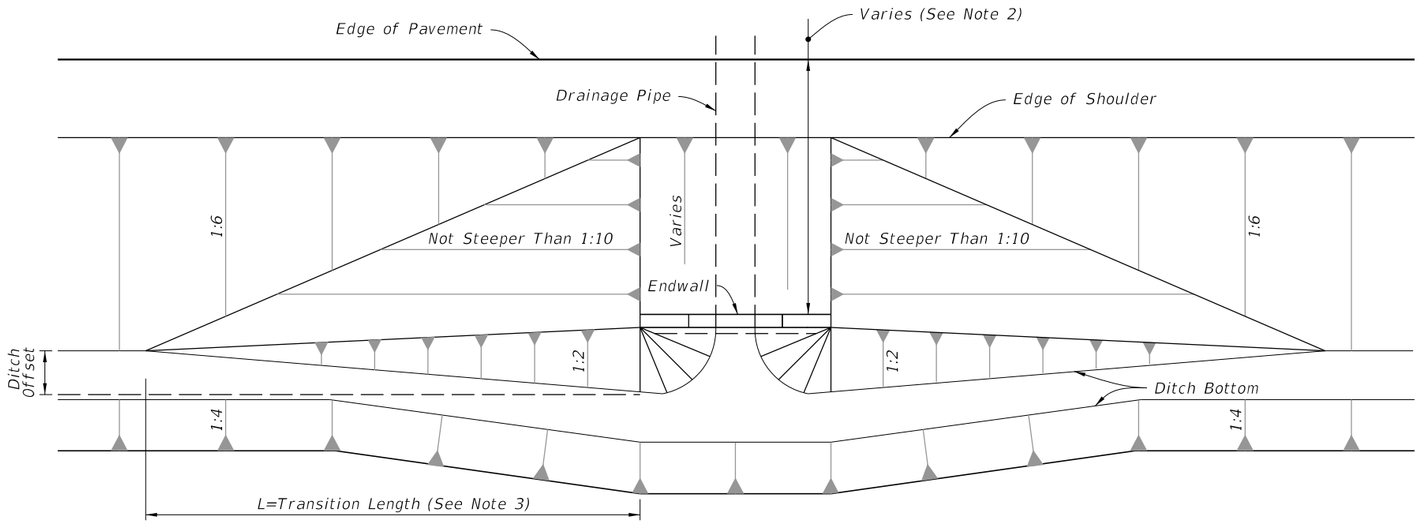
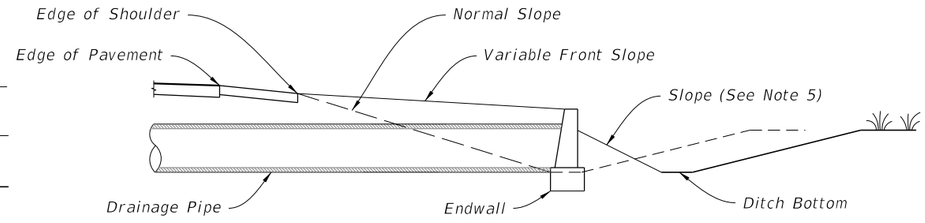


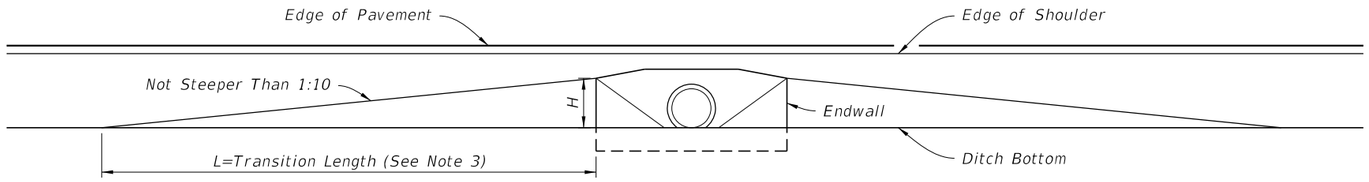
PLAN

NOTES:

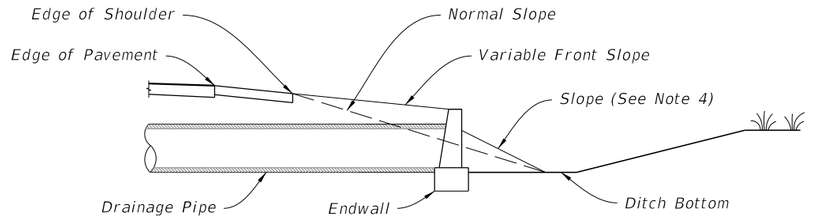
1. Fill or excavate variable slopes during normal grading operations.
2. Minimum distance as required to comply with safety criteria.
3. Use Larger Value Of Either:
   L=10xH (No Maximum)
   L=10xDitch Offset (Maximum L=100')
4. Slope to normal slope if possible. Slope not to be steeper than 1:2. See side elevation (extended) below if 1:2 slope must go beyond toe of normal slope.
5. 1:2 slope if necessary to go beyond normal toe of slope and maintain ditch width by moving out back slope.



SIDE ELEVATION (EXTENDED)



END ELEVATION



SIDE ELEVATION (TYPICAL)

FRONT SLOPES AT DRAINAGE STRUCTURES

TABLE OF CONTENTS:

Sheet	Description
1	Limits of Variable Front Slopes at Drainage Structures
2	Round and Elliptical Concrete Pipe Joint
3	Filter Fabric Jacket, Concrete Jacket, and Pipe Plug
4	Concrete Collars
5	Single Pipe End Guard
6	Double Pipe End Guard
7	Retaining Wall Concrete Gutter and Drains

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LIMITS OF VARIABLE FRONT SLOPES AT DRAINAGE STRUCTURES

LAST REVISION	REVISION	DESCRIPTION:	FY 2023-24 STANDARD PLANS	MISCELLANEOUS DRAINAGE DETAILS	INDEX	SHEET
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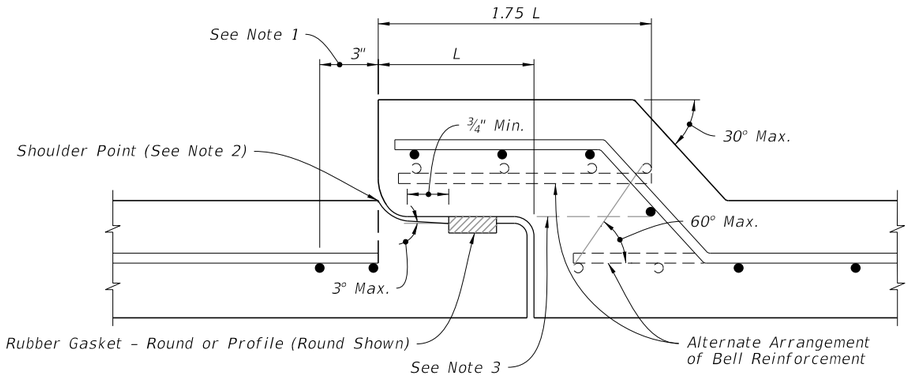
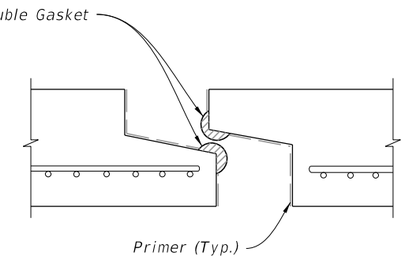


TABLE 1 SCHEDULE OF BELL REINFORCEMENT Classes II,III,IV,V; Wall A,B,C		
Nominal Pipe Diameter	Design Bell Reinforcement	Maximum Reinforcement Under Tolerance
	in^2 per foot	in^2 per foot
15"	0.07	0.010
18"	0.07	0.010
24"	0.09	0.010
30"	0.12	0.010
36"	0.14	0.010
42"	0.16	0.010
48"	0.19	0.011
54"	0.21	0.012
60"	0.23	0.0135
66"	0.26	0.015
72"	0.28	0.0165
78"	0.30	0.018
84"	0.33	0.0195
90"	0.35	0.021
96"	0.37	0.0225
102"	0.40	0.024
108"	0.42	0.0255

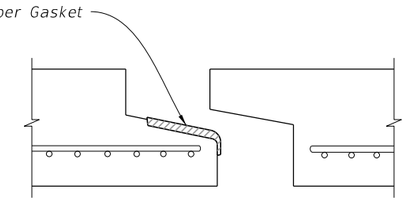
NOTES:

1. Allowable Tolerance for the last full wrap of reinforcing when using single elliptical cage.
2. Extend the last full wrap of reinforcing to the shoulder point and meet ASTM C-76 requirements.
3. All circumferential steel located above this line and within the 1.75 L is defined as bell reinforcement.

ROUND CONCRETE PIPE JOINT DETAIL



PREFORMED PLASTIC JOINT



PROFILE RUBBER GASKET

NOTES:

1. Filter Fabric Jacket is required on both type of joints.
2. Details shown before pull-up.

ELLIPTICAL CONCRETE PIPE JOINT DETAIL

ROUND AND ELLIPTICAL CONCRETE PIPE JOINT

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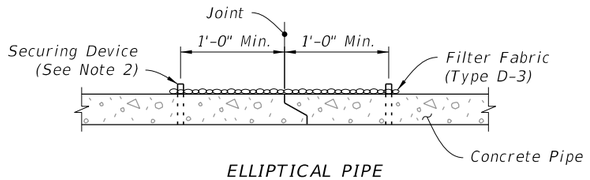
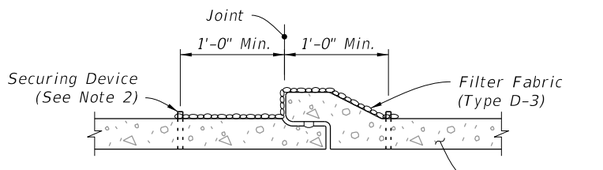
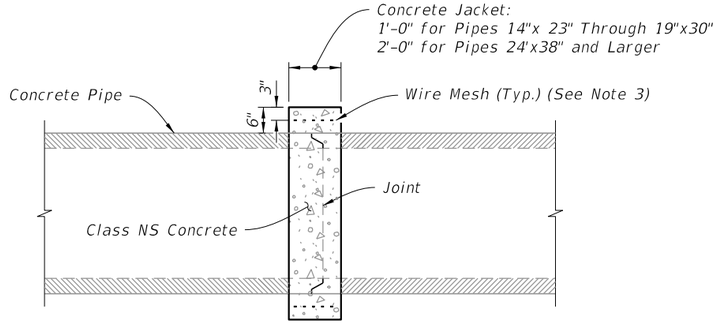


ELLIPTICAL PIPE
(Tongue & Groove Shown)

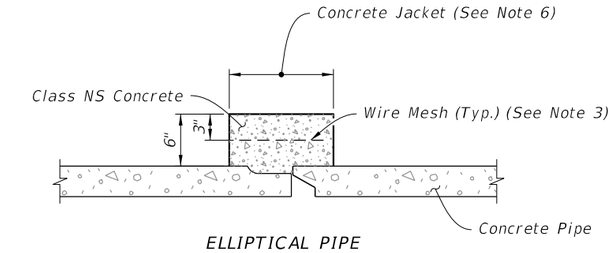


ROUND PIPE
(Bell & Spigot Shown)

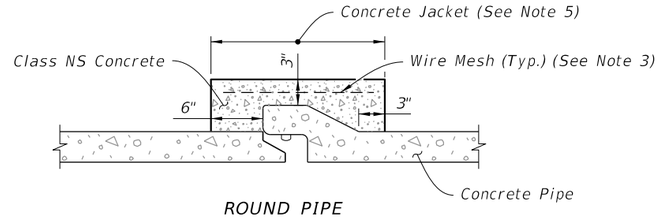
SECTION VIEW



ELLIPTICAL PIPE

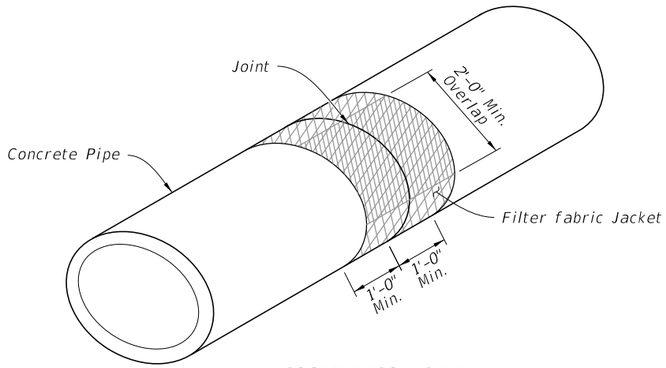


ELLIPTICAL PIPE
(Tongue & Groove Shown)



ROUND PIPE
(Bell & Spigot Shown)

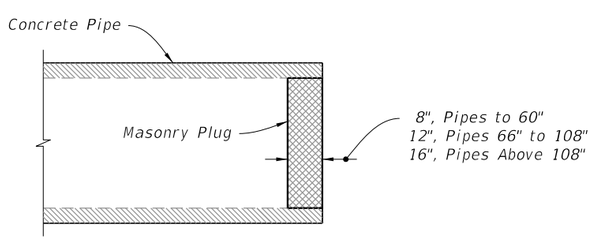
DISSIMILAR JOINTS



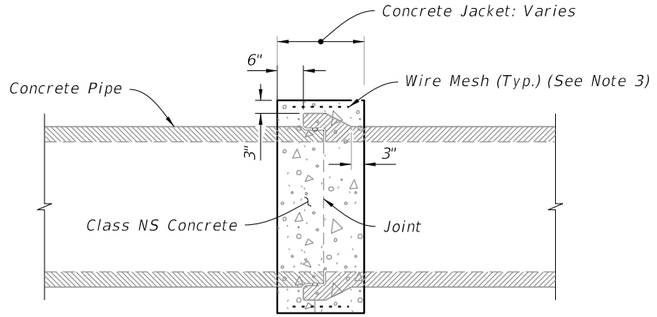
ISOMETRIC VIEW

FILTER FABRIC JACKET

(For All Pipe Types - Concrete Elliptical Pipe Shown)

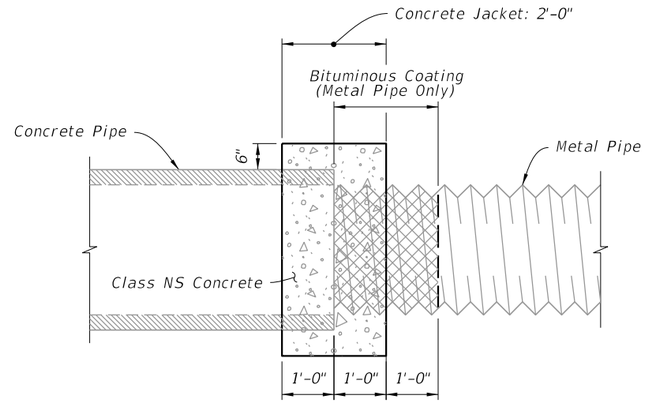


PIPE PLUG



ROUND PIPE

SIMILAR TYPES
(Only When Called For In The Plans)



CONCRETE AND METAL PIPE SHOWN
(Others Similar)

DISSIMILAR TYPES

CONCRETE JACKET

NOTES:

1. Alternate connection must be approved by the Engineer.
2. Install securing device in accordance with Specification 985.
3. Any wire mesh arrangement which provides 0.126 square inches of steel area per linear foot both ways may be used, provided the wires are spaced a minimum of 2" and/or a maximum of 6" on centers.
4. Do not use a concrete jacket to join dissimilar metal pipes.
5. 12" for pipes 15" through 24"; 24" for pipes 30" and larger.
6. 12" for pipes 14" x 23" through 19" x 30"; 24" for pipes 24" x 38" and larger.

FILTER FABRIC JACKET, CONCRETE JACKET, AND PIPE PLUG

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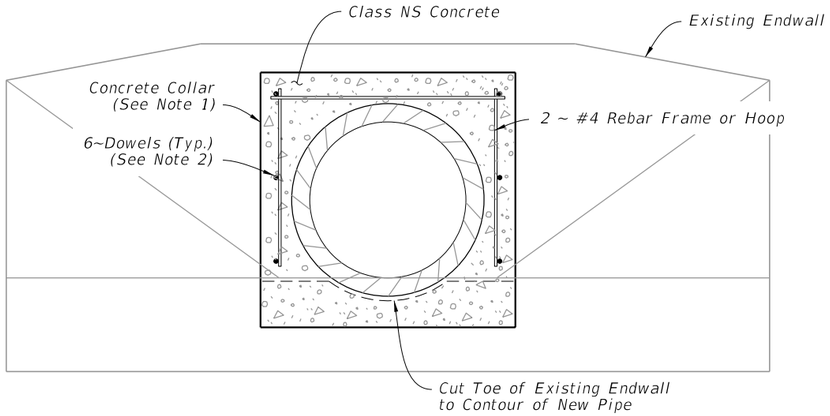
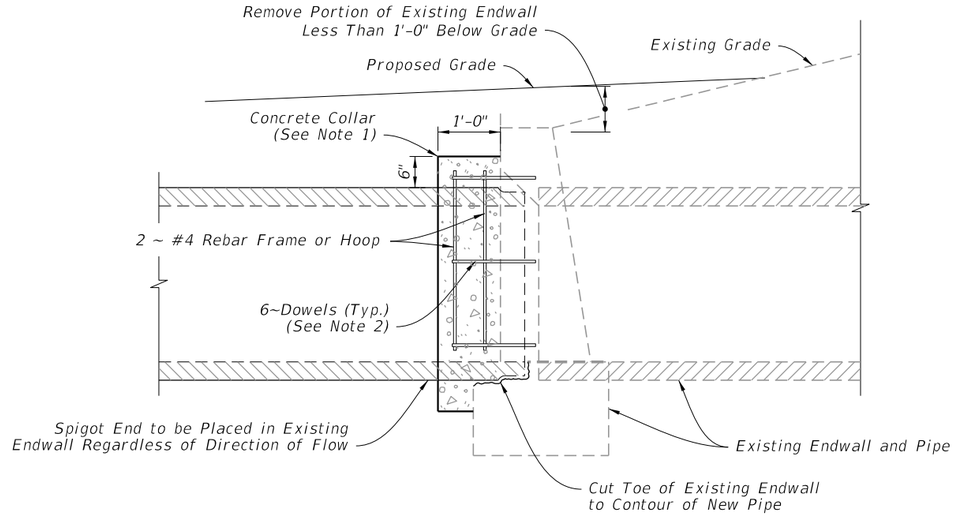


END ELEVATION



SIDE ELEVATION

EXTENSION OF EXISTING PIPE CULVERTS

NOTES:

1. The collar may be formed by any method approved by the Engineer.
2. Install ½"x16" dowels in adhesive bond material.

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CONCRETE COLLARS

LAST REVISION	REVISION	DESCRIPTION:			INDEX	SHEET
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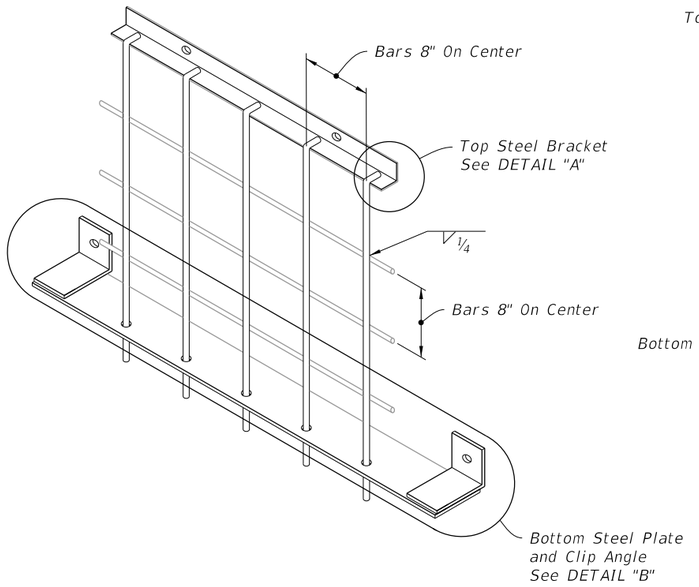
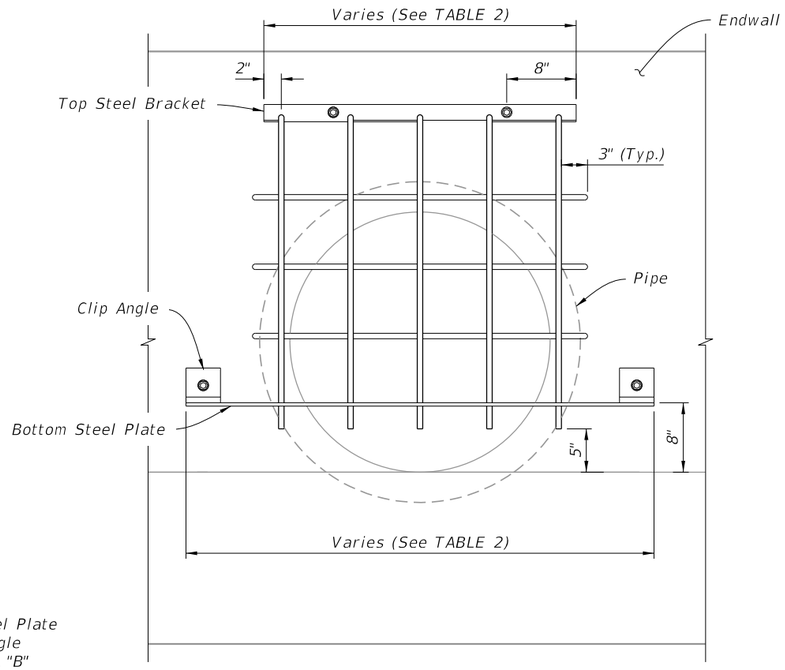


ISOMETRIC VIEW



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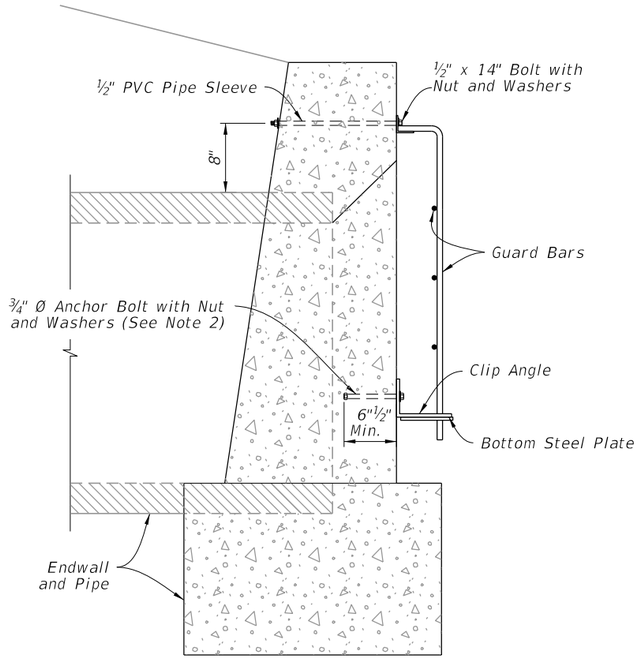
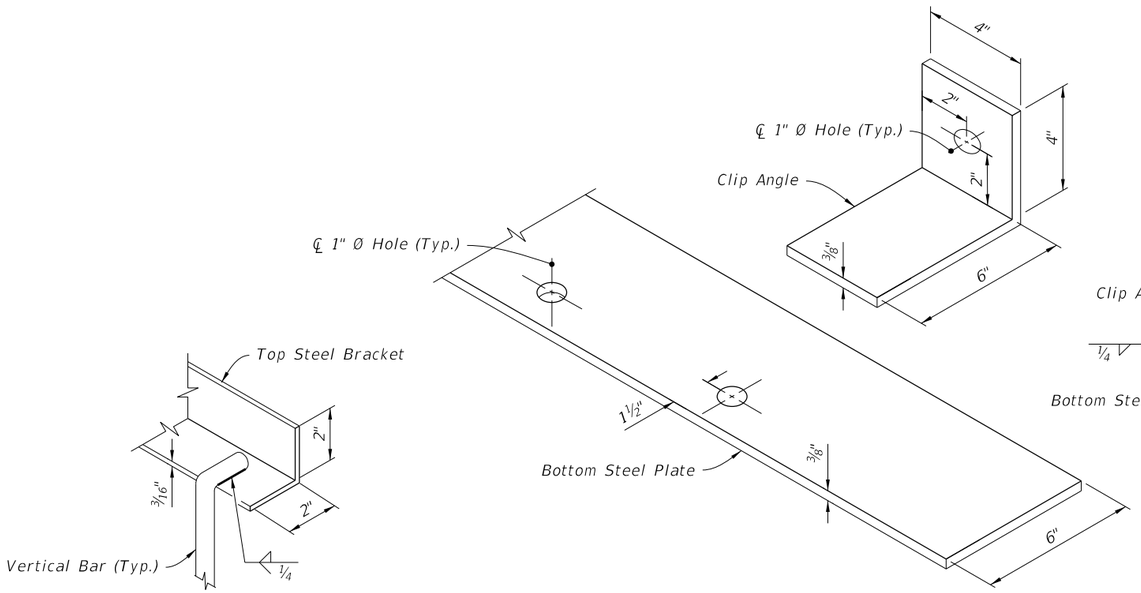
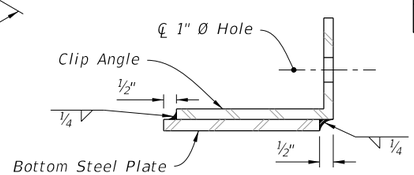


SIDE ELEVATION

SINGLE GUARD
(30" Pipe Shown)



DETAIL "A"



DETAIL "B"

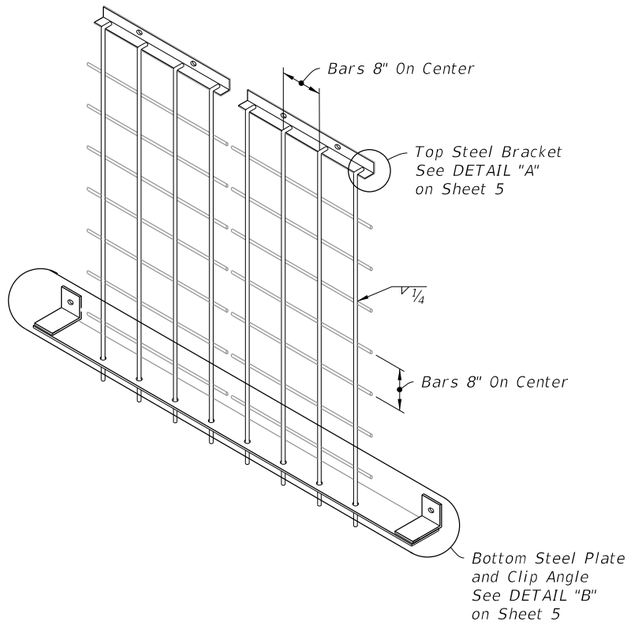
TABLE 2 - SINGLE GUARD								
Pipe Dia. (in)	Top Steel Bracket	Bottom Steel Plate	Number of Holes	Number of Vert. Bars	Vertical Bars Size	Number of Horiz. Bars	Horizontal Bars Size	Weight lbs.
18	2'-4"	3'-6"	4	4	½"	1	½"	48
24	3'-0"	4'-0"	5	5	½"	2	½"	58
30	3'-0"	4'-6"	5	5	⅝"	3	⅝"	74
36	3'-8"	5'-0"	6	6	⅝"	4	⅝"	90
42	4'-4"	5'-6"	7	7	⅝"	5	⅝"	111

NOTES:

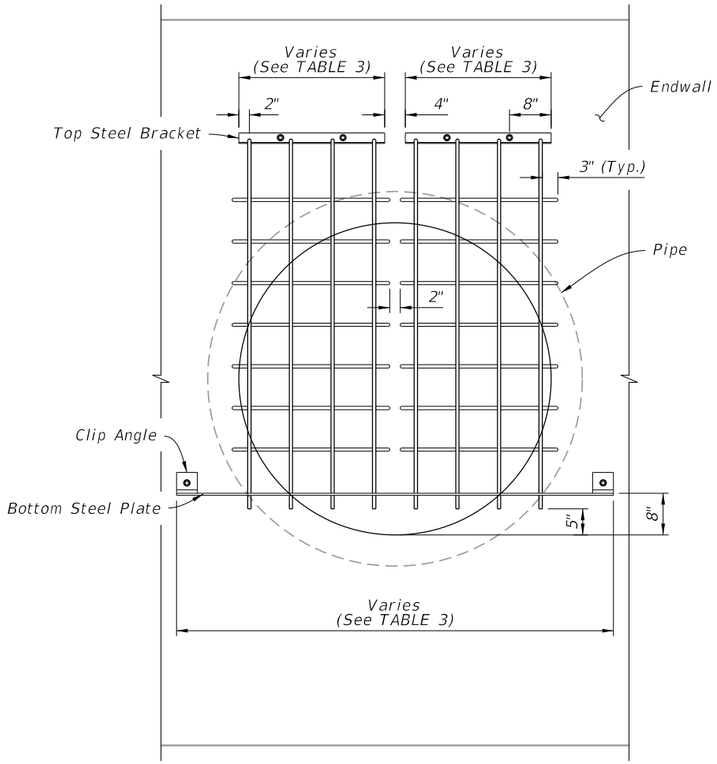
1. Construct guards only at locations specifically called for in Plans.

2. Anchor Bolts (Galvanized): Use C-I-P Hex Head bolts or fully threaded adhesive anchors, installed in accordance with Specification 416.

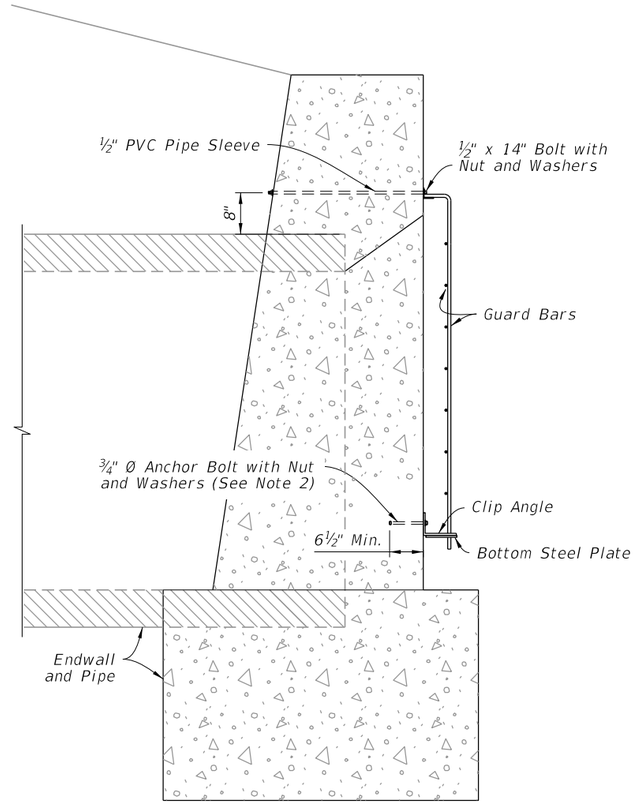
SINGLE PIPE END GUARD



ISOMETRIC VIEW



END ELEVATION



SIDE ELEVATION

DOUBLE GUARD
(60" Pipe Shown)

NOTES:

1. Construct guards only at locations specifically called for in Plans.

2. Anchor Bolts (Galvanized): Use C-I-P Hex Head bolts or fully threaded adhesive anchors, installed in accordance with Specification 416.

TABLE 3 - DOUBLE GUARD

Pipe Dia. (in)	Top Steel Bracket Grate 1	Top Steel Bracket Grate 2	Bottom Steel Plate	Number of Total Holes	Number of Vert. Bars Grate 1	Number of Vert. Bars Grate 2	Vertical Bars Size	Number of Horiz. Bars (each grate)	Horizontal Bars Size	Weight lbs.
48	2'-4"	2'-4"	6'-0"	8	4	4	5/8"	5	5/8"	127
54	2'-4"	2'-4"	6'-6"	8	4	4	3/4"	6	5/8"	157
60	2'-4"	2'-4"	7'-0"	8	4	4	3/4"	7	5/8"	172

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DOUBLE PIPE END GUARD

LAST REVISION	REVISION	DESCRIPTION:				
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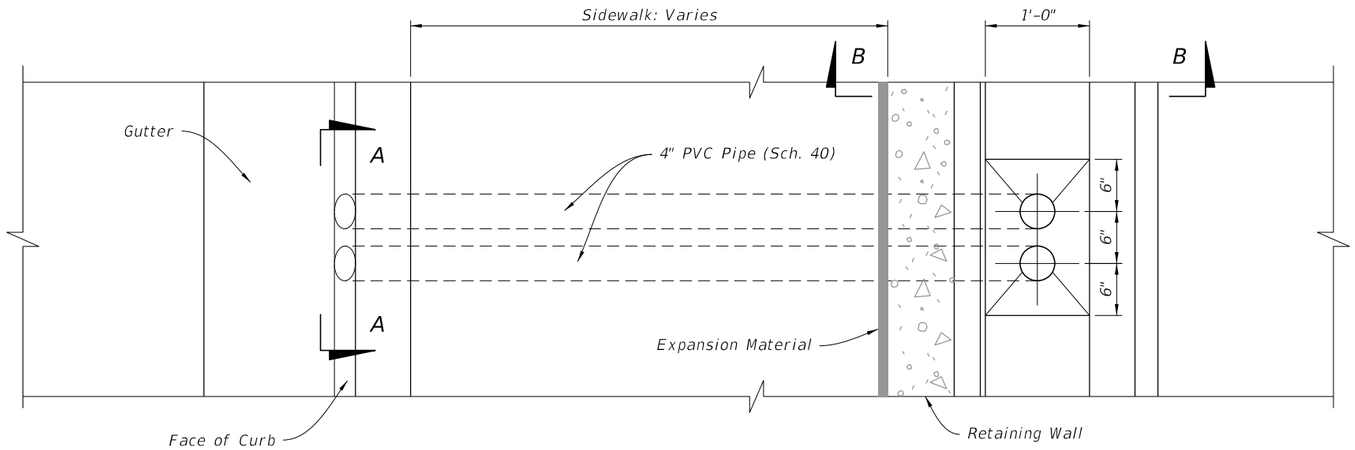
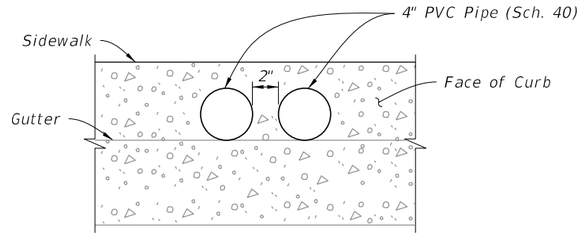
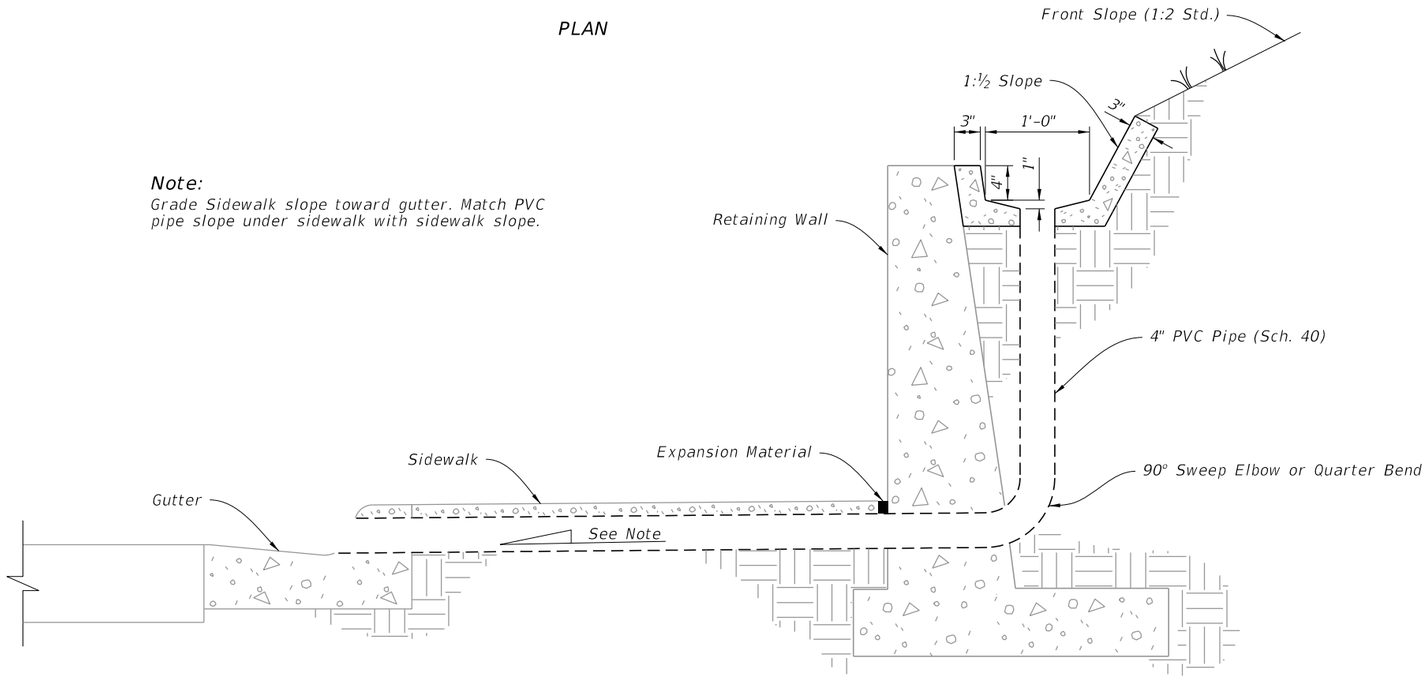


PLAN

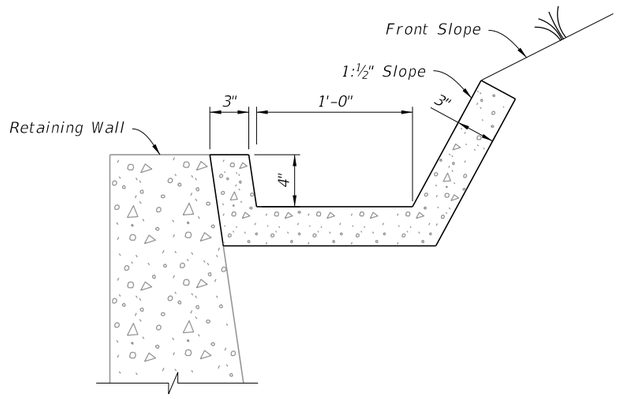


SECTION A-A

Note:
Grade Sidewalk slope toward gutter. Match PVC pipe slope under sidewalk with sidewalk slope.



ELEVATION



SECTION B-B

GUTTER AND DRAINS

RETAINING WALL CONCRETE GUTTER AND DRAINS

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