STANDARD CRITERIA

CLASS	TYPE (1)	APPLICATION DESCRIPTION	INDEX NO.	PERMITTIVITY (sec^{-1})	AOS SIEVE#	MIN. GRAB TENSILE STRENGTH (lb)	MIN. SEWN STRENGTH (lb/in)	MIN. PUNCTURE (lb)	MIN. TRAPEZOIDAL TEAR (lb)	MIN. WIDE WIDTH TENSILE STRENGTH (lb/in)	UV RESISTANCE (Min. Allowed) %	UV RESISTANCE (Min. Allowed) Time (Hrs.)	COMMENTS
DRAINAGE (D)	D-1	Revetment (Special)		(See D-2)	(See D-2)	315	7.2	113	113		50	500	Woven Monofilament Geotextiles only (Elongation <50%) Provide 12" thick bedding stone layer.
	D-2	Revetment (Standard) Articulating Block**** Gabions Rock, Rubble, Broken Concrete	281	% SOIL PASSING No. 200 SIEVE <15% 0.7 15% to 50% 0.2 >50% 0.1	% SOIL PASSING No. 200 SIEVE <15% 40 15% to 50% 60 >50% 70*	Woven Monofilament 248 Other Geotextiles: Elongation <50% 315 ≥50% 203	Woven Monofilament 5.7 Other Geotextiles: Elongation <50% 6.9 ≥50% 4.7	Woven Monofilament 90 Other Geotextiles: Elongation <50% 113 ≥50% 79	Woven Monofilament 57 Other Geotextiles: Elongation <50% 113 ≥50% 79		50	500	Woven Geotextiles only. No Slit Film Geotextiles allowed. Provide 12" thick bedding stone layer for revetment (standard). The bedding layer may be omitted if a D-1 fabric is used with revetment (standard). ****Bedding Stone not required for Articulating Block. *For cohesive soils with a plasticity index >7, maximum average role value for AOS is number 50 sieve.
	D-3	Underdrain *** French Drain Sheet Piling Filter Filter Fabric Jacket (Culvert) Concrete Pavement Subdrainage	286 285 280 287	% SOIL PASSING No. 200 SIEVE <15% 0.5 15% to 50% 0.2 >50% 0.1	% SOIL PASSING No. 200 SIEVE <15% 40 15% to 50% 60 >50% 70*	Elongation <50% 248 ≥50% 158	Elongation <50% 5.7 ≥50% 3.6	Elongation <50% 90 ≥50% 57	Elongation <50% 90** ≥50% 57		50	500	No woven slit film fabrics allowed. *For cohesive soils with a plasticity index >7, maximum average role value for AOS is number 50 sieve. **Required Trapezoidal tear for woven monofilament is 250. ***See Index No. 286 for the permittivity and AOS values of the internal filter fabric of Type V Underdrain.
	D-4	Slope Pavement (Sand-Cement) Ditch Pavement (Sand-Cement)	 281	0.5	40	180	4.2	50	35		50	500	Non-woven, needle-punch only. Elongation ≥50%
	D-5	Mechanical Stabilized Retaining Wall Cast-In-Place Retaining Wall		0.5	40	90	2.1	50	40		50	500	
	D-6	Slope Pavement (Concrete) Ditch Pavement (Concrete)	 281	0.5	40	180	4.2	50	35		50	500	Non-woven, needle-punch only. Elongation ≥50%
EROSION (E)	E-1	Staked Silt Fence		0.05	NA	90	2.1	NA	35		80	500	Min. Filtration Efficiency of 75% & min. flow rate of 0.3 gal.
	E-2	Wind Screen		0.05	NA	90	2.1	NA	NA		80	150	
	E-3	Plastic Erosion Mat (Turf Reinforcement Mat) (Type 1)		NA	NA	NA	NA	NA	NA	12 x 6	80	500	Use where design shear stress is ≤2.1 psf
	E-4	Plastic Erosion Mat (Turf Reinforcement Mat) (Type 2)		NA	NA	NA	NA	NA	NA	23 x 12	80	500	Use where design shear stress is ≤3.6 psf
	E-5	Plastic Erosion Mat (Turf Reinforcement Mat) (Type 3)		NA	NA	NA	NA	NA	NA	46 x 23	80	500	Use where design shear stress is ≤5.0 psf

(1) Type refers to FDOT class and application.

TABLE I

Test	Unit	Test Method
Permittivity	sec^{-1}	ASTM-D-4491
AOS	US Sieve No.	ASTM-D-4751
Elongation	%	ASTM-D-4632
Grab Tensile Strength	lb	ASTM-D-4632
Wide Width Tensile Strength	lb/in	ASTM-D-4595
Maximum Design Velocity	fps	See Design Note 3
Sewn Strength	lb/in	ASTM-D-4884
Puncture	lb	ASTM-D-4833
Trapezoidal Tear	lb	ASTM-D-4533
Ultraviolet Resistance	% Retained In Strength	ASTM-D-4355
Filtration Efficiency	%	ASTM-D-5141
Flow Rate	gal^3/min	ASTM-D-5141

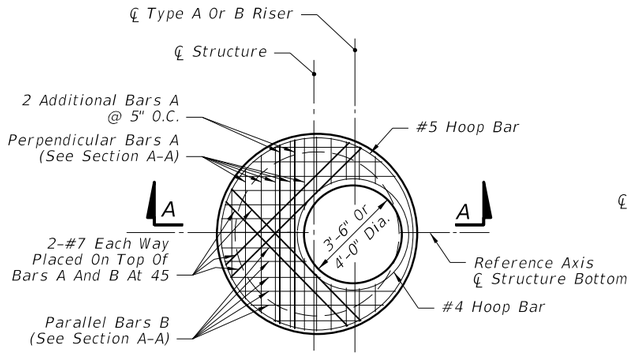
GENERAL NOTES

1. Specifications for geotextiles are in Section 985. Physical criteria for each application is provided by this standard, in conjunction with those sections.
2. All values except AOS are MINIMUM AVERAGE ROLL values in the weakest principal direction. Values for AOS are MAXIMUM AVERAGE ROLL values.
3. Test soil or fill material adjacent to the geotextile for gradation to select values for permittivity and AOS.
4. Unless specifically restricted in COMMENTS column, any type of material meeting specification 985 may be used.
5. Wide width tensile strength is expressed in units of measure of lb./in., in machine direction and cross direction, as MD x CD.
6. The Manufacturer shall provide results in English Units.

DESIGN NOTES

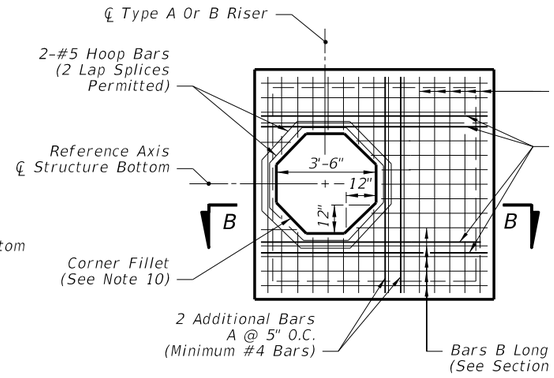
1. The Designer shall review this criteria and adjust the values as necessary to satisfy project requirements. These adjustments shall be called for in the plans or contained in the project special provisions.
2. UV Resistance: The value represents the percent minimum textile strength retained (ASTM-D-4632) after weathering per ASTM-D-4355 for the test period (hours).
3. Shear stress limits for plastic erosion mats determined by 30 minutes sustained flow in unvegetated state as determined by tests performed by Utah State University, Texas Transportation Institute or an independent testing laboratory approved by the State Drainage Engineer.

LAST REVISION	REVISION	DESCRIPTION:		FDOT DESIGN STANDARDS 2013	GEOTEXTILE CRITERIA	INDEX NO.	SHEET NO.
07/01/12						199	1

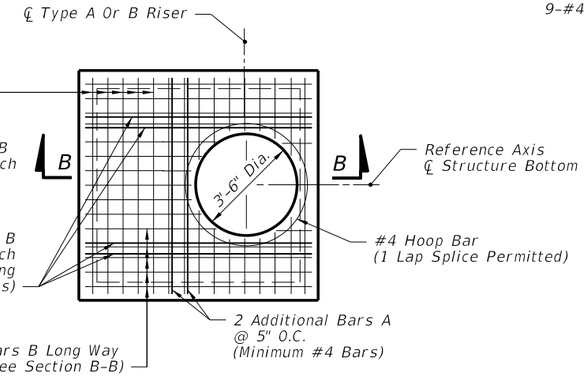


NOTE:
Not Applicable For Type A, B, C, D & E Ditch Bottom Inlets Or Type S & V Gutter Inlets. See Index Nos. 220, 221, 230, 231 & 232.

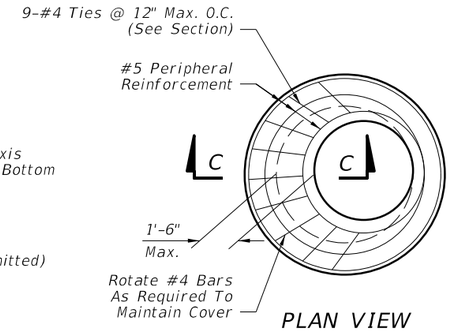
TOP SLAB REINFORCING STEEL DIAGRAM (ALTERNATE A)



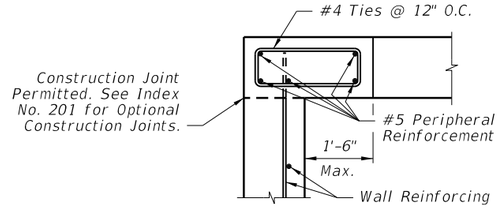
SQUARE OPENING WITH CORNER FILLETS TOP SLAB REINFORCING STEEL DIAGRAM (ALTERNATE B)



ROUND RISER OPENING



PLAN VIEW



SECTION C-C

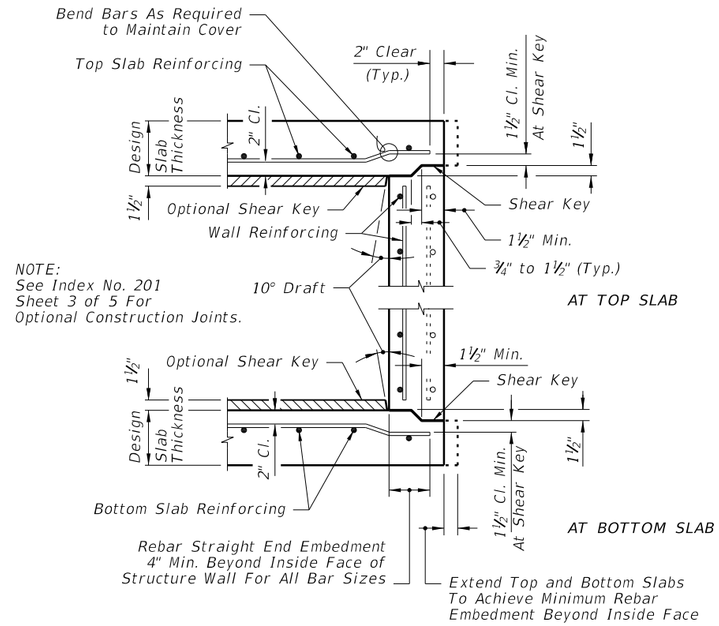
SPECIAL TOP SLAB*

*NOTE:
When the inside diameter of a round structure is not more than 1'-6" larger than the opening in the riser or top slab, the top of the structure or riser shall be constructed according to the "Special Top Slab" details on this sheet.

SECTION A-A (ALTERNATE A)

NOTE:
Provide one extra #4 bar reinforcement each side of each opening and two extra #4 bars at 3" min. spacing above each opening.

SECTION B-B (ALTERNATE B)



NOTE:
See Index No. 201 Sheet 3 of 5 For Optional Construction Joints.

TYPICAL SLAB TO WALL DETAILS FOR PRECAST STRUCTURES

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LAST REVISION	REVISION	DESCRIPTION:			INDEX NO.	SHEET NO.
01/01/10			FDOT DESIGN STANDARDS 2013	STRUCTURE BOTTOMS TYPE J AND P	200	1

ROUND STRUCTURE BOTTOMS (ALTERNATE A) & ROUND RISERS– TABLE 1

Wall Thickness (t_1 & t_2) and Vertical & Horizontal Areas of Reinforcement (A_s)

Type	Structure/Riser Diameter (ft)	Cast–In–Place Items Class II Concrete			Precast Items				
					Class II Concrete			ASTM C478	
		t_1 Riser (in.)	t_2 Bottom (in.)	A_s (in.²/ft.)	t_1 Riser (in.)	t_2 Bottom (in.)	A_s (in.²/ft.)	t_1 or t_2 (in.)	A_2 *** (in.²/ft.)
P	3'–6"	6	8	0.20	6	8	0.20	4**	0.105
P	4'–0"	6	8	0.20	6	8	0.20	5**	0.120
J	5'–0"	–	8	0.20	–	8	0.20	6**	0.150
J	6'–0"	–	8	0.20	–	8	0.20	6	0.180
J	7'–0"	–	8	0.20	–	8	0.20	7	0.210
J	8'–0"	–	8	0.20	–	8	0.20	8	0.240
J	10'–0"	–	10	0.40##	–	10	0.40##	10	0.300
J	12'–0"	–	10	0.40##	–	12	0.40##	12	0.360

TABLE 1 NOTES:

##Provide 0.20 eq. in.²/ft. at each face, 12" max. bar spacing.

**Modified minimum wall thickness.

***Min. total circumferential reinforcement for continuous steel hoops:

A_2 = 0.50 sq. in. for riser section height equal or less than 2'–0" (2 hoop min.)

A_2 = 0.75 sq. in. for riser section height more than 2'–0" up to 4'–0" (3 hoop min.)

Areas of reinforcing for precast items are based on Grade 60 reinforcing;

No reduction in the area of reinforcement is allowed for welded wire fabric in Table 1;

Area of vertical reinforcing may be reduced in accordance with ASTM C478.

SQUARE & RECTANGULAR STRUCTURES (ALTERNATE B) – TABLE 2

Type	Wall Length (ft)	Max. Depth (ft)	Wall Thickness (t_3)	
			CIP (in.)	Precast (in.)
P	≤ 3'–6"	40	6 Riser 8 Bottom	6
J	4'–0"	40	8	6
J	5'–0"	22	–	6
J	6'–0"	15	–	6
J	5'–0" to 9'–0"	40	8	8
J	10'–0"	26	8	8
J	10'–0" to 12'–0"	40	10	9
J	16'–0"	35	–	9
J	16'–0"	40	10	10
J	20'–0"	25	–	9
J	20'–0"	30	10	10

TABLE 2 NOTES:

See Table 8 for Reinforcing Schedule.

GENERAL NOTES

1. Standard structure bottoms 4'–0" diameter and smaller (Alt. A) and 3'–6" square (Alt. B) are designated Type P. Larger standard structure bottoms are designated Type J. Risers are permitted for all structures. Round risers are designated Type A, square risers are designated Type B.

2. Walls of circular structures (Alt. A) constructed in place may be of brick or reinforced concrete. Precast and rectangular structures (Alt. B) shall be constructed of reinforced concrete only.

3. Wall thickness and reinforcement are for either reinforced cast–in–place or precast concrete units except that precast circular units may be furnished with walls in accordance with ASTM C478 (see modified wall thicknesses in Table 1).

4. Top and bottom slab thickness and reinforcement are for precast and cast–in–place construction. All concrete shall be of Class II concrete, except use Class IV concrete when shown in the Plans, for special applications of structures located in extremely aggressive environments. Concrete as specified in ASTM C478 (4000 psi) may be used in lieu of Class II concrete for precast items manufactured in accordance with Specifications Section 449.

5. All reinforcement shown is ASTM A615/A615M Grade 60 steel, deformed bar. Equivalent area Grade 40 steel or equivalent area ASTM A185 (smooth) or ASTM A497 (deformed) welded wire fabric may be substituted according to Index No. 201, unless otherwise noted.

6. Alt. A or Alt. B structure bottoms may be used in conjunction with curb inlet tops Types 1, 2, 3, 4, 5, 6, 9, and 10, and any manhole or junction box unless otherwise shown in the plans or other standard drawings. Alt. B structure bottoms may be used in conjunction with curb inlet Types 7 & 8, or any ditch bottom inlet unless otherwise shown in the plans or other standard drawings.

7. Rectangular structures may be rotated as directed by the Engineer in order to facilitate connections between the structure walls and storm sewer pipes.

8. Except when ACI hooks are specifically required, reinforcement in top and bottom slab shall be straight embedment.

9. All reinforcement must have 2" minimum cover except for 3'–6" diameter precast circular units manufactured under ASTM C478, keyed construction otherwise shown. Additional bars used to restrain hole formers for precast structures with grouted pipe connections,may be left flush with the hole surface. Cut or bend reinforcement at pipe openings to maintain cover. Exposed ends of reinforcing at precast pipe openings and grouted joints must be removed to 1" below the concrete surface and sealed with a Type F epoxy in accordance with Specification Section 926. Horizontal steel in rectangular structures shall be lapped a minimum of 30 bar diameters or by standard hooks at corners.

10. The corner fillets shown are necessary for rectangular structures used with circular risers and inlet throats and when used on skew with rectangular risers, inlets and inlet throats. Fillets will be required in the top slab of the Alt. A structure bottoms when used with the Alt. B risers. Each fillet shall be reinforced with two #5 bars.

11. Inlet walls, throats, risers or manhole tops shall be secured to structures as shown on Index No. 201 (Sheet 3 of 5) Optional Construction Joints.

12. Structures with depths over 14' below the mean high water table are to be checked for flotation by the designer of the drainage project.

13. Units larger than specified standards may be substituted at the contractor's option when these units will not cause or increase the severity of utility conflicts. Such larger units shall be furnished at no additional cost to the Department. Larger Alt. A units cannot replace Alt. B units without approval of the Engineer. This note applies to this Index only.

14. For manhole and junction box tops, for frames and covers, and, for supplementary details and notes see Index No. 201.

15. Type J structure bottoms must have a minimum 6'–0" wall height when possible, for maintenance access.

TABLE 3-MINIMUM STRUCTURE SIZES FOR SINGLE PIPE CONNECTION PER SIDE

PIPE SIZE	RECTANGULAR		ROUND	
	Side Dimension (L)		Diameter (D)	
	Single Pipe Per Side	Note Number	Single Pipe or θ=180°	2 to 4 Pipes θ=90°
18"	3'-6"		3'-6"	4'-0"
24"	3'-6"		3'-6"	5'-0"
30"	3'-6"/4'-0"	2	4'-0"	6'-0"
36"	4'-0"/5'-0"	3	5'-0"	7'-0"
42"	5'-0"		6'-0"	7'-0"
48"	6'-0"		6'-0"	8'-0"
54"	6'-0"		7'-0"	10'-0"
60"	7'-0"		7'-0"	10'-0"
66"	7'-0"/8'-0"	4	8'-0"	12'-0"
72"	8'-0"		8'-0"	12'-0"
78"	9'-0"		10'-0"	12'-0"
84"	9'-0"		12'-0"	N/A

TABLE 3 NOTES:

1. For Round Structures sizes with variable angles between pipes and variable pipe sizes, refer to the FDOT Storm Drain Handbook.

2. For 3'-6" Precast Square Structure Bottoms, 30" Pipes with similar invert elevations are not permitted in adjacent walls. Use 4'-0" Side Dimensions when 30" pipe openings are required on adjacent walls and the difference in flow lines is less than 3'-0".

3. For 4'-0" Precast Square Structure Bottoms, 36" Pipes with similar invert elevations are not permitted in adjacent walls. Use 5'-0" Side Dimensions when 36" pipe openings are required on adjacent walls and the difference in flow lines is less than 3'-0".

4. For 7'-0" Precast Square Structure Bottoms, 66" Pipes with similar invert elevations are not permitted in adjacent walls. Use 8'-0" Side Dimensions when 66" pipe openings are required on adjacent walls and the difference in flow lines is less than 4'-0".

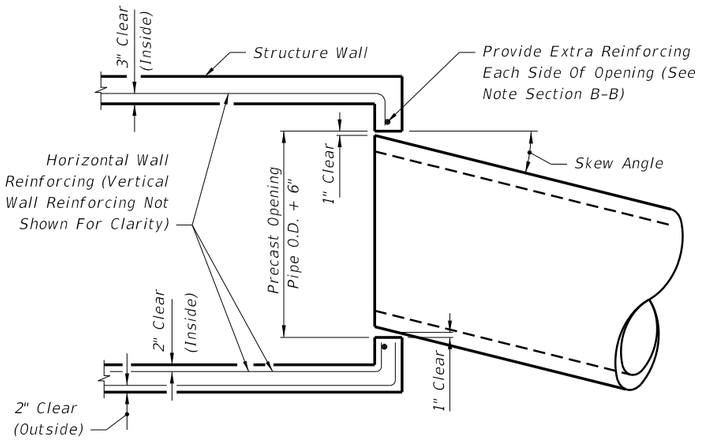
TABLE 4-MINIMUM SIZES FOR MULTIPLE PARALLEL PIPE CONNECTIONS FOR RECTANGULAR STRUCTURE BOTTOMS

PIPE SIZE	PIPE SPACING (S)	MINIMUM WALL LENGTH (L) FOR NUMBER OF PARALLEL PIPES		
		2	3	4
18"	2'-10"	6'-0"	8'-6"	11'-0"
24"	3'-5"	6'-6"	10'-0"	13'-6"
30"	4'-3"	8'-0"	12'-6"	16'-6"
36"	5'-1'	9'-6"	14'-6"	19'-6"
42"	6'-0"	11'-0"	17'-0"	–
48"	6'-9"	12'-6"	19'-0"	–
54"	7'-8"	14'-0"	–	–
60"	8'-6"	15'-0"	–	–
66"	9'-0"	16'-6"	–	–
72"	10'-0"	18'-0"	–	–
78"	10'-9"	19'-0"	–	–
84"	11'-8"	20'-6"	–	–

TABLE 4 NOTES:

1. Minimum wall lengths based on precast structures, using concrete pipe with maximum skew angles per Table 5.

2. Wall lengths exceeding 20'-0" require special designs.

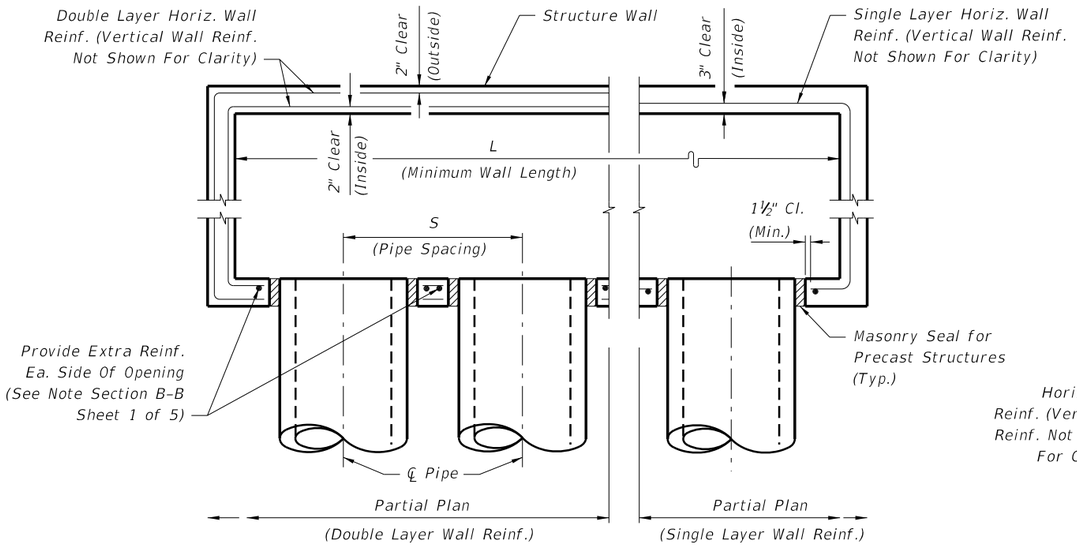


MAXIMUM PIPE SKEW FOR PRECAST ROUND OPENINGS
PLAN VIEW

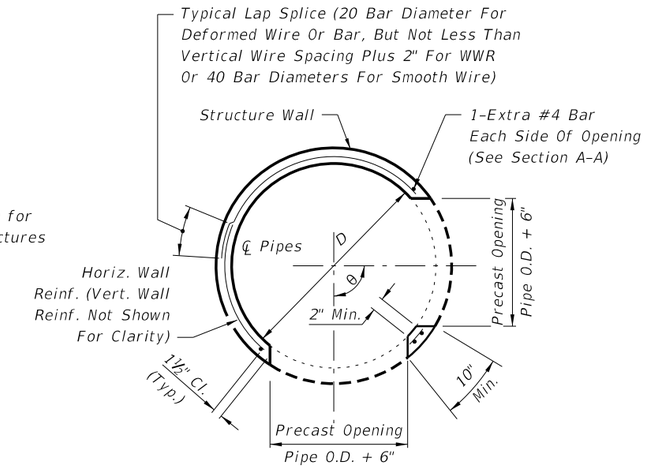
TABLE 5 - MAXIMUM PIPE SKEW FOR PRECAST ROUND OPENINGS

	WALL THICKNESS	PIPE SIZE											
		18"	24"	30"	36"	42"	48"	54"	60"	66"	72"	78"	84"
MAXIMUM SKEW ANGLE	8"	19°	17°	16°	16°	15°	14°	14°	13°	13°	13°	12°	12°
	6"	21°	20°	18°	17°	17°	16°	15°	15°	14°	14°	13°	13°

TABLE 5 NOTES:
These values are based on 2" clearance for precast structures.
Larger skews are possible for Cast-In-Place Structures or elliptical pipe openings when approved by the Engineer.



MULTIPLE PARALLEL PIPE CONNECTIONS DETAIL
PLAN VIEW



PRECAST ROUND STRUCTURES WITH MULTIPLE PIPE CONNECTIONS

STRUCTURE SIZES FOR PIPE CONNECTIONS

LAST REVISION	REVISION	DESCRIPTION:		INDEX NO.	SHEET NO.
07/01/07			FDOT DESIGN STANDARDS 2013	200	3

STRUCTURE BOTTOMS TYPE J AND P

SLAB DESIGNS - SQUARE AND RECTANGULAR STRUCTURES (TABLE 6)
(ALL SLABS 8" THICK EXCEPT AS NOTED - REINFORCING PARALLEL TO SHORT WAY AND LONG WAY)

SHORT-WAY		LONG-WAY	
SLAB DEPTH	SCHEDULE (Bars A)	SLAB DEPTH	SCHEDULE (Bars B)
SIZE: 3'-6" x UNLIMITED			
≥0.5' < 8'	B10	≥0.5' < 24'	B10
8' < 13'	B5.5	24'-40'	B5.5
13' < 31'	C6.5		
31'-40'	D7		
SIZE: 4' x UNLIMITED			
≥0.5' < 7'	B5.5	≥0.5' < 15'	B10
7' < 19'	C6.5	15' < 29'	B5.5
19' < 31'	D7	29'-40'	C6.5
31'-40'	E5		
SIZE: 5' x 5'			
≥0.5' < 3'	C6.5	≥0.5' < 3'	C6.5
3' < 7'	B5.5	3' < 13'	C6.5
7' < 22'	C6.5	13' < 22'	D7
22' < 29'	D7	22' < 29'	D4.5
29'-40'	E5	29'-40'	E5
SIZE: 5' x 6'			
≥0.5' < 12'	C6.5	≥0.5' < 3'	C6.5
12' < 26'	D7	3' < 9'	B5.5
26'-40'	E5	9' < 23'	C3.5
		23' < 35'	D4.5
		35'-40'	E5
SIZE: 5' x 7'			
≥0.5' < 10'	C6.5	≥0.5' < 10'	B5.5
10' < 20'	D7	10' < 31'	C3.5
20' < 34'	E5	31'-40'	D4.5
34'-40'	F5		
SIZE: 5' x 8'			
≥0.5' < 7'	C6.5	≥0.5' < 8'	B10
7' < 13'	D7	8' < 17'	B5.5
13' < 24'	E5	17' < 25'	C6.5
24'-40'	F5	25'-40'	C3.5
SIZE: 5' x 9'			
≥0.5' < 8'	C6.5	≥0.5' < 14'	B10
8' < 14'	D7	14' < 24'	B5.5
14' < 25'	E5	24' < 34'	C6.5
25'-40'	F5	34'-40'	C3.5
SIZE: 5' x UNLIMITED			
≥0.5' < 8'	C6.5	≥0.5' < 14'	B10
8' < 14'	D7	14' < 24'	B5.5
14' < 25'	E5	24' < 34'	C6.5
25'-40'	F5	34'-40'	C3.5

SHORT-WAY		LONG-WAY	
SLAB DEPTH	SCHEDULE (Bars A)	SLAB DEPTH	SCHEDULE (Bars B)
SIZE: 6' x 6'			
≥0.5' < 13'	C6.5	≥0.5' < 10'	C3.5
13' < 23'	D7	10' < 18'	D4.5
23'-40'	E5	18' < 27'	E5
		27' < 33'	E3
		33'-40'	F5
SIZE: 6' x 7'			
≥0.5' < 8'	C6.5	≥0.5' < 8'	C6.5
8' < 16'	D7	8' < 12'	C3.5
16' < 28'	E5	12' < 21'	D4.5
28'-40'	F5	21' < 28'	E5
		28' < 35'	E3
		35'-40'	F5
SIZE: 6' x 8'			
≥0.5' < 6'	C6.5	≥0.5' < 6'	B5.5
6' < 13'	D7	6' < 11'	C6.5
13' < 22'	E5	11' < 17'	C3.5
22' < 35'	F5	17' < 22'	D4.5
35'-40'	G5	22' < 32'	E5
		32'-40'	E3
SIZE: 6' x 9'			
≥0.5' < 8'	D7	≥0.5' < 8'	B5.5
8' < 14'	E5	8' < 14'	C6.5
14' < 24'	F5	14' < 21'	C3.5
24'-34'	G5	21' < 25'	D4.5
		25'-34'	E5
SIZE: 6' x UNLIMITED			
≥0.5' < 8'	D7	≥0.5' < 8'	B5.5
8' < 14'	E5	8' < 14'	C6.5
14' < 24'	F5	14' < 21'	C3.5
24'-34'	G5	21' < 25'	D4.5
		25'-34'	E5
SIZE: 7' x 7'			
≥0.5' < 8'	C6.5	≥0.5' < 4'	C6.5
8' < 15'	D7	4' < 7'	C3.5
15' < 26'	E5	7' < 11'	D4.5
26'-40'	F5	11' < 22'	E3
		22' < 32'	F3.5
		32'-40'	G3.5
SIZE: 7' x 8'			
≥0.5' < 5'	C6.5	≥0.5' < 5'	C6.5
5' < 11'	D7	5' < 8'	C3.5
11' < 19'	E5	8' < 13'	D4.5
19' < 30'	F5	13' < 22'	E3
30'-40'	G5	22' < 30'	F3.5
		30'-40'	G3.5
SIZE: 7' x 9'			
≥0.5' < 9'	D7	≥0.5' < 7'	C6.5
9' < 15'	E5	7' < 10'	C3.5
15' < 25'	F5	10' < 14'	D4.5
25' - 34'	G5	14' < 21'	E5
		21' < 29'	F5
		29'-34'	F3.5

SHORT-WAY		LONG-WAY	
SLAB DEPTH	SCHEDULE (Bars A)	SLAB DEPTH	SCHEDULE (Bars B)
SIZE: 8' x 8'			
≥0.5' < 10'	D7	≥0.5' < 9'	D4.5
10' < 19'	E5	9' < 13'	E5
19'-30'	F5	13' < 18'	F5
		18' < 23'	F3.5
		23'-30'	G3.5
SIZE: 8' x 9'			
≥0.5' < 8'	D7	≥0.5' < 7'	D7
8' < 14'	E5	7' < 9'	D4.5
14' < 23'	F5	9' < 15'	E3
23'-31'	G3.5	15' < 20'	F5
		20' < 23'	F3.5
		23'-31'	G3.5
SIZE: 9' x 9'			
≥0.5' < 8'	D7	≥0.5' < 7'	D4
8' < 14'	E5	7' < 10'	E5
14' < 22'	F5	10' < 17'	F3.5
		17' < 22'	G3.5
SIZE: 9'x9'x10" SLAB THICKNESS			
22' < 36'	F5	22' < 31'	F3.5
36'-40'	G5	31'-40'	G3.5
SIZE: 10'x10'x10" SLAB THICKNESS			
≥0.5' < 7'	C6.5	0.5' < 6'	C6.5
7' < 10'	D7	6' < 9'	D4.5
10' < 18'	E5	9' < 15'	E5
18' < 27'	F5	15' < 22'	F5
27'-32'	G5	22'-32'	G3.5
SIZE: 12'x12'x12" SLAB THICKNESS			
≥0.5' < 10'	D7	≥0.5' < 8'	D7
10' < 16'	E5	8' < 14'	E5
16' < 25'	F5	14' < 22'	F5
25'-35'	G5	22' < 30'	G5
		30'-35'	H4

SLAB DESIGNS - ROUND STRUCTURES (TABLE 7)

SLAB DEPTH	SLAB THICKNESS	REINF. (2-WAY) SCHEDULE
SIZE: 3'-6" DIAMETER		
2'-15'	6" Precast	C6.5
0.5' < 30'	8"	A6
30'-40'	8"	B5.5
SIZE: 4'-0" DIAMETER		
≥0.5' < 19'	8"	A6
19' < 30'	8"	B5.5
30'-40'	8"	C6.5
SIZE: 5'-0" DIAMETER		
≥0.5' < 15'	8"	B5.5
15' < 26'	8"	C6.5
26' < 35'	8"	D7
35'-40'	8"	D4.5
SIZE: 6'-0" DIAMETER		
≥0.5' < 9'	8"	B5.5
9' < 15'	8"	C6.5
15' < 22'	8"	C3.5
22' < 30'	8"	D4.5
30'-40'	8"	E5
SIZE: 7'-0" DIAMETER		
≥0.5' < 8'	8"	C3.5
8' < 16'	8"	D4.5
16' < 23'	8"	E5
23' < 27'	8"	E3
27'-40'	8"	F3.5
SIZE: 8'-0" DIAMETER		
≥0.5' < 10'	8"	D4.5
10' < 16'	8"	E5
16' < 19'	8"	E3
19' < 29'	8"	F3.5
29'-40'	10"	F5
SIZE: 10'-0" DIAMETER		
≥0.5' < 12'	10"	D4.5
12' < 20'	10"	E5
20' < 28'	10"	F5
28'-40'	10"	G3.5
SIZE: 12'-0" DIAMETER		
≥0.5' < 8'	10"	D4.5
8' < 13'	10"	E5
13' < 18'	10"	F5
18' < 26'	10"	G3.5
26'-40'	12"	G3.5

SLAB AND WALL DESIGN TABLE NOTES

1. Size is the inside dimension(s) of a structure.
2. Slab reinforcement is appropriate for top, intermediate, and bottom slabs.
3. Bottom Slabs for precast 3'-6" x 3'-6" rectangular structures at 15' depth or less, may be 6" thick.
4. Slab depth is measured from finished grade to top of slab.
5. Wall depth is measured to the top of the bottom slab for boxes and to the top of the intermediate slab for risers.
6. Wall height is the distance between top of lower slab to bottom of upper slab. Maximum wall height is 12' for wall lengths exceeding 5', or 10' for wall lengths exceeding 12'.
7. Wall lengths exceeding 6'-0" require two layers of reinforcing (See Table 8) with 2" of cover from the horizontal bars to the inside and outside faces for each layer.
8. Wall lengths exceeding the dimensions or depths shown in Table 8, or 12'-0" diameter require a special design.
9. Wall thickness and reinforcing for rectangular structures is the same for both long and short sides.
10. Reinforcing schedules with larger areas of steel may be substituted for schedules with smaller bar or wire spacing, except that Schedule B10 may not be substituted for Schedule A6. See Index 201, Sheet 4 for allowable bar spacing adjustments when larger areas of reinforcing are substituted.

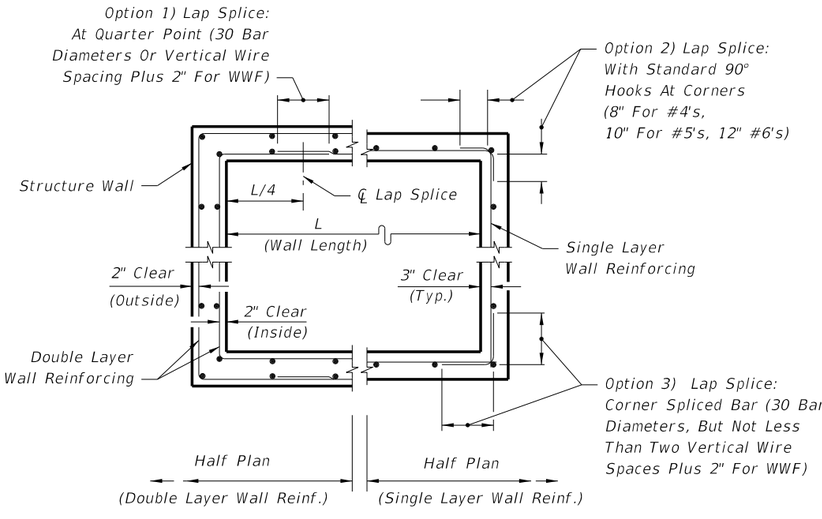
WALL DESIGNS - RECTANGULAR STRUCTURES (TABLE 8)

VERTICAL REINFORCING			HORIZONTAL REINFORCING			WALL THICKNESS
WALL DEPTH	SCHEDULE		WALL DEPTH	SCHEDULE		
SIZE: 3'-6' & RISERS						
≥1.17' – 40'	A12		≥1.17' < 10'	B10		6"/8"
			10' < 18'	B5.5		6"/8"
			18' < 29'	C6.5		6"/8"
			29' – 40'	C3.5		6"/8"
SIZE: 4'-0"						
≥1.17' – 40'	A12		≥1.17' < 6'	B10		6"/8"
			6' < 10'	B5.5		6"/8"
			10' < 20'	C6.5		6"/8"
			20' < 28'	C3.5		6"/8"
			28' – 40'	D4.5		6"/8"
SIZE: 5'-0"						
≥1.17' – 40'	A12		≥1.17' < 5'	B5.5		6"/8"
			5' < 9'	C6.5		6"/8"
			9' < 15'	C3.5		6"/8"
			15' < 22'	D4.5		6"/8"
			22' – 40'	E3		8"
SIZE: 6'-0"						
≥1.17' < 26'	A12		≥1.17' < 9'	C3.5		6"/8"
			9' < 15'	D4.5		6"/8"
			15' < 26'	E3		8"
	Inside	Outside		Inside	Outside	
26' – 40'	A12	A12	26' – 40'	D7	D7	8"
SIZE: 7'-0"						
	Inside	Outside		Inside	Outside	
≥1.17' < 25'	A12	A12	≥1.17' < 7'	B10	B10	8"
26' – 40'	B10	B10	7' < 10'	B5.5	B5.5	8"
			10' < 20'	C6.5	C6.5	8"
			20' < 30'	D7	D7	8"
			30' – 40'	E5	E5	8"
SIZE: 8'-0"						
	Inside	Outside		Inside	Outside	
≥1.17' < 20'	A12	A12	≥1.17' < 6'	B5.5	B5.5	8"
20' – 40'	C6.5	C6.5	6' < 13'	C6.5	C6.5	8"
			13' < 22'	D7	D7	8"
			22' < 31'	E5	E5	8"
			31' – 40'	F5	F5	8"
SIZE: 9'-0"						
	Inside	Outside		Inside	Outside	
≥1.17' < 12'	A12	A12	≥1.17' < 8'	C6.5	C6.5	8"
12' < 28'	C6.5	C6.5	8' < 15'	D7	D7	8"
28' – 40'	D7	D7	15' < 23'	E5	E5	8"
			23' – 40'	F5	F5	8"
SIZE: 10'-0"						
	Inside	Outside		Inside	Outside	
≥1.17' < 10'	B10	B10	≥1.17' < 10'	D7	D7	8"
10' < 21'	C6.5	C6.5	10' < 17'	E5	E5	8"
21' < 26'	D7	D7	17' < 26'	F5	F5	8"
26' – 40'	C6.5	C6.5	26' – 40'	F5	F5	10"

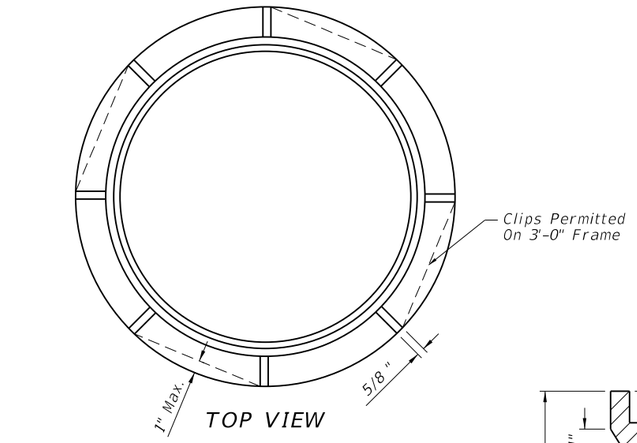
VERTICAL REINFORCING			HORIZONTAL REINFORCING			WALL THICKNESS
WALL DEPTH	SCHEDULE		WALL DEPTH	SCHEDULE		
SIZE: 10'-0" (Precast Only)						
	Inside	Outside		Inside	Outside	
26' – 40'	D7	D7	26' – 40'	F5	F5	9"
SIZE: 12'-0"						
	Inside	Outside		Inside	Outside	
≥1.17' < 14'	B10	B10	≥1.17' < 10'	C6.5	C6.5	10"
14' < 25'	C6.5	C6.5	10' < 17'	D7	D7	10"
25' – 40'	D7	D7	17' < 24'	E5	E5	10"
			24' – 40'	F5	F5	10"
SIZE: 12'-0" (Precast Only)						
	Inside	Outside		Inside	Outside	
≥1.17' < 12'	B10	B10	≥1.17' < 10'	D7	D7	9"
12' < 24'	C6.5	C6.5	10' < 17'	D4.5	D4.5	9"
24' – 40'	D7	D7	17' < 23'	E5	E5	9"
			23' < 32'	F5	F5	9"
			32' – 40'	G5	G5	9"
SIZE: 16'-0"						
	Inside	Outside		Inside	Outside	
≥1.17' < 11'	C6.5	C6.5	≥1.17' < 13'	D7	D7	10"
11' < 20'	D7	D7	13' < 20'	E5	E5	10"
20' < 28'	E5	E5	20' < 28'	F5	F5	10"
28' – 40'	F5	F5	28' – 40'	G5	G5	10"
SIZE: 16'-0" (Precast Only)						
	Inside	Outside		Inside	Outside	
≥1.17' < 10'	C6.5	C6.5	≥1.17' < 9'	D7	D7	9"
10' < 18'	D7	D7	9' < 13'	D4.5	D4.5	9"
18' < 25'	E5	E5	13' < 19'	E5	E5	9"
25' – 35'	F5	F5	19' < 27'	F5	F5	9"
			27' – 35'	G5	G5	9"
SIZE: 20'-0"						
	Inside	Outside		Inside	Outside	
≥1.17' < 10'	C6.5	C6.5	≥1.17' < 8'	D7	D7	10"
10' < 17'	D7	D7	8' < 12'	E5	E5	10"
17' – 30'	E5	E5	12' < 20'	F5	F5	10"
			20' – 30'	G5	G5	10"
SIZE: 20'-0" (Precast Only)						
	Inside	Outside		Inside	Outside	
≥1.17' < 8'	C6.5	C6.5	≥1.17' < 8'	D4.5	D4.5	9"
8' < 13'	D7	D7	8' < 12'	E5	E5	9"
13' – 25'	E5	E5	12' < 19'	F5	F5	9"
			19' – 25'	G5	G5	9"

REINFORCING SCHEDULE				
SCHEDULE	GRADE 60 BARS OR 65 KSI & 70 KSI WELDED WIRE REINFORCING			
	GRADE 60 AREA ($in.^2/ft.$)	MAXIMUM SPACING		
		GR 60 BARS (in.)	WWR EQUIV. AREA*	
			65 KSI (in.)	70 KSI (in.)
A12	0.20	12	8	8
A6	0.20	6	5	4½
B10	0.24	10	8	7½
B5.5	0.24	5½	5	4
C6.5	0.37	6½	6	5
C3.5	0.37	3½	3	2½
D7	0.53	7	6	5
D4.5	0.53	4½	4	3½
E5	0.73	5	4	4
E3	0.73	3	3	3
F5	1.06	5	4	4
F3.5	1.06	3½	3	3
G5	1.45	5	4	4
G.3.5	1.45	3½	3	3
H4	1.75	4	3	3

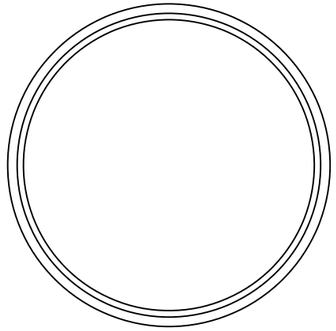
*Equivalent Area Welded Wire Reinforcing may be substituted in accordance with Index No. 201, Sheet 4.



WALL REINFORCING SPLICE DETAILS (ALTERNATE B)



TOP VIEW



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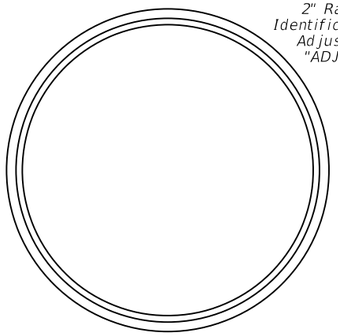

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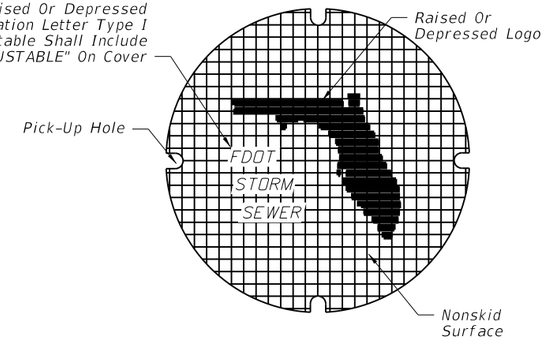
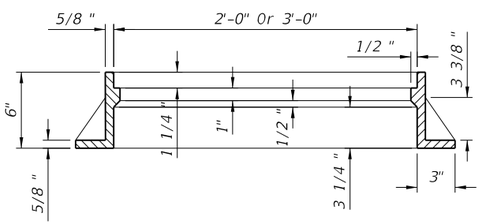


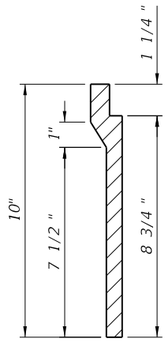
TOP VIEW



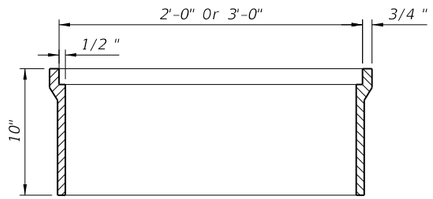
SECTION

For Manholes

TYPE I



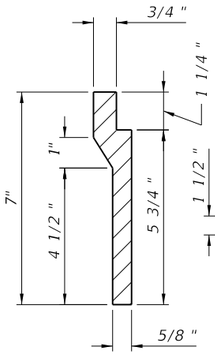
WALL SECTION



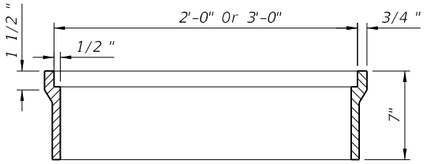
SECTION

For Curb Inlets Types 1, 2, 3, & 4

TYPE II



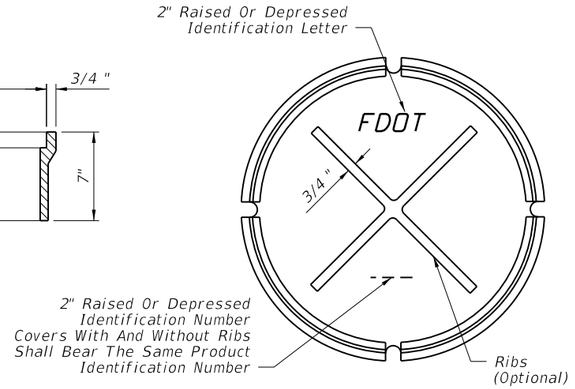
WALL SECTION



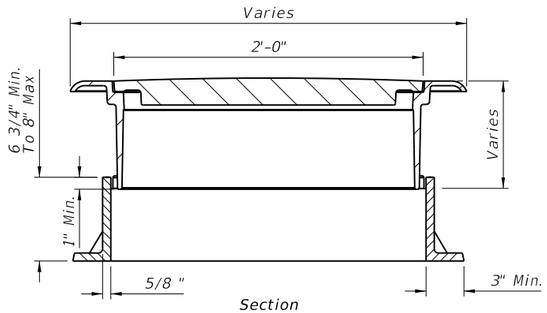
SECTION

For Curb Inlets Types 7 & 8

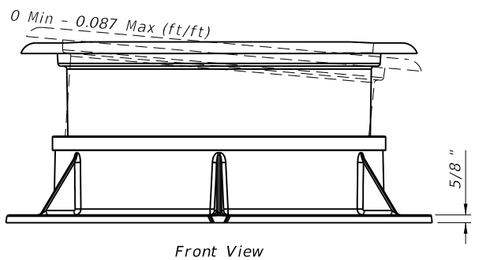
TYPE III



BOTTOM VIEW



Section



Front View

TYPE I ADJUSTABLE

WEIGHT OF CASTINGS (lb)						
Frame Type	2' OPENING		3' OPENING			
	Frame	Cover (Std.)	Frame	2-Piece Cover		
				Inside	Outside	Total
I *	155	190	220	190	220	410
II	145	190	255	190	220	410
III	90	190	180	190	220	410

* Includes Type I Adjustable

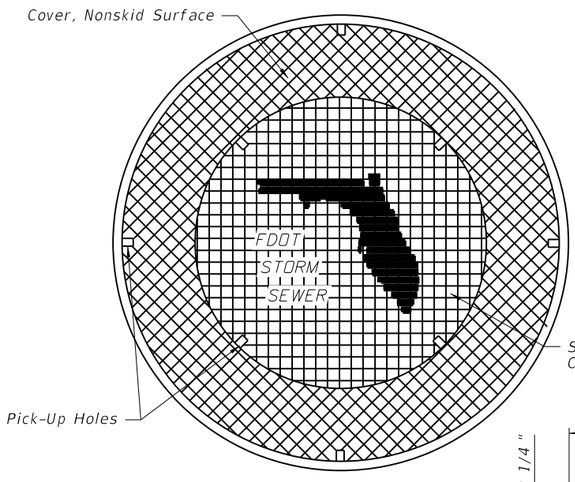
NOTES (FRAMES, AND COVER)

1. The standard cover is to be used for all frames Types I, II, III and the 2-piece cover, and is the replacement cover for all previous frames with 1½" deep seats (traffic type). The 185 lb. cover (nontraffic type), 1984 Roadway and Traffic Design Standards Index No. 201, is the replacement cover for existing frames with ½" deep seats. Installation of frame with ½" deep seats is not permitted.

2. Use the 2'-0" cover, unless the 2-piece cover is called for in the plans, except at inlets and manholes with sump bottoms use the 2-piece cover when the sump depth exceeds 2', unless otherwise noted.

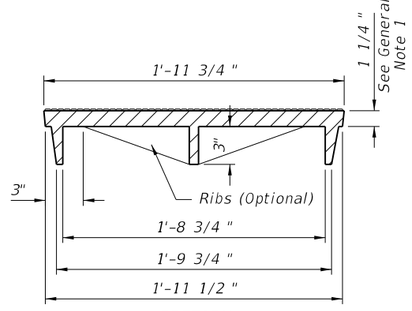
DESIGNER NOTE:

Consider using the 2-piece cover where depths exceed 5' and manual entry may be required for cleaning. Clearly note the requirement for a 2-piece cover, on the Drainage Structure sheets in the plans.



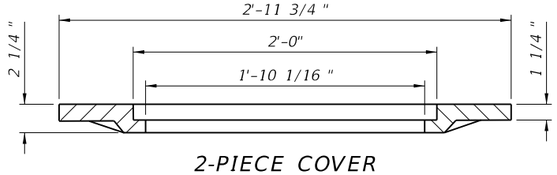
For Use With Types I, II And III Frames With 3'-0" Opening

2-PIECE COVER



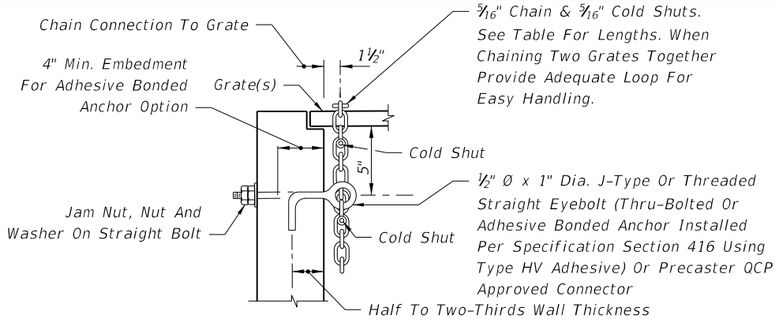
SECTION

COVER FOR ALL FRAMES



2-PIECE COVER

LAST REVISION	REVISION	DESCRIPTION:				
01/01/12			FDOT DESIGN STANDARDS 2013	SUPPLEMENTARY DETAILS FOR MANHOLES & INLETS	INDEX NO. 201	SHEET NO. 1



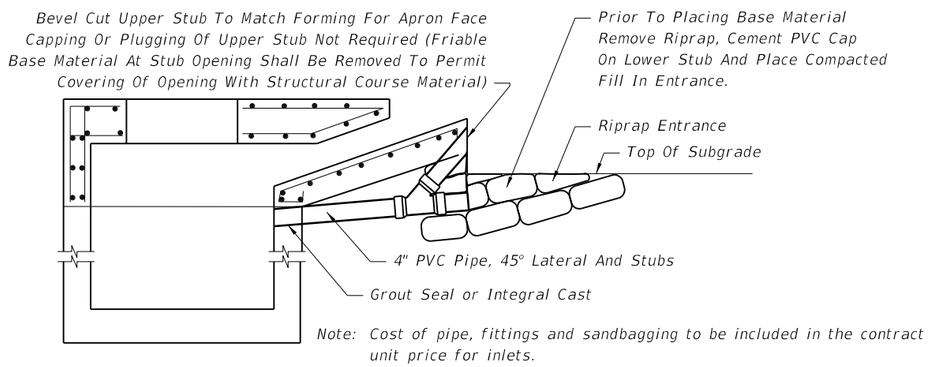
NOTE: When Alternate "G" grate is specified, the chain, bolt, nuts, washer and cold shuts shall be galvanized in accordance with Section 425 of the Standard Specifications.

Cost of eyebolt and chain to be included in the contract unit price for inlets.

EYEBOLT AND CHAIN REQUIREMENTS

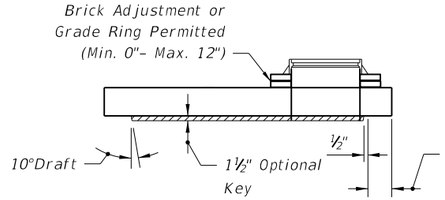
Index Number	Inlet Type	Eye-Bolts	Length Of Chain	Handling & Remarks
217	(MB) 1	1	4'-0"	Slide & Spin
	(MB) 2	1	4'-0"	Slide & Spin
	(MB) 3	2	2 @ 4'-0"	Slide & Spin
	(MB) 4	2	2 @ 4'-0"	Slide & Spin
	(MB) 5	2	2 @ 4'-0"	Slide & Spin
218	(BW)	1	3'-8"	Slide Or Slide & Spin
219	(BW, RGD)	1	4'-0"	Slide & Spin
220	S	1	4'-0"	Slide & Spin
221	V	1	4'-0"	Slide & Spin
230	A	1	3'-0"	Slide
231	B	1	5'-0"	Slide & Spin
232	C	1	2'-6"	Slide & Spin
	D	1	2'-6"	Slide & Spin
	E	2	2 @ 2'-6"	Slide & Spin
	H	2	2 @ 2'-6"	Flip Ctr. Grate and Slide & Spin Single Free Grate
			1 or 2 @ 1'-6"	Ctr. Grate(s) Chained To One End Grate
233	F	1	3'-6"	Flip Or Slide & Spin
	G	1	6'-0"	Slide
			2'-0"	Lifting Loop
234	J	1	4'-0"	Slide & Spin

EYEBOLT AND CHAIN FOR LOCKING GRATES TO INLETS



Note: Cost of pipe, fittings and sandbagging to be included in the contract unit price for inlets.

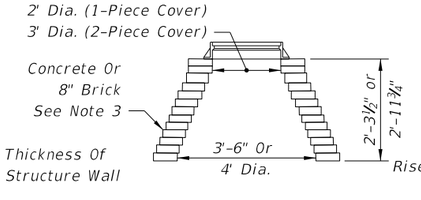
TEMPORARY DRAINS FOR SUBGRADE AND BASE



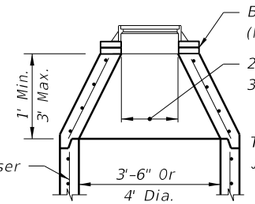
SECTION

Note: See Slab Designs Index No. 200.

TYPE 7

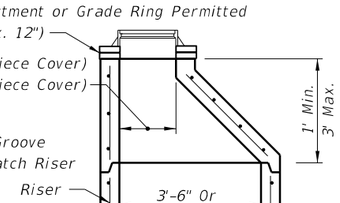


BRICK OR CONCRETE



PRECAST CONCENTRIC CONE

TYPE 8



PRECAST ECCENTRIC CONE

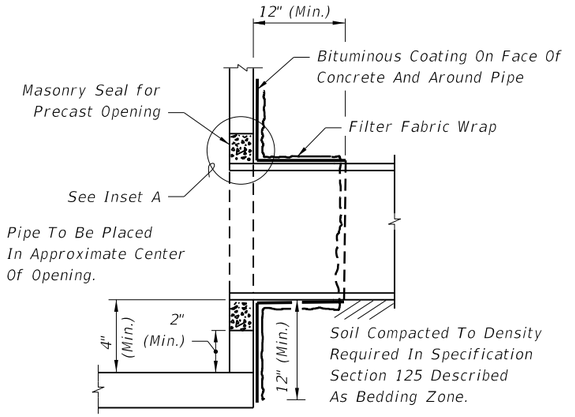
MANHOLE TOPS

NOTES (TOPS)

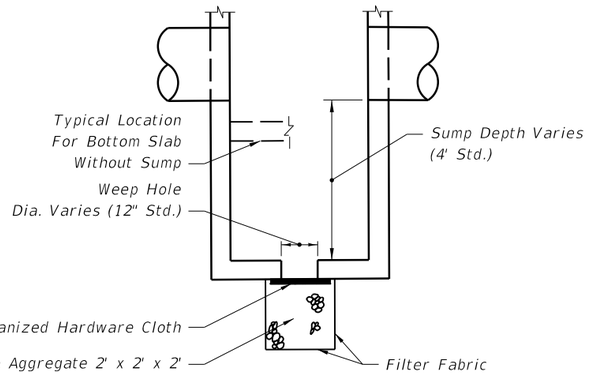
1. Manhole top Type 7 slabs shall be of Class II concrete. Concrete as specified in ASTM C478 may be used for precast units; see General Note No. 3.
2. Manhole top Type 7 slabs may be of cast-in-place or precast construction. The optional key is for precast tops and in lieu of dowels. Frame and slab openings are to be omitted when top is used over a junction box.
3. Manhole top Type 8 may be of cast-in-place or precast concrete construction or brick construction. For concrete construction, the concrete and steel reinforcement shall be the same as the supporting wall unit. An eccentric cone may be used.
4. Manhole tops shall be secured to structures by optional construction joints as shown on Sheet 3.
5. Frames can be adjusted a maximum 12" height with brick or precast ASTM C478 grade rings.
6. Substitution of manhole top Type 8 for manhole top Type 7 is allowed provided that minimum dimensions shown above are not reduced.
7. Substitution of Manhole top Type 7 for Type 8 is allowed if the minimum thickness (h) above pipe opening cannot be maintained with manhole top Type 8.

DESIGN NOTES

1. Manhole top Type 8 should be specified in the plans when depths shown above can be maintained.

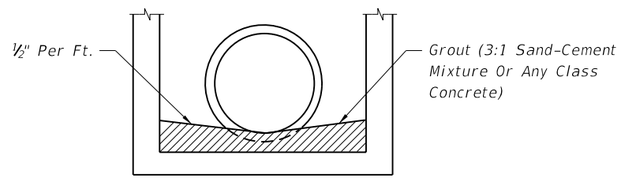


FILTER FABRIC WRAP ON GROUTED PIPE TO STRUCTURE JOINT



NOTE: Sump bottom appropriate for all manhole and inlet types. Sumps are to be constructed in inlet and manholes connected to French Drains unless excluded in the plans. At other locations, sump is to be constructed only where called for in the plans. Weep holes to be constructed in sump bottom only where called for in the plans. Cost of sump bottom and weep hole to be included in the contract unit price for inlet or manhole.

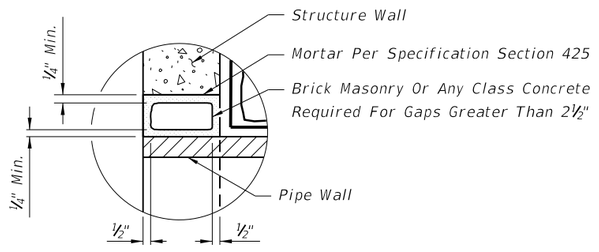
SUMP BOTTOM



FOR ALL STRUCTURES UNLESS EXCLUDED BY SPECIAL DETAIL

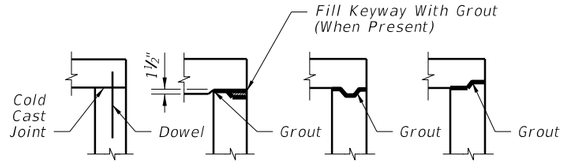
ALL PIPE TYPES

DRAINAGE STRUCTURE INVERT

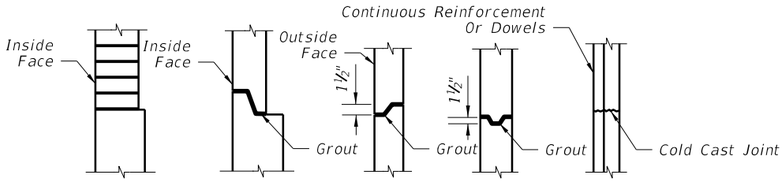


INSET A

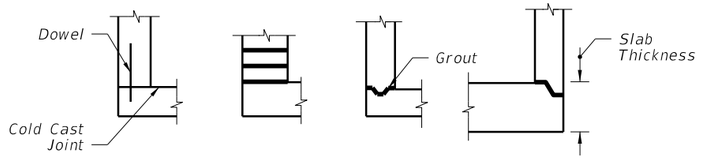
LAST REVISION	REVISION	DESCRIPTION:		FDOT DESIGN STANDARDS 2013	SUPPLEMENTARY DETAILS FOR MANHOLES & INLETS	INDEX NO.	SHEET NO.
07/01/12			STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION			201	2



TOP SLABS TO WALLS



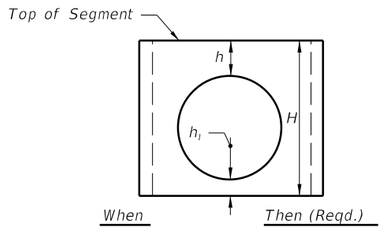
WALL JOINTS



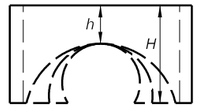
BOTTOM SLABS TO WALLS

1. One or more types of joints may be used in a single structure, except brick wall structure. Brick wall construction is permitted on circular units only.
2. All grouted joints are to have a maximum thickness of 1".
3. Keyways are to be a minimum of 1½" deep.
4. Joint dowels are to be #4 bars, 12" long with a minimum of 6 bars per joint approximately evenly spaced for circular structures or at maximum 12" spacing for rectangular structures. Bars may be either Adhesive Bonded Dowels in accordance with Specification Section 416, or placed approximately 6" into fresh concrete leaving the remainder to extend into the secondary cast. Welded wire fabric may be substituted for the dowel bar in accordance with the equivalent steel area table on Sheet 4.
5. Minimum cover on dowel reinforcing bars is 2" to outside face of structure.
6. Joints between wall segments and between wall segments and top or bottom slabs may be sealed either by preformed plastic gasket material using the procedures given in Section 430-7.3.1 of the Specifications or by non-shrink grout, in accordance with Section 934 of the Specifications.
7. Approved product inserts may be used in lieu of dowel embedment.

OPTIONAL CONSTRUCTION JOINTS

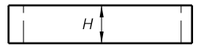


When	Then (Reqd.)
6" ≤ h_1 < 0.75H (min.)	h ≥ 0.4H
h_1 ≥ 0.75H (min.)	h ≥ H (min.)



H (min.) ≤ h ≥ 0.4H

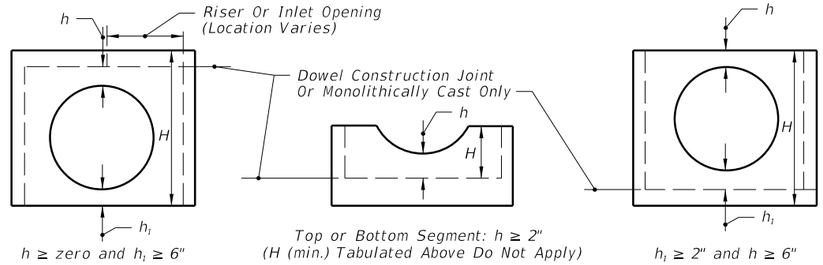
Segments may be inverted. Opening for pipe shall be the pipe OD plus 6" (± 2" tolerance). If h can not be attained, then a top or bottom slab must be attached to the segment as shown below.



H ≥ H (min.)

Minimum Value For H	
H (min.)	Box Or Riser Diameter
1'-0"	3'-6" & 4'-0"
1'-6"	5'-0" & 6'-0"
2'-0"	>6'-0"

SEPARATE RISER SEGMENTS WITH CONSTRUCTION JOINTS OTHER THAN DOWEL OPTION



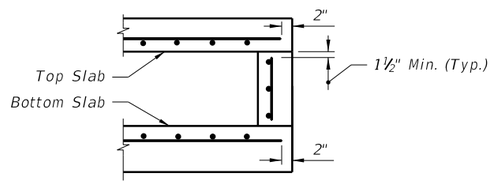
h ≥ zero and h_1 ≥ 6" | Top or Bottom Segment: h ≥ 2" (H (min.) Tabulated Above Do Not Apply) | h_1 ≥ 2" and h ≥ 6"

SEGMENTS FOR SLAB TO WALL DOWEL CONSTRUCTION JOINTS OR MONOLITHICALLY CAST SEGMENTS

NOTE: h may be less than 6" when approved by the Engineer, but not for inlet segments at finish grade elevation.

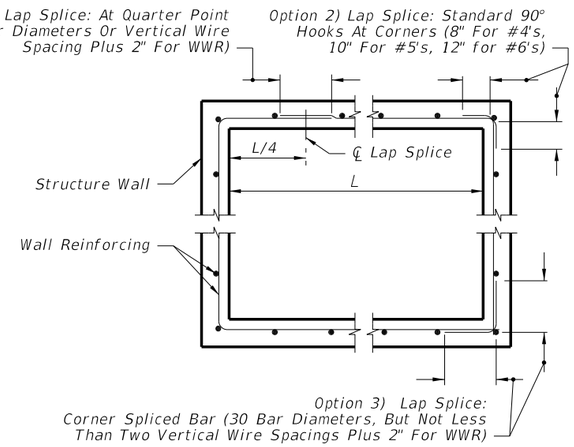
COMPARATIVE SIDE VIEWS

MINIMUM DIMENSIONS FOR BOX AND RISER SEGMENTS



(NOTE: NOT APPLICABLE AROUND MANHOLE AND RISER OPENINGS)

REBAR STRAIGHT END EMBEDMENT FOR TOP AND BOTTOM SLABS



WALL REINFORCING SPLICE DETAILS

LAST REVISION	REVISION	DESCRIPTION:				
01/01/10			FDOT DESIGN STANDARDS 2013	SUPPLEMENTARY DETAILS FOR MANHOLES & INLETS	INDEX NO. 201	SHEET NO. 3

EXAMPLE TABLE OF EQUIVALENT STEEL AREA

SCHEDULE	GRADE 60 REINFORCING BAR		EQUIVALENT GRADE 40 REINFORCING BAR		EQUIVALENT 65 KSI SMOOTH WELDED WIRE REINFORCEMENT		EQUIVALENT 70 KSI DEFORMED WELDED WIRE REINFORCEMENT	
	Bar Size & Spacing	Steel Area (in^2/ft)	Bar Size & Spacing	Min. Steel Area (in^2/ft)	Style Designation	Min. Steel Area (in^2/ft)	Style Designation	Min. Steel Area (in^2/ft)
A	#3 @ 6½" Ctrs. #4 @ 12" Ctrs.	0.20	#3 @ 4½" Ctrs. #4 @ 8" Ctrs. #5 @ 12" Ctrs.	0.30	3"x3"–W4.6xW4.6 4"x4"–W6.2xW6.2 6"x6"–W9.2xW9.2	0.1846	3"x3"–D4.3xD4.3 4"x4"–D5.7xD5.7 6"x6"–D8.6xD8.6	0.1714
B	#3 @ 5½" Ctrs. #4 @ 10" Ctrs.	0.24	#3 @ 3½" Ctrs. #4 @ 6½" Ctrs. #5 @ 10" Ctrs.	0.36	3"x3"–W5.5xW5.5 4"x4"–W7.4xW7.4 6"x6"–W11.1xW11.1	0.2215	3"x3"–D5.1xD5.1 4"x4"–D6.9xD6.9 6"x6"–D10.3xD10.3	0.2057
Special 1	#3 @ 5" Ctrs.. #4 @ 9" Ctrs.	0.267	#3 @ 3" Ctrs. #4 @ 6" Ctrs. #5 @ 9" Ctrs.	0.40	3"x3"–W6.2xW6.2 4"x4"–W8.2xW8.2 6"x6"–W12.3xW12.3	0.2465	3"x3"–D5.7xD5.7 4"x4"–D7.6xD7.6 6"x6"–D11.4xD11.4	0.2289
C	#3 @ 3½" Ctrs. #4 @ 6½" Ctrs. #5 @ 10" Ctrs.	0.37	#4 @ 4" Ctrs. #5 @ 6½" Ctrs. #6 @ 9½" Ctrs.	0.555	3"x3"–W8.5xW8.5 4"x4"–W11.4xW11.4 6"x6"–W17.1xW17.1	0.3415	3"x3"–D7.9xD7.9 4"x4"–D10.6xD10.6 6"x6"–D15.9xD15.9	0.3171
D	#4 @ 4½" Ctrs. #5 @ 7" Ctrs. #6 @ 10" Ctrs.	0.53	#4 @ 3" Ctrs. #5 @ 4½" Ctrs. #6 @ 6½" Ctrs.	0.795	3"x3"–W12.2xW12.2 4"x4"–W16.3xW16.3 6"x6"–W24.5xW24.5	0.4892	3"x3"–D11.4xD11.4 4"x4"–D15.1xD15.1 6"x6"–D22.7xD22.7	0.4543
E	#4 @ 3" Ctrs. #5 @ 5" Ctrs. #6 @ 7" Ctrs.	0.73	#5 @ 3½" Ctrs. #6 @ 4½" Ctrs. #7 @ 6½" Ctrs.	1.095	3"x3"–W16.8xW16.8 4"x4"–W22.5xW22.5 6"x6"–W33.7xW33.7	0.6738	3"x3"–D15.6xD15.6 4"x4"–D20.9xD20.9 6"x6"–D31.3xD31.3	0.6257
F	#5 @ 3½" Ctrs. #6 @ 5" Ctrs. #7 @ 7" Ctrs.	1.06	#6 @ 3" Ctrs. #7 @ 4½" Ctrs. #8 @ 6" Ctrs.	1.59	3"x3"–W24.5xW24.5 4"x4"–W32.6xW32.6 6"x6"–W48.9xW48.9	0.9785	3"x3"–D22.7xD22.7 4"x4"–D30.3xD30.3 6"x6"–D45.4xD45.4	0.9086
Special 2	#5 @ 3" Ctrs. #6 @ 4" Ctrs. #7 @ 5½" Ctrs.	1.24	#7 @ 4" Ctrs. #8 @ 5" Ctrs.	1.86	3"x3"–W28.6xW28.6 4"x4"–W38.2xW38.2 6"x6"–W57.2xW57.2	1.1446	3"x3"–D26.6xD26.6 4"x4"–D35.4xD35.4 6"x6"–D53.1xD53.1	1.0629
G	#6 @ 3½" Ctrs. #7 @ 5" Ctrs.	1.46	#7 @ 3" Ctrs. #8 @ 4" Ctrs.	2.19	3"x3"–W33.7xW33.7 4"x4"–W44.9xW44.9	1.3477	3"x3"–D31.3xD31.3 4"x4"–D41.7xD41.7	1.2514

GENERAL NOTES

1. For square or rectangular precast drainage structures, either deformed or smooth welded wire reinforcement may be used provided:

   a) The smooth welded wire reinforcement shall comply with ASTM A185 and deformed welded wire reinforcement shall comply with ASTM A497.

   b) Width and length of the unit is four times the spacing of the cross wires.

   c) Wire reinforcement shall be continuous around the box, and lapped in accordance with Option 1 or 3 as shown in the Wall Reinforcing Splice Details.

2. Horizontal steel in the walls of rectangular structures shall be lap spliced in accordance with Option 1, 2 or 3 as shown in the Wall Reinforcing Splice Details.

3. Welding of splices and laps is permitted. The requirements and restrictions placed on welding in AASHTO M259 shall apply.

4. Rebar straight end embedment of peripheral reinforcement may be used in lieu of ACI standard hooks for top and bottom slabs except when hooks are specifically called for in the plans or standard drawings.

5. Concrete as specified in ASTM C478, (4000 psi) may be used in lieu of Class II concrete in precast items manufactured in plants which meet the requirements of Section 449 of the Specifications.

6. Precast opening for pipe shall be the pipe OD plus 6" (± 2" tolerance). Mortar used to seal the pipe into the opening will be of such a mix that shrinkage will not cause leakage into or out of the structure. Dry-pack mortar may be used in lieu of brick and mortar construction to seal openings less than 2½" wide.

7. For pay item purposes, the height used to determine if a drainage structure is greater than 10 feet shall be computed using:
   a) the elevation of the top of the manhole lid,
   b) the grate elevation or the theoretical gutter grade elevation of an inlet, or
   c) the outside top elevation of a junction box less the flow line elevation of the lowest pipe or to top of sump floor.

NOTES FOR PRECAST OPTIONS & EQUIVALENT REINFORCEMENT SUBSTITUTION

1. Details for optional precast inlet construction up to depths of 15' are shown on the inlet indexes.

2. When precast units are used in conjunction with Alt. "B" Structure Bottoms, Index No. 200, the interior dimensions of an Alt. "B" Bottom can be adjusted to reflect these inlet interior dimensions.

3. Concrete which meets the requirements of ASTM C478 or Class IV must be used for precast structures constructed with 6" wall or slab thickness.

4. Reinforcement can be either deformed bar reinforcement or welded wire reinforcement. Bar reinforcement other than 60 ksi may be used, however only two grades are recognized; Grade 40 and Grade 60. Smooth welded wire reinforcement, will be recognized as having a design strength of 65 ksi and deformed welded wire reinforcement will be recognized as having a design strength of 70 ksi. The area of reinforcement required may be adjusted in accordance with the Equivalent Steel Area Table provided. For bars and spacings not given, the steel area required can be determined by the following equations:

   Grade 40 Steel Area = $A_s40 = \frac{60}{40} \times A_s60$

   Smooth Welded Wire Reinforcement Steel Area = $A_s65 = \frac{60}{65} \times A_s60$

   Deformed Welded Wire Reinforcement Steel Area = $A_s70 = \frac{60}{70} \times A_s60$

continued...

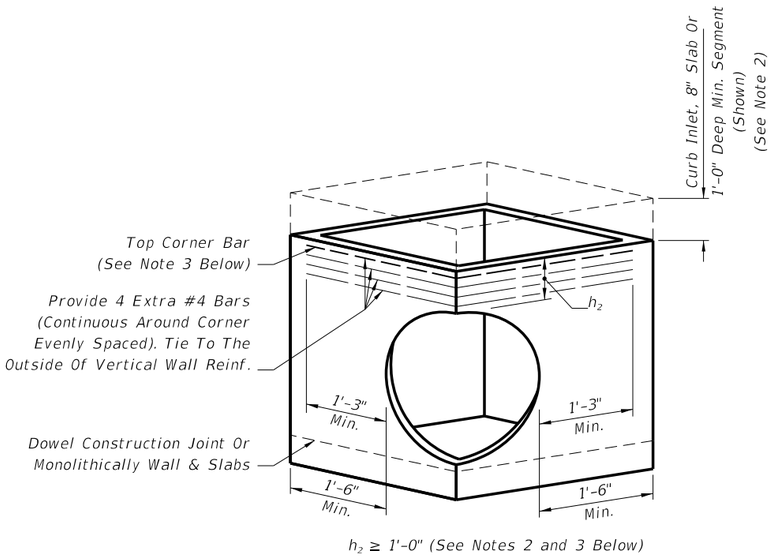
When a reduced area of reinforcement is provided, any maximum bar spacing shown must also be reduced as determined by the following equations, unless otherwise shown:

Max. Grade 40 Bar Spacing = Grade 60 Bar Spacing
Max. Smooth Welded Wire Spacing = Grade 60 Bar Spacing x 0.86
Max. Deformed Welded Wire Spacing = Grade 60 Bar Spacing x 0.74

When an increased area of reinforcing is provided, then the maximum bar spacing may be increased by the squared ratio of increased steel area, but not to exceed 12":

$$\text{Max. Bar Spacing Provided} \le \text{Max. Bar Spacing Required} \times \left(\frac{\text{Steel Area Provided}}{\text{Min. Steel Area Required}}\right)^2$$

In no case will reinforcement with wires smaller than W3.1 or D3.1, or spacings greater than 8" be permitted. Bar reinforcement shall show the minimum yield designation grade mark or either the number 60 or one (1) grade mark line to be acceptable at the higher value. Maximum bar spacing shall not be greater than two (2) times the slab thickness with a maximum spacing of 12" or three (3) times the wall thickness, with a maximum spacing of 18" for vertical bars and 12" for horizontal bars. Wires smaller than W3.1 or D3.1 are permitted in the walls of ASTM C 478 round structure bottoms and round risers.



$h_2 \geq$ 1'-0" (See Notes 2 and 3 Below)

DESIGNER NOTE: Use only when round structures are not practical, engineer of record approval required.

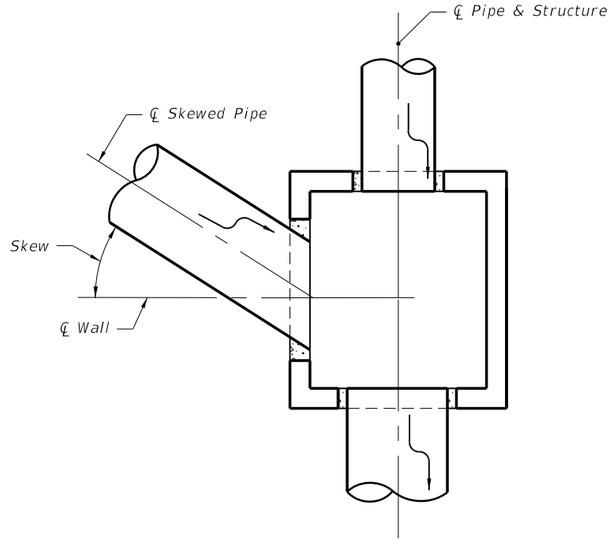
PICTORIAL VIEW

NOTE: 1. Submit Shop Drawings of corner openings for approval by the Engineer of Record.

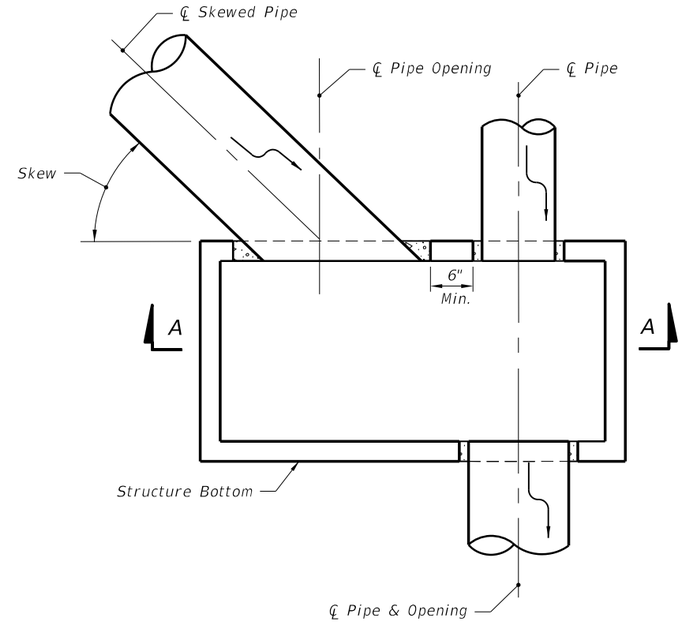
2. h_2 may be less than 1'-0" when a minimum 1'-0" deep segment, 8" slab or curb inlet is provided above the corner opening.

3. For inlet segments at finish grade elevation substitute a #8 Bar for the top corner bar when 1'-0" $\leq h_2 <$ 2'-0".

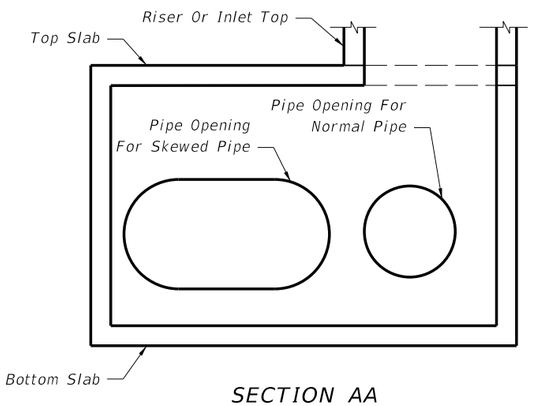
RECTANGULAR SEGMENT WITH
PIPE OPENING AT CORNER



PLAN VIEW FOR SKEWS ≤ 45°
(Not Centered)



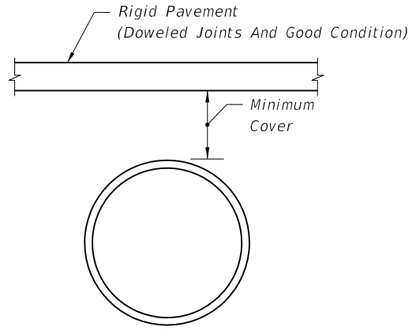
PLAN VIEW FOR SKEWS > 45°
(Not Centered)



SECTION AA

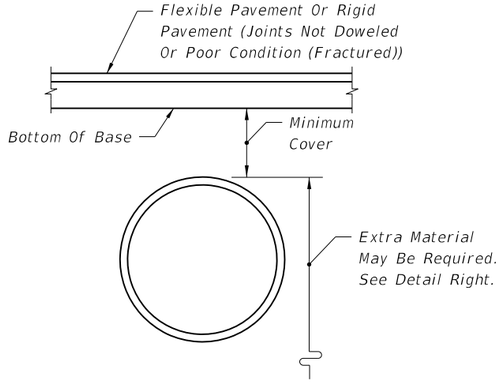
(Pipes Not Shown For Clarity)

DETAILS FOR SKEWED PIPES IN
RECTANGULAR STRUCTURES



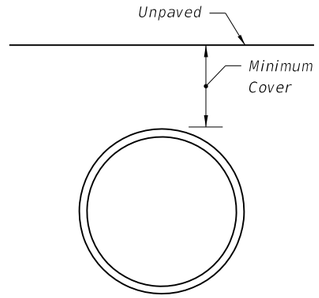
RIGID PAVEMENT

PIPE TYPE/SIZE & SHAPE	MINIMUM COVER
CONCRETE (See Note 6)	
Round & Elliptical	9"
CORRUGATED STEEL	
15"–72" Round & Arch Equiv.	9"
78" & Larger Round & Arch Eq.	15"
CORRUGATED ALUMINUM	
15"–72" Round & Arch Equiv.	9"
78"–102" Round & Arch Equiv.	15"
108" & Larger Round	18"
CORRUGATED POLYETHYLENE	
15"–60" Round	9"
POLYVINYL CHLORIDE	
15"–36" Round	9"



FLEXIBLE PAVEMENT

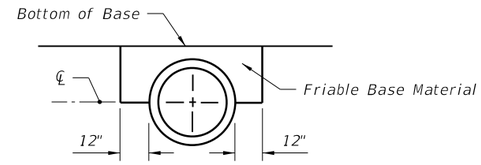
PIPE TYPE/SIZE & SHAPE	MINIMUM COVER
CONCRETE (See Note 6)	
Round & Elliptical	7"
CORRUGATED STEEL	
12"–30" Round	12" [12"]
36"–48" Round	18" (12") [15"]
54"–72" Round	21" (15") [18"]
78"–96" Round	(18") [27"]
102" & Larger Round	(24") [33"]
15"–30" Arch Equiv.	18" [18"]
36"–48" Arch Equiv.	24" (12") [18"]
54"–72" Arch Equiv.	27" (15") [24"]
78"–96" Arch Equiv.	(18") [30"]
102" & Larger Arch Equiv.	(24")
CORRUGATED ALUMINUM	
12"–24" Round	15" [12"]
30"–48" Round	18" (12") [18"]
54"–72" Round	24" (18") [24"]
78"–102" Round	(24") [30"]
108" & Larger	(30")
15"–24" Arch Equiv.	24" [21"]
30"–48" Arch Equiv.	27" (15") [24"]
54"–72" Arch Equiv.	30" (18") [27"]
78"–90" Arch Equiv.	(24") [30"]
96"–102" Arch Equiv.	(30")
CORRUGATED POLYETHYLENE	
15"–60" Round	15"
POLYVINYL CHLORIDE	
15"–36" Round	15"



UNPAVED

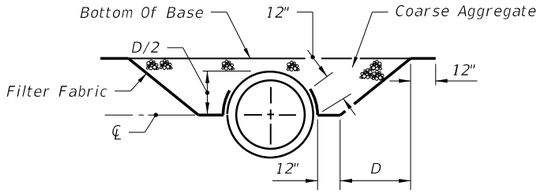
PIPE TYPE/SIZE & SHAPE	MINIMUM COVER	
	COMMERCIAL	NON-COMMERCIAL
CONCRETE (See Note 6)		
Round & Elliptical	12"	3"
CORRUGATED STEEL		
12"–30" Round	18" [15"]	12" [12"]
36"–48" Round	18" (12") [15"]	12" (12") [12"]
54"–72" Round	18" (12") [15"]	15" (12") [12"]
78"–96" Round	(18") [27"]	(12") [12"]
102" & Larger Round	24" [33"]	18" [21"]
15"–30" Arch Equiv.	18" [18"]	12" [12"]
36"–48" Arch Equiv.	24" (12") [21"]	18" (12") [15"]
54"–72" Arch Equiv.	30" (18") [24"]	24" (12") [18"]
78"–96" Arch Equiv.	(24") [27"]	(18") [21"]
102" & Larger Arch Equiv.	(30")	(24")
CORRUGATED ALUMINUM		
12"–24" Round	21" [21"]	15" [15"]
30"–48" Round	24" (18") [21"]	18" (12") [15"]
54"–72" Round	30" (24") [27"]	24" (18") [21"]
78"–102" Round	(30") [33"]	(24") [27"]
108" & Larger	36"	30"
15"–24" Arch Equiv.	27" [24"]	24" [21"]
30"–48" Arch Equiv.	33" (21") [27"]	27" (15") [21"]
54"–72" Arch Equiv.	36" (24") [30"]	30" (18") [24"]
78"–90" Arch Equiv.	(30") [36"]	(24") [30"]
96"–102" Arch Equiv.	(36")	(30")
CORRUGATED POLYETHYLENE		
15"–60" Round	21"	15"
POLYVINYL CHLORIDE		
15"–36" Round	21"	15"

MINIMUM COVER FOR CONCRETE, STEEL, ALUMINUM, POLYETHYLENE AND POLYVINYL CHLORIDE PIPE



The cost of furnishing and installing the extra base material shall be included in the cost of the culvert.

FRIABLE BASE



The coarse aggregate shall be placed in 6 inch lifts and compacted sufficiently as to be firm and unyielding. The coarse aggregate shall be gravel or stone meeting the requirements of Standard Specification Sections 901–2 or 901–3 respectively. The gradation shall meet Section 901–1.4, Grades 4, 467, 5, 56, or 57 unless restricted in the plans. The filter fabric shall be Type D–3 (See Index No. 199). The cost of furnishing and installing the coarse aggregate and filter fabric shall be included in the cost of the culvert.

ASPHALTIC CONCRETE BASE

Note: Extra material is required when cross culverts are located on facilities subject to high speed traffic (≥ 55 mph) or high traffic volumes (> 1600 ADT) and the cover is less than 12 inches for concrete pipe, 15 inches for corrugated steel pipe, and 18 inchesfor corrugated aluminum pipe, corrugated polyethylene and corrugated polyvinyl chloride pipe.

EXTRA MATERIAL FOR CROSS CULVERTS UNDER FLEXIBLE PAVEMENTS

GENERAL NOTES

1. The tabulated values are recommended minimum dimensions to withstand anticipated highway traffic loads. Additional cover may be required to support construction equipment loads or highway traffic loads before pavement is completed. Some size thickness combinations may require minimum cover greater than those listed above. See Sheets 2, 3, & 4.
2. Less than the tabulated minimum cover may be used provided suitable method(s) are detailed in the plans.
3. Values shown in parenthesis () are for 3" x 1" corrugations which must be specified to utilize the lesser cover.
4. The tabulated values in the brackets [] apply to Type 1–R (Spiral Rib) pipe which must be specified to utilize the lesser cover.
5. Commercial and noncommercial refers to typical vehicular utilization of unpaved roads and drives where rutting and cover displacement may occur.
6. For Pipe Class S with diameters of 12" to 30", the minimum height of fill measured from top of finished grade to outside top of pipe is 3 feet.

LAST REVISION	REVISION	DESCRIPTION:				
07/01/07			FDOT DESIGN STANDARDS 2013	COVER HEIGHT	INDEX NO. 205	SHEET NO. 1

ROUND PIPE DIMENSIONS

Equiv. Dia. (In.)	Area (Sq. Ft.)	Wall Thickness (In.)* CLASSES II, III, IV, V B WALL
12	0.8	2
15	1.2	2¼
18	1.8	2½
24	3.1	3
30	4.9	3½
36	7.1	4
42	9.6	4½
48	12.6	5
54	15.9	5½
60	19.6	6
66	23.8	6½
72	28.3	7
78	33.2	7½
84	38.5	8
90	44.4	8½
96	50.3	9
102	56.7	9½
108	63.7	10
114	70.9	—
120	78.5	—

* For Informational Purposes Only.
Do Not Specify Wall Thickness.
Option B Wall Is Industry Standard.

ELLIPTICAL PIPE DIMENSIONS

Nominal Dimensions				Equiv. Dia. (In.)	Area (Sq.Ft.)	Wall Thickness (In.)
Horiz.		Vert.				
Rise (In.)	Span (In.)	Rise (In.)	Span (In.)			Classes HE II, III, IV VE II, III, IV
NA	NA	NA	NA	12	NA	NA
12	18	18	12	15	1.3	2½
14	23	23	14	18	1.8	2¾
19	30	30	19	24	3.3	3¼
24	38	38	24	30	5.1	3¾
29	45	45	29	36	7.4	4½
34	53	53	34	42	10.2	5
38	60	60	38	48	12.9	5½
43	68	68	43	54	16.6	6
48	76	76	48	60	20.5	6½
53	83	83	53	66	24.8	7
58	91	91	58	72	29.5	7½
63	98	98	63	78	34.6	8
68	106	106	68	84	40.1	8½
72	113	113	72	90	46.1	9
77	121	121	77	96	52.4	9½
82	128	128	82	102	59.2	10
87	136	136	87	108	66.4	10½
92	143	143	92	114	74.0	11
97	151	151	97	120	82.0	11½

For Informational Purposes Only

ROUND PIPE INSTALLATIONS

PIPE DIAMETER	Maximum Height of Fill (ft.)					
	Class S	Class I	Class II	Class III	Class IV	Class V
12"–30"	9	13	17	24	36	55
36"–54"	8	12	16	22	34	52
60"–78"	7	11	15	21	33	51
84"–96"	6	10	14	20	32	49

Pipe Class S	D-Load=600 Lbs./Ft./Ft. (0.01" Crack) D-Load=900 Lbs./Ft./Ft. (Ultimate)
Pipe Class I	D-Load=800 Lbs./Ft./Ft. (0.01" Crack) D-Load=1200 Lbs./Ft./Ft. (Ultimate)
Pipe Class II	D-Load=1000 Lbs./Ft./Ft. (0.01" Crack) D-Load=1500 Lbs./Ft./Ft. (Ultimate)
Pipe Class III	D-Load=1350 Lbs./Ft./Ft. (0.01" Crack) D-Load=2000 Lbs./Ft./Ft. (Ultimate)
Pipe Class IV	D-Load=2000 Lbs./Ft./Ft. (0.01" Crack) D-Load=3000 Lbs./Ft./Ft. (Ultimate)
Pipe Class V	D-Load=3000 Lbs./Ft./Ft. (0.01" Crack) D-Load=3750 Lbs./Ft./Ft. (Ultimate)

Note: At the option of the pipe supplier or the contractor, a Pipe Class with greater strength may be substituted for the Pipe Class designated in the plans.

ELLIPTICAL PIPE INSTALLATIONS (All Sizes)

Installation	Maximum Height Of Fill (Ft.)	Pipe Class	Bedding Class
Horizontal	1–6* 7–10 11–16 17+	HE II* HE III HE IV Special Design	C C C Modified
Vertical	1–6* 7–10 11–16 17+	VE II* VE III VE IV Special Design	C C C Modified

Pipe Class HE II And VE II	D-Load=1000 Lbs./Ft./Ft. (0.01" Crack) D-Load=1500 Lbs./Ft./Ft. (Ultimate)
Pipe Class HE III And VE III	D-Load=1350 Lbs./Ft./Ft. (0.01" Crack) D-Load=2000 Lbs./Ft./Ft. (Ultimate)
Pipe Class HE IV And VE IV	D-Load=2000 Lbs./Ft./Ft. (0.01" Crack) D-Load=3000 Lbs./Ft./Ft. (Ultimate)

* Note: HE III and VE III pipe required for depths of cover less than 2' for 15", 18" and 24" equivalent.

PIPE DIMENSIONS CONCRETE PIPE

MAXIMUM COVER HEIGHTS CONCRETE PIPE

Note: Height of fill (maximum cover) is measured from top of finished grade to outside top of pipe.

POLYETHYLENE PIPE

DIAMETER	HEIGHT OF MAXIMUM FILL (Ft.)
12"–60"	17'

POLYVINYL CHLORIDE PIPE

DIAMETER	HEIGHT OF MAXIMUM FILL (Ft.)
12"–36"	17'

MAXIMUM COVER FOR PLASTIC PIPE

ROUND PIPE - 2⅔" x ½" CORRUGATION

D (In.)	Area (Sq. Ft.)	Maximum Height Of Fill (Ft.) Sheet Thickness In Inches (Gage) 0.064 (16)	0.079 (14)	0.109 (12)	0.138 (10)	0.168 (8)	Min. Cover (Ft.)
12	0.79	100+	100+	NA	NA	NA	See Sheet 1 of 6
15	1.23	100+	100+	NA	NA	NA	
18	1.77	100+	100+	100+	NA	NA	
21	2.40	100+	100+	100+	NA	NA	
24	3.14	100+	100+	100+	NA	NA	
30	4.91	85	100+	100+	NA	NA	
36	7.1	71+	88	100+	100+	NA	
42	9.6	60+	76	100+	100+	NA	
48	12.6	53	66	93	100+	100+*	
54	16.0	NS	59	82	100+	100+*	
60	19.6	NS	NS	74	95	100+*	
66	23.8	NS	NS	NS	87	100+*	
72	28.3	NS	NS	NS	79	97*	
78	33.2	NS	NS	NS	NS	90*	
84	38.5	NS	NS	NS	NS	83*	

ROUND PIPE - 3" x 1" CORRUGATION

D (In.)	Area (Sq. Ft.)	Maximum Height Of Fill (Ft.) Sheet Thickness In Inches (Gage) 0.064 (16)	0.079 (14)	0.109 (12)	0.138 (10)	0.168 (8)	Min. Cover (Ft.)
36	7.1	81	100+	100+	NA	NA	See Sheet 1 of 6
42	9.6	70	87	100+	NA	NA	
48	12.6	61	76	100+	100+	NA	
54	16.0	54	68	95	100+	NA	
60	19.6	48	61	85	100+	NA	
66	23.8	44	55	78	100	100+*	
72	28.3	40	51	71	91	100+*	
78	33.2	37	47	66	84	100+*	
84	38.5	35	43	61	78	100+*	
90	44.2	32	40	57	73	90*	
96	50.3	NS	38	53	68	84*	
102	56.7	NS	36	50	64	79*	
108	63.6	NS	NS	47	61	75*	
114	70.9	NS	NS	45	58	71*	
120	78.5	NS	NS	42	55	67*	
132	95.0	NS	NS	NS	50	61*	

ROUND PIPE - 5" x 1" CORRUGATION ③

D (In.)	Area (Sq. Ft.)	Maximum Height Of Fill (Ft.) Sheet Thickness In Inches (Gage) 0.064 (16)	0.079 (14)	0.109 (12)	0.138 (10)	0.168 (8)	Min. Cover (Ft.)
36	7.1	72	90	100+	NA	NA	See Sheet 1 of 6
42	9.6	62	77	100+	NA	NA	
48	12.6	54	68	95	100+	NA	
54	16.0	48	60	84	100+	NA	
60	19.6	43	54	76	98	NA	
66	23.8	39	49	69	89	100+*	
72	28.3	36	45	63	81	100*	
78	33.2	33	41	58	75	92*	
84	38.5	31	38	54	70	85*	
90	44.2	29	36	50	65	80*	
96	50.3	NS	34	47	61	75*	
102	56.7	NS	32	44	57	70*	
108	63.6	NS	NS	42	54	66*	
114	70.9	NS	NS	40	51	63*	
120	78.5	NS	NS	38	49	60*	
132	95.0	NS	NS	NS	44	54*	

Notes:

Increase the minimum cover values shown on Sheet 1 of 6 by 6" for gage and size combinations below the heavy lines.

Height of fill (maximum cover) is measured from top of finished grade to outside of pipe.

* Recorrugated end not available. May be considered for cross drain and side drain applications only.
NA–Not Available
NS–Not Suitable (For Highway H–20 or HS–20 Loadings)

① Limited availability of this product. Check availability before specifying (generally limited to 3" x 1" corrugation pipe arch fabricated from 60" and smaller diameter round pipe in 12 ga. and thicker material).

② 360° perforated pipe arch (french drain pipe) is not recommended. Do not specify without checking suitability and availability.

③ 5" x 1" corrugated pipe is currently not manufactured for the Florida market. Check availability before specifying.

PIPE ARCH: SPIRAL RIB: ¾"x¾"x7½" RIB SPACING
PIPE ARCH: SPIRAL RIB: ¾"X1"X11½" RIB SPACING
PIPE ARCH - 2⅔"x½" CORRUGATION

Span (In.)	Rise (In.)	Equiv. Round Pipe (In.)	Area (Ft.²)	Minimum Sheet Thickness Required (In.) (Ga.)	Maximum Height Of Fill (Ft.) Maximum Corner Pressure Lbs./Ft.² 4000	6000	Min. Cover (Ft.)
17	13	15	1.1	0.064 (16)	12	14	See Sheet 1 of 6
21	15	18	1.6	0.064 (16)	10	14	
24	18	21	2.2	0.064 (16)	7	13	
28	20	24	2.9	0.064 (16)	5	11	
35	24	30	4.5	0.064 (16)	NS	7	
42	29	36	6.5	0.064 (16)	NS	7	
49	33	42	8.9	0.079 (14)	NS	6	
57	38	48	11.6	0.109 (12)	NS	8	
64	43	54	14.7	0.109 (12)	NS	9	
71	47	60	18.1	0.138 (10)	NS	10	
77	52	66	21.9	0.168 (8)*	5	10	
83	57	72	26.0	0.168 (8)*	5	10	

PIPE ARCH-3" x 1" ①②③ and 5" x 1" ②③ CORR.

Span (In.)	Rise (In.)	Equiv. Round Pipe (In.)	Area (Ft.²)	Minimum Sheet Thickness Required (In.) (Ga.)	Maximum Height Of Fill (Ft.) Maximum Corner Pressure Lbs./Ft.² 4000	6000	Min. Cover (Ft.)
40	31	36	7.0	0.079 (14)	8	12	See Sheet 1 of 6
46	36	42	9.4	0.079 (14)	8	13	
53	41	48	12.3	0.079 (14)	8	13	
60	46	54	15.6	0.079 (14)	8	13	
66	51	60	19.3	0.079 (14)	9	13	
73	55	66	23.2	0.079 (14)	11	16	
81	59	72	27.4	0.079 (14)	11	17	
87	63	78	32.1	0.079 (14)	10	16	
95	67	84	37.0	0.079 (14)	11	17	
103	71	90	42.4	0.109 (12)	10	15	
112	75	96	48.0	0.109 (12)	10	16	
117	79	102	54.2	0.109 (12)	10	15	
128	83	108	60.5	0.138 (10)	9	14	
137	87	114	67.4	0.138 (10)	8	13	
142	91	120	74.5	0.168 (8)	7	12	

ROUND PIPE - SPIRAL RIB
RIB SPACING (¾"x¾"x7½") or (¾"x1"x11½")

D (In.)	Area (Sq. Ft.)	Maximum Height Of Fill (Ft.) Sheet Thickness In Inches (Gage) 0.064 (16)	0.079 (14)	0.109 (12)	0.138 (10)	0.168 (8)	Min. Cover (Ft.)
12	0.79	NA	NA	NA	NA	NA	See Sheet 1 of 6
15	1.23	NA	NA	NA	NA	NA	
18	1.77	68	72	NA	NA	NA	
21	2.40	58	62	100+	NA	NA	
24	3.14	51	72	100+	100+	NA	
30	4.91	41	58	97	100+	NA	
36	7.1	34	48	81	100+	NA	
42	9.6	29	41	69	100+	NA	
48	12.6	26	36	61	100+	NA	
54	16.0	23	32	54	91	NA	
60	19.6	NS	29	49	83	NA	
66	23.8	NS	26	44	74	NA	
72	28.3	NS	24	40	67	NA	
78	33.2	NS	NS	37	59	NA	
84	38.5	NS	NS	35	54	NA	
90	44.2	NS	NS	32	48	NA	
96	50.3	NS	NS	30	45	NA	
102	56.7	NS	NS	29	40	NA	
108	63.6	NS	NS	27 Ⓐ	36	NA	

Ⓐ = ¾" x 1" x 11½" Only

MAXIMUM COVER FOR CORRUGATED STEEL PIPE ROUND AND PIPE ARCH

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LAST REVISION	REVISION	DESCRIPTION:				
07/01/09			FDOT DESIGN STANDARDS 2013	COVER HEIGHT	INDEX NO. 205	SHEET NO. 3

ROUND PIPE - 2⅔" x ½" CORRUGATION

D (In.)	Area (Sq. Ft.)	Maximum Height Of Fill (Ft.) Sheet Thickness In Inches (Gage) 0.060 (16)	0.075 (14)	0.105 (12)	0.135 (10)	0.164 (8)	Min. Cover (Ft.)
12	0.8	90	100+	NA	NA	NA	See Sheet 1 of 6
15	1.2	72	90	NA	NA	NA	
18	1.8	59	75	100+	NA	NA	
21	2.4	52	65	92	NA	NA	
24	3.1	44	56	79	NA	NA	
30	4.9	35 DR	44	63	NA	NA	
36	7.1	NS	36 DR	52	68	NA	
42	9.6	NS	NS	44 DR	58	NA	
48	12.6	NS	NS	38 DR	50 DR	61	
54	15.9	NS	NS	34 DR	45 DR	54 DR	
60	19.6	NS	NS	NS	39 DR	49 DR	
66	23.8	NS	NS	NS	NS	44 DR	
72	28.3	NS	NS	NS	NS	40 DR	

ROUND PIPE - 3" x 1" CORRUGATION

D (In.)	Area (Sq. Ft.)	Maximum Height Of Fill (Ft.) Sheet Thickness In Inches (Gage) 0.060 (16)	0.075 (14)	0.105 (12)	0.135 (10)	0.164 (8)	Min. Cover (Ft.)
36	7.1	33	42	60	NA	NA	See Sheet 1 of 6
42	9.6	28	36	51	NA	NA	
48	12.6	24	31	45	58	NA	
54	15.9	21	28	39	51	NA	
60	19.6	19	24	35	46	NA	
66	23.8	15 DR	22	32	42	51	
72	28.3	NS	20 DR	29	38	47	
78	33.2	NS	15 DR	27	35	43	
84	38.5	NS	NS	24 DR	32	40	
90	44.2	NS	NS	23 DR	30	37	
96	50.3	NS	NS	21 DR	28 DR	34	
102	56.7	NS	NS	NS	26 DR	32	
108	63.6	NS	NS	NS	24 DR	30 DR	
114	70.9	NS	NS	NS	NS	28 DR	
120	78.5	NS	NS	NS	NS	27 DR	

ROUND PIPE - SPIRAL RIB
RIB SPACING (¾" x ¾" x 7½")

D (In.)	Area (Sq. Ft.)	Maximum Height Of Fill (Ft.) Sheet Thickness In Inches (Gage) 0.060 (16)	0.075 (14)	0.105 (12)	0.135 (10)	0.164 (8)	Min. Cover (Ft.)
12	0.79	NA	NA	NA	NA	NA	See Sheet 1 of 6
15	1.23	63 ①	87 ①	NA	NA	NA	
18	1.77	55	76	NA	NA	NA	
21	2.40	47	65	NA	NA	NA	
24	3.14	41	57	NA	NA	NA	
30	4.91	33 DR	45	73	NA	NA	
36	7.1	27 ④	38 DR	61	NA	NA	
42	9.6	NS	32 ④	52	NA	NA	
48	12.6	NS	NS	46	65	NA	
54	16.0	NS	NS	40 DR	57	NA	
60	19.6	NS	NS	36 ④	52	NA	
66	23.8	NS	NS	NS	47 DR	NA	
72	28.3	NS	NS	NS	43 ④	NA	
78	33.2	NS	NS	NS	39 ④	NA	
84	38.5	NS	NS	NS	34 ④	NA	
90	44.2	NS	NS	NS	30 ①③④	NA	
96	50.3	NS	NS	NS	27 ①③④	NA	

– Note:

Special installation required. Refer to AASHTO Standard Specifications for Highway Bridges or ASTM B788-88 and manufacturer's recommendations.

PIPE ARCH - 2⅔" x ½" CORRUGATION ②

Span (In.)	Rise (In.)	Equiv. Round Pipe (In.)	Area (Sq. Ft.)	Minimum Sheet Thickness Required (In.) (Ga.)	Maximum Height Of Fill (Ft.) Maximum Corner Pressure-Lbs./Sq.Ft. 4000	6000	Min. Cover (Ft.)
17	13	15	1.1	0.060 (16)	12	15	See Sheet 1 of 6
21	15	18	1.6	0.060 (16)	10	14	
24	18	21	2.2	0.060 (16)	7	13	
28	20	24	2.9	0.075 (14)	5	11	
35	24	30	4.5	0.075 (14)	NS	7	
42	29	36	6.5	0.105 (12)	NS	7	
49	33	42	8.9	0.105 (12)	NS	6	
57	38	48	11.6	0.135 (10)	NS	8	
64	43	54	14.7	0.135 (10)	NS	9	
71	47	60	18.1	0.164 (8)	NS	10	
77	52	66	21.9	0.164 (8)	NS	10	
83	57	72	26.0	0.164 (8)	NS	10	

PIPE ARCH - 3" x 1" CORRUGATION ①②

Span (In.)	Rise (In.)	Equiv. Round Pipe (In.)	Area (Sq. Ft.)	Minimum Sheet Thickness Required (In.) (Ga.)	Maximum Height Of Fill (Ft.) Maximum Corner Pressure-Lbs./Sq.Ft. 4000	6000	Min. Cover (Ft.)
40	31	36	7.0	0.060 (16)	8	12	See Sheet 1 of 6
46	36	42	9.4	0.060 (16)	8	13	
53	41	48	12.3	0.060 (16)	8	13	
60	46	54	15.6	0.075 (14)	8	13	
66	51	60	19.3	0.075 (14)	8	13	
73	55	66	23.2	0.105 (12)	11	16	
81	59	72	27.4	0.105 (12)	11	17	
87	63	78	32.1	0.105 (12)	10	16	
95	67	84	37.0	0.105 (12)	11	17	
103	71	90	42.4	0.135 (10)	10	15	
112	75	96	48.0	0.135 (10)	10	16	
117	79	102	54.2	0.164 (8)	10	15	

PIPE ARCH - SPIRAL RIB
RIB SPACING (¾" x ¾" x 7½")

Span (In.)	Rise (In.)	Equiv. Round Pipe (In.)	Area (Sq. Ft.)	Minimum Sheet Thickness Required (In.) (Ga.)	Maximum Height Of Fill (Ft.) Maximum Corner Pressure-Lbs./Sq.Ft. 4000	6000	Min. Cover (Ft.)
16	14	15	1.2	0.060 (16)	12	13	See Sheet 1 of 6
20	16	18	1.7	0.060 (16)	10	12	
23	19	21	2.3	0.060 (16)	7	11	
27	21	24	3.0	0.060 (16)	5	10	
33	26	30	4.7	0.075 (14)	NS	9	
40	31	36	7.0	0.075 (14)	NS	8	
46	36	42	9.4	0.105 (12)	NS	8	
53	41	48	12.3	0.105 (12)	NS	8	
60	46	54	15.6	0.105 (10)	NS	8	
66	51	60	19.3	0.135 (10)	NS	8	
73	55	66	23.2	0.135 (10) ④	NS	8	
81	59	72	27.4	0.135 (10) ④	NS	8	

MAXIMUM COVER FOR CORRUGATED ALUMINUM ALLOY ROUND PIPE AND PIPE ARCH

Notes:

Increase the minimum cover values shown on Sheet 1 of 6 by 6" for gage and size combinations below the heavy lines.

Height of fill (maximum cover) is measured from top of finished grade to outside top of pipe.

NA– Not Available

NS– Not Suitable (For Highway H-20 or HS-20 Loadings)

DR– Design Review is recommended for each specific application. The review should identify any special handling, installation, backfill procedures, and construction load restrictions which may be required. (The review performed by the designer does not relieve the contractor from analyzing and taking any necessary precautions required to protect partially or completely constructed pipe from the equipment used during construction.)
(NOTE: The DESIGNER may use a thicker gage in lieu of the Design Review.)

① *Limited availability of this product. Check availability before specifying.*

② *360° perforated pipe (french drain pipe) is not recommended in the pipe arch shape. Do not specify without checking both for suitability and availability.*

③ *This size and gage combination must be strutted during installation per manufacturer's recommendations. Extra care will be required during handling and installation.*

④ *Use of this size and gage combination must be approved by the State Drainage Engineer.*

Aluminum Structural Plate
Height of Cover Limits*
Combination Metal Thickness, Reinforcing Rib Type, and Rib Spacing
Arch Shape- HS 20 Live Load

Span (Ft.-In.)	Rise (Ft.-In.)	Area (Sq.Ft.)	Minimum Height of Cover (Ft.) 1.00	1.50	2.00	2.50	3.00	3.50
5-0	1-9 2-3 2-7	7 9 10	0.125 (45)	0.100 (31)	0.100 (31)	0.100 (31)	0.100 (31)	0.100 (31)
6-0	1-10 2-4 2-9 3-2	8 10 13 15	0.125-II-18 (37)	0.100 (25)	0.100 (25)	0.100 (25)	0.100 (25)	0.100 (25)
7-0	2-4 2-10 3-3 3-8	12 15 18 20	0.125-II-18 (32)	0.100 (22)	0.100 (22)	0.100 (22)	0.100 (22)	0.100 (22)
8-0	2-11 3-4 4-2	17 20 26	0.125-II-9 (28)	0.150 (37)	0.100 (19)	0.100 (19)	0.100 (19)	0.100 (19)
9-0	2-11 3-10 4-8	19 26 33	0.125-IV-9 (25)	0.125-II-18 (25)	0.100 (17)	0.100 (17)	0.100 (17)	0.100 (17)
10-0	3-6 4-5 5-2	25 33 41	0.125-IV-9 (22)	0.125-II-18 (22)	0.125 (22)	0.100 (15)	0.100 (15)	0.100 (15)
11-0	3-6 4-6 5-8	28 37 50	0.175-IV-9 (32)	0.125-II-18 (20)	0.125-II-27 (20)	0.100 (14)	0.100 (14)	0.100 (14)
12-0	4-1 5-0 6-3	35 45 59		0.125-IV-18 (18)	0.125-II-27 (18)	0.125 (18)	0.100 (12)	0.100 (12)
13-0	4-1 5-1 5-11 6-9	38 49 59 70		0.150-IV-18 (23)	0.125-II-27 (17)	0.150 (23)	0.100 (11)	0.100 (11)
14-0	4-8 5-7 6-5 7-3	47 58 70 81		0.125-IV-9 (16)	0.125-IV-27 (16)	0.125-II-27 (16)	0.100 (11)	0.100 (11)
15-0	4-8 5-8 6-7 7-5 7-9	50 63 75 87 93		0.125-IV-9 (15)	0.125-IV-27 (15)	0.125-II-27 (15)	0.125 (15)	0.125 (15)
16-0	5-3 6-2 7-1 7-11 8-3	60 73 86 99 105		0.150-IV-9 (18)	0.125-IV-18 (14)	0.125-II-27 (14)	0.150 (18)	0.125 (14)
17-0	5-3 6-3 7-2 8-0 8-10	64 78 92 105 119		0.225-IV-9 (27)	0.150-IV-18 (17)	0.125-II-27 (13)	0.175 (20)	0.150 (17)
18-0	5-9 6-9 7-8 8-6 8-11	75 90 105 119 126			0.175-IV-18 (19)	0.125-IV-27 (12)	0.200 (22)	0.175 (19)
19-0	6-4 7-4 8-2 9-0 9-5	87 103 118 133 141			0.125-IV-9 (11)	0.125-IV-27 (11)	0.125-IV-54 (11)	0.125-IV-54 (11)

Aluminum Structural Plate
Height of Cover Limits*
Combination Metal Thickness, Reinforcing Rib Type, and Rib Spacing
Round Shape- HS 20 Live Load

Diameter (Ft.-In.)	Area (Sq. Ft.)	Minimum Height of Cover (Ft.) 1.00	1.50	2.00	2.50	3.00	3.50
5-0	19	0.125 (45)	0.100 (31)	0.100 (31)	0.100 (31)	0.100 (31)	0.100 (31)
5-6 6-0	23 28	0.125-II-18 (37)	0.100 (25)	0.100 (25)	0.100 (25)	0.100 (25)	0.100 (25)
6-6 7-0	32 38	0.125-II-18 (32)	0.100 (22)	0.100 (22)	0.100 (22)	0.100 (22)	0.100 (22)
7-6 8-0	44 50	0.125-II-9 (28)	0.150 (37)	0.100 (19)	0.100 (19)	0.100 (19)	0.100 (19)
8-6 9-0	56 63	0.125-IV-9 (25)	0.125-II-18 (25)	0.100 (17)	0.100 (17)	0.100 (17)	0.100 (17)
9-6 10-0	71 79	0.125-IV-9 (22)	0.125-II-18 (22)	0.125 (22)	0.100 (15)	0.100 (15)	0.100 (15)
10-6 11-0	87 95	0.175-IV-9 (32)	0.125-II-18 (20)	0.125-II-27 (20)	0.100 (14)	0.100 (14)	0.100 (14)
11-6 12-0	104 114		0.125-IV-18 (18)	0.125-II-27 (18)	0.125 (18)	0.100 (12)	0.100 (12)
12-6 13-0	124 134		0.150-IV-18 (23)	0.125-II-27 (17)	0.150 (23)	0.125 (17)	0.125 (17)
13-6 14-0	145 156		0.125-IV-9 (16)	0.125-IV-27 (16)	0.125-II-27 (16)	0.150 (21)	0.150 (21)
14-6 15-0	167 179		0.125-II-54 (15)	0.125-IV-9 (15)	0.125-IV-27 (15)	0.125-II-27 (15)	0.125-II-54 (15)
15-6 16-0	191 204		0.150-IV-9 (18)	0.125-IV-18 (14)	0.125-II-27 (14)	0.150-II-54 (18)	0.150-II-54 (18)
16-6 17-0	217 231		0.225-IV-9 (27)	0.150-IV-18 (17)	0.150-II-27 (17)	0.150-II-27 (17)	0.150-II-27 (17)
17-6 18-0	245 259			0.175-IV-18 (19)	0.175-II-27 (19)	0.175-II-27 (19)	0.175-II-27 (19)
18-6 19-0	274 289			0.175-IV-9 (18)	0.175-IV-27 (18)	0.175-II-27 (18)	0.175-II-27 (18)
19-6	305			0.200-IV-9 (20)	0.200-IV-27 (20)	0.200-II-27 (20)	0.200-II-27 (20)

* Number in ( ) below combination indicates maximum cover for the given combination plate thickness, rib type and rib spacing. All maxium cover depths are given in feet. (See Note Number 2 Under Structural Plate Notes Sheet 6 of 6).

MINIMUM AND MAXIMUM COVER FOR ALUMINUM STRUCTURAL PLATE

Aluminum Structural Plate
Height of Cover Limits*
Combination Metal Thickness, Reinforcing Rib Type, and Rib Spacing
Underpass Shape- HS 20 Live Load

Span (Ft.-In.)	Rise (Ft.-In.)	Area (Sq.Ft.)	Minimum Height of Cover (Ft.) 1.00	1.50	2.00	2.50	3.00	3.50
6–1	5–9	28	0.125–II–18 (29)	0.100 (25)	0.100 (25)	0.100 (25)	0.100 (25)	0.100 (25)
6–3 6–3 6–2 6–4 6–3 6–5	6–1 6–5 6–11 7–3 7–9 8–1	30 32 34 37 39 42	0.125–II–18 (25)	0.100 (22)	0.100 (22)	0.100 (22)	0.100 (22)	0.100 (22)
12–1	11–0	106		0.125–IV–18 (14)	0.125–II–27 (14)	0.125 (14)	0.100 (12)	0.100 (12)
12–10 13–0	11–2 12–0	114 124		0.150–IV–18 (13)	0.125–II–27 (13)	0.150 (13)	0.125 (13)	0.125 (13)
13–8 14–0	12–4 12–11	133 143		0.125–IV–9 (12)	0.125–IV–27 (12)	0.125–II–27 (12)	0.125–II–54 (12)	0.125–II–54 (12)
14–6 14–8	13–5 14–1	155 165		0.125–IV–9 (11)	0.125–IV–27 (11)	0.125–II–27 (11)	0.125–II–54 (11)	0.125–II–54 (11)
15–5 15–6	14–5 15–2	177 190		0.150–IV–9 (11)	0.125–IV–18 (11)	0.125–II–27 (11)	0.125–II–27 (11)	0.125–II–2 (11)
16–2 16–6 16–8	15–6 16–0 16–4	200 208 215		0.225–IV–9 (10)	0.150–IV–18 (10)	0.150–II–27 (10)	0.150–II–27 (10)	0.150–II–27 (10)

Aluminum Structural Plate
Height of Cover Limits*
Combination Metal Thickness, Reinforcing Rib Type, and Rib Spacing
Pipe-Arch Shape- HS 20 Live Load

Span (Ft.-In.)	Rise (Ft-In)	Area (Sq-Ft)	Minimum Height of Cover (Ft.) 1.00	1.50	2.00	2.50	3.00	3.50
6–7 6–11	5–8 5–9	30 32	0.125–II–18 (25)	0.100 (22)	0.100 (22)	0.100 (22)	0.100 (22)	0.100 (22)
7–3 7–9 8–1	5–11 6–0 6–1	34 37 39	0.125–IV–18 (22)	0.150 (22)	0.100 (19)	0.100 (19)	0.100 (19)	0.100 (19)
8–5 8–10	6–3 6–4	42 45	0.125–IV–9 (19)	0.125–II–18 (19)	0.100 (17)	0.100 (17)	0.100 (17)	0.100 (17)
9–3 9–7 9–11	6–5 6–6 6–8	47 50 53	0.125–IV–9 (17)	0.125–II–18 (17)	0.125 (17)	0.100 (15)	0.100 (15)	0.100 (15)
10–3 10–9 11–1	6–9 6–10 7–0	56 58 61	0.175–IV–9 (16)	0.125–II–18 (16)	0.125–II–27 (16)	0.100 (14)	0.100 (14)	0.100 (14)
11–5 11–9	7–1 7–2	64 68		0.125–II–18 (14)	0.125–II–27 (14)	0.125 (14)	0.100 (12)	0.100 (12)
12–3 12–7 12–11 13–1 13–1	7–3 7–5 7–6 8–2 8–4	71 74 77 83 87		0.150–IV–18 (13)	0.125–II–27 (13)	0.150 (13)	0.100 (11)	0.100 (11)
13–11 14–0 13–11	8–5 8–7 9–5	90 94 102		0.125–IV–9 (12)	0.125–IV–27 (12)	0.125–II–27 (12)	0.100 (11)	0.100 (11)
14–3 14–8 14–11	9–7 9–8 9–10	106 110 114		0.125–IV–9 (11)	0.125–IV–27 (11)	0.125–II–27 (11)	0.125 (11)	0.125 (11)
15–4 15–7 16–1	10–0 10–2 10–4	119 123 128		0.150–IV–9 (11)	0.125–IV–18 (11)	0.125–II–27 (11)	0.125–II–54 (11)	0.125 (11)
16–4	10–6	132		0.225–IV–9 (10)	0.150–IV–18 (10)	0.125–II–27 (10)	0.125–II–54 (10)	0.125–II–54 (10)

* Number in ( ) below combination indicates maximum cover for the given combination plate thickness, rib type and rib spacing. All maximum cover depths are given in feet. (See Note Number 2 Under Structural Plate Notes)

ALUMINUM STRUCTURAL PLATE NOTES

1. Allowable cover (minimum & maximum) is measured from the outside valley of crown plate to the bottom of flexible pavement or from the outside valley of the crown plate to the top of rigid pavement. Minimum cover must be maintained in unpaved areas. Maximum cover is measured at the highest fill and/or the highest pavement elevation.

2. To find the minimum material requirements for the aluminum structural plate structure:
   a. Select the span in the left hand column that is equal to or larger than structure size required.

   b. Select the cover in the top row that is equal to or smaller than that required for the site.

   c. Intersect appropriate span and cover to find the appropriate plate.
   Example: Round Pipe, Span= 17'–0", Height of Cover= 2'–7" (use 2.5 ft. in table). Ans: 0.150–II–27 (17)
   The table selections show metal thickness, rib type, rib spacing and maximum cover.
   Example: 0.150–II–27=0.150" thick plate structure with Type II rib at 27" on centers on the crown.
   Number (17) in parenthesis below combination indicates maximum cover in feet for the given combination of plate thickness, rib type, and rib spacing.

3. Arch shapes shown are single radius and have a rise–to–span ratio of 0.30 to 0.53 Structures with rise–to–span ratios of less than 0.30 are typically not used because of structural considerations.

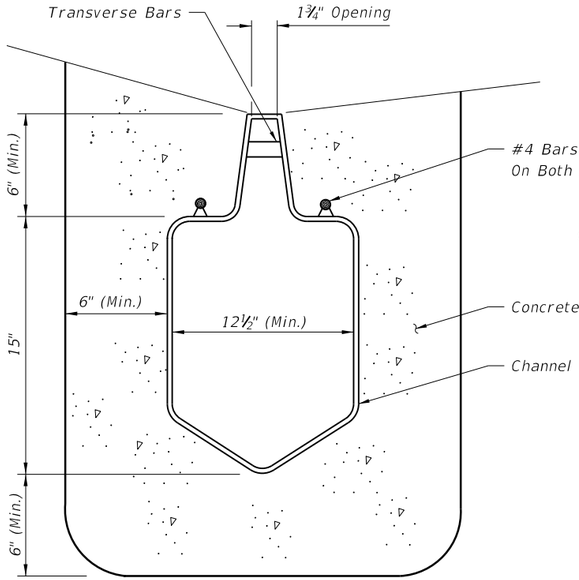
4. Tables based on HS 20 wheel loads.

DESIGN NOTES

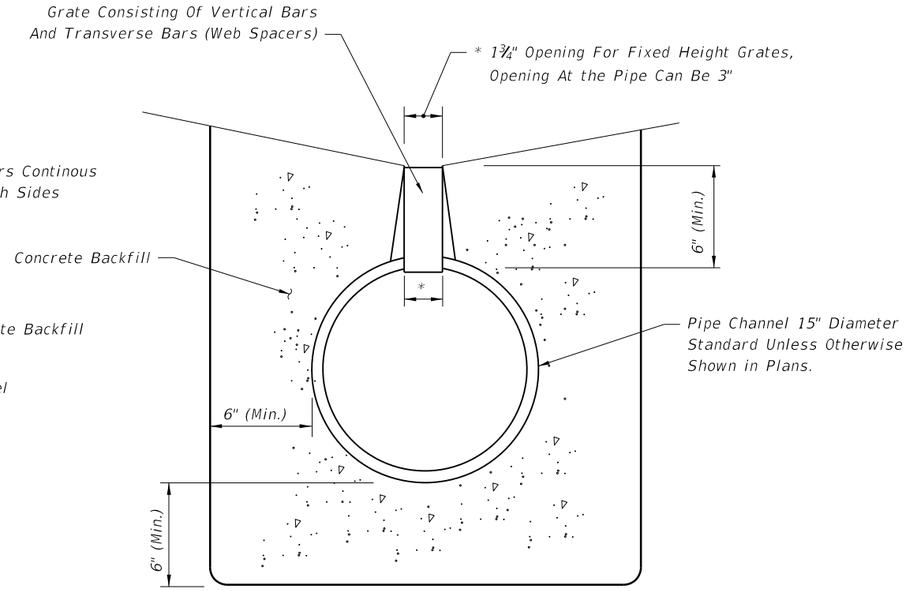
1. The plans must call out size, metal thickness, reinforcing rib type and rib spacing.

2. Pipe–arch and underpass shapes will generate high corner bearing pressures against the sidefill and foundation. The height of cover is directly affected by these bearing pressures. The surrounding soil and foundation must be checked to ensure that they to react against these pressures to avoid inducing excessive strain in plate.

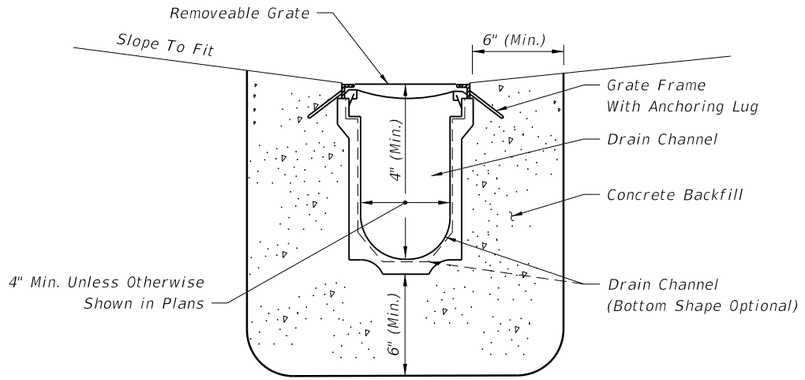
MINIMUM AND MAXIMUM COVER FOR ALUMINUM STRUCTURAL PLATE



PREFORMED POLYETHYLENE ALTERNATE



ROUND ALTERNATE



PREFORMED CHANNEL WITH REMOVABLE GRATE

SEE SHEET 2 FOR TYPICAL LOCATIONS

TYPE I (NON-REMOVABLE GRATE)

GENERAL NOTES

1. Trench drain is intended for use in gutters and driveways as shown on the typical locations on Sheet 2. Type I is intended for use in Type E, F and drop curbing, and adjacent to traffic separators and standard barrier walls. The width of the channel grate for Type I Trench Drain shall be 1¾" throughout varying the depth of the channel neck. Type II may also be used in those locations if an independent laboratory certifies that the grating used has an open area equal to at least 0.27 square feet per linear foot. Type II is primarily intended for use in valley gutter across driveway openings and drop curbing; Type I may also be used in those locations. The width of the channel grate for Type II Trench Drain shall be the same as the width of the channel. The linear slope or gradient for Type II may be manufactured by varying the depth of the channel. Trench Drain shall not be placed in pedestrian paths unless ADA compliant grates are used.

2. Unless shown in the plans, outlet pipes and preformed channel inverts shall be sloped 0.6% or steeper toward the outlet regardless of the surface slope.

3. Trench drain may be stubbed directly into drainage structures, or outlet pipes may be used to connect trench drain to drainage structures.

4. A cleanout port compatible with the manufactured system shall be provided for Type I drains at the upstream end and at intervals not to exceed 50 feet. The cleanout port shall provide an opening 6" to 10" wide (transverse to the trench drain length) and 18" to 24" long. Where cleanouts are placed adjacent to raised curb or separator, the curb or separator shall be formed around the cleanout. The cleanout shall have a removable load resistant cover or grate.

5. Trench excavation must allow for a minimum of 6" of concrete to be placed under and alongside the trench drain channel system. Concrete backfill shall meet the requirements of Section 347 of the Standard Specifications. At the end of all units (Type I or II), the concrete backfill shall extend 6" minimum past the end of the drain opening.

6. Transverse bars for Type I Trench Drain shall be spaced 4" to 6" on center.

7. Whenever the work disturbs existing conditions or work already completed, restore the same to its original condition in every detail. All such repair and replacement shall meet the approval of the Engineer.

8. Payment to be made under the contract unit price for Trench Drain, LF.

SEE SHEET 2 FOR TYPICAL LOCATIONS

TYPE II

DESIGN NOTES

1. Where placed adjacent to reinforced concrete barrier wall or median barrier wall, the designer shall detail in the plans the position of the drain relative to the barrier wall to avoid conflicts with the barrier wall footing. See Index No. 410.

2. The designer shall identify the following in the plans:

   (a) The type of drain at each location.

   (b) The begin and end locations of the Trench Drain.

   (c) The location of the outlet pipe if the Trench Drain is not stubbed directly into a drainage structure.

   (d) The design flow (Q) for the Trench Drain must be shown on the plans.

3. Capture efficiency for Type I Trench Drain may be computed using the equations for slotted drain in FHWA's HEC 12 & 22. Grate Type I and Type II must have at least 30% open area.

