

ORIGINATION FORM

Proposed Revisions to a Standard Plans Index
(Please provide all information – Incomplete forms will be returned)

Contact Information:

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Standard Plans:

Index Number: 430-022
Sheet Number (s): 1 of 1
Index Title: Side Drain Mitered End Section

Summary of the changes:

Reorganized Index. Moved General Notes and overview to Sheet 1.
Added Pipe/Slab Fillet Detail, and General Note on Saddle Slope. Deleted references to payment and design criteria, information moved to Specifications or Drainage Design Guide. Combined Details for Round and Elliptical Concrete Pipe. and Round and Arched Corrugated Metal Pipe. Sod requirements and information moved to Specifications. +

Commentary / Background:

Index reordered/reorganized to add clarity. Notes and callouts referencing pay items or design criteria moved to the appropriate publication.

Other Affected Offices / Documents: (Provide name of responsible personnel)

- | Yes | No | |
|-------------------------------------|-------------------------------------|-----------------------------|
| <input type="checkbox"/> | <input checked="" type="checkbox"/> | Other Standard Plans – |
| <input type="checkbox"/> | <input type="checkbox"/> | FDOT Design Manual – |
| <input type="checkbox"/> | <input type="checkbox"/> | Basis of Estimates Manual – |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | Standard Specifications – |
| <input type="checkbox"/> | <input type="checkbox"/> | Approved Product List – |
| <input type="checkbox"/> | <input type="checkbox"/> | Construction – |
| <input type="checkbox"/> | <input type="checkbox"/> | Maintenance – |

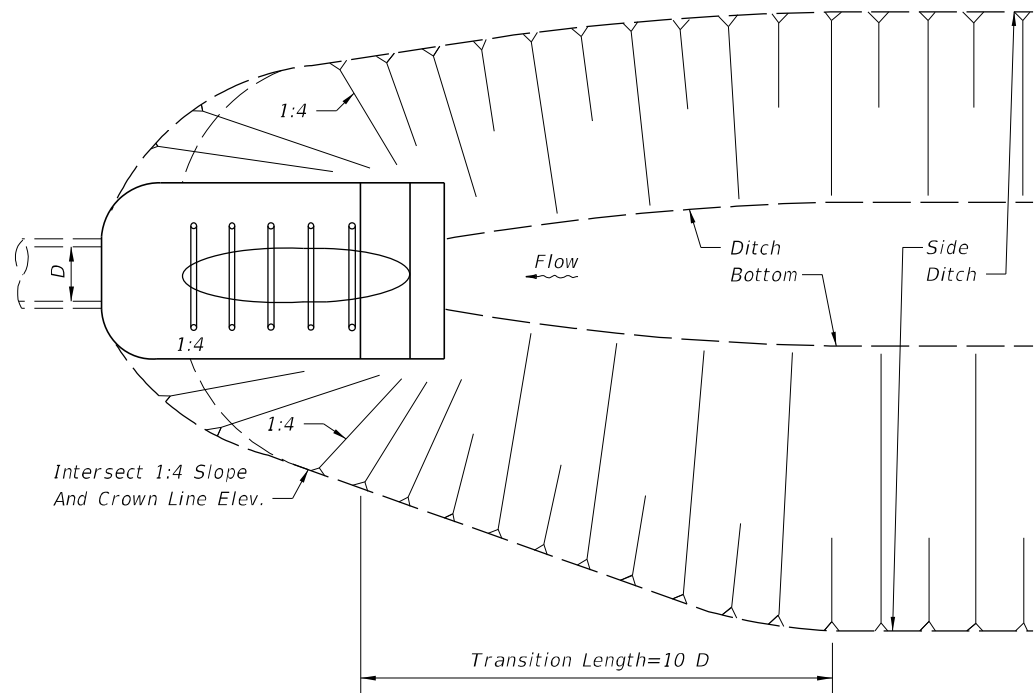
Origination Package Includes: (Email or hand deliver package to Derwood Sheppard)

- | Yes | N/A | |
|-------------------------------------|--------------------------|---|
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | Redline Mark-ups |
| <input type="checkbox"/> | <input type="checkbox"/> | Proposed Standard Plan Instructions (SPI) |
| <input type="checkbox"/> | <input type="checkbox"/> | Revised SPI |
| <input type="checkbox"/> | <input type="checkbox"/> | Other Support Documents |

Implementation:

- Design Bulletin (Interim) DCE Memo Program Mgmt. Bulletin FY-Standard Plans (Next Release)

Contact the Roadway Design Office for assistance in completing this form



PLAN
DITCH TRANSITION

GENERAL NOTES

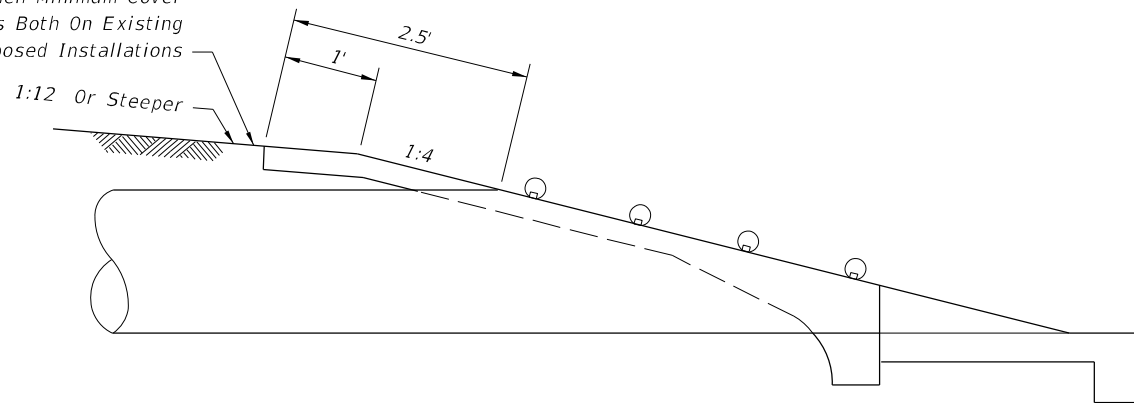
1. Unless otherwise designated in the plans, concrete pipe mitered end sections may be used with any type of side drain pipe; corrugated steel pipe mitered end sections may be used with any type of side drain pipe except aluminum pipe; and, corrugated aluminum mitered end sections may be used with any type of side drain pipe except steel pipe. When bituminous coated metal pipe is specified for side drain pipe, construct the mitered end sections with like pipe or concrete pipe. When the mitered end section pipe is dissimilar to the side drain pipe, construct a concrete jacket in accordance with Index 430-001.
2. Use either corrugated metal or concrete mitered end sections for corrugated polyethylene pipe (HDPE), polyvinyl-chloride pipe (PVC) and polypropylene pipe (PPP). When used in conjunction with corrugated mitered end sections, make connection using 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 mitered end sections, concrete jacket constructed in accordance with Index 430-001.
3. Select lengths of concrete pipe that avoid excessive connections in the assembly of the mitered end section.
4. Repair corrugated metal pipe galvanizing that is damaged during beveling and perforating.
5. Prior to placing concrete slab apply a bituminous coating to any portion of corrugated metal pipe in direct contact with concrete. Extend the coating 12" beyond the concrete slab.
6. When existing multiple side drain pipes are spaced other than the dimensions shown in this Index, have nonparallel axes, or non-uniform sections, either construct the mitered end sections separately as single pipe or collectively as multiple pipe end sections as directed by the Engineer.

7. Saddle Slope:

Slope to centerline pipe for round pipes less than or equal to 18" diameter and 1:2 for round pipes greater than or equal to 24" diameter. Slope to the major axis for elliptical pipes 24" x 38" or smaller and 1:2 for pipes 29" x 45" or larger. Slope to the span line for pipe arch 28" x 20" or smaller and 1:2 for pipe arch 35" x 24" or larger.

19"x30" or greater, unless it the lower grate on the
All remaining grates. Fabricate accordance with ASTM A123 for

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



PERMISSIBLE PAVEMENT MODIFICATION

Moved to Sheet 3

DESIGN NOTES

1. Do not use grates until the debris transport potential 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 10).
2. The design engineer must determine and designate in the plans which alternate types of mitered end section will not be permitted. Restrict use based on corrosive or structural requirements.
3. Contact the District Drainage Engineer for possible alternate treatment of side drain mitered end sections where a minimum spacing of 30' will not result between, the toe points of the mitered end sections.
4. Provide ditch transitions on all grades in excess of 3%.

Deleted from sheet.
Added information to DDG 3.2.8.3

NOTES & INFORMATION

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LAST REVISION 11/01/17	DESCRIPTION:		FY 2019-20 STANDARD PLANS	SIDE DRAIN MITERED END SECTION	INDEX	SHEET
					430-022	1 of 7

