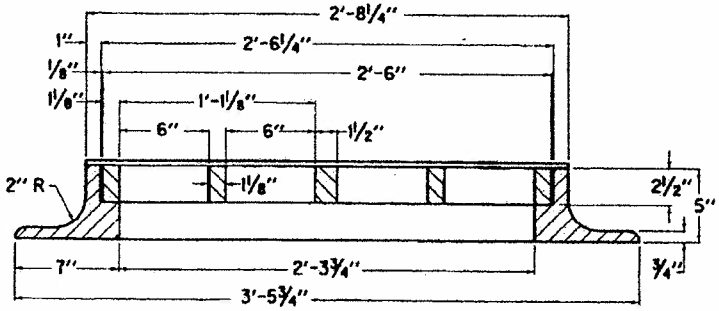


SECTION A-A



SECTION B-B





SECTIONAL VIEW OF FRAME AND GRATE

NOTES

PRIMARY USE: VALLEY GUTTER LOCATION

CONSTRUCT VALLEY GUTTER IN ACCORDANCE WITH CURRENT STD. DWG. RPM-100.

① 1'-5¼" FOR 15" PIPE
1'-8½" FOR 18" PIPE

② 1'-0" MINIMUM COVER BELOW SUBGRADE.

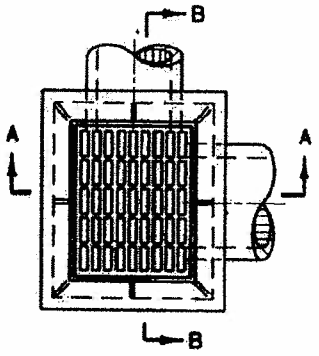
APPROX. CONCRETE QUANTITIES

PIPE SIZE	MIN. HEIGHT	CU. YDS. CONC.
15"	3'-4"	0.90
18"	3'-8"	0.97

APPROXIMATE WEIGHTS
FRAME 365 LBS.
GRATE 185 LBS.

NO DEDUCTIONS HAVE BEEN MADE FOR PIPE.

DROPBOXES
AMLSUB 1-2



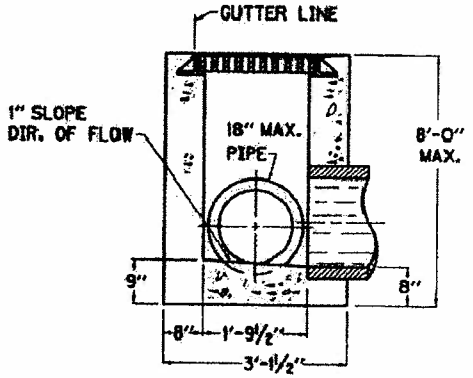
PLAN VIEW

APPROX. CONCRETE QUANTITIES

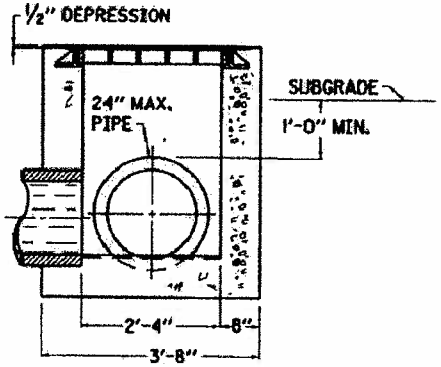
PIPE SIZE	MIN. HEIGHT	CU. YDS. CONC.
15"	2'-11"	0.89
18"	3'-3"	0.97
24"	4'-9"	1.38

APPROXIMATE WEIGHTS
FRAME 195 LBS.
GRATE 265 LBS.

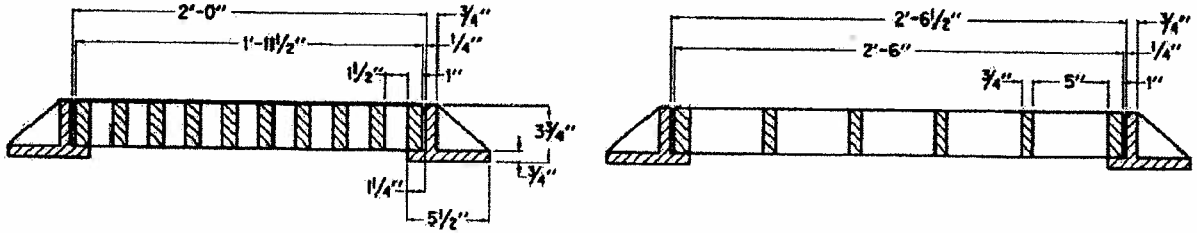
NO DEDUCTIONS HAVE BEEN MADE FOR PIPE.



SECTION A-A

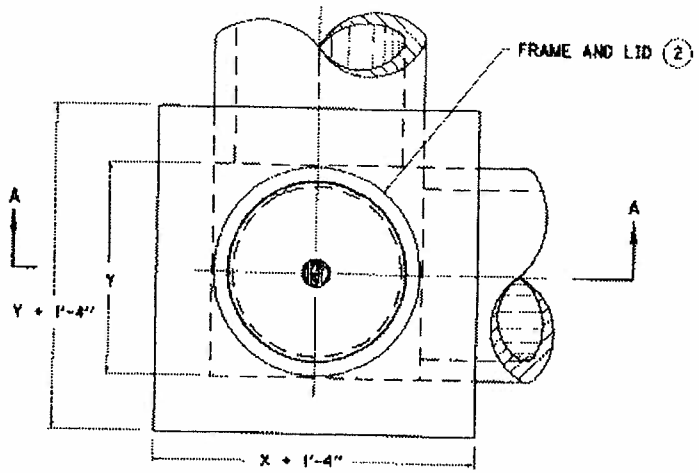


SECTION B-B

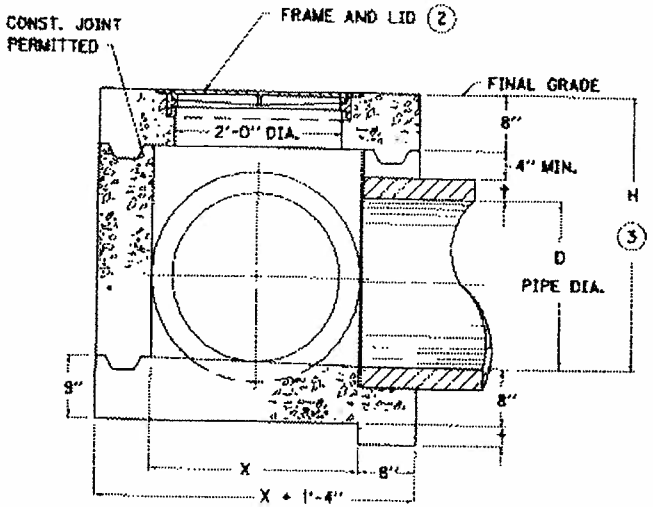


SECTIONAL VIEW OF FRAME AND GRATE

DROPBOXES
AMLSUB 1–3



PLAN VIEW



SECTION A-A

~ NOTES ~

1. THE CONTRACT UNIT PRICE EACH SHALL INCLUDE PAYMENT IN FULL FOR EXCAVATION, LABOR, FRAME AND LID, CONCRETE, AND ALL OTHER INCIDENTALS NECESSARY TO COMPLETE THE WORK.
   BID ITEM: JUNCTION BOX TYPE B (☆)
   (☆) = "1" (FRAME AND LID TYPE 1)
   (☆) = "2" (FRAME AND LID TYPE 2)

(2) WHEN THIS BOX IS TO BE USED IN NON-VEHICULAR TRAFFIC AREAS SEE CURRENT STD. DWG. RDM-100 "FRAME AND LID TYPE 1. WHEN THIS BOX IS TO BE USED IN VEHICULAR TRAFFIC AREAS SEE CURRENT STD. DWG. RDM-105 "FRAME AND LID TYPE 2.

(3) THE MAXIMUM DEPTH OF BOX FROM FINAL GRADE TO FLOW LINE OF PIPE SHALL BE 8'-0". ANY BOXES DEEPER THAN 8'-0" SHALL BE SPECIFICALLY DESIGNED.

(4) BASED ON H AS EQUAL TO D + t + 1'-0".

(5) Q = CUBIC YARDS OF CONCRETE PER FOOT INCREASE OR DECREASE WHEN H VARIES FROM D + t + 1'-0".

6. NO DEDUCTIONS HAVE BEEN MADE FOR PIPE, SEE REFERENCE CHART FOR QUANTITIES TO DEDUCT.

7. THE DIMENSIONS AND QUANTITIES HAVE BEEN CALCULATED FOR ROUND CONCRETE PIPE. WHEN NON-CIRCULAR PIPE IS USED THE BOX SIZE SHALL BE DETERMINED BY CONTROLLING DIMENSIONS OF THE PIPE.

8. FOR THIS APPLICATION THE "X" DIMENSION IS ASSUMED TO BE EQUAL TO OR GREATER THAN THE "Y" DIMENSION.

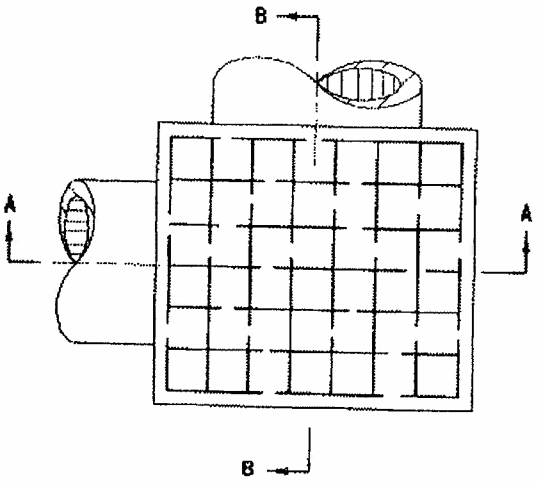
9. THE BOX SIZE NUMBER TO BE SHOWN ON THE PLANS SHALL BE DETERMINED BY THE LARGEST PIPE IN THE "X" AND "Y" DIMENSION.

DIMENSIONS & ESTIMATE OF QUANTITIES

INLET SIZE			PIPE	(4)	CONCRETE	
NO.	X	Y	MAX. DIA.	H	CUBIC YARDS	(5) Q
1	2'-0"	2'-0"	12"	2'-2"	0.91	0.3
2			15"	2'-5"	0.98	
3			18"	2'-9"	1.05	
4	2'-6"		21"	3'-0"	1.27	
5		2'-6"			1.43	
6		2'-0"	24"	3'-3"	1.36	
7		2'-6"			1.52	

REFERENCE CHART			
DIA. OF PIPE	JUNCTION BOX		CONCRETE TO DEDUCT FOR EACH PIPE
	PIPE ON "X" SIDE OF BOX	PIPE ON "Y" SIDE OF BOX	CUBIC YARDS
0	2'-0"	2'-0"	---
12"			0.1
15"-18"			
21"-24"	2'-6"	2'-6"	

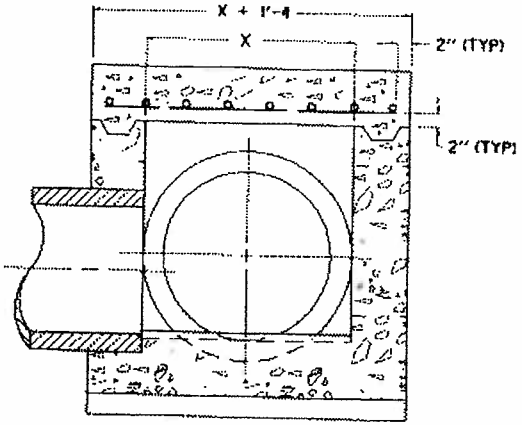
JUNCTION BOXES
AMLSUB 2-1



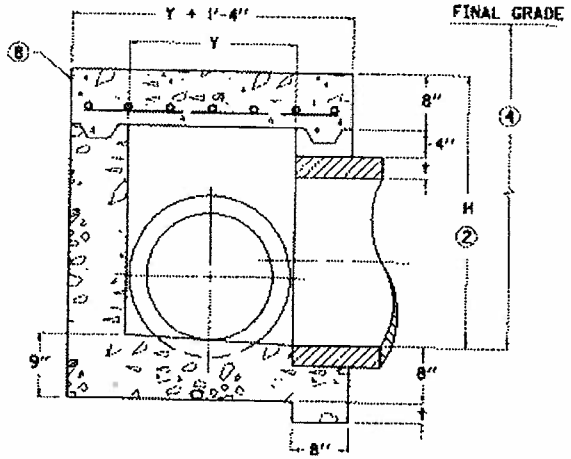
PLAN VIEW

NOTES

1. THE CONTRACT UNIT PRICE EACH SHALL INCLUDE PAYMENT IN FULL FOR ALL MATERIALS, EXCAVATION, LABOR AND INCIDENTALS NECESSARY TO COMPLETE THE WORK.
2. H = D + t + 1'-0" FOR THE LARGEST PIPE INVOLVED.
3. STEEL REINFORCEMENT SHALL BE NO. 4 BARS PLACED 6" O.C.
4. THE MAXIMUM DEPTH OF BOX FROM FINAL GRADE TO FLOW LINE OF PIPE SHALL BE 8'-0". ANY BOXES DEEPER THAN 8'-0" SHALL BE SPECIFICALLY DESIGNED.
5. SEE CURRENT STD. DWG. RDX-002 FOR DIMENSIONS AND QUANTITIES.
6. FOR THIS APPLICATION THE "X" DIMENSION IS ASSUMED TO BE EQUAL TO OR GREATER THAN THE "Y" DIMENSION.
7. THE BOX SIZE NUMBER TO BE SHOWN ON THE PLANS SHALL BE DETERMINED BY THE LARGEST PIPE IN THE "X" OR "Y" DIMENSION.
8. TO ELIMINATE FORM REMOVAL, THE TOP SHALL BE PRECAST.



SECTION A-A



SECTION B-B

JUNCTION BOXES
AMLSUB 2-2

DIMENSIONS AND ESTIMATE OF QUANTITIES

INLET SIZE			PIPE	①	CONCRETE		REINF. STEEL
NO.	X	Y	MAX. DIA.	H	CUBIC YARDS	② Q	LBS.
1	2'-0"	2'-0"	12"	2'-2"	0.99	0.3	28
2			15"	2'-5"	1.06		
3			18"	2'-9"	1.13		
4	2'-6"		21"	3'-0"	1.35		32
5		2'-6"			1.51		37
6		2'-0"	24"	3'-3"	1.44		32
7		2'-6"			1.60		37
8	3'-0"	2'-0"	27"	3'-6"	1.68		
9		2'-6"			1.86		42
10		3'-0"			2.04	0.4	48
11	3'-6"	2'-0"	30"	3'-10"	1.93	0.3	41
12		2'-6"			2.13	0.4	47
13		3'-0"			2.34		54
14		3'-6"			2.54		60
15		2'-0"	33"	4'-1"	2.02	0.3	41
16		2'-6"			2.24	0.4	47
17		3'-0"			2.45		54
18		3'-6"			2.66		60
19	4'-0"	2'-0"	36"	4'-4"	2.30		45
20		2'-6"			2.53		52
21		3'-0"			2.76		59
22		3'-6"			2.99		66
23		4'-0"			3.22	0.5	73
24	4'-6"	2'-0"	42"	4'-11"	2.70	0.4	50
25		2'-6"			2.95		57
26		3'-0"			3.21		65
27		3'-6"			3.47	0.5	73
28		4'-0"			3.73		80
29		4'-6"			3.98		88
30	5'-0"	2'-0"	48"	5'-5"	3.12	0.4	54
31		2'-6"			3.41		62
32		3'-0"			3.69	0.5	71
33		3'-6"			3.97		79
34		4'-0"			4.26		88
35		4'-6"			4.54		96
36		5'-0"			4.83	0.6	104
37	5'-6"	2'-0"	54"	6'-0"	3.58	0.4	58
38		2'-6"			3.89	0.5	67
39		3'-0"			4.20		76
40		3'-6"			4.51		86
41		4'-0"			4.82		95
42		4'-6"			5.13	0.6	104
43		5'-0"			5.44		113
44		5'-6"			5.75		122
45	6'-0"	2'-0"	60"	6'-6"	4.06	0.5	63
46		2'-6"			4.39		72
47		3'-0"			4.73		82
48		3'-6"			5.07		92
49	6'-0"	4'-0"	60"	6'-6"	5.40	0.6	102
50		4'-6"			5.74		111
51		5'-0"			6.08		121
52		5'-6"			6.42		131
53		6'-0"			6.75	0.7	140
54	7'-0"	2'-0"	66"	7'-1"	4.81	0.5	71
55		2'-6"			5.19		83
56		3'-0"			5.57	0.6	94
57		3'-6"			5.94		105
58		4'-0"			6.32		116
59		4'-6"			6.70		127
60		5'-0"			7.07	0.7	138
61		5'-6"			7.45		149
62		6'-0"			7.83		160
63		7'-0"			8.58	0.8	182
64	7'-6"	2'-0"	72"	7'-7"	5.37	0.5	76
65		2'-6"			5.77	0.6	88
66		3'-0"			6.17		99
67		3'-6"			6.57		111
68		4'-0"			6.98	0.7	123
69		4'-6"			7.38		134
70		5'-0"			7.78		146
71		5'-6"			8.19		158
72		6'-0"			8.59	0.8	169
73		7'-0"			9.39		193
74		7'-6"			9.80		204

REFERENCE CHART

DIA. OF PIPE	JUNCTION BOX		CONCRETE TO DEDUCT FOR EACH PIPE
	PIPE ON "X" SIDE OF BOX	PIPE ON "Y" SIDE OF BOX	CUBIC YARDS
0	2'-0"	2'-0"	---
12"			0.1
15"-18"			
21"-24"	2'-6"	2'-6"	
27"	3'-0"	3'-0"	0.2
30"-33"	3'-6"	3'-6"	
36"	4'-0"	4'-0"	0.3
42"	4'-6"	4'-6"	0.4
48"	5'-0"	5'-0"	0.5
54"	5'-6"	5'-6"	0.6
60"	6'-0"	6'-0"	0.7
66"	7'-0"	7'-0"	0.8
72"	7'-6"	7'-6"	1.0

NOTES

① BASED ON H AS EQUAL TO D++1'-0".

② Q = CUBIC YARDS OF CONCRETE PER FOOT INCREASE OR DECREASE WHEN H VARIES FROM D++1'-0".

3. NO DEDUCTIONS HAVE BEEN MADE FOR PIPE, SEE REFERENCE CHART FOR QUANTITIES TO DEDUCT.

4. THE DIMENSIONS AND QUANTITIES HAVE BEEN CALCULATED FOR ROUND CONCRETE PIPE. WHEN NON-CIRCULAR PIPE IS USED THE BOX SIZE SHALL BE DETERMINED BY CONTROLLING DIMENSIONS OF THE PIPE.

JUNCTION BOXES
AMLSUB 2-3

INTERMEDIATE ANCHOR FOR PIPE

CLASS "A" CONCRETE

		DIAMETER OF PIPE IN INCHES															
	% GRADE	12"	15"	18"	21"	24"	27"	30"	36"	42"	48"	54"	60"	66"	72"	78"	84"
VOLUME IN CU. YDS OF CLASS "A" CONC. FOR ONE ANCHOR	0	0.68	0.86	1.07	1.31	1.59	1.90	2.25	3.06	5.91	7.41	9.30	11.28	14.99	18.34	22.15	25.64
	10	0.72	0.91	1.13	1.38	1.68	2.01	2.38	3.24	6.23	7.83	9.70	11.79	15.77	19.27	23.24	26.88
	20	0.75	0.96	1.19	1.44	1.78	2.14	2.52	3.43	6.59	8.28	10.07	12.24	16.48	20.11	24.22	27.98
	30	0.79	1.01	1.26	1.53	1.88	2.27	2.67	3.65	6.97	8.78	10.40	12.64	17.12	20.87	25.10	28.95
	40	0.84	1.07	1.33	1.62	1.99	2.41	2.83	3.88	7.39	9.31	10.69	12.99	17.70	21.53	25.88	29.79
	50	0.88	1.13	1.41	1.72	2.11	2.56	3.01	4.12	7.83	9.87	10.95	13.30	18.22	22.13	26.56	30.51
	60	0.93	1.19	1.49	1.82	2.24	2.71	3.19	4.38	8.29	10.47	11.12	13.57	18.69	22.66	27.15	31.15
	70	0.98	1.25	1.57	1.94	2.37	2.87	3.38	4.65	8.77	11.10	11.40	13.81	19.12	23.14	27.69	31.70
	80	1.03	1.32	1.66	2.08	2.50	3.07	3.58	4.93	9.28	11.58	11.74	14.02	19.51	23.57	28.16	32.17
	90	1.08	1.39	1.75	2.19	2.64	3.25	3.79	5.22	9.79	11.75	12.41	14.21	19.79	23.87	28.46	32.42
	100	1.13	1.46	1.84	2.31	2.78	3.43	4.00	5.52	10.32	11.91	13.10	14.38	20.20	24.31	28.95	32.92
DIMENSIONS	L	3'-4"	3'-7½"	3'-11"	4'-2½"	4'-6"	4'-9½"	5'-1"	5'-8"	6'-11"	7'-6"	8'-1"	8'-8"	9'-7"	10'-2"	10'-9"	11'-4"
	W	2'-4"	2'-7½"	2'-11"	3'-2½"	3'-6"	3'-9½"	4'-1"	4'-8"	5'-7"	6'-2"	6'-9"	7'-4"	8'-1"	8'-8"	9'-3"	9'-10"
	H	1'-8"	1'-11¼"	2'-2½"	2'-5¾"	2'-9"	3'-0¼"	3'-3½"	3'-10"	4'-6½"	5'-1"	5'-7½"	6'-2"	6'-9½"	7'-4"	7'-10½"	8'-5"
	D	1'-0"	1'-0"	1'-0"	1'-0"	1'-0"	1'-0"	1'-0"	1'-0"	1'-6"	1'-6"	1'-6"	1'-8"	1'-8"	1'-8"	2'-0"	2'-0"
	T	6"	6"	6"	6"	6"	6"	6"	6"	8"	8"	8"	8"	9"	9"	9"	9"

END ANCHORS FOR PIPE OUTLETS

CLASS "A" CONCRETE

DIMENSIONS	L	2'-4"	2'-8"	2'-9"	3'-3"	3'-6"	3'-10"	4'-1"	4'-0"	5'-3"	5'-10"	6'-5"	7'-0"	7'-7"	8'-2"	8'-9"	9'-4"
	H ON EARTH	1'-6"	1'-6"	1'-6"	1'-6"	1'-6"	1'-6"	1'-6"	1'-6"	2'-0"	2'-0"	2'-0"	2'-0"	2'-0"	2'-0"	2'-0"	2'-0"
	H ON ROCK	1'-0"	1'-0"	1'-0"	1'-0"	1'-0"	1'-0"	1'-0"	1'-0"	1'-0"	1'-0"	1'-0"	1'-0"	1'-0"	1'-0"	1'-0"	1'-0"
VOLUME CU YDS	ON EARTH	0.13	0.15	0.16	0.18	0.19	0.21	0.23	0.26	0.39	0.43	0.48	0.52	0.56	0.61	0.65	0.69
	ON ROCK	0.09	0.10	0.10	0.12	0.13	0.14	0.15	0.17	0.19	0.22	0.24	0.26	0.28	0.31	0.33	0.35

NOTES

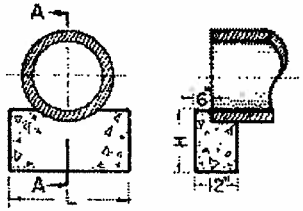
Circular Pipe includes slightly elliptical Concrete Pipe with circular reinforcement.

Volume displaced by barrel of pipe has been computed using inside dimension of pipe.

The unit price bid per cu. yd. for Class "A" Conc. shall include all forms, material, labor, etc. incidental to construction.

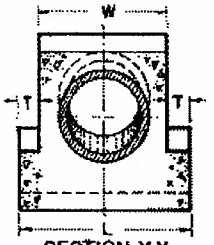
For grade breaks in pipe, use average grade to calculate volumes.

END ANCHORS FOR PIPE OUTLET

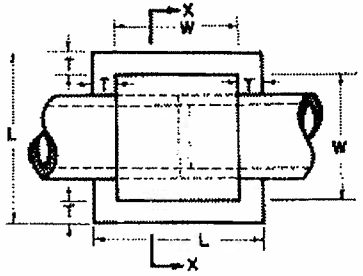


END ELEVATION SECTION A-A

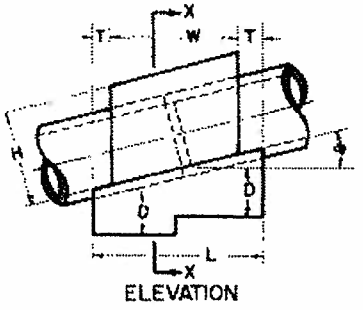
INTERMEDIATE ANCHOR



SECTION X-X

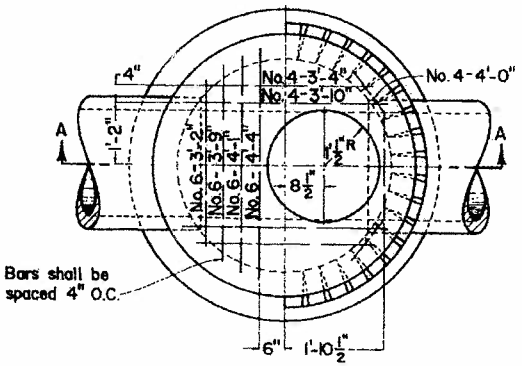


PLAN



ELEVATION

INTERMEDIATE AND END CULVERT ANCHOR
AMLSUB 3



·PLAN·

·NOTES·

See Current Standard Drawing RDM-105 for castings to be used in traffic areas and Current Standard Drawing RDM-100 for castings to be used in non-traffic areas.

The riser section may be precast concrete pipe, cast-in-place concrete, or brick. A concentric brick cone, cast-in-place cone or precast concrete cone may be permitted, provided height limitations would permit.

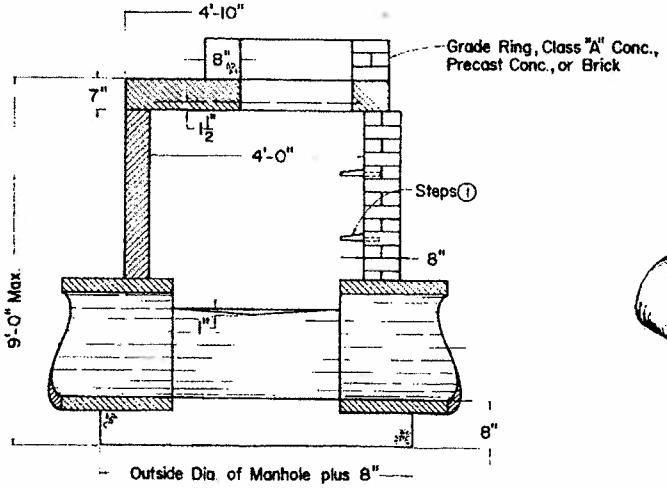
The maximum size of intercepted pipe shall be 27"

Cover over highest pipe, exclusive of pavement shall be 2'-0"

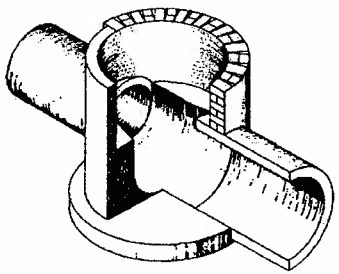
Cast-in-place concrete manholes shall have 8" thick walls.

See Proposal Notes or Standard Specifications for additional requirements.

① See current Standard Drawing RDB-430 for Step type, spacing and detail.

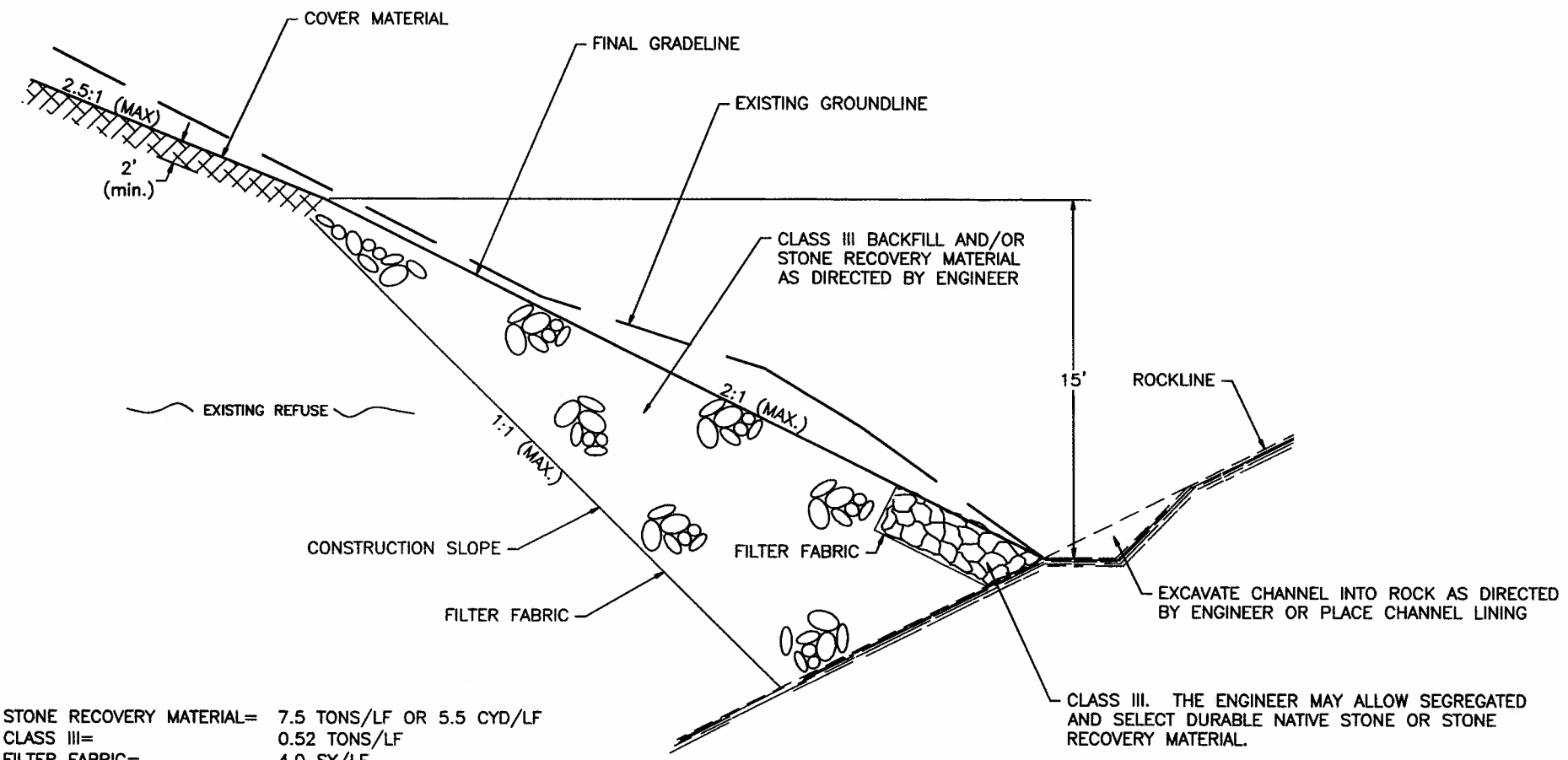


SECTION A-A



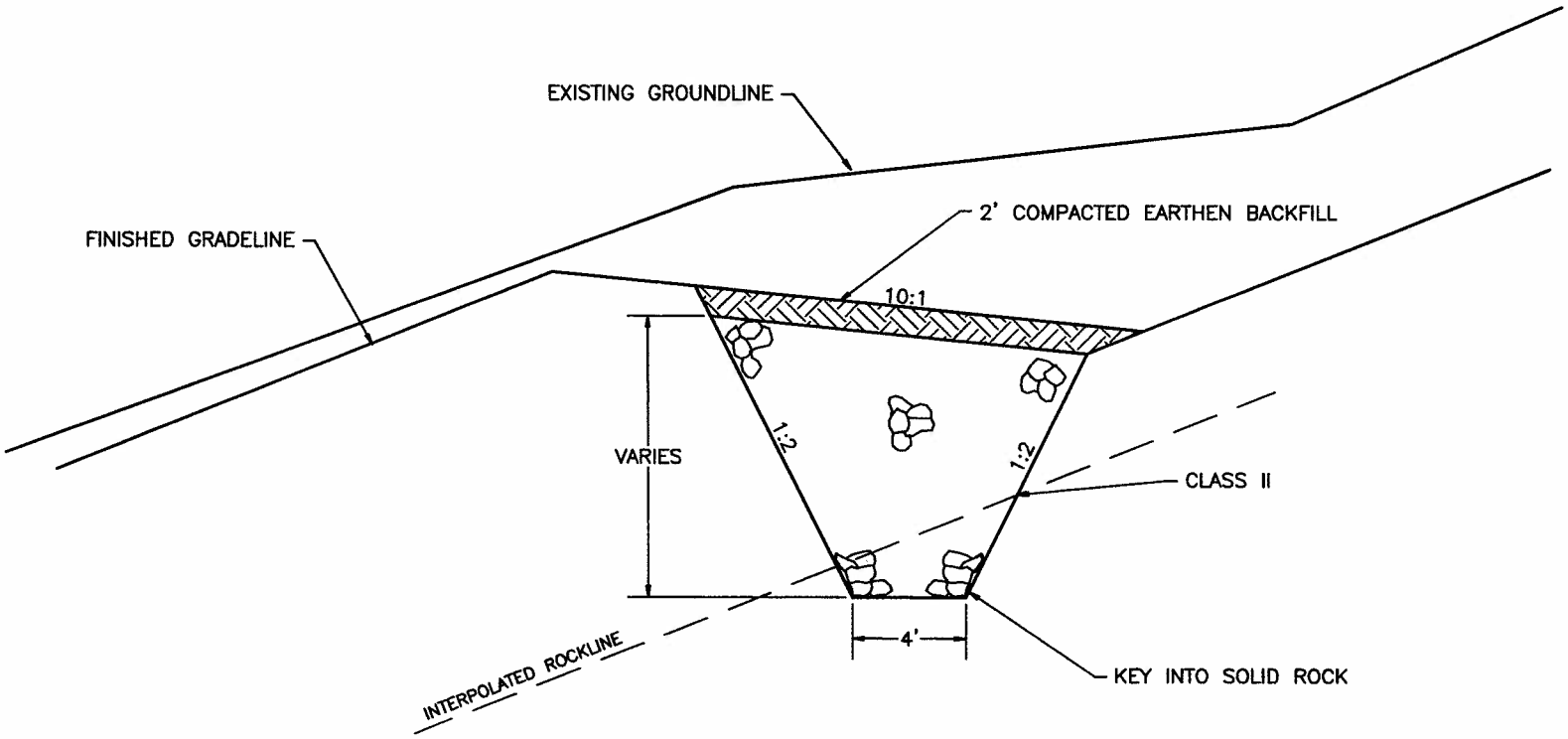
ISOMETRIC OF BASE

MANHOLE TYPE A
AMLSUB 4

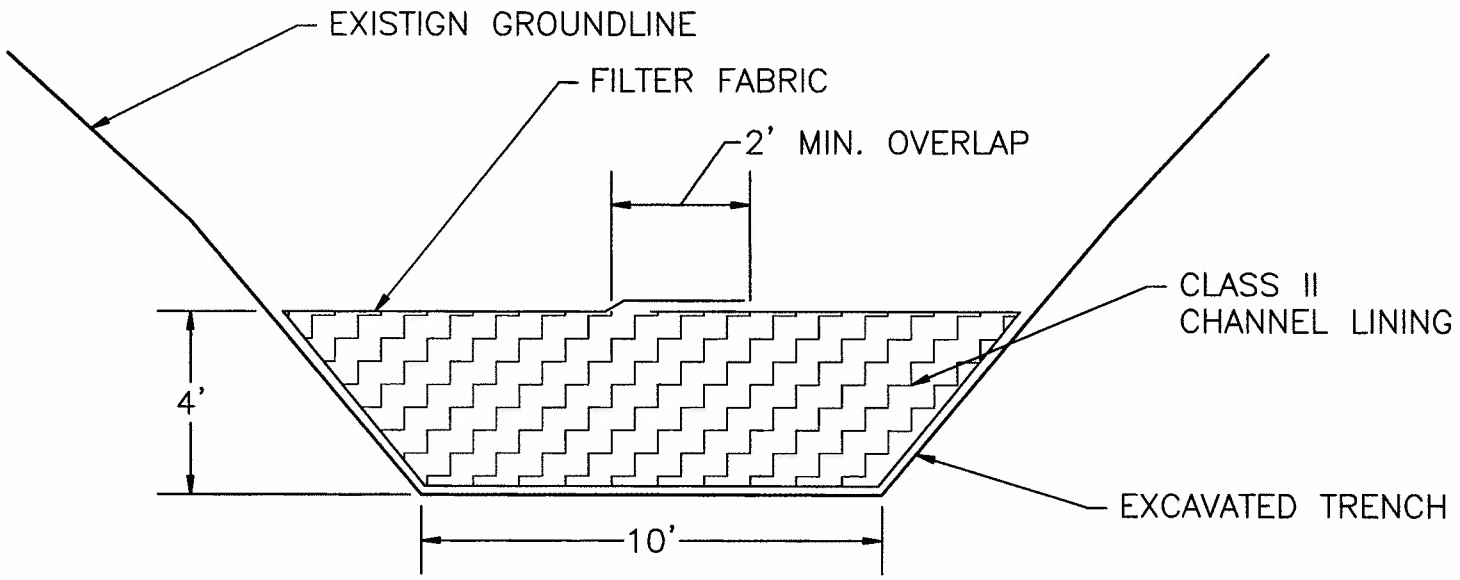


STONE RECOVERY MATERIAL=	7.5 TONS/LF OR 5.5 CYD/LF
CLASS III=	0.52 TONS/LF
FILTER FABRIC=	4.0 SY/LF

ROCK TOE BUTRESS & DRAIN
AMLSUB 5-1



ROCK TOE BUTRESS & DRAIN
AMLSUB 5–2

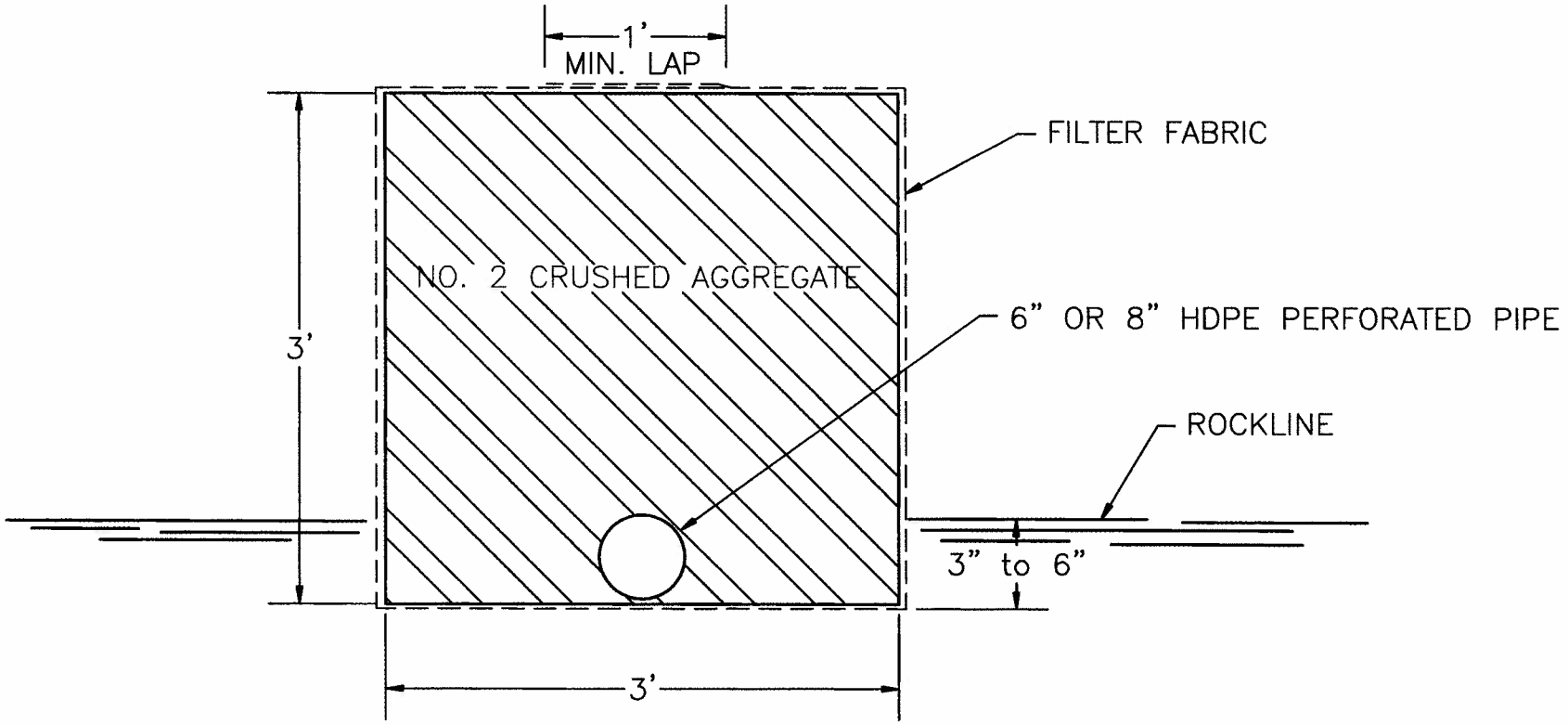


CLASS II= 2.6 TONS/LF
FILTER FABRIC= 4.22 SY/LF

ROCK CORE DRAIN
AMLSUB 6

NOTE:

1. EXCAVATION SHALL BE CONSIDERED INCIDENTAL FOR SUBDRAINS INSTALLED LESS THAN 5 FT DEEP. FOR SUBDRAINS DEEPER THAN 5 FT., EXCAVATION SHALL BE INCLUDED FOR PAYMENT AS EARTHWORK ON A CUBIC YARD BASIS.
2. FOR SUBDRAINS DEEPER THAN 5' USE SOCK PIPE.

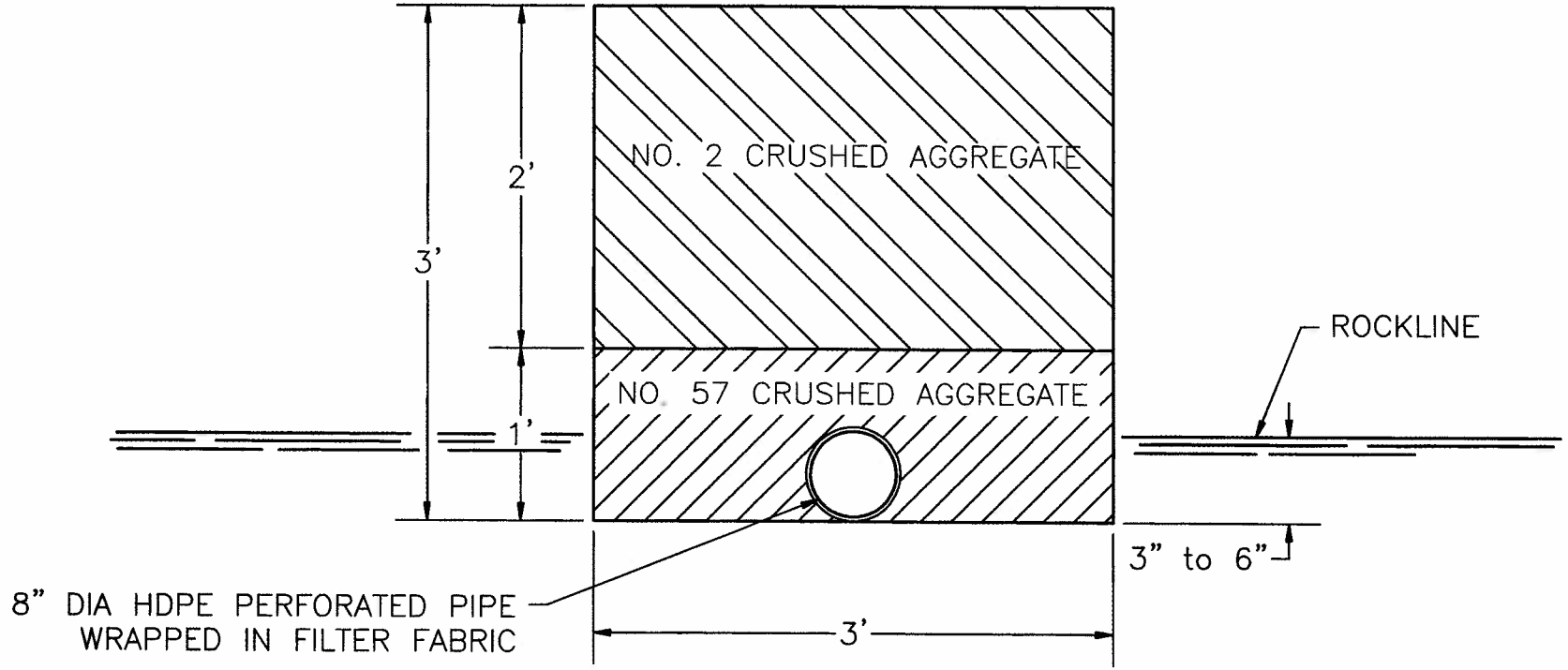


SCALE 1:1

SUBDRAIN–TYPE 1
AMLSUB 7

NOTES:

1. THIS SUBDRAIN SHALL BE USED FOR SUBDRAINS BETWEEN 5 AND 15 FT DEEP
2. EXCAVATION SHALL BE CONSIDERED INCIDENTAL FOR SUBDRAINS INSTALLED LESS THAN 5 FT DEEP. FOR SUBDRAINS DEEPER THAN 5 FT, EXCAVATION SHALL BE INCLUDED FOR PAYMENT AS EARTHWORK ON A CUBIC YARD BASIS.
3. THE ENGINEER MAY ALLOW THE CONTRACTOR TO USE #2 CRUSHED AGGREGATE INSTEAD OF #57 CRUSHED AGGREGATE IF IT CAN BE INSTALLED WITHOUT DAMAGE TO THE PIPE AND FABRIC.
4. FOR SUBDRAINS DEEPER THAN 5' USE SOCK PIPE.

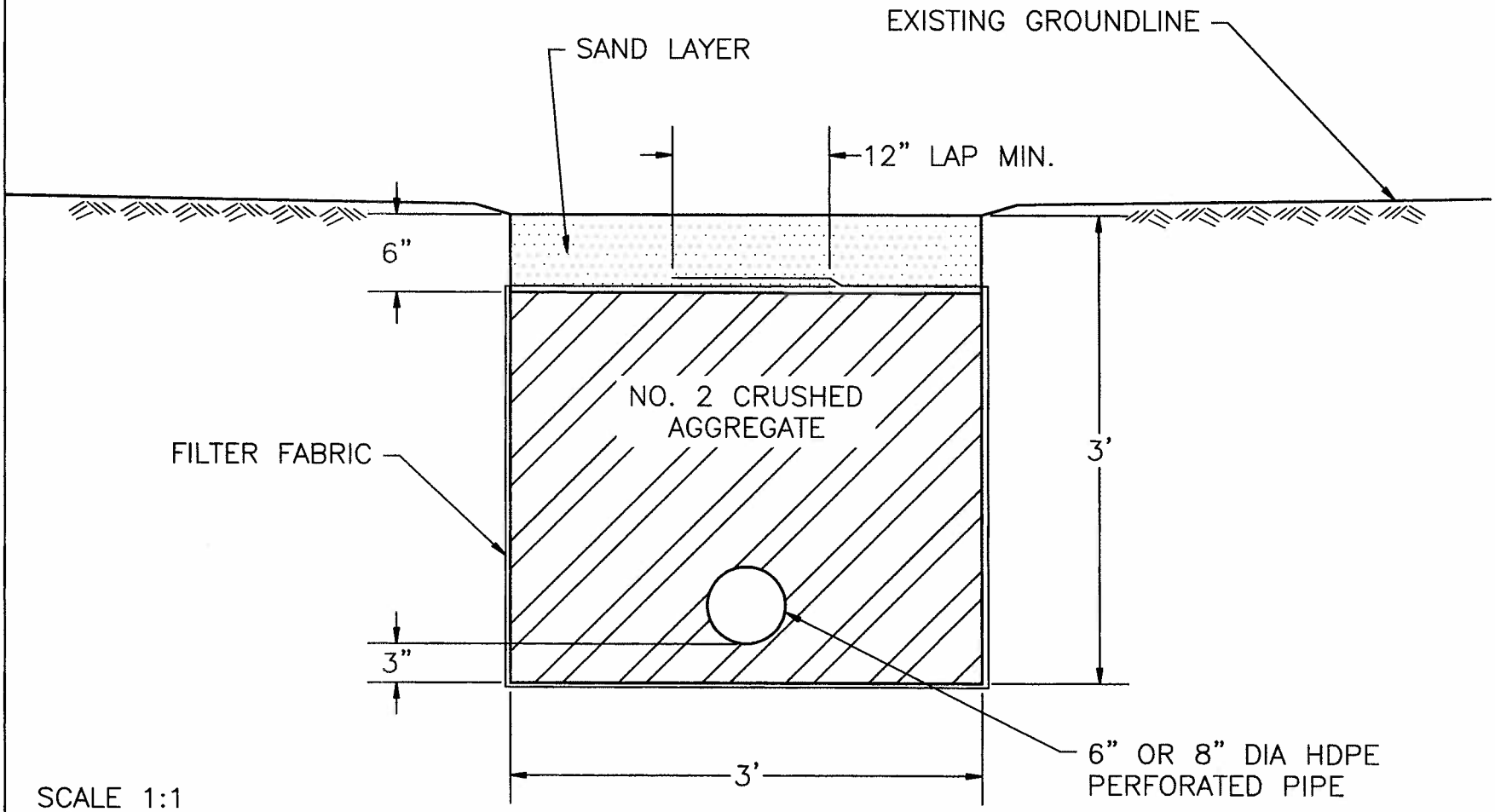


SCALE 1:1

SUBDRAIN– TYPE 2
AMLSUB 8

NOTES:

1. EXCAVATION SHALL BE CONSIDERED INCIDENTAL FOR SUBDRAINS INSTALLED LESS THAN 5 FT DEEP. FOR SUBDRAINS DEEPER THAN 5 FT, EXCAVATION SHALL BE INCLUDED FOR PAYMENT AS EARTHWORK ON A CUBIC YARD BASIS.
2. FOR SUBDRAINS DEEPER THAN 5' USE SOCK PIPE.



SCALE 1:1

SUBDRAIN– TYPE 3
AMLSUB 9