4. Round pipe alternate is available in 12, 18, 24 and 36 inch.

5. Type II Preformed Channel with integral anchoring lugs are applicable.

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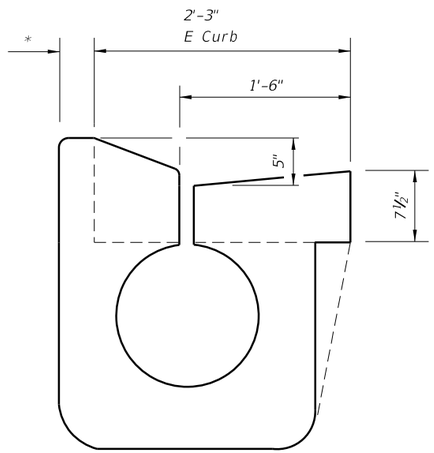
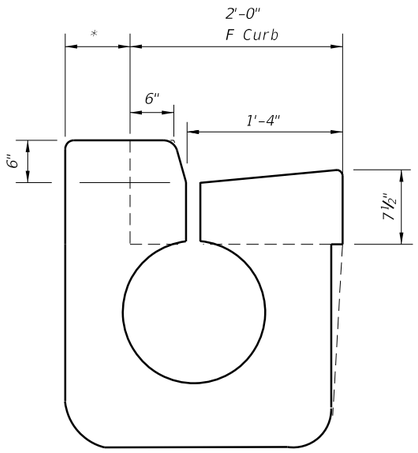
LAST REVISION	REVISION	DESCRIPTION:	FDOT DESIGN STANDARDS 2013	TRENCH DRAIN	INDEX NO.	SHEET NO.
07/01/10					206	1



WITHIN TYPE E CURB



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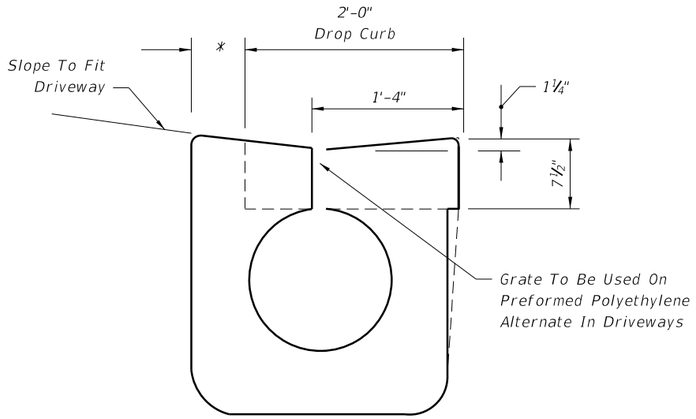
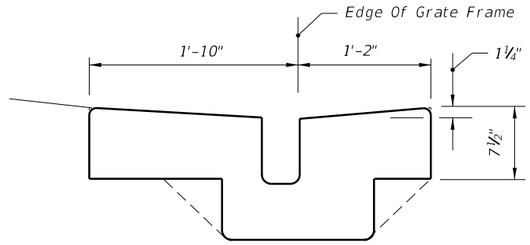
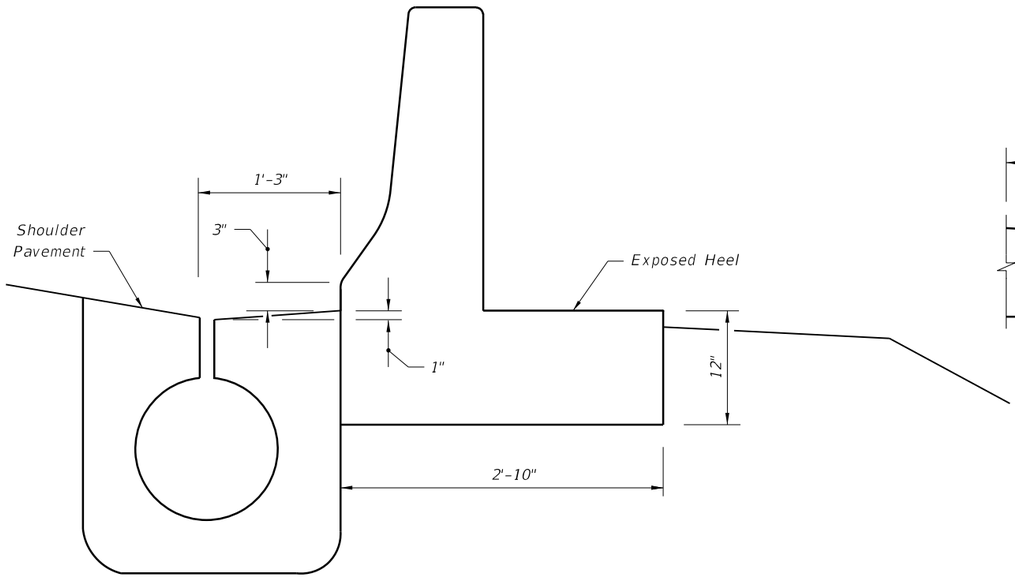


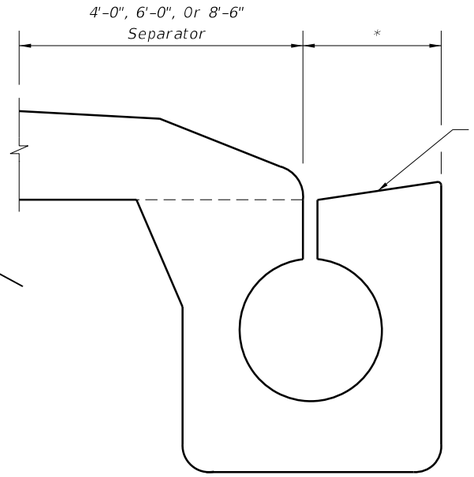
WITHIN DROP CURB



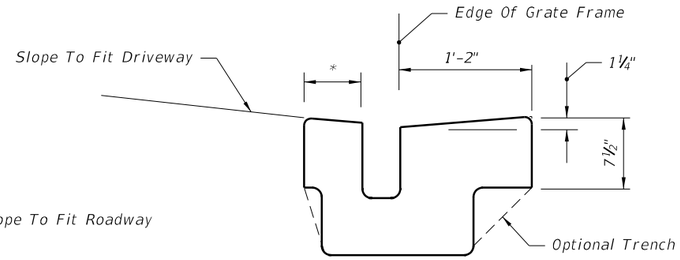
WITHIN VALLEY GUTTER



ADJACENT TO SHOULDER BARRIER WALL



ADJACENT TO TRAFFIC SEPARATOR



WITHIN DROP CURB

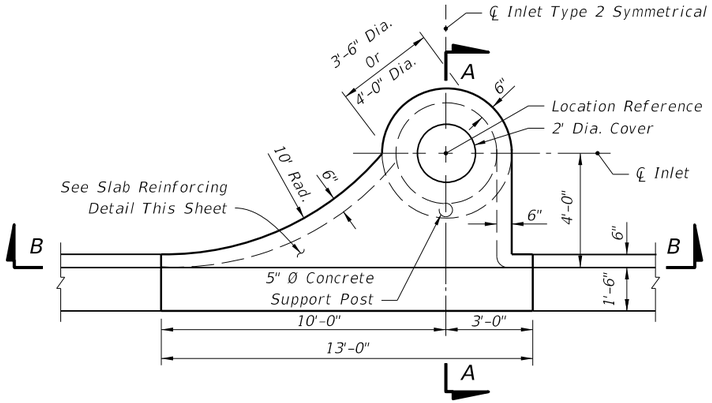
TYPICAL LOCATIONS FOR TYPE II

* As Necessary To Provide 6" Of Concrete
On This Side Of Drain

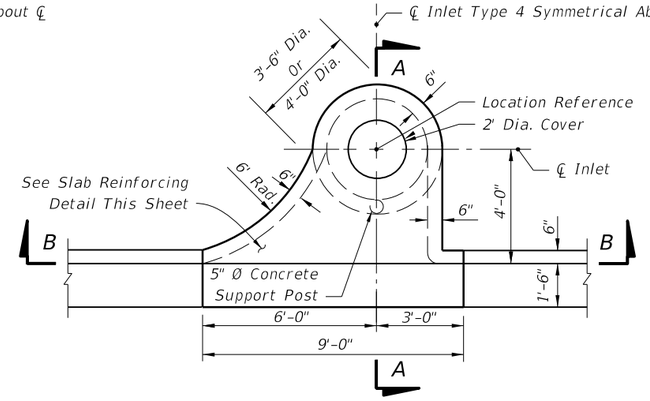
ROUND PIPE ALTERNATE SHOWN, BUT PREFORMED POLYETHYLENE ALTERNATE ACCEPTABLE

TYPICAL LOCATIONS FOR TYPE I

LAST REVISION	REVISION	DESCRIPTION:			INDEX NO.	SHEET NO.
04			FDOT DESIGN STANDARDS 2013	TRENCH DRAIN	206	2



PLAN (INLET TYPE 2 SYMMETRICAL ABOUT ℄)



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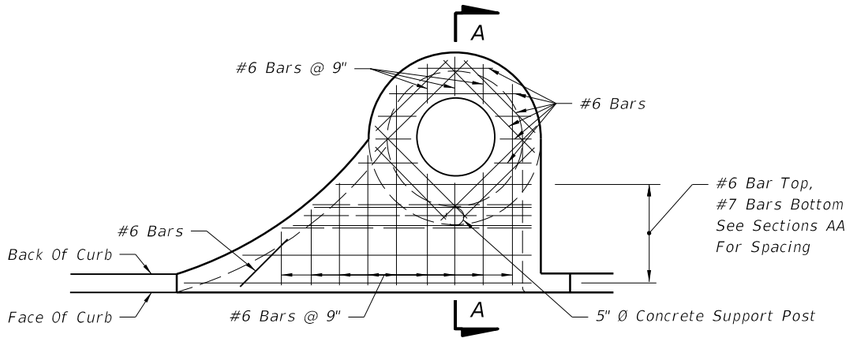
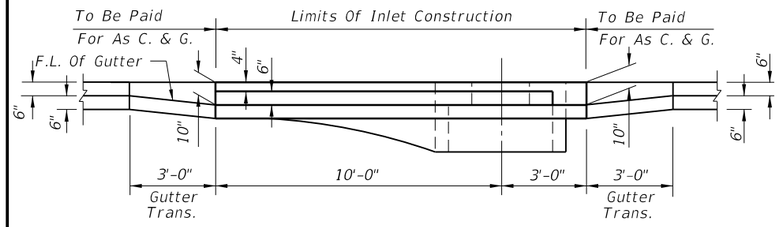
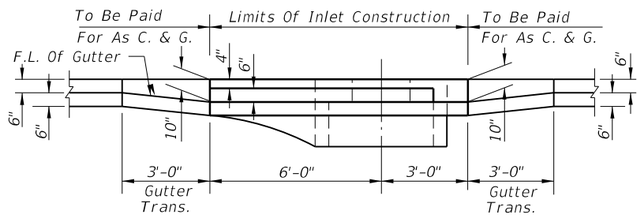


INLETS TYPES 1 AND 3



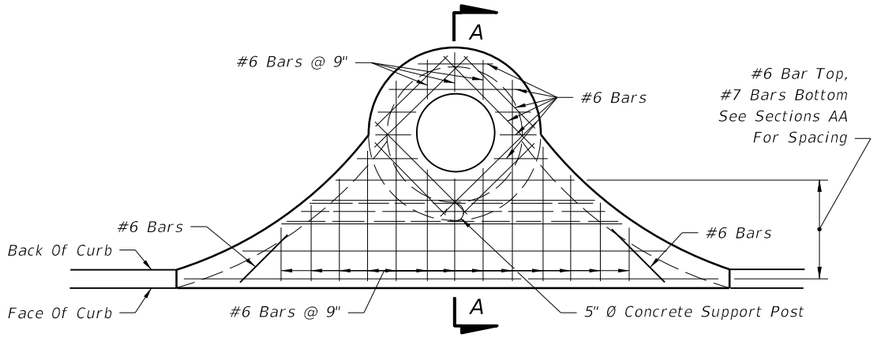
SECTION BB (INLET TYPE 2 SYMMETRICAL ABOUT ℄)



SECTION BB (INLET TYPE 4 SYMMETRICAL ABOUT ℄)

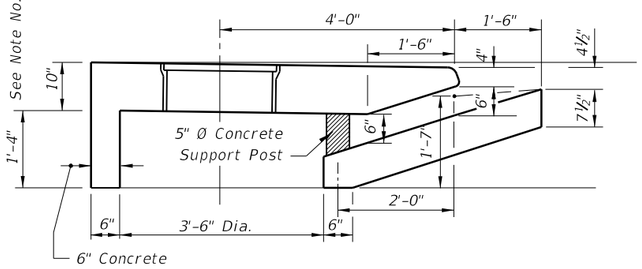
INLETS TYPES 1 AND 2

INLETS TYPES 3 AND 4

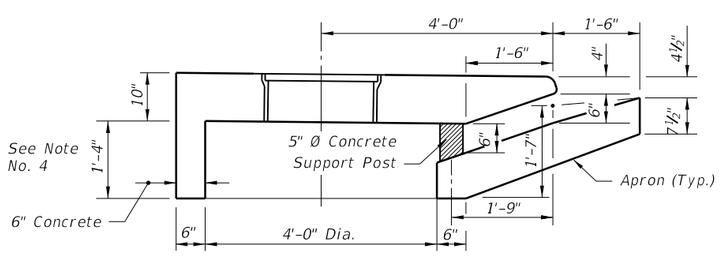


INLETS TYPES 2 AND 4

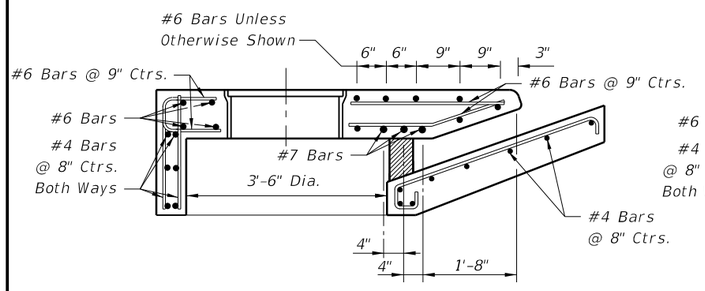
SLAB REINFORCING



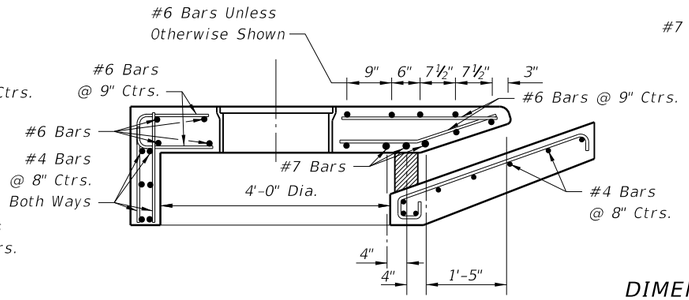
DIMENSIONAL SECTION



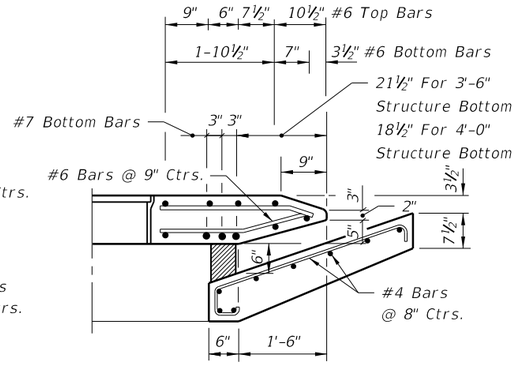
DIMENSIONAL SECTION



REINFORCING SECTION
3'-6" DIA. STRUCTURE BOTTOM (SECTION AA)



REINFORCING SECTION
4'-0" DIA. STRUCTURE BOTTOM (SECTION AA)



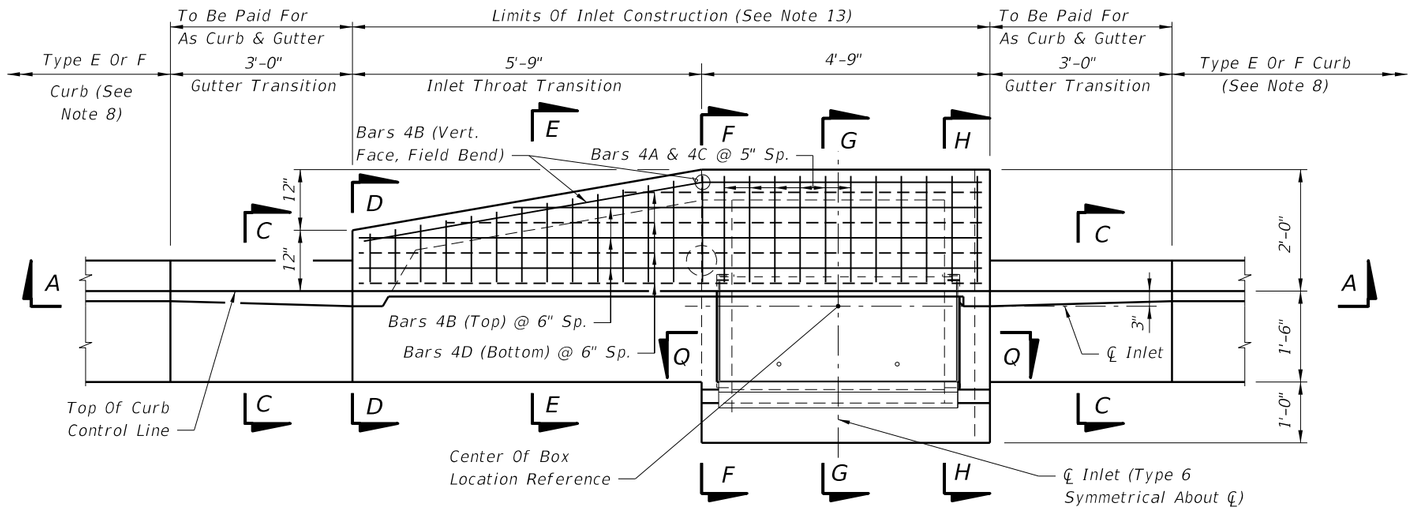
DIMENSION & REINFORCING HALF SECTION
TYPES A & E CURB (HALF SECTION AA)
(TYPE E GUTTER SHOWN)

TRANSVERSE SECTIONS FOR INLETS TYPES 1, 2, 3 & 4

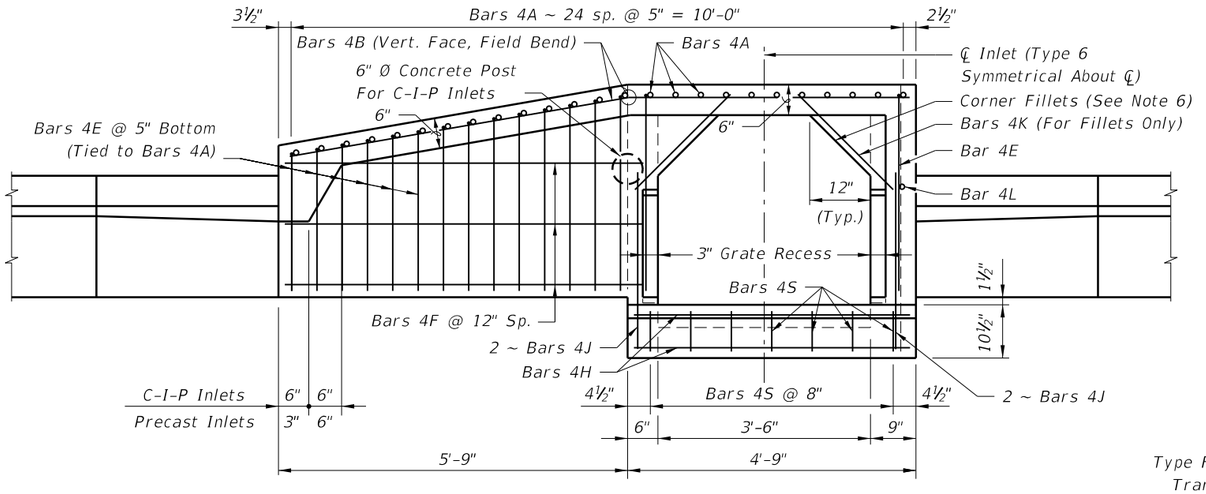
GENERAL NOTES

1. The finished grade and slope of the inlet tops are to conform with the finished cross slope and grade of the proposed sidewalk and/or border.
2. When inlets are to be constructed on a curve, refer to the plans to determine the radius and, where necessary, modify the inlet details accordingly. Bend steel when necessary.
3. All steel in inlet top shall have 1¼" minimum cover unless otherwise shown. Inlet tops shall be either cast-in-place or precast concrete.
4. For precast units the rear wall and apron may be precast as a separate piece from the top slab. Provide a minimum of 7 ~ #4 dowels in accordance with Index No. 201 "OPTIONAL CONSTRUCTION JOINTS".
5. For supplemental details see Index No. 201.
6. Only round concrete support post will be acceptable.
7. These inlets are designed for use with standard curb and gutter Types E and Type F. Locate inlet outside of pedestrian crosswalks.
8. For structure bottoms see Index No. 200.
9. Inlet to be paid for under the contract unit price for inlets (Curb) (Type_), Each.

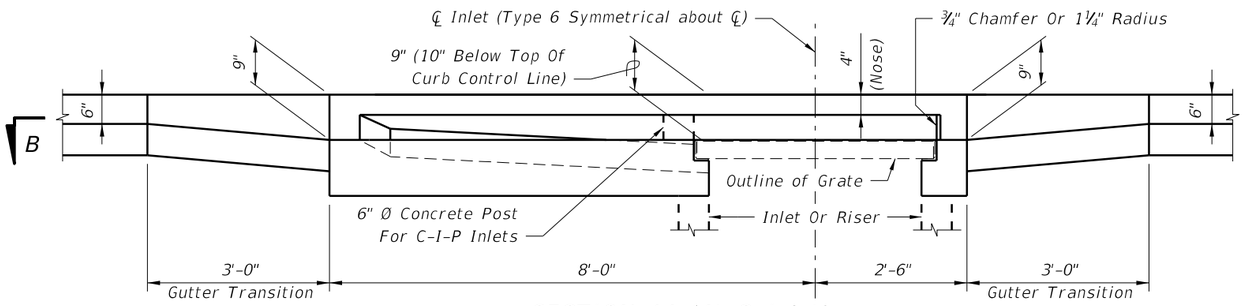
LAST REVISION	REVISION	DESCRIPTION:				
07/01/09			FDOT DESIGN STANDARDS 2013	CURB INLET TOPS TYPES 1, 2, 3 AND 4	INDEX NO. 210	SHEET NO. 1



TOP VIEW



SECTION BB

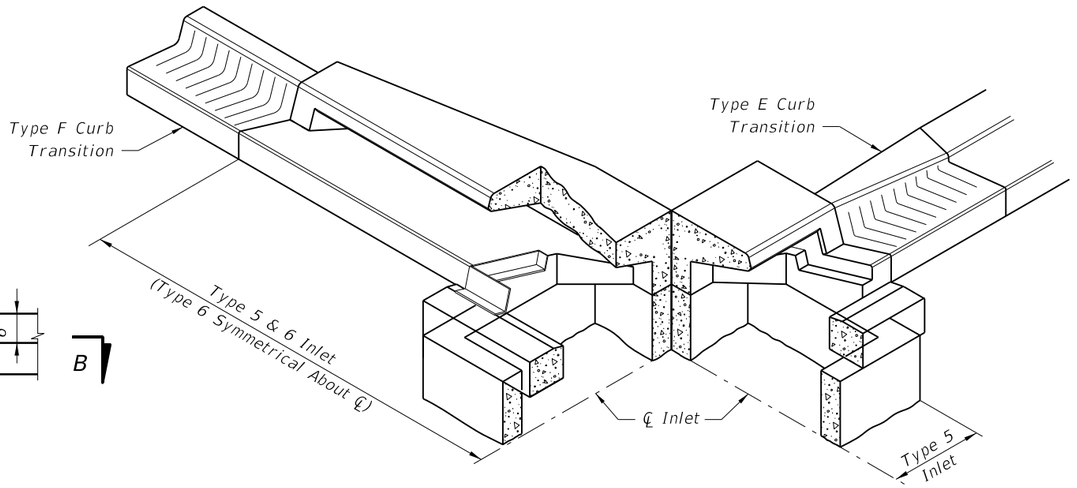


SECTION AA (At ℄ Inlet)

INLET TYPE 5 (Curb Inlet Type 6 Symmetrical With Left Half)

GENERAL NOTES

1. The finished grade and slope of the inlet tops are to conform with the finished cross slope and grade of the proposed sidewalk and/or border.
2. For inlets constructed on a curve, refer to the plans to determine the radius, and modify the inlet details accordingly. Bend steel when necessary.
3. All reinforcing steel to be Grade 60 bars with 1¼" minimum cover unless otherwise shown, see Sheet 4 for equivalent area Welded Wire Reinforcement details.
4. Inlet tops shall be either cast-in-place or precast concrete. Precast units shall conform to the dimensions shown or in accordance with approved shop drawing's. Request for shop drawing approval shall be directed to the State Drainage Engineer.
5. Concrete meeting the requirements of ASTM C478 (4,000 psi) may be used in lieu of Class II concrete for precast units, manufactured in plants which meet the requirements of Section 449 of the Specifications.
6. Corner fillets are required at inlet opening for precast units or C-I-P units used in conjunction with circular inlet bottoms or skewed rectangular inlet boxes. Finish top of fillets flush with drain throat bottom and match slope.
7. For inlet bottoms see Index No. 200. Inlet tops are to be used with Type P bottoms, or Type J bottoms with 3'-6" square (Type B), 3'-6" or 4' round (Type A) risers or top slab openings.
8. These inlet tops are designed for use with standard curb and gutter Type E and Type F. Locate inlet outside of pedestrian crosswalks. For Type E curb, transition the shape of the curb over the gutter transition length to match the face of the inlet (Type F).
9. See Index No. 201 for supplemental details.
10. All steel used for frame and grate shall meet the requirements of ASTM A36/A36M.
11. Either cast iron grates or steel grates may be used.
12. When Alternate "G" grate is specified in the plans either the cast iron grate and galvanized steel frame or the the galvanized steel grate and frame must be used. Grates are to be grouted in accordance with the grouting detail shown on Sheet 5, in lieu of tack welding.
13. Inlet to be paid for under the contract unit price for Inlets (Curb) (Type _), Each.



SKETCH SHOWING FRAME SEAT AND THROAT RECESS

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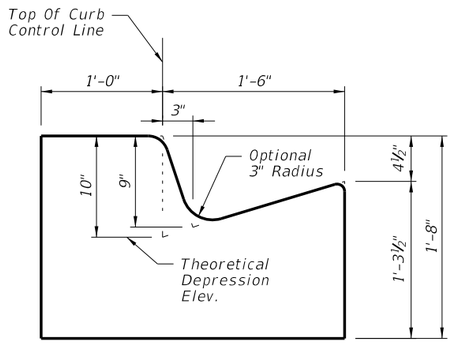
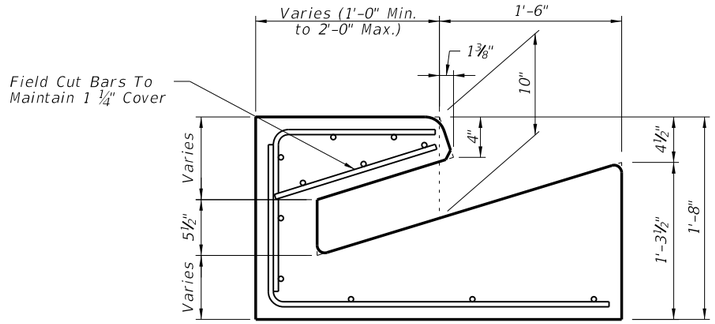
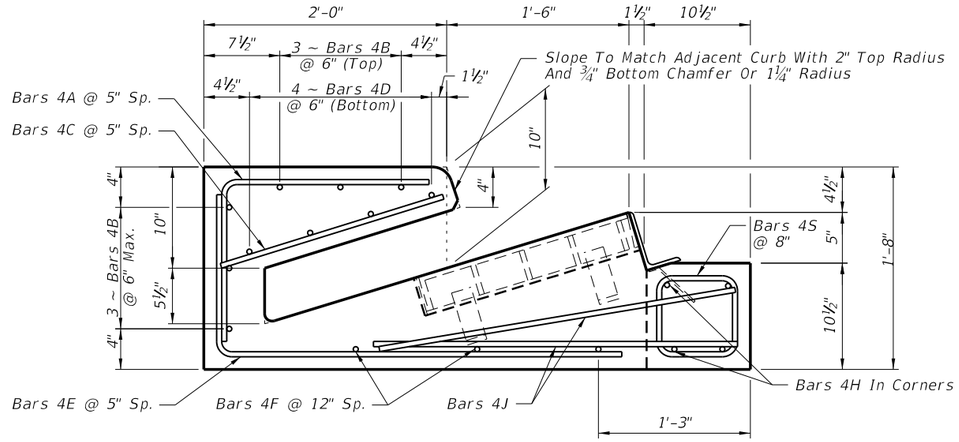
LAST REVISION	REVISION	DESCRIPTION:		FDOT DESIGN STANDARDS 2013	CURB INLET TOPS TYPES 5 AND 6	INDEX NO.	SHEET NO.
01/01/10						211	1



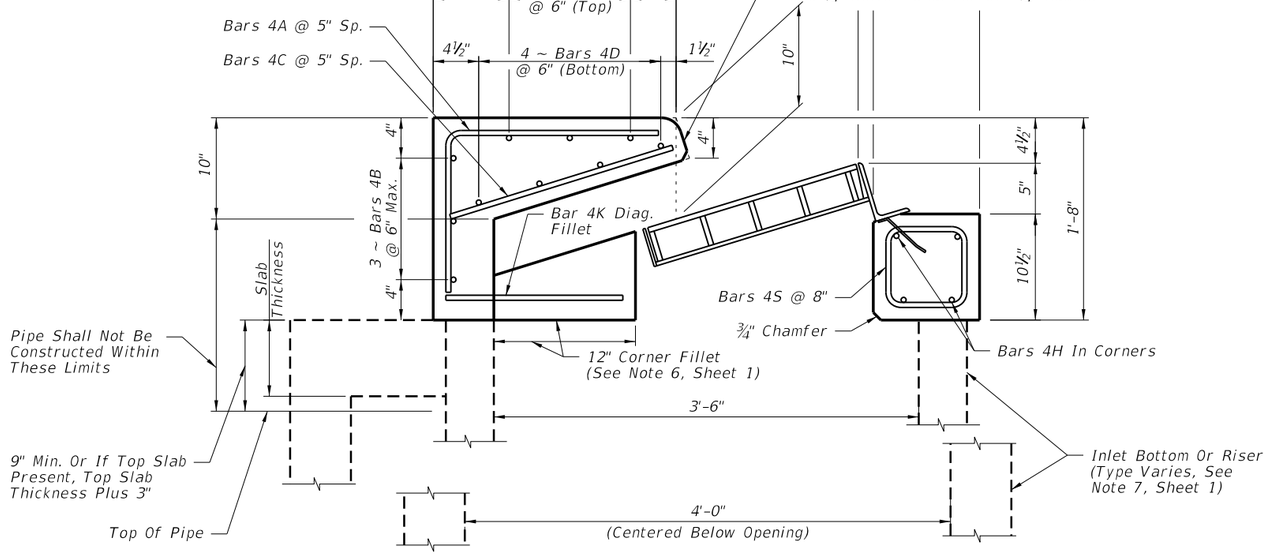
SECTION DD
(End View Of Inlet)



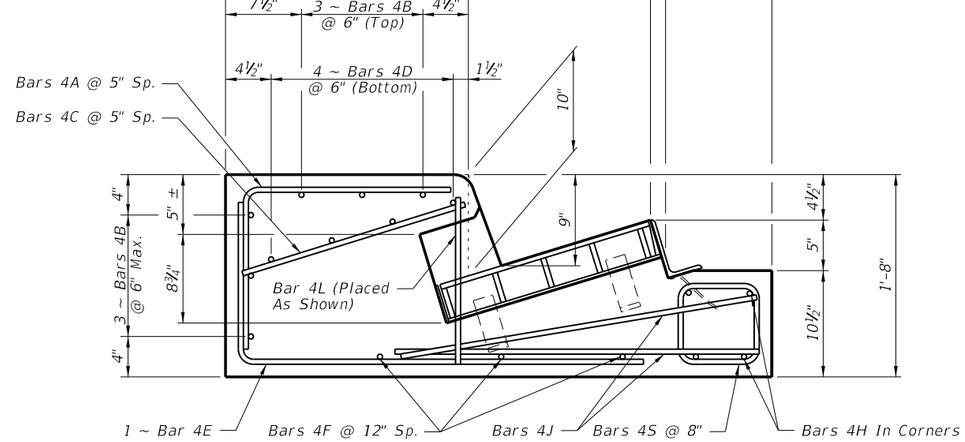
SECTION EE



SECTION FF



SECTION GG

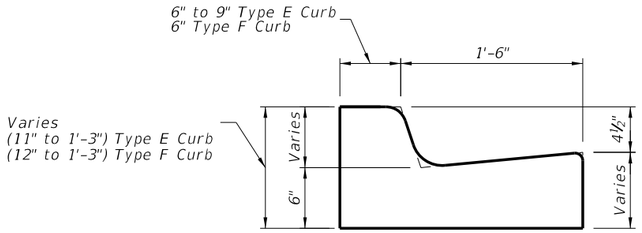


SECTION HH
(Type 5 Inlet Only)

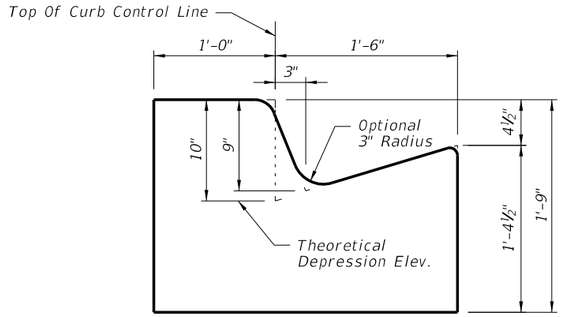
CROSS REFRENCES:
For General Notes See Sheet 1.
For Location Of Sections DD
Thru HH See Sheet 1.

PRECAST DETAILS

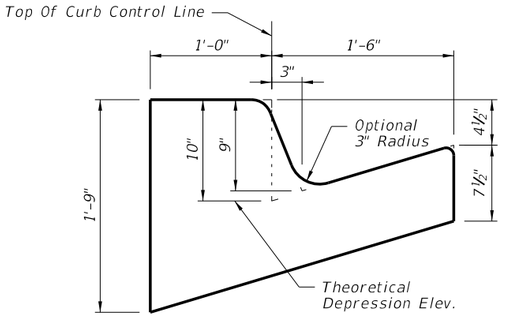
LAST REVISION	REVISION	DESCRIPTION:			INDEX NO.	SHEET NO.
07/01/12			FDOT DESIGN STANDARDS 2013	CURB INLET TOPS TYPES 5 AND 6	211	2



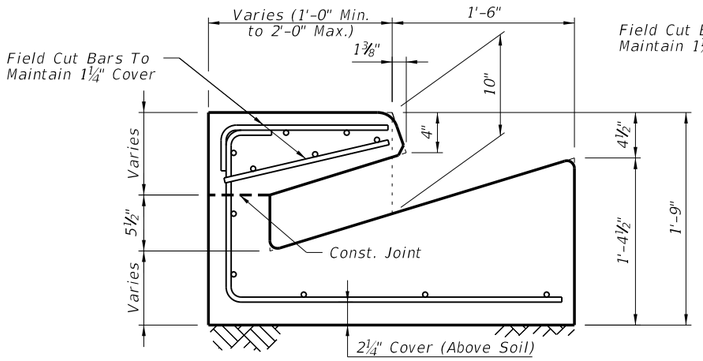
SECTION CC
(Gutter Transition
Type F Shown, Type E Similar)



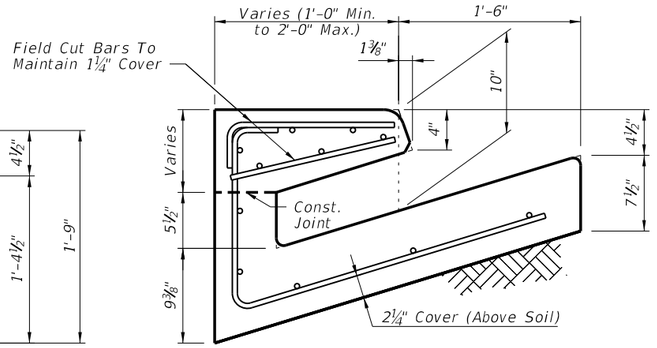
SECTION DD (OPTION A)
(End View Of Inlet)



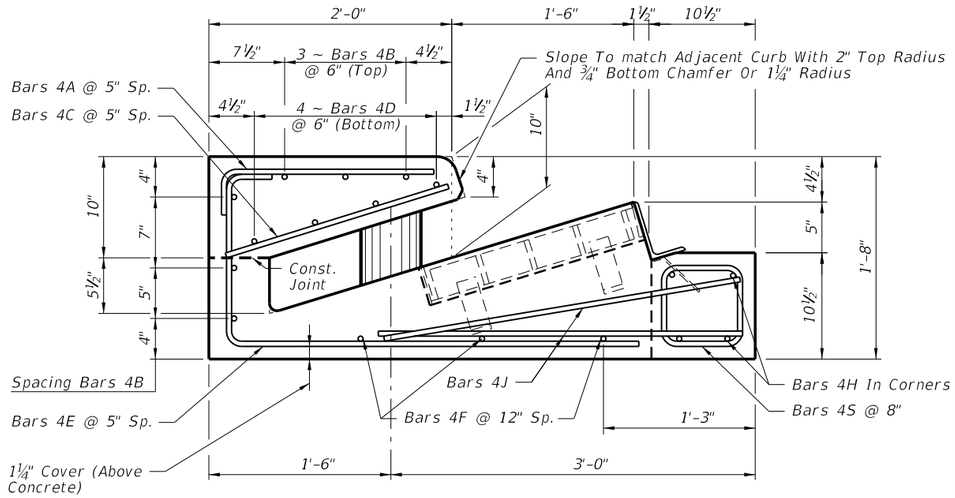
SECTION DD (OPTION B)
(End View Of Inlet)



SECTION EE (OPTION A)



SECTION EE (OPTION B)



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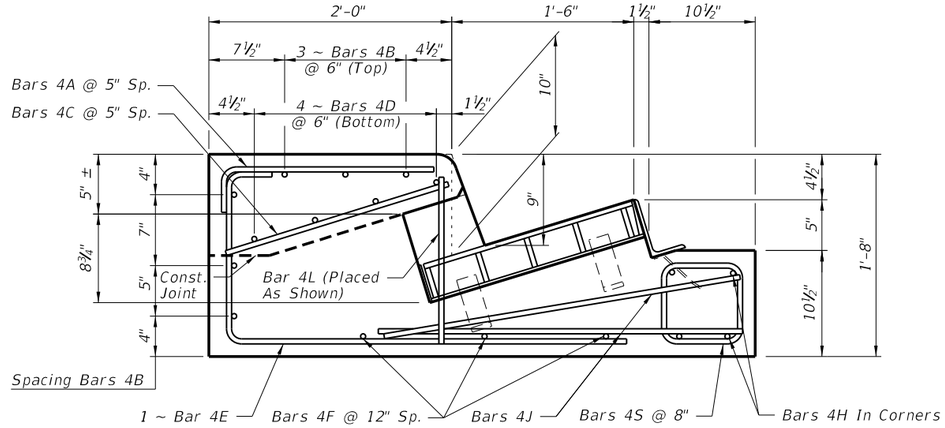
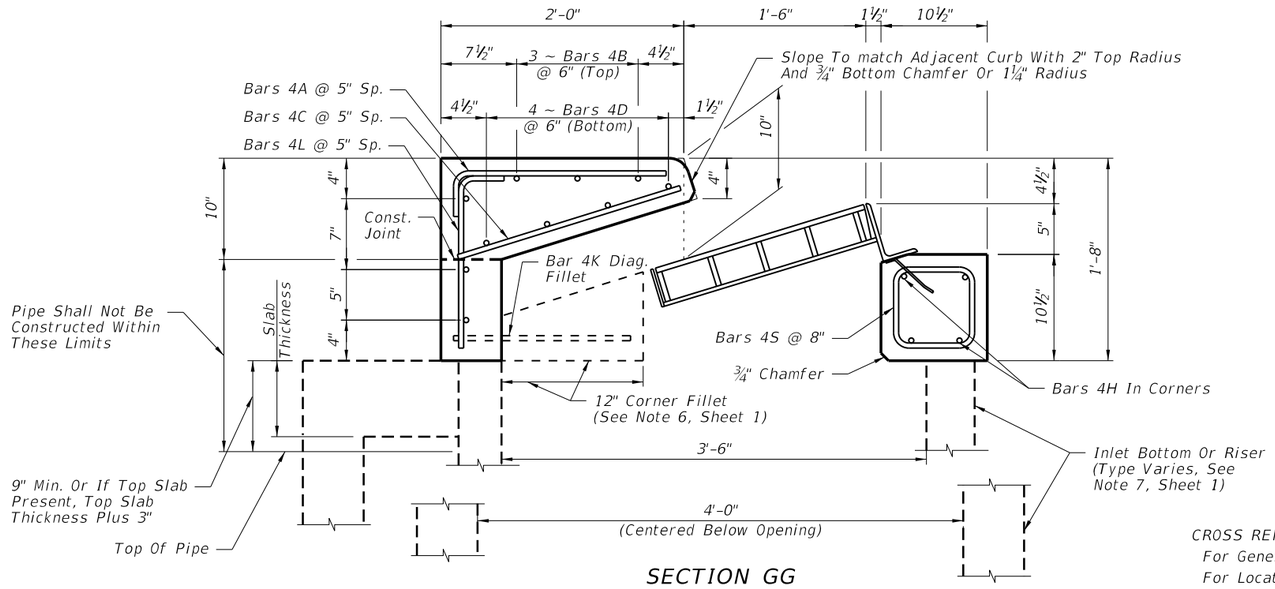


SECTION HH (Type 5 Inlet Only)



SECTION GG

CROSS REFRENCES:
For General Notes See Sheet 1.
For Location Of Sections CC Thru HH See Sheet 1.

CAST-IN-PLACE DETAILS

LAST REVISION	REVISION	DESCRIPTION:				
07/01/12			FDOT DESIGN STANDARDS 2013	CURB INLET TOPS TYPES 5 AND 6	INDEX NO. 211	SHEET NO. 3

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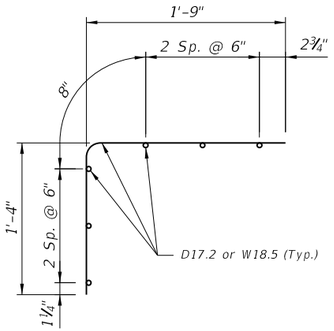
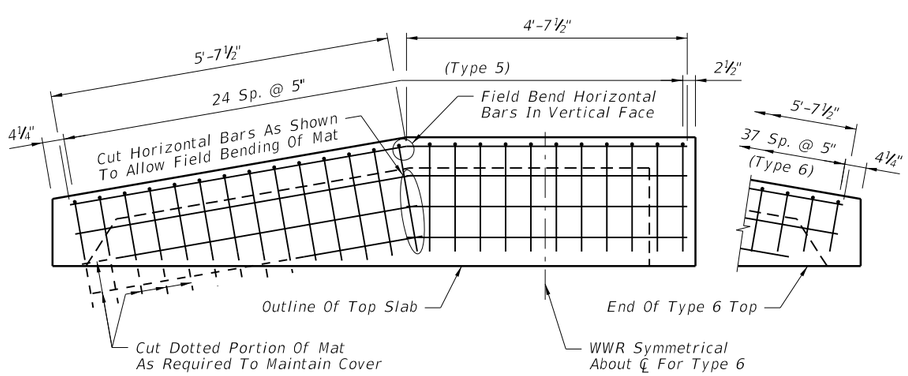
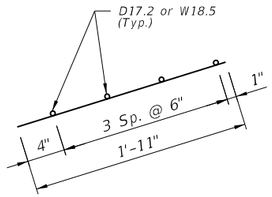
ALTERNATE REINFORCING STEEL DETAILS FOR WELDED WIRE REINFORCEMENT (WWR)



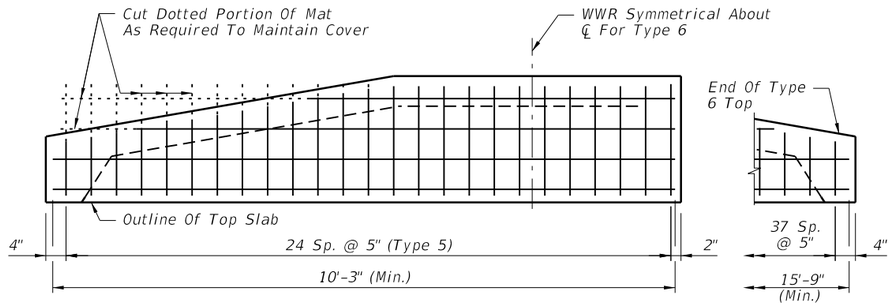
WELDED WIRE REINFORCEMENT
PIECE NO. 1



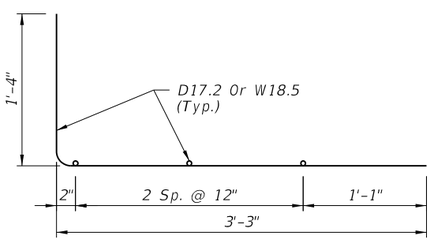
PLACEMENT SCHEMATIC FOR WELDED
WIRE REINFORCEMENT PIECE NO. 1



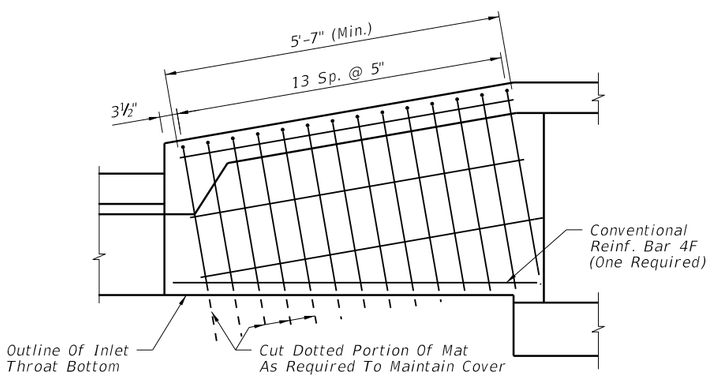
WELDED WIRE REINFORCEMENT
PIECE NO. 2



PLACEMENT SCHEMATIC FOR WELDED
WIRE REINFORCEMENT PIECE NO. 2



WELDED WIRE REINFORCEMENT
PIECE NO. 3



PLACEMENT SCHEMATIC FOR WELDED
WIRE REINFORCEMENT PIECE NO. 3

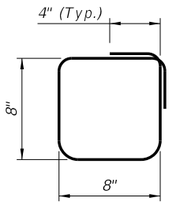
CONVENTIONAL REINFORCING STEEL BENDING DIAGRAMS

BILL OF REINFORCING STEEL

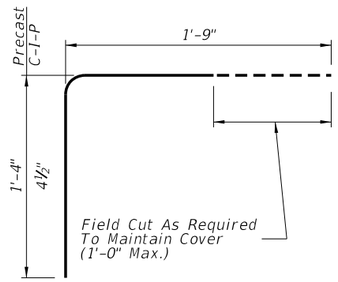
MARK	SIZE	TYPE 5 INLET		TYPE 6 INLET	
		NO.	LENGTH	NO.	LENGTH
A (Precast)	4	25	3'-1"	38	3'-1"
A (C-I-P)	4	25	2'-1½"	38	2'-1½"
B	4	6	10'-3"	6	15'-9"
C	4	25	11" to 1'-11"	38	11" to 1'-11"
D	4	4	10'-3"	4	15'-9"
E	4	16	4'-11½"	30	4'-11½"
F	4	3	6'-0"	6	6'-0"
H	4	4	4'-6"	4	4'-6"
J	4	4	3'-0"	4	3'-0"
K (Fillet)	4	2	2'-3"	2	2'-3"
L (Precast)	4	1	1'-4"	0	---
L (C-I-P)	4	10	1'-4"	9	1'-4"
S	4	7	3'-2"	7	3'-2"

REINFORCING STEEL NOTES:

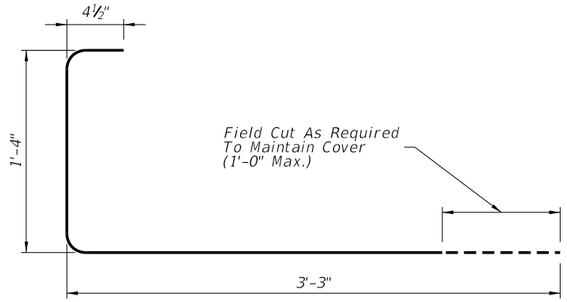
1. All bar dimensions in the bending diagrams are out to out.
2. Bars 4A and 4E may be combined into a single bar.
3. Welded Wire Reinforcement shall comply with ASTM A185 or ASTM A497.



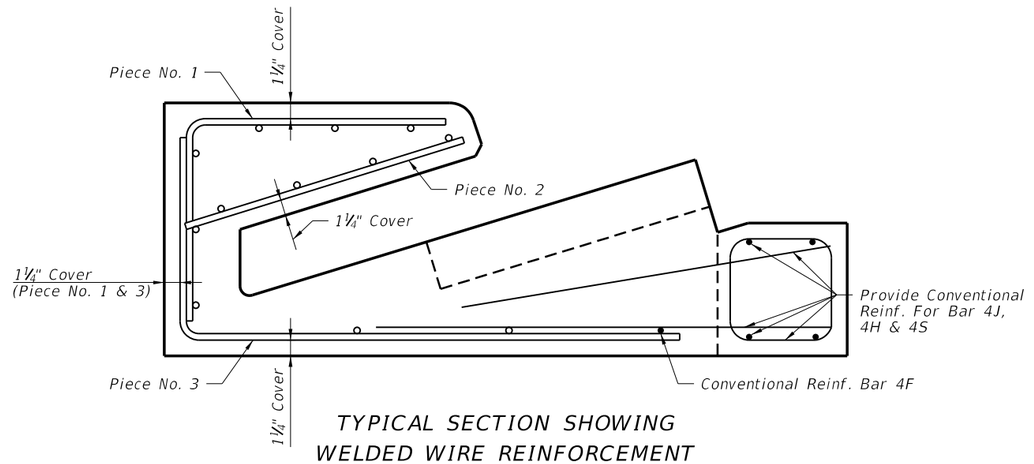
BAR 4S



BAR 4A

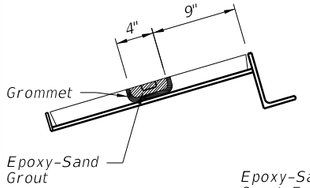


BAR 4E

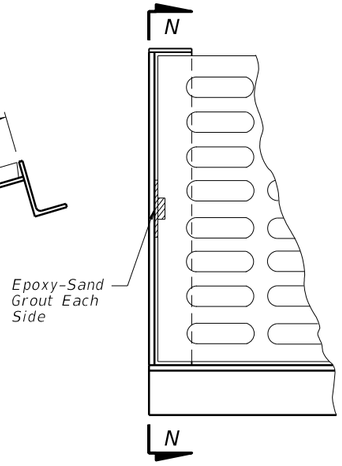


TYPICAL SECTION SHOWING
WELDED WIRE REINFORCEMENT

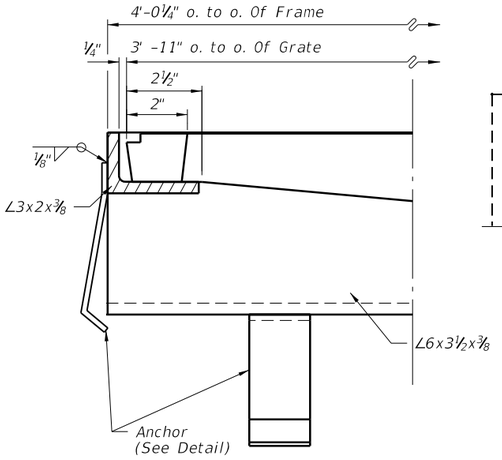
LAST REVISION	REVISION	DESCRIPTION:			INDEX NO.	SHEET NO.
07/01/12			FDOT DESIGN STANDARDS 2013	CURB INLET TOPS TYPES 5 AND 6	211	4



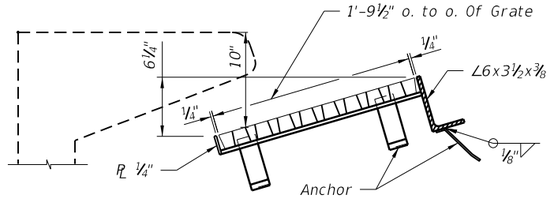
SECTION NN



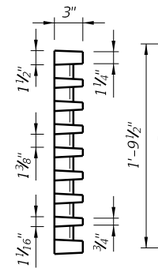
TOP VIEW
CAST IRON GRATE



SECTION QQ



SECTION GG



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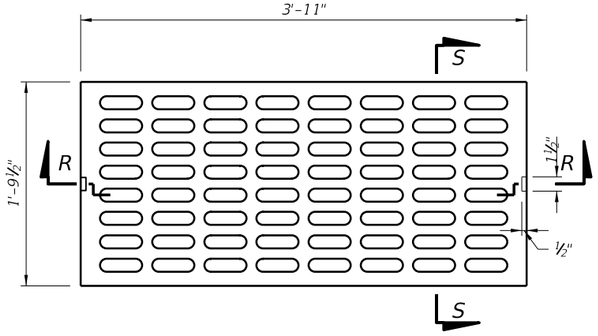
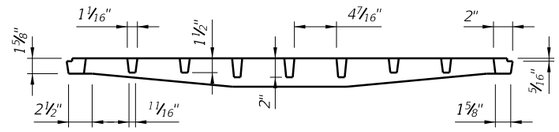
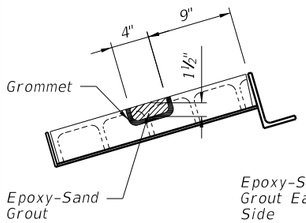


TOP VIEW

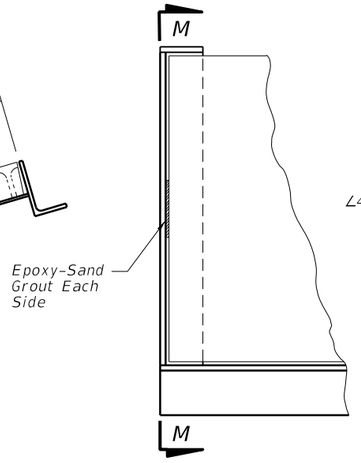


SECTION RR

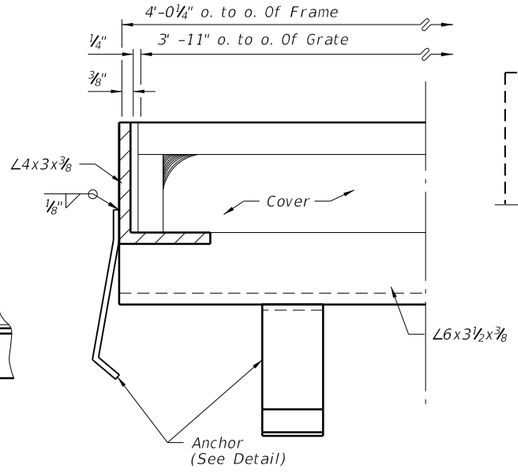
CAST IRON GRATE



SECTION MM



TOP VIEW
STEEL GRATE



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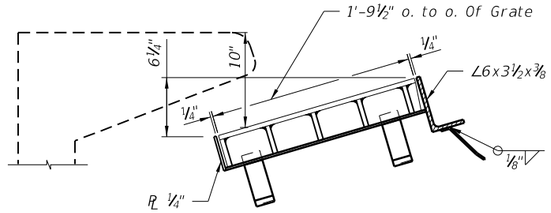

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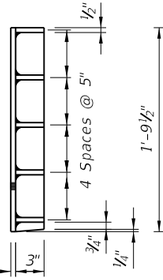
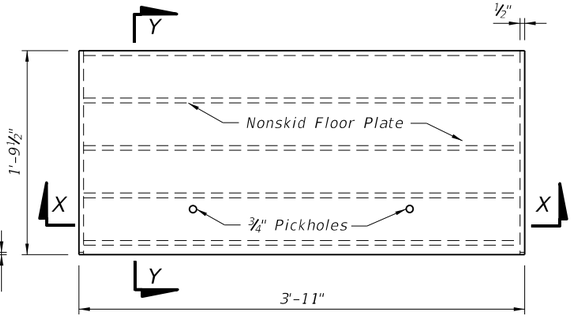
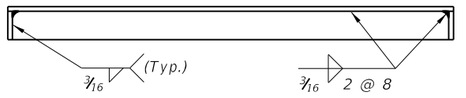


SECTION YY



TOP VIEW

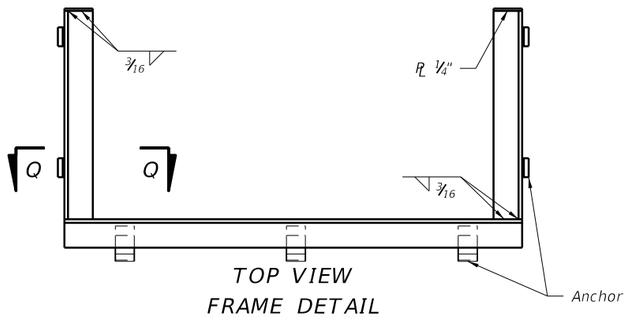


SECTION XX

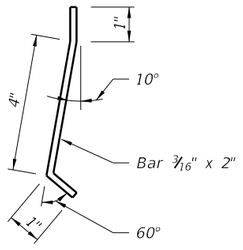
GROUTING DETAILS

CROSS REFERENCES:
For Location Of Section GG and QQ
See Sheet 1.

STEEL GRATE

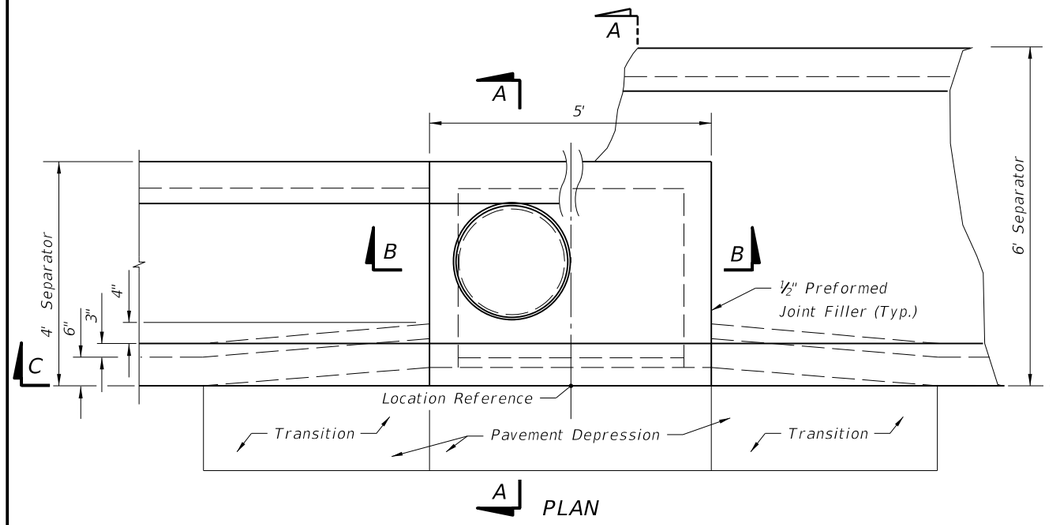


TOP VIEW
FRAME DETAIL

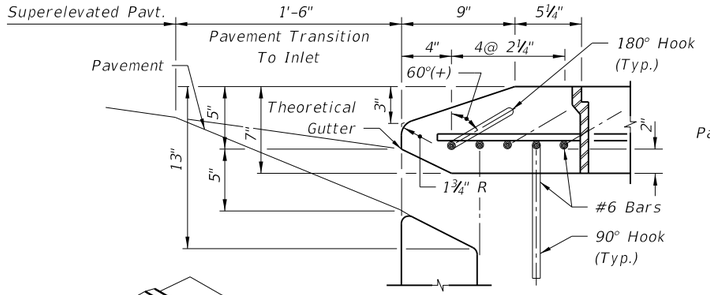


ANCHOR DETAIL

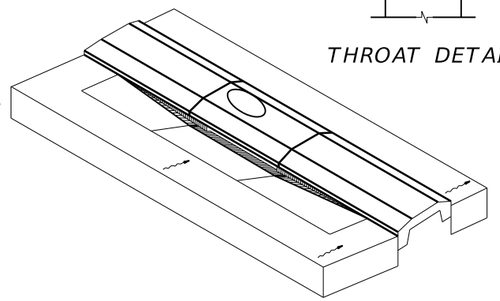
LAST REVISION	REVISION	DESCRIPTION:				
07/01/09			FDOT DESIGN STANDARDS 2013	CURB INLET TOPS TYPES 5 AND 6	INDEX NO. 211	SHEET NO. 5

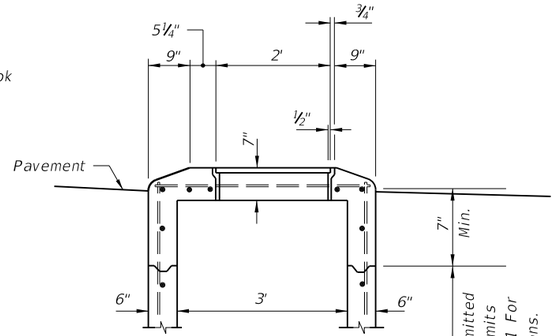


A PLAN



THROAT DETAIL

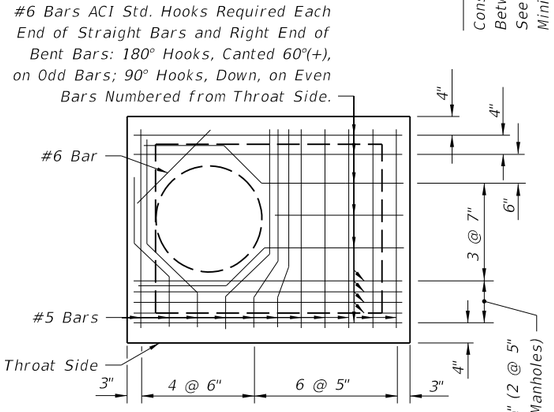




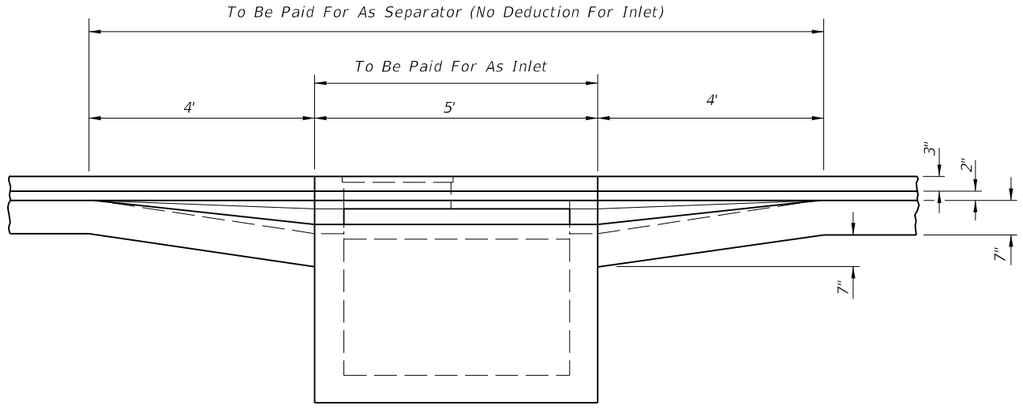
MODIFICATION WHEN USED AS A MANHOLE

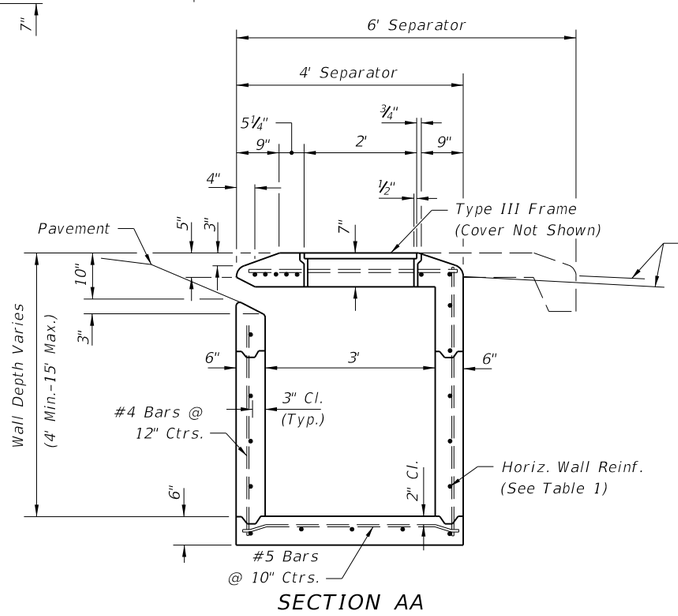
HORIZONTAL WALL REINFORCING SCHEDULE (TABLE 1)

WALL DEPTH	SCHEDULE	AREA ($in.^2/ft.$)	MAX. SPACING	
			BARS	WWF
0' – 6'	A12	0.20	12"	8"
6' – 10'	A6	0.20	6"	5"
10' – 13'	A4	0.20	4"	3"
10' – 15'	B5.5	0.24	5½"	5"

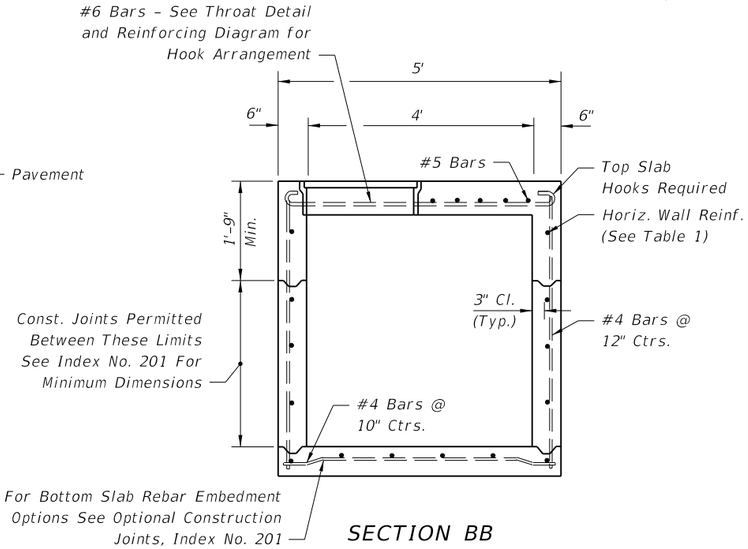


REINFORCING STEEL DIAGRAM TOP SLAB OF INLETS





SECTION AA



SECTION BB

GENERAL NOTES

1. This inlet is used in Traffic Separators Types I and II; or, in separators constructed with Curbs Types A, B and E and sidewalk paving, which cannot accommodate Inlets Types 1, 2, 3, 4, 5, or 6. Use of this Inlet on through traffic side of the separator is not permitted in medians with Curb Types A and B. Locate inlet outside of pedestrian way.

2. All reinforcing to be Grade 60 bars with 2" min. cover unless otherwise shown. See Index No. 201 for equivalent area of welded wire fabric. Cut or bend bars out of way of pipe when necessary. Bars to clear pipe by 1½"

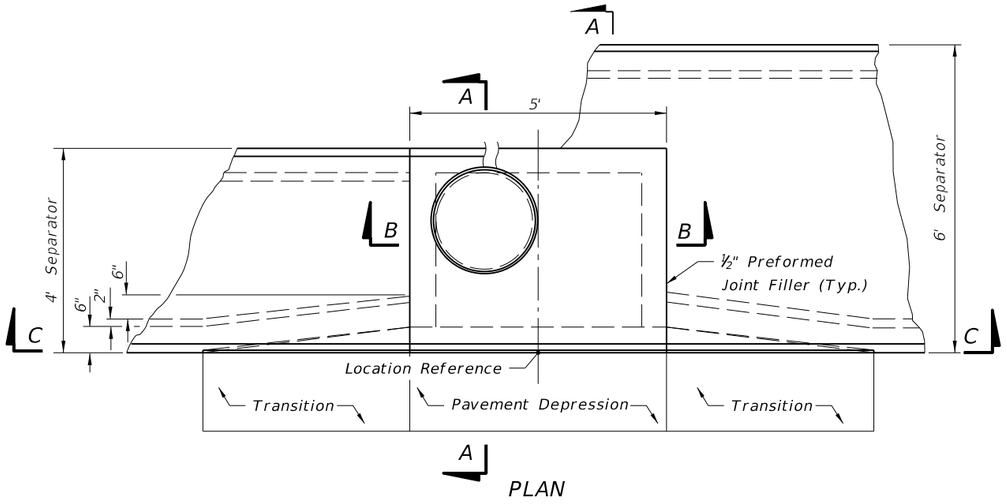
3. Recommended maximum pipe sizes are 24" longitudinal and 30" transverse. For larger pipe, inlets with Alt. B bottoms, Index No. 200 are recommended.

4. For supplementary details see Index No. 201.

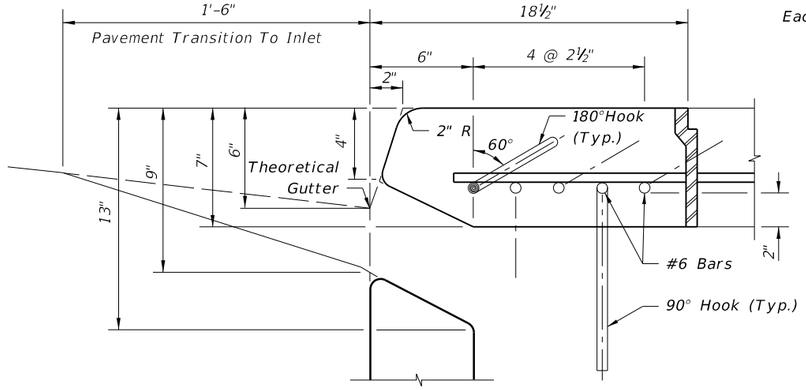
5. All dimensions are for both precast and cast-in-place inlets unless otherwise shown.

6. Inlet to be paid for under the contract unit price for Inlets (Curb) (Type 7), Each.

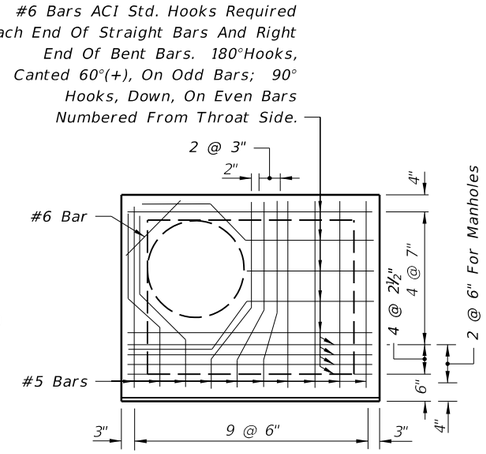
LAST REVISION	REVISION	DESCRIPTION:				
07/01/10			FDOT DESIGN STANDARDS 2013	CURB INLET TYPE 7	INDEX NO. 212	SHEET NO. 1



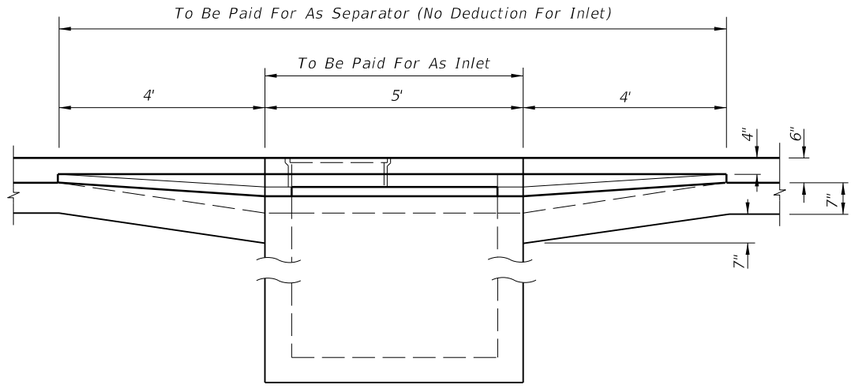
PLAN



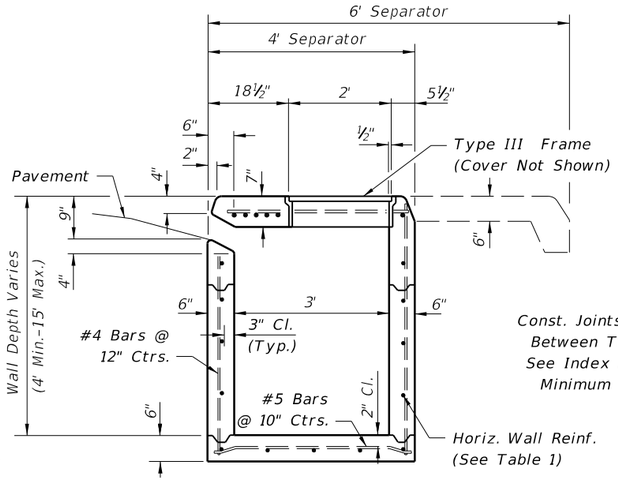
THROAT DETAIL (SECTION AA)



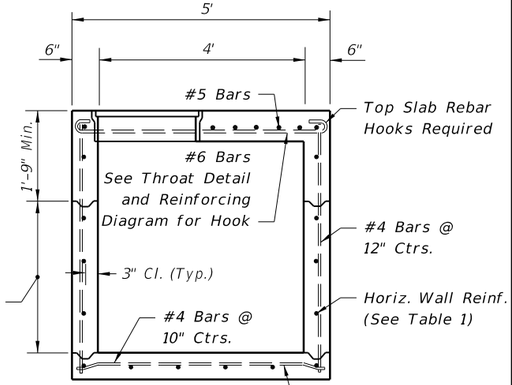
REINFORCING STEEL DIAGRAM
TOP SLAB OF INLET



SECTION CC



SECTION AA



SECTION BB

GENERAL NOTES

1. This inlet is to be used only in Traffic Separators Types IV and V; or, in separators constructed with Curbs Types D and F and sidewalk paving, which cannot accommodate Inlets Types 1, 2, 3, 4, 5 or 6. Use of this inlet on the through traffic side of the separator should be avoided in medians constructed with Curb Type D (Curb inlets Types 9 or 10 are recommended). Locate inlet outside of pedestrian way.

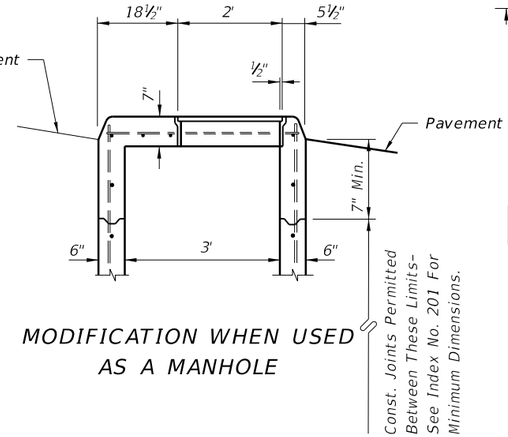
2. All reinforcing to be Grade 60 bars with 2" min. cover unless otherwise shown. See Index No. 201 for equivalent area of welded wire fabric. Cut or bend bars out of way of pipe when necessary. Bars to clear pipe by 1½".

3. Recommended maximum pipe sizes are 24" longitudinal and 30" transverse. For larger pipe, inlets with Alt. B bottoms, Index No. 200 are recommended.

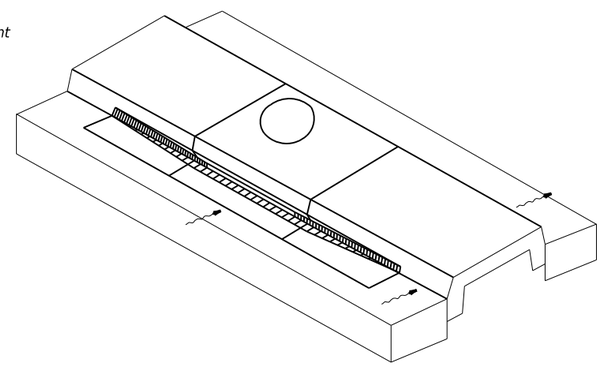
4. For supplemental details and notes see Index No. 201.

5. All dimensions are for both precast and cast-in-place inlets unless otherwise shown.

6. Inlet to be paid for under the contract unit price for Inlets (Curb) (Type 8), Each.



MODIFICATION WHEN USED
AS A MANHOLE



HORIZONTAL WALL REINFORCING SCHEDULE (TABLE 1)

WALL DEPTH	SCHEDULE	AREA (in.²/ft.)	MAX. SPACING	
			BARS	WWF
0' -6'	A12	0.20	12"	8"
6' -10'	A6	0.20	6"	5"
10'-13'	A4	0.20	4"	3"
10'-15'	B5.5	0.24	5½"	5"

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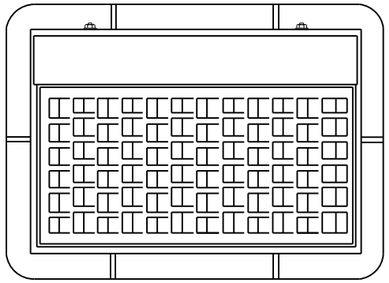
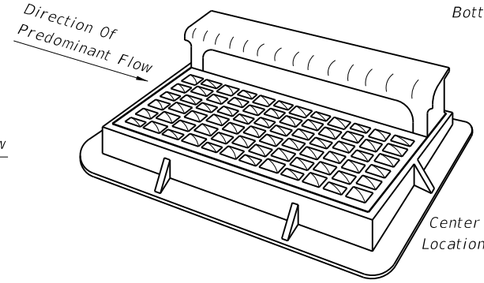
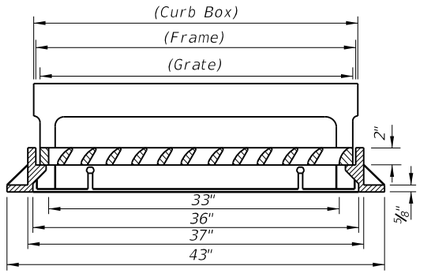
6/28/2012

LAST REVISION	REVISION	DESCRIPTION:			INDEX NO.	SHEET NO.
07/01/10			FDOT DESIGN STANDARDS 2013	CURB INLET TYPE 8	213	1

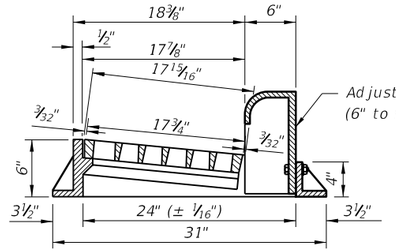


TOP VIEW



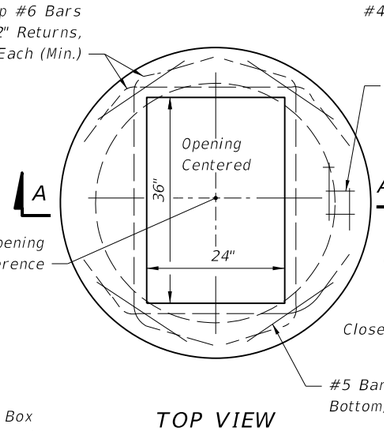


LONGITUDINAL SECTION

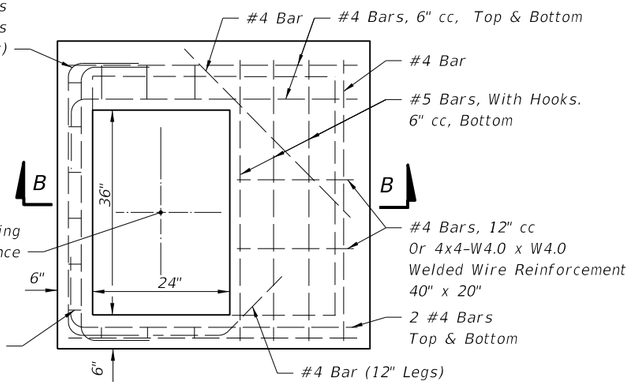


TRANSVERSE SECTION

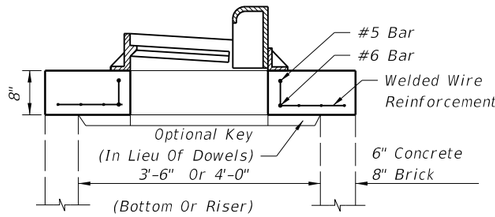
FRAME AND GRATE



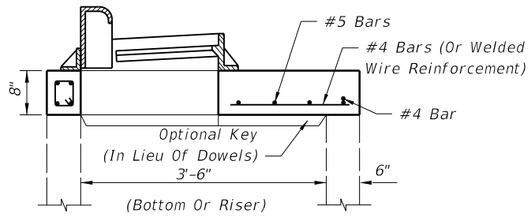
TOP VIEW



TOP VIEW

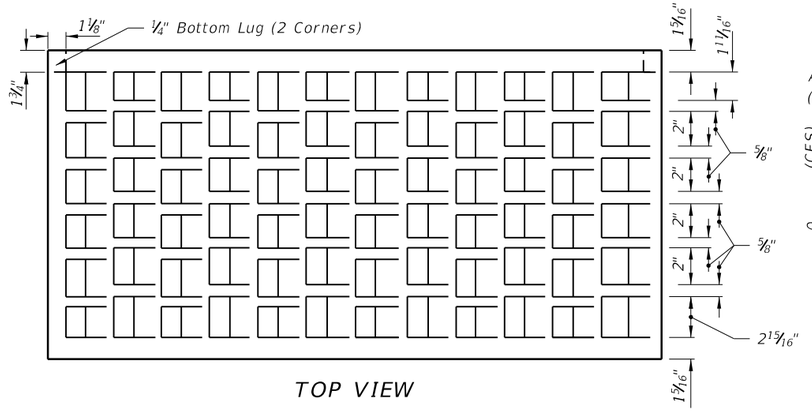


SECTION AA
(SEE NOTE 6 BELOW)

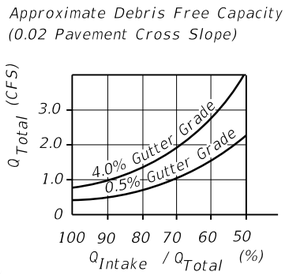


SECTION BB
(SEE NOTE 6 BELOW)

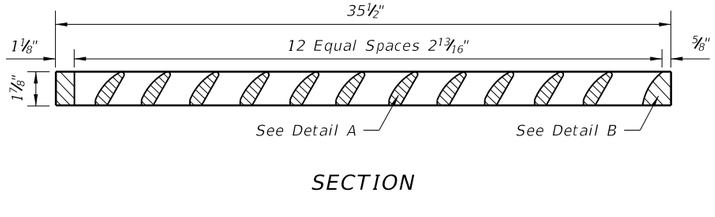
TOP SLABS



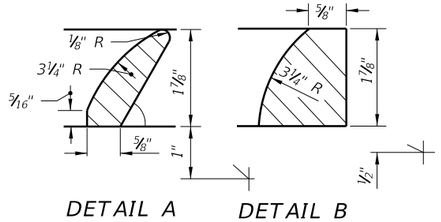
TOP VIEW



EFFICIENCY CURVE



SECTION



DETAIL A

DETAIL B

GRATE DETAIL

GENERAL NOTES

1. This inlet is primarily intended for locations with light to moderate flows where right of way does not permit the use of throated Curb Inlets Types 1 through 6. The typical application is on curb returns to city streets. The inlet grate is suitable for pedestrian and bicycle traffic.

2. This inlet to be located outside of curb ramp area in vertical faced curbs such as Curb and Gutter Type F. Grate shall be oriented with vanes directed toward Predominant Flow.

3. For structure bottoms see Index No. 200. For supplemental details see Index No. 201.

4. All steel in slab tops shall have 1¼" minimum cover unless otherwise shown. Tops shall be either cast-in-place or precast concrete.

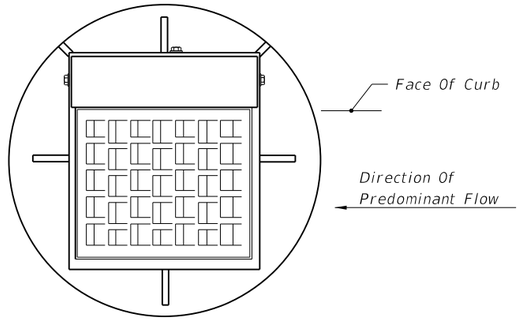
5. For Alternate B applications, top slab openings shall be placed such that 2 edges of inlet frame will be located directly above bottom wall or riser wall.

6. When used on a structure with dimensions larger than those detailed above and risers are not applied, the top slab shall be constructed using Index No. 200 with the slab opening adjusted to 24"x36". The "Special Top Slab" on Index No. 200 is not permitted.

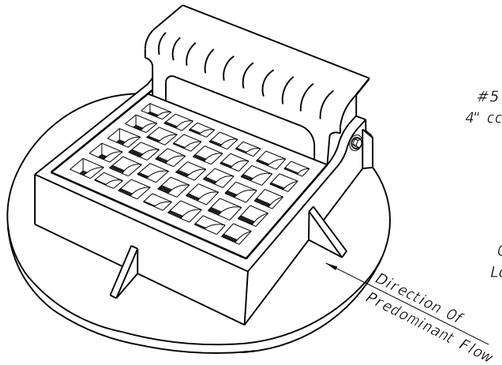
7. Frame may be adjusted with one to six courses of brick.

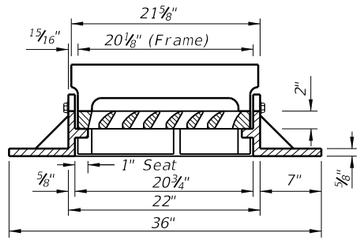
8. Cast iron frame grate and hood to be U.S. Foundry 5130-6016, Neenah Foundry R-3067-L, or approved equal. Inlet and grate detail shown is Neenah R-3067-L. Vaned grates with approximately equal openings will be permitted that satisfy AASHTO HS-20 loading. Grates shall be reversible, right or left.

LAST REVISION	REVISION	DESCRIPTION:			INDEX NO.	SHEET NO.
07/01/05			FDOT DESIGN STANDARDS 2013	CURB INLET TOP TYPE 9	214	1

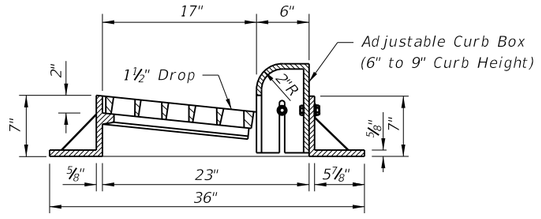


TOP VIEW



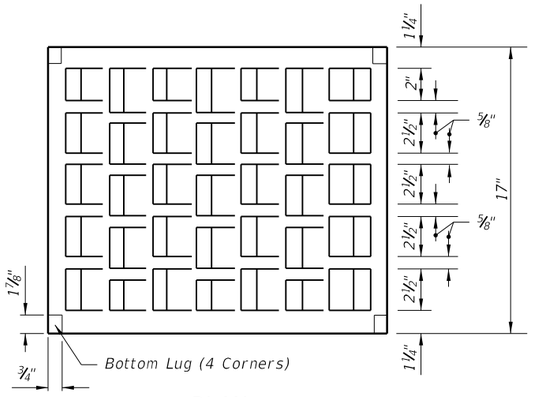


LONGITUDINAL SECTION



TRANSVERSE SECTION

FRAME AND GRATE



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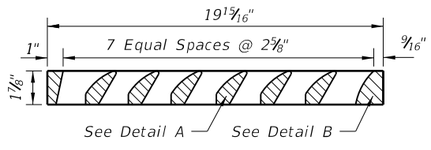

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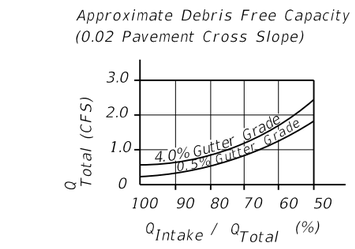
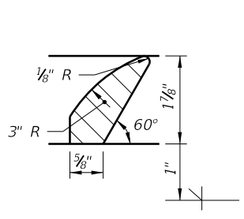
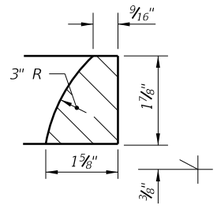


EFFICIENCY CURVE

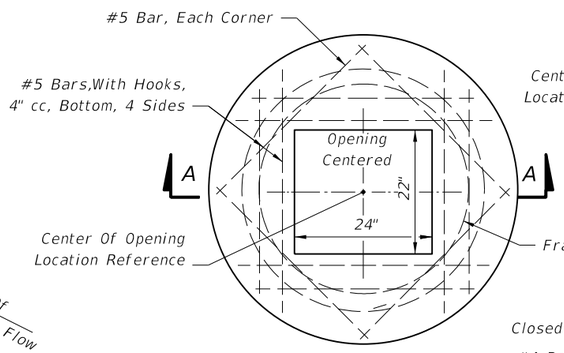


DETAIL A

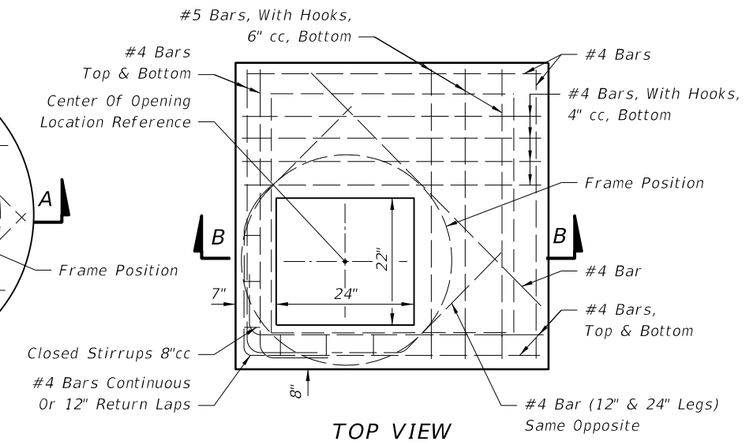


DETAIL B

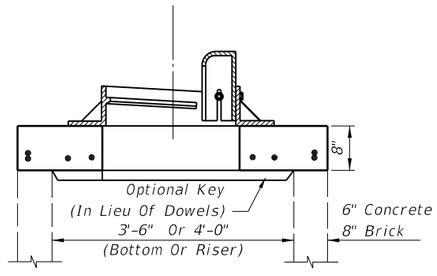
GRATE DETAIL



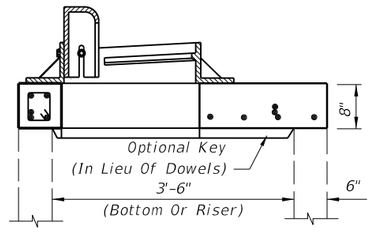
TOP VIEW



TOP VIEW



SECTION AA
(SEE NOTE 6 BELOW)



SECTION BB
(SEE NOTE 6 BELOW)

TOP SLABS

GENERAL NOTES

1. This inlet is primarily intended for locations with light flows where right of way does not permit the use of throated Curb Inlets Types 1 through 6. The typical application is on curb returns to city streets. The inlet grate is suitable for pedestrian and bicycle traffic.

2. This inlet to be located outside of curb ramp area in vertical faced curbs such as Curb and Gutter Type F. Grate shall be oriented with vanes directed toward predominant flow.

3. For structure bottoms see Index No. 200. For supplemental details see Index No. 201.

4. All steel in slab tops shall have 1¼" minimum cover unless otherwise shown. Tops shall be either cast-in-place or precast concrete.

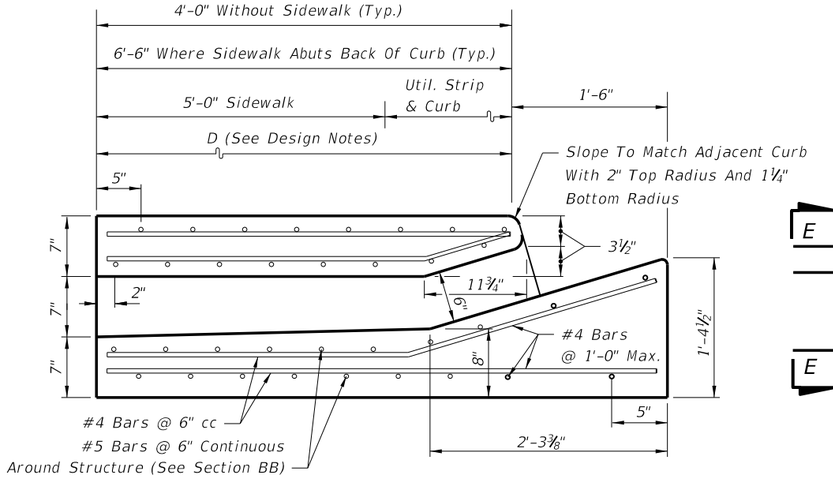
5. For Alternate B applications, top slab openings shall be placed such that 2 edges of inlet frame will be located directly above bottom or riser walls.

6. When used on a structure with dimensions larger than those detail above and risers are not applied, the top slab shall be constructed using Index No. 200 with the slab opening adjusted to 22"x24". The "Special Top Slab" on Index No. 200 is not permitted.

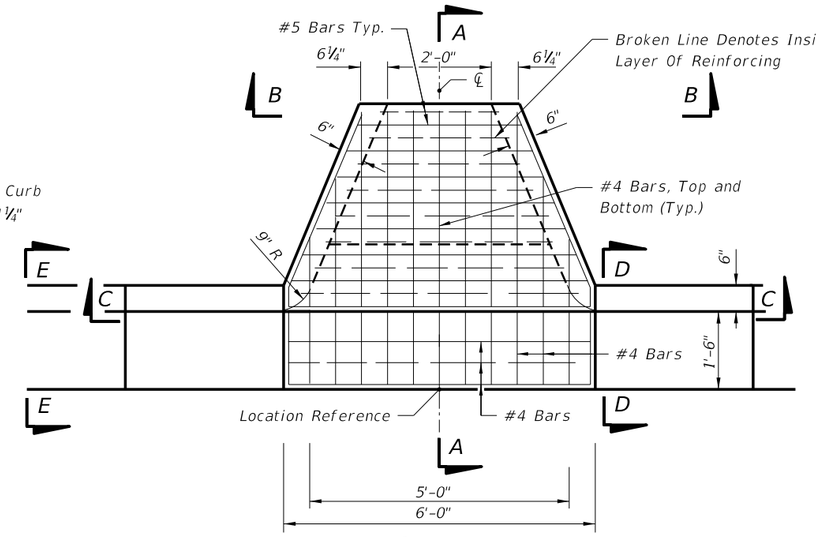
7. Frame may be adjusted with one to six courses of brick.

8. Cast iron frame grate and hood to be U.S. Foundry 5161-6019, Neenah Foundry R-3065-L, or approved equal. Inlet and grate detail shown is Neenah R-3065-L. Vaned grates with approximately equal openings will be permitted that satisfy AASHTO HL-93 loading. Grates shall be reversible.

LAST REVISION	REVISION	DESCRIPTION:			INDEX NO.	SHEET NO.
04			FDOT DESIGN STANDARDS 2013	CURB INLET TOP TYPE 10	215	1



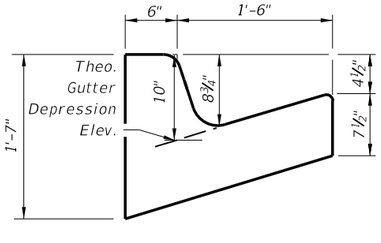
SECTION AA



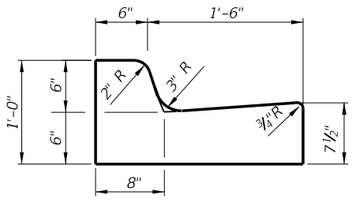
TOP VIEW

GENERAL NOTES

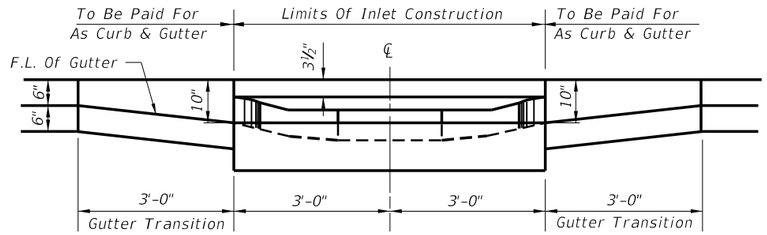
1. The finished grade and slope of the inlet top are to conform with the finished cross slope and grade of the proposed sidewalk and/or border.
2. When inlets are to be constructed on a curve, refer to the plans to determine the radius and, where necessary, modify the inlet details accordingly. Bend steel when necessary.
3. All steel shall have 1¼" minimum cover unless otherwise shown. Inlets can be either cast-in-place or precast concrete. Chamfer all exposed edges ¾".
4. All reinforcement is ASTM A615/A615M Grade 60 steel, either smooth or deformed. Equivalent area grade 40 steel or 65 ksi welded wire fabric may be substituted.
5. Inlets to be paid for under the contract unit price for Inlets (Closed Flume) EA.



SECTION DD



Curb And Gutter Type F
SECTION EE



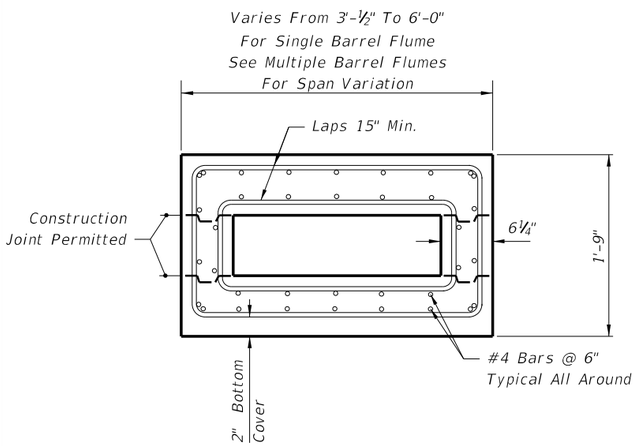
SECTION CC

SINGLE BARREL FLUME

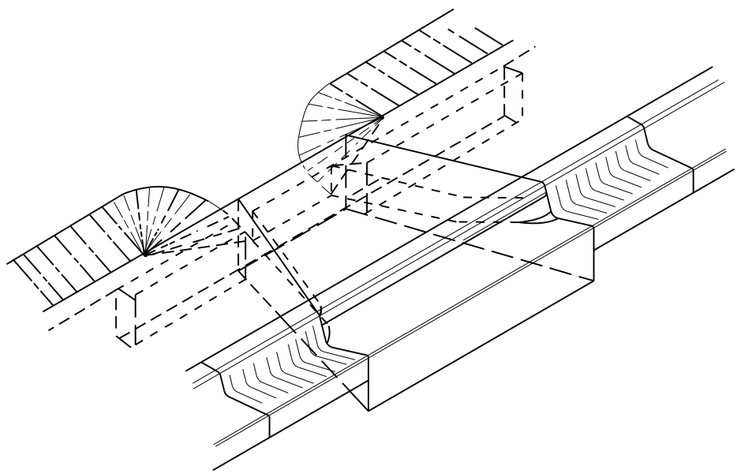
DESIGN NOTES

1. These inlets are designed for use with Type F curb and gutter only. Locate inlet outside of curb ramp area.

   The Single Barrel Flume is intended for locations with light to moderate flows. Multiple Barrel Flumes must be selected to meet design heavy flows.
2. Designer must specify Flume Type, "D" dimension, number of barrels and guiderail requirements in plans.
3. Designer must specify where energy dissipating bricks are required.

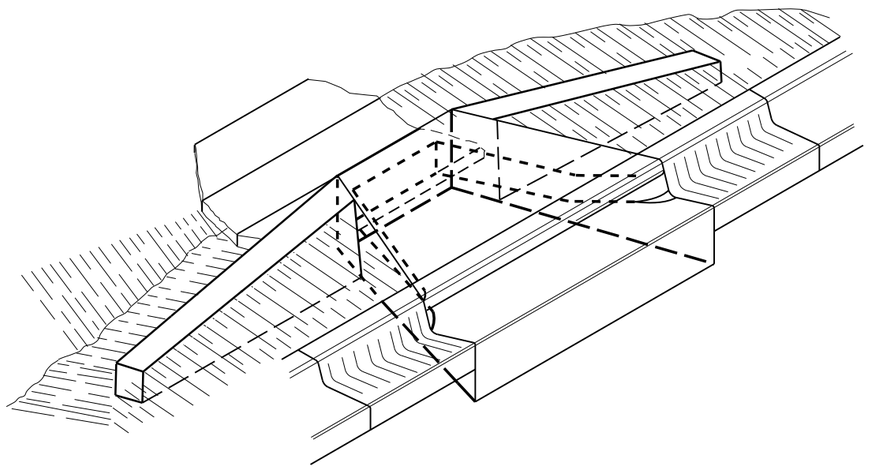


SECTION BB



SINGLE BARREL FLUME DEPICTED

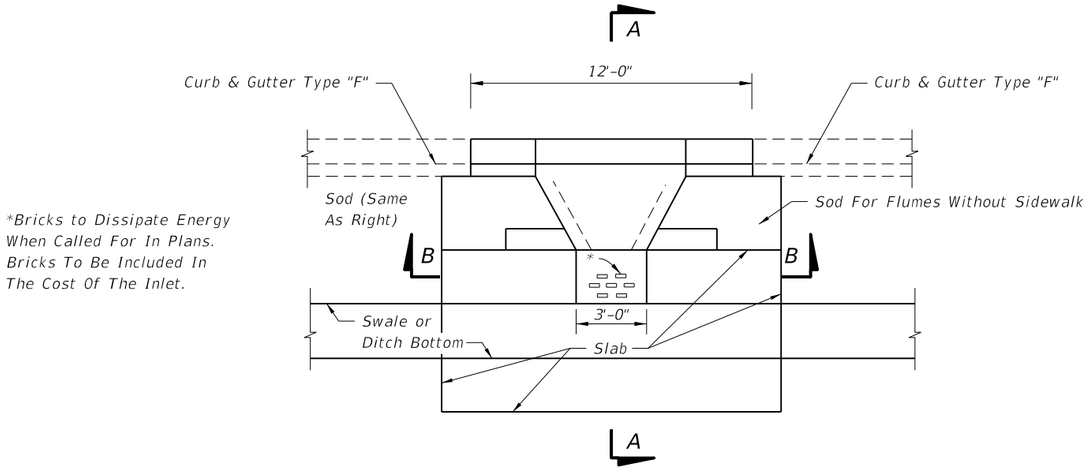
FLUME W/SIDEWALK INLET (CLOSED FLUME) TYPE I



SINGLE BARREL FLUME DEPICTED

FLUME W/O SIDEWALK INLET (CLOSED FLUME) TYPE II

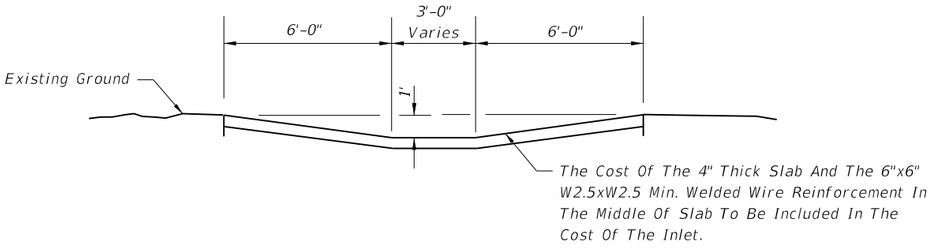
LAST REVISION	REVISION	DESCRIPTION:				
07/01/07			FDOT DESIGN STANDARDS 2013	CLOSED FLUME INLET	INDEX NO. 216	SHEET NO. 1



*Bricks to Dissipate Energy When Called For In Plans. Bricks To Be Included In The Cost Of The Inlet.

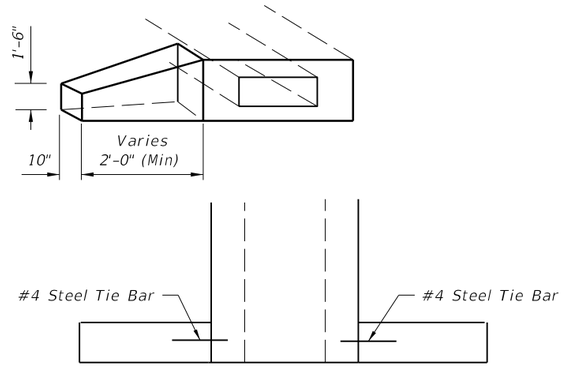
SINGLE BARREL FLUME DEPICTED

PLAN



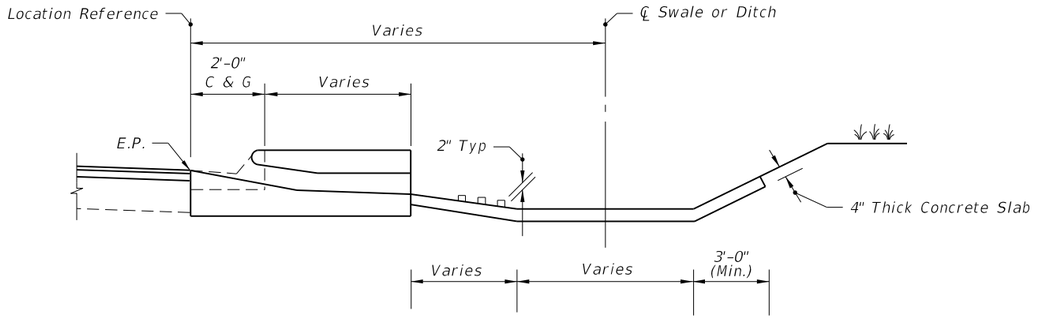
SINGLE BARREL FLUME DEPICTED

SECTION BB



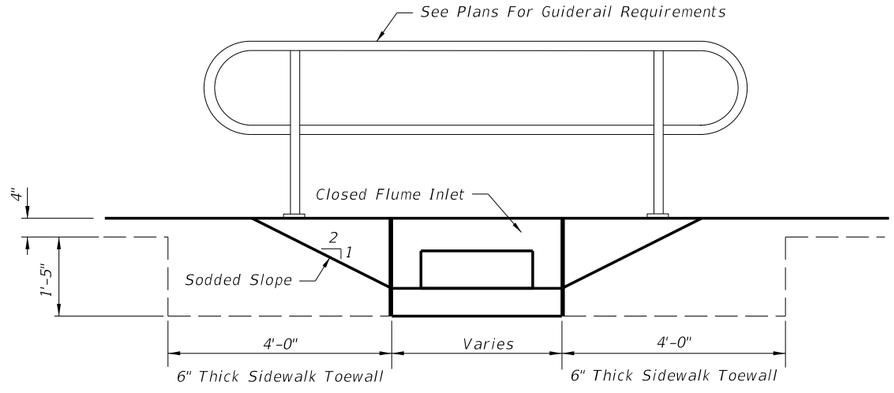
SINGLE BARREL FLUME DEPICTED

ENDWALL



SECTION AA

SLOPES, DITCH APRON AND ENDWALLS

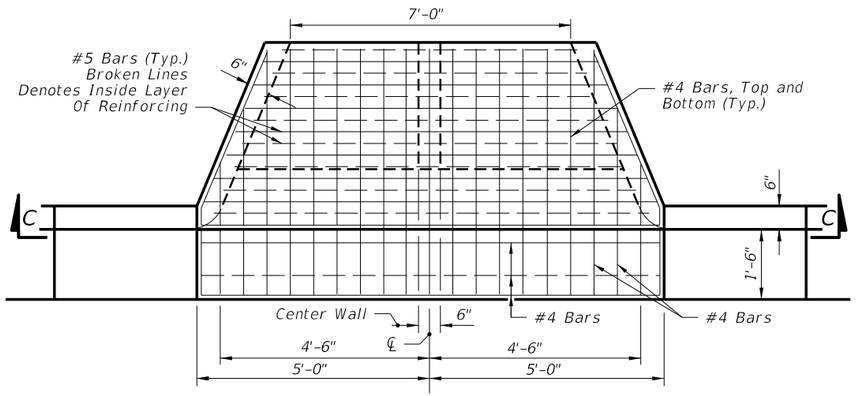


SINGLE BARREL FLUME DEPICTED

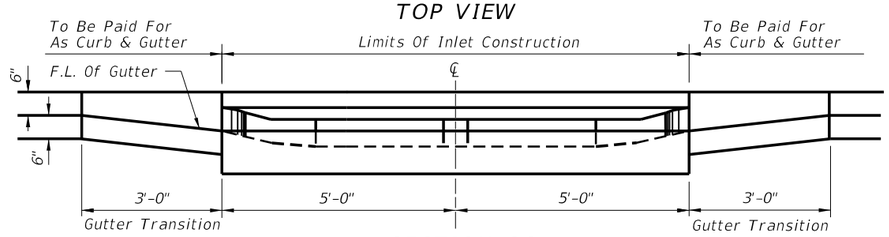
ELEVATION

GUIDERAIL FOR FLUME IN SIDEWALK

LAST REVISION	REVISION	DESCRIPTION:		FDOT DESIGN STANDARDS	CLOSED FLUME INLET	INDEX NO.	SHEET NO.
07				2013		216	2

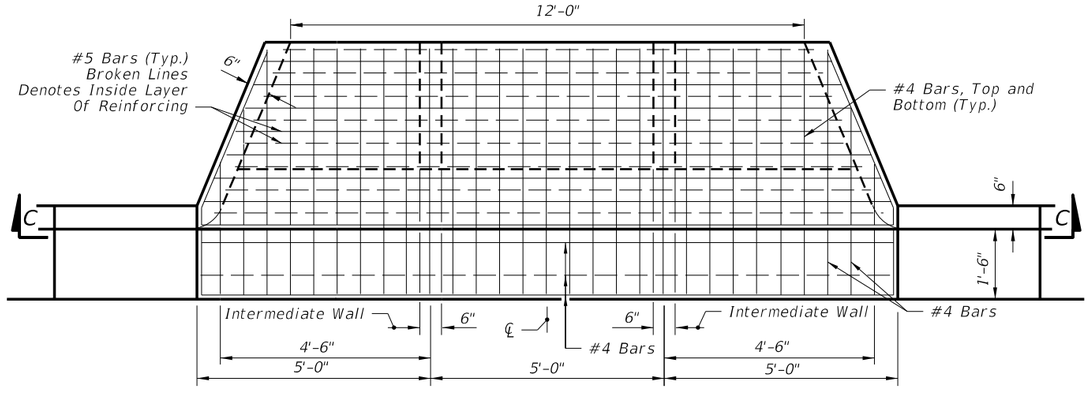


TOP VIEW

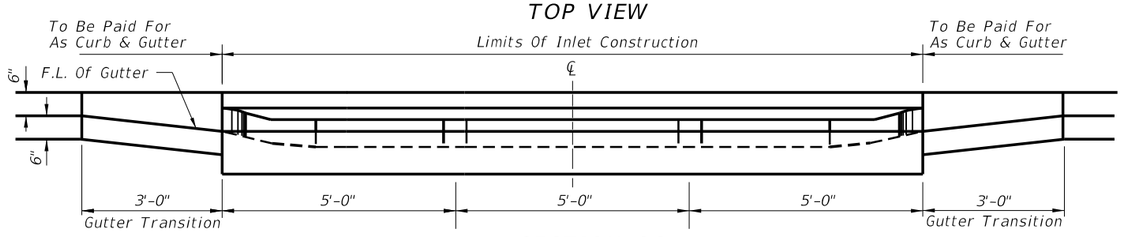


SECTION CC

DOUBLE BARREL FLUME

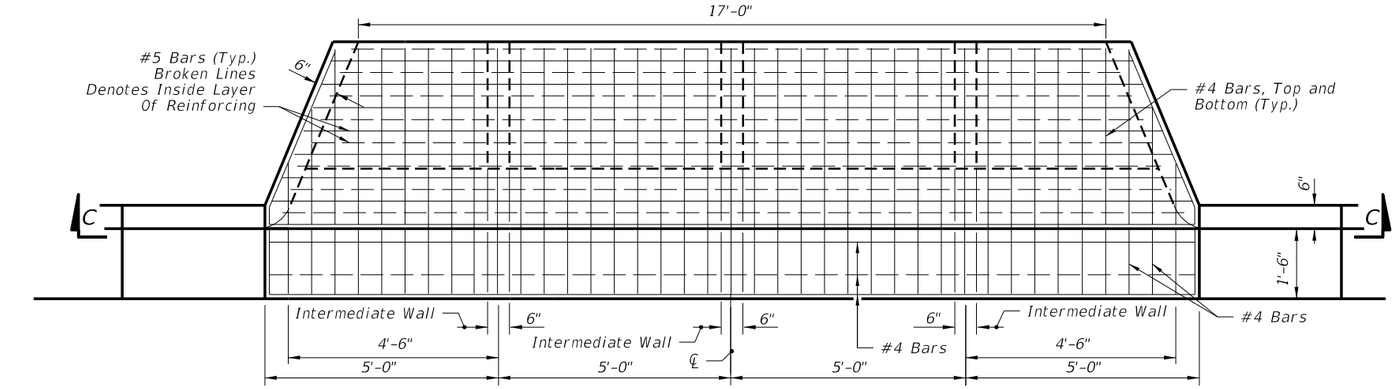


TOP VIEW

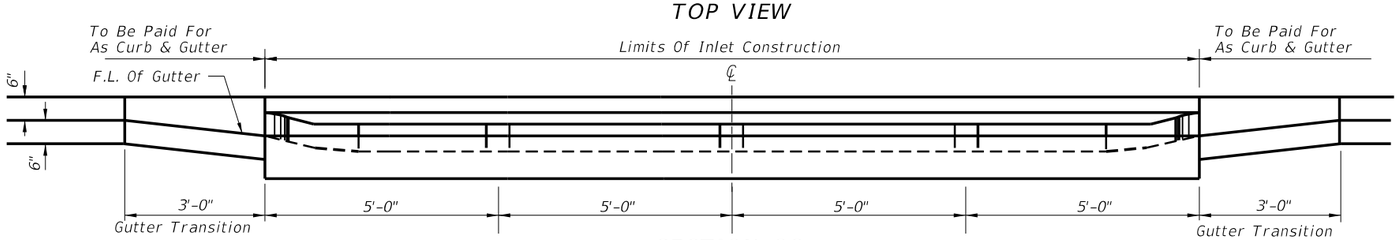


SECTION CC

TRIPLE BARREL FLUME

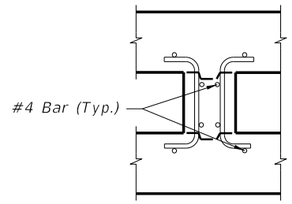


TOP VIEW



SECTION CC

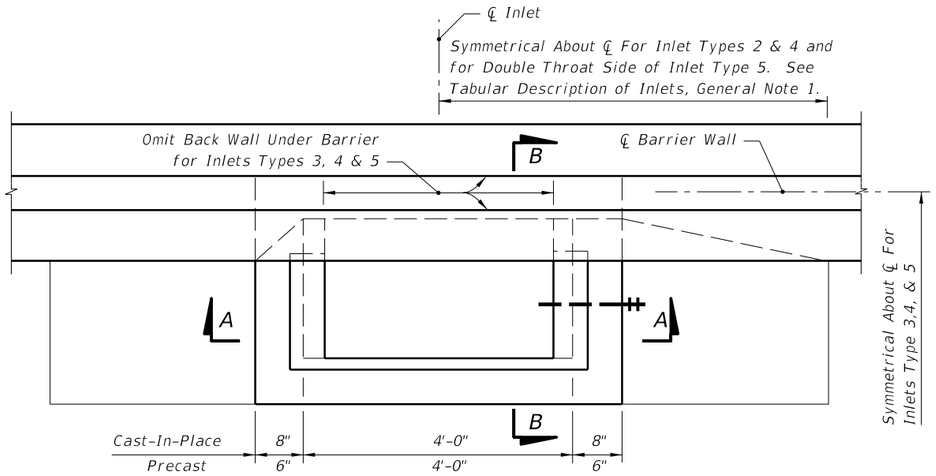
QUADRUPLE BARREL FLUME



INTER-WALL REINFORCING

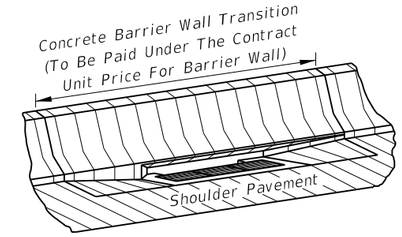
NOTE: See Single Barrel Flume For Base Dimensions.

LAST REVISION	REVISION	DESCRIPTION:			INDEX NO.	SHEET NO.
02			FDOT DESIGN STANDARDS 2013	CLOSED FLUME INLET	216	3



PLAN (INLETS TYPES 1 THRU 5)

GRATE SLOPE & DROP HEIGHT				
Shoulder Slope	Grate Slope Rate	Drop Height		Remarks
		CIPL	Precast	
0.03	1:6	1 9/16"	1 5/16"	Std. Median Concrete Shoulder
0.05	1:6	1 1/16"	7/8"	Std. Median Flexible Shoulder
0.06	1:6	13/16"	5/8"	
0.07	1:5	1 5/8"	1 3/8"	
0.08	1:5	1 3/8"	1 3/16"	
0.09	1:5	1 1/8"	15/16"	
0.10	1:5	7/8"	1 1/16"	e (max)



PICTORIAL VIEW (TYPE I SHOWN)

HORIZONTAL WALL REINFORCING SCHEDULE (TABLE 1)

WALL DEPTH	SCHEDULE	AREA (in.²/ft.)	MAX. SPACING	
			BARS	WWF
0'-3'	A12	0.20	12"	8"
3'-6'	A6	0.20	6"	5"
6'-9'	B5.5	0.24	5½"	5"
9'-15'	C6.5	0.37	6½"	6"

GENERAL NOTES

1. Inlet Descriptions:
   Type 1 Single throat, one side of barrier wall.
   Type 2 Double throats, one side of barrier wall.
   Type 3 Two single throats, opposite side of barrier wall.
   Type 4 Two double throats, opposite sides of barrier wall.
   Type 5 Double throats, one side of barrier wall, and single throat other side of barrier wall.

2. For grate details see Index No. 220. The parallel bar grate shall be used unless the reticuline grate is called for in the plans. The reticuline grate shall be specified where bicycle traffic is anticipated. Used in areas of occasional pedestrian traffic. Not suitable for use in pedestrian traffic or bicycle way.

3. All exposed edges and corners shall be ¾" chamfer or tooled to ¼" radius.

4. For standard concrete barrier wall dimensions, and for dimensions of concrete barrier wall incorporating light standards within the wall, see Index No. 410.

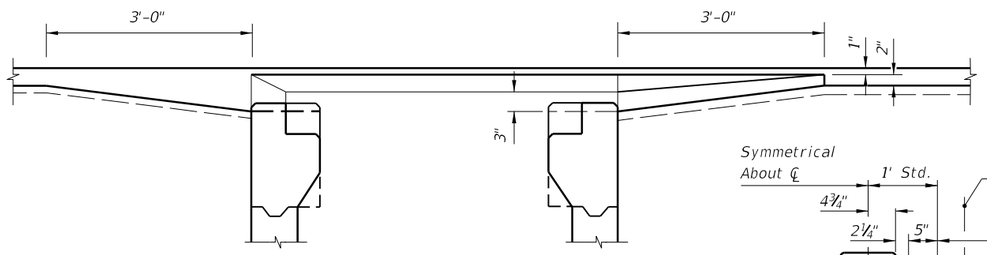
5. Reinforcing steel shall have 2" minimum cover. Horizontal wall reinforcing must be positioned 3" from the inside face unless otherwise shown.

6. All reinforcing is Grade 60 #4 bars. See Index No. 201 for equivalent area of welded wire fabric for inlet. Longitudinal steel bars extend over full length of concrete barrier wall transition. Tie bars @ 12" ctrs. Reinforcing to be paid for under the contract unit price for Concrete Barrier Wall. LF.

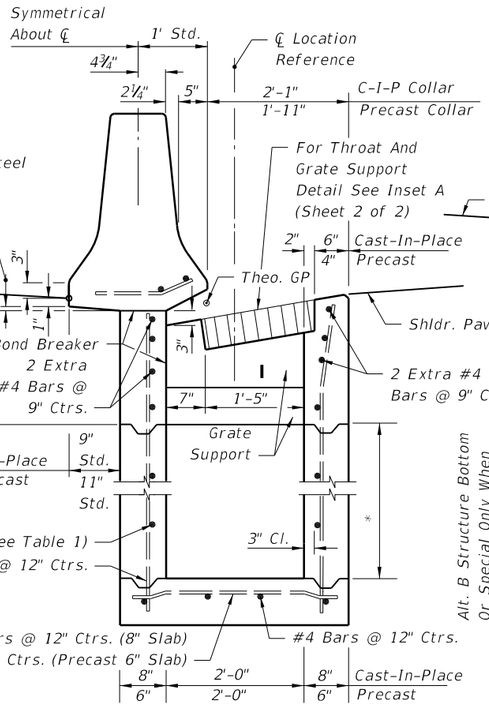
7. For supplemental details see Index No. 201.

8. All dimensions are for both precast and cast-in-place inlets unless otherwise noted.

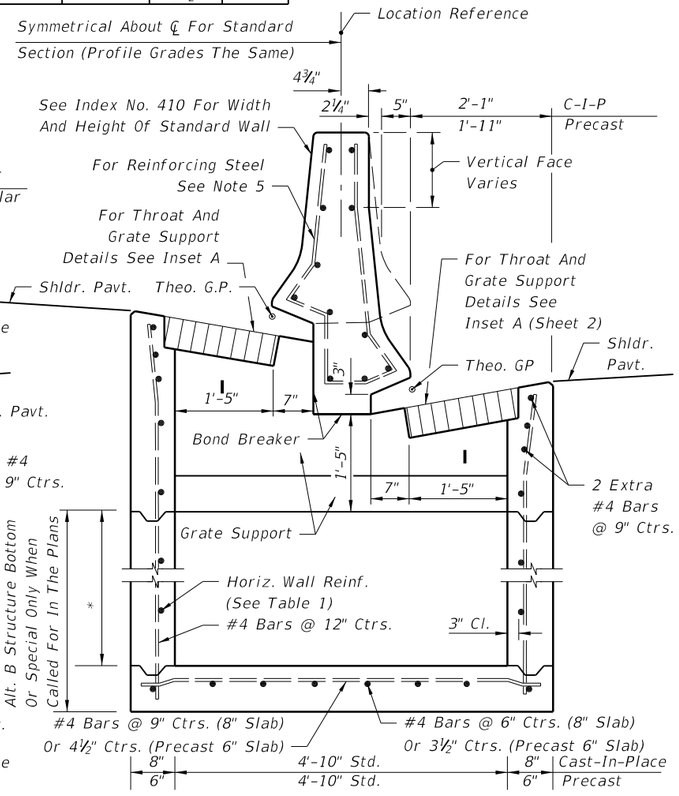
9. Inlets to be paid for under the contract unit price for Inlets (Median Barrier Type_), EA. Barrier wall to be paid for under the contract unit price for Concrete Barrier Wall, LF.



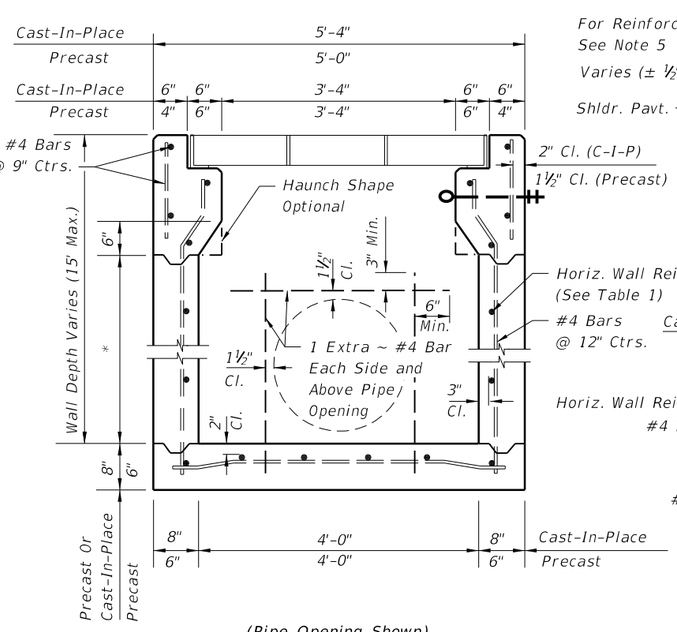
SECTION CC



SECTION FOR INLETS TYPES 1 & 2



SECTION FOR INLETS TYPES 3, 4 & 5
(NON-SYMMETRICAL SECTION SHOWN)

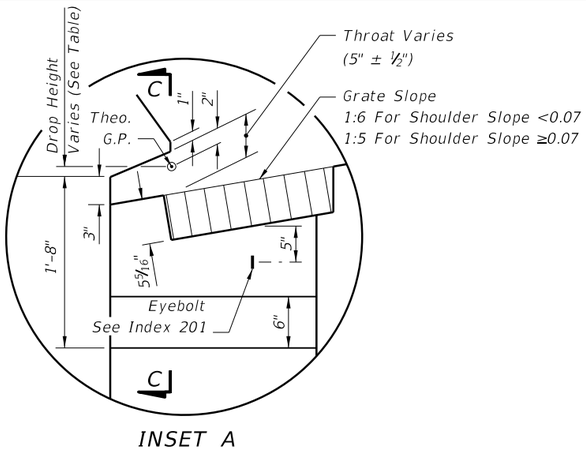


(Pipe Opening Shown)
SECTION AA

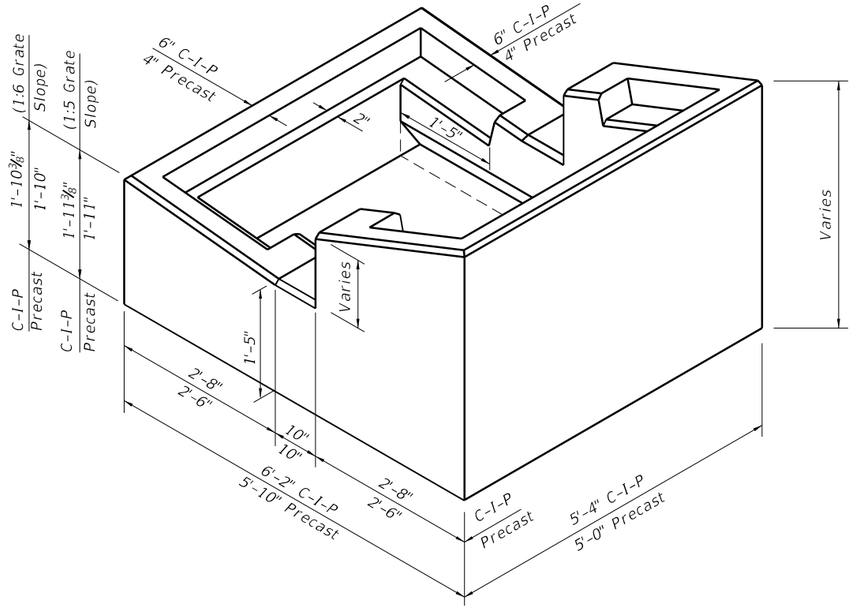
* Const. Joint Permitted Between These Limits See Index No. 201 For Min. Dimensions

(Pipe Opening Shown)
SECTION BB

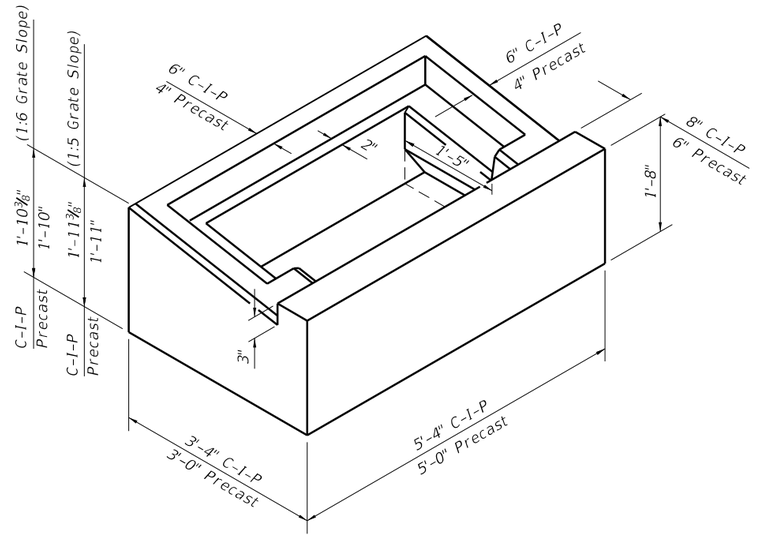
LAST REVISION	REVISION	DESCRIPTION:				
07/01/10			FDOT DESIGN STANDARDS 2013	MEDIAN BARRIER INLETS TYPES 1, 2, 3 4 AND 5	INDEX NO. 217	SHEET NO. 1



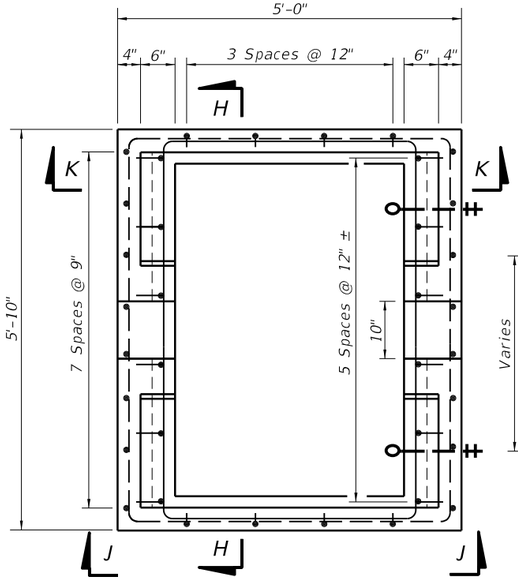
INSET A



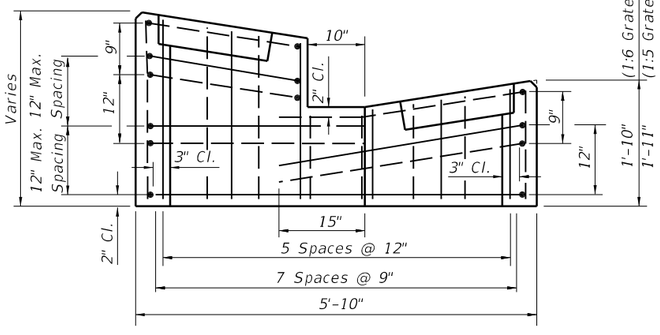
PICTORIAL VIEW OF INLET COLLAR (TYPES 3, 4, & 5)



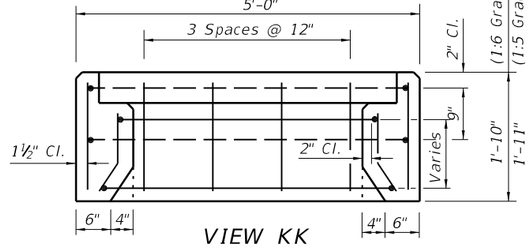
PICTORIAL VIEW OF INLET COLLAR (TYPES 1 & 2)



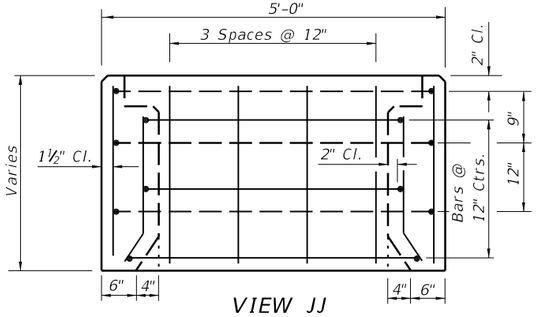
TOP VIEW OF INLET COLLAR WITHOUT GRATE



SECTION HH

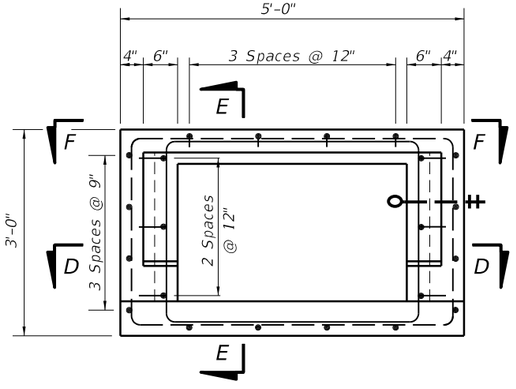


VIEW KK

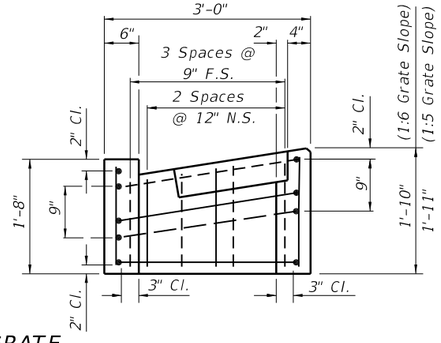


VIEW JJ

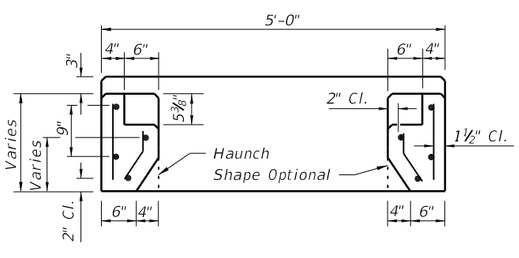
PRECAST COLLAR REINFORCING DETAILS (TYPES 3, 4 & 5)
(C-I-P COLLAR REINFORCING DETAILS SIMILAR)



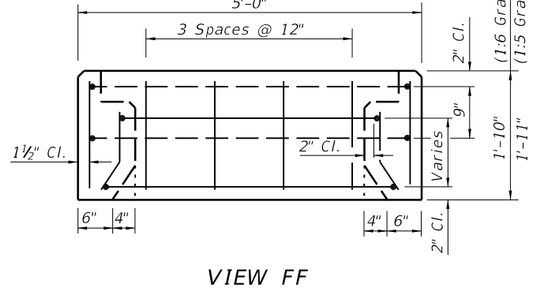
TOP VIEW OF INLET COLLAR WITHOUT GRATE



SECTION EE



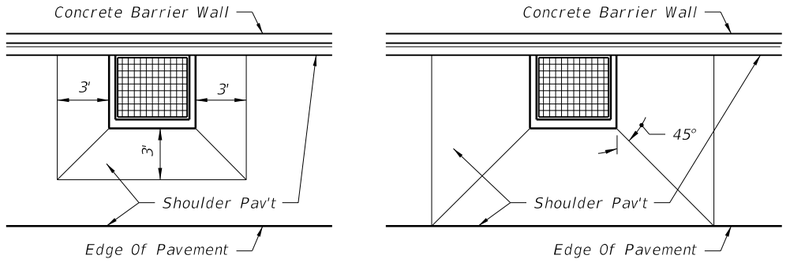
SECTION DD



VIEW FF

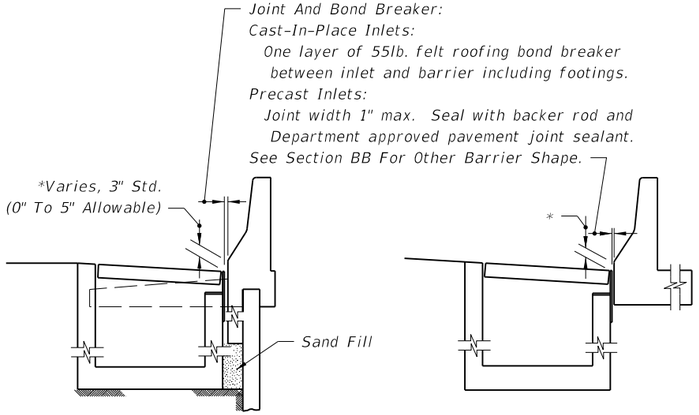
PRECAST COLLAR REINFORCING DETAILS (TYPES 1 & 2)
(C-I-P COLLAR REINFORCING DETAILS SIMILAR)

LAST REVISION	REVISION	DESCRIPTION:		FDOT DESIGN STANDARDS 2013	MEDIAN BARRIER INLETS TYPES 1, 2, 3 4 AND 5	INDEX NO.	SHEET NO.
07/01/05						217	2



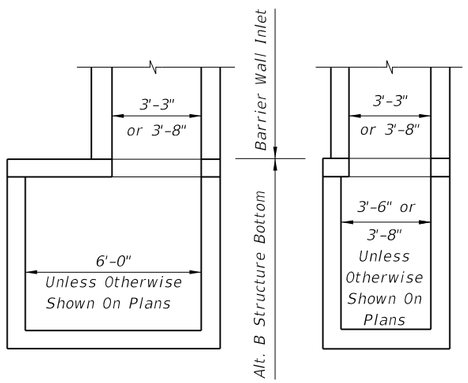
LOW SIDE SUPERELEVATION — HIGH SIDE TRANSITION

PAVEMENT WARP FOR SHOULDERS IN SUPERELEVATION



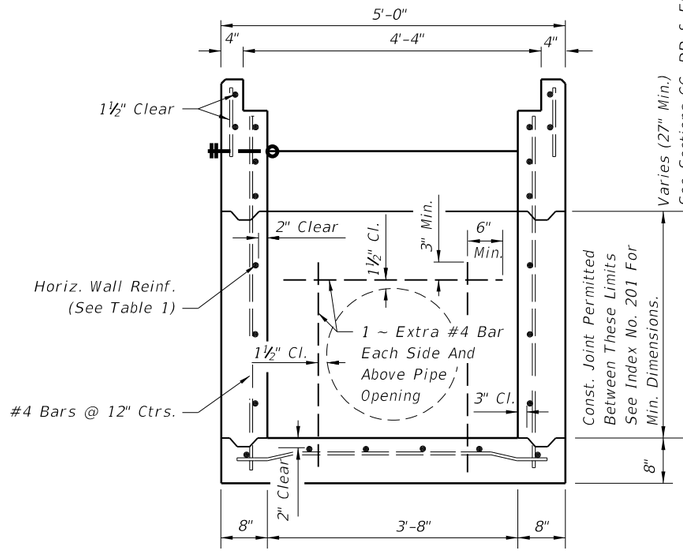
BARRIER WALL / RETAINING WALL — SINGLE FACE ROADWAY BARRIER

INLET SECTION AT WALLS



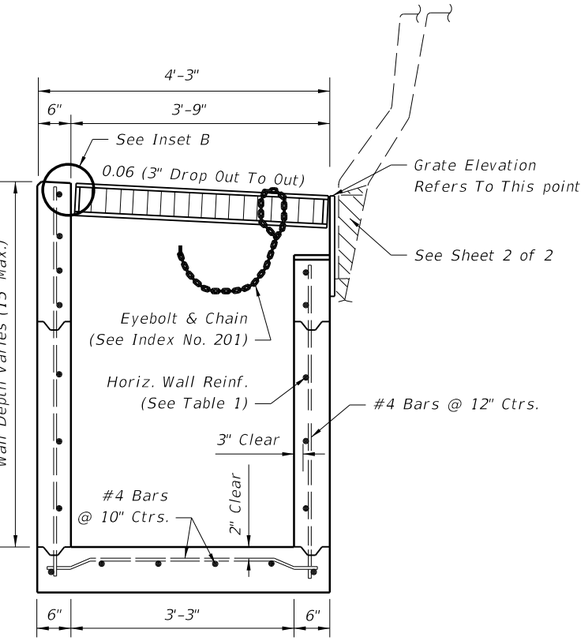
Note: Alt. B Structure Bottom Only. See Index No. 200.

INLET WITH STRUCTURE BOTTOM



(Pipe Opening Shown)

SECTION AA (WITHOUT GRATE)



(Pipe Opening Not Shown)

SECTION BB

GENERAL NOTES

1. This inlet is primarily intended for use adjacent to concrete barrier walls on paved shoulders. Use of the inlet adjacent to other wall types shall be approved by the Drainage Engineer. The inlet is suitable for bicycle and occasional pedestrian traffic, with roller bar installation (see inset B) but should not be placed in a designated pedestrian travel way. It is not intended for use in curb and gutter or other areas where throated inlets are required, nor areas subject to high debris.

2. Inlets located in embankments constructed with earth anchored retaining wall shall be designed with minimum depths to reduce adverse impact on the anchorage system. Runs of pipe parallel to and near anchored wall shall be avoided wherever practical. Special coordination must be exercised during the design and construction of storm water systems within anchored wall systems.

3. Inlet bottoms and/or tops may be either precast or cast-in-place. Whether cast as a single unit or as multiple segments, and whether precast or cast-in-place, the upper 2'-3" of the inlet shall be reinforced in accordance with sections CC, DD and EE.

4. All exposed edges and corners shall be ¾" chamfer or tooled to ¼" radius.

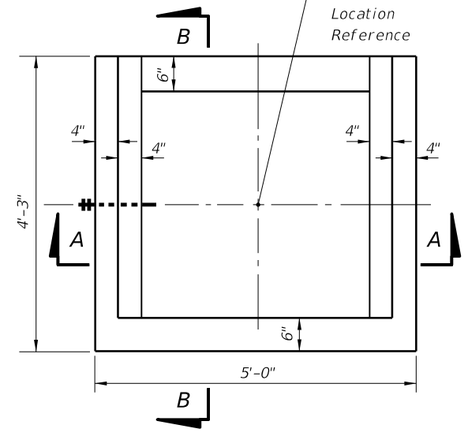
5. When Alternate G grate is specified in the plans, the grate is to be hot-dip galvanized after fabrication. Field installation of the filler bar called for in Inset B will not be permitted, thereby requiring tolerance adjustment during fabrication and/or casting, or, matching grate to structure prior to galvanizing.

6. All reinforcing is Grade 60 bars. See Index No. 201 for equivalent area of welded wire fabric.

7. All dimensions are for both precast and cast-in-place inlets unless otherwise noted.

8. For supplemental details see Index Nos. 200 and 201.

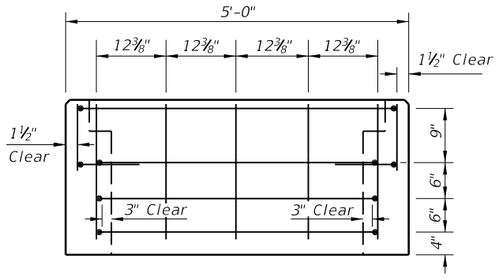
9. Inlets to be paid for under the contract unit for Inlets (Barrier Wall), Each.



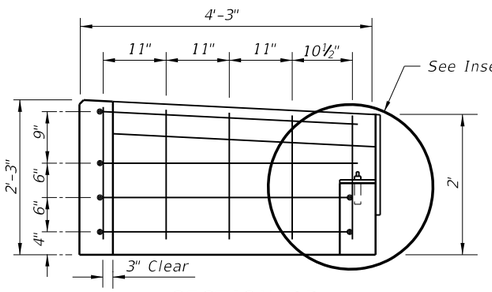
TOP VIEW (WITHOUT GRATE)

HORIZONTAL WALL REINFORCING SCHEDULE (TABLE 1)

WALL DEPTH	SCHEDULE	AREA (in.²/ft.)	MAX. SPACING	
			BARS	WWF
0'-5'	A12	0.20	12"	8"
5'-10'	A6	0.20	6"	5"
10'-15'	A4	0.20	4"	3"
10'-15'	B5.5	0.24	5½"	5"



SECTION CC



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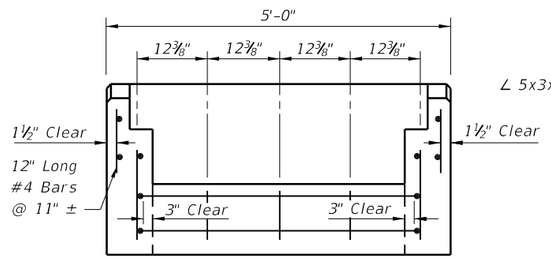

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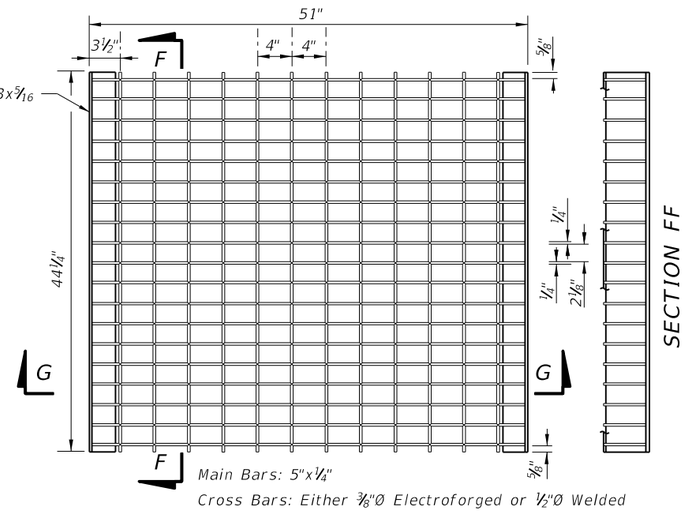
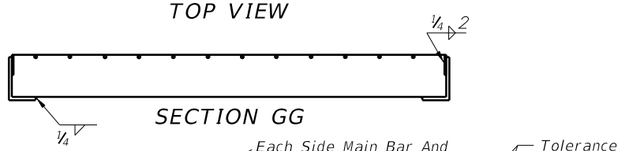
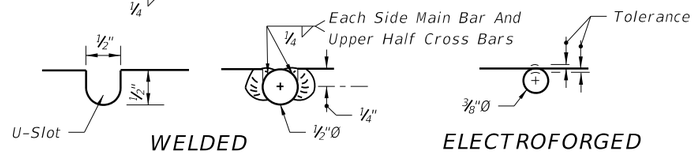


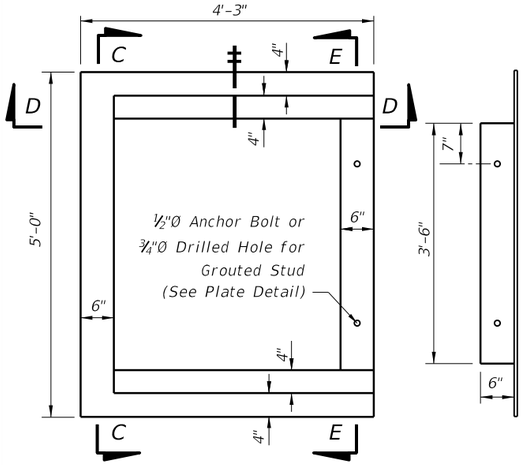
TOP VIEW





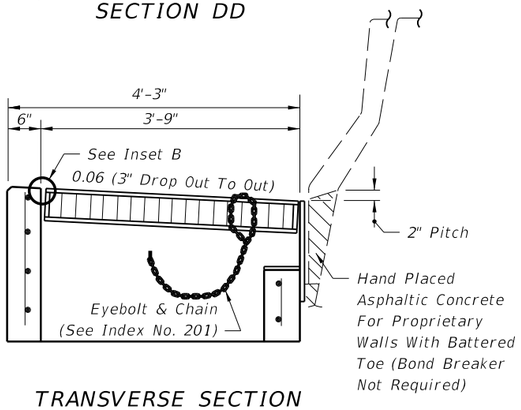
CROSS BAR OPTIONS

STEEL GRATE

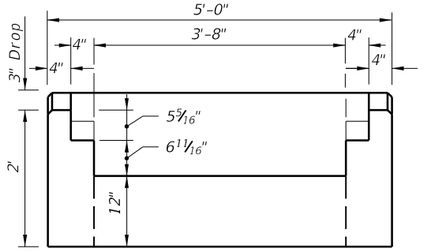


TOP VIEW OF INLET WITHOUT GRATE

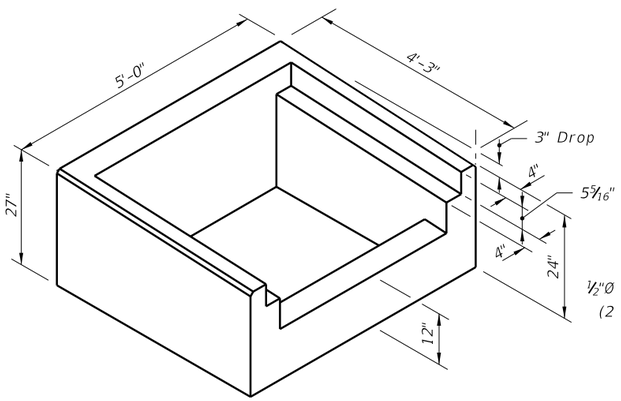
TOP VIEW OF METAL PLATE



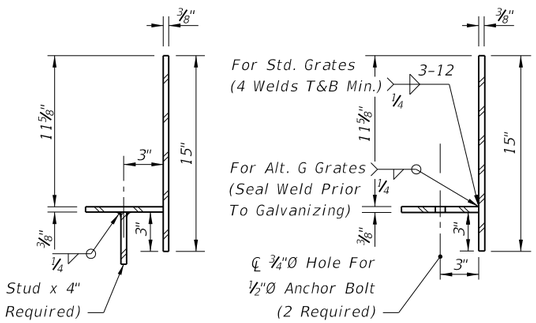
TRANSVERSE SECTION WITH GRATE & PLATE



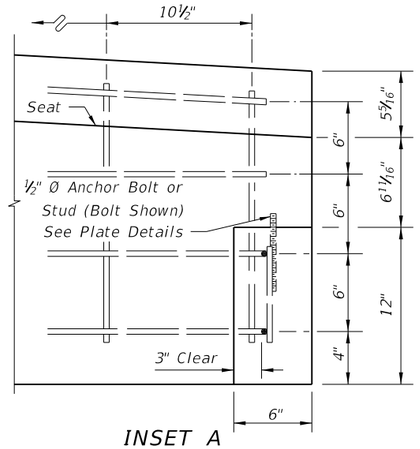
BACK VIEW WITHOUT BACK PLATE



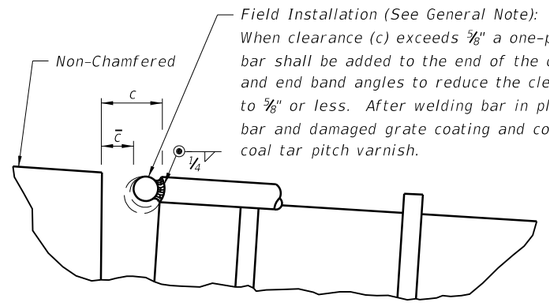
PICTORIAL VIEW OF INLET COLLAR



TRANSVERSE SECTIONS THRU BACKWALL PLATE



INSET A



INSET B

NOTES

1. All bars #4.

2. Anchor bolts shall be either ASTM A307 hex head bolts cast-in-place, or ASTM A36 or F1554 (Grade 36) galvanized fully threaded rod, adhesive bonded anchors installed in accordance with Specification Section 416. Bolts or rods shall be 6" long (4" min. embedment) with one heavy hex head nut (ASTM 194 or A563) and one flat washer (ASTM F436) each. All anchor bolts, nuts and washers shall be hot-dip galvanized.

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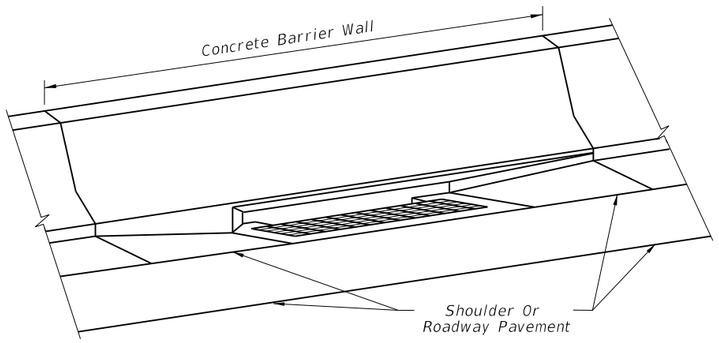
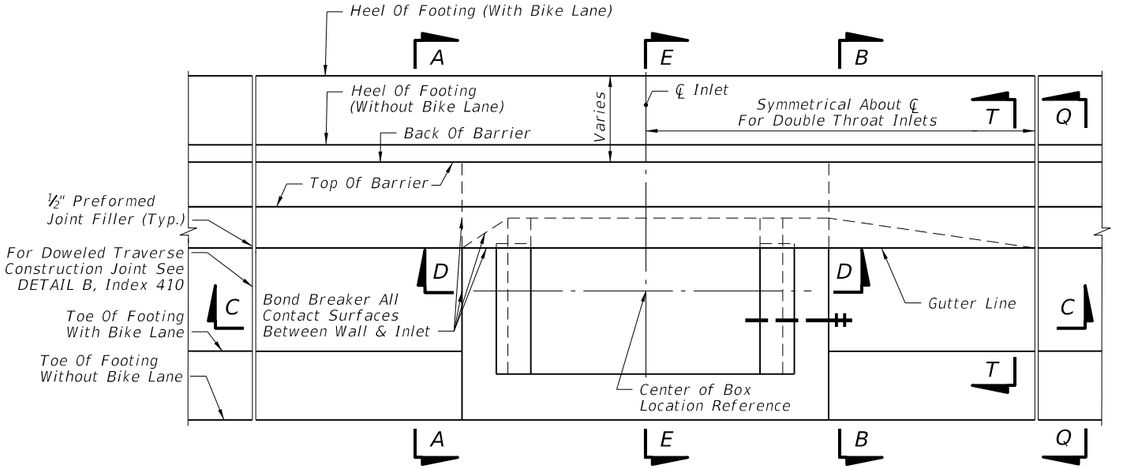
LAST REVISION	REVISION	DESCRIPTION:			INDEX NO.	SHEET NO.
07/07/09			FDOT DESIGN STANDARDS 2013	BARRIER WALL INLET	218	2

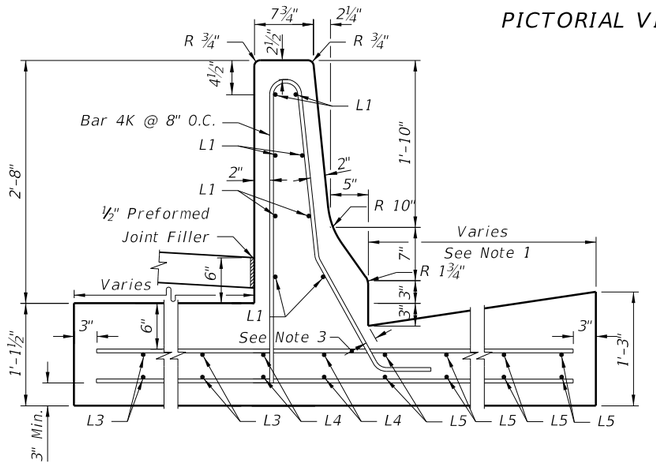


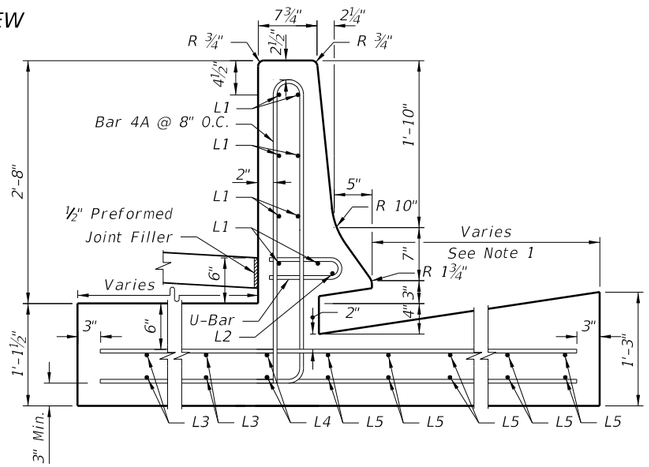
PICTORIAL VIEW

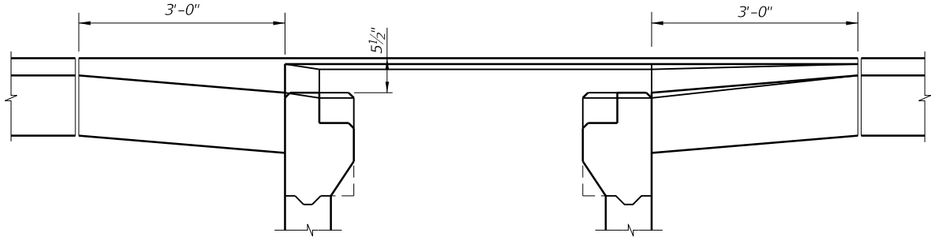


NOTE: For Sections QQ & TT, see Index 410.

PLAN VIEW







NOTES:
1. Distance = 1'-6" With Bike Lane, Or 2'-6" Without Bike Lane.
2. For Double Throat Inlet, Section BB replaces Section AA.
3. Field Bend Bar 4K To Maintain 2" Minimum Concrete Cover.

SECTION AA

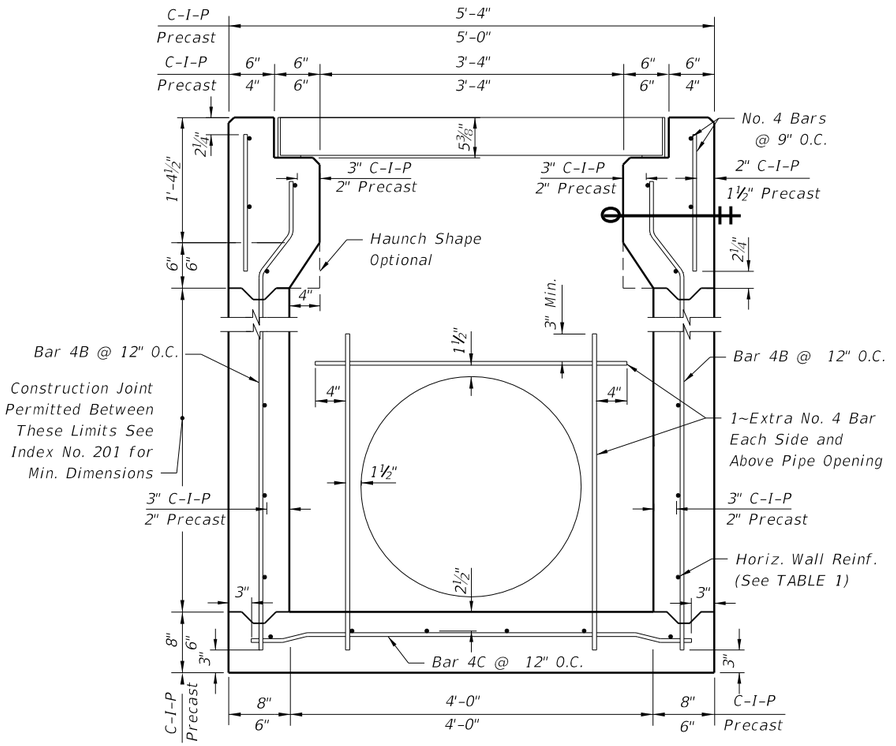
SECTION BB

SECTION CC

GENERAL NOTES

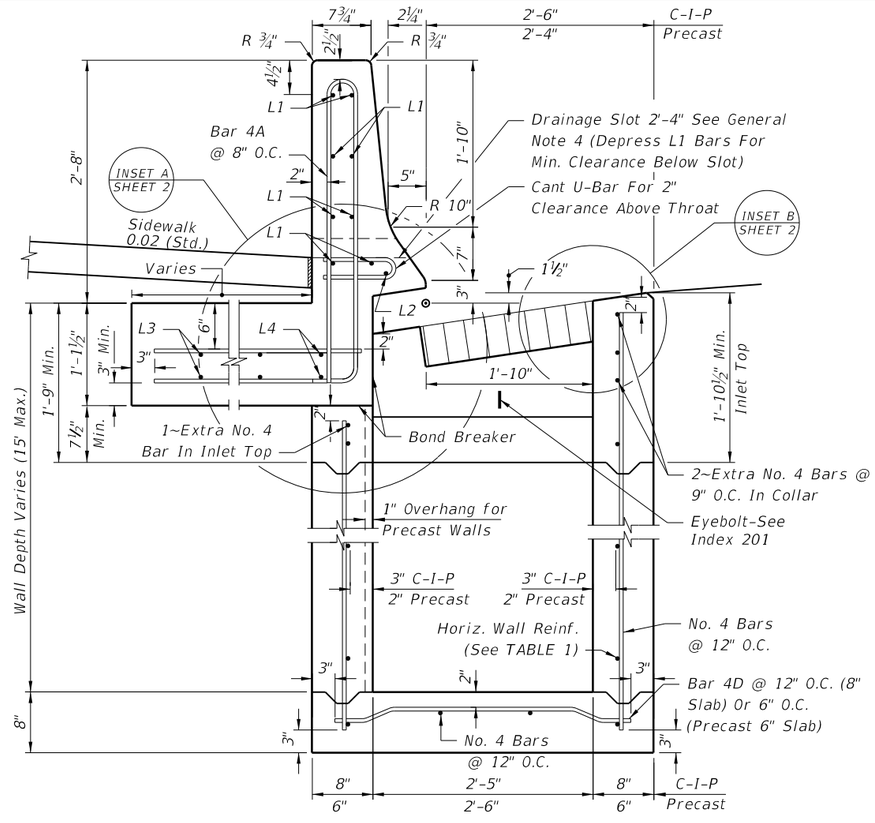
1. This inlet to be used in conjunction with Concrete Barrier Wall, Curb and Gutter, Index No. 410. The inlet is suitable for bicycle and occasional pedestrian traffic with extended crossbar or bar stub (see INSETS B & B ALTERNATE). Inlet should not be placed in a pedestrian way.
2. All reinforcing is Grade 60 bars. For equivalent area of welded wire fabric for inlet, see Index No. 201. Reinforcing shall have 2" min. cover unless otherwise shown. Bars shall be trimmed or bent to provide 1½" clearance around pipe openings. Cost for additional reinforcing in barrier wall to be included in cost of concrete barrier wall.
3. Barrier wall shall be Class II Concrete, finished surface in accordance with General Note 1, Sheet 1, Index No. 410.
4. All exposed edges and corners shall be 3/4" chamfer or tooled to 1/4" radius.
5. A flat 18"x2½" drainage slot shall be constructed at the inlet centerline when the inlet is located in a curb sag. For drainage slot construction, no more than two bars shall be trimmed or deleted such as type: 4A, 4K, and U-Bar. On each side of drainage slots, vertical & horizontal bars shall be placed to provide 2" concrete cover.
6. Recommended maximum pipe sizes are 18" longitudinal and 30" transverse. For larger pipe, use Alternate B bottoms, Index No. 200.
7. Grates can be fabricated with reticuline bars or with either 1/2"∅ welded or 3/8"∅ electroforged cross bars and bearing bars as detailed on Sheet 3.
8. When Alternate G grate is specified in plans, the grate is to be hot-dip galvanized after fabrication according to Specification 962-9.
9. For Pay Item purposes, the depth of the barrier wall inlet shall be computed using the center of box grate elevation, less the flow line elevation of the lowest pipe flow line or to the top of the sump floor elevation.
10. All dimensions are for both precast and C-I-P inlets unless otherwise noted.
11. Inlets to be paid for under the contract unit price for Inlets, Barrier Wall, Rigid, Curb & Gutter, Each.
12. Concrete Barrier Wall to be paid for under the contract unit price for Shoulder Concrete Barrier Wall, Rigid-Curb & Gutter, LF.

LAST REVISION	REVISION	DESCRIPTION:				
01/01/12			FDOT DESIGN STANDARDS 2013	CONCRETE BARRIER WALL INLET	INDEX NO. 219	SHEET NO. 1



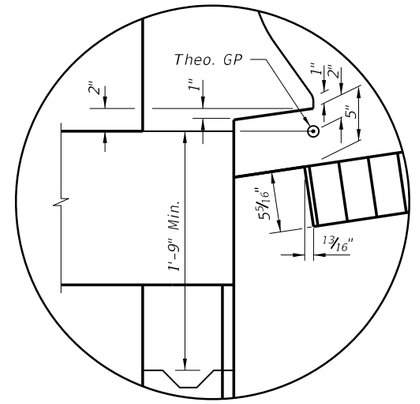
(18" Dia. Pipe Opening Shown)

SECTION DD

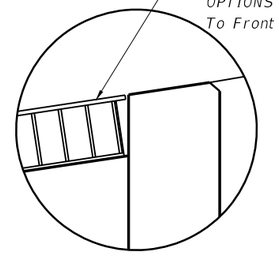


(Pipe Opening Not Shown)

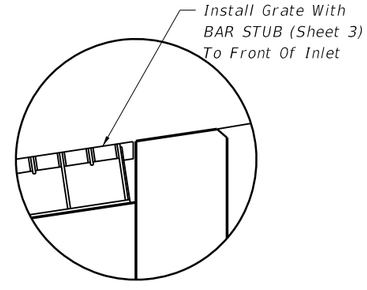
SECTION EE



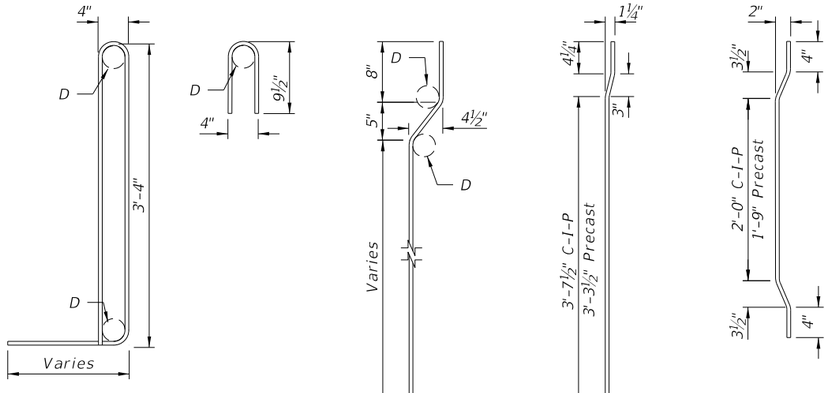
INSET A



INSET B



INSET B (ALTERNATE)



BAR BENDING DIAGRAMS

REINFORCING NOTES:

1. Bars L1: Length 11'-1", Straight @ 8" O.C.
2. Bars L2: Length: 8'-4" (Single Throat) 11'-0" (Double Throat) @ 8" O.C.
3. Bars L3 & L4: Length 11'-1" Field Bend For 4" Drop (Top Bars) 3" Drop (Bottom Bars) @ 8" O.C.
4. Bars L5: Length 2'-8" Field Bend For Drop Same As L3 & L4 @ 8" O.C.
5. U Bars @ 8" O.C.

WALL DEPTH		SCHEDULE	AREA (in.²/ft.)	MAX. SPACING	
C-I-P	PRECAST			BARS	WWR
0'-4'	0'-3'	A12	0.20	12"	8"
4'-9'	3'-6'	A6	0.20	6"	5"
9'-15'	6'-10'	B5.5	0.24	5½"	5"
	10'-15'	C6.5	0.37	6½"	6"

HORIZONTAL WALL REINFORCING SCHEDULE (TABLE 1)

NOTES:

1. For DOWELED TRANSVERSE CONSTRUCTION JOINT WHEN ABUTTING SEGMENT(S) LESS THAN 40' IN LENGTH, see DETAIL B, Index 410.
2. For Additional Information on "STANDARD BAR BENDING DETAILS," See Index 21300.

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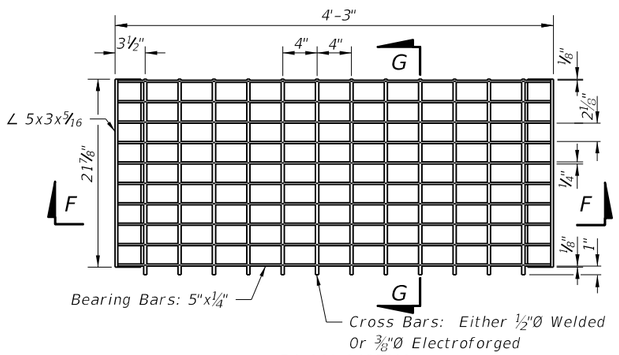
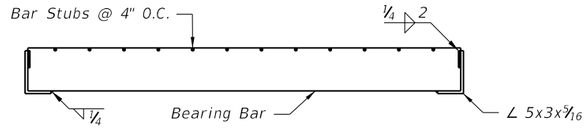
LAST REVISION	REVISION	DESCRIPTION:			INDEX NO.	SHEET NO.
01/01/12			FDOT DESIGN STANDARDS 2013	CONCRETE BARRIER WALL INLET	219	2



PLAN VIEW



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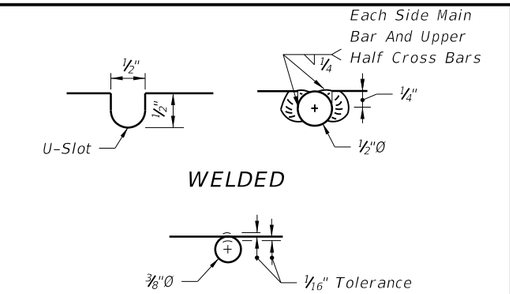
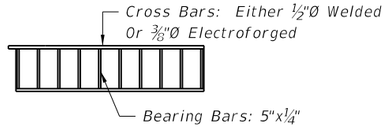
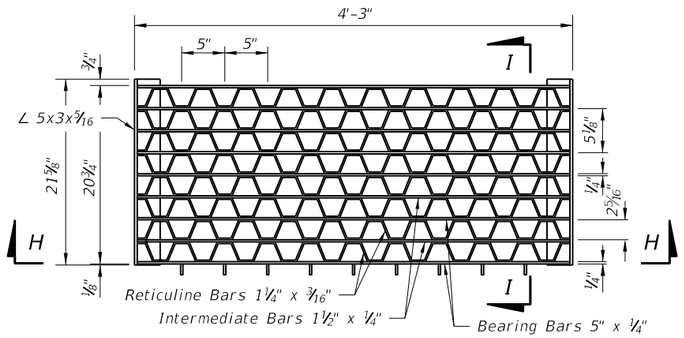


CROSS BAR OPTIONS

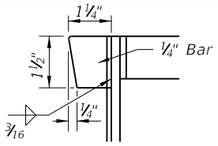


SECTION GG

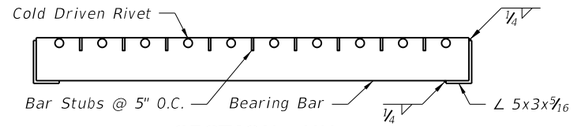
CROSS BAR GRATE



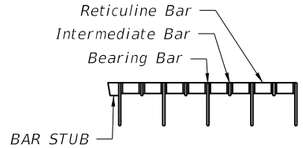
PLAN VIEW



BAR STUB



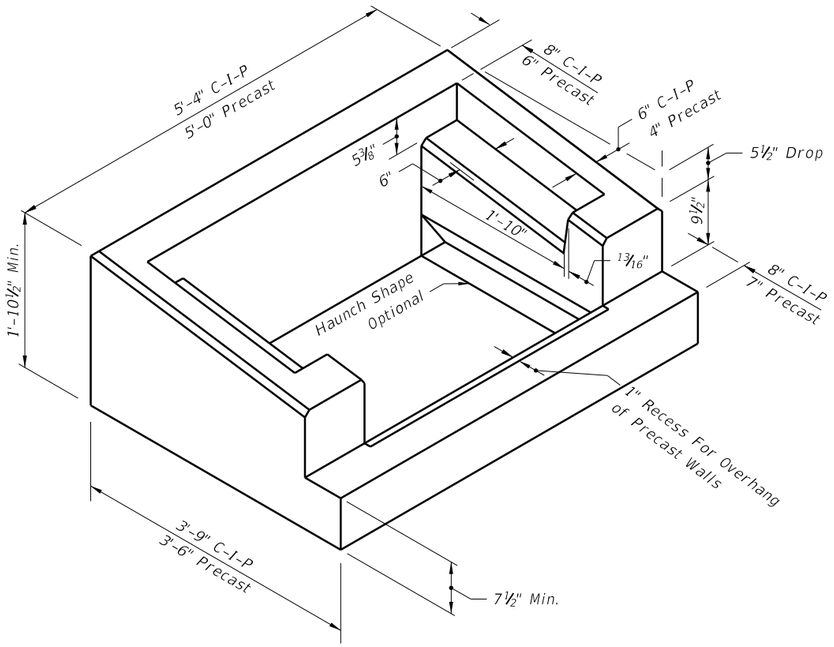
SECTION HH



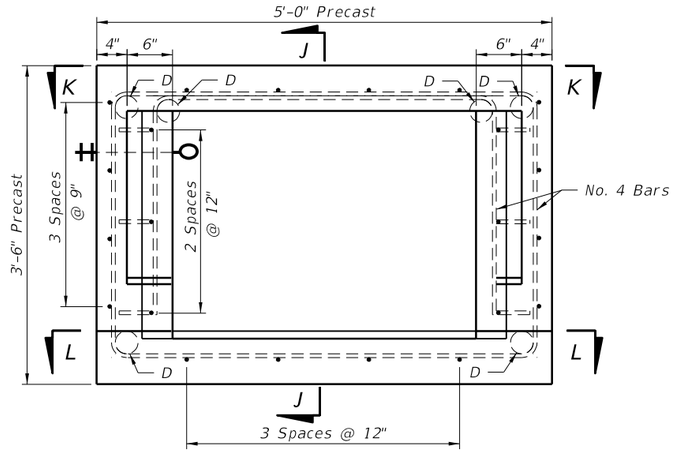
SECTION II

RETICULINE GRATE

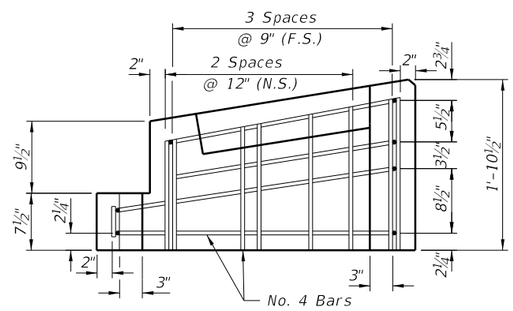
OPTIONAL STEEL GRATES



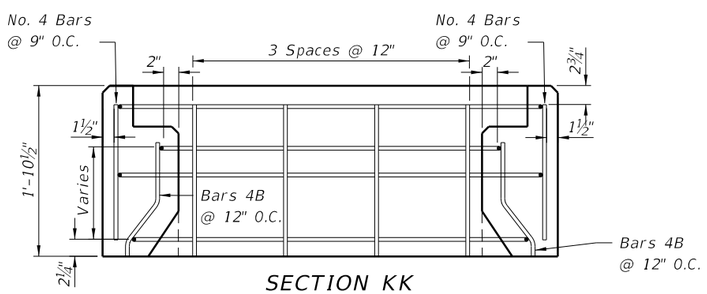
PICTORIAL VIEW OF INLET TOP



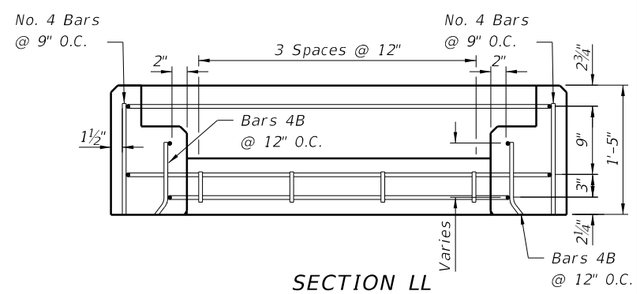
TOP VIEW OF INLET TOP WITHOUT GRATE



SECTION JJ



SECTION KK

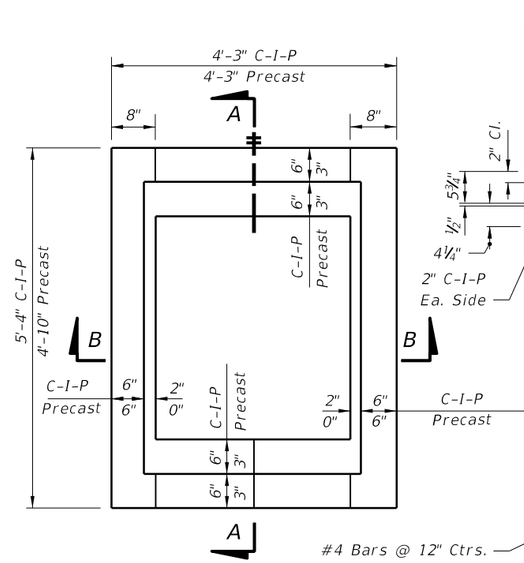


SECTION LL

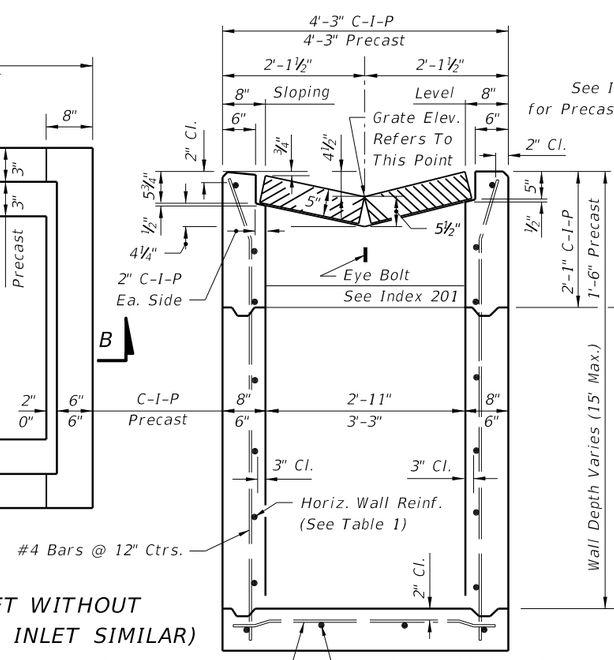
NOTE:
1. For additional information on Bar 4B, see BAR BENDING DIAGRAMS (Sheet 2).
2. C-I-P Inlet Top Reinforcing Similar

PRECAST INLET TOP REINFORCING DETAILS

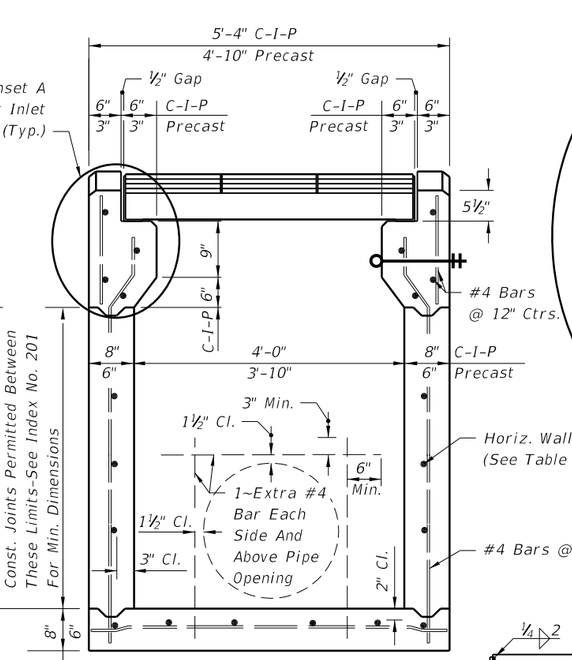
LAST REVISION	REVISION	DESCRIPTION:				
01/01/12			FDOT DESIGN STANDARDS 2013	CONCRETE BARRIER WALL INLET	INDEX NO. 219	SHEET NO. 3



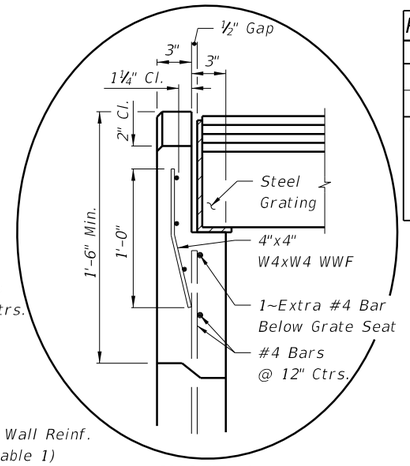
PLAN
(CAST-IN-PLACE INLET WITHOUT GRATE SHOWN, PRECAST INLET SIMILAR)



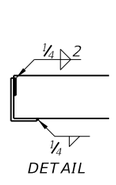
(Pipe Opening Not Shown)
SECTION BB
(CAST-IN-PLACE INLET SHOWN, PRECAST INLET SIMILAR)



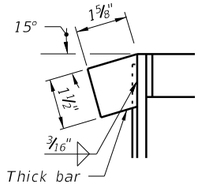
(Pipe Opening Shown)
SECTION AA



INSET A
(PRECAST OPTION)



DETAIL



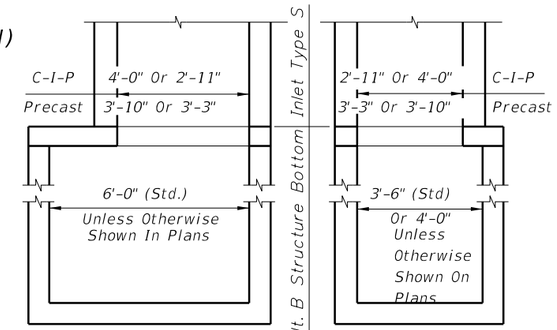
DETAIL OF BAR STUB

RECOMMENDED MAXIMUM PIPE SIZES	
INLET INSIDE WIDTH	PIPE SIZE
2'-11" or 3'-3"	24"
4'-0" or 3'-10"	30"

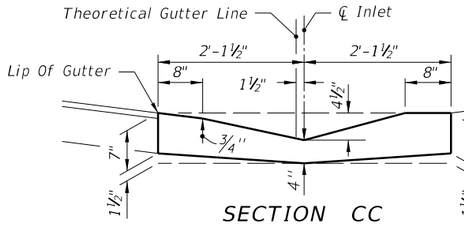
Note: Recommended sizes are for concrete pipe. Sizes for other types of pipe must be verified for fit in accordance with Index No. 201. For larger pipe see bottom detail below and Index No. 200.

HORIZONTAL WALL REINFORCING SCHEDULE (TABLE 1)

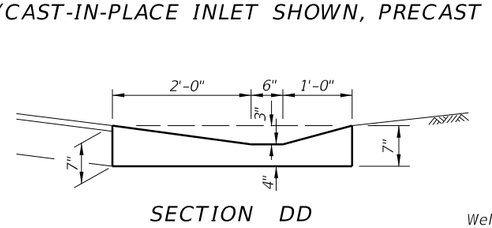
WALL DEPTH	SCHEDULE	AREA (in^2/ft)	MAX. SPACING	
			BARS	WWF
0'-5'	A12	0.20	12"	8"
5'-9'	A6	0.20	6"	5"
9'-12'	A4	0.20	4"	3"
9'-15'	B5.5	0.24	5½"	5"



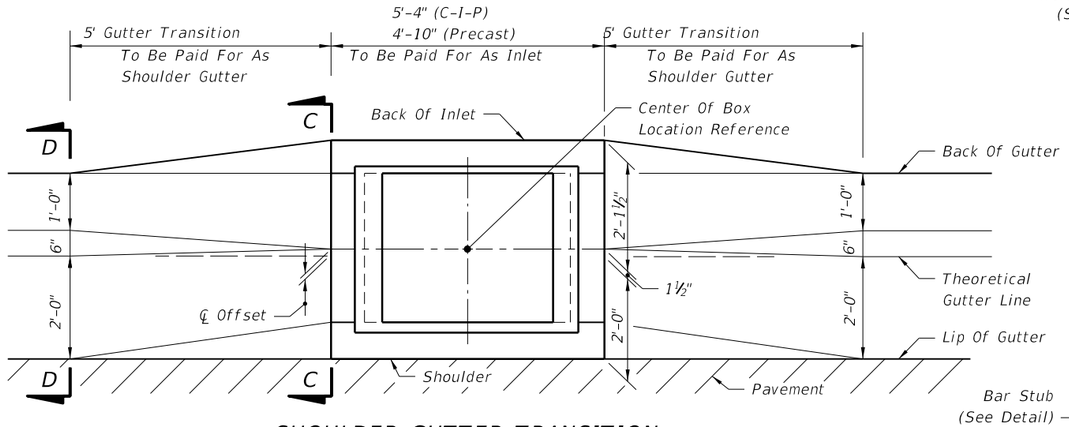
NOTE: Alt. B Structure Bottom Only. See Index No. 200 for structure bottom details and hole reinforcement.



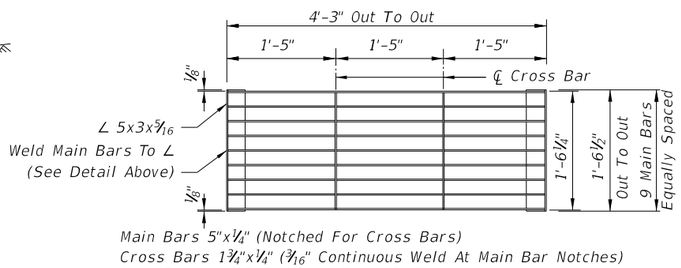
SECTION CC

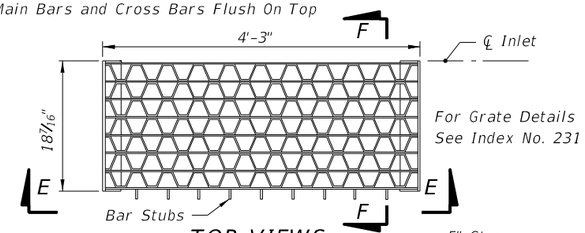


SECTION DD

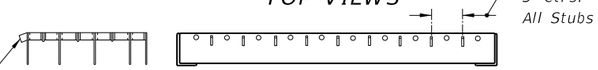


SHOULDER GUTTER TRANSITION





TOP VIEWS



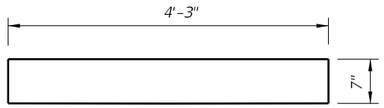
SECTION FF
SECTION EE

STEEL GRATE

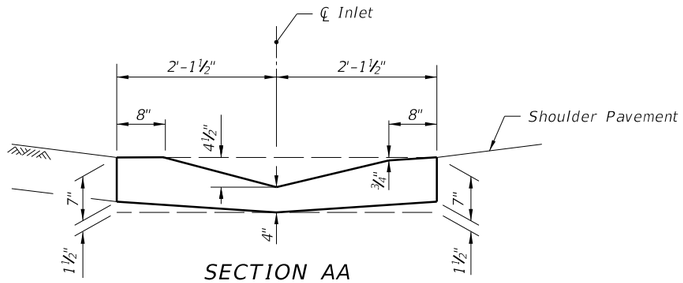
GENERAL NOTES

1. This inlet is intended for use in shoulder gutter on facilities subject to heavy wheel loads. The parallel bar grate shall be used on limited access facilities. On other facilities the reticuline grate shall be used. Locate inlet outside of pedestrian way.
2. All reinforcing is Grade 60 bars with 2" min. cover unless otherwise noted. See Index No. 201 for equivalent area of welded wire fabric. Bars to be cut or bent for 1½" minimum clearance around pipe.
3. All exposed edges and corners shall be ¾" chamfer or tooled to ¼" radius.
4. When Alternate G grate is specified in plans, the grate is to be hot-dip galvanized after fabrication.
5. For supplementary details and notes see Index Nos. 200 and 201.
6. All dimensions are for both precast and cast-in-place inlets unless otherwise noted.
7. Inlets to be paid for under the contract unit price for inlets (Gutter Type S), EA. Cost of concrete apron at terminal inlets to be included in the cost of the inlet.

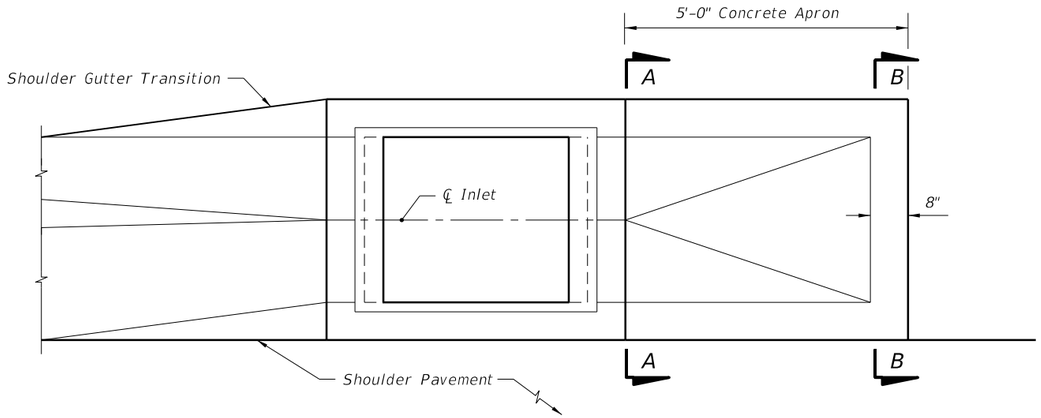
LAST REVISION	REVISION	DESCRIPTION:				
07/01/10			FDOT DESIGN STANDARDS 2013	GUTTER INLET TYPE S	INDEX NO. 220	SHEET NO. 1



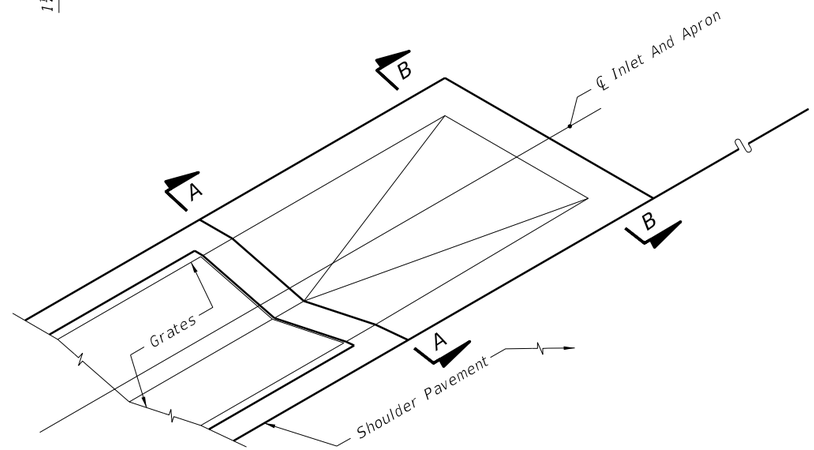
SECTION BB
(Enlarged)



SECTION AA
(Enlarged)



Top View



PICTORIAL VIEW

Apron To be Constructed At The Most Downstream Inlet In A Run Of Shoulder Gutter

CONCRETE APRON AT TERMINAL INLETS

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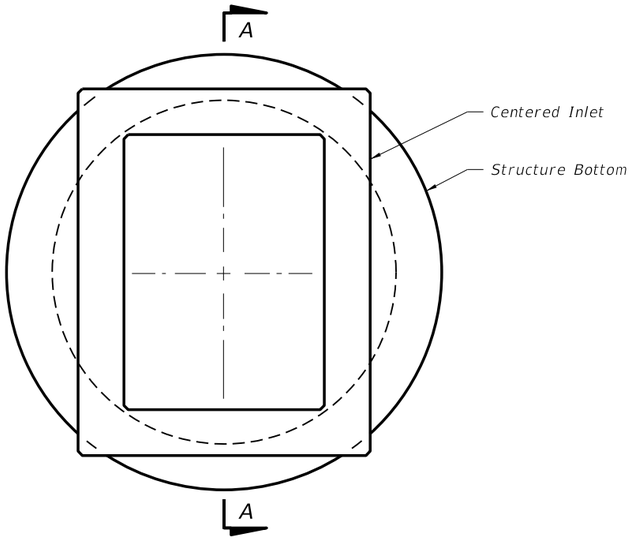
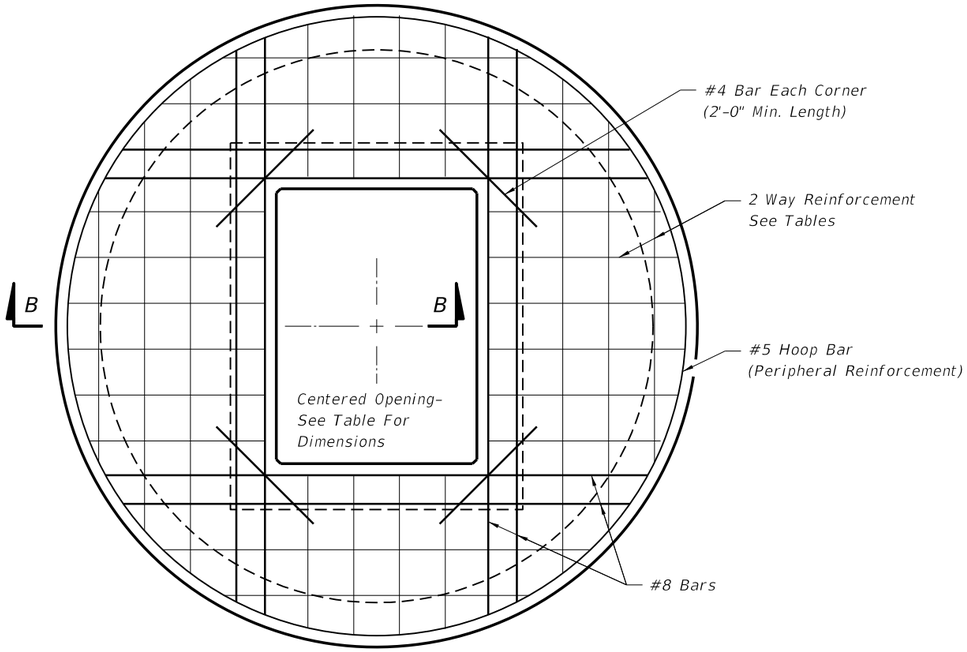
LAST REVISION	REVISION	DESCRIPTION:		FDOT DESIGN STANDARDS 2013	GUTTER INLET TYPE S	INDEX NO.	SHEET NO.
07/01/07			STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION			220	2



TOP VIEW

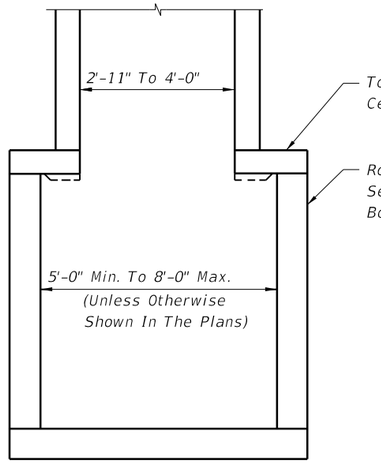
TOP SLAB OPENINGS		
DIAMETER	OPENING SIZE	
	MIN.	MAX.
5'-0" To 8'-0"	2'-11" x 4'-0"	3'-3" x 3'-10"



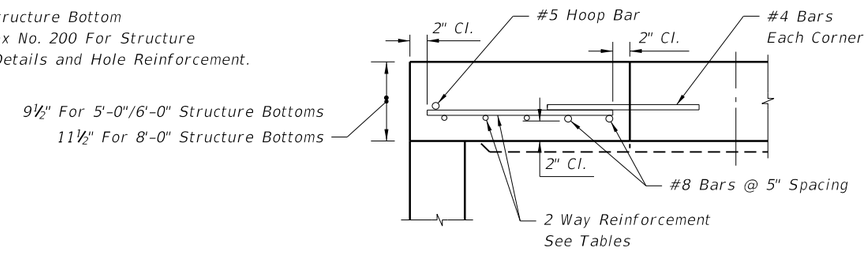
TOP SLAB REINFORCING DIAGRAM

TOP SLAB REINFORCING SCHEDULE	
SCHEDULE	GRADE 60 (BAR) OR 65 KSI & 70 KSI (WIRE FABRIC) $In^2/ft.$
A	0.20
B	0.24
C	0.37
D	0.53
E	0.73
F	1.06
G	1.45

TOP SLAB WITH CENTERED OPENING		
SLAB DEPTH	SLAB THICKNESS	REINFORCING (2 WAYS) SCHEDULE
SIZE: 5'-0"		
≥0.5'<30'	9½"	C
30'-40'	9½"	D
SIZE: 6'-0"		
≥0.5'<8'	9½"	B
8'<18'	9½"	C
18'<30'	9½"	D
30'<37'	9½"	E
37'-40'	9½"	G
SIZE: 8'-0"		
≥0.5'<9'	11½"	C
9'<15'	11½"	D
15'<23'	11½"	E
23'<33'	11½"	E
33'-40'	11½"	G



SECTION AA



SECTION BB

ALT. A STRUCTURE BOTTOM FOR INLET TYPE S

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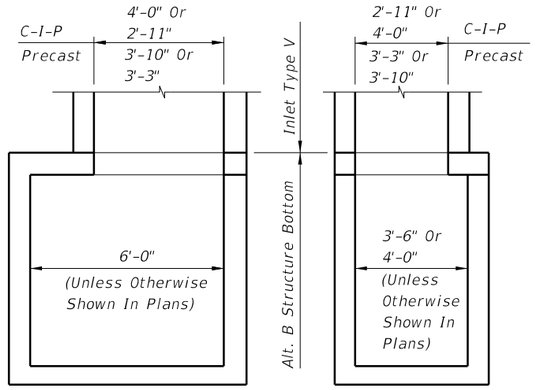
LAST REVISION	REVISION	DESCRIPTION:		FDOT DESIGN STANDARDS 2013	GUTTER INLET TYPE S	INDEX NO.	SHEET NO.
07/01/05						220	3

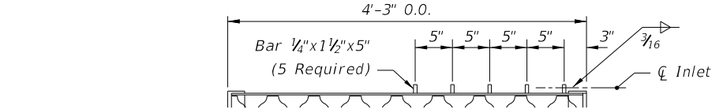


NOTE: Alt. B Structure Bottom Only. See Index No. 200 for structure bottom details and hole reinforcement.

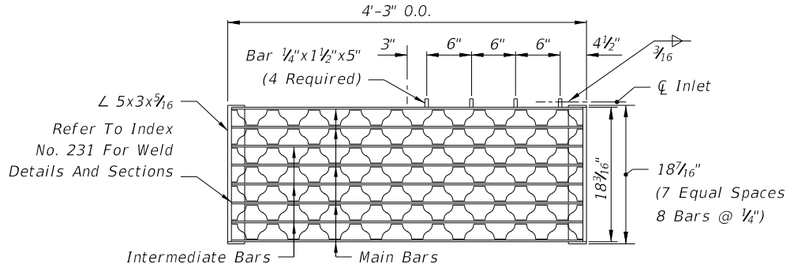
(For Pipes 30" Dia. And Larger)

INLET WITH STRUCTURE BOTTOM

RECOMMENDED MAXIMUM PIPE SIZES	
Inlet Inside Width	Pipe Size
2'-11" Or 3'-3"	24"
4'-0" Or 3'-10"	30"
Note: Recommended sizes are for concrete pipe. Sizes for other types of pipe must be verified for fit in accordance with Index No. 201. For larger pipe see bottom detail above and Index No. 200.	



OPTIONAL BAR SPACING



TWO REQUIRED PER INLET

5" Steel Grate: Main Bars 5"x¼"
Intermediate Bars 1½"x¼"
Reticuline Bars 1¼"x3/16"

Steel Grate : Manufactured By Borden, Florida Steel, U.S. Foundry Irving, Reliance, Greulich (Or Equal).

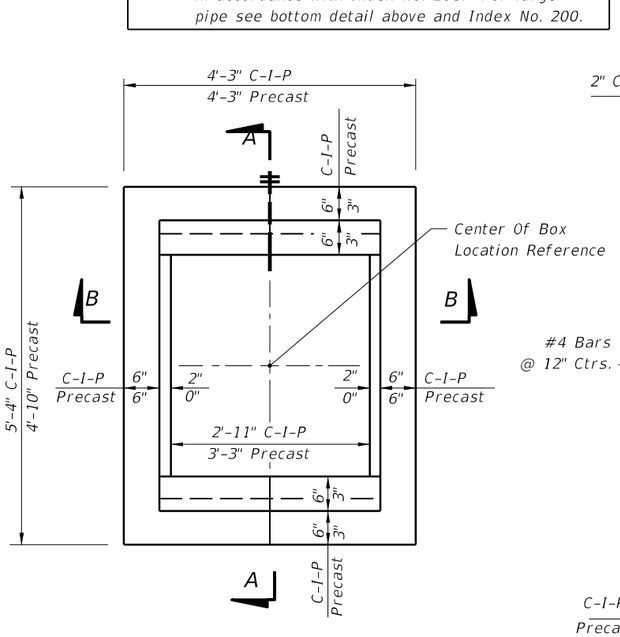
STEEL GRATE

GENERAL NOTES

1. This inlet is suitable for village swales, ditches, or other areas subject to heavy wheel loads, minimum debris. This inlet may be placed in areas subject to occasional pedestrian traffic such as landscaped areas and pavement areas where pedestrians can walk around the inlet. This inlet is not for use in a bicycle way.
2. When alternate "G" grate is specified in plans, the grate is to be hot dip galvanized after fabrication.
3. All reinforcing is Grade 60 bars with 2" min. cover unless otherwise noted. See Index No. 201 for equivalent area of welded wire fabric. Cut or bend bars out of way of pipe to clear pipe 1½".
4. All exposed edges and corners shall be ¾" chamfer or tooled to ¼" radius.
5. All dimensions are for both precast and cast-in-place inlets unless otherwise noted.
6. For supplementary details see Index No. 201.
7. Inlet to be paid for under the contract unit price for Inlets (Gutter Type V), EA

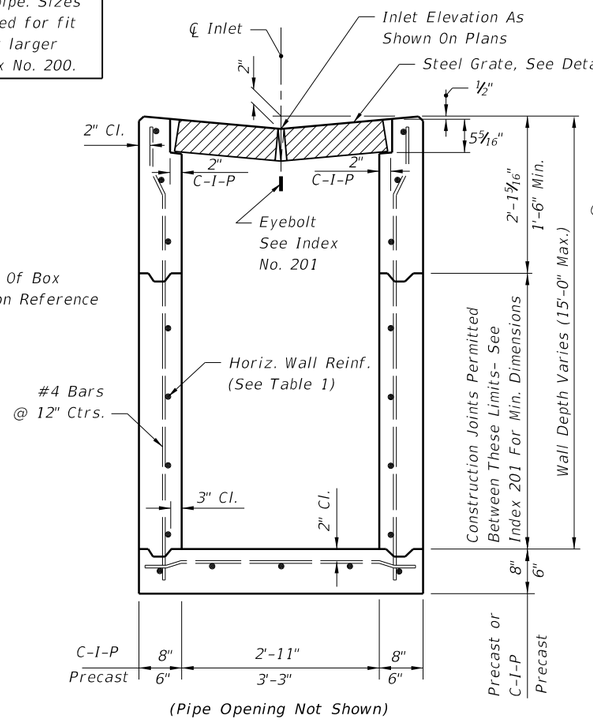
HORIZONTAL WALL REINFORCING SCHEDULE (TABLE 1)

WALL DEPTH	SCHEDULE	AREA (in.²/ft.)	MAX. SPACING	
			BARS	WWF
0' - 5'	A12	0.20	12"	8"
5' - 9'	A6	0.20	6"	5"
9' - 12'	A4	0.20	4"	3"
9' - 15'	B5.5	0.24	5½"	5"



PLAN

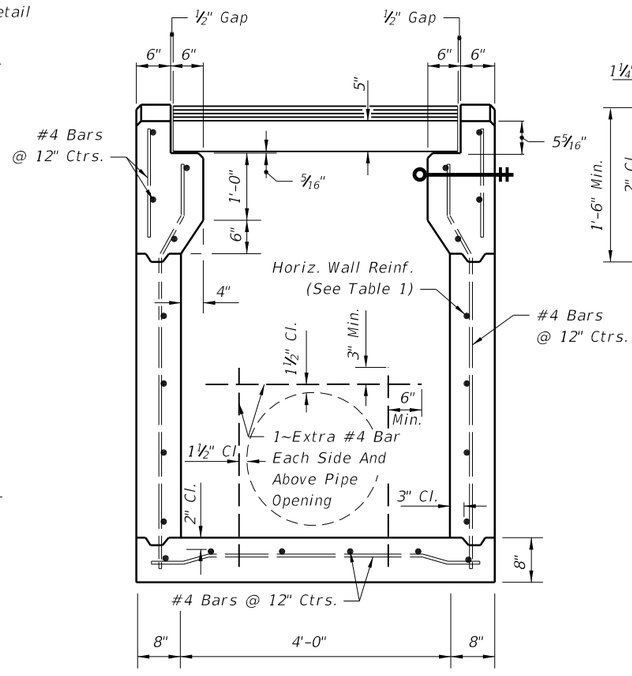
(CAST-IN-PLACE INLET SHOWN WITHOUT GRATE; PRECAST INLET SIMILAR)



(Pipe Opening Not Shown)

SECTION BB

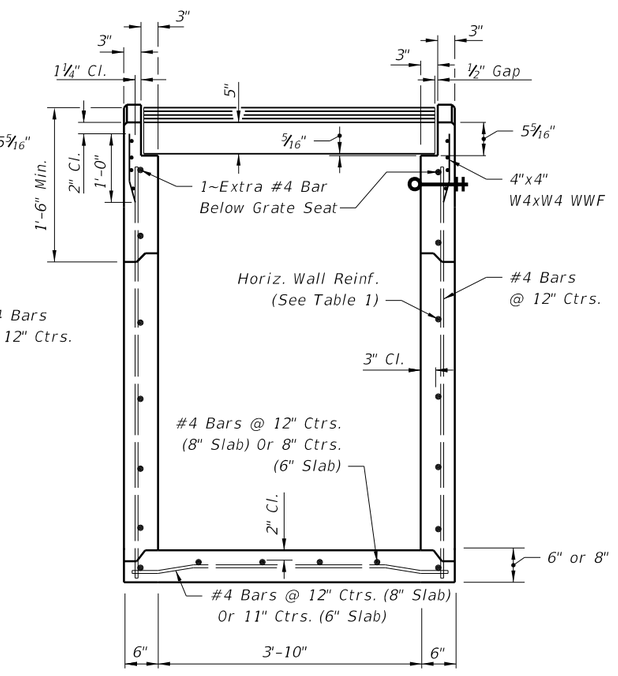
(CAST-IN-PLACE INLET SHOWN PRECAST INLET SIMILAR)



(Pipe Opening Shown)

SECTION AA

(CAST-IN-PLACE INLET)



(Pipe Opening Not Shown)

SECTION AA

(PRECAST INLET)

LAST REVISION	REVISION	DESCRIPTION:	FDOT DESIGN STANDARDS 2013	GUTTER INLET TYPE V	INDEX NO.	SHEET NO.
07/01/10					221	1

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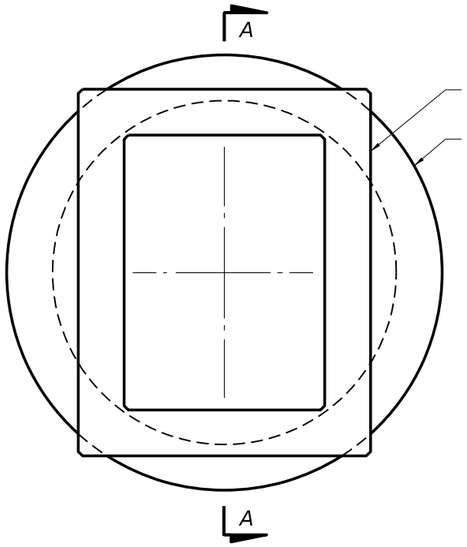
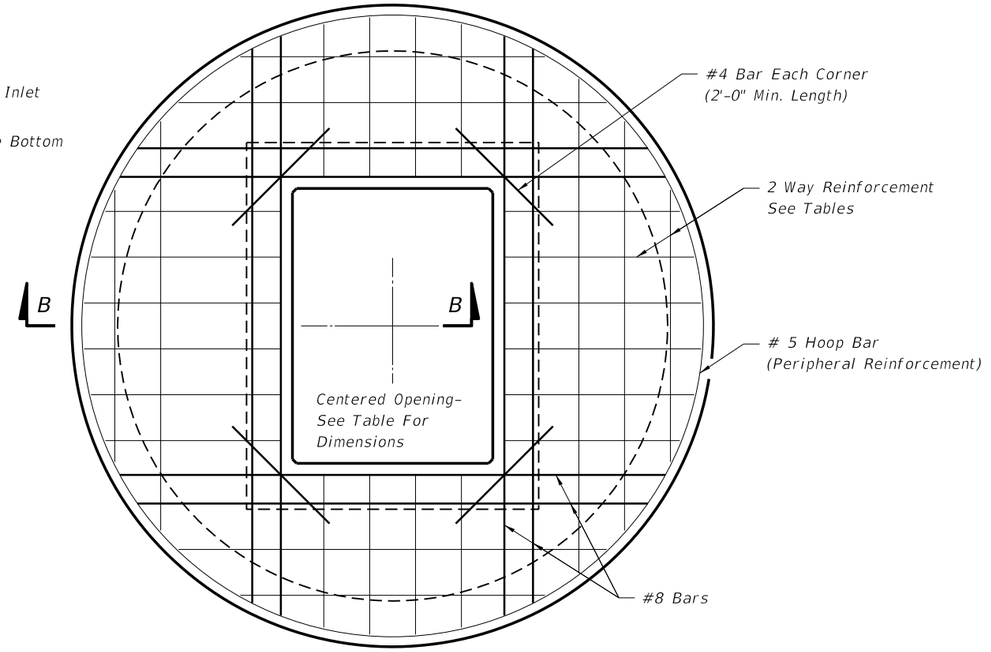


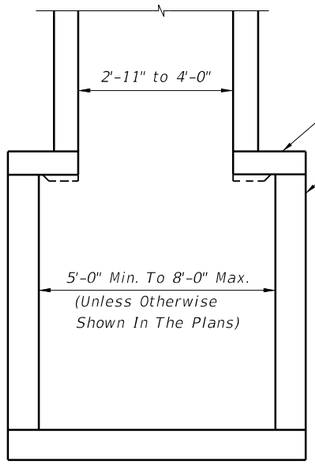
TOP SLAB OPENINGS		
DIAMETER	OPENING SIZE	
	MIN.	MAX.
5'-0" To 8'-0"	2'-11" x 4'-0"	3'-3" x 3'-10"



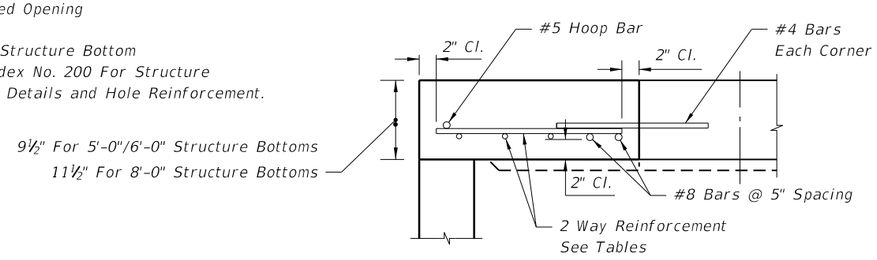
TOP SLAB REINFORCING DIAGRAM

TOP SLAB REINFORCING SCHEDULE	
SCHEDULE	GRADE 60 (BAR) OR 65 KSI & 70 KSI (WIRE FABRIC) $In.^2/ft.$
A	0.20
B	0.24
C	0.37
D	0.53
E	0.73
F	1.06
G	1.45

TOP SLAB WITH CENTERED OPENING		
SLAB DEPTH	SLAB THICKNESS	REINFORCING (2 WAYS) SCHEDULE
SIZE: 5'-0"		
≥0.5' <30'	9½"	C
30'-40'	9½"	D
SIZE: 6'-0"		
0.5' < 8'	9½"	B
8' < 18'	9½"	C
18' < 30'	9½"	D
30' < 37'	9½"	E
37'-40'	9½"	G
SIZE: 8'-0"		
≥0.5' < 9'	11½"	C
9' < 15'	11½"	D
15' < 23'	11½"	E
23' < 33'	11½"	E
33'-40'	11½"	G



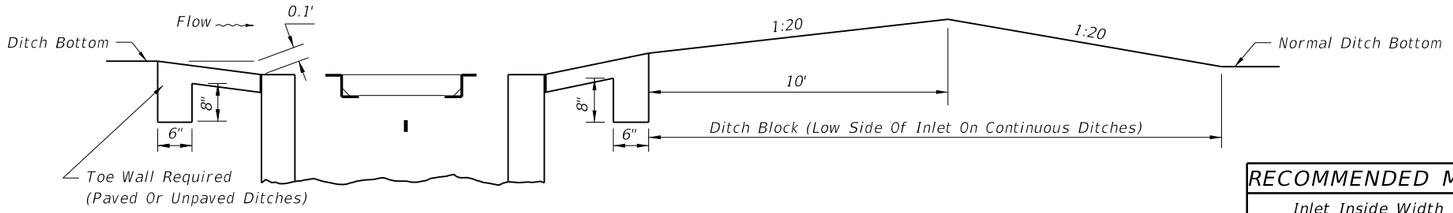
SECTION AA



SECTION BB

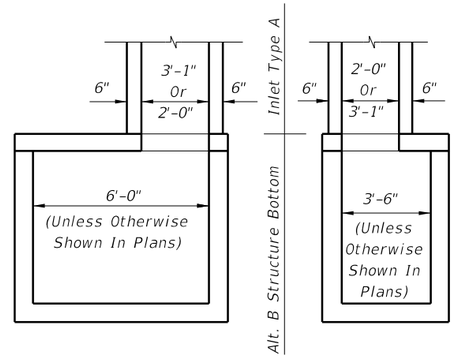
ALT. A STRUCTURE BOTTOM FOR INLET TYPE V

LAST REVISION	REVISION	DESCRIPTION:		FDOT DESIGN STANDARDS 2013	GUTTER INLET TYPE V	INDEX NO.	SHEET NO.
0701/05						221	2



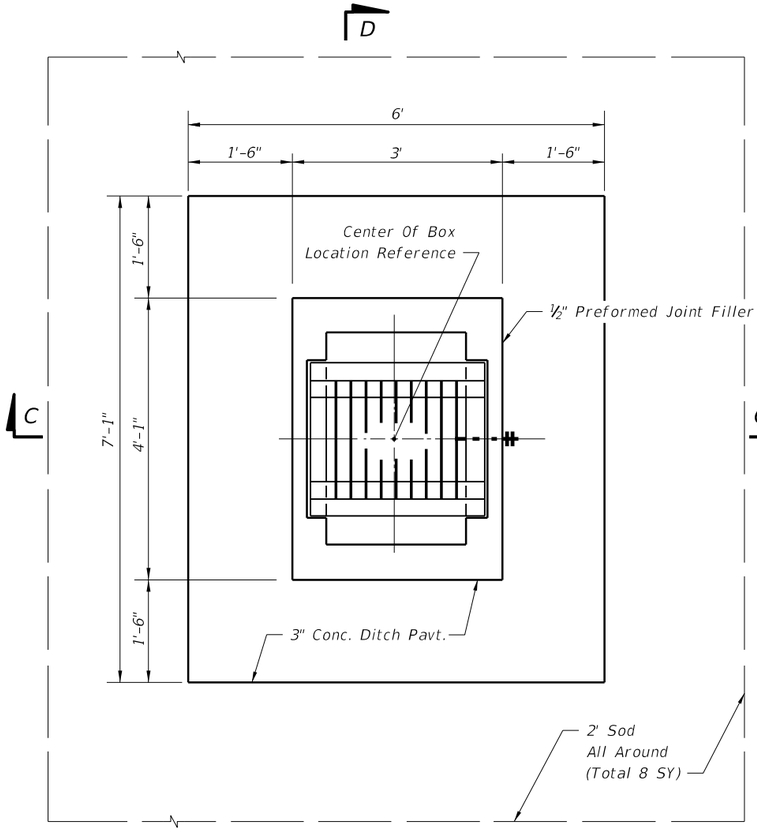
SECTION DD

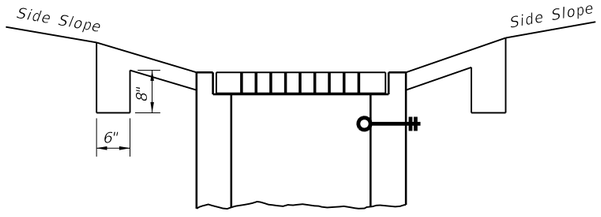
RECOMMENDED MAXIMUM PIPE SIZES	
Inlet Inside Width	Pipe Size
2'-0"	18"
3'-1"	24" 18" Where An 18" pipe Enters A 2'-0" Wall
Note: Recommended sizes are for concrete pipe. Sizes for other types of pipe must be verified for fit in accordance with Index No. 201. For larger pipe see bottom detail right and Index No. 200.	



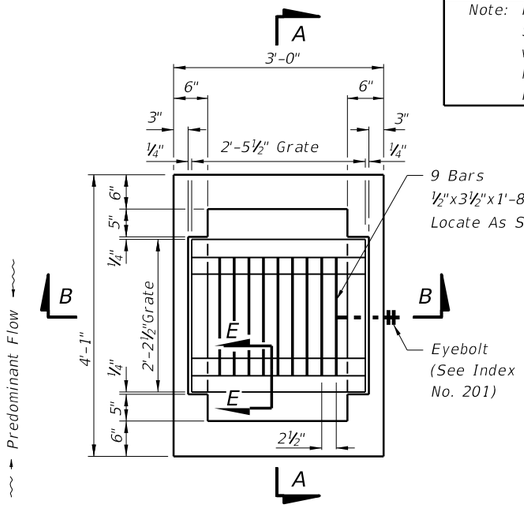
NOTE: Alt. B Structure Bottom Only. See Index No. 200 for Structure Bottom Details And Hole Reinforcement.

INLET WITH STRUCTURE BOTTOM

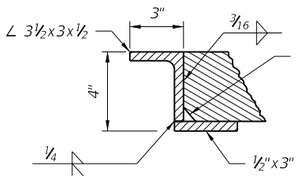




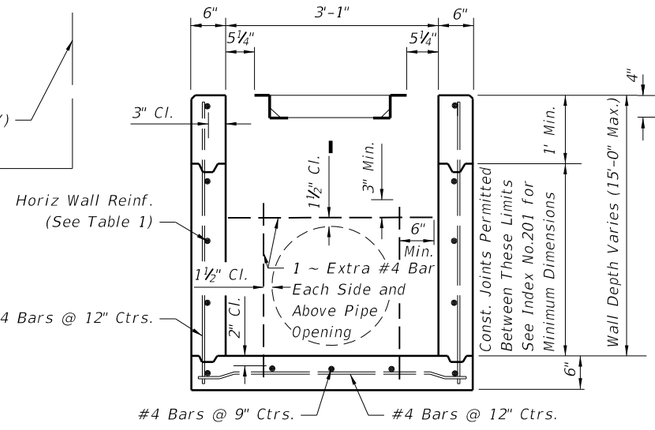
SECTION CC



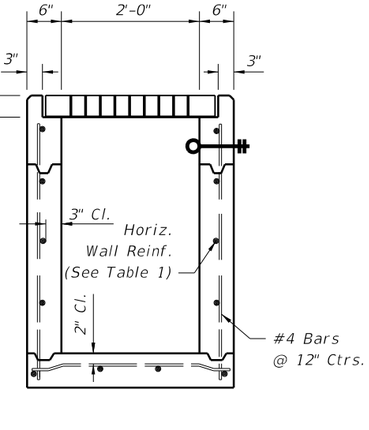
PLAN



SECTION EE



(Pipe Opening Shown)
SECTION AA



(Pipe Opening Not Shown)
SECTION BB

GENERAL NOTES

1. This inlet is designed for ditches, medians, or other area subject to heavy wheel loads on limited access facilities where debris may be a problem. This inlet is not for use in areas subject to pedestrian and/or bicycle traffic.
2. All reinforcing is Grade 60 bars with 2" min. cover unless otherwise noted. Cut or bend bars out of way of pipe to clear pipe by 1½". See Index 201 for equivalent area of welded wire fabric.
3. All exposed edges and corners shall be ¾" chamfer or tooled to ¼" radius.
4. When alternate "G" grate is specified in plans, the grate is to be hot-dip galvanized after fabrication.
5. Cost of ditch paving to be included in the cost of Inlet. Sodding to be paid for under contract unit price for Performance Turf, SY.
6. For supplemental details see Index No. 201.
7. All dimensions are for both precast and cast-in-place inlets unless otherwise noted.
8. Inlet to be paid for under the contract unit price for inlets (Dt Bot Type A), EA.

HORIZONTAL WALL REINFORCING SCHEDULE (TABLE 1)

WALL DEPTH	SCHEDULE	AREA (in.²/ft.)	MAX. SPACING	
			BARS	WWF
0' - 10'	A12	0.20	12"	8"
10' - 15'	A6	0.20	6"	5"

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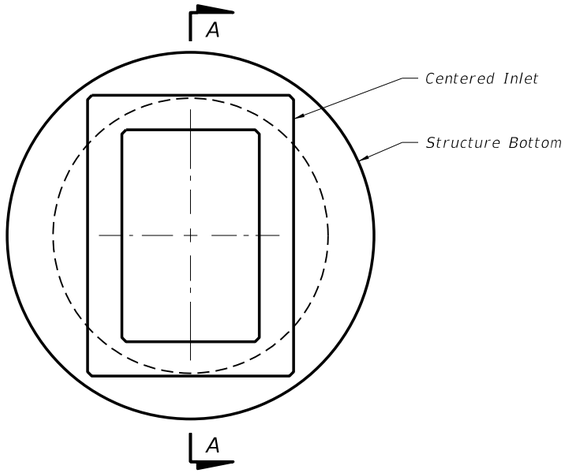
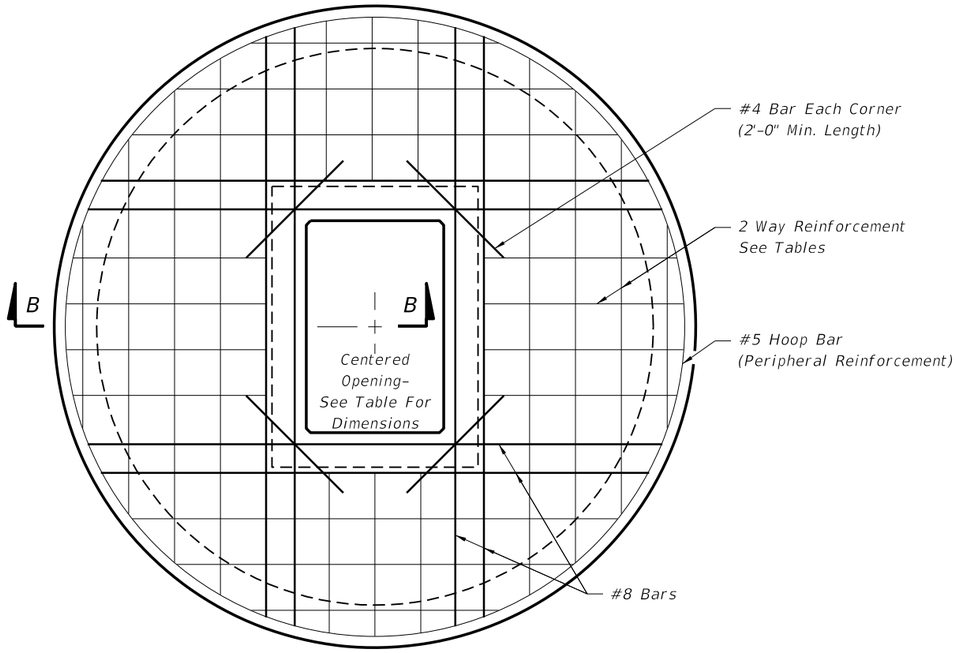
LAST REVISION	REVISION	DESCRIPTION:				
07/01/09			FDOT DESIGN STANDARDS 2013	DITCH BOTTOM INLET TYPE A	INDEX NO. 230	SHEET NO. 1



TOP VIEW

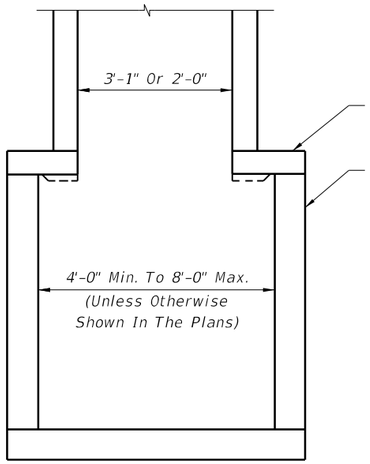


TOP SLAB REINFORCING DIAGRAM

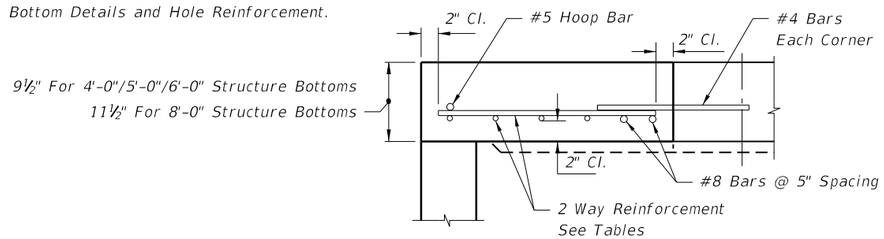
TOP SLAB OPENINGS	
DIAMETER	OPENING SIZE
	MIN.
4'-0" To 8'-0"	2'-0" x 3'-1"

TOP SLAB REINFORCING SCHEDULE	
SCHEDULE	GRADE 60 (BAR) OR 65 KSI & 70 KSI (WIRE FABRIC) $In.^2/ft.$
A	0.20
B	0.24
C	0.37
D	0.53
E	0.73
F	1.06
G	1.45

TOP SLAB WITH CENTERED OPENING		
SLAB DEPTH	SLAB THICKNESS	REINFORCING (2 WAYS) SCHEDULE
SIZE: 4'-0"		
≥0.5'-40'	9½"	C
SIZE: 5'-0"		
≥0.5'<30'	9½"	C
30'-40'	9½"	D
SIZE: 6'-0"		
0.5'<8'	9½"	B
8'<18'	9½"	C
18'<30'	9½"	D
30'<37'	9½"	E
37'-40'	9½"	G
SIZE: 8'-0"		
≥0.5'<9'	11½"	C
9'<15'	11½"	D
15'<23'	11½"	E
23'<33'	11½"	E
33'-40'	11½"	G



SECTION AA



SECTION BB

ALT. A STRUCTURE BOTTOM FOR INLET TYPE A

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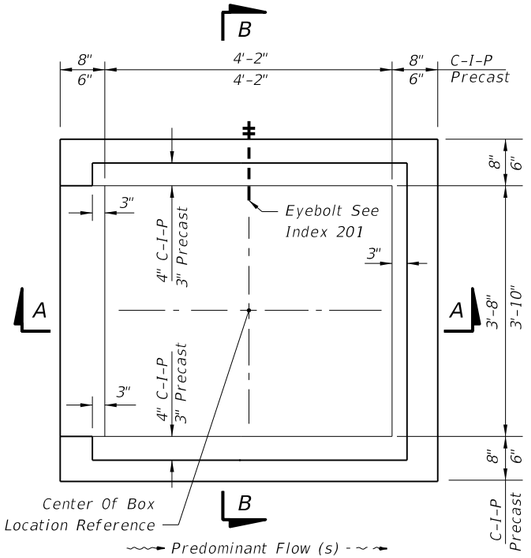
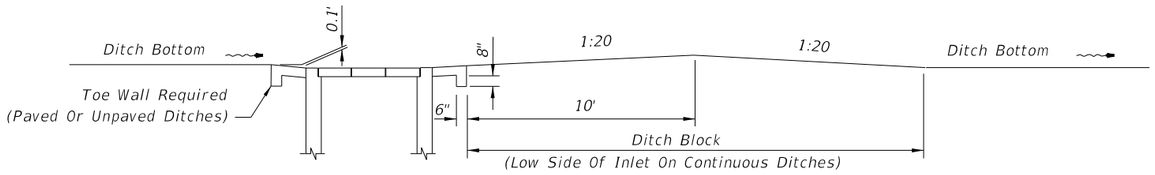
LAST REVISION	REVISION	DESCRIPTION:		FDOT DESIGN STANDARDS 2013	DITCH BOTTOM INLET TYPE A	INDEX NO.	SHEET NO.
07/01/07			STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION			230	2



(Grate, Apron And Slot Not Shown)

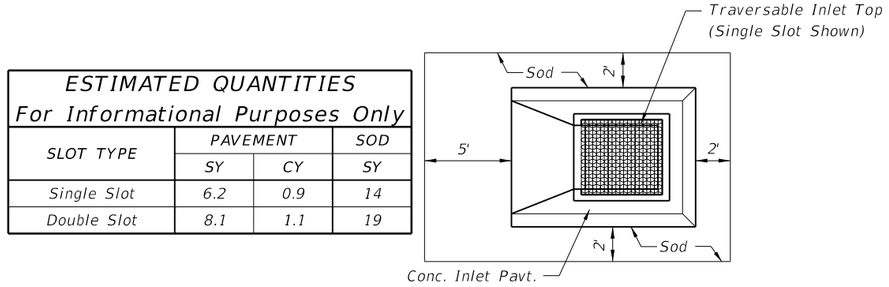
PLAN



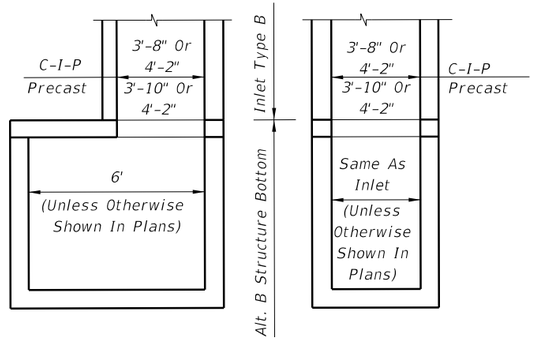
SECTION EE

DITCH BLOCK

ESTIMATED QUANTITIES For Informational Purposes Only			
SLOT TYPE	PAVEMENT		SOD
	SY	CY	SY
Single Slot	6.2	0.9	14
Double Slot	8.1	1.1	19



CONCRETE INLET PAVEMENT AND SODDING

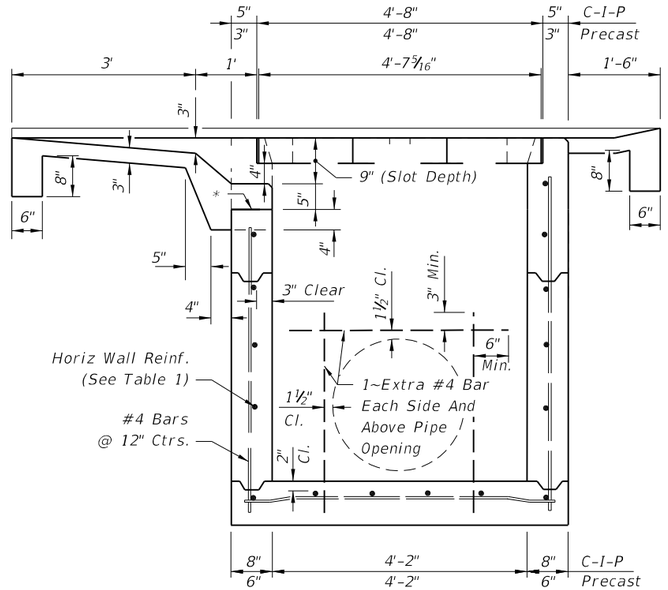


NOTE: Alt. B Structure Bottom Only. See Index No. 200 for structure bottom details and pipe opening reinforcement.

INLET WITH STRUCTURE BOTTOM

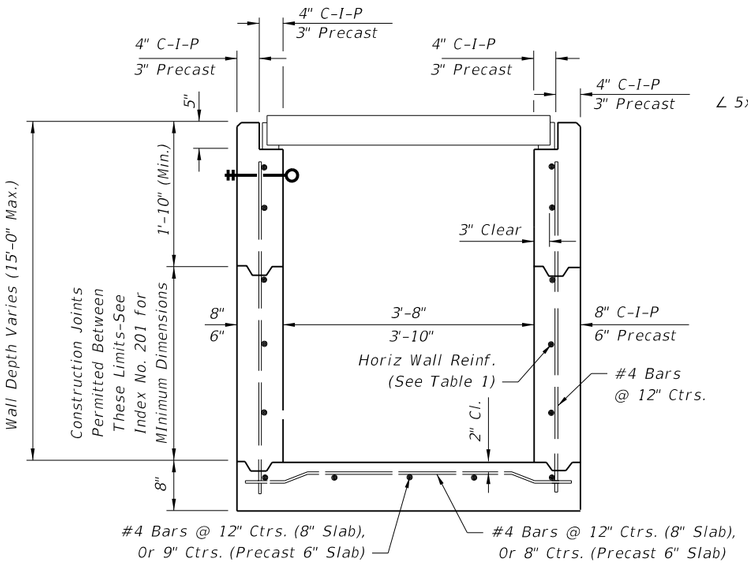
RECOMMENDED MAXIMUM PIPE SIZES	
INLET INSIDE WIDTH	PIPE SIZE
3'-8"	30"
4'-2"	36"

Note: Recommended sizes are for concrete pipe. Sizes for other types of pipe must be verified for fit in accordance with Index No. 201. For larger pipe see bottom detail above and Index No. 200.



SECTION AA

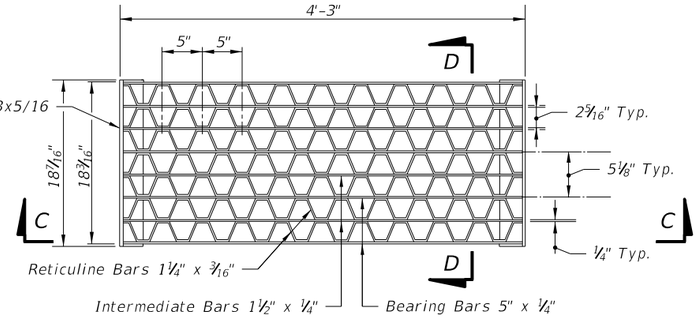
*See Sheet 2 of 3



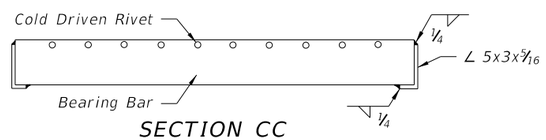
SECTION BB

HORIZONTAL WALL REINFORCING SCHEDULE (TABLE 1)

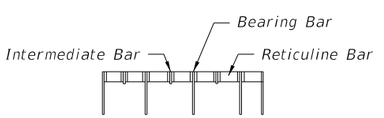
WALL DEPTH	SCHEDULE	AREA (in.²/ft.)	MAX. SPACING	
			BARS	WWF
0' – 5'	A12	0.20	12"	8"
5' – 9'	A6	0.20	6"	5"
9' – 13'	B5.5	0.24	5½"	5"
13' – 15'	Special	0.267	5"	4"



PLAN



SECTION CC



SECTION DD

STEEL GRATE

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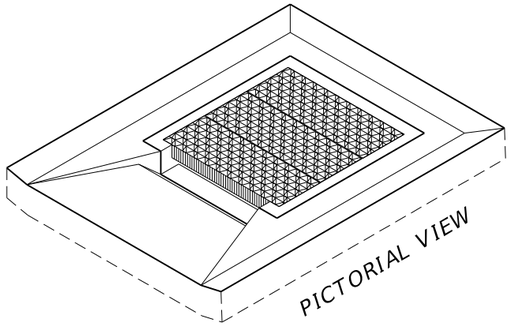
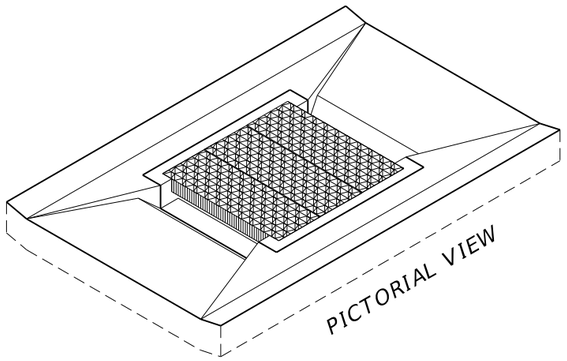
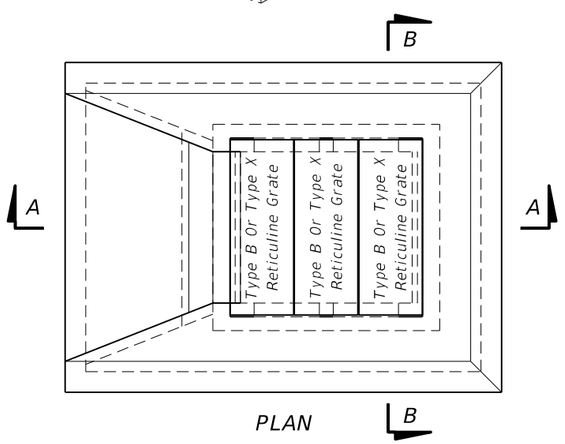
LAST REVISION	REVISION	DESCRIPTION:				
07/01/09			FDOT DESIGN STANDARDS 2013	DITCH BOTTOM INLET TYPE B	INDEX NO. 231	SHEET NO. 1







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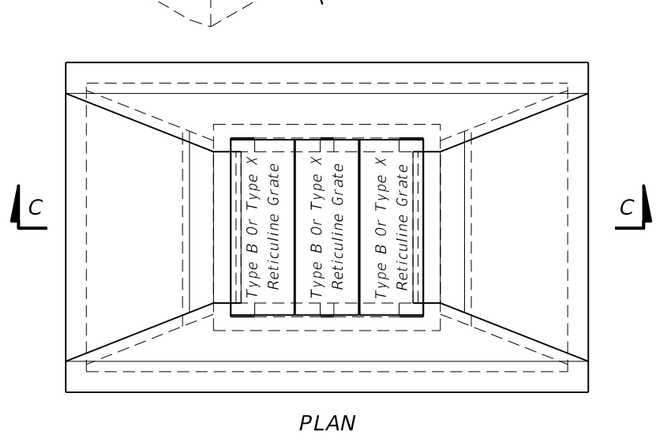
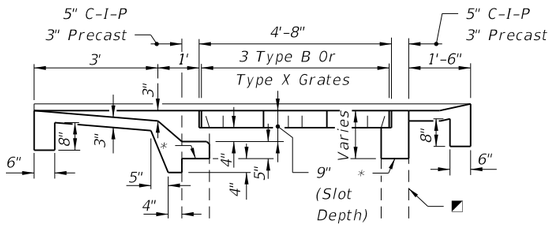
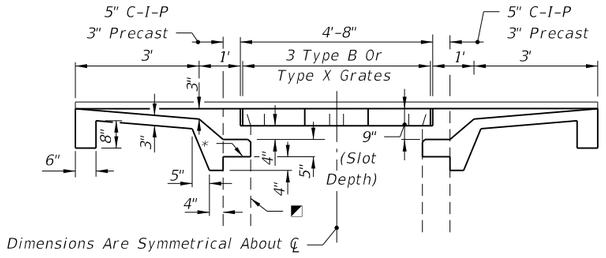


PLAN

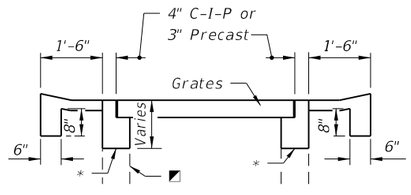


SECTION AA
SINGLE SLOT



Dimensions Are Symmetrical About ℄

SECTION CC
DOUBLE SLOT



SECTION BB

◩ Inlet Box (Line Type Indicates Existing Box To Facilitate Depiction Of Partial Construction On Existing Inlets)

* On new boxes the traversable top may be cast as a monolithic unit or cast in segments, and the location of this line may be lower to facilitate handling and placement; however, the slot depth is to remain at 9 inches. See Index No. 201 for top to wall connection. For converting to traversable tops on existing inlets remove concrete to this line and expose the existing reinforcement. Reshape or splice in reinforcement to penetrate the rim and returns of the grate seat, and bend the reinforcement into the slot shelf to extend into the abutting throat pavement.

GENERAL NOTES

1. The general purpose of the inlet top designs are:
   a. For ditches, medians or other areas subject to heavy wheel loads. This inlet may be placed in areas subject to occasional pedestrian traffic such as landscaped areas and pavement areas where pedestrians can walk around the inlet. Inlet not suitable for bicycle traffic.
   b. Provide full grate and horizontal slot designs for new construction.
   c. Provide full grate and horizontal slot designs for replacing the vertical slot tops on existing Inlets Type B and Type X that are in locations subject to occasional pedestrian traffic.
2. All reinforcing is Grade 60 bars with 2" min. cover unless otherwise noted. See Index No. 201 for equivalent area of welded wire fabric. Bars to be cut or bent for min. 1½" clearance around pipe.
3. All exposed edges and corners shall be ¾" chamfer or tooled to ¼" radius.
4. When Alternate G grates are specified in the plans, the grates are to be hot-dip galvanized after fabrication.
5. Cost for constructing traversable tops on new inlet boxes shall be included in the contract unit price for Inlets (DT BOT) (Type B), EA., and shall include the cost for surrounding concrete inlet pavement. Existing Inlets Type B and Inlets Type X that are converted to traversable inlet tops shall be paid for under the contract unit price for Inlets (DT BOT) (Type B) (Partial), EA. Unit price and payment shall be full compensation for inlet conversion and shall include the removal and disposal of any existing concrete inlet pavement; the removal and stockpiling or disposal of sufficient material from the existing inlet box to facilitate construction of the required inlet top; construction of the required inlet conversion; backfill construction; construction of concrete inlet pavement; reusing, supplementing, transferring or replacing grates as required by plans or as directed by the Engineer; any required earthwork for ditch restoration within 30' of the inlet; and, restoration of disturbed turf.
6. Ditch pavement shall be paid for, separate from the inlet and concrete inlet pavement, by pavement types and units as called for in the plans.
7. Sod will be paid for under the contract unit price for Performance Turf, SY.
8. For supplementary details see Index No. 201.
9. All dimensions are for both precast and cast-in-place inlets unless otherwise noted.

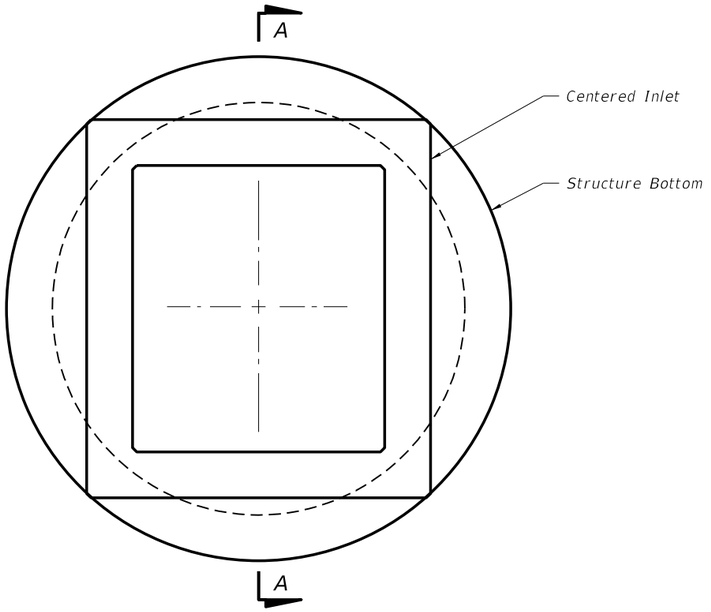
DESIGN NOTES

1. The type of top (single or double slots) depends on the approach ditch configuration and the hydraulic requirements of the site. The designer will stipulate in the plans the type of top to be constructed at each individual inlet location.
2. On existing inlets, conversion grates shall be constructed at the original grate elevations unless other elevations are called for in the plans. When plans call for the inlet top to be constructed to support storm water detention, details for ditch modifications and underdrains shall be shown in the plans.

MAINTENANCE NOTES

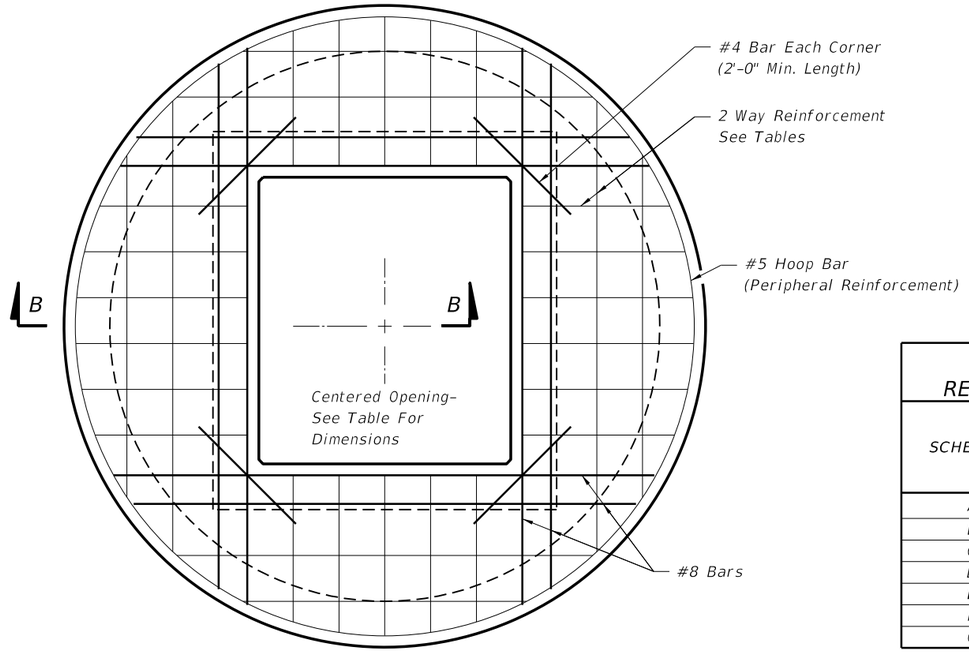
1. Traversable inlet tops that are constructed by maintenance contract or by maintenance forces may reuse the existing grates that are determined by the Maintenance Engineer to be functionally sound, and their reuse is so directed by the Maintenance Engineer. Existing grates approved for reuse and new grates may be mixed, matched or replaced as directed by the Maintenance Engineer.

TRAVERSABLE TOPS FOR INLETS TYPE B AND FOR CONVERSIONS OF EXISTING INLETS TYPE B AND TYPE X



TOP VIEW

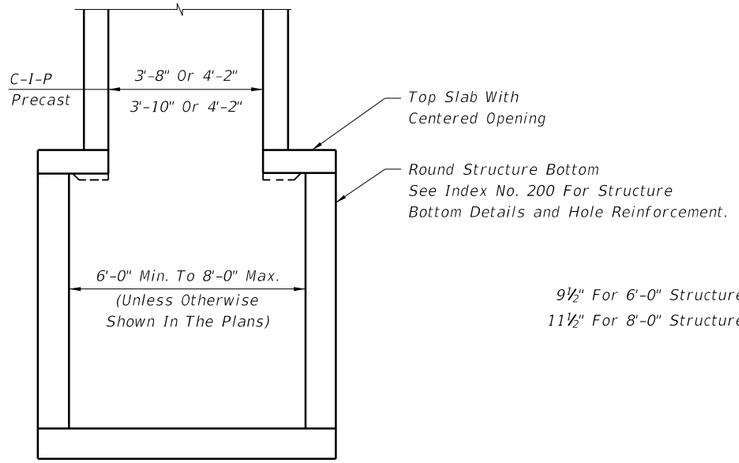
TOP SLAB OPENINGS		
DIAMETER	OPENING SIZE	
	MIN.	MAX.
6'-0" to 8'-0"	3'-8" x 4'-2"	3'-10" x 4'-2"



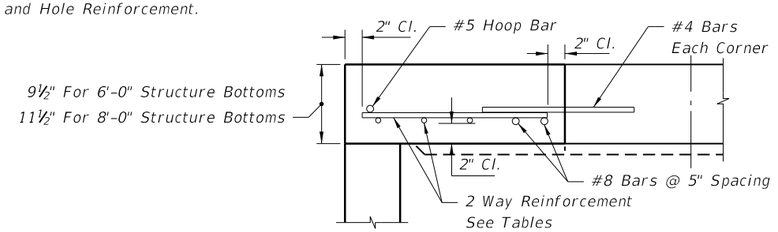
TOP SLAB REINFORCING DIAGRAM

TOP SLAB REINFORCING SCHEDULE	
SCHEDULE	GRADE 60 (BAR) OR 65 KSI & 70 KSI (WIRE FABRIC) $In^2/ft.$
A	0.20
B	0.24
C	0.37
D	0.53
E	0.73
F	1.06
G	1.45

TOP SLAB WITH CENTERED OPENING		
SLAB DEPTH	SLAB THICKNESS	REINFORCING (2 WAYS) SCHEDULE
SIZE: 6'-0"		
0.5' < 8'	9½"	B
8' < 18"	9½"	C
18' < 30'	9½"	D
30' < 37'	9½"	E
37'-40'	9½"	G
SIZE: 8'-0"		
≥0.5' < 9'	11½"	C
9' < 15'	11½"	D
15' < 23'	11½"	E
23' < 33'	11½"	E
33'-40'	11½"	G



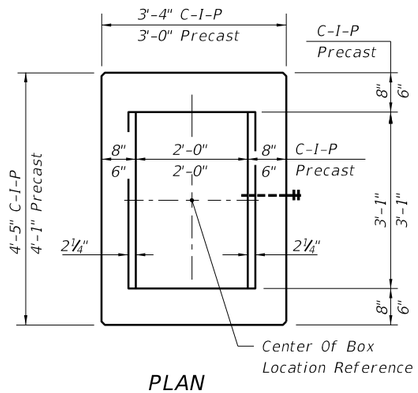
SECTION AA



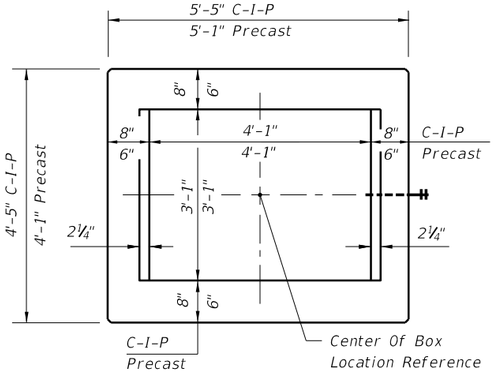
SECTION BB

ALT. A STRUCTURE BOTTOM FOR INLET TYPE B

LAST REVISION	REVISION	DESCRIPTION:		FDOT DESIGN STANDARDS 2013	DITCH BOTTOM INLET TYPE B	INDEX NO.	SHEET NO.
07/01/05						231	3



PLAN



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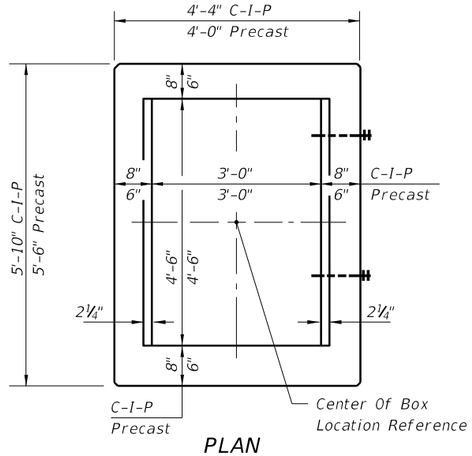

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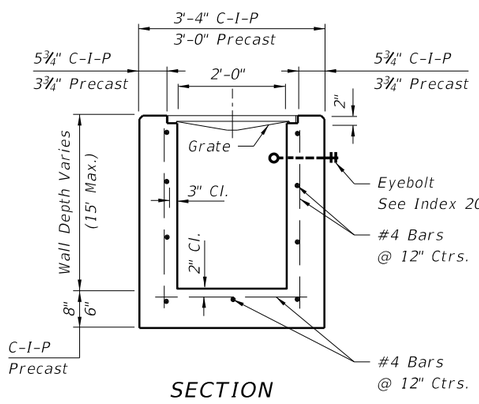

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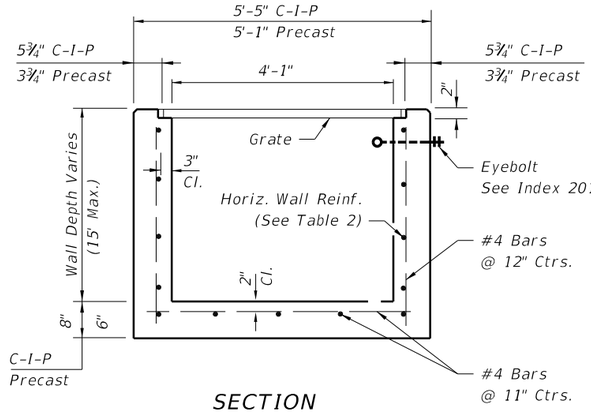

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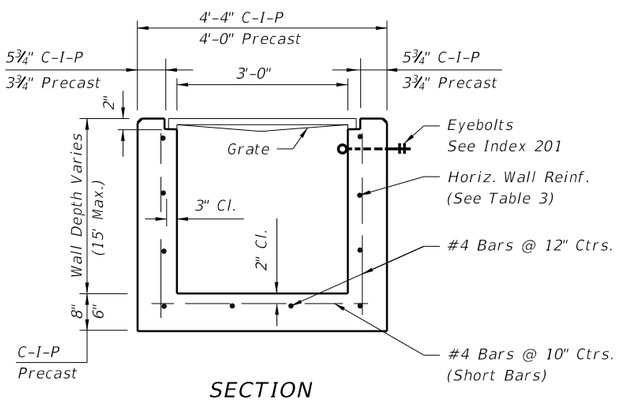


SECTION

HORIZONTAL WALL REINFORCING SCHEDULES (TABLE 1)

WALL DEPTH	SCHEDULE	AREA (in.²/ft.)	MAX. SPACING	
			BARS	WWF
0'-15'	A12	0.20	12"	8"

TYPE C

Recommended Maximum Pipe Size:

2'-0" Wall – 18" Pipe
3'-1" Wall – 24" Pipe (18" where an 18" pipe enters a 2'-0" wall)

HORIZONTAL WALL REINFORCING SCHEDULES (TABLE 2)

WALL DEPTH	SCHEDULE	AREA (in.²/ft.)	MAX. SPACING	
			BARS	WWF
0'-6'	A12	0.20	12"	8"
6'-10'	A6	0.20	6"	5"
10'-13'	A4	0.20	4"	3"
10'-15'	B5.5	0.24	5½"	5"

TYPE D

Recommended Maximum Pipe Size:

3'-1" Wall – 24" Pipe
4'-1" Wall – 36" Pipe

HORIZONTAL WALL REINFORCING SCHEDULES (TABLE 3)

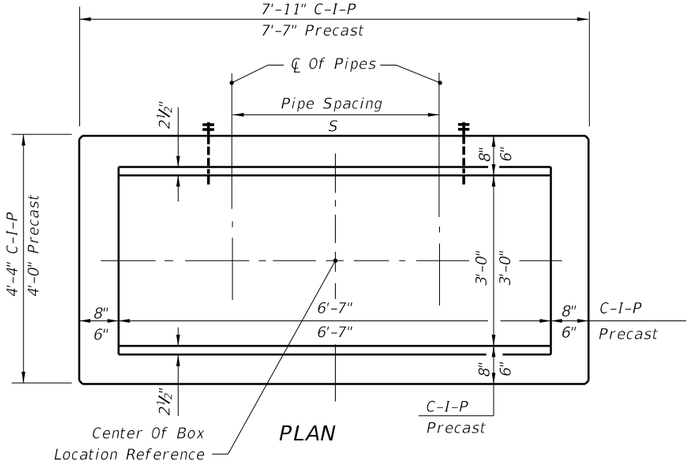
WALL DEPTH	SCHEDULE	AREA (in.²/ft.)	MAX. SPACING	
			BARS	WWF
0'-5'	A12	0.20	12"	8"
0'-7.5'	A6	0.20	6"	5"
7.5'-10'	B5.5	0.24	5½"	5"
10'-15'	C6.5	0.37	6½"	6"

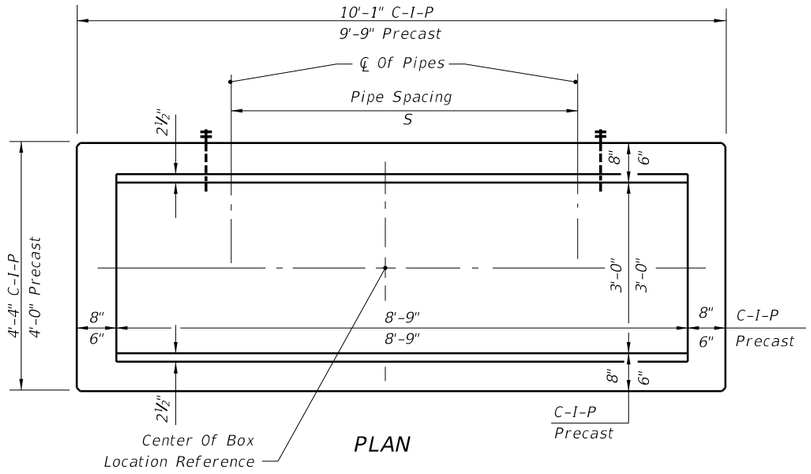
TYPE E

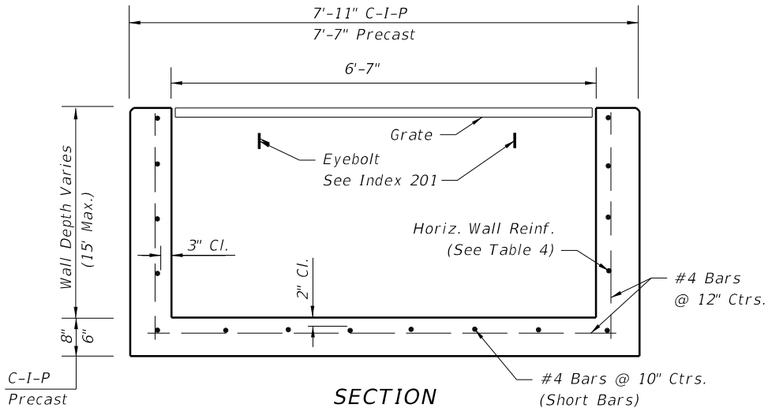
Recommended Maximum Pipe Size:

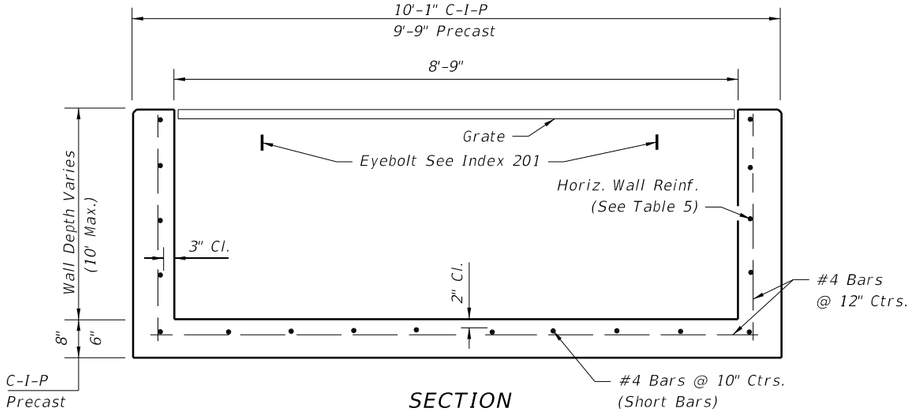
3'-0" Wall – 24" Pipe
4'-6" Wall – 36" Pipe

LAST REVISION	REVISION	DESCRIPTION:			INDEX NO.	SHEET NO.
07/01/05			FDOT DESIGN STANDARDS 2013	DITCH BOTTOM INLET TYPES C, D, E AND H	232	1









HORIZONTAL WALL REINFORCING SCHEDULES (TABLE 4)

WALL DEPTH	SCHEDULE	AREA (in.²/ft.)	MAX. SPACING	
			BARS	WWF
0'-5'	B5.5	0.24	5½"	5"
5'-7'	C6.5	0.37	6½"	6"
7'-15'	D4.5	0.53	4½"	4"

TYPE H (2 & 3-GRATE INLET)

Recommended Maximum Pipe Size:
3'-0" Wall - 24" Pipe
6'-7" Wall - 1-60" Pipe
Or 2-24" Pipe (S=3'-5")

HORIZONTAL WALL REINFORCING SCHEDULES (TABLE 5)

WALL DEPTH	SCHEDULE	AREA (in.²/ft.)	MAX. SPACING	
			BARS	WWF
0'-5'	C3.5	0.37	3½"	3"
5'-10'	D4.5	0.53	4½"	4"

TYPE H (4-GRATE INLET)

Recommended Maximum Pipe Size:
3'-0" Wall - 24" Pipe
8'-9" Wall - 1-78" Pipe
Or 2-30" Pipe (S=4'-3")

GENERAL NOTES

See Sheet 3 of 7.

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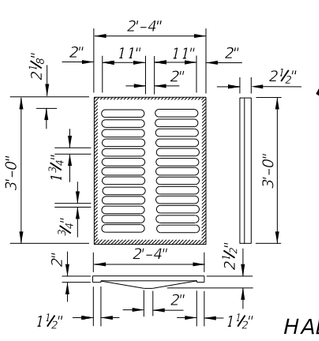
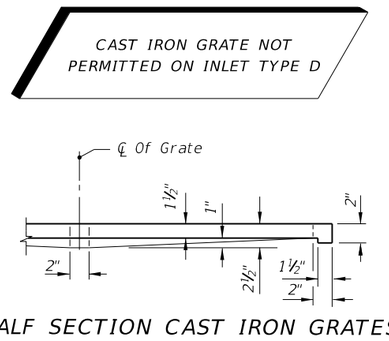
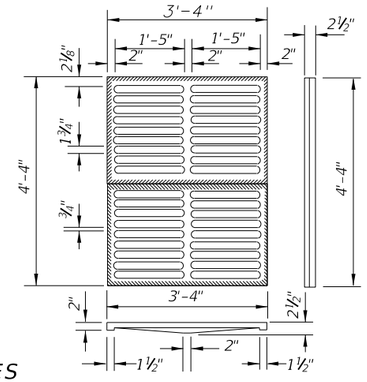
LAST REVISION	REVISION	DESCRIPTION:				
07/01/05			FDOT DESIGN STANDARDS 2013	DITCH BOTTOM INLET TYPES C, D, E AND H	INDEX NO. 232	SHEET NO. 2



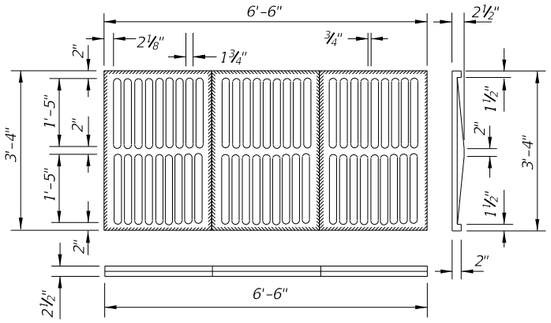


HALF SECTION CAST IRON GRATES

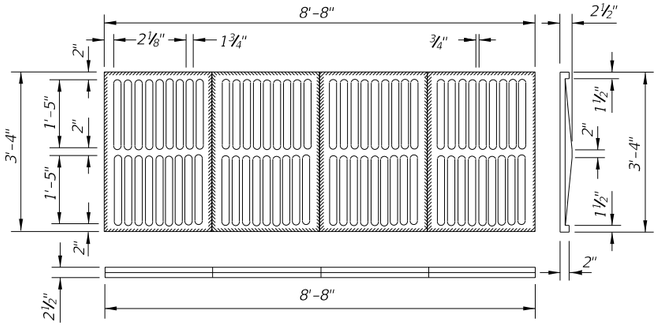


TYPE C
Approx. Weight 235 Lbs.

TYPE E
Approx. Weight 465 Lbs.

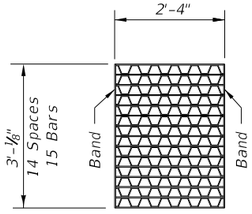


TYPE H (3-GRATE INLET)
Approx. Weight 725 Lbs.

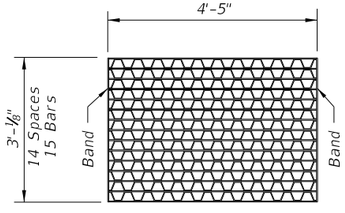


TYPE H (4-GRATE INLET)
Approx. Weight 967 Lbs.

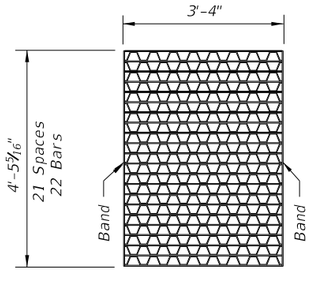
CAST IRON GRATES



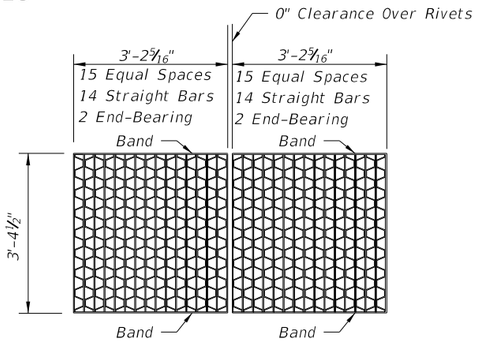
TYPE C
Straight Bars 2"x ¼"
Reticuline Bars 1¼" x 3⁄16"
Bands 2" x ¼"
Approx. Weight 104 Lbs.



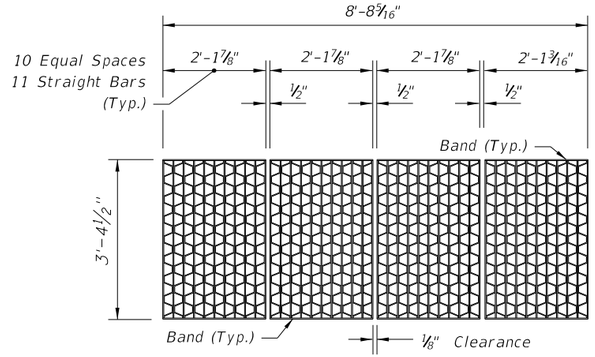
TYPE D
Straight Bars 2" x ¼"
Reticuline Bars 1¼" x 3⁄16"
Bands 2" x ¼"
Approx. Weight 190 Lbs.



TYPE E
Straight Bars 2" x ¼"
Reticuline Bars 1¼" x 3⁄16"
Bands 2" x ¼"
Approx. Weight 215 Lbs.



TYPE H (2-GRATE INLET)
Straight End-Bearing Bars 2" x 3⁄8"
Straight Bearing Bars 2" x ¼"
Reticuline Bars 1¼" x 3⁄16"
Banding Bars 2" x ¼"
Approx. Total Weight 310 Lbs.



TYPE H (4-GRATE INLET)
Straight End-Bearing Bars 2" x ¼"
Reticuline Bars 1¼" x 3⁄16"
Banding Bars 2" x 3⁄16"
Approx. Total Weight 388 Lbs.

STEEL GRATES

NOTE: Steel Grates Are Required On Inlets With Traversable Slots And On Inlets where Bicycle Traffic Is Anticipated.

GENERAL NOTES

1. *These inlets are suitable for bicycle traffic and are to be used in ditches, medians and other areas subject to infrequent traffic loadings but are not to be placed in areas subject to any heavy wheel loads. These inlets may be placed in areas subject to occasional pedestrian traffic such as landscaped areas and pavement areas where pedestrians can walk around the inlet.*

2. *Inlets subject to minimal debris should be constructed without slots. Where debris is a problem inlets should be constructed with slots. Slotted inlets located within roadway clear zones and areas subject to pedestrians shall have traversable slots. The traversable slot modification is not adaptable to inlet Type H. Slots may be constructed at either or both ends as shown on plans. Traversable slots shall not be used in areas subject to occasional bicycle traffic.*

3. *Steel grates are to be used on all inlets where bicycle traffic is anticipated. Steel grates are to be used on all inlets with traversable slots. Either cast iron or steel grates may be used on inlets without slots where bicycle traffic is not anticipated. Either cast iron or steel grates may be used on all inlets with non-traversable slots. Subject to the selection described above, when Alternate G grate is specified in the plans, either the steel grate, hot dip galvanized after fabrication, or the cast iron grate may be used, unless the plans stipulate the particular type.*

4. *Recommended maximum pipe sizes shown are for concrete pipe. Size for other types of pipe must be checked for fit.*

5. *All exposed edges and corners shall be ¾" chamfer or tooled to ¼" radius.*

6. *Concrete inlet pavement to be used on inlets without slots and inlets with non-traversable slots only when called for in the plans; but required on all traversable slot inlets. Cost to be included in contract unit price for inlets. Quantities shown are for information only.*

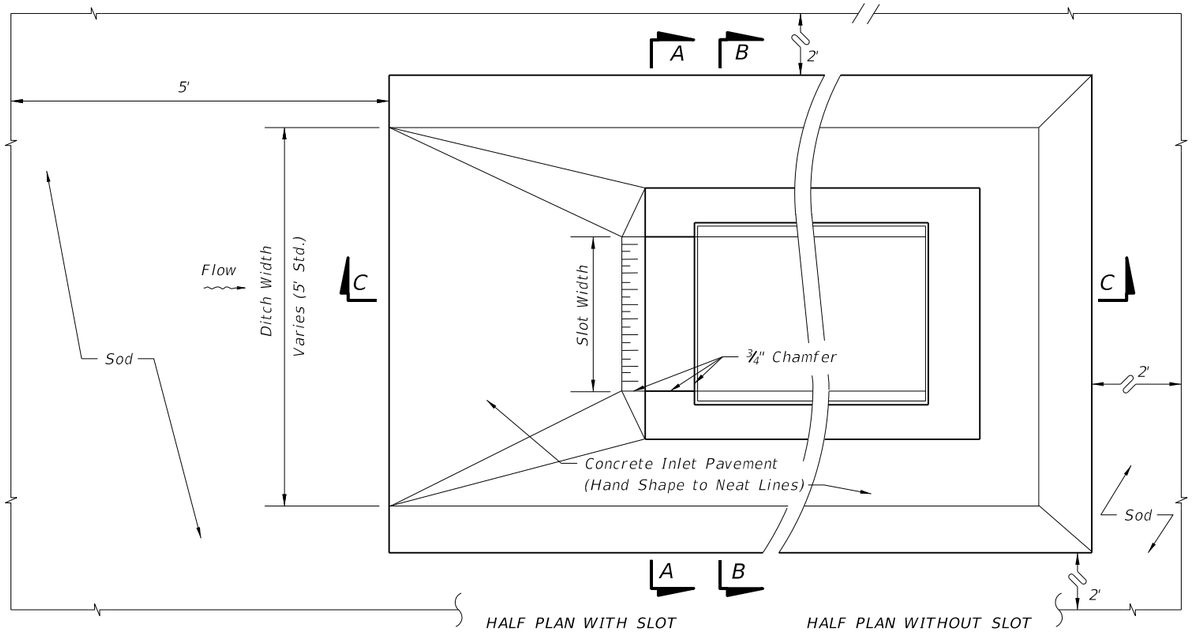
7. *Traversable slots constructed in existing inlets shall be paid for as inlets partial. For conversion work and method of payment see 'TRAVERSABLE SLOT INLETS (PARTIAL) FOR EXISTING INLETS'.*

8. *Sodding to be used on all inlets not located in paved areas and paid for under contract unit price for Performance Turf, SY.*

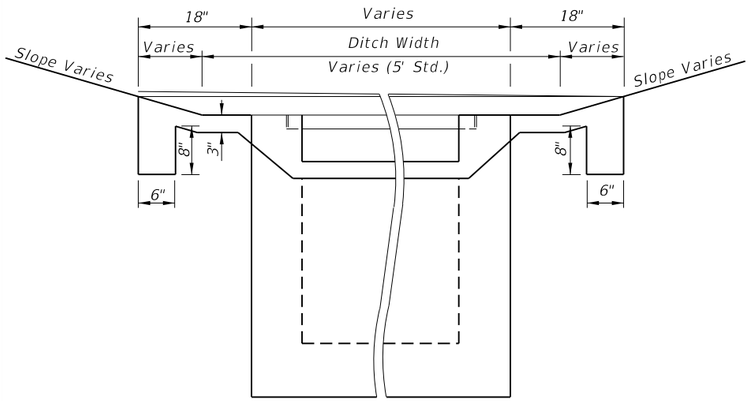
9. *For supplementary details see Index No. 201.*

10. *All reinforcing is Grade 60 bars with 2" min. cover unless otherwise noted. Bars to be cut or bent for 1½" clearance around pipe opening. Provide one additional #4 bar above and at each side of pipe opening.*

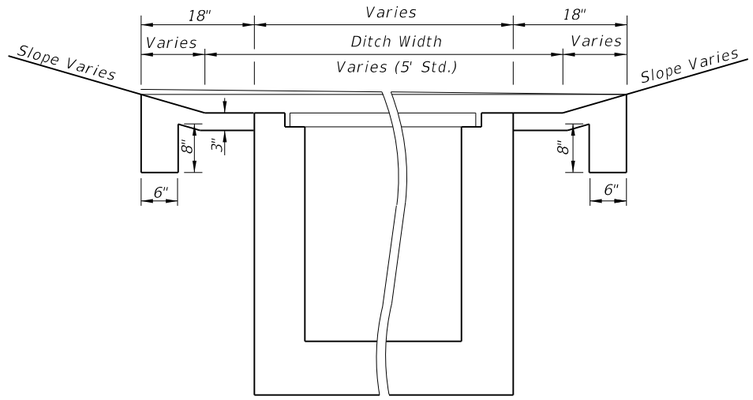
LAST REVISION	REVISION	DESCRIPTION:				
07/01/10			FDOT DESIGN STANDARDS 2013	DITCH BOTTOM INLET TYPES C, D, E AND H	INDEX NO. 232	SHEET NO. 3



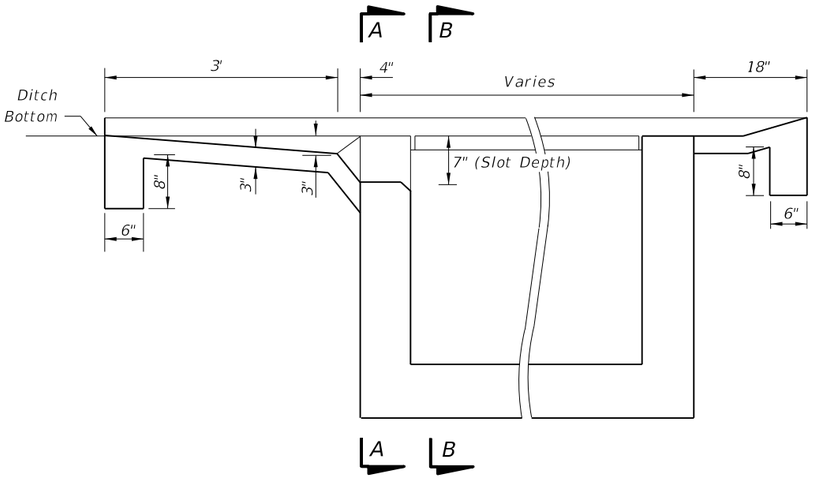
PLAN VIEW



SECTION AA



SECTION BB



SECTION CC

PAVEMENT AND SODDING QUANTITIES FOR TRAVERSABLE SLOTS

Inlet	Pavement				Sod	
	Single Slot		Double Slot		Single Slot	Double Slot
	SY	CY	SY	CY	SY	SY
C	4.87	0.77	6.16	0.93	12	16
D	5.99	0.91	7.70	1.10	14	19
E	5.88	0.91	7.37	1.08	14	18

TRAVERSABLE SLOTS

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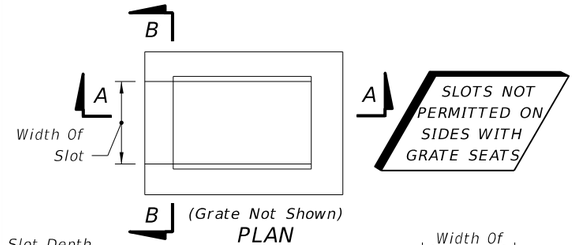
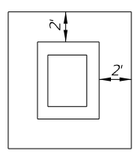
LAST REVISION	REVISION	DESCRIPTION:				
07/01/07			FDOT DESIGN STANDARDS 2013	DITCH BOTTOM INLET TYPES C, D, E AND H	INDEX NO. 232	SHEET NO. 4



SECTION AA SECTION BB

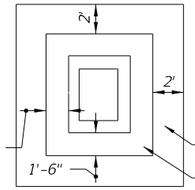
NON-TRAVERSABLE SLOTS



Inlet	Sod SY
C	6
D	6
E	7
H	8

SOD ONLY

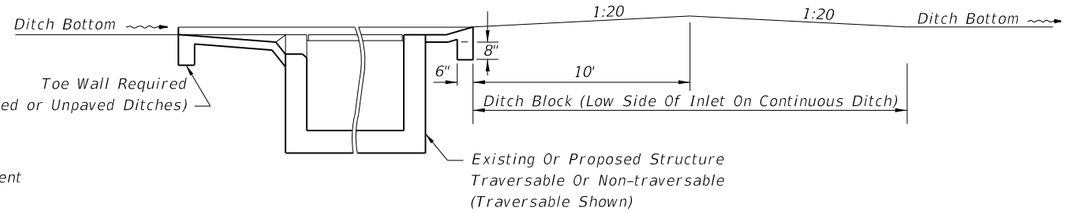
Inlet	Pavt. CY	Sod SY
C	0.30	8
D	0.36	9
E	0.37	9
H	0.45	11



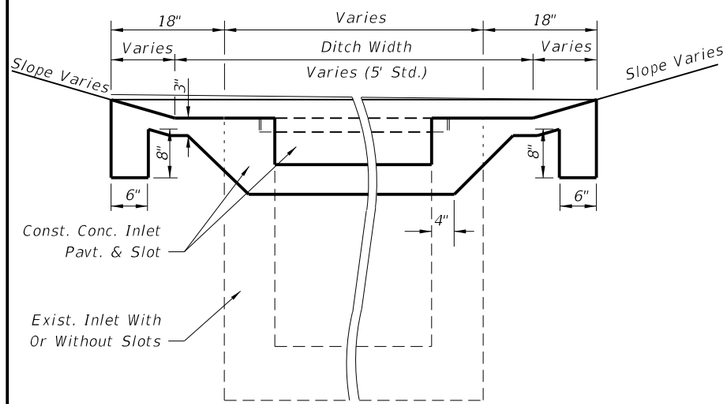
PAVT. AND SOD

NOTE: See General Notes Nos. 6 and 7, Sheet 3 of 7.

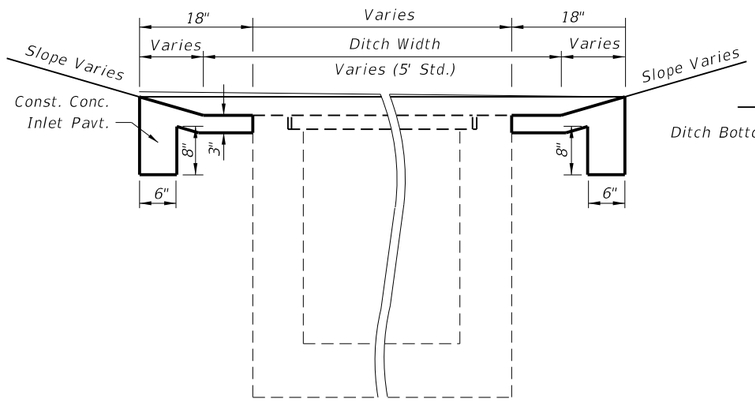
SODDING AND PAVEMENT FOR INLETS WITHOUT SLOTS AND INLETS WITH NON-TRAVERSABLE SLOTS



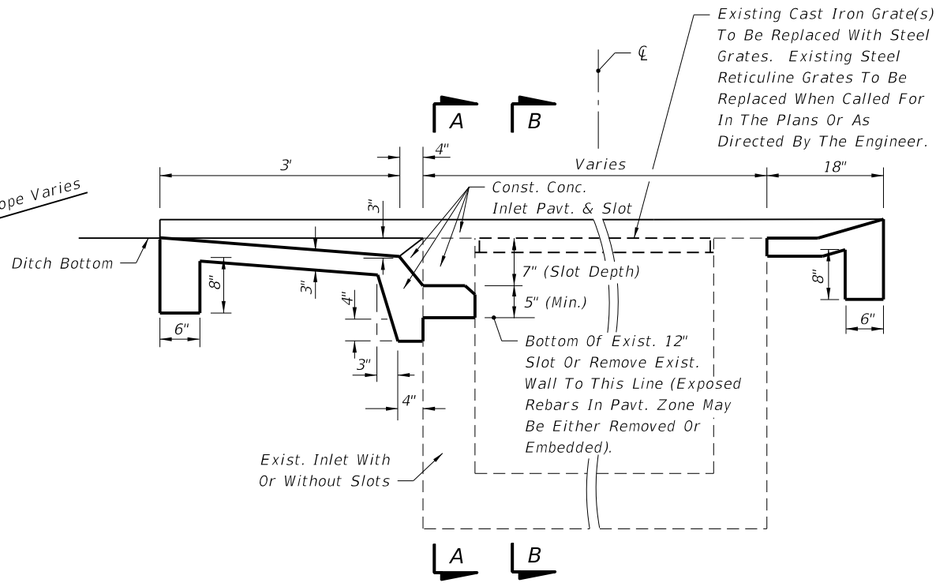
DITCH BLOCK FOR INLETS WITH OR WITHOUT SLOTS



SECTION AA



SECTION BB



SINGLE SLOT SHOWN (DOUBLE SLOTS SYMMETRICAL ABOUT CENTERLINE)

SECTION CC (CASE I)

PAVEMENT AND SODDING QUANTITIES FOR TRAVERSABLE SLOTS						
Inlet	Pavement				Sod	
	Single Slot		Double Slot		Single Slot	Double Slot
	SY	CY	SY	CY	SY	SY
C	4.87	0.83	6.16	1.05	12	16
D	5.99	1.01	7.70	1.30	14	19
E	5.88	0.99	7.37	1.24	14	18

NOTE: For plan view and additional details see Sheet 4 of 7.
For payment see General Notes Nos. 6 and 7, Sheet 3 of 7.

TRAVERSABLE SLOTS FOR EXISTING INLETS

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LAST REVISION	REVISION	DESCRIPTION:				
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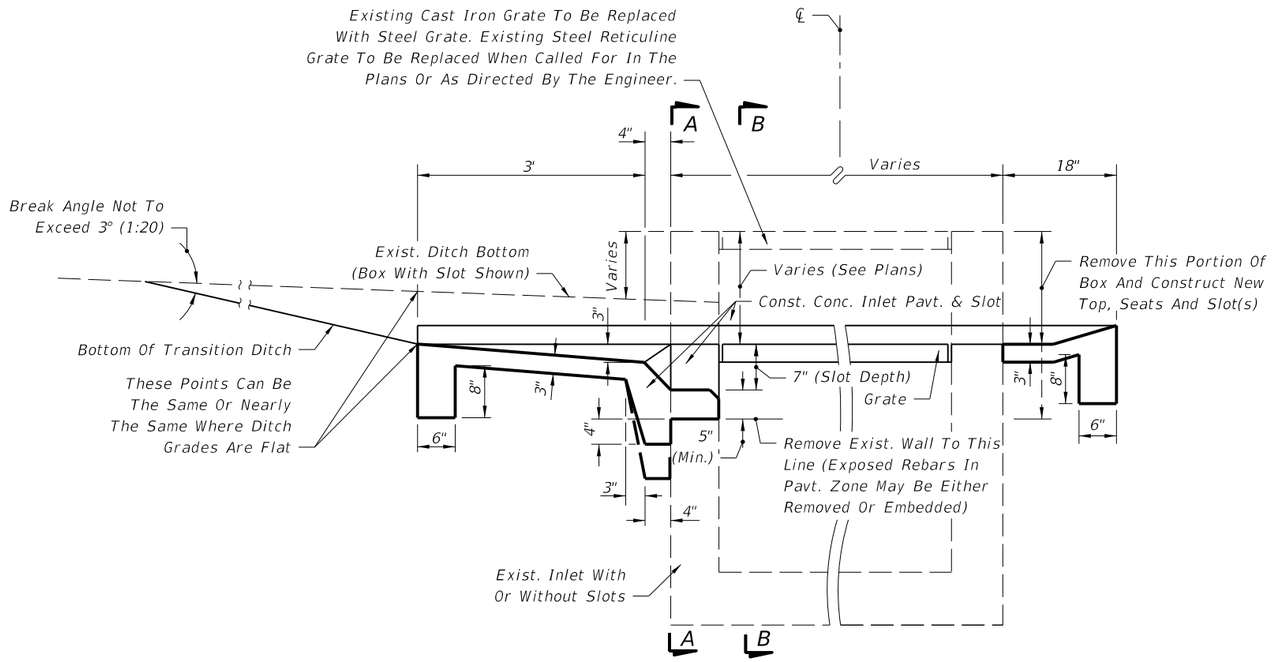
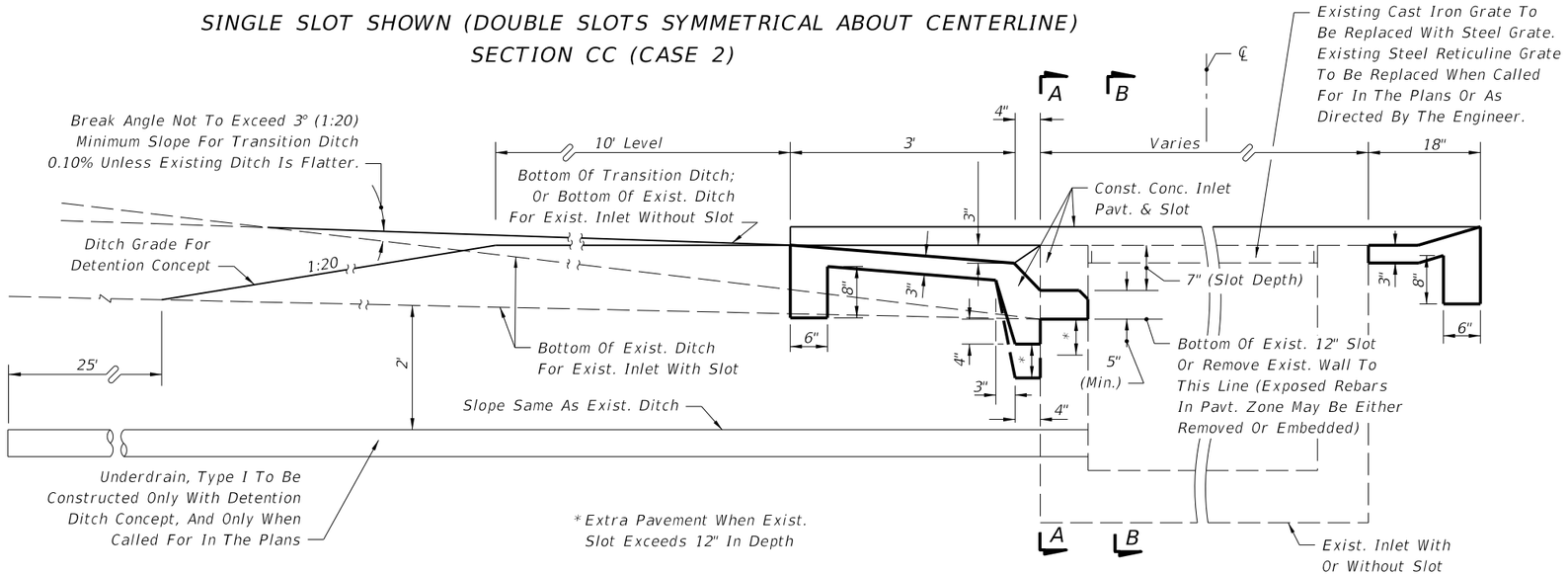


SINGLE SLOT SHOWN (DOUBLE SLOTS SYMMETRICAL ABOUT CENTERLINE) SECTION CC (CASE 2)



SINGLE SLOT SHOWN (DOUBLE SLOTS SYMMETRICAL ABOUT CENTERLINE) SECTION CC (CASE 3)

TRAVERSABLE SLOT INLETS (PARTIAL) FOR EXISTING INLETS

DESIGN NOTES FOR TRAVERSABLE SLOT INLETS (PARTIAL) FOR EXISTING INLETS

1. The general purpose of these conversions is to remove the hazard of the protruding inlet top, while not creating a hazard by depressing the top too deeply.

2. The corrective procedure depends on the approach ditch grade and hydraulic requirements of the site. The selection of the appropriate case depends on the relationship between inlet top and ditch elevation, and, on the vertical clearance between the top of the uppermost pipe(s) and the grate. The purpose for the Case 1 conversion is to add the traversable slot to an existing inlet where top removal, change in grate elevation and ditch transitions are not required. Case 2 will normally be applicable to ditches with flatter grades adjoining the inlet. Case 3 will normally be applicable to ditches with steeper grades adjoining the inlet where build up of the existing ditch is acceptable.

3. The designer shall stipulate in the plans which case is to be constructed at each individual inlet location.

   Where the existing inlet top is above the existing ditch (Case 2) but borrow material will be required to adjust the ditch (Case 3), and vertical clearance or other conditions do not prevent removal of the inlet top, the designer should call for Case 2. The designer shall determine if ditch reconstruction is required more than 35 feet beyond any traversable slot side and shall include separate pay items in the plans to cover the cost for that portion of required ditch reconstruction exceeding the 35 foot limit. The designer shall also determine whether ditch pavement is required for ditch restoration within the 35 foot limit and include that pavement under a pay item separate from the inlets partial.

   When the detention ditch concept is to be used with Case 3, the designer shall stipulate 'Case 3 (Detention)' in the plans.

   The designer shall determine whether tight soil or other conditions at each individual inlet indicates the need for underdrain in Case 3 conversions and shall call for Underdrain, Type I in the plans.

METHOD OF PAYMENT FOR TRAVERSABLE SLOT INLETS (PARTIAL) FOR EXISTING INLETS

1. Existing inlets converted to traversable slot tops under Cases 1, 2 and 3 shall be paid for as inlets partial, each. Case shall not be included in the pay item description.

2. All ditch reconstruction work within 35 feet of each traversable slot conversion, whether required by these details or as a direct result of the conversion, shall be included as a part of the partial cost. Reconstruction work shall include excavation and removal of surplus materials or borrow materials in place, grading, compaction, shaping and restoration of disturbed turf. Sodding, ditch pavement and underdrain are not included as part of the inlet partial cost and are to be paid for separately.

3. Concrete inlet pavement and sodding shall be in accordance with the sections on this detail and with the Plan on Sheet 4 and Sections AA, BB and CC (as Case 1) and tabular quantities on Sheet 5.

4. Unit price and payment shall constitute full compensation for inlet conversion (including concrete inlet paving and replacement grate(s)), ditch reconstruction, restoration of disturbed turf, and shall be paid for under the contract price for Inlets (DT Bot) (Type __) (Partial), each.

   Sodding shall be paid for under the contract unit price for Performance Turf, SY.

   Ditch pavement shall be paid for separate from the inlet by pavement type(s) and unit(s) as called for in the plans.

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LAST REVISION	REVISION	DESCRIPTION:				
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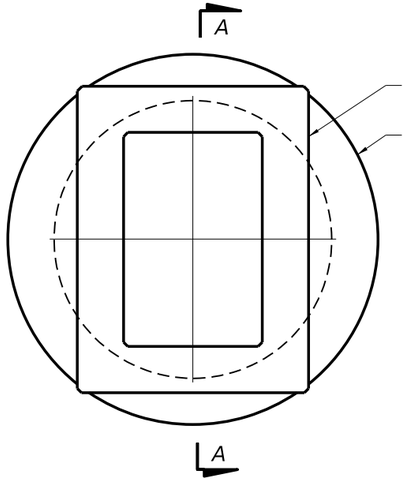
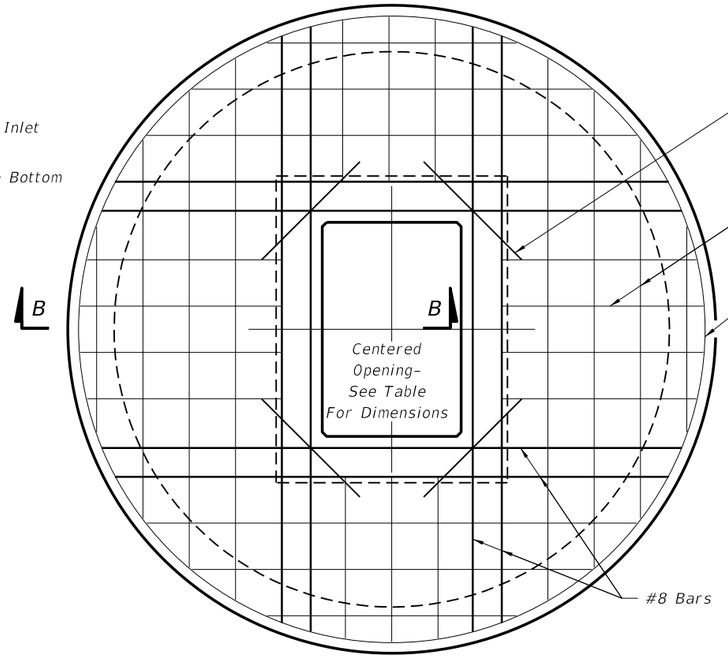


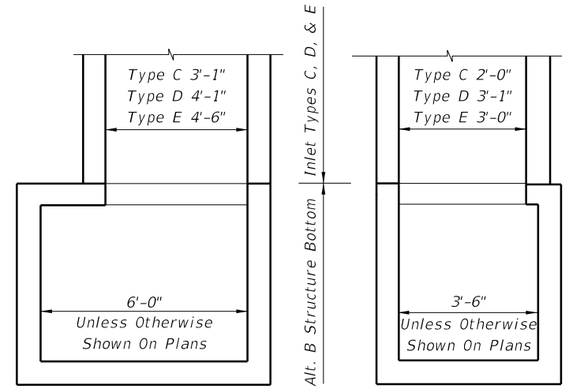
TOP VIEW

TOP SLAB OPENINGS		
DIAMETER	OPENING SIZE	
	MIN.	MAX.
4'-0"	2'-0" x 3'-1"	2'-0" x 3'-1"
5'-0"	2'-0" x 3'-1"	3'-1" x 4'-1"
6'-0"	2'-0" x 3'-1"	3'-0" x 4'-6"
8'-0"	2'-0" x 3'-1"	3'-0" x 4'-6"



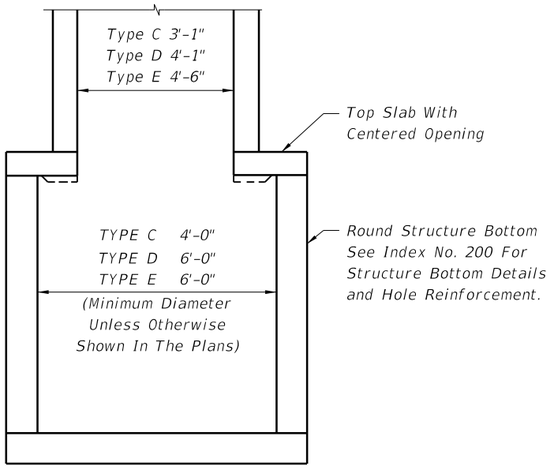
TOP SLAB REINFORCING DIAGRAM

TOP SLAB REINFORCING SCHEDULE	
SCHEDULE	GRADE 60 (BAR) OR 65 KSI & 70 KSI (WIRE FABRIC) In.²/ft.
A	0.20
B	0.24
C	0.37
D	0.53
E	0.73
F	1.06
G	1.45

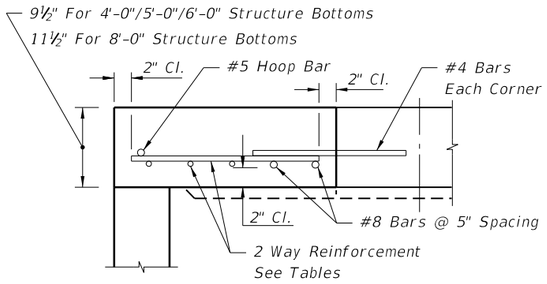


See Index No. 200 for structure bottom details and hole reinforcement.

ALT. B STRUCTURE BOTTOM FOR INLETS TYPE C, D & E

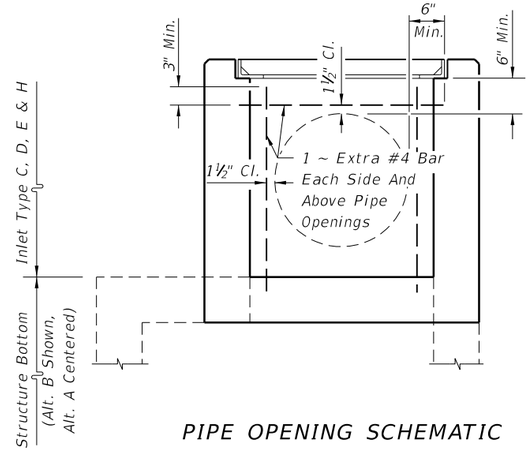


SECTION AA



SECTION BB

TOP SLAB WITH CENTERED OPENING		
SLAB DEPTH	SLAB THICKNESS	REINFORCING (2 WAYS) SCHEDULE
SIZE: 4'-0"		
≥0.5'-40'	9½"	C
SIZE: 5'-0"		
≥0.5' < 30'	9½"	C
30'-40'	9½"	D
SIZE: 6'-0"		
0.5' < 8'	9½"	B
8' < 18'	9½"	C
18' < 30'	9½"	D
30' < 37'	9½"	E
37'-40'	9½"	G
SIZE: 8'-0"		
≥0.5' < 9'	11½"	C
9' < 15'	11½"	D
15' < 23'	11½"	E
23' < 33'	11½"	E
33'-40'	11½"	G



PIPE OPENING SCHEMATIC

ALT. A STRUCTURE BOTTOM FOR INLETS TYPE C, D AND E

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LAST REVISION	REVISION	DESCRIPTION:				
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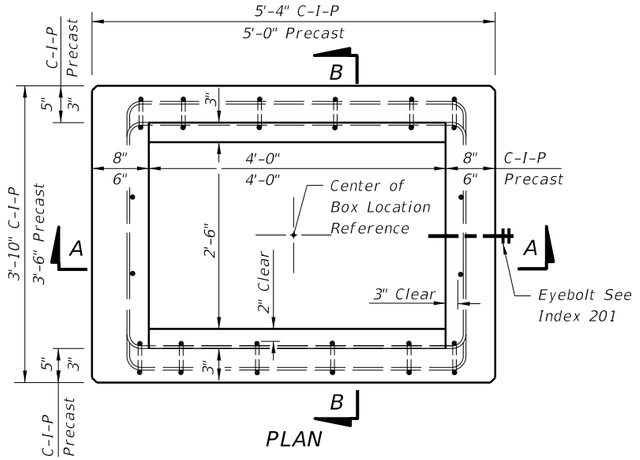
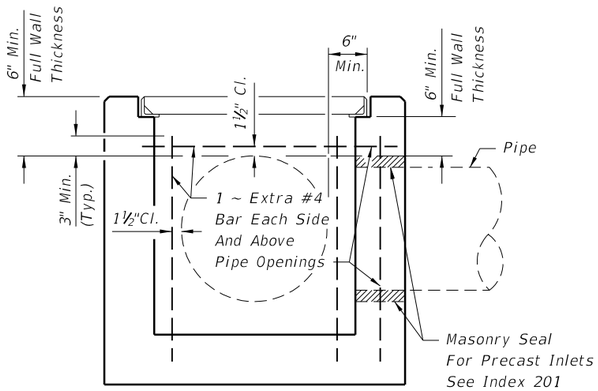
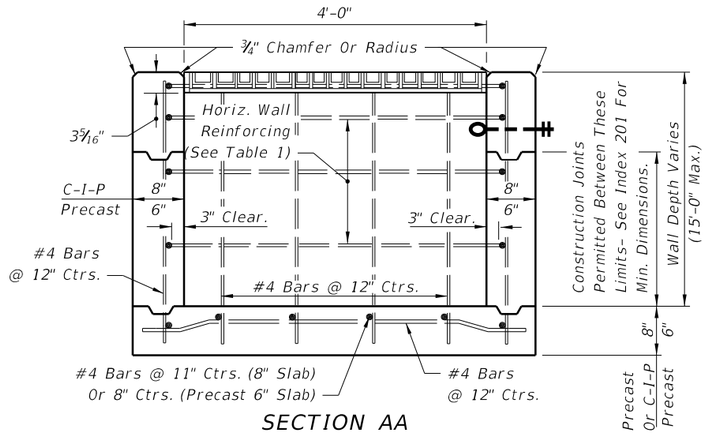


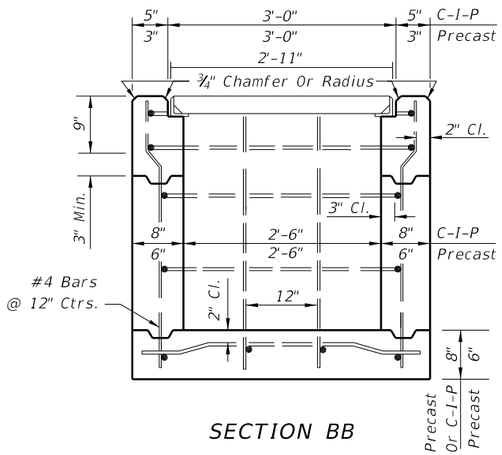


(TYPE F SHOWN, TYPE G SIMILAR)

PIPE OPENING SCHEMATIC

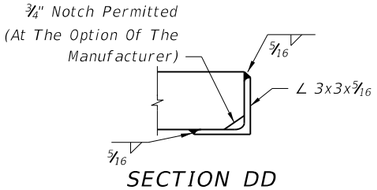


SECTION AA

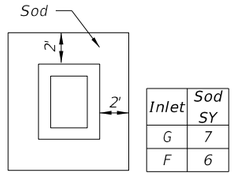


SECTION BB

SECTION CC

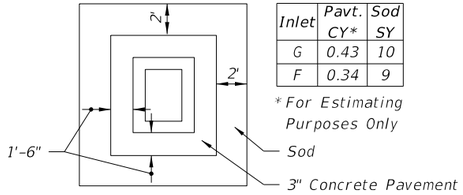


SECTION DD



Inlet	Sod SY
G	7
F	6

SOD ONLY

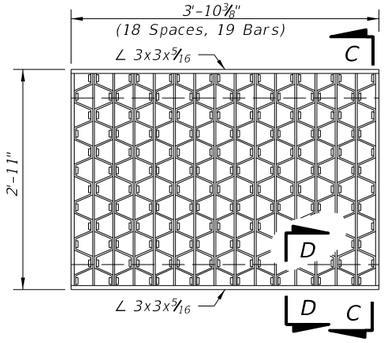


Inlet	Pavt. CY*	Sod SY
G	0.43	10
F	0.34	9

*For Estimating Purposes Only

PAVT. AND SOD

Notes:
1. Pavement and/or sod to be used only where called for in the plans.
2. Cost of paving to be included in cost of inlet.



STEEL GRATE

Steel Grating, Straight Bars 3"x¼"
Reticuline Bars 2"x5/16"

TYPE F

PAVEMENT AND SODDING

GENERAL NOTES

1. These inlets are designed for use in ditches, medians, pavement areas, or other areas subject to heavy wheel loads, minimal debris, and bicycle traffic. This inlet may be placed in areas subject to occasional pedestrian traffic such as landscaped areas and pavement areas where pedestrians can walk around the inlet. When inlet is placed in areas subject to bicycle traffic, install filler bar when clearance or gap is greater than 1" as shown in Index 218 Inset B.
2. When Alternate G grate is specified in plans, the grate is to be hot dip galvanized after fabrication.
3. These inlets may be used with Alternate B structure bottoms, Index 200. The inlet and bottom combinations are to be paid for under the contract unit price for inlets (DT Bot) (Type F (or G)) (J Bot, Depth), Ea.
4. All exposed edges and corners shall be ¾" chamfer or tooled to ¼" radius.
5. For supplemental details, see Index 201.
6. All reinforcing is Grade 60 bars with 2" min. cover unless otherwise noted. Bars to be cut or bent for 1½" clearance around pipe opening. Provide one additional #4 bar above and at each side of pipe opening, as shown.
7. All dimensions are for both precast and cast-in-place inlets unless otherwise noted.

HORIZONTAL WALL REINF. SCHEDULES
TYPE F INLET (TABLE 1)

WALL DEPTH	SCHEDULE	AREA (in²/ft)	MAX. SPACING BARS	MAX. SPACING WWF
0' - 4'	A12	0.20	12"	8"
4' - 7'	A6	0.20	6"	5"
7' - 12'	B5.5	0.24	5½"	5"
12' - 15'	Special 1	0.267	5"	4"

RECOMMENDED MAXIMUM PIPE SIZES

INLET INSIDE WIDTH	PIPE SIZE
2'-6" (Type F)	18"
4'-0" (Type F)	30"
4'-10" / 5'-0" (Type G)	42"

Note: Recommended sizes are for concrete pipe. Sizes for other types of pipe must be verified for fit in accordance with Index No. 201. For larger pipe sizes see Note 3.

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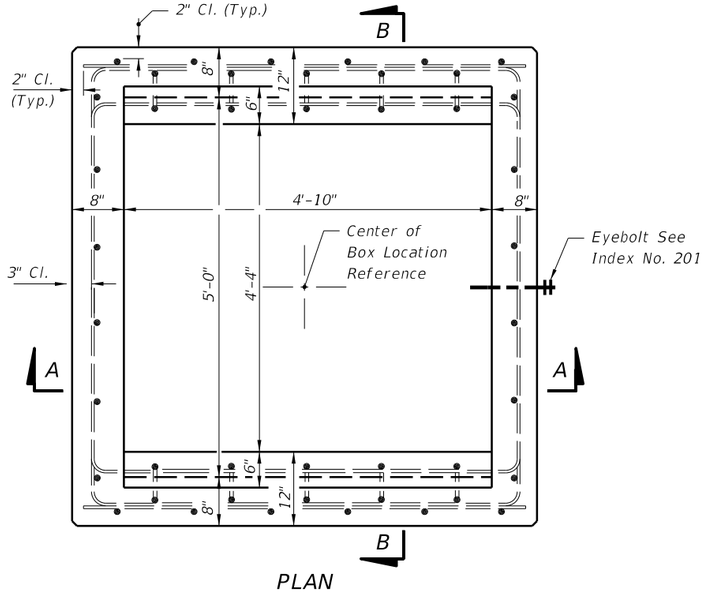
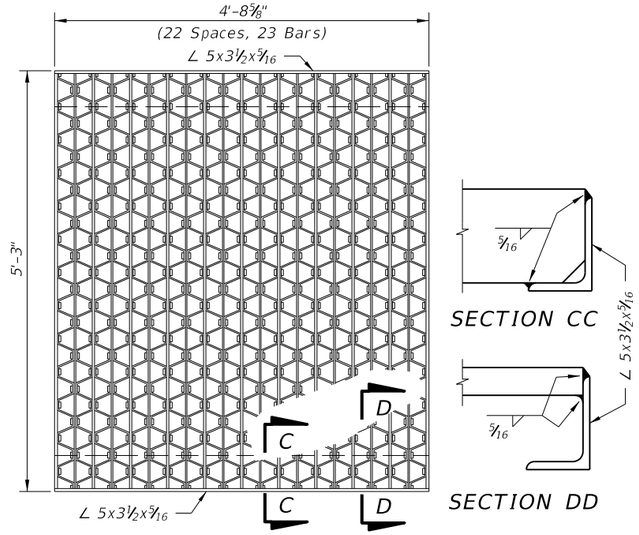
LAST REVISION	REVISION	DESCRIPTION:			INDEX NO.	SHEET NO.
01/01/10			FDOT DESIGN STANDARDS 2013	DITCH BOTTOM INLET TYPES F AND G	233	1



PLAN

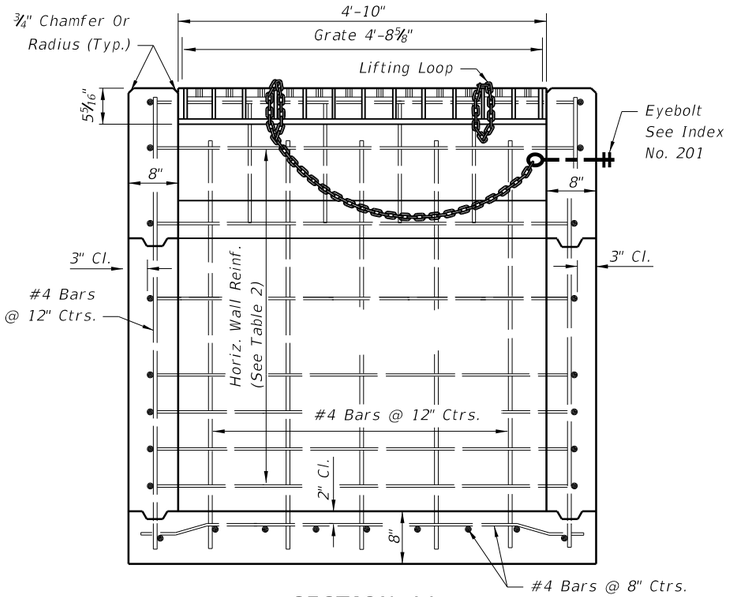


STEEL GRATE

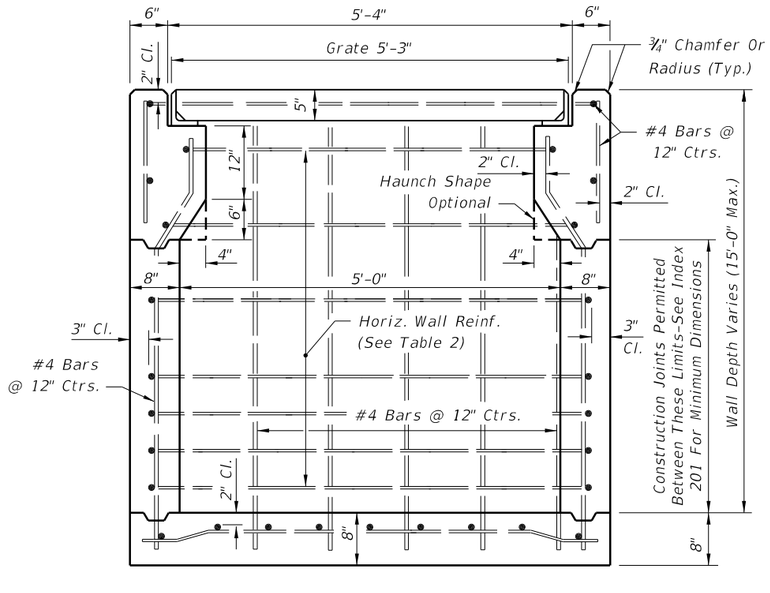
5" Steel Decking, Weight 630 Lbs. Main Bars 5" x ¼"
Intermediate Bars 1½" x¼", Reticuline Bars 1¼" x 3⁄16"

TYPE G INLET (TABLE 2)

WALL DEPTH	SCHEDULE	AREA (in^2/ft)	MAX. SPACING	
			BARS	WWF
0' – 3'	A12	0.20	12"	8"
3' – 7'	A6	0.20	6"	5"
7' – 10'	B5.5	0.24	5½"	5"
10' – 15'	C6.5	0.37	6½"	6"



SECTION AA

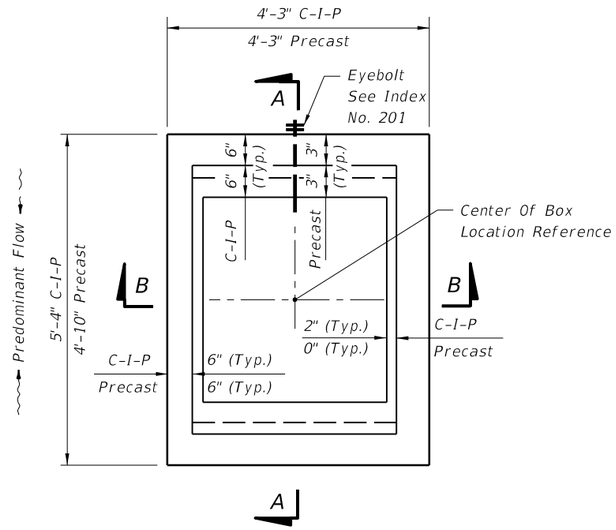


SECTION BB

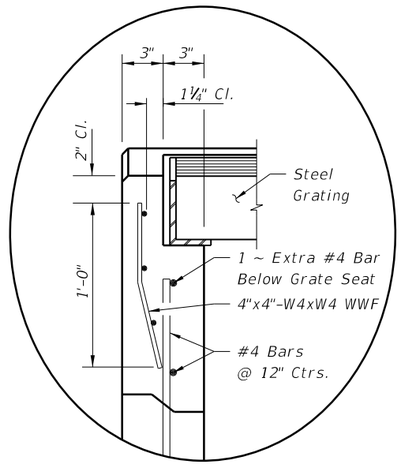
TYPE G

LAST REVISION	REVISION	DESCRIPTION:		INDEX NO.	SHEET NO.
01/01/10			FDOT DESIGN STANDARDS 2013	233	2

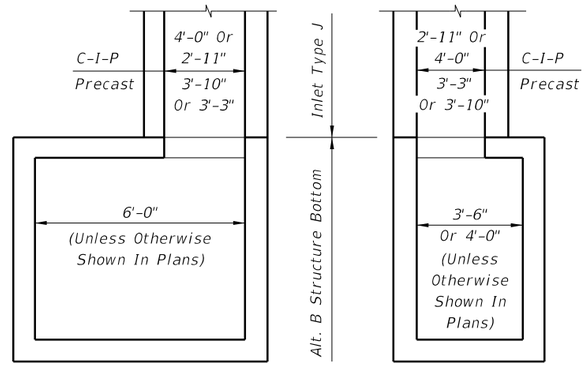
DITCH BOTTOM INLET TYPES F AND G



PLAN
(CAST-IN-PLACE INLET SHOWN, WITHOUT GRATE, PRECAST INLET SIMILAR)



INSET A
(PRECAST OPTION)



NOTE: Alt. B Structure Bottom Only. See Index No. 200 for structure bottom details and hole reinforcement.

INLET WITH STRUCTURE BOTTOM

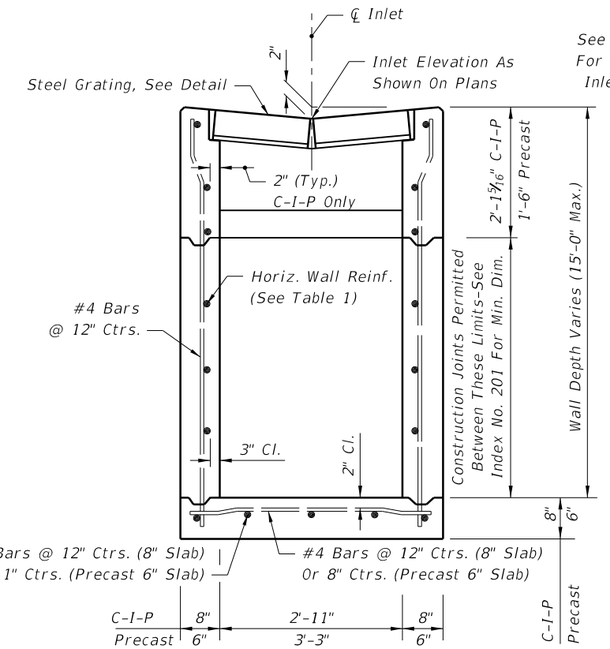
HORIZONTAL WALL REINFORCING SCHEDULE (TABLE 1)

WALL DEPTH	SCHEDULE	AREA (In^2/ft)	MAX. SPACING	
			BARS	WWF
0' - 4'	A12	0.20	12"	8"
4' - 9'	A6	0.20	6"	5"
9' - 12'	A4	0.20	4"	3"
9' - 15'	B5.5	0.24	5½"	5"

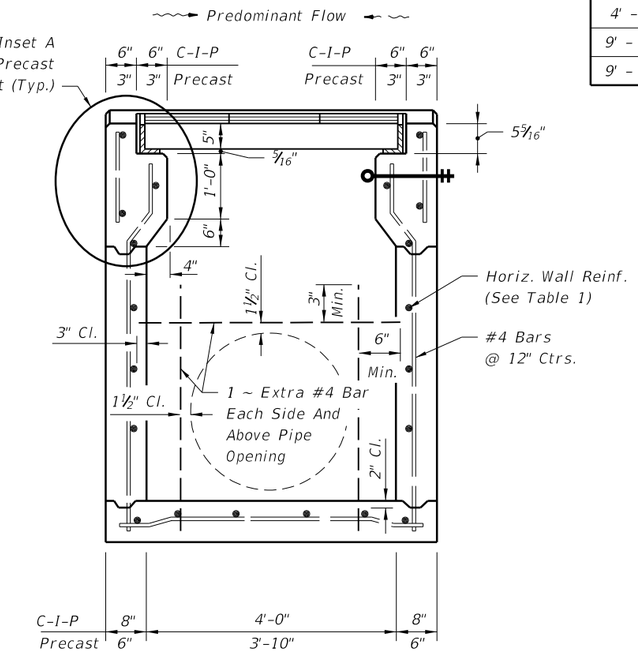
RECOMMENDED MAXIMUM PIPE SIZES

INLET INSIDE WIDTH	PIPE SIZE
2'-11" or 3'-3"	24"
3'-10" or 4'-0"	30"

Note: Recommended sizes are for concrete pipe. Sizes for other types of pipe must be verified for fit in accordance with Index No. 201. For larger pipe, see Structure Bottom detail above and Index No. 200.



(Pipe Opening Not Shown)
SECTION BB



(Pipe Opening Shown)
SECTION AA

GENERAL NOTES

1. This inlet is designed for use in ditches, medians, pavement areas or other areas subject to heavy wheel loads with minimal debris. This inlet is not for use in areas subject to bicycle traffic. This inlet may be placed in areas subject to occasional pedestrian traffic such as landscaped areas and pavement areas where pedestrians can walk around the inlet.
2. All reinforcing Grade 60 bars with 2" min. cover unless otherwise noted. See Index No. 201 for equivalent area of welded wire fabric. Cut or bend bars out of way of pipe when necessary; bars to clear pipe by 1½".
3. All exposed edges and corners shall be ¾" chamfer or tooled to ¼" radius.
4. When alternate G grate is specified in plans the grate is to be hot dip galvanized after fabrication.
5. For supplemental details, see Index No. 201.
6. All dimensions are for both precast and cast-in-place inlets unless otherwise noted.
7. Cost of ditch paving to be included in cost of inlet. Sodding to be paid for under contract unit price for Performance Turf, SY.

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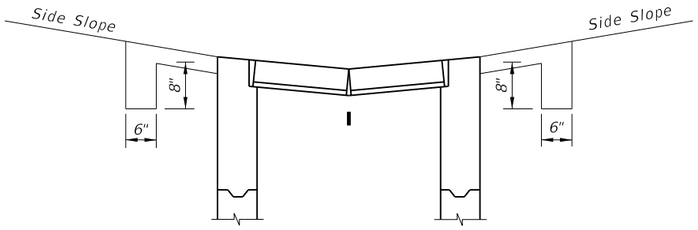
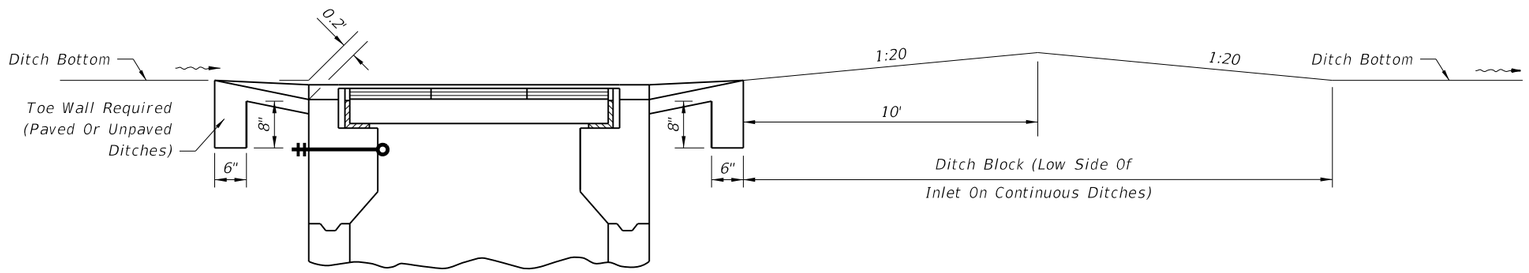
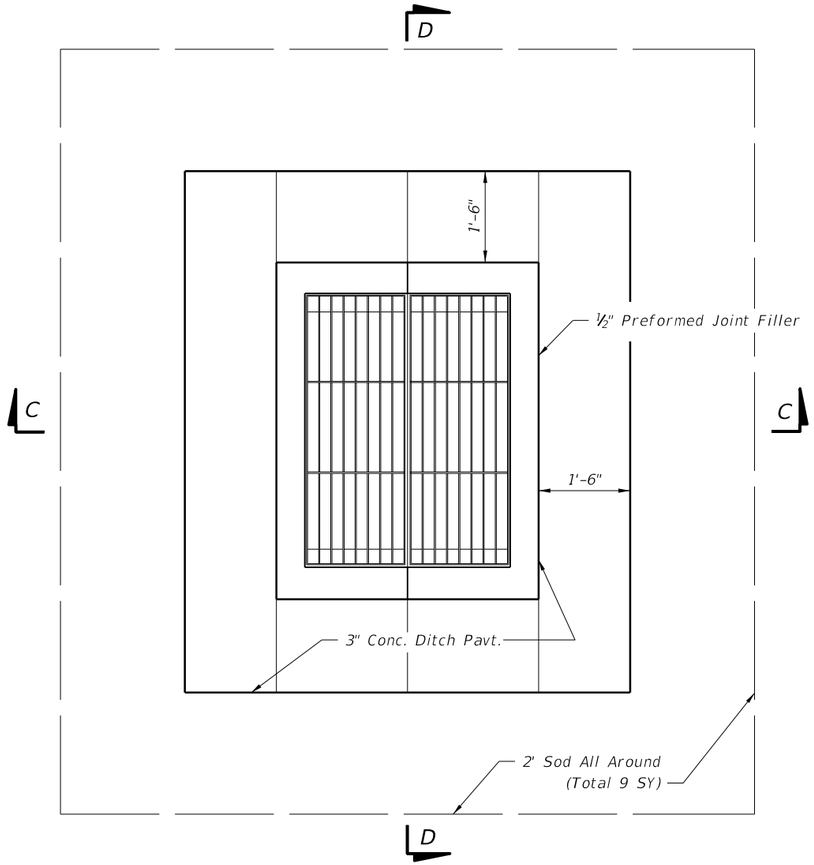
LAST REVISION	REVISION	DESCRIPTION:				
07/01/09			FDOT DESIGN STANDARDS 2013	DITCH BOTTOM INLET TYPE J	INDEX NO. 234	SHEET NO. 1



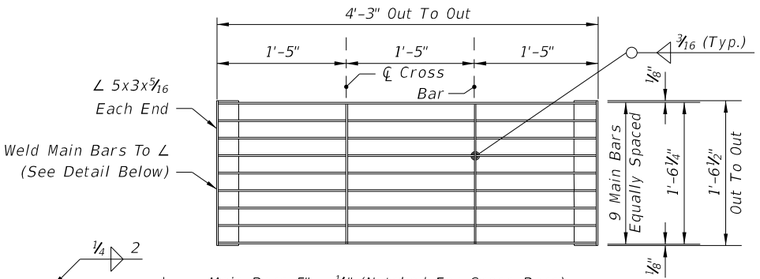
SECTION CC

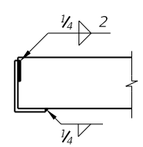


SECTION DD



PAVEMENT & SODDING





DETAIL

Main Bars 5" x ¼" (Notched For Cross Bars)
Cross Bars 1¾" x¼" (Continuously Welded At
Main Bar Notches) Main Bars And Cross Bars Flush On Top.

Note: Two Required Per Inlet

STEEL GRATING

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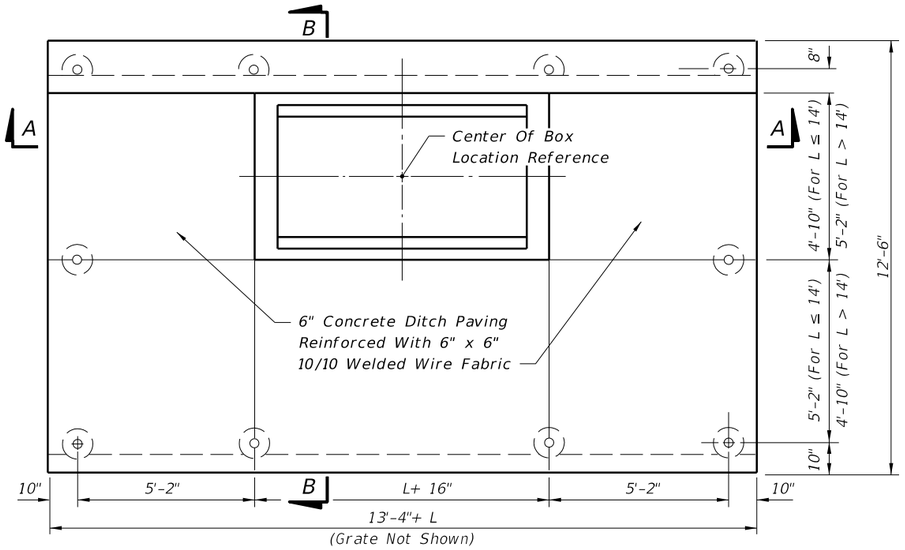
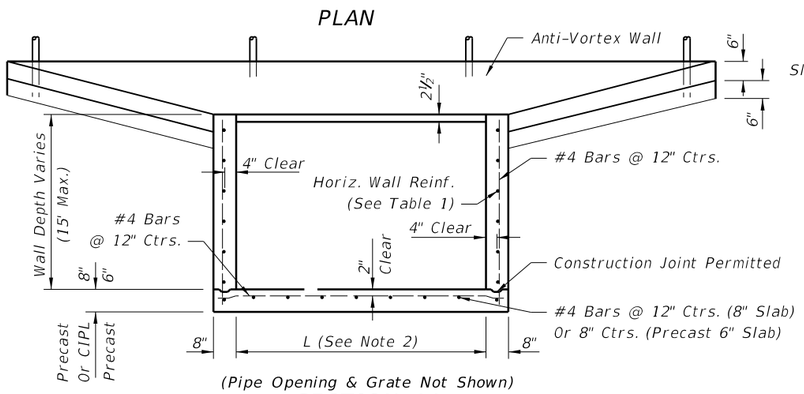
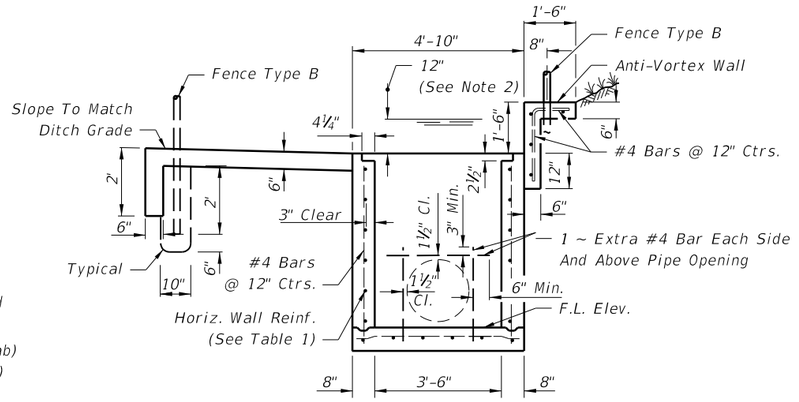
LAST REVISION	REVISION	DESCRIPTION:		FDOT DESIGN STANDARDS 2013	DITCH BOTTOM INLET TYPE J	INDEX NO.	SHEET NO.
07/01/09						234	2





(Pipe Opening & Grate Not Shown)

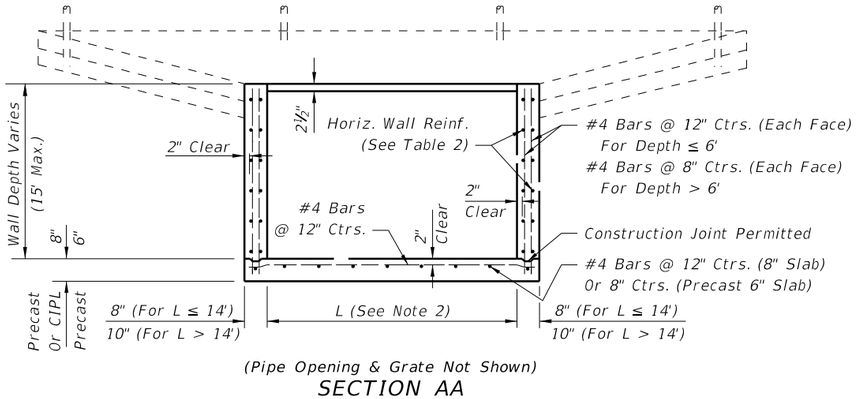
SECTION AA



(Pipe Opening Shown, Grate Not Shown)

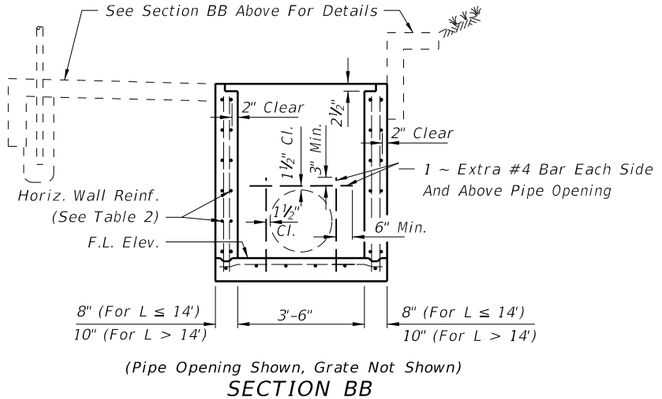
SECTION BB

INLET LENGTHS (L) LESS THAN OR EQUAL TO 9' (SINGLE LAYER WALL REINFORCING)



(Pipe Opening & Grate Not Shown)

SECTION AA



(Pipe Opening Shown, Grate Not Shown)

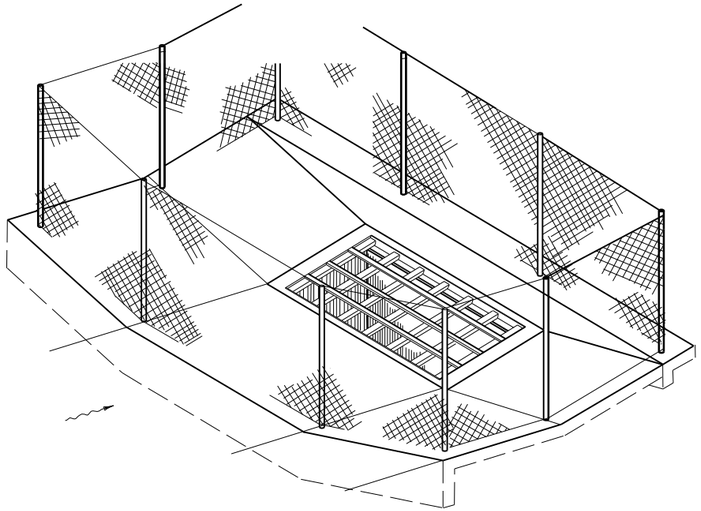
SECTION BB

INLET LENGTHS (L) GREATER THAN OR EQUAL TO 9' (DOUBLE LAYER WALL REINFORCING)

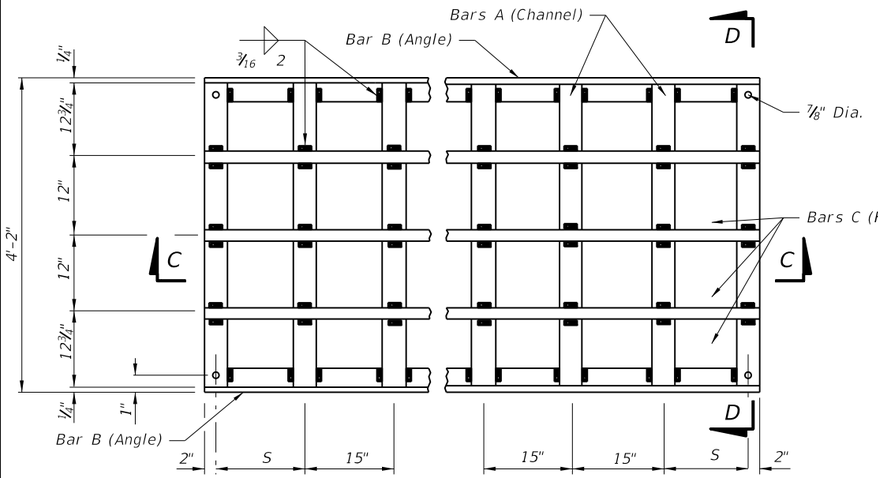
GENERAL NOTES

1. This inlet is to be used at locations having high flow rates, usually where an endwall could not be utilized without hazardous intake.
2. Inlet length (L) shall be set by the designer for the greater of either culvert requirement or inlet pool not to exceed 12" depth. Structures over 6 feet in depth are to be checked for flotation by the designer of project drainage.
3. This inlet is not intended for use with Index 200 structure bottoms.
4. All exposed edges and corners shall be ¾" chamfer or tooled to ¼" radius.
5. Inlet and anti-vortex wall to be Class II Concrete.
6. All reinforcing is Grade 60 with 2" min. cover unless otherwise noted. See Index No. 201 for equivalent area of welded wire fabric (WWF). Bars to be cut or bent for 1½" clearance around pipe opening. Bend top and corner bars to clear anchor holes.
7. Channel section C 3x6 at 14" max. bar spacing may be used as an alternate for the C 4x5.4 channel at 15" bar spacing.
8. Channels and bars for grate shall be ASTM A242/A242M, A572/A572M or A588/A588M, Grade 50 steel, and galvanized in accordance with Specification Section 975.
9. Fence enclosure shall be Fence Type B (Index No. 802). All posts to be set in concrete. A minimum of 10 posts required. Corner and approach side posts to be 3" nominal diameter.
10. Cost of ditch paving, anti-vortex wall, grate, concrete, reinforcing steel and fence enclosure to be included in the cost of inlet. Inlet to be paid for under the contract unit price for Inlets (DT Bot) (Type K), Each.
11. Anchor Bolts shall be ASTM F1554 Grade 36 fully threaded headless bolts, installed in accordance with Specification Sections 416 and 937. Nuts shall be ASTM A563 or A194 and washers shall be ASTM F436 or Type A plain washers. All nuts, bolts and washers shall be galvanized.

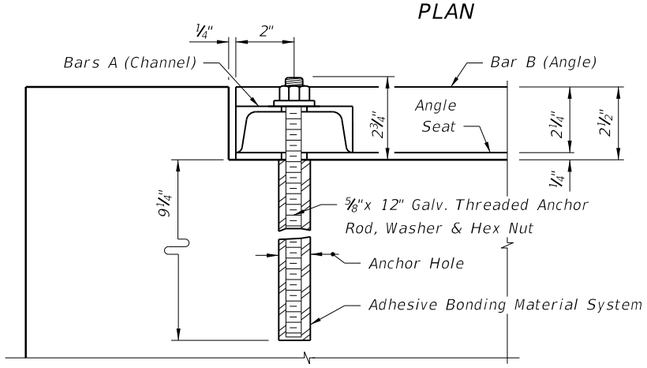
LAST REVISION	REVISION	DESCRIPTION:			INDEX NO.	SHEET NO.
07/01/09			FDOT DESIGN STANDARDS 2013	DITCH BOTTOM INLET TYPE K	235	1



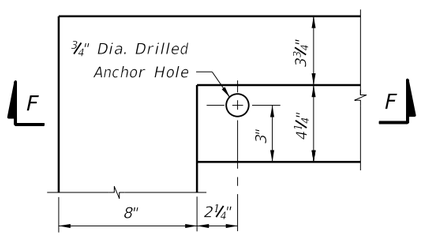
ISOMETRIC OF INLET FENCE ENCLOSURE



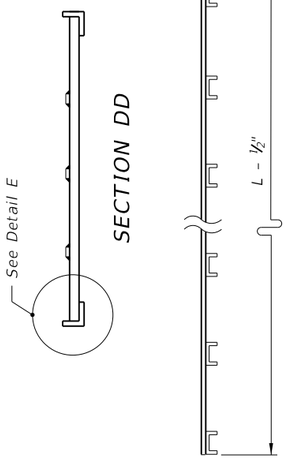
PLAN



SECTION FF



GRATE SEAT AND ANCHOR HOLE PLAN



SECTION DD

SECTION CC

STEEL GRATE

HORIZONTAL WALL REINFORCING SCHEDULES

WALL DEPTH	SCH.	AREA (in²/ft)	MAX. SPACING BARS	MAX. SPACING WWF
SIZE: L = 5'-0"				
0'-5'	A12	0.20	12"	8"
5'-8'	A6	0.20	6"	5"
8'-15'	B5.5	0.24	5½"	5"
SIZE: L = 6'-0"				
0'-4'	A12	0.20	12"	8"
4'-6'	B5.5	0.24	5½"	5"
6'-9'	C6.5	0.37	6½"	6"
9'-15'	C3.5	0.37	3½"	3"
SIZE: L = 7'-0"				
0'-4'	B5.5	0.24	5½"	5"
4'-7'	C6.5	0.37	6½"	6"
7'-15'	D4.5	0.53	4½"	4"
SIZE: L = 8'-0"				
0'-3'	B5.5	0.24	5½"	5"
3'-5'	C6.5	0.37	6½"	6"
5'-9'	D4.5	0.53	4½"	4"
9'-15'	E5	0.73	5"	4"
SIZE: L = 9'-0"				
0'-4'	C6.5	0.37	6½"	6"
4'-7'	D4.5	0.53	4½"	4"
7'-15'	E3	0.73	3"	3"

SINGLE LAYER REINFORCING (TABLE 1)

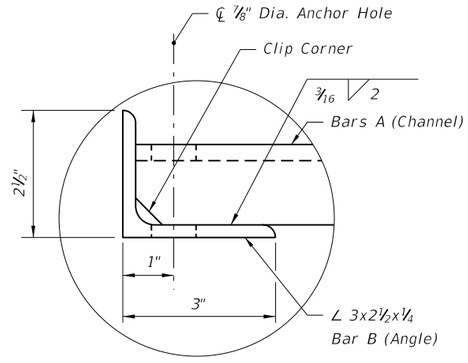
WALL DEPTH	SCH.	AREA (in²/ft)	MAX. SPACING BARS	MAX. SPACING WWF
SIZE: L = 9'-0"				
0'-4'	A12	0.20	12"	8"
4'-6'	A6	0.20	6"	5"
6'-8'	B5.5	0.24	5½"	5"
8'-15'	C6.5	0.37	6½"	6"
SIZE: L = 10'-0"				
0'-3'	A12	0.20	12"	8"
3'-5'	A6	0.20	6"	5"
5'-8'	C6.5	0.37	6½"	6"
8'-15'	C3.5	0.37	3½"	3"
SIZE: L = 12'-0"				
0'-4'	B5.5	0.24	5½"	5"
4'-6'	C6.5	0.37	6½"	6"
6'-15'	D4.5	0.53	4½"	4"
SIZE: L = 14'-0"				
0'-4'	C6.5	0.37	6½"	6"
4'-7'	D4.5	0.53	4½"	4"
7'-15'	E5	0.73	5"	4"
SIZE: L = 16'-0" x 10" WALL THICK				
0'-4'	C6.5	0.37	6½"	6"
4'-8'	D4.5	0.53	4½	4"
8'-15'	E5	0.73	5"	4"
SIZE: L = 18'-0" x 10" WALL THICK				
0'-3'	C6.5	0.37	6½"	6"
3'-5'	D4.5	0.53	4½"	4"
5'-8'	E5	0.73	5"	4"
8'-15'	F5	1.06	5"	4"

DOUBLE LAYER REINFORCING (TABLE 2)

GRATE QUANTITIES

PIPE SIZE	L	S	BILL OF STEEL BAR	No. REQD.	LENGTH	STEEL WEIGHT CHANNEL 4"x 5.4 lb	ANGLE 3"x 2½"x ¼" (4.5 lb/ft)	FLAT 2" x ½" (3.4 lb/ft)
30"&36"	5'-0"	12¾"	A	5	4'-1½"	111		
			B	2	4'-11½"		45	
			C	3	4'-11½"			51
42"&48"	6'-0"	11¼"	A	6	4'-1½"	134		
			B	2	5'-11½"		54	
			C	3	5'-11½"			61
54"&60"	7'-0"	9¾"	A	7	4'-1½"	156		
			B	2	6'-11½"		63	
			C	3	6'-11½"			71
66"&72"	8'-0"	8¼"	A	8	4'-1½"	178		
			B	2	7'-11½"		72	
			C	3	7'-11½"			81
84"	9'-0"	14¼"	A	8	4'-1½"	178		
			B	2	8'-11½"		81	
			C	3	8'-11½"			91
SPECIAL	10'-0"	12¾"	A	9	4'-1½"	201		
			B	2	9'-11½"		90	
			C	3	9'-11½"			102
SPECIAL	12'-0"	9¾"	A	11	4'-1½"	245		
			B	2	11'-11½"		108	
			C	3	11'-11½"			122
SPECIAL	14'-0"	14¼"	A	12	4'-1½"	267		
			B	2	13'-11½"		126	
			C	3	13'-11½"			142
SPECIAL	16'-0"	11¼"	A	14	4'-1½"	312		
			B	2	15'-11½"		144	
			C	3	15'-11½"			163
SPECIAL	18'-0"	8¼"	A	16	4'-1½"	356		
			B	2	17'-11½"		162	
			C	3	17'-11½"			183

Table Notes:
See Sheet No. 1 of 2 for dimension "L" location.
See steel grate Plan View for dimension "S" location.



DETAIL E

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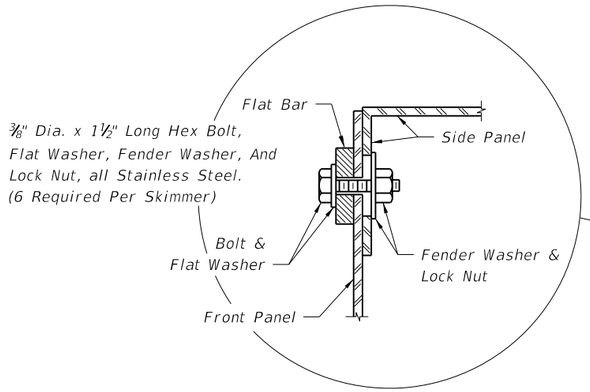
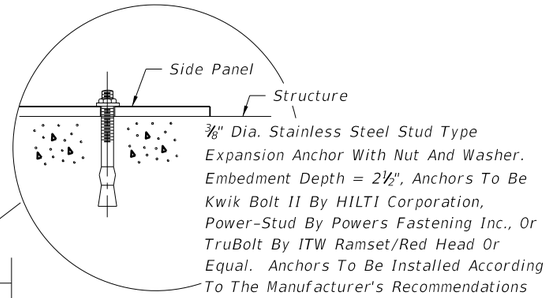
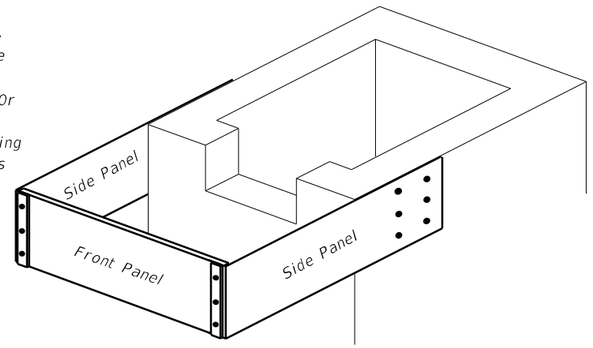
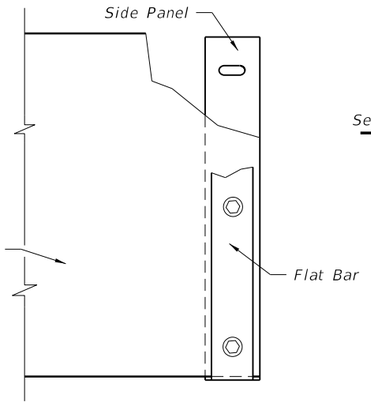
LAST REVISION	REVISION	DESCRIPTION:			INDEX NO.	SHEET NO.
07/01/05			FDOT DESIGN STANDARDS 2013	DITCH BOTTOM INLET TYPE K	235	2



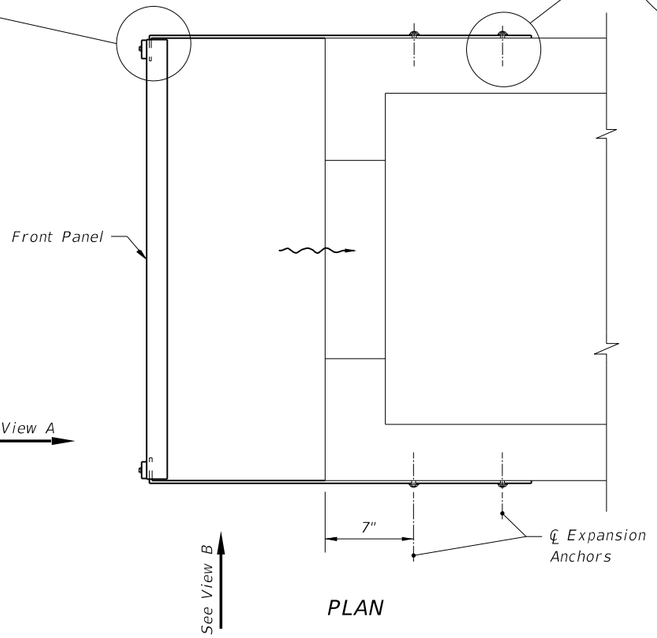




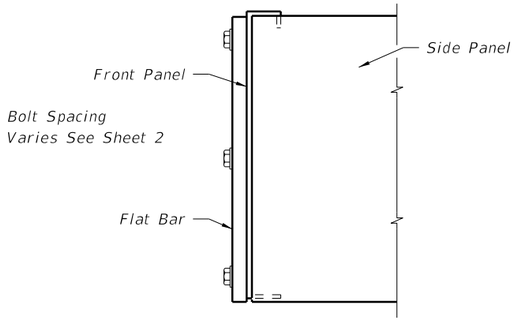
PICTORIAL VIEW



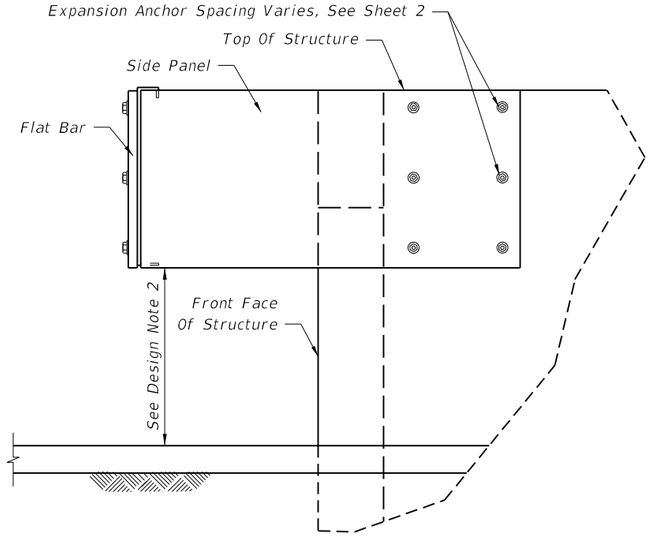
VIEW A



PLAN



VIEW B



SIDE VIEW

GENERAL NOTES

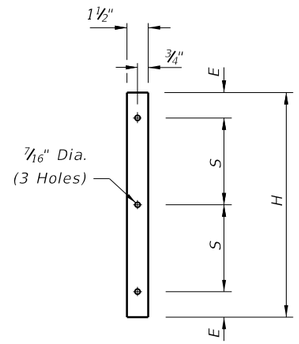
1. This skimmer is intended for use on Type C, D, or E Ditch Bottom Inlets that are used as outlet control structures of stormwater management facilities.
2. The side panels are dimensionally symmetric, therefore they may be used on either side of the structure.
3. Two (2) skimmers may be constructed on one structure provided they are on opposite ends.
4. The width of the front panel (dimension W) shall be the same as the outside dimension across the front of the structure.
5. The front panel, side panels, and flat bars are to be hot dip galvanized after fabrication.
6. The location of the reinforcing steel in these structures must conform to the applicable standards to avoid conflict with the expansion anchors used to attach the skimmer.
7. Grates to be used on the inlets unless otherwise specified in the plans.
8. A skimmer consists of two (2) side panels, one front panel, two (2) flat bars, and accessory hardware. The cost of skimmers is to be included in the cost of the inlet.

DESIGN NOTES

1. The designer must specify, in the plans, the skimmer height (dimension H) and the sides where the weir slots and skimmers are located. The skimmer height must be one of the dimensions shown in the table on Sheet 2. The skimmer should not be used on structure sides with outside dimensions greater than 6'-4".
2. To minimize hydraulic losses across the skimmer, the flow area under the skimmer should be three times larger than the flow area of the weir slot. The distance between the pond bottom at the structure and the skimmer shall be not less than 1 foot.
3. The configuration of skimmers may be subject to regulatory requirements. The designer should coordinate the outlet control structure details with the permitting agencies.
4. Where this skimmer is used, the designer should reference this index with the outlet control structure details. Where a different skimmer design is needed, the designer should provide skimmer details in the plans.
5. The designer shall evaluate if a grate is needed for safety reasons. Where a grate is not needed for safety reasons and is not desirable for hydraulic or other reasons, the designer may omit the grate by stating so in the outlet control structure details.
6. The designer must show the configuration of the weir slots in the outlet control structure detail.

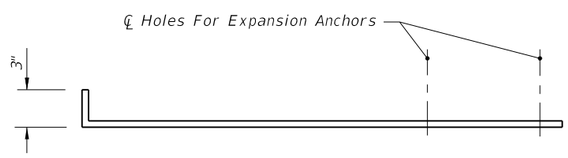
LAST REVISION	REVISION	DESCRIPTION:				
00			FDOT DESIGN STANDARDS 2013	SKIMMER FOR OUTLET CONTROL STRUCTURES	INDEX NO. 240	SHEET NO. 1

DIMENSIONS				
Skimmer Height as Specified in the Plans				Bolt Spacing
H	D	E	L	S
Inches				
12	3 3/16	3	28	3
14	3 3/16	3	28	4
16	3 3/16	3	28	5
18	3 3/16	3	28	6
20	4 3/16	4	31	6
22	4 3/16	4	31	7
24	4 3/16	4	31	8
26	4 3/16	4	31	9
28	4 3/16	4	31	10
30	5 3/16	5	31	10
32	5 3/16	5	31	11
34	5 3/16	5	31	12
36	6 3/16	6	31	12
38	6 3/16	6	31	13
40	6 3/16	6	31	14

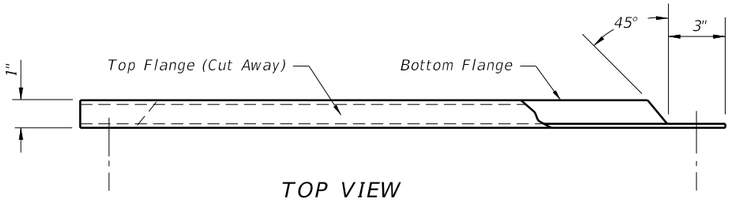


¼" Thick x 1½" Wide

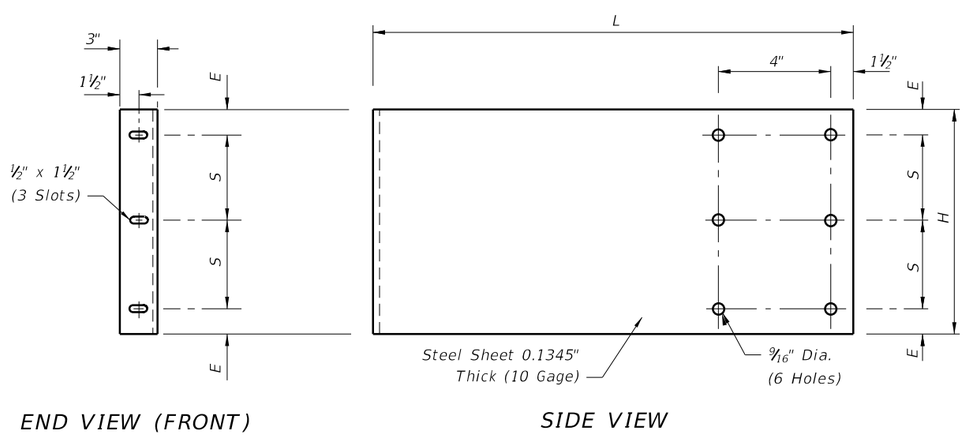
FLAT BAR



TOP VIEW



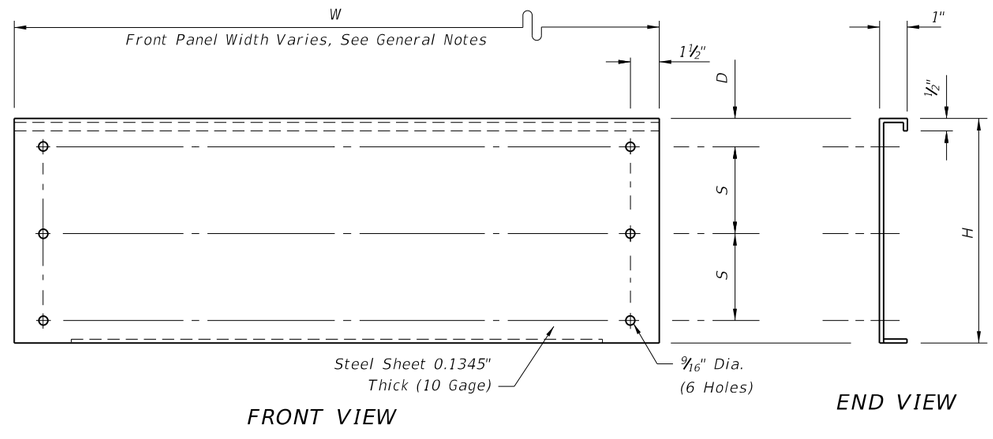
TOP VIEW



END VIEW (FRONT)

SIDE VIEW

SIDE PANEL



FRONT VIEW

END VIEW

FRONT PANEL

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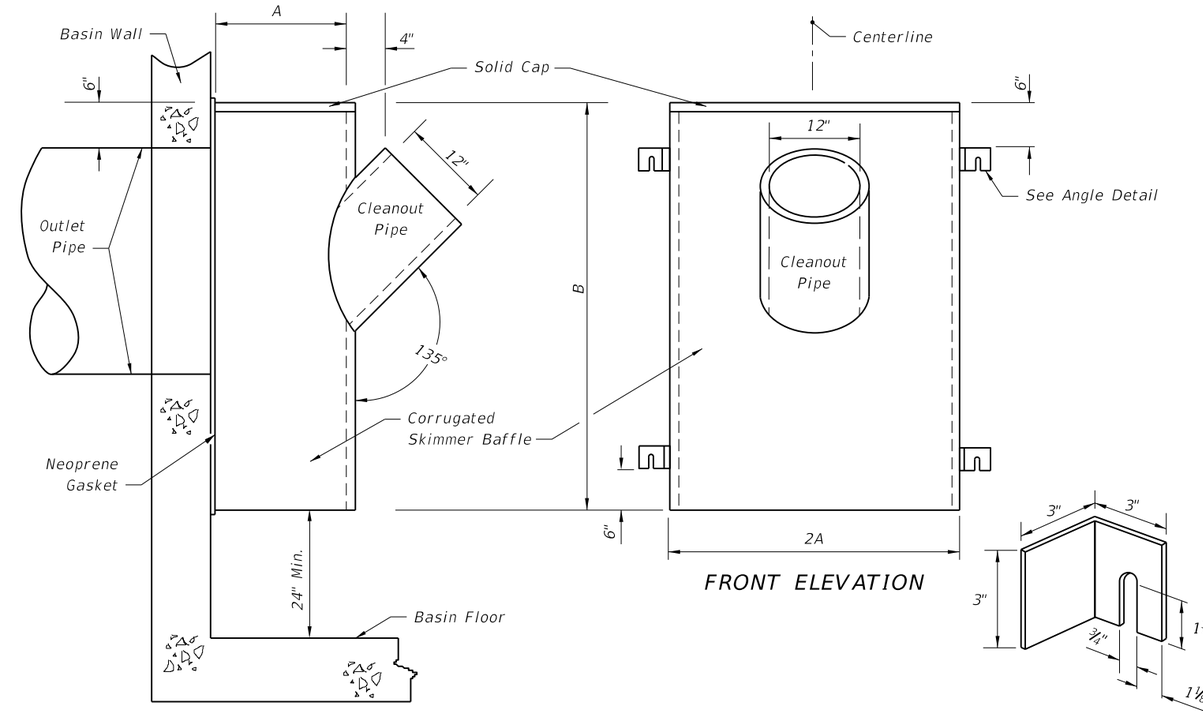
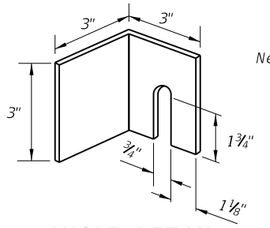
LAST REVISION	REVISION	DESCRIPTION:			INDEX NO.	SHEET NO.
01/01/12			FDOT DESIGN STANDARDS 2013	SKIMMER FOR OUTLET CONTROL STRUCTURES	240	2



SIDE ELEVATION

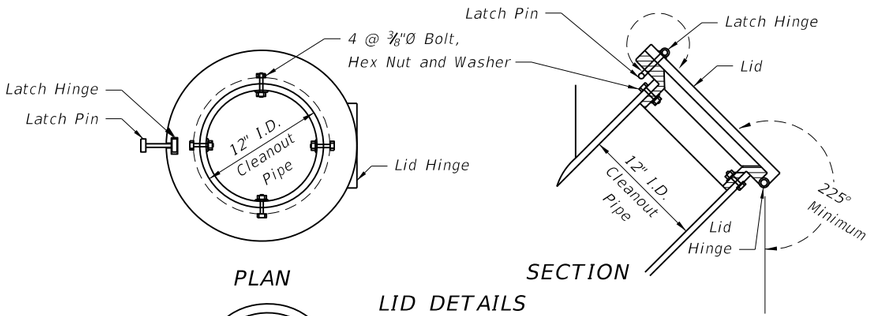
FRONT ELEVATION



ANGLE DETAIL

Angles on other side of skimmer are mirror image.

TYPE I SKIMMER

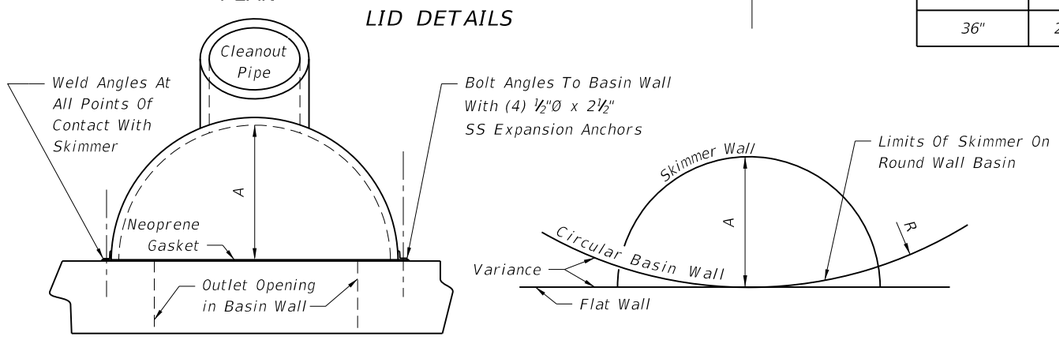


PLAN

SECTION

LID DETAILS

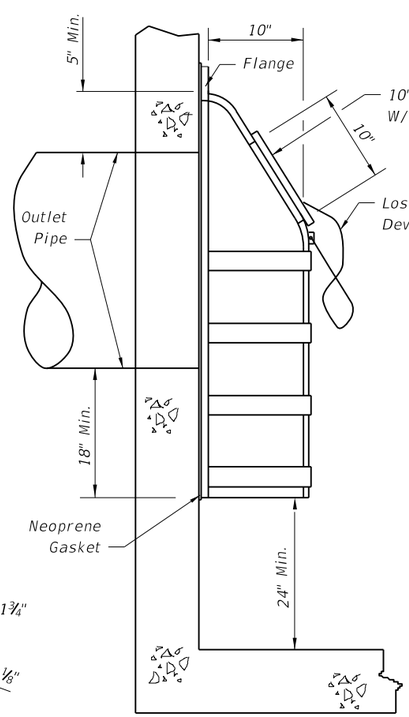
TYPE I SKIMMER DIMENSION TABLE		
OUTLET PIPE	A	B
18"	12"	42"
24"	15"	48"
30"	18"	54"
36"	21"	60"



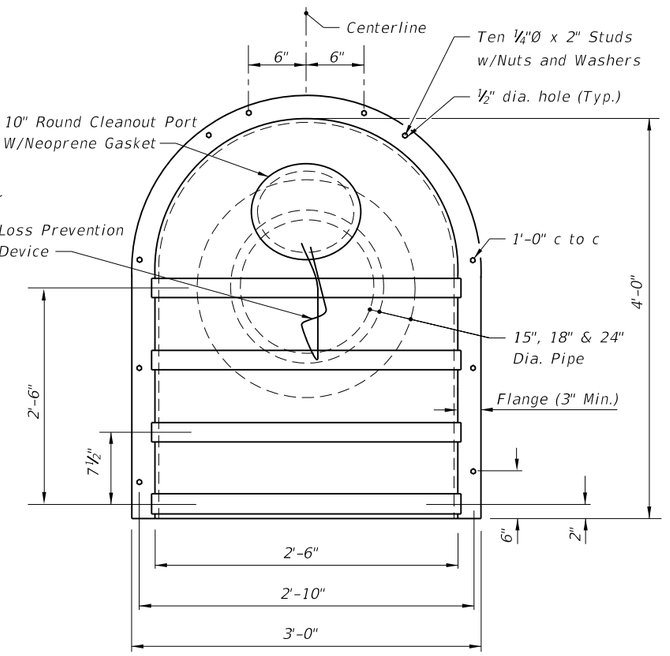
TOP VIEW

TOP VIEW SCHEMATIC

The backs of skimmers must conform to the shape of the basin walls on which they are mounted. Show, in the plans, the radii required for curved-back skimmers. Applies to both skimmer types.



SIDE ELEVATION



FRONT ELEVATION

Note: The cleanout port for the Type II skimmer shall be gasketed, with either a threaded screw-in lid or a lid secured by four stainless steel quick-release latches.

TYPE II SKIMMER

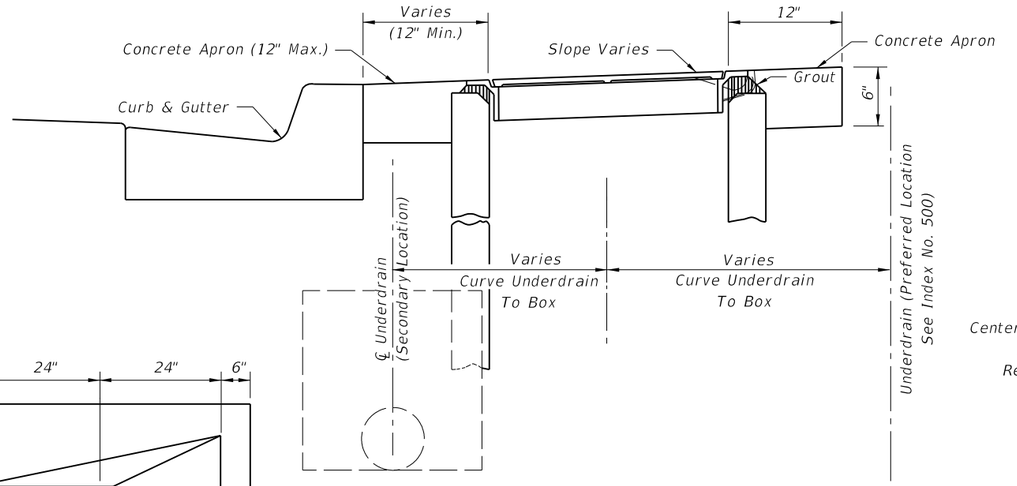
GENERAL NOTES

1. The Frenchdrain Skimmer is a hooded cover, mounted over an outlet in a catchbasin, that prevents oil and floating debris from exiting the basin. Use this skimmer in Frenchdrain Catchbasins and in other locations where there is a need to prevent oil, debris or other floating contaminants from exiting Catchbasins through outlet pipes.
2. Place neoprene gasket material between the skimmer and the catchbasin at all points of contact. Trim the gasket neatly to extend ½ inch beyond the joint on all sides.
3. Skimmer baffle, cleanout pipe and angles shall be primarily constructed of either galvanized steel, aluminum, polyvinyl chloride, polyethylene, fiberglass or acrylonitrite butadiene styrene. All steel components, other than stainless, shall be hot-dip galvanized.
4. Mounting hardware, hinges and latches shall all be stainless steel. Loss prevention device shall be either stainless steel chain or riveted nylon strap.
5. Material used in construction of skimmer bodies (baffles) and cleanout pipe shall comply with Standard Specification 943 for steel, 945 for aluminum or 948 for plastics.
6. All costs for furnishing and installing a frenchdrain skimmer shall be included in the cost of the basin in which it is installed. Retrofit skimmers shall be paid for as 'modify existing structure'.
7. Plastic Skimmers shall contain a minimum of 1.5% by weight of carbon black for UV protection.

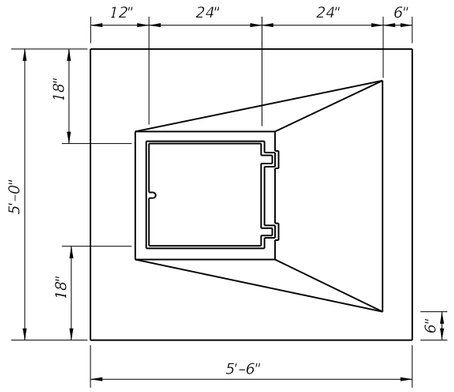
DESIGN NOTES

1. The contractor may submit an alternative design prefabricated Frenchdrain Skimmer for approval by the Engineer.
2. Show, in the plans, the location of the basin and indicate the interior side(s) of the basin on which a skimmer will be installed.
3. Type I Skimmer dimensions shall be based on the outlet pipe diameter as shown in the dimension table.
4. Type II Skimmers are to be used only with outlet pipe diameters of 15", 18", and 24".

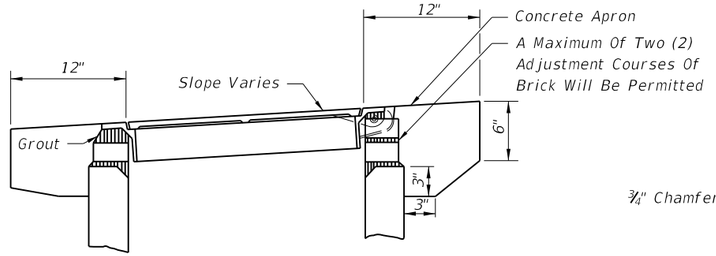
LAST REVISION	REVISION	DESCRIPTION:				
04			FDOT DESIGN STANDARDS 2013	SKIMMERS FOR FRENCHDRAIN OUTLETS	INDEX NO. 241	SHEET NO. 1



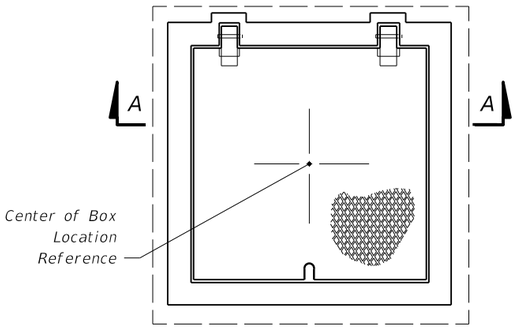
TYPICAL URBAN INSTALLATION



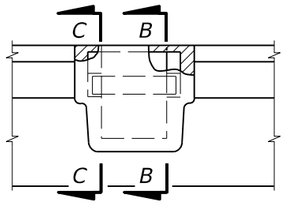
TOP VIEW



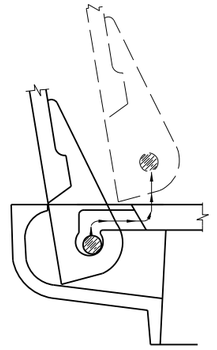
PERMISSIBLE TOP ADJUSTMENT



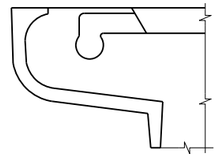
TOP VIEW



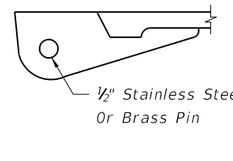
BACK VIEW



COVER REMOVAL

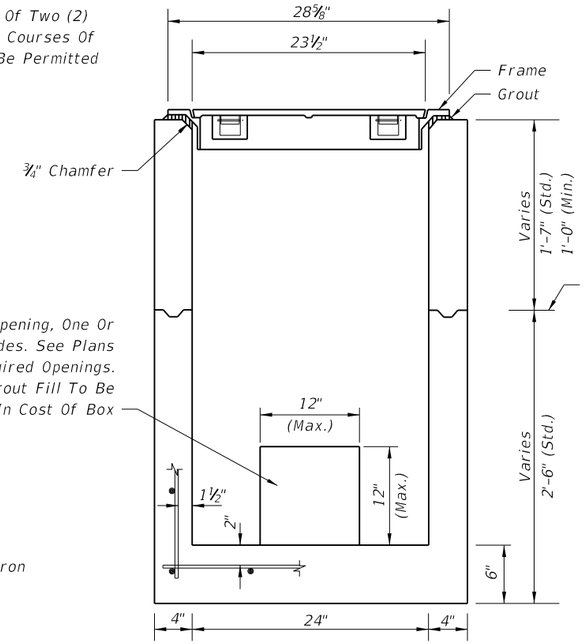


SECTION CC



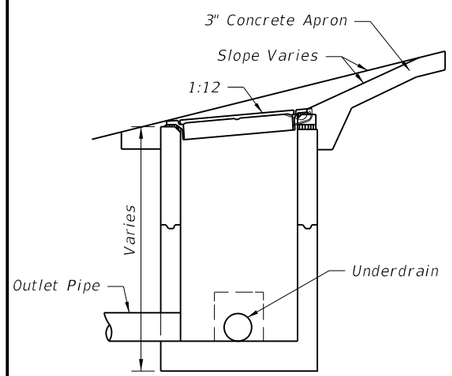
SECTION BB

HINGE DETAIL



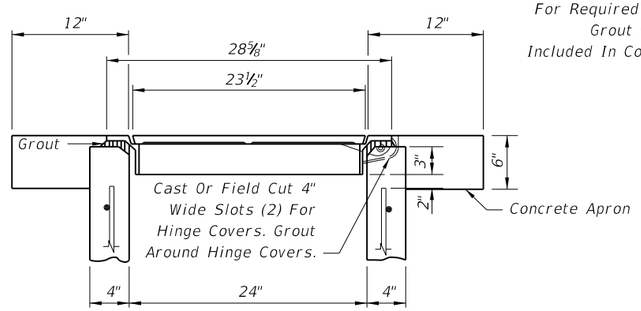
SECTION AA

BOX AND TOP



SECTION

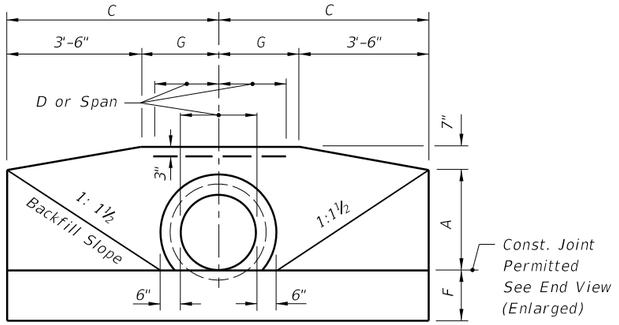
TYPICAL INSTALLATION ON SLOPES



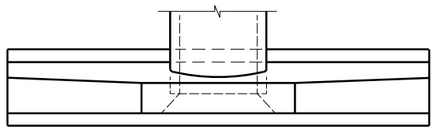
TYPICAL TOP AND APRON

GENERAL NOTES

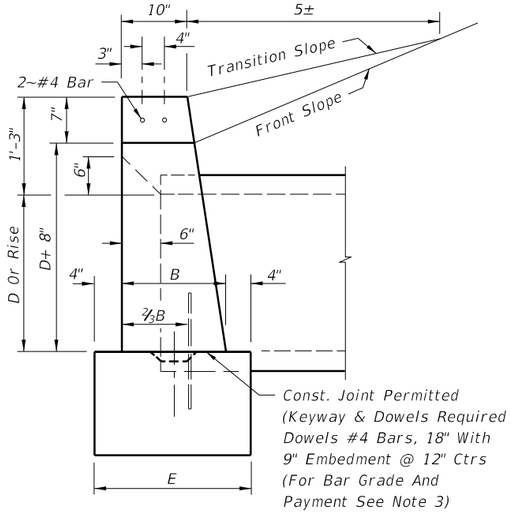
1. Cast iron cover and frame to be Neenah Foundary Company R-6660-JH, U.S. Foundary & Manufacturing Corporation No. 7640-JK or equal. Neenah R-6660-JH detailed this index.
2. Concrete shall be Class I, except ASTM C478 (4000 psi) concrete may be substituted for precast items manufactured in plants meeting the requirements of Section 449 of the Specifications. Box shall be reinforced with No. 3 bars (Grade 60) on 8" centers both ways, sides and bottom.
3. Concrete apron to be included in the contract unit price for Underdrain Inspection Box.
4. All covers shall be furnished with pick holes. Fitted lifts or handles are not permitted.
5. Manhole Type P Alternate A, Index No. 200, with Type I Frame and Cover, Index No. 201, may be used in lieu of the box detailed on this sheet, and is recommended when high ADT increases chance of the repeated vehicle loadings.



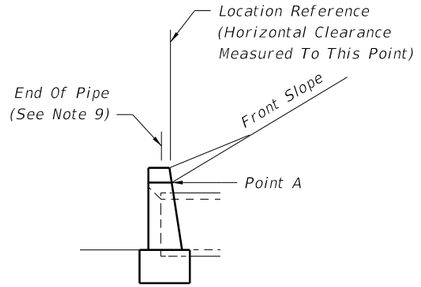
FRONT VIEW



TOP VIEW



END VIEW (ENLARGED)



END VIEW

1. Position is set by the intersection of the front slope and Point A where this intersection falls outside the clear zone.

2. Where the front slope and Point A intersects inside the clear zone, the endwall is positioned so the location reference point is at the clear zone limit. The front slope is transitioned to the endwall as shown in Index No. 280.

STANDARD LOCATION CONTROL

GENERAL NOTES

1. Endwall dimensions, locations and positions are for round and elliptical concrete pipe and for round and pipe-arch corrugated metal pipe. Round concrete pipe shown.

2. Front slope and ditch transitions shall be in accordance with Index No. 280.

3. Endwalls may be cast in place or precast concrete. Reinforcing steel shall be Grades 40 or 60. Additional reinforcement necessary for handling precast units shall be determined by the Contractor or the supplier. Cost of reinforcement shall be included in the contract unit price for Concrete, (Endwalls).

4. All exposed corners and edges of concrete are to be chamfered ¾".

5. Concrete shall be Class I, except ASTM C478 (4000 psi) concrete may be substituted for precast items manufactured in plants meeting the requirements of Section 449 of the Specifications.

6. On outfall ditches with side slopes flatter than 1:1½ provide 20' transitions from the endwall to the flatter side slopes, right of way permitting.

7. For sodding around endwalls see Index No. 281.

8. Payment for concrete quantities for endwalls skewed to the pipe shall be made on the following basis:

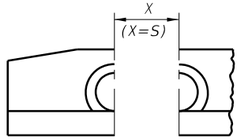
Endwall Skew to Pipe	Use Tabulated Value
0° to 5°	0°
6°	15°
16°	30°
31° or over	45°

9. Pipe length plan quantities shall be based on the pipe end locations shown in the standard location control end view, or lengths based on special endwall locations called for in the plans.

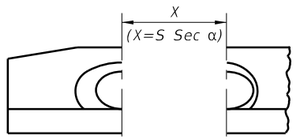
10. Payment for pipe in pipe culverts shall be based on plan quantities, adjusted for endwall locations subsequently established by the Engineer.

11. Endwalls to be paid for under the contract unit price for Class I Concrete (Endwalls), CY.

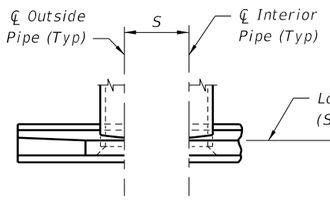
ENDWALL DIMENSIONS (EXCLUSIVE OF MULTIPLE PIPE SPACING)



FRONT VIEW

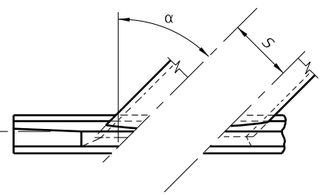


FRONT VIEW



TOP VIEW

NORMAL PIPE



TOP VIEW

SKEWED PIPE

LEGEND

α Pipe Skew
S Center To Center Pipe Spacing
X Centerline To Centerline Dimension At Face Of Headwall

PIPE AND SPACING FOR MULTIPLE PIPE ENDWALL POSITIONS FOR SINGLE AND MULTIPLE

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LAST REVISION	REVISION	DESCRIPTION:		FDOT DESIGN STANDARDS 2013	STRAIGHT CONCRETE ENDWALLS SINGLE AND MULTIPLE PIPE	INDEX NO.	SHEET NO.
07/01/09						250	1

DATA AND ESTIMATED QUANTITIES FOR ONE ENDWALL

ROUND CONCRETE AND CORRUGATED METAL PIPE

D	Opening Area (SF)				Dimensions												Class I Concrete (CY)																				D
																	Number And Type Of Pipe And Skew Angle Of Pipe																				
	Number Of Pipes												X				Single		Double						Triple								Quadruple					
																			Concrete				Metal								Concrete				Metal			
	1	2	3	4	A	B	C	E	F	G	S	0°	15°	30°	45°	0°	0°	0°	15°	30°	45°	0°	15°	30°	45°	0°	15°	30°	45°	0°	15°	30°	45°	0°	15°	30°	45°	
15"	1.23	2.46	3.69	4.92	1'-11"	1'-2"	4'-0"	1'-10"	1'-2"	0'-6"	2'-7"	2'-7"	2'-8"	3'-0"	3'-8"	1.23	1.24	1.59	1.60	1.65	1.74	1.62	1.63	1.68	1.78	1.94	1.96	2.05	2.23	1.99	2.02	2.11	2.30	2.30	2.34	2.47	2.74	2.37	2.41	2.75	2.84	15"
18"	1.77	3.54	5.31	7.08	2'-2"	1'-3"	4'-6"	1'-11"	1'-3"	1'-0"	2'-10"	2'-10"	2'-11"	3'-3"	4'-0"	1.56	1.59	1.99	2.01	2.06	2.17	2.04	2.06	2.11	2.23	2.43	2.46	2.56	2.79	2.51	2.54	2.65	2.89	2.86	2.91	3.06	3.40	2.96	3.01	3.17	3.53	18"
21"	2.41	4.82	7.23	9.64	2'-5"	1'-4"	5'-0"	2'-0"	1'-4"	1'-6"	3'-2"	3'-2"	3'-3"	3'-8"	4'-6"	1.97																									21"
24"	3.14	6.28	9.42	12.56	2'-8"	1'-4"	5'-6"	2'-0"	1'-4"	2'-0"	3'-5"	3'-5"	3'-6"	3'-11"	4'-10"	2.24	2.29	2.82	2.84	2.91	3.06	2.91	2.93	3.01	3.17	3.39	3.43	3.57	3.87	3.52	3.56	3.71	4.03	3.97	4.03	4.24	4.69	4.14	4.20	4.43	4.91	24"
27"	3.98	7.96	11.94	15.92	2'-11"	1'-5"	6'-0"	2'-1"	1'-5"	2'-6"	3'-10"	3'-10"	4'-0"	4'-5"	5'-5"	2.73																									27"
30"	4.91	9.82	14.73	19.64	3'-2"	1'-6"	6'-6"	2'-2"	1'-6"	3'-0"	4'-3"	4'-3"	4'-5"	4'-11"	6'-0"	3.26	3.34	4.13	4.16	4.26	4.49	4.28	4.31	4.43	4.67	4.98	5.04	5.25	5.69	5.20	5.27	5.49	5.97	5.84	5.93	6.24	6.91	6.13	6.23	6.56	7.29	30"
36"	7.07	14.14	21.21	28.28	3'-8"	1'-8"	7'-6"	2'-4"	1'-8"	4'-0"	5'-1"	5'-1"	5'-3"	5'-10"	7'-2"	4.53	4.64	5.73	5.77	5.92	6.23	5.95	6.00	6.15	6.49	6.92	7.00	7.29	7.91	7.25	7.34	7.65	8.33	8.13	8.26	8.69	9.62	8.57	8.71	9.18	10.20	36"
42"	9.62	19.24	28.86	38.48	4'-2"	1'-10"	8'-6"	2'-6"	2'-0"	5'-0"	6'-0"	6'-0"	6'-3"	6'-11"	8'-6"	6.33	6.49	8.11	8.17	8.39	8.85	8.43	8.50	8.73	9.23	9.90	10.02	10.45	11.38	10.38	10.52	10.98	11.99	11.68	11.87	12.51	13.89	12.32	12.52	13.22	14.73	42"
48"	12.57	25.14	37.71	50.28	4'-8"	2'-1"	9'-6"	2'-9"	2'-0"	6'-0"	6'-9"	6'-9"	7'-0"	7'-10"	9'-7"	8.15	8.38	10.40	10.48	10.75	11.33	10.85	10.94	11.23	11.87	12.64	12.80	13.34	14.50	13.34	13.51	14.11	15.39	14.89	15.13	15.93	17.68	15.82	16.08	16.97	18.90	48"
54"	15.90	31.80	47.70	63.60	5'-2"	2'-6"	10'-6"	3'-2"	2'-3"	7'-0"	7'-8"	7'-8"	7'-11"	8'-10"	10'-10"	11.71	11.77	15.23	15.35	15.78	16.69	15.35	15.48	15.90	16.83	18.77	19.02	19.86	21.69	18.93	19.18	20.04	21.89	22.29	22.66	23.93	26.67	22.51	22.89	24.17	26.96	54"

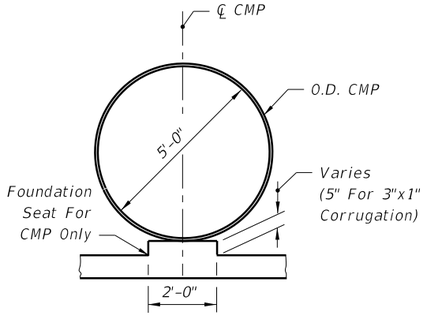
CORRUGATED METAL PIPE ARCH

Span	Rise	Opening Area (SF)				Dimensions											Class I Concrete (CY)												Span	Rise	Approx. Equiv. Round Pipe
																	Number Of Pipe And Skew Angle Of Pipe														
		Number Of Pipes											X				Single	Double				Triple				Quadruple						
		1	2	3	4	A	B	C	E	F	G	S	0°	15°	30°	45°	0°	0°	15°	30°	45°	0°	15°	30°	45°	0°	15°	30°	45°			
17"	13"	1.1	2.2	3.3	4.4	1'-9"	1'-2"	3'-10"	1'-10"	1'-2"	0'-4"	2'-6"	2'-6"	2'-7"	2'-11"	3'-6"	1.16	1.47	1.48	1.52	1.60	1.78	1.80	1.88	2.04	2.09	2.12	2.23	2.48	17"	13"	15"
21"	15"	1.6	3.2	4.8	6.4	1'-11"	1'-2"	4'-3"	1'-10"	1'-2"	0'-9"	2'-10"	2'-10"	2'-11"	3'-3"	4'-0"	1.33	1.69	1.70	1.75	1.84	2.04	2.06	2.15	2.33	2.40	2.44	2.57	2.84	21"	15"	18"
28"	20"	2.8	5.6	8.4	11.2	2'-4"	1'-3"	5'-2"	1'-11"	1'-3"	1'-8"	3'-5"	3'-5"	3'-6"	3'-11"	4'-10"	1.78	2.31	2.33	2.39	2.53	2.83	2.87	2.99	3.26	3.36	3.42	3.60	4.01	28"	20"	24"
35"	24"	4.3	8.6	12.9	17.2	2'-8"	1'-4"	5'-11½"	2'-0"	1'-4"	2'-5½"	4'-0"	4'-0"	4'-2"	4'-7"	5'-8"	2.34	3.03	3.05	3.14	3.32	3.72	3.77	3.93	4.29	4.40	4.47	4.72	5.25	35"	24"	30"
42"	29"	5.9	11.8	17.7	23.6	3'-1"	1'-5"	6'-10½"	2'-1"	1'-5"	3'-4½"	4'-9"	4'-9"	4'-11"	5'-6"	6'-9"	3.13	4.06	4.09	4.20	4.45	4.99	5.06	5.28	5.76	5.93	6.03	6.36	7.09	42"	29"	36"
49"	33"	8.4	16.8	25.2	33.6	3'-5"	1'-6"	7'-8"	2'-2"	1'-6"	4'-2"	5'-6"	5'-6"	5'-8"	6'-4"	7'-9"	3.83	5.00	5.04	5.18	5.48	6.16	6.24	6.52	7.12	7.32	7.44	7.86	8.76	49"	33"	42"
57"	38"	10.6	21.2	31.8	42.4	3'-10"	1'-7"	8'-7½"	2'-3"	1'-7"	5'-1½"	6'-4"	6'-4"	6'-7"	7'-4"	8'-11"	4.87	6.31	6.36	6.53	6.91	7.74	7.84	8.18	8.93	9.18	9.33	9.85	10.96	57"	38"	48"
64"	43"	13.2	26.4	39.6	52.8	4'-3"	1'-8"	9'-6½"	2'-4"	1'-8"	6'-0½"	7'-1"	7'-1"	7'-4"	8'-2"	10'-0"	5.88	7.64	7.70	7.91	8.37	9.40	9.52	9.94	10.86	11.15	11.33	11.97	13.33	64"	43"	54"
71"	47"	16.9	33.8	50.7	67.6	4'-7"	1'-10"	10'-4"	2'-6"	2'-0"	6'-10"	7'-10"	7'-10"	8'-1"	9'-1"	11'-1"	7.80	10.15	10.23	10.51	11.12	12.49	12.65	13.22	14.43	14.85	15.10	15.94	17.77	71"	47"	60"

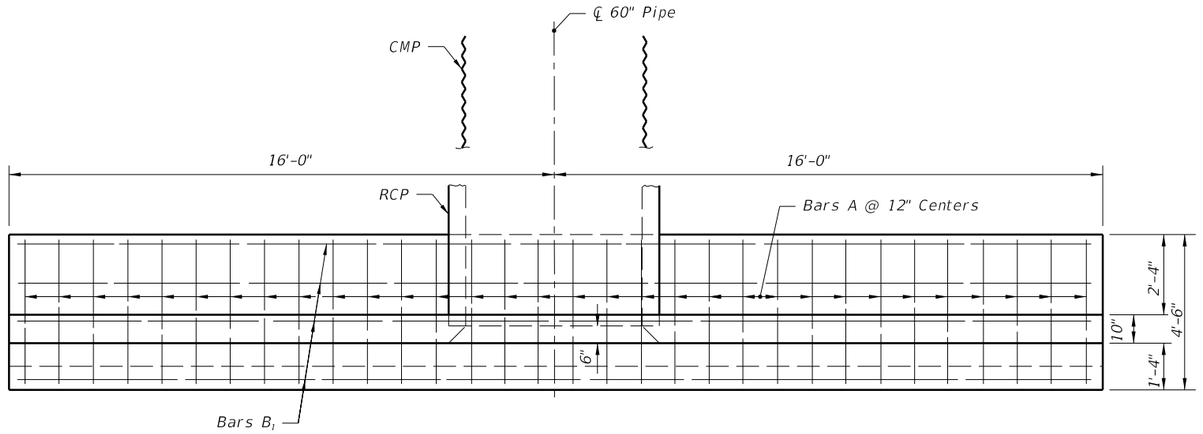
Note: Use the guidelines of General Note No. 8 for selecting tabular quantities.

CONCRETE ELLIPTICAL PIPE

Rise	Span	Opening Area (SF)				Dimensions											Class I Concrete (CY)												Rise	Span	Approx. Equiv. Round Pipe
																	Number Of Pipe And Skew Angle Of Pipe														
		Number Of Pipes											X				Single	Double				Triple				Quadruple						
		1	2	3	4	A	B	C	E	F	G	S	0°	15°	30°	45°	0°	0°	15°	30°	45°	0°	15°	30°	45°	0°	15°	30°	45°			
12"	18"	1.3	2.6	3.9	5.2	1'-8"	1'-2"	3'-9"	1'-10"	1'-2"	0'-3"	2'-10"	2'-10"	2'-11"	3'-3"	4'-0"	1.09	1.45	1.46	1.51	1.60	1.80	1.82	1.91	2.09	2.16	2.20	2.33	2.60	12"	18"	15"
14"	23"	1.8	3.6	5.4	7.2	1'-10"	1'-3"	4'-2½"	1'-11"	1'-3"	8½"	3'-5"	3'-5"	3'-6"	3'-11"	4'-10"	1.36	1.82	1.84	1.89	2.01	2.29	2.32	2.43	2.68	2.75	2.80	2.97	3.33	14"	23"	18"
19"	30"	3.3	6.6	9.9	13.2	2'-3"	1'-4"	5'-1½"	2'-0"	1'-4"	1'-7½"	4'-2"	4'-2"	4'-4"	4'-10"	5'-11"	1.89	2.55	2.57	2.65	2.82	3.22	3.27	3.43	3.77	3.88	3.95	4.19	4.70	19"	30"	24"
24"	38"	5.1	10.2	15.3	20.4	2'-8"	1'-5"	6'-3"	2'-1"	1'-5"	2'-9"	5'-2"	5'-2"	5'-4"	6'-0"	7'-4"	2.64	3.55	3.58	3.69	3.93	4.48	4.54	4.77	5.24	5.39	5.49	5.82	6.53	24"	38"	30"
29"	45"	7.4	14.8	22.2	29.6	3'-1"	1'-6"	7'-0"	2'-2"	1'-6"	3'-6"	6'-0"	6'-0"	6'-3"	6'-11"	8'-6"	3.32	4.48	4.52	4.66	4.96	5.64	5.72	6.00	6.60	6.80	6.92	7.34	8.24	29"	45"	36"
34"	53"	10.2	20.4	30.6	40.8	3'-6"	1'-7"	7'-11½"	2'-3"	1'-7"	4'-5½"	7'-1"	7'-1"	7'-4"	8'-2"	10'-0"	4.24	5.76	5.81	6.00	6.39	7.29	7.40	7.76	8.55	8.81	8.97	9.52	10.70	34"	53"	42"
38"	60"	12.9	25.8	38.7	51.6	3'-10"	1'-8"	8'-9"	2'-4"	1'-8"	5'-3"	7'-11"	7'-11"	8'-2"	9'-2"	11'-2"	5.22	7.16	7.23	7.46	7.96	9.10	9.24	9.70	10.71	11.05	11.25	11.95	13.46	38"	60"	48"
43"	68"	16.6	33.2	49.8	66.4	4'-3"	1'-10"	9'-8½"	2'-6"	1'-10"	6'-2½"	8'-10"	8'-10"	9'-2"	10'-2"	12'-6"	6.63	9.01	9.09	9.38	10.00	11.39	11.56	12.13	13.36	13.77	14.02	14.88	16.73	43"	68"	54"
48"	76"	20.5	41.0	61.5	82.0	4'-8"	2'-1"	10'-8"	2'-9"	2'-0"	7'-2"	9'-9"	9'-9"	10'-1"	11'-3"	13'-9"	8.66	11.74	11.85	12.22	13.02	14.82	15.04	15.77	17.37	17.91	18.23	19.34	21.74	48"	76"	60"
53"	83"	24.8	49.6	74.4	99.2	5'-1"	2'-6"	11'-7"	3'-2"	2'-6"	8'-1"	10'-7"	10'-7"	10'-11"	12'-3"	15'-0"	12.50	16.98	16.98	17.67	18.83	21.47	21.78	22.86	25.18	25.97	26.44	28.06	31.55	53"	83"	66"
58"	91"	29.5	59.0	88.5	118.0	5'-6"	2'-10"	12'-6½"	3'-6"	2'-10"	9'-0½"	11'-4"	11'-4"	11'-9"	13'-1"	16'-0"	16.46	22.26	22.46	23.16	24.66	28.05	28.46	29.85	32.85	33.85	34.46	36.55	41.05	58"	91"	72"



SECTION BB

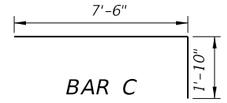


PLAN
(Showing Bar In Footing)

BILL OF REINFORCING STEEL

MARK	SIZE	NO. REQD.	LENGTH	LOCATION	BENDING
A	#4	32	4'-2"	Footing	Straight
B_1	#4	13	31'-8"	Footing & Wall	Straight
B_2	#4	4	12'-4"	Wall	Straight
B_3	#4	4	13'-9"	Wall	Straight
C	#4	26	9'-4"	Wall	Bend
D	#4	18	7'-6"	Wall	Straight
E	#4	8	1'-8"	Footing & Wall	Straight

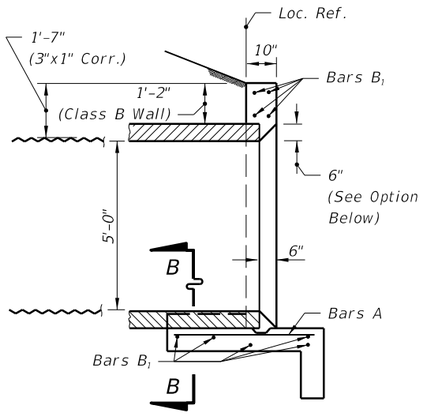
BENDING DIAGRAM



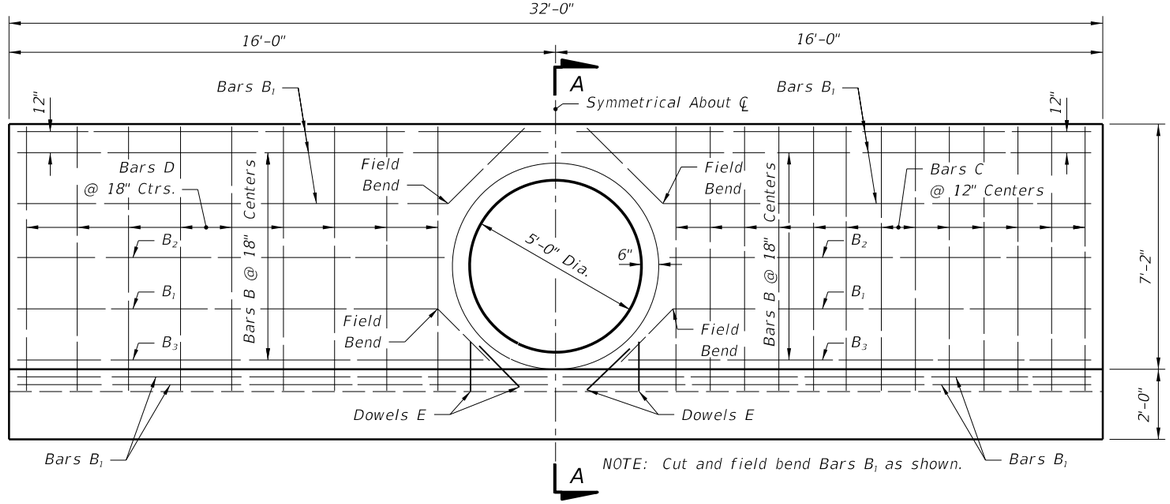
NOTE: All bar dimensions are out to out

ESTIMATED QUANTITIES

ITEM	UNIT	RCP	CMP
Class II Concrete	Cu. Yd.	11.3	11.4
Reinforcing Steel	Lb.	695	695

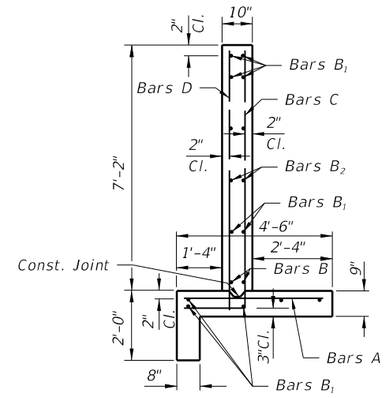


SECTION AA

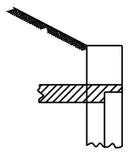


HALF ELEVATION
(Showing Bars In Front Face Of Wall)

HALF ELEVATION
(Showing Bars In Back Face Of Wall)



TYPICAL SECTION
THRU ENDWALL

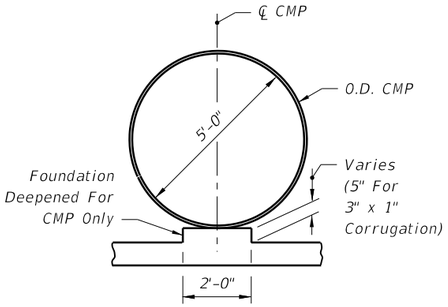


OPTIONAL ENTRANCE
FOR CONCRETE PIPE

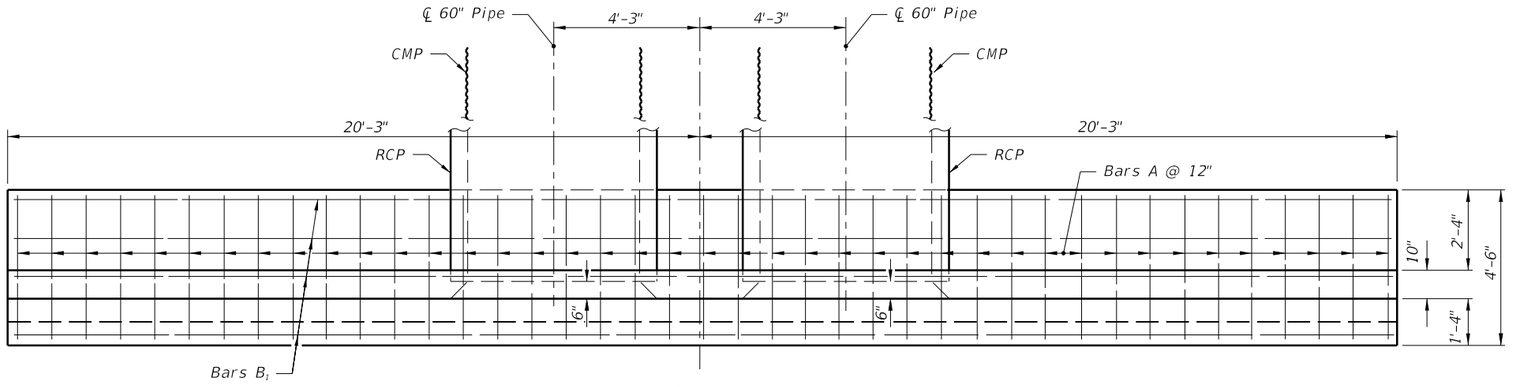
GENERAL NOTES

1. Straight concrete endwalls are intended for use outside the clear zone.
2. Endwalls may be cast-in-place or precast construction. Cast-in-place endwalls shall conform to the details on this index, design specifications AASHTO 1989. Precast construction which adheres to this Index, including any additional reinforcement required for handling which shall be determined by the Contractor or supplier, does not require additional approvals. Deviations from this Index, for precast units, shall require the approval of the State Drainage Engineer prior to construction. For precast construction, see Index No. 201 for opening and grouting details.
3. Reinforcing steel shall be either Grade 40 or 60.
4. Concrete shall be Class II, except ASTM C478 (4000 psi) concrete may be substituted for precast items manufactured in plants meeting the requirements of Section 449 of the Specifications.
5. Chamfer: All exposed edges and corners to be chamfered ¾" unless otherwise shown.
6. That portion of corrugated metal pipe in direct contact with the concrete slab and extending 12" beyond shall have a continuous bituminous coating of .004" minimum thickness applied prior to placing of the concrete.
7. Sodding shall be in accordance with Index No. 281 and paid for under the contract unit price for Performance Turf, SY.
8. Basis of payment for either cast-in-place or precast construction shall be the estimated quantities tabulated on the Index. Concrete and reinforcing steel shall be paid for under the contract unit prices for Class II Concrete (Endwalls), CY and Reinforcing Steel (Roadway), LB.

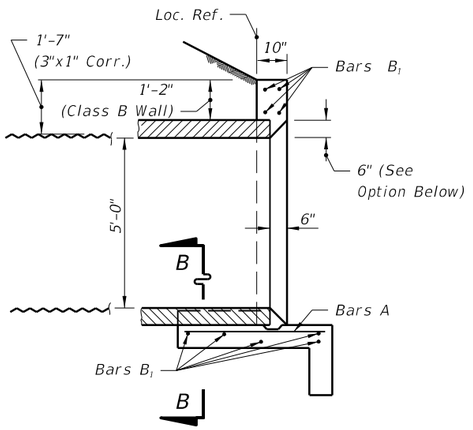
LAST REVISION	REVISION	DESCRIPTION:			INDEX NO.	SHEET NO.
07/01/09			FDOT DESIGN STANDARDS 2013	STRAIGHT CONCRETE ENDWALLS SINGLE AND DOUBLE 60" PIPE	251	1



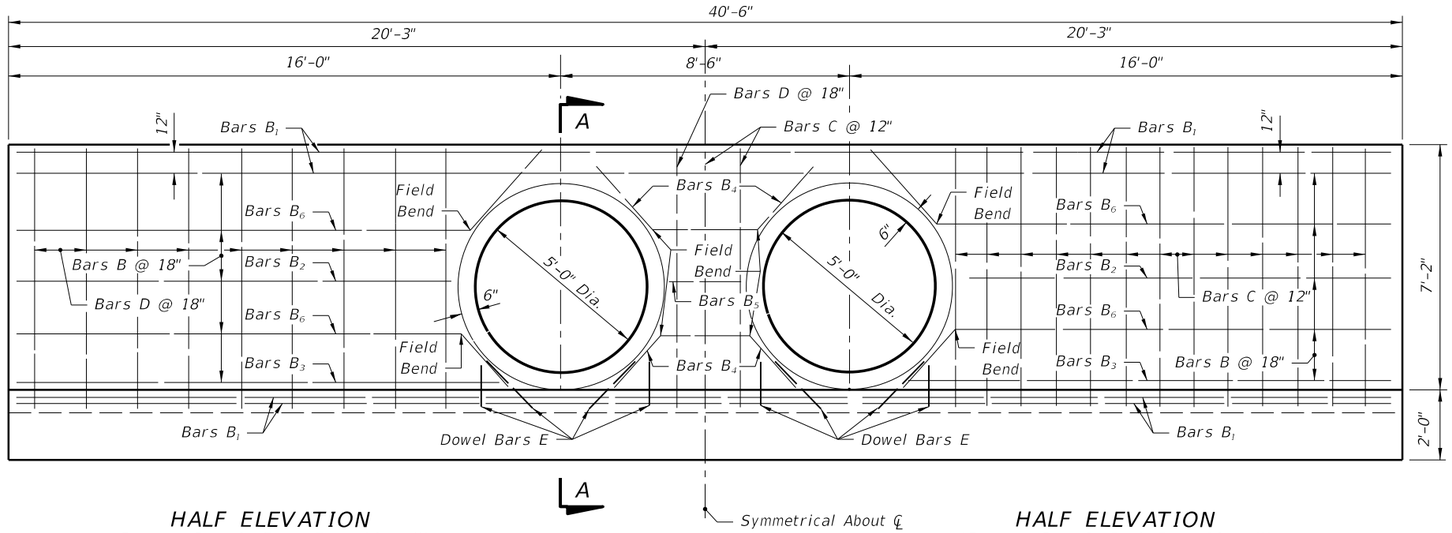
SECTION BB



PLAN

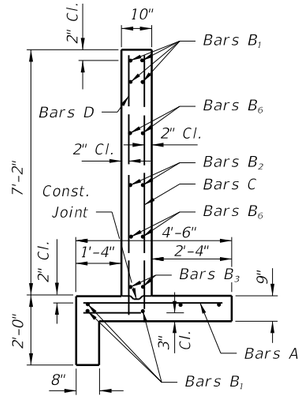


SECTION AA

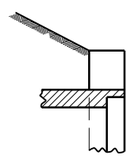


HALF ELEVATION
(Showing Bars In Front Face Of Wall)

HALF ELEVATION
(Showing Bars In Back Face Of Wall)



TYPICAL SECTION
THRU ENDWALL

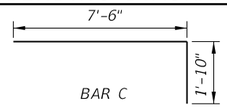


OPTIONAL ENTRANCE
FOR CONCRETE PIPE

BILL OF REINFORCING STEEL

MARK	SIZE	NO. REQD.	LENGTH	LOCATION	BENDING
A	#4	41	4'-2"	Footing	Straight
B_1	#4	9	40'-2"	Footing & Wall	Straight
B_2	#4	4	12'-6"	Wall	Straight
B_3	#4	4	13'-9"	Wall	Straight
B_4	#4	4	6'-0"	Wall	Field Bend
B_5	#4	2	2'-2"	Wall	Straight
B_6	#4	8	15'-0"	Wall	Field Bend
C	#4	29	9'-4"	Footing & Wall	Bend
D	#4	20	7'-6"	Footing & Wall	Straight
E	#4	16	1'-8"	Footing & Wall	Straight

BENDING DIAGRAM



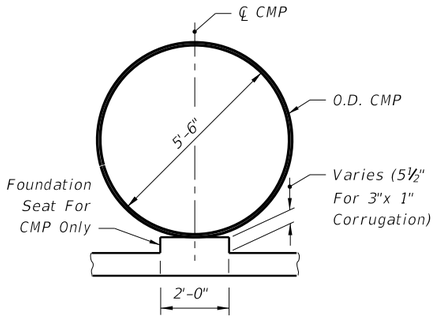
NOTE: All bar dimensions are out to out

ESTIMATED QUANTITIES

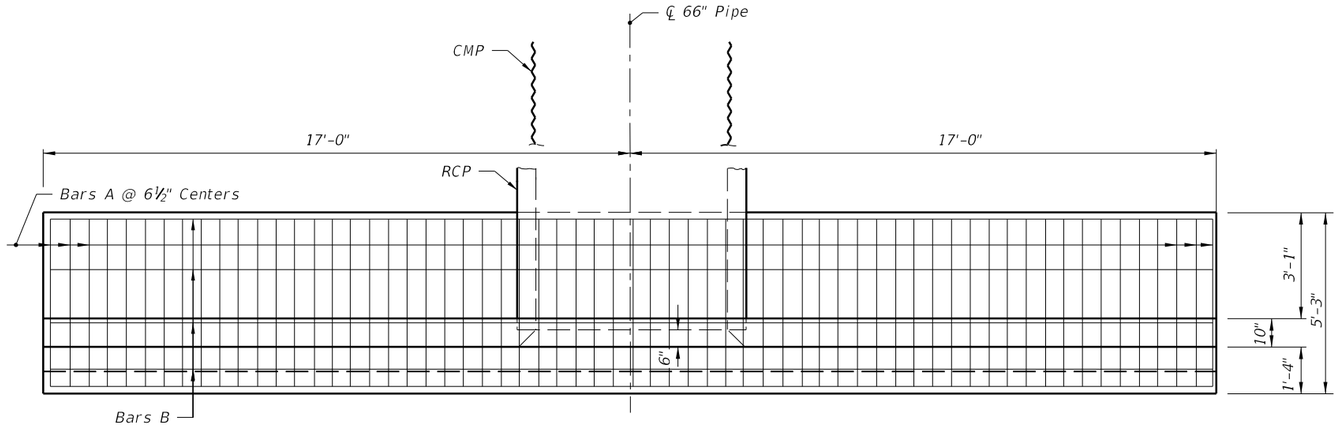
ITEM	UNIT	RCP	CMP
Class II Concrete	Cu. Yd.	13.7	13.8
Reinforcing Steel	Lb.	824	824

NOTE: See Sheet 1 of 2 For General Notes.

LAST REVISION	REVISION	DESCRIPTION:			INDEX NO.	SHEET NO.
00			FDOT DESIGN STANDARDS 2013	STRAIGHT CONCRETE ENDWALLS SINGLE AND DOUBLE 60" PIPE	251	2



SECTION BB



PLAN
(Showing Bars In Footing)

BILL OF REINFORCING STEEL

MARK	SIZE	NO. REQD.	LENGTH	LOCATION	BENDING
A	5	63	4'-11"	Footing	Straight
B	4	17	33'-8"	Footing & Wall	Straight
C	5	34	9'-11"	Wall	Bend
D	4	20	8'-1"	Wall	Straight
E	4	4	1'-8"	Wall	Straight

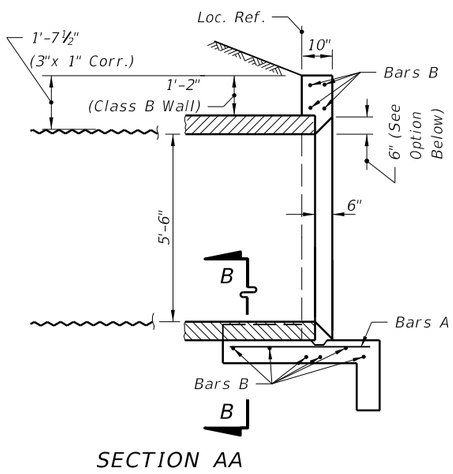
BENDING DIAGRAM

BAR C

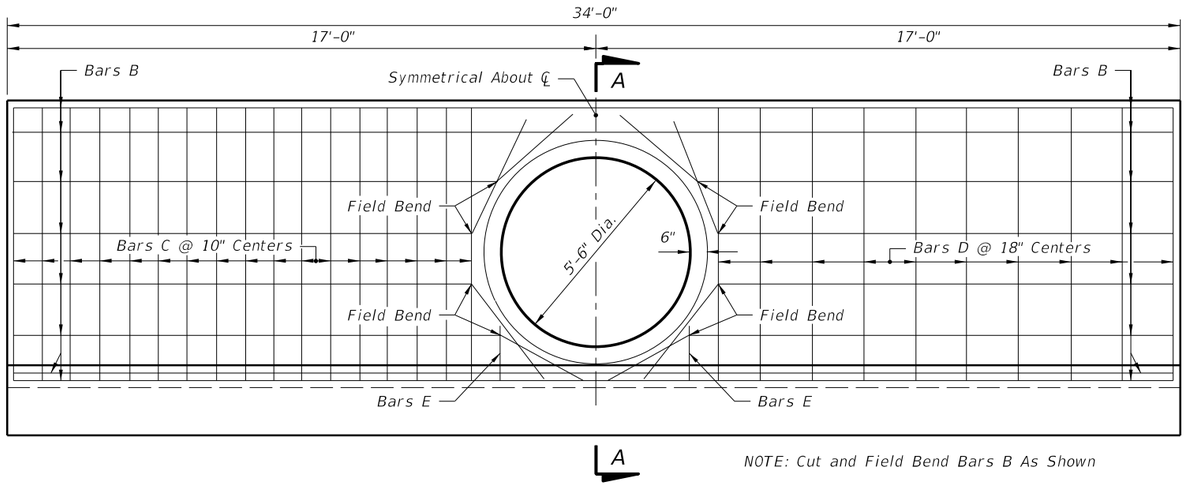
NOTE: All bar dimensions are out to out

ESTIMATED QUANTITIES

ITEM	UNIT	RCP	CMP
Class II Concrete	Cu. Yd.	13.2	13.3
Reinforcing Steel	Lb.	1170	1170



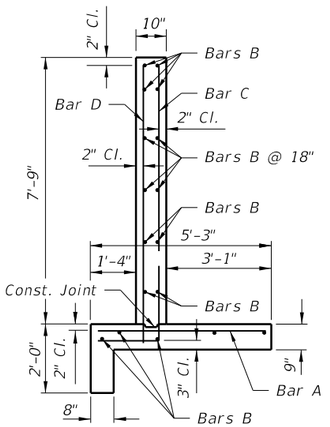
SECTION AA



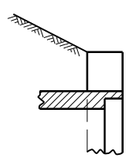
HALF ELEVATION
(Showing Bars In Back Face Of Wall)

NOTE: Cut and Field Bend Bars B As Shown

HALF ELEVATION
(Showing Bars In Front Face Of Wall)



TYPICAL SECTION
THRU ENDWALL

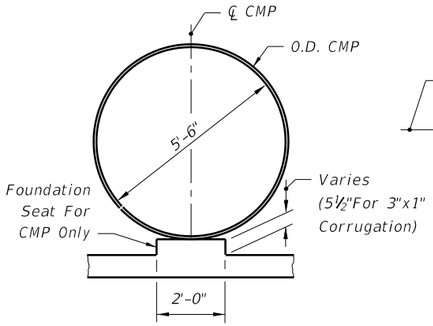


OPTIONAL ENTRANCE
FOR CONCRETE PIPE

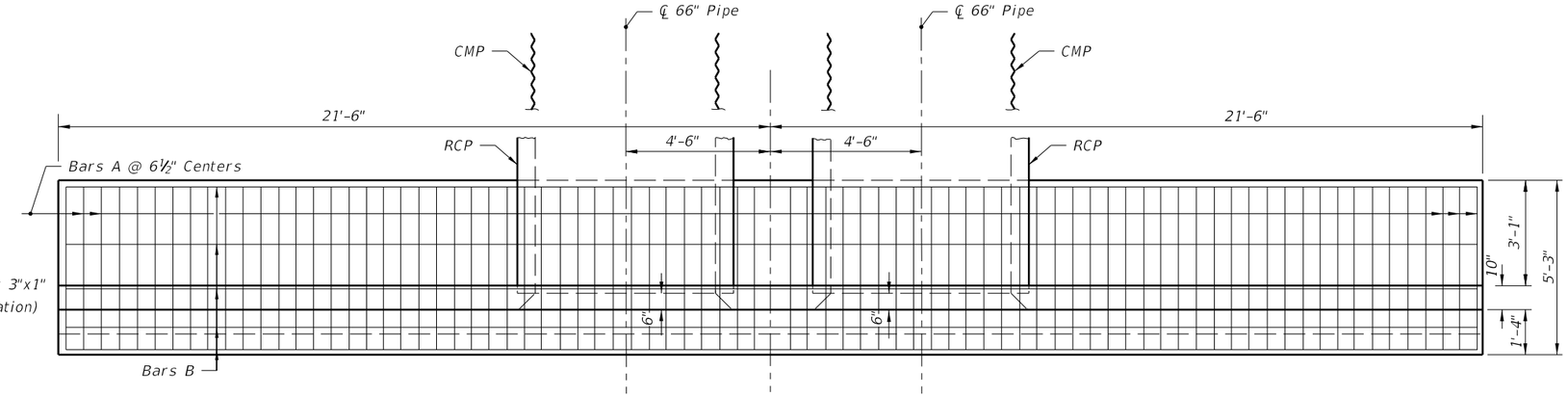
GENERAL NOTES

1. Straight concrete endwalls are intended for use outside the clear zone.
2. Endwalls may be cast-in-place or precast construction. Cast-in-place endwalls shall conform to the details on this index, design specifications AASHTO 1989. Precast construction which adheres to this Index, including any additional reinforcement required for handling which shall be determined by the Contractor or supplier, does not require additional approvals. Deviations from this Index, for precast units, shall require the approval of the State Drainage Engineer prior to construction. For precast construction, see Index No. 201 for opening and grouting details.
3. Reinforcing steel shall be either Grade 40 or 60.
4. Concrete shall be Class II except ASTM C478 (4000 psi) concrete may be substituted for precast items manufactured in plants meeting the requirements of Section 449 of the Specifications.
5. Chamfer: All exposed edges and corners to be chamfered ¾" unless otherwise shown.
6. That portion of corrugated Metal pipe in direct contact with the concrete slab and extending 12" beyond shall have a continuous bituminous coating of 0.004" minimum thickness applied prior to placing of the concrete.
7. Sodding shall be in accordance with Index No. 281 and paid for under the contract unit price for Performance Turf, SY.
8. Basis of payment for either cast-in-place or precast construction shall be the estimated quantities tabulated on the Index. Concrete and reinforcing steel shall be paid for under the contract unit prices for Class II Concrete (Endwalls), CY and Reinforcing Steel (Roadway), LB.

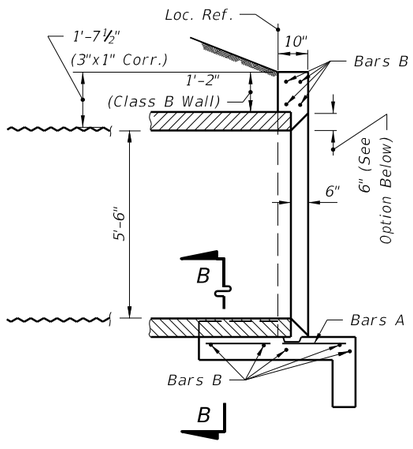
LAST REVISION	REVISION	DESCRIPTION:				
07/01/09			FDOT DESIGN STANDARDS 2013	STRAIGHT CONCRETE ENDWALLS SINGLE AND DOUBLE 66" PIPE	INDEX NO. 252	SHEET NO. 1



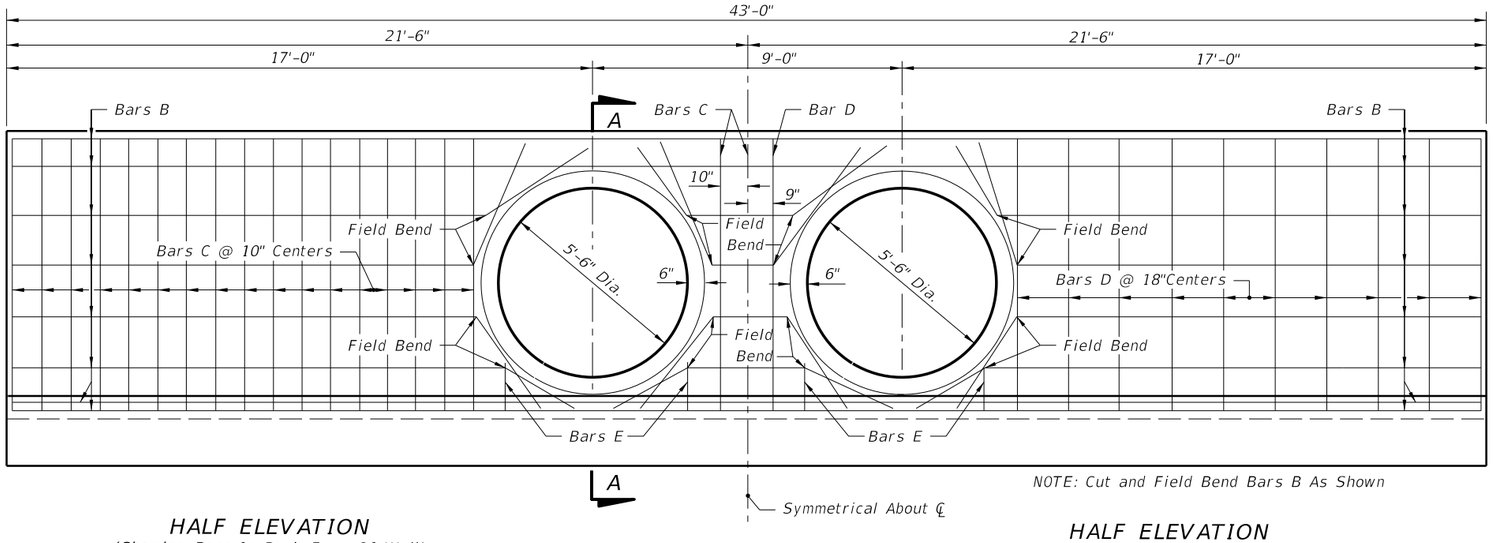
SECTION BB



PLAN
(Showing Bars In Footing)



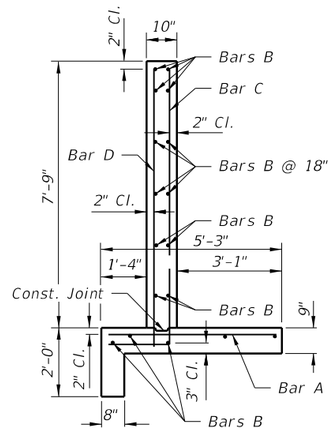
SECTION AA



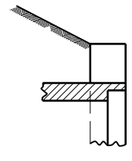
HALF ELEVATION
(Showing Bars In Back Face Of Wall)

NOTE: Cut and Field Bend Bars B As Shown

HALF ELEVATION
(Showing Bars In Front Face Of Wall)



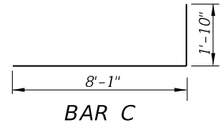
TYPICAL SECTION
THRU ENDWALL



OPTIONAL ENTRANCE
FOR CONCRETE PIPE

BILL OF REINFORCING STEEL					
MARK	SIZE	NO. REQD.	LENGTH	LOCATION	BENDING
A	5	80	4'-11"	Footing	Straight
B	4	17	42'-8"	Footing & Wall	Straight
C	5	37	9'-11"	Wall	Bend
D	4	22	8'-1"	Wall	Straight
E	4	8	1'-8"	Wall	Straight

BENDING DIAGRAMS



BAR C

Note: All bar dimensions are out to out

ESTIMATED QUANTITIES			
ITEM	UNIT	RCP	CMP
Class II Concrete	Cu. Yd.	16.0	16.2
Reinforcing Steel	Lb.	1,406	1,406

NOTE: See Sheet 1 of 2 for General Notes.

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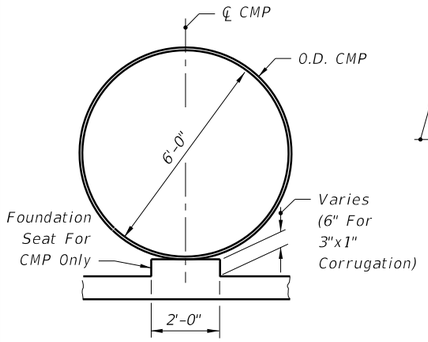
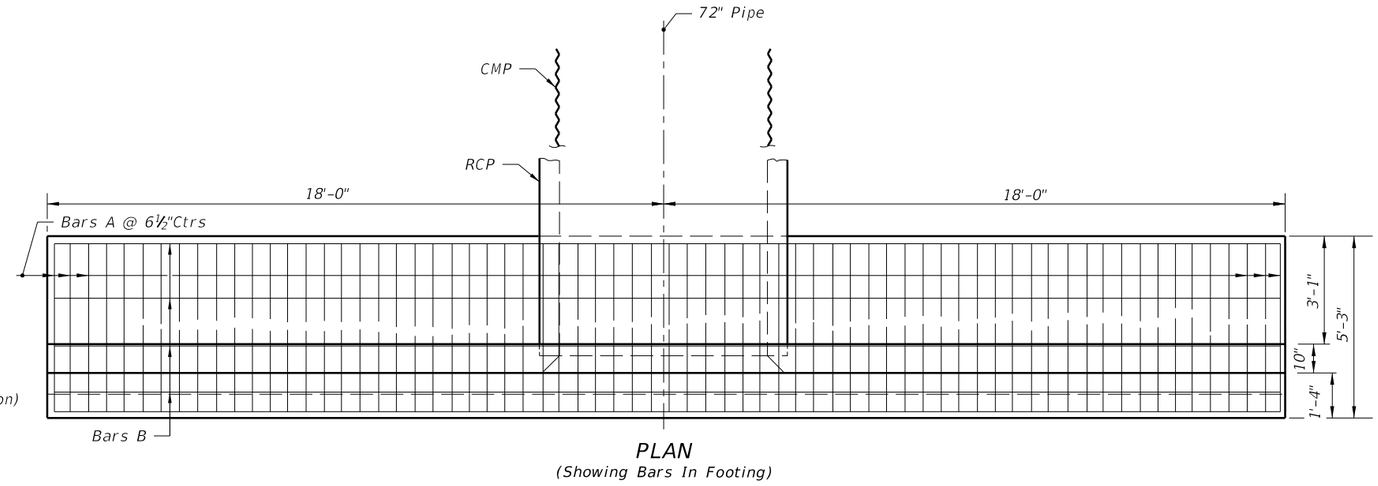
LAST REVISION	REVISION	DESCRIPTION:		FDOT DESIGN STANDARDS 2013	STRAIGHT CONCRETE ENDWALLS SINGLE AND DOUBLE 66" PIPE	INDEX NO.	SHEET NO.
00						252	2



SECTION BB

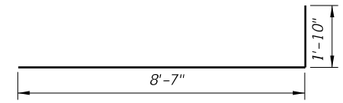


PLAN
(Showing Bars In Footing)

BILL OF REINFORCING STEEL

MARK	SIZE	NO. REQD.	LENGTH	LOCATION	BENDING
A	5	68	4'-11"	Footing	Straight
B	4	17	35'-8"	Footing & Wall	Straight
C	5	34	10'-5"	Wall	Bend
D	4	20	8'-7"	Wall	Straight
E	4	4	2'-6"	Wall	Straight
F	4	4	1'-6"	Wall	Straight

BENDING DIAGRAM

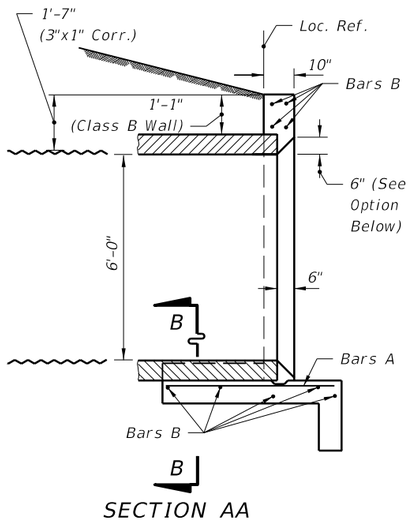


BAR C

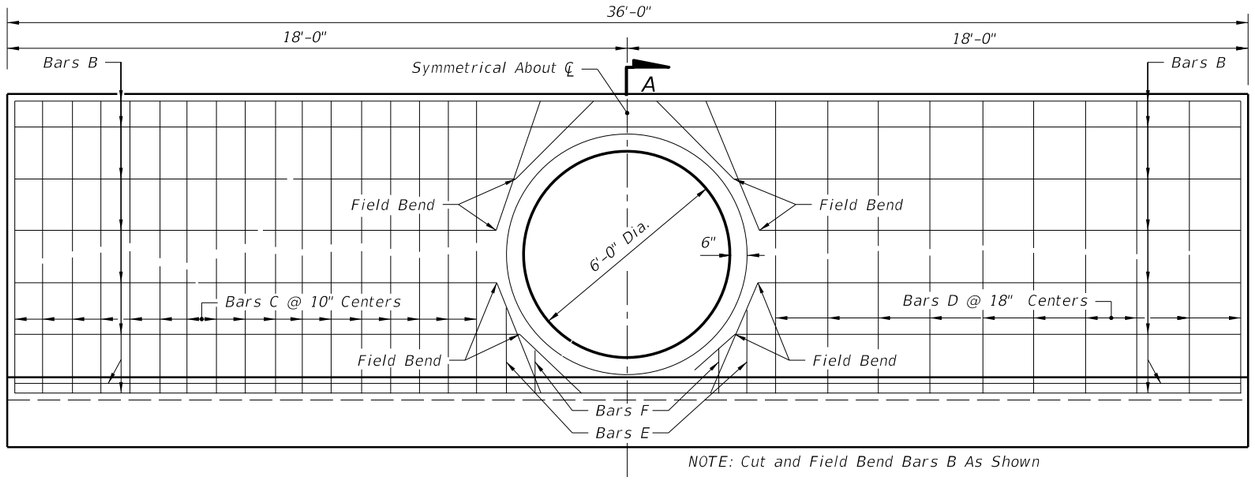
NOTE: All bar dimensions are out to out

ESTIMATED QUANTITIES

ITEM	UNIT	RCP	CMP
Class II Concrete	Cu. Yd.	14.4	14.5
Reinforcing Steel	Lb.	1249	1249



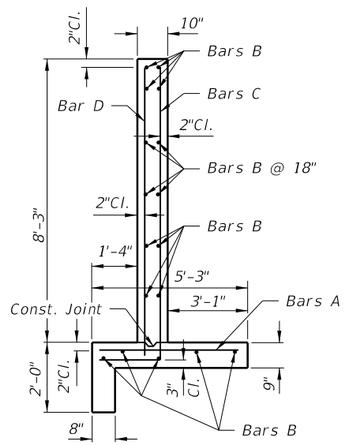
SECTION AA



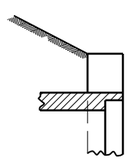
HALF ELEVATION
(Showing Bars In Back Face Of Wall)

A

HALF ELEVATION
(Showing Bars In Front Face Of Wall)



TYPICAL SECTION
THRU ENDWALL

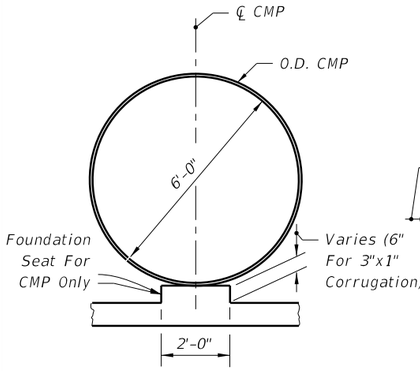


OPTIONAL ENTRANCE
FOR CONCRETE PIPE

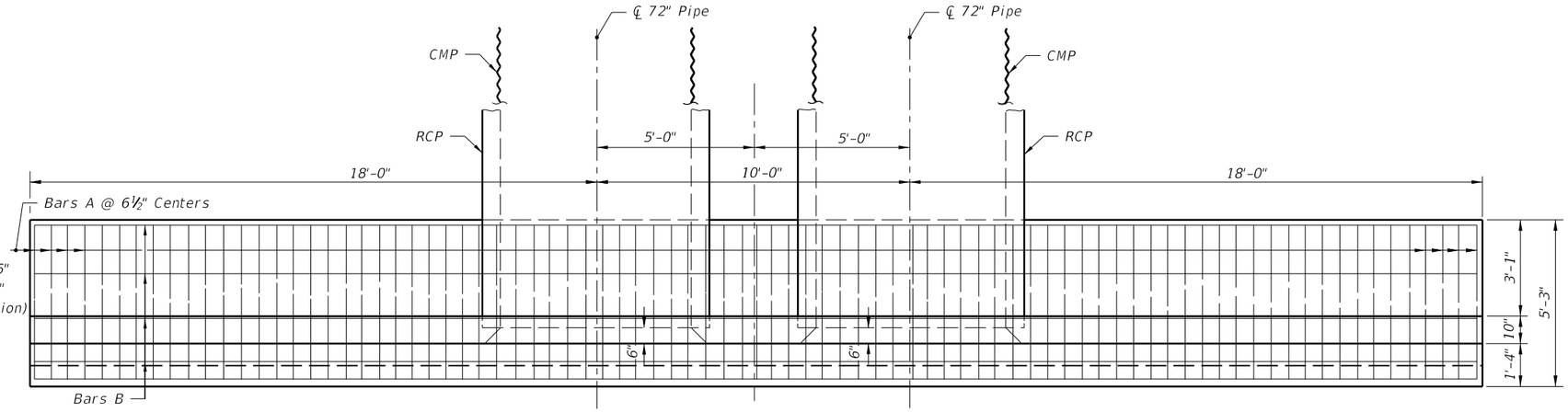
GENERAL NOTES

1. Straight concrete endwalls are intended for use outside the clear zone.
2. Endwalls may be cast-in-place or precast construction. Cast-in-place endwalls shall conform to the details on this index, design specifications AASHTO 1989. Precast construction which adheres to this Index, including any additional reinforcement required for handling which shall be determined by the Contractor or supplier, does not require additional approvals. Deviations from this Index, for precast units, shall require the approval of the State Drainage Engineer prior to construction. For precast construction, see Index No. 201 for opening and grouting details.
3. Reinforcing steel shall be either Grade 40 or 60.
4. Concrete shall be Class II, except ASTM C478 (4000 psi) concrete may be substituted for precast items manufactured in plants meeting the requirements of Section 449 of the Specifications.
5. Chamfer: All exposed edges and corners to be chamfered ¾" unless otherwise shown.
6. That portion of corrugated Metal pipe in direct contact with the concrete slab and extending 12" beyond shall have a continuous bituminous coating of 0.004" minimum thickness coated applied prior to placing of the concrete.
7. Sodding shall be in accordance with Index No. 281 and paid for under the contract unit price for Performance Turf, SY.
8. Basis of payment for either cast-in-place or precast construction shall be the estimated quantities tabulated on the Index. Concrete and reinforcing steel shall be paid for under the contract unit prices for Class II Concrete (Endwalls), CY and Reinforcing Steel (Roadway), LB.

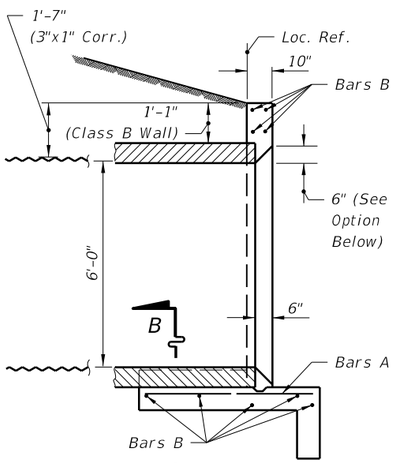
LAST REVISION	REVISION	DESCRIPTION:				
07/01/09			FDOT DESIGN STANDARDS 2013	STRAIGHT CONCRETE ENDWALLS SINGLE AND DOUBLE 72" PIPE	INDEX NO. 253	SHEET NO. 1



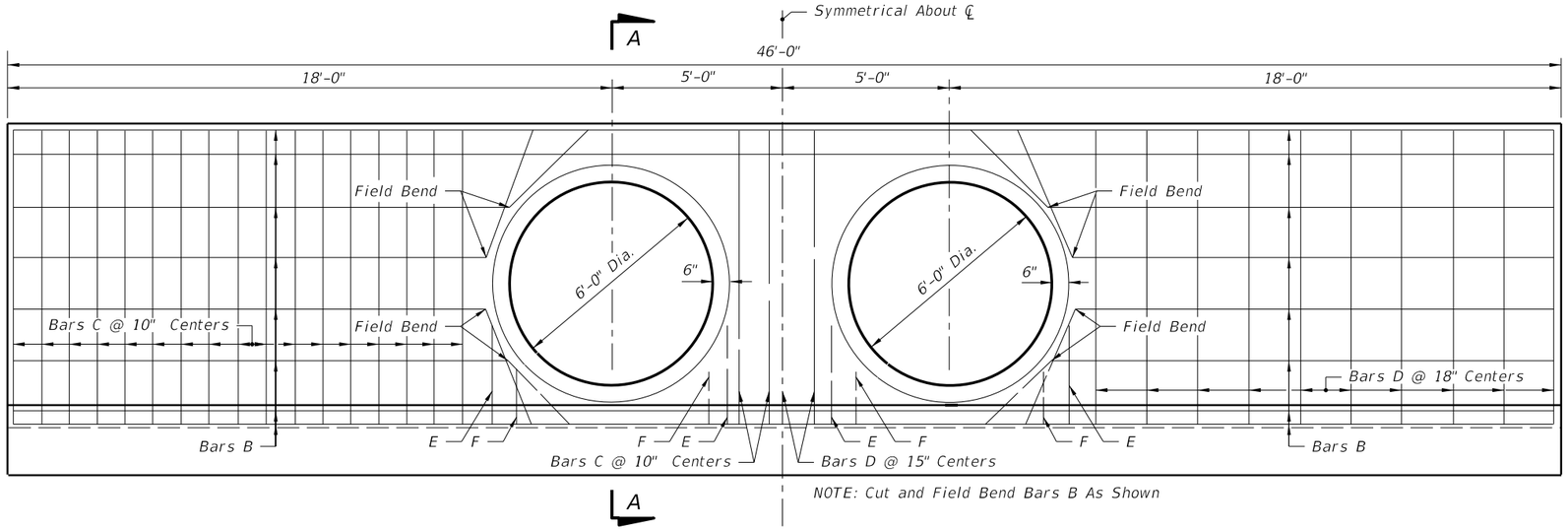
SECTION BB



PLAN
(Showing Bars In Footing)



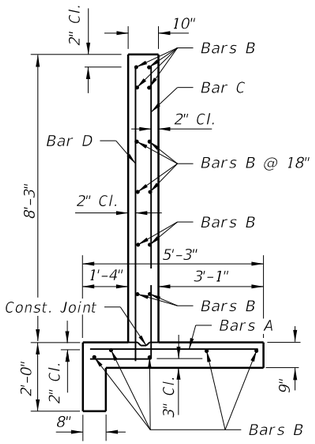
SECTION AA



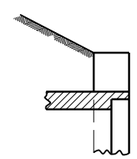
NOTE: Cut and Field Bend Bars B As Shown

HALF ELEVATION
(Showing Bars In Back Face Of Wall)

HALF ELEVATION
(Showing Bars In Front Face Of Wall)



TYPICAL SECTION
THRU ENDWALL

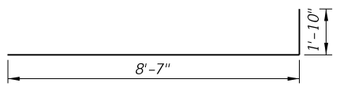


OPTIONAL ENTRANCE
FOR CONCRETE PIPE

BILL OF REINFORCING STEEL

MARK	SIZE	NO. REQD.	LENGTH	LOCATION	BENDING
A	5	85	4'-11"	Footing	Straight
B	4	17	45'-8"	Footing & Wall	Straight
C	5	38	10'-5"	Wall	Bend
D	4	23	8'-7"	Wall	Straight
E	4	8	2'-6"	Wall	Straight
F	4	8	1'-6"	Wall	Straight

BENDING DIAGRAM



BAR C

NOTE: All bar dimensions are out to out

ESTIMATED QUANTITIES

ITEM	UNIT	RCP	CMP
Concrete Class II	Cu. Yd.	17.5	17.8
Reinforcing Steel	Lb.	1519	1519

NOTE: See Sheet 1 of 2 for General Notes.

LAST REVISION	REVISION	DESCRIPTION:
07/01/07		

FDOT DESIGN STANDARDS
2013

STRAIGHT CONCRETE ENDWALLS SINGLE AND DOUBLE 72" PIPE

INDEX NO. 253

SHEET NO. 2

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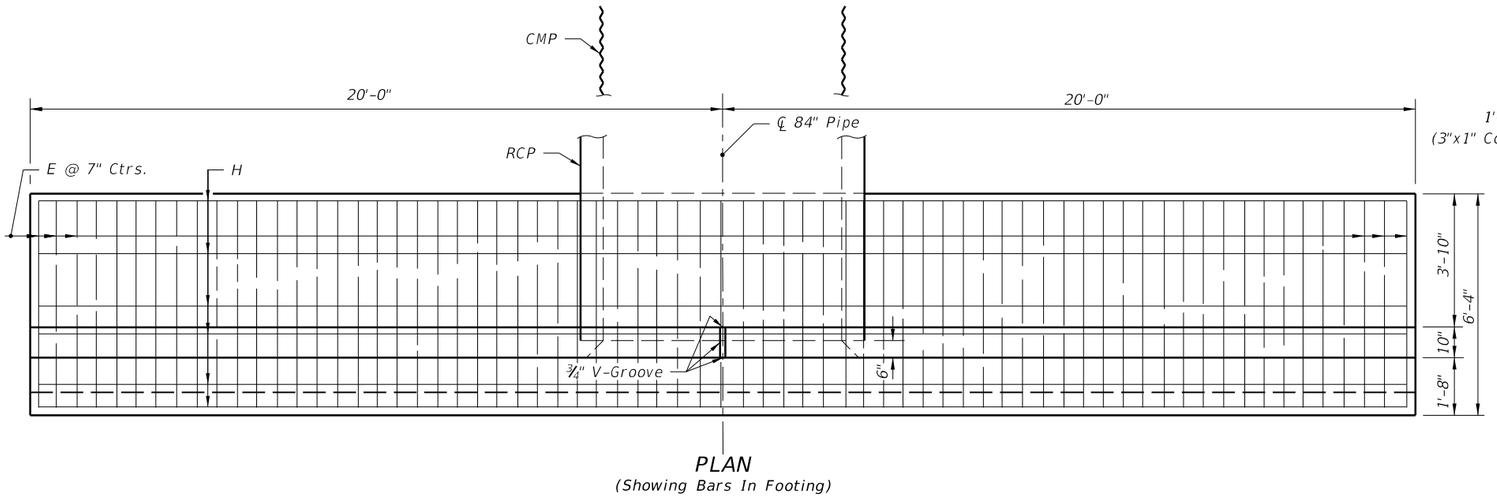
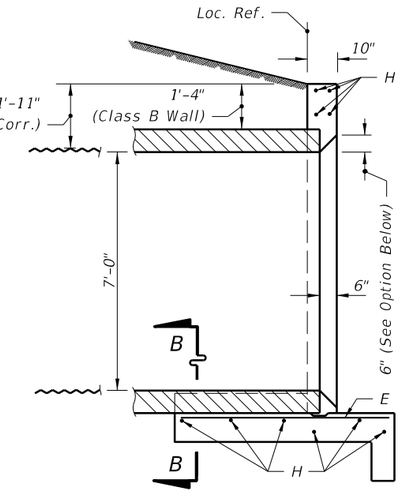
6/28/2012



PLAN
(Showing Bars In Footing)

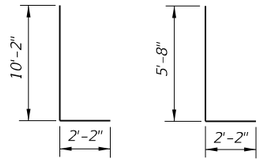


SECTION AA

BILL OF REINFORCING STEEL

MARK	SIZE	NO. REQD.	LENGTH
E	6	69	6'-0"
H	4	20	39'-8"
V_1	6	26	12'-4"
V_2	6	26	7'-10"
V_3	4	22	10'-2"
V_4	4	4	2'-0"

BENDING DIAGRAM

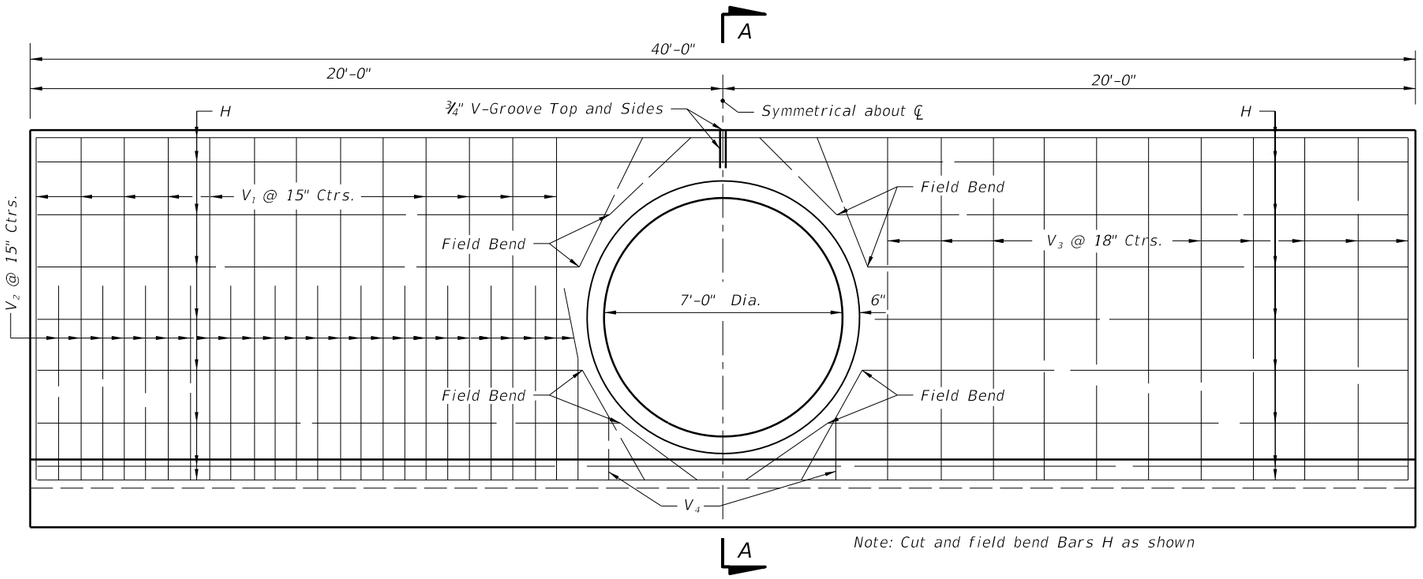


BAR V_1 BAR V_2

NOTE: All bar dimensions are out to out

ESTIMATED QUANTITIES

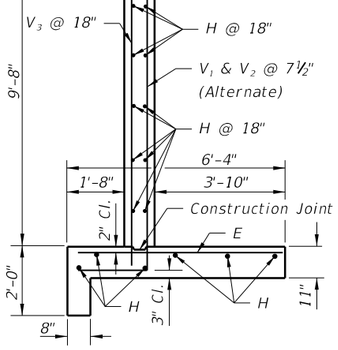
ITEM	UNIT	RCP	CMP
Class II Concrete	Cu. Yd.	20.0	20.2
Reinforcing Steel	Lb.	2,095	2,095



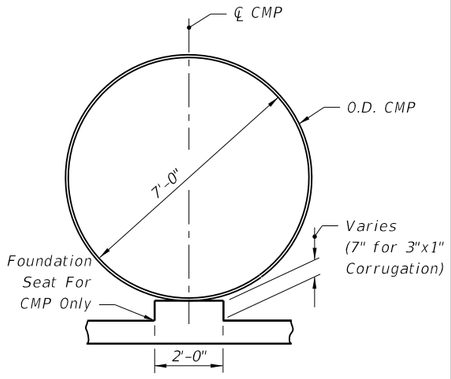
Note: Cut and field bend Bars H as shown

HALF ELEVATION
(Showing Bars In Back Face Of Wall)

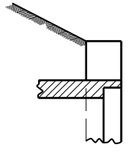
HALF ELEVATION
(Showing Bars In Front Face Of Wall)



TYPICAL SECTION
THRU ENDWALL



SECTION BB

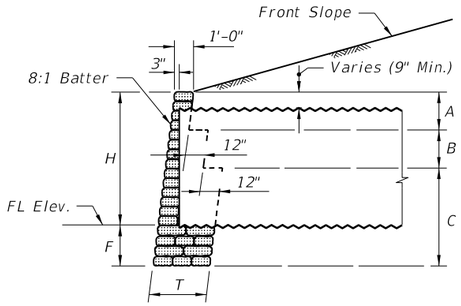


OPTIONAL ENTRANCE
FOR CONCRETE PIPE

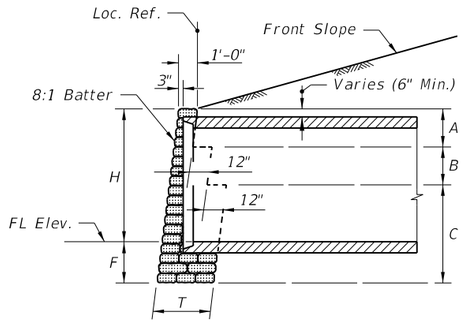
GENERAL NOTES

1. Straight concrete endwalls are intended for use outside the clear zone.
2. Endwalls may be cast-in-place or precast construction. Cast-in-place endwalls shall conform to the details on this index, design specifications AASHTO 1989. Precast construction which adheres to this Index, including any additional reinforcement required for handling which shall be determined by the Contractor or supplier, does not require additional approvals. Deviations from this Index, for precast units, shall require the approval of the State Drainage Engineer prior to construction. For precast construction, see Index No. 201 for opening and grouting details.
3. Reinforcing steel shall be either Grade 40 or 60.
4. Concrete shall be Class II, except ASTM C478 (4000 psi) concrete may be substituted for precast items manufactured in plants meeting the requirements of Section 449 of the Specifications.
5. Chamfer: All exposed edges and corners to be chamfered ¾" unless otherwise shown.
6. That portion of corrugated metal pipe in direct contact with the concrete slab and extending 12" beyond shall have a continuous bituminous coating of 0.004" minimum thickness applied prior to placing of the concrete.
7. Sodding shall be in accordance with Index No. 281 and paid for under the contract unit price for Performance Turf, SY.
8. Basis of payment for either cast-in-place or precast construction shall be the estimated quantities tabulated on the Index. Concrete and reinforcing steel shall be paid for under the contract unit prices for Class II Concrete (Endwalls), CY and Reinforcing Steel (Roadway), LB.

LAST REVISION	REVISION	DESCRIPTION:				
07/01/09			FDOT DESIGN STANDARDS 2013	STRAIGHT CONCRETE ENDWALLS SINGLE 84" PIPE	INDEX NO. 255	SHEET NO. 1

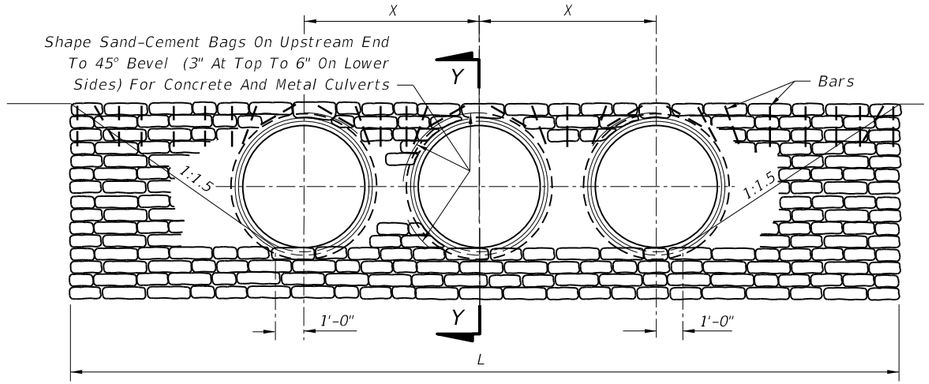


CORRUGATED METAL PIPE



CONCRETE PIPE

SECTION YY



Note:

1. For concrete and corrugated metal pipes. Concrete pipe shown.
2. The top row of riprap bags shall be secured by pinning, using #4 reinforcing bars 18 inches in length, as follows:
   a. The end bags shall be secured using two bars per bag, one vertical and one diagonal as shown.
   b. The next to last bag on each end shall be secured with two bars vertically.
   c. Bags located over the pipe shall be secured by a bar which is driven diagonally except that for concrete pipe two bars shall be used for single bags above the pipe.
   d. Intermediate bags shall be secured with a single bar.

   Bars shall be driven to one inch below the surface of the bag. The cost of furnishing and installing the bars shall be included in the cost of the riprap.

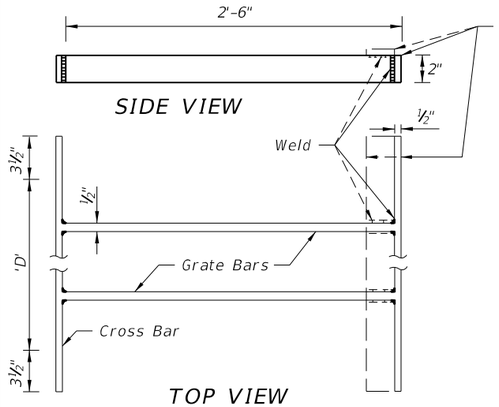
FRONT ELEVATION

TABLE OF DIMENSIONS AND QUANTITIES FOR ONE ENDWALL

SIZE OF PIPE	H	T	A	B	C	F	X	ONE PIPE CULVERTS			TWO PIPE CULVERTS			THREE PIPE CULVERTS			FOUR PIPE CULVERTS		
								L	RIPRAP CY		L	RIPRAP CY		L	RIPRAP CY		L	RIPRAP CY	
									CP	CMP		CP	CMP		CP	CMP		CP	CMP
18"	2'-3"	1'-0"	4'-0"	0'-0"	0'-0"	1'-9"	2'-10"	8'-9"	1.2	1.2	11'-7"	1.5	1.6	14'-5"	1.8	1.9	17'-3"	2.1	2.3
24"	2'-9"	2'-0"	2'-0"	2'-6"	0'-0"	1'-9"	3'-5"	10'-3"	2.4	2.5	13'-8"	3.0	3.2	17'-1"	3.7	4.0	20'-6"	4.3	4.7
30"	3'-4"	2'-0"	2'-0"	3'-2"	0'-0"	1'-10"	4'-3"	12'-0"	3.3	3.4	16'-3"	4.2	4.5	20'-6"	5.1	5.5	24'-9"	6.0	6.5
36"	3'-10"	2'-0"	2'-0"	3'-8"	0'-0"	1'-10"	5'-1"	13'-6"	4.0	4.2	18'-7"	5.2	5.7	23'-8"	6.3	6.9	28'-9"	7.4	8.2
42"	4'-5"	3'-0"	2'-0"	2'-0"	2'-4"	1'-11"	6'-0"	15'-3"	6.4	6.7	21'-3"	8.3	8.9	27'-3"	10.2	11.2	33'-3"	12.3	13.4
48"	4'-11"	3'-0"	2'-0"	2'-0"	2'-10"	1'-11"	6'-9"	16'-9"	7.7	8.1	23'-6"	10.0	10.8	30'-3"	12.3	13.5	37'-0"	14.5	16.2
54"	5'-6"	3'-0"	2'-0"	2'-0"	3'-6"	2'-0"	7'-8"	18'-6"	9.5	10.1	26'-2"	12.4	13.5	33'-10"	15.3	17.0	41'-6"	18.2	20.4
60"	6'-0"	3'-0"	2'-0"	2'-0"	4'-0"	2'-0"	8'-6"	20'-0"	11.0	11.7	28'-6"	14.4	15.8	37'-0"	17.8	19.8	45'-6"	21.1	23.8
66"	6'-7"	3'-0"	2'-0"	2'-0"	4'-8"	2'-1"	9'-3"	21'-9"	13.2	14.1	31'-0"	17.2	18.9	40'-3"	21.2	23.7	49'-6"	25.1	28.5
72"	7'-1"	3'-0"	2'-0"	2'-0"	5'-2"	2'-1"	10'-0"	23'-3"	15.0	16.0	33'-3"	19.4	21.4	43'-3"	23.9	26.8	53'-3"	28.3	32.3
78"	7'-8"	3'-0"	2'-0"	2'-0"	5'-10"	2'-2"	10'-9"	25'-0"	17.5	18.7	35'-9"	22.6	25.0	46'-6"	27.8	31.3	57'-3"	32.9	37.6
84"	8'-2"	3'-0"	2'-0"	2'-0"	6'-4"	2'-2"	11'-8"	26'-6"	19.5	20.9	38'-2"	25.3	28.1	49'-10"	31.1	35.2	61'-6"	36.9	42.4

GENERAL NOTES

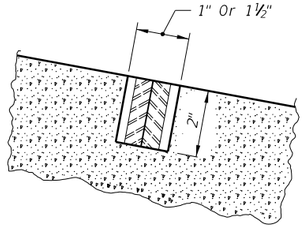
1. Straight sand-cement endwalls are intended for use outside the clear zone.



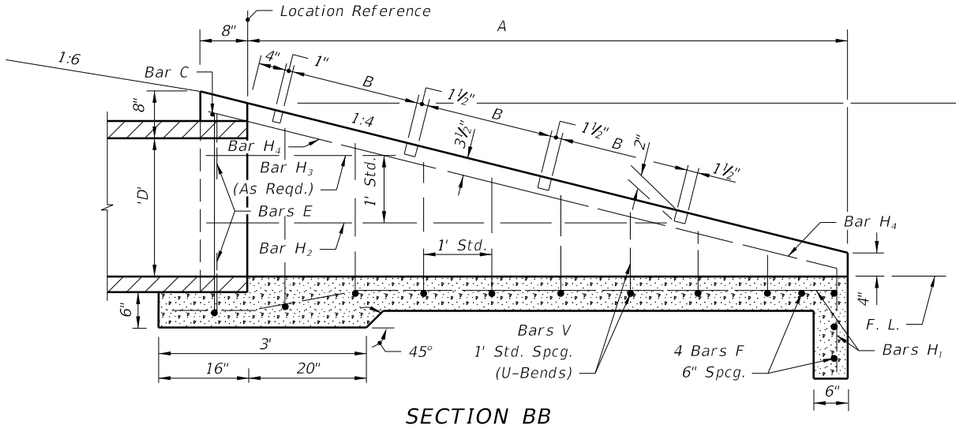
GRATE TYPE NO. 1

Pipe Size	Grate Bars Reqd.	Grate (lb)
15"	2	28.93

Bars to be evenly spaced across dimension 'D'
All bars ½" x 2"



SECTION AA



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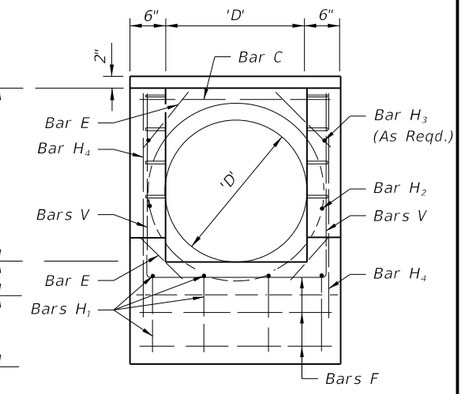
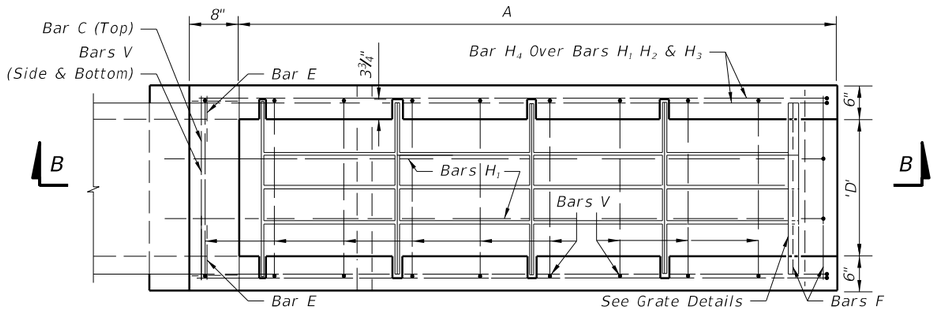
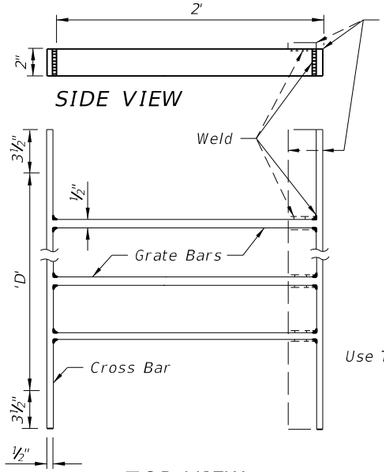


END VIEW



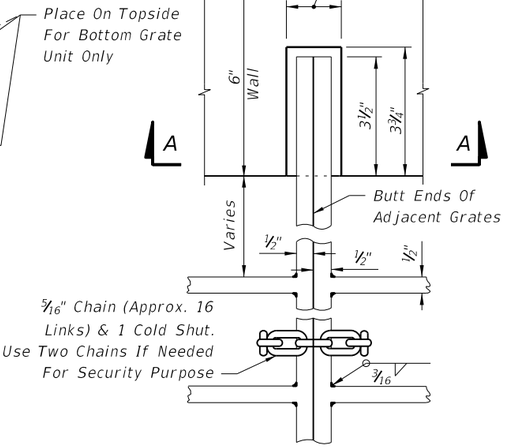
TOP VIEW



GRATE TYPE NO. 2

Pipe Size	Grate Bars Reqd.	Grate (lb)
18"	3	33.69
24"	4	43.63
30"	5	53.55

Bars to be evenly spaced across dimension 'D'.
All bars ½" x 2".



TOP VIEW

GRATE, SEAT, WELD & CHAIN DETAIL

TABLE OF DIMENSIONS AND QUANTITIES

	Pipe Size D	A	B	Class I Conc. (CY)	Reinf. Steel (lb)	Number Of Grates Reqd. Type No. 1	Number Of Grates Reqd. Type No. 2	Total Grate Wt. (lb)	Sodding (SY)	Slope Transition Offset	Slope Transition L
Slope 1:4	15"	5.67'	2.38'	0.85	56	2	0	57.86	15	4.2'	42'
	18"	6.67'	1.875'	1.01	73	0	3	101.08	16	4.8'	48'
	24"	8.67'	1.875'	1.65	97	0	4	174.52	19	5.8'	58'
	30"	10.67'	1.875'	2.33	129	0	5	267.75	21	6.9'	69'

GENERAL NOTES

1. This endwall is to be used only in the clear zone for the drainage of medians and other areas having low design velocities and negligible debris.

2. Reinforcing steel: All bars are size #4. Spacings shown are center to center. Laps to be 12" minimum. Clearance is 2" except as noted. Square welded wire fabric (two cages max.) having an equivalent cross sectional area (0.20 sq. in.) may be substituted for bar reinforcement.

3. Grates shall be ASTM A242/A242M, A572/A572M or ASTM A5888/A588M, Grade 50 steel. When "Alt. G" grates are specified in the plans, grates shall be galvanized in accordance with Section 975 and 425.3.2 of the Standard Specifications.

4. Endwall to be paid for under the contract unit price for U-Endwall, Each. Payment shall include cost of concrete, reinforcing steel, grate, and accessories. Quantities shown are for estimating purposes only.

5. Sod slopes 5' each side and above endwall. Sodding to be paid for under contract unit price for Performance Turf, SY.

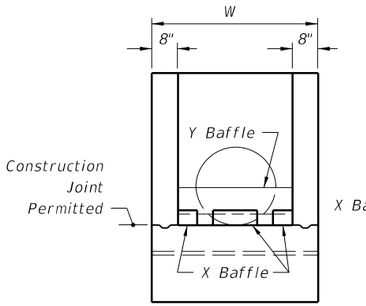
6. Precasting of this endwall will be permitted. Precast units shall conform to the dimensions shown or in accordance with approved shop drawings. Request for shop drawing approval shall be directed to the State Drainage Engineer. Use Index No. 201 for opening and grouting details.

7. Concrete shall be Class I except ASTM C478 (4000 psi) concrete may be substituted for precast items manufactured in plants meeting the requirements of Section 449 of the Specifications.

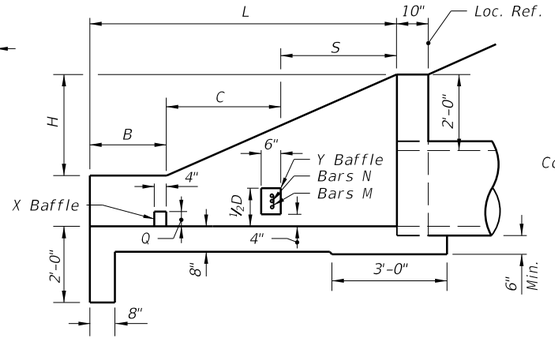
FRONT SLOPE
TRANSITION AT ENDWALL

C:\d\projects\standards\roadway\00200-s\00260-01.dgn
rd960rh
2:37:19 PM
6/28/2012

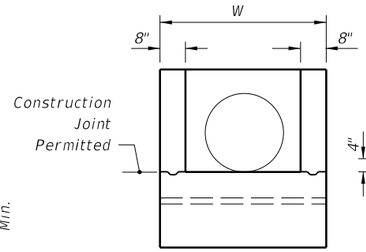
LAST REVISION	REVISION	DESCRIPTION:				
07/01/09			FDOT DESIGN STANDARDS 2013	U-TYPE CONCRETE ENDWALLS WITH GRATES 15" TO 30" PIPE	INDEX NO. 260	SHEET NO. 1



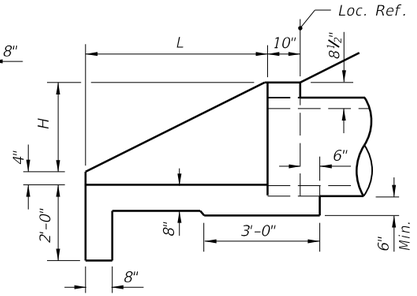
END VIEW



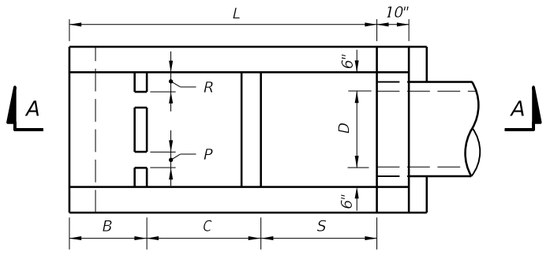
SECTION AA



END VIEW

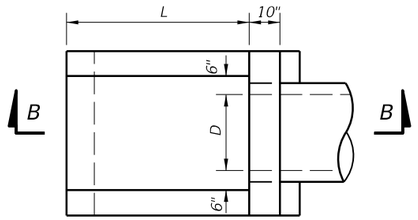


SECTION BB



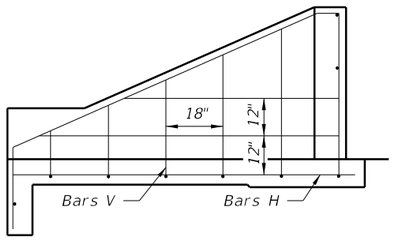
PLAN

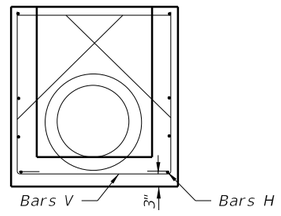
DIMENSIONAL DETAILS



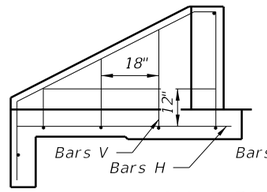
PLAN

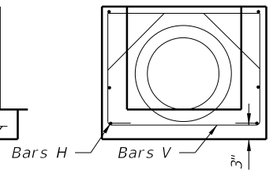
DIMENSIONAL DETAILS





ALL PIPE SIZES
SIDE VIEW AND BACKWALL SECTION
REINFORCING DETAIL





ALL PIPE SIZES
SIDE VIEW AND BACKWALL SECTION
REINFORCING DETAIL

DIMENSIONS AND QUANTITIES FOR ONE U-ENDWALL

Pipe Size		L	H	W	S	B	C	X Baffle			Y Baffle Reinf. Steel		Class I Conc. Cu. Yd.	Reinf. Steel Lbs.
D	Area Sq. Ft.							P	Q	R	Bar M	Bar N		
15"	1.23	5'-9"	2'-3½"	3'-7"	2'-3"	1'-3"	2'-3"	4"	4"	4"	2 #4	1 #4	1.61	72
18"	1.77	6'-6"	2'-5"	3'-10"	2'-6"	1'-6"	2'-6"	4"	4"	5"	3 #4	2 #4	1.89	86
24"	3.14	8'-0"	2'-8"	4'-4"	3'-0"	2'-0"	3'-0"	5"	5"	6"	4 #4	3 #4	2.52	108
30"	4.91	9'-6"	2'-11"	4'-10"	3'-6"	2'-6"	3'-6"	5"	5"	7"	4 #4	4 #4	3.34	131

WITH BAFFLES

DIMENSIONS AND QUANTITIES FOR ONE U-ENDWALL

Pipe Size		L	H	W	Class I Conc. Cu. Yd.	Reinf. Steel Lbs.
D	Area Sq. Ft.					
15"	1.23	3'-3"	1'-7½"	3'-7"	0.89	39
18"	1.77	3'-9"	1'-10½"	3'-10"	1.05	43
24"	3.14	4'-9"	2'-4½"	4'-4"	1.40	55
30"	4.91	5'-9"	2'-10½"	4'-10"	1.88	64

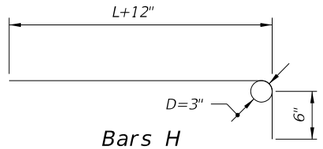
WITHOUT BAFFLES

GENERAL NOTES

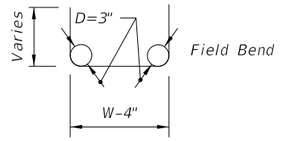
1. Baffles to be constructed only when called for in plans.
2. When steel grating is required on endwall see Sheet 3 of 3 for details.
3. All reinforcing No. 4 bars with 2" clearance except as noted.
4. All angles, channels and bars shall be ASTM A242/A242M, A572/A572M or A588/A588M Grade 50 steel. When designated Alternate G in the plans galvanize in accordance with Section 975 and 425-3.2 of the Standard Specifications.
5. Channel section C 3x6 may be substituted for C 4x5.4 channel.
6. Precasting of this endwall will be permitted. Precast units shall conform to the dimensions shown or in accordance with approved shop drawings. Request for shop drawing approval shall be directed to the State Drainage Engineer. Use Index No. 201 for opening and grouting details.
7. Concrete shall be Class I, except ASTM C478 (4000 psi) concrete may be substituted for precast items manufactured in plants meeting the requirements of Section 449 of the Specifications.
8. Sodding shall be in accordance with Index No. 281, and paid for under the contract unit price for Performance Turf, SY.
9. Endwall to be paid for under the contract unit price for U-Endwall, Each. Payment shall include cost of concrete, reinforcing steel, and when called for in the plans, steel grating, baffles and accessories. Quantities shown are for estimating purposes only.

ENDWALLS FOR 1:2 SLOPES

LAST REVISION	REVISION	DESCRIPTION:		FDOT DESIGN STANDARDS 2013	U-TYPE CONCRETE ENDWALLS BAFFLES & GRATE OPTIONAL 15" TO 30" PIPE	INDEX NO.	SHEET NO.
07/01/09						261	1

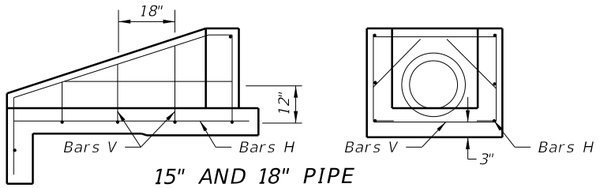


Bars H

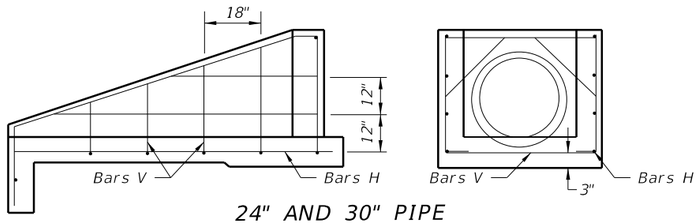


Bars V

BENDING DIAGRAM

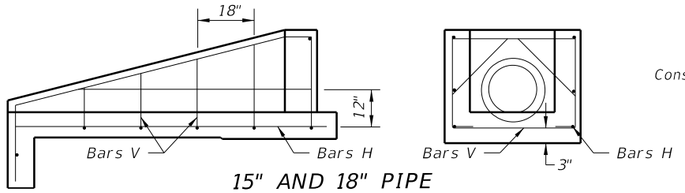


15" AND 18" PIPE

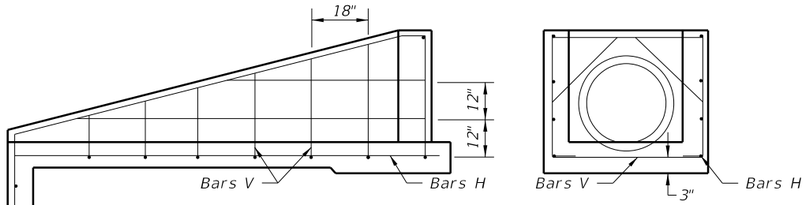


24" AND 30" PIPE

1:3 SLOPES

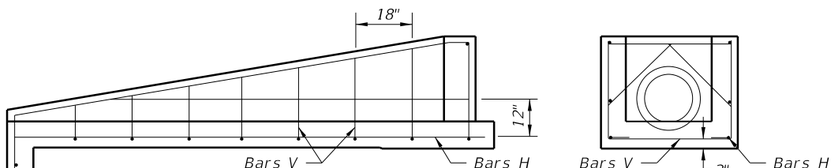


15" AND 18" PIPE

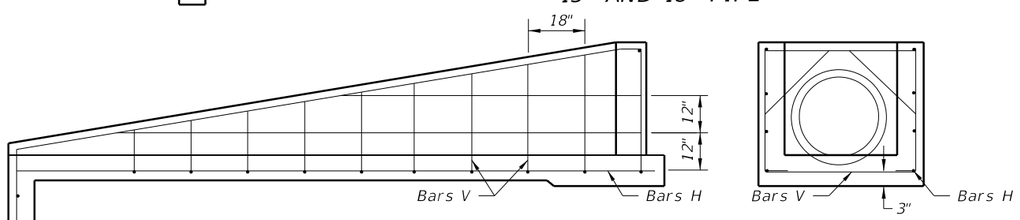


24" AND 30" PIPE

1:4 SLOPES



15" AND 18" PIPE

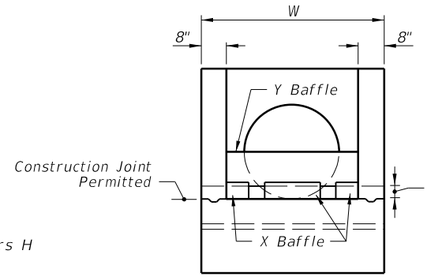


24" AND 30" PIPE

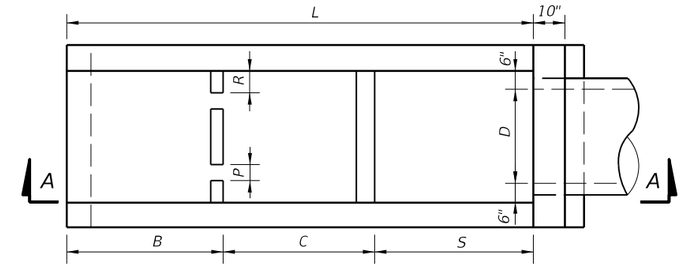
1:6 SLOPES

SIDE VIEWS AND BACKWALL SECTIONS

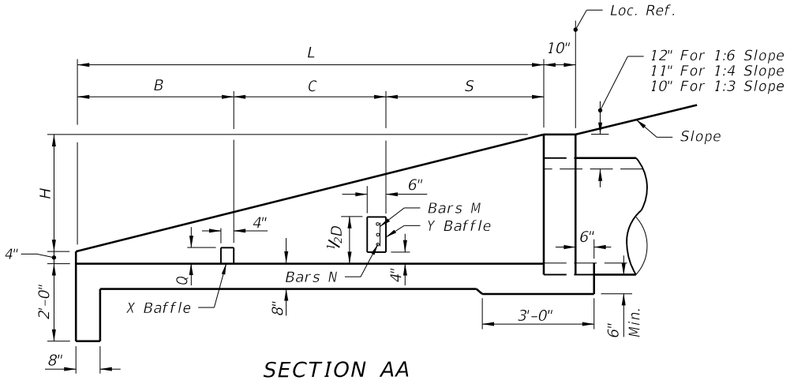
REINFORCING DETAILS



END VIEW



PLAN



SECTION AA

DIMENSIONAL DETAILS

DIMENSIONS AND QUANTITIES FOR BAFFLES

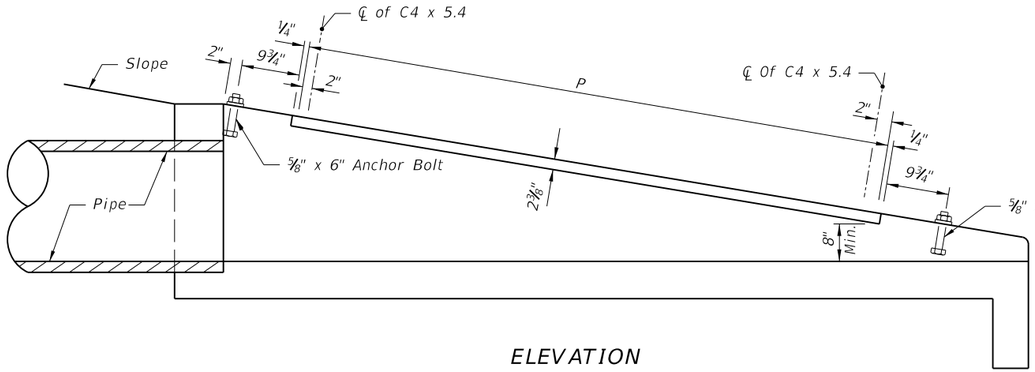
Pipe Size D	X Baffle			Ybaffle Reinf. Steel		Class I Concrete Cu. Yd.	Reinf. Steel Lbs
	P Width	Q Height	R Length	Bar M	Bar N		
15"	4"	4"	4"	2- #4	1- #4	0.10	4
18"	4"	4"	5"	3- #4	2- #4		8
24"	5"	5"	6"	4- #4	3- #4		12
30"	5"	5"	7"	4- #4	4- #4		16

DIMENSIONS AND QUANTITIES FOR ONE U-ENDWALL

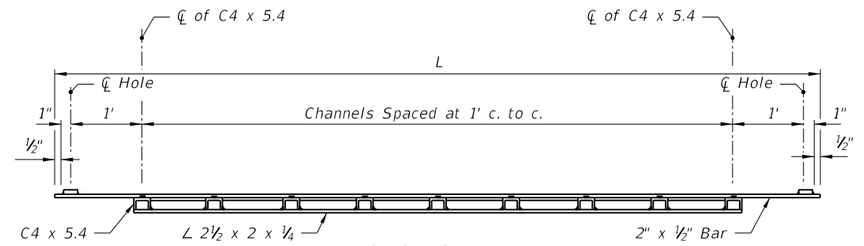
Rate Of Slope	Pipe Size		L	H	W	Baffle Locations (When Required)			Class I Concrete Cu. Yd.	Reinf. Steel Lbs.
	D	Area (Sq. Ft.)				S	B	C		
1 : 3	15"	1.23	5'-3"	1'-9"	3'-7"	1'-9"	1'-9"	1'-9"	1.19	51
	18"	1.77	6'-0"	2'-0"	3'-10"	2'-0"	2'-0"	2'-0"	1.42	56
	24"	3.14	7'-6"	2'-6"	4'-4"	2'-6"	2'-6"	2'-6"	1.94	77
	30"	4.91	9'-0"	3'-0"	4'-10"	3'-0"	3'-0"	3'-0"	2.54	96
1 : 4	15"	1.23	7'-4"	1'-10"	3'-7"	2'-6"	2'-6"	2'-4"	1.54	64
	18"	1.77	8'-4"	2'-1"	3'-10"	2'-10"	2'-10"	2'-8"	1.84	71
	24"	3.14	10'-4"	2'-7"	4'-4"	3'-6"	3'-6"	3'-4"	2.53	92
	30"	4.91	12'-4"	3'-1"	4'-10"	4'-2"	4'-2"	4'-0"	3.34	124
1 : 6	15"	1.23	11'-6"	1'-11"	3'-7"	3'-10"	3'-10"	3'-10"	2.19	89
	18"	1.77	13'-0"	2'-2"	3'-10"	4'-4"	4'-4"	4'-4"	2.63	103
	24"	3.14	16'-0"	2'-8"	4'-4"	5'-4"	5'-4"	5'-4"	3.59	143
	30"	4.91	19'-0"	3'-2"	4'-10"	6'-4"	6'-4"	6'-4"	4.81	180

ENDWALLS WITH AND WITHOUT BAFFLES FOR 1:3, 1:4 AND 1:6 SLOPES

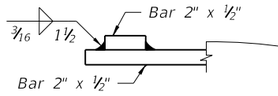
LAST REVISION	REVISION	DESCRIPTION:				
07/01/12			FDOT DESIGN STANDARDS 2013	U-TYPE CONCRETE ENDWALLS BAFFLES & GRATE OPTIONAL 15" TO 30" PIPE	INDEX NO. 261	SHEET NO. 2



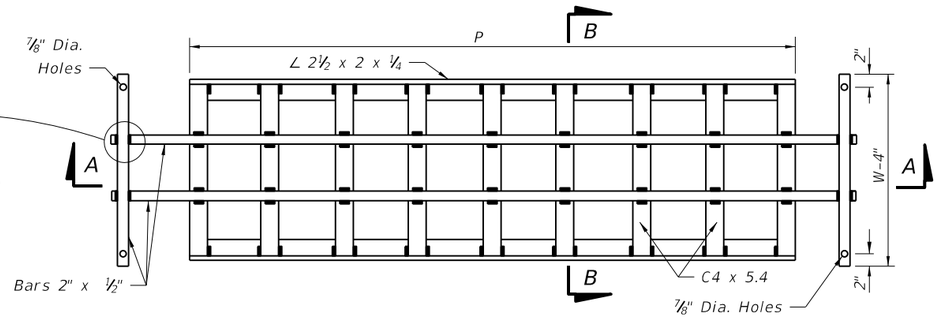
ELEVATION



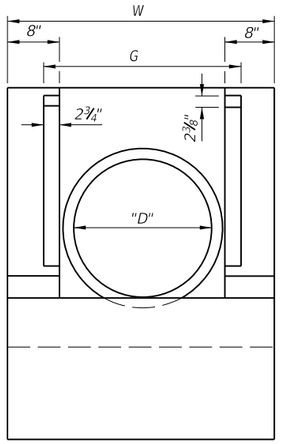
SECTION AA



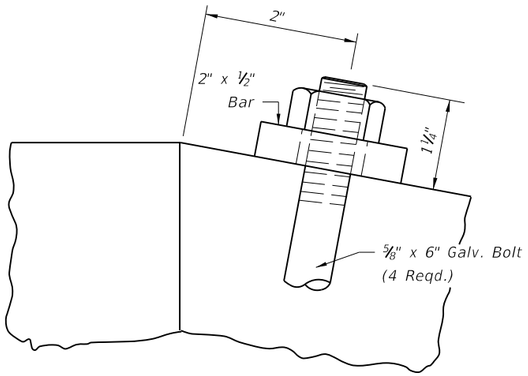
BAR TO BAR WELD



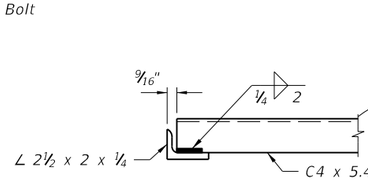
PLAN



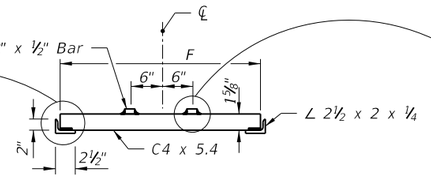
END VIEW



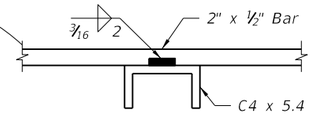
ANCHOR BOLT DETAIL



CHANNEL TO ANGLE WELD



SECTION BB



BAR TO CHANNEL WELD

MOUNTING FOR STEEL GRATE

STEEL GRATE

STEEL GRATING USE CRITERIA

1. Grates to be used on pipe culvert endwalls located within the designated clear zone. Positive debris control shall be provided at all upgradient openings. Grates shall not be used unless one or more of the following conditions exist:

   A. Drainage area to culvert consists of median or infield areas or areas where debris and/or drift is negligible.
   B. Runoff to culvert is by sheet flow or in such ill defined channels that debris transport is not considered a major problem.
   C. Runoff to culvert is minor except on an infrequent basis (10 to 15 year frequency); for example a drainage basin in flat sandy terrain with normally low ground water table.
   D. Areas where culvert blockage with resultant backwater would not seriously affect roadway embankment, traffic operation or upland property.

2. Steel grating to be used only where called for in plans.

TABLE OF DIMENSIONS AND QUANTITIES FOR ONE GRATE

Rate Of Slope	Size Pipe D	G	2 Each Bars @ 3.4 lb/ft			(X) Channels @ 5.4 lb/ft			2 Angles @ 3.62 lb/ft		Total Weight (lb)
			L	W-4"	lb	(X)	F	lb	P	lb	
1:6	15"	2' -8½"	9'-3"	3'-3"	85	8	2' -6⅞"	111	7'-4"	53	249
	18"	2' -11½"	10'-3"	3'-6"	94	9	3' -9⅞"	137	8'-4"	62	292
	24"	3' -5½"	13'-3"	4'-0"	117	12	3' -3⅞"	215	11'-4"	82	414
	30"	3' -11½"	16'-3"	4'-6"	141	15	3' -9⅞"	310	14'-4"	104	555
1:4	15"	2' -8½"	6'-3"	3'-3"	65	5	2' -6⅞"	70	4'-4"	32	167
	18"	2' -11½"	7'-3"	3'-6"	73	6	2' -9⅞"	92	5'-4"	39	204
	24"	3' -5½"	9'-3"	4'-0"	90	8	3' -3⅞"	144	7'-4"	53	287
	30"	3' -11½"	11'-3"	4'-6"	107	10	3' -9⅞"	206	9'-4"	68	381
1:3	15"	2' -8½"	4'-3"	3'-3"	51	3	2' -6⅞"	42	2'-4"	17	110
	18"	2' -11½"	5'-3"	3'-6"	60	4	2' -9⅞"	61	3'-4"	24	145
	24"	3' -5½"	6'-3"	4'-0"	70	5	3' -3⅞"	90	4'-4"	31	191
	30"	3' -11½"	8'-3"	4'-6"	87	7	3' -9⅞"	145	6'-4"	46	278

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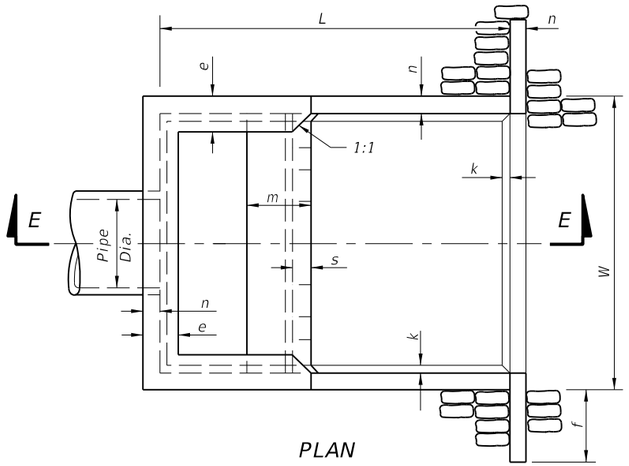
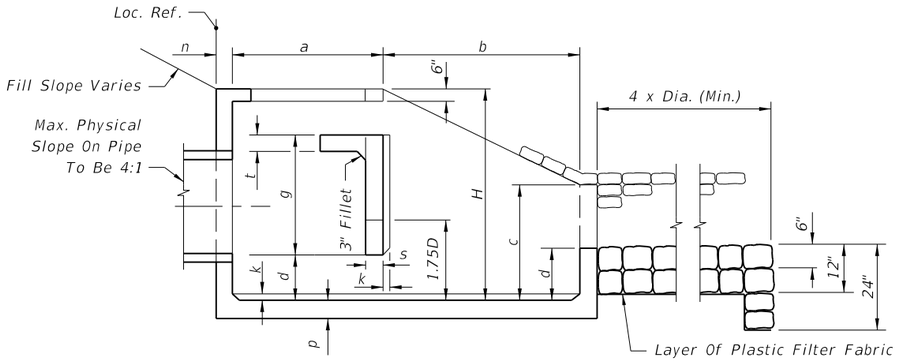
6/28/2012

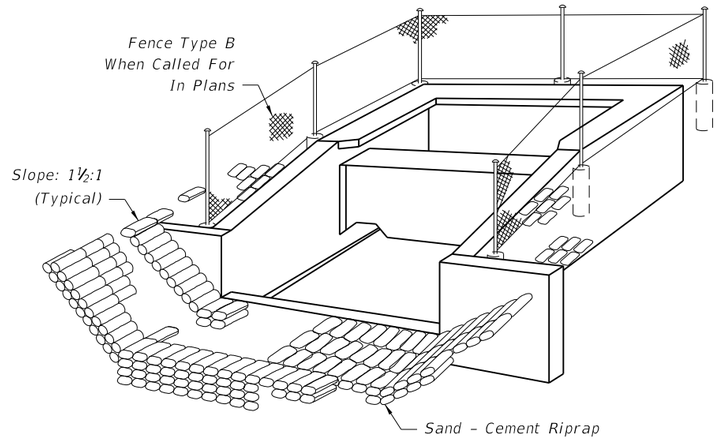
LAST REVISION	REVISION	DESCRIPTION:			INDEX NO.	SHEET NO.
00			FDOT DESIGN STANDARDS 2013	U-TYPE CONCRETE ENDWALLS BAFFLES & GRATE OPTIONAL 15" TO 30" PIPE	261	3



PLAN



SECTION EE



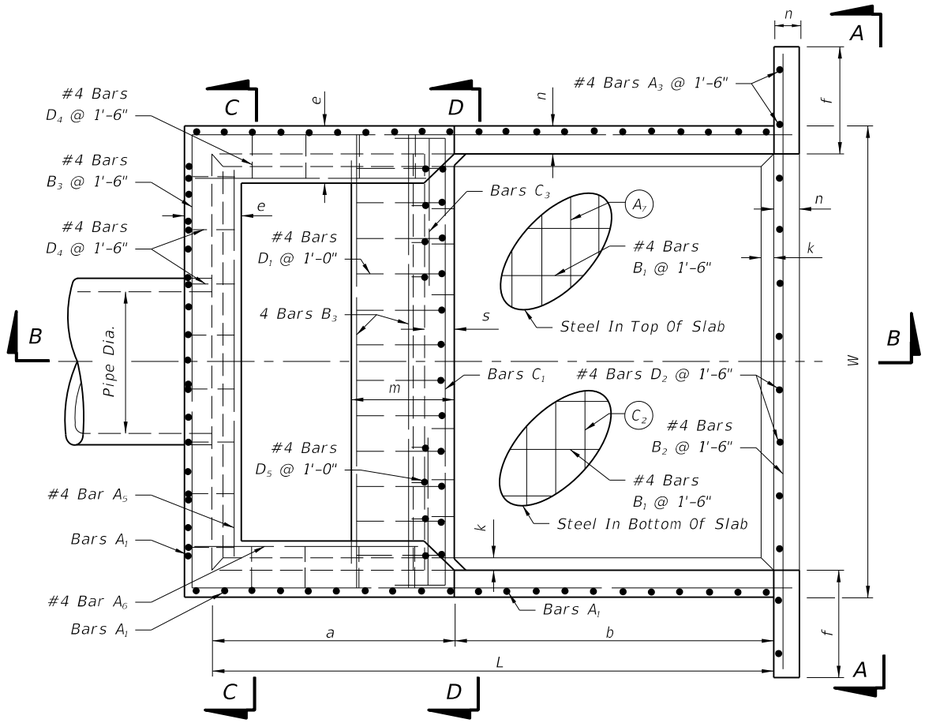
PERSPECTIVE

GENERAL NOTES

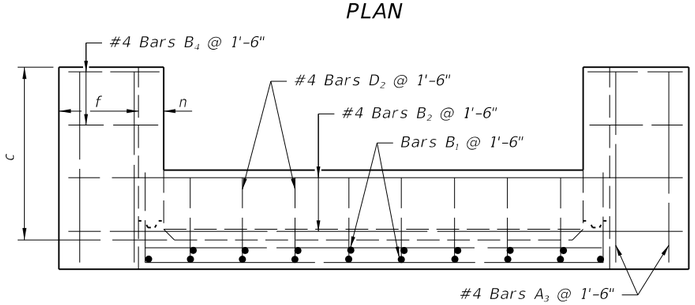
1. U-type concrete endwall energy dissipators are intended for use outside the clear zone.
2. Chamfer all exposed edges ¾".
3. Concrete shall be Class I, except ASTM C478 (4000 psi) concrete may be substituted for precast items manufactured in plants meeting the requirements of Section 449 of the Specifications.
4. Reinforcing steel shall have 2" min. cover.
5. Endwall to be paid for under the contract unit price for Class I Concrete (Endwalls), CY and Reinforcing Steel (Roadway), LB. Riprap to be paid for under the contract unit price for Riprap (Sand-Cement) (Roadway), CY. Cost of plastic filter fabric to be included in the contract unit price for riprap.
6. Fencing, when called for in the plans, to be paid for under the contract unit price for Fencing, Type B, LF. See Index No. 802 for details of Type B fencing.

Pipe Size		Q (Max) (cfs)	Dimensions																	Concrete Class I (CY)	Reinf. Steel (lb)	Sand-Cement Riprap (Nom.) (CY)
			Feet - Inches											Inches								
Dia. (in)	Area (SF)		W	H	L	a	b	c	d	e	f	g	m	n	p	s	t	k			
30	4.91	59	9-0	6-3	10-8	4-7	6-1	3-4	1-4	1-2	2-6	3-0	1-11	6	6½	7	7	3	6.72	736	10.6
36	7.07	85	10-5	7-3	12-4	5-3	7-1	3-10	1-7	1-3	3-0	3-6	2-3	7	7½	8	8	3	10.34	1,072	13.6
42	9.62	115	11-10	8-0	14-0	6-0	8-0	4-5	1-9	1-6	3-0	3-11	2-6	8	8½	9	8	4	14.82	1,429	17.5
48	12.57	151	13-3	9-0	15-8	6-9	8-11	4-11	2-0	1-7	3-0	4-5	2-10	9	9½	10	8	4	20.36	2,000	22.1
54	15.90	191	14-8	9-9	17-4	7-4	10-0	5-5	2-2	1-10	3-0	4-11	3-0	10	10½	10	8	4	27.19	2,659	27.2
60	13.63	236	16-1	10-9	19-0	8-0	11-0	5-11	2-5	1-11	3-0	5-4	3-4	11	11½	11	8	6	34.49	3,552	32.5
66	23.76	285	17-3	11-6	20-6	8-8	11-10	6-5	2-7	2-1	3-0	5-9	3-7	12	12½	12	8	6	42.82	4,472	38.3
72	28.27	339	18-6	12-3	22-0	9-3	12-9	6-11	2-9	2-3	3-0	6-2	3-9	12	12½	12	8	6	50.68	5,426	44.5

LAST REVISION	REVISION	DESCRIPTION:		FDOT DESIGN STANDARDS 2013	U-TYPE CONCRETE ENDWALL ENERGY DISSIPATOR 30" TO 72" PIPE	INDEX NO.	SHEET NO.
07/01/09						264	1

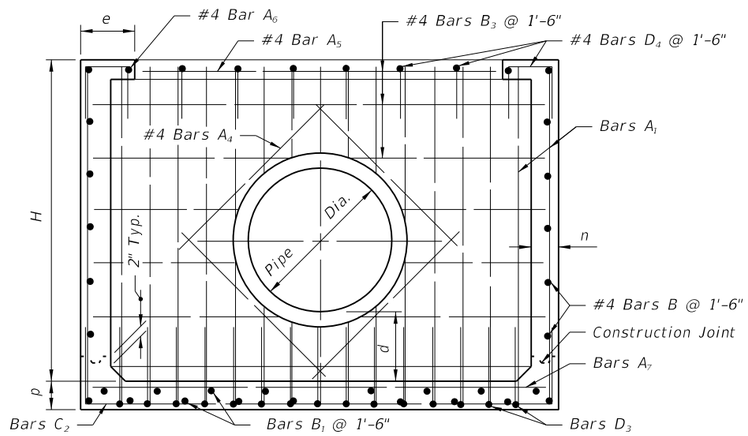


PLAN

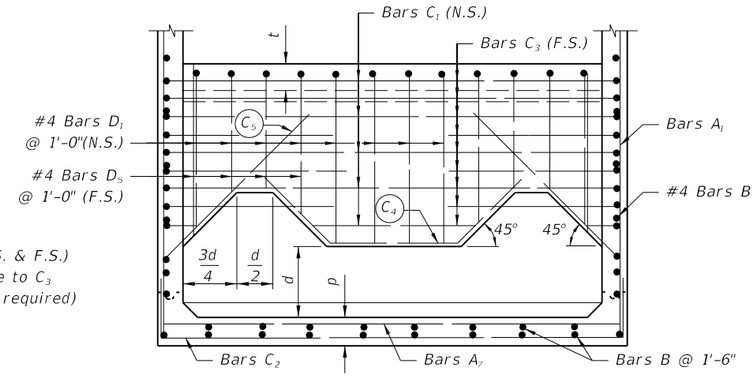


VIEW AA

Note: Bars C_4 & C_5 (N.S. & F.S.) equivalent in size to C_3 (cut and bend as required)



SECTION CC



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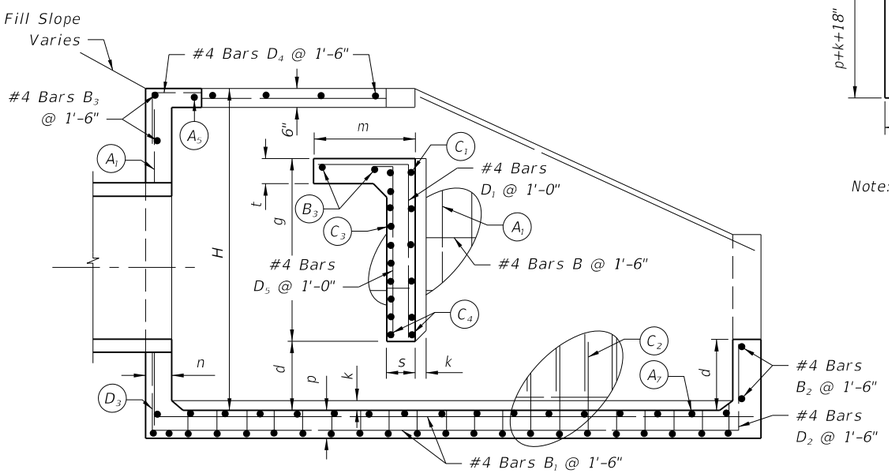
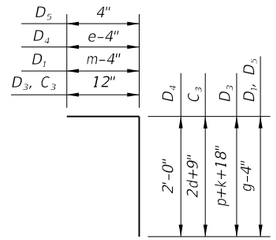
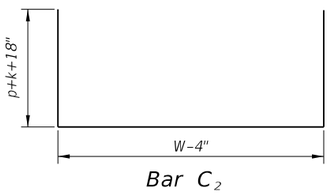


SECTION BB



Bars: C_3, D_1, D_3, D_4, D_5



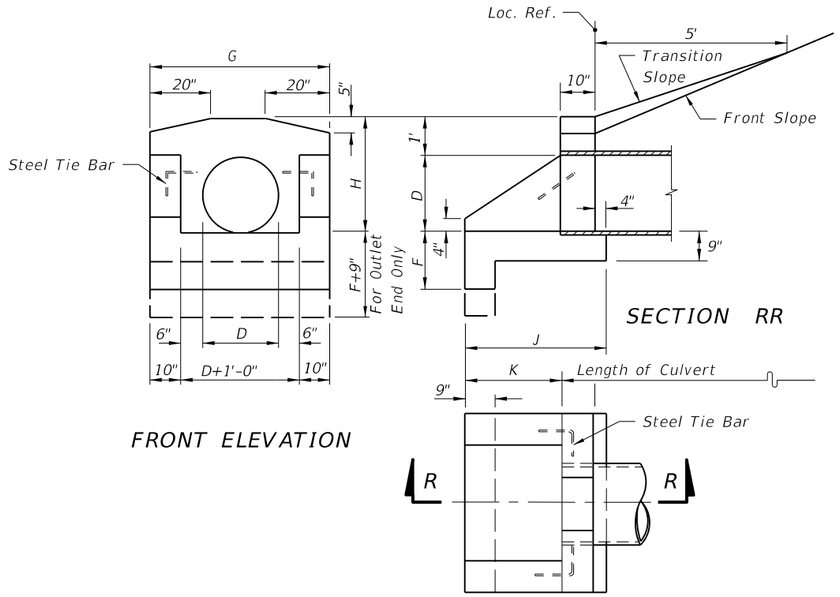
Bar C_2

Note: All bar dimensions are out to out.

BENDING DIAGRAM

BARS												
Pipe Size	A_1		A_7		C_1		C_2		C_3		D_3	
	Size (No.)	Spacing (Ft.-In.)	Size (No.)	Spacing (Ft.-In.)	Size (No.)	Spacing (Ft.-In.)	Size (No.)	Spacing (Ft.-In.)	Size (No.)	Spacing (Ft.-In.)	Size (No.)	Spacing (Ft.-In.)
30"	4	0-9½	4	1-6	5	0-11	4	0-9½	5	0-5½	4	0-9½
36"	5	1-0	4	1-6	5	0-10	5	1-0	5	0-5	5	1-0
42"	5	0-11	4	1-6	6	1-1	5	0-11	6	0-6½	5	0-11
48"	5	0-9½	4	1-0	6	1-0	5	0-9½	6	0-6	5	0-9½
54"	5	0-8½	4	0-10	7	1-1	5	0-8½	7	0-6½	5	0-8½
60"	6	0-10	5	1-1	7	1-0	6	0-10	7	0-6	6	0-10
66"	6	0-8½	5	0-11½	7	0-11	6	0-8½	7	0-5½	6	0-8½
72"	6	0-7½	5	0-10	7	0-10	6	0-7½	7	0-5	6	0-7½

LAST REVISION	REVISION	DESCRIPTION:			INDEX NO.	SHEET NO.
07/01/07			FDOT DESIGN STANDARDS 2013	U-TYPE CONCRETE ENDWALL ENERGY DISSIPATOR 30" TO 72" PIPE	264	2

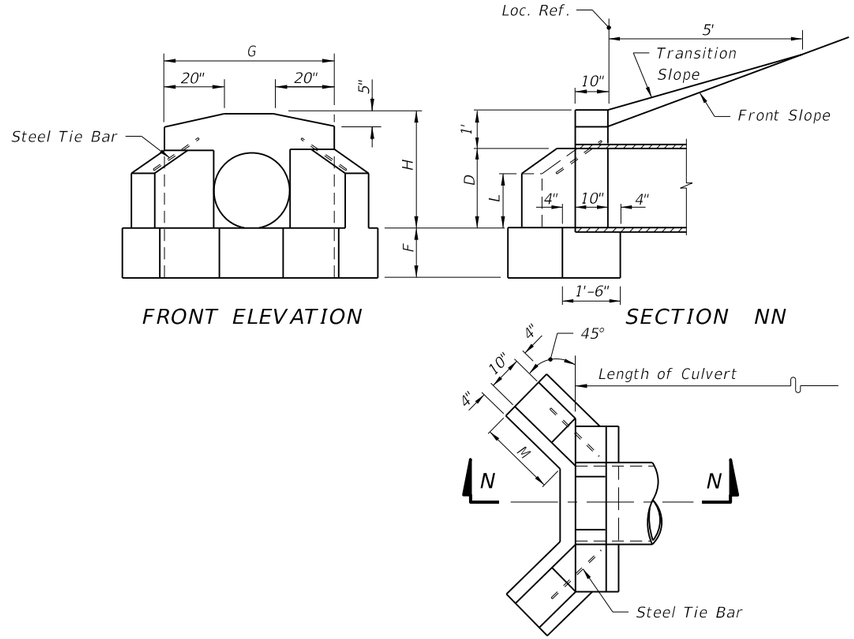


FRONT ELEVATION

SECTION RR

PLAN

CONCRETE ENDWALL WITH U-TYPE WINGS FOR PIPE CULVERTS



FRONT ELEVATION

SECTION NN

PLAN

CONCRETE ENDWALL WITH 45° WINGS FOR PIPE CULVERTS

TABLE OF DIMENSIONS AND ESTIMATED QUANTITIES
PIPE CULVERT ENDWALLS WITH U-TYPE WINGS

DIMENSIONS							QUANTITIES IN ONE ENDWALL						
Opening		Wall			Footing		Concrete, Class I, Total (CY)						Steel Tie Bars
							RCP		CMP		CIP		
D	Area (ft^2)	G	H	K	F	J	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet	
12"	0.8	3'-8"	2'-0"	1'-0"	1'-3"	2'-2"	0.48	0.55	0.49	0.57	0.49	0.57	none
15"	1.2	3'-11"	2'-3"	1'-5"	1'-3"	2'-7"	0.59	0.67	0.62	0.70	0.61	0.70	none
18"	1.8	4'-2"	2'-6"	1'-9"	1'-3"	2'-11"	0.70	0.79	0.74	0.82	0.74	0.82	none
24"	3.1	4'-8"	3'-0"	2'-6"	1'-6"	3'-8"	1.01	1.11	1.06	1.16	1.06	1.16	2-#6 Bars x 2'-0"
30"	4.9	5'-2"	3'-6"	3'-3"	1'-6"	4'-5"	1.33	1.44	1.41	1.51	1.40	1.51	2-#6 Bars x 2'-0"
36"	7.1	5'-8"	4'-0"	4'-0"	1'-9"	5'-2"	1.73	1.85	1.84	1.96	1.82	1.94	2-#6 Bars x 2'-6"
42"	9.6	6'-2"	4'-6"	4'-9"	2'-0"	5'-11"	2.19	2.32	2.32	2.45			2-#6 Bars x 2'-6"
48"	12.6	6'-8"	5'-0"	5'-6"	2'-0"	6'-8"	2.64	2.78	2.81	2.95			2-#6 Bars x 3'-0"

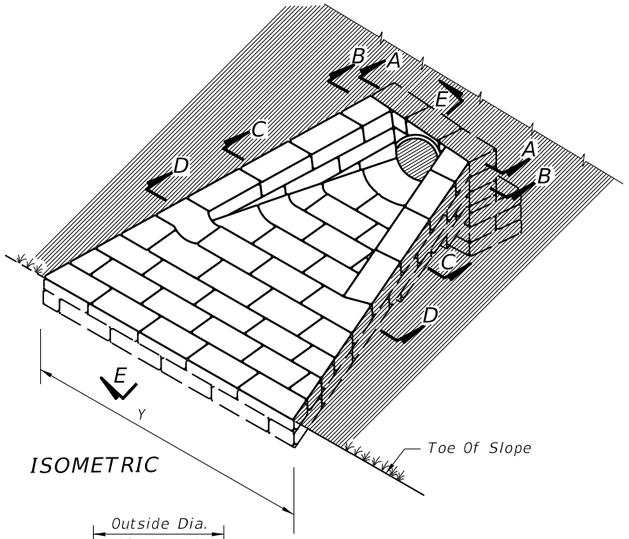
TABLE OF DIMENSIONS AND ESTIMATED QUANTITIES
PIPE CULVERT ENDWALLS WITH 45° WINGS

DIMENSIONS							QUANTITIES IN ONE ENDWALL			
Opening		Wall				Footing	Concrete, Class I			Steel Tie Bars
							Total (CY)			
D	Area (ft^2)	H	G	L	M	F	RCP	CMP	CIP	
15"	1.2	2'-3"	3'-7"	1'-0"	1'-3"	1'-3"	0.56	0.59	0.59	none
18"	1.8	2'-6"	3'-10"	1'-2"	1'-7"	1'-3"	0.74	0.77	0.77	none
24"	3.1	3'-0"	4'-4"	1'-5"	2'-1"	1'-4"	1.01	1.06	1.06	2 -#6 Bars x 2'-0"
30"	4.9	3'-6"	4'-10"	1'-9"	2'-5"	1'-6"	1.32	1.40	1.39	2 -#6 Bars x 2'-0"
36"	7.1	4'-0"	5'-4"	2'-0"	2'-11"	1'-8"	1.72	1.83	1.82	2 -#6 Bars x 2'-6"
42"	9.6	4'-6"	5'-10"	2'-3"	3'-6"	2'-0"	2.34	2.47		2 -#6 Bars x 2'-6"
48"	12.6	5'-0"	6'-4"	2'-6"	4'-0"	2'-0"	2.74	2.90		2 -#6 Bars x 2'-6"

GENERAL NOTES

1. Winged concrete endwalls are intended for use outside the clear zone.
2. Chamfer all exposed edges ¾".
3. Concrete shall be Class I, except ASTM C478 (4000 psi) Concrete may be substituted for precast items manufactured in plants meeting the requirements of Section 449 of the Specifications.
4. Endwall to be paid for under the contract unit price for Class I Concrete.
5. Sodding to be in accordance with Index No. 281, and paid for under the contract unit price for Performance Turf, SY.

LAST REVISION	REVISION	DESCRIPTION:				
07/01/09			FDOT DESIGN STANDARDS 2013	WINGED CONCRETE ENDWALLS SINGLE ROUND PIPE	INDEX NO. 266	SHEET NO. 1



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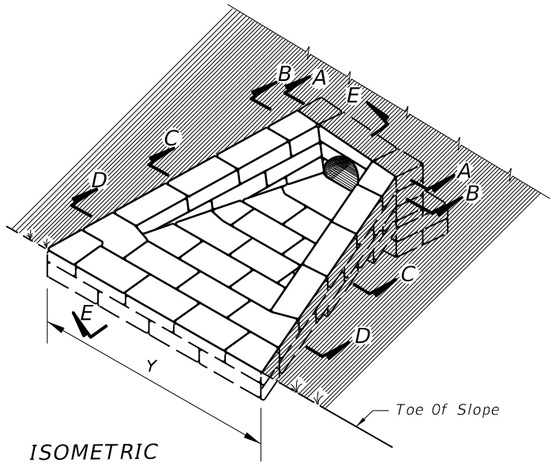
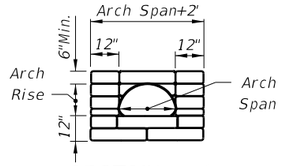


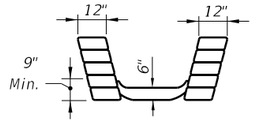
ISOMETRIC

GENERAL NOTES

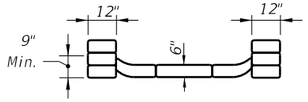
1. U-Type Sand-Cement Endwalls Are Intended For Use Outside The Clear Zone.



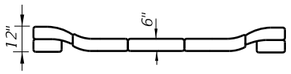
SECTION AA



SECTION BB

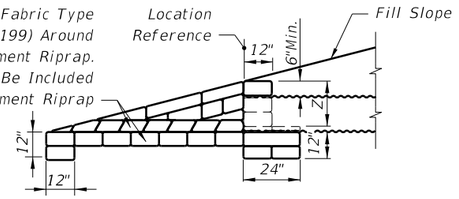


SECTION CC



SECTION DD

Place Plastic Filter Fabric Type D-4 (See Index No. 199) Around And Below Sand-Cement Riprap. Cost Of Fabric To Be Included In Cost Of Sand-Cement Riprap



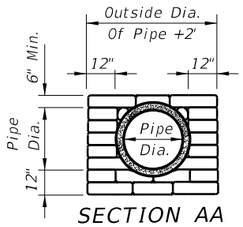
SECTION EE

DETAILS FOR SINGLE METAL PIPE ARCH CULVERTS

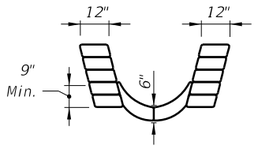
NOTE: For multiple metal pipe arch culvert spacing between arch centers=X

DIMENSIONS AND QUANTITIES FOR METAL PIPE ARCH CULVERTS

Span	Rise	Dimensions						Quantity Of Sand-Cement Riprap In Cu. Yds. For One Endwall							
		X	Y				Z	For 1:2 Slopes				For 1:4 Slopes			
			1-Arch	2-Arch	3-Arch	4-Arch		1-Arch	2-Arch	3-Arch	4-Arch	1-Arch	2-Arch	3-Arch	4-Arch
17"	13"	2'-6"	6'-6"	9'-0"	11'-6"	14'-0"	1'-7"	1.0	1.5	2.0	2.5	1.5	2.2	2.9	3.6
21"	15"	2'-10"	7'-6"	10'-4"	13'-2"	16'-0"	1'-9"	1.2	1.8	2.4	3.0	1.9	2.7	3.5	4.3
28"	20"	3'-5"	9'-3"	12'-8"	16'-1"	19'-6"	2'-0"	1.7	2.5	3.3	4.1	2.6	3.7	4.8	5.9
35"	24"	4'-0"	11'-0"	15'-0"	19'-0"	23'-0"	2'-0"	2.2	3.1	4.0	4.9	3.4	4.7	6.0	7.3
42"	29"	4'-9"	12'-9"	17'-6"	22'-3"	27'-0"	2'-0"	2.9	4.1	5.3	6.5	4.5	6.1	7.7	9.3
49"	33"	5'-6"	14'-6"	20'-0"	25'-6"	31'-0"	2'-0"	3.5	4.9	6.3	7.7	5.5	7.4	9.3	11.2
57"	38"	6'-4"	16'-6"	22'-10"	29'-2"	35'-6"	2'-0"	4.4	6.1	7.8	9.5	6.9	9.2	11.5	13.8
64"	43"	7'-1"	18'-3"	25'-4"	32'-5"	39'-6"	2'-0"	5.1	7.0	8.9	10.8	8.1	10.7	13.3	15.9
71"	47"	7'-10"	20'-0"	27'-10"	35'-8"	43'-6"	2'-0"	5.9	8.1	10.3	12.5	9.5	12.4	15.3	18.2



SECTION AA



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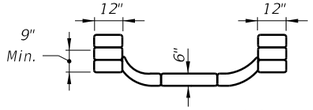

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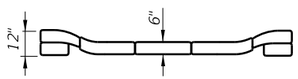
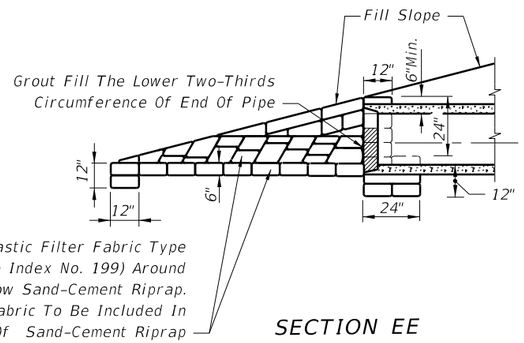


SECTION DD



Place Plastic Filter Fabric Type D-4 (See Index No. 199) Around And Below Sand-Cement Riprap. Cost Of Fabric To Be Included In Cost Of Sand-Cement Riprap

SECTION EE

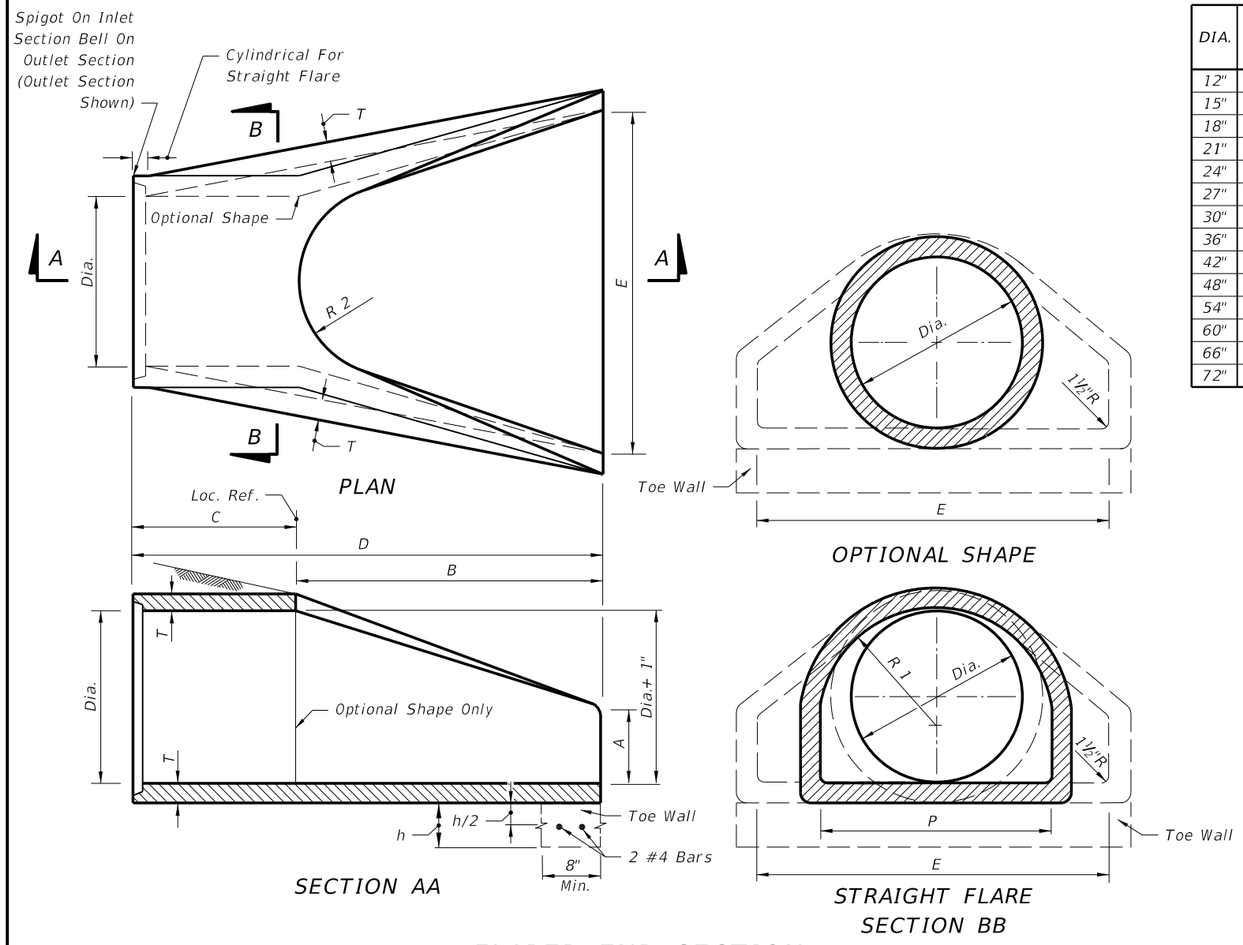
DETAIL FOR SINGLE PIPE CULVERT

Note: For multiple pipe culvert spacing between pipe centers=X

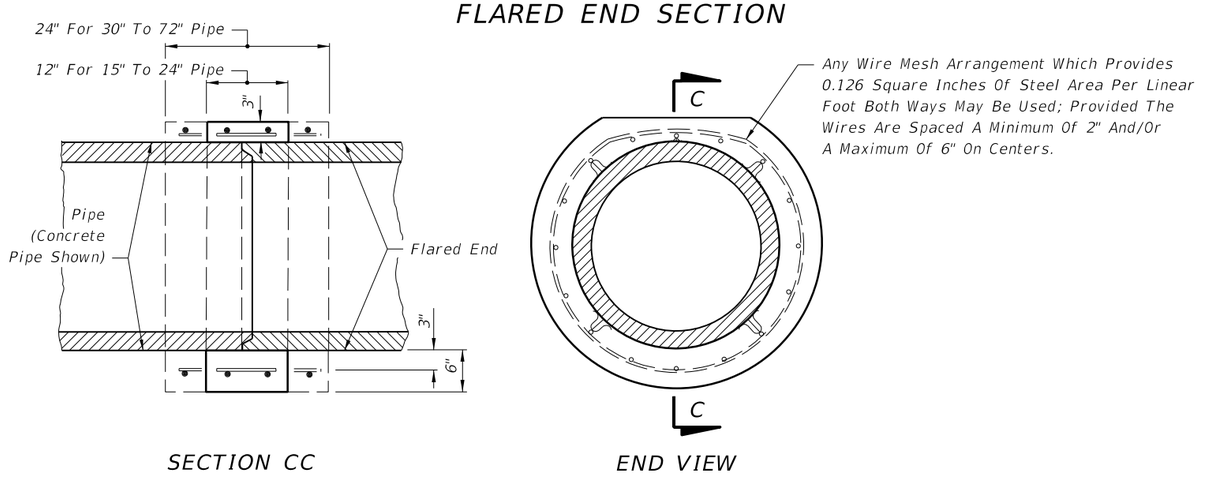
DIMENSIONS AND QUANTITIES FOR ROUND PIPE CULVERTS

Pipe Dia.	Dimensions					Quantity Of Sand-Cement Riprap In Cu. Yds. For One Endwall							
	X	Y				For 1:2 Slopes				For 1:4 Slopes			
		1-Pipe	2-Pipes	3-Pipes	4-Pipes	1-Pipe	2-Pipes	3-Pipes	4-Pipes	1-Pipe	2-Pipes	3-Pipes	4-Pipes
15"	2'-7"	7'-0"	9'-7"	12'-2"	14'-9"	1.2	1.6	2.1	2.6	1.7	2.4	3.0	3.6
18"	2'-10"	8'-0"	10'-10"	13'-8"	16'-6"	1.4	2.0	2.6	3.1	2.1	2.9	3.7	4.4
24"	3'-5"	10'-0'	13'-5"	16'-10"	20'-3"	1.9	2.7	3.5	4.3	2.9	4.0	5.1	6.3
30"	4'-3"	12'-0"	16'-3"	20'-6"	24'-9"	2.5	3.6	4.8	5.9	3.8	5.4	7.0	8.6
36"	5'-1"	14'-0"	19'-1"	24'-2"	29'-3"	3.1	4.6	6.2	7.7	4.8	7.0	9.2	11.4
42"	6'-0"	16'-0"	22'-0"	28'-0"	34'-0"	3.8	5.8	7.7	9.7	6.0	8.8	11.7	14.5
48"	6'-9"	18'-0"	24'-9"	31'-6"	38'-3"	4.5	7.0	9.4	11.8	7.2	10.8	14.3	17.9
54"	7'-8"	20'-0"	27'-8"	35'-4"	43'-0"	5.3	8.3	11.3	14.2	8.5	12.9	17.3	21.7
60"	8'-6"	22'-0"	30'-6"	39'-0"	47'-6"	6.2	9.7	13.3	16.9	10.0	15.3	20.6	25.9

LAST REVISION	REVISION	DESCRIPTION:				
00			FDOT DESIGN STANDARDS 2013	U-TYPE SAND-CEMENT ENDWALLS	INDEX NO. 268	SHEET NO. 1



FLARED END SECTION



REINFORCED CONCRETE JACKET DETAIL

DIA.	T	REINF. (in²/ft)	BELL Or Spigot	A	B	C	D	E	P	R 1	R 2	FLAT	WEIGHT (lb)	h	TOE WALL CLASS I CONC (CY)
12"	2"	0.07	1½"	4"	2'-0"	4'-0⅞"	6'-0⅞"	2'-0"	19 15/16"	10⅛"	9"	3½"	530	12"	.06
15"	2¼"	0.07	2"	6"	2'-3"	3'-10"	6'-1"	2'-6"	24 3/16"	12½"	11"	3½"	740	12"	.07
18"	2½"	0.07	2½"	9"	2'-3"	3'-10"	6'-1"	3'-0"	29"	15½"	12"	4"	990	15"	.11
21"	2¾"	0.07	2¼"	9"	2'-11"	3'-2"	6'-1"	3'-6"	31⅝"	16⅛"	13"	4"	1280	15"	.12
24"	3"	0.07	2½"	9½"	3'-7½"	2'-6"	6'-1½"	4'-0"	33 3/16"	16 13/16"	14"	4½"	1520	18"	.17
27"	3¼"	0.148	2½"	10½"	4'-0"	2'-1½"	6'-1½"	4'-6"	36"	18 9/16"	14½"	4½"	1930	18"	.19
30"	3½"	0.148	3"	1'-0"	4'-6"	1'-7¾"	6'-1¾"	5'-0"	37"	18½"	15"	5"	2190	21"	.24
36"	4"	0.148	3½"	1'-3"	5'-3"	2'-10¾"	8'-1¾"	6'-0"	47 13/16"	24 5/16"	20"	5½"	4100	21"	.29
42"	4½"	0.148	3¾"	1'-9"	5'-3"	2'-11"	8'-2"	6'-6"	53⅞"	27½"	22"	5½"	5380	24"	.36
48"	5"	0.148	4¼"	2'-0"	6'-0"	2'-2"	8'-2"	7'-0"	56½"	28½"	22"	5¾"	6550	24"	.39
54"	5½"	0.174	4¾"	2'-3"	5'-5"	2'-11"	8'-4"	7'-6"	65½"	33⅛"	24"	6¼"	8040	24"	.42
60"	6"	0.174	5"	2'-6"	5'-0"	3'-3"	8'-3"	8'-0"	72½"	36 11/16"	24"	6¾"	8750	24"	.44
66"	6½"	0.174	5½"	2'-0"	6'-6"	1'-9"	8'-3"	8'-6"	72"	36⅛"	24"	7¼"	10630	24"	.47
72"	7"	0.174	6"	2'-0"	6'-6"	1'-9"	8'-3"	9'-0"	77 13/16"	38 15/16"	24"	7¾"	12520	24"	.50

GENERAL NOTES

1. Flared end sections shall conform to the requirements of ASTM C76 with the exception that dimensions and reinforcement shall be as prescribed in the table above. Circumferential reinforcement may consist of either one cage or two cages of steel. Compressive strength of concrete shall be 4000 psi. Shop drawings for flared end sections having dimensions other than above must be submitted for approval to the State Drainage Engineer.

2. Connections between the flared end section and the pipe culvert may be any of the following types unless otherwise shown on the plans.

   a. Joints meeting the requirements of Section 449 of the Standard Specifications (O-Ring Gasket). Flared end section joint dimensions and tolerances shall be identical or compatible to those used in the pipe culvert joint. When pipe culvert and flared end section manufacturers are different, the compatibility of joint designs shall be certified to by the manufacturer of the flared end sections.

   b. Joints sealed with preformed plastic gaskets. The gaskets shall meet the requirements of Section 942-2 of the Standard Specifications and the minimum sizes for gaskets shall be as that specified for equivalent sizes of elliptical pipe.

   c. Reinforced concrete jackets, as detailed on this drawing. Cost of the reinforced concrete jacket to be included in the contract unit price for the flared end section. When non-coated corrugated metal pipe is called for in the plans, the pipe shall be bituminous coated in the jacketed area as specified on Index No. 280. Bituminous coating to be included in the contract unit price for the pipe culvert. Concrete jacket shall be as specified on Index No. 280. Cost of concrete and reinforcement shall be included in the contract unit price for the pipe culvert.

3. Toe walls shall be constructed when shown on the plans or at locations designated by the Engineer. Toe walls are to be cast-in-place with Class I Concrete and paid for under the contract unit price for Flared End Section (Concrete), EA. Reinforcing steel shall also be included in the cost of the Flared End Section (Concrete), EA.

4. On skewed pipe culverts the flared end sections shall be placed in line with the pipe culvert. Side slopes shall be warped as required to fit the flared end sections.

5. Flared End Section to be paid for under the contract unit price for Flared End Section (Concrete), EA. Sodding shall be in accordance with Index No. 281, and paid for under the contract unit price for Performance Turf, SY.

DESIGN NOTES

1. Flared end sections are intended for use outside the clear zone on median drain and cross drain installation, except that flared end sections for pipe sizes 12" and 15" are permitted within the clear zone. When the slope intersection permits, 12" and 15" flared end sections may be located with the culvert opening as close as 8' beyond the outside edge of the shoulder. Flared end sections are not intended for side drain installations.

2. Reinforced concrete jackets shall be used at all locations where high velocities and/or highly erosive soils may cause disjointing. These locations are to be shown on the plans.

3. Toe walls shall be used whenever the anticipated velocity of discharge and soil type are such that erosive action would occur. Toe walls are not required where ditch pavement is provided, except when disjointing would occur if the ditch pavement should fail.

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LAST REVISION	REVISION	DESCRIPTION:	FDOT DESIGN STANDARDS 2013	FLARED END SECTION	INDEX NO.	SHEET NO.
07/01/09					270	1

DIMENSIONS AND QUANTITIES

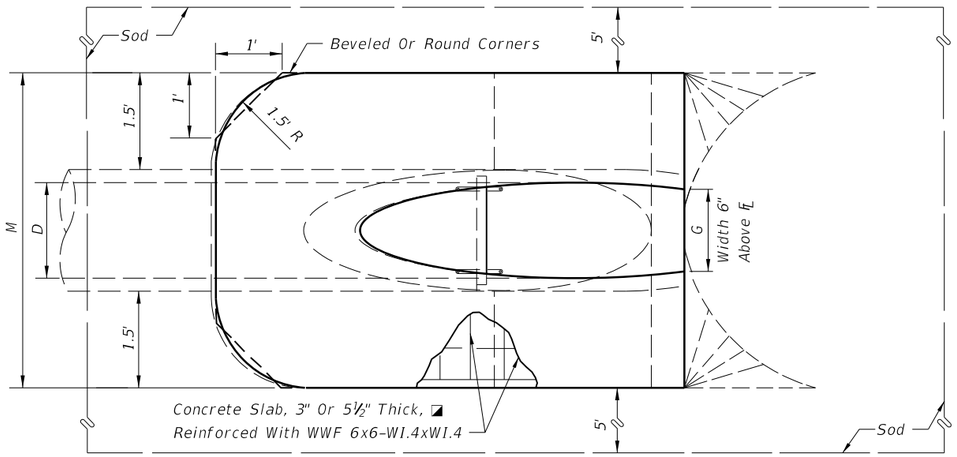
	D	X	A	B	C	E	F	G	H ■	M Single Pipe	M Double Pipe	M Triple Pipe	M Quad. Pipe	N	5½" CONCRETE SLAB (CY) ◪ Single Pipe	5½" CONCRETE SLAB (CY) ◪ Double Pipe	5½" CONCRETE SLAB (CY) ◪ Triple Pipe	5½" CONCRETE SLAB (CY) ◪ Quad. Pipe	SODDING (SY) Single Pipe	SODDING (SY) Double Pipe	SODDING (SY) Triple Pipe	SODDING (SY) Quad. Pipe
1:2 Slope	15"	2'-7"	1.92'	2.18'	4.10'	2.06'	5'	1.22'	2.9'	4.63'	7.21'	9.79'	12.37'	1.19'	0.38	0.58	0.77	0.96	21	24	27	30
	18"	2'-10"	1.97'	2.74'	4.71'	2.56'	6'	1.41'	3.4'	4.92'	7.75'	10.58'	13.42'	1.21'	0.44	0.65	0.87	1.09	22	25	28	31
	24"	3'-5"	2.06'	3.85'	5.91'	3.56'	7'	1.73'	3.4'	5.50'	8.92'	12.33'	15.75'	1.25'	0.54	0.83	1.12	1.42	24	28	32	35
	30"	4'-3"	2.15'	4.95'	7.10'	4.56'	8'	2.00'	3.4'	6.08'	10.33'	14.58'	18.83'	1.29'	0.66	1.09	1.50	1.91	26	31	35	40
	36"	5'-1"	2.25'	6.08'	8.33'	5.56'	9'	2.24'	3.4'	6.67'	11.75'	16.83'	21.92'	1.33'	0.81	1.38	1.95	2.51	28	34	39	45
	42"	6'-0"	2.34'	7.21'	9.55'	6.56'	10'	2.45'	3.4'	7.25'	13.25'	19.25'	25.25'	1.38'	0.97	1.70	2.45	3.19	30	37	43	50
	48"	6'-9"	2.43'	8.33'	10.76'	7.56'	11'	2.65'	3.4'	7.83'	14.58'	21.33'	28.08'	1.42'	1.13	2.04	2.93	3.84	32	39	47	54
	54"	7'-8"	2.52'	9.44'	11.96'	8.56'	12'	2.83'	3.4'	8.42'	16.08'	23.75'	31.42'	1.46'	1.31	2.44	3.58	4.72	34	42	51	59
	60"	8'-6"	2.62'	10.56'	13.18'	9.56'	14'	3.00'	4.4'	9.00'	17.50'	26.00'	34.50'	1.50'	1.51	2.89	4.28	5.68	36	45	55	64
	66"	9'-2"	2.71'	11.68'	14.39'	10.56'	15'	3.18'	4.4'	9.58'	18.75'	27.92'	37.08'	1.54'	1.68	3.25	4.84	6.43	38	48	58	68
	72"	10'-0"	2.80'	12.80'	15.60'	11.56'	16'	3.30'	4.4'	10.16'	20.16'	30.16'	40.16'	1.58'	1.89	3.74	5.59	7.45	40	51	62	73
1:4 Slope	15"	2'-7"	2.27'	4.09'	6.36'	4.03'	8'	1.22'	4.0'	4.63'	7.21'	9.79'	12.37'	1.19'	0.57	0.87	1.15	1.44	23	26	29	32
	18"	2'-10"	2.36'	5.12'	7.48'	5.03'	9'	1.41'	4.0'	4.92'	7.75'	10.58'	13.42'	1.21'	0.66	0.99	1.31	1.65	25	28	31	35
	24"	3'-5"	2.53'	7.18' △	9.71'	7.03' △	11'	1.73'	4.0'	5.50'	8.92'	12.33'	15.75'	1.25'	0.85	1.30	1.75	2.20	28	32	36	40
	30"	4'-3"	2.70'	9.25'	11.95'	9.03'	13'	2.00'	4.0'	6.08'	10.33'	14.58'	18.83'	1.29'	1.10	1.74	2.39	3.05	31	36	41	46
	36"	5'-1"	2.87'	11.31' ◇	14.18'	11.03' ◇	15'	2.24'	4.0'	6.67'	11.75'	16.83'	21.92'	1.33'	1.32	2.21	3.08	3.96	34	40	46	52
	42"	6'-0"	3.05'	13.37'	16.42'	13.03'	17'	2.45'	4.0'	7.25'	13.25'	19.25'	25.25'	1.38'	1.58	2.76	3.91	5.09	38	44	51	58
	48"	6'-9"	3.22'	15.43'	18.65'	15.03'	19'	2.65'	4.0'	7.83'	14.58'	21.33'	28.08'	1.42'	1.85	3.30	4.73	6.17	41	48	56	63
	54"	7'-8"	3.39'	17.49'	20.88'	17.03'	21'	2.83'	4.0'	8.42'	16.08'	23.75'	31.42'	1.46'	2.14	3.95	5.77	7.58	44	52	61	69
	60"	8'-6"	3.56'	19.55'	23.11'	19.03'	23'	3.00'	4.0'	9.00'	17.50'	26.00'	34.50'	1.50'	2.45	4.66	6.87	9.07	47	56	66	75
	66"	9'-2"	3.73'	21.62'	25.35'	21.03'	25'	3.18'	4.0'	9.58'	18.75'	27.92'	37.08'	1.54'	2.88	5.54	8.18	10.84	49	59	69	80
	72"	10'-0"	3.91'	23.68'	27.59'	23.03'	27'	3.30'	4.0'	10.16'	20.16'	30.16'	40.16'	1.58'	3.54	6.61	9.87	13.13	52	63	74	85

◪ See General Note No. 5.
See Sheet 5 For 3" Slab Quantities

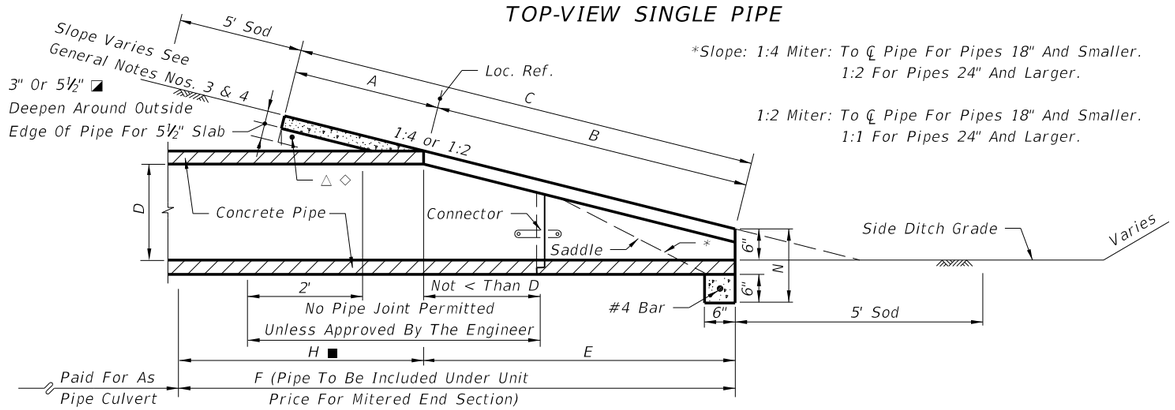
■ Values shown for estimating pipe quantities and are for information only.

B	E	
△ 6.42'	△ 6.25'	Dimensions permitted to allow use of 8' standard pipe lengths.
◇ 10.40'	◇ 10.10'	Dimensions permitted to allow use of 12' standard pipe lengths.

△ ◇ Concrete slab shall be deepened to form bridge across crown of pipe. See section below.



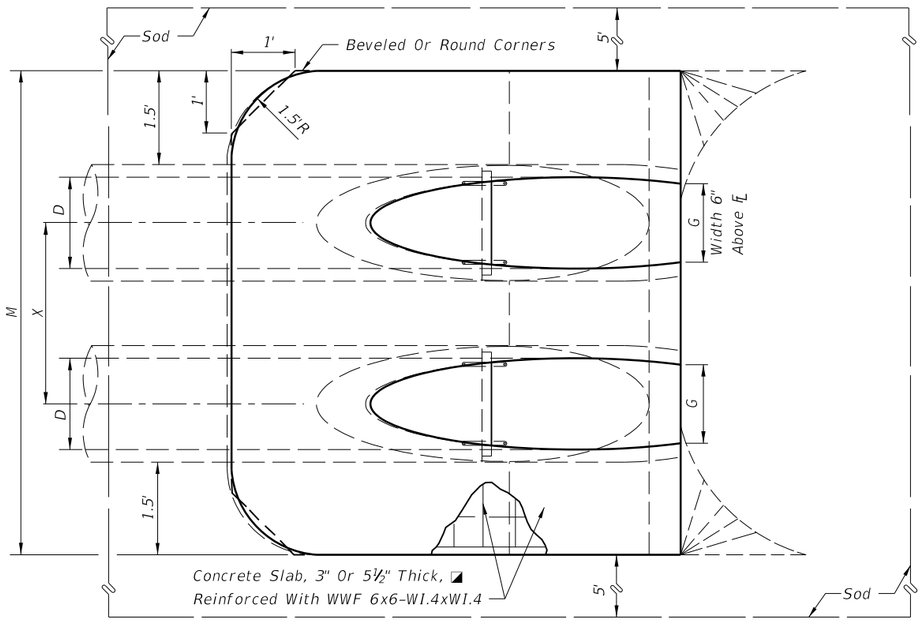
TOP-VIEW SINGLE PIPE



*Slope: 1:4 Miter: To ℄ Pipe For Pipes 18" And Smaller.
1:2 For Pipes 24" And Larger.

1:2 Miter: To ℄ Pipe For Pipes 18" And Smaller.
1:1 For Pipes 24" And Larger.

SECTION



TOP-VIEW MULTIPLE PIPE

NOTE: See sheet 6 for details and notes.

SINGLE AND MULTIPLE ROUND CONCRETE PIPE

LAST REVISION	REVISION	DESCRIPTION:		INDEX NO.	SHEET NO.
02			FDOT DESIGN STANDARDS 2013	272	1

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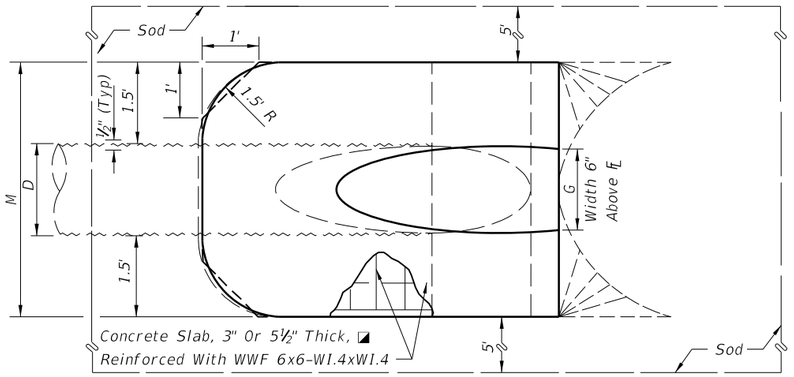
DIMENSIONS AND QUANTITIES

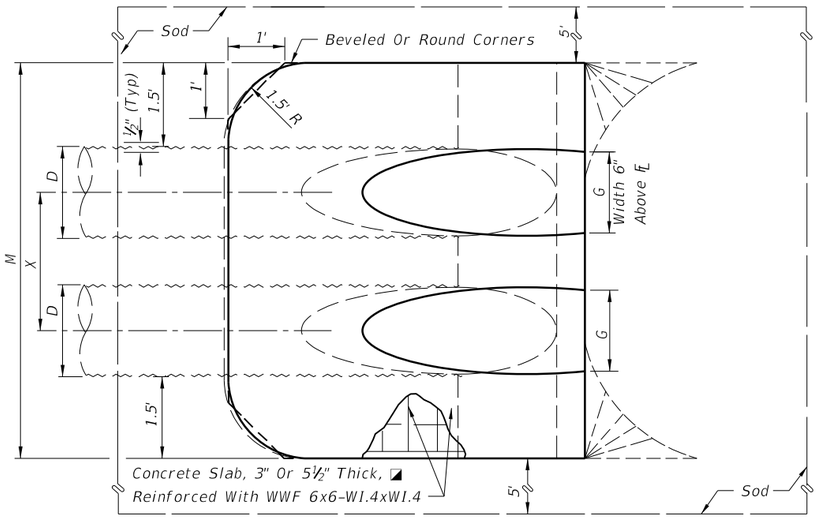
	D	X	A	B	C	E	F	G	H ■	M				N	5½" CONCRETE SLAB (CY) ◪				SODDING (SY)			
										Single Pipe	Double Pipe	Triple Pipe	Quad. Pipe		Single Pipe	Double Pipe	Triple Pipe	Quad. Pipe	Single Pipe	Double Pipe	Triple Pipe	Quad. Pipe
1:2 Slope	15"	2'-7"	2.5'	1.68'	4.18'	1.5'	5.0'	1.23'	3.5'	4.33'	6.92'	9.50'	12.08'	1.04'	0.35	0.54	0.74	0.94	21	24	27	29
	18"	2'-10"	2.5'	2.24'	4.74'	2.0'	6.0'	1.41'	4'	4.58'	7.42'	10.25'	13.08'	1.04'	0.38	0.62	0.87	1.12	22	25	28	31
	24"	3'-5"	2.5'	3.35'	5.85'	3.0'	7.0'	1.73'	4'	5.08'	8.50'	11.92'	15.33'	1.04'	0.47	0.76	1.05	1.34	23	27	31	35
	30"	4'-3"	2.5'	4.47'	6.97'	4.0'	8.0'	2.00'	4'	5.58'	9.83'	14.08'	18.33'	1.04'	0.57	0.96	1.37	1.77	25	30	35	39
	36"	5'-1"	2.5'	5.59'	8.09'	5.0'	9.0'	2.24'	4'	6.08'	11.17'	16.25'	21.33'	1.04'	0.67	1.19	1.72	2.26	27	33	38	44
	42"	6'-0"	2.5'	6.71'	9.21'	6.0'	10.0'	2.45'	4'	6.58'	12.58'	18.58'	24.58'	1.04'	0.78	1.48	2.17	2.87	29	36	42	49
	48"	6'-9"	2.5'	7.83'	10.33'	7.0'	11.0'	2.65'	4'	7.08'	13.83'	20.58'	27.33'	1.04'	0.89	1.71	2.54	3.36	31	38	46	53
	54"	7'-8"	2.5'	8.94'	11.44'	8.0'	12.0'	2.83'	4'	7.58'	15.25'	22.92'	30.58'	1.04'	1.02	2.06	3.10	4.14	33	41	50	58
	60"	8'-6"	2.5'	10.06'	12.56'	9.0'	13.0'	3.00'	4'	8.08'	16.58'	25.08'	33.58'	1.04'	1.14	2.38	3.63	4.89	34	44	53	63
1:4 Slope	15"	2'-7"	2.5'	3.09'	5.59'	3.0'	7.0'	1.23'	4'	4.33'	6.92'	9.50'	12.08'	1.04'	0.44	0.68	0.91	1.15	22	25	28	31
	18"	2'-10"	2.5'	4.12'	6.62'	4.0'	8.0'	1.41'	4'	4.58'	7.42'	10.25'	13.08'	1.04'	0.49	0.77	1.03	1.31	24	27	30	33
	24"	3'-5"	2.5'	6.18'	8.68'	6.0'	10.0'	1.73'	4'	5.08'	8.50'	11.92'	15.33'	1.04'	0.65	1.09	1.38	1.77	27	30	34	38
	30"	4'-3"	2.5'	8.25'	10.75'	8.0'	12.0'	2.00'	4'	5.58'	9.83'	14.08'	18.33'	1.04'	0.81	1.34	1.90	2.44	29	34	39	44
	36"	5'-1"	2.5'	10.31'	12.81'	10.0'	14.0'	2.24'	4'	6.08'	11.17'	16.25'	21.33'	1.04'	0.97	1.68	2.41	3.14	32	38	44	49
	42"	6'-0"	2.5'	12.37'	14.87'	12.0'	16.0'	2.45'	4'	6.58'	12.58'	18.58'	24.58'	1.04'	1.13	2.08	3.06	4.02	35	42	48	55
	48"	6'-9"	2.5'	14.43'	16.93'	14.0'	18.0'	2.65'	4'	7.08'	13.83'	20.58'	27.33'	1.04'	1.29	2.49	3.69	4.88	38	46	53	60
	54"	7'-8"	2.5'	16.49'	18.99'	16.0'	20.0'	2.83'	4'	7.58'	15.25'	22.92'	30.58'	1.04'	1.48	2.98	4.47	5.98	41	49	58	66
	60"	8'-6"	2.5'	18.55'	21.05'	18.0'	22.0'	3.00'	4'	8.08'	16.58'	25.08'	33.58'	1.04'	1.66	3.49	5.31	7.13	44	53	63	72

◪ See General Note No. 5. See Sheet 5 For 3" Slab Quantities

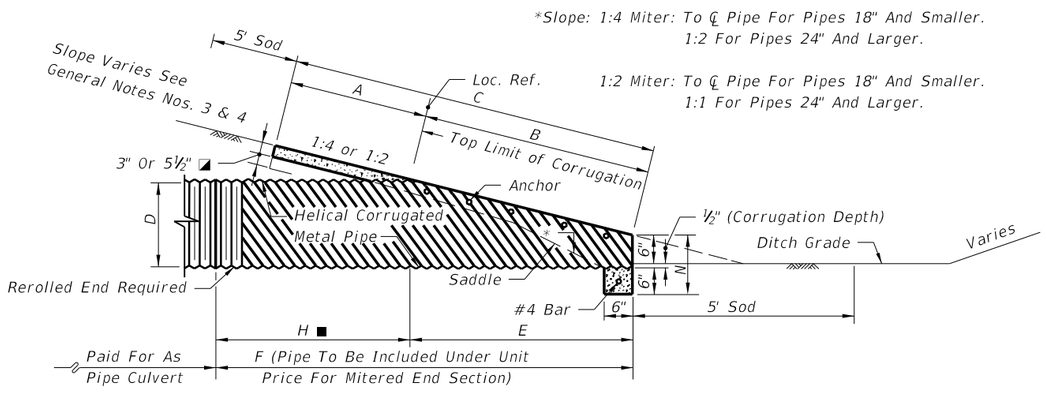
■ Values shown for estimating pipe quantities and are for information only



TOP VIEW-SINGLE PIPE



TOP VIEW-MULTIPLE PIPE



SECTION

*Slope: 1:4 Miter: To ℄ Pipe For Pipes 18" And Smaller.
1:2 For Pipes 24" And Larger.

1:2 Miter: To ℄ Pipe For Pipes 18" And Smaller.
1:1 For Pipes 24" And Larger.

NOTE: See Sheet 6 For Details And Notes.

SINGLE AND MULTIPLE ROUND CORRUGATED METAL PIPE

LAST REVISION	REVISION	DESCRIPTION:				
02			FDOT DESIGN STANDARDS 2013	CROSS DRAIN MITERED END SECTION	INDEX NO. 272	SHEET NO. 2

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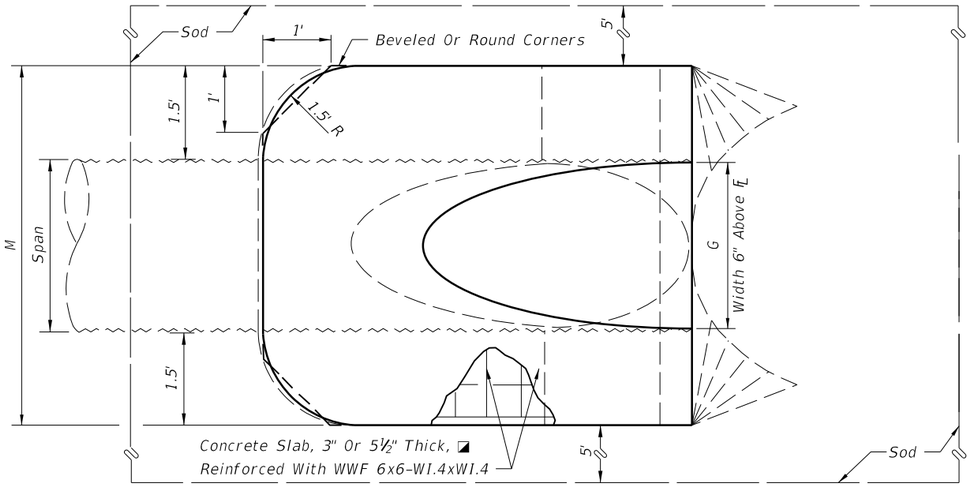
1974 AASHTO — DIMENSIONS AND QUANTITIES

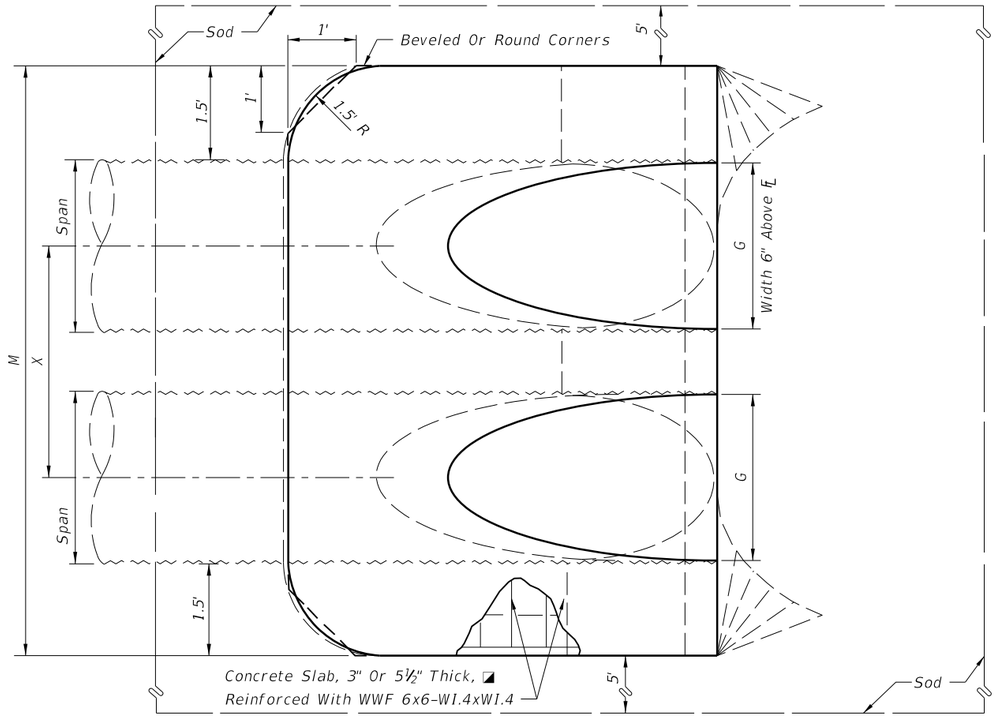
	SPAN	RISE	X	A	B	C	E	F	G	H ■	M				N	5½" CONCRETE SLAB (CY) ◪				SODDING (SY)			
											Single Pipe	Double Pipe	Triple Pipe	Quad. Pipe		Single Pipe	Double Pipe	Triple Pipe	Quad. Pipe	Single Pipe	Double Pipe	Triple Pipe	Quad. Pipe
1:2 Slope	17"	13"	2'-6"	2.5'	1.30'	3.80'	1.17'	4'	1.39'	2.8'	4.50'	7.00'	9.50'	12.00'	1.04'	0.41	0.61	0.81	1.02	21	23	26	29
	21"	15"	2'-10"	2.5'	1.68'	4.17'	1.50'	5'	1.76'	3.5'	4.83'	7.67'	10.50'	13.33'	1.04'	0.43	0.66	0.88	1.10	22	25	28	31
	28"	20"	3'-5"	2.5'	2.61'	5.11'	2.33'	6'	2.22'	3.7'	5.42'	8.83'	12.25'	15.67'	1.04'	0.51	0.78	1.06	1.33	23	27	30	34
	35"	24"	4'-0"	2.5'	3.35'	5.85'	3.00'	7'	2.55'	4.0'	6.00'	10.00'	14.00'	18.00'	1.04'	0.57	0.90	1.22	1.55	24	29	33	38
	42"	29"	4'-9"	2.5'	4.29'	6.79'	3.83'	8'	2.97'	4.2'	6.58'	11.33'	16.08'	20.83'	1.04'	0.64	1.04	1.46	1.87	26	31	37	42
	49"	33"	5'-6"	2.5'	5.03'	7.53'	4.50'	9'	3.34'	4.5'	7.17'	12.67'	18.17'	23.67'	1.04'	0.73	1.23	1.72	2.22	28	34	40	46
	57"	38"	6'-4"	2.5'	5.96'	8.46'	5.33'	10'	3.65'	4.7'	7.83'	14.17'	20.50'	26.83'	1.04'	0.83	1.44	2.04	2.64	29	36	44	51
	64"	43"	7'-1"	2.5'	6.89'	9.39'	6.17'	11'	3.89'	4.8'	8.42'	15.50'	22.58'	29.67'	1.04'	0.95	1.67	2.39	3.11	31	39	47	55
	71"	47"	7'-10"	2.5'	7.64'	10.14'	6.83'	12'	4.14'	5.2'	9.00'	16.83'	24.67'	32.50'	1.04'	1.05	1.89	2.74	3.57	33	41	50	59
1:4 Slope	17"	13"	2'-6"	2.5'	2.41'	4.91'	2.33'	7'	1.39'	4.7'	4.50'	7.00'	9.50'	12.00'	1.04'	0.48	0.71	0.95	1.18	22	25	27	30
	21"	15"	2'-10"	2.5'	3.09'	5.59'	3.00'	8'	1.76	5.0'	4.83'	7.67'	10.50'	13.33'	1.04'	0.52	0.80	1.09	1.31	23	26	29	32
	28"	20"	3'-5"	2.5'	4.81'	7.31'	4.67'	9'	2.22'	4.3'	5.42'	8.83'	12.25'	15.67'	1.04'	0.61	0.92	1.27	1.59	25	29	33	37
	35"	24"	4'-0"	2.5'	6.18'	8.68'	6.00'	11'	2.55'	5.0'	6.00'	10.00'	14.00'	18.00'	1.04'	0.73	1.14	1.55	1.97	28	32	37	41
	42"	29"	4'-9"	2.5'	7.90'	10.40'	7.67'	12'	2.97'	4.3'	6.58'	11.33'	16.08'	20.83'	1.04'	0.87	1.39	1.92	2.45	30	35	41	46
	49"	33"	5'-6"	2.5'	9.28'	11.78'	9.00'	14'	3.34'	5.0'	7.17'	12.67'	18.17'	23.67'	1.04'	1.00	1.66	2.30	2.96	32	38	45	51
	57"	38"	6'-4"	2.5'	11.00'	13.50'	10.67'	16'	3.65'	5.3'	7.83'	14.17'	20.50'	26.83'	1.04'	1.18	2.00	2.82	3.64	35	42	49	56
	64"	43"	7'-1"	2.5'	12.71'	15.21'	12.33'	17'	3.89'	4.7'	8.42'	15.50'	22.58'	29.67'	1.04'	1.36	2.39	3.38	4.38	38	45	53	61
	71"	47"	7'-10"	2.5'	14.09'	16.59'	13.67'	19'	4.14'	5.3'	9.00'	16.83'	24.67'	32.50'	1.04'	1.50	2.65	3.81	4.97	40	48	57	66

◪ See General Note No. 5.
See Sheet 5 For 3" Slab Quantities

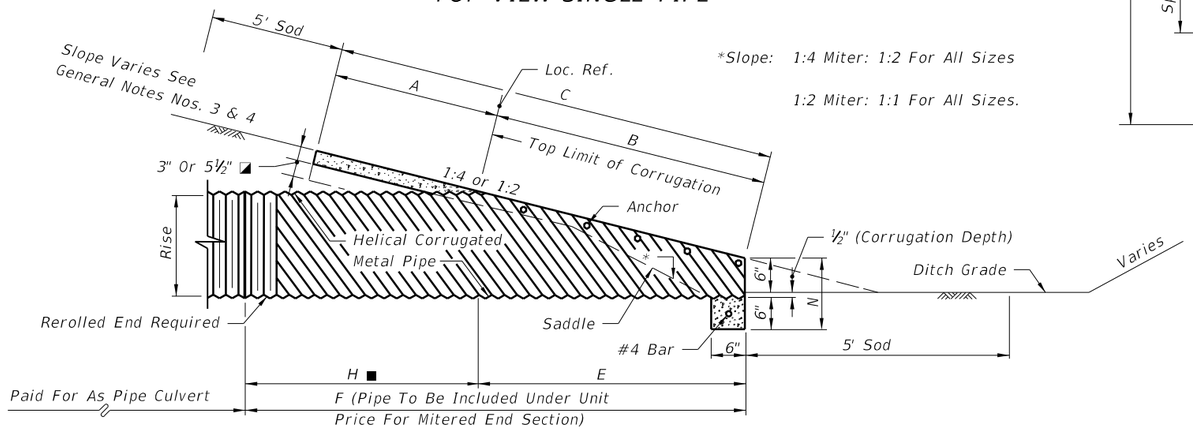
■ Values shown for estimating pipe quantities and are for information.



TOP VIEW-SINGLE PIPE



TOP VIEW-MULTIPLE PIPE



*Slope: 1:4 Miter: 1:2 For All Sizes
1:2 Miter: 1:1 For All Sizes.

SECTION

NOTE: See Sheet 6 For Details And Notes.

SINGLE AND MULTIPLE CORRUGATED METAL PIPE-ARCH

LAST REVISION	REVISION	DESCRIPTION:				
02			FDOT DESIGN STANDARDS 2013	CROSS DRAIN MITERED END SECTION	INDEX NO. 272	SHEET NO. 3

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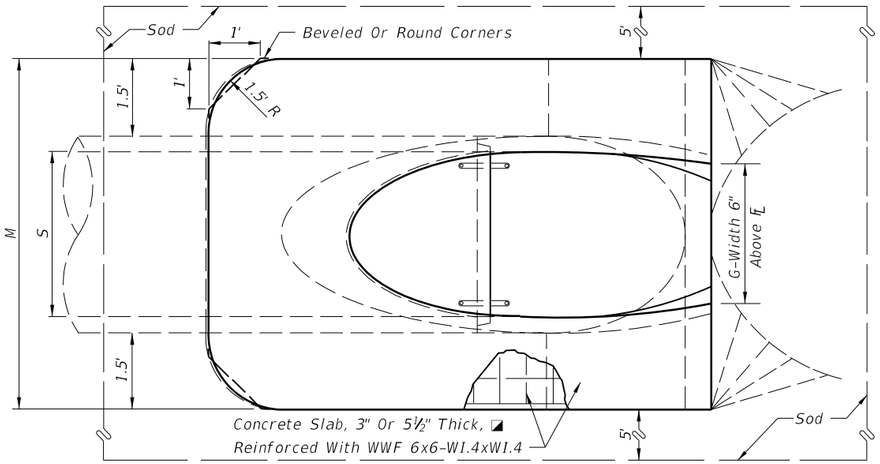
DIMENSIONS & QUANTITIES

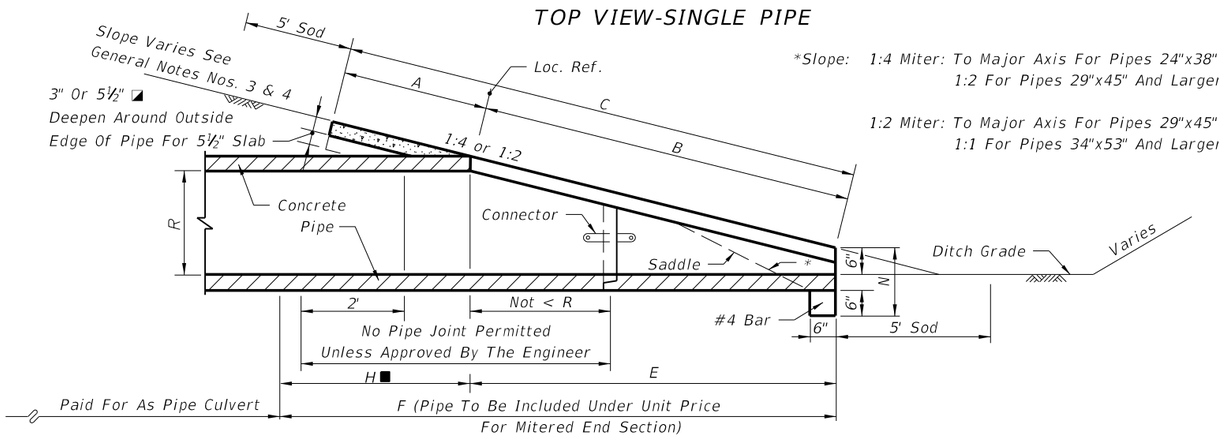
	Rise R	Span S	X	A	B	C	E	F	G	H ■	M				N	5½" CONC. SLAB (CY) ◪				SODDING (SY)			
											Single Pipe	Double Pipe	Triple Pipe	Quad. Pipe		Single Pipe	Double Pipe	Triple Pipe	Quad. Pipe	Single Pipe	Double Pipe	Triple Pipe	Quad. Pipe
1:2 Slope	12"	18"	2'-10"	1.97'	1.62'	3.59'	1.56'	4'	1.50'	2.4'	4.92'	7.75'	10.58'	13.42'	1.21'	0.30	0.49	0.67	0.85	21	24	27	30
	14"	23"	3'-4"	2.01'	1.99'	4.00'	1.89'	5'	1.90'	3.1'	5.38'	8.71'	12.04'	15.38'	1.23'	0.37	0.59	0.81	1.02	22	26	29	33
	19"	30"	4'-0"	2.11'	2.92'	5.03'	2.73'	6'	2.37'	3.3'	6.04'	10.04'	14.04'	18.04'	1.27'	0.50	0.80	1.09	1.39	24	28	33	37
	24"	38"	5'-0"	2.20'	3.85'	6.05'	3.56'	7'	2.85'	3.4'	6.79'	11.79'	16.79'	21.79'	1.31'	0.62	1.03	1.45	1.86	26	31	37	42
	29"	45"	5'-11"	2.34'	4.79'	7.13'	4.39'	8'	3.19'	3.6'	7.50'	13.42'	19.33'	25.25'	1.38'	0.75	1.30	1.84	2.39	28	34	41	47
	34"	53"	7'-0"	2.43'	5.72'	8.15'	5.23'	9'	3.57'	3.8'	8.25'	15.25'	22.25'	29.25'	1.42'	0.90	1.61	2.32	3.03	30	37	45	53
	38"	60"	7'-10"	2.52'	6.46'	8.98'	5.89'	9'	3.95'	3.1'	8.92'	16.75'	24.58'	32.42'	1.46'	1.03	1.89	2.74	3.60	31	40	49	57
	43"	68"	8'-11"	2.62'	7.39'	10.01'	6.73'	10'	4.28'	3.3'	9.67'	18.58'	27.50'	36.42'	1.50'	1.19	2.26	3.33	4.40	33	43	53	63
	48"	76"	9'-11"	2.71'	8.33'	11.04'	7.56'	11'	4.59'	3.4'	10.42'	20.33'	30.25'	40.17'	1.54'	1.38	2.65	3.93	5.21	35	46	57	68
	53"	83"	10'-8"	2.80'	9.26'	12.06'	8.39'	12'	4.77'	3.6'	11.08'	21.75'	32.42'	43.08'	1.58'	1.55	3.03	4.50	5.96	37	49	61	73
	58"	91"	11'-8"	2.90'	10.19'	13.09'	9.23'	13'	5.01'	3.8'	11.83'	23.50'	35.17'	46.83'	1.63'	1.75	3.47	5.20	6.93	39	52	65	78
1:4 Slope	12"	18"	2'-10"	2.36'	3.06'	5.42'	3.03'	5'	1.50'	2.0'	4.92'	7.75'	10.58'	13.42'	1.21'	0.45	0.68	0.92	1.14	23	26	29	32
	14"	23"	3'-4"	2.44'	3.75'	6.19'	3.70'	6'	1.90'	2.3'	5.38'	8.71'	12.04'	15.38'	1.23'	0.53	0.83	1.13	1.42	24	28	32	35
	19"	30"	4'-0"	2.62'	5.47'	8.09'	5.36'	8'	2.37'	2.6'	6.04'	10.04'	14.04'	18.04'	1.27'	0.74	1.15	1.57	1.98	27	32	36	40
	24"	38"	5'-0"	2.79'	7.18'	9.97'	7.03'	10'	2.85'	3.0'	6.79'	11.79'	16.79'	21.79'	1.31'	0.97	1.57	2.19	2.81	30	36	41	47
	29"	45"	5'-11"	3.05'	8.90'	11.95'	8.70'	12'	3.19'	3.3'	7.50'	13.42'	19.33'	25.25'	1.38'	1.22	2.07	2.92	3.77	33	40	46	53
	34"	53"	7'-0"	3.22'	10.62'	13.84'	10.36'	13'	3.57'	2.6'	8.25'	15.25'	22.25'	29.25'	1.42'	1.48	2.62	3.77	4.92	36	44	52	59
	38"	60"	7'-10"	3.39'	11.99'	15.38'	11.70'	15'	3.95'	3.3'	8.92'	16.75'	24.58'	32.42'	1.46'	1.72	3.12	4.53	5.92	38	47	56	65
	43"	68"	8'-11"	3.56'	13.71'	17.27'	13.36'	17'	4.28'	3.6'	9.67'	18.58'	27.50'	36.42'	1.50'	2.02	3.78	5.56	7.32	41	51	61	71
	48"	76"	9'-11"	3.73'	15.43'	19.16'	15.03'	19'	4.59'	4.0'	10.42'	20.33'	30.25'	40.17'	1.54'	2.34	4.49	6.64	8.79	44	55	66	77
	53"	83"	10'-8"	3.91'	17.15'	21.06'	16.70'	20'	4.77'	3.3'	11.08'	21.75'	32.42'	43.08'	1.58'	2.66	5.17	7.66	10.16	47	59	71	83
	58"	91"	11'-8"	4.08'	18.87'	22.95'	18.36'	22'	5.01'	3.6'	11.83'	23.50'	35.17'	46.83'	1.63'	3.02	5.98	8.95	11.90	50	63	76	89

◪ See General Note No. 3.
See Sheet 5 For 3" Slab Quantities

■ Values shown for estimating pipe quantities and are for information only.



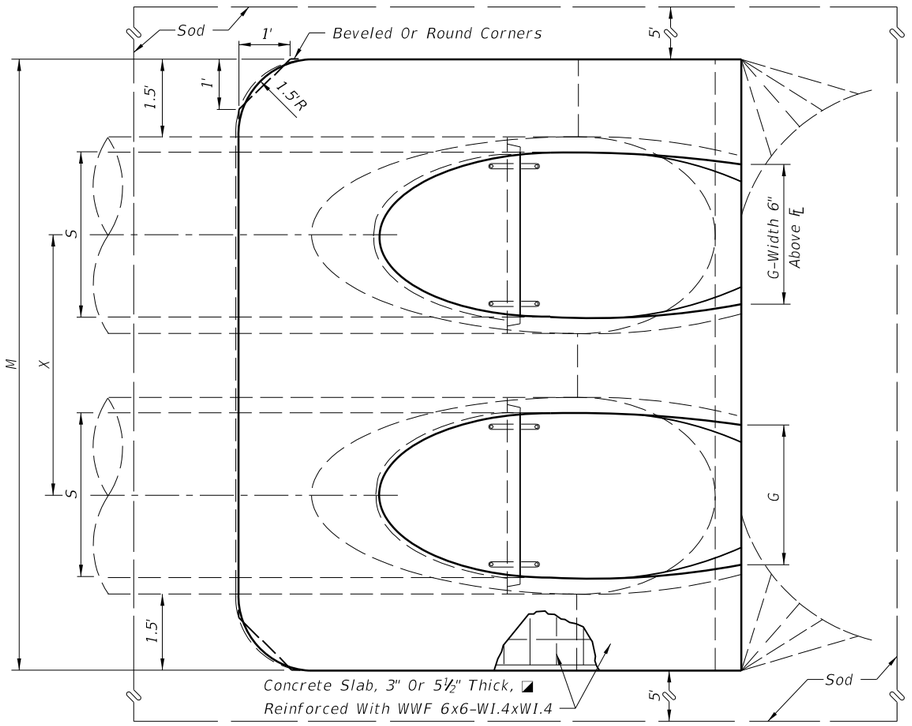
TOP VIEW-SINGLE PIPE



SECTION

*Slope: 1:4 Miter: To Major Axis For Pipes 24"x38" And Smaller.
1:2 For Pipes 29"x45" And Larger.

1:2 Miter: To Major Axis For Pipes 29"x45" And Smaller.
1:1 For Pipes 34"x53" And Larger.



NOTE: See Sheet 6 For Details And Notes.

TOP VIEW - MULTIPLE PIPE

SINGLE AND MULTIPLE ELLIPTICAL CONCRETE PIPE

LAST REVISION	REVISION	DESCRIPTION:			INDEX NO.	SHEET NO.
02			FDOT DESIGN STANDARDS 2013	CROSS DRAIN MITERED END SECTION	272	4

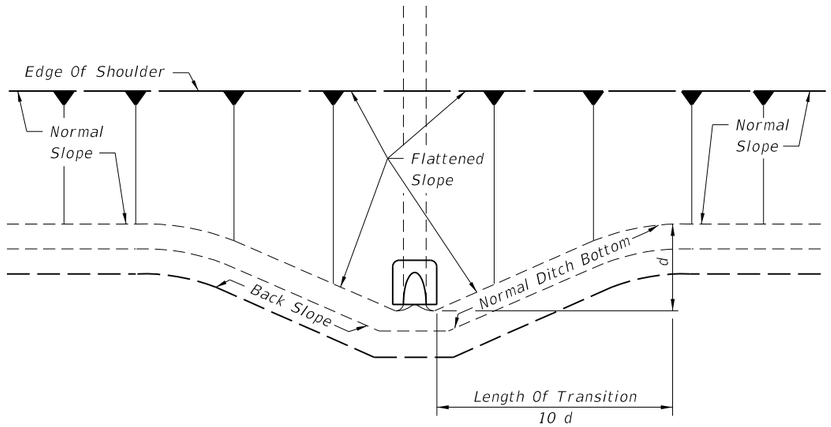
QUANTITIES FOR 3" THICK CONCRETE SLABS (CY)

	D	ROUND-CONCRETE			
		Single Pipe	Double Pipe	Triple Pipe	Quad. Pipe
1:2 Slope	15"	0.27	0.41	0.54	0.67
	18"	0.31	0.45	0.60	0.75
	24"	0.39	0.59	0.79	1.00
	30"	0.46	0.76	1.04	1.32
	36"	0.55	0.94	1.33	1.71
	42"	0.66	1.15	1.66	2.15
	48"	0.76	1.37	1.96	2.57
	54"	0.87	1.62	2.38	3.14
	60"	0.99	1.90	2.81	3.73
	66"	1.11	2.15	3.21	4.27
	72"	1.24	2.46	3.68	4.90
1:4 Slope	15"	0.40	0.61	0.80	1.00
	18"	0.47	0.69	0.91	1.14
	24"	0.60	0.90	1.21	1.52
	30"	0.76	1.19	1.63	2.07
	36"	0.89	1.48	2.05	2.63
	42"	1.05	1.82	2.57	3.34
	48"	1.21	2.15	3.07	4.00
	54"	1.39	2.55	3.72	4.88
	60"	1.59	3.02	4.44	5.86
	66"	1.91	3.66	5.40	7.15
	72"	2.12	4.18	6.24	8.30

	D	ROUND-CMP			
		Single Pipe	Double Pipe	Triple Pipe	Quad. Pipe
1:2 Slope	15"	0.24	0.37	0.51	0.64
	18"	0.26	0.43	0.61	0.78
	24"	0.32	0.52	0.72	0.91
	30"	0.38	0.64	0.91	1.18
	36"	0.44	0.78	1.13	1.48
	42"	0.51	0.96	1.41	1.87
	48"	0.57	1.09	1.63	2.15
	54"	0.65	1.32	1.99	2.66
	60"	0.71	1.49	2.28	3.07
1:4 Slope	15"	0.31	0.47	0.63	0.79
	18"	0.34	0.53	0.71	0.90
	24"	0.44	0.69	0.92	1.18
	30"	0.53	0.88	1.25	1.60
	36"	0.62	1.07	1.53	2.00
	42"	0.71	1.30	1.92	2.52
	48"	0.80	1.54	2.29	3.02
	54"	0.91	1.83	2.74	3.67
	60"	1.02	2.15	3.27	4.39

	Span	Rise	CMP-ARCH			
			Single Pipe	Double Pipe	Triple Pipe	Quad. Pipe
1:2 Slope	17"	13"	0.33	0.49	0.65	0.81
	21"	15"	0.33	0.50	0.67	0.83
	28"	20"	0.37	0.56	0.76	0.95
	35"	24"	0.40	0.62	0.84	1.07
	42"	29"	0.43	0.70	0.98	1.25
	49"	33"	0.49	0.82	1.15	1.48
	57"	38"	0.55	0.95	1.35	1.75
	64"	43"	0.62	1.10	1.57	2.05
	71"	47"	0.69	1.24	1.80	2.35
1:4 Slope	17"	13"	0.38	0.56	0.74	0.92
	21"	15"	0.39	0.59	0.80	0.95
	28"	20"	0.43	0.64	0.88	1.10
	35"	24"	0.49	0.77	1.05	1.33
	42"	29"	0.57	0.92	1.27	1.62
	49"	33"	0.65	1.08	1.50	1.93
	57"	38"	0.76	1.30	1.83	2.37
	64"	43"	0.87	1.55	2.18	2.83
	71"	47"	0.95	1.68	2.43	3.17

	Rise	Span	ELLIPTICAL-CONCRETE			
			Single Pipe	Double Pipe	Triple Pipe	Quad. Pipe
1:2 Slope	12"	18"	0.19	0.33	0.45	0.57
	14"	23"	0.25	0.40	0.55	0.69
	19"	30"	0.34	0.55	0.75	0.95
	24"	38"	0.43	0.71	1.00	1.28
	29"	45"	0.52	0.90	1.27	1.65
	34"	53"	0.62	1.11	1.60	2.09
	38"	60"	0.70	1.29	1.87	2.46
	43"	68"	0.81	1.54	2.26	2.99
	48"	76"	0.93	1.79	2.66	3.53
	53"	83"	1.04	2.04	3.03	4.02
	58"	91"	1.17	2.33	3.49	4.66
1:4 Slope	12"	18"	0.30	0.45	0.61	0.76
	14"	23"	0.36	0.56	0.76	0.95
	19"	30"	0.51	0.79	1.08	1.36
	24"	38"	0.68	1.10	1.53	1.96
	29"	45"	0.86	1.45	2.04	2.63
	34"	53"	1.02	1.81	2.60	3.39
	38"	60"	1.18	2.14	3.10	4.05
	43"	68"	1.38	2.58	3.79	4.99
	48"	76"	1.59	3.05	4.51	5.97
	53"	83"	1.80	3.50	5.19	6.88
	58"	91"	2.04	4.04	6.05	8.05



PLAN

NOTE: See General Note 4

SLOPE AND DITCH TRANSITIONS

GENERAL NOTES

1. Unless otherwise designated in the plans, concrete pipe mitered end sections may be used with any type of cross drain pipe; corrugated steel pipe mitered end sections may be used with any type of cross drain pipe except aluminum pipe; and, corrugated aluminum mitered end sections may be used with any type of cross drain pipe except steel pipe. When bituminous coated metal pipe is specified for cross drain pipe, mitered end sections shall be constructed with like pipe or concrete pipe. When the mitered end section pipe is dissimilar to the cross drain pipe, a concrete jacket shall be constructed in accordance with Standard Index 280.

2. Corrugated polyethylene pipe (HDPE), polyvinyl-chloride pipe (PVC) and polypropylene pipe (PPP) for cross drain applications shall utilize either corrugated metal or concrete mitered end sections (MES). When used in conjunction with corrugated (MES), connection shall be by either a formed metal band specifically designated to join HDPE or PVC pipe, with metal pipe or other coupler approved by the State Drainage Engineer. When used in conjunction with a concrete (MES), connection shall be by concrete jacket constructed in accordance with Index No. 280.

3. Mitered end sections for pipe sizes 15", 18" and 24" round or equivalent pipe arch or elliptical pipe are permitted within the clear zone. When the slope intersection permits, the mitered end section may be located with the culvert opening as close as 8' beyond the outside edge of the shoulder.

4. Slope and ditch transitions shall be used when the normal roadway slope must be flattened to place end section outside clear zone. See detail left.

5. The reinforced concrete slab shall be constructed for all sizes of cross drain pipe and cast in place with Class NS concrete. Slabs shall be 5½" thick unless 3" thickness called for in plans.

6. Concrete pipe used in the assembly of mitered end sections shall be selective lengths to avoid excessive connections.

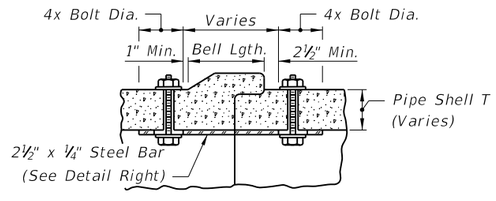
7. Corrugated metal pipe galvanizing that is damaged during beveling and perforating for mitered end section shall be repaired.

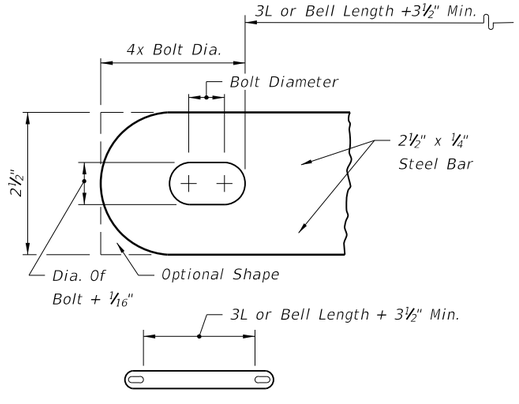
8. That portion of corrugated metal pipe in direct contact with the concrete slab and extending 12" beyond shall be bituminous coated prior to placing of the concrete.

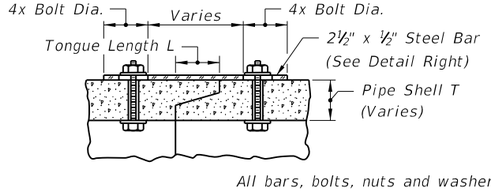
9. When existing multiple cross drain pipes are spaced other than the dimensions shown in this detail, or have non-parallel axes, or have non-uniform sections, the mitered end sections will be constructed either separately as single pipe mitered end sections or collectively as multiple pipe end sections as directed by the Engineer; however, mitered end sections will be paid for each based on each independent pipe end.

10. The cost of all pipe(s), fasteners, reinforcing, connectors, anchors, concrete, sealants, jackets, and coupling bands shall be included in the cost for the mitered end section. Sodding shall be paid for separately under the contract unit price of Performance Turf, SY.

11. Mitered end sections shall be paid for under the contract unit price for Mitered End Section (CD), Each, based on each independent pipe end.

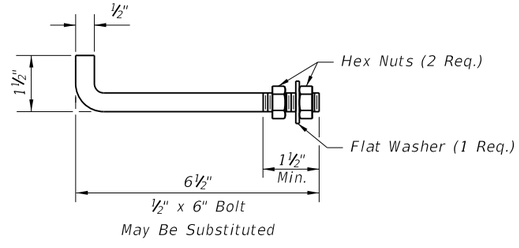






All bars, bolts, nuts and washers are to be galvanized steel.
Bolt diameters shall be ⅜" for 15" to 36" pipe and ⅝" for 42" to 72" pipe.
Two connectors required per joint, located 60° right and left of bottom center of pipe.
Bolt holes in pipe shell are to be drilled.

CONCRETE PIPE CONNECTOR



Anchors required for CMP only.

Anchor, washer and nuts to be galvanized steel.

Bend anchor where required to center in concrete slab. Damaged surfaces to be repaired after bending. Anchors are to be spaced a distance equal to four (4) corrugations. Place the anchors in the outside crest of corrugation.

Flat washers to be placed on inside wall of pipe.

Holes in the mitered end pipe are to be drilled or punched; burning not permitted.

ANCHOR DETAIL

SPECIAL DETAILS AND NOTES

LAST REVISION	REVISION	DESCRIPTION:		FDOT DESIGN STANDARDS 2013	CROSS DRAIN MITERED END SECTION	INDEX NO.	SHEET NO.
07/01/12						272	6

DIMENSIONS & QUANTITIES

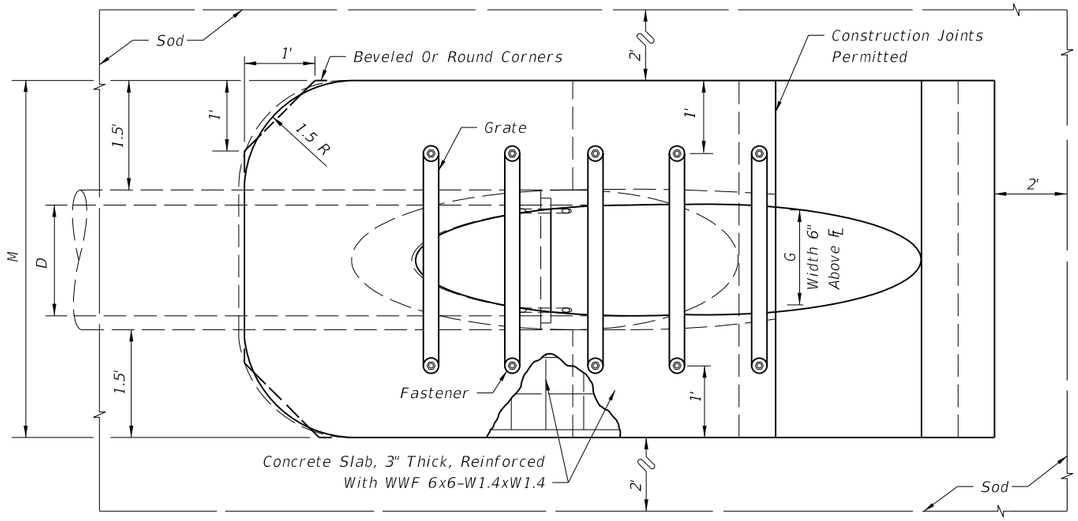
D	X	A	B	C	E	F	G	H ■	M				N	GRATE SIZES		CONCRETE (CY)				SODDING (SY)			
									Single Pipe	Double Pipe	Triple Pipe	Quad Pipe		Standard Weight Pipe	Extra Strong Pipe	Single Pipe	Double Pipe	Triple Pipe	Quad Pipe	Single Pipe	Double Pipe	Triple Pipe	Quad Pipe
15"	2'-7"	2.27'	4.09'	6.36'	4.03'	8'	1.22'	4.0'	4.63'	7.21'	9.79'	12.37'	1.19'			0.76	1.16	1.54	1.94	8	10	11	12
18"	2'-10"	2.36'	5.12'	7.48'	5.03'	9'	1.41'	4.0'	4.92'	7.75'	10.58'	13.42'	1.21'			0.85	1.28	1.71	2.17	9	10	12	13
24"	3'-5"	2.53'	7.18' △	9.71'	7.03' △	11'	1.73'	4.0'	5.50'	8.92'	12.33'	15.75'	1.25'			1.02	1.58	2.15	2.75	10	12	13	15
30"	4'-3"	2.70'	9.25'	11.95'	9.03'	13'	2.00'	4.0'	6.08'	10.33'	14.58'	18.83'	1.29'	2½"	3"	1.23	1.98	2.74	3.50	12	14	15	17
36"	5'-1"	2.87'	11.31' ◇	14.18'	11.03' ◇	15'	2.24'	4.0'	6.67'	11.75'	16.83'	21.92'	1.33'	2½"	3"	1.40	2.38	3.33	4.24	13	15	17	20
42"	6'-0"	3.05'	13.37'	16.42'	13.03'	17'	2.45'	4.0'	7.25'	13.25'	19.25'	25.25'	1.38'	2½"	3½"	1.60	2.83	4.04	5.26	14	17	19	22
48"	6'-9"	3.22'	15.43'	18.65'	15.03'	19'	2.65'	4.0'	7.83'	14.58'	21.33'	28.08'	1.42'	2½"	3½"	1.81	3.26	4.70	6.14	15	18	21	24
54"	7'-8"	3.39'	17.49'	20.88'	17.03'	21'	2.83'	4.0'	8.42'	16.08'	23.75'	31.42'	1.46'	3"	4"	2.03	3.78	5.54	7.28	17	20	23	27
60"	8'-6"	3.56'	19.55'	23.11'	19.03'	23'	3.00'	4.0'	9.00'	17.50'	26.00'	34.50'	1.50'	3"	4"	2.28	4.36	6.43	8.50	18	22	25	29

△ 6.42' △ 6.25' Dimensions permitted to allow use of 8' standard pipe lengths.

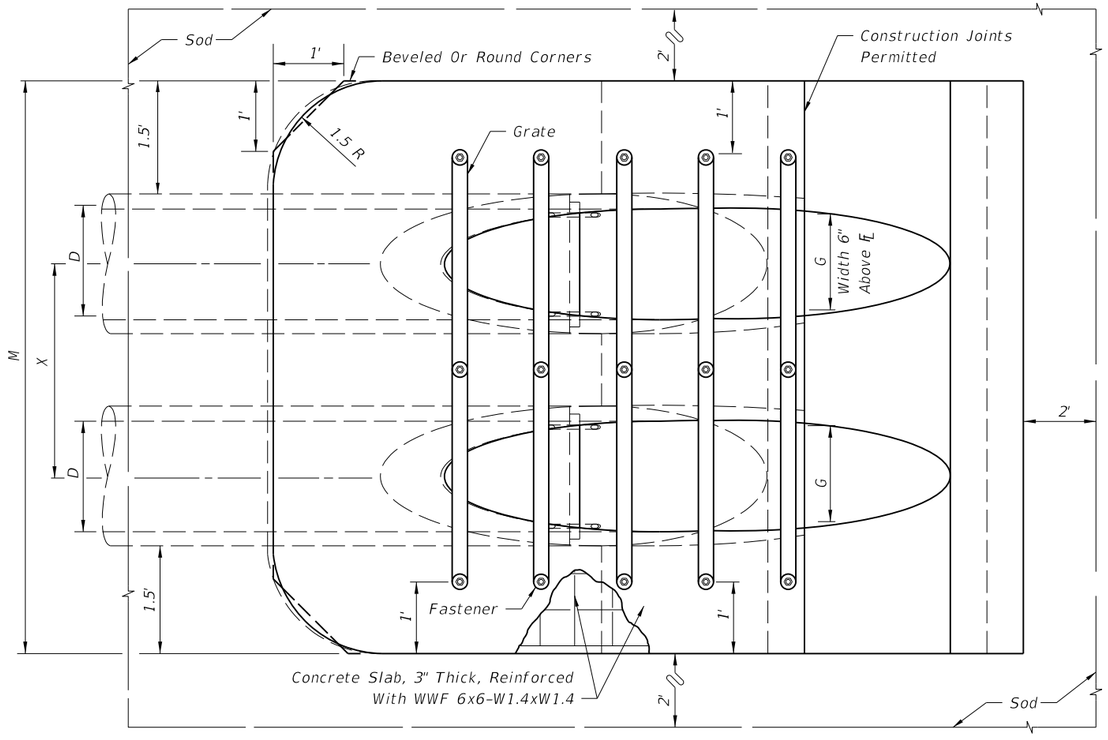
◇ 10.40' ◇10.10' Dimensions permitted to allow use of 12' standard pipe lengths.

△ ◇ Concrete slab shall be deepened to form bridge across crown of pipe. See section below.

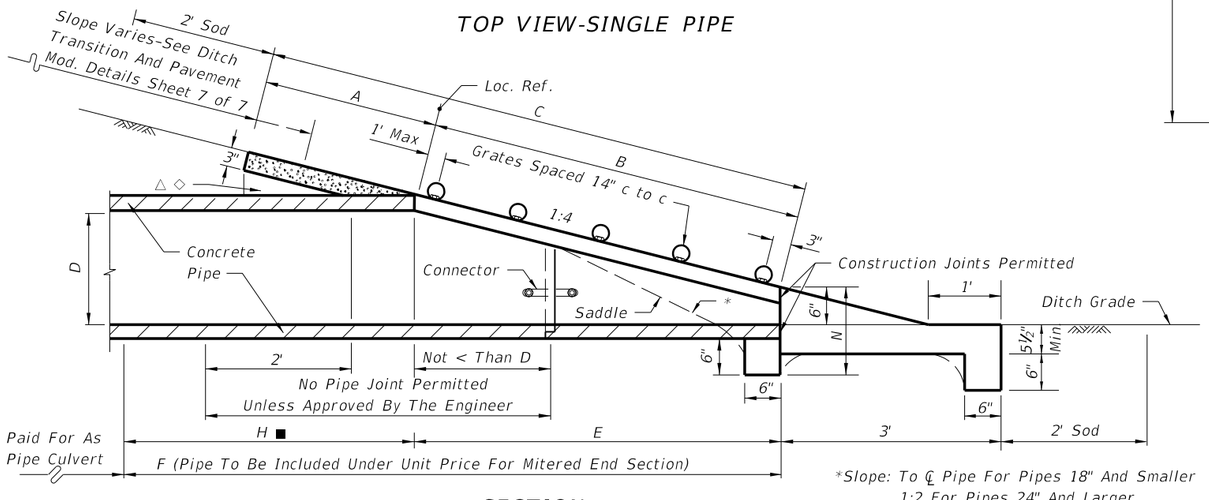
■ Values shown for estimating pipe quantities and are for information only.



TOP VIEW-SINGLE PIPE



TOP VIEW-MULTIPLE PIPE



SECTION

*Slope: To ℄ Pipe For Pipes 18" And Smaller
1:2 For Pipes 24" And Larger.

Note: See Sheets 6 and 7 for details and general notes.

SINGLE AND MULTIPLE ROUND CONCRETE PIPE

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LAST REVISION	REVISION	DESCRIPTION:		FDOT DESIGN STANDARDS 2013		INDEX NO.	SHEET NO.
02					SIDE DRAIN MITERED END SECTION	273	1

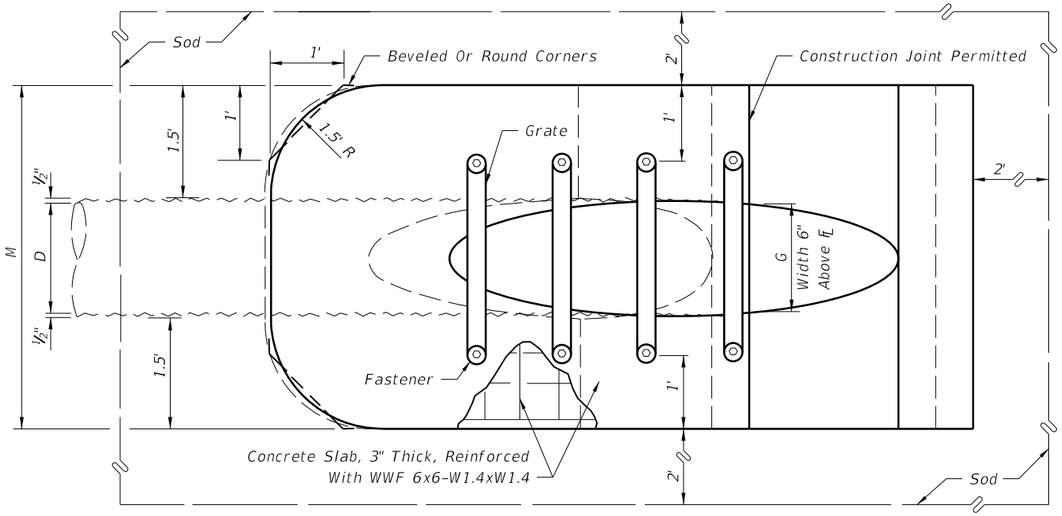
DIMENSIONS & QUANTITIES

D	X	A	B	C	E	F	G	H ■	M				N	GRATE SIZES		CONCRETE (CY)				SODDING (SY)			
									Single Pipe	Double Pipe	Triple Pipe	Quad. Pipe		Standard Weight Pipe	Extra Strong Pipe	Single Pipe	Double Pipe	Triple Pipe	Quad. Pipe	Single Pipe	Double Pipe	Triple Pipe	Quad. Pipe
8"	2'-0"	2.5'	0.72'	3.22'	0.7'	4.0'	0.58'	3.3'	3.75'	5.75'	7.75'	9.75'	1.04'			0.52	0.90	1.22	1.54	7	8	8	9
10"	2'-2"	2.5'	1.34'	3.84'	1.3'	5.0'	0.81'	3.7'	3.92'	6.08'	8.25'	10.41'	1.04'			0.64	0.99	1.34	1.70	7	8	9	10
12"	2'-4"	2.5'	2.06'	4.56'	2.0'	6.0'	1.00'	4.0'	4.08'	6.42'	8.75'	11.08'	1.04'			0.68	1.09	1.48	1.88	7	8	10	11
15"	2'-7"	2.5'	3.09'	5.59'	3.0'	7.0'	1.23'	4.0'	4.33'	6.92'	9.50'	12.08'	1.04'			0.64	1.00	1.35	1.71	8	9	10	11
18"	2'-10"	2.5'	4.12'	6.62'	4.0'	8.0'	1.41'	4.0'	4.58'	7.42'	10.25'	13.08'	1.04'			0.69	1.09	1.49	1.89	9	10	11	12
24"	3'-5"	2.5'	6.18'	8.68'	6.0'	10.0'	1.73'	4.0'	5.08'	8.50'	11.92'	15.33'	1.04'			0.83	1.34	1.82	2.34	10	11	13	14
30"	4'-3"	2.5'	8.25'	10.75'	8.0'	12.0'	2.00'	4.0'	5.58'	9.83'	14.08'	18.33'	1.04'	2½"	3"	0.96	1.63	2.32	2.99	11	13	15	17
36"	5'-1"	2.5'	10.31'	12.81'	10.0'	14.0'	2.24'	4.0'	6.08'	11.17'	16.25'	21.33'	1.04'	2½"	3"	1.08	1.92	2.77	3.62	12	14	17	19
42"	6'-0"	2.5'	12.37'	14.87'	12.0'	16.0'	2.45'	4.0'	6.58'	12.58'	18.58'	24.58'	1.04'	2½"	3½"	1.20	2.26	3.34	4.61	13	16	18	21
48"	6'-9"	2.5'	14.43'	16.93'	14.0'	18.0'	2.65'	4.0'	7.08'	13.83'	20.58'	27.33'	1.04'	2½"	3½"	1.60	3.11	4.62	6.12	14	17	20	23
54"	7'-8"	2.5'	16.49'	18.99'	16.0'	20.0'	2.83'	4.0'	7.58'	15.25'	22.92'	30.58'	1.04'	3"	4"	1.76	3.56	5.34	7.14	15	19	22	26
60"	8'-6"	2.5'	18.55'	21.05'	18.0'	22.0'	3.00'	4.0'	8.08'	16.58'	25.08'	33.58'	1.04'	3"	4"	1.94	4.03	6.12	8.20	17	20	24	28

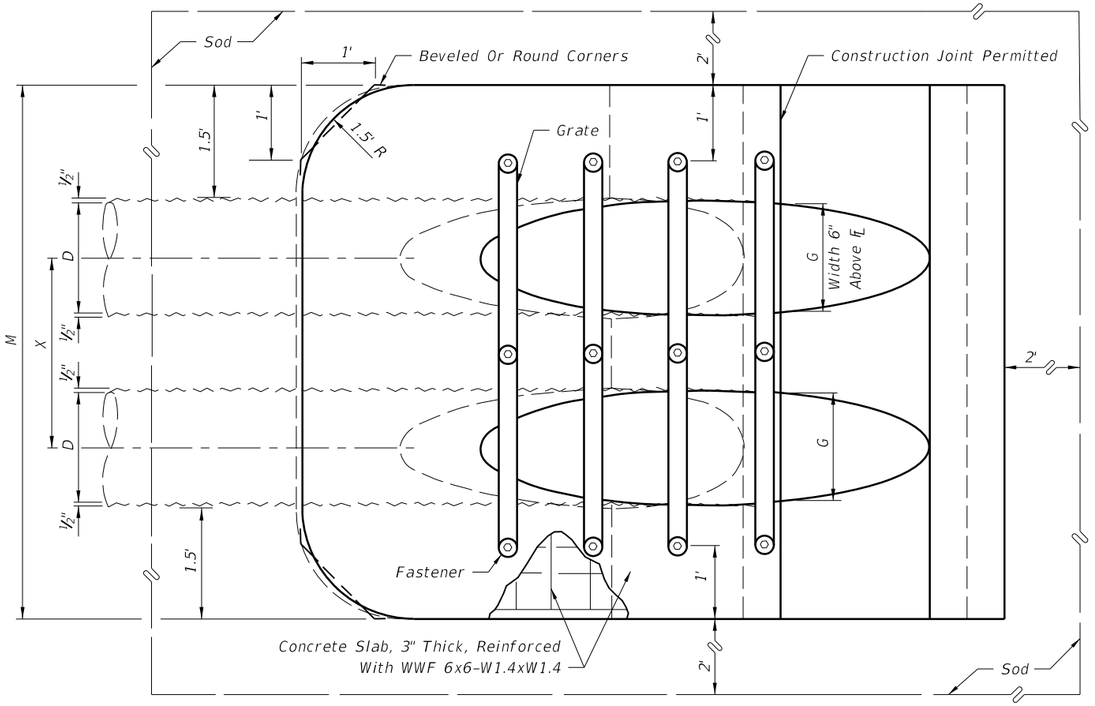
REMARKS

These sizes are restricted to inlet and outlet treatment for water management systems or similar applications.

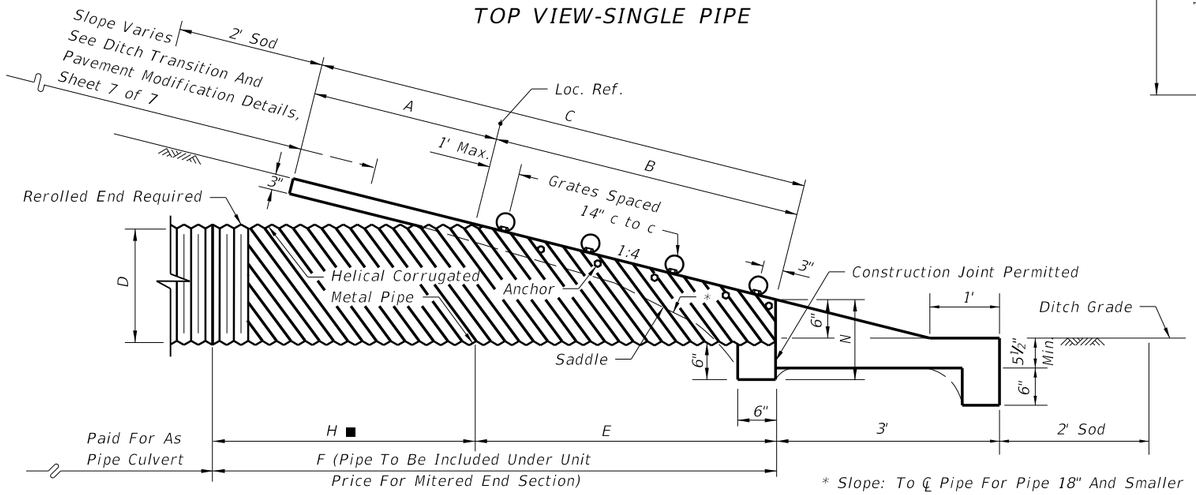
■ Values shown for estimating pipe quantities and are for information only.



TOP VIEW-SINGLE PIPE



TOP VIEW-MULTIPLE PIPE



* Slope: To ℄ Pipe For Pipe 18" And Smaller
1:2 For Pipe 24" And Larger

SECTION

NOTE: See Sheets 6 and 7 for details and general notes.

SINGLE AND MULTIPLE ROUND CORRUGATED METAL PIPE

LAST REVISION	REVISION	DESCRIPTION:		FDOT DESIGN STANDARDS 2013	SIDE DRAIN MITERED END SECTION	INDEX NO.	SHEET NO.
02						273	2

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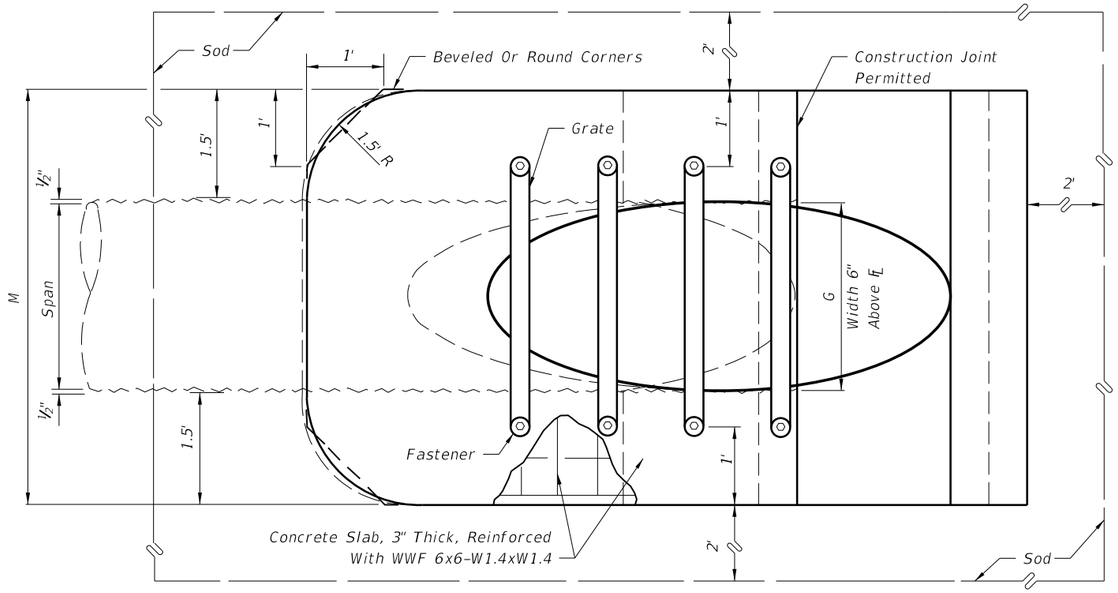
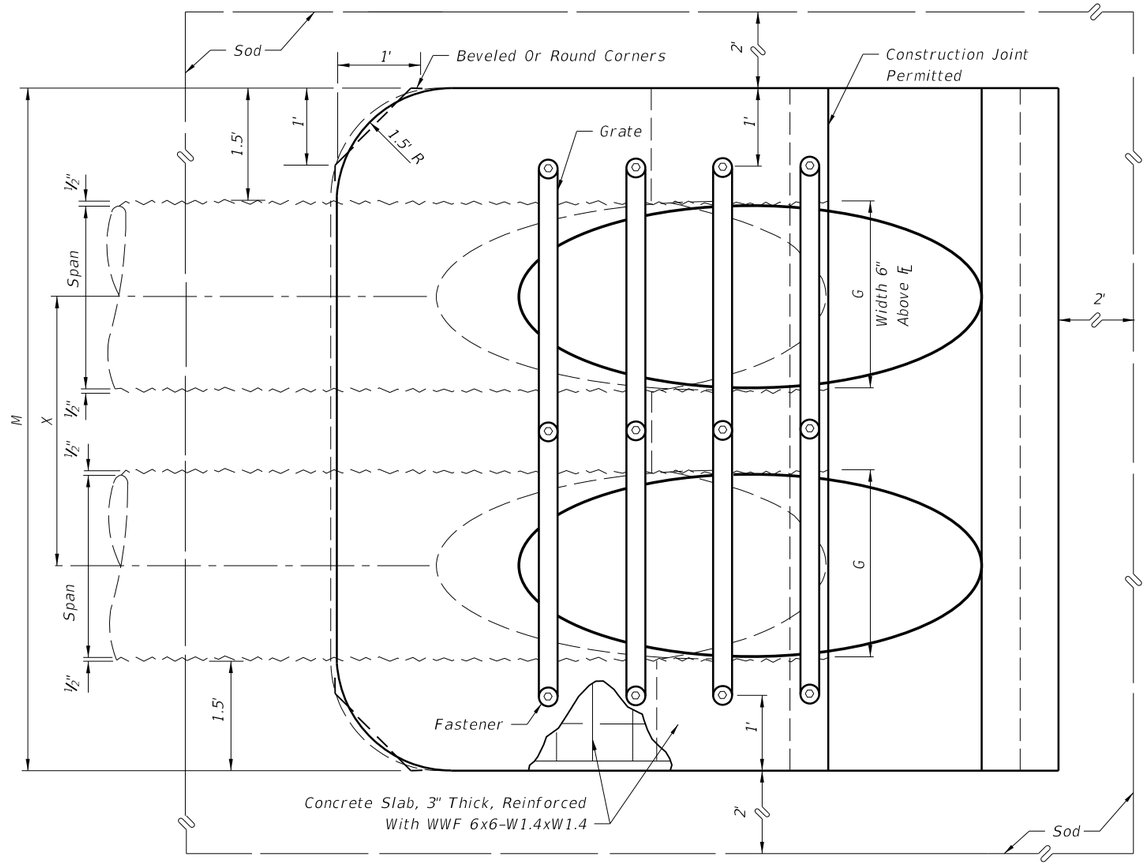
DIMENSIONS & QUANTITIES

1974 AASHTO										M					GRATE SIZES		CONCRETE (CY)				SODDING (SY)			
Span	Rise	X	A	B	C	E	F	G	H ■	Single Pipe	Double Pipe	Triple Pipe	Quad. Pipe	N	Standard Weight Pipe	Extra Strong Pipe	Single Pipe	Double Pipe	Triple Pipe	Quad. Pipe	Single Pipe	Double Pipe	Triple Pipe	Quad. Pipe
17"	13"	2'-6"	2.5'	2.41'	4.91'	2.33'	7'	1.39'	4.7'	4.50'	7.00'	9.50'	12.00'	1.04'			0.62	0.95	1.27	1.60	8	9	10	11
21"	15"	2'-10"	2.5'	3.09'	5.59'	3.00'	8'	1.76'	5.0'	4.83'	7.67'	10.50'	13.33'	1.04'			0.69	1.06	1.44	1.77	8	9	11	12
28"	20"	3'-5"	2.5'	4.81'	7.31'	4.67'	9'	2.22'	4.3'	5.42'	8.83'	12.25'	15.67'	1.04'			0.81	1.26	1.73	2.19	9	11	12	14
35"	24"	4'-0"	2.5'	6.18'	8.68'	6.00'	11'	2.55'	5.0'	6.00'	10.00'	14.00'	18.00'	1.04'	2½"	3"	0.94	1.51	2.09	2.66	10	12	14	15
42"	29"	4'-9"	2.5'	7.90'	10.40'	7.67'	12'	2.97'	4.3'	6.58'	11.33'	16.08'	20.83'	1.04'	2½"	3½"	1.06	1.76	2.46	3.16	11	13	15	17
49"	33"	5'-6"	2.5'	9.28'	11.78'	9.00'	14'	3.34'	5.0'	7.17'	12.67'	18.17'	23.67'	1.04'	2½"	3½"	1.19	2.02	2.84	3.68	12	14	17	19
57"	38"	6'-4"	2.5'	11.00'	13.50'	10.67'	16'	3.65'	5.3'	7.83'	14.17'	20.50'	26.83'	1.04'	3"	4"	1.35	2.35	3.35	4.36	13	16	19	22
64"	43"	7'-1"	2.5'	12.71'	15.21'	12.33'	17'	3.89'	4.7'	8.42'	15.50'	22.58'	29.67'	1.04'	3"	4"	1.50	2.70	3.86	5.03	14	17	20	24
71"	47"	7'-10"	2.5'	14.09'	16.59'	13.67'	19'	4.14'	5.3'	9.00'	16.83'	24.67'	32.50'	1.04'	3"	4"	1.62	2.94	4.27	5.59	15	18	22	25

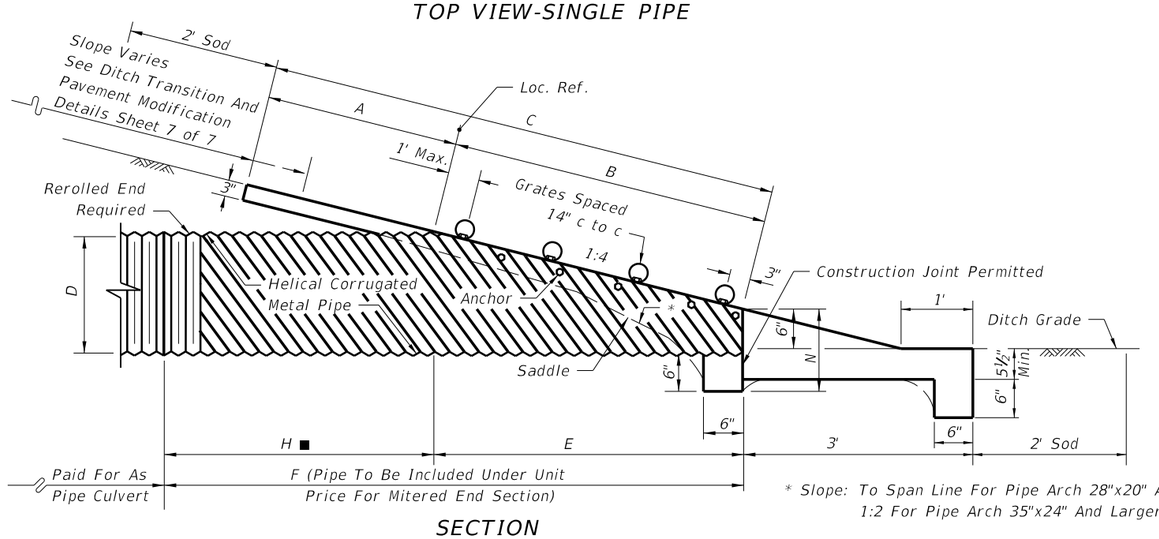
■ Values shown for estimating pipe quantities and are for information only.



TOP VIEW-SINGLE PIPE



TOP VIEW-MULTIPLE PIPE



SECTION

* Slope: To Span Line For Pipe Arch 28"x20" And Smaller
1:2 For Pipe Arch 35"x24" And Larger

NOTE: See Sheets 6 and 7 for details and general notes.

SINGLE AND MULTIPLE CORRUGATED METAL PIPE-ARCH

LAST REVISION	REVISION	DESCRIPTION:		FDOT DESIGN STANDARDS 2013	SIDE DRAIN MITERED END SECTION	INDEX NO.	SHEET NO.
02						273	3

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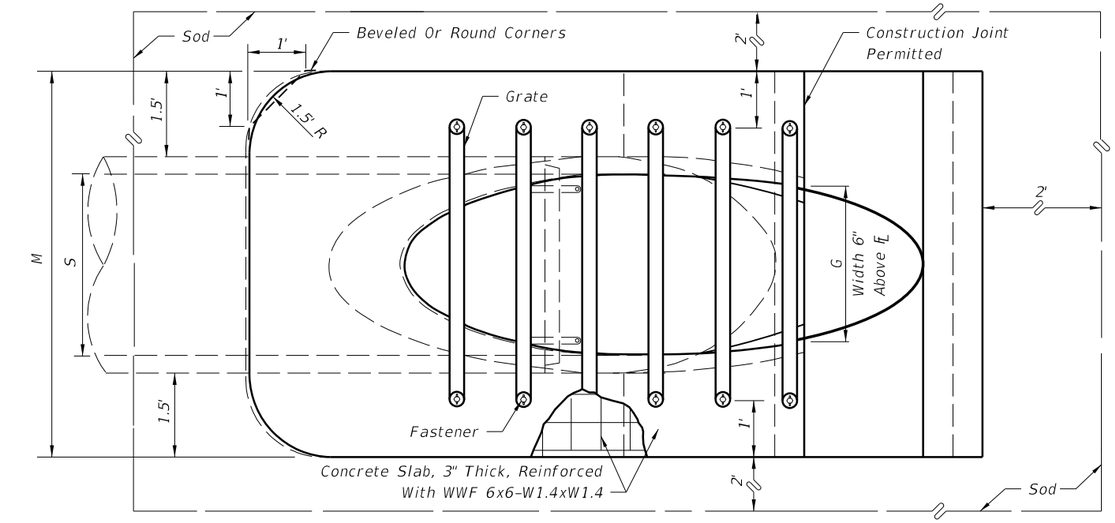
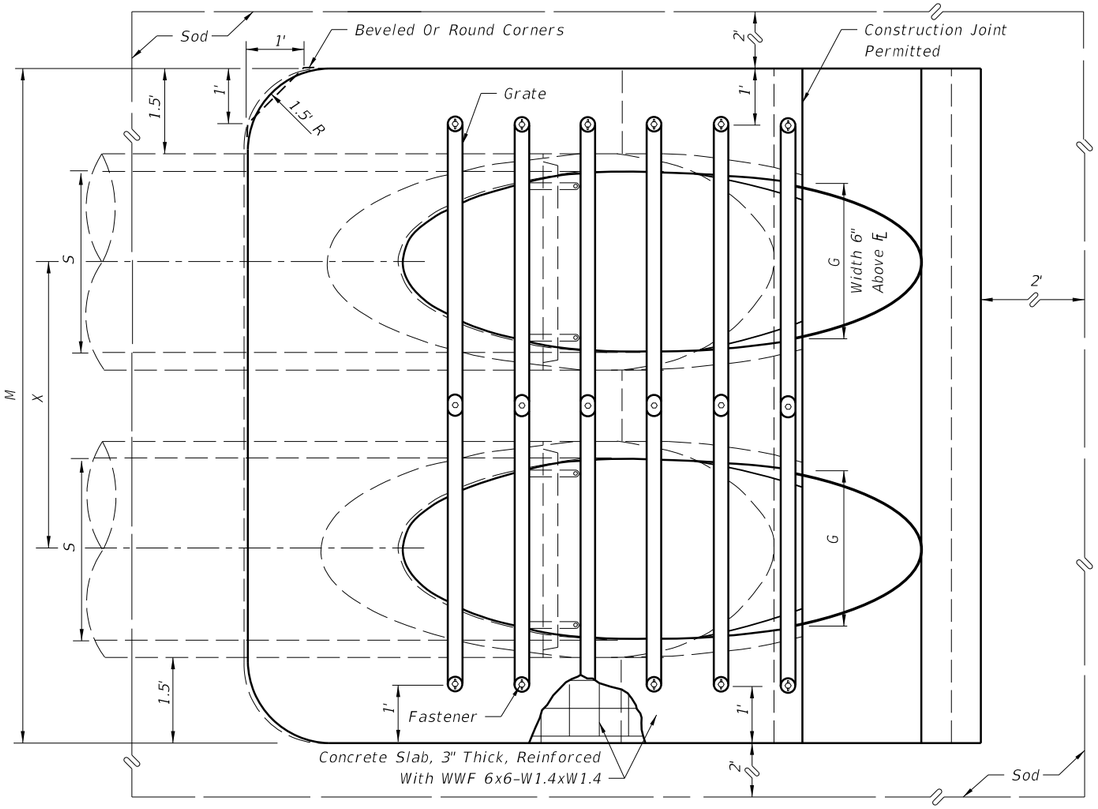
DIMENSIONS & QUANTITIES

Rise R	Span S	X	A	B	C	E	F	G	H ■	M				N	GRATE SIZES		CONCRETE (CY)				SODDING (SY)			
										Single Pipe	Double Pipe	Triple Pipe	Quad. Pipe		Standard Weight Pipe	Extra Strong Pipe	Single Pipe	Double Pipe	Triple Pipe	Quad. Pipe	Single Pipe	Double Pipe	Triple Pipe	Quad. Pipe
12"	18"	2'-10"	2.36'	3.06'	5.42'	3.03'	5'	1.50'	2.0'	4.92'	7.75'	10.58'	13.42'	1.21'			0.68	1.04	1.41	1.77	8	9	11	12
14"	23"	3'-4"	2.44'	3.75'	6.19'	3.70'	6'	1.90'	2.3'	5.38'	8.71'	12.04'	15.38'	1.23'			0.76	1.19	1.63	2.05	9	10	12	13
19"	30"	4'-0"	2.62'	5.47'	8.09'	5.36'	8'	2.37'	2.6'	6.04'	10.04'	14.04'	18.04'	1.27'	2½"	3"	0.95	1.52	2.09	2.65	10	12	13	15
24"	38"	5'-0"	2.79'	7.18'	9.97'	7.03'	10'	2.85'	3.0'	6.79'	11.79'	16.79'	21.79'	1.31'	2½"	3"	1.18	1.95	2.74	3.53	11	13	15	18
29"	45"	5'-11"	3.05'	8.90'	11.95'	8.70'	12'	3.19'	3.3'	7.50'	13.42'	19.33'	25.25'	1.38'	2½"	3½"	1.41	2.42	3.44	4.45	12	15	18	20
34"	53"	7'-0"	3.22'	10.62'	13.84'	10.36'	13'	3.57'	2.6'	8.25'	15.25'	22.25'	29.25'	1.42'	3"	3½"	1.63	2.92	4.22	5.52	13	17	20	23
38"	60"	7'-10"	3.39'	11.99'	15.38'	11.70'	15'	3.95'	3.3'	8.92'	16.75'	24.58'	32.42'	1.46'	3"	4"	1.83	3.36	4.89	6.41	14	18	21	25
43"	68"	8'-11"	3.56'	13.71'	17.27'	13.36'	17'	4.28'	3.6'	9.67'	18.58'	27.50'	36.42'	1.50'	3"	4"	2.09	3.95	5.80	7.65	16	20	23	27
48"	76"	9'-11"	3.73'	15.43'	19.16'	15.03'	19'	4.59'	4.0'	10.42'	20.33'	30.25'	40.17'	1.54'	Special	Special	2.37	4.54	6.73	8.92	17	21	26	30
53"	83"	10'-8"	3.91'	17.15'	21.06'	16.70'	20'	4.77'	3.3'	11.08'	21.75'	32.42'	43.08'	1.58'	Special	Special	2.61	5.09	7.56	10.03	18	23	27	32
58"	91"	11'-8"	4.08'	18.87'	22.95'	18.36'	22'	5.01'	3.6'	11.83'	23.50'	35.17'	46.83'	1.63'	Special	Special	2.91	5.77	8.64	11.50	19	24	29	35

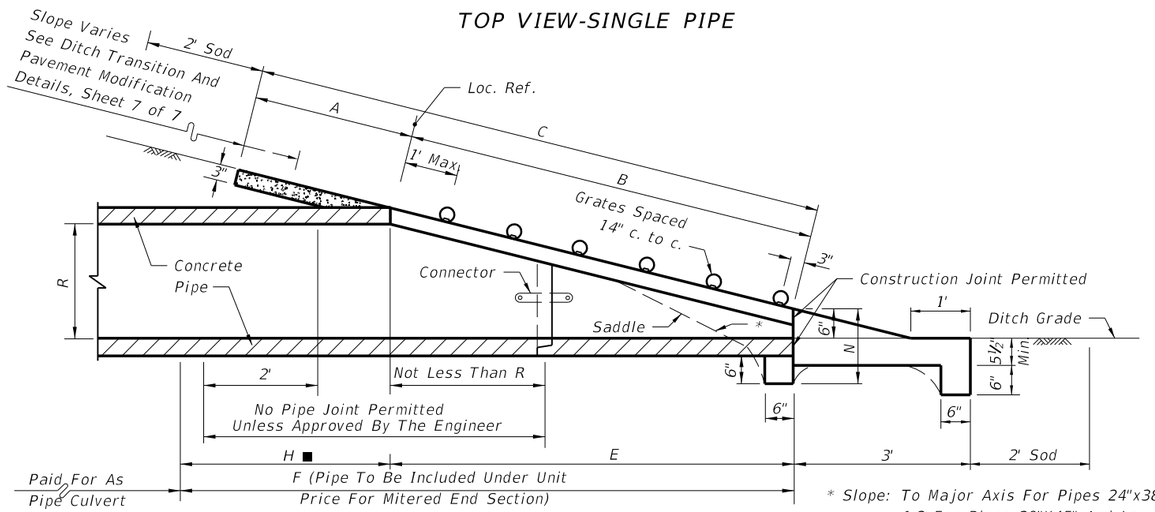
■ Values shown for estimating pipe quantities and are for information only.



TOP VIEW-SINGLE PIPE



TOP VIEW-MULTIPLE PIPE



SECTION

* Slope: To Major Axis For Pipes 24"x38" And Smaller. 1:2 For Pipes 29"X45" And Larger.

NOTE: See Sheets 6 and 7 for details and general notes.

SINGLE AND MULTIPLE ELLIPTICAL CONCRETE PIPE

LAST REVISION	REVISION	DESCRIPTION:			INDEX NO.	SHEET NO.
02			FDOT DESIGN STANDARDS 2013	SIDE DRAIN MITERED END SECTION	273	4

Drain Size	s	n	L	La
CONCRETE PIPE (ROUND)				
15"	3	4	4'-0"	4'-11"
18"	4	5	5'-2"	6'-1"
24"	6	7	7'-6"	8'-5"
30"	7	8	8'-8"	9'-7"
36"	9	10	11'-0"	11'-11"
42"	11	12	13'-4"	14'-3"
48"	13	14	15'-8"	16'-7"
54"	14	15	16'-10"	17'-9"
60"	16	17	19'-2"	20'-1"
CORRUGATED METAL PIPE (ROUND)				
15"	2	3	2'-10"	3'-9"
18"	3	4	4'-0"	4'-11"
24"	5	6	6'-4"	7'-3"
30"	7	8	8'-8"	9'-7"
36"	8	9	9'-10"	10'-9"
42"	10	11	12'-2"	13'-1"
48"	12	13	14'-6"	15'-5"
54"	14	15	16'-10"	17'-9"
60"	15	16	18'-0"	18'-11"

**

Drain Size	s	n	L	La
ELLIPTICAL CONCRETE PIPE				
12"x18"	2	3	2'-10"	3'-9"
14"x23"	3	4	4'-0'	4'-11"
19"x30"	4	5	5'-2"	6'-1"
24"x38"	5	6	6'-4"	7'-3"
29"x45"	7	8	8'-8"	9'-7"
34"x53"	8	9	9'-10"	0'-9"
38"x60"	10	11	12'-2"	13'-1"
43"x68"	11	12	13'-4"	14'-3"
48"x76"	13	14	15'-8"	16'-7"
53"x83"	14	15	16'-10"	17'-9"
58"x91"	15	16	18'-0"	18'-11"

**

Drain Size	s	n	L	La
CORRUGATED METAL PIPE (ARCH)				
17"x13"	1	2	1'-8"	2'-7"
21"x15"	2	3	2'-10"	3'-9"
28"x20"	4	5	5'-2"	6'-1"
35"x24"	5	6	6'-4"	7'-3"
42"x29"	6	7	7'-6"	8'-5"
49"x33"	7	8	8'-8"	9'-7"
57"x38"	9	10	11'-0"	11'-11"
64"x43"	10	11	12'-2"	13'-1"
71"x47"	12	13	14'-6"	15'-5"

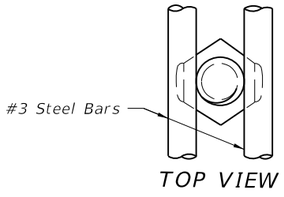
*** **

Note: ⅝" x 3" bolts are standard for all grate fasteners, except when the contractor elects to use the slotted upper holes for the intermediate fasteners on multiple drain pipes, which will require the following bolt lengths:

Grate Size (Std. & X-Stg.)	Bolt Length
2½"	5½"
3"	6"
3½"	6½"
4"	7"

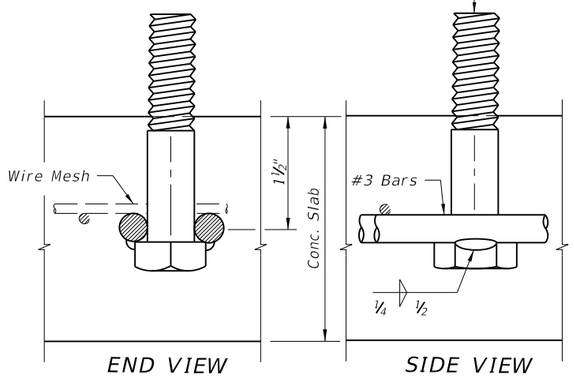
** To be used only when grates are called for in the plans.

*** 1974 AASHTO Pipe Arch Sizes.

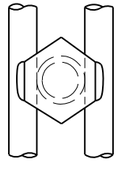


TOP VIEW

⅝" Galvanized Bolt Hex Head Bolt Shown; Either Hex Head Or Square Head Bolt May Be Used. Only Hex Nut To Be Used.

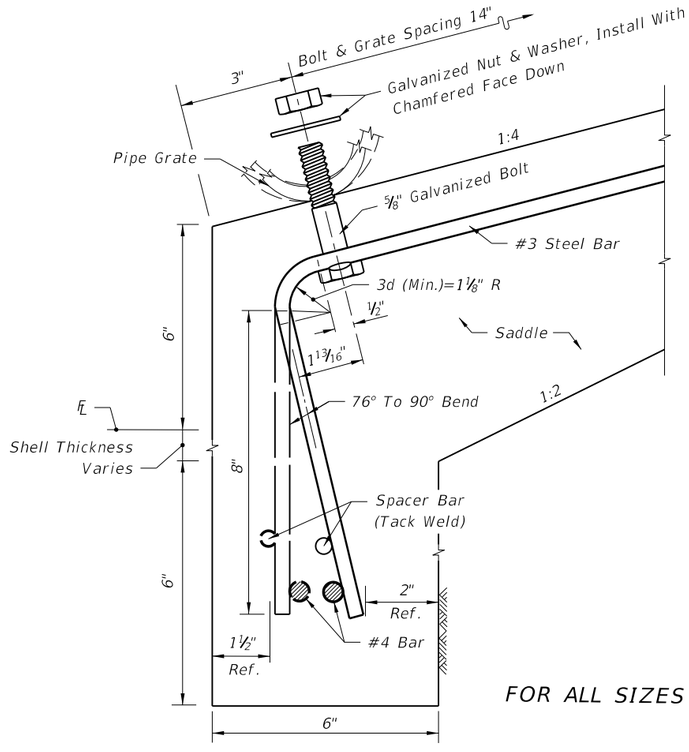


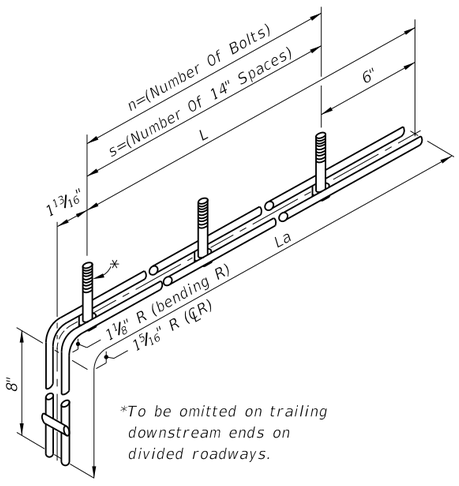
END VIEW SIDE VIEW



BOTTOM VIEW

The specified weld shall be made when the fabricated unit is subject to hazardous hauls and repeated handling. Tack welds are permitted for local or job site fabrication. Galvanizing over welded surface not required.





*To be omitted on trailing downstream ends on divided roadways.

FOR ALL SIZES OF SINGLE AND MULTIPLE DRAIN PIPE FASTENER UNIT

DETAILS FOR CONCRETE & CORRUGATED METAL PIPE

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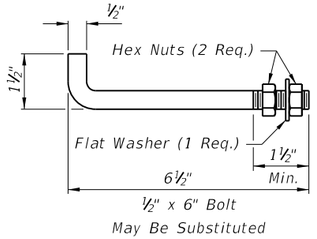
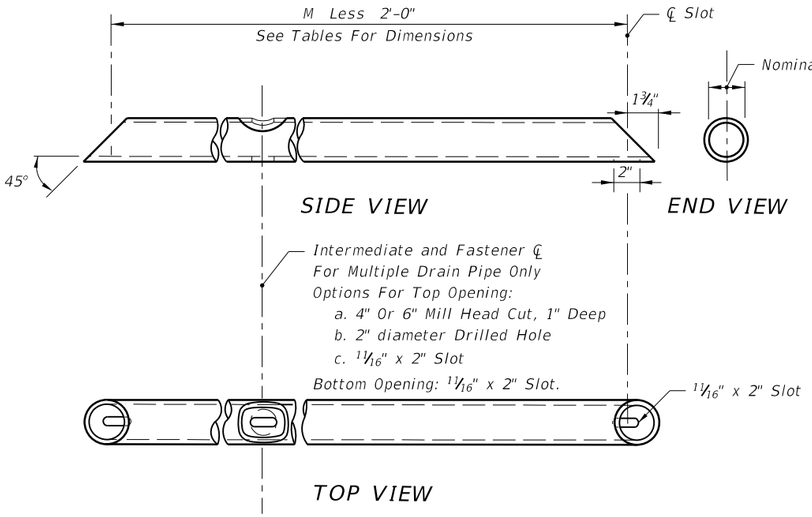
LAST REVISION	REVISION	DESCRIPTION:				
00			FDOT DESIGN STANDARDS 2013	SIDE DRAIN MITERED END SECTION	INDEX NO. 273	SHEET NO. 5



Notes:
Anchors required for CMP only.
Anchor, washer and nuts to be galvanized steel.
Bend anchor where required to center in concrete slab.
Damaged surfaces to be repaired after bending.
Anchors are to be spaced a distance equal to four (4) corrugations.
Place the anchors in the outside crest of corrugation.
Flat washer to be placed on inside wall of pipe.
Holes in the mitered end pipe are to be drilled or punched; burning not permitted.

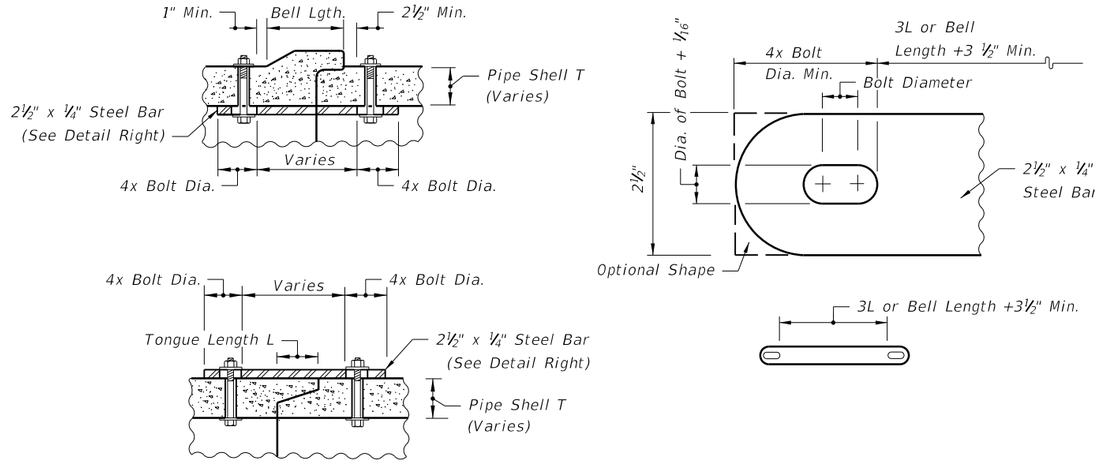
ANCHOR DETAIL



FOR SINGLE & MULTIPLE DRAIN PIPE

GRATE DETAIL

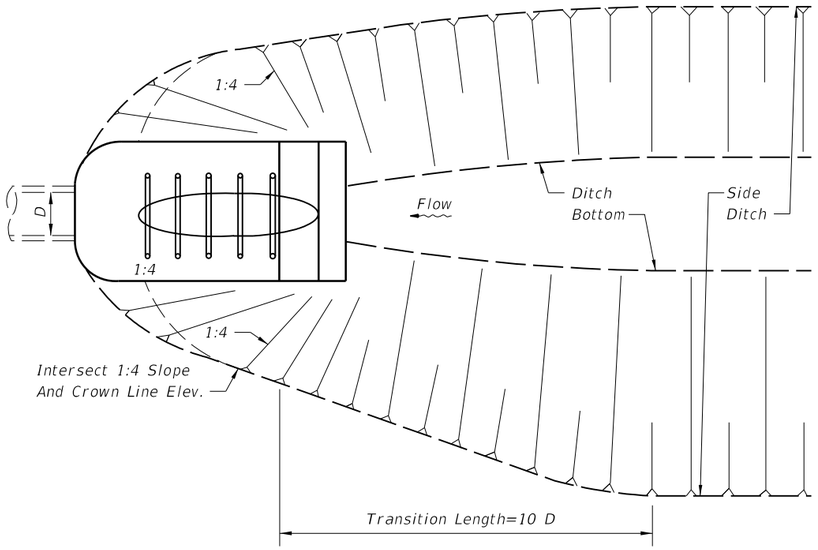
See General Notes, Sheet 7.



All bars, bolts, nuts and washers are to be galvanized steel.
Bolt diameters shall be ⅜" for 15" to 36" pipe and ⅝" for 42" to 60" pipe.
Two connectors required per joint, located 60° right and left of bottom center of pipe.
Bolt holes in pipe shell are to be drilled.

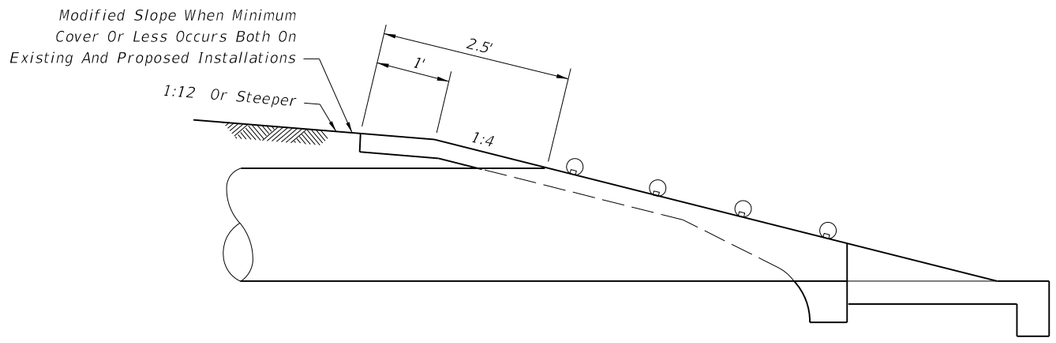
CONCRETE PIPE CONNECTOR DETAIL

DETAILS FOR CONCRETE & CORRUGATED METAL PIPE



PLAN

DITCH TRANSITION



PERMISSIBLE PAVEMENT MODIFICATION

GENERAL NOTES

1. Unless otherwise designated in the plans, concrete pipe mitered end sections may be used with any type of side drain pipe; corrugated steel pipe mitered end sections may be used with any type of side drain pipe except aluminum pipe; and, corrugated aluminum mitered end sections may be used with any type of side drain pipe except steel pipe. When bituminous coated metal pipe is specified for side drain pipe, mitered end sections shall be constructed with like pipe or concrete pipe. When the mitered end section pipe is dissimilar to the side drain pipe, a concrete jacket shall be constructed in accordance with Index No. 280.

2. Corrugated polyethylene pipe (HDPE), polyvinyl-chloride pipe (PVC) and polypropylene pipe (PPP) for side drain applications shall utilize either corrugated metal or concrete mitered end sections (MES). When used in conjunction with corrugated (MES), connection shall be by either a formed metal band specifically designated to join HDPE or PVC pipe, with metal pipe or other coupler approved by the State Drainage Engineer. When used in conjunction with a concrete (MES), connection shall be by concrete jacket constructed in accordance with Index No. 280.

3. Concrete pipe used in the assembly of mitered end sections shall be of selective lengths to avoid excessive connections.

4. Corrugated metal pipe galvanizing that is damaged during beveling and perforating for mitered end section shall be repaired.

5. That portion of corrugated metal pipe in direct contact with the concrete slab and extending 12" beyond shall be bituminous coated prior to placing of the concrete.

6. When existing multiple side drain pipes are spaced other than the dimensions shown in this detail, or have nonparallel axes, or have non-uniform sections, The mitered end sections will be constructed either separately as single pipe mitered end sections or collectively as multiple pipe end sections as directed by the Engineer; however, mitered end sections will be paid for each, based on each independent pipe end.

7. In addition to the requirements of Section 430-4, side drain culverts shall comply with the cover requirements shown on Index No. 205.

8. The reinforced concrete slab shall be constructed for all sizes of side drain pipe and cast in place with Class NS concrete.

9. Round pipe size 30" or greater, pipe-arch size 35"x24" or greater and elliptical pipe 19"x30" or greater shall be grated unless excepted in the plans. Smaller sizes of pipe shall be grated only when called for in plans. The lower grate on trailing downstream ends on divided highways shall be omitted.

10. Grates are to be fabricated from steel ASTM A53, Grade B, pipe. The lower grate on all traffic approach ends shall be Schedule 80 and all remaining grates shall be Schedule 40. Grates subject to salt free and corrosive free environment may be fabricated from galvanized pipe, with base metal exposed during fabrication repaired as specified in Section 562, Standard Specifications; or, fabricated from black pipe and hot dip galvanized after fabrication in accordance with ASTM A123. Grates subject to salt water or highly corrosive environment shall be hot dip galvanized after fabrication in accordance with ASTM A123.

11. Ditch transitions shall be used on all grades in excess of 3% as directed by the Engineer.

12. The project engineer shall contact the District Drainage Engineer for possible alternate treatment prior to constructing side drain mitered end sections where a minimum spacing of 30' will not result between the toe points of the mitered end sections.

13. The cost of all pipe(s), grates, fasteners, reinforcing, connectors, anchors, concrete, sealants, jackets and coupling bands shall be included in the cost for the mitered end section. Sodding shall be paid for separately under the contract unit price for Performance Turf, SY.

14. Mitered end sections shall be paid for under the contract unit price for Mitered End Section (SD), Ea., based on each independent pipe end.

DESIGN NOTES

1. In critical hydraulic locations, grates shall not be used until potential debris transport has been evaluated by the drainage engineer and appropriate adjustments made. Ditch grades in excess of 3% or pipe with less than 1.5' of cover and grades in excess of 1% will require such an evaluation (General Note 9).

2. The design engineer shall determine highly corrosive locations and specify in the plans when the grates shall be hot-dip galvanized after fabrication (General Note 10).

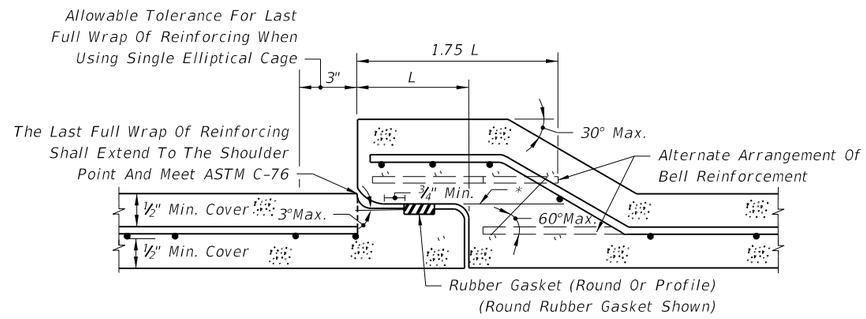
3. The design engineer shall determine and designate in the plans which alternate types of mitered end section will not be permitted. The restriction shall be based on corrosive or structural requirements.

NOTES & INFORMATION

LAST REVISION	REVISION	DESCRIPTION:				
07/01/12			FDOT DESIGN STANDARDS 2013	SIDE DRAIN MITERED END SECTION	INDEX NO. 273	SHEET NO. 7

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

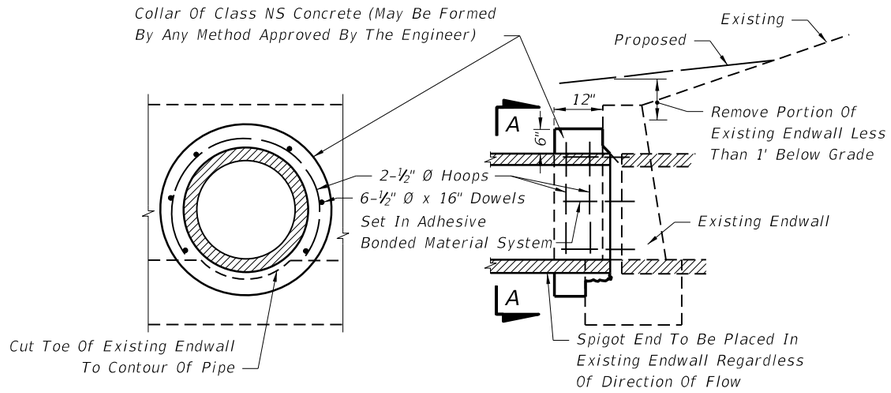
Nominal Pipe Diameter	Design Bell Reinforcement	Maximum Reinforcement Under Tolerance
	in^2 per foot	in^2 per foot
15"	0.07	0.010
18"	0.07	0.010
24"	0.09	0.010
30"	0.12	0.010
36"	0.14	0.010
42"	0.16	0.010
48"	0.19	0.011
54"	0.21	0.012
60"	0.23	0.0135
66"	0.26	0.015
72"	0.28	0.0165
78"	0.30	0.018
84"	0.33	0.0195
90"	0.35	0.021
96"	0.37	0.0225
102"	0.40	0.024
108"	0.42	0.0255



*All circumferential steel located above this line within 1.75 L is defined as bell reinforcement.

ROUND RUBBER GASKET SHOWN

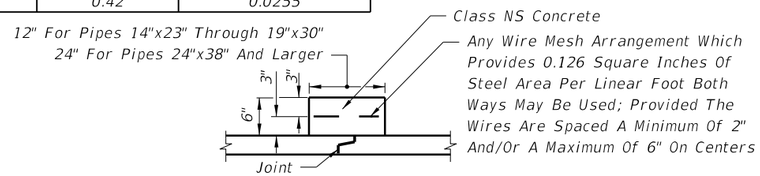
DETAIL OF BELL & SPIGOT CONCRETE PIPE JOINT USING ROUND OR PROFILE RUBBER GASKET



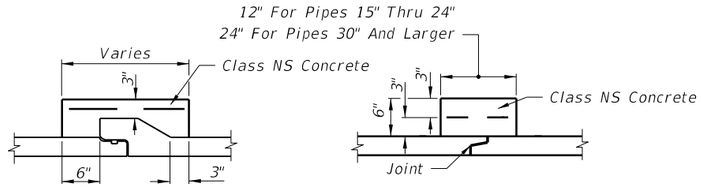
SECTION AA LONGITUDINAL SECTION

Note: Cost for removal and disposal of portions of top and toe of existing endwall and cost of concrete, reinforcing steel and construction of collar to be included in the contract unit price for pipe culvert.

CONCRETE COLLAR FOR EXTENSION OF EXISTING PIPE CULVERTS



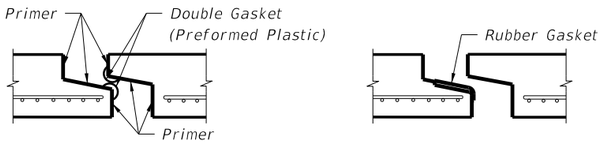
CONCRETE JACKET



Note: For reinforcement see elliptical pipe concrete jacket. (All Pipe Sizes)

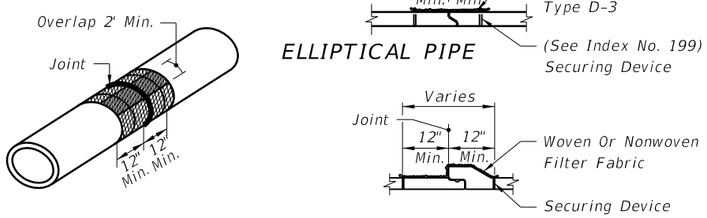
BELL AND SPIGOT TONGUE & GROOVE

DISSIMILAR JOINTS



Cost of concrete jacket or filter fabric jacket to be included in cost of elliptical concrete pipe culverts.

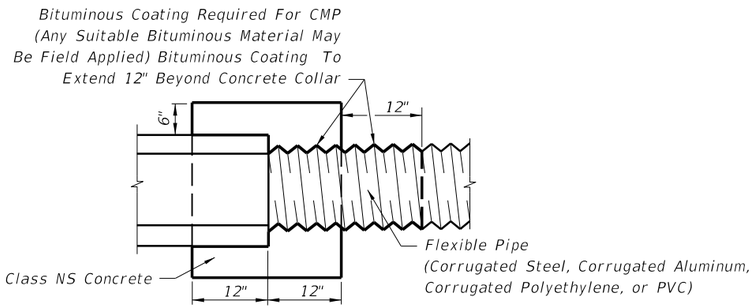
ELLIPTICAL CONCRETE PIPE JOINTS



Cost of filter fabric jacket to be included in cost of pipe culverts.

FOR ALL PIPE TYPES - CONCRETE PIPE SHOWN

FILTER FABRIC JACKET



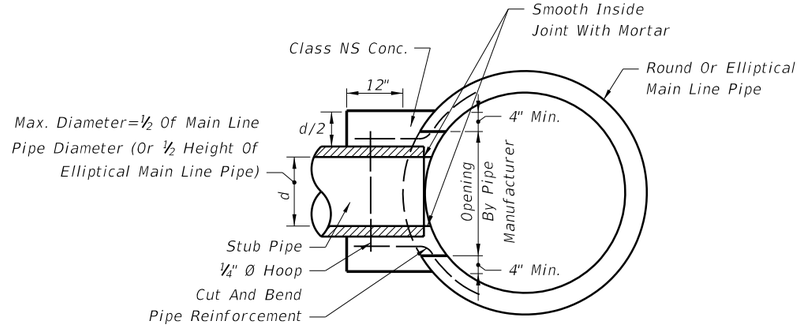
Note: Cost of concrete and bituminous coating to be included in contract unit price for either new pipe or Mitered End Section.

Alternate connection must be approved by the State Drainage Engineer.

A concrete jacket shall not be used to join:
a) metal pipe of dissimilar materials
b) flexible pipe when the minimum cover required in accordance with Index No. 205 cannot be obtained

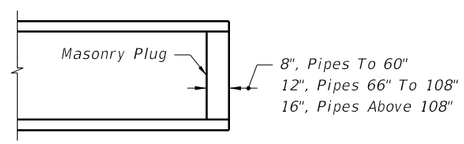
DISSIMILAR TYPES

CONCRETE JACKET FOR CONNECTING DISSIMILAR TYPES OF PIPE AND CONCRETE PIPES WITH DISSIMILAR JOINTS



Cost of concrete and steel to be included in contract unit price for pipe culvert.

CONCRETE COLLAR FOR JOINING MAINLINE PIPE AND STUB PIPE



Note: Unless otherwise called for in the plans, the cost of plugging pipes to be included in contract unit price for new pipe.

PIPE PLUG

LAST REVISION	REVISION	DESCRIPTION:				
01/01/11			FDOT DESIGN STANDARDS 2013	MISCELLANEOUS DRAINAGE DETAILS	INDEX NO. 280	SHEET NO. 1

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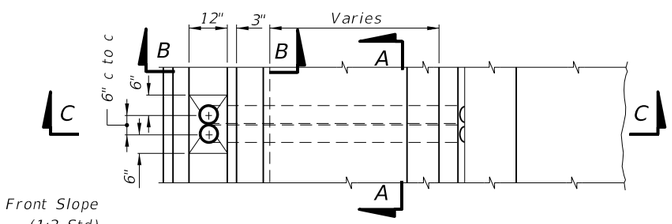
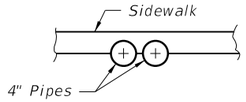
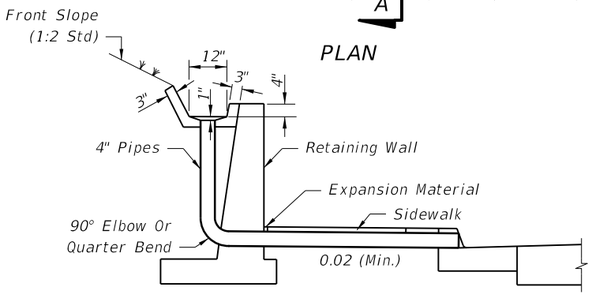


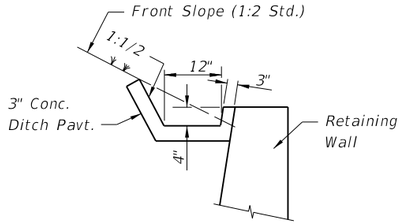
PLAN



SECTION AA



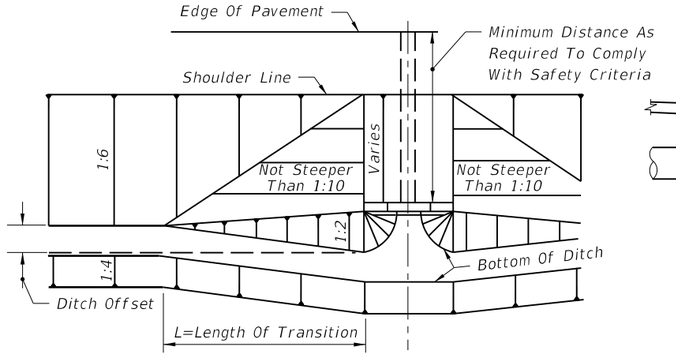
SECTION CC

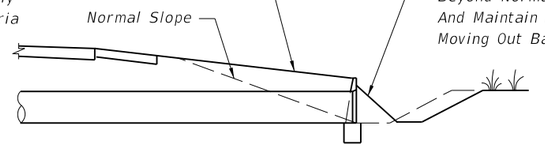


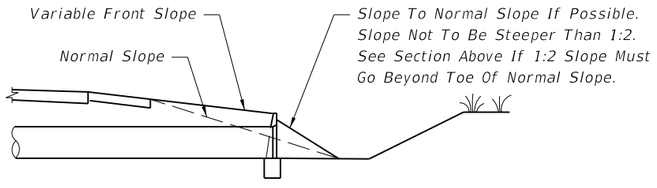
SECTION BB

Note: PVC pipe, Schedule 40, to be paid for under the contract unit price for Polyvinyl Chloride Pipe Culvert (4"), LF.

CONCRETE GUTTER AND DRAINS AT RETAINING WALLS

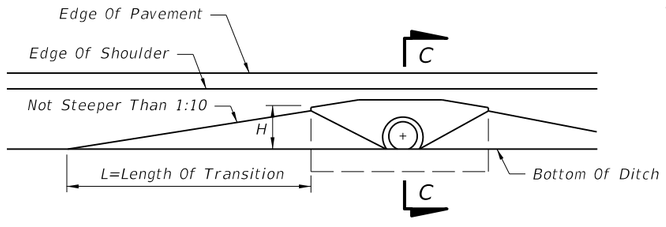






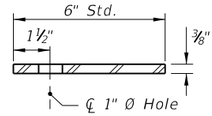
NOTE: Filling or excavation of variable slopes to be done during normal grading operations.

SECTION CC

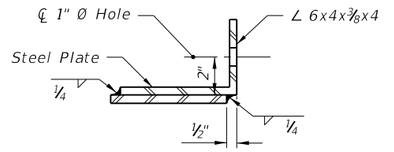


Use Larger Value Of Either:
1. L=10xH (No Maximum)
2. L=10xDitch Offset (Maximum L=100')

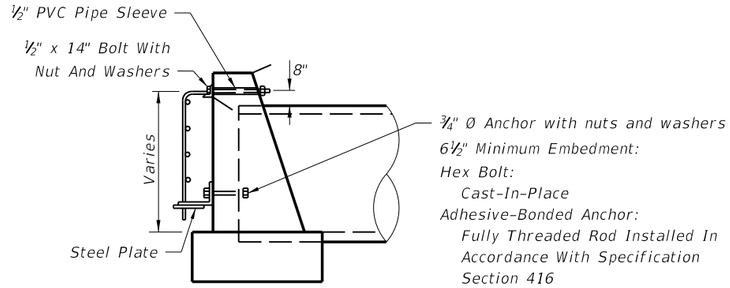
METHOD FOR SETTING LIMITS OF VARIABLE FRONT SLOPES AT DRAINAGE STRUCTURES



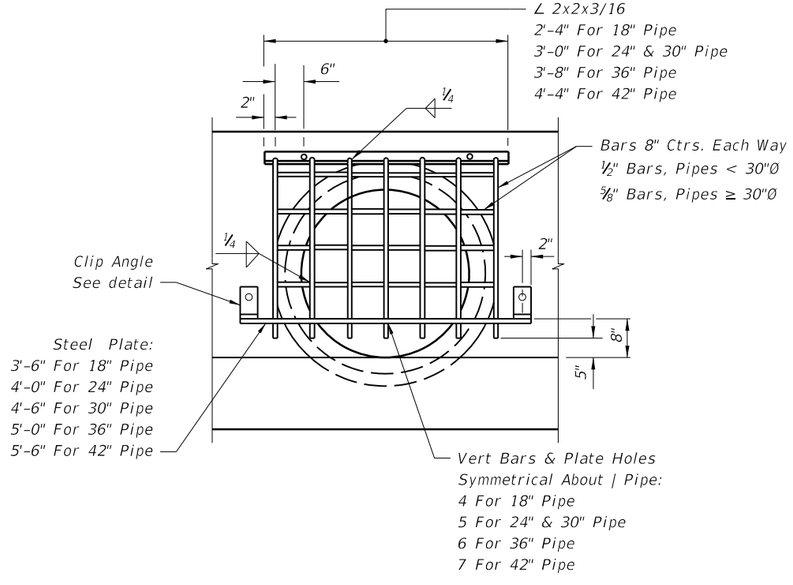
SECTION - STEEL PLATE



CLIP DETAIL



SIDE VIEW



Pipe Dia.	18"	24"	30"	36"	42"
Grate (Lbs.)	48	58	74	90	111

FRONT VIEW

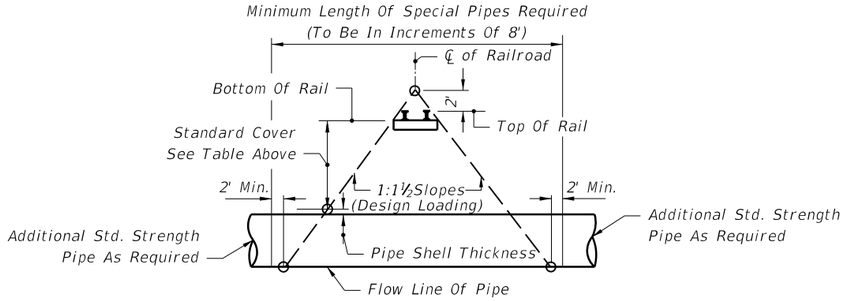
Note: Guards to be constructed only at locations specifically called for in plans. Guard, plate & clips, bolts, nuts and sleeves to be included in the contract unit price for Reinforcing Steel (Miscellaneous).

GUARD AT PIPE ENDS

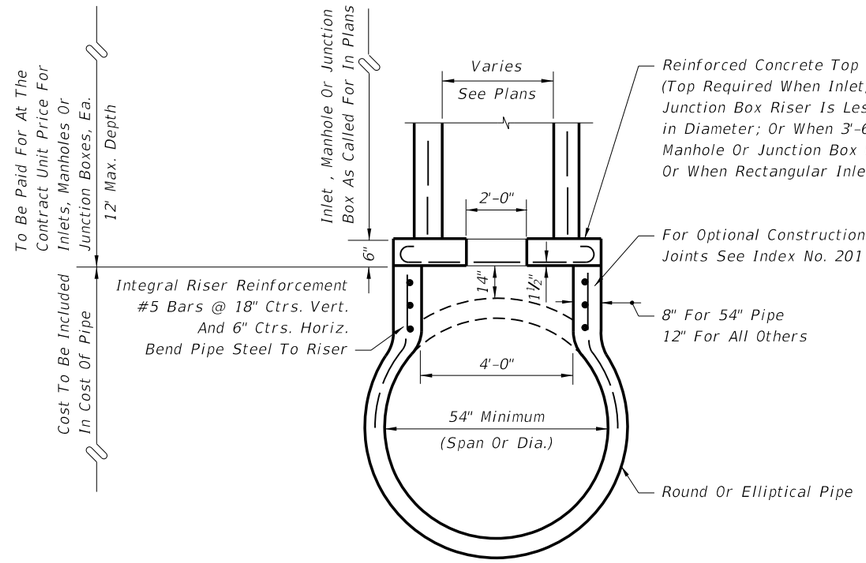
RAILROAD COMPANY	CLEARANCE BELOW BOTTOM OF RAIL (FEET)(2)	STRENGTH ASTM (C76) CLASS
Alabama & Gulf Coast Railway (Rail America)	5.5	IV
AN Railway & Bay Line Railroad (Genesee & Wyoming)	5.5 / 4.5(1)	V
CSX Transportation	5.5	V
First Coast Railroad (Genesee & Wyoming)	5.5 / 4.5(1)	V
Florida Midland, Central, and Northern Railroads (Pinsly Railroad)	5.5	V
Florida East Coast (FEC) Railway Company	5.5	IV
Florida West Coast Railroad Company	5.5	V
Georgia & Florida Railway, Inc.	5.5	V
Norfolk Southern (NS) Railway Corporation	5.5 / 4.5(1)	V
Port of Palm Beach District Railroad	5.5	IV
Seminole Gulf Railway (LP)	6.0	V
South Central Florida Express	6.0	V
Talleyrand Terminal Railroad (Genesee & Wyoming)	5.5 / 4.5 (1)	V
South Florida Regional Transportation Authority (Tri-County Commuter Rail)	5.5	V

(1) – Distance standard for yard and industrial tracks.

(2) – Clearance is for casing pipe. All subgrade carrier pipelines and wirelines will be installed within a casing pipe which will extend from Right-of-Way line to Right-of-Way line.



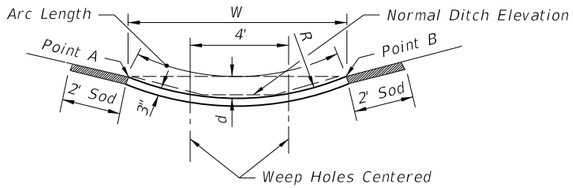
METHOD FOR DETERMINING THE LENGTH OF SPECIAL PIPE REQUIRED UNDER RAILROADS



SECTION

PLAN OF TOP

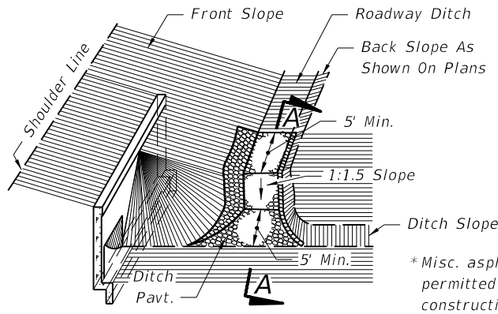
INLETS, MANHOLES OR JUNCTION BOXES ON INTEGRAL PRECAST CONCRETE RISER FOR CONCRETE PIPE



TO REPLACE:	W	d	R	Rows Of Weep Holes	Arc Length
6' Median Swale	6'	0.24'	19'	0	6.0'
1:6 Front Slopes; 1:4 Back Slope					
5' BW Ditch	10'	0.67'	19'	2	10.1'
4' BW Ditch	9'	0.54'	19'	2	9.1'
1:4 Front Slopes & Back Slope					
5' BW Ditch	9'	0.74'	14'	2	9.2'
4' BW Ditch	8'	0.58'	14'	1 (in center)	8.1'

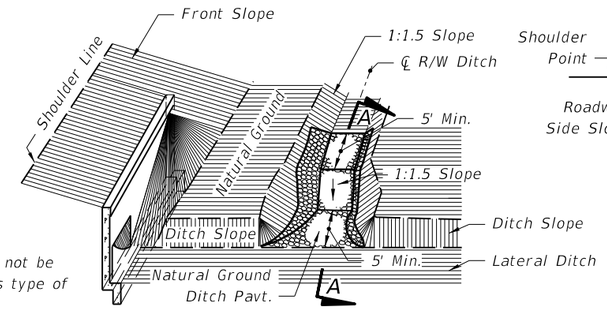
For use only where side slopes are 1:4 or flatter. Point "A" and "B" are to be the same elevation and should be used to locate the paved section.

ALTERNATE DITCH PAVEMENT

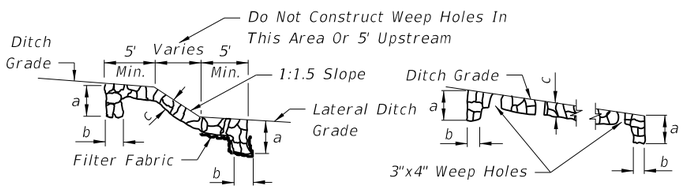


*Misc. asphalt will not be permitted for this type of construction.

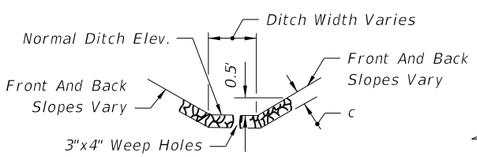
JUNCTION OF ROADWAY DITCH* AND LATERAL DITCH



JUNCTION OF R/W DITCH* AND LATERAL DITCH



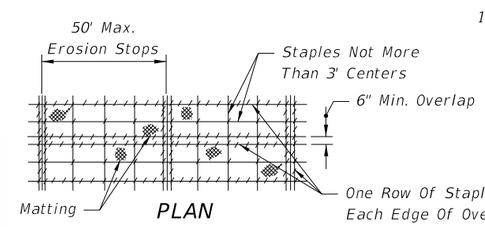
SECTION AA



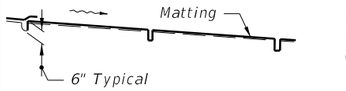
TYPICAL SECTION

PROFILE OF DITCH PAVEMENT AT LOCATIONS OTHER THAN JUNCTION WITH LATERAL DITCH

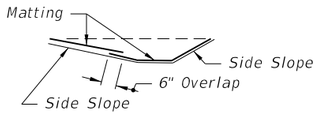
DITCH PAVEMENT								
Pavement Type	Dimensions			Payment Unit	Basis Of Estimate	Filter Fabric Type	Velocity Range	References & Remarks
	a	b	c					
Concrete	24"	6"	3"	SY	SY	D-6	Low-High	Section 524 of the Standard Specifications.
Miscellaneous Asphalt	24"	12"	4"	TN	0.2 TN/SY	None	Low-Moderate	Section 339.
Riprap (Sand-Cement)	24"	12"	4"	CY	0.11 CY/SY	D-4	Low-Moderate	Section 530. Grouting of joints required.
Riprap (Ditch Lining)				TN	TN	D-2	Moderate-High	Section 530.



PLAN

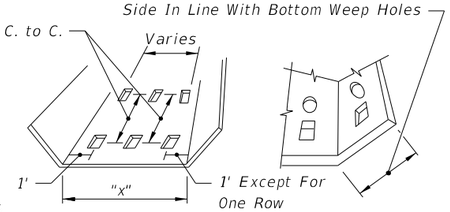


LONGITUDINAL SECTION



SECTION MATTING FOR DITCH

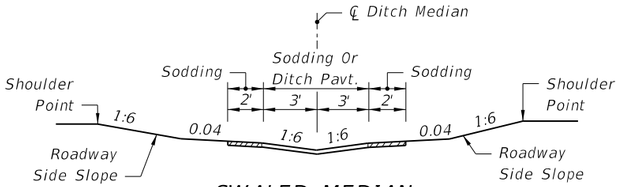
When Width Is Greater Than 4', Const. Weep Holes Half-Way Up The Side In Line With Bottom Weep Holes



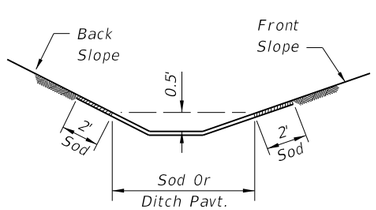
When "x"= 1' To 4' Const. 1 Row (Centered)
"x"= 5' To 7' Const. 2 Rows
"x"= 8' To 12' Const. 3 Rows
"x"= 13' To 17' Const. 4 Rows
"x"= 18' To 22' Const. 5 Rows

Note: All weep holes to be 3"x4" rectangle or 4" or 5" dia. circle hole. ½ cu. ft. (12" x 12" x 6") of No. 6 aggregate to be placed under each hole. 1 sq. ft. of galv. wire mesh (¼" openings) shall be placed between the aggregate and the concrete. Cost of holes, aggregate and wire mesh to be included in the cost of ditch pavement.

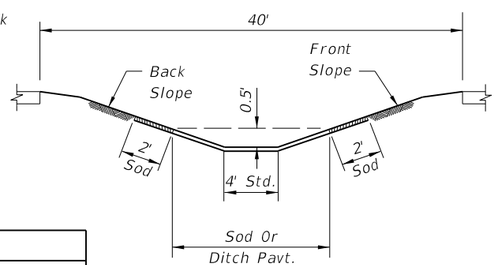
WEEP HOLE ARRANGEMENT



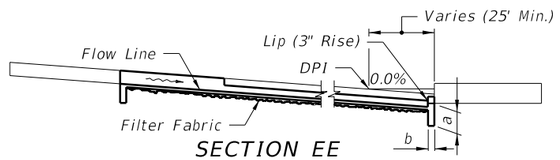
SWALED MEDIAN (No Weep Holes)



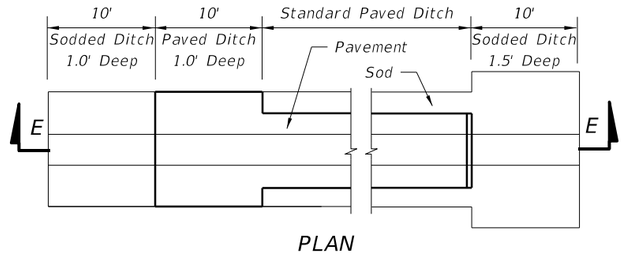
ROADWAY SIDE DITCH



40' MEDIAN



SECTION EE



PLAN

PAVED DITCH END TREATMENT

GENERAL NOTES

1. Type of ditch pavement shall be as shown on plans.
2. In concrete ditch pavement, contraction joints are to be spaced at 25' maximum intervals, or as directed by the Engineer. Contraction joints may be either formed (construction joint) or tooled. No open joints will be permitted in concrete ditch pavement.

   Expansion joints with ½" preformed joint filler shall be constructed at all inlets, endwalls, and at intervals of not more than 200'.
3. Lip at end of ditch pavement shall normally be located downstream of DPI or on flatter grades where there is a decrease in ditch velocity.
4. Toewalls are to be used with all ditch paving. A toewall is not required adjacent to drainage structures.
5. When directed by the Engineer, weep hole spacing may be reduced to 5' minimum.
6. For junction of R/W ditch spillway and lateral ditch, sides of paving to be 1' high minimum.
7. For ditch pavements requiring filter fabric, the fabric shall be placed directly beneath the pavement for the entire length and width of the pavement. When weep holes with aggregate are used, the filter fabric shall be placed below the aggregate to form a mat continuous with or underlapping the pavement fabric. (See Index No. 199 for fabric type and application).
8. Ditch pavement requiring reinforcement shall be detailed in the plan.
9. Cost of plastic filter fabric to be included in the contract unit price for ditch pavement.
10. Sodding to be paid for under contract unit price for Performance Turf, SY

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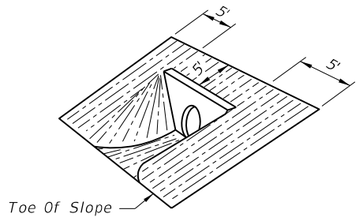
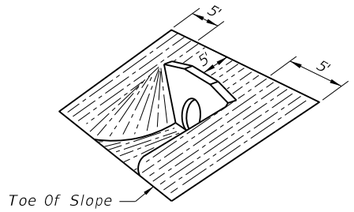
rd960rh
2:38:12 PM
6/28/2012

LAST REVISION	REVISION	DESCRIPTION:			
07/01/07			FDOT DESIGN STANDARDS 2013	DITCH PAVEMENT AND SODDING	INDEX NO. 281 / SHEET NO. 1

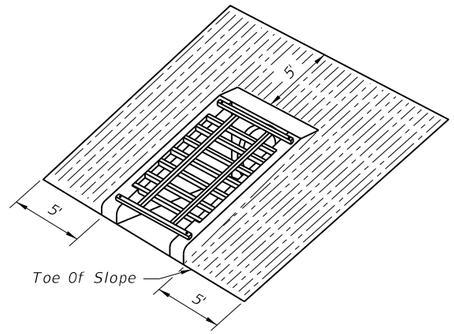


Note: Sodding quantities for each endwall to be determined by the designer from this detail.

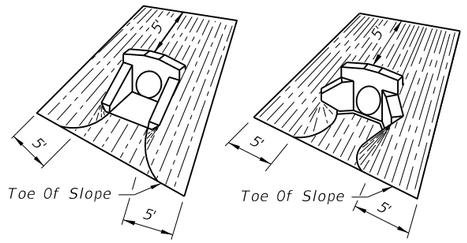
(EXCEPT INDEX NO. 250)
STRAIGHT ENDWALL



STRAIGHT ENDWALL
INDEX NO. 250

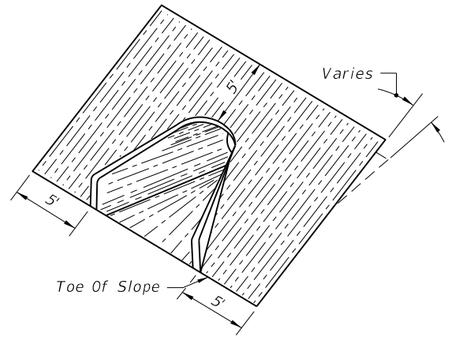


U-TYPE ENDWALL
INDEX NO. 261

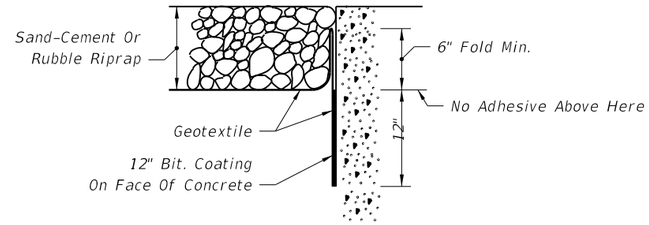


U-TYPE WINGS 45° WINGS

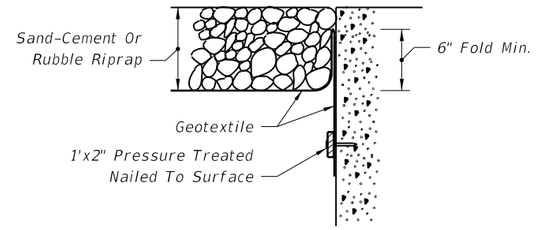
WINGED ENDWALLS
INDEX NO. 266



FLARED END SECTION
INDEX NO. 270



BONDED OPTION



NAILED OPTION

Note: Either option may be used unless otherwise called for in the plans.

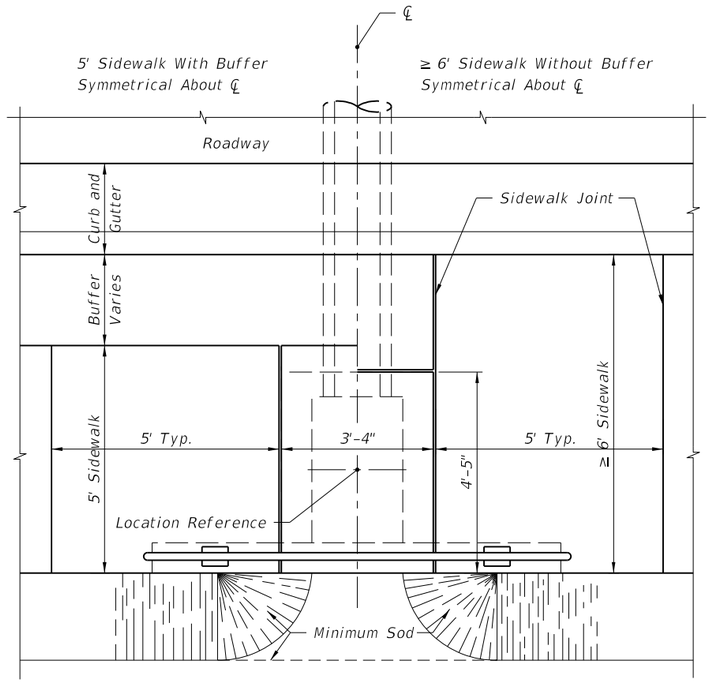
GEOTEXTILE PLACEMENT AT CONCRETE STRUCTURE

SOD QUANTITIES (SY)

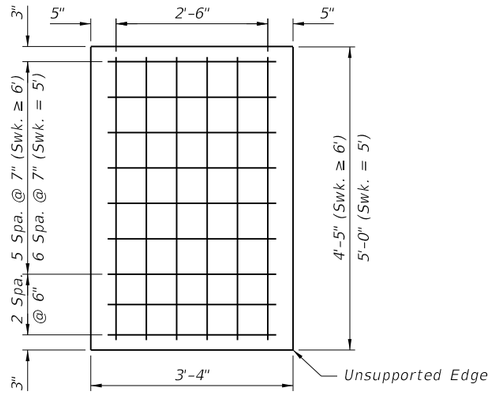
PIPE SIZE	INDEX NO. 250												INDEX NO. 261				INDEX NO. 266				INDEX NO. 270
	SLOPE												SLOPE				SLOPE				ALL SLOPES
	1:2			1:3			1:4			1:6			1:2	1:3	1:4	1:6	1:2	1:3	1:4	1:6	
	PIPES												PIPES				PIPES				PIPES
	1	2	3	1	2	3	1	2	3	1	2	3	1	1	1	1	1	1	1	1	1
12"																	14	15	18	22	10
15"	19	21	24	22	26	29	26	30	33	34	38	43	13 (15)	16	17	23	15	17	20	25	11
18"	21	24	27	25	29	33	30	34	38	39	44	50	14 (16)	17	19	25	16	18	22	28	11
21"																					12
24"	26	30	34	32	37	42	38	44	50	50	58	66	15 (17)	19	21	28	19	22	26	34	14
27"																					15
30"	31	37	42	39	46	53	46	55	63	62	74	85	17 (18)	21	24	32	21	25	30	40	16
36"	37	44	52	46	56	65	56	67	79	76	91	107					24	29	35	47	18
42"	43	53	62	55	67	79	67	82	96	91	111	132					27	32	39	54	19
48"	50	62	73	64	79	93	78	97	115	108	133	158					30	36	44	61	21
54"	57	71	85	74	92	110	91	113	136	126	157	188									21
60"																					22
66"																					25
72"																					26
													() Endwall With Baffles								

SOD

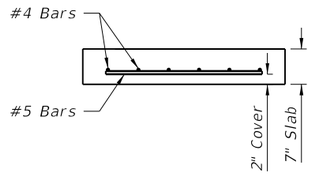
LAST REVISION	REVISION	DESCRIPTION:		FDOT DESIGN STANDARDS 2013	DITCH PAVEMENT AND SODDING	INDEX NO.	SHEET NO.
00						281	2



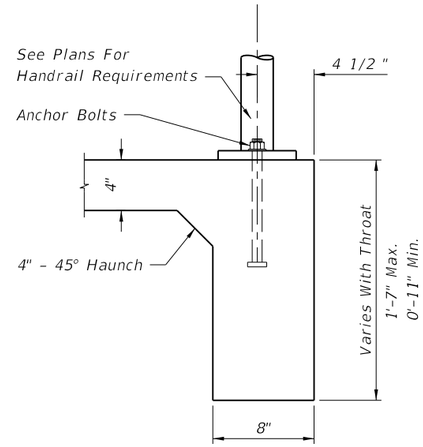
PLAN



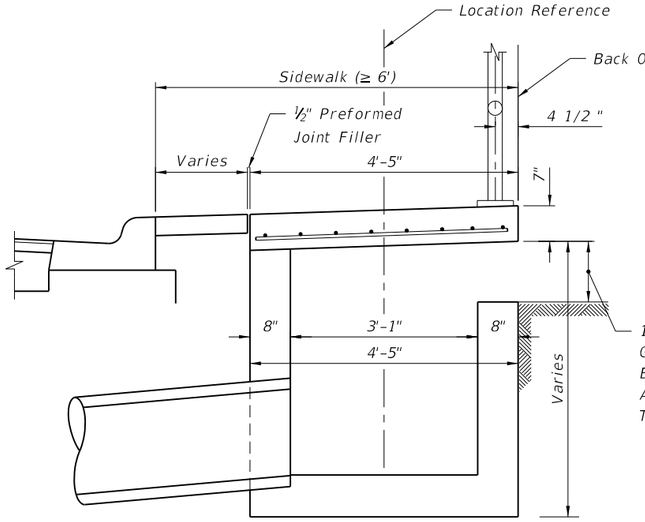
SLAB REINFORCEMENT



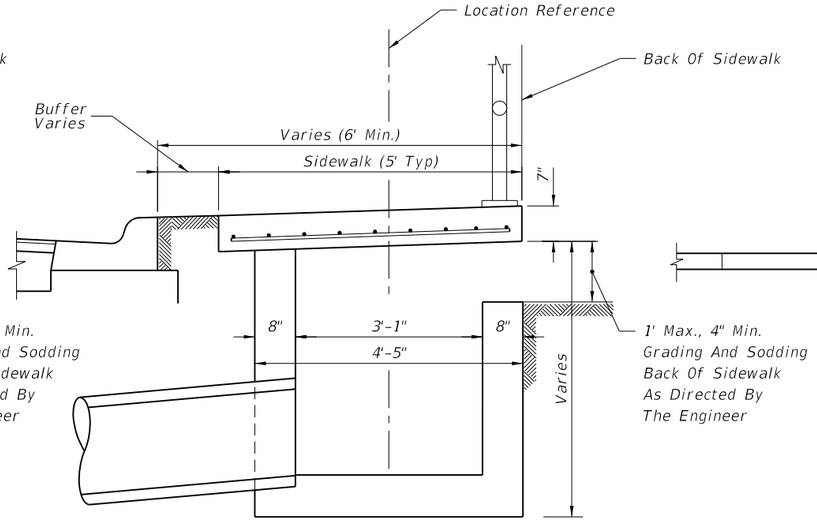
SLAB SECTION



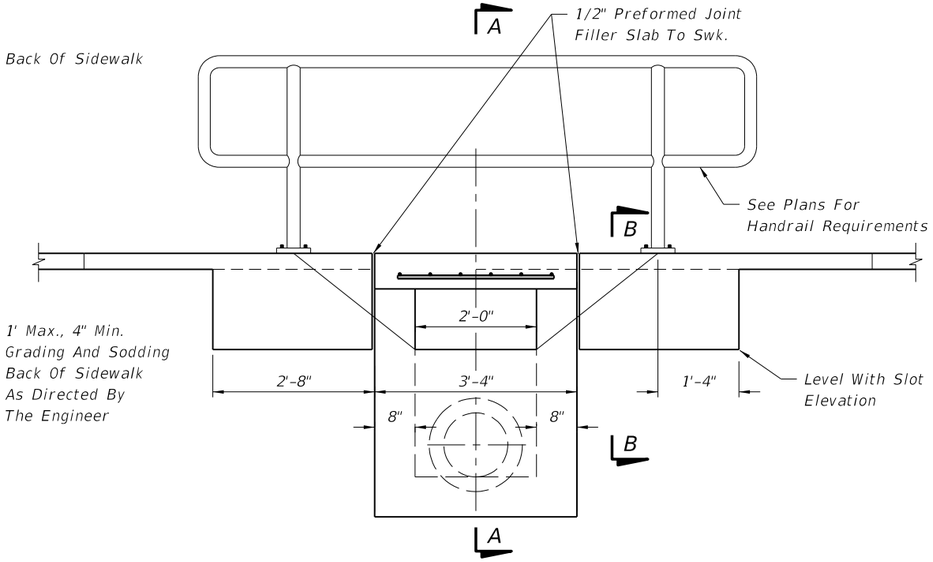
SECTION BB



≥ 6' SIDEWALK
SECTION AA



5' SIDEWALK
SECTION AA



FRONT ELEVATION

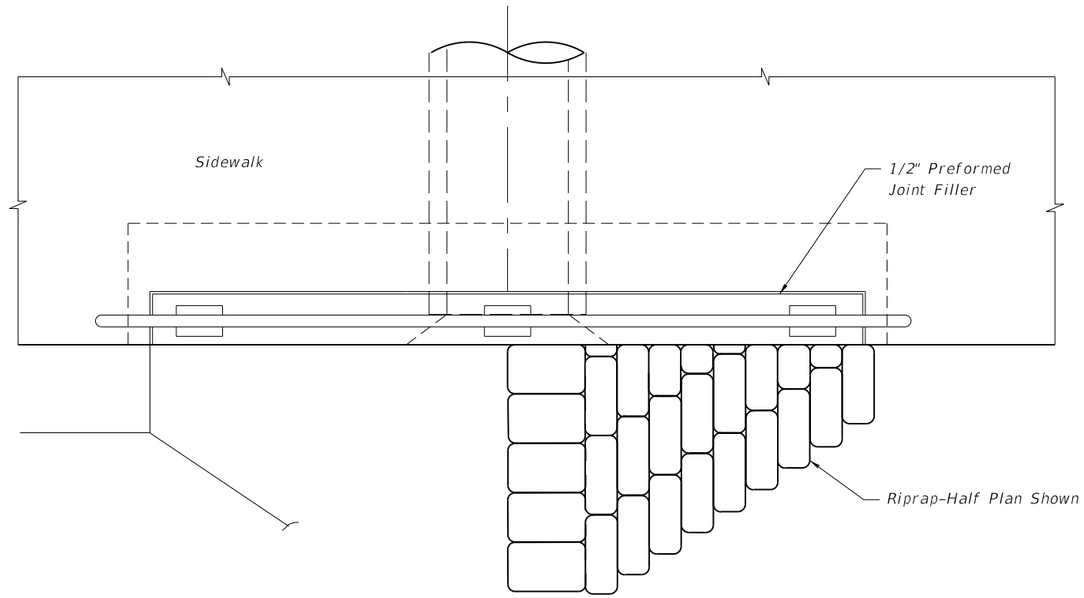
Notes:

1. For additional details see Index No. 232.

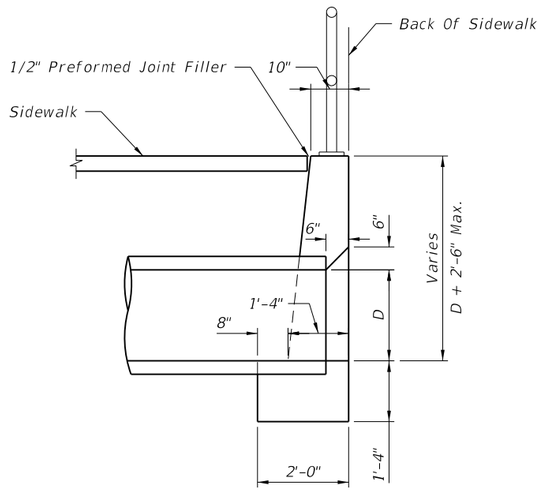
2. Inlet to be paid for under the contract unit price for Inlets (Ditch Bottom Type C Modified), EA. Handrail to be paid for under the contract unit price for Pipe Handrail, (Material), LF.

INLET TYPE C (MODIFIED)

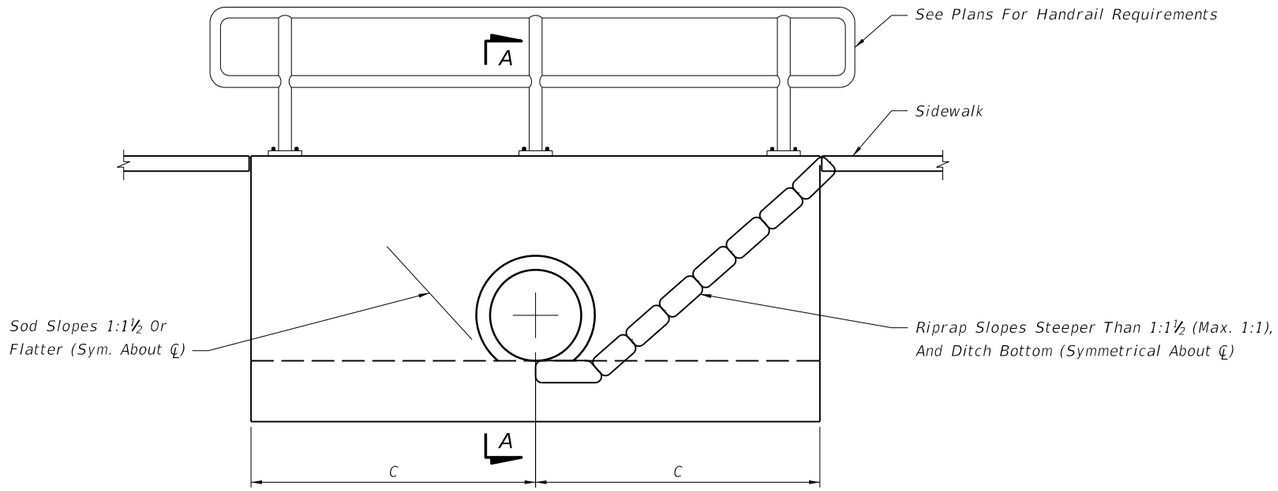
LAST REVISION	REVISION	DESCRIPTION:	FDOT DESIGN STANDARDS 2013	BACK OF SIDEWALK DRAINAGE	INDEX NO.	SHEET NO.
01/01/12					282	1



PLAN



SECTION AA



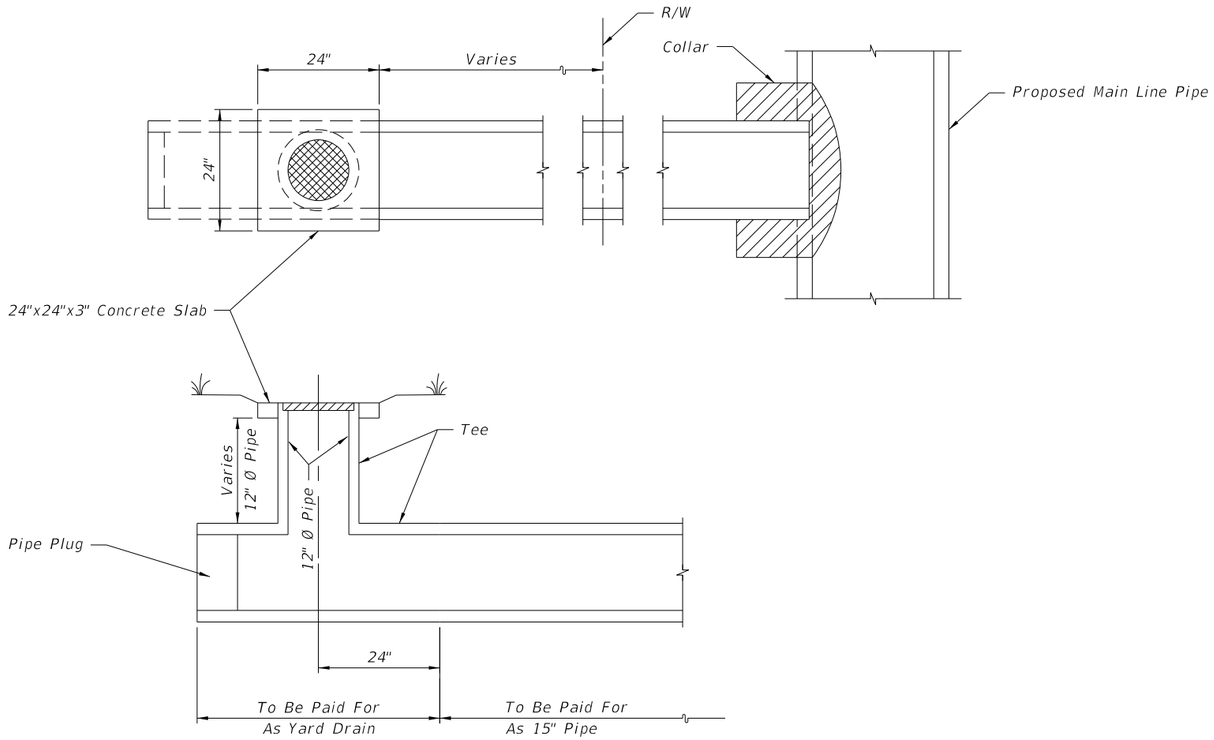
FRONT ELEVATION

Pipe Size (in)	C	Concrete Class I (CY)	Sand-Cement Riprap (CY)
15	4'-9"	2.3	1.1
18	5'-3"	2.6	1.3
24	6'-3"	3.3	1.8

Notes:
1. Maximum pipe size shall be 24" diameter.
2. Grading back of sidewalk varies and shall be done as directed by the Engineer.
3. Concrete quantities shown are for maximum wall heights, and shall be basis for estimate and payment.
4. Riprap quantities shown are for estimate purposes only. Cost of riprap to be included in cost of the endwall.
5. Endwalls to be paid for under the contract unit price for Concrete Class I (Endwalls), CY. Handrail to be paid for under the contract unit price for Pipe Handrail, (Material), LF.

SPECIAL CONCRETE ENDWALL

LAST REVISION	REVISION	DESCRIPTION:				
07/01/09			FDOT DESIGN STANDARDS 2013	BACK OF SIDEWALK DRAINAGE	INDEX NO. 282	SHEET NO. 2



YARD DRAIN ITEM INCLUDES:

① 15" x 15" x 12" Concrete or PVC Tee 4' long.

② One (1) Grate-Neenah No. R-4030, Phoenix No. P-1058, U.S. Foundry No. 5605 or equivalent.

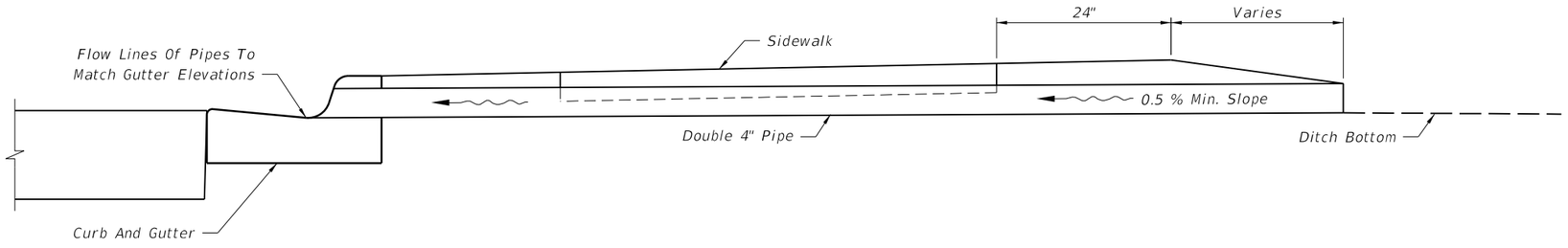
③ 12" pipe as necessary.

④ 0.04 Cubic yards concrete for slab.

YARD DRAINS

Notes:

1. Yard drains to be located outside the R/W. Drainage area should not exceed 750 SF (grate flow 0.1 Cfs).
2. Yard drains may be constructed at the option of the property owner as shown on the plans.
3. Cost of plugs and collars to be included in the cost for 15" pipe. For collar and plug details see Index No. 280.
4. Yard drains to be paid for under the contract unit price for Yard Drains, EA.

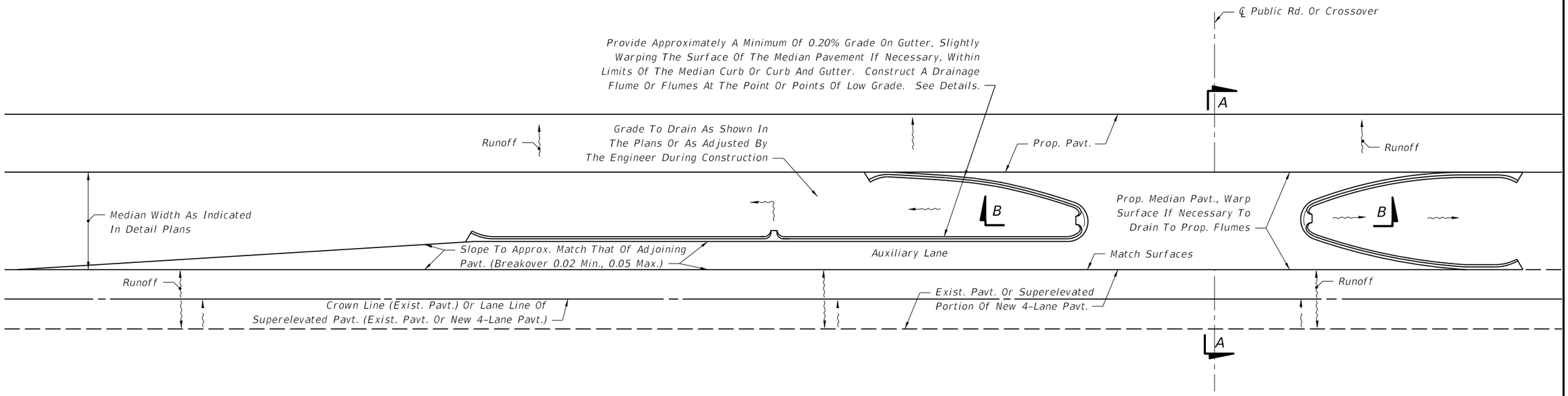


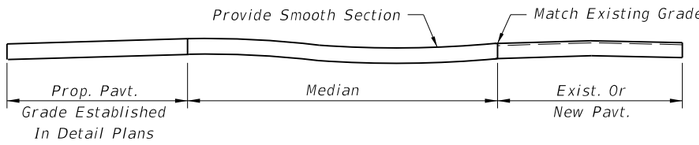
SHALLOW DITCHES

Notes:

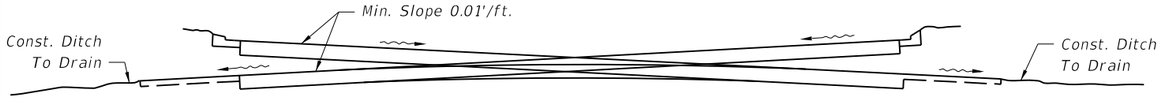
1. To be constructed at locations as directed by the Engineer.
2. Either cast iron pipe or PVC rigid conduit, U.L. listed for direct sunlight exposure, Schedule 40, may be used.
3. Pipe to be paid for under the contract unit price for either Cast Iron Soil Pipe (Standard) (4"), LF or Polyvinyl Chloride Pipe Culvert (4"), LF.

LAST REVISION	REVISION	DESCRIPTION:		FDOT DESIGN STANDARDS 2013	BACK OF SIDEWALK DRAINAGE	INDEX NO.	SHEET NO.
07/01/09						282	3



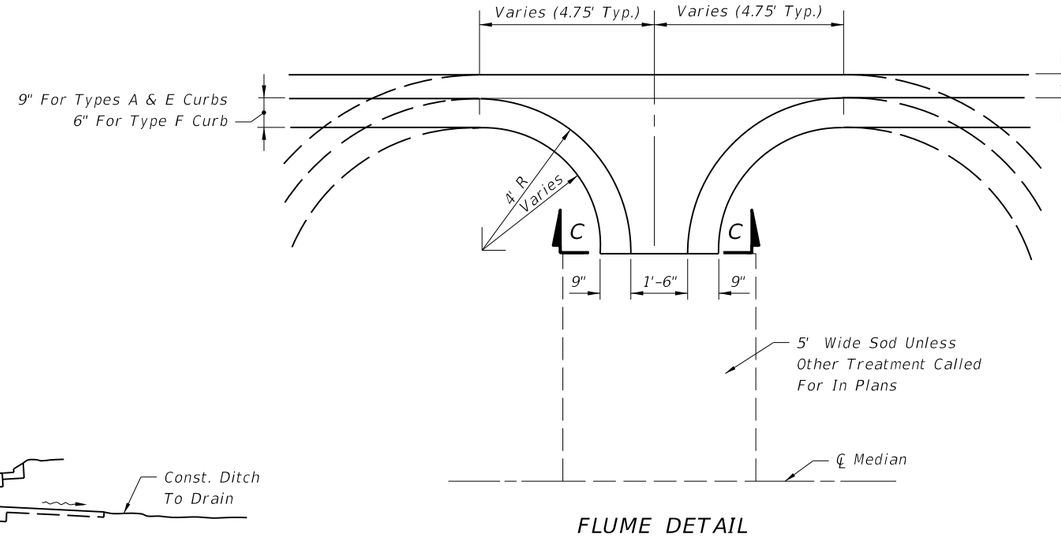


SECTION AA

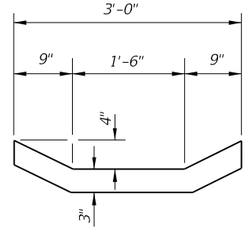


SECTION BB

(May Drain From Any Point Designated In the Plans Or As Adjusted By The Engineer During Construction)



FLUME DETAIL



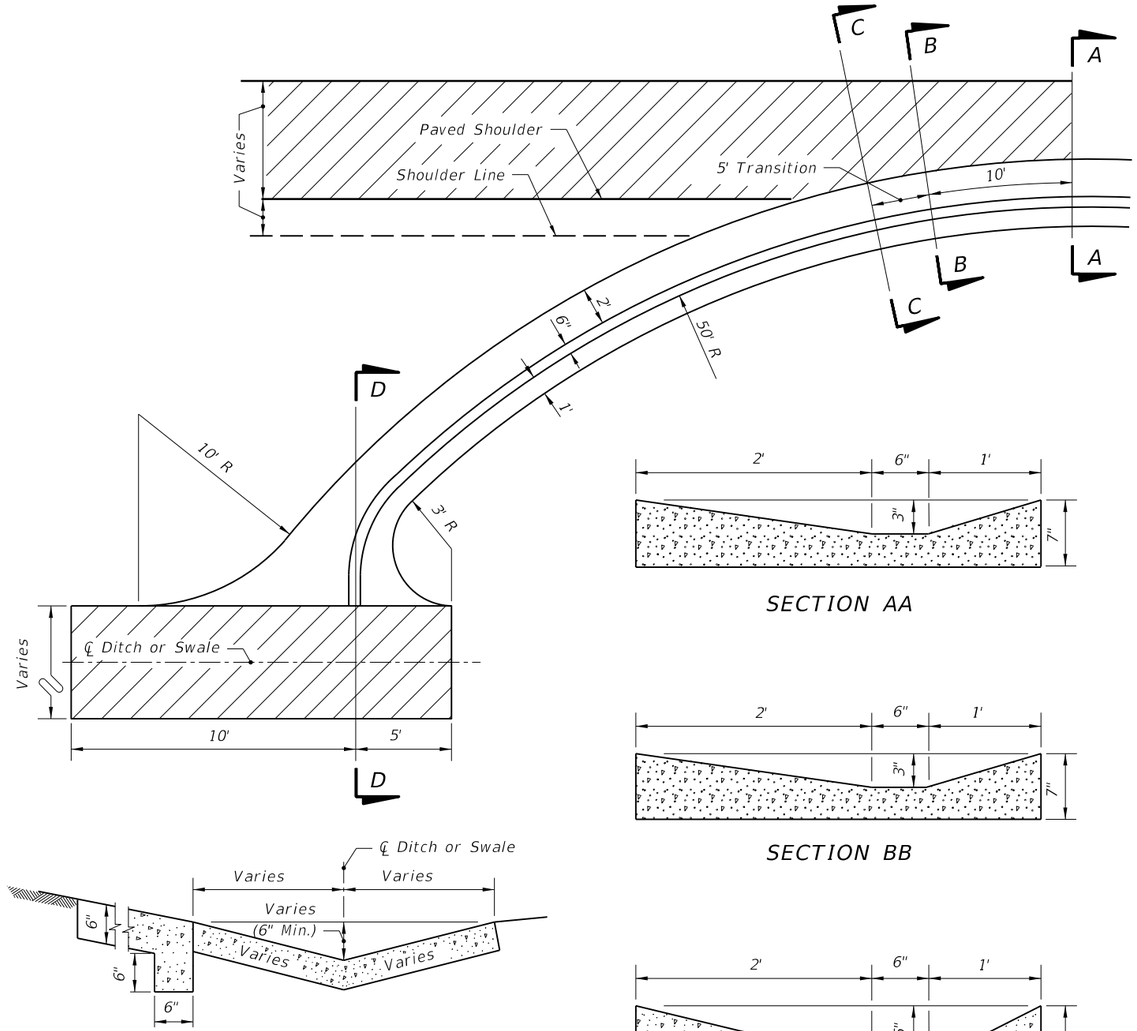
SECTION CC

GENERAL NOTES

1. These details are to apply to projects which provide for the conversion of 2-lane sections to 4-lane divided highway sections and for superelevated sections of new 4-lane divided highways. Layout above is illustration only. Cost of flumes to be included in the contract price for Curb or Curb and Gutter. Sod to be paid for under the contract unit price for Performance Turf, SY.

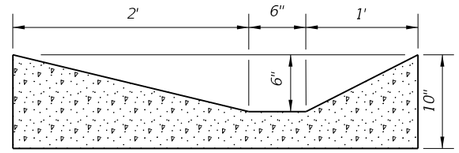
2. Flumes to be located in low point of noses and at other points as designated in the plans. The locations may be adjusted by the Engineer during construction.

LAST REVISION	REVISION	DESCRIPTION:				
07/01/07			FDOT DESIGN STANDARDS 2013	MEDIAN OPENING FLUME	INDEX NO. 283	SHEET NO. 1



SECTION AA

SECTION BB



SECTION CC

SECTION DD

1. Spillway to be paid for as Shoulder Gutter, L.F.

2. If spillway empties into an unpaved ditch, the detail should be modified as necessary.

DETAIL OF CONCRETE SPILLWAY AT END OF SHOULDER GUTTER

(TO BE USED WHERE INLETS, PIPES & ENDWALLS ARE IMPRACTICAL)

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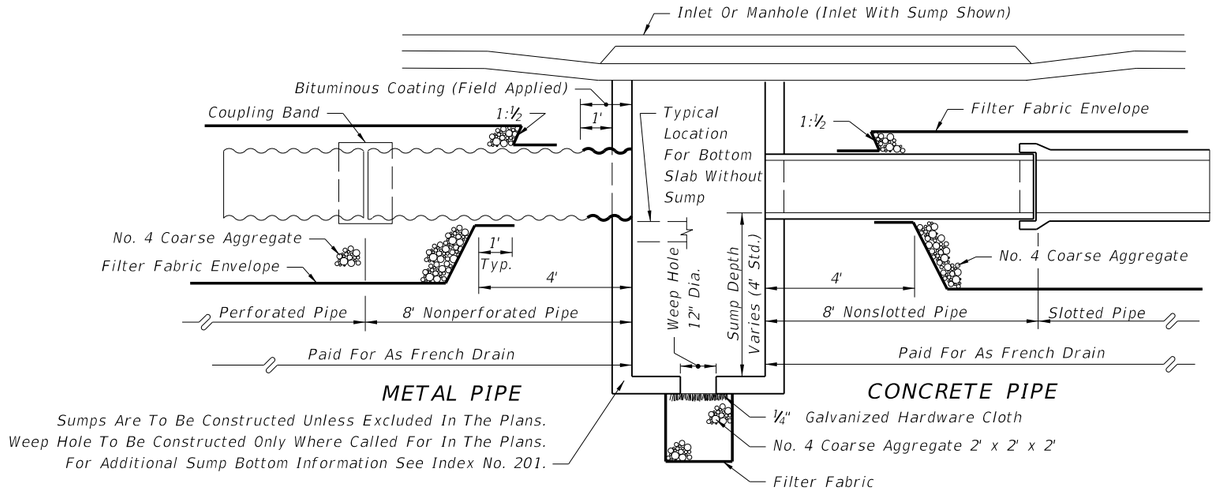
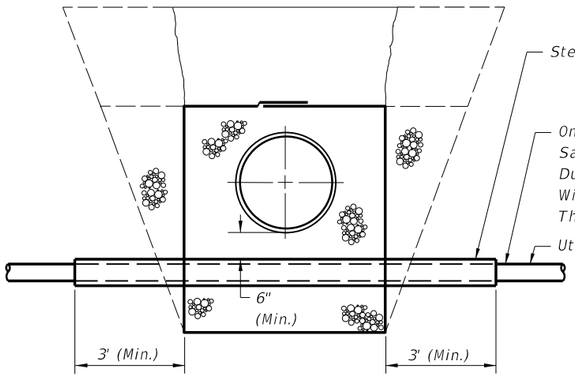
LAST REVISION	REVISION	DESCRIPTION:		FDOT DESIGN STANDARDS 2013	CONCRETE SHOULDER GUTTER SPILLWAY	INDEX NO.	SHEET NO.
07/01/09						284	1



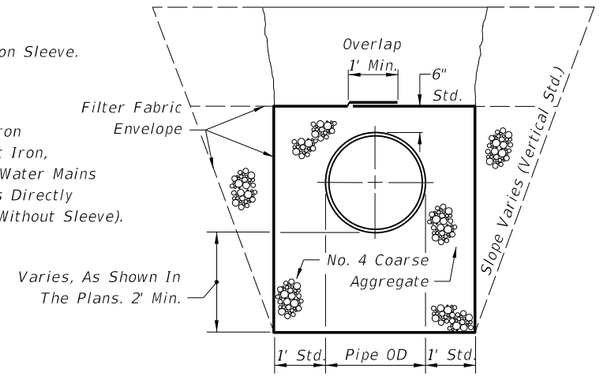
LONGITUDINAL SECTION

GENERAL NOTES

1. Pipe shall be any of the optional types permitted in Section 443 of the Specifications unless otherwise restricted in the plans. Dissimilar types of pipe will not be permitted in a continuous run of pipe.
2. Concrete pipe shall be placed with the slots positioned on sides.
3. Alignment joints are standard (gaskets not required). Recorrugation of metal pipe ends not required.
4. The contractor may submit other methods of providing slots having equal or greater area of opening, for approval by the Engineer.
5. Filter fabric shall be Type D-3 meeting the requirements of Section 985. All filter fabric joints shall lap a minimum of one (1) foot.
6. The standard cross section shall be constructed unless other section(s) described or detailed in the plans.
7. For supplemental details see Index No. 280.
8. The contractor shall take the necessary precautions to prevent contamination of the trench with sand, silt and foreign materials.
9. French drains shall be paid for under the contract unit price for French Drains, LF. The unit price shall include the cost of pipe, pipe plugs, pipe fittings, coarse aggregate and filter fabric in place, and the cost for trench excavation, backfill and compaction. The unit price shall also include the cost for disposal of surplus excavated materials and cost for restoration of pavement removed or damaged by french drain construction, but shall not include payments for items paid for elsewhere.



ROUND PIPE SHOWN
UTILITY PIPES THRU FRENCH DRAIN



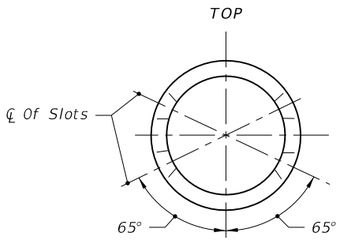
ROUND PIPE SHOWN
STANDARD CROSS SECTION (ENLARGED)

DESIGN NOTES

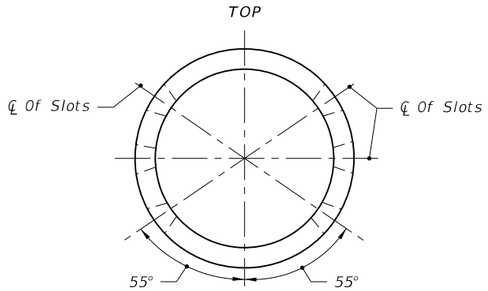
1. Pipe invert should be at or above the water table whenever possible.
2. French drains with minor dimensional changes or otherwise different from the standard cross-section shall be either described or detailed in the plans. French drains with significantly different cross-sections shall be detailed in the plans.

FRENCH DRAIN SYSTEM

LAST REVISION	REVISION	DESCRIPTION:		FDOT DESIGN STANDARDS 2013	FRENCH DRAIN	INDEX NO.	SHEET NO.
07/01/10						285	1



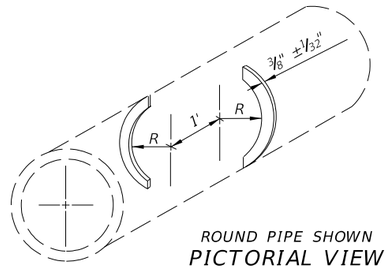
15"-30"



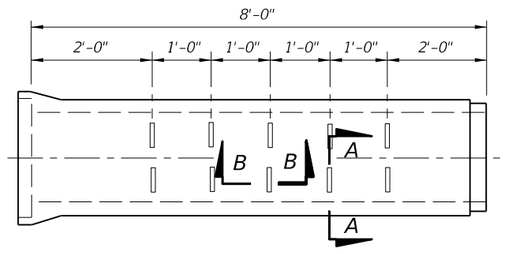
36"-72"

ELLIPTICAL PIPE		
Pipe Size	Slot Cut Opening c	
	Min.	Max.
14"x23"	10"	12"
19"x30"	14"	16"
24"x38"	14"	16"
29"x45"	20"	22"
34"x53"	20"	22"
38"x60"	20"	22"

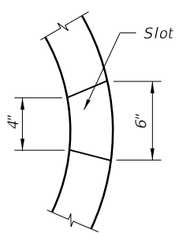
ROUND PIPE		
Pipe Size	Slot Cut Opening c	
	Min.	Max.
15"	12"	14"
18"	12"	14"
24"	16"	18"
30"	16"	18"
36"	22"	24"
42"	22"	24"
48"	22"	24"
54"	24"	26"
60"	24"	26"
66"	24"	26"
72"	24"	26"



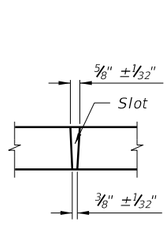
ROUND PIPE SHOWN
PICTORIAL VIEW



SIDE VIEW



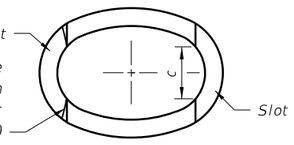
SECTION AA



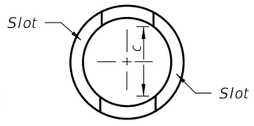
SECTION BB

OPTION A - ROUND PIPE

A curved cut is acceptable provided the control dimension is maintained (Typical For Elliptical & Round Pipe)

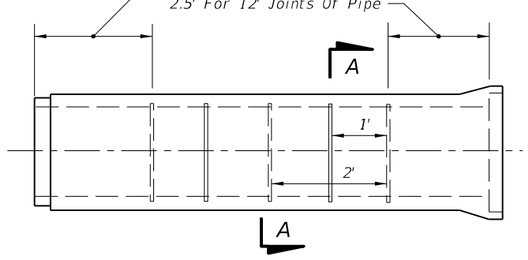


ELLIPTICAL PIPE



ROUND PIPE

SECTION AA

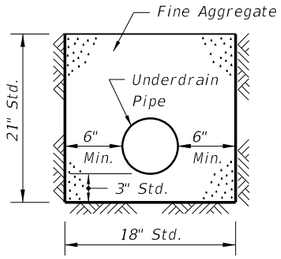


SIDE VIEW

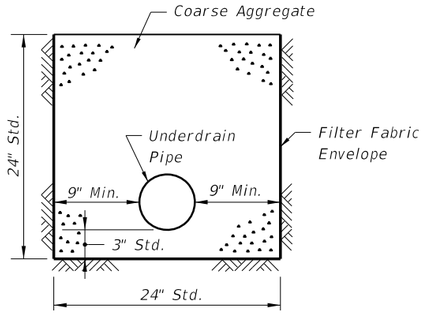
OPTION B - ROUND OR ELLIPTICAL PIPE

SLOTTED PIPE OPTIONS

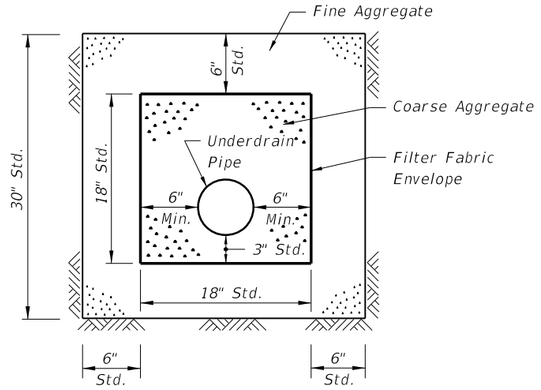
LAST REVISION	REVISION	DESCRIPTION:		FDOT DESIGN STANDARDS 2013	FRENCH DRAIN	INDEX NO.	SHEET NO.
07/01/07						285	2



TYPE I



TYPE II



TYPE III

DESIGN NOTES

1. The type of underdrain should be selected to meet design water removal rate and soil conditions. Caution is prescribed in the use of these typical sections since special designs may be required to satisfy project conditions.

2. Type I underdrain is intended for minimum water removal conditions.

3. Type II underdrain is intended for moderate water removal conditions. Where reactive conditions may create chemical clogging, the use of an inert material and/or elimination of the filter fabric may be necessary.

4. Type III underdrain is intended for maximum water removal conditions. Filter fabric is required between the coarse aggregate or fine aggregate including those described in general notes 2 and 3. Design note 3 applies for reactive conditions.

5. Type V underdrain is intended for use in detention basins and other locations which require a filtration system. The standard fine aggregate specified for Type V underdrain conforms to filtration gradation requirements of Chapter 62-25 FAC.

6. The designer should detail in the plans, the location of:
(a) Type V underdrain, (b) nonstandard locations of Type I, II, and III underdrain, (c) underdrain inspection boxes, (d) cleanouts for Type V underdrain, and (e) underdrain outlet pipes.

7. The designer should specify the flow line elevations at the beginning, bends, junctions and ends of underdrain pipes and outlet pipes.

8. The designer should evaluate whether an external filter fabric envelope is required around underdrain Types I and III. When required, fabric shall be specified in the plans.

GENERAL NOTES

1. The underdrain pipe shall be either 4" smooth or 5" corrugated tubing unless otherwise shown in the plans. The size to be furnished will be based on the nominal internal diameter of a pipe with a smooth interior wall. Except when prohibited by the plans, the special provisions or this standard, pipe with a corrugated interior wall may be provided based on the following size equivalency.

   4" smooth interior equivalent to 5" corrugated interior
   5" smooth interior equivalent to 6" corrugated interior
   6" smooth interior equivalent to 8" corrugated interior
   8" smooth interior equivalent to 10" corrugated interior

2. Fine aggregate shall be quartz sand meeting the requirements of Sections 902-4 of the Standard Specifications.

3. Coarse aggregate shall be gravel or stone meeting the requirements of Sections 901-2 or 901-3. The gradation shall meet Section 901, Grades 4, 467, 5, 56 or 57 stone unless otherwise shown restricted in the plans.

4. Underdrain Type I, II, III and V shall be in accordance with Section 440.

5. Filter fabric shall be Type D-3 (See Index No. 199). The internal filter fabric of Type V underdrain shall have a permittivity of 0.7 /sec. and an AOS of #40 sieve.

6. When Type I is used, a filter fabric sock meeting Section 948 is required.

7. See Index No. 500 for the standard location of Type I, II, and III underdrain. The location of Type V underdrain and nonstandard locations of Type I, II, and III underdrain will be as detailed in the plans.

8. All filter fabric joints shall overlap a minimum of 1'. The internal filter fabric of Type V underdrain shall overlap into the coarse aggregate or the fine aggregate a minimum of 1'.

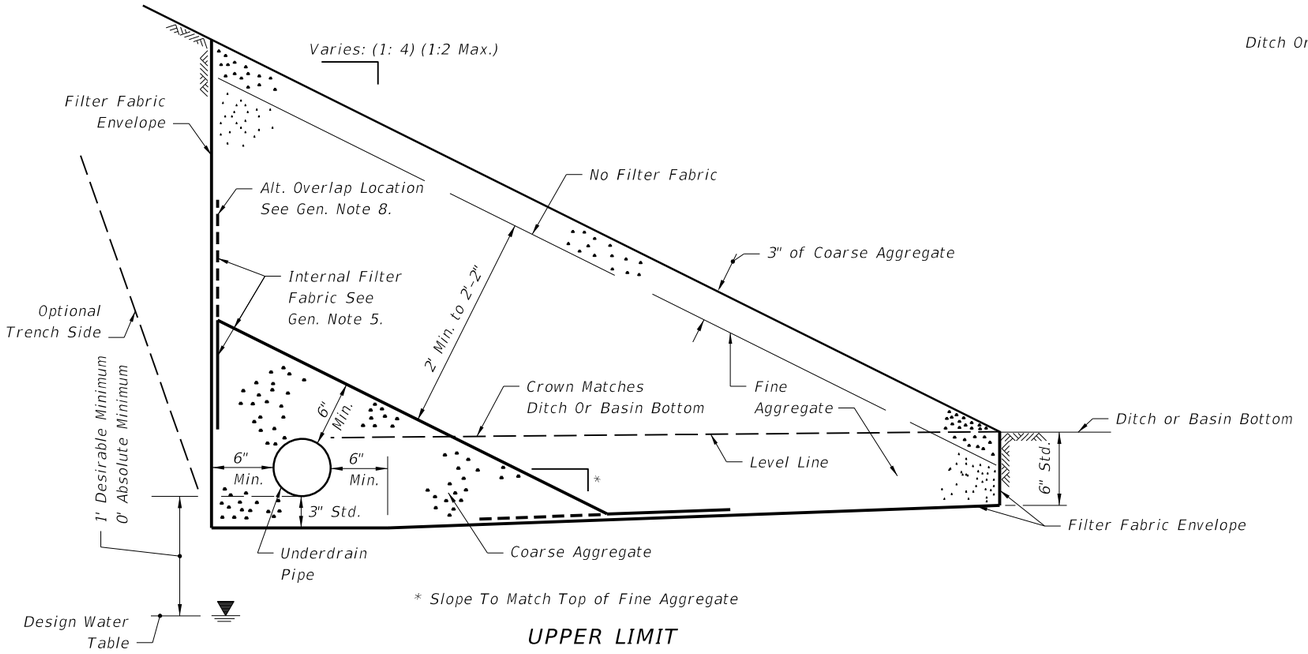
9. Underdrain outlet pipes shall be nonperforated and all bends shall be made using ⅛ (45 deg.) elbows. 90 deg. bends shall be constructed with two ⅛ elbows separated by at least 1' of straight pipe. Outlet pipes stubbed into inlets or other drainage structures shall be not less than 6" above the structure flow line. Outlet pipes discharging to grassed areas shall have concrete aprons, hardware cloth, and bordering sod as shown in Index No. 287 for Edgedrain outlets.

10. Pay Item shall be based on the size of the smooth interior products. The contract unit price for Underdrain, LF, shall include the cost of pipe, fittings, aggregate, sock, filter fabric, underdrain cleanouts, and concrete aprons.

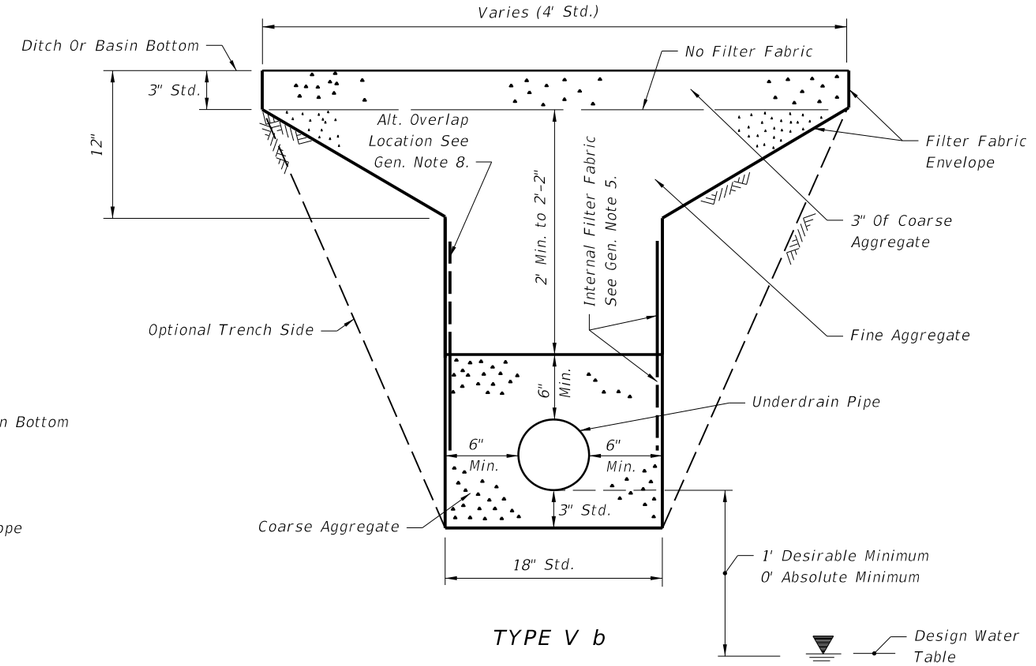
    The contract unit price for Underdrain Outlet Pipe, LF, shall be full compensation for trench excavation, pipe and fittings, concrete aprons, hardware cloth for concrete aprons, stubbing into drainage structures, backfill in place, and disposal of excess materials.

    The contract unit price for Underdrain Inspection Box, EA. shall be for the number completed and accepted.

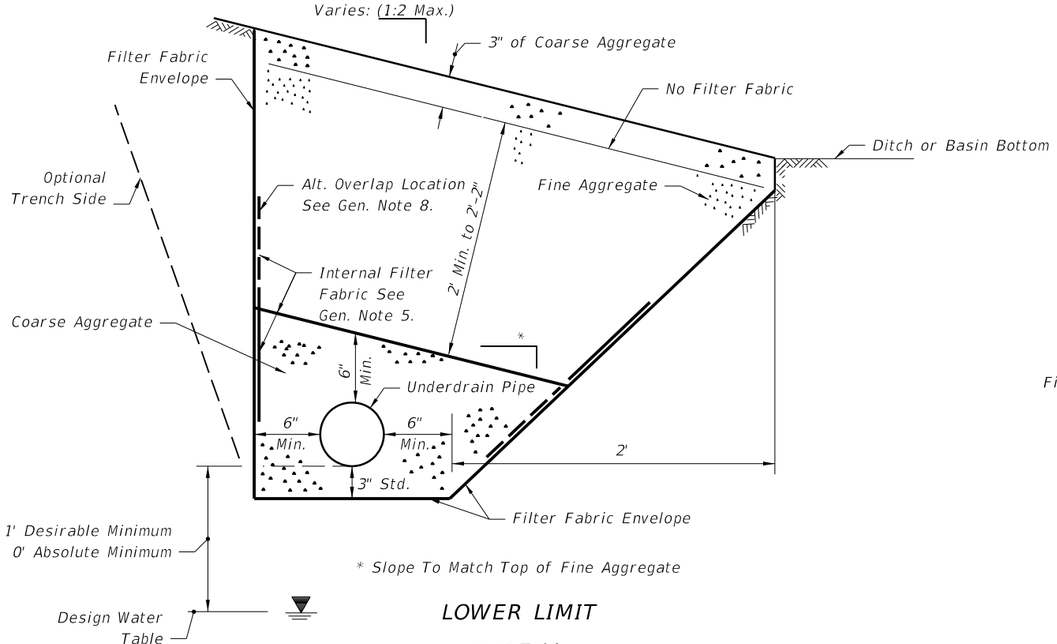
LAST REVISION	REVISION	DESCRIPTION:		FDOT DESIGN STANDARDS 2013	UNDERDRAIN	INDEX NO.	SHEET NO.
07/01/07						286	1



UPPER LIMIT

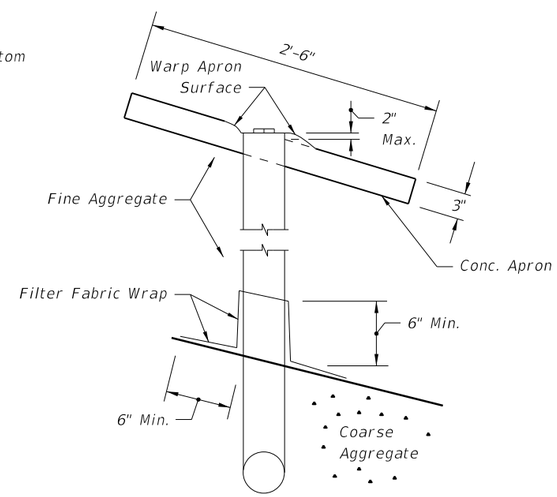


TYPE V b



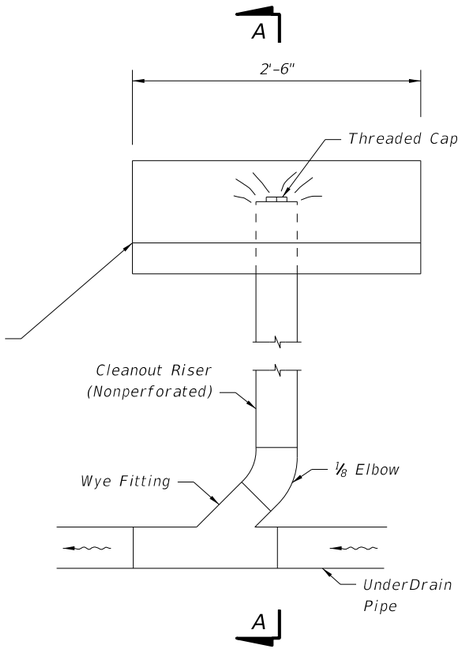
LOWER LIMIT

TYPE V a

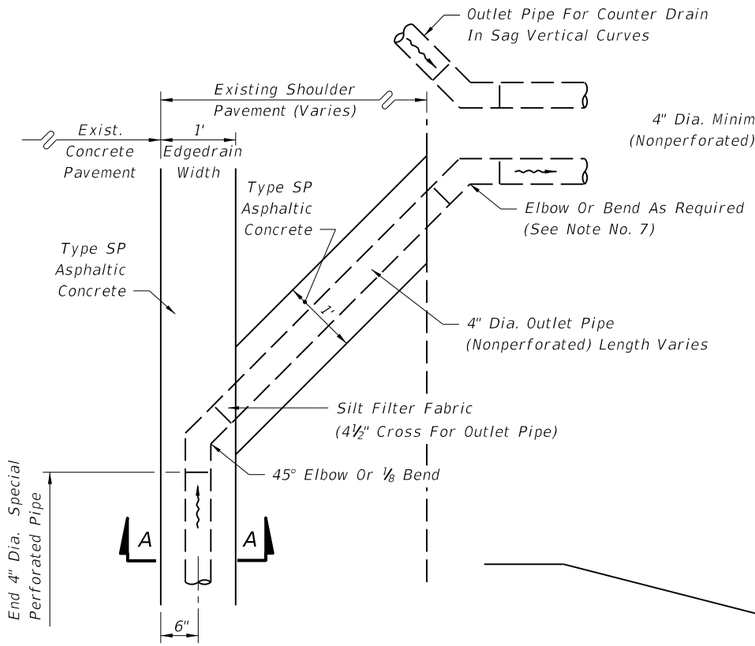


SECTION AA

CLEANOUT FOR TYPE V UNDERDRAIN

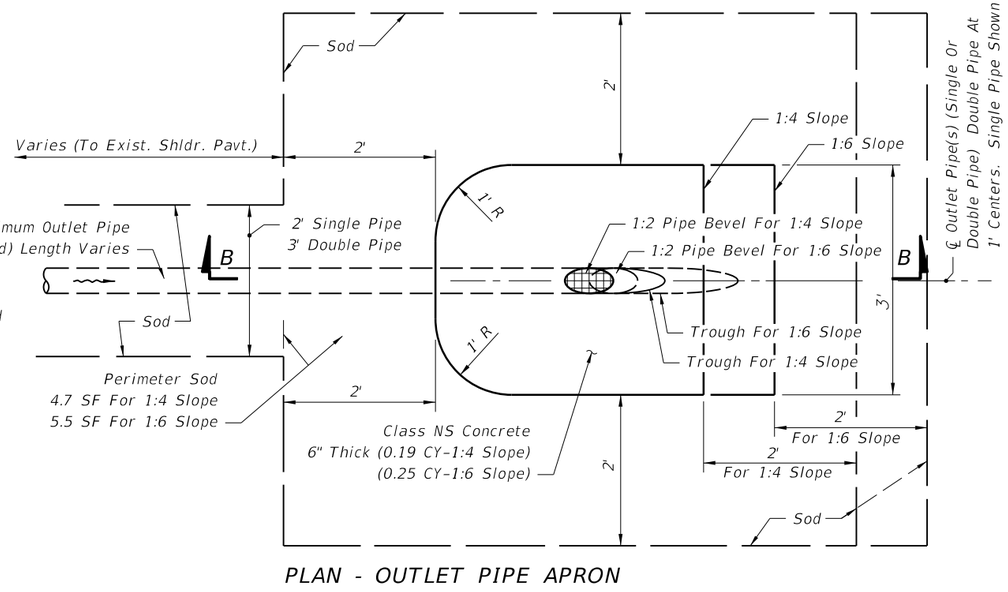


LAST REVISION	REVISION	DESCRIPTION:			INDEX NO.	SHEET NO.
02			FDOT DESIGN STANDARDS 2013	UNDERDRAIN	286	2

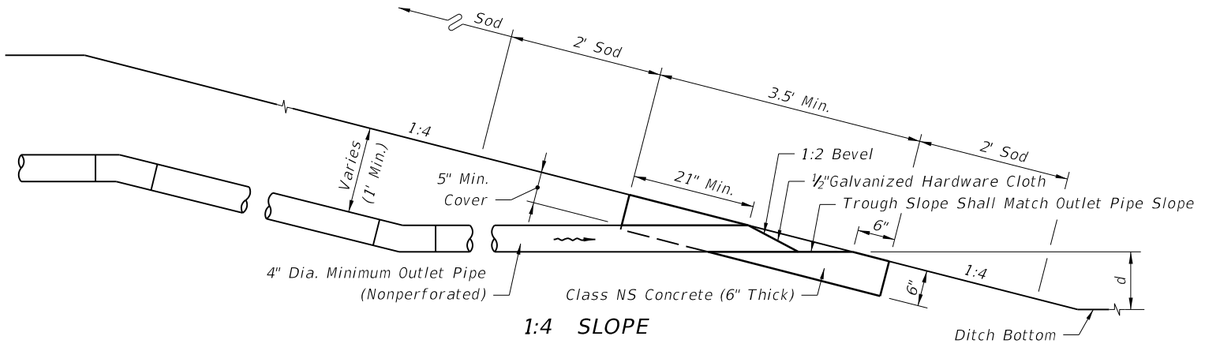


ALIGNMENT OF OUTLET PIPE

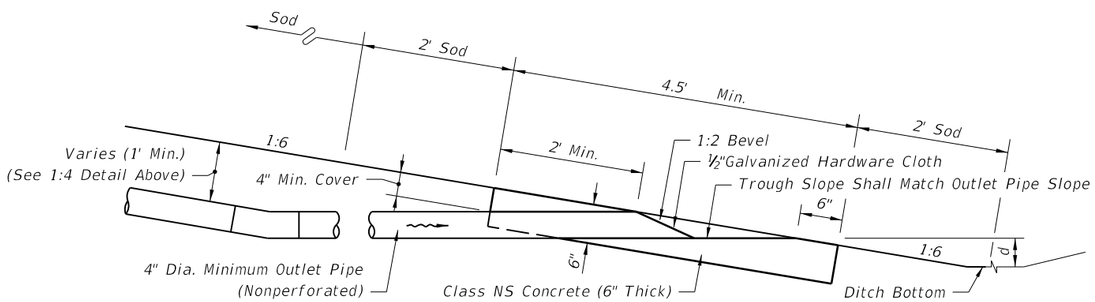
NOTE: For Section AA see following Sheets.



PLAN - OUTLET PIPE APRON



1:4 SLOPE



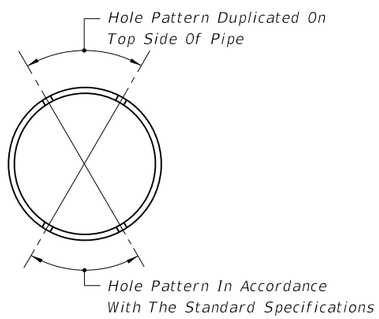
1:6 SLOPE

SECTIONS BB

4" EDGEDRAIN

EDGEDRAIN OUTLET

d = 1.75' std. for grassed ditches; 0.5' std. for paved ditches
[less is acceptable to provide minimum 0.1% outlet pipe slope]



SUBDRAINAGE PIPE

GENERAL NOTES FOR CONCRETE PAVEMENT SUBDRAINAGE

1. No trench greater than 2' in depth will be allowed overnight. Trenches shall be barricaded at all times.

2. Concrete pavement subdrainage shall be constructed adjacent to the low edge of the roadway pavement and under travel lanes, auxiliary pavement and shoulders, as called for in the plans. When the low edge shifts between outside and inside edges of pavement the concrete pavement subdrainage shall extend 50' beyond and begin 50' before the flat point (100' overlap).

   Concrete pavement subdrainage shall be placed on the low side of ramps of crossroad terminals.

3. Concrete pavement subdrainage shall be constructed on a grade parallel with the edge of pavement profile, except on profiles flatter than one-tenth percent (0.10%) the concrete pavement subdrainage shall be constructed on a grade of one-tenth percent (0.10%).

4. Immediately prior to placing the filter fabric the entire vertical face of the concrete pavement shall be cleaned to remove adhering base material and soil.

5. The Contractor shall devise a procedure for holding the filter fabric in position on the vertical face of the trench. The procedure must be approved by the Engineer prior to placement of the draincrete.

6. The upper end of each separate run of the concrete pavement subdrainage pipe shall be capped.

7. Outlet pipes shall be constructed at a maximum of 500' intervals. Elbows or ⅛ bends shall be used to connect the outlet pipe to the concrete pavement subdrain pipe. The elbows or bends shall be of the same material as the outlet pipe but compatible with the pipe.

   When directed by the Engineer, outlet pipes shall be stubbed into existing inlets or into existing ditch pavements at an elevation 6" above the inlet flowline or ditch bottom. Concrete apron and bordering sod are not required for stubbed outlets,but replacement sodding will be required at trenches for pipes stubbed into paved ditches.

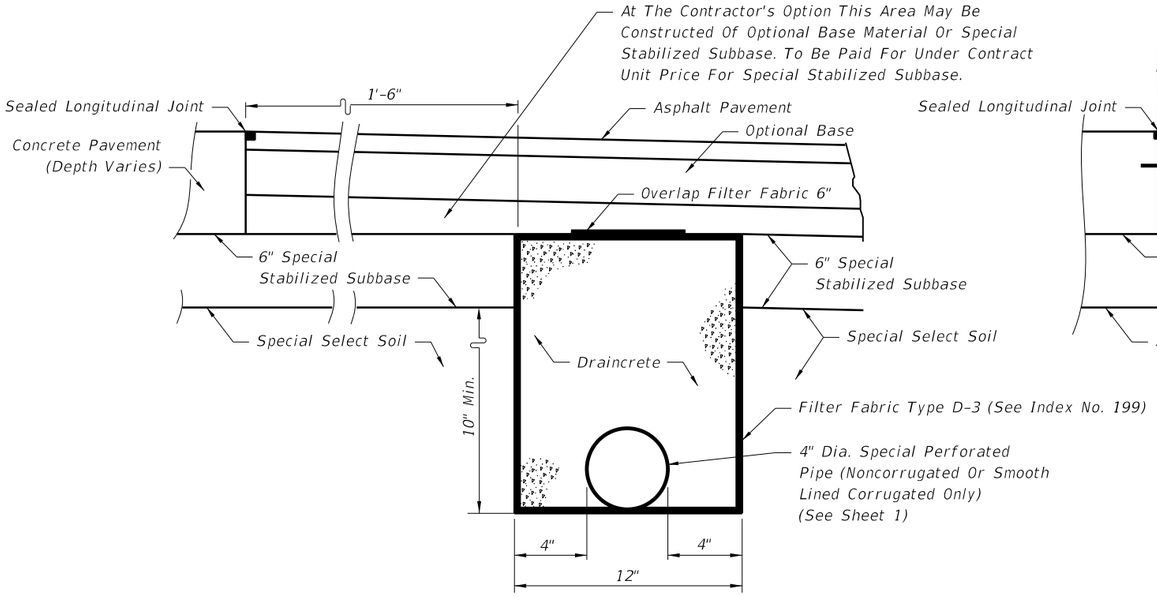
   In sag vertical curves separate outlet pipes for concrete pavement subdrains from opposite directions shall use a single apron unless otherwise shown in the plans or otherwise directed by the Engineer.

   Backfill around outlet pipes shall be of cohesive soils, draincrete will not be permitted.

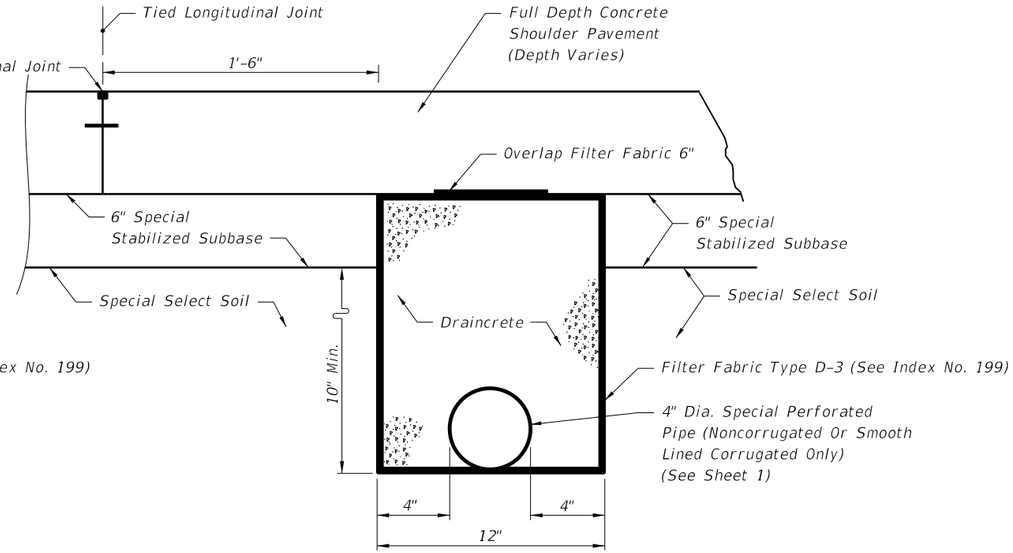
8. Existing paved shoulder that is removed for the construction of outlet pipes shall be replaced with Type SP asphaltic concrete at the rate of 500 LB per SY.

9. The contract unit price for Edgedrain Outlet Pipe (4") LF, shall be full compensation for removal of existing shoulder pavement, trench excavation, pipe and fitting, concrete apron, hardware cloth, sod, stubbing into existing inlets and paved ditches, restoration of ditch pavement, backfill in place, and disposal of excess materials.

LAST REVISION	REVISION	DESCRIPTION:				
07/01/09			FDOT DESIGN STANDARDS 2013	CONCRETE PAVEMENT SUBDRAINAGE	INDEX NO. 287	SHEET NO. 1

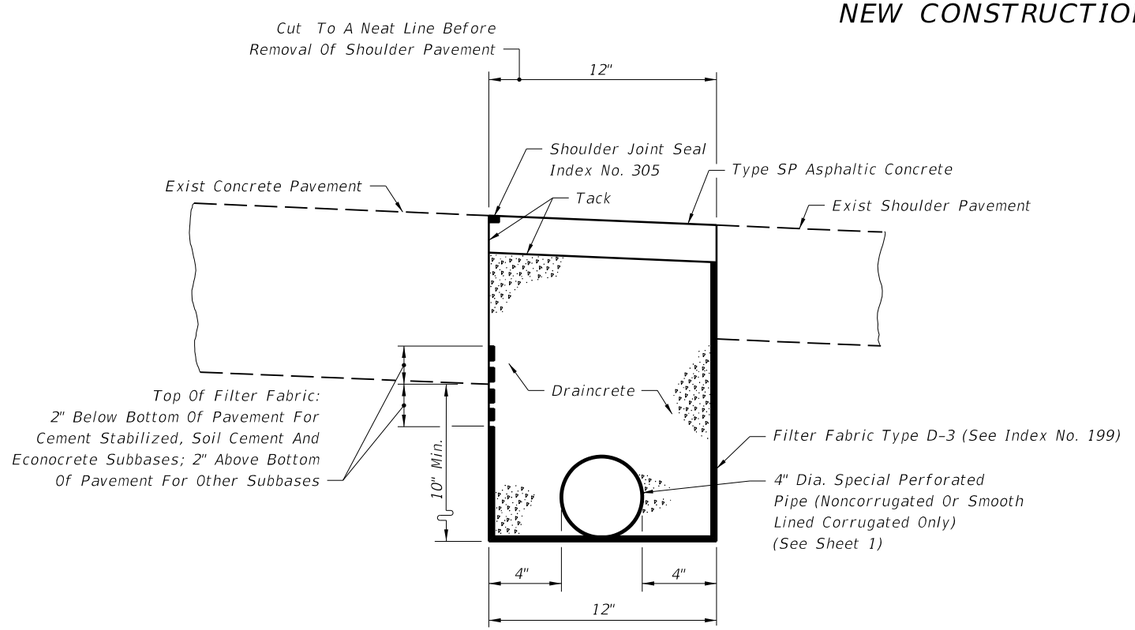


ASPHALT SHOULDERS



CONCRETE TRAVEL LANES, SHOULDERS, AND AUXILIARY PAVEMENT

NEW CONSTRUCTION



REHABILITATION

DRAINCRETE SUBDRAINAGE

NOTES FOR DRAINCRETE PAVEMENT SUBDRAINAGE

1. The edgedrain sections for DRAINCRETE SUBDRAINAGE are applicable to pavement construction identified as RIGID PAVEMENT on Index No. 505, Sheet 2 and 4.

2. The contractor shall confine the construction of draincrete edgedrain to an area in which the entire operation can be carried out in five (5) work days, unless another construction period is called for in the plans, with sufficient time allowed for the draincrete to set before placement of pavement.

METHOD OF PAYMENT

NEW CONSTRUCTION:

1. The contract unit price for Edgedrain (Draincrete) LF shall be full compensation for trench excavation, disposal of excess material, filter fabric, draincrete edgedrain pipe and fittings and draincrete.

   Payment for outlet pipe shall be in accordance with General Note 9, Sheet 1 of 4.

FOR REHABILITATION:

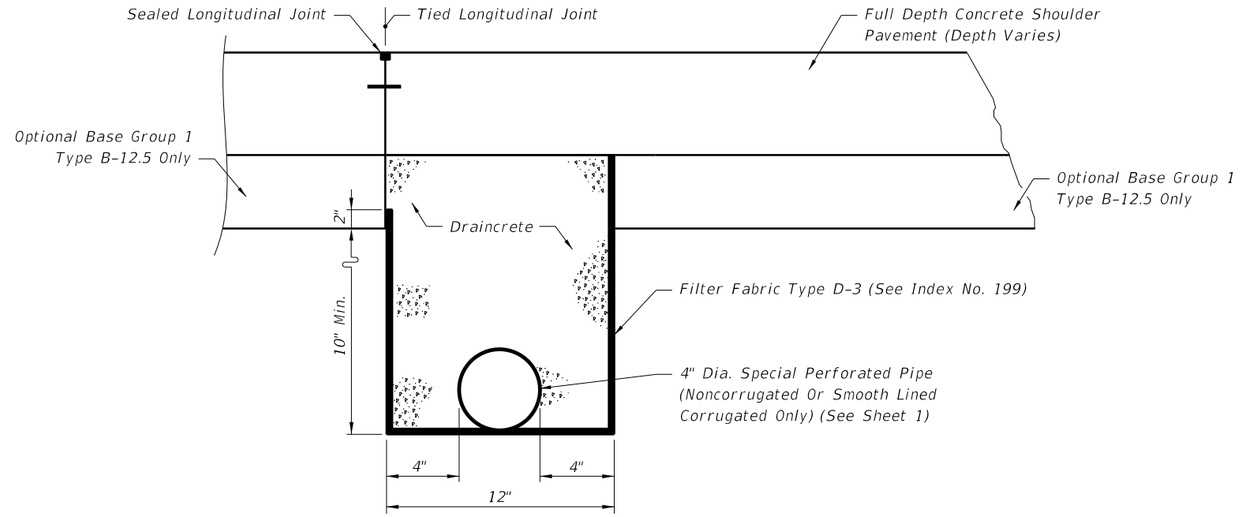
1. The contract unit price for Edgedrain (Draincrete) LF, shall be full compensation for removal of existing shoulder pavement, trench excavation, disposal of excess materials, filter fabric, draincrete edgedrain pipe and fittings, and draincrete, necessary for edgedrain construction.

   Payment for outlet pipe shall be in accordance with General Note 9, Sheet 1 of 4.

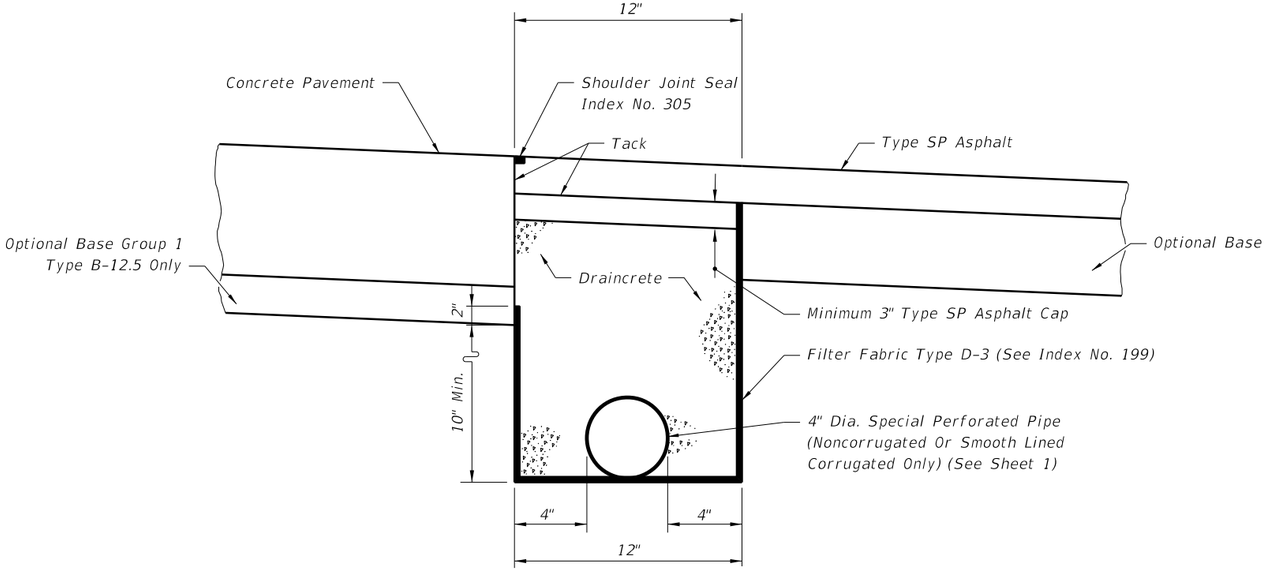
   Shoulder pavement shall be paid for under the contract unit price for Type SP, Asphaltic Concrete.

   Shoulder joint seal shall be paid for under the contract unit price for Pavement Joint, LF.

LAST REVISION	REVISION	DESCRIPTION:				
07/01/09			FDOT DESIGN STANDARDS 2013	CONCRETE PAVEMENT SUBDRAINAGE	INDEX NO. 287	SHEET NO. 2



CONCRETE TRAVEL LANES, SHOULDERS, AND AUXILIARY PAVEMENT



ASPHALT SHOULDERS

ASPHALT BASE SUBDRAINAGE

NOTES FOR DRAINCRETE PAVEMENT SUBDRAINAGE

1. The edgedrain sections for DRAINCRETE SUBDRAINAGE are applicable to pavement construction identified as RIGID PAVEMENT on Index No. 505, Sheet 2 and 3.

2. The contractor shall confine the construction of draincrete edgedrain to an area in which the entire operation can be carried out in five (5) work days, unless another construction period is called for in the plans, with sufficient time allowed for the draincrete to set before placement of pavement.

METHOD OF PAYMENT

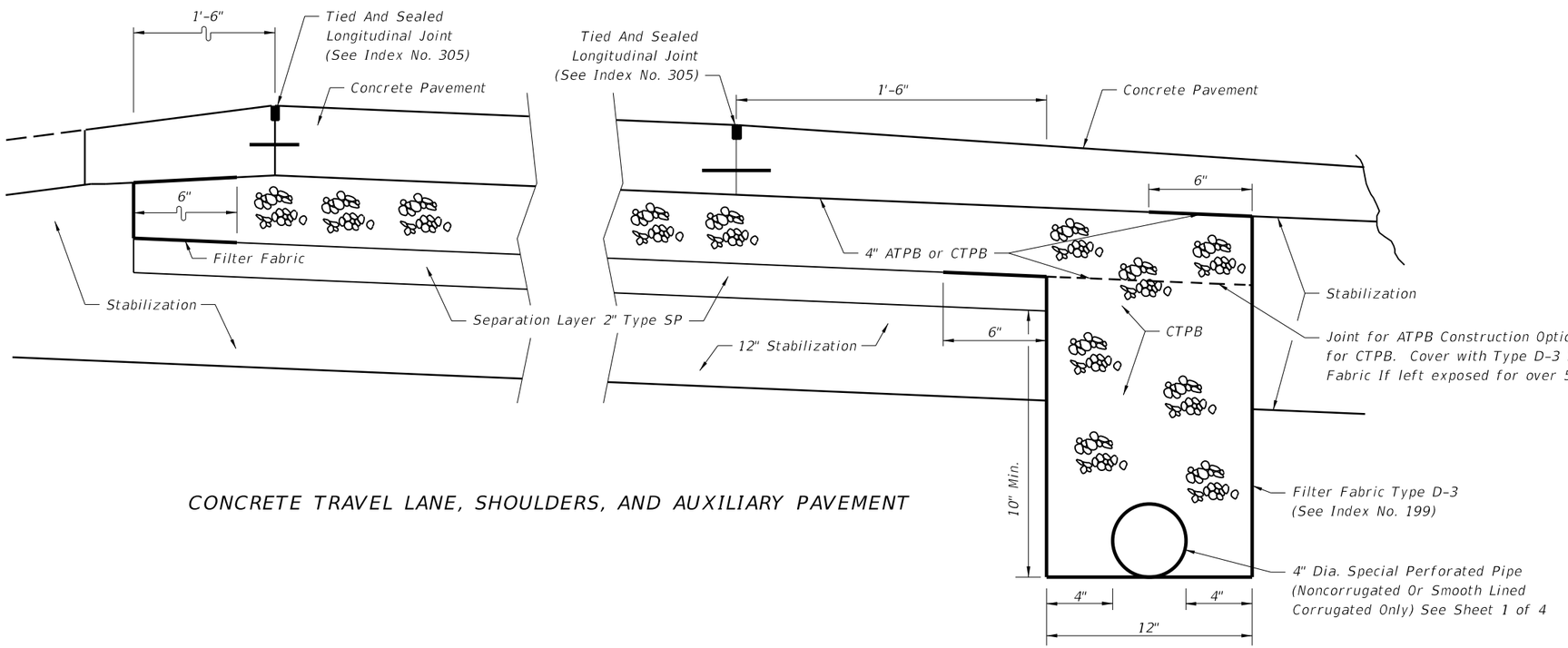
NEW CONSTRUCTION:

1. The contract unit price for Edgedrain (Draincrete) LF shall be full compensation for trench excavation, disposal of excess material, filter fabric, draincrete edgedrain pipe and fittings and draincrete.

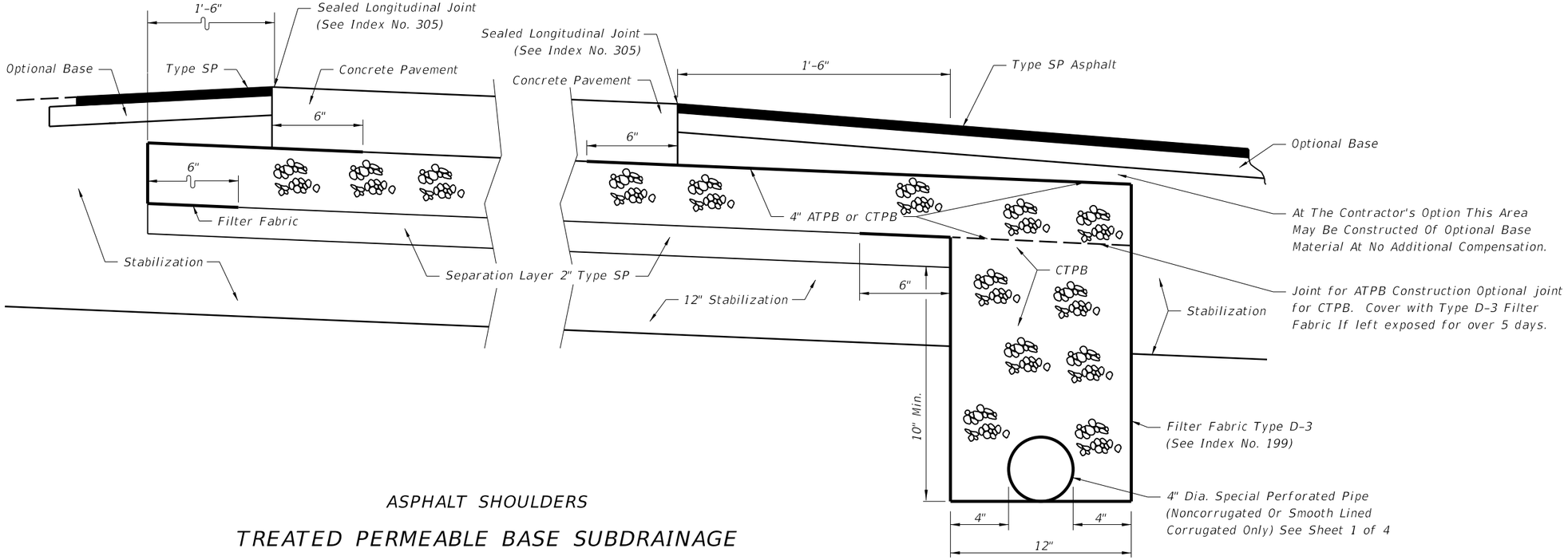
   Payment for outlet pipe shall be in accordance with General Note 9, Sheet 1 of 4.

2. Type B-12.5 shall be paid for under the contract unit price for Optional Base.

3. Shoulder pavement shall be paid for under the contract unit price for Type SP, Asphaltic Concrete.



CONCRETE TRAVEL LANE, SHOULDERS, AND AUXILIARY PAVEMENT



ASPHALT SHOULDERS

TREATED PERMEABLE BASE SUBDRAINAGE

GENERAL NOTES FOR TREATED PERMEABLE BASE EDGEDRAIN

NEW CONSTRUCTION

1. The contractor shall confine the construction of edgedrain to an area in which the entire operation can be carried out in (5) work days, unless another construction period is called for the plans.

METHOD OF PAYMENT

NEW CONSTRUCTION

1. Payment shall be full compensation for trench excavation, disposal of excess materials, filter fabric, pipe and fittings, necessary for concrete pavement subdrainage construction. Payment shall be included in the cost for Asphalt Treated Permeable Base, CY or Cement Treated Permeable Base, CY.

   Payment for outlet pipe shall be in accordance with General Note 9, Sheet 1 of 4.

2. Shoulder pavement and separation layer shall be paid for under the contract unit price for Type SP, Asphaltic Concrete.

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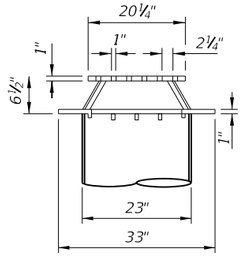
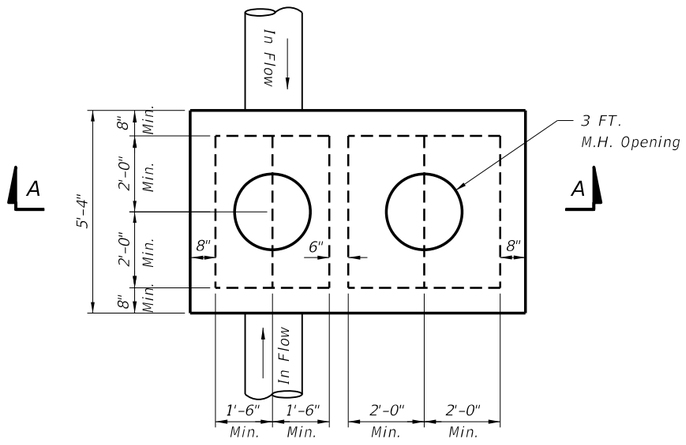
LAST REVISION	REVISION	DESCRIPTION:		FDOT DESIGN STANDARDS 2013	CONCRETE PAVEMENT SUBDRAINAGE	INDEX NO.	SHEET NO.
01/01/08						287	4

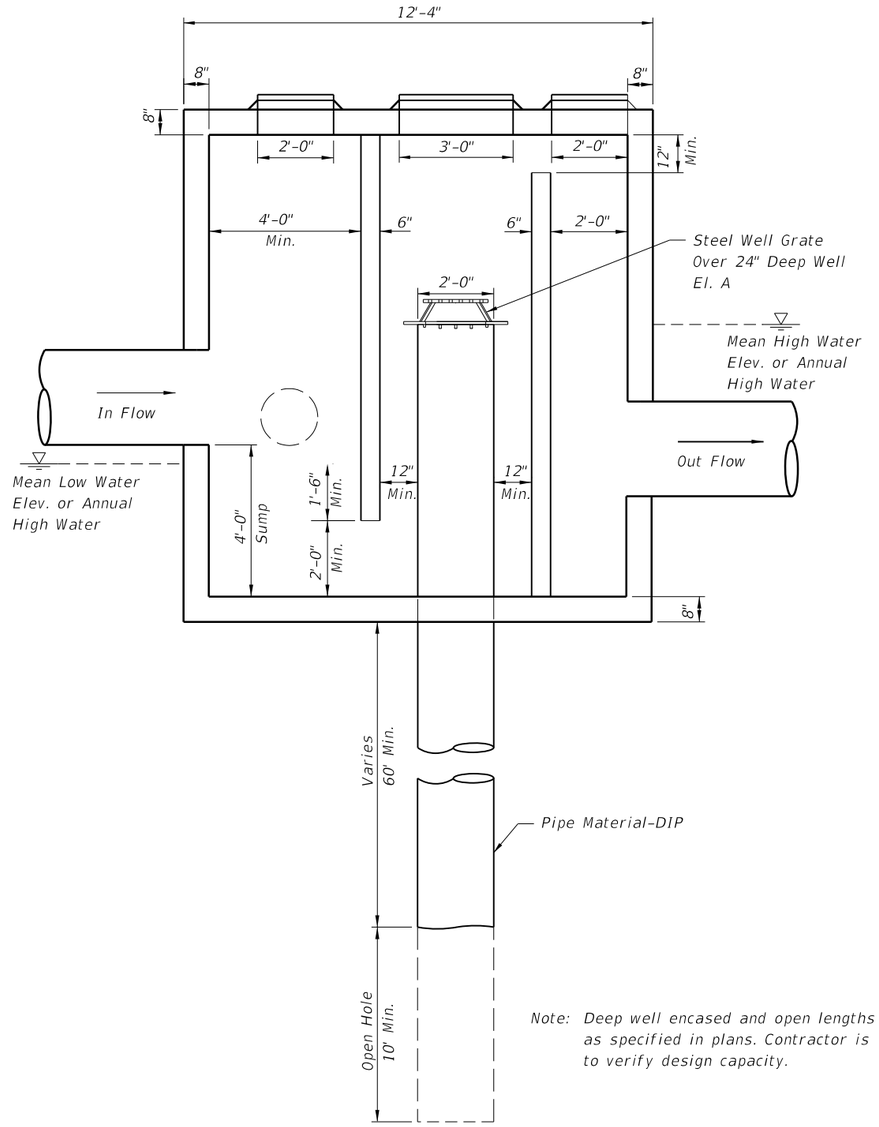


STEEL WELL GRATE DETAIL
NEENAH GRATE CATALOG NO. R-4341-A
OR EQUIVALENT

Note: Steel well grate to be installed over 24" deep well. Steel grate to be hot dipped galvanized after fabrication. Cost to be included in the price of casing.

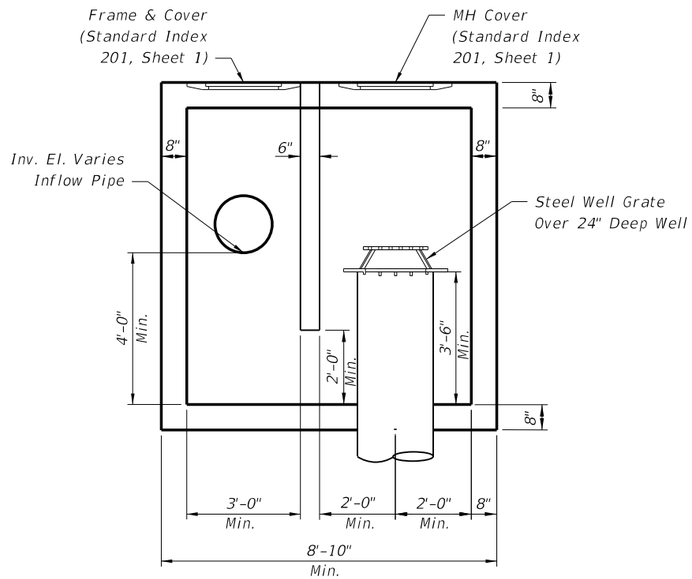


TOP SLAB PLAN



Note: Deep well encased and open lengths as specified in plans. Contractor is to verify design capacity.

SPECIAL MANHOLE STRUCTURE
DETAIL WITH OUTFALL



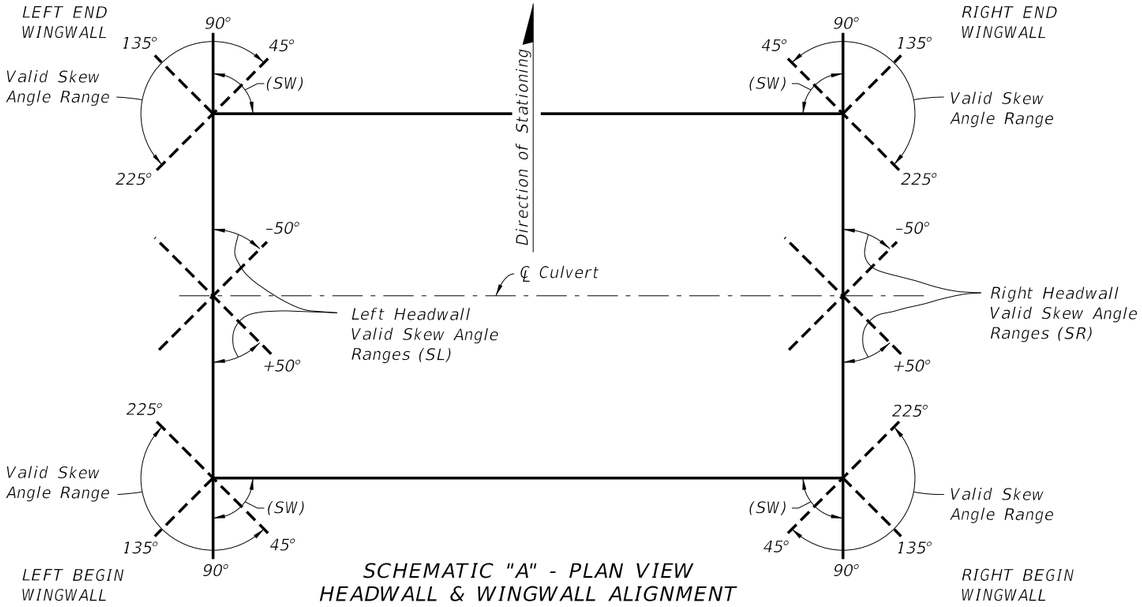
SECTION A-A

STRUCTURE WITH NO OUTFLOW

Design Notes

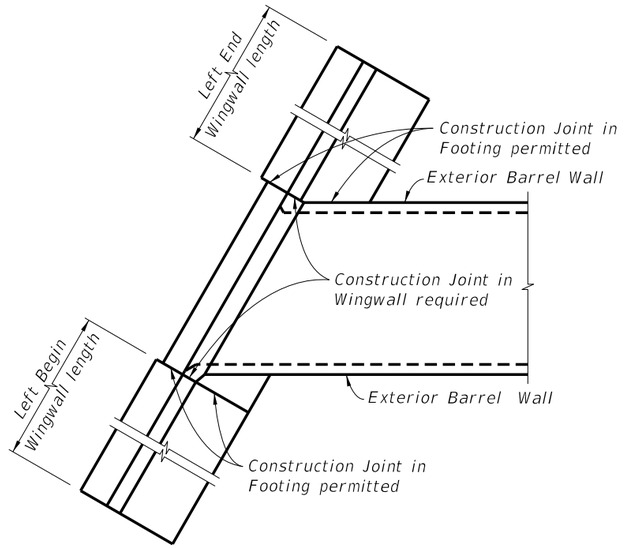
1. Depth of Casing Varies, 60' min.
2. Depth of Open Hole, 10'-20'.
3. Actual Size Of The Inflow And Outflow Chambers Will Be Determined By The Size Of The Pipes (Refer To Table 3 Of Index 200.) The Width Of The Box Shall Be Constant Based On The Largest Pipe. The Length Is To Be Adjusted Based On Size and Orientation Of The Pipes.

LAST REVISION	REVISION	DESCRIPTION:		FDOT DESIGN STANDARDS 2013	DEEP WELL INJECTION BOX	INDEX NO.	SHEET NO.
01/01/09						288	1



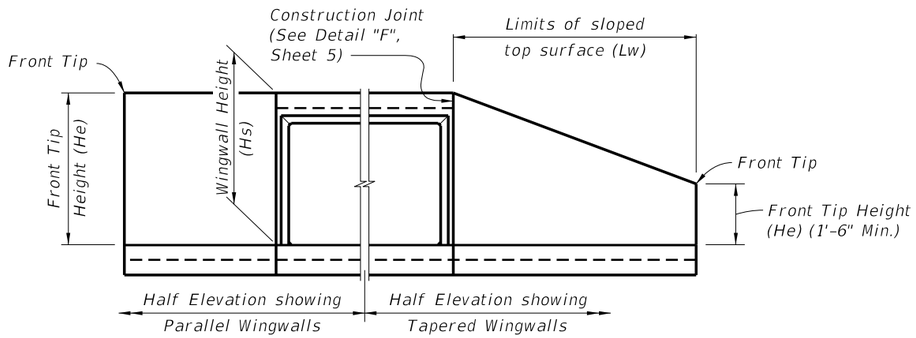
SCHEMATIC "A" - PLAN VIEW
HEADWALL & WINGWALL ALIGNMENT

NOTE: All headwall and culvert skew angles are measured in degrees from a line perpendicular to the centerline of culvert (counter-clockwise positive), see Schematic "B".



PART PLAN SHOWING PARALLEL WINGWALLS
AND LOCATION OF CONSTRUCTION JOINTS

NOTE:
Construction Joints in wingwalls and footings are located as follows: For non-skewed wingwalls they are located adjacent to the exterior face of the exterior barrel wall; when the ℄ of wingwall and ℄ of exterior barrel wall results in an acute angle see Left End Wingwall above, and when the angle is obtuse see Left Begin Wingwall above and Detail C (Sheet 5).



END ELEVATION
OF CULVERT

GENERAL NOTES:

LIVE LOAD: HL-93.

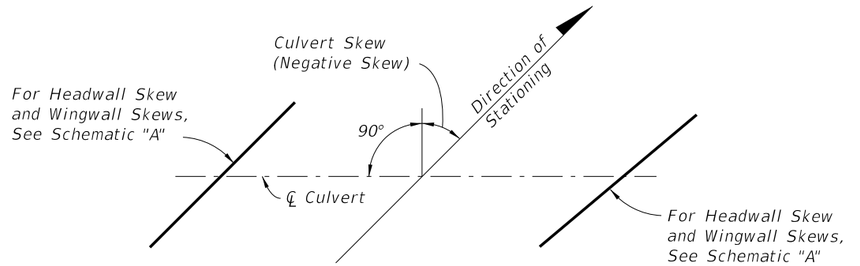
CONSTRUCTION LOADING: It is the construction Contractor's responsibility to provide for supporting construction loads that exceed AASHTO HL-93, and any construction load applied prior to 2 feet of compacted fill placed above the top slab.

SURFACE FINISH: All concrete surfaces shall receive a general surface finish.

SKEWED CONSTRUCTION JOINTS: Construction joints in barrels of culverts with skewed wingwalls may be placed parallel to the headwalls and the reinforcing steel, and the slabs may be cut provided that the cut reinforcing steel extends beyond the construction joint enough for splices to be made in accordance with Table 1 on this sheet. The cost of construction joints and additional reinforcing shall be at the expense of the Contractor.

CULVERT EXTENSIONS: For cut backs and ties into existing concrete box culverts see Sheet 6 of 7.

REINFORCING STEEL: See the "Box Culvert Data Tables" in the Contract Plans for grade and bar spacing. See the Reinforcing Bar List in the Contract Plans for bar sizes and bar bending details.



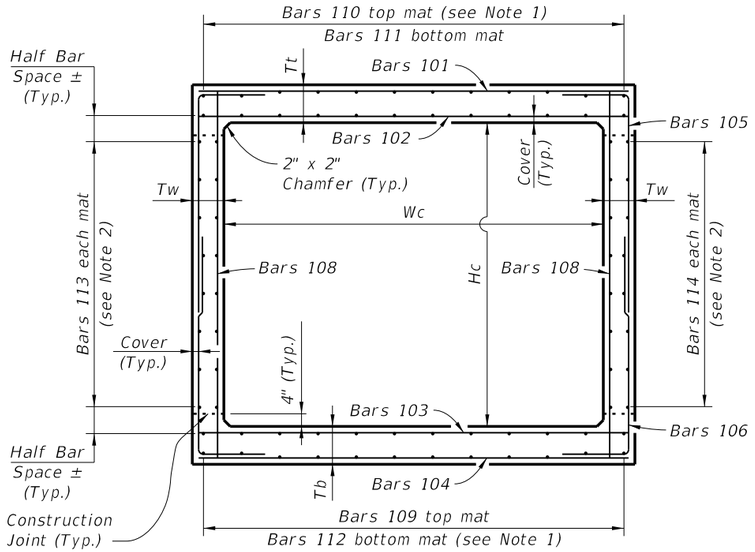
SCHEMATIC "B" - PLAN VIEW
CULVERT ALIGNMENT

NOTE: For Culvert Skew see Contract Plans.

TABLE 1 - MINIMUM BAR SPLICE LENGTHS FOR LONGITUDINAL REINFORCING

BAR SIZE	SPLICE (CLASS B)		BAR SIZE	SPLICE (CLASS B)	
	CLASS II (3400 psi)	CLASS IV (5500 psi)		CLASS II (3400 psi)	CLASS IV (5500 psi)
#3	1'-0"	1'-0"	#8	3'-6"	2'-9"
#4	1'-4"	1'-4"	#9	4'-5"	3'-6"
#5	1'-8"	1'-8"	#10	6'-7"	4'-5"
#6	1'-11"	1'-11"	#11	7'-10"	6'-5"
#7	2'-8"	2'-3"			

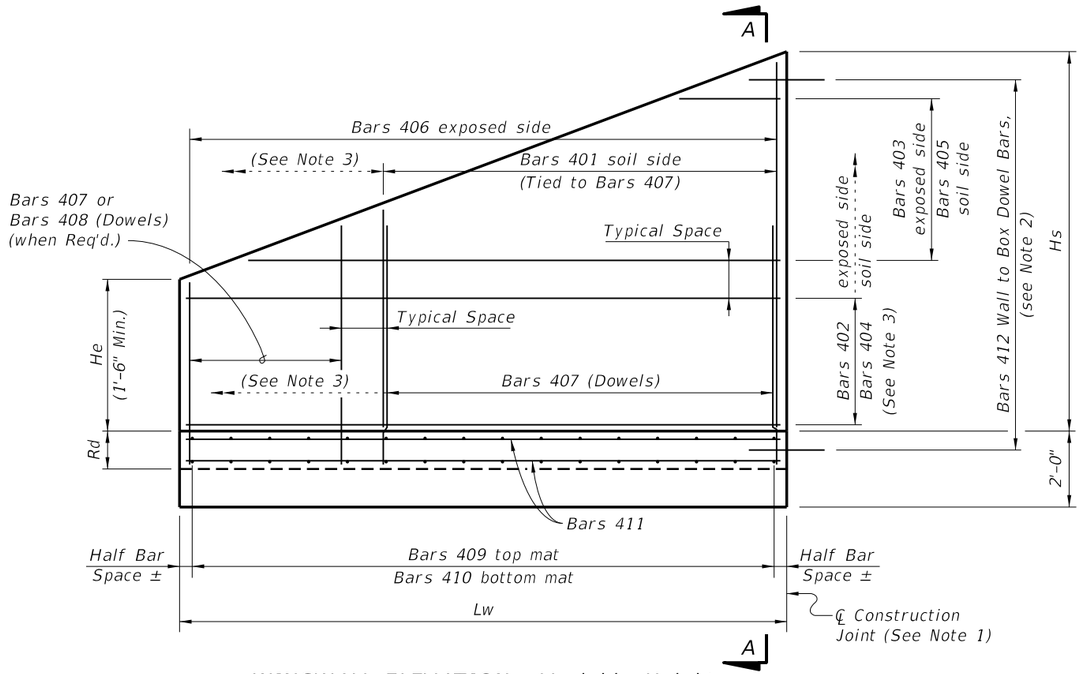
TABLE 1 NOTE: Splice lengths are based on an AASHTO Class B tension lap splice for the Specification Section 346 concrete class shown.



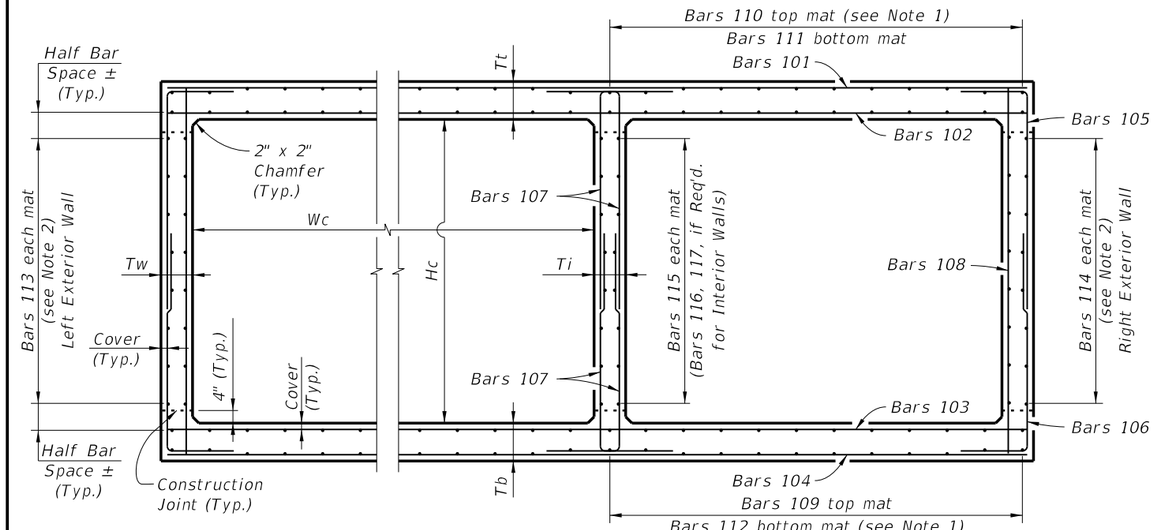
TYPICAL SECTION THRU SINGLE BARREL CULVERT

CULVERT BARREL NOTES:

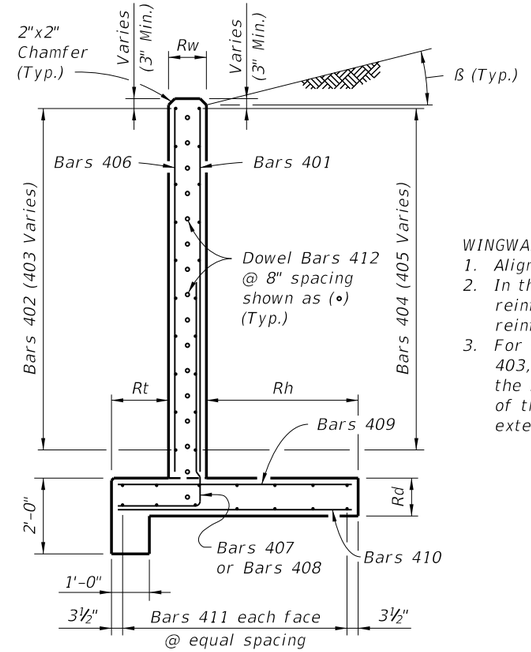
1. *Space Bars 110 and 112 with a bar in each corner, and at the ℄ of interior walls (for multiple barrel culverts only), and the remaining bars placed at equal spacing shown in the Contract Plans. Adjust last bar spacing when required.*
2. *Place Bars 113 and 114 at spacing shown in the Contract Plans evenly between Bars 109 and 111.*
3. *Locate the first transverse bar from the ends of the culvert at one half the bar spacing, but provide the minimum reinforcement cover and not greater than 4" clear.*



WINGWALL ELEVATION - Variable Height (Left End shown - other corners similar)



TYPICAL SECTION THRU MULTIPLE BARREL CULVERT



WINGWALL NOTES:

1. *Align construction joint perpendicular to wingwall.*
2. *In the vicinity of the construction joint, field bend reinforcement as necessary to maintain minimum reinforcement cover.*
3. *For constant height wingwalls, variable length Bars 403, 405 & 408 are not required, and as such the limits of Bars 401 & 407 extend the full length of the wingwall, and the limits of Bars 402 & 404 extend to the full height of the wingwall.*

WINGWALL SECTION A-A

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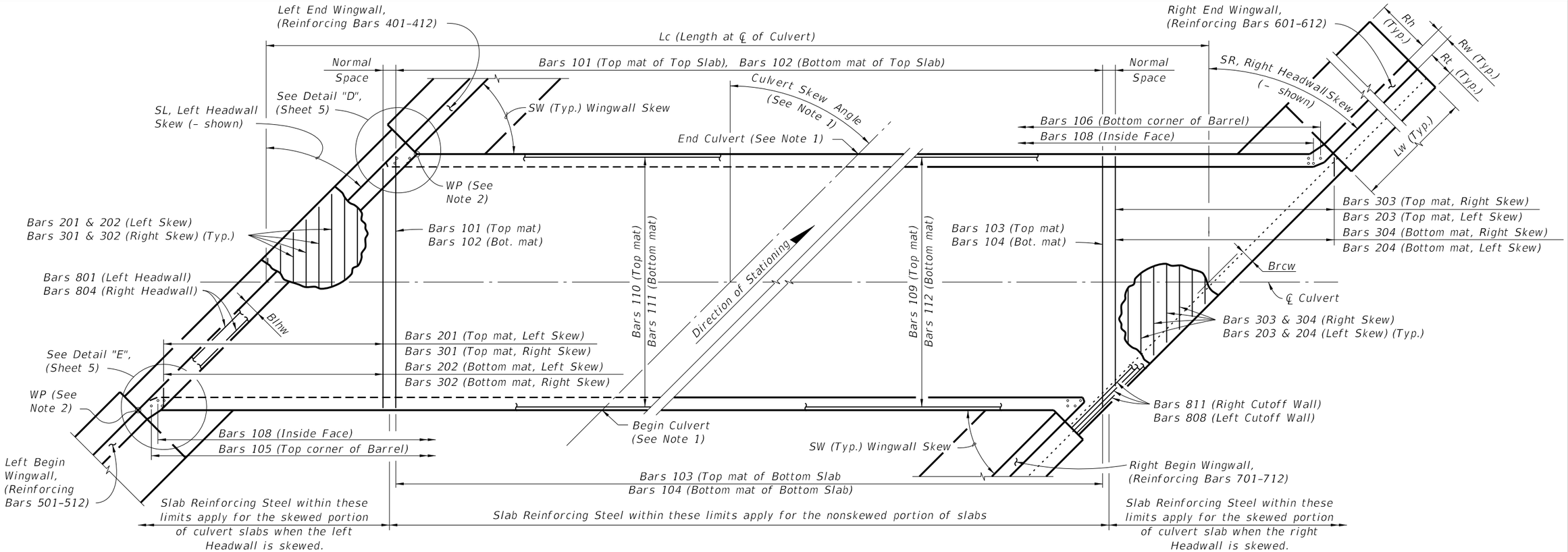
LAST REVISION	REVISION	DESCRIPTION:				
01/01/07			FDOT DESIGN STANDARDS 2013	CONCRETE BOX CULVERT DETAILS (LRFD)	INDEX NO. 289	SHEET NO. 2

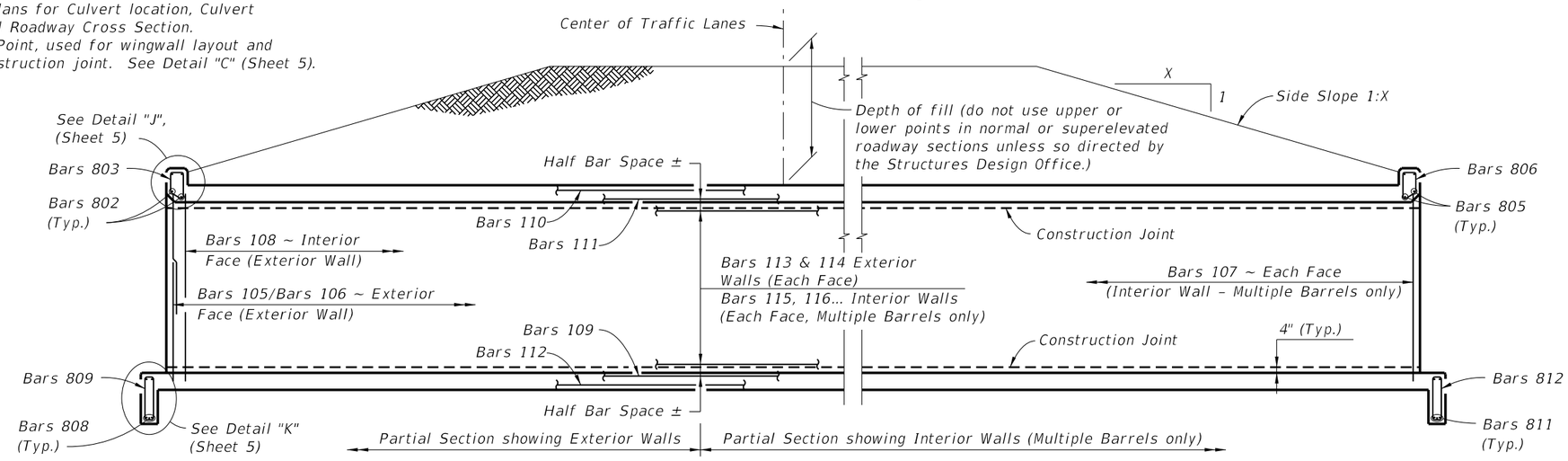


PARTIAL PLAN TOP SLAB
(Left Side, Left Skew)

PARTIAL PLAN BOTTOM SLAB
(Right Side, Right Skew)

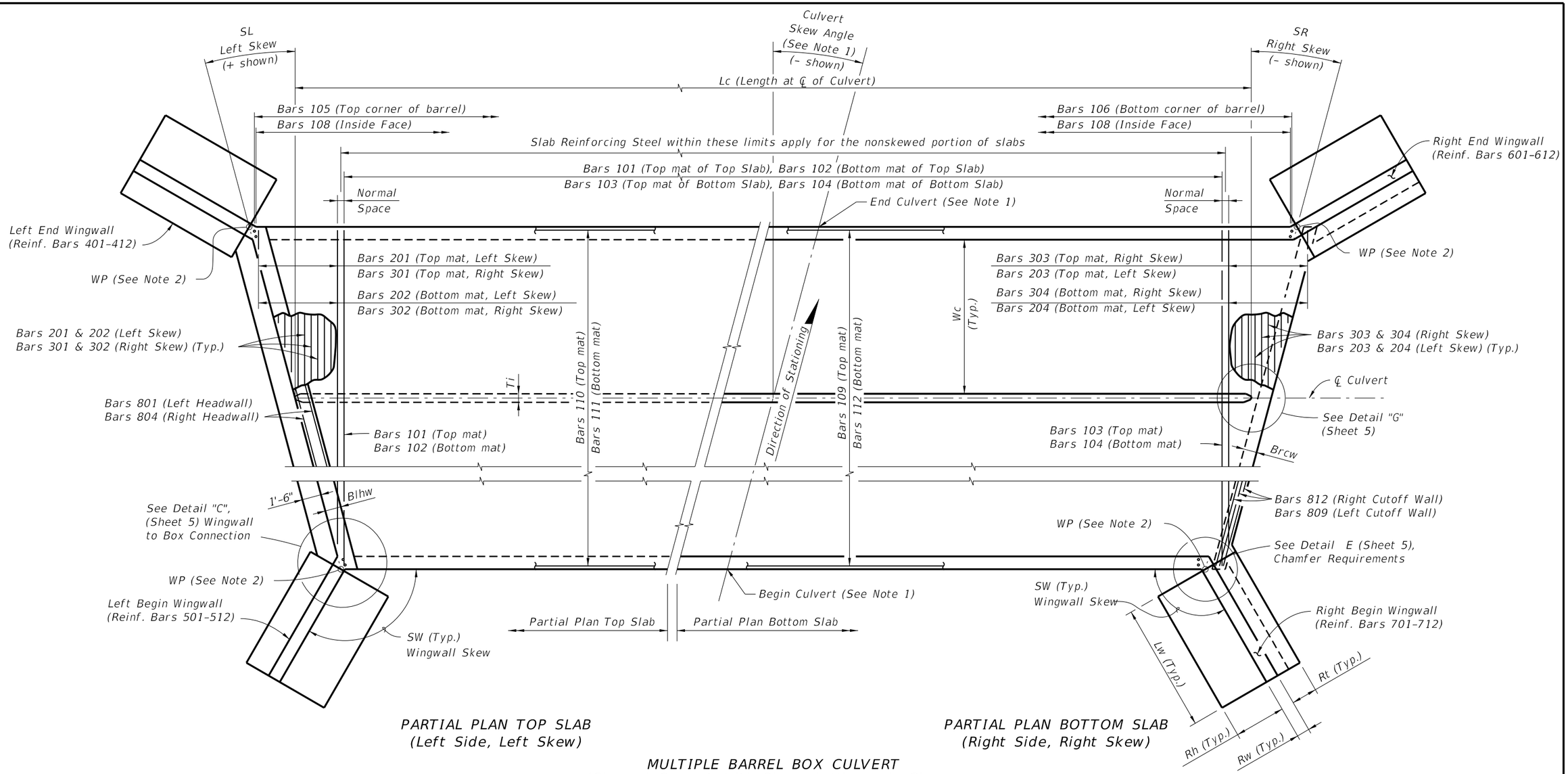
NOTES:
1. See Contract Plans for Culvert location, Culvert Skew Angle and Roadway Cross Section.
2. WP = Working Point, used for wingwall layout and location of construction joint. See Detail "C" (Sheet 5).

SINGLE BARREL BOX CULVERT
(Skewed Culvert With Parallel Wingwalls Shown)



LONGITUDINAL SECTION THRU CULVERT
(Transverse Top & Bottom Slab Reinforcing Not Shown For Clarity)

LAST REVISION	REVISION	DESCRIPTION:		FDOT DESIGN STANDARDS 2013	CONCRETE BOX CULVERT DETAILS (LRFD)	INDEX NO.	SHEET NO.
01/01/07						289	3



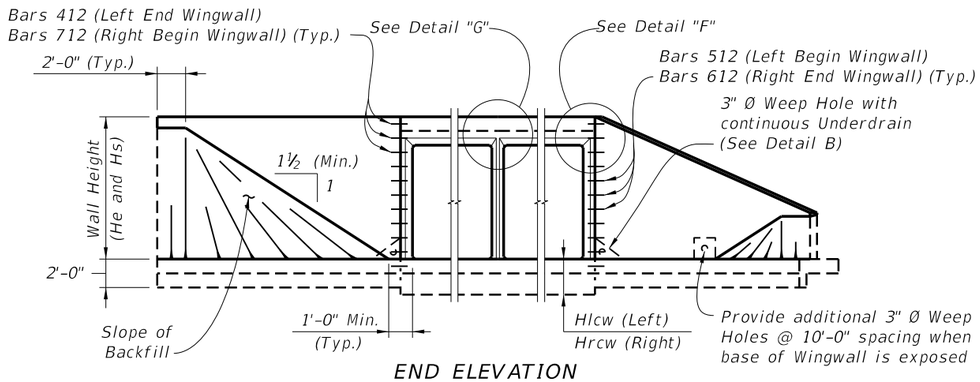
PARTIAL PLAN TOP SLAB
(Left Side, Left Skew)

PARTIAL PLAN BOTTOM SLAB
(Right Side, Right Skew)

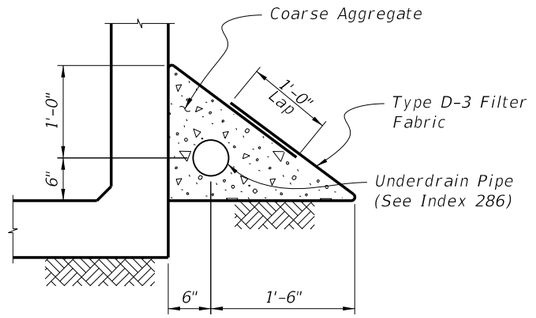
MULTIPLE BARREL BOX CULVERT
(Skewed Culvert With Skewed Wingwalls Shown)

NOTES:
1. *See Contract Plans for Culvert Location, Culvert Skew Angle and Roadway Cross Section.*
2. *WP = Working Point, used for wingwall layout and location of construction joint. See Detail C (Sheet 5).*

LAST REVISION	REVISION	DESCRIPTION:			INDEX NO.	SHEET NO.
01/01/07			FDOT DESIGN STANDARDS 2013	CONCRETE BOX CULVERT DETAILS (LRFD)	289	4



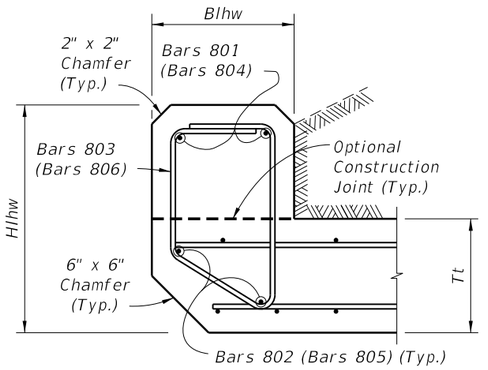
END ELEVATION
(Showing Constant Height And Variable Height Wingwalls)



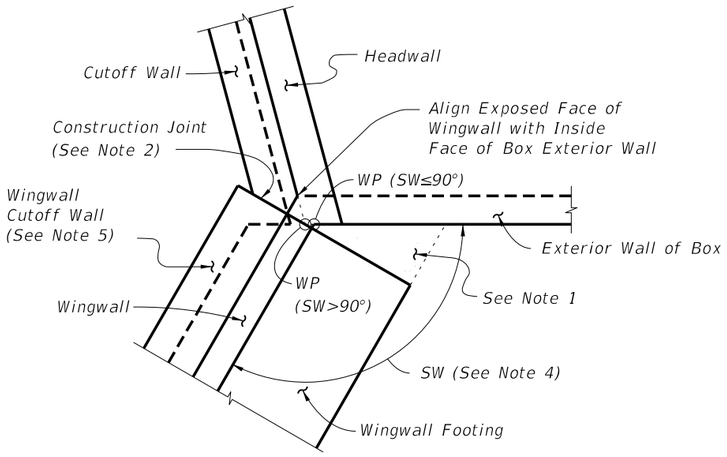
DETAIL "B"
UNDERDRAIN DETAIL
(Similar to Type II ~ Index 286)

NOTES:

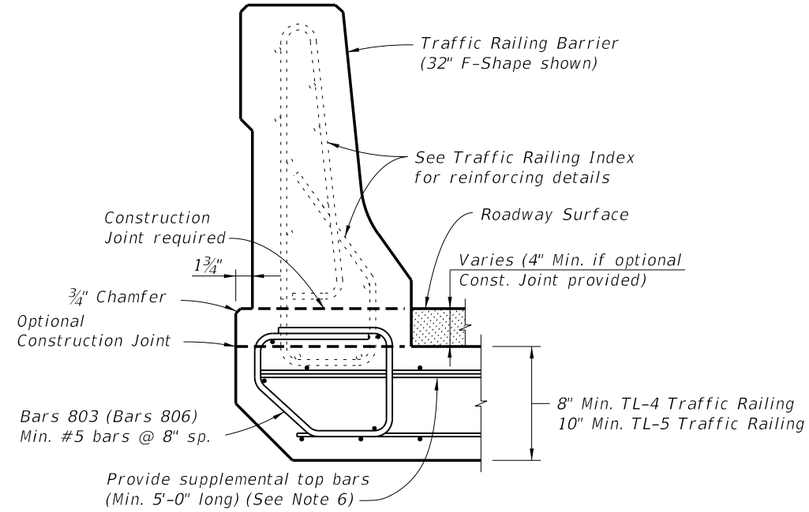
1. *For small angles, the Contractor may elect to fill the area between the box and the wingwall footing with unreinforced concrete. For wingwall skew angles less then 90 degrees, field bend wingwall reinforcement as necessary while maintaining cover. No additional payment will be made for this work.*
2. *Location of Construction Joint determined by WP at theoretical intersection of:*
   – Soil side face of Headwall and outside face of Box Exterior Wall, for SW≤90°;
   – Outside face of Wingwall and outside face of Box Exterior Wall, for SW>90°.
3. *Provide 6" chamfer when angle 'A' is greater than 45°. Maintain minimum wall thickness. Field adjust reinforcing to maintain cover.*
4. *Wingwall Skew Angles (SW) are measured from the adjacent box exterior wall to the wingwall.*
5. *Turn or extend Wingwall Cutoff Wall as necessary to meet Box Cutoff Wall.*
6. *Provide additional reinforcement in the top of the top slab below traffic railings to ensure a minimum area of 0.80 sq. in./ft. transverse reinforcing.*



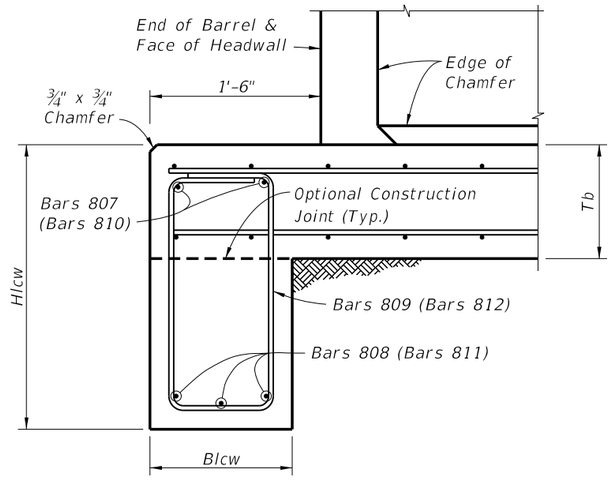
DETAIL "J"
LEFT HEADWALL SECTION
(Right Headwall similar)



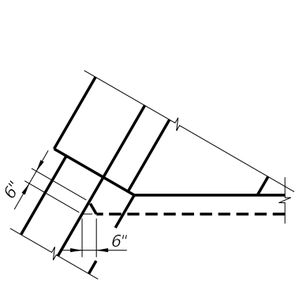
DETAIL "C" - PLAN VIEW
WINGWALL TO BOX CONNECTION
(Left Begin Corner Shown, Other Corners Similar)



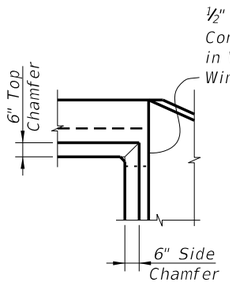
DETAIL "I"
TRAFFIC RAILING ATTACHMENT TO HEADWALL



DETAIL "K"
LEFT CUTOFF WALL SECTION
(Right Cutoff Wall similar)



DETAIL "D"



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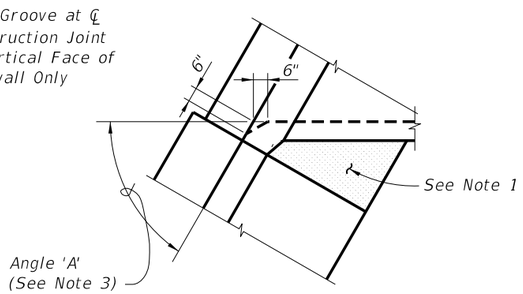

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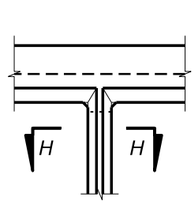

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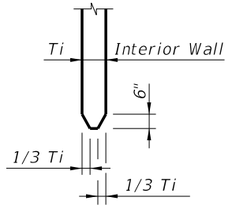

SECTION H-H

CROSS REFERENCE:
See Sheet 3 for locations of Details "D", "E", "J" & "K".
See Sheet 4 for locations of Detail "C".

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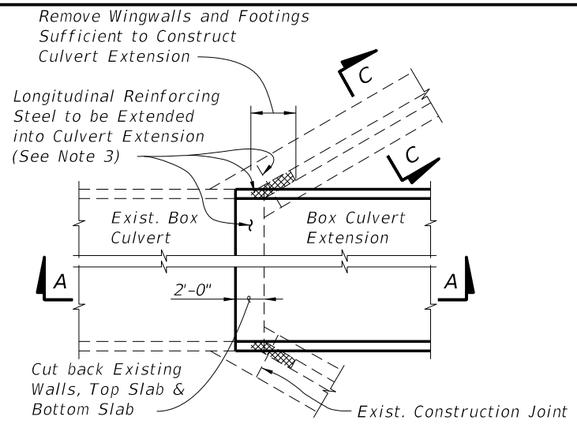
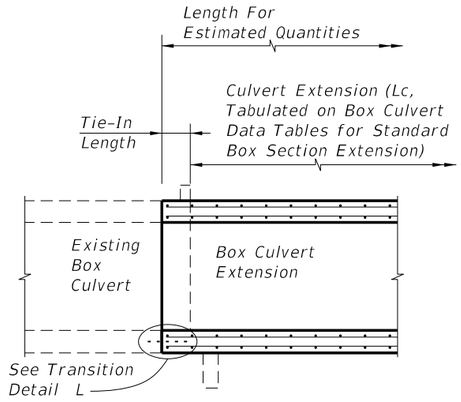
LAST REVISION	REVISION	DESCRIPTION:				
01/01/10			FDOT DESIGN STANDARDS 2013	CONCRETE BOX CULVERT DETAILS (LRFD)	INDEX NO. 289	SHEET NO. 5

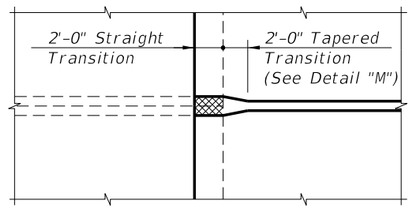


OUTSIDE WALLS OF BOXES

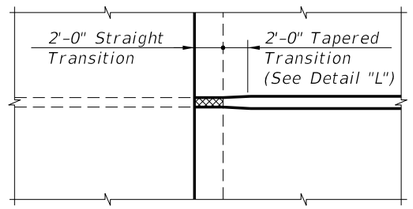


SECTION A-A

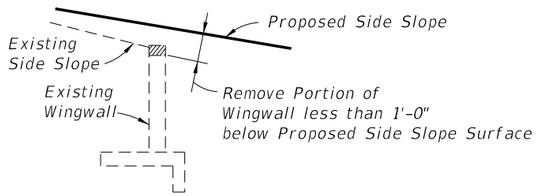
FLARED WINGWALL



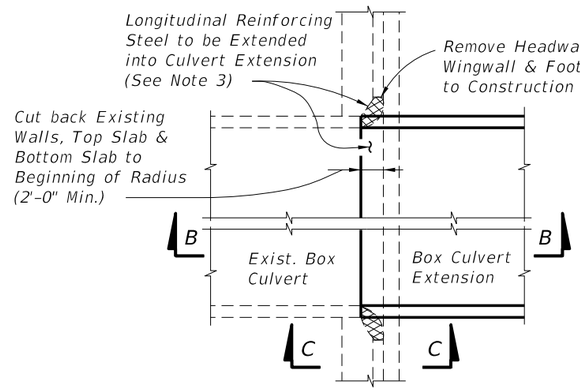
INTERIOR DOUBLE WALLS OF BOXES



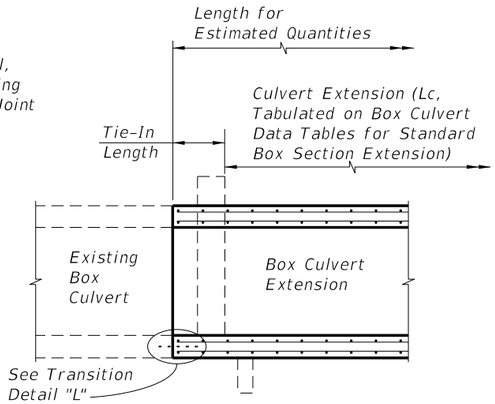
INTERIOR SINGLE WALLS OF BOXES



SECTION C-C



OUTSIDE WALLS OF BOXES



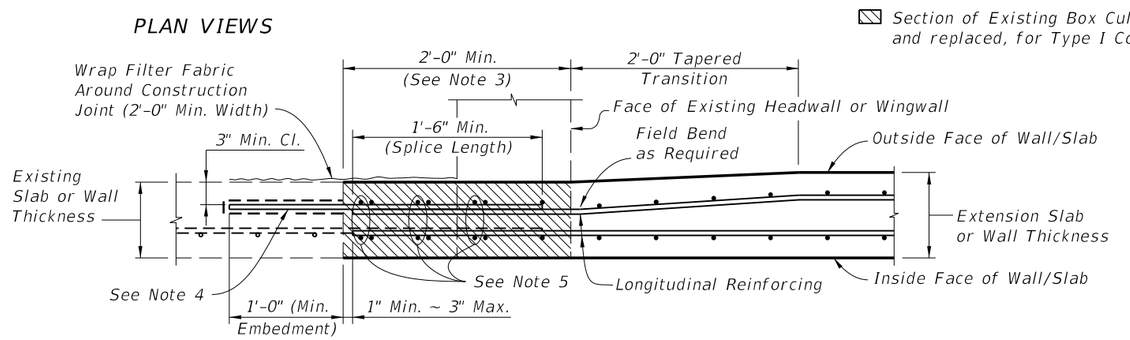
SECTION B-B

STRAIGHT WINGWALL

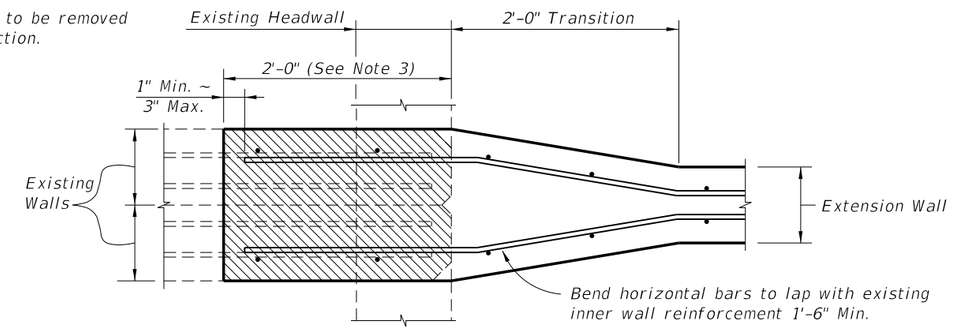
NOTES:

1. The Box Culvert Data Tables and Reinforcing Bar List do not include the additional quantities needed for dowel connections or transitions from double walls of existing concrete box culverts; the cost for additional reinforcement and the thickened concrete wall in the transitional area shall be included in the costs for concrete and steel in the culvert extension.
2. Cost for removal and disposal of material from existing headwalls, wingwalls and box, and cost of cleaning, straightening and extending or doweling longitudinal reinforcing steel shall be included in the cost for concrete and steel of the culvert extension.
3. Remove existing concrete while avoiding damage to existing reinforcement. Clean and straighten existing reinforcement, lap and tie onto extension reinforcement.
4. Dowel in #4 Bars @ 1'-0" max. spacing into wall/slab when there is a single mat of existing reinforcing steel, otherwise splice 1'-6" as shown for inside reinforcement. Use an Adhesive Bonding Material System in accordance with Specifications Section 416 & 937.
5. Provide additional transverse bars for top and bottom slab, parallel and full width of any skewed joint connection when shown in the Plans.
6. See Box Culvert Data Table notes in Plans for Connection Types allowed.

PLAN VIEWS



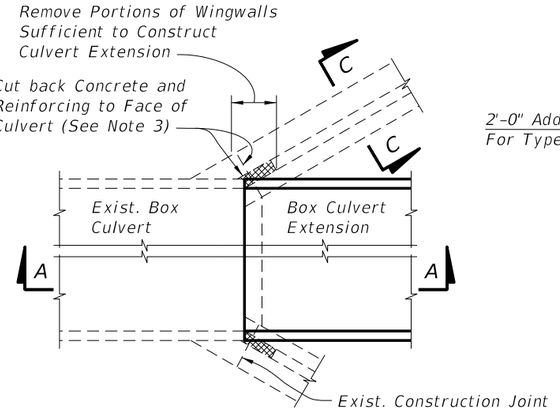
DETAIL "L" - TRANSITION FOR EXTERIOR WALL/SLAB EXTENSION
(Interior Single Walls Similar)



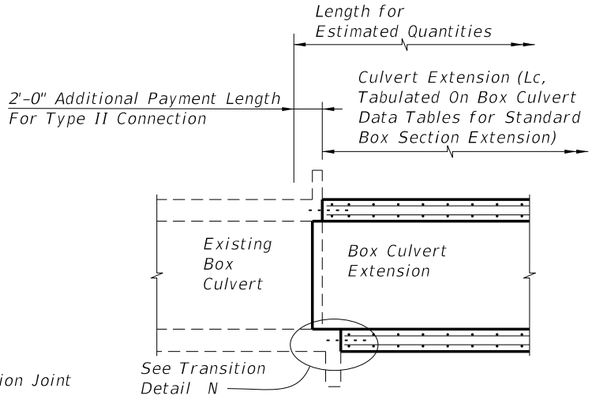
DETAIL "M" - TRANSITION FOR INTERIOR DOUBLE WALLS OF BOX CULVERTS

TYPE I CONNECTION DETAILS FOR CONCRETE BOX CULVERT EXTENSIONS (CUT BACK EXISTING CONCRETE)

LAST REVISION	REVISION	DESCRIPTION:				
01/01/12			FDOT DESIGN STANDARDS 2013	CONCRETE BOX CULVERT DETAILS (LRFD)	INDEX NO. 289	SHEET NO. 6

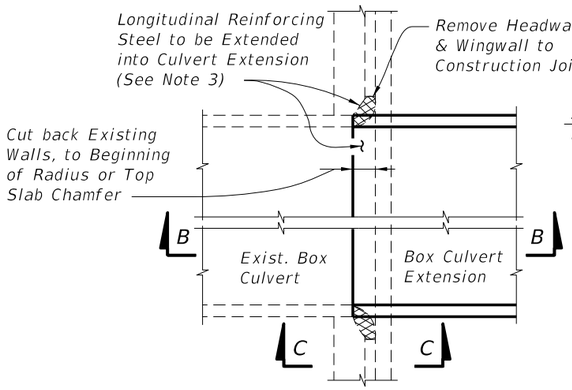


OUTSIDE WALLS OF BOXES

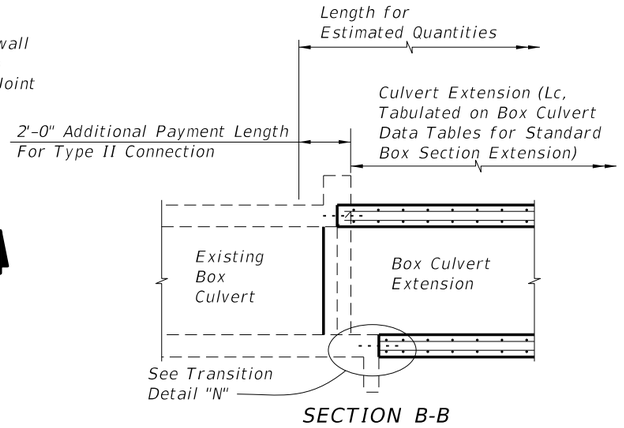


SECTION A-A

FLARED WINGWALL

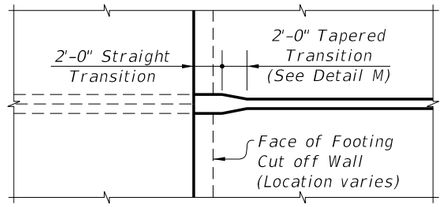


OUTSIDE WALLS OF BOXES

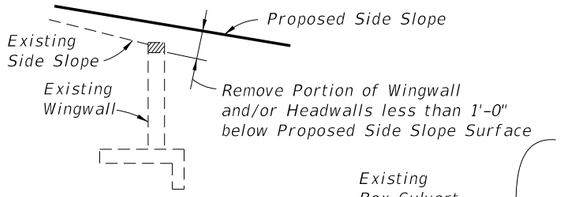


SECTION B-B

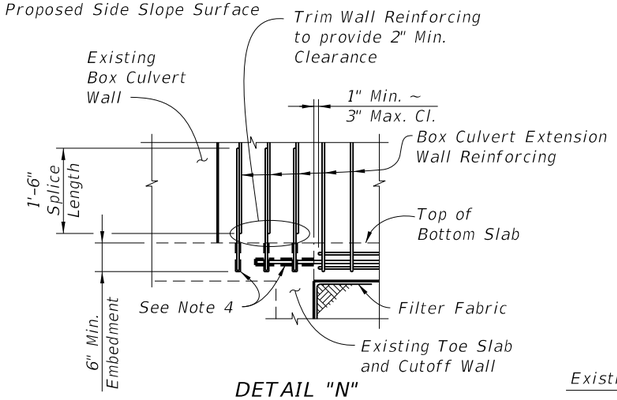
STRAIGHT WINGWALL



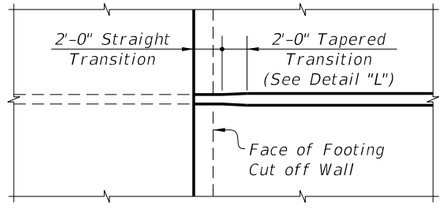
INTERIOR DOUBLE WALLS OF BOXES



SECTION C-C

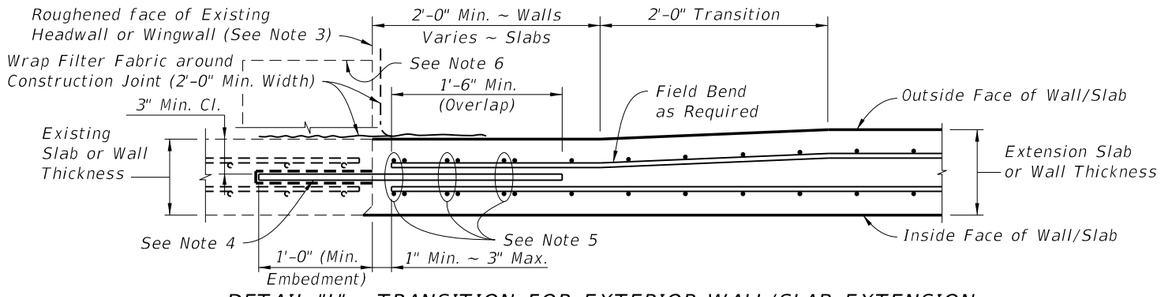


DETAIL "N"



INTERIOR SINGLE WALLS OF BOXES

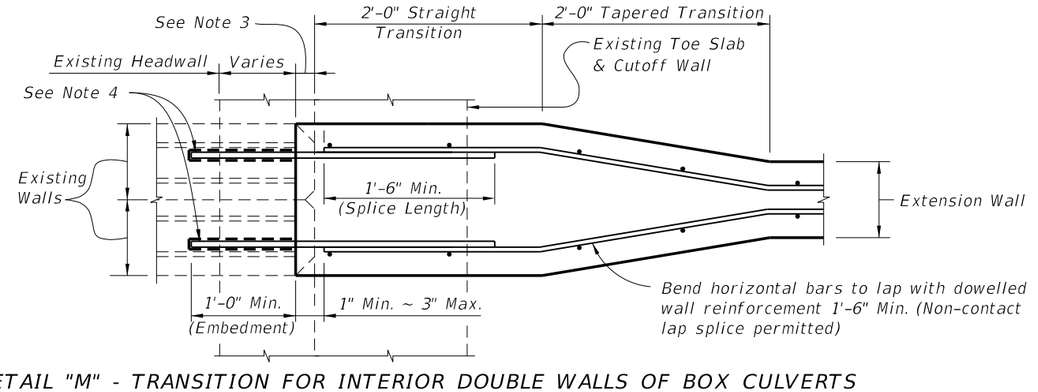
PLAN VIEWS



DETAIL "L" - TRANSITION FOR EXTERIOR WALL/SLAB EXTENSION
(Interior Single Walls Similar)

NOTES:

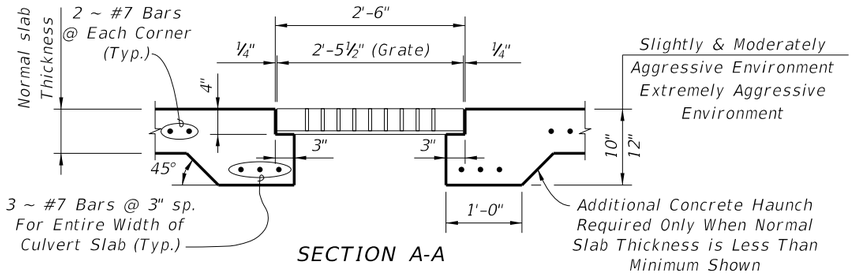
1. The Box Culvert Data Tables and Reinforcing Bar List do not include the additional quantities needed for dowel connections or transitions from double walls of existing concrete box culverts; the cost for additional reinforcement and the thickened concrete wall in the transitional area shall be included in the costs for concrete and steel in the culvert extension.
2. Cost for roughening and cleaning existing headwalls, wingwalls and box, and cost of doweling longitudinal reinforcing steel shall be included in the cost for concrete and steel of the culvert extension.
3. Remove existing concrete and reinforcing back to edge of any chamfers exceeding 1". Roughen and clean existing or exposed surface and coat with a Type A epoxy bonding compound in accordance with the manufacturer's recommendations.
4. Dowel in #5 Bars @ 1'-0" max. spacing horizontally into center of wall/slab. Provide vertical dowels in footing to match size, alignment and spacing of outside vertical wall reinforcing. Use an Adhesive Bonding Material System in accordance with Specifications Section 416 & 937.
5. Provide additional transverse bars for top and bottom slab, parallel and full width of any skewed joint connection when shown in the Plans.
6. Remove top of existing headwall when necessary to provide 1'-0" clearance below finished grade. Saw cut full width and seal with Type F-2 epoxy compound to protect exposed reinforcing.
7. See Box Culvert Data Table notes in Plans for Connection Types allowed.



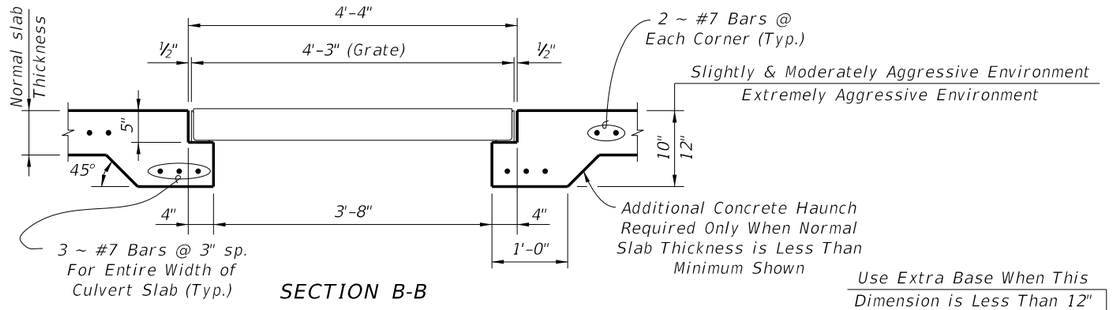
DETAIL "M" - TRANSITION FOR INTERIOR DOUBLE WALLS OF BOX CULVERTS

TYPE II CONNECTION DETAILS FOR CONCRETE BOX CULVERT EXTENSIONS
(ADHESIVE DOWEL TO EXISTING CONCRETE)

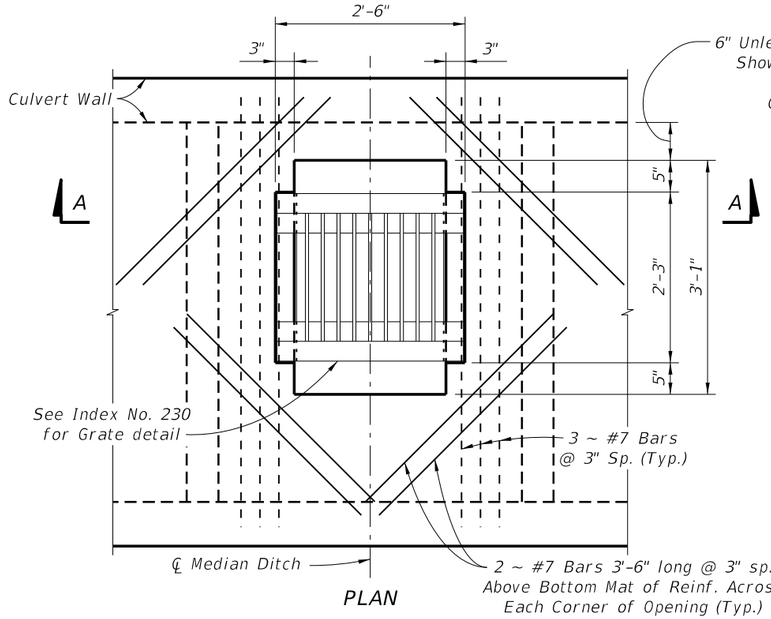
LAST REVISION	REVISION	DESCRIPTION:				
07/01/12			FDOT DESIGN STANDARDS 2013	CONCRETE BOX CULVERT DETAILS (LRFD)	INDEX NO. 289	SHEET NO. 7



SECTION A-A

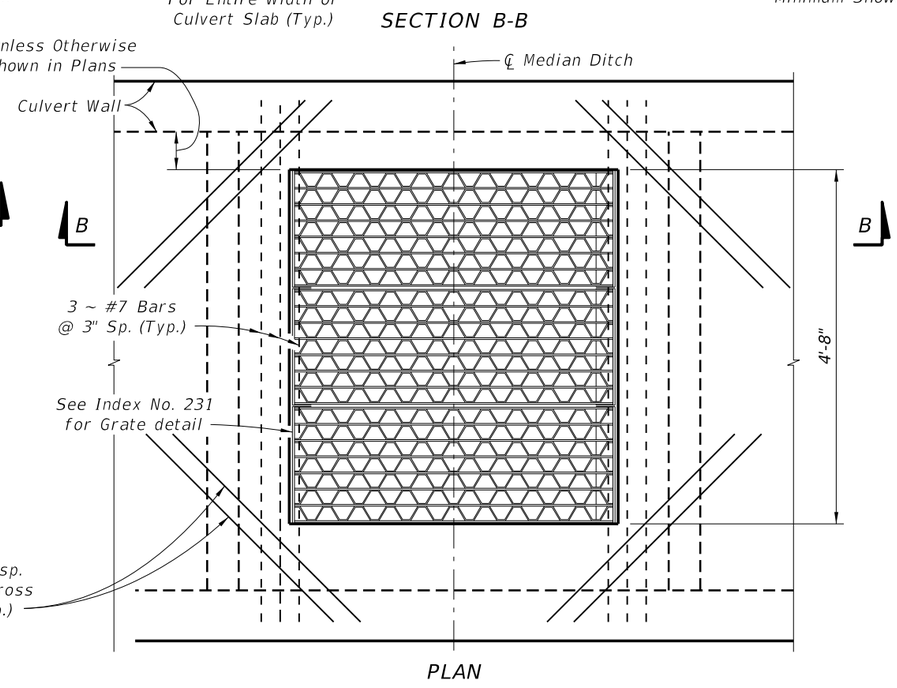


SECTION B-B



PLAN

INLET TYPE A GRATE



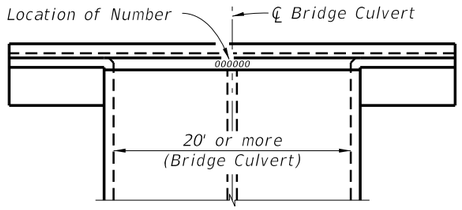
PLAN

INLET TYPE B GRATE

NOTES:

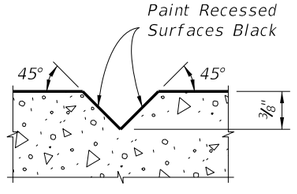
1. Cost of Steel Grating to be included in cost of Box Culvert.
2. All reinforcing shall be 2" clear for Slightly and Moderately Aggressive Environments, and 3" clear for Extremely Aggressive Environments.

INLET IN TOP OF BOX CULVERT



The number is to be placed in the center of the top surface of all bridge culvert headwalls. For Bridge Number see Plan-Profile sheet(s).

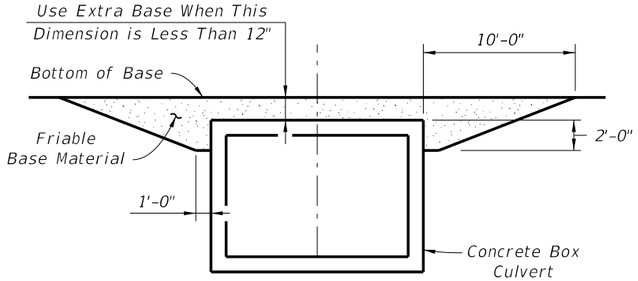
TOP VIEW OF HEADWALL



SECTION THRU RECESSED V-GROOVE TO FORM INSCRIBED FIGURES

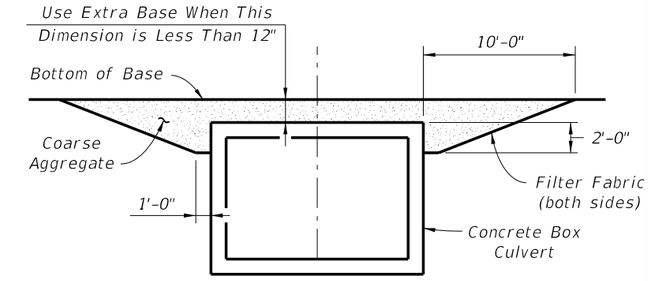
Black Plastic Figures 3" in height as approved by the Engineer may be used in lieu of numbers formed by ⅜" V-Grooves. V-Grooves shall be formed by preformed figures.

BRIDGE CULVERT NUMBER LOCATION



The cost of furnishing and installing extra friable base material shall be included in the cost of the Box Culvert.

FRIABLE BASE



Place coarse aggregate in 6 inch lifts and compact sufficiently as to be firm and unyielding. Provide coarse aggregate gravel or stone meeting the requirements of Specification Section 901-2 or 901-3 respectively. Meet the gradation requirements of Specification Section 901-6, Grades 4, 467, 5, 56 or 57 unless restricted in the plans. Provide Type D-3 filter fabric (see Index No. 199). The cost of furnishing and installing the coarse aggregate and filter fabric shall be included in the cost of the Box Culvert.

ASPHALTIC CONCRETE BASE

NOTE: Extra base is required when cross box culverts are located on facilities subject to high speed traffic (>45 mph) or high traffic volumes (>1600 ADT) and the cover is within the range specified in the notation above.

EXTRA BASE FOR BOX CULVERTS CROSSING UNDER FLEXIBLE PAVEMENT

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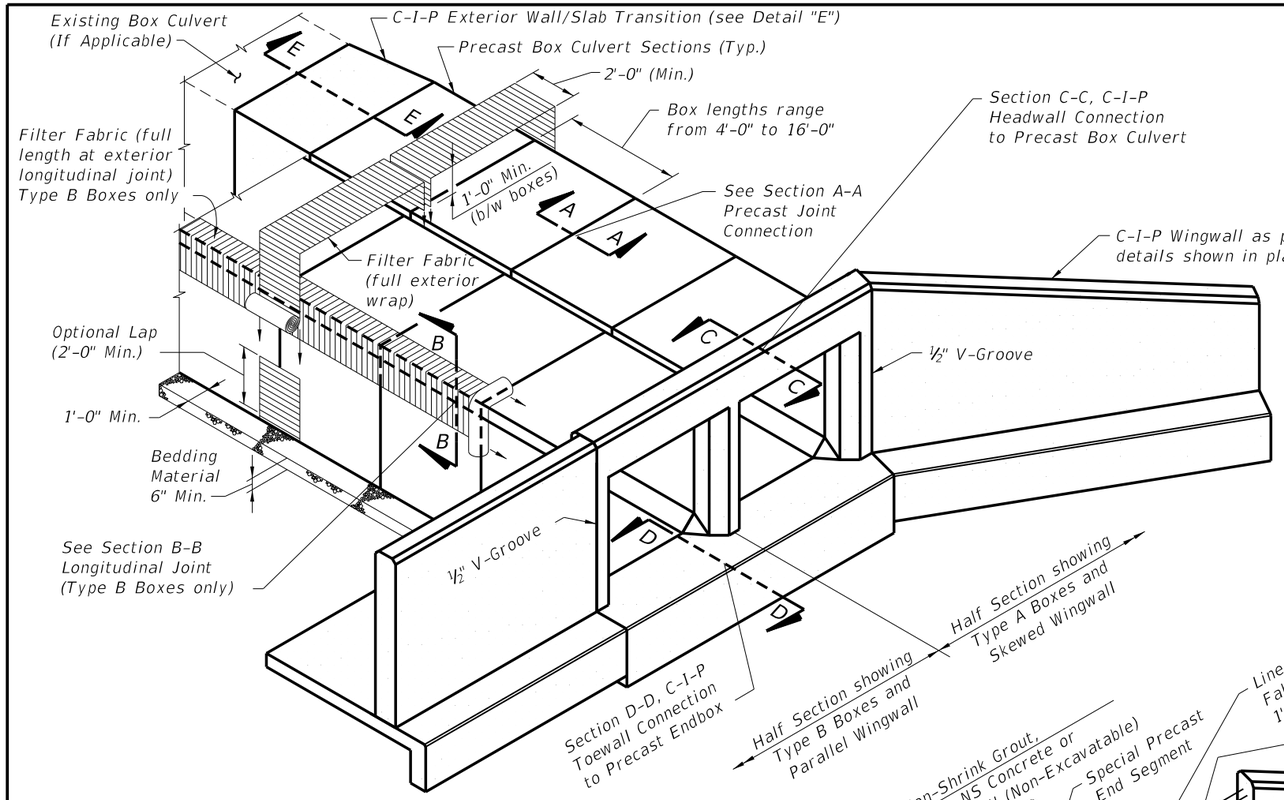
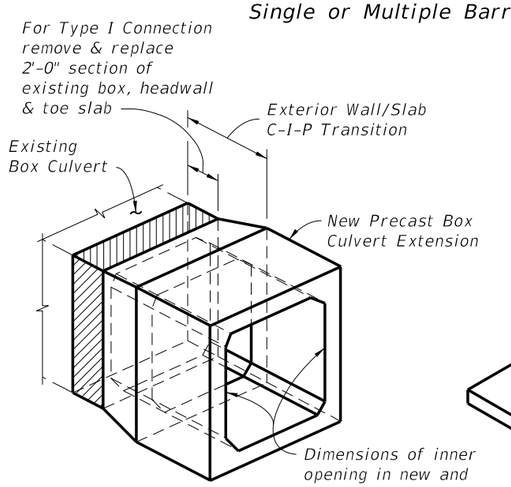
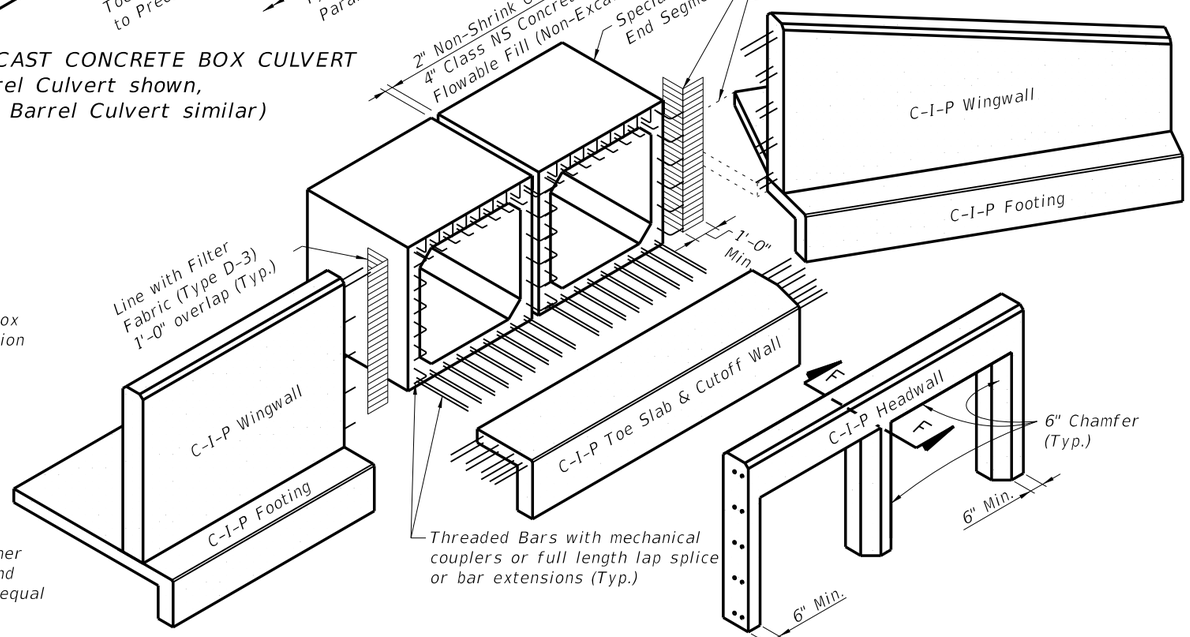
LAST REVISION	REVISION	DESCRIPTION:				
01/01/07			FDOT DESIGN STANDARDS 2013	CONCRETE BOX CULVERT DETAILS (LRFD)	INDEX NO. 289	SHEET NO. 8



ISOMETRIC VIEW OF PRECAST CONCRETE BOX CULVERT
(Double Barrel Culvert shown, Single or Multiple Barrel Culvert similar)

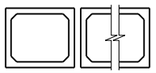
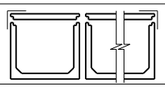


DETAIL E
PICTORIAL VIEW OF EXTERIOR WALL/SLAB TRANSITION



EXPLODED VIEW OF CONNECTIONS AT END OF CULVERT
(Double Barrel Culvert shown, Single or Multiple Barrel Culvert similar)

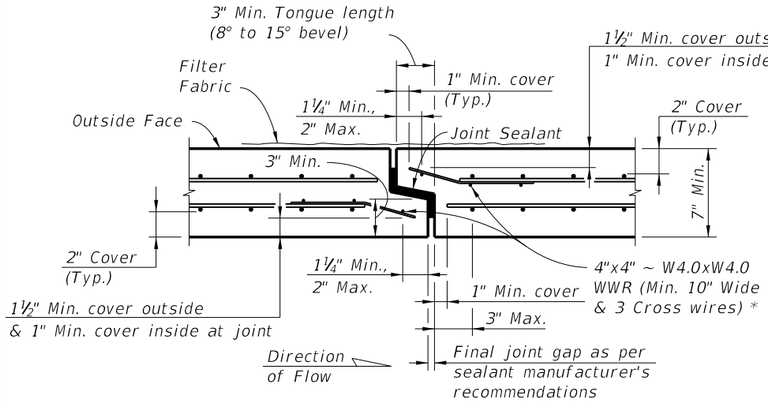
PERMITTED PRECAST ALTERNATE BOX SECTIONS

TYPE	DESCRIPTION	SINGLE BARREL	MULTIPLE BARRELS	DESIGN NOTES
A	Single Cell Monolithic (Four Sided)			Index No. 292 or Contractor Design
B	Single Cell Two-Piece (Four Sided)			Contractor Design
C	Multicell Monolithic	Not Applicable		Contractor Design

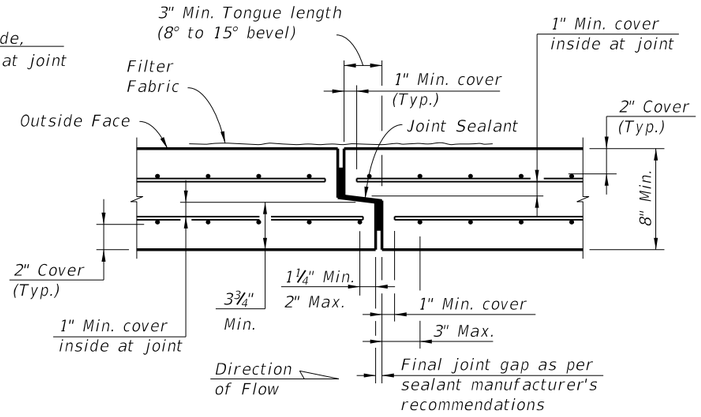
GENERAL NOTES:

1. Specifications:
   - General:
     FDOT Standard Specifications for Road and Bridge Construction, Section 410 (current edition, and supplements thereto).
   - Concrete (Precast):
     Class III or Class II Modified (5,000 psi) for slightly aggressive environments.
     Class IV (5,500 psi) for moderately to extremely aggressive environments.
   - Concrete (Cast-In-Place):
     Class II (3,400 psi) for slightly aggressive environments.
     Class IV (5,500 psi) for moderately to extremely aggressive environments.
   - Reinforcing Steel:
     Maintain minimum clearance of 2" for slightly and moderately aggressive environments or 3" for extremely aggressive environments, unless otherwise shown. Equal area substitution of welded wire (WWR) reinforcement is permitted.
2. Work this Index with the Cast-In-Place Concrete Box Culvert Details and Data Tables shown in the plans, Index No. 289 and the Precast Concrete Box Culverts shown in the shop drawings.
3. All joints between precast sections must be tongue & groove with joint sealant. Joints between cast-in-place & precast sections shall have longitudinal reinforcing extending from top, bottom & both side slabs of the precast box tied to the cast-in-place reinforcement. Single barrel culverts may have precast headwalls cast integrally with the end segment when approved by the Engineer.
4. Extension of existing multiple barrel box culverts with multiple single cell precast box culverts is not permitted unless approved by the District Structures Engineer. Full transition details must be shown in the shop drawings when approved.
5. Culverts larger than the specified size may be substituted with no additional payment to the Contractor. Substitution must be approved by the Engineer, minimum earth cover and invert elevations shown in the Contract Documents must be maintained.

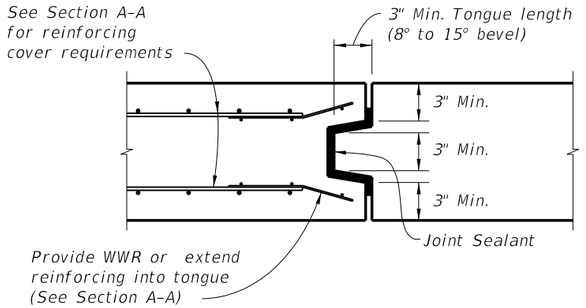
LAST REVISION	REVISION	DESCRIPTION:			INDEX NO.	SHEET NO.
01/01/11			FDOT DESIGN STANDARDS 2013	SUPPLEMENTAL DETAILS FOR PRECAST CONCRETE BOX CULVERTS	291	1



SECTION A-A
(2" Cover - Thin Wall Detail)

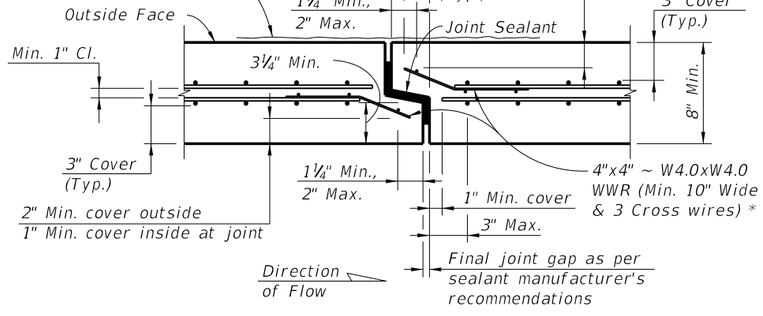


SECTION A-A
(2" Cover - Thick Wall Detail)



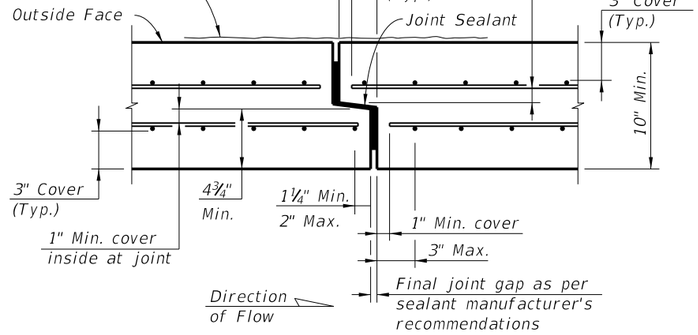
ALTERNATE BOTTOM SLAB TRANSVERSE JOINT
TYPICAL SECTION
(DOUBLE-SIDED TONGUE & GROOVE JOINT)
(All reinforcing not shown for clarity)

NOTE:
Bottom Slab Joints in Type B Boxes may be single tongue & groove joints as shown in Section A-A when the Top Slab Joints are oriented as shown in Schematic "A".

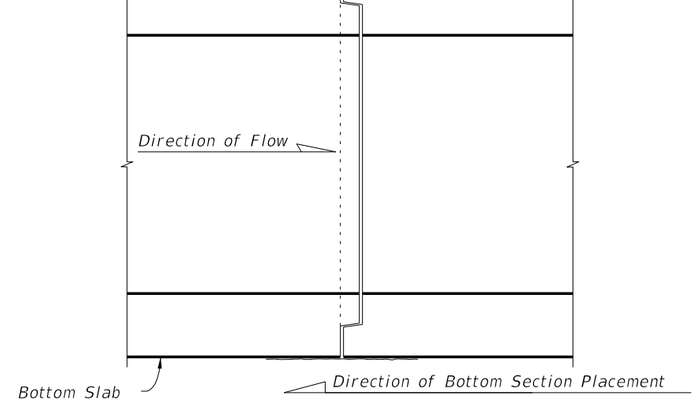


SECTION A-A
(3" Cover - Thin Wall Detail)

* *At the Contractor's option when the box culvert reinforcing utilizes WWR, extend wall and slab reinforcing into the joint and bend to maintain cover in lieu of 4"x4" ~ W4.0xW4.0 WWR at joint. Transverse wire in tongue may be cut at corners of box to allow bending of the WWR.*



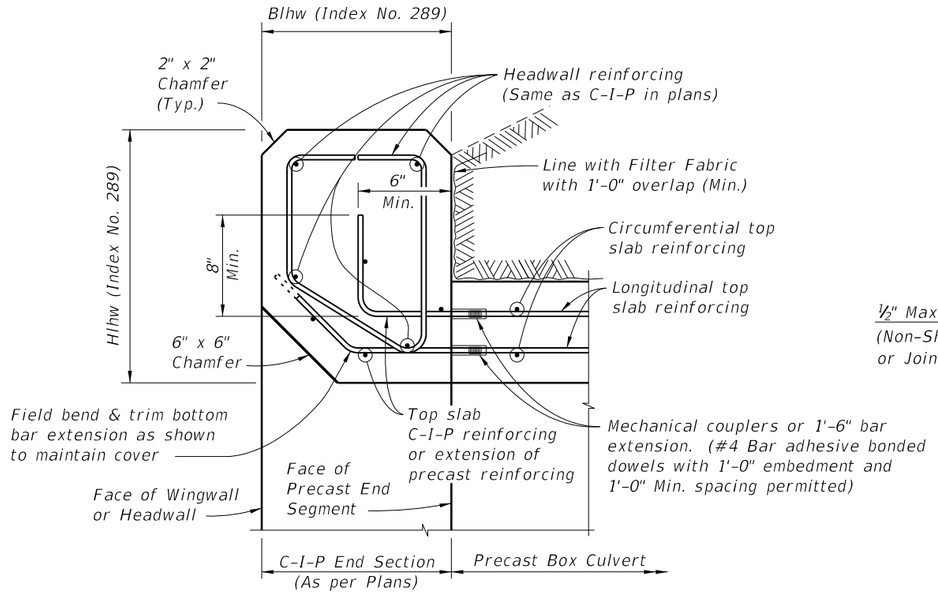
SECTION A-A
(3" Cover - Thick Wall Detail)



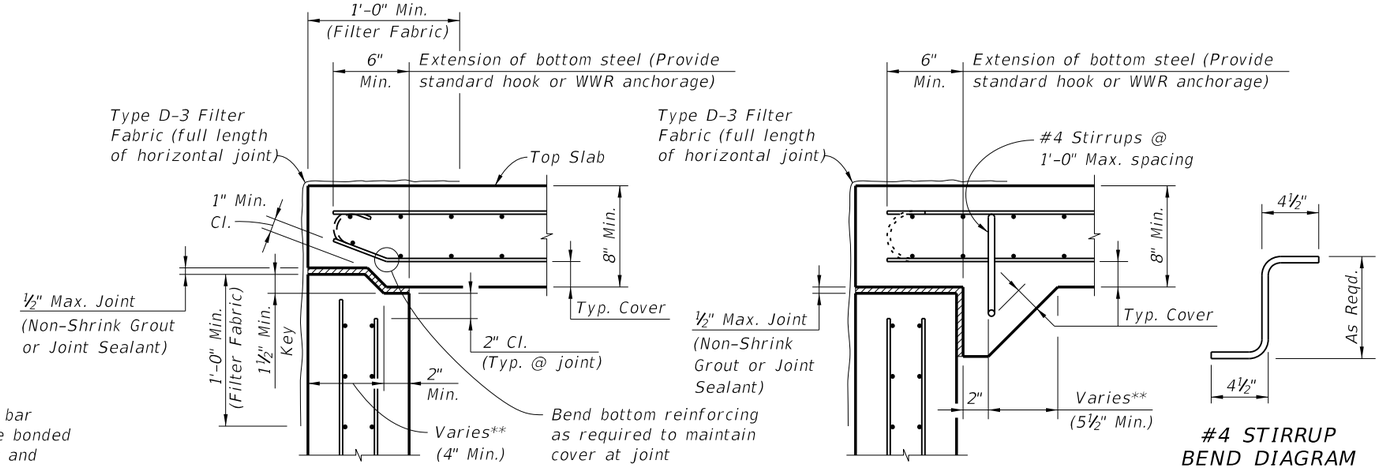
SCHEMATIC "A"
TYPE B BOX SECTION PLACEMENT
FOR SINGLE TONGUE & GROOVE JOINTS

PRECAST SEGMENT TO SEGMENT TONGUE & GROOVE TRANSVERSE JOINTS

TWO-PIECE PRECAST SEGMENT ADDITIONAL JOINT DETAILS (TYPE B BOX)



SECTION C-C
C-I-P HEADWALL DETAILS AND CONNECTION TO PRECAST BOX



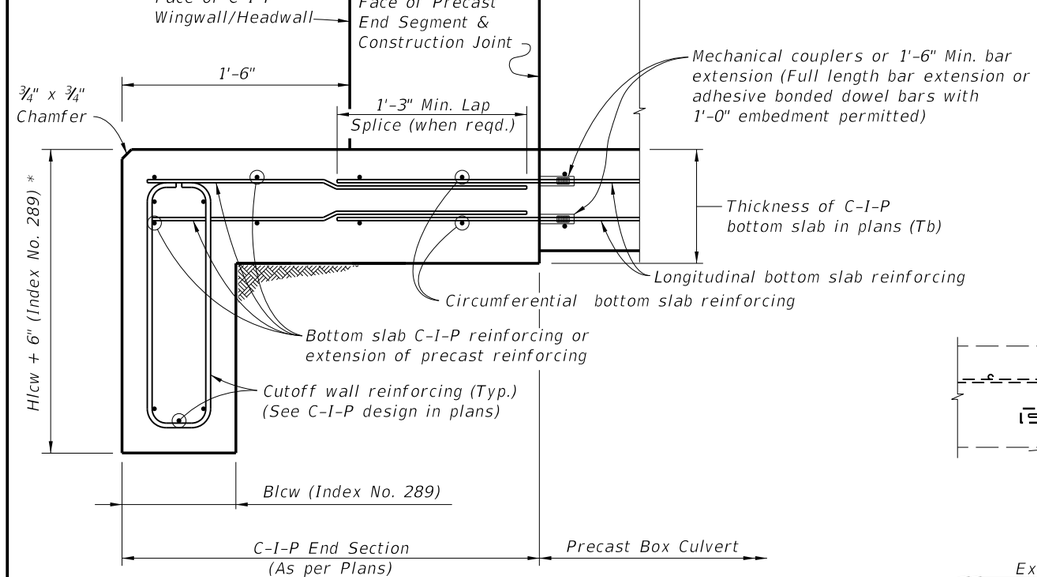
SECTION B-B
TOP SLAB TO WALL JOINT
(KEYED JOINT)

SECTION B-B
TOP SLAB TO WALL JOINT
(HAUNCHED JOINT)

#4 STIRRUP
BEND DIAGRAM

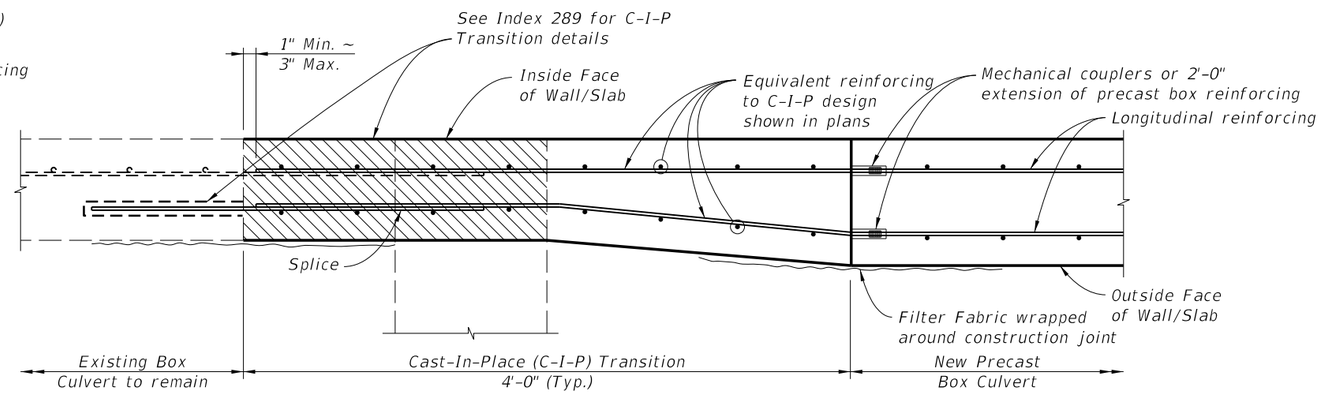
** Provide adequate width to satisfy shear strength requirements at joint

TYPE B BOX LONGITUDINAL JOINTS



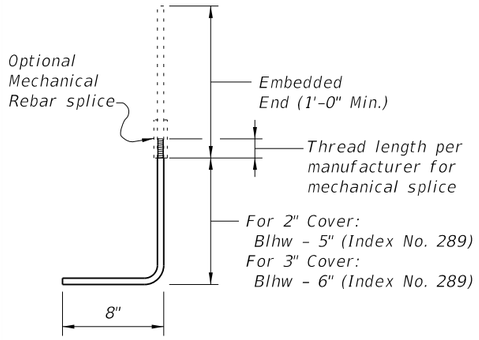
SECTION D-D
C-I-P TOE SLAB & CUTOFF WALL DETAILS
AND CONNECTION TO PRECAST BOX

* Provide additional 6" depth of cutoff wall at no additional cost.

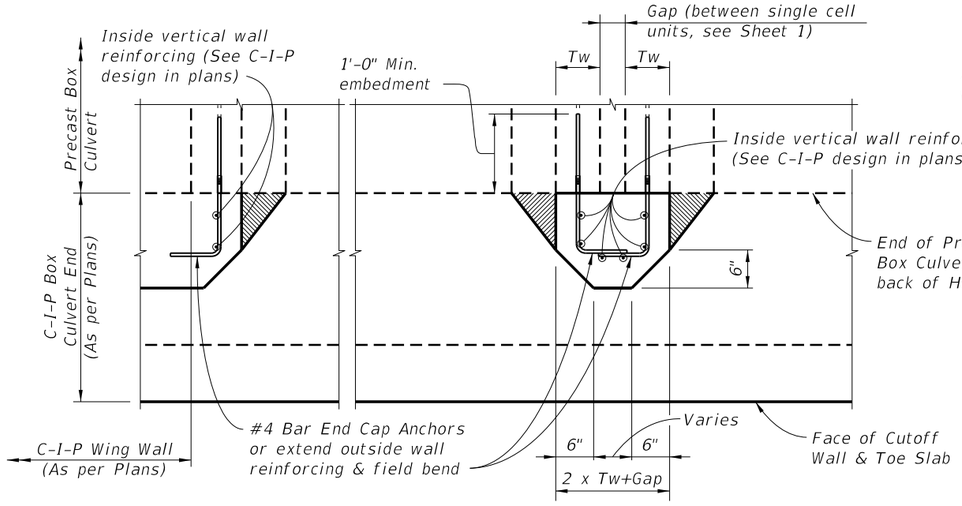


SECTION E-E
EXTERIOR WALL/SLAB TRANSITION DETAIL FOR PRECAST EXTENSION
(Type I Connection shown, Type II Connection similar)

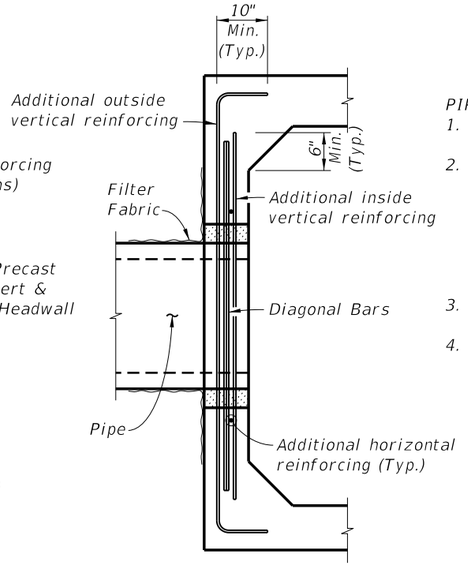
LAST REVISION	REVISION	DESCRIPTION:			INDEX NO.	SHEET NO.
01/01/12			FDOT DESIGN STANDARDS 2013	SUPPLEMENTAL DETAILS FOR PRECAST CONCRETE BOX CULVERTS	291	3



#4 BAR END CAP ANCHOR
BAR BEND DIAGRAM



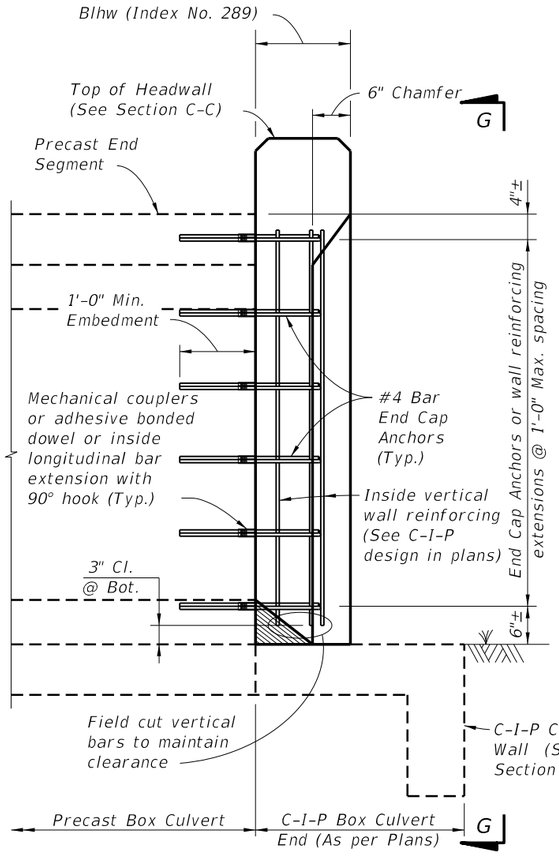
SECTION H-H



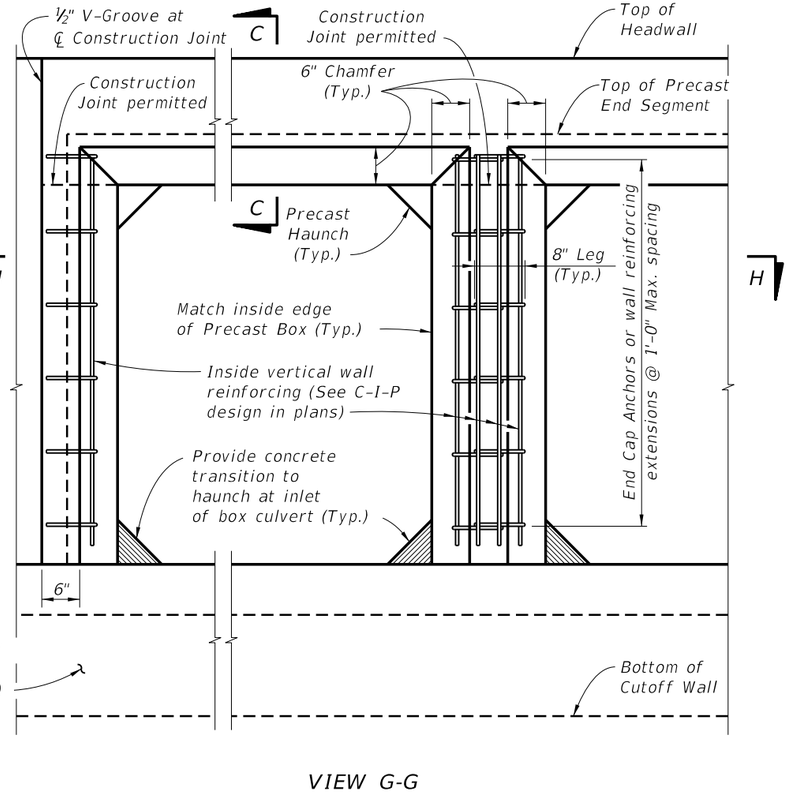
PIPE BLOCKOUT NOTES:

1. Cut box culvert reinforcement as required to maintain 2" cover.
2. For Precast Sections construct opening a minimum of 1'-6" away from any box to box joint, except opening may be a minimum of 1'-0" away from joint when at least 2'-0" of clearance to the box to box joint is provided on the opposite side of the pipe opening.
3. Pipe blockout diameter to be 6" greater than pipe outside diameter.
4. See Drainage Plans for size, placement, and invert elevation.

SECTION I-I
(Showing additional blockout reinforcing only)

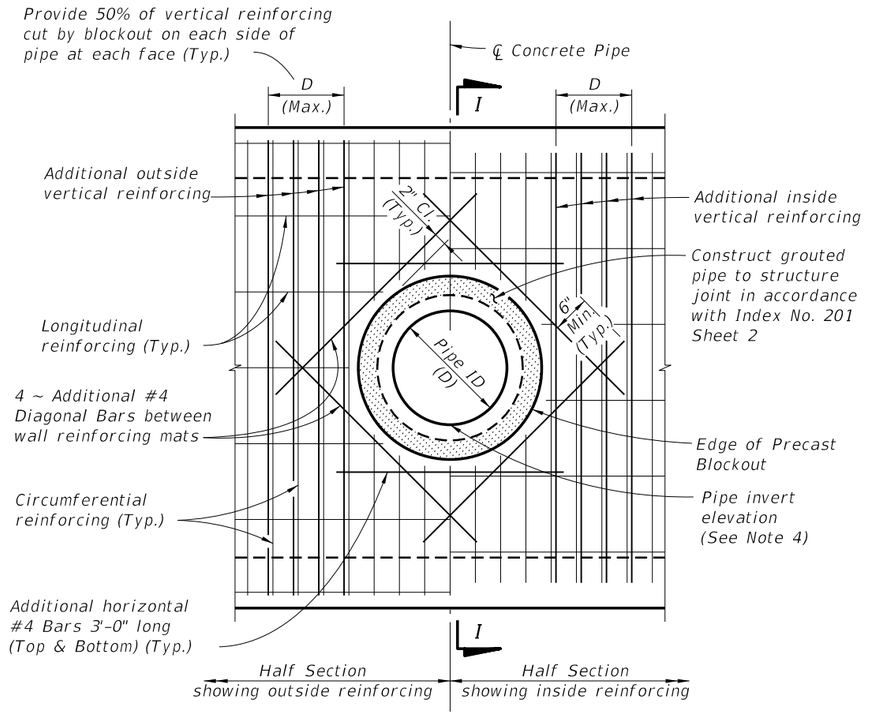


SECTION F-F



VIEW G-G
(Headwall, Toe Slab and Cutoff Wall Reinforcing not shown for clarity)

C-I-P END CAP DETAILS AND CONNECTION TO PRECAST BOX



ELEVATION VIEW

PIPE BLOCKOUT DETAILS

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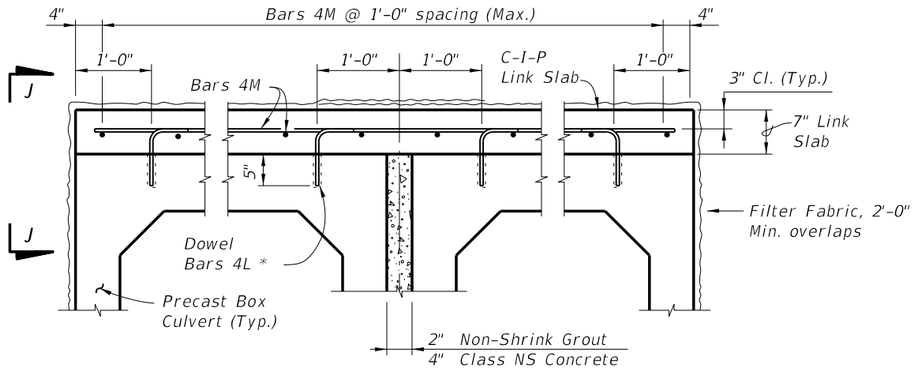
LAST REVISION	REVISION	DESCRIPTION:				
07/01/07			FDOT DESIGN STANDARDS 2013	SUPPLEMENTAL DETAILS FOR PRECAST CONCRETE BOX CULVERTS	INDEX NO. 291	SHEET NO. 4



LINK SLAB TYPICAL SECTION
(Multiple Barrel Culvert shown, Single Barrel Culvert similar)

* Install dowels with an Adhesive Bonding Material System in accordance with Specification Section 416. The Contractor may substitute mechanical couplers in lieu of adhesive bonded dowels. Shift dowels to clear box culvert reinforcing.

LINK SLAB NOTES:

1. Provide a Cast-In-Place Link Slab to ensure uniform joint opening of precast box culverts when the differential settlement shown in the plans exceeds the following limits, except that a Link Slab is not required for differential settlements less than ½".

$$\Delta Y \leq \frac{(L)^2}{760 \times R \times W}$$

Where:
ΔY = Maximum Long-Term Differential Settlement (ft.)
R = Exterior height of Box Culvert (ft.)
W = Length of Box Culvert Segments (ft.)
L = Effective length for single curvature deflection (ft.)

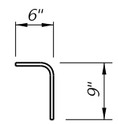
2. Extend Link Slab to back face of headwalls and to limits of existing box culverts for extensions.

ESTIMATED LINK SLAB QUANTITIES		
ITEM	UNIT	QUANTITY
Class II or IV Concrete (Culvert)	CY/SF	0.0216
Reinforcing Steel (Roadway)	Lb./SF	1.52

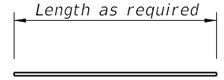
NOTE: Estimated quantities are based the plan area of precast box slabs, and are provided for information only. No additional payment will be made for Link Slabs where these are required for the precast box culverts.

BILL OF REINFORCING STEEL			
MARK	SIZE	NO. REQ'D	LENGTH
L	4	2 per Barrel/Ft.	1'-3"
M	4	As Reqd.	As Reqd.

REINFORCING STEEL BENDING DIAGRAMS



DOWEL BARS 4L

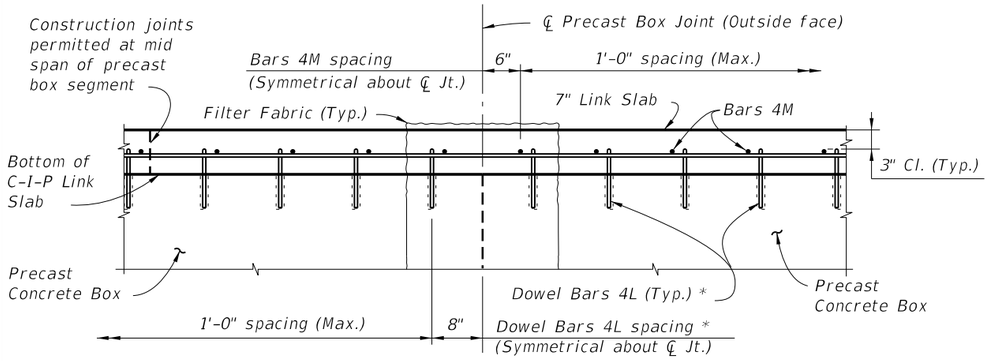


BAR 4M

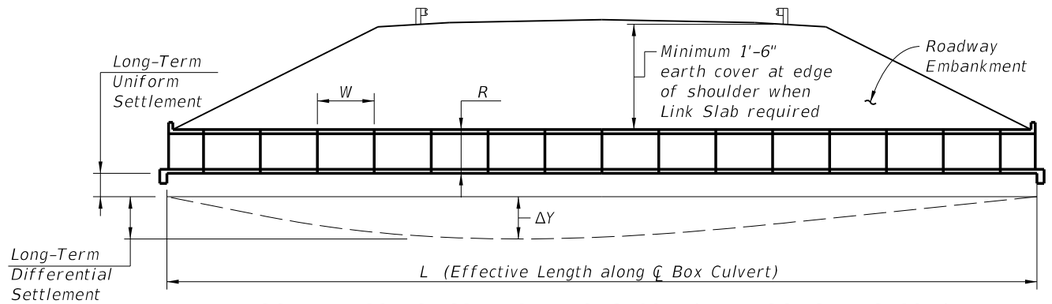
NOTES:
1. All bar dimensions are out to out.
2. Lap splice length for Bars 4M is 1'-4" minimum.

DESIGN NOTE:

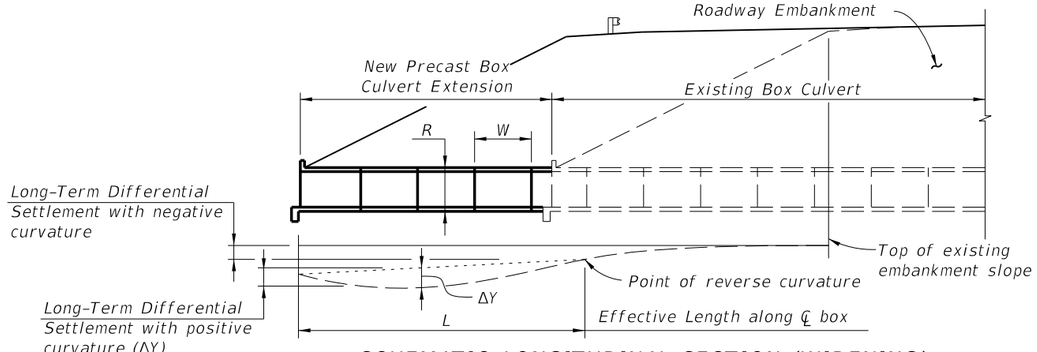
1. Link Slab required when joint openings from differential settlement exceed ⅛" as determined in Link Slab Note 1.



VIEW J-J



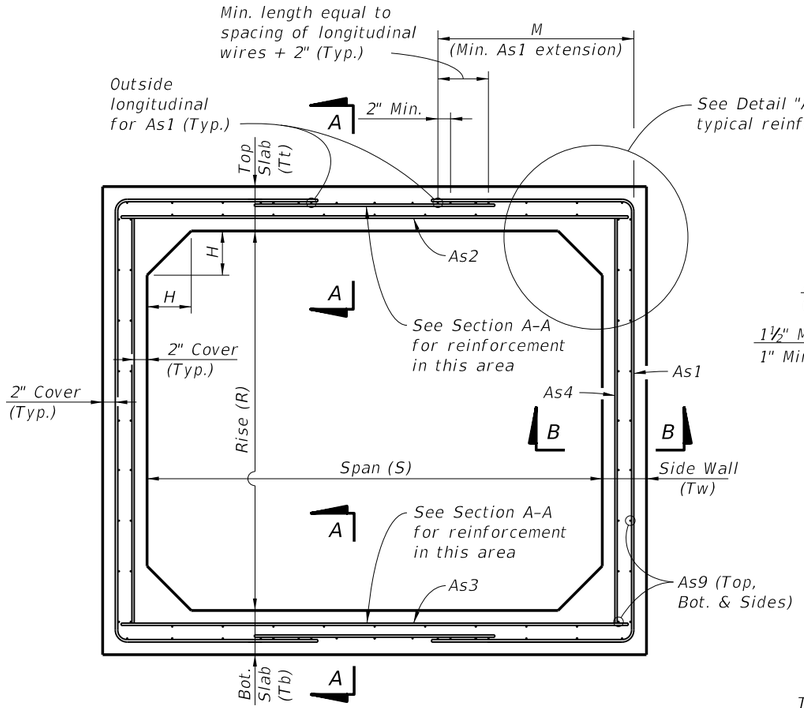
SCHEMATIC LONGITUDINAL SECTION (NEW CONSTRUCTION)



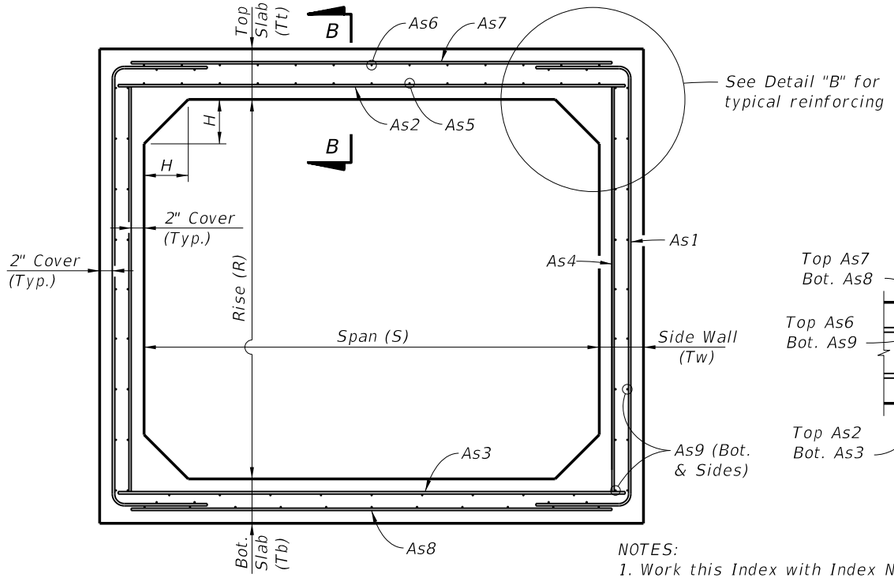
SCHEMATIC LONGITUDINAL SECTION (WIDENING)

DIFFERENTIAL SETTLEMENT COUNTERMEASURES FOR PRECAST BOX CULVERTS

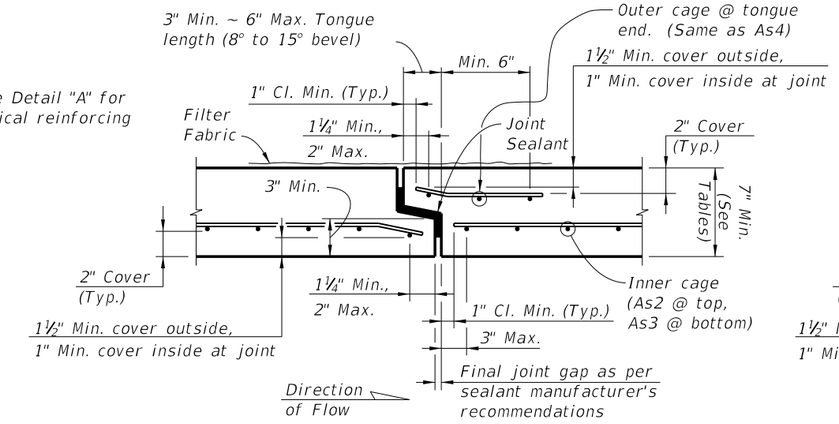
LAST REVISION	REVISION	DESCRIPTION:		FDOT DESIGN STANDARDS 2013	SUPPLEMENTAL DETAILS FOR PRECAST CONCRETE BOX CULVERTS	INDEX NO.	SHEET NO.
01/01/09						291	5



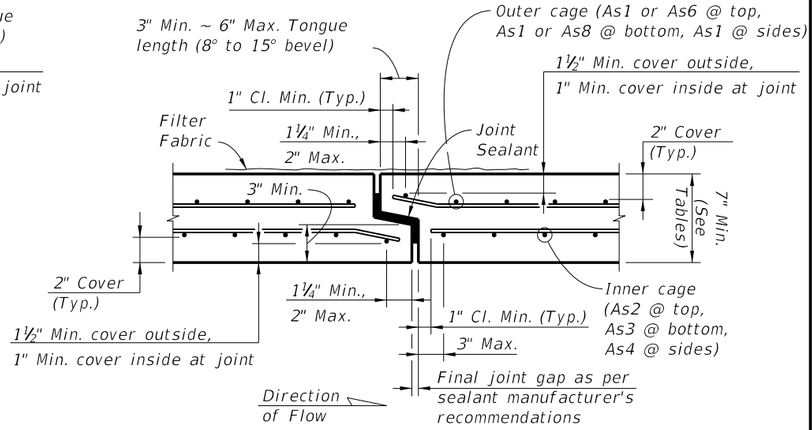
TYPICAL BOX SECTION (TYPE 2)
DESIGN EARTH COVER 2' OR GREATER
(Option 1 Reinforcing Configuration Shown)



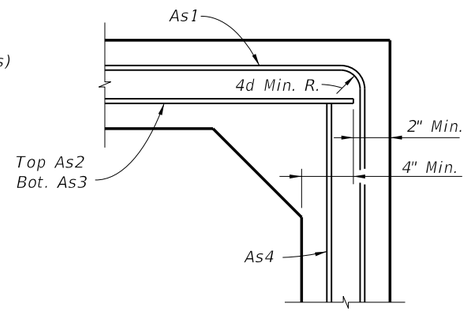
TYPICAL BOX SECTION (TYPE 1)
DESIGN EARTH COVER LESS THAN 2'
(Option 1 Reinforcing Configuration Shown)



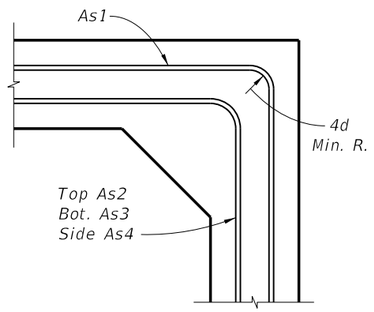
SECTION A-A



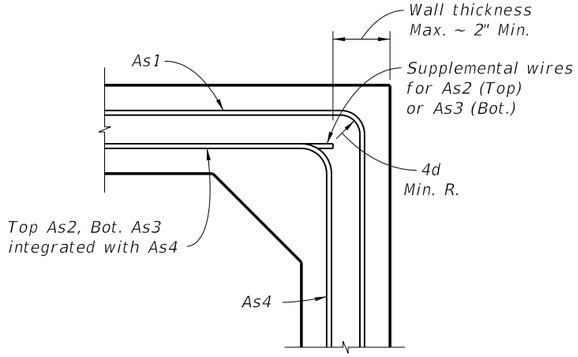
SECTION B-B
TYPICAL SECTION THRU JOINT



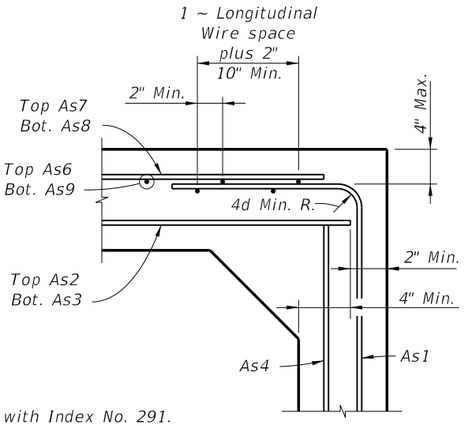
DETAIL "A"
(OPTION 1)



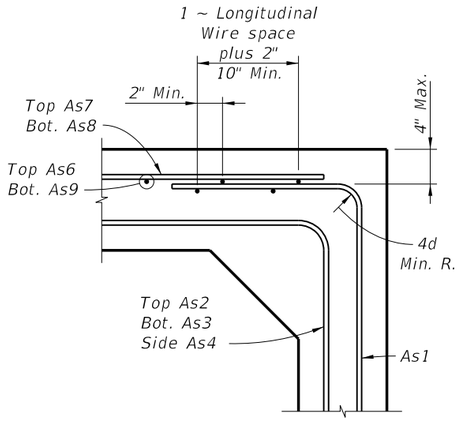
DETAIL "A"
(OPTION 2)



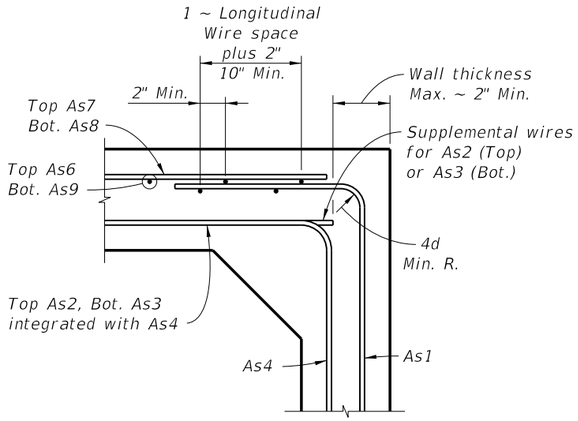
DETAIL "A"
(OPTION 3)



DETAIL "B"
(OPTION 1)



DETAIL "B"
(OPTION 2)



DETAIL "B"
(OPTION 3)

NOTES:
1. Work this Index with Index No. 291.
2. See sheets 2 thru 5 for dimensions and areas of reinforcement.

STANDARD PRECAST BOX CULVERT WITH 2" CONCRETE COVER

LAST REVISION	REVISION	DESCRIPTION:				
01/01/12			FDOT DESIGN STANDARDS 2013	STANDARD PRECAST CONCRETE BOX CULVERTS	INDEX NO. 292	SHEET NO. 1

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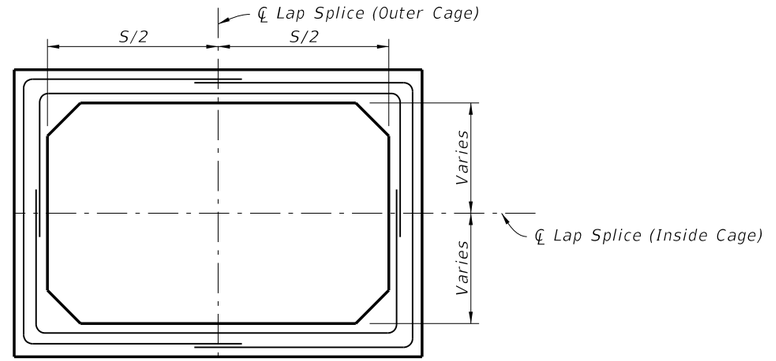
GENERAL NOTES:

1. These precast designs may be substituted for cast-in-place box culverts designed to AASHTO LRFD Bridge Design Specifications, 4th Edition. Designs are based on the design criteria shown in FDOT Structures Design Guidelines.
2. Loading: HL-93 & any fill heights between the minimum & maximum shown.
3. Only one design of precast box culvert is to be used for any installation.
4. Reinforcing steel must consist of smooth or deformed welded wire reinforcement (WWR) conforming to ASTM A185 or A497. Longitudinal reinforcement may consist of ASTM A615 Grade 60 bars. Minimum cover must be 2" unless otherwise shown. The spacing of circumferential wires must not be less than 2" nor more than 4". The spacing of longitudinal wires or bars must not be more than 8".
5. As9 longitudinal wires must have a minimum cross-sectional area of 40% of the circumferential wires, but not less than a W2.5 or D2.5 for WWR, or #3 bars for ASTM A615 deformed bars.
6. Welding of reinforcement must be limited to the locations shown in ASTM C1577 and in accordance with ANSI/AWS D1.4 "Structural Welding Code - Reinforcing Steel".
7. For alternate reinforcing configuration Options 2 and 3 shown in Detail "A" and "B" (Sheet 1), As1 may be extended to the middle of either slab and lap spliced with As7 and As8. As4 may be lap spliced at any location or connected to As2 or As3 at corners by welding.
8. Haunch dimensions may vary between the minimum and maximum dimensions shown in the Design Tables but only one haunch dimension must be used within the full length of the box culvert installation.
9. Submittal of redesign calculations are not required for any increase to the slab and/or wall thickness when the minimum reinforcement areas shown in the Design Tables are provided.
10. For Design Earth Cover greater than 10 feet, the Contractor may interpolate the required areas of reinforcement and slab or wall thickness. Interpolated areas of reinforcement, slab or wall thickness must be approved by the Engineer.
11. Minimum length of precast box segments is 4 feet and maximum length is 16 feet.
12. See Index No. 291 for connections to wingwalls, headwalls and other general details.



SCHEMATIC OF LAP SPLICE LOCATIONS
FOR OPTION 2 & 3 REINFORCING CONFIGURATIONS

TABLE 1A - STANDARD PRECAST BOX CULVERT DESIGNS (2" COVER) - 3' & 4' SPANS

SPAN x RISE (S) (R) (Ft.)	SLAB / WALL THICKNESS TOP (Tt) (in.)	BOT. (Tb) (in.)	SIDE (Tw) (in.)	HAUNCH (H) (in.)	DESIGN EARTH COVER ABOVE TOP SLAB	REINFORCEMENT AREAS (sq. in./Ft.) As1	As2	As3	As4	As5	As6	As7	As8	As9	As1 EXT. LENGTH (M) (in.)
3' x 3'	7	7	7	4	0.33" - <2'	0.17	0.29	0.21	0.17	0.17	0.17	0.17	0.17	See General Note 5	-
					2' - <3'	0.13	0.28	0.21	0.09	-	-	-	-		31
					3' - <5'	0.09	0.17	0.17	0.09	-	-	-	-		31
				to	5' - 10'	0.09	0.17	0.17	0.09	-	-	-	-		31
					15'	0.09	0.17	0.17	0.09	-	-	-	-		31
					20'	0.12	0.17	0.17	0.09	-	-	-	-		31
					25'	0.14	0.18	0.18	0.09	-	-	-	-		31
				8	30'	0.17	0.21	0.22	0.09	-	-	-	-		31
					35'	0.19	0.25	0.25	0.09	-	-	-	-		31
4' x 3'	7	7	7	4	0.33" - <2'	0.19	0.38	0.26	0.17	0.19	0.17	0.17	0.19		-
					2' - <3'	0.19	0.38	0.26	0.09	-	-	-	-		38
					3' - <5'	0.14	0.20	0.22	0.09	-	-	-	-		38
				to	5' - 10'	0.11	0.17	0.17	0.09	-	-	-	-		38
					15'	0.15	0.17	0.18	0.09	-	-	-	-		38
					20'	0.20	0.23	0.23	0.09	-	-	-	-		38
				8	25'	0.24	0.28	0.29	0.09	-	-	-	-		38
					30'	0.29	0.34	0.35	0.09	-	-	-	-		38
4' x 4'	7	7	7	4	0.33" - <2'	0.19	0.41	0.28	0.17	0.21	0.17	0.17	0.19		-
					2' - <3'	0.19	0.41	0.28	0.09	-	-	-	-		38
					3' - <5'	0.14	0.21	0.24	0.09	-	-	-	-		38
				to	5' - 10'	0.12	0.17	0.17	0.09	-	-	-	-		38
					15'	0.16	0.19	0.20	0.09	-	-	-	-		38
					20'	0.21	0.25	0.25	0.09	-	-	-	-		38
				8	25'	0.26	0.31	0.32	0.09	-	-	-	-		38
					30'	0.31	0.37	0.38	0.09	-	-	-	-		38

TABLE 1B - STANDARD PRECAST BOX CULVERT DESIGNS (2" COVER) - 3' & 4' SPANS

SPAN x RISE (S) (R) (Ft.)	SLAB / WALL THICKNESS TOP (Tt) (in.)	BOT. (Tb) (in.)	SIDE (Tw) (in.)	HAUNCH (H) (in.)	DESIGN EARTH COVER ABOVE TOP SLAB	REINFORCEMENT AREAS (sq. in./Ft.) As1	As2	As3	As4	As5	As6	As7	As8	As9	As1 EXT. LENGTH (M) (in.)
3' x 3'	8	8	8	4	0.33" - <2'	0.20	0.26	0.32	0.20	0.20	0.20	0.20	0.20	See General Note 5	-
					2' - <3'	0.16	0.25	0.31	0.10	-	-	-	-		31
					3' - <5'	0.10	0.20	0.20	0.10	-	-	-	-		31
				to	5' - 10'	0.10	0.20	0.20	0.10	-	-	-	-		31
					15'	0.10	0.20	0.20	0.10	-	-	-	-		31
					20'	0.10	0.20	0.20	0.10	-	-	-	-		31
					25'	0.11	0.20	0.20	0.10	-	-	-	-		31
				8	30'	0.13	0.20	0.20	0.10	-	-	-	-		31
					35'	0.15	0.21	0.21	0.10	-	-	-	-		31
4' x 3'	8	8	8	4	0.33" - <2'	0.20	0.31	0.22	0.20	0.20	0.20	0.20	0.20		-
					2' - <3'	0.12	0.31	0.22	0.10	-	-	-	-		38
					3' - <5'	0.12	0.20	0.20	0.10	-	-	-	-		38
				to	5' - 10'	0.10	0.20	0.20	0.10	-	-	-	-		38
					15'	0.12	0.20	0.20	0.10	-	-	-	-		38
					20'	0.16	0.20	0.20	0.10	-	-	-	-		38
				8	25'	0.19	0.24	0.24	0.10	-	-	-	-		38
					30'	0.22	0.28	0.29	0.10	-	-	-	-		38
4' x 4'	8	8	8	4	0.33" - <2'	0.20	0.33	0.24	0.20	0.20	0.20	0.20	0.20		-
					2' - <3'	0.17	0.33	0.24	0.10	-	-	-	-		38
					3' - <5'	0.12	0.20	0.20	0.10	-	-	-	-		38
				to	5' - 10'	0.10	0.20	0.20	0.10	-	-	-	-		38
					15'	0.13	0.20	0.20	0.10	-	-	-	-		38
					20'	0.16	0.21	0.22	0.10	-	-	-	-		38
				8	25'	0.20	0.26	0.27	0.10	-	-	-	-		38
					30'	0.23	0.31	0.32	0.10	-	-	-	-		38

NOTES: 1. See Sheet 1 for Reinforcing Details and dimension locations.
2. See Sheet 14 for WWR Bending Diagram.

TABLE 2A - STANDARD PRECAST BOX CULVERT DESIGNS (2" COVER) - 5' & 6' SPANS

SPAN x RISE (S) (R) (Ft.)	SLAB / WALL THICKNESS TOP (Tt) (in.)	BOT. (Tb) (in.)	SIDE (Tw) (in.)	HAUNCH (H) (in.)	DESIGN EARTH COVER ABOVE TOP SLAB	REINFORCEMENT AREAS (sq. in./Ft.) As1	As2	As3	As4	As5	As6	As7	As8	As9	As1 EXT. LENGTH (M) (in.)
5' x 3'	7	7	7	4 to 8	0.33' - <2'	0.31	0.48	0.42	0.17	0.21	0.17	0.23	0.31	See General Note 5	–
					2' - <3'	0.31	0.48	0.42	0.09	–	–	–	–		45
					3' - <5'	0.20	0.27	0.27	0.09	–	–	–	–		36
					5' - 10'	0.17	0.19	0.21	0.09	–	–	–	–		36
					15'	0.24	0.25	0.25	0.09	–	–	–	–		35
					20'	0.32	0.33	0.33	0.09	–	–	–	–		35
					25'	0.39	0.41	0.42	0.09	–	–	–	–		35
					30'	0.47	0.50	0.50	0.09	–	–	–	–		35
5' x 4'	7	7	7	4 to 8	0.33' - <2'	0.30	0.51	0.45	0.17	0.23	0.17	0.21	0.30		–
					2' - <3'	0.30	0.51	0.45	0.09	–	–	–	–		45
					3' - <5'	0.18	0.30	0.29	0.09	–	–	–	–		45
					5' - 10'	0.17	0.21	0.23	0.09	–	–	–	–		36
					15'	0.24	0.27	0.28	0.09	–	–	–	–		35
					20'	0.31	0.36	0.37	0.09	–	–	–	–		35
					25'	0.39	0.45	0.46	0.09	–	–	–	–		35
					30'	0.46	0.55	0.56	0.09	–	–	–	–		35
5' x 5'	7	7	7	4 to 8	0.33' - <2'	0.30	0.53	0.48	0.17	0.24	0.17	0.21	0.30		–
					2' - <3'	0.29	0.53	0.48	0.09	–	–	–	–		45
					3' - <5'	0.19	0.31	0.31	0.09	–	–	–	–		45
					5' - 10'	0.19	0.22	0.25	0.09	–	–	–	–		45
					15'	0.26	0.29	0.31	0.09	–	–	–	–		36
					20'	0.34	0.39	0.40	0.09	–	–	–	–		35
					25'	0.41	0.49	0.50	0.09	–	–	–	–		35
					30'	0.49	0.59	0.61	0.09	–	–	–	–		35
6' x 3'	7.5	7	7	4 to 8	0.33' - <2'	0.39	0.54	0.48	0.17	0.22	0.18	0.25	0.39		–
	7	7	7		2' - <3'	0.39	0.58	0.49	0.09	–	–	–	–		43
					3' - <5'	0.28	0.36	0.36	0.09	–	–	–	–		39
					5' - 10'	0.25	0.26	0.28	0.09	–	–	–	–		39
				12	15'	0.36	0.34	0.34	0.09	–	–	–	–		38
					20'	0.47	0.46	0.46	0.09	–	–	–	–		38
	7	7.5	7		25'	0.59	0.57	0.55	0.09	–	–	–	–		38
	8	8	7		30'	0.60	0.64	0.64	0.09	–	–	–	–		38
6' x 4'	7.5	7	7	4 to 8	0.33' - <2'	0.37	0.58	0.52	0.17	0.24	0.18	0.23	0.37		–
	7	7	7		2' - <3'	0.37	0.61	0.53	0.09	–	–	–	–		43
					3' - <5'	0.26	0.39	0.39	0.09	–	–	–	–		39
					5' - 10'	0.24	0.28	0.31	0.09	–	–	–	–		39
				12	15'	0.35	0.37	0.38	0.09	–	–	–	–		38
					20'	0.46	0.50	0.50	0.09	–	–	–	–		38
	7	7.5	7		25'	0.56	0.63	0.60	0.09	–	–	–	–		38
	8	8	7		30'	0.58	0.69	0.69	0.09	–	–	–	–		38
6' x 5'	7.5	7	7	4 to 8	0.33' - <2'	0.36	0.60	0.56	0.17	0.25	0.18	0.22	0.36		–
	7	7	7		2' - <3'	0.36	0.64	0.56	0.09	–	–	–	–		43
					3' - <5'	0.26	0.410	0.42	0.09	–	–	–	–		43
					5' - 10'	0.25	0.30	0.33	0.09	–	–	–	–		39
					15'	0.34	0.40	0.41	0.09	–	–	–	–		38
				12	20'	0.46	0.54	0.54	0.09	–	–	–	–		38
	7	7.5	7		25'	0.56	0.67	0.65	0.09	–	–	–	–		38
	8	8	8		30'	0.60	0.74	0.74	0.09	–	–	–	–		38
6' x 6'	7.5	7	7	4 to 8	0.33' - <2'	0.36	0.63	0.59	0.17	0.26	0.18	0.22	.036		–
	7	7	7		2' - <3'	0.35	0.67	0.59	0.09	–	–	–	–		52
					3' - <5'	0.27	0.43	0.44	0.09	–	–	–	–		52
					5' - 10'	0.27	0.32	0.35	0.09	–	–	–	–		43
					15'	0.38	0.43	0.44	0.09	–	–	–	–		39
				12	20'	0.50	0.57	0.59	0.09	–	–	–	–		39
	7	7.5	7		25'	0.60	0.72	0.70	0.09	–	–	–	–		38
	8	8	7		30'	0.67	0.78	0.79	0.09	–	–	–	–		38

TABLE 2B - STANDARD PRECAST BOX CULVERT DESIGNS (2" COVER) - 5' & 6' SPANS

SPAN x RISE (S) (R) (Ft.)	SLAB / WALL THICKNESS TOP (Tt) (in.)	BOT. (Tb) (in.)	SIDE (Tw) (in.)	HAUNCH (H) (in.)	DESIGN EARTH COVER ABOVE TOP SLAB	REINFORCEMENT AREAS (sq. in./Ft.) As1	As2	As3	As4	As5	As6	As7	As8	As9	As1 EXT. LENGTH (M) (in.)
5' x 3'	8	8	8	4 to 8	0.33' - <2'	0.26	0.39	0.36	0.20	0.20	0.20	0.20	0.26	See General Note 5	–
					2' - <3'	0.26	0.39	0.36	0.10	–	–	–	–		45
					3' - <5'	0.16	0.23	0.24	0.10	–	–	–	–		36
					5' - 10'	0.13	0.20	0.20	0.10	–	–	–	–		36
					15'	0.19	0.21	0.22	0.10	–	–	–	–		35
					20'	0.24	0.28	0.28	0.10	–	–	–	–		35
					25'	0.30	0.34	0.35	0.10	–	–	–	–		35
					30'	0.36	0.41	0.41	0.10	–	–	–	–		35
5' x 4'	8	8	8	4 to 8	0.33' - <2'	0.25	0.42	0.38	0.20	0.20	0.20	0.20	0.25		–
					2' - <3'	0.25	0.42	0.38	0.10	–	–	–	–		45
					3' - <5'	0.16	0.25	0.25	0.10	–	–	–	–		45
					5' - 10'	0.13	0.20	0.20	0.10	–	–	–	–		36
					15'	0.19	0.23	0.24	0.10	–	–	–	–		35
					20'	0.24	0.30	0.31	0.10	–	–	–	–		35
					25'	0.30	0.37	0.38	0.10	–	–	–	–		35
					30'	0.35	0.45	0.46	0.10	–	–	–	–		35
5' x 5'	8	8	8	4 to 8	0.33' - <2'	0.25	0.44	0.41	0.20	0.20	0.20	0.20	0.25		–
					2' - <3'	0.25	0.44	0.41	0.10	–	–	–	–		45
					3' - <5'	0.16	0.26	0.27	0.10	–	–	–	–		45
					5' - 10'	0.15	0.20	0.22	0.10	–	–	–	–		45
					15'	0.20	0.25	0.26	0.10	–	–	–	–		36
					20'	0.26	0.32	0.33	0.10	–	–	–	–		35
					25'	0.32	0.40	0.41	0.10	–	–	–	–		35
					30'	0.37	0.48	0.49	0.10	–	–	–	–		35
6' x 3'	8	8	8	4 to 8	0.33' - <2'	0.32	0.47	0.41	0.20	0.20	0.20	0.25	0.32		–
					2' - <3'	0.32	0.47	0.41	0.10	–	–	–	–		43
					3' - <5'	0.23	0.30	0.31	0.10	–	–	–	–		39
					5' - 10'	0.19	0.22	0.24	0.10	–	–	–	–		39
					15'	0.28	0.29	0.29	0.10	–	–	–	–		38
				12	20'	0.36	0.38	0.38	0.10	–	–	–	–		38
					25'	0.45	0.47	0.47	0.10	–	–	–	–		38
					30'	0.54	0.57	0.57	0.10	–	–	–	–		38
6' x 4'	8	8	8	4 to 8	0.33' - <2'	0.31	0.50	0.44	0.20	0.21	0.20	0.23	0.31		–
					2' - <3'	0.31	0.50	0.44	0.10	–	–	–	–		43
					3' - <5'	0.23	0.32	0.34	0.10	–	–	–	–		39
					5' - 10'	0.19	0.24	0.26	0.10	–	–	–	–		39
				12	15'	0.27	0.31	0.32	0.10	–	–	–	–		38
					20'	0.35	0.41	0.41	0.10	–	–	–	–		38
					25'	0.43	0.51	0.51	0.10	–	–	–	–		38
					30'	0.52	0.62	0.62	0.10	–	–	–	–		38
6' x 5'	8	8	8	4 to 8	0.33' - <2'	0.30	0.52	0.47	0.20	0.22	0.20	0.22	0.30		–
					2' - <3'	0.30	0.52	0.47	0.10	–	–	–	–		43
					3' - <5'	0.22	0.34	0.36	0.10	–	–	–	–		43
					5' - 10'	0.20	0.26	0.28	0.10	–	–	–	–		39
					15'	0.27	0.33	0.34	0.10	–	–	–	–		38
				12	20'	0.36	0.44	0.45	0.10	–	–	–	–		38
					25'	0.44	0.55	0.55	0.10	–	–	–	–		38
					30'	0.52	0.66	0.67	0.10	–	–	–	–		38
6' x 6'	8	8	8	4 to 8	0.33' - <2'	0.30	0.54	0.50	0.20	0.22	0.20	0.22	0.30		–
					2' - <3'	0.30	0.54	0.50	0.10	–	–	–	–		52
					3' - <5'	0.23	0.36	0.38	0.10	–	–	–	–		52
					5' - 10'	0.21	0.27	0.30	0.10	–	–	–	–		43
					15'	0.29	0.35	0.37	0.10	–	–	–	–		39
				12	20'	0.38	0.47	0.48	0.10	–	–	–	–		39
					25'	0.47	0.59	0.60	0.10	–	–	–	–		38
					30'	0.55	0.70	0.71	0.10	–	–	–	–		38

TABLE 3 - STANDARD PRECAST BOX CULVERT DESIGNS (2" COVER) - 7' SPANS

SPAN x RISE (S) (R) (Ft.)	SLAB / WALL THICKNESS TOP (Tt) (in.)	BOT. (Tb) (in.)	SIDE (Tw) (in.)	HAUNCH (H) (in.)	DESIGN EARTH COVER ABOVE TOP SLAB	REINFORCEMENT AREAS (sq. in./Ft.) As1	As2	As3	As4	As5	As6	As7	As8	As9	As1 EXT. LENGTH (M) (in.)
7' x 4'	8	8	8	4 to 12	0.33' - <2'	0.37	0.58	0.49	0.20	0.22	0.20	0.29	0.37	See General Note 5	–
					2' - <3'	0.37	0.58	0.49	0.10	–	–	–	–		43
					3' - <5'	0.30	0.40	0.42	0.10	–	–	–	–		43
					5' - 10'	0.26	0.30	0.33	0.10	–	–	–	–		43
					15'	0.37	0.40	0.40	0.10	–	–	–	–		41
					20'	0.49	0.53	0.53	0.10	–	–	–	–		41
	8	8	8	7 to 12	25'	0.60	0.67	0.66	0.10	–	–	–	–		41
	8.5	8.5	8		30'	0.68	0.79	0.78	0.10	–	–	–	–		41
7' x 5'	8	8	8	4 to 12	0.33' - <2'	0.36	0.60	0.53	0.20	0.23	0.20	0.28	0.36		–
					2' - <3'	0.36	0.60	0.53	0.10	–	–	–	–		47
					3' - <5'	0.30	0.42	0.45	0.10	–	–	–	–		43
					5' - 10'	0.26	0.32	0.35	0.10	–	–	–	–		43
					15'	0.37	0.43	0.44	0.10	–	–	–	–		41
					20'	0.48	0.57	0.57	0.10	–	–	–	–		41
	8	8	8	7 to 12	25'	0.60	0.72	0.72	0.10	–	–	–	–		41
	8.5	8.5	8		30'	0.67	0.84	0.84	0.10	–	–	–	–		41
7' x 6'	8	8	8	4 to 12	0.33' - <2'	0.36	0.63	0.56	0.20	0.24	0.20	0.27	0.36		–
					2' - <3'	0.36	0.63	0.56	0.10	–	–	–	–		59
					3' - <5'	0.29	0.44	0.47	0.10	–	–	–	–		47
					5' - 10'	0.27	0.34	0.37	0.10	–	–	–	–		43
					15'	0.38	0.46	0.46	0.10	–	–	–	–		41
					20'	0.49	0.60	0.61	0.10	–	–	–	–		41
	8	8	8	7 to 12	25'	0.61	0.76	0.76	0.10	–	–	–	–		41
	8.5	8.5	8		30'	0.69	0.89	0.89	0.10	–	–	–	–		41
7' x 7'	8	8	8	4 to 12	0.33' - <2'	0.36	0.65	0.58	0.20	0.25	0.20	0.27	0.36		–
					2' - <3'	0.36	0.65	0.58	0.10	–	–	–	–		59
					3' - <5'	0.30	0.46	0.50	0.10	–	–	–	–		59
					5' - 10'	0.30	0.35	0.50	0.10	–	–	–	–		47
					15'	0.41	0.48	0.50	0.10	–	–	–	–		43
					20'	0.53	0.64	0.65	0.10	–	–	–	–		43
	8	8	8	7 to 12	25'	0.65	0.80	0.81	0.10	–	–	–	–		43
	8.5	9	8		30'	0.72	0.92	0.91	0.10	–	–	–	–		41

TABLE 4 - STANDARD PRECAST BOX CULVERT DESIGNS (2" COVER) - 8' SPANS

SPAN x RISE (S) (R) (Ft.)	SLAB / WALL THICKNESS TOP (Tt) (in.)	BOT. (Tb) (in.)	SIDE (Tw) (in.)	HAUNCH (H) (in.)	DESIGN EARTH COVER ABOVE TOP SLAB	REINFORCEMENT AREAS (sq. in./Ft.) As1	As2	As3	As4	As5	As6	As7	As8	As9	As1 EXT. LENGTH (M) (in.)
8' x 4'	9	8.5	8	4 to 12	0.33' - <2'	0.40	0.60	0.52	0.20	0.22	0.22	0.28	0.39	See General Note 5	–
	8	8	8		2' - <3'	0.45	0.66	0.54	0.10	–	–	–	–		50
					3' - <5'	0.39	0.48	0.50	0.10	–	–	–	–		50
					5' - 10'	0.34	0.38	0.40	0.10	–	–	–	–		45
					15'	0.49	0.51	0.50	0.10	–	–	–	–		41
					20'	0.65	0.68	0.66	0.10	–	–	–	–		41
	8.5	8.5	8	8 to 12	25'	0.76	0.83	0.80	0.10	–	–	–	–		41
	9.5	9.5	8		30'	0.79	0.94	0.92	0.10	–	–	–	–		41
8' x 5'	9	8.5	8	4 to 12	0.33' - <2'	0.38	0.65	0.59	0.20	0.22	0.22	0.30	0.37		–
	8	8	8		2' - <3'	0.43	0.69	0.58	0.10	–	–	–	–		50
					3' - <5'	0.37	0.51	0.53	0.10	–	–	–	–		45
					5' - 10'	0.33	0.41	0.42	0.10	–	–	–	–		45
					15'	0.48	0.54	0.53	0.10	–	–	–	–		41
					20'	0.63	0.73	0.70	0.10	–	–	–	–		41
	8.5	8.5	8	8 to 12	25'	0.74	0.88	0.86	0.10	–	–	–	–		41
	9.5	9.5	8		30'	0.77	1.00	0.98	0.10	–	–	–	–		41
8' x 6'	9	9	8	4 to 12	0.33' - <2'	0.32	0.65	0.58	0.20	0.23	0.22	0.25	0.31		–
	8	8	8		2' - <3'	0.42	0.71	0.61	0.10	–	–	–	–		50
					3' - <5'	0.37	0.54	0.56	0.10	–	–	–	–		50
					5' - 10'	0.34	0.43	0.45	0.10	–	–	–	–		45
					15'	0.49	0.57	0.57	0.10	–	–	–	–		41
					20'	0.64	0.77	0.76	0.10	–	–	–	–		41
	8.5	8.5	8	8 to 12	25'	0.74	0.94	0.92	0.10	–	–	–	–		41
	9.5	9.5	8		30'	0.78	1.05	1.04	0.10	–	–	–	–		41
8' x 7'	9	9	8	4 to 12	0.33' - <2'	0.31	0.67	0.60	0.20	0.24	0.22	0.24	0.31		–
	8	8	8		2' - <3'	0.42	0.74	0.64	0.10	–	–	–	–		55
					3' - <5'	0.37	0.56	0.59	0.10	–	–	–	–		55
					5' - 10'	0.36	0.45	0.47	0.10	–	–	–	–		50
					15'	0.51	0.61	0.61	0.10	–	–	–	–		45
					20'	0.66	0.81	0.80	0.10	–	–	–	–		41
	8.5	8.5	8	8 to 12	25'	0.78	0.98	0.97	0.10	–	–	–	–		41
	9.5	9.5	8		30'	0.84	1.10	1.09	0.10	–	–	–	–		41
8' x 8'	9	9	8	4 to 12	0.33' - <2'	0.32	0.68	0.62	0.20	0.24	0.22	0.25	0.32		–
	8	8	8		2' - <3'	0.43	0.76	0.67	0.14	–	–	–	–		65
					3' - <5'	0.38	0.58	0.61	0.14	–	–	–	–		65
					5' - 10'	0.39	0.46	0.50	0.13	–	–	–	–		55
					15'	0.55	0.64	0.65	0.10	–	–	–	–		45
					20'	0.71	0.86	0.85	0.10	–	–	–	–		45
	8.5	8.5	8	8 to 12	25'	0.84	1.03	1.02	0.10	–	–	–	–		41
	9.5	9.5	8		30'	0.93	1.15	1.15	0.10	–	–	–	–		41

NOTES:
1. See Sheet 1 for Reinforcing Details and dimension locations.
2. See Sheet 2 for General Notes.
3. See Sheet 14 for Welded Wire Reinforcement Bending Diagram.

TABLE 5 - STANDARD PRECAST BOX CULVERT DESIGNS (2" COVER) - 9' SPANS

SPAN x RISE (S) (R) (Ft.)	SLAB / WALL THICKNESS TOP (Tt) (in.)	BOT. (Tb) (in.)	SIDE (Tw) (in.)	HAUNCH (H) (in.)	DESIGN EARTH COVER ABOVE TOP SLAB	REINFORCEMENT AREAS (sq. in./Ft.) As1	As2	As3	As4	As5	As6	As7	As8	As9	As1 EXT. LENGTH (M) (in.)
9' x 5'	9.5	9.5	9	4	0.33' - <2'	0.41	0.62	0.53	0.22	0.23	0.23	0.34	0.38	See General Note 5	–
	9	9	9	to 12	2' - <3'	0.44	0.65	0.54	0.11	–	–	–	–		54
					3' - <5'	0.39	0.53	0.51	0.11	–	–	–	–		49
					5' - 10'	0.35	0.42	0.44	0.11	–	–	–	–		49
					15'	0.50	0.56	0.55	0.11	–	–	–	–		44
					20'	0.65	0.75	0.73	0.11	–	–	–	–		44
	9.5	9.5	9	8 to 12	25'	0.77	0.92	0.90	0.11	–	–	–	–		44
	10.5	11	9		30'	0.81	1.05	1.02	0.11	–	–	–	–		44
9' x 6'	9.5	9.5	9	4	0.33' - <2'	0.38	0.64	0.56	0.23	0.23	0.23	0.33	0.37		–
	9	9	9	to 12	2' - <3'	0.43	0.67	0.57	0.11	–	–	–	–		54
					3' - <5'	0.37	0.55	0.54	0.11	–	–	–	–		49
					5' - 10'	0.35	0.45	0.47	0.11	–	–	–	–		49
					15'	0.49	0.60	0.59	0.11	–	–	–	–		44
					20'	0.65	0.80	0.78	0.11	–	–	–	–		44
	9.5	9.5	9	8 to 12	25'	0.76	0.98	0.95	0.11	–	–	–	–		44
	10.5	11	9		30'	0.80	1.10	1.08	0.11	–	–	–	–		44
9' x 7'	9.5	9.5	9	4	0.33' - <2'	0.37	0.67	0.59	0.22	0.23	0.23	0.32	0.37		–
	9	9	9	to 12	2' - <3'	0.42	0.69	0.60	0.11	–	–	–	–		59
					3' - <5'	0.37	0.58	0.56	0.11	–	–	–	–		54
					5' - 10'	0.36	0.47	0.49	0.11	–	–	–	–		49
					15'	0.50	0.63	0.63	0.11	–	–	–	–		44
					20'	0.66	0.84	0.80	0.11	–	–	–	–		44
	9.5	9.5	9	8 to 12	25'	0.77	1.02	1.00	0.11	–	–	–	–		44
	10.5	11	9		30'	0.81	1.15	1.13	0.11	–	–	–	–		44
9' x 8'	9.5	9.5	9	4	0.33' - <2'	0.37	0.68	0.61	0.22	0.23	0.23	0.31	0.37		–
	9	9	9	to 12	2' - <3'	0.42	0.71	0.62	0.11	–	–	–	–		59
					3' - <5'	0.37	0.60	0.59	0.11	–	–	–	–		59
					5' - 10'	0.38	0.49	0.51	0.11	–	–	–	–		54
					15'	0.53	0.66	0.66	0.11	–	–	–	–		44
					20'	0.68	0.88	0.87	0.11	–	–	–	–		44
	9.5	9.5	9	8 to 12	25'	0.81	1.07	1.05	0.11	–	–	–	–		44
	10.5	11	9		30'	0.86	1.20	1.18	0.11	–	–	–	–		44
9' x 9'	9.5	9.5	9	4	0.33' - <2'	0.38	0.70	0.63	0.22	0.23	0.23	0.32	0.38		–
	9	9	9	to 12	2' - <3'	0.43	0.73	0.65	0.15	–	–	–	–		72
					3' - <5'	0.38	0.62	0.61	0.15	–	–	–	–		72
					5' - 10'	0.41	0.50	0.53	0.14	–	–	–	–		59
					15'	0.57	0.69	0.70	0.12	–	–	–	–		49
					20'	0.73	0.92	0.91	0.11	–	–	–	–		49
	9.5	10	9	8 to 12	25'	0.83	1.11	1.09	0.11	–	–	–	–		44
	10.5	11	9		30'	0.93	1.25	1.23	0.11	–	–	–	–		44

TABLE 6 - STANDARD PRECAST BOX CULVERT DESIGNS (2" COVER) - 10' SPANS

SPAN x RISE (S) (R) (Ft.)	SLAB / WALL THICKNESS TOP (Tt) (in.)	BOT. (Tb) (in.)	SIDE (Tw) (in.)	HAUNCH (H) (in.)	DESIGN EARTH COVER ABOVE TOP SLAB	REINFORCEMENT AREAS (sq. in./Ft.) As1	As2	As3	As4	As5	As6	As7	As8	As9	As1 EXT. LENGTH (M) (in.)
10' x 5'	10	10	10	4	0.33' - <2'	0.46	0.62	0.52	0.24	0.24	0.24	0.41	0.45	See General Note 5	–
				to 12	2' - <3'	0.46	0.62	0.52	0.12	–	–	–	–		58
					3' - <5'	0.42	0.54	0.50	0.12	–	–	–	–		53
					5' - 10'	0.38	0.46	0.49	0.12	–	–	–	–		52
					15'	0.52	0.59	0.58	0.12	–	–	–	–		47
					20'	0.69	0.78	0.76	0.12	–	–	–	–		47
	10.5	10.5	10	8 to 12	25'	0.81	0.97	0.93	0.12	–	–	–	–		47
	11.5	12	10		30'	0.87	1.11	1.11	0.12	–	–	–	–		47
10' x 6'	10	10	10	4	0.33' - <2'	0.44	0.64	0.54	0.24	0.24	0.24	0.39	0.44		–
				to 12	2' - <3'	0.44	0.64	0.54	0.12	–	–	–	–		58
					3' - <5'	0.39	0.57	0.52	0.12	–	–	–	–		52
					5' - 10'	0.37	0.48	0.52	0.12	–	–	–	–		52
					15'	0.51	0.62	0.61	0.12	–	–	–	–		47
					20'	0.67	0.83	0.80	0.12	–	–	–	–		47
	10.5	10.5	10	8 to 12	25'	0.79	1.02	0.99	0.12	–	–	–	–		47
	11.5	12	10		30'	0.85	1.17	1.14	0.12	–	–	–	–		47
10' x 7'	10	10	10	4	0.33' - <2'	0.43	0.66	0.57	0.24	0.24	0.24	0.38	0.43		–
				to 12	2' - <3'	0.43	0.66	0.57	0.12	–	–	–	–		58
					3' - <5'	0.38	0.59	0.55	0.12	–	–	–	–		58
					5' - 10'	0.37	0.50	0.54	0.12	–	–	–	–		52
					15'	0.52	0.66	0.65	0.12	–	–	–	–		47
					20'	0.67	0.87	0.85	0.12	–	–	–	–		47
	10.5	10.5	10	8 to 12	25'	0.79	1.07	1.04	0.12	–	–	–	–		47
	11.5	12	10		30'	0.84	1.22	1.19	0.12	–	–	–	–		47
10' x 8'	10	10	10	4	0.33' - <2'	0.43	0.68	0.60	0.24	0.24	0.24	0.38	0.43		–
				to 12	2' - <3'	0.43	0.68	0.60	0.12	–	–	–	–		64
					3' - <5'	0.38	0.62	0.57	0.12	–	–	–	–		58
					5' - 10'	0.38	0.52	0.57	0.12	–	–	–	–		52
					15'	0.53	0.69	0.68	0.12	–	–	–	–		47
					20'	0.68	0.91	0.89	0.12	–	–	–	–		47
	10.5	10.5	10	8 to 12	25'	0.81	1.12	1.09	0.12	–	–	–	–		47
	11.5	12	10		30'	0.86	1.27	1.25	0.12	–	–	–	–		47
10' x 9'	10	10	10	4	0.33' - <2'	0.43	0.70	0.62	0.24	0.24	0.24	0.38	0.43		–
				to 12	2' - <3'	0.43	0.70	0.62	0.12	–	–	–	–		70
					3' - <5'	0.39	0.64	0.60	0.12	–	–	–	–		64
					5' - 10'	0.40	0.54	0.59	0.12	–	–	–	–		58
					15'	0.56	0.72	0.72	0.12	–	–	–	–		52
					20'	0.71	0.95	0.94	0.12	–	–	–	–		47
	10.5	11	10	8 to 12	25'	0.82	1.15	1.13	0.12	–	–	–	–		47
	11.5	12	10		30'	0.90	1.32	1.30	0.12	–	–	–	–		47
10' x 10'	10	10	10	4	0.33' - <2'	0.44	0.71	0.64	0.24	0.24	0.24	0.38	0.44		–
				to 12	2' - <3'	0.44	0.71	0.64	0.17	–	–	–	–		79
					3' - <5'	0.40	0.65	0.62	0.16	–	–	–	–		70
					5' - 10'	0.44	0.56	0.61	0.15	–	–	–	–		64
					15'	0.60	0.75	0.76	0.12	–	–	–	–		52
					20'	0.76	0.99	0.99	0.12	–	–	–	–		52
	10.5	11	10	8 to 12	25'	0.86	1.20	1.18	0.12	–	–	–	–		47
	11.5	12	10		30'	0.97	1.36	1.35	0.13	–	–	–	–		47

NOTES:
1. See Sheet 1 for Reinforcing Details and dimension locations.
2. See Sheet 2 for General Notes.
3. See Sheet 14 for WWR Bending Diagram.

LAST REVISION	REVISION	DESCRIPTION:				
07/01/07			FDOT DESIGN STANDARDS 2013	STANDARD PRECAST CONCRETE BOX CULVERTS	INDEX NO. 292	SHEET NO. 5

TABLE 7 - STANDARD PRECAST BOX CULVERT DESIGNS (2" COVER) - 11' SPANS

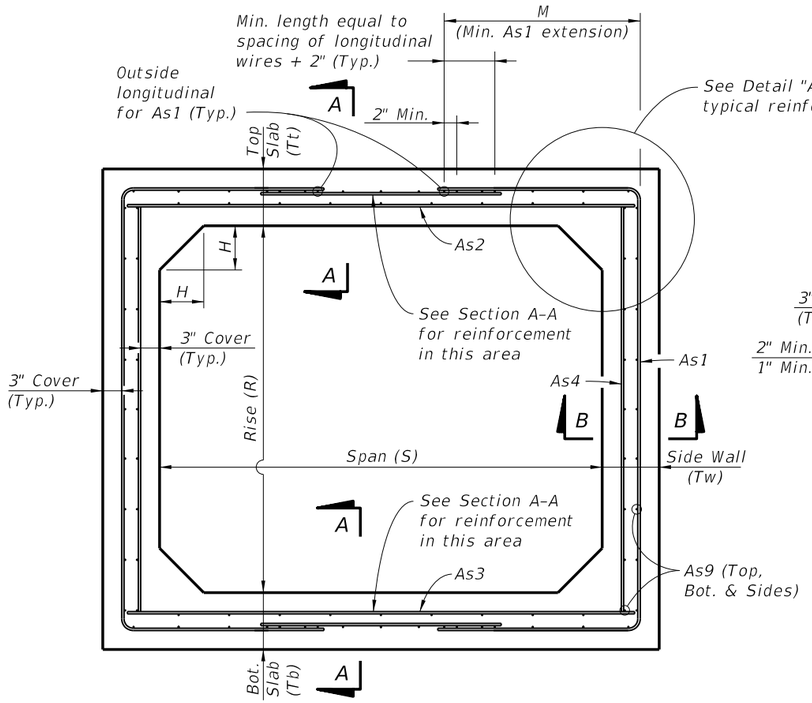
SPAN x RISE (S) (R) (Ft.)	SLAB / WALL THICKNESS TOP (Tt) (in.)	BOT. (Tb) (in.)	SIDE (Tw) (in.)	HAUNCH (H) (in.)	DESIGN EARTH COVER ABOVE TOP SLAB	REINFORCEMENT AREAS (sq. in./Ft.) As1	As2	As3	As4	As5	As6	As7	As8	As9	As1 EXT. LENGTH (M) (in.)
11' x 4'	11	11	11	4 to 12	0.33' - <2'	0.51	0.57	0.47	0.27	0.27	0.27	0.45	0.48	See General Note 5	–
					2' - <3'	0.51	0.57	0.47	0.14	–	–	–	–		62
					3' - <5'	0.48	0.57	0.46	0.14	–	–	–	–		62
					5' - 10'	0.47	0.50	0.50	0.14	–	–	–	–		55
					15'	0.59	0.58	0.56	0.14	–	–	–	–		55
					20'	0.77	0.77	0.74	0.14	–	–	–	–		55
	11.5	11.5	11	8 to 12	25'	0.92	0.95	0.91	0.14	–	–	–	–		55
	13	13	11		30'	0.94	1.09	1.06	0.14	–	–	–	–		55
11' x 6'	11	11	11	4 to 12	0.33' - <2'	0.45	0.62	0.52	0.27	0.27	0.27	0.41	0.45		–
					2' - <3'	0.45	0.62	0.52	0.14	–	–	–	–		62
					3' - <5'	0.42	0.58	0.51	0.14	–	–	–	–		55
					5' - 10'	0.43	0.56	0.56	0.14	–	–	–	–		55
					15'	0.54	0.65	0.64	0.14	–	–	–	–		50
					20'	0.70	0.86	0.83	0.14	–	–	–	–		50
	11.5	11.5	11	8 to 12	25'	0.83	1.07	1.03	0.14	–	–	–	–		50
	13	13	11		30'	0.85	1.22	1.19	0.14	–	–	–	–		50
11' x 8'	11	11	11	4 to 12	0.33' - <2'	0.42	0.67	0.57	0.27	0.27	0.27	0.39	0.43		–
					2' - <3'	0.43	0.67	0.57	0.14	–	–	–	–		62
					3' - <5'	0.39	0.63	0.56	0.14	–	–	–	–		62
					5' - 10'	0.43	0.60	0.61	0.14	–	–	–	–		55
					15'	0.54	0.72	0.71	0.14	–	–	–	–		50
					20'	0.70	0.94	0.92	0.14	–	–	–	–		50
	11.5	11.5	11	8 to 12	25'	0.82	1.16	1.13	0.14	–	–	–	–		50
	13	13	11		30'	0.86	1.32	1.30	0.14	–	–	–	–		50
11' x 10'	11	11	11	4 to 12	0.33' - <2'	0.44	0.71	0.62	0.27	0.27	0.27	0.38	0.44		–
					2' - <3'	0.44	0.71	0.62	0.14	–	–	–	–		75
					3' - <5'	0.41	0.67	0.61	0.14	–	–	–	–		69
					5' - 10'	0.47	0.64	0.66	0.14	–	–	–	–		62
					15'	0.59	0.78	0.78	0.14	–	–	–	–		55
					20'	0.75	1.03	1.01	0.14	–	–	–	–		50
	11.5	12	11	8 to 12	25'	0.85	1.24	1.22	0.14	–	–	–	–		50
	13	13.5	11		30'	0.91	1.40	1.39	0.14	–	–	–	–		50
11' x 11'	11	11	11	4 to 12	0.33' - <2'	0.45	0.72	0.64	0.27	0.27	0.27	0.39	0.45		–
					2' - <3'	0.45	0.72	0.64	0.18	–	–	–	–		86
					3' - <5'	0.42	0.69	0.63	0.18	–	–	–	–		75
					5' - 10'	0.51	0.66	0.69	0.16	–	–	–	–		69
					15'	0.63	0.81	0.82	0.14	–	–	–	–		55
					20'	0.80	1.07	1.06	0.14	–	–	–	–		55
	11.5	12	11	8 to 12	25'	0.91	1.29	1.27	0.14	–	–	–	–		50
	13	13.5	11		30'	0.99	1.44	1.44	0.14	–	–	–	–		50

TABLE 8 - STANDARD PRECAST BOX CULVERT DESIGNS (2" COVER) - 12' SPANS

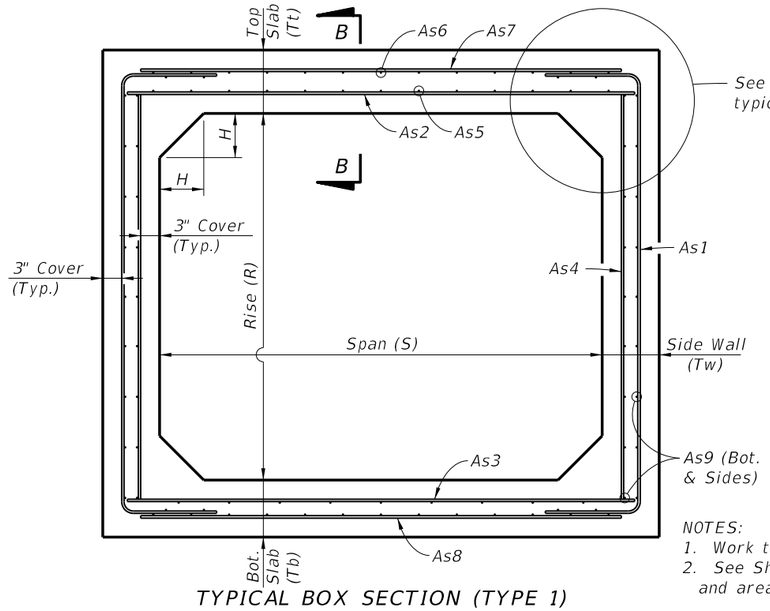
SPAN x RISE (S) (R) (Ft.)	SLAB / WALL THICKNESS TOP (Tt) (in.)	BOT. (Tb) (in.)	SIDE (Tw) (in.)	HAUNCH (H) (in.)	DESIGN EARTH COVER ABOVE TOP SLAB	REINFORCEMENT AREAS (sq. in./Ft.) As1	As2	As3	As4	As5	As6	As7	As8	As9	As1 EXT. LENGTH (M) (in.)
12' x 4'	12	12	12	4 to 12	0.33' - <2'	0.52	0.57	0.45	0.29	0.29	0.29	0.47	0.49	See General Note 5	–
					2' - <3'	0.52	0.57	0.45	0.15	–	–	–	–		73
					3' - <5'	0.50	0.54	0.45	0.15	–	–	–	–		66
					5' - 10'	0.50	0.52	0.52	0.15	–	–	–	–		66
					15'	0.63	0.61	0.59	0.15	–	–	–	–		59
					20'	0.82	0.81	0.77	0.15	–	–	–	–		59
	12.5	12.5	12	8 to 12	25'	0.99	0.99	0.95	0.15	–	–	–	–		59
	14	14	12		30'	1.03	1.15	1.11	0.15	–	–	–	–		59
12' x 6'	12	12	12	4 to 12	0.33' - <2'	0.47	0.62	0.51	0.29	0.29	0.29	0.42	0.46		–
					2' - <3'	0.47	0.62	0.51	0.15	–	–	–	–		66
					3' - <5'	0.45	0.60	0.51	0.15	–	–	–	–		59
					5' - 10'	0.47	0.59	0.59	0.15	–	–	–	–		59
					15'	0.57	0.68	0.66	0.15	–	–	–	–		53
					20'	0.74	0.90	0.86	0.15	–	–	–	–		53
	12.5	12.5	12	8 to 12	25'	0.88	1.11	1.06	0.15	–	–	–	–		53
	14	14.5	12		30'	0.92	1.27	1.24	0.15	–	–	–	–		53
12' x 8'	12	12	12	4 to 12	0.33' - <2'	0.44	0.67	0.56	0.29	0.29	0.29	0.40	0.44		–
					2' - <3'	0.44	0.67	0.56	0.15	–	–	–	–		66
					3' - <5'	0.41	0.64	0.56	0.15	–	–	–	–		59
					5' - 10'	0.45	0.63	0.64	0.15	–	–	–	–		59
					15'	0.56	0.75	0.73	0.15	–	–	–	–		53
					20'	0.72	0.98	0.95	0.15	–	–	–	–		53
	12.5	13	12	8 to 12	25'	0.85	1.20	1.16	0.15	–	–	–	–		53
	14	14.5	12		30'	0.89	1.38	1.35	0.15	–	–	–	–		53
12' x 10'	12	12	12	4 to 12	0.33' - <2'	0.44	0.71	0.60	0.29	0.29	0.29	0.39	0.44		–
					2' - <3'	0.44	0.71	0.60	0.15	–	–	–	–		73
					3' - <5'	0.42	0.68	0.60	0.15	–	–	–	–		66
					5' - 10'	0.47	0.67	0.69	0.15	–	–	–	–		59
					15'	0.59	0.81	0.81	0.15	–	–	–	–		53
					20'	0.75	1.06	1.04	0.15	–	–	–	–		53
	12.5	13	12	8 to 12	25'	0.87	1.30	1.26	0.15	–	–	–	–		53
	14	14.5	12		30'	0.92	1.47	1.45	0.15	–	–	–	–		53
12' x 12'	12	12	12	4 to 12	0.33' - <2'	0.46	0.74	0.64	0.29	0.29	0.29	0.40	0.46		–
					2' - <3'	0.46	0.74	0.64	0.20	–	–	–	–		93
					3' - <5'	0.42	0.72	0.64	0.20	–	–	–	–		80
					5' - 10'	0.54	0.71	0.74	0.18	–	–	–	–		73
					15'	0.66	0.87	0.89	0.15	–	–	–	–		59
					20'	0.83	1.14	1.13	0.15	–	–	–	–		59
	12.5	13	12	8 to 12	25'	0.96	1.39	1.37	0.15	–	–	–	–		53
	14	14.5	12.5		30'	1.05	1.56	1.56	0.15	–	–	–	–		53

NOTES:

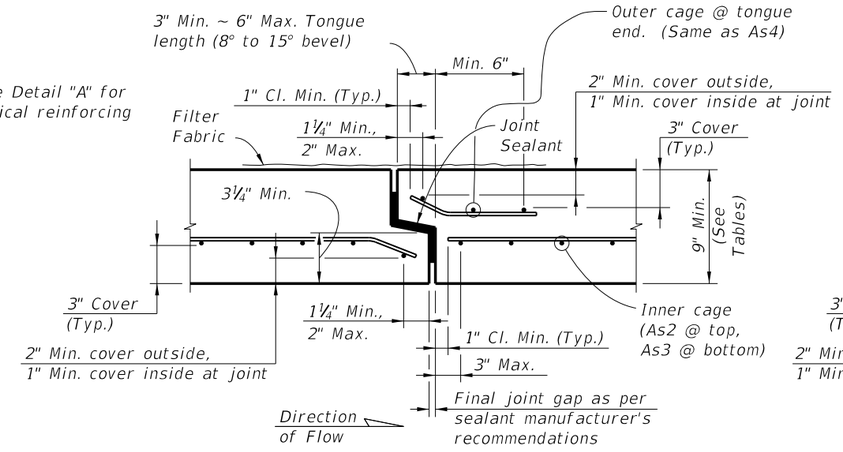
1. See Sheet 1 for Reinforcing Details and dimension locations.
2. See Sheet 2 for General Notes.
3. See Sheet 14 for Welded Wire Reinforcement Bending Diagram.



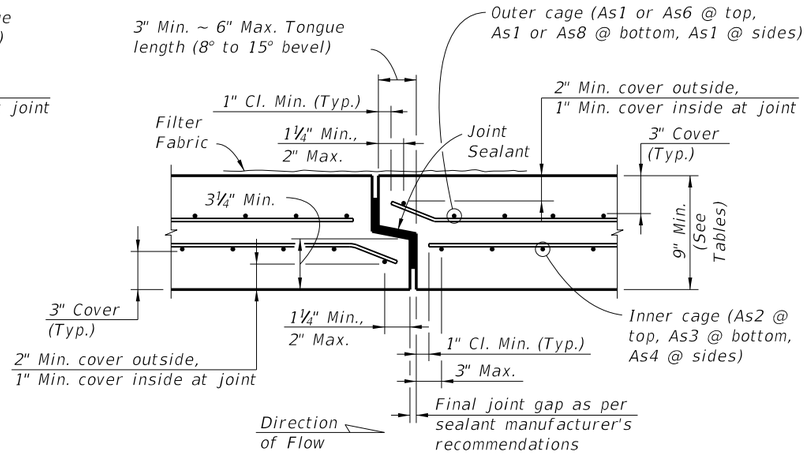
TYPICAL BOX SECTION (TYPE 2)
DESIGN EARTH COVER 2' OR GREATER
(Option 1 Reinforcing Configuration Shown)



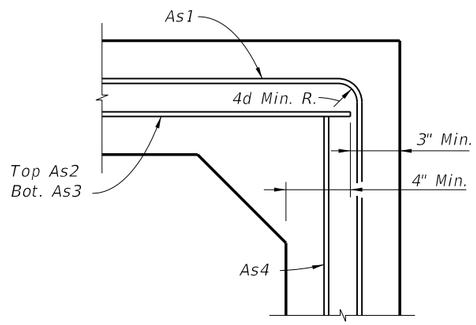
TYPICAL BOX SECTION (TYPE 1)
DESIGN EARTH COVER LESS THAN 2'
(Option 1 Reinforcing Configuration Shown)



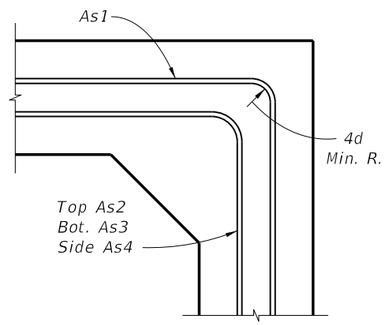
SECTION A-A



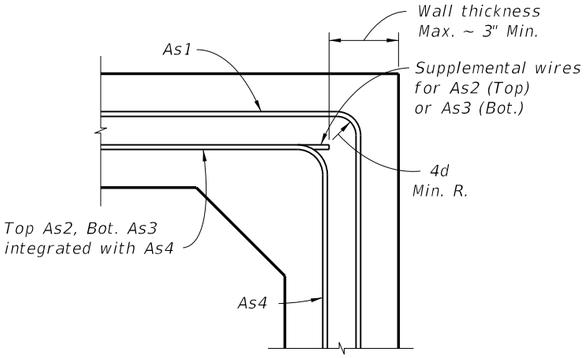
SECTION B-B
TYPICAL SECTION THRU JOINT



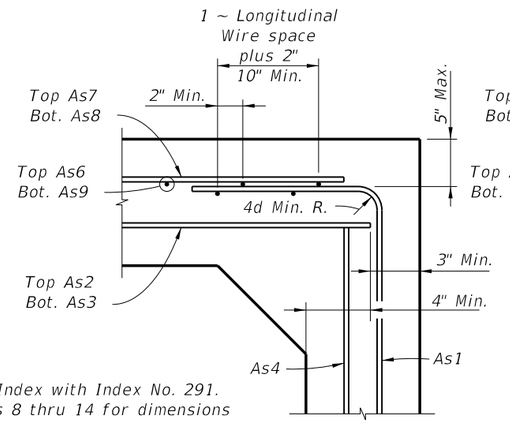
DETAIL "A"
(OPTION 1)



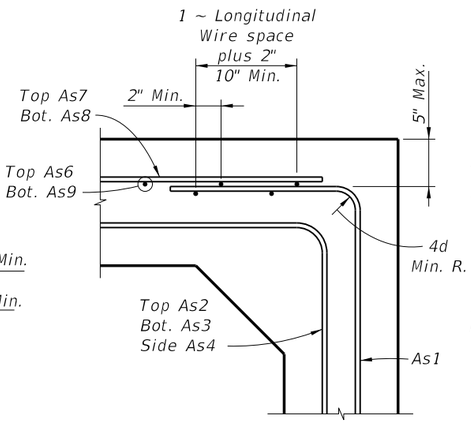
DETAIL "A"
(OPTION 2)



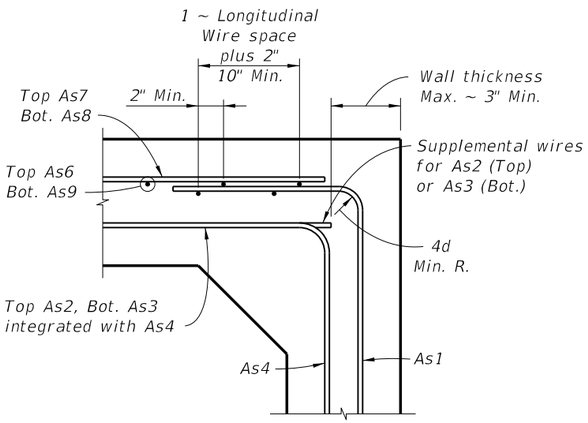
DETAIL "A"
(OPTION 3)



DETAIL "B"
(OPTION 1)



DETAIL "B"
(OPTION 2)



DETAIL "B"
(OPTION 3)

NOTES:
1. Work this Index with Index No. 291.
2. See Sheets 8 thru 14 for dimensions and areas of reinforcement.

STANDARD PRECAST BOX CULVERT WITH 3" CONCRETE COVER

LAST REVISION	REVISION	DESCRIPTION:			INDEX NO.	SHEET NO.
01/01/12			FDOT DESIGN STANDARDS 2013	STANDARD PRECAST CONCRETE BOX CULVERTS	292	7

TABLE 9A - STANDARD PRECAST BOX CULVERT DESIGNS (3" COVER) - 3' & 4' SPANS

SPAN x RISE (S) (R) (Ft.)	SLAB / WALL THICKNESS TOP (Tt) (in.)	BOT. (Tb) (in.)	SIDE (Tw) (in.)	HAUNCH (H) (in.)	DESIGN EARTH COVER ABOVE TOP SLAB	REINFORCEMENT AREAS (sq. in./Ft.) As1	As2	As3	As4	As5	As6	As7	As8	As9	As1 EXT. LENGTH (M) (in.)
3' x 3'	9	9	9	4 to 8	0.33' - <2'	0.22	0.24	0.22	0.22	0.22	0.22	0.22	0.22	See General Note 5	–
					2' - <3'	0.11	0.23	0.22	0.11	–	–	–	–		31
					3' - <5'	0.11	0.22	0.22	0.11	–	–	–	–		31
					5' - 10'	0.11	0.22	0.22	0.11	–	–	–	–		31
					15'	0.11	0.22	0.22	0.11	–	–	–	–		31
					20'	0.13	0.22	0.22	0.11	–	–	–	–		31
					25'	0.16	0.22	0.22	0.11	–	–	–	–		31
					30'	0.19	0.24	0.25	0.11	–	–	–	–		31
					35'	0.22	0.28	0.29	0.11	–	–	–	–		31
4' x 3'	9	9	9	4 to 8	0.33' - <2'	0.22	0.32	0.24	0.22	0.22	0.22	0.22	0.22		–
					2' - <3'	0.17	0.31	0.24	0.11	–	–	–	–		38
					3' - <5'	0.13	0.22	0.22	0.11	–	–	–	–		38
					5' - 10'	0.13	0.22	0.22	0.11	–	–	–	–		38
					15'	0.17	0.22	0.22	0.11	–	–	–	–		38
					20'	0.23	0.26	0.27	0.11	–	–	–	–		38
					25'	0.28	0.32	0.34	0.11	–	–	–	–		38
					30'	0.33	0.39	0.40	0.11	–	–	–	–		38
4' x 4'	9	9	9	4 to 8	0.33' - <2'	0.22	0.34	0.26	022	0.22	0.22	0.22	0.22		–
					2' - <3'	0.17	0.33	0.26	0.11	–	–	–	–		38
					3' - <5'	0.13	0.22	0.22	0.11	–	–	–	–		38
					5' - 10'	0.14	0.22	0.22	0.11	–	–	–	–		38
					15'	0.19	0.22	0.23	0.11	–	–	–	–		38
					20'	0.24	0.28	0.30	0.11	–	–	–	–		38
					25'	0.29	0.36	0.37	0.11	–	–	–	–		38
					30'	0.34	0.43	0.45	0.11	–	–	–	–		38

TABLE 9B - STANDARD PRECAST BOX CULVERT DESIGNS (3" COVER) - 3' & 4' SPANS

SPAN x RISE (S) (R) (Ft.)	SLAB / WALL THICKNESS TOP (Tt) (in.)	BOT. (Tb) (in.)	SIDE (Tw) (in.)	HAUNCH (H) (in.)	DESIGN EARTH COVER ABOVE TOP SLAB	REINFORCEMENT AREAS (sq. in./Ft.) As1	As2	As3	As4	As5	As6	As7	As8	As9	As1 EXT. LENGTH (M) (in.)
3' x 3'	10	10	10	4 to 8	0.33' - <2'	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	See General Note 5	–
					2' - <3'	0.12	0.24	0.24	0.24	–	–	–	–		31
					3' - <5'	0.12	0.24	0.24	0.24	–	–	–	–		31
					5' - 10'	0.12	0.24	0.24	0.24	–	–	–	–		31
					15'	0.12	0.24	0.24	0.24	–	–	–	–		31
					20'	0.12	0.24	0.24	0.24	–	–	–	–		31
					25'	0.13	0.24	0.24	0.24	–	–	–	–		31
					30'	0.15	0.24	0.24	0.12	–	–	–	–		31
					35'	0.18	0.24	0.24	0.12	–	–	–	–		31
4' x 3'	10	10	10	4 to 8	0.33' - <2'	0.24	0.26	0.24	0.24	0.24	0.24	0.24	0.24		–
					2' - <3'	0.14	0.26	0.24	0.12	–	–	–	–		38
					3' - <5'	0.12	0.24	0.24	0.12	–	–	–	–		38
					5' - 10'	0.12	0.24	0.24	0.12	–	–	–	–		38
					15'	0.14	0.24	0.24	0.12	–	–	–	–		38
					20'	0.18	0.24	0.24	0.12	–	–	–	–		38
					25'	0.22	0.26	0.27	0.12	–	–	–	–		38
					30'	0.26	0.31	0.32	0.12	–	–	–	–		38
4' x 4'	10	10	10	4 to 8	0.33' - <2'	0.24	0.28	0.24	0.24	0.24	0.24	0.24	0.24		–
					2' - <3'	0.14	0.28	0.24	0.12	–	–	–	–		38
					3' - <5'	0.12	0.24	0.24	0.12	–	–	–	–		38
					5' - 10'	0.12	0.24	0.24	0.12	–	–	–	–		38
					15'	0.15	0.24	0.24	0.12	–	–	–	–		38
					20'	0.19	0.24	0.24	0.12	–	–	–	–		38
					25'	0.23	0.28	0.30	0.12	–	–	–	–		38
					30'	0.27	0.34	0.35	0.12	–	–	–	–		38

NOTES:
1. See Sheet 2 for General Notes.
2. See Sheet 7 for Reinforcing Details and dimension locations.
3. See Sheet 14 for WWR Bending Diagrams.

TABLE 10A - STANDARD PRECAST BOX CULVERT DESIGNS (3" COVER) - 5' & 6' SPANS

SPAN x RISE (S) (R) (Ft.)	SLAB / WALL THICKNESS TOP (Tt) (in.)	BOT. (Tb) (in.)	SIDE (Tw) (in.)	HAUNCH (H) (in.)	DESIGN EARTH COVER ABOVE TOP SLAB	REINFORCEMENT AREAS (sq. in./Ft.) As1	As2	As3	As4	As5	As6	As7	As8	As9	As1 EXT. LENGTH (M) (in.)
5' x 3'	9	9	9	4 to 8	0.33' - <2'	0.27	0.39	0.37	0.22	0.22	0.22	0.22	0.27	See General Note 5	–
					2' - <3'	0.26	0.39	0.37	0.11	–	–	–	–		45
					3' - <5'	0.19	0.24	0.25	0.11	–	–	–	–		36
					5' - 10'	0.20	0.22	0.22	0.11	–	–	–	–		36
					15'	0.28	0.28	0.30	0.11	–	–	–	–		35
					20'	0.37	0.38	0.39	0.11	–	–	–	–		35
					25'	0.45	0.48	0.49	0.11	–	–	–	–		35
					30'	0.54	0.58	0.59	0.11	–	–	–	–		35
5' x 4'	9	9	9	4 to 8	0.33' - <2'	0.26	0.42	0.39	0.22	0.22	0.22	0.22	0.26		–
					2' - <3'	0.26	0.42	0.39	0.11	–	–	–	–		45
					3' - <5'	0.19	0.26	0.27	0.11	–	–	–	–		45
					5' - 10'	0.20	0.22	0.23	0.11	–	–	–	–		36
					15'	0.27	0.31	0.33	0.11	–	–	–	–		35
					20'	0.36	0.42	0.43	0.11	–	–	–	–		35
					25'	0.44	0.52	0.54	0.11	–	–	–	–		35
					30'	0.53	0.63	0.65	0.11	–	–	–	–		35
5' x 5'	9	9	9	4 to 8	0.33' - <2'	0.27	0.44	0.42	0.22	0.22	0.22	0.22	0.27		–
					2' - <3'	0.27	0.44	0.42	0.11	–	–	–	–		45
					3' - <5'	0.20	0.27	0.28	0.11	–	–	–	–		45
					5' - 10'	0.22	0.23	0.26	0.11	–	–	–	–		45
					15'	0.30	0.34	0.36	0.11	–	–	–	–		36
					20'	0.38	0.45	0.47	0.11	–	–	–	–		35
					25'	0.47	0.56	0.59	0.11	–	–	–	–		35
					30'	0.55	0.68	0.71	0.11	–	–	–	–		35
6' x 3'	9	9	9	4 to 12	0.33' - <2'	0.34	0.47	0.42	0.22	0.22	0.22	0.25	0.34		–
					2' - <3'	0.34	0.47	0.42	0.11	–	–	–	–		43
					3' - <5'	0.27	0.31	0.32	0.11	–	–	–	–		39
					5' - 10'	0.29	0.26	0.28	0.11	–	–	–	–		39
					15'	0.42	0.39	0.40	0.11	–	–	–	–		38
					20'	0.55	0.52	0.53	0.11	–	–	–	–		38
					25'	0.68	0.66	0.67	0.11	–	–	–	–		38
					30'	0.82	0.81	0.82	0.11	–	–	–	–		38
6' x 4'	9	9	9	4 to 12	0.33' - <2'	0.33	0.50	0.46	0.22	0.22	0.22	0.23	0.33		–
					2' - <3'	0.33	0.50	0.46	0.11	–	–	–	–		43
					3' - <5'	0.27	0.33	0.35	0.11	–	–	–	–		39
					5' - 10'	0.28	0.29	0.31	0.11	–	–	–	–		39
					15'	0.40	0.43	0.45	0.11	–	–	–	–		38
					20'	0.52	0.57	0.59	0.11	–	–	–	–		38
					25'	0.65	0.73	0.74	0.11	–	–	–	–		38
					30'	0.78	0.88	0.90	0.11	–	–	–	–		38
6' x 5'	9	9	9	4 to 12	0.33' - <2'	0.33	0.52	0.49	0.22	0.22	0.22	0.23	0.33		–
					2' - <3'	0.33	0.52	0.49	0.11	–	–	–	–		43
					3' - <5'	0.27	0.35	0.37	0.11	–	–	–	–		43
					5' - 10'	0.29	0.31	0.34	0.11	–	–	–	–		39
					15'	0.41	0.46	0.49	0.11	–	–	–	–		38
					20'	0.53	0.62	0.64	0.11	–	–	–	–		38
					25'	0.66	0.78	0.80	0.11	–	–	–	–		38
					30'	0.78	0.95	0.97	0.11	–	–	–	–		38
6' x 6'	9	9	9	4 to 12	0.33' - <2'	0.34	0.55	0.51	0.22	0.22	0.22	0.24	0.34		–
					2' - <3'	0.34	0.54	0.51	0.11	–	–	–	–		52
					3' - <5'	0.29	0.37	0.39	0.11	–	–	–	–		52
					5' - 10'	0.32	0.34	0.37	0.11	–	–	–	–		43
					15'	0.44	0.50	0.53	0.11	–	–	–	–		39
					20'	0.57	0.66	0.70	0.11	–	–	–	–		39
					25'	0.70	0.84	0.87	0.11	–	–	–	–		38
					30'	0.83	1.02	1.05	0.11	–	–	–	–		38

TABLE 10B - STANDARD PRECAST BOX CULVERT DESIGNS (3" COVER) - 5' & 6' SPANS

SPAN x RISE (S) (R) (Ft.)	SLAB / WALL THICKNESS TOP (Tt) (in.)	BOT. (Tb) (in.)	SIDE (Tw) (in.)	HAUNCH (H) (in.)	DESIGN EARTH COVER ABOVE TOP SLAB	REINFORCEMENT AREAS (sq. in./Ft.) As1	As2	As3	As4	As5	As6	As7	As8	As9	As1 EXT. LENGTH (M) (in.)
5' x 3'	10	10	10	4 to 12	0.33' - <2'	0.24	0.33	0.32	0.24	0.24	0.24	0.24	0.24	See General Note 5	–
					2' - <3'	0.22	0.33	0.32	0.12	–	–	–	–		45
					3' - <5'	0.16	0.24	0.24	0.12	–	–	–	–		36
					5' - 10'	0.16	0.24	0.24	0.12	–	–	–	–		36
					15'	0.23	0.24	0.24	0.12	–	–	–	–		35
					20'	0.29	0.30	0.31	0.12	–	–	–	–		35
					25'	0.36	0.38	0.39	0.12	–	–	–	–		35
					30'	0.43	0.46	0.47	0.12	–	–	–	–		35
5' x 4'	10	10	10	4 to 12	0.33' - <2'	0.24	0.35	0.34	0.24	0.24	0.24	0.24	0.24		–
					2' - <3'	0.22	0.35	0.34	0.12	–	–	–	–		45
					3' - <5'	0.15	0.24	0.24	0.12	–	–	–	–		45
					5' - 10'	0.16	0.24	0.24	0.12	–	–	–	–		36
					15'	0.22	0.25	0.27	0.12	–	–	–	–		35
					20'	0.29	0.33	0.34	0.12	–	–	–	–		35
					25'	0.36	0.41	0.43	0.12	–	–	–	–		35
					30'	0.42	0.50	0.51	0.12	–	–	–	–		35
5' x 5'	10	10	10	4 to 12	0.33' - <2'	0.24	0.37	0.36	0.24	0.24	0.24	0.24	0.24		–
					2' - <3'	0.21	0.37	0.36	0.12	–	–	–	–		45
					3' - <5'	0.16	0.24	0.25	0.12	–	–	–	–		45
					5' - 10'	0.17	0.24	0.24	0.12	–	–	–	–		45
					15'	0.24	0.27	0.29	0.12	–	–	–	–		36
					20'	0.30	0.36	0.38	0.12	–	–	–	–		35
					25'	0.37	0.44	0.47	0.12	–	–	–	–		35
					30'	0.44	0.53	0.56	0.12	–	–	–	–		35
6' x 3'	10	10	10	4 to 12	0.33' - <2'	0.28	0.40	0.36	0.24	0.24	0.24	0.24	0.28		–
					2' - <3'	0.28	0.40	0.36	0.12	–	–	–	–		43
					3' - <5'	0.22	0.26	0.28	0.12	–	–	–	–		39
					5' - 10'	0.24	0.24	0.24	0.12	–	–	–	–		39
					15'	0.34	0.31	0.32	0.12	–	–	–	–		38
					20'	0.44	0.41	0.42	0.12	–	–	–	–		38
					25'	0.54	0.52	0.53	0.12	–	–	–	–		38
					30'	0.64	0.63	0.64	0.12	–	–	–	–		38
6' x 4'	10	10	10	4 to 12	0.33' - <2'	0.27	0.42	0.39	0.24	0.24	0.24	0.24	0.27		–
					2' - <3'	0.27	0.42	0.39	0.12	–	–	–	–		43
					3' - <5'	0.21	0.28	0.30	0.12	–	–	–	–		39
					5' - 10'	0.23	0.24	0.25	0.12	–	–	–	–		39
					15'	0.32	0.34	0.35	0.12	–	–	–	–		38
					20'	0.42	0.45	0.47	0.12	–	–	–	–		38
					25'	0.51	0.56	0.58	0.12	–	–	–	–		38
					30'	0.61	0.68	0.70	0.12	–	–	–	–		38
6' x 5'	10	10	10	4 to 12	0.33' - <2'	0.26	0.44	0.42	0.24	0.24	0.24	0.24	0.26		–
					2' - <3'	0.26	0.44	0.42	0.12	–	–	–	–		43
					3' - <5'	0.22	0.30	0.33	0.12	–	–	–	–		43
					5' - 10'	0.24	0.25	0.27	0.12	–	–	–	–		39
					15'	0.33	0.36	0.39	0.12	–	–	–	–		38
					20'	0.42	0.48	0.51	0.12	–	–	–	–		38
					25'	0.52	0.61	0.63	0.12	–	–	–	–		38
					30'	0.61	0.74	0.76	0.12	–	–	–	–		38
6' x 6'	10	10	10	4 to 12	0.33' - <2'	0.27	0.46	0.44	0.24	0.24	0.24	0.24	0.27		–
					2' - <3'	0.27	0.46	0.44	0.12	–	–	–	–		52
					3' - <5'	0.23	0.31	0.34	0.12	–	–	–	–		52
					5' - 10'	0.25	0.27	0.30	0.12	–	–	–	–		43
					15'	0.35	0.39	0.42	0.12	–	–	–	–		39
					20'	0.45	0.52	0.55	0.12	–	–	–	–		39
					25'	0.54	0.65	0.68	0.12	–	–	–	–		38
					30'	0.64	0.78	0.81	0.12	–	–	–	–		38

TABLE 11A - STANDARD PRECAST BOX CULVERT DESIGNS (3" COVER) - 7' SPANS

SPAN x RISE (S) (R) (Ft.)	SLAB / WALL THICKNESS TOP (Tt) (in.)	BOT. (Tb) (in.)	SIDE (Tw) (in.)	HAUNCH (H) (in.)	DESIGN EARTH COVER ABOVE TOP SLAB	REINFORCEMENT AREAS (sq. in./Ft.) As1	As2	As3	As4	As5	As6	As7	As8	As9	As1 EXT. LENGTH (M) (in.)
7' x 4'	9	9	9	4 to 12	0.33' - <2'	0.42	0.58	0.52	0.22	0.22	0.22	0.31	0.42	See General Note 5	–
					2' - <3'	0.42	0.58	0.51	0.11	–	–	–	–		43
					3' - <5'	0.36	0.41	0.44	0.11	–	–	–	–		43
					5' - 10'	0.39	0.40	0.39	0.11	–	–	–	–		43
					15'	0.56	0.56	0.58	0.11	–	–	–	–		41
					20'	0.74	0.76	0.77	0.11	–	–	–	–		41
					25'	0.92	0.97	0.97	0.11	–	–	–	–		41
	9	9.5	9	7 to 12	30'	1.09	1.18	1.10	0.11	–	–	–	–		41
7' x 5'	9	9	9	4 to 12	0.33' - <2'	0.41	0.61	0.55	0.22	0.23	0.22	0.30	0.41		–
					2' - <3'	0.41	0.61	0.55	0.11	–	–	–	–		47
					3' - <5'	0.37	0.43	0.47	0.11	–	–	–	–		43
					5' - 10'	0.39	0.41	0.43	0.11	–	–	–	–		43
					15'	0.56	0.61	0.63	0.11	–	–	–	–		41
					20'	0.73	0.82	0.83	0.11	–	–	–	–		41
					25'	0.90	1.04	1.06	0.11	–	–	–	–		41
	9	9.5	9	7 to 12	30'	1.06	1.26	1.19	0.11	–	–	–	–		41
7' x 6'	9	9	9	4 to 12	0.33' - <2'	0.42	0.63	0.58	0.22	0.24	0.22	0.30	0.42		–
					2' - <3'	0.42	0.63	0.58	0.11	–	–	–	–		59
					3' - <5'	0.38	0.45	0.50	0.11	–	–	–	–		47
					5' - 10'	0.41	0.44	0.47	0.11	–	–	–	–		43
					15'	0.57	0.65	0.68	0.11	–	–	–	–		41
					20'	0.75	0.87	0.90	0.11	–	–	–	–		41
					25'	0.93	1.11	1.13	0.11	–	–	–	–		41
	9	9.5	9	7 to 12	30'	1.07	1.35	1.27	0.11	–	–	–	–		41
7' x 7'	9	9	9	4 to 12	0.33' - <2'	0.44	0.66	0.61	0.22	0.25	0.22	0.31	0.44		–
					2' - <3'	0.44	0.65	0.61	0.11	–	–	–	–		59
					3' - <5'	0.41	0.47	0.52	0.11	–	–	–	–		59
					5' - 10'	0.44	0.47	0.52	0.11	–	–	–	–		47
					15'	0.62	0.69	0.74	0.11	–	–	–	–		43
					20'	0.80	0.93	0.97	0.11	–	–	–	–		43
					25'	0.99	1.18	1.22	0.11	–	–	–	–		43
	9	9.5	9	7 to 12	30'	1.12	1.43	1.36	0.11	–	–	–	–		41

TABLE 11B - STANDARD PRECAST BOX CULVERT DESIGNS (3" COVER) - 7' SPANS

SPAN x RISE (S) (R) (Ft.)	SLAB / WALL THICKNESS TOP (Tt) (in.)	BOT. (Tb) (in.)	SIDE (Tw) (in.)	HAUNCH (H) (in.)	DESIGN EARTH COVER ABOVE TOP SLAB	REINFORCEMENT AREAS (sq. in./Ft.) As1	As2	As3	As4	As5	As6	As7	As8	As9	As1 EXT. LENGTH (M) (in.)
7' x 4'	10	10	10	4 to 12	0.33' - <2'	0.33	0.49	0.44	0.24	0.24	0.24	0.24	0.33	See General Note 5	–
					2' - <3'	0.33	0.49	0.44	0.12	–	–	–	–		43
					3' - <5'	0.29	0.35	0.38	0.12	–	–	–	–		43
					5' - 10'	0.31	0.30	0.31	0.12	–	–	–	–		43
					15'	0.44	0.44	0.45	0.12	–	–	–	–		41
					20'	0.58	0.59	0.60	0.12	–	–	–	–		41
					25'	0.71	0.74	0.75	0.12	–	–	–	–		41
					30'	0.85	0.91	0.91	0.12	–	–	–	–		41
7' x 5'	10	10	10	4 to 12	0.33' - <2'	0.32	0.51	0.47	0.24	0.24	0.24	0.24	0.32		–
					2' - <3'	0.32	0.51	0.47	0.12	–	–	–	–		47
					3' - <5'	0.29	0.37	0.41	0.12	–	–	–	–		43
					5' - 10'	0.31	0.32	0.35	0.12	–	–	–	–		43
					15'	0.44	0.47	0.50	0.12	–	–	–	–		41
					20'	0.57	0.63	0.65	0.12	–	–	–	–		41
					25'	0.70	0.80	0.82	0.12	–	–	–	–		41
					30'	0.84	0.97	0.99	0.12	–	–	–	–		41
7' x 6'	10	10	10	4 to 12	0.33' - <2'	0.33	0.53	0.50	0.24	0.24	0.24	0.24	0.33		–
					2' - <3'	0.33	0.53	0.50	0.12	–	–	–	–		59
					3' - <5'	0.30	0.38	0.43	0.12	–	–	–	–		47
					5' - 10'	0.33	0.35	0.38	0.12	–	–	–	–		43
					15'	0.45	0.51	0.54	0.12	–	–	–	–		41
					20'	0.58	0.68	0.70	0.12	–	–	–	–		41
					25'	0.72	0.85	0.88	0.12	–	–	–	–		41
					30'	0.85	1.04	1.06	0.12	–	–	–	–		41
7' x 7'	10	10	10	4 to 12	0.33' - <2'	0.35	0.55	0.52	0.24	0.24	0.24	0.24	0.35		–
					2' - <3'	0.35	0.55	0.52	0.12	–	–	–	–		59
					3' - <5'	0.32	0.40	0.46	0.12	–	–	–	–		59
					5' - 10'	0.35	0.37	0.41	0.12	–	–	–	–		47
					15'	0.48	0.54	0.58	0.12	–	–	–	–		43
					20'	0.62	0.72	0.76	0.12	–	–	–	–		43
					25'	0.76	0.90	0.94	0.12	–	–	–	–		43
					30'	0.90	1.10	1.13	0.12	–	–	–	–		41

NOTES:
1. See Sheet 2 for General Notes.
2. See Sheet 7 for Reinforcing Details and dimension locations.
3. See Sheet 14 for WWR Bending Diagrams.

TABLE 12A - STANDARD PRECAST BOX CULVERT DESIGNS (3" COVER) - 8' SPANS

SPAN x RISE (S) (R) (Ft.)	SLAB / WALL THICKNESS TOP (Tt) (in.)	BOT. (Tb) (in.)	SIDE (Tw) (in.)	HAUNCH (H) (in.)	DESIGN EARTH COVER ABOVE TOP SLAB	REINFORCEMENT AREAS (sq. in./Ft.) As1	As2	As3	As4	As5	As6	As7	As8	As9	As1 EXT. LENGTH (M) (in.)
8' x 4'	9	9	9	4 to 12	0.33' - <2'	0.52	0.66	0.57	0.22	0.24	0.22	0.42	0.52	See General Note 5	–
					2' - <3'	0.52	0.66	0.57	0.11	–	–	–	–		50
					3' - <5'	0.48	0.49	0.52	0.11	–	–	–	–		50
					5' - 10'	0.52	0.48	0.49	0.11	–	–	–	–		45
					15'	0.75	0.72	0.72	0.11	–	–	–	–		41
					20'	1.00	0.98	0.97	0.11	–	–	–	–		41
	9	9.5	9	8 to 12	25'	1.25	1.24	1.14	0.11	–	–	–	–		41
	10	10.5	9		30'	1.31	1.29	1.21	0.11	–	–	–	–		41
8' x 5'	9	9	9	4 to 12	0.33' - <2'	0.51	0.69	0.60	0.22	0.25	0.22	0.40	0.51		–
					2' - <3'	0.51	0.69	0.60	0.11	–	–	–	–		50
					3' - <5'	0.46	0.52	0.56	0.11	–	–	–	–		45
					5' - 10'	0.51	0.51	0.53	0.11	–	–	–	–		45
					15'	0.74	0.77	0.78	0.11	–	–	–	–		41
					20'	0.97	1.05	1.05	0.11	–	–	–	–		41
	9	9.5	9	8 to 12	25'	1.20	1.33	1.23	0.11	–	–	–	–		41
	10	10.5	9		30'	1.26	1.38	1.30	0.11	–	–	–	–		41
8' x 6'	9	9	9	4 to 12	0.33' - <2'	0.51	0.72	0.64	0.22	0.26	0.22	0.39	0.51		–
					2' - <3'	0.51	0.72	0.64	0.11	–	–	–	–		50
					3' - <5'	0.47	0.55	0.59	0.11	–	–	–	–		50
					5' - 10'	0.52	0.55	0.58	0.11	–	–	–	–		45
					15'	0.74	0.83	0.85	0.11	–	–	–	–		41
					20'	0.97	1.12	1.13	0.11	–	–	–	–		41
	9	9.5	9	8 to 12	25'	1.18	1.42	1.32	0.11	–	–	–	–		41
	10	10.5	9		30'	1.26	1.46	1.39	0.11	–	–	–	–		41
8' x 7'	9	9	9	4 to 12	0.33' - <2'	0.52	0.74	0.67	0.22	0.26	0.22	0.40	0.52		–
					2' - <3'	0.52	0.74	0.67	0.11	–	–	–	–		55
					3' - <5'	0.49	0.57	0.62	0.11	–	–	–	–		55
					5' - 10'	0.55	0.59	0.63	0.11	–	–	–	–		50
					15'	0.77	0.88	0.91	0.11	–	–	–	–		41
					20'	1.01	1.19	1.21	0.11	–	–	–	–		41
	9	9.5	9	8 to 12	25'	1.21	1.51	1.41	0.11	–	–	–	–		41
	10	10.5	9		30'	1.31	1.53	1.47	0.11	–	–	–	–		41
8' x 8'	9	9	9	4 to 12	0.33' - <2'	0.55	0.77	0.70	0.22	0.27	0.22	0.41	0.55		–
					2' - <3'	0.55	0.77	0.70	0.13	–	–	–	–		65
					3' - <5'	0.53	0.59	0.64	0.12	–	–	–	–		65
					5' - 10'	0.60	0.63	0.68	0.11	–	–	–	–		55
					15'	0.83	0.93	0.98	0.11	–	–	–	–		45
					20'	1.08	1.26	1.29	0.11	–	–	–	–		45
	9	9.5	9	8 to 12	25'	1.28	1.59	1.50	0.11	–	–	–	–		41
	10	10.5	9		30'	1.41	1.61	1.55	0.11	–	–	–	–		41

TABLE 12B - STANDARD PRECAST BOX CULVERT DESIGNS (3" COVER) - 8' SPANS

SPAN x RISE (S) (R) (Ft.)	SLAB / WALL THICKNESS TOP (Tt) (in.)	BOT. (Tb) (in.)	SIDE (Tw) (in.)	HAUNCH (H) (in.)	DESIGN EARTH COVER ABOVE TOP SLAB	REINFORCEMENT AREAS (sq. in./Ft.) As1	As2	As3	As4	As5	As6	As7	As8	As9	As1 EXT. LENGTH (M) (in.)
8' x 4'	10	10	10	4 to 12	0.33' - <2'	0.42	0.56	0.49	0.24	0.24	0.24	0.32	0.41	See General Note 5	–
					2' - <3'	0.42	0.56	0.49	0.12	–	–	–	–		50
					3' - <5'	0.38	0.42	0.46	0.12	–	–	–	–		50
					5' - 10'	0.41	0.38	0.39	0.12	–	–	–	–		45
					15'	0.59	0.56	0.57	0.12	–	–	–	–		41
					20'	0.78	0.75	0.76	0.12	–	–	–	–		41
					25'	0.97	0.96	0.96	0.12	–	–	–	–		41
	10	10.5	10	8 to 12	30'	1.15	1.16	1.10	0.12	–	–	–	–		41
8' x 5'	10	10	10	4 to 12	0.33' - <2'	0.40	0.58	0.52	0.24	.034	0.24	0.31	0.40		–
					2' - <3'	0.40	0.58	0.52	0.12	–	–	–	–		50
					3' - <5'	0.37	0.45	0.48	0.12	–	–	–	–		45
					5' - 10'	0.41	0.41	0.43	0.12	–	–	–	–		45
					15'	0.58	0.60	0.62	0.12	–	–	–	–		41
					20'	0.76	0.81	0.81	0.12	–	–	–	–		41
					25'	0.94	1.03	1.03	0.12	–	–	–	–		41
	10	10.5	10	8 to 12	30'	1.10	1.24	1.24	0.12	–	–	–	–		41
8' x 6'	10	10	10	4 to 12	0.33' - <2'	0.40	0.60	0.55	0.24	0.24	0.24	0.30	0.40		–
					2' - <3'	0.40	0.60	0.55	0.12	–	–	–	–		50
					3' - <5'	0.37	0.47	0.51	0.12	–	–	–	–		50
					5' - 10'	0.42	0.43	0.46	0.12	–	–	–	–		45
					15'	0.58	0.64	0.67	0.12	–	–	–	–		41
					20'	0.76	0.86	0.88	0.12	–	–	–	–		41
					25'	0.94	1.09	1.11	0.12	–	–	–	–		41
	10	10.5	10	8 to 12	30'	1.09	1.32	1.26	0.12	–	–	–	–		41
8' x 7'	10	10	10	4 to 12	0.33' - <2'	0.41	0.63	0.58	0.24	0.24	0.24	0.30	0.41		–
					2' - <3'	0.41	0.63	0.58	0.12	–	–	–	–		55
					3' - <5'	0.39	0.49	0.53	0.12	–	–	–	–		55
					5' - 10'	0.44	0.46	0.50	0.12	–	–	–	–		50
					15'	0.61	0.68	0.72	0.12	–	–	–	–		45
					20'	0.78	0.91	0.94	0.12	–	–	–	–		41
					25'	0.97	1.16	1.18	0.12	–	–	–	–		41
	10	10.5	10	8 to 12	30'	1.11	1.40	1.34	0.12	–	–	–	–		41
8' x 8'	10	10	10	4 to 12	0.33' - <2'	0.44	0.64	0.60	0.24	0.24	0.24	0.31	0.44		–
					2' - <3'	0.44	0.64	0.60	0.12	–	–	–	–		65
					3' - <5'	0.42	0.51	0.56	0.12	–	–	–	–		65
					5' - 10'	0.47	0.50	0.55	0.12	–	–	–	–		55
					15'	0.65	0.72	0.77	0.12	–	–	–	–		45
					20'	0.84	0.96	1.01	0.12	–	–	–	–		45
					25'	1.03	1.22	1.26	0.12	–	–	–	–		41
	10	10.5	10	8 to 12	30'	1.16	1.47	1.42	0.12	–	–	–	–		41

NOTES:
1. See Sheet 2 for General Notes.
2. See Sheet 7 for Reinforcing Details and dimension locations.
3. See Sheet 14 for WWR Bending Diagrams.

TABLE 13A - STANDARD PRECAST BOX CULVERT DESIGNS (3" COVER) - 9' SPANS

SPAN x RISE (S) (R) (Ft.)	SLAB / WALL THICKNESS TOP (Tt) (in.)	BOT. (Tb) (in.)	SIDE (Tw) (in.)	HAUNCH (H) (in.)	DESIGN EARTH COVER ABOVE TOP SLAB	REINFORCEMENT AREAS (sq. in./Ft.) As1	As2	As3	As4	As5	As6	As7	As8	As9	As1 EXT. LENGTH (M) (in.)
9' x 5'				4 to 12	0.33' - <2'	0.62	0.78	0.65	0.22	0.26	0.22	0.52	0.61	See General Note 5	–
					2' - <3'	0.62	0.78	0.65	0.11	–	–	–	–		54
					3' - <5'	0.58	0.63	0.61	0.11	–	–	–	–		49
	9	9	9		5' - 10'	0.65	0.63	0.64	0.11	–	–	–	–		49
					15'	0.95	0.96	0.95	0.11	–	–	–	–		44
	9	9	9	8	20'	1.26	1.32	1.28	0.11	–	–	–	–		44
	10	10.5	9	to	25'	1.39	1.41	1.32	0.11	–	–	–	–		44
	11	11.5	9	12	30'	1.46	1.50	1.42	0.11	–	–	–	–		44
9' x 6'				4 to 12	0.33' - <2'	0.60	0.81	0.69	0.22	0.27	0.27	0.51	0.60		–
					2' - <3'	0.60	0.81	0.69	0.11	–	–	–	–		54
					3' - <5'	0.56	0.66	0.65	0.11	–	–	–	–		49
	9	9	9		5' - 10'	0.65	0.68	0.69	0.11	–	–	–	–		49
					15'	0.94	1.03	1.02	0.11	–	–	–	–		44
	9	9	9	8	20'	1.25	1.40	1.38	0.11	–	–	–	–		44
	10	10.5	9	to	25'	1.37	1.49	1.40	0.11	–	–	–	–		44
	11	11.5	9	12	30'	1.44	1.58	1.50	0.11	–	–	–	–		44
9' x 7'				4 to 12	0.33' - <2'	0.61	0.84	0.72	0.22	0.28	0.22	0.51	0.61		–
					2' - <3'	0.61	0.83	0.72	0.11	–	–	–	–		59
					3' - <5'	0.58	0.69	0.68	0.11	–	–	–	–		54
	9	9	9		5' - 10'	0.67	0.73	0.75	0.11	–	–	–	–		49
					15'	0.96	1.09	1.10	0.11	–	–	–	–		44
	9	9	9	8	20'	1.27	1.49	1.47	0.11	–	–	–	–		44
	10	10.5	9	to	25'	1.38	1.57	1.48	0.11	–	–	–	–		44
	11	11.5	9	12	30'	1.49	1.70	1.58	0.11	–	–	–	–		44
9' x 8'	9	9.5	9		0.33' - <2'	0.60	0.85	0.73	0.22	0.29	0.22	0.52	0.53		–
				4 to 12	2' - <3'	0.64	0.86	0.76	0.12	–	–	–	–		59
					3' - <5'	0.62	0.72	0.72	0.11	–	–	–	–		59
	9	9	9		5' - 10'	0.71	0.77	0.81	0.11	–	–	–	–		54
					15'	1.01	1.16	1.17	0.11	–	–	–	–		44
	9	9.5	9	8	20'	1.27	1.56	1.45	0.11	–	–	–	–		44
	10	10.5	9	to	25'	1.45	1.65	1.57	0.11	–	–	–	–		44
	11	11.5	9	12	30'	1.59	1.72	1.66	0.11	–	–	–	–		44
9' x 9'	9	9.5	9		0.33' - <2'	0.68	0.88	0.76	0.22	0.29	0.22	0.55	0.57		–
				4 to 12	2' - <3'	0.68	0.88	0.78	0.18	–	–	–	–		72
					3' - <5'	0.68	0.75	0.78	0.18	–	–	–	–		72
	9	9	9		5' - 10'	0.79	0.82	0.88	0.17	–	–	–	–		59
					15'	1.11	1.22	1.26	0.13	–	–	–	–		49
	9	9.5	9	8	20'	1.37	1.64	1.54	0.13	–	–	–	–		49
	10	10.5	9	to	25'	1.56	1.73	1.65	0.13	–	–	–	–		44
	11	11.5	9.5	12	30'	1.56	1.73	1.68	0.12	–	–	–	–		44

TABLE 13B - STANDARD PRECAST BOX CULVERT DESIGNS (3" COVER) - 9' SPANS

SPAN x RISE (S) (R) (Ft.)	SLAB / WALL THICKNESS TOP (Tt) (in.)	BOT. (Tb) (in.)	SIDE (Tw) (in.)	HAUNCH (H) (in.)	DESIGN EARTH COVER ABOVE TOP SLAB	REINFORCEMENT AREAS (sq. in./Ft.) As1	As2	As3	As4	As5	As6	As7	As8	As9	As1 EXT. LENGTH (M) (in.)
9' x 5'				4 to 12	0.33' - <2'	0.49	0.65	0.57	0.24	0.24	0.24	0.40	0.48	See General Note 5	–
					2' - <3'	0.49	0.65	0.57	0.12	–	–	–	–		54
					3' - <5'	0.46	0.54	0.53	0.12	–	–	–	–		49
	10	10	10		5' - 10'	0.52	0.50	0.51	0.12	–	–	–	–		49
					15'	0.75	0.74	0.75	0.12	–	–	–	–		44
	10	10.5	10	8 to	20'	0.98	1.01	1.00	0.12	–	–	–	–		44
	11	11.5	10	12	25'	1.21	1.27	1.19	0.12	–	–	–	–		44
					30'	1.30	1.36	1.30	0.12	–	–	–	–		44
9' x 6'				4 to 12	0.33' - <2'	0.48	0.68	0.60	0.24	0.24	0.24	0.39	0.48		–
					2' - <3'	0.48	0.68	0.60	0.12	–	–	–	–		54
					3' - <5'	0.45	0.57	0.56	0.12	–	–	–	–		49
	10	10	10		5' - 10'	0.52	0.53	0.56	0.12	–	–	–	–		49
					15'	0.74	0.79	0.81	0.12	–	–	–	–		44
	10	10.5	10	8 to	20'	0.97	1.07	1.07	0.12	–	–	–	–		44
	11	11.5	10	12	25'	1.18	1.35	1.28	0.12	–	–	–	–		44
					30'	1.27	1.44	1.38	0.12	–	–	–	–		44
9' x 7'				4 to 12	0.33' - <2'	0.49	0.70	0.63	0.24	0.24	0.24	0.39	0.49		–
					2' - <3'	0.49	0.70	0.63	0.12	–	–	–	–		59
					3' - <5'	0.46	0.59	0.59	0.12	–	–	–	–		54
	10	10	10		5' - 10'	0.54	0.57	0.60	0.12	–	–	–	–		49
					15'	0.75	0.84	0.86	0.12	–	–	–	–		44
	10	10.5	10	8 to	20'	0.98	1.13	1.14	0.12	–	–	–	–		44
	11	11.5	10	12	25'	1.18	1.43	1.36	0.12	–	–	–	–		44
					30'	1.28	1.52	1.46	0.12	–	–	–	–		44
9' x 8'				4 to 12	0.33' - <2'	0.51	0.72	0.65	0.24	0.24	0.24	0.39	0.51		–
					2' - <3'	0.51	0.72	0.65	0.12	–	–	–	–		59
					3' - <5'	0.49	0.61	0.62	0.12	–	–	–	–		59
	10	10	10		5' - 10'	0.57	0.60	0.65	0.12	–	–	–	–		54
					15'	0.79	0.89	0.92	0.12	–	–	–	–		44
	10	10.5	10	8 to	20'	1.02	1.20	1.22	0.12	–	–	–	–		44
	11	11.5	10	12	25'	1.21	1.50	1.44	0.12	–	–	–	–		44
					30'	1.33	1.59	1.54	0.12	–	–	–	–		44
9' x 9'				4 to 12	0.33' - <2'	0.54	0.74	0.68	0.24	0.24	0.24	0.41	0.54		–
					2' - <3'	0.54	0.74	0.68	0.15	–	–	–	–		72
					3' - <5'	0.53	0.63	0.64	0.13	–	–	–	–		72
	10	10	10		5' - 10'	0.62	0.64	0.70	0.12	–	–	–	–		59
					15'	0.85	0.94	0.99	0.12	–	–	–	–		49
	10	10.5	10	8 to	20'	1.09	1.26	1.29	0.12	–	–	–	–		49
	11	11.5	10	12	25'	1.28	1.56	1.52	0.12	–	–	–	–		44
					30'	1.42	1.66	1.66	0.12	–	–	–	–		44

NOTES:
1. See Sheet 2 for General Notes.
2. See Sheet 7 for Reinforcing Details and dimension locations.
3. See Sheet 14 for WWR Bending Diagrams.

TABLE 14 - STANDARD PRECAST BOX CULVERT DESIGNS (3" COVER) - 10' SPANS

SPAN x RISE (S) (R) (Ft.)	SLAB / WALL THICKNESS TOP (Tt) (in.)	BOT. (Tb) (in.)	SIDE (Tw) (in.)	HAUNCH (H) (in.)	DESIGN EARTH COVER ABOVE TOP SLAB	REINFORCEMENT AREAS (sq. in./Ft.) As1	As2	As3	As4	As5	As6	As7	As8	As9	As1 EXT. LENGTH (M) (in.)
10' x 5'	10	10	10	4 to 12	0.33' - <2'	0.60	0.73	0.61	0.24	0.24	0.24	0.50	0.57	See General Note 5	–
					2' - <3'	0.60	0.73	0.61	0.12	–	–	–	–		58
					3' - <5'	0.57	0.64	0.58	0.12	–	–	–	–		53
					5' - 10'	0.65	0.60	0.60	0.12	–	–	–	–		52
					15'	0.94	0.90	0.89	0.12	–	–	–	–		47
	10	10	10	8 to 12	20'	1.24	1.23	1.19	0.12	–	–	–	–		47
	11	11.5	10		25'	1.39	1.37	1.28	0.12	–	–	–	–		47
	12.5	12.5	10		30'	1.38	1.43	1.41	0.12	–	–	–	–		47
10' x 6'	10	10	10	4 to 12	0.33' - <2'	0.58	0.75	0.64	0.24	0.24	0.24	0.48	0.56		–
					2' - <3'	0.58	0.75	0.64	0.12	–	–	–	–		58
					3' - <5'	0.56	0.67	0.62	0.12	–	–	–	–		52
					5' - 10'	0.64	0.64	0.65	0.12	–	–	–	–		52
					15'	0.92	0.96	0.95	0.12	–	–	–	–		47
	10	10	10	8 to 12	20'	1.21	1.31	1.27	0.12	–	–	–	–		47
	11	11.5	10		25'	1.35	1.44	1.36	0.12	–	–	–	–		47
	12.5	12.5	10		30'	1.35	1.51	1.49	0.12	–	–	–	–		47
10' x 7'	10	10	10	4 to 12	0.33' - <2'	0.57	0.78	0.67	0.24	0.24	0.25	0.48	0.57		–
					2' - <3'	0.57	0.78	0.67	0.12	–	–	–	–		58
					3' - <5'	0.58	0.70	0.65	0.12	–	–	–	–		58
					5' - 10'	0.65	0.68	0.70	0.12	–	–	–	–		52
					15'	0.92	1.02	1.02	0.12	–	–	–	–		47
	10	10	10	8 to 12	20'	1.21	1.38	1.35	0.12	–	–	–	–		47
	11	11.5	10		25'	1.33	1.52	1.44	0.12	–	–	–	–		47
	12.5	12.5	10		30'	1.38	1.58	1.57	0.12	–	–	–	–		47
10' x 8'	10	10	10	4 to 12	0.33' - <2'	0.58	0.80	0.70	0.24	0.26	0.24	0.48	0.58		–
					2' - <3'	0.58	0.80	0.70	0.12	–	–	–	–		64
					3' - <5'	0.60	0.72	0.68	0.12	–	–	–	–		58
					5' - 10'	0.67	0.72	0.75	0.12	–	–	–	–		52
					15'	0.95	1.08	1.08	0.12	–	–	–	–		47
	10	10	10	8 to 12	20'	1.24	1.45	1.44	0.12	–	–	–	–		47
	11	11.5	10		25'	1.36	1.59	1.52	0.12	–	–	–	–		47
	12.5	12.5	10		30'	1.45	1.64	1.64	0.12	–	–	–	–		47
10' x 9'	10	10	10	4 to 12	0.33' - <2'	0.61	0.82	0.73	0.24	0.26	0.24	0.50	0.61		–
					2' - <3'	0.61	0.82	0.73	0.14	–	–	–	–		70
					3' - <5'	0.64	0.75	0.73	0.13	–	–	–	–		64
					5' - 10'	0.72	0.77	0.80	0.12	–	–	–	–		58
					15'	1.00	1.13	1.15	0.12	–	–	–	–		52
	10	10	10	8 to 12	20'	1.30	1.53	1.52	0.12	–	–	–	–		47
	11	11.5	10		25'	1.42	1.66	1.60	0.12	–	–	–	–		47
	12.5	12.5	10		30'	1.57	1.70	1.72	0.12	–	–	–	–		47
10' x 10'	10	10	10	4 to 12	0.33' - <2'	0.66	0.84	0.75	0.24	0.27	0.24	0.52	0.65		–
					2' - <3'	0.66	0.84	0.75	0.20	–	–	–	–		79
					3' - <5'	0.70	0.77	0.79	0.19	–	–	–	–		70
					5' - 10'	0.79	0.81	0.87	0.18	–	–	–	–		64
					15'	1.09	1.19	1.23	0.15	–	–	–	–		52
	10	10	10	8 to 12	20'	1.40	1.61	1.61	0.14	–	–	–	–		52
	11	11.5	10		25'	1.53	1.74	1.68	0.14	–	–	–	–		47
	12.5	12.5	10.5		30'	1.60	1.71	1.74	0.14	–	–	–	–		47

TABLE 15 - STANDARD PRECAST BOX CULVERT DESIGNS (3" COVER) - 11' SPANS

SPAN x RISE (S) (R) (Ft.)	SLAB / WALL THICKNESS TOP (Tt) (in.)	BOT. (Tb) (in.)	SIDE (Tw) (in.)	HAUNCH (H) (in.)	DESIGN EARTH COVER ABOVE TOP SLAB	REINFORCEMENT AREAS (sq. in./Ft.) As1	As2	As3	As4	As5	As6	As7	As8	As9	As1 EXT. LENGTH (M) (in.)
11' x 4'	11	11	11	4 to 12	0.33' - <2'	0.60	0.66	0.54	0.27	0.27	0.27	0.52	0.56	See General Note 5	–
					2' - <3'	0.60	0.66	0.54	0.14	–	–	–	–		62
					3' - <5'	0.60	0.61	0.53	0.14	–	–	–	–		62
					5' - 10'	0.79	0.63	0.62	0.14	–	–	–	–		55
					15'	1.01	0.82	0.79	0.14	–	–	–	–		55
	12	12	11	8 to 12	20'	1.34	1.11	1.06	0.14	–	–	–	–		55
	13.5	13.5	11		25'	1.52	1.27	1.23	0.14	–	–	–	–		55
					30'	1.54	1.37	1.34	0.14	–	–	–	–		50
11' x 6'	11	11	11	4 to 12	0.33' - <2'	0.57	0.71	0.60	0.27	0.27	0.27	0.47	0.53		–
					2' - <3'	0.56	0.71	0.60	0.14	–	–	–	–		62
					3' - <5'	0.56	0.67	0.59	0.14	–	–	–	–		55
					5' - 10'	0.73	0.71	0.72	0.14	–	–	–	–		55
					15'	0.92	0.92	0.91	0.14	–	–	–	–		50
	11	11	11	8 to 12	20'	1.21	1.25	1.21	0.14	–	–	–	–		50
	12	12	11		25'	1.37	1.43	1.39	0.14	–	–	–	–		50
	13.5	13.5	11		30'	1.39	1.53	1.50	0.14	–	–	–	–		50
11' x 8'	11	11	11	4 to 12	0.33' - <2'	0.55	0.76	0.66	0.27	0.27	0.27	0.46	0.55		–
					2' - <3'	0.55	0.76	0.66	0.14	–	–	–	–		62
					3' - <5'	0.54	0.72	0.65	0.14	–	–	–	–		62
					5' - 10'	0.73	0.79	0.82	0.14	–	–	–	–		55
					15'	0.93	1.03	1.03	0.14	–	–	–	–		50
	11	11	11	8 to 12	20'	1.21	1.39	1.36	0.14	–	–	–	–		50
	12	12.5	11		25'	1.34	1.56	1.50	0.14	–	–	–	–		50
	13.5	13.5	11		30'	1.41	1.66	1.65	0.14	–	–	–	–		50
11' x 10'	11	11	11	4 to 12	0.33' - <2'	0.60	0.81	0.71	0.27	0.27	0.27	0.48	0.60		–
					2' - <3'	0.60	0.81	0.71	0.15	–	–	–	–		75
					3' - <5'	0.61	0.77	0.70	0.14	–	–	–	–		69
					5' - 10'	0.80	0.88	0.93	0.14	–	–	–	–		62
					15'	1.01	1.13	1.15	0.14	–	–	–	–		55
	11	11	11	8 to 12	20'	1.30	1.52	1.52	0.14	–	–	–	–		50
	12	12.5	11		25'	1.42	1.70	1.65	0.14	–	–	–	–		50
	13.5	14	11		30'	1.53	1.77	1.74	0.14	–	–	–	–		50
11' x 11'	11	11	11	4 to 12	0.33' - <2'	0.64	0.83	0.74	0.27	0.27	0.27	0.51	0.64		–
					2' - <3'	0.64	0.83	0.74	0.21	–	–	–	–		86
					3' - <5'	0.67	0.79	0.75	0.21	–	–	–	–		75
					5' - 10'	0.88	0.93	0.99	0.19	–	–	–	–		69
					15'	1.09	1.19	1.23	0.16	–	–	–	–		55
	11	11	11	8 to 12	20'	1.40	1.59	1.60	0.15	–	–	–	–		55
	12	12.5	11		25'	1.54	1.77	1.73	0.15	–	–	–	–		50
	13.5	14	11.5		30'	1.57	1.77	1.76	0.14	–	–	–	–		50

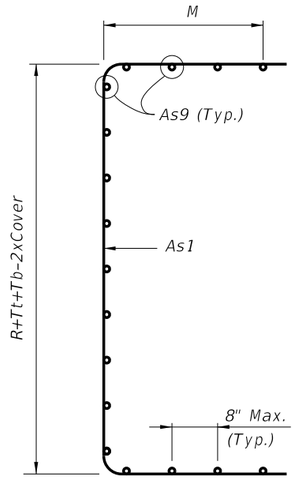
NOTES:
1. See Sheet 2 for General Notes.
2. See Sheet 7 for Reinforcing Details and dimension locations.
3. See Sheet 14 for WWR Bending Diagrams.

TABLE 16 - STANDARD PRECAST BOX CULVERT DESIGNS (3" COVER) - 12' SPANS

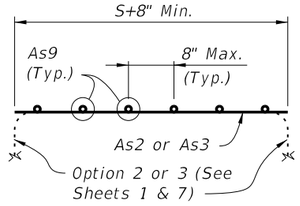
SPAN x RISE (S) (R) (Ft.)	SLAB / WALL THICKNESS TOP (Tt) (in.)	BOT. (Tb) (in.)	SIDE (Tw) (in.)	HAUNCH (H) (in.)	DESIGN EARTH COVER ABOVE TOP SLAB	REINFORCEMENT AREAS (sq. in./Ft.) As1	As2	As3	As4	As5	As6	As7	As8	As9	As1 EXT. LENGTH (M) (in.)
12' x 4'	12	12	12	4 to 12	0.33' - <2'	0.59	0.64	0.51	0.29	0.29	0.29	0.52	0.55	See General Note 5	–
					2' - <3'	0.60	0.64	0.51	0.15	–	–	–	–		73
					3' - <5'	0.60	0.61	0.51	0.15	–	–	–	–		66
					5' - 10'	0.81	0.61	0.61	0.15	–	–	–	–		66
					15'	1.04	0.80	0.77	0.15	–	–	–	–		59
					20'	1.37	1.08	1.03	0.15	–	–	–	–		59
	13	13	12	8 to 12	25'	1.58	1.26	1.21	0.15	–	–	–	–		59
	14.5	14.5	12		30'	1.63	1.38	1.34	0.15	–	–	–	–		53
12' x 6'	12	12	12	4 to 12	0.33' - <2'	0.56	0.70	0.57	0..29	0.29	0.29	0.47	0.52		–
					2' - <3'	0.56	0.70	0.57	0.15	–	–	–	–		66
					3' - <5'	0.56	0.67	0.57	0.15	–	–	–	–		59
					5' - 10'	0.74	0.69	0.70	0.15	–	–	–	–		59
					15'	0.94	0.90	0.88	0.15	–	–	–	–		53
					20'	1.23	1.22	1.17	0.15	–	–	–	–		53
	13	13	12	8 to 12	25'	1.40	1.42	1.37	0.15	–	–	–	–		53
	14.5	15	12		30'	1.44	1.54	1.48	0.15	–	–	–	–		53
12' x 8'	12	12	12	4 to 12	0.33' - <2'	0.55	0.75	0.63	0.29	0.29	0.29	0.45	0.53		–
					2' - <3'	0.55	0.75	0.63	0.15	–	–	–	–		66
					3' - <5'	0.55	0.73	0.63	0.15	–	–	–	–		59
					5' - 10'	0.73	0.77	0.79	0.15	–	–	–	–		59
					15'	0.93	1.00	0.99	0.15	–	–	–	–		53
	12	12	12	8 to 12	20'	1.21	1.35	1.31	0.15	–	–	–	–		53
	13	13.5	12		25'	1.35	1.55	1.48	0.15	–	–	–	–		53
	14.5	15	12		30'	1.40	1.67	1.62	0.15	–	–	–	–		53
12' x 10'	12	12	12	4 to 12	0.33' - <2'	0.57	0.80	0.68	0.29	0.29	0.29	0.46	0.57		–
					2' - <3'	0.57	0.80	0.68	0.15	–	–	–	–		73
					3' - <5'	0.59	0.77	0.68	0.15	–	–	–	–		66
					5' - 10'	0.78	0.85	0.89	0.15	–	–	–	–		59
					15'	0.98	1.10	1.11	0.15	–	–	–	–		53
	12	12	12	8 to 12	20'	1.26	1.47	1.45	0.15	–	–	–	–		53
	13	13.5	12		25'	1.39	1.68	1.63	0.15	–	–	–	–		53
	14.5	15	12		30'	1.48	1.79	1.76	0.15	–	–	–	–		53
12' x 12'	12	12	12	4 to 12	0.33' - <2'	0.65	0.84	0.73	0.29	0.29	0.29	0.50	0.65		–
					2' - <3'	0.65	0.84	0.73	0.23	–	–	–	–		93
					3' - <5'	0.68	0.81	0.75	0.22	–	–	–	–		80
					5' - 10'	0.90	0.94	1.01	0.21	–	–	–	–		73
					15'	1.12	1.20	1.24	0.18	–	–	–	–		59
	12	12	12	8 to 12	20'	1.42	1.60	1.61	0.16	–	–	–	–		59
	13	13.5	12		25'	1.57	1.81	1.78	0.16	–	–	–	–		53
	14.5	15	12.5		30'	1.63	1.86	1.85	0.15	–	–	–	–		53

NOTES:
1. See Sheet 2 of 14 for General Notes.
2. See Sheet 7 of 14 for Reinforcing Details and dimension locations.

WELDED WIRE REINFORCEMENT BENDING DIAGRAM



WWR PIECE NO. 1
(2 Reqd. per segment)



WWR PIECE NO. 2
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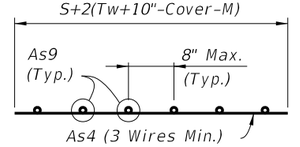
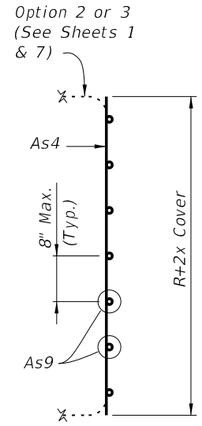
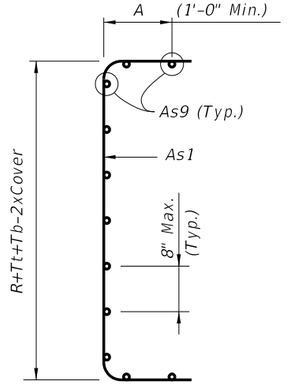


WWR PIECE NO. 4
(Tongue Reinforcement)
(4 Reqd. per segment)

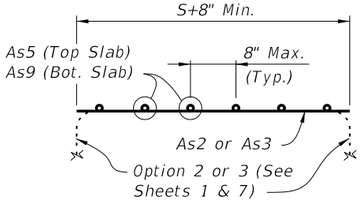


WWR PIECE NO. 3
(2 Reqd. per segment)

TYPE 2 BOX SECTION (DESIGN EARTH COVER 2' OR GREATER)



WWR PIECE NO. 1
(2 Reqd. per segment)



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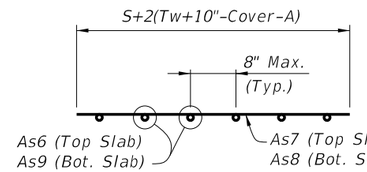
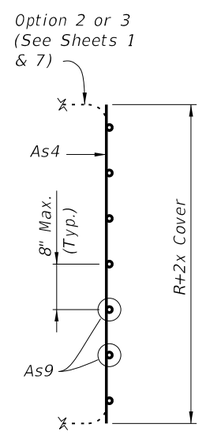


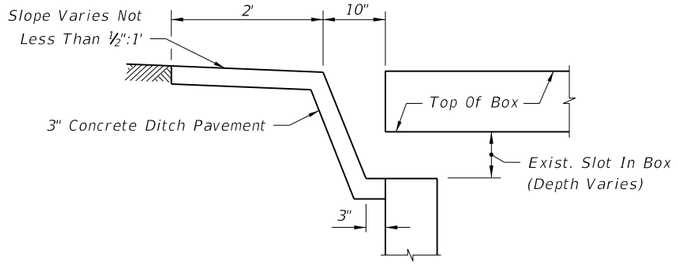
WWR PIECE NO. 4
(2 Reqd. per segment)



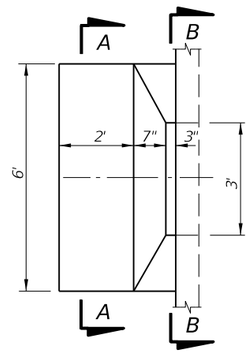
WWR PIECE NO. 3
(2 Reqd. per segment)

TYPE 1 BOX SECTION (DESIGN EARTH COVER LESS THAN 2')

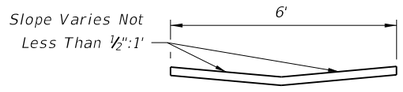
REINFORCEMENT NOTES:
1. Reinforcement bending dimensions are out-to-out.
2. See General Notes 4, 5 and 6 on Sheet 2.
3. See Tables 1 thru 16 for dimensions M, R, S, Tb, Tt and Tw.
4. Dimension "A" is determined by the Manufacturer in accordance with the requirements of Detail "B" on Sheets 1 and 7.



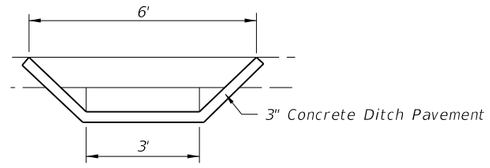
LONGITUDINAL SECTION



PLAN



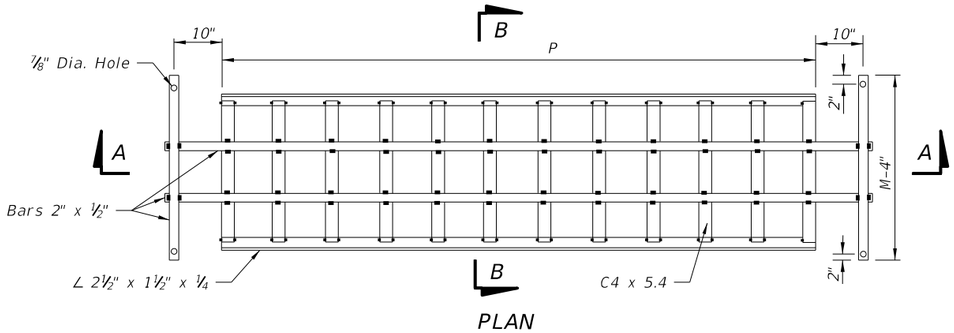
SECTION AA



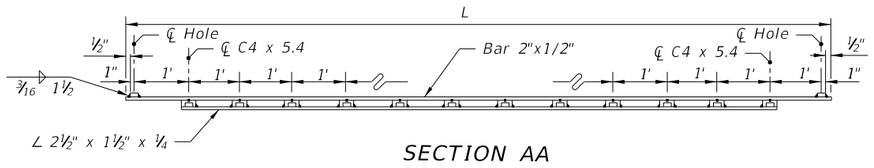
SECTION BB

SAFETY MODIFICATION FOR INLETS IN BOX CULVERTS

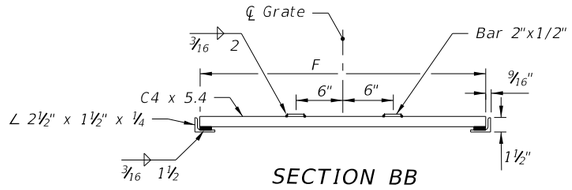
LAST REVISION	REVISION	DESCRIPTION:		FDOT DESIGN STANDARDS 2013	SAFETY MODIFICATIONS FOR INLETS IN BOX CULVERTS	INDEX NO.	SHEET NO.
07/01/07						293	1



PLAN

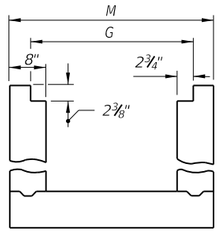


SECTION AA

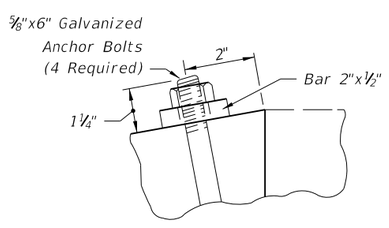


SECTION BB

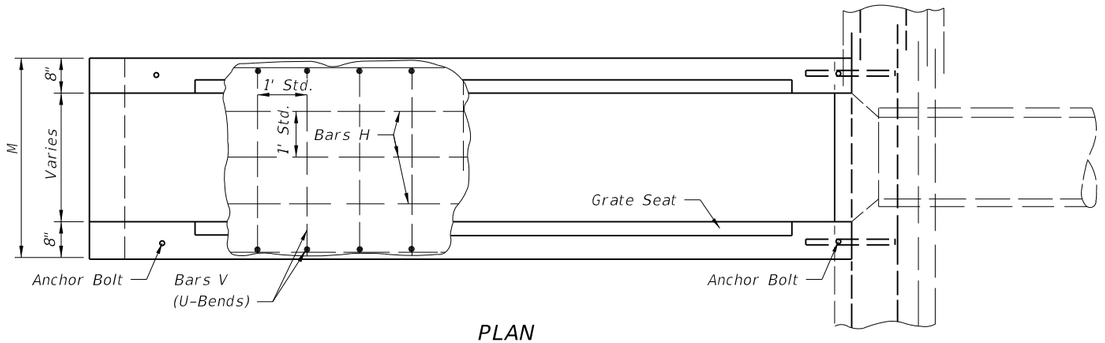
GRATE DETAIL



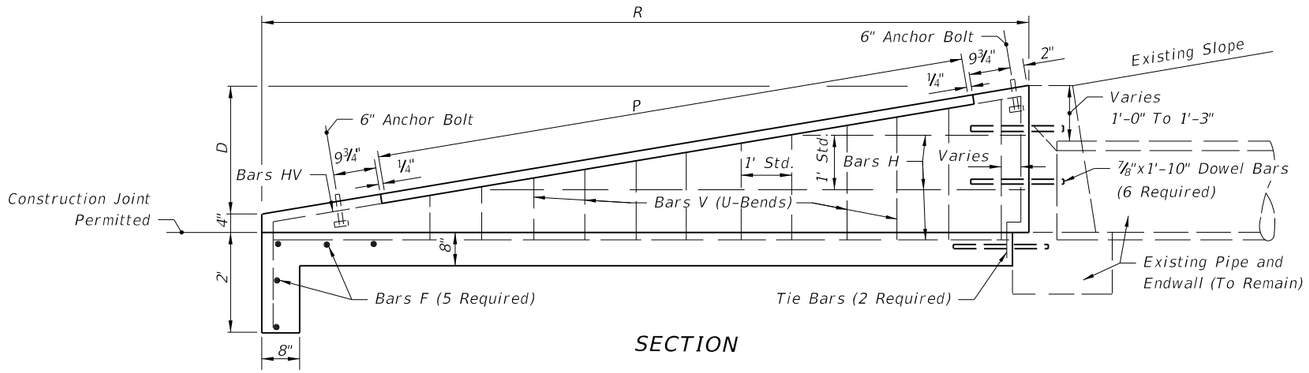
GRATE SEAT DETAIL



ANCHOR BOLT DETAIL



PLAN



SECTION

GENERAL NOTES

1. For use criteria see "Steel Grating Use Criteria" Index No. 261.
2. Grates shall be ASTM A242, A572 or A588, Grade 50 steel, and galvanized in accordance with Section 975 and 425-3.2 of the Standard Specifications.
3. Channel section C3 x 6.0 may be substituted for the C4 x 5.4 channel.
4. All reinforcing No. 4 bars with 2" clearance except as noted. Spacings shown are center to center. Laps to be 12" minimum. Welded wire fabric (two cages max.) having an equivalent cross section area (0.20 sq. in.) may be substituted for bar reinforcement.
5. Drill 1¼" holes 8" deep with a rotary drill in existing endwall for dowel bars. Holes shall be thoroughly cleaned prior to installing Adhesive-Bonded Dowels.
6. Endwall to be paid for under the contract unit price for Class I Concrete (Endwalls), CY and Reinforcing Steel (Roadway), LB. Cost of Adhesive-Bonded Dowels to be included in the contract unit price for reinforcing steel. Cost of grates to be paid for under the contract unit price for Endwall Grate, LB., plan quantity. Cost of galvanized bolts and nuts to be included in the contract unit price for the grate.
7. Sod slopes 5' each side and above endwall. Sodding to be paid for under the contract unit price for Performance Turf, SY.

DIMENSIONS AND QUANTITIES PER GRATE

Slope	Pipe Size	Channels @ 5.4 Lbs./LF			Bars @ 3.4 lbs/LF (2 ea.)			Angles @ 3.2 Lbs./LF		(2)Total Weight-Lbs
		Quantity	F	Lbs.	L	M-4"	Lbs.	P	Lbs.	
1:6	15"	10	2'-6⅞"	139	11'-3"	3'-3"	99	9'-4"	60	298
	18"	12	2'-9⅞"	183	13'-3"	3'-6"	114	11'-4"	73	370
	24"	15	3'-3⅞"	269	16'-3"	4'-0"	138	14'-4"	92	499
	30"	18	3'-9⅞"	372	19'-3"	4'-6"	162	17'-4"	111	645
1:4	15"	6	2'-6⅞"	83	7'-3"	3'-3"	71	5'-4"	34	188
	18"	7	2'-9⅞"	107	8'-3"	3'-6"	80	6'-4"	41	228
	24"	9	3'-3⅞"	161	10'-3"	4'-0"	97	8'-4"	53	311
	30"	11	3'-9⅞"	227	12'-3"	4'-6"	114	10'-4"	66	407

DIMENSIONS AND QUANTITIES PER U-ENDWALL

Pipe Size	G	M	D	R	P	Class I Concrete-CY	Reinforcing Steel-Lbs.	Sod SY
15"	2'-8½"	3'-7"	2'-2"	13'-0"	9'-4"	2.12	167	23
18"	2'-11½"	3'-10"	2'-5"	14'-6"	11'-4"	2.53	173	25
24"	3'-5½"	4'-4"	2'-11"	17'-6"	14'-4"	3.48	238	29
30"	3'-11½"	4'-10"	3'-5"	20'-6"	17'-4"	4.57	315	32
15"	2'-8½"	3'-7"	2'-2"	8'-8"	5'-4"	1.44	120	19
18"	2'-11½"	3'-10"	2'-5"	9'-8"	6'-4"	1.72	130	20
24"	3'-5½"	4'-4"	2'-11"	11'-8"	8'-4"	2.36	167	22
30"	3'-11½"	4'-10"	3'-5"	13'-8"	10'-4"	3.09	225	25

LAST REVISION	REVISION	DESCRIPTION:		FDOT DESIGN STANDARDS 2013	SAFETY MODIFICATIONS FOR ENDWALLS	INDEX NO.	SHEET NO.
07/01/07						295	1