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

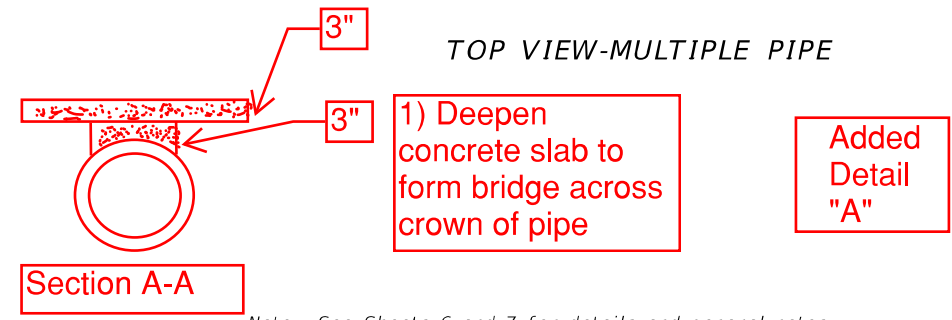
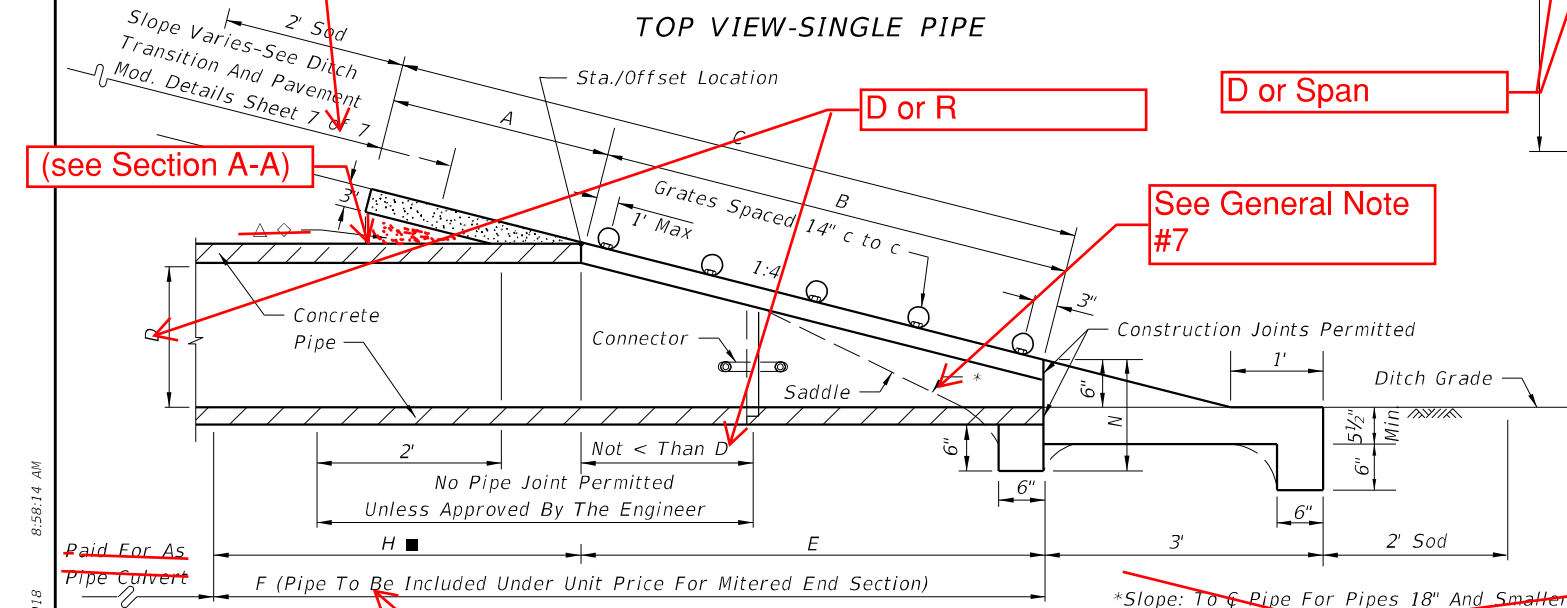
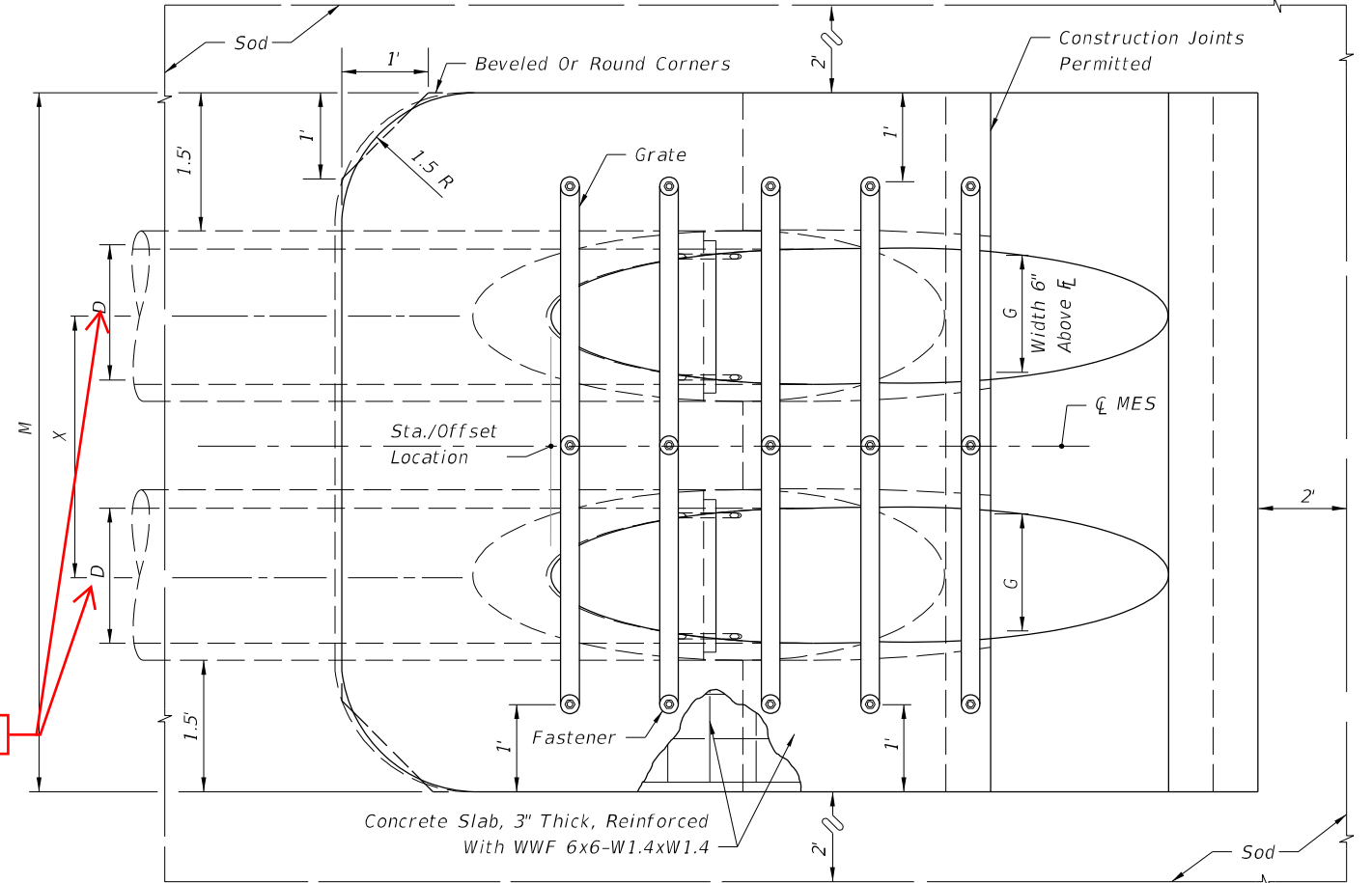
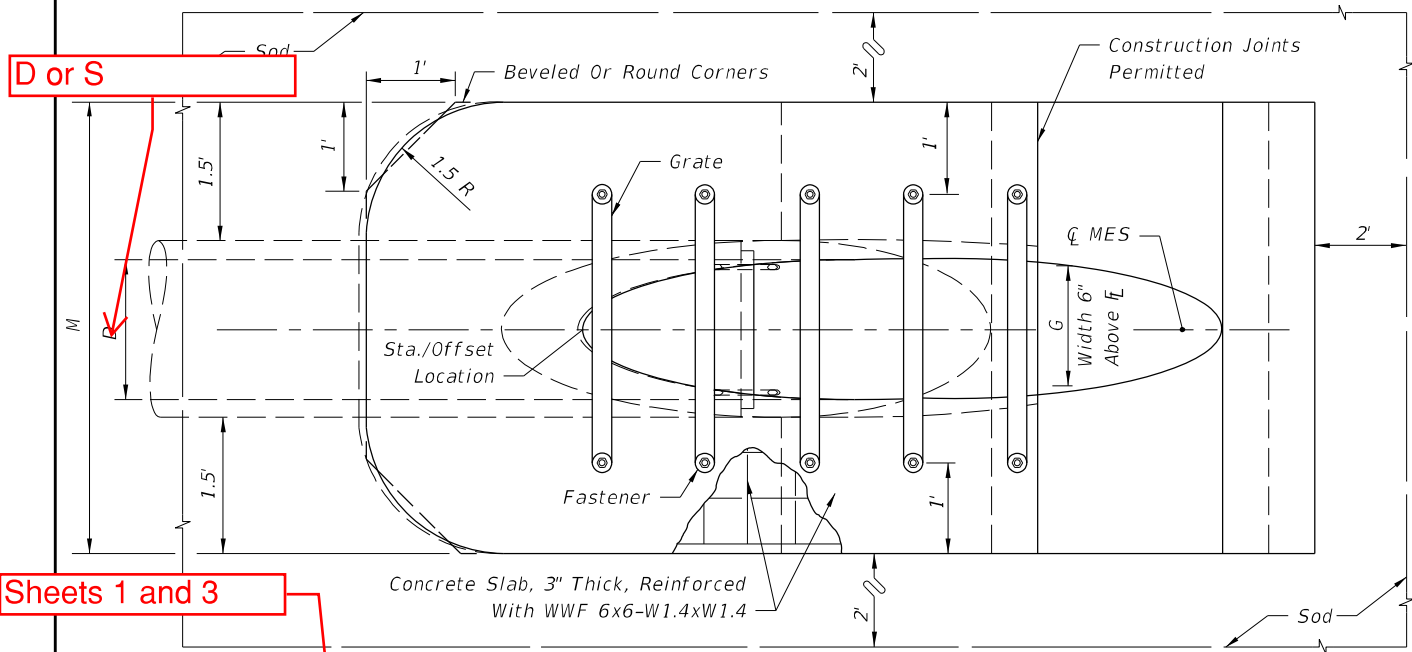
△ 6.42' △ 6.25' Dimensions permitted to allow use of 8' standard pipe lengths.

◇ 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.

Moved to Sheet 3



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

SINGLE AND MULTIPLE ROUND CONCRETE PIPE

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LAST REVISION	DESCRIPTION:
11/01/17	

FY 2019-20
STANDARD PLANS

SIDE DRAIN MITERED END SECTION

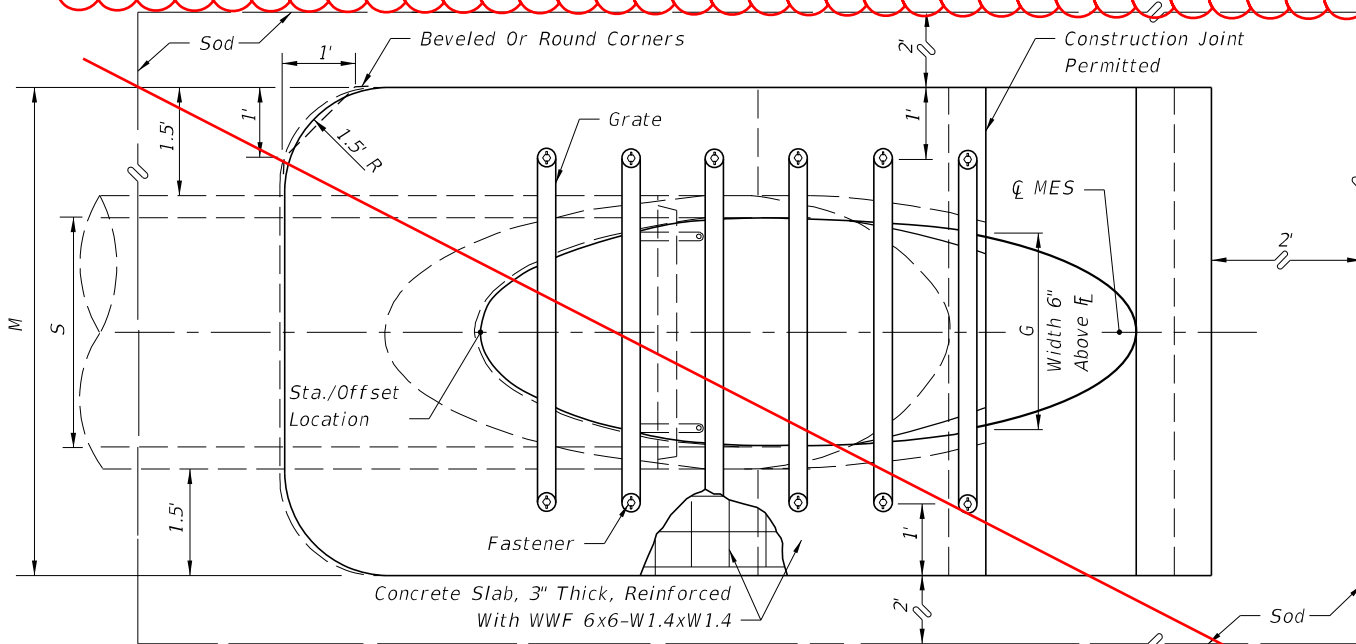
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DIMENSIONS & QUANTITIES

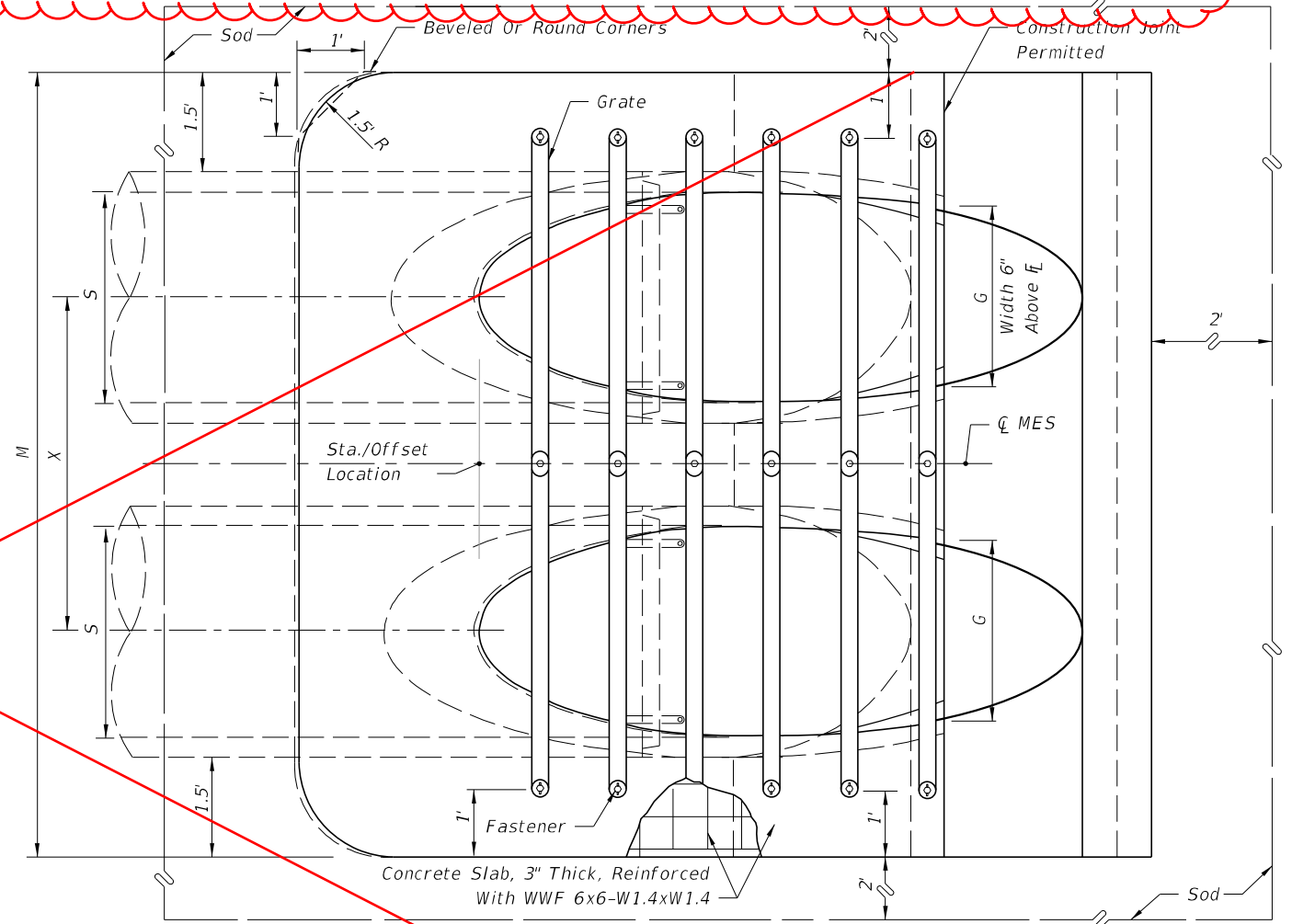
Rise A	Span S	X	A	B	C	E	F	G	H ■	M				N	GRATE SIZES		CONCRETE (CY)				SODDING (SY)			
										Single Pipe	Double Pipe	Triple Pipe	Quad. Pipe		Standard Weight Pipe	Extra Strong Pipe	Single Pipe	Double Pipe	Triple Pipe	Quad. Pipe	Single Pipe	Double Pipe	Triple Pipe	Quad. Pipe
12"	18"	2'-10"	2.36'	3.06'	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
12"	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'	3"	HSS 5"x3/16"	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'	3"	HSS 5"x3/16"	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'	3 1/2"	HSS 5"x3/8"	2.91	5.77	8.64	11.50	19	24	29	35

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

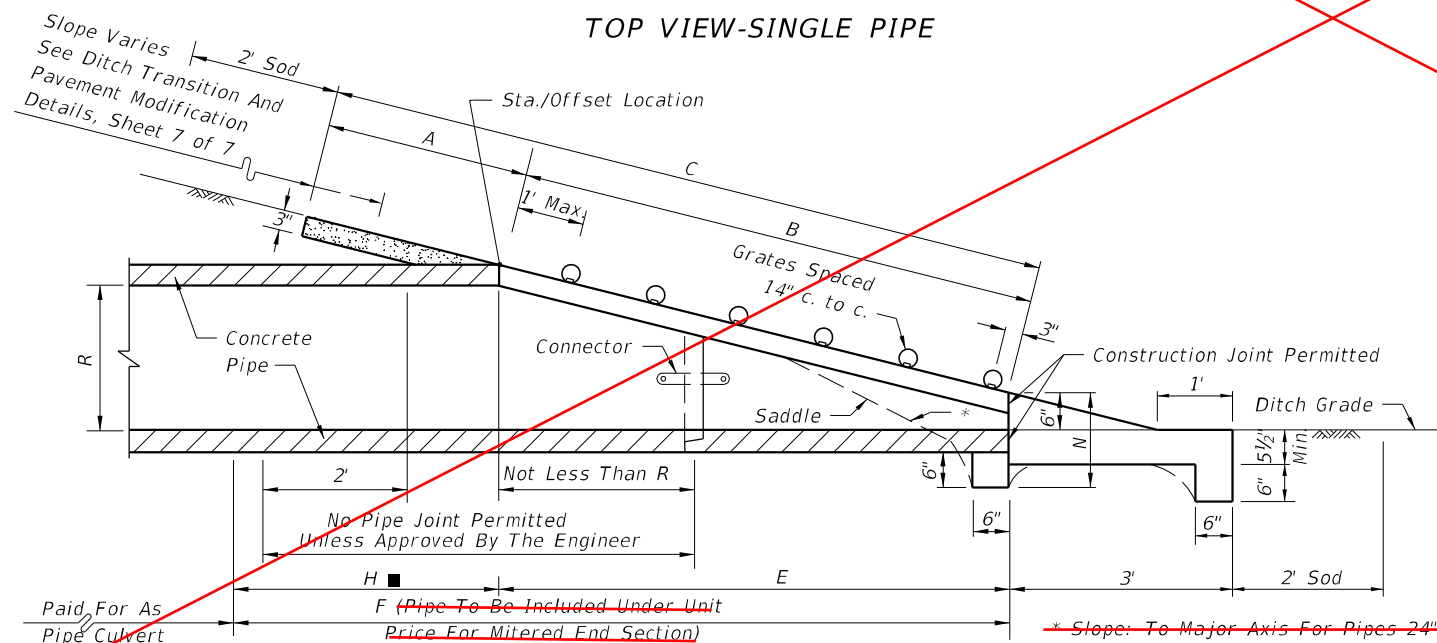
Combined with Table from old Sheet 1



TOP VIEW-SINGLE PIPE



TOP VIEW-MULTIPLE PIPE



SECTION

CONCRETE PIPE DIMENSIONS AND QUANTITIES AND PERMISSIBLE PAVEMENT MODIFICATION

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

~~SINGLE AND MULTIPLE ELLIPTICAL CONCRETE PIPE~~

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LAST REVISION 11/01/17	DESCRIPTION:
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FY 2019-20
STANDARD PLANS

SIDE DRAIN MITERED END SECTION

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DIMENSIONS & QUANTITIES

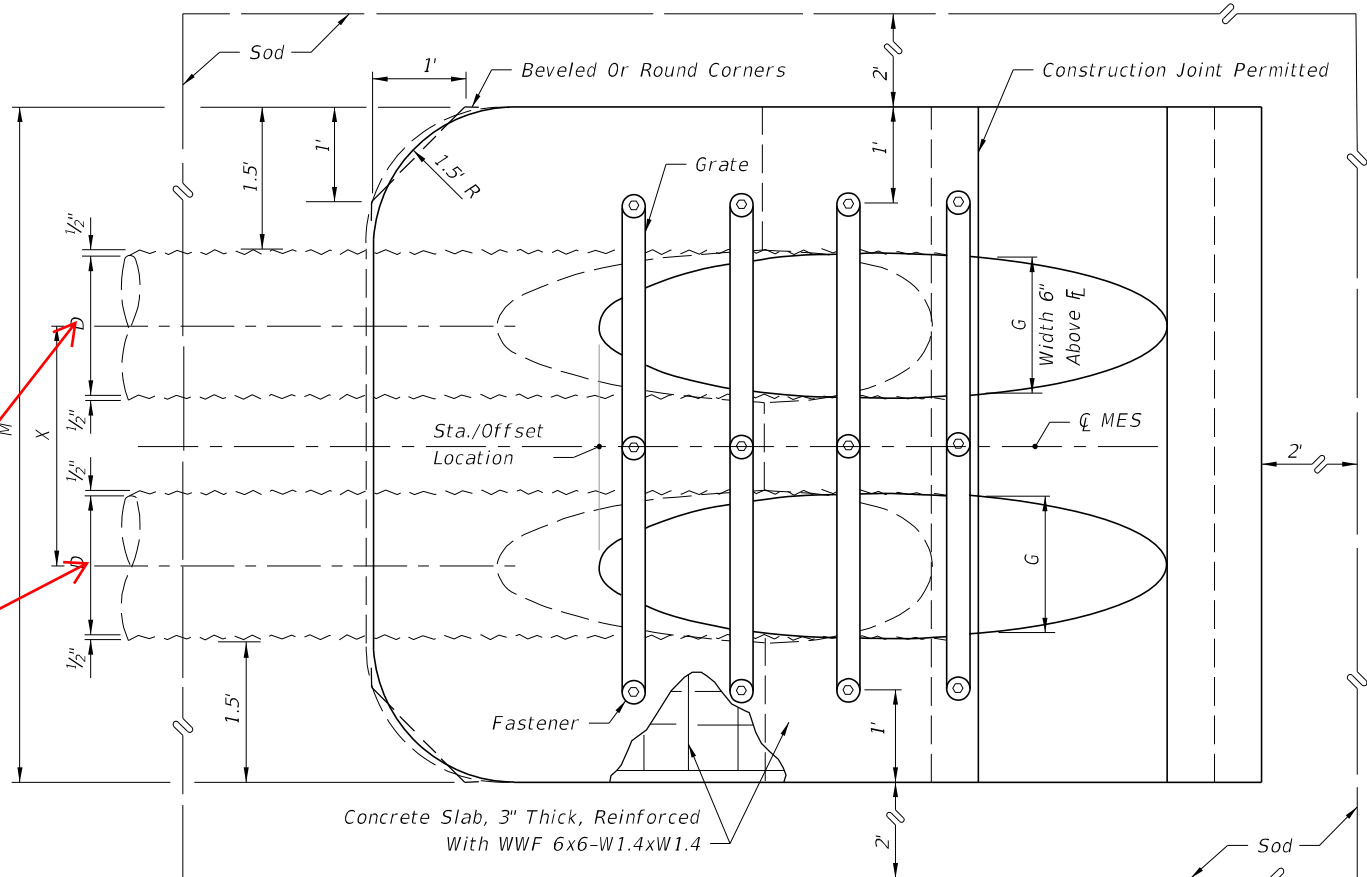
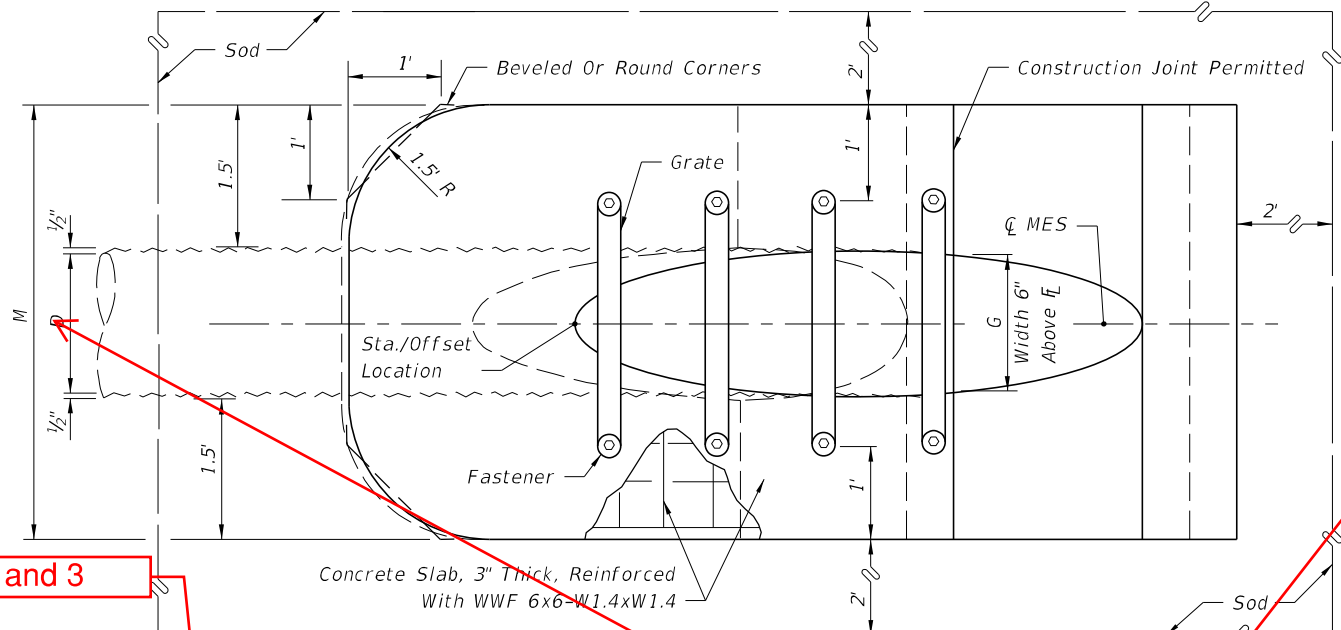
D	X	A	B	C	E	F	G	H ■	M				N	GRATE SIZES		CONCRETE (CY)				SODDING (SY)			
									Single Pipe	Double Pipe	Triple Pipe	Quad. Pipe		Standard Weight Pipe	Extra Strong Pipe	Single Pipe	Double Pipe	Triple Pipe	Quad. Pipe	Single Pipe	Double Pipe	Triple Pipe	Quad. Pipe
8"	2'-0"	2.5'	0.72'	3.22'	0.7'	4.0'	0.58'	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'	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

REMARKS

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

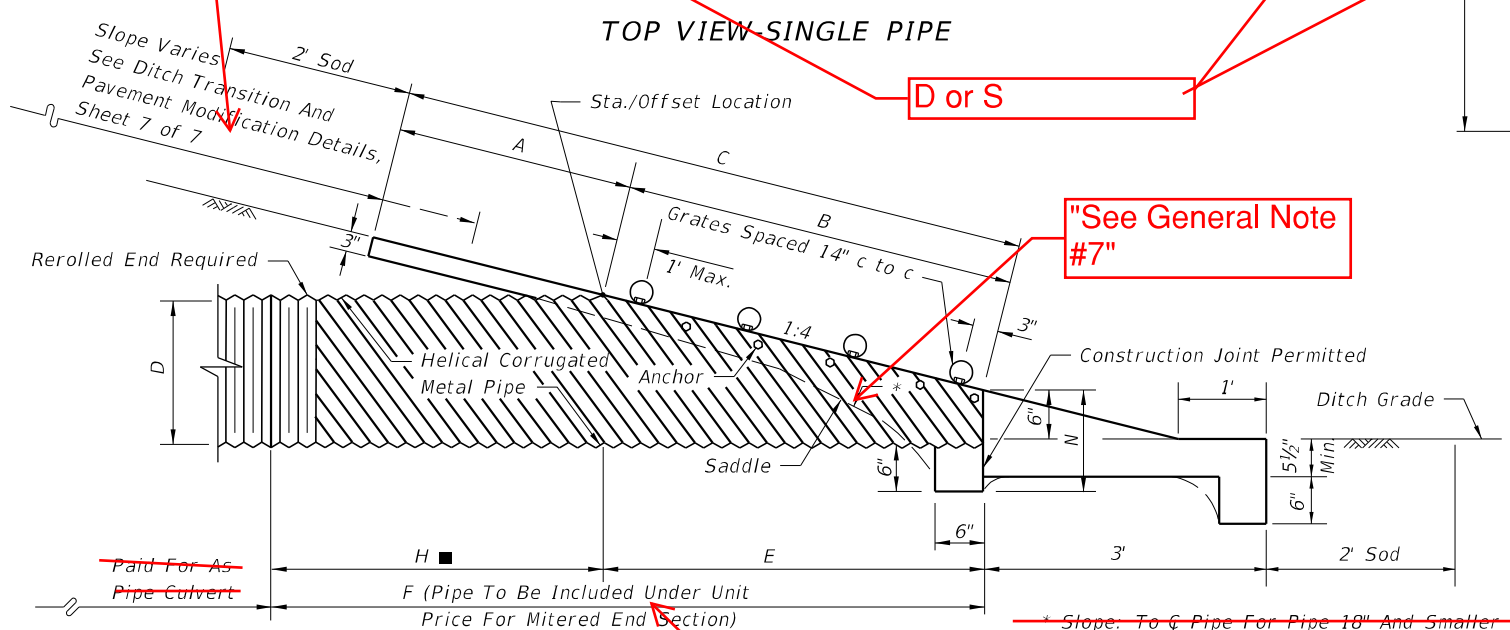
■ Values shown for estimating pipe quantities and are for information only.

Moved to Sheet 5



TOP VIEW SINGLE PIPE

TOP VIEW MULTIPLE PIPE



SECTION

SINGLE AND MULTIPLE ROUND CORRUGATED METAL PIPE

Sheets 1 and 3

D or S

"See General Note #7"

"F(Pipe included in Mitered End Section)"

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

LAST REVISION 11/01/17	DESCRIPTION:	FY 2019-20 STANDARD PLANS	SIDE DRAIN MITERED END SECTION	INDEX 430-022	SHEET 4 of 7
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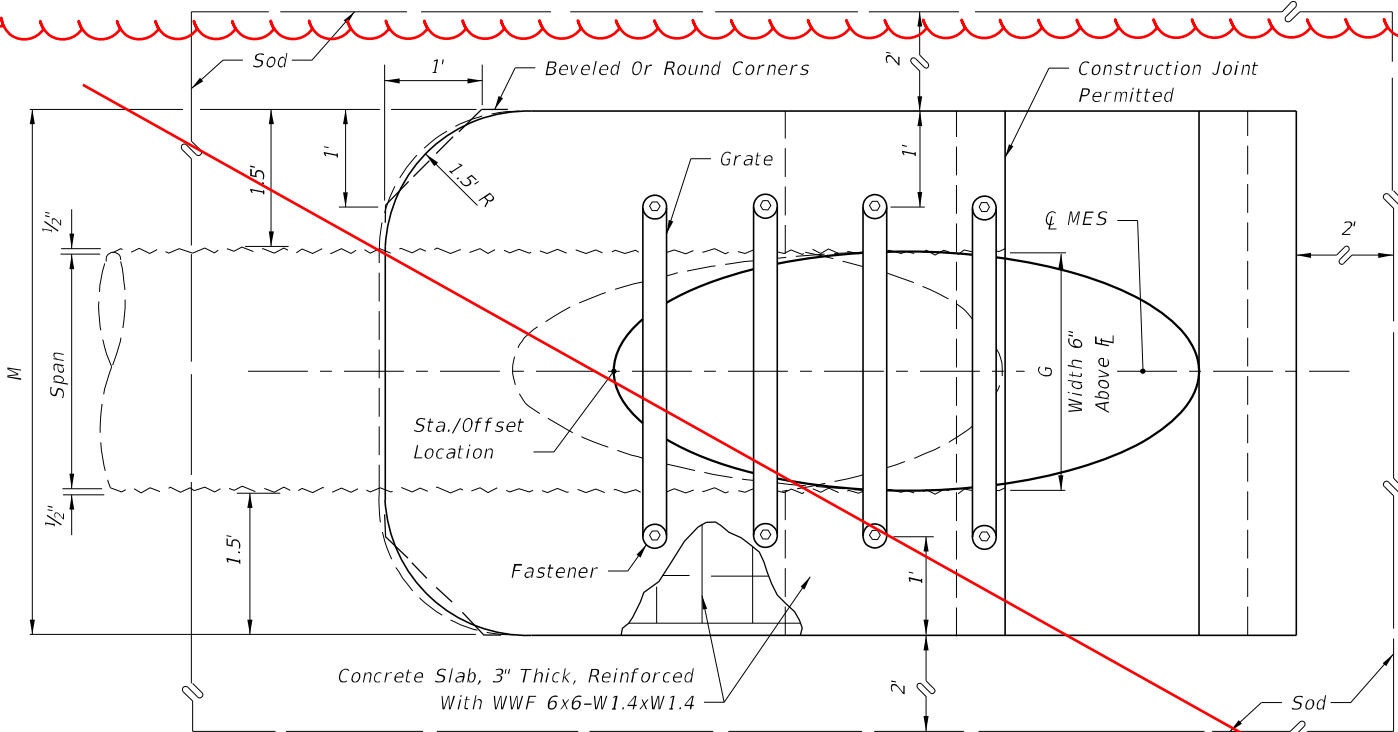
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DIMENSIONS & QUANTITIES

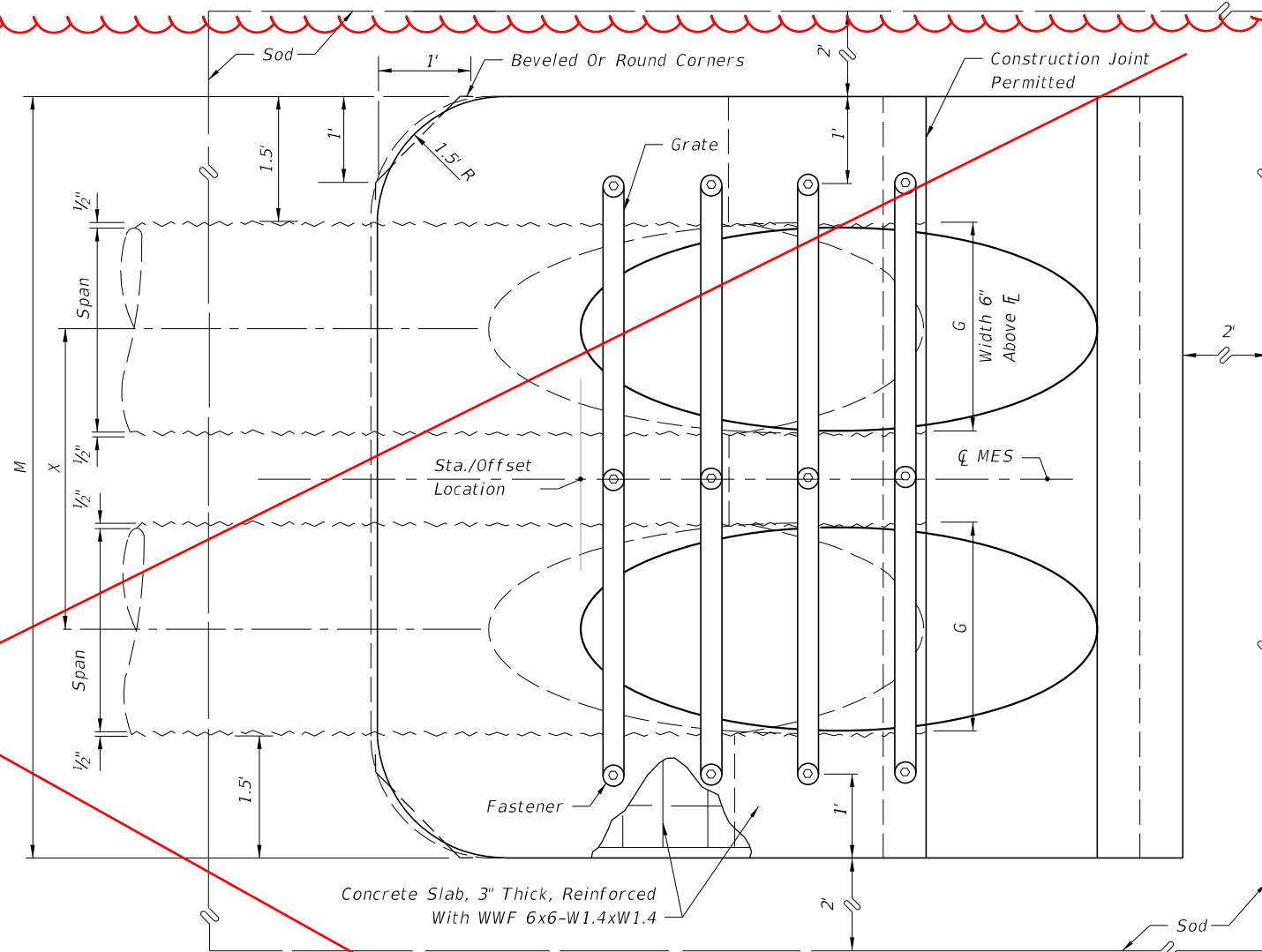
1974 AASHTO		X	A	B	C	E	F	G	H ■	M				N	GRATE SIZES		CONCRETE (CY)				SODDING (SY)			
Span	Rise									Single Pipe	Double Pipe	Triple Pipe	Quad. Pipe		Standard Weight Pipe	Extra Strong Pipe	Single Pipe	Double Pipe	Triple Pipe	Quad. Pipe	Single Pipe	Double Pipe	Triple Pipe	Quad. Pipe
17"	13"	2'-6"	2.5'	2.41'	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.

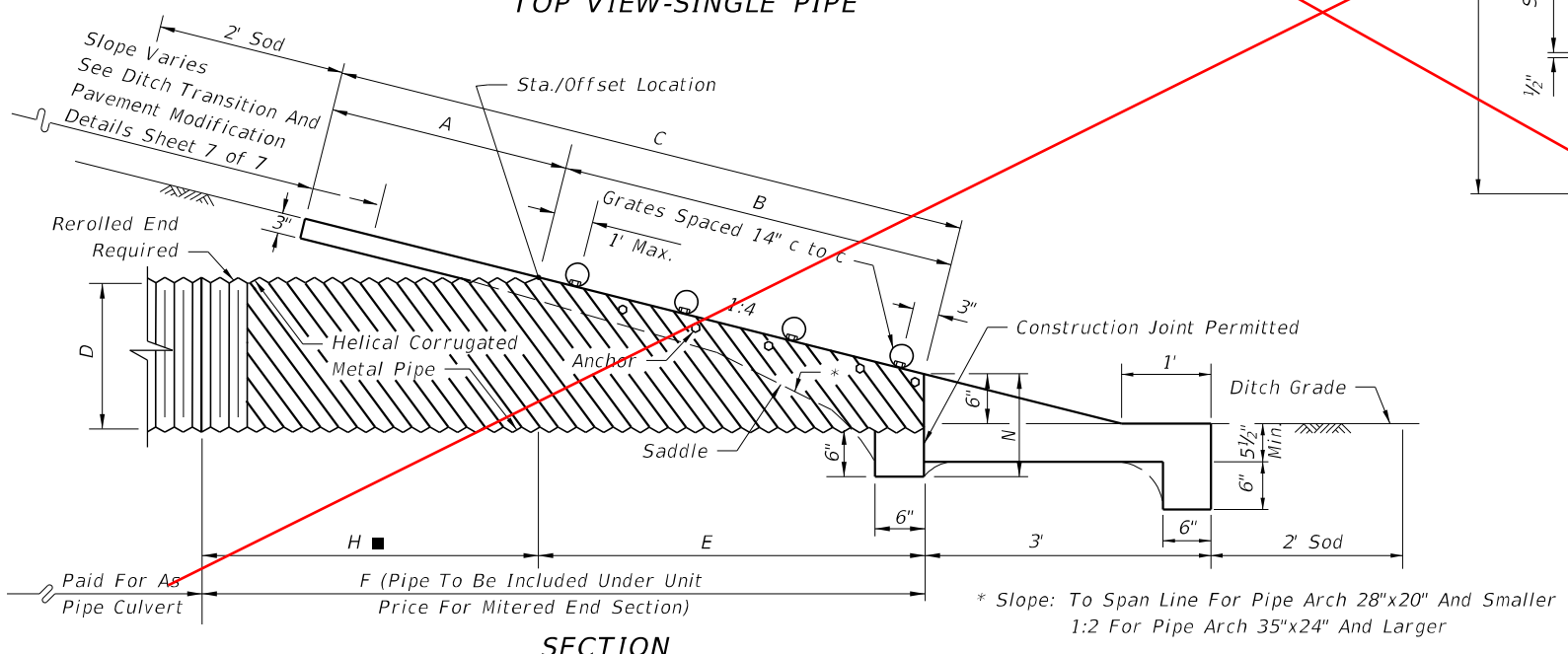
Added Table from old Sheet 2



TOP VIEW-SINGLE PIPE



TOP VIEW-MULTIPLE PIPE



SECTION

CORRUGATED METAL PIPE DIMENSIONS AND QUANTITIES

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

~~SINGLE AND MULTIPLE CORRUGATED METAL PIPE-ARCH~~

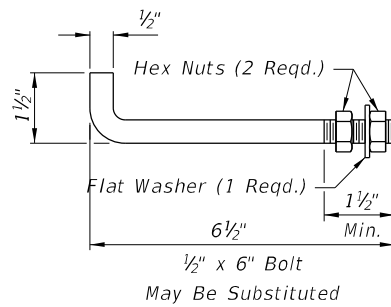
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LAST REVISION	DESCRIPTION:
11/01/17	

FDOT
FY 2019-20
STANDARD PLANS

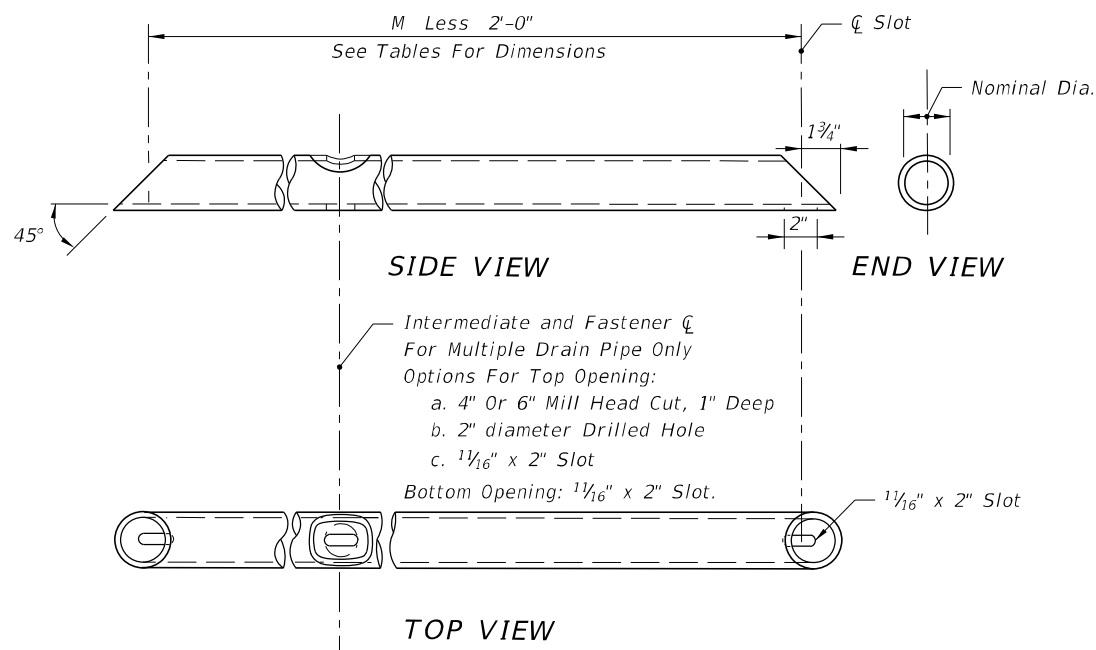
SIDE DRAIN MITERED END SECTION

INDEX SHEET
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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.

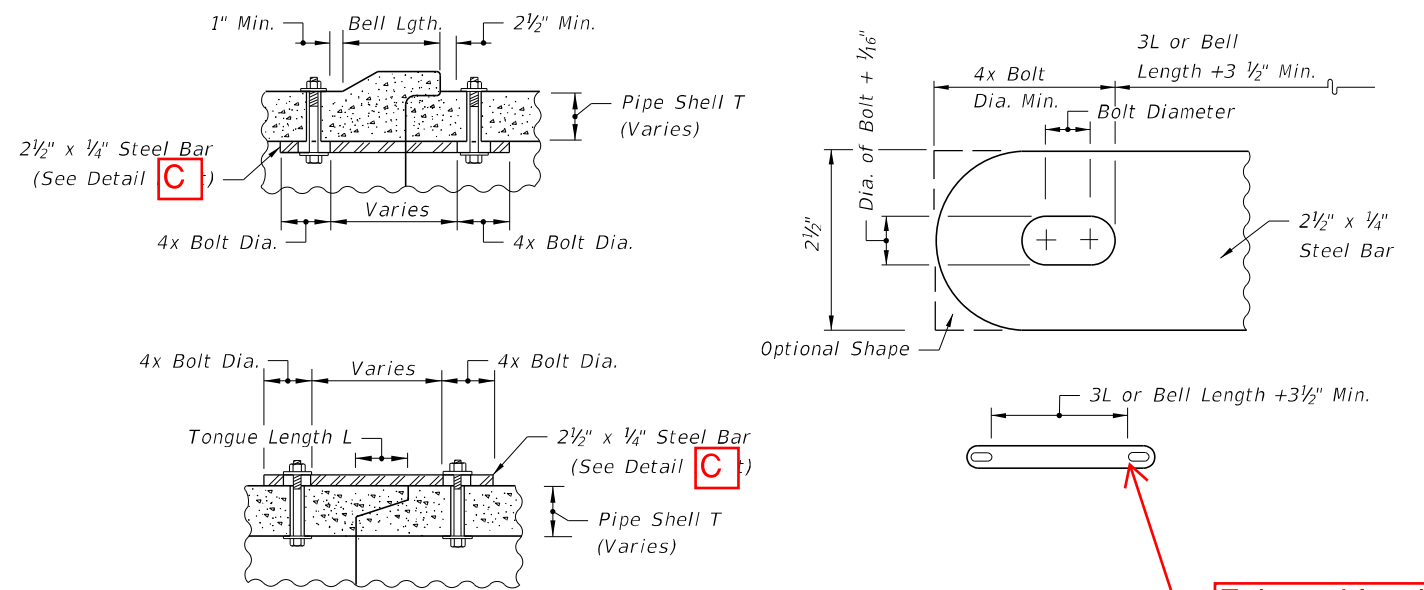
**Corrugated Metal Pipe (CMP) Anchor Detail
 DETAIL "D"**



**FOR SINGLE & MULTIPLE DRAIN PIPE
 GRATE DETAIL**

~~See General Notes, Sheet 7.~~

Moved to Sheet 7



Enlarged for clarity

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

Detail "C"

DETAILS FOR CONCRETE & CORRUGATED METAL PIPE

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LAST REVISION 11/01/17	DESCRIPTION:		FY 2019-20 STANDARD PLANS	SIDE DRAIN MITERED END SECTION	INDEX	SHEET
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Notes:
 1) ...
 2) ...

5 Use grates only when called for in the plans on round pipes with 24" or less diameter, arch pipes 28" x 20" or smaller, and elliptical pipes 14" x 23" or smaller.

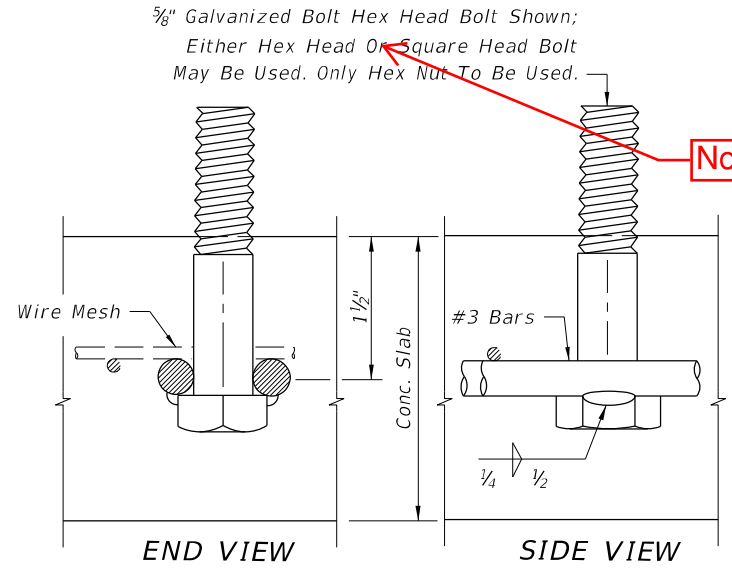
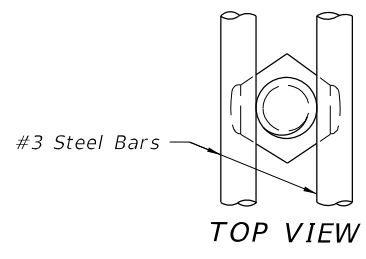
Drain Size	s	n	L	La
CONCRETE PIPE (ROUND)				
15"	3	4	4'-0"	4'-11"
18"	4	5	5'-2"	6'-1"
24"	6	7	7'-6"	8'-5"
30"	7	8	8'-8"	9'-7"
36"	9	10	11'-0"	11'-11"
42"	11	12	13'-4"	14'-3"
48"	13	14	15'-8"	16'-7"
54"	14	15	16'-10"	17'-9"
60"	16	17	19'-2"	20'-1"
CORRUGATED METAL PIPE (ROUND)				
15"	2	3	2'-10"	3'-9"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

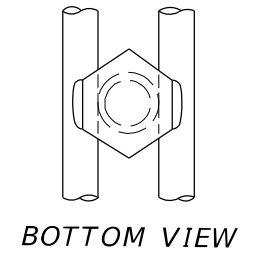
Note 1 $\frac{5}{8}$ " x 3" bolts are standard for all grate fasteners, except when the contractor elects to use the slotted upper holes for the intermediate fasteners on multiple drain pipes, which will require the following bolt lengths:

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.~~

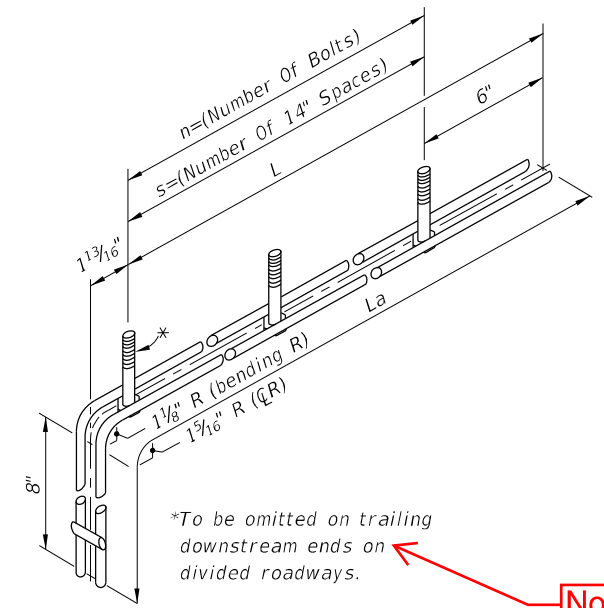
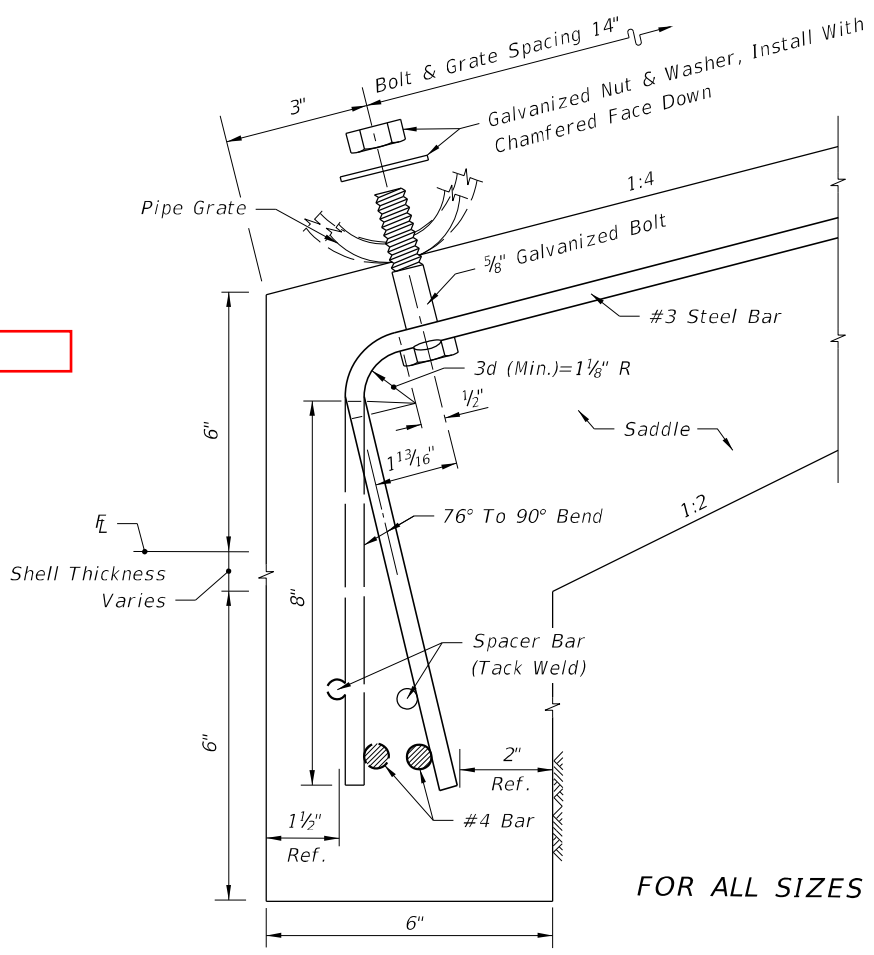


Note 2



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.

Note 3



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

Note 4

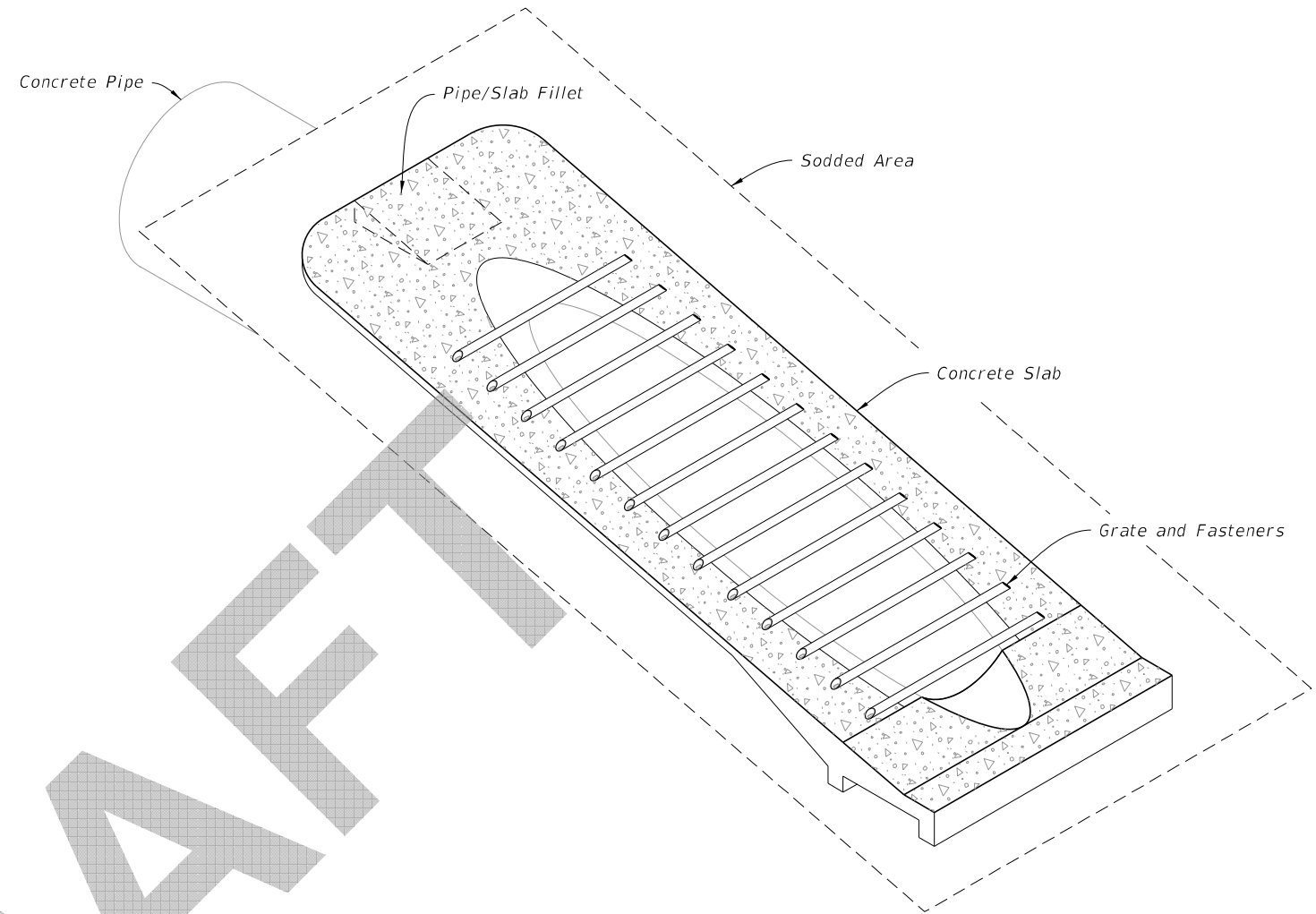
FOR ALL SIZES OF SINGLE AND MULTIPLE DRAIN PIPE FASTENER UNIT

DETAILS FOR CONCRETE & CORRUGATED METAL PIPE

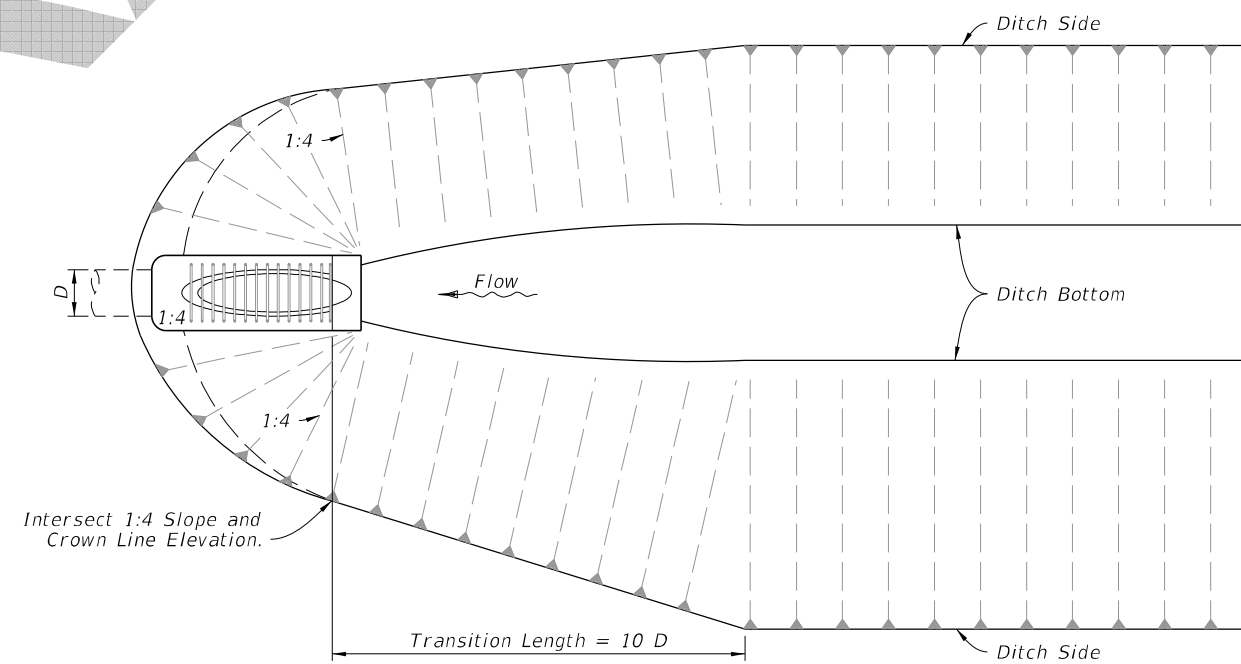
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GENERAL NOTES:

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, construct the mitered end sections with like pipe or concrete pipe. When the mitered end section pipe is dissimilar to the side drain pipe, construct a concrete jacket in accordance with Index 430-001.
2. Use either corrugated metal or concrete mitered end sections for corrugated polyethylene pipe (HDPE), polyvinyl-chloride pipe (PVC), steel reinforced polyethylene pipe (SRPE), and polypropylene pipe (PP). When used in conjunction with corrugated mitered end sections, make connection using either a formed metal band specifically designated to join HDPE, PVC, SRPE, or PVC pipe. When used in conjunction with a concrete mitered end sections, construct concrete jacket in accordance with Index 430-001.
3. Use class NS concrete cast-in-place reinforced slabs for all cross drain pipes.
4. Select lengths of concrete pipe that avoid excessive connections in the assembly of the mitered end section.
5. Repair corrugated metal pipe galvanizing that is damaged during beveling and perforating.
6. When existing multiple side drain pipes are spaced other than the dimensions shown in this Index, have nonparallel axes, or non-uniform sections, either construct the mitered end sections separately as single pipe or collectively as multiple pipe end sections as directed by the Engineer.
7. Saddle Slope:
 - 1:4 Miter - Slope to C of pipe for round pipes less than or equal to 18" diameter and 1:1 for round pipes greater than or equal to 24" diameter. Slope to the major axis for elliptical pipes 24"x38" or smaller and 1:2 for pipes 29"x45" or larger. Slope to the span line for pipe arch 28"x20" or smaller and 1:2 for pipe arch 35"x24" or larger.
 - 1:2 Miter - Slope to C of pipe for round pipes less than or equal to 18" diameter and 1:2 for round pipes greater than or equal to 24" diameter. Slope to the major axis for elliptical pipes 29"x45" or smaller and 1:1 for pipes 34"x53" or larger. Slope 1:1 for all pipe arch sizes.
8. Quantities shown are for estimating purposes only.



SIDEDRAIN MITERED END SECTION
(Concrete Pipe Shown, Corrugated Metal Pipe Similar)



DITCH TRANSITION

TABLE OF CONTENTS:

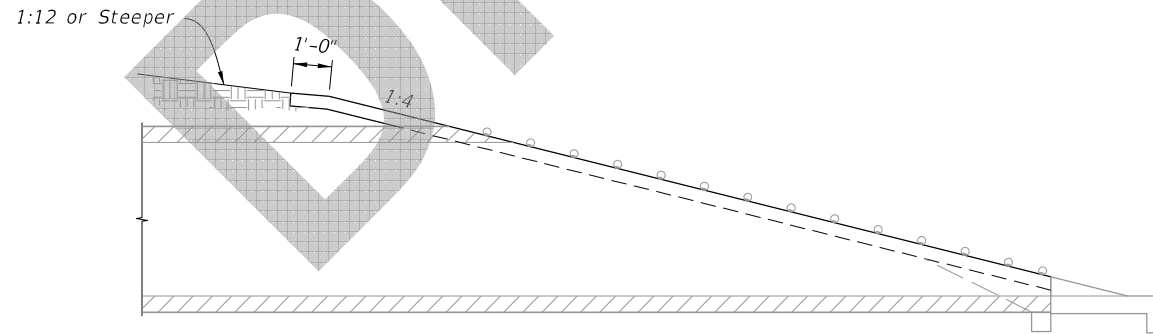
Sheet	Description
1	General Notes and Contents
2	Single and Multiple Concrete Pipe
3	Concrete Pipe Dimensions and Quantities and Permissible Pavement Modifications
4	Single and Multiple Corrugated Metal Pipe
5	Corrugated Metal Dimensions and Quantities
6	Concrete Pipe Connection and Corrugated Metal Pipe Anchor Details
7	Fastener Unit and Grate Details

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SINGLE AND MULTIPLE CONCRETE PIPE DIMENSIONS AND QUANTITIES

Pipe	Dia. D	Rise R	Span S	X	A	B	C	E	F	G	H	M				N	GRATE SIZES		3" CONC. SLAB (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		
Round Concrete	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'			2 1/2"	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'			2 1/2"	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'			2 1/2"	3 1/2"	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'			2 1/2"	3 1/2"	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
	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'					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'					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'					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'					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'					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'					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'					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'					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'					2.91	5.77	8.64	11.50	19	24	29	35		


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

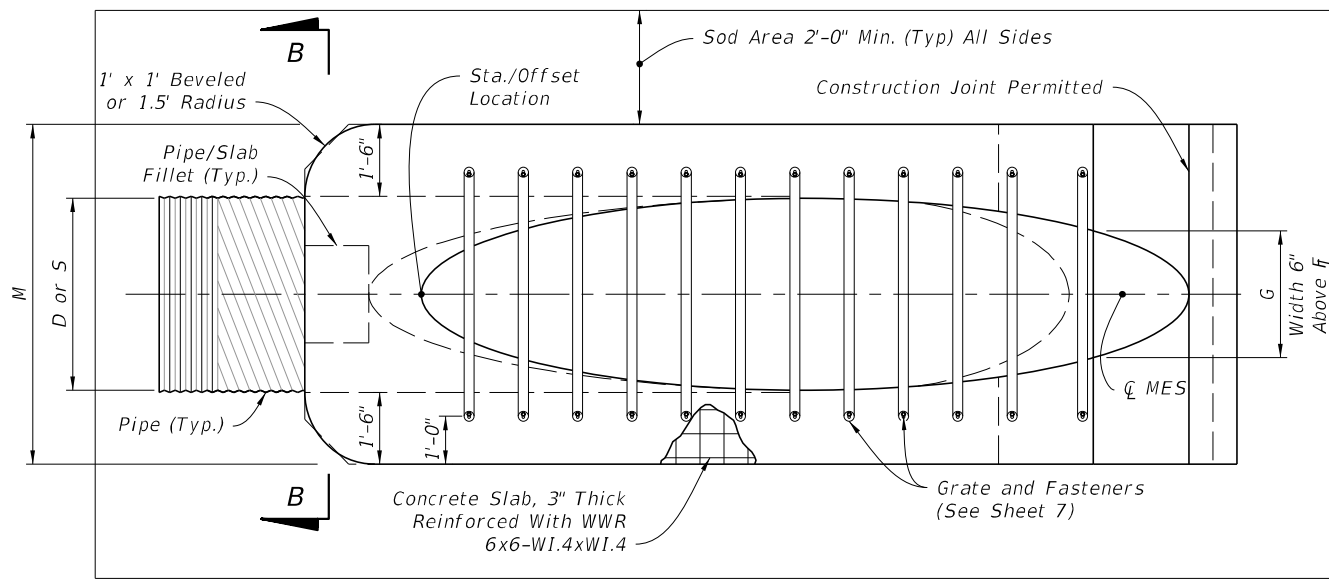


PERMISSIBLE PAVEMENT MODIFICATION

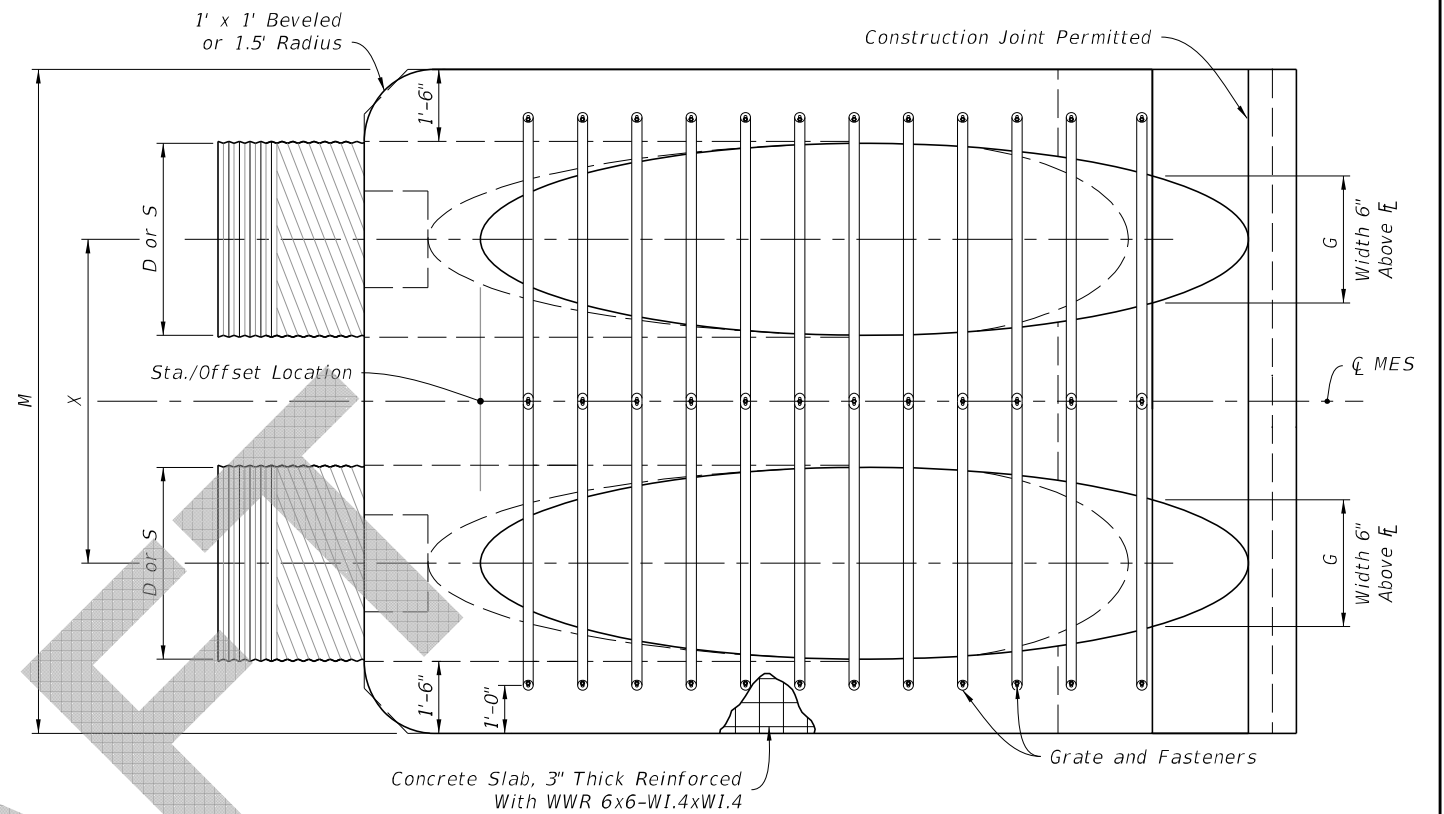
**CONCRETE PIPE DIMENSIONS AND QUANTITIES
AND PERMISSIBLE PAVEMENT MODIFICATION**

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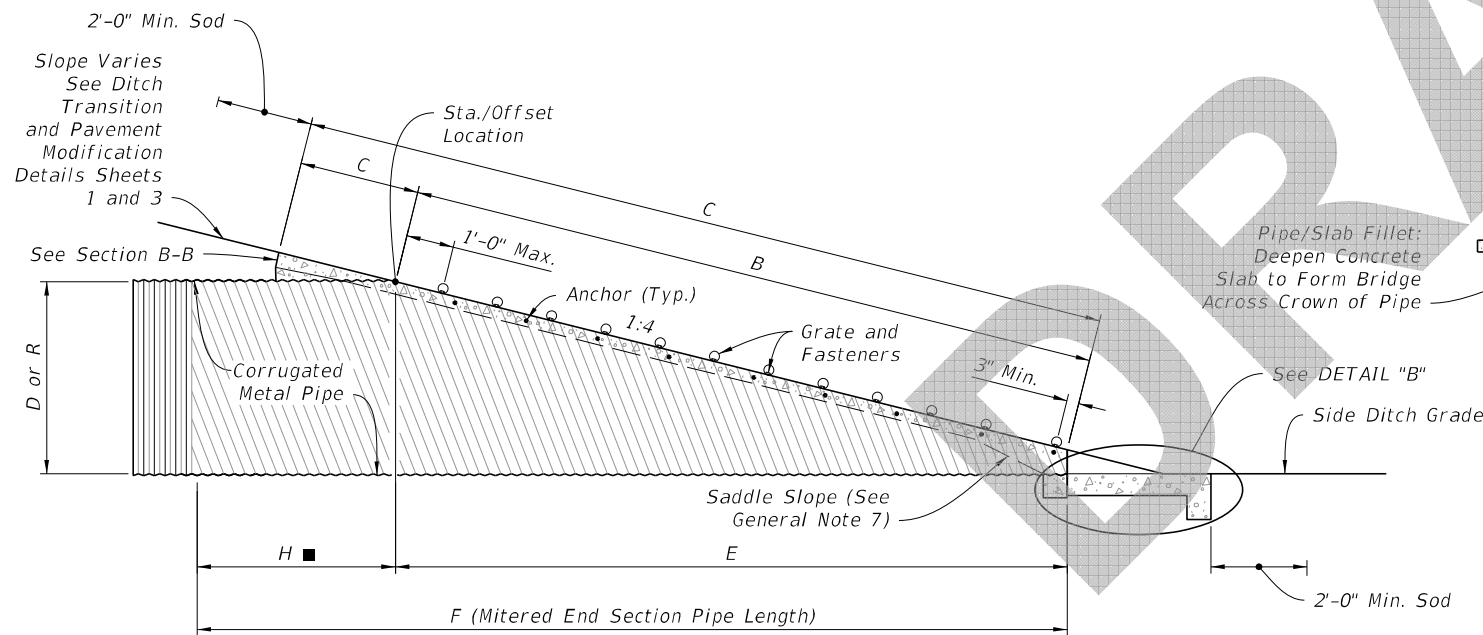
LAST REVISION 11/01/19	REVISION	DESCRIPTION:	 FY 2020-21 STANDARD PLANS	SIDE DRAIN MITERED END SECTION	INDEX 430-022	SHEET 3 of 7
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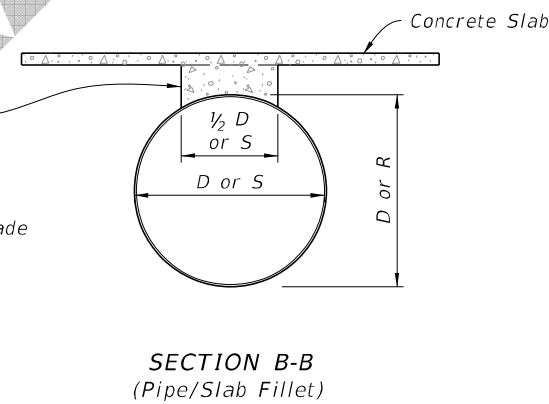
PLAN - SINGLE PIPE



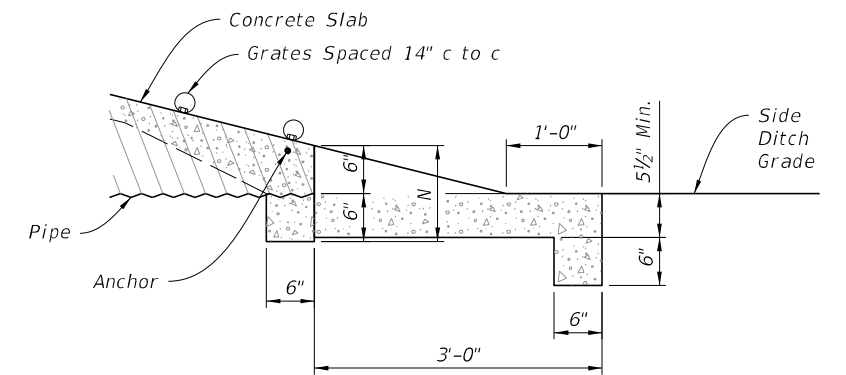
PLAN - MULTIPLE PIPE



ELEVATION



SECTION B-B
(Pipe/Slab Fillet)



DETAIL "B"

ROUND CORRUGATED PIPE
(Arched Pipe Similar)

SINGLE AND MULTIPLE CORRUGATED METAL PIPE

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LAST REVISION 11/01/19	DESCRIPTION:
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STANDARD PLANS


SIDE DRAIN MITERED END SECTION

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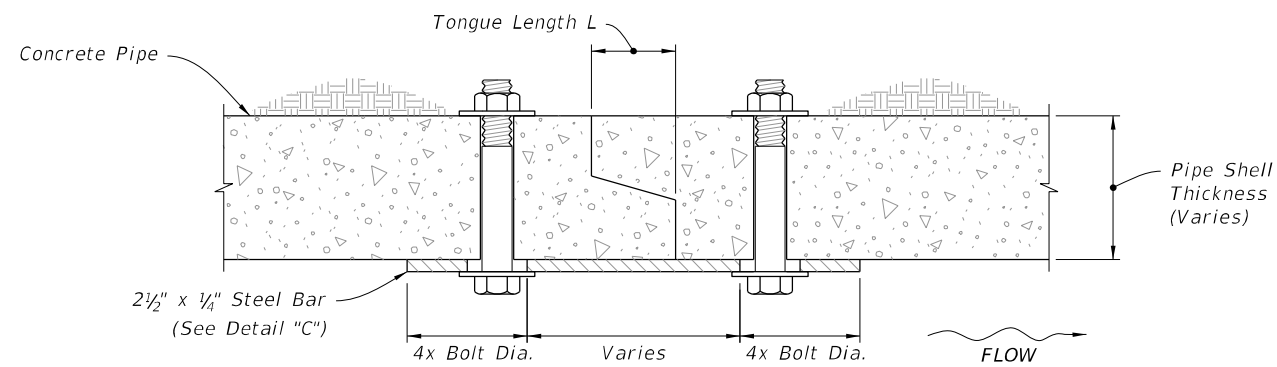
SINGLE AND MULTIPLE CORRUGATED METAL PIPE DIMENSIONS AND QUANTITIES

Pipe	Dia. D	Rise R	Span S	X	A	B	C	E	F	G	H	M				N	GRATE SIZES		3" CONC. SLAB (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
Round Corrugated Metal 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'	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	
Corrugated Metal Pipe - Arch	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'	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	

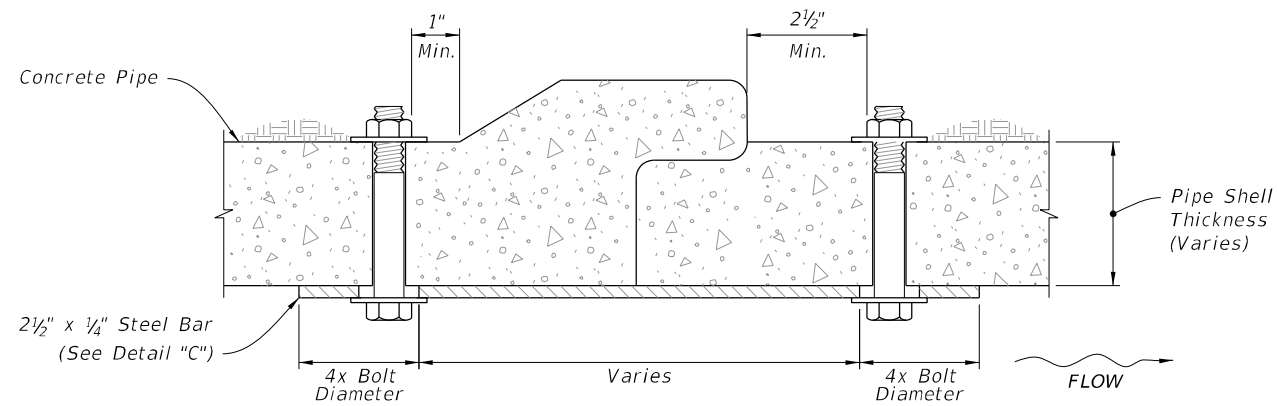
CORRUGATED METAL PIPE DIMENSIONS AND QUANTITIES

LAST REVISION 11/01/19	REVISION	DESCRIPTION:	 FY 2020-21 STANDARD PLANS	SIDE DRAIN MITERED END SECTION	INDEX 430-022	SHEET 5 of 7
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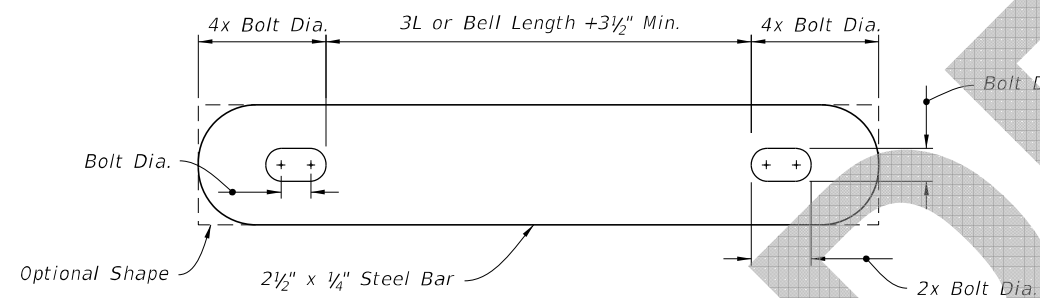
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TONGUE AND GROOVE CONNECTOR DETAIL



BELL AND SPIGOT CONNECTOR DETAIL



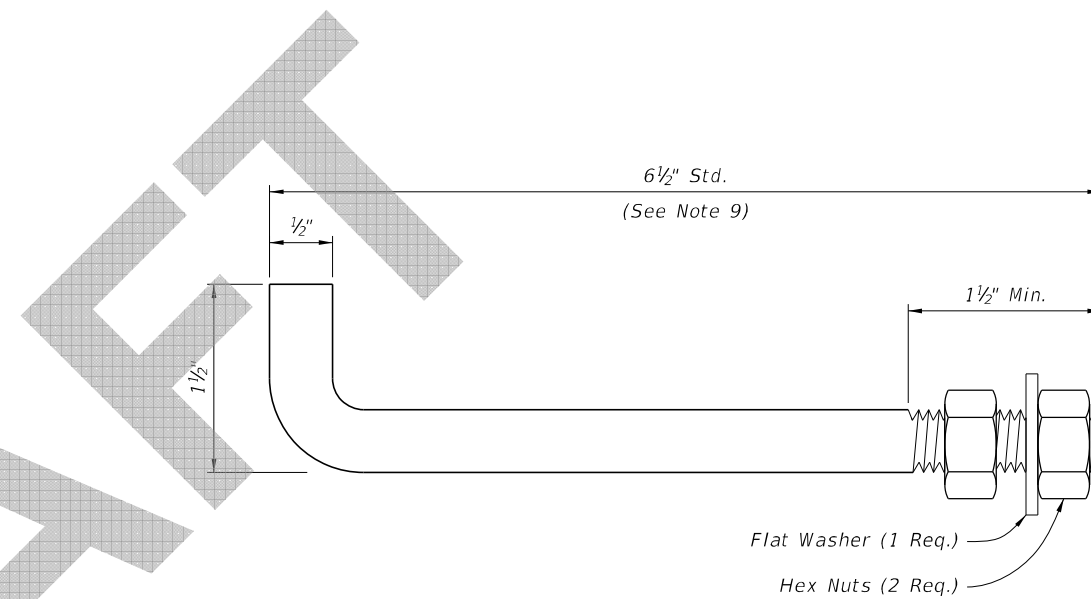
STEEL BAR

NOTES:

1. Use galvanized steel for all bars, bolts, nuts, and washers.
2. Two connectors required per joint, located 60° right and left of bottom center of pipe.
3. Bolt holes in pipe shell are to be drilled.

Bolt Dia.	Pipe Dia.
3/8"	15" to 36"
5/8"	42" to 72"

CONCRETE PIPE CONNECTION DETAIL
DETAIL "C"



NOTES:

1. Anchors required for CMP only.
2. Use galvanized steel for all anchors, nuts, and washers.
3. Bend anchor where required to center in concrete slab.
4. Repair damaged surfaces after bending.
5. Space anchors a distance equal to four (4) corrugations.
6. Place the anchors in the outside crest of corrugation.
7. Place flat washers on inside wall of pipe.
8. Drill or punch holes in the mitered end pipe; burning not permitted.
9. A 6" x 1/2" bolt substitution is permitted.

CORRUGATED METAL PIPE (CMP) ANCHOR DETAIL

DETAIL "D"

CONCRETE PIPE CONNECTION AND CORRUGATED PIPE ANCHOR DETAILS

SIDE DRAIN MITERED END SECTION



FY 2020-21
STANDARD PLANS

INDEX
430-022

SHEET
6 of 7

NOTES:

1. $\frac{5}{8}$ " 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 pipes, which will require bolt lengths in the Special Bolt Length Table.
2. $\frac{5}{8}$ " galvanized bolt hex head bolt shown; either hex head or square head bolt may be used. Use only hex nuts.
3. Make the specified weld 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.
4. Omit on trailing downstream ends on divided roadways.
5. Use grates only when called for in the plans on round pipes 24" or less in diameter, arch pipes 28" x 20" or smaller, and elliptical pipes 14" x 23" or smaller.

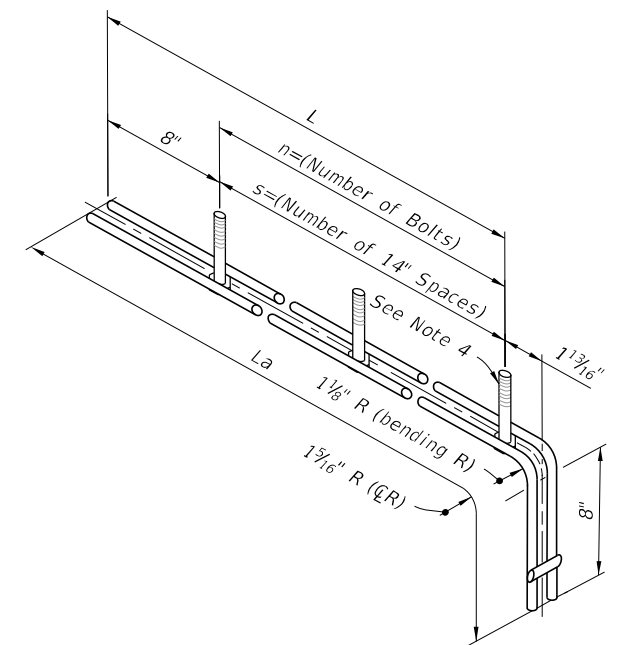
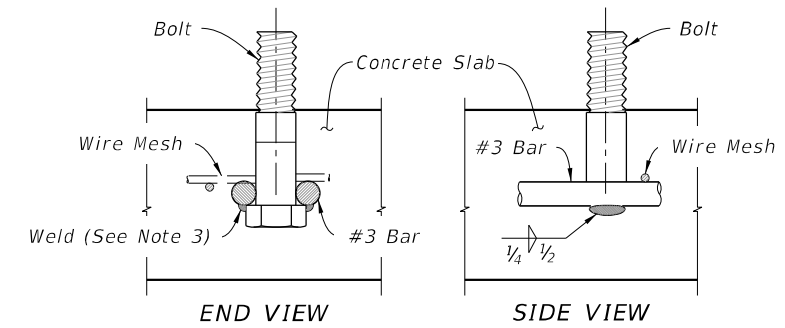
CONCRETE PIPE									
ROUND PIPE					ELLIPTICAL PIPE				
Pipe Dia.	s	n	L	La	Drain Size	s	n	L	La
*15"	3	4	4'-0"	4'-11"	*12"x18"	2	3	2'-10"	3'-9"
*18"	4	5	5'-2"	6'-1"	*14"x23"	3	4	4'-0"	4'-11"
*24"	6	7	7'-6"	8'-5"	19"x30"	4	5	5'-2"	6'-1"
30"	7	8	8'-8"	9'-7"	24"x38"	5	6	6'-4"	7'-3"
36"	9	10	11'-0"	11'-11"	29"x45"	7	8	8'-8"	9'-7"
42"	11	12	13'-4"	14'-3"	34"x53"	8	9	9'-10"	0'-9"
48"	13	14	15'-8"	16'-7"	38"x60"	10	11	12'-2"	13'-1"
54"	14	15	16'-10"	17'-9"	43"x68"	11	12	13'-4"	14'-3"
60"	16	17	19'-2"	20'-1"	48"x76"	13	14	15'-8"	16'-7"
					53"x83"	14	15	16'-10"	17'-9"
					58"x91"	15	16	18'-0"	18'-11"

CORRUGATED METAL PIPE									
ROUND PIPE					ARCHED PIPE				
Pipe Dia.	s	n	L	La	Drain Size	s	n	L	La
*15"	2	3	2'-10"	3'-9"	*17"x13"	1	2	1'-8"	2'-7"
*18"	3	4	4'-0"	4'-11"	*21"x15"	2	3	2'-10"	3'-9"
*24"	5	6	6'-4"	7'-3"	*28"x20"	4	5	5'-2"	6'-1"
30"	7	8	8'-8"	9'-7"	35"x24"	5	6	6'-4"	7'-3"
36"	8	9	9'-10"	10'-9"	42"x29"	6	7	7'-6"	8'-5"
42"	10	11	12'-2"	13'-1"	49"x33"	7	8	8'-8"	9'-7"
48"	12	13	14'-6"	15'-5"	57"x38"	9	10	11'-0"	11'-11"
54"	14	15	16'-10"	17'-9"	64"x43"	10	11	12'-2"	13'-1"
60"	15	16	18'-0"	18'-11"	71"x47"	12	13	14'-6"	15'-5"

* See Note 5

MULTIPLE FASTENER UNIT DETAIL
(For Single and Multiple Pipes)

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

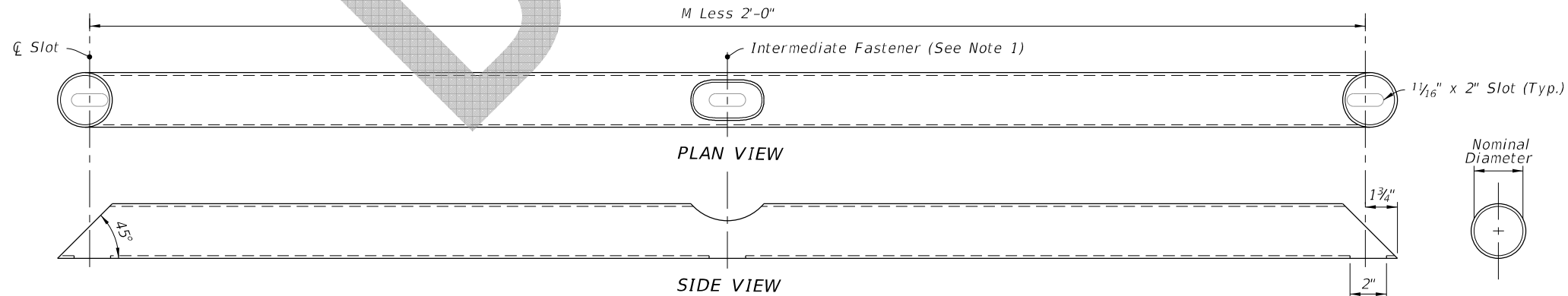


NOTE:

1. Install intermediate slot and fastener for multiple drain pipes only.

- Options for top opening:
- a. 4" of 6" mill head cut, 1" deep
 - b. 2" diameter drilled hole
 - c. 1 1/16" x 2" slot

Bottom opening: 1 1/16" x 2" slot.



GRATE DETAIL
(For Single and Multiple Pipes)

FASTENER UNIT AND GRATE DETAILS

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