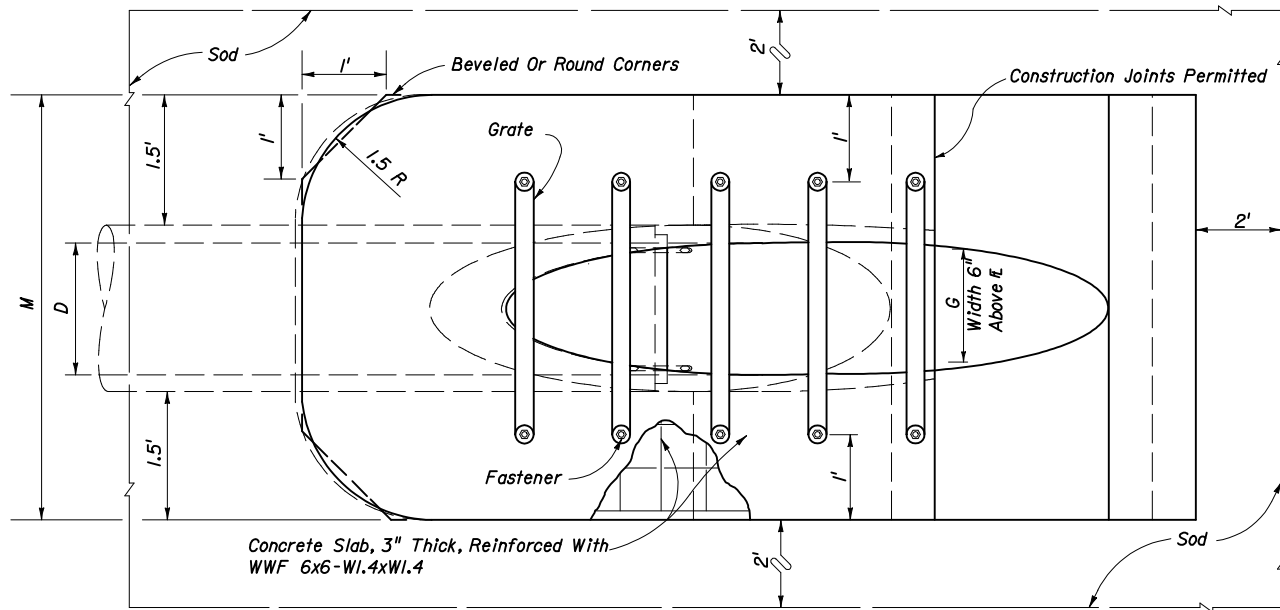


DIMENSIONS & QUANTITIES

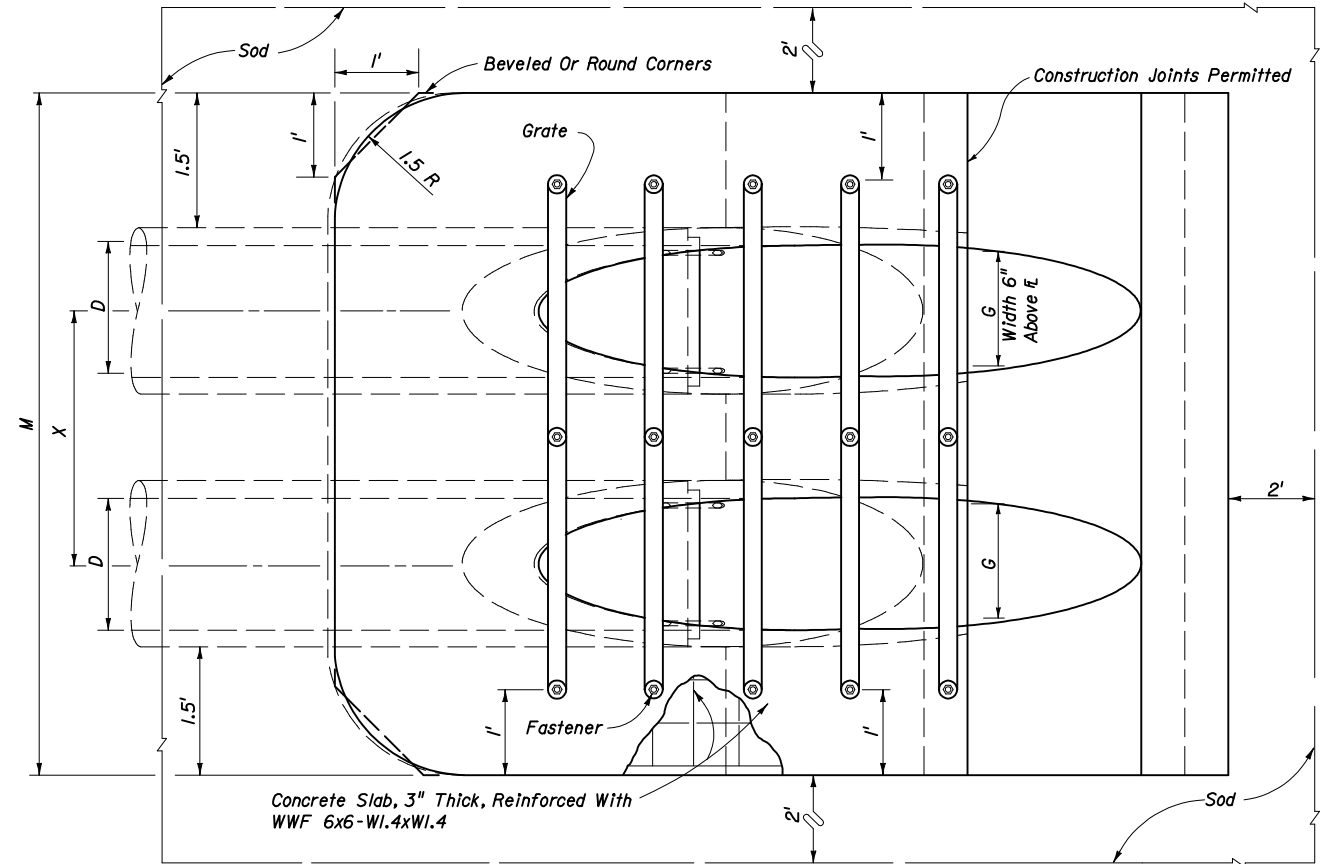
D	X	A	B	C	E	F	G	H	M				N	GRATE SIZES		CONCRETE (Cu. Yds.)				SODDING (Sq. Yds.)			
									Single Pipe	Double Pipe	Triple Pipe	Quad Pipe		Standard Weight Pipe	Extra Strong Pipe	Single Pipe	Double Pipe	Triple Pipe	Quad Pipe	Single Pipe	Double Pipe	Triple Pipe	Quad Pipe
15"	2'-7"	2.27'	4.09'	6.36'	4.03'	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' Δ	9.71'	7.03' Δ	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'			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'			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'			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'			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'			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'			2.28	4.36	6.43	8.50	18	22	25	29

Δ 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.
 Δ ◇ 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.

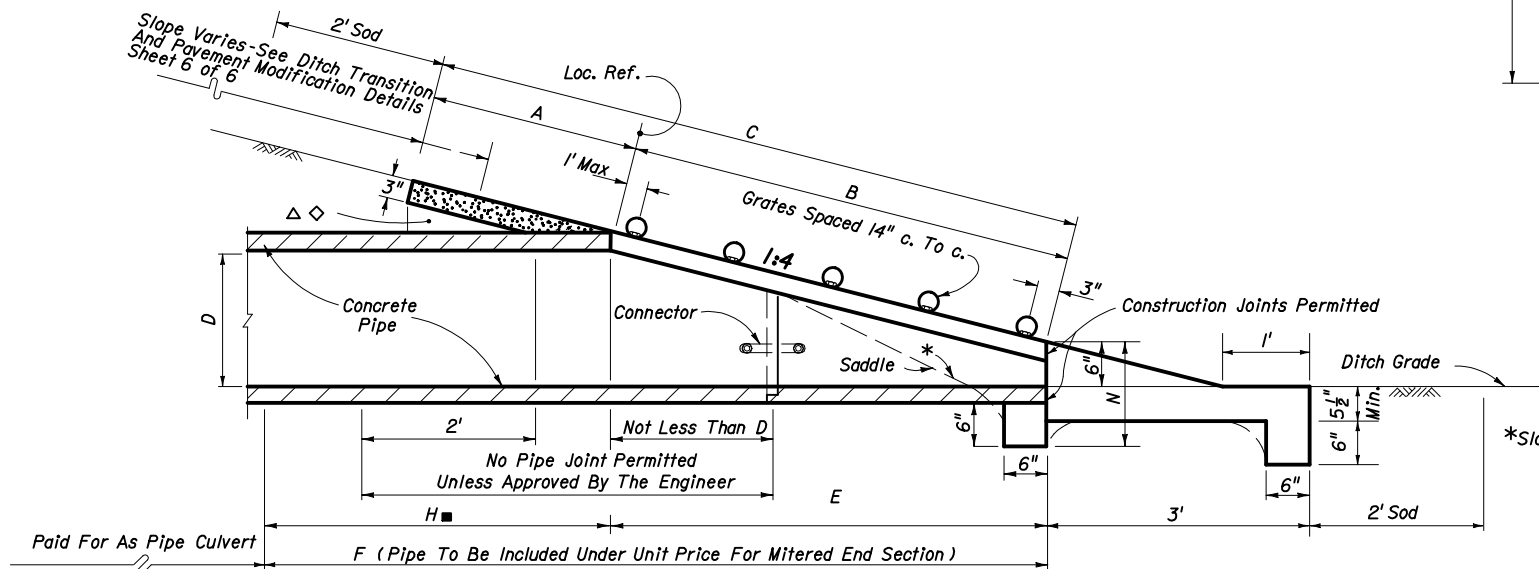


TOP VIEW-SINGLE PIPE



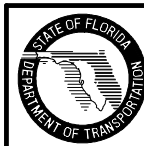
TOP VIEW-MULTIPLE PIPE

Note: See Sheets 5 and 6 for details and general notes.



