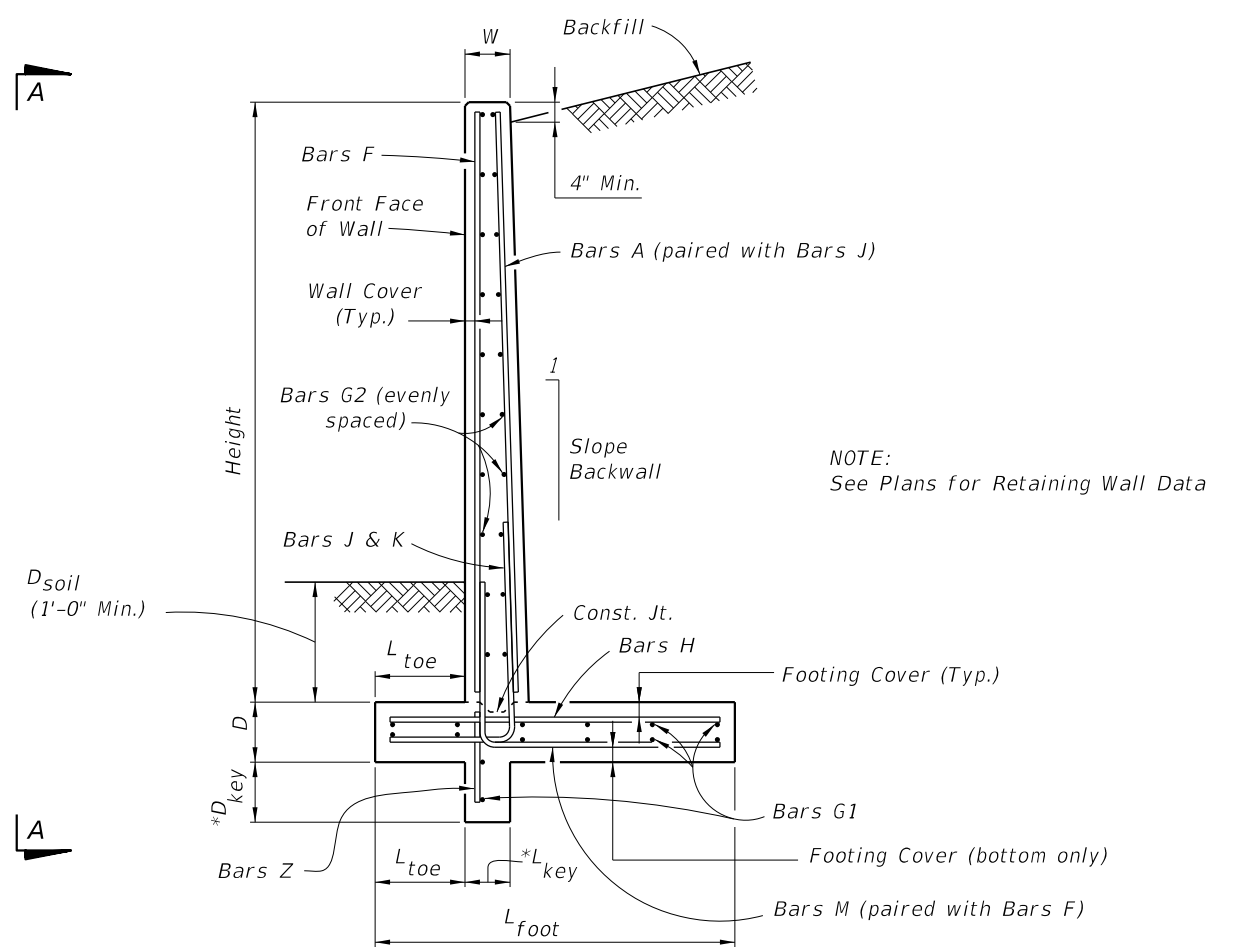


VIEW A-A
(Shear key shown dashed)



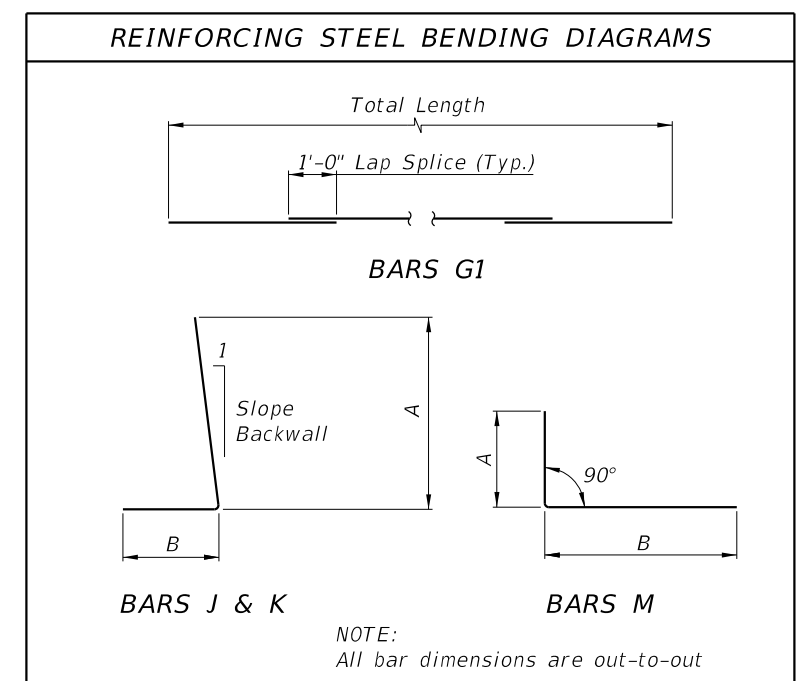
* Shear Key is required only when specified in the Plans.

TYPICAL SECTION


NOTES

TRAFFIC RAILINGS OR PARAPETS:
If there is a Traffic Railing or Parapet on the wall, align Wall Joints with V-Grooves, and Wall Expansion Joints with Barrier Open Joints.

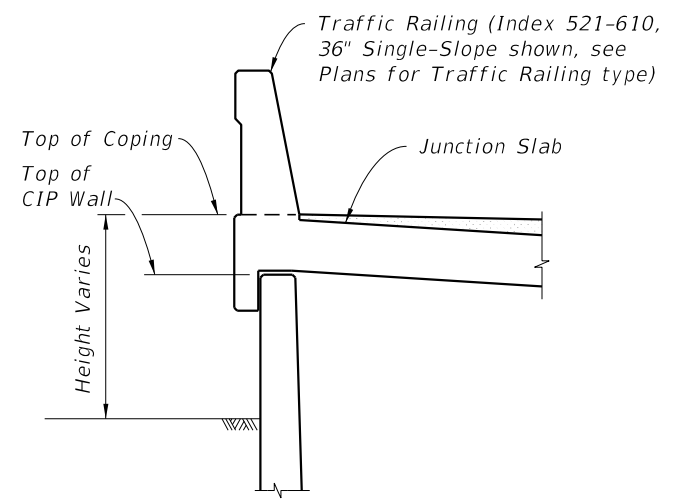
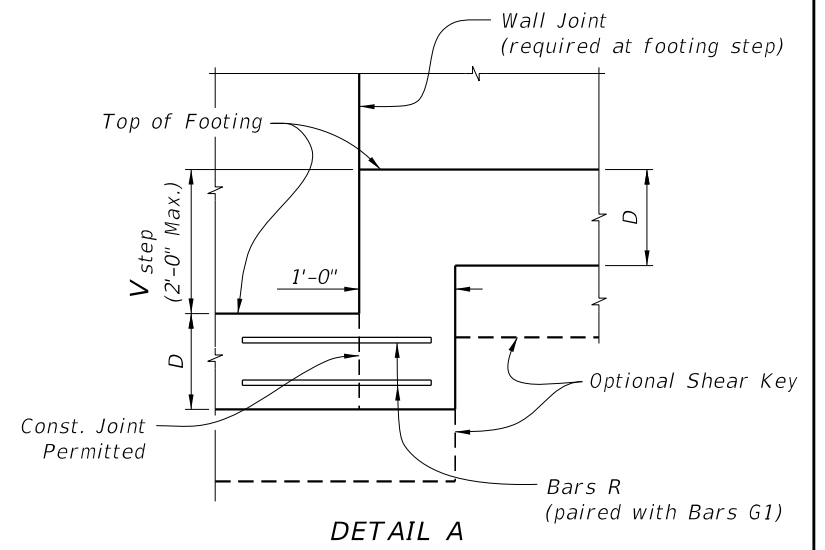
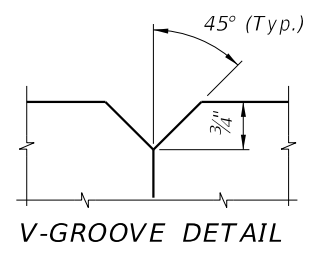
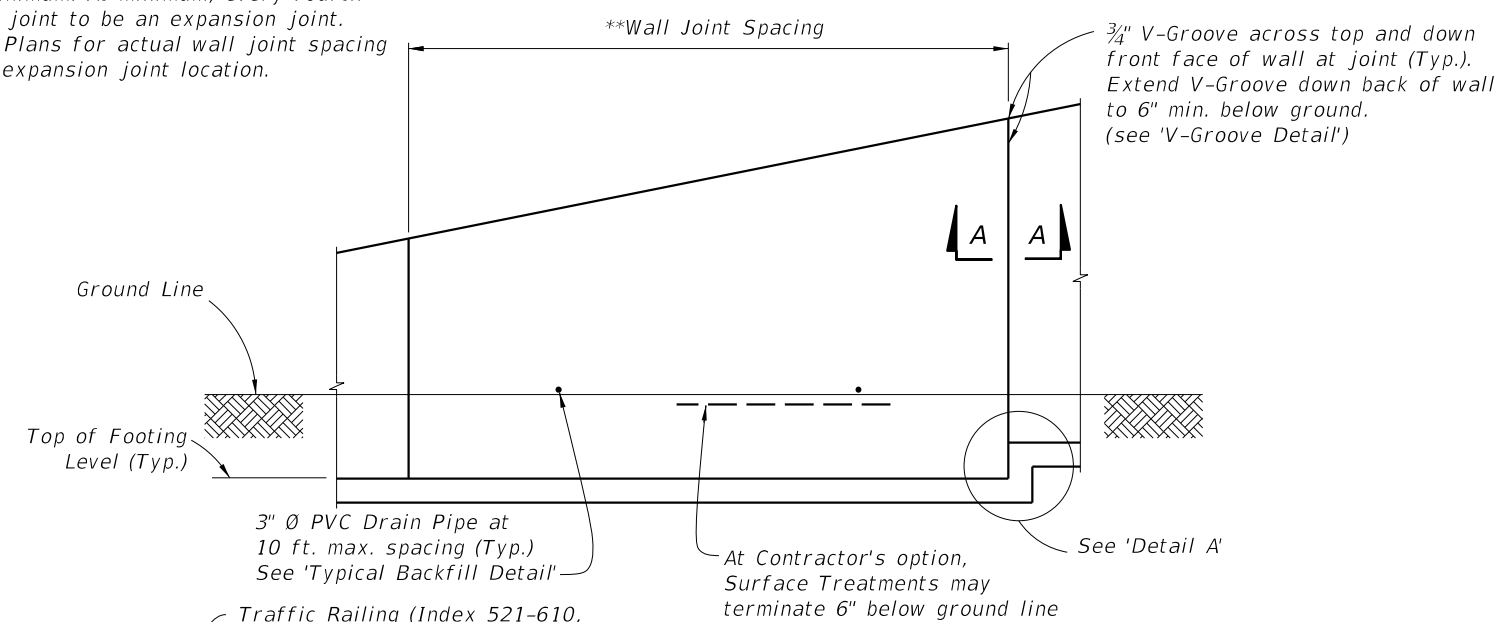
FOUNDATION:
Prepare the soil below the footing in accordance with the requirements for spread footings in Specification Section 455.



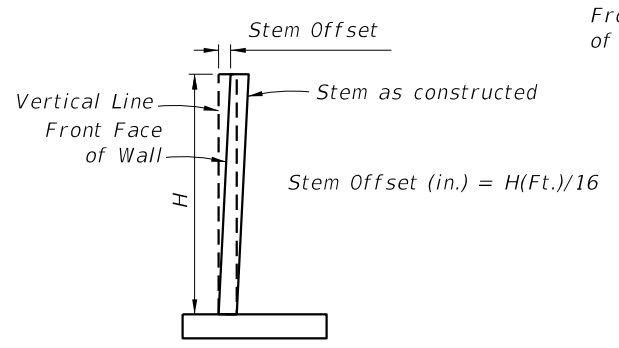
10/29/2019 8:15:03 AM

LAST REVISION 11/01/17	REVISION	DESCRIPTION:	 FY 2020-21 STANDARD PLANS	CANTILEVER RETAINING WALL (C-I-P)	INDEX 400-010	SHEET 1 of 2
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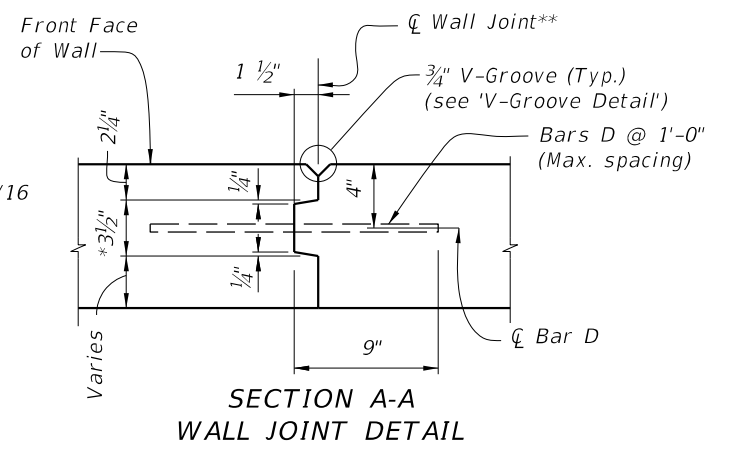
**Wall joint spacing 25 ft. maximum and 5' minimum. At minimum, every fourth wall joint to be an expansion joint. See Plans for actual wall joint spacing and expansion joint location.



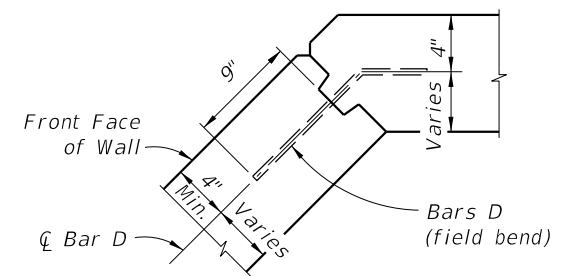
FRONT ELEVATION



STEM OFFSET VALUES
(for H < 20 Ft.)

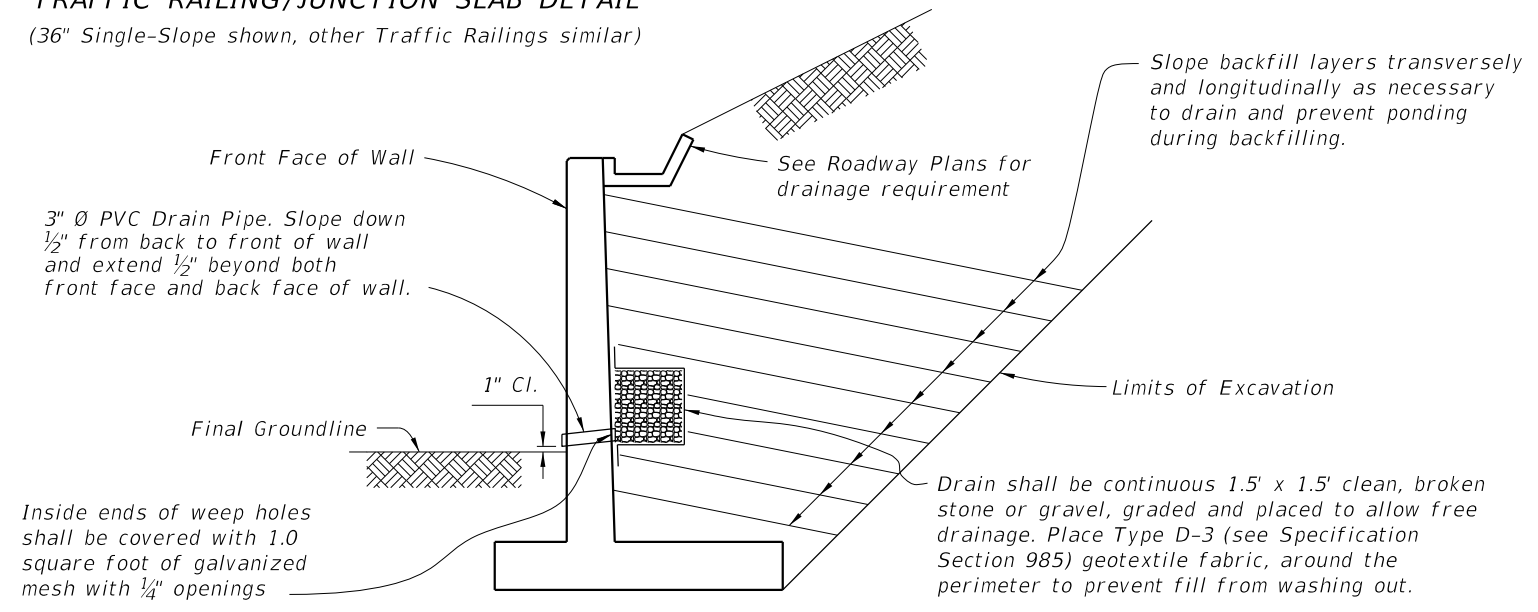


SECTION A-A WALL JOINT DETAIL

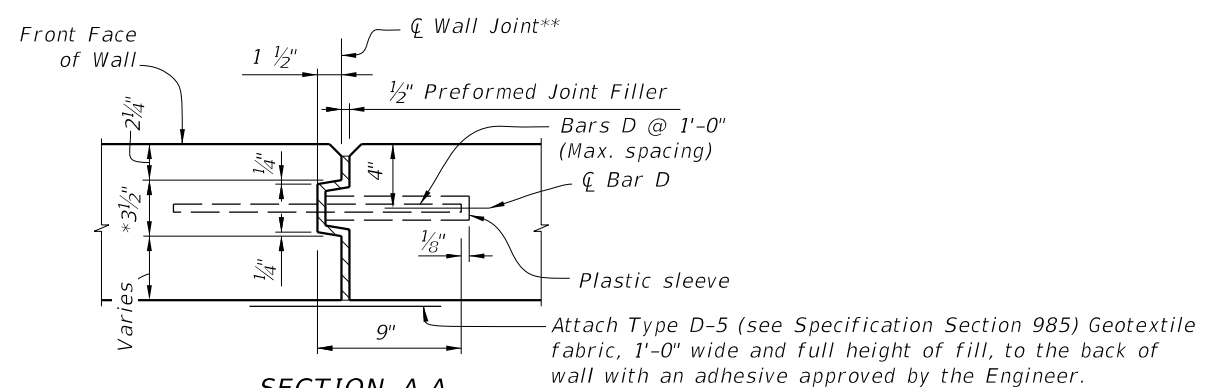


TYPICAL CORNER JOINT DETAIL

TRAFFIC RAILING/JUNCTION SLAB DETAIL
(36" Single-Slope shown, other Traffic Railings similar)



TYPICAL BACKFILL DETAIL



SECTION A-A EXPANSION JOINT DETAIL

* Key to stop at top of footing and 6" from top of wall. Joint across footing and top of wall to be a straight line.

** Stay-In-Place Plastic Preformed Bond Beakers are permitted to form joints.

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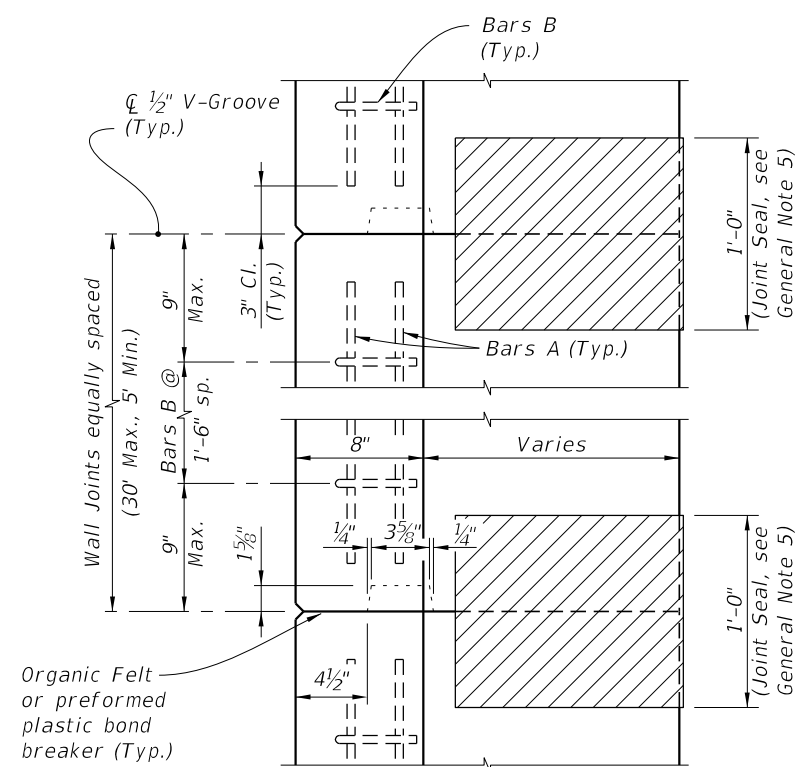
LAST REVISION 11/01/17	REVISION	DESCRIPTION:	 FY 2020-21 STANDARD PLANS	CANTILEVER RETAINING WALL (C-I-P)	INDEX 400-010	SHEET 2 of 2
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GENERAL NOTES

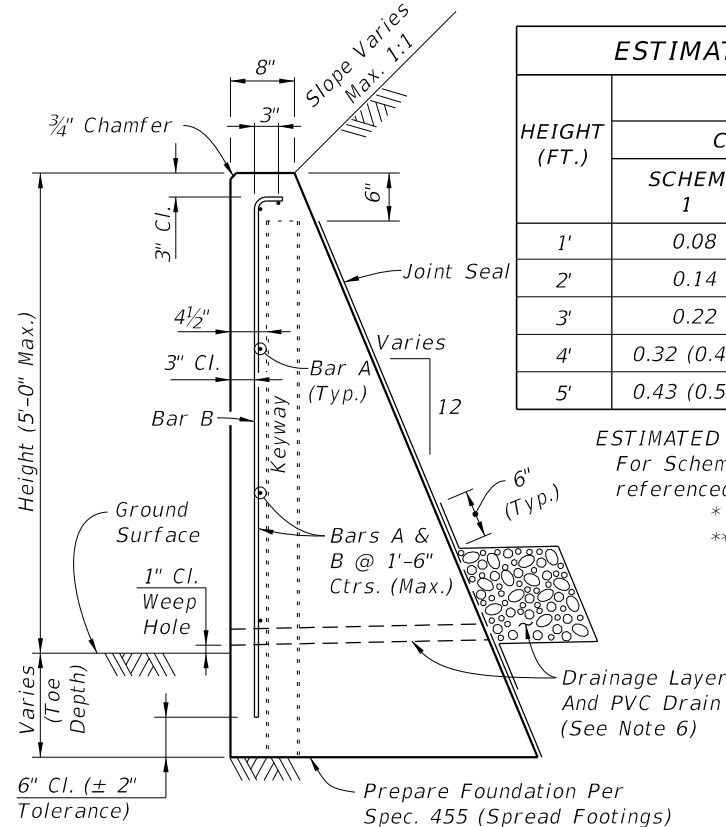
- C-I-P Gravity Walls constructed as extensions of reinforced concrete retaining walls, except walls of proprietary designs, shall have the same face texture and finish as the reinforced concrete retaining wall.
- Concrete for Gravity Wall shall be Class NS per Section 347. Concrete for Scheme 3 Junction Slab and Traffic Railing shall be Class II per Section 346, unless otherwise specified in the plans.
- Reinforcing steel shall meet the requirements of Specification Section 931 (Grade 40 or 60). Smooth or Deformed Welded Wire Reinforcement (WWR) may be substituted on an equal area basis. Do not increase bar/wire spacing for Grade 60 reinforcing steel or WWR.
- When required, for adjunct guiderail, see Index 515-070 or 515-080 as appropriate. For adjunct Type B fence see Index 550-002.
- Joint Seal: Organic Felt bond breaker in accordance with Specification Section 400 or Type D-5 geotextile fabric in accordance with Specification Section 985. Mop all contact surfaces of concrete and Organic Felt or geotextile fabric with cut-back asphalt. Stop Organic Felt or geotextile fabric 6" below top of wall.
- Provide a continuous 1'x1' clean gravel or crushed rock drain for wall heights 3 ft. and higher. Wrap drainage layer as shown, with Type D-3 geotextile fabric in accordance with Specification Section 985. Provide 8"x8" galvanized mesh with 1/4" openings, at the inside end of the PVC Drain Pipe. Provide 2" Ø PVC Drain Pipe (Sch. 40) at 10 ft. max. spacing (when Drainage Layer is required). Locate outermost edge of Drain Pipe a minimum of 2'-0" from wall joints.
- Cost of reinforcing steel, face texture, finish, joint seal, drain pipes, drainage layer, galvanized mesh and geotextile fabric to be included in the Contract Unit Price for Concrete Class NS, Gravity Wall. Cost of concrete for Junction Slab in Scheme 3, to be included in Contract Unit Price for Concrete Traffic Railing Barrier With Junction Slab. Adjunct railings or fences to be paid for separately.

HEIGHT (FT.)	PER LINEAR FOOT OF WALL			WEEP HOLES & DRAIN REQD.
	CLASS NS CONCRETE (CY)			
	SCHEME 1	SCHEME 2	SCHEME 3**	
1'	0.08	0.11 (0.20*)	0.03	3 (4*) No
2'	0.14	0.20 (0.32*)	0.09	4 (5*) No
3'	0.22	0.32 (0.47*)	0.29	5 (6*) Yes
4'	0.32 (0.43*)	0.47 (0.65*)	0.43	6 (7*) Yes
5'	0.43 (0.55*)	0.65 (0.85*)	0.60	7 (8*) Yes

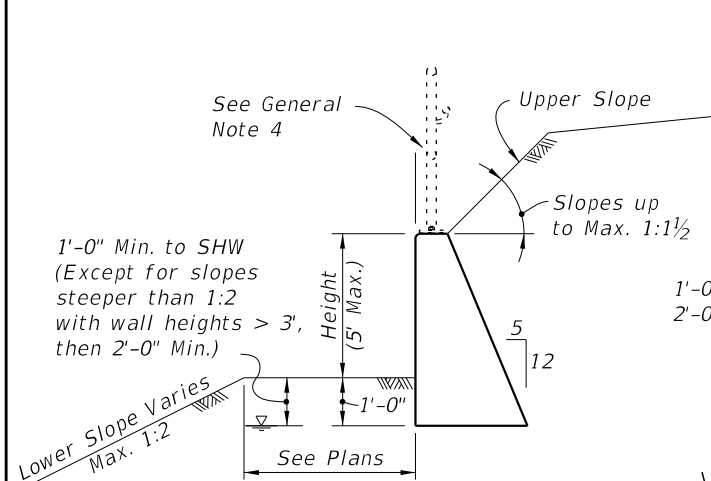
ESTIMATED QUANTITIES NOTES:
 For Scheme 3 Junction Slab and Traffic Railing see the referenced Index for estimated quantities.
 * Quantity for 2'-0" Toe Depth.
 ** Quantity for Scheme 3 assumes 1'-3" thick coping above Gravity Wall.



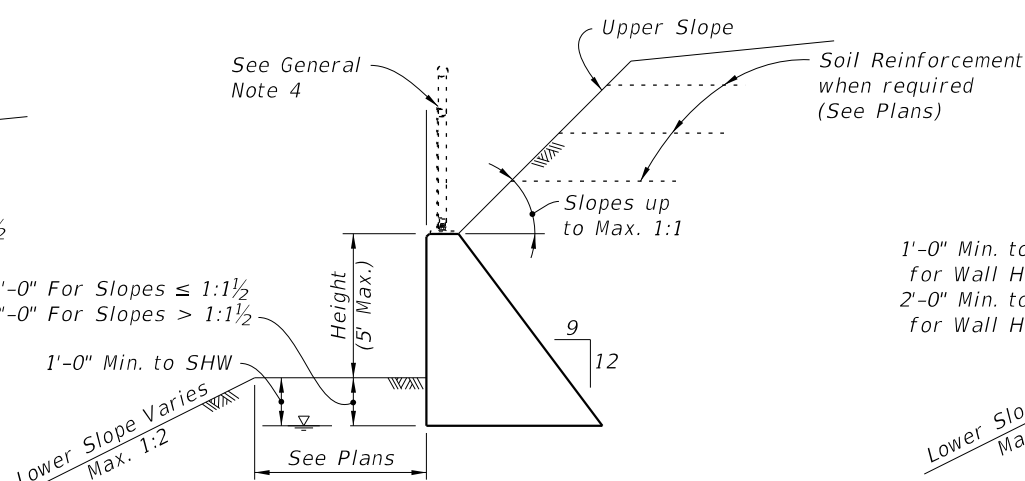
KEYWAY & WALL JOINT DETAIL (TOP VIEW)



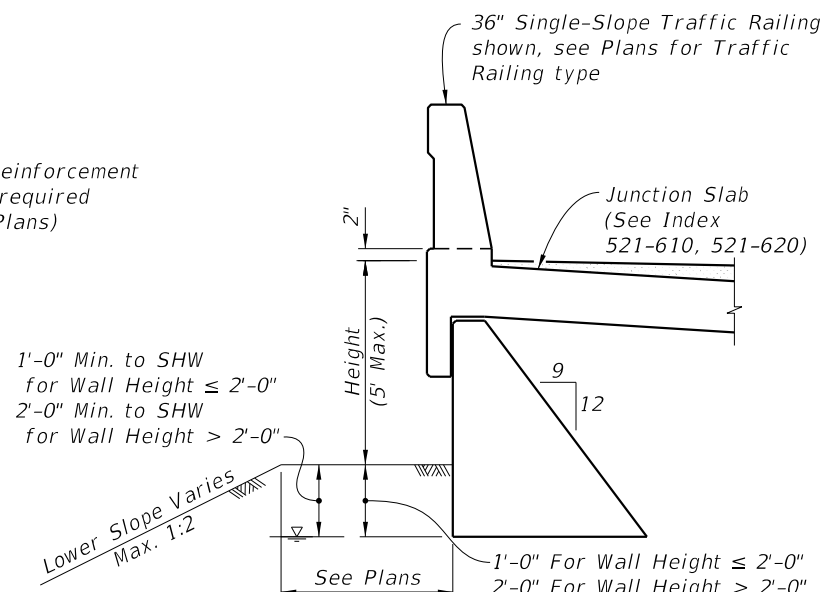
TYPICAL SECTION C-I-P CONCRETE GRAVITY WALL



SCHEME 1 (No Traffic Loading Effects & Upper Slopes ≤ 1:1 1/2)



SCHEME 2 (With Traffic Loading or Upper Slopes > 1:1 1/2)



SCHEME 3 (With Traffic Railing)

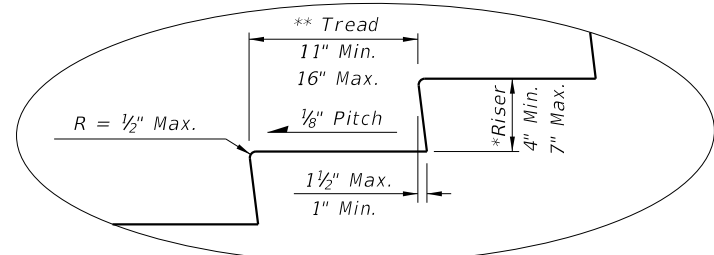
BILL OF REINFORCING STEEL		
MARK	SIZE	LENGTH
A	4	As Reqd.
B	4	As Reqd.

BAR BENDING DIAGRAM

Bar bending diagram for Scheme 3 showing wall joint spacing - 4" (29'-8" Max.), wall joint spacing - 4", and bar dimensions for BAR A and BAR B.

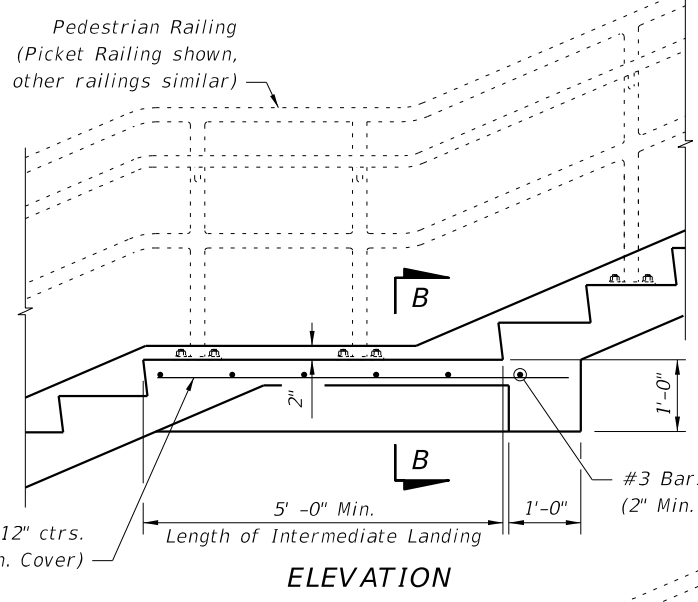
NOTES:
 1. All bar dimensions are out to out.
 2. Lap splices for Bars A must be a minimum of 1'-10".

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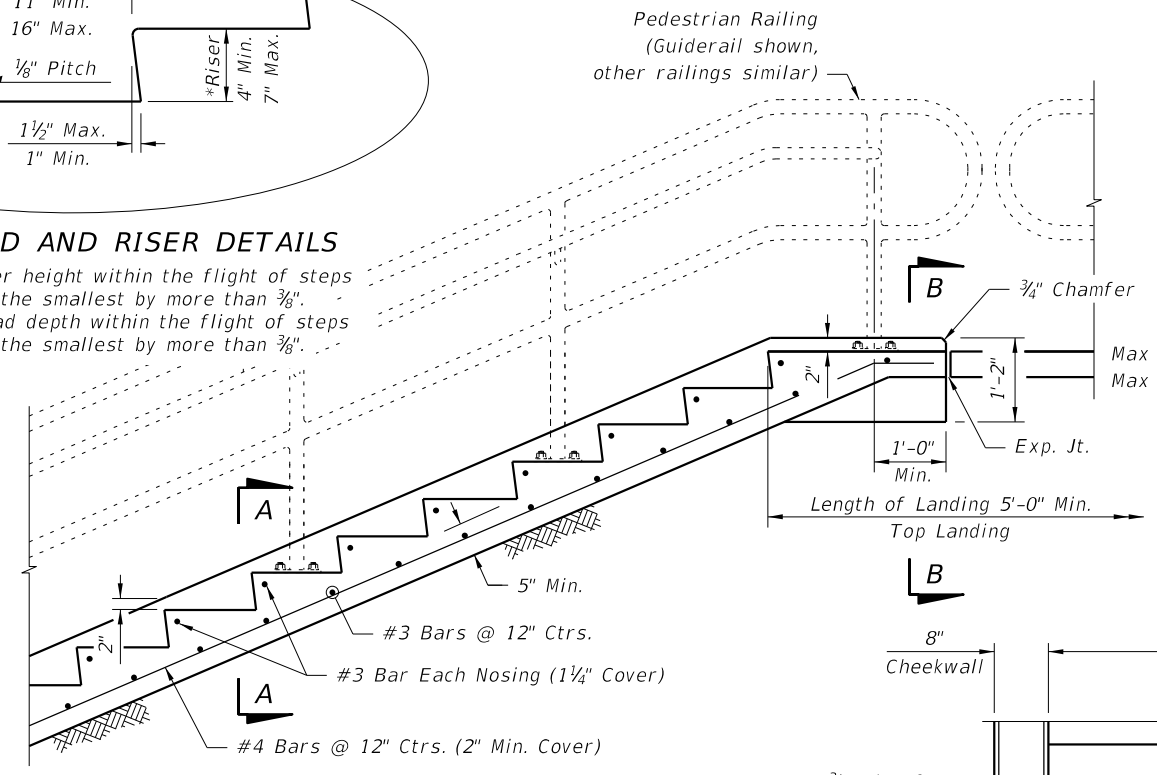


STAIR TREAD AND RISER DETAILS

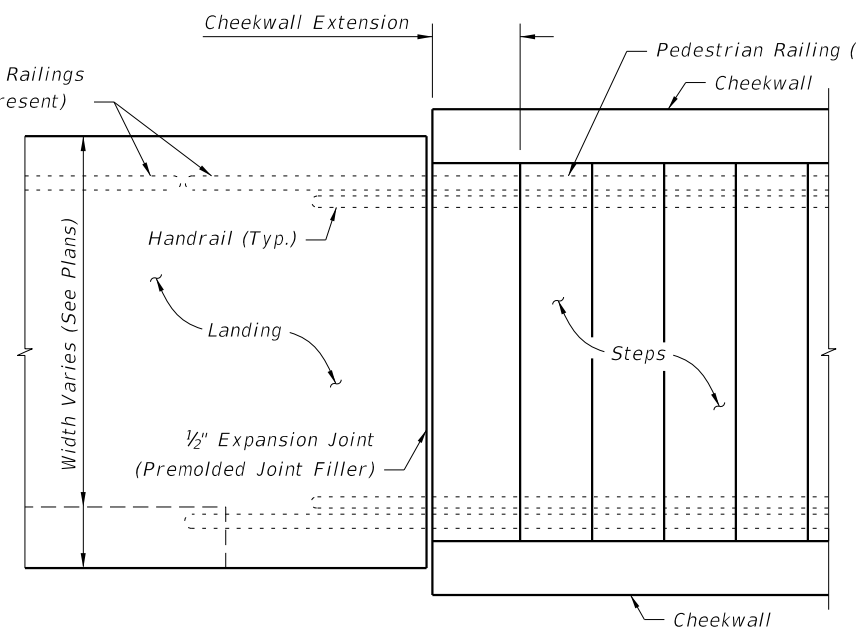
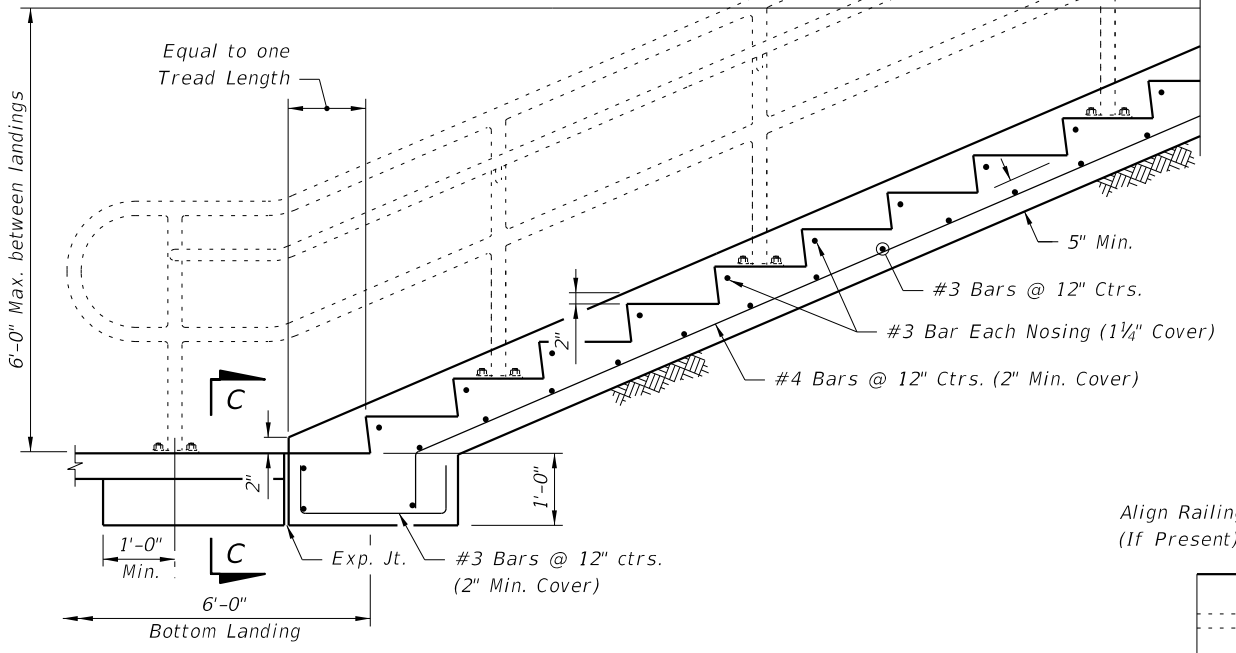
* The greatest riser height within the flight of steps shall not exceed the smallest by more than 3/8".
 ** The greatest tread depth within the flight of steps shall not exceed the smallest by more than 3/8".



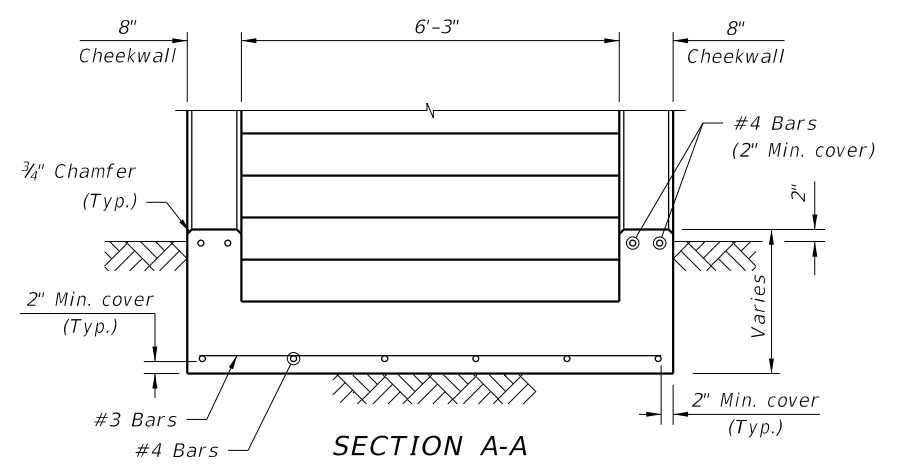
ELEVATION



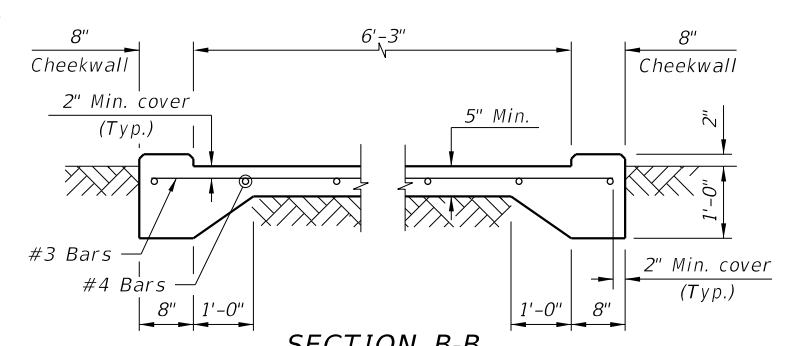
NOTE: Provide a maximum of 12 risers between landings.



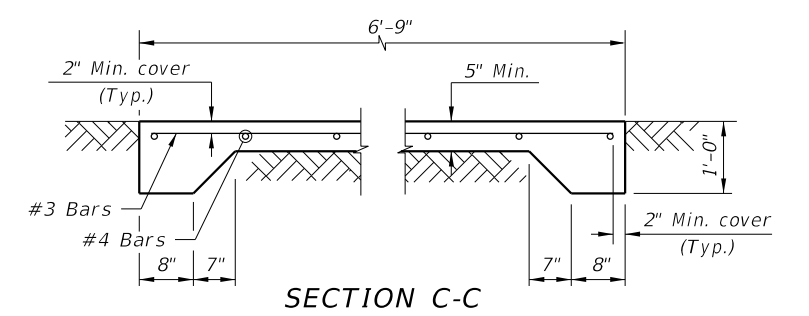
PLAN AT JUNCTION OF STEPS & LANDING
 (Bottom Landing shown, Top Landing similar)



SECTION A-A



SECTION B-B



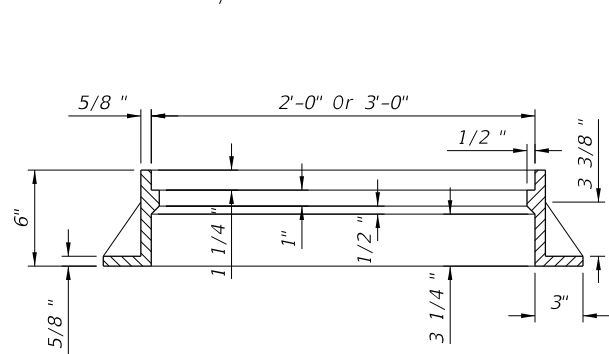
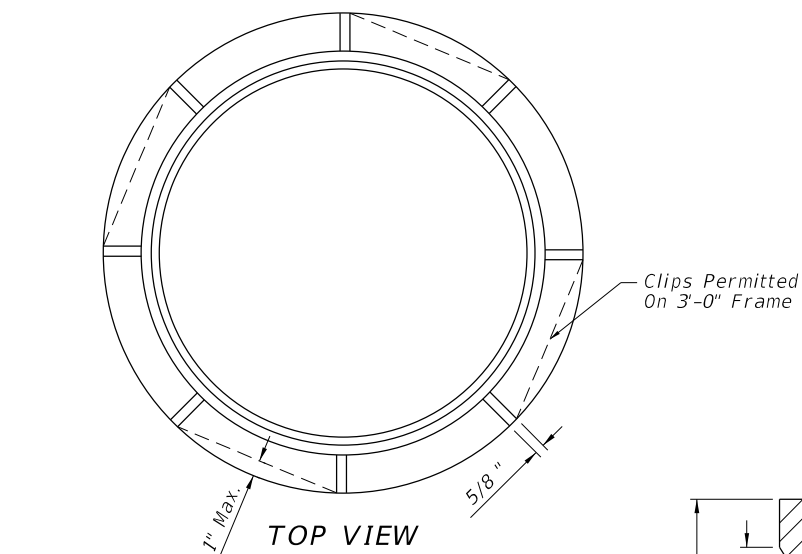
SECTION C-C

Max Landing Slope = 2%
 Max Landing Cross-Slope = 2%

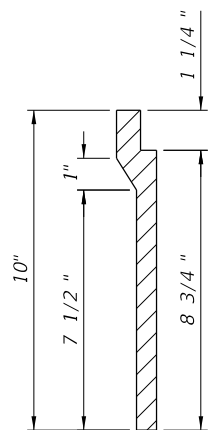
- NOTES:**
1. Do not use this Index for suspended (structural) steps or stairways.
 2. Construct steps in accordance with Specification 522.
 3. Concrete: Class NS, Specification 347.
 4. Tread Finish: Broom finish parallel to steps unless otherwise shown in Plans.
 5. Pedestrian Railing: See Indexes 515-052, 515-062, 515-070, 515-080 or Project Specific Design.
 6. Cost of concrete steps, landings and cheekwalls shall be paid for under the contract unit price for Class NS Concrete (Concrete Steps), CY. Cost of reinforcing steel shall be paid for under the contract unit price for Reinforcing Steel (Miscellaneous), LB.

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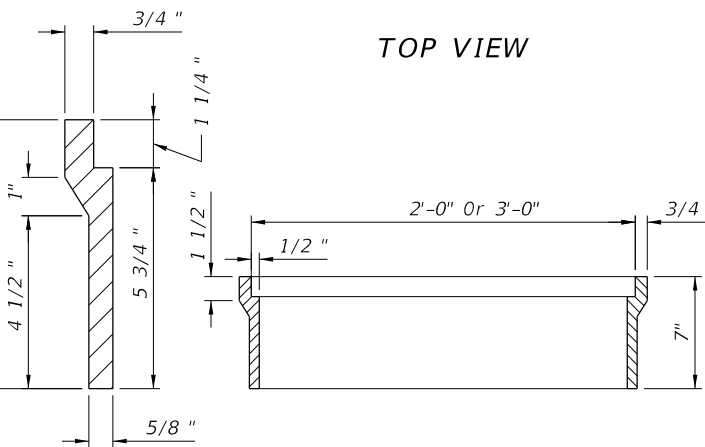
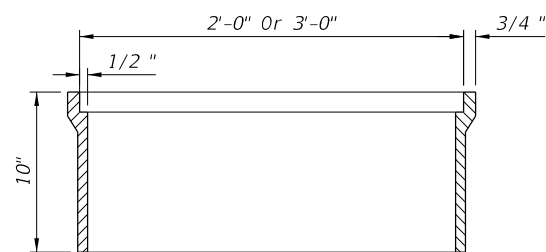
LAST REVISION 11/01/17	REVISION	DESCRIPTION:	 FY 2020-21 STANDARD PLANS	CONCRETE STEPS	INDEX 400-021	SHEET 1 of 1
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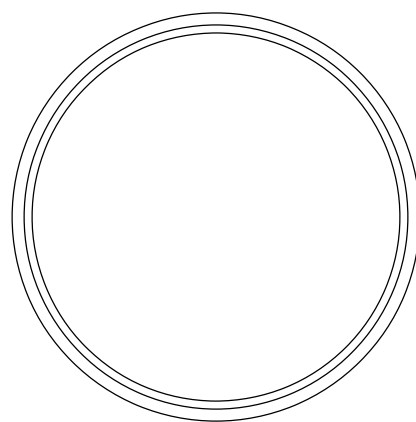
SECTION
For Manholes
TYPE I



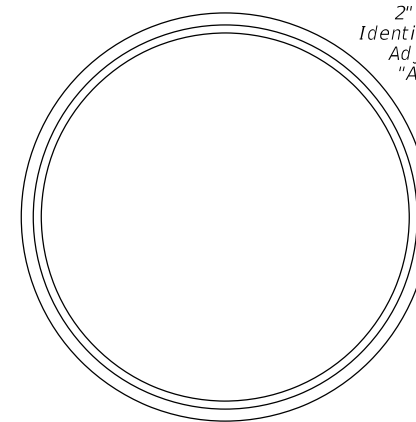
WALL SECTION
For Curb Inlets Types 1, 2, 3, & 4
TYPE II



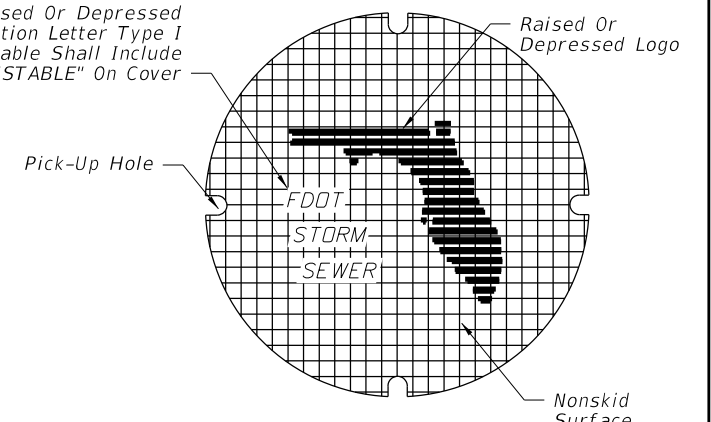
WALL SECTION
For Curb Inlets Types 7 & 8
TYPE III



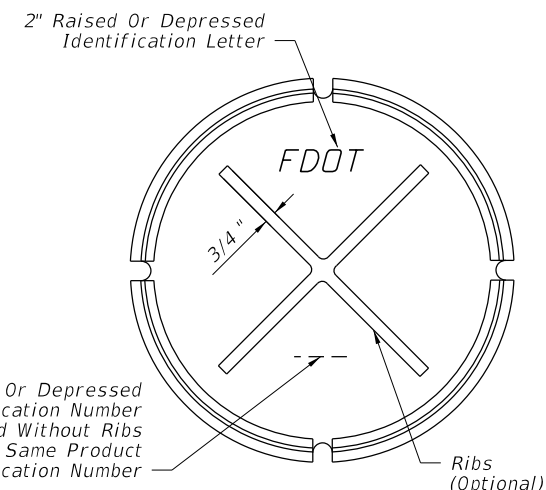
TOP VIEW



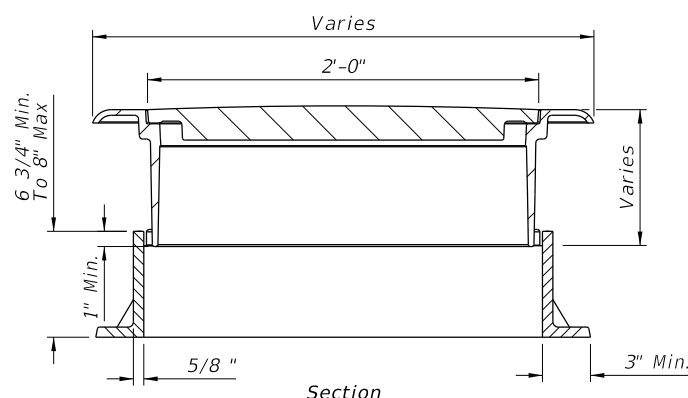
TOP VIEW



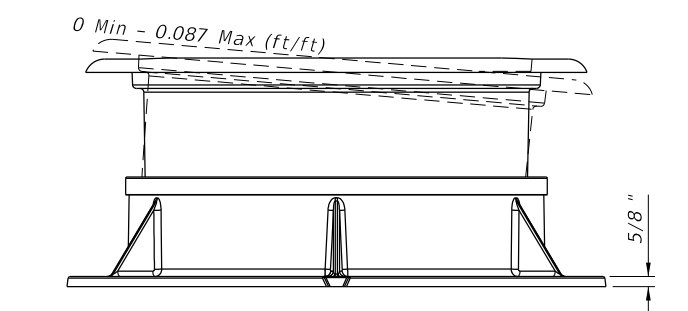
TOP VIEW



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

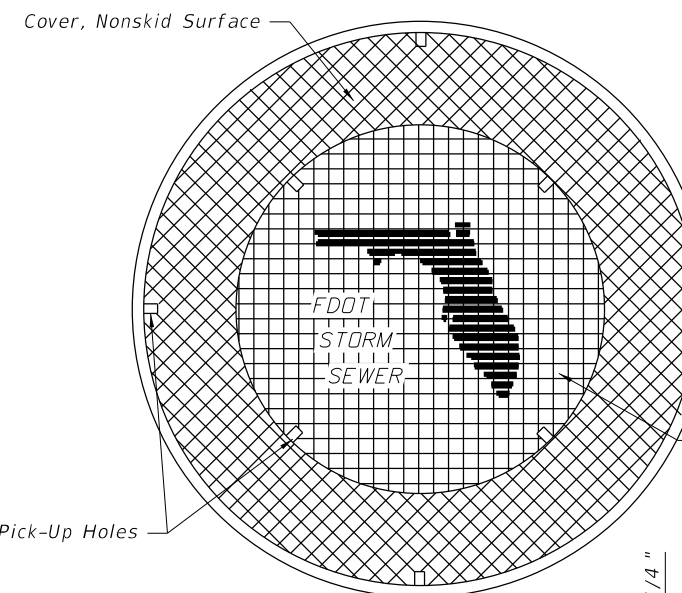
* Includes Type I Adjustable

NOTES (FRAMES, AND COVER)

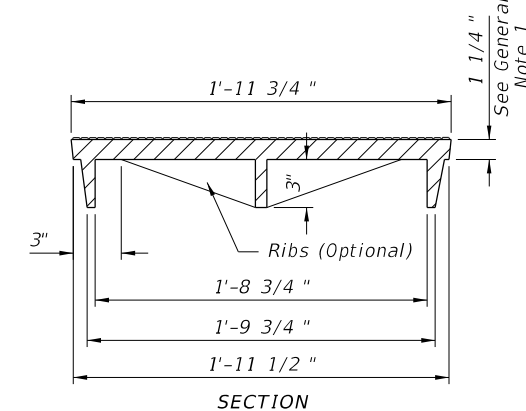
- The standard cover is to be used for all frames Types I, II, III and the 2-piece cover, and is the replacement cover for all previous frames with 1 1/2" deep seats (traffic type). The 185 lb. cover (nontraffic type), 1984 Roadway and Traffic Design Standards Index 201, is the replacement cover for existing frames with 1/2" deep seats. Installation of frame with 1/2" deep seats is not permitted.
- 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:

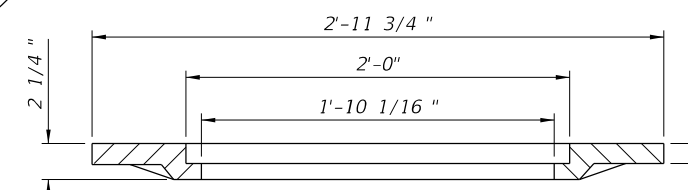
Consider using the 2-piece cover where depths exceed 5' and manual entry may be required for cleaning. Clearly note the requirement for a 2-piece cover, on the Drainage Structure sheets in the plans.



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



COVER FOR ALL FRAMES



2-PIECE COVER

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LAST REVISION
11/01/17

DESCRIPTION:

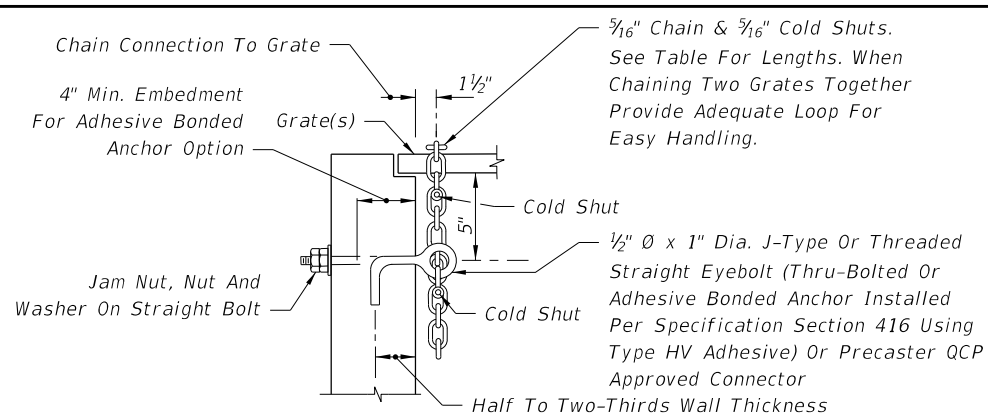


FY 2020-21
STANDARD PLANS

SUPPLEMENTARY DETAILS FOR
MANHOLES AND INLETS

INDEX
425-001

SHEET
1 of 5



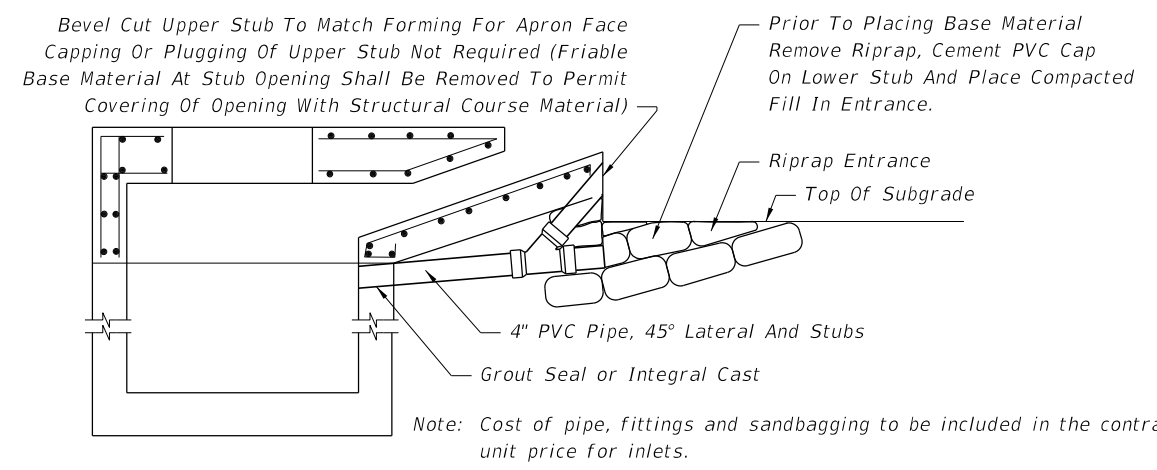
NOTE: When Alternate "G" grate is specified, the chain, bolt, nuts, washer and cold shuts shall be galvanized in accordance with Section 425 of the Standard Specifications.

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

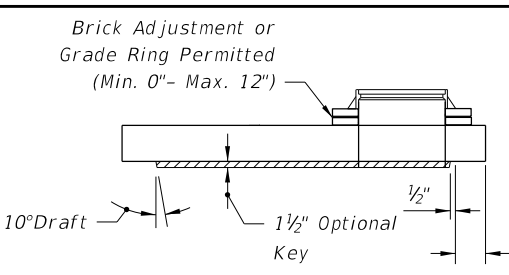
EYEBOLT AND CHAIN REQUIREMENTS

Index Number	Inlet Type	Eye-Bolts	Length Of Chain	Handling & Remarks
425-030	1	1	4'-0"	Slide & Spin
	2	1	4'-0"	Slide & Spin
	3	2	2 @ 4'-0"	Slide & Spin
	4	2	2 @ 4'-0"	Slide & Spin
	5	2	2 @ 4'-0"	Slide & Spin
425-031	N/A	1	3'-8"	Slide Or Slide & Spin
425-032	N/A	1	4'-0"	Slide & Spin
425-040	S	1	4'-0"	Slide & Spin
425-041	V	1	4'-0"	Slide & Spin
425-050	A	1	3'-0"	Slide
425-051	B	1	5'-0"	Slide & Spin
425-052	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" Center Grate(s) Chained To One End Grate
425-053	F	1	3'-6"	Flip Or Slide & Spin
	G	1	6'-0"	Slide
425-054	J	1	2'-0"	Lifting Loop
			4'-0"	Slide & Spin

EYEBOLT AND CHAIN FOR LOCKING GRATES TO INLETS

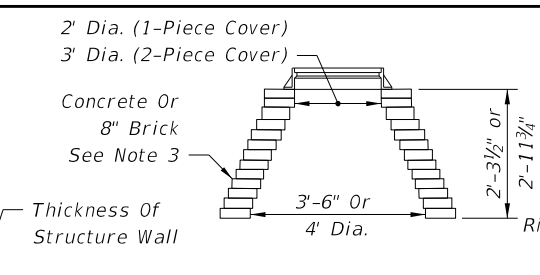


TEMPORARY DRAINS FOR SUBGRADE AND BASE

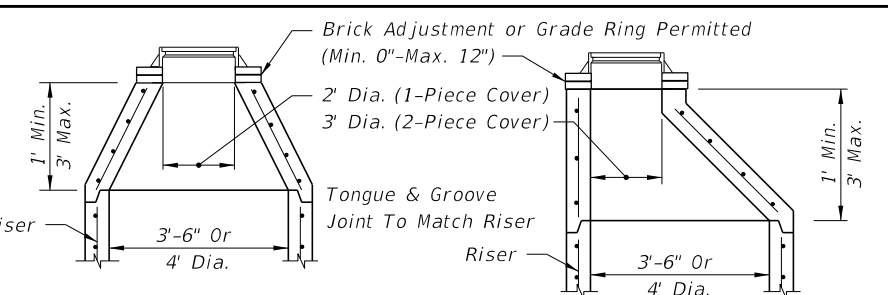


SECTION TYPE 7

Note: See Slab Designs Index 425-010.



BRICK OR CONCRETE PRECAST CONCENTRIC CONE TYPE 8



PRECAST ECCENTRIC CONE TYPE 8

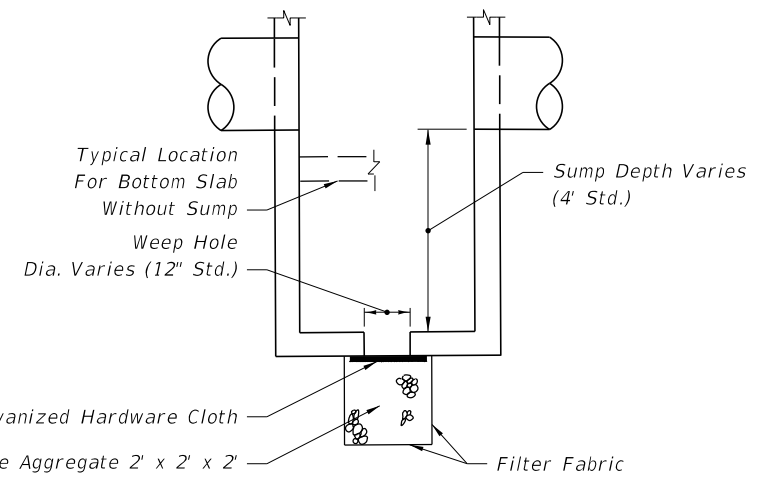
MANHOLE TOPS

NOTES (TOPS)

- 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 3.
- 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.
- 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.
- Manhole tops shall be secured to structures by optional construction joints as shown on Sheet 3.
- Frames can be adjusted a maximum 12" height with brick or precast ASTM C478 grade rings.
- Substitution of manhole top Type 8 for manhole top Type 7 is allowed provided that minimum dimensions shown above are not reduced.
- 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.

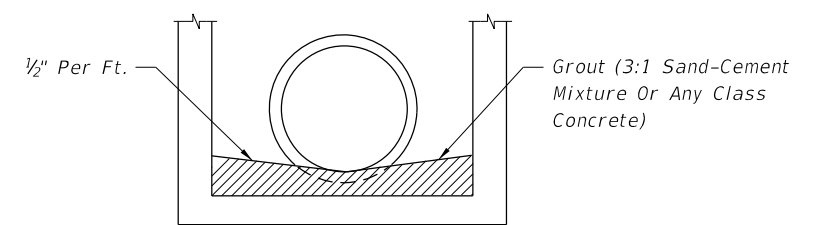
DESIGN NOTES

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



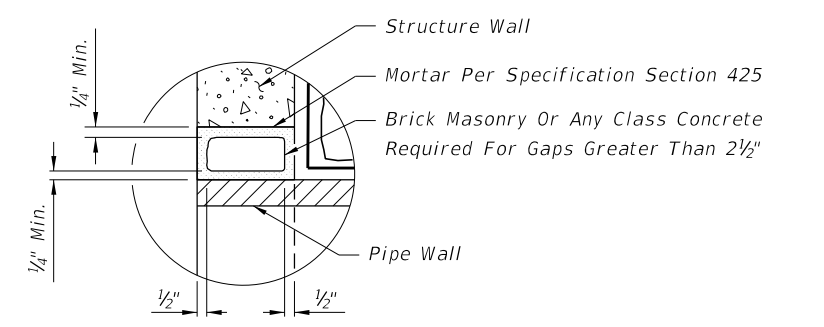
NOTE: Sump bottom appropriate for all manhole and inlet types. Sumps are to be constructed in inlet and manholes connected to French Drains unless excluded in the plans. At other locations, sump is to be constructed only where called for in the plans. Weep holes to be constructed in sump bottom only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



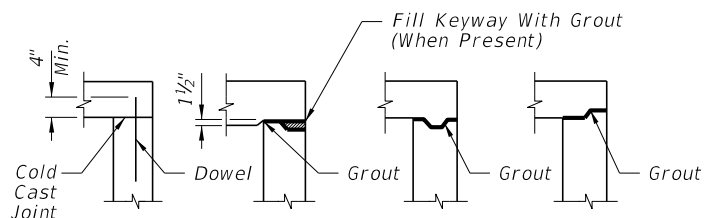
FILTER FABRIC WRAP ON GROUTED PIPE TO STRUCTURE JOINT

FOR ALL STRUCTURES UNLESS EXCLUDED BY SPECIAL DETAIL ALL PIPE TYPES DRAINAGE STRUCTURE INVERT

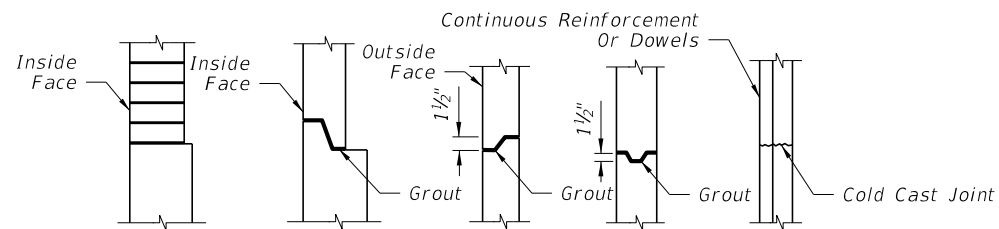


INSET A

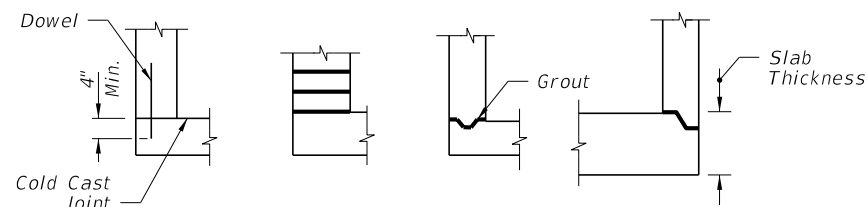
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TOP SLABS TO WALLS



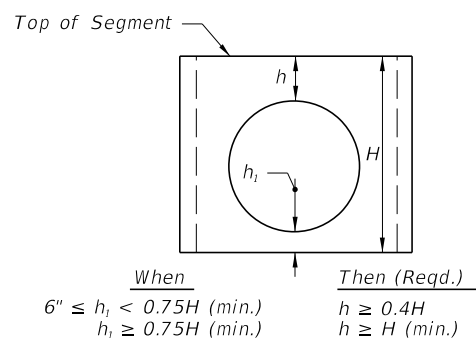
WALL JOINTS



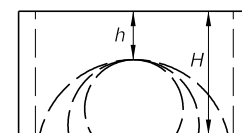
BOTTOM SLABS TO WALLS

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 1 1/2" 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 reinforcement 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 of the Specifications or by non-shrink grout, in accordance with Section 934 of the Specifications.
7. Insert products approved by the Engineer may be used in lieu of dowel embedment.

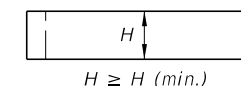
OPTIONAL CONSTRUCTION JOINTS



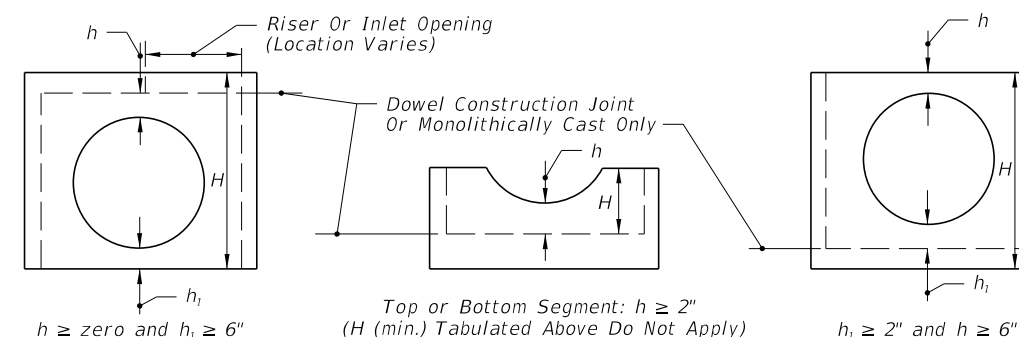
SEPARATE RISER SEGMENTS WITH CONSTRUCTION JOINTS OTHER THAN DOWEL OPTION



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.



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"

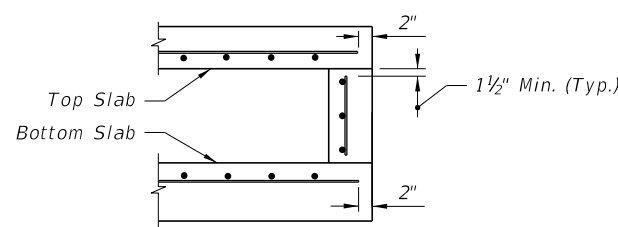


SEGMENTS FOR SLAB TO WALL DOWEL CONSTRUCTION JOINTS OR MONOLITHICALLY CAST SEGMENTS

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

COMPARATIVE SIDE VIEWS

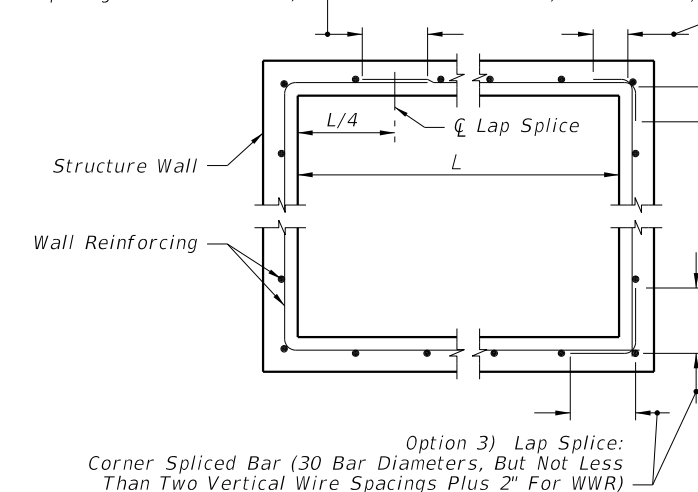
MINIMUM DIMENSIONS FOR BOX AND RISER SEGMENTS



(NOTE: NOT APPLICABLE AROUND MANHOLE AND RISER OPENINGS)

REBAR STRAIGHT END EMBEDMENT FOR TOP AND BOTTOM SLABS

Option 1) Lap Splice: At Quarter Point (30 Bar Diameters Or Vertical Wire Spacing Plus 2" For WWR)
 Option 2) Lap Splice: Standard 90° Hooks At Corners (8" For #4's, 10" For #5's, 12" for #6's)



Option 3) Lap Splice: Corner Spliced Bar (30 Bar Diameters, But Not Less Than Two Vertical Wire Spacings Plus 2" For WWR)

WALL REINFORCING SPLICE DETAILS

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LAST REVISION	DESCRIPTION:
11/01/17	



FY 2020-21
STANDARD PLANS

SUPPLEMENTARY DETAILS FOR
MANHOLES AND INLETS

INDEX
425-001

SHEET
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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 @ 6 1/2" Ctrs. #4 @ 12" Ctrs.	0.20	#3 @ 4 1/2" 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 @ 5 1/2" Ctrs. #4 @ 10" Ctrs.	0.24	#3 @ 3 1/2" Ctrs. #4 @ 6 1/2" 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 @ 3 1/2" Ctrs. #4 @ 6 1/2" Ctrs. #5 @ 10" Ctrs.	0.37	#4 @ 4" Ctrs. #5 @ 6 1/2" Ctrs. #6 @ 9 1/2" 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 @ 4 1/2" Ctrs. #5 @ 7" Ctrs. #6 @ 10" Ctrs.	0.53	#4 @ 3" Ctrs. #5 @ 4 1/2" Ctrs. #6 @ 6 1/2" 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 @ 3 1/2" Ctrs. #6 @ 4 1/2" Ctrs. #7 @ 6 1/2" 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 @ 3 1/2" Ctrs. #6 @ 5" Ctrs. #7 @ 7" Ctrs.	1.06	#6 @ 3" Ctrs. #7 @ 4 1/2" 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 @ 5 1/2" 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 @ 3 1/2" 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

NOTES FOR PRECAST OPTIONS AND EQUIVALENT REINFORCEMENT SUBSTITUTION

- Details for optional precast inlet construction up to depths of 15' are shown on the inlet indexes.
- When precast units are used in conjunction with Alt. "B" Structure Bottoms, Index 425-010, the interior dimensions of an Alt. "B" Bottom can be adjusted to reflect these inlet interior dimensions.
- Concrete which meets the requirements of ASTM C478 or Class IV must be used for precast structures constructed with 6" wall or slab thickness.
- 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:

$$\text{Grade 40 Steel Area} = A_{s40} = \frac{60}{40} \times A_{s60}$$

$$\text{Smooth Welded Wire Reinforcement Steel Area} = A_{s65} = \frac{60}{65} \times A_{s60}$$

$$\text{Deformed Welded Wire Reinforcement Steel Area} = A_{s70} = \frac{60}{70} \times A_{s60}$$

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:

$$\begin{aligned} \text{Max. Grade 40 Bar Spacing} &= \text{Grade 60 Bar Spacing} \\ \text{Max. Smooth Welded Wire Spacing} &= \text{Grade 60 Bar Spacing} \times 0.86 \\ \text{Max. Deformed Welded Wire Spacing} &= \text{Grade 60 Bar Spacing} \times 0.74 \end{aligned}$$

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":

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

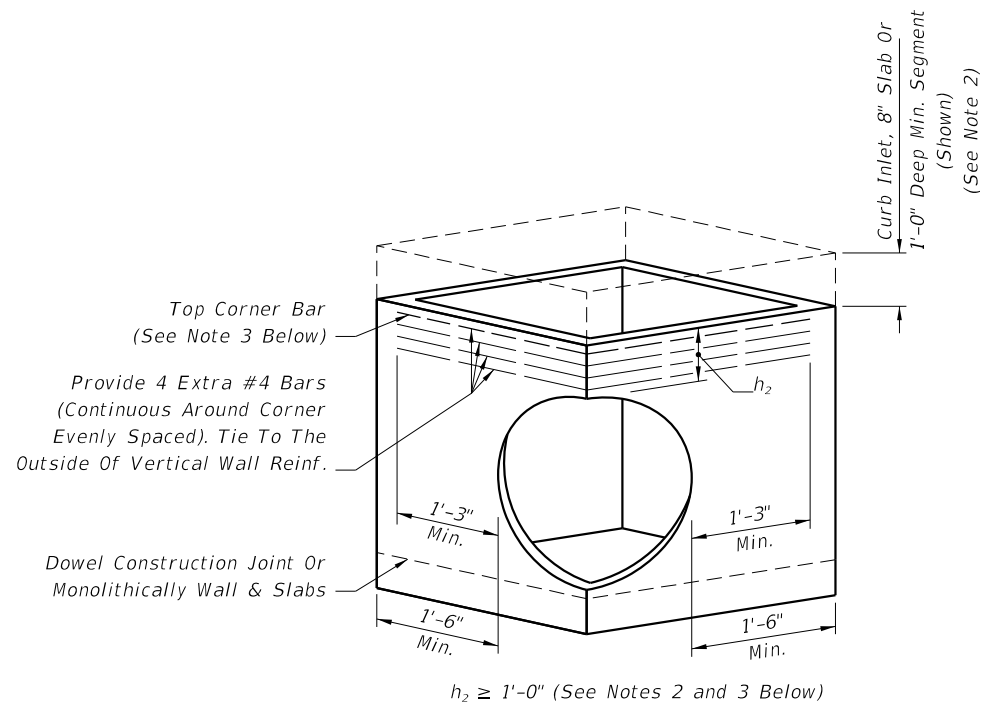
In no case will reinforcement with wires smaller than W3.1 or D4.0, or spacings greater than 8" be permitted. Bar reinforcement shall show the minimum yield designation grade mark or either the number 60 or one (1) grade mark line to be acceptable at the higher value. Maximum bar spacing shall not be 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 D4.0 are permitted in the walls of ASTM C 478 round structure bottoms and round risers.

- Fiber-reinforced concrete may be substituted for conventional steel reinforcement in accordance with the Structures Design Guidelines. Shop drawings corresponding to an approved fiber-reinforced concrete mix design must be submitted for approval to the State Drainage Engineer.

GENERAL NOTES

- For square or rectangular precast drainage structures, using either deformed or smooth WWR meeting the requirements of Specification Section 931, WWR shall be continuous around the box and lapped in accordance with Option 1 or 3 as shown in the Wall Reinforcing Splice Details.
- 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.
- Welding of splices and laps is permitted. The requirements and restrictions placed on welding in AASHTO M259 shall apply.
- 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.
- 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 in accordance with Specification Section 449.
- 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 2 1/2" wide.
- For pay item purposes, the height used to determine if a drainage structure is greater than 10 feet shall be computed using:
 - the elevation of the top of the manhole lid,
 - the grate elevation or the theoretical gutter grade elevation of an inlet, or
 - the outside top elevation of a junction box less the flow line elevation of the lowest pipe or to top of sump floor.

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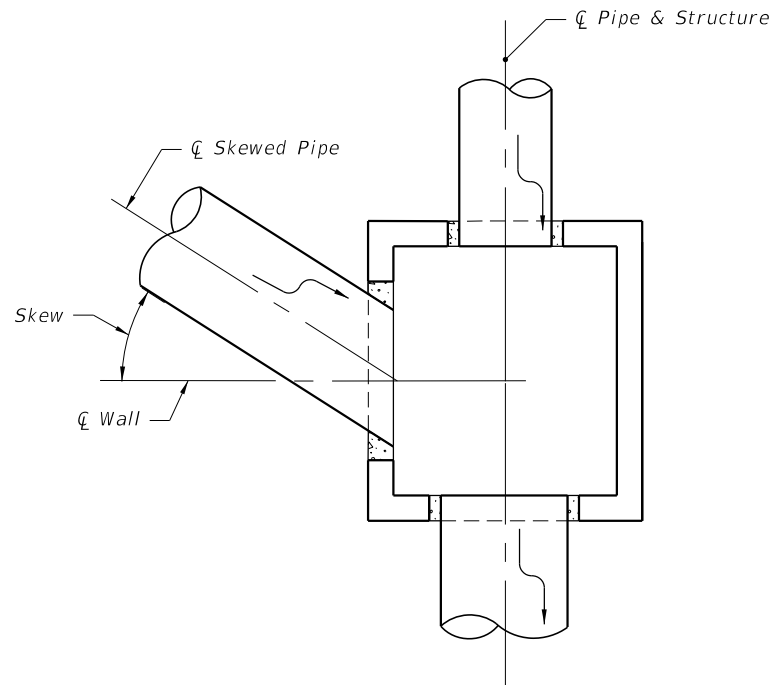


DESIGNER NOTE: Use only when round structures are not practical, engineer of record approval required.

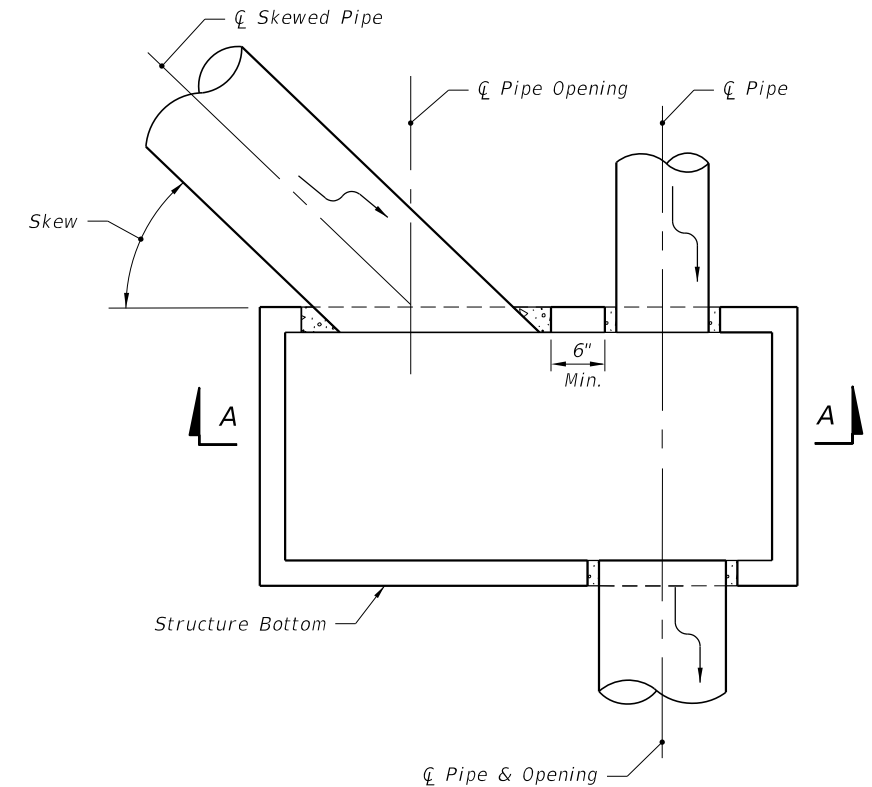
PICTORIAL VIEW

- 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 $1'-0" \leq h_2 < 2'-0"$.

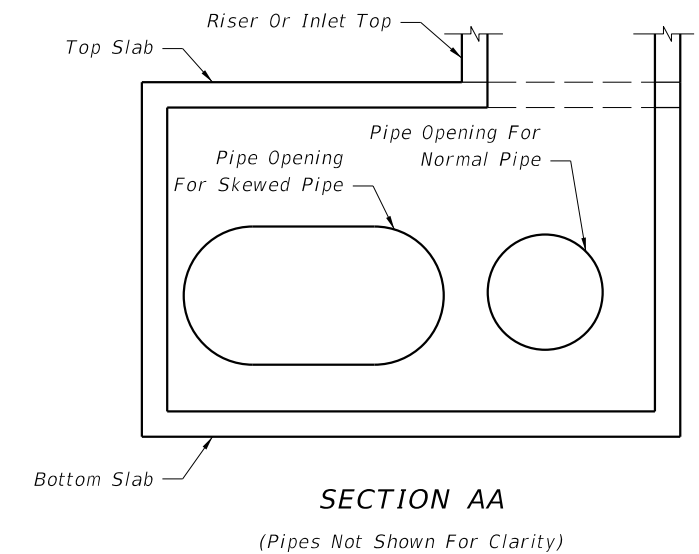
RECTANGULAR SEGMENT WITH PIPE OPENING AT CORNER



**PLAN VIEW FOR SKEWS $\leq 45^\circ$
(Not Centered)**



**PLAN VIEW FOR SKEWS $> 45^\circ$
(Not Centered)**



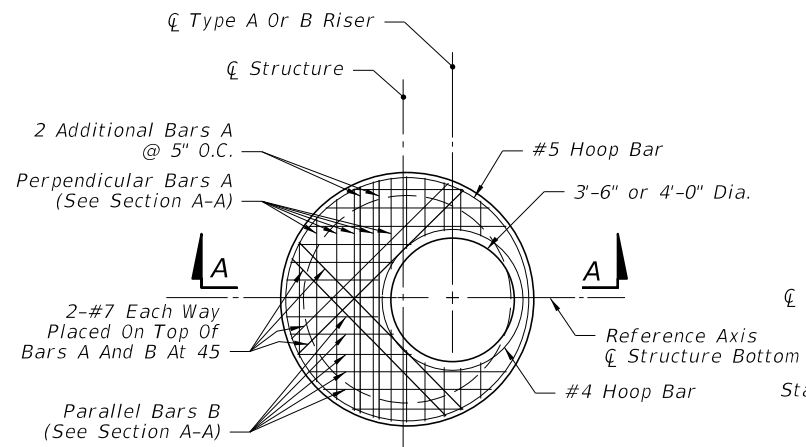
SECTION AA

(Pipes Not Shown For Clarity)

DETAILS FOR SKEWED PIPES IN RECTANGULAR STRUCTURES

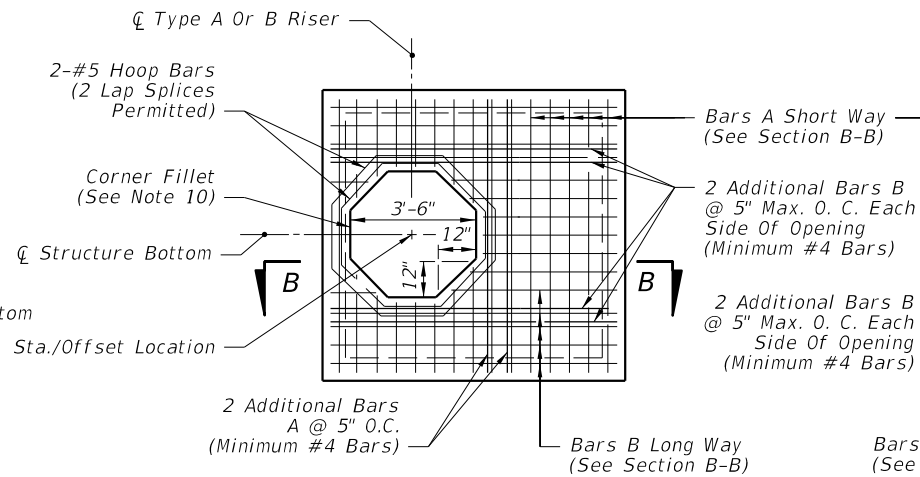
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LAST REVISION 11/01/17	REVISION	DESCRIPTION:		FY 2020-21 STANDARD PLANS	SUPPLEMENTARY DETAILS FOR MANHOLES AND INLETS	INDEX 425-001	SHEET 5 of 5
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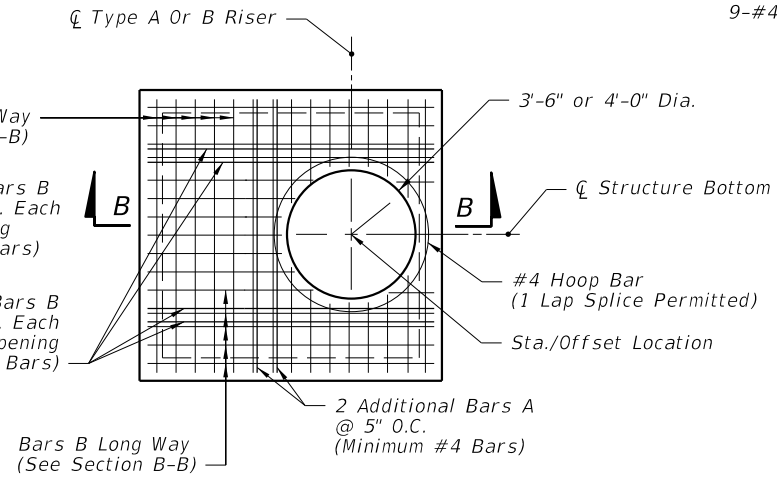


NOTE:
Not Applicable For Type A, B, C, D & E Ditch Bottom Inlets Or Type S & V Gutter Inlets.
See Indexes 425-040, 425-050, 425-051, and 425-052.

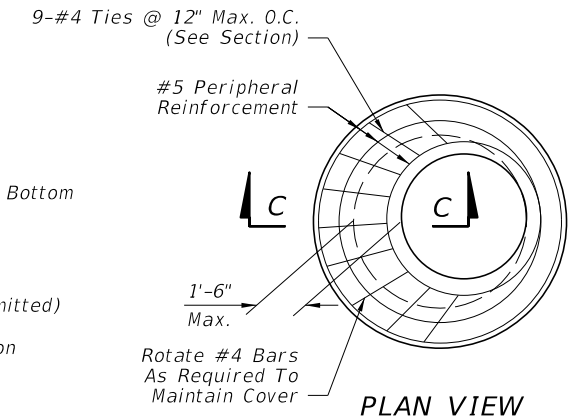
TOP SLAB REINFORCING STEEL DIAGRAM
(ALTERNATE A)



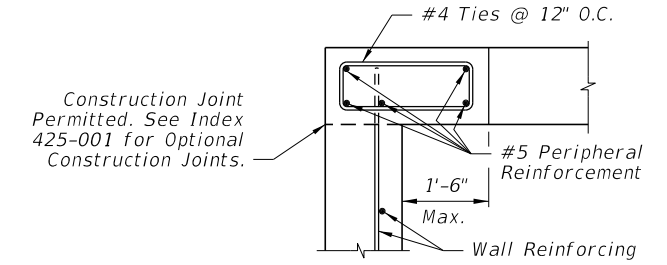
SQUARE OPENING WITH CORNER FILLETS
TOP SLAB REINFORCING STEEL DIAGRAM
(ALTERNATE B)



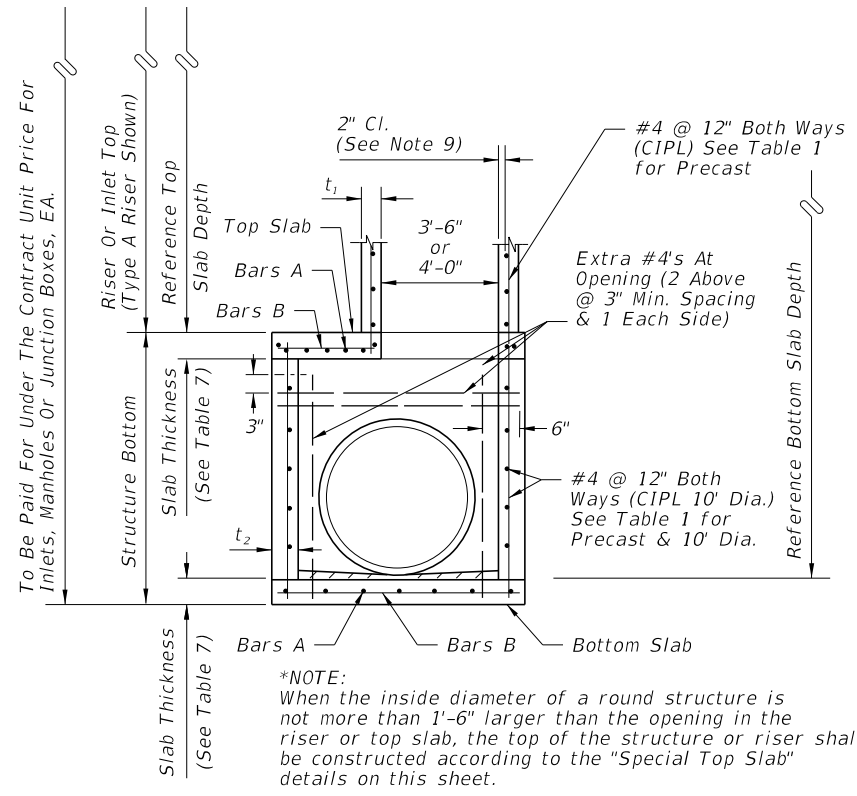
ROUND RISER OPENING
TOP SLAB REINFORCING STEEL DIAGRAM



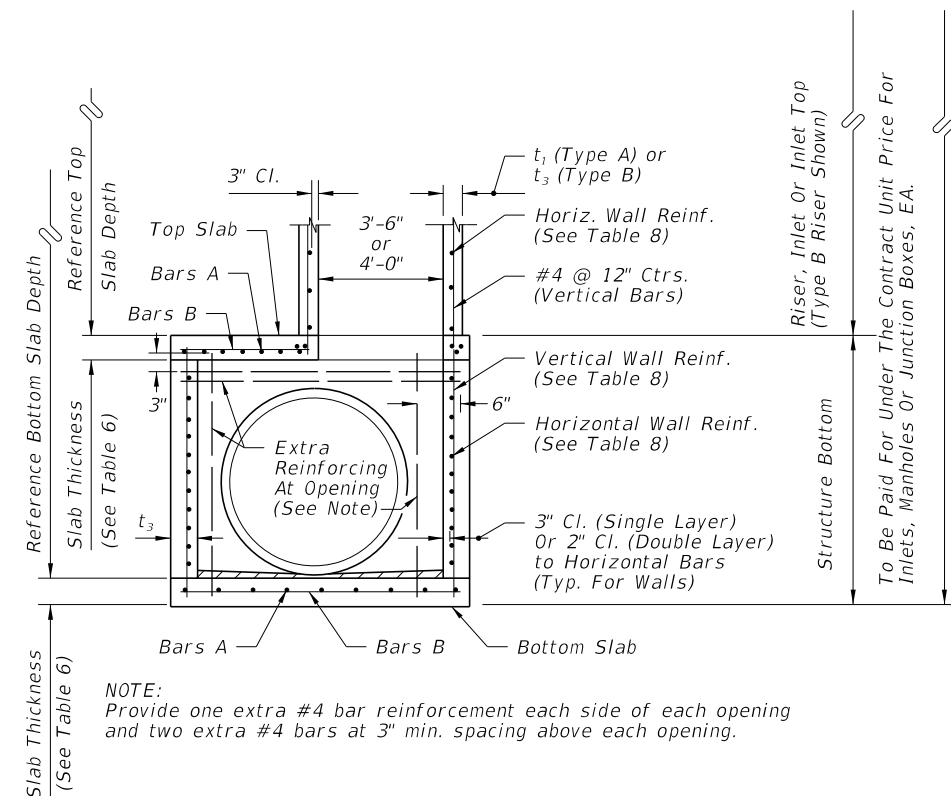
PLAN VIEW



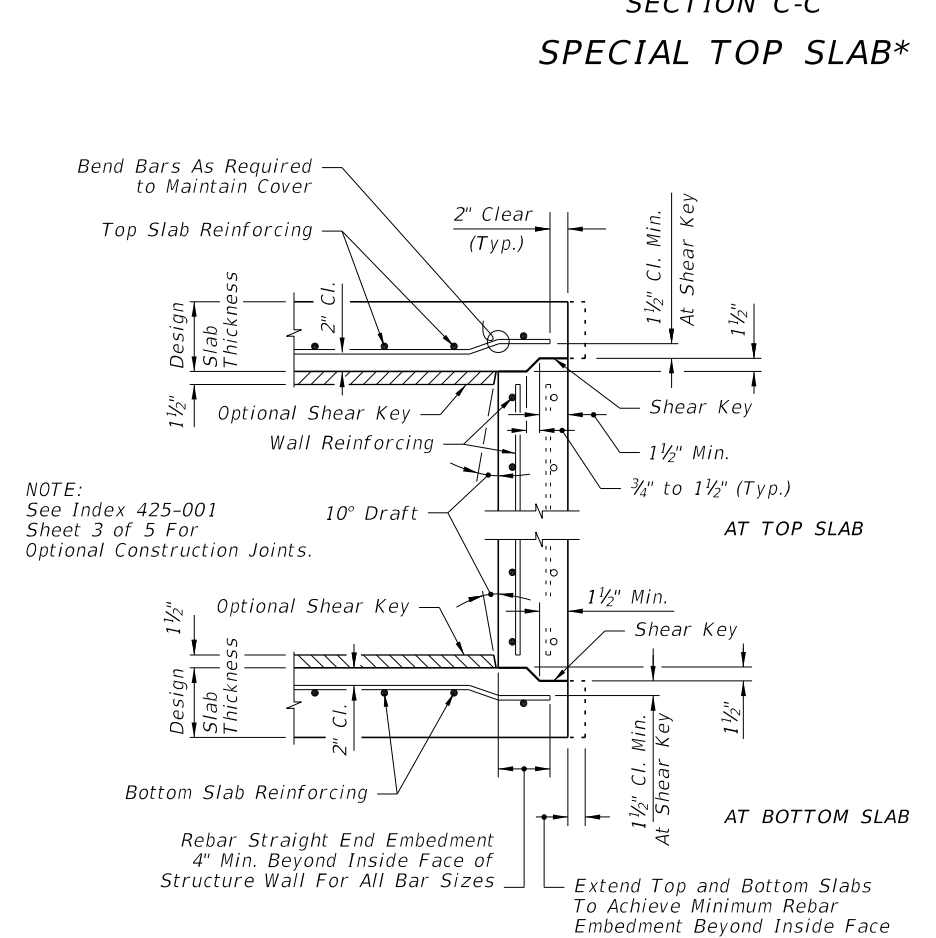
SECTION C-C
SPECIAL TOP SLAB*



SECTION A-A
(ALTERNATE A)



SECTION B-B
(ALTERNATE B)



TYPICAL SLAB TO WALL DETAILS
FOR PRECAST STRUCTURES

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LAST REVISION 11/01/19	DESCRIPTION:	 FY 2020-21 STANDARD PLANS	STRUCTURE BOTTOMS TYPE J AND P	INDEX 425-010	SHEET 1 of 5
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GENERAL NOTES

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				
		t ₁ Riser (in.)	t ₂ Bottom (in.)	A _s (in. ² /ft.)	Class II Concrete			ASTM C478	
					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:

A₂ = 0.40 sq. in. for riser section height equal or less than 2'-0" (2 hoop min.)

A₂ = 0.60 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.

- 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.
- 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.
- 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).
- 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.
- All reinforcement shown is Grade 60 steel, deformed bar. Equivalent area Grade 40 steel or equivalent area smooth or deformed welded wire reinforcement in accordance with Specification Section 931 may be substituted according to Index 425-001, unless otherwise noted.
- 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.
- Rectangular structures may be rotated as directed by the Engineer in order to facilitate connections between the structure walls and storm sewer pipes.
- Except when ACI hooks are specifically required, reinforcement in top and bottom slab shall be straight embedment.
- 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.
- 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.
- Inlet walls, throats, risers or manhole tops shall be secured to structures as shown on Index 425-001 Optional Construction Joints.
- Structures with depths over 14' below the mean high water table are to be checked for flotation by the designer of the drainage project.
- 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.
- For manhole and junction box tops, for frames and covers, and, for supplementary details and notes see Index 425-001.
- Type J structure bottoms must have a minimum 6'-0" wall height when possible, for maintenance access.

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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 $\theta=180^\circ$	2 to 4 Pipes $\theta=90^\circ$
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:

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

- Minimum wall lengths based on precast structures, using concrete pipe with maximum skew angles per Table 5.
- Wall lengths exceeding 20'-0" require special designs.

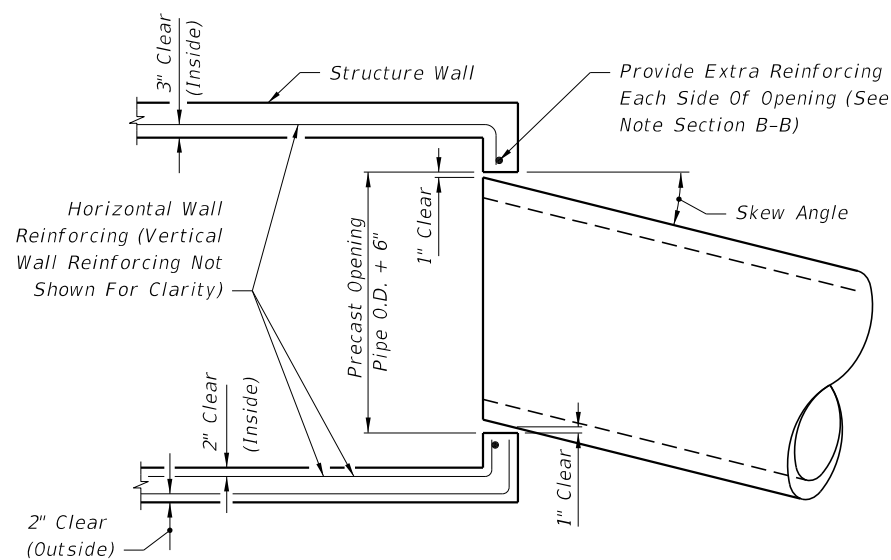


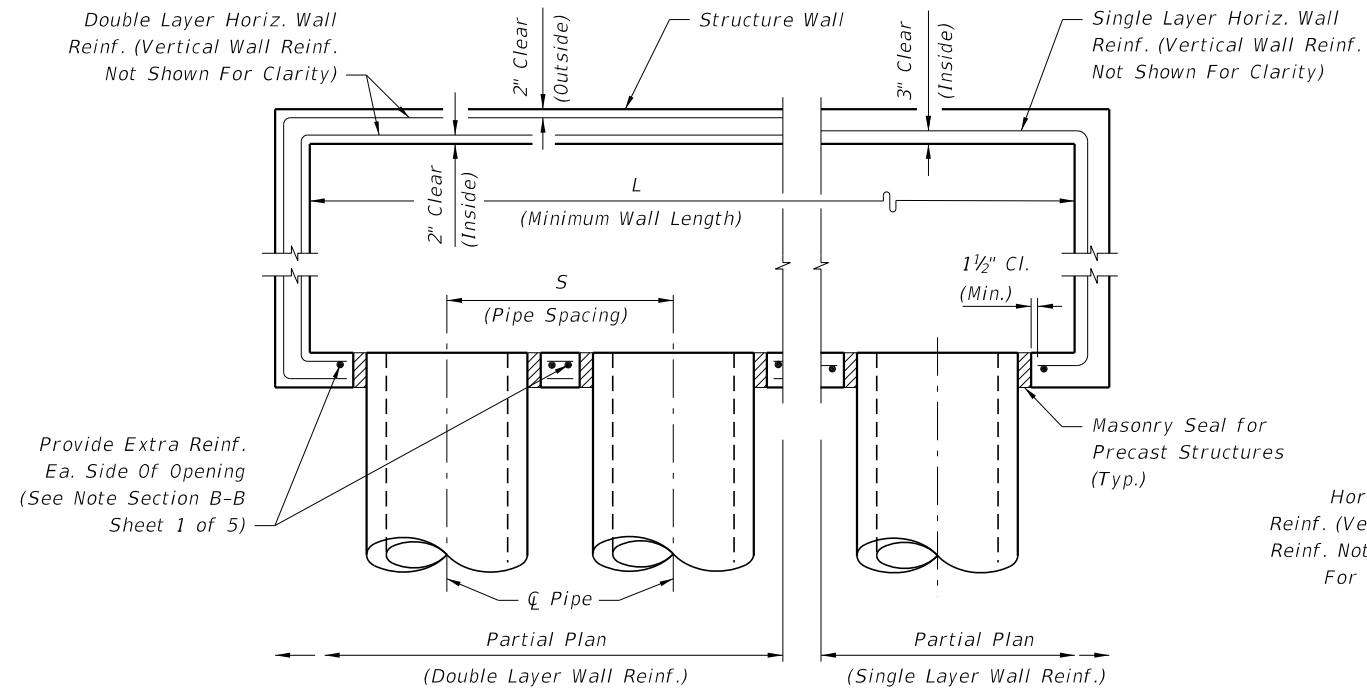
TABLE 5 - MAXIMUM PIPE SKEW FOR PRECAST ROUND OPENINGS

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°

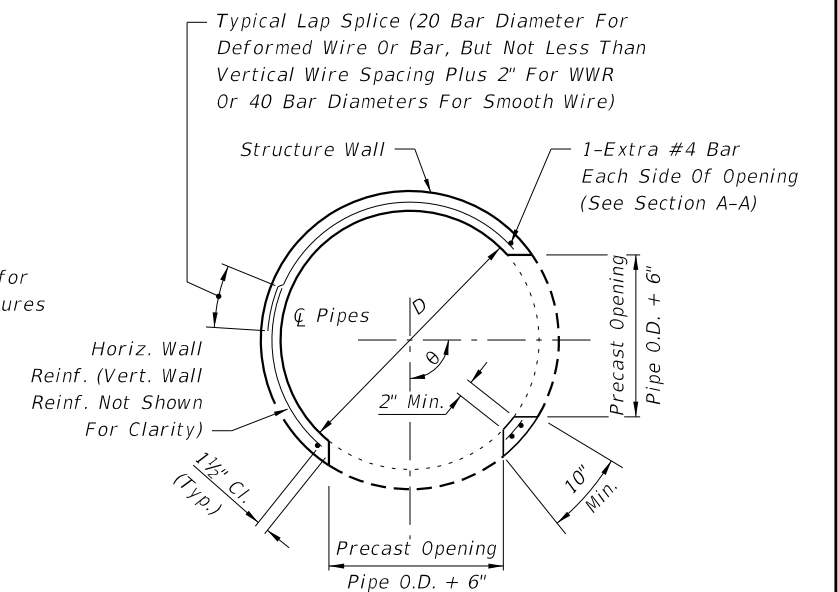
TABLE 5 NOTES:

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.

MAXIMUM PIPE SKEW FOR PRECAST ROUND OPENINGS PLAN VIEW



MULTIPLE PARALLEL PIPE CONNECTIONS DETAIL PLAN VIEW



PRECAST ROUND STRUCTURES WITH MULTIPLE PIPE CONNECTIONS

STRUCTURE SIZES FOR PIPE CONNECTIONS

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LAST REVISION 11/01/17	DESCRIPTION:
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STRUCTURE BOTTOMS TYPE J AND P

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

SLAB DESIGNS - ROUND STRUCTURES (TABLE 7)

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 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

- Size is the inside dimension(s) of a structure.
- Slab reinforcement is appropriate for top, intermediate, and bottom slabs.
- Bottom Slabs for precast 3'-6" x 3'-6" rectangular structures at 15' depth or less, may be 6" thick.
- Slab depth is measured from finished grade to top of slab.
- Wall depth is measured to the top of the bottom slab for boxes and to the top of the intermediate slab for risers.
- 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'.
- 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.
- Wall lengths exceeding the dimensions or depths shown in Table 8, or 12'-0" diameter require a special design.
- Wall thickness and reinforcing for rectangular structures is based on the longer wall length.
- 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 425-001 for allowable bar spacing adjustments when larger areas of reinforcing are substituted.

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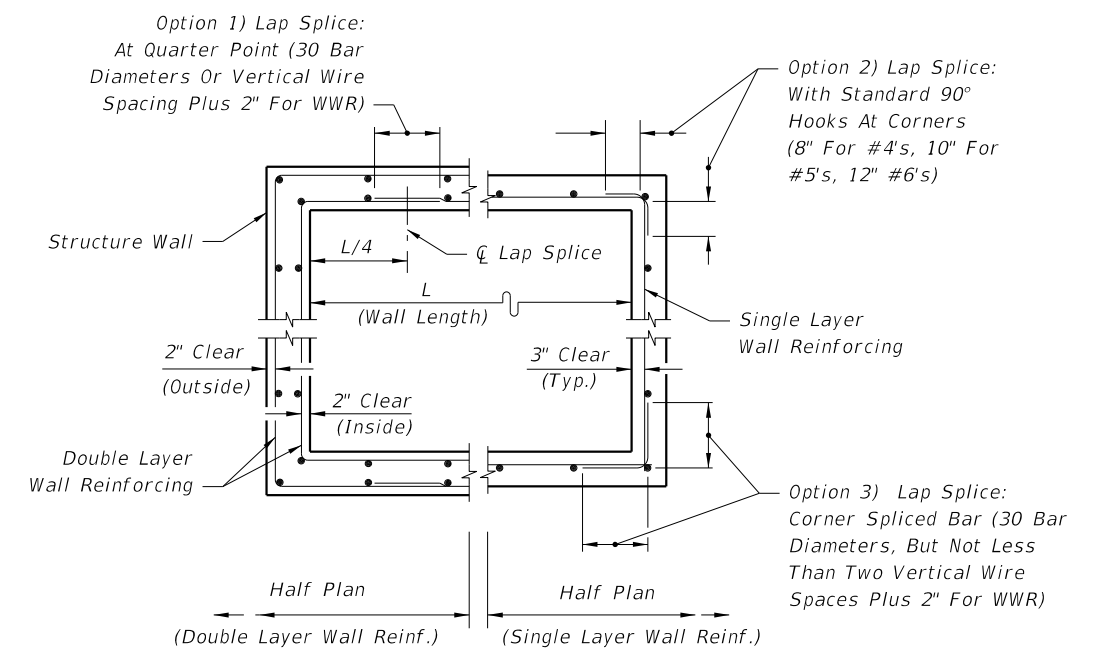
WALL DESIGNS - RECTANGULAR STRUCTURES (TABLE 8)

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	D7	D7	8"
SIZE: 7'-0"					
	Inside	Outside	Inside	Outside	
≥1.17' < 25'	A12	A12	B10	B10	8"
26' - 40'	B10	B10	B5.5	B5.5	8"
			C6.5	C6.5	8"
			D7	D7	8"
			E5	E5	8"
SIZE: 8'-0"					
	Inside	Outside	Inside	Outside	
≥1.17' < 20'	A12	A12	B5.5	B5.5	8"
20' - 40'	C6.5	C6.5	C6.5	C6.5	8"
			D7	D7	8"
			E5	E5	8"
			F5	F5	8"
SIZE: 9'-0"					
	Inside	Outside	Inside	Outside	
≥1.17' < 12'	A12	A12	C6.5	C6.5	8"
12' < 28'	C6.5	C6.5	D7	D7	8"
28' - 40'	D7	D7	E5	E5	8"
			F5	F5	8"
SIZE: 10'-0"					
	Inside	Outside	Inside	Outside	
≥1.17' < 10'	B10	B10	D7	D7	8"
10' < 21'	C6.5	C6.5	E5	E5	8"
21' < 26'	D7	D7	F5	F5	8"
26' - 40'	C6.5	C6.5	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	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.)	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 425-001.



WALL REINFORCING SPLICE DETAILS (ALTERNATE B)

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LAST REVISION 11/01/17	DESCRIPTION:
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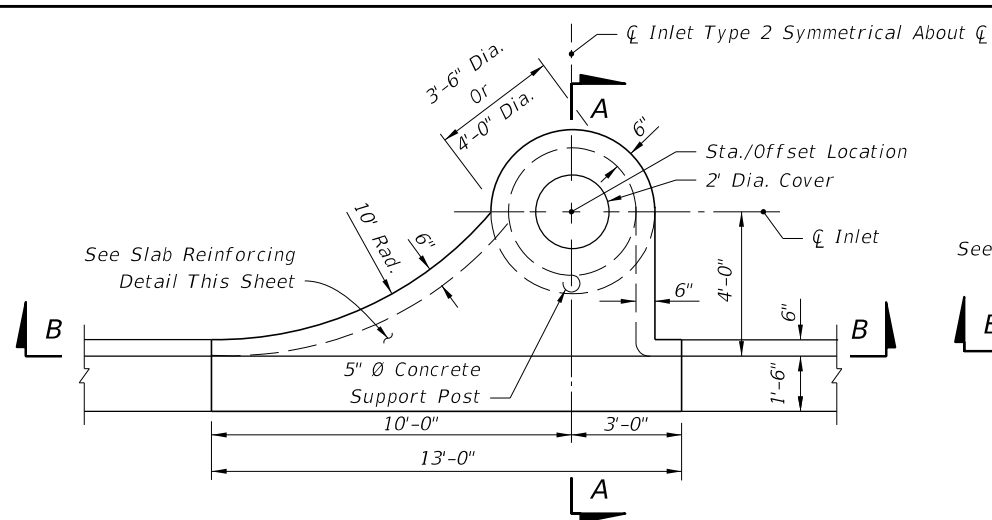


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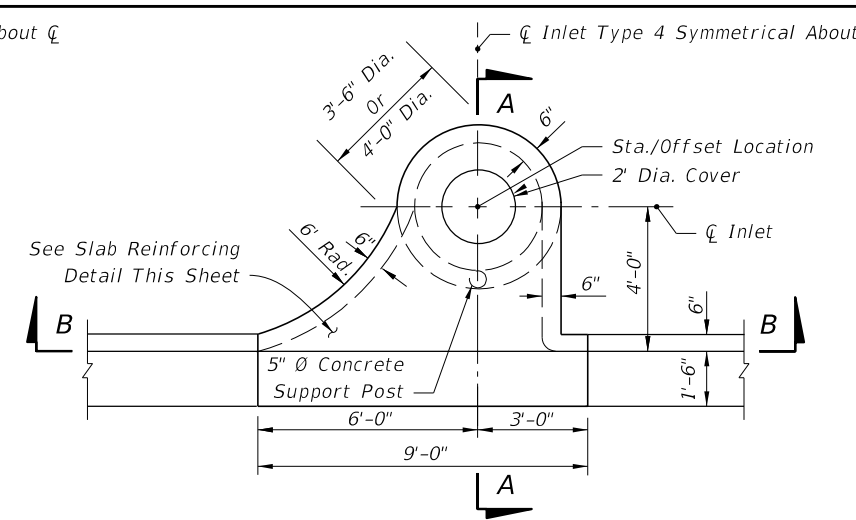
STRUCTURE BOTTOMS TYPE J AND P

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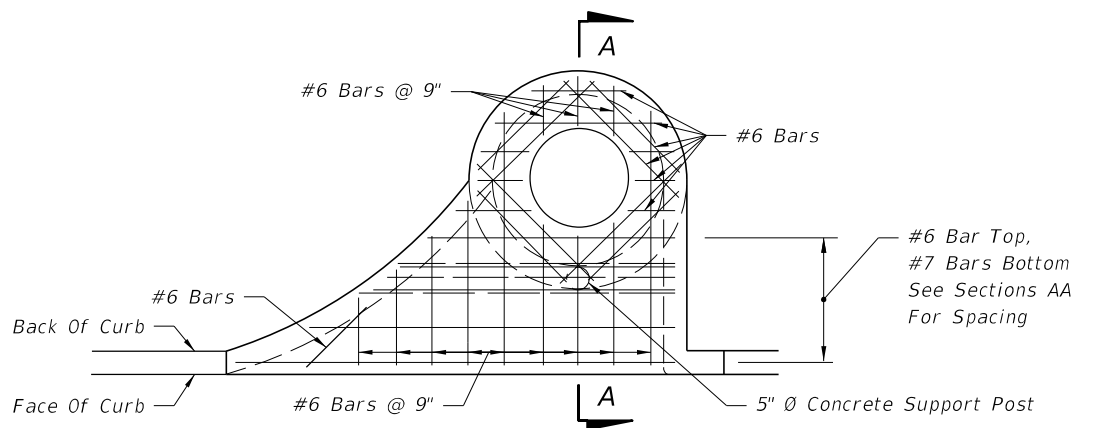
SHEET
5 of 5



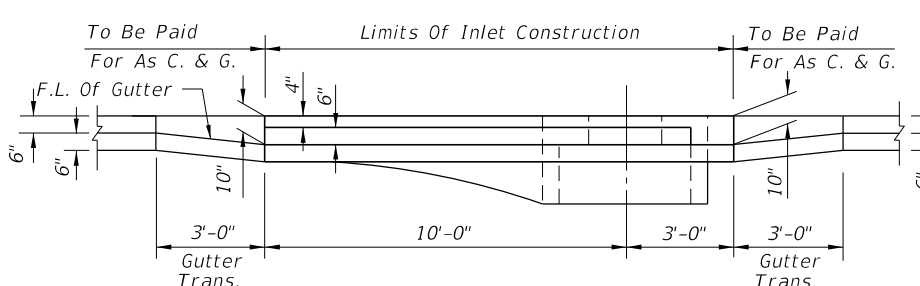
PLAN (INLET TYPE 2 SYMMETRICAL ABOUT CL)



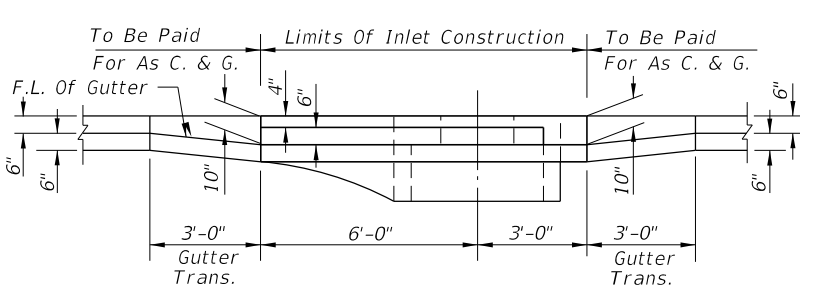
PLAN (INLET TYPE 4 SYMMETRICAL ABOUT CL)



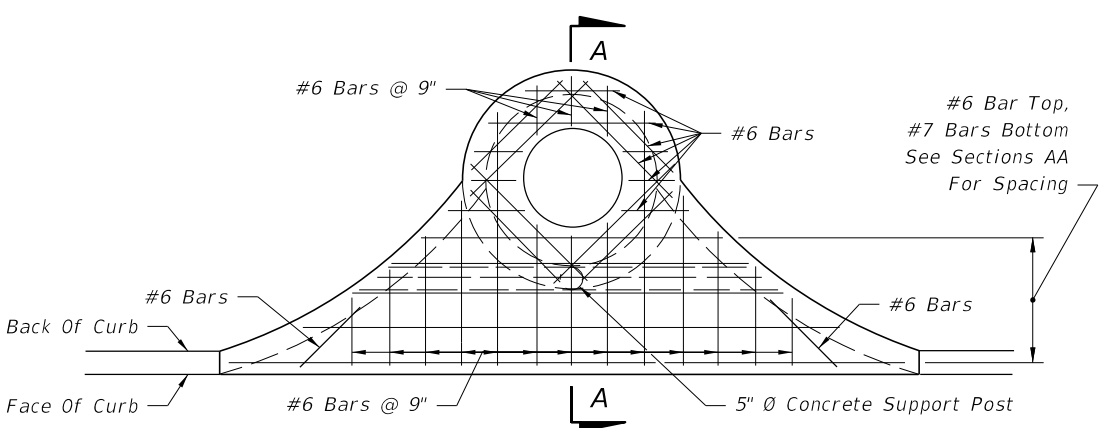
INLETS TYPES 1 AND 3



SECTION BB (INLET TYPE 2 SYMMETRICAL ABOUT CL)
INLETS TYPