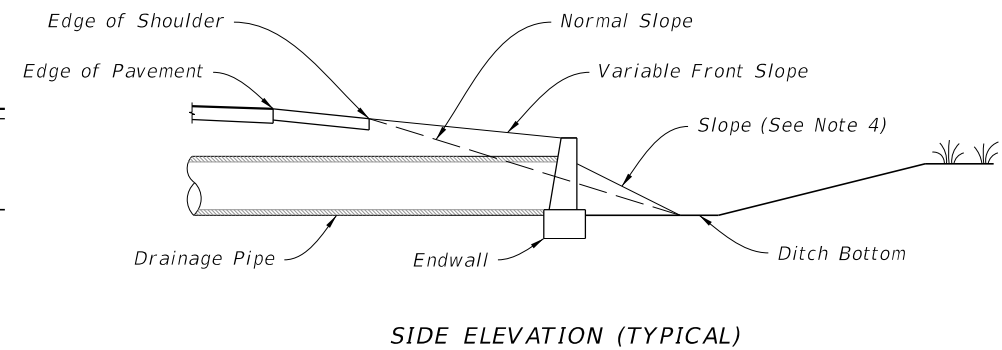
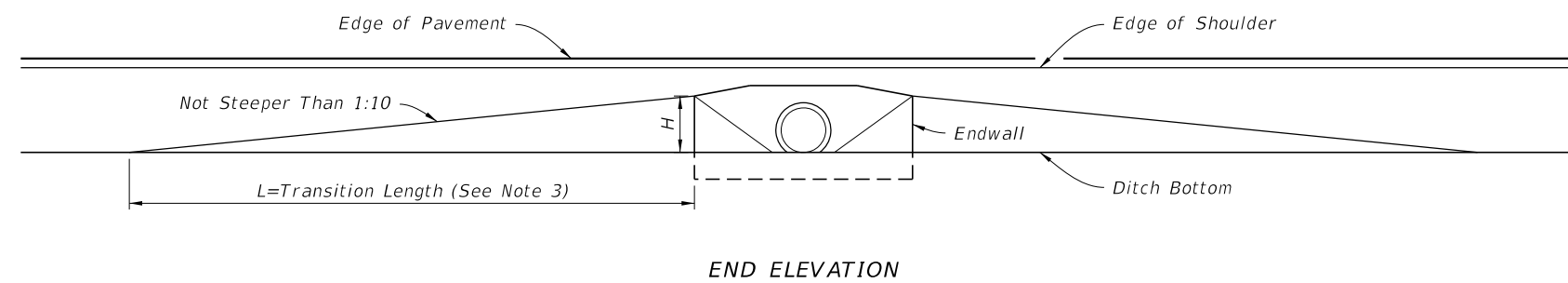
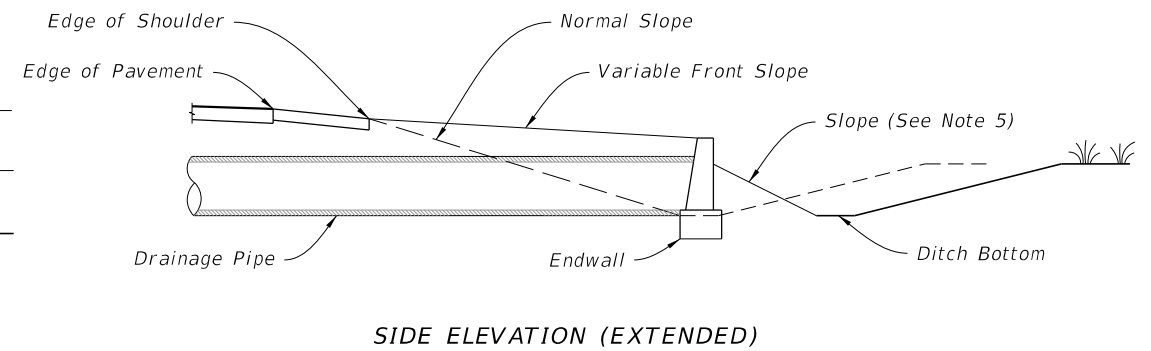
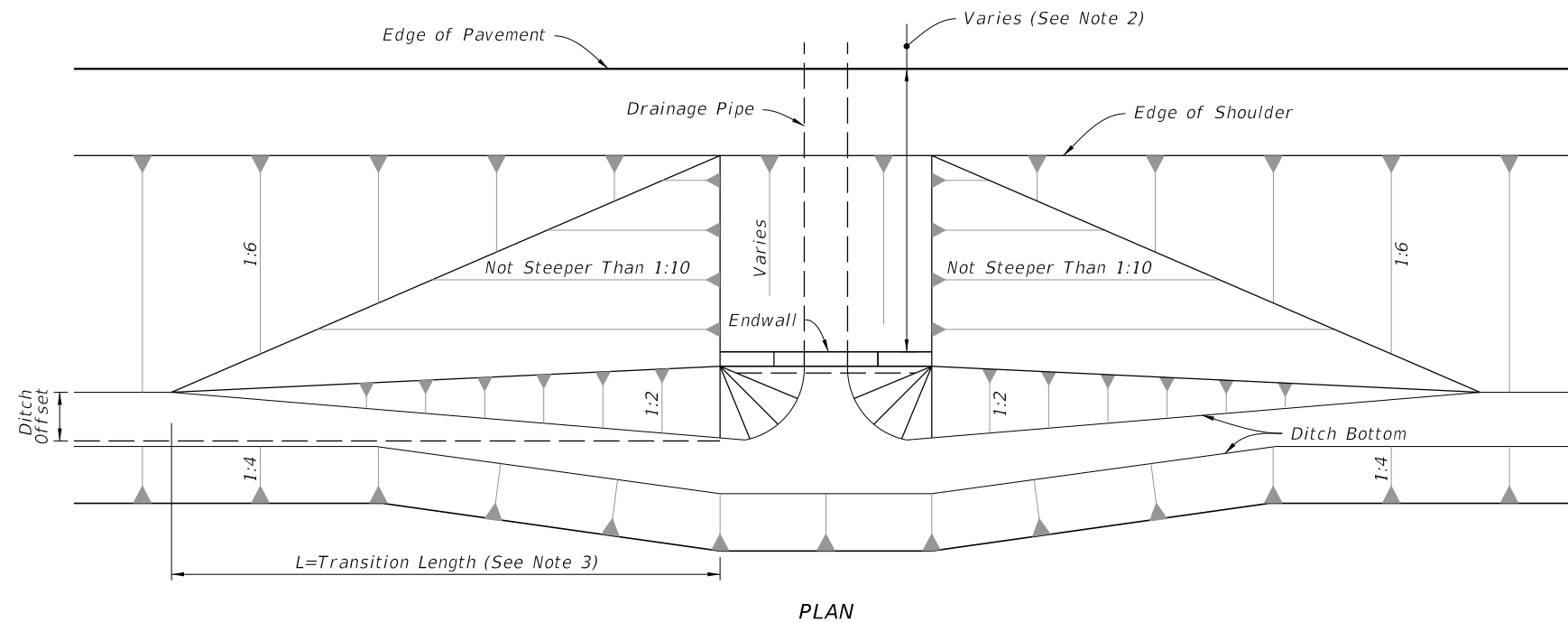


**NOTES:**

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:  
 $L=10 \times H$  (No Maximum)  
 $L=10 \times \text{Ditch Offset}$  (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.



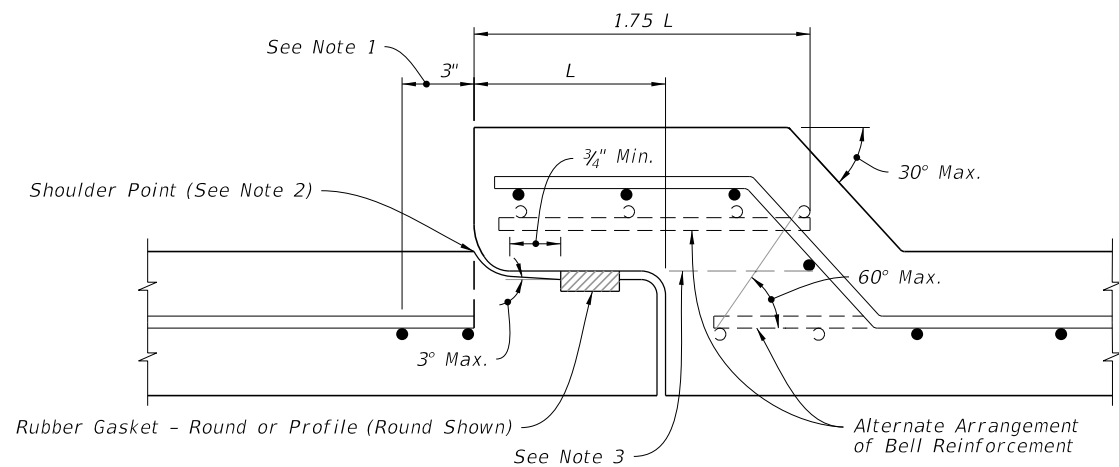
FRONT SLOPES AT DRAINAGE STRUCTURES

**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	Pipe End Guard
6	Retaining Wall Concrete Gutter and Drains

LIMITS OF VARIABLE FRONT SLOPES AT DRAINAGE STRUCTURES

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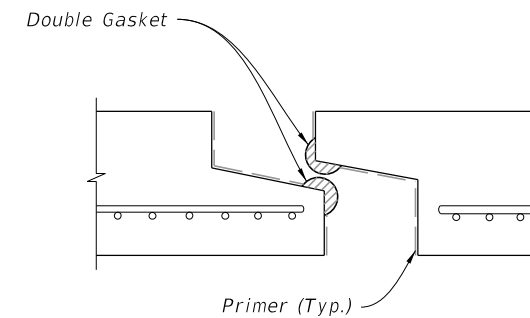
**SCHEDULE OF BELL REINFORCEMENT**  
Classes II,III,IV,V; Wall A,B,C

Nominal Pipe Diameter	Design Bell Reinforcement	Maximum Reinforcement Under Tolerance
	in <sup>2</sup> per foot	in <sup>2</sup> 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

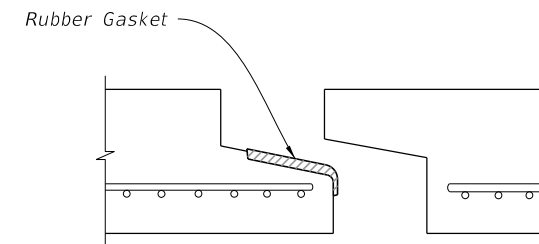
**NOTES:**

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

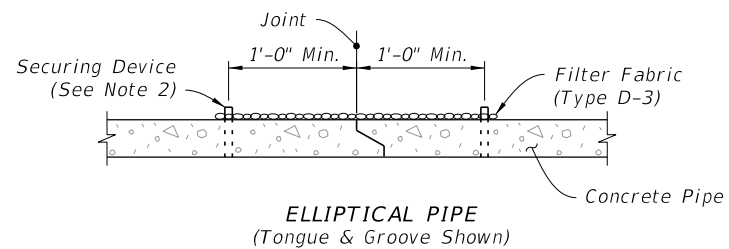
**NOTES:**

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

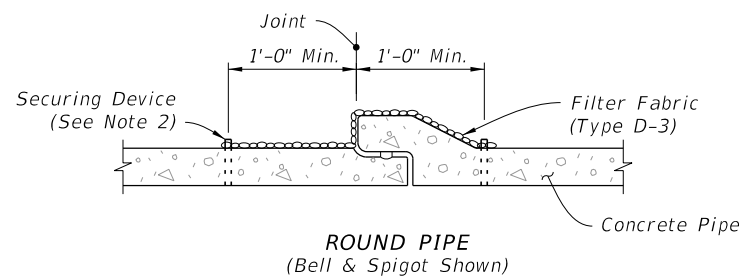
===== ELLIPTICAL CONCRETE PIPE JOINT DETAIL =====

**ROUND AND ELLIPTICAL CONCRETE PIPE JOINT**

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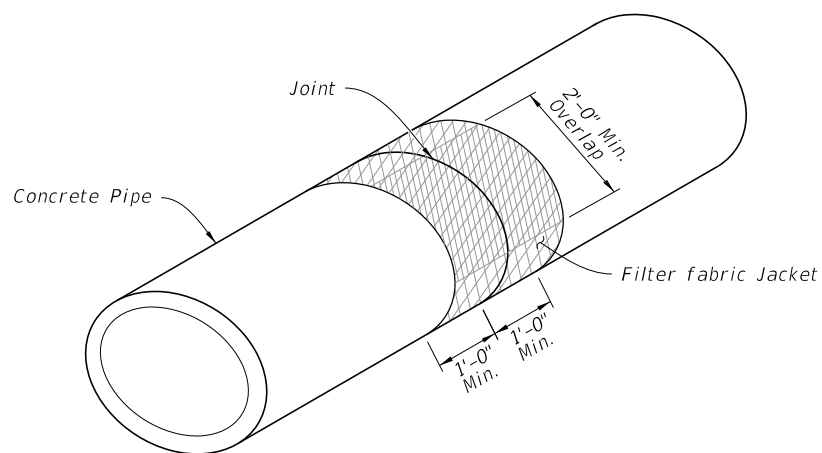


**ELLIPTICAL PIPE**  
(Tongue & Groove Shown)



**ROUND PIPE**  
(Bell & Spigot Shown)

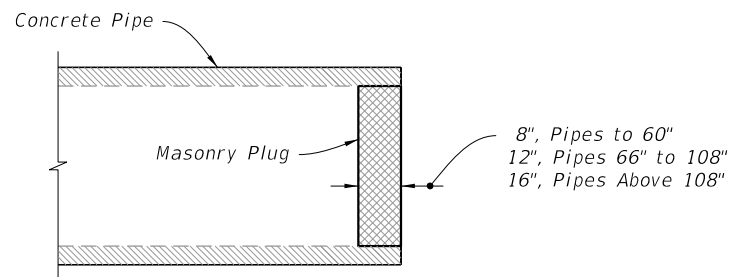
**SECTION VIEW**



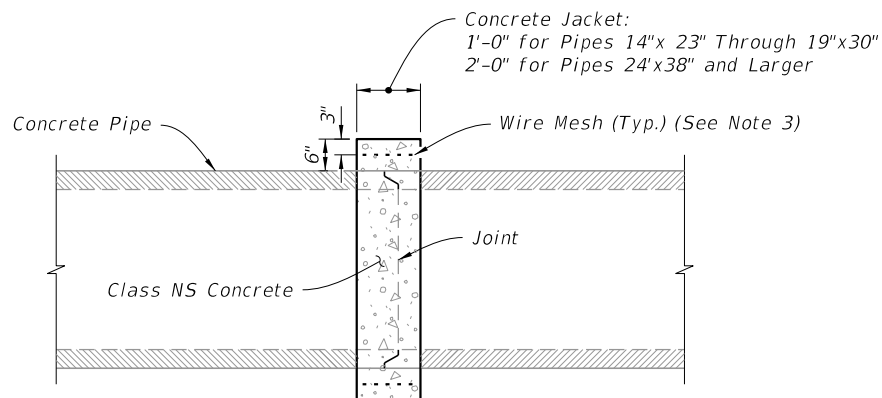
**ISOMETRIC VIEW**

**FILTER FABRIC JACKET**

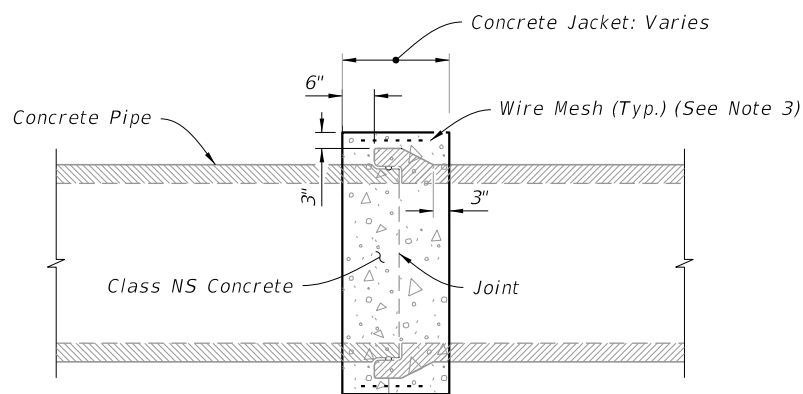
(For All Pipe Types - Concrete Elliptical Pipe Shown)



**PIPE PLUG**



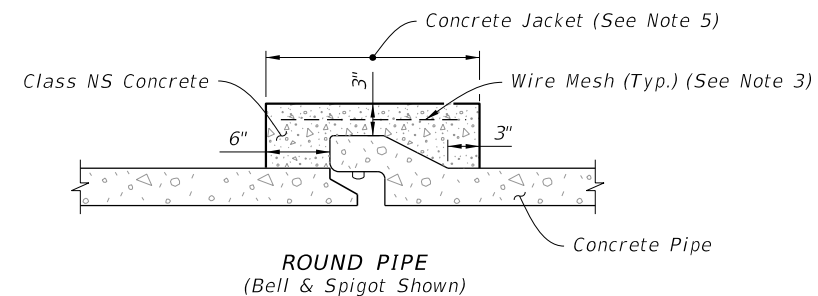
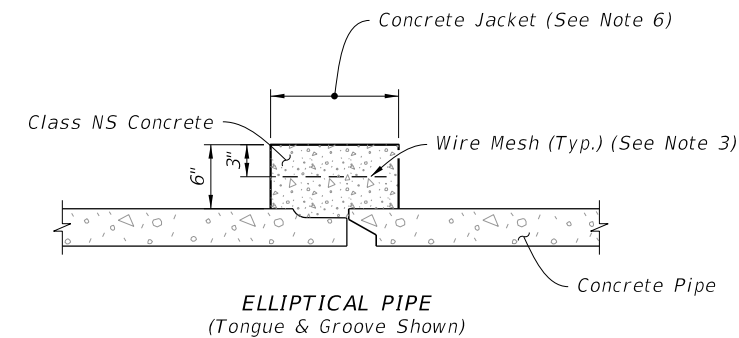
**ELLIPTICAL PIPE**



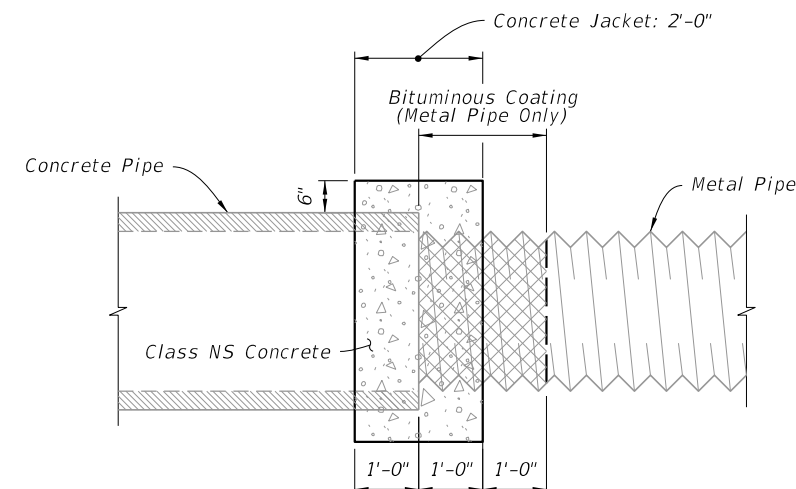
**ROUND PIPE**

**SIMILAR TYPES**

(Only When Called For In The Plans)



**DISSIMILAR JOINTS**



**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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LAST REVISION 11/01/19	DESCRIPTION:
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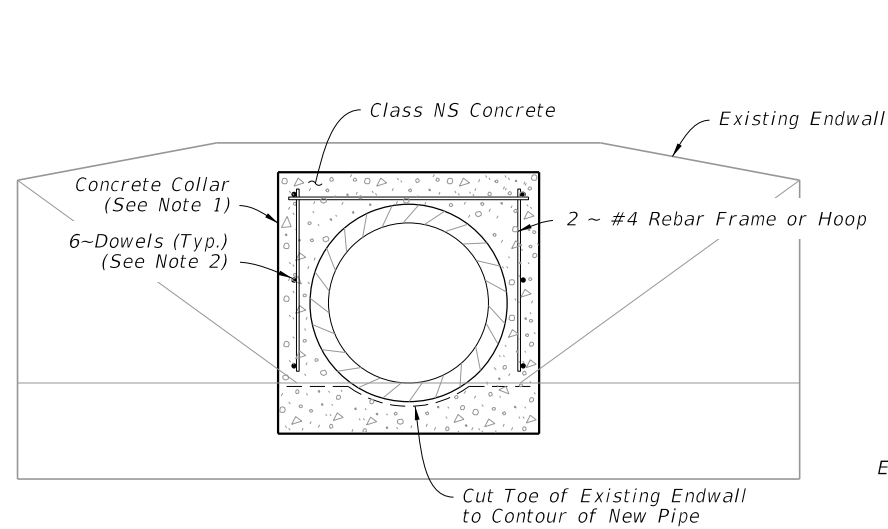


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STANDARD PLANS

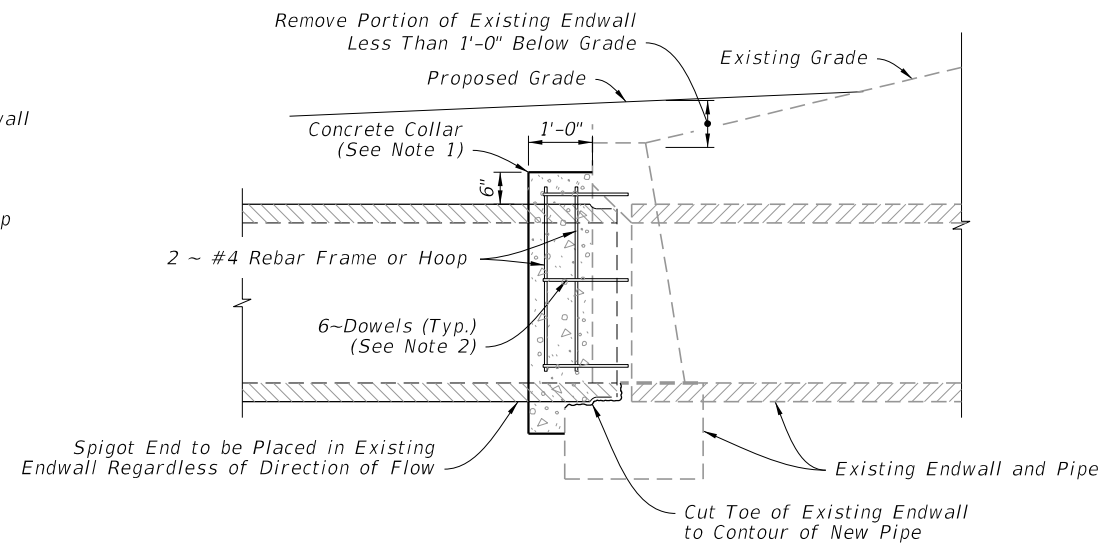
MISCELLANEOUS DRAINAGE DETAILS

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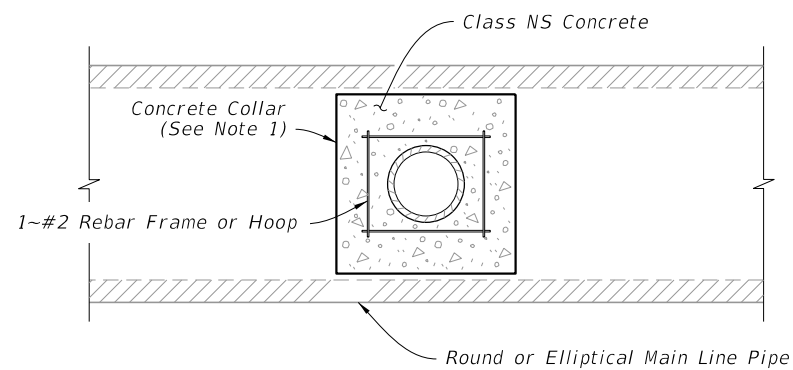


END ELEVATION

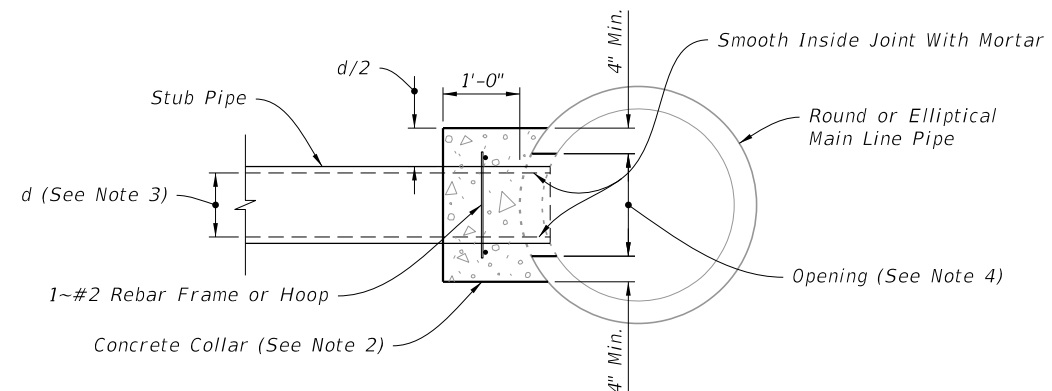


SIDE ELEVATION

EXTENSION OF EXISTING PIPE CULVERTS



STUB END ELEVATION



SIDE ELEVATION

JOINING MAINLINE PIPE TO STUB PIPE

NOTES:

1. The collar may be formed by any method approved by the Engineer.
2. Install 1/2"x16" dowels in adhesive bond material.
3. Stub Pipes maximum diameter: 1/2 of a round main line pipe diameter, or 1/2 the height of elliptical main line pipes.
4. Opening by Pipe Manufacturer.
5. Install riser reinforcement using #5 Bars @ 18" centers vertically and 6" centers horizontally. Bend pipe steel to riser.
6. Reinforced concrete top required when inlet: manhole or junction box riser is less than 4 feet in diameter; or when 3'-6", alt. b inlet, manhole or junction box riser is used; or when rectangular inlet is used.
7. See Index 425-001 for optional construction joints.

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LAST REVISION	11/01/19	REVISION	DESCRIPTION:
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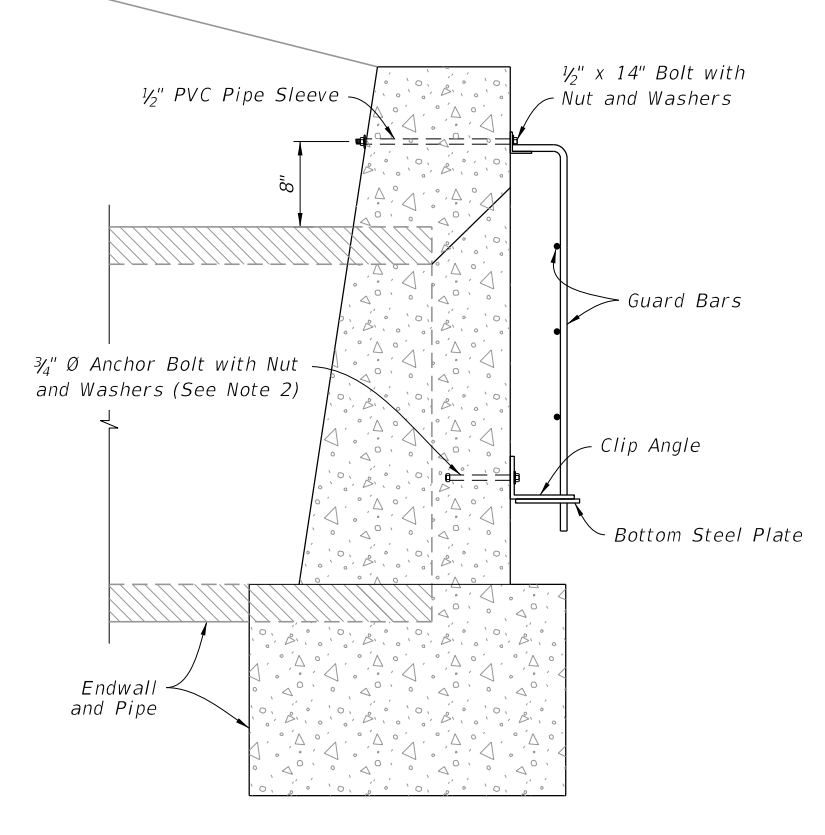
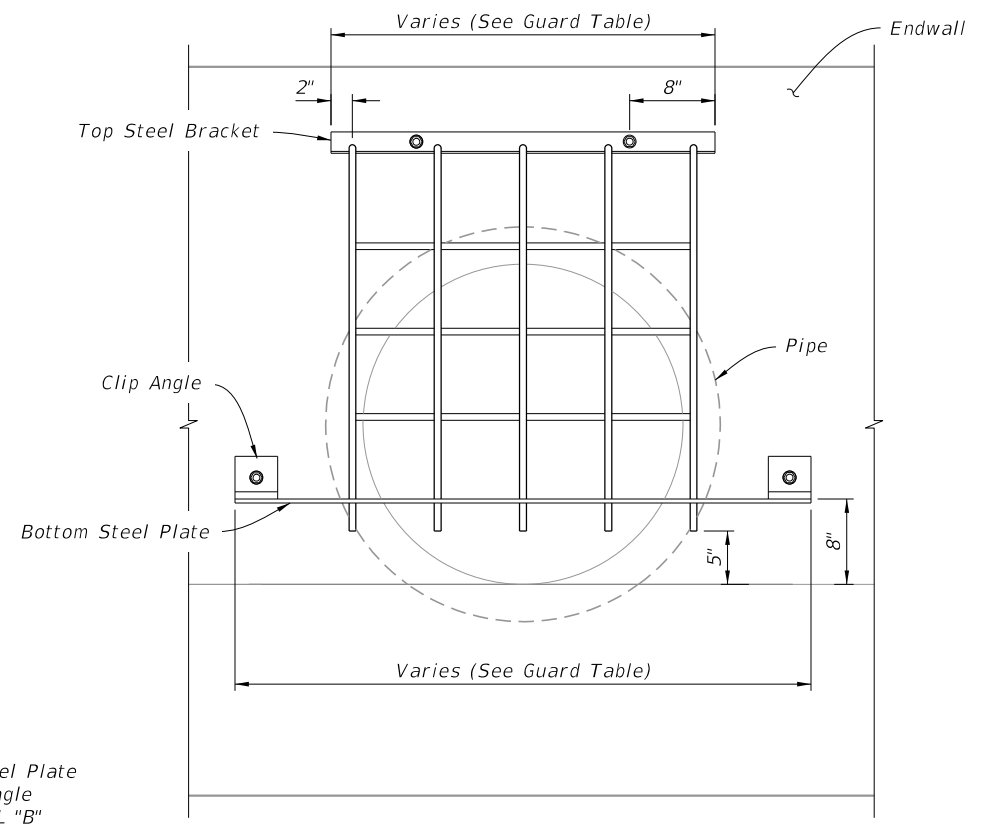
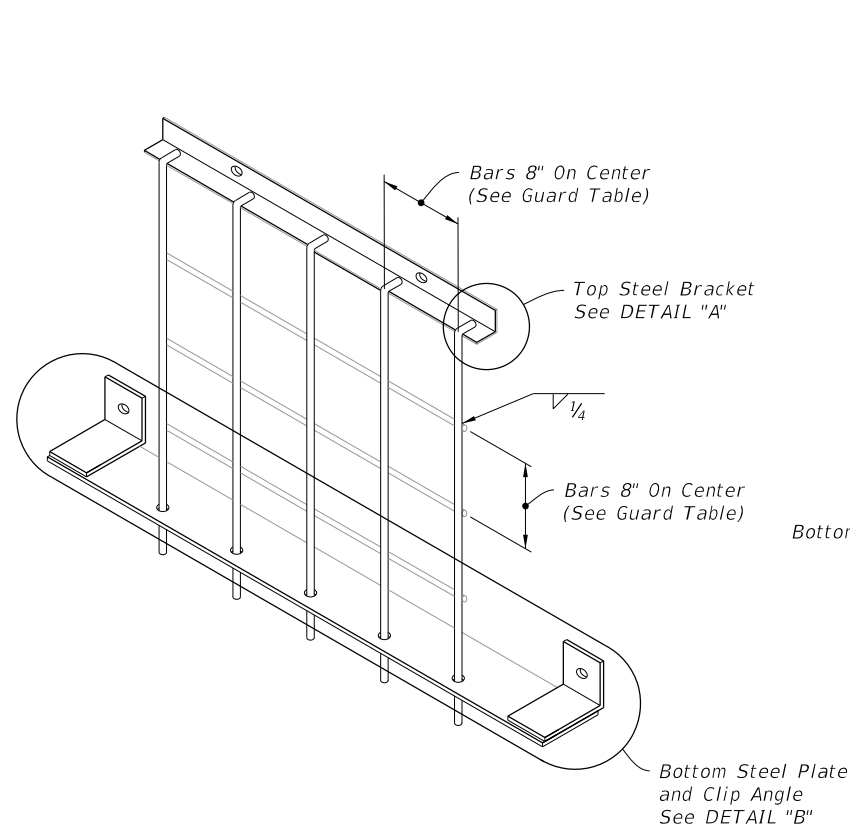


FY 2020-21  
STANDARD PLANS

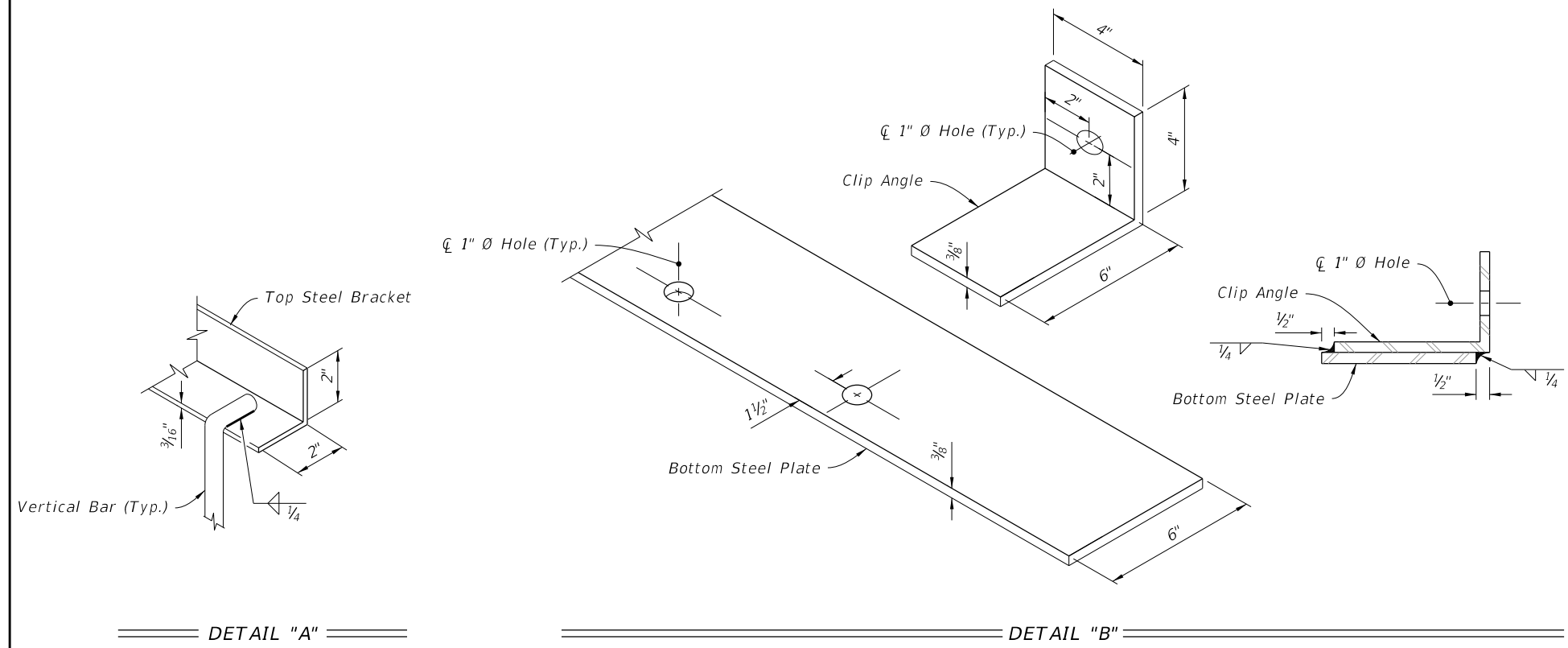
MISCELLANEOUS DRAINAGE DETAILS

CONCRETE COLLARS

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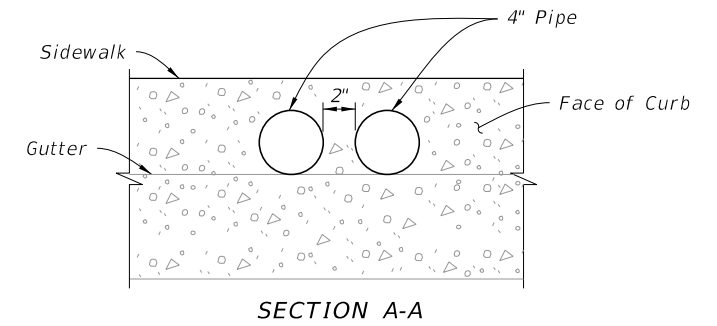
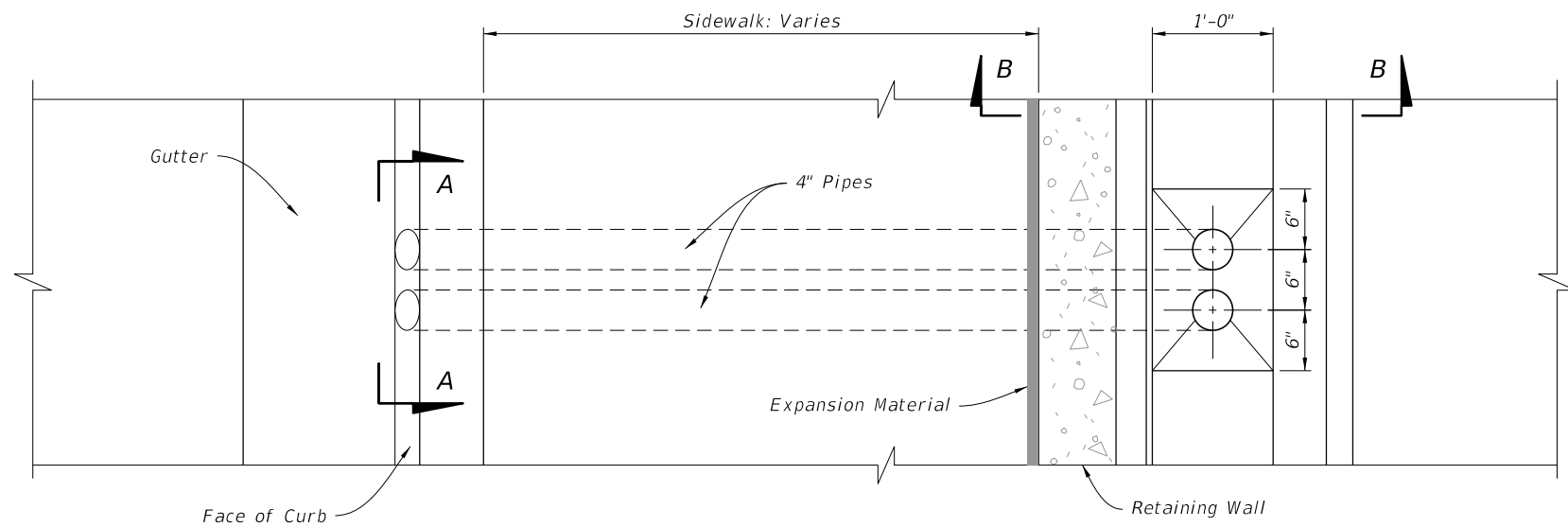
GUARD



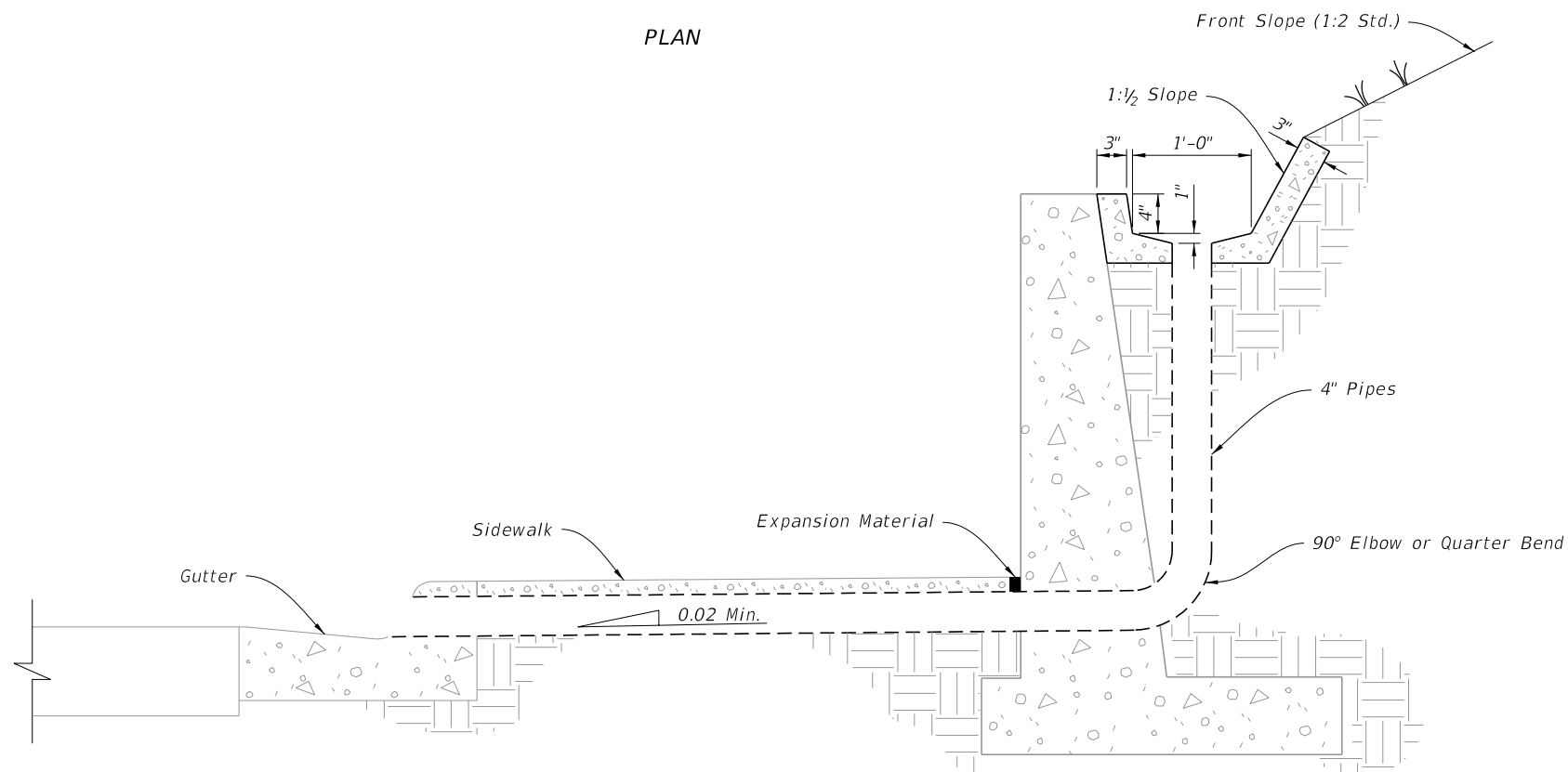
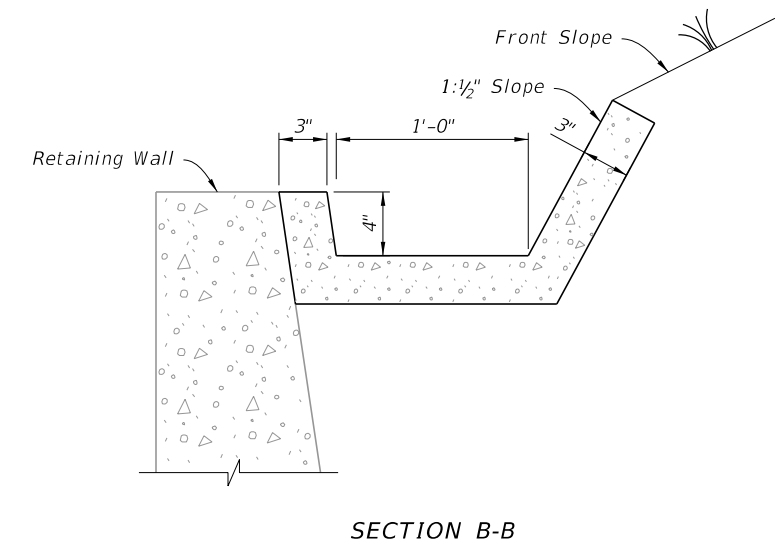
GUARD TABLE						
Pipe Dia.	Top Steel Bracket	Bottom Steel Plate	Number of Vert. Bars and Plate Holes	Number of Horiz. Bars	Bars Size	Weight lbs.
18"	2'-4"	3'-6"	4	1	$1/2$ "	48
24"	3'-0"	4'-0"	5	2	$1/2$ "	58
30"	3'-0"	4'-6"	5	3	$5/8$ "	74
36"	3'-8"	5'-0"	6	4	$5/8$ "	90
42"	4'-4"	5'-6"	7	5	$5/8$ "	111

- NOTES:**
- Construct guards only at locations specifically called for in Plans.
  - Install anchor bolt to a  $1/2$ " minimum embedment. Hex Bolt: cast-in-place. Adhesive-bonded anchor: fully threaded rod installed in accordance with Specification 416.

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PLAN



ELEVATION

GUTTER AND DRAINS

RETAINING WALL CONCRETE GUTTER AND DRAINS

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STANDARD PLANS

MISCELLANEOUS DRAINAGE DETAILS

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