SECTION

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



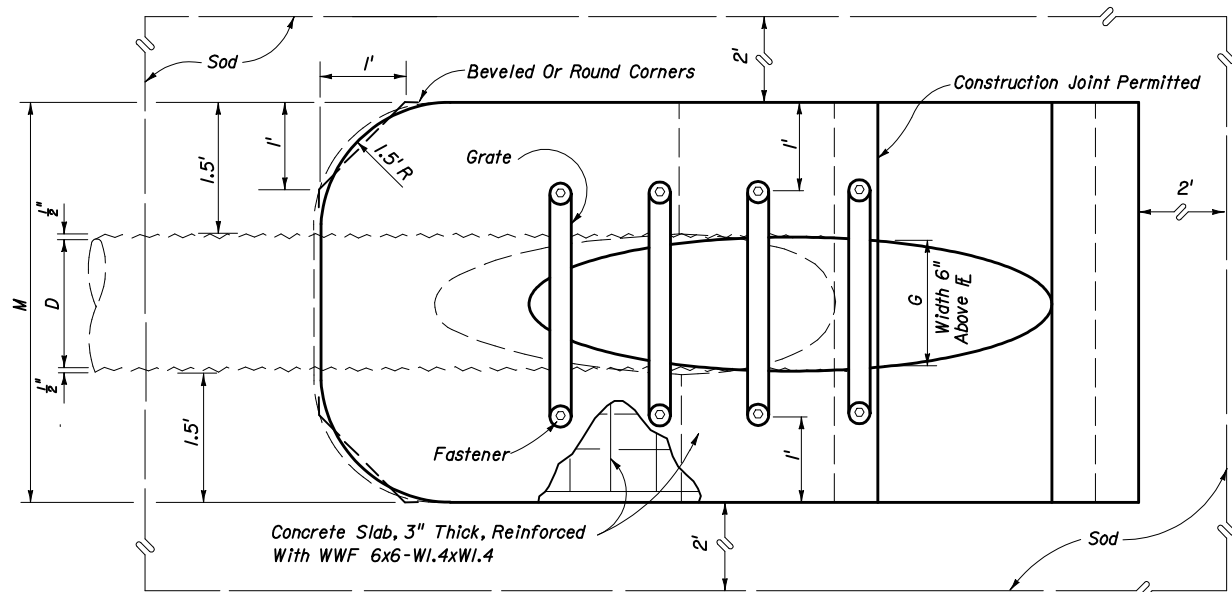
2006 FDOT Design Standards

**SIDE DRAIN MITERED END SECTION
 SINGLE AND MULTIPLE ROUND CONCRETE PIPE**

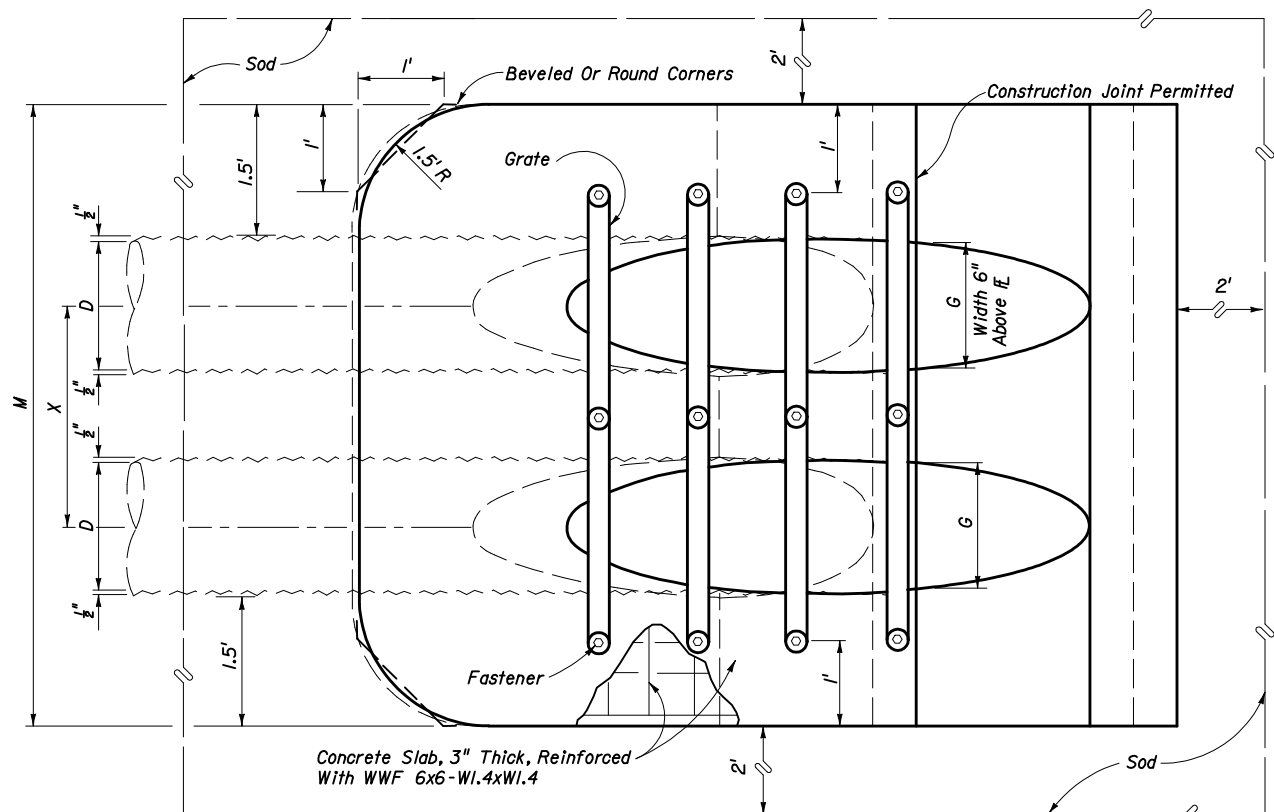
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DIMENSIONS & QUANTITIES

D	X	A	B	C	E	F	G	H	M				N	GRATE SIZES		CONCRETE (Cu. Yds.)				SODDING (Sq. Yds.)				REMARKS
									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	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.
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'	2 1/2"	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'	2 1/2"	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'	2 1/2"	3 1/2"	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'	2 1/2"	3 1/2"	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	

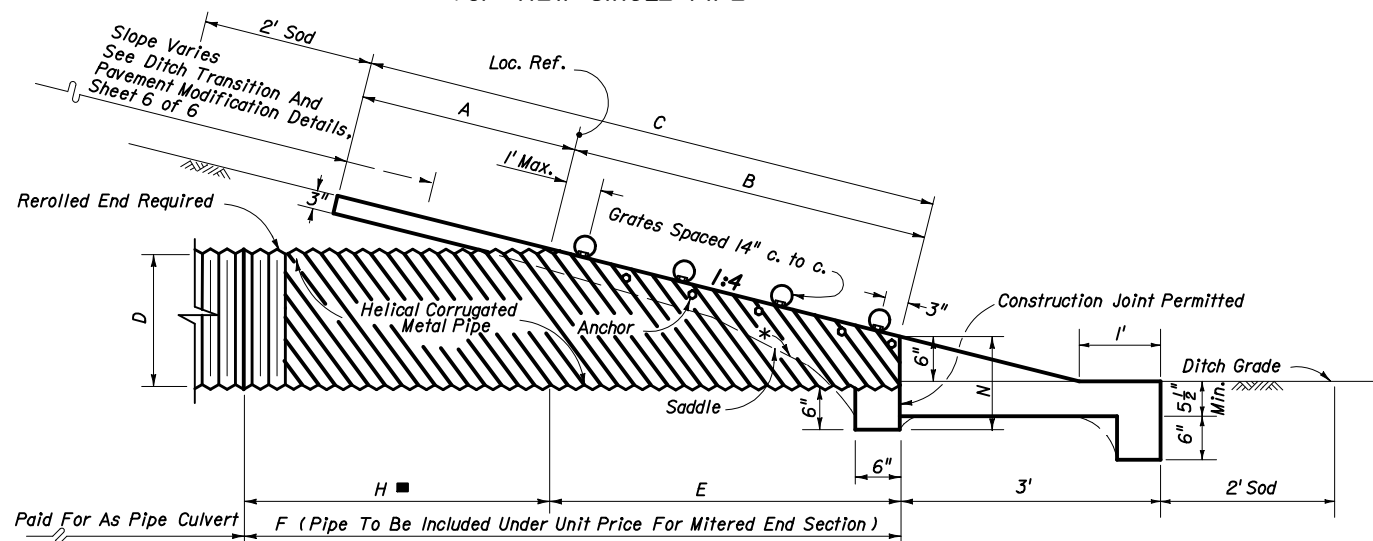


TOP VIEW-SINGLE PIPE



TOP VIEW-MULTIPLE PIPE

NOTE: See Sheets 5 and 6 for details and general notes.



SECTION

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



2006 FDOT Design Standards

SIDE DRAIN MITERED END SECTION - SINGLE AND MULTIPLE ROUND CORRUGATED METAL PIPE

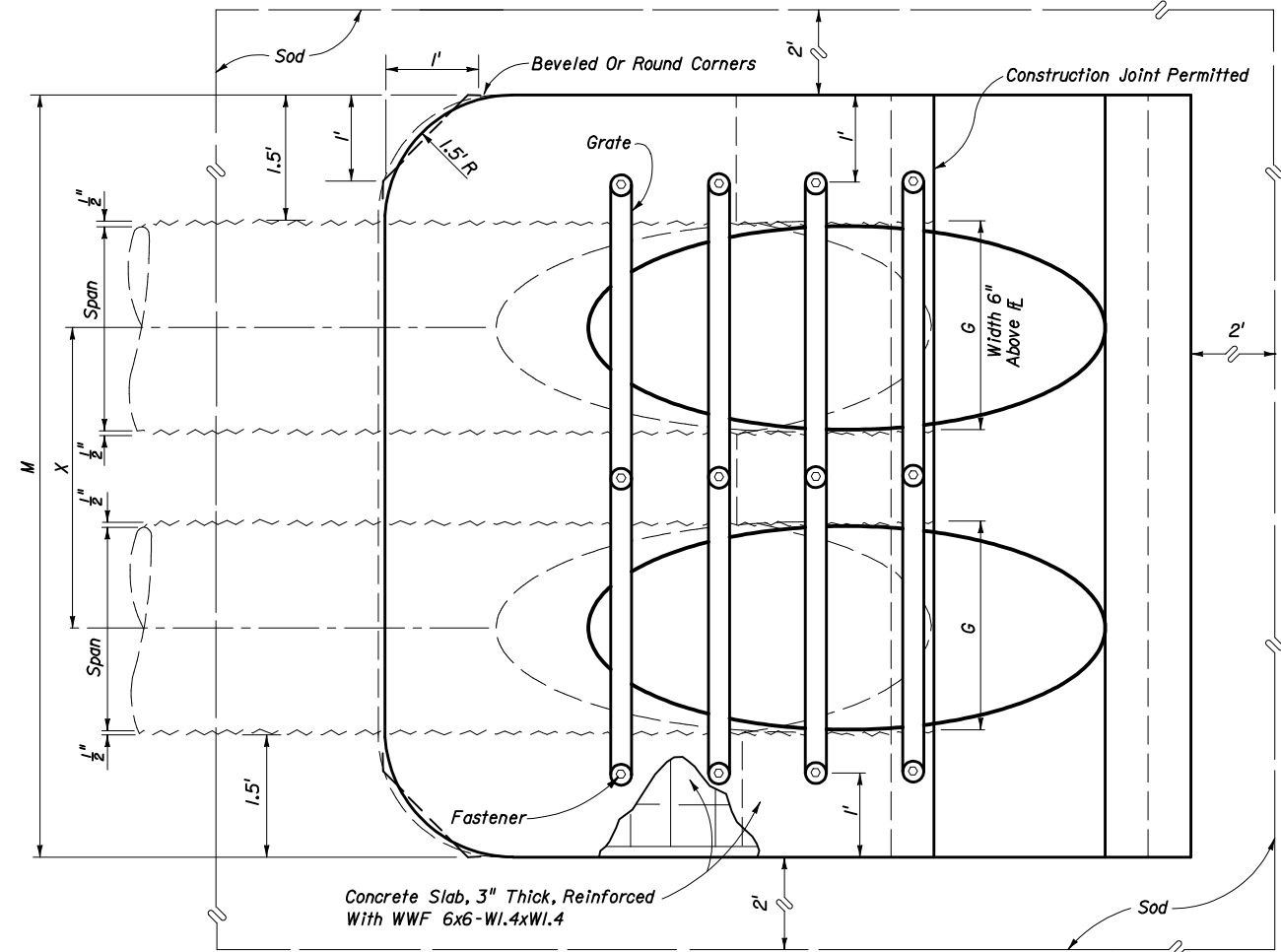
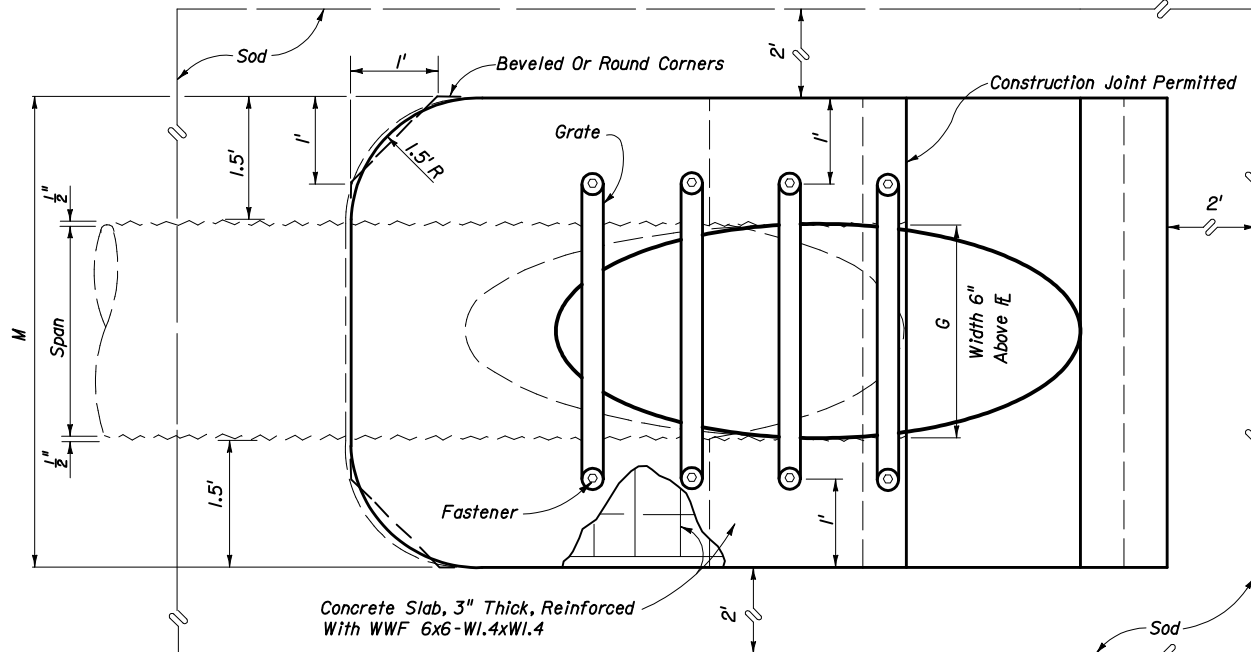
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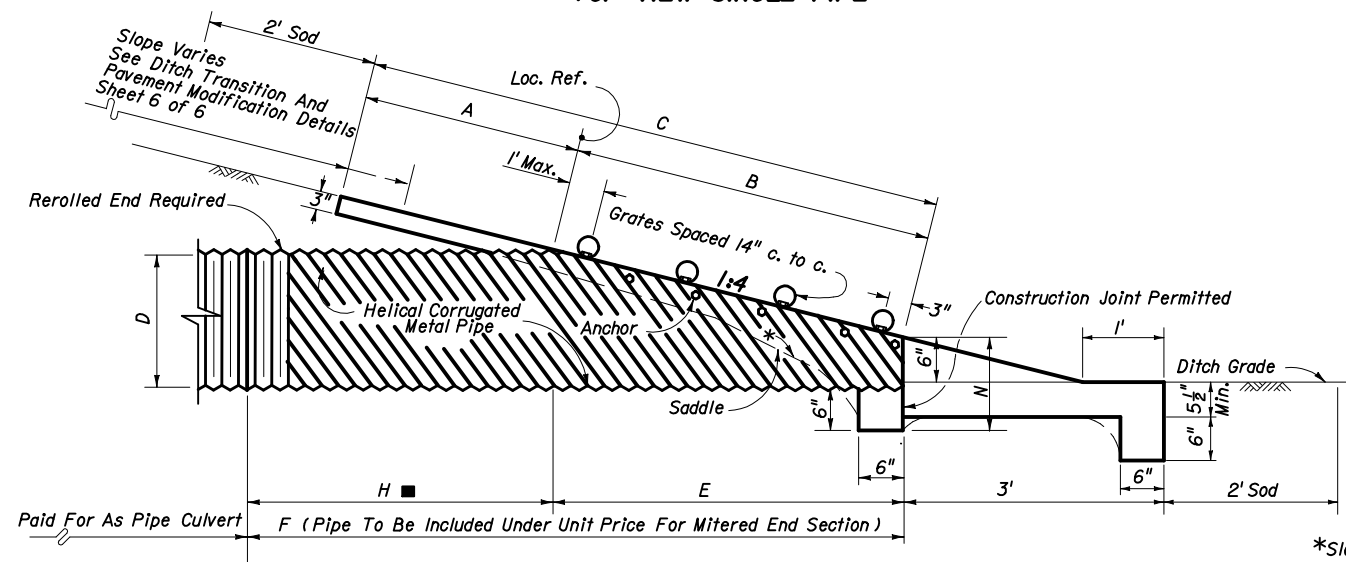
DIMENSIONS & QUANTITIES

1974 AASHTO		X	A	B	C	E	F	G	H	M				N	GRATE SIZES		CONCRETE (Cu. Yds.)				SODDING (Sq. Yds.)			
Span	Rise									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
17"	13"	2'-6"	2.5'	2.4'	4.9'	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'	4.8'	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'	2 1/2"	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'	2 1/2"	3 1/2"	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'	2 1/2"	3 1/2"	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.



NOTE: See Sheets 5 and 6 for details and general notes.



*Slope:
To Span Line For Pipe Arch 28" x 20" And Smaller
1:2 For Pipe Arch 35" x 24" And Larger



2006 FDOT Design Standards

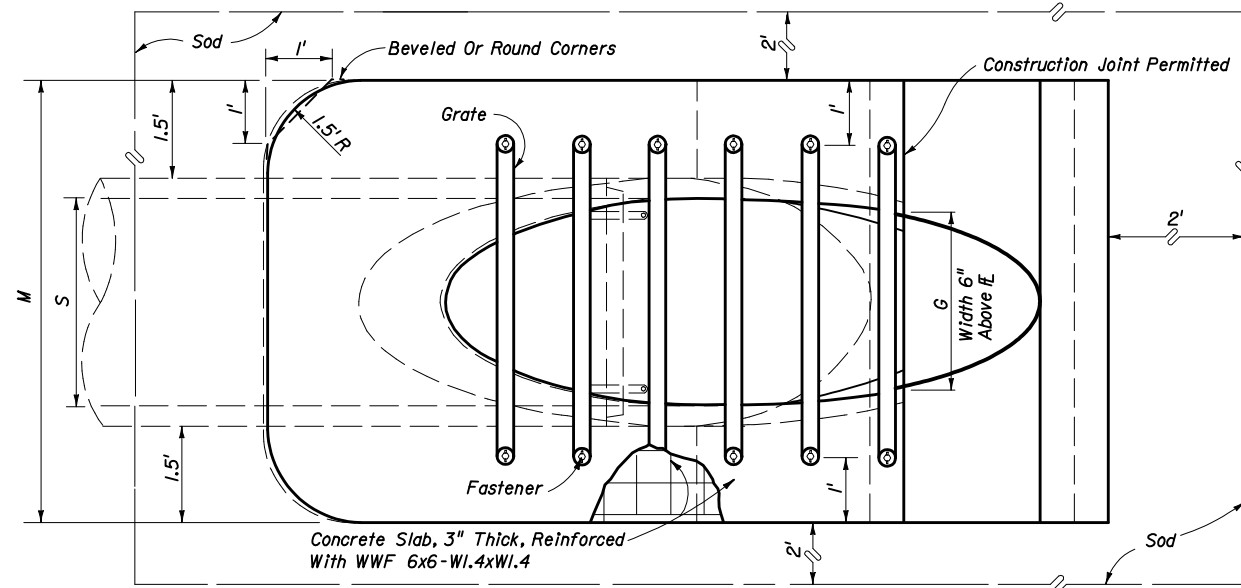
SIDE DRAIN MITERED END SECTION - SINGLE AND MULTIPLE CORRUGATED METAL PIPE-ARCH

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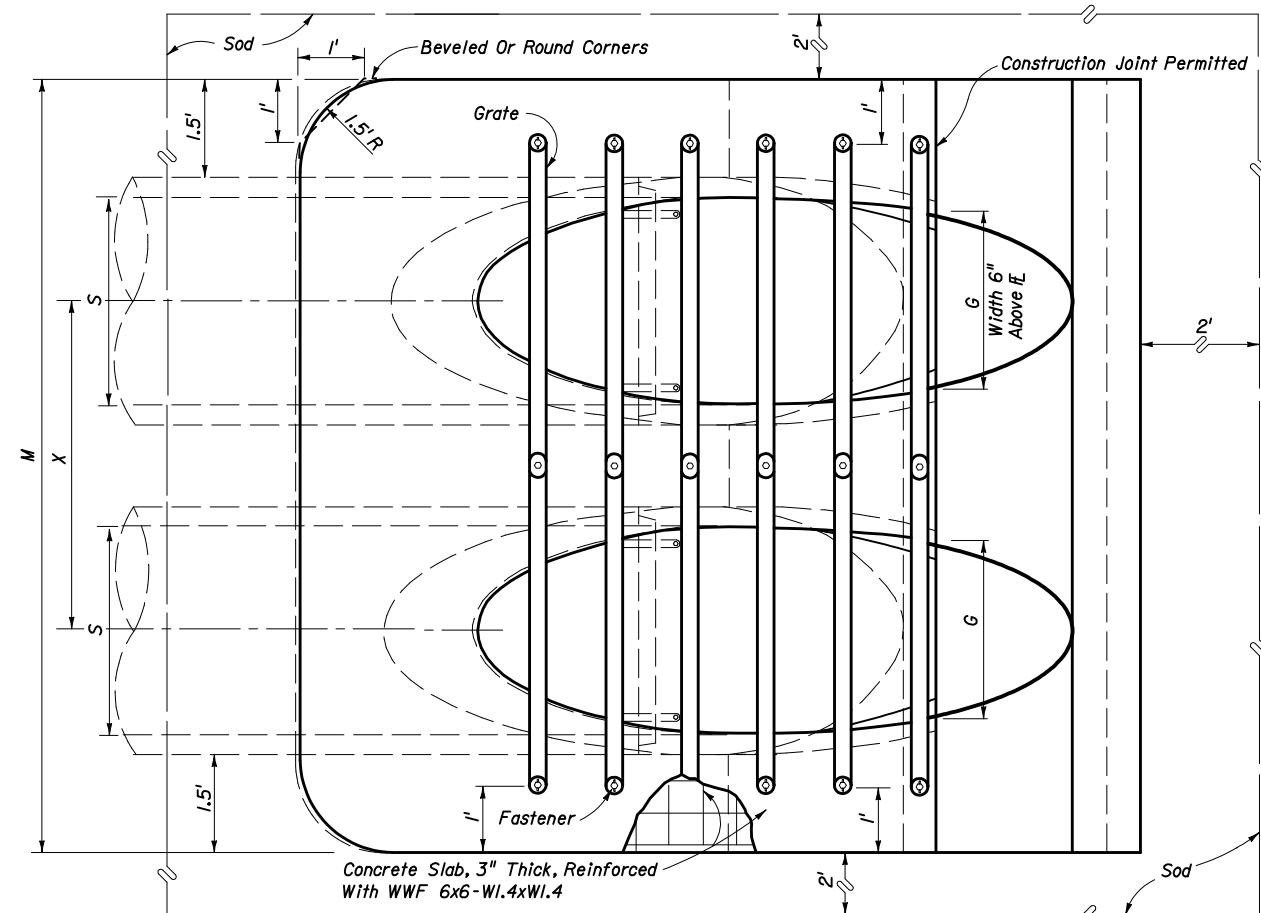
DIMENSIONS & QUANTITIES

Rise R	Span S	X	A	B	C	E	F	G	H	M				N	GRATE SIZES		CONCRETE (Cu. Yds.)				SODDING (Sq. Yds.)			
										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'	2 1/2"	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'	2 1/2"	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'	2 1/2"	3 1/2"	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"	3 1/2"	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.

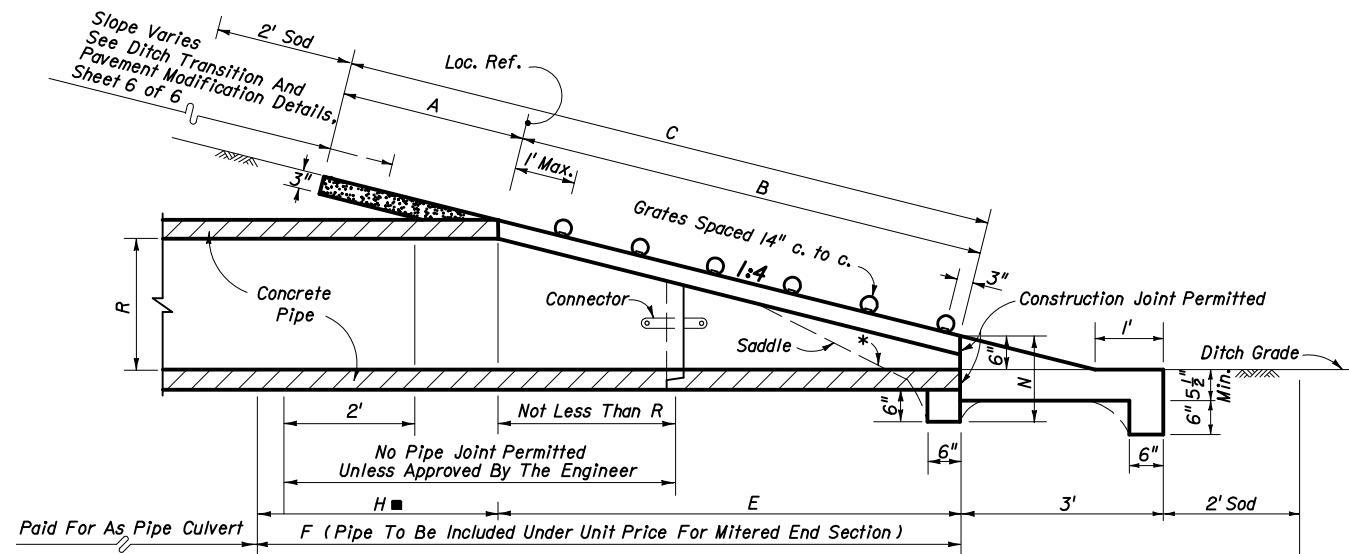


TOP VIEW-SINGLE PIPE



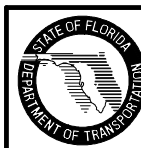
TOP VIEW-MULTIPLE PIPE

NOTE: See Sheets 5 and 6 for details and general notes.



SECTION

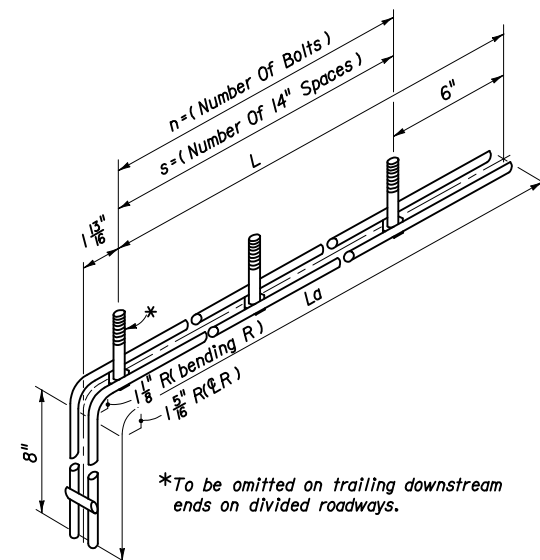
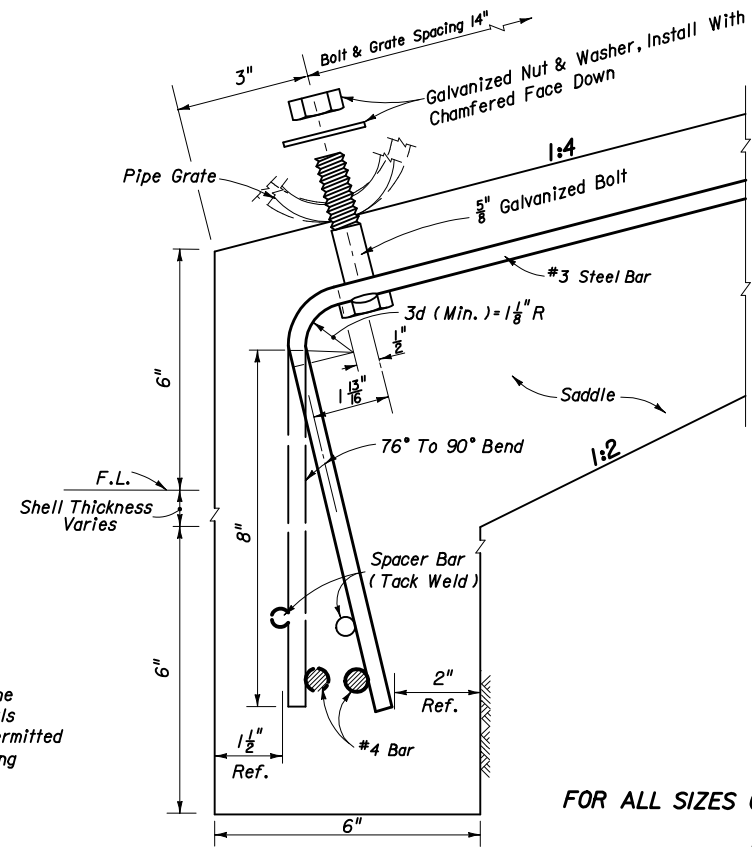
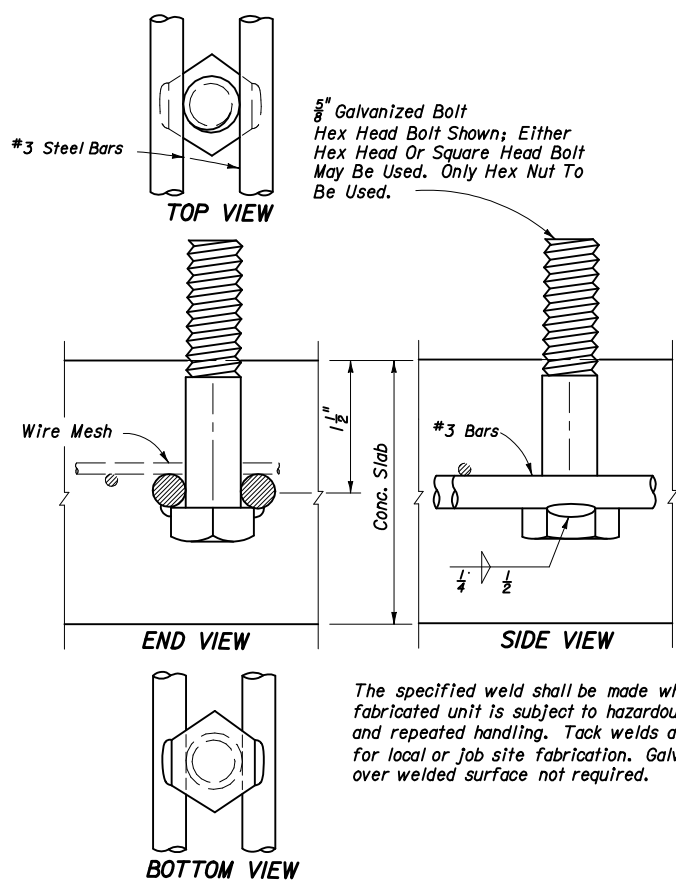
*Slope:
To Major Axis For Pipes 24" x 38" And Smaller.
1:2 For Pipes 29" x 45" And Larger.



2006 FDOT Design Standards

SIDE DRAIN MITERED END SECTION - SINGLE AND MULTIPLE ELLIPTICAL CONCRETE PIPE

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FOR ALL SIZES OF SINGLE AND MULTIPLE DRAIN PIPE
FASTENER UNIT

Drain Size	s	n	L	La
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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'-11"

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"

CORRUGATED METAL PIPE (ARCH) ***				
17" x 13"	1	2	1'-8"	2'-7"
21" x 15"	2	3	2'-10"	3'-9"
28" x 20"	4	5	5'-2"	6'-1"
35" x 24"	5	6	6'-4"	7'-3"
42" x 29"	6	7	7'-6"	8'-5"
49" x 33"	7	8	8'-8"	9'-7"
57" x 38"	9	10	11'-0"	11'-11"
64" x 43"	10	11	12'-2"	13'-1"
71" x 47"	12	13	14'-6"	15'-5"

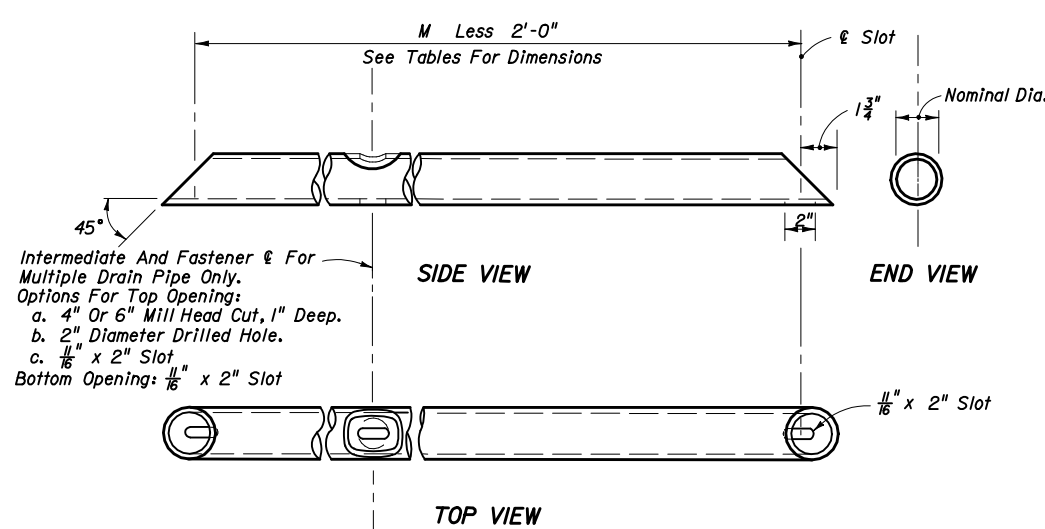
Drain Size	s	n	L	La
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ELLIPTICAL CONCRETE PIPE				
12" x 18"	2	3	2'-10"	3'-9"
14" x 23"	3	4	4'-0"	4'-11"
19" x 30"	4	5	5'-2"	6'-1"
24" x 38"	5	6	6'-4"	7'-3"
29" x 45"	7	8	8'-8"	9'-7"
34" x 53"	8	9	9'-10"	10'-9"
38" x 60"	10	11	12'-2"	13'-1"
43" x 68"	11	12	13'-4"	14'-3"
48" x 76"	13	14	15'-8"	16'-7"
53" x 83"	14	15	16'-10"	17'-9"
58" x 91"	15	16	18'-0"	18'-11"

Note: 5/8" 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 pipe, which will require the following bolt lengths:

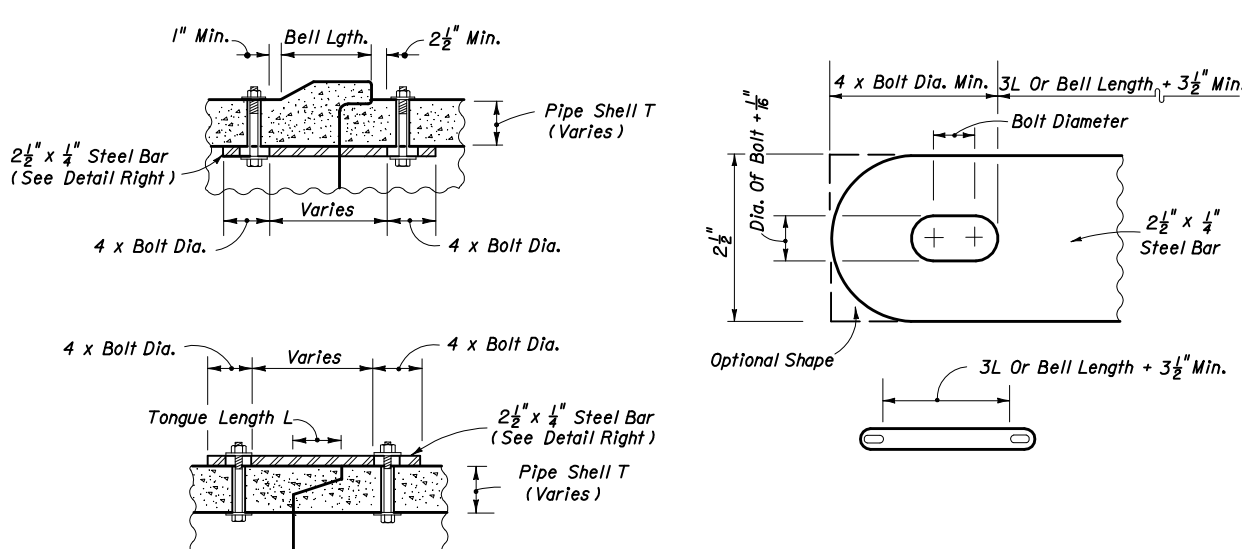
Grate Size (Std. & X-Stg.)	Bolt Length
2 1/2"	5 1/2"
3"	6"
3 1/2"	6 1/2"
4"	7"

**To be used only when grates are called for in the plans.
***1974 AASHTO Pipe Arch Sizes.



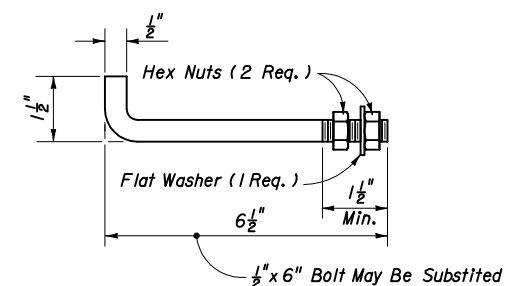
GRATE DETAIL
FOR SINGLE & MULTIPLE DRAIN PIPE

See General Notes, Sheet 6.



All bars, bolts, nuts and washers are to be galvanized steel. Bolt diameters shall be 3/8" for 15" to 36" pipe and 5/8" 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



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.

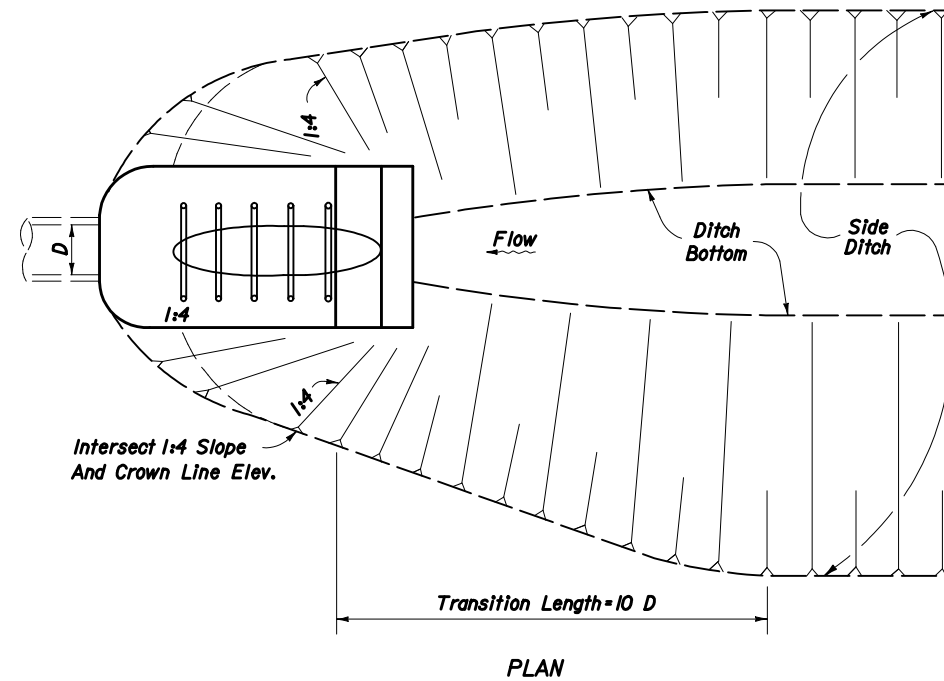
ANCHOR DETAIL

GENERAL NOTES

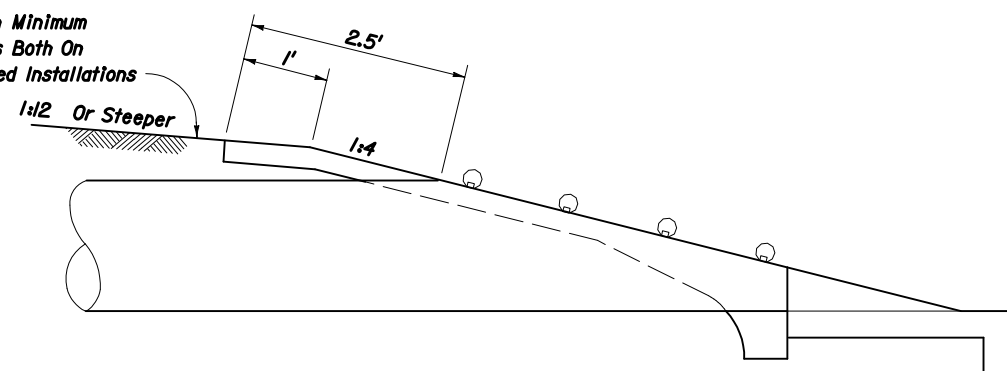
1. Unless otherwise designated in the plans, concrete pipe mitered end sections may be used with any type of side drain pipe; corrugated steel pipe mitered end sections may be used with any type of side drain pipe except aluminum pipe; and, corrugated aluminum mitered end sections may be used with any 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. Concrete pipe used in the assembly of mitered end sections shall be of selective lengths to avoid excessive connections.
3. Corrugated metal pipe galvanizing that is damaged during beveling and perforating for mitered end section shall be repaired.
4. 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.
5. Corrugated polyethylene pipe (CPE) for side drain application of 15", 18" or 24" diameter shall utilize either corrugated metal or concrete mitered end sections. When used in conjunction with corrugated metal mitered end sections, connection shall be by either a formed metal band specifically designated to join CPE pipe and metal pipe or other coupler approved by the State Drainage Engineer. When used in conjunction with a concrete mitered end section, connection shall be by concrete jacket constructed in accordance with Index No. 280.
6. When existing multiple side 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.
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 I concrete.
9. Round pipe size 30" or greater, pipe-arch size 35" x 24" or greater and elliptical pipe 19" x 30" 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 dipped galvanized after fabrication in accordance with ASTM A123. Grates subject to salt water or highly corrosive environment shall be hot dipped 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 Sodding, 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-dipped 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.



Modified Slope When Minimum Cover Or Less Occurs Both On Existing And Proposed Installations



2006 FDOT Design Standards

**SIDE DRAIN MITERED END SECTION
NOTES & INFORMATION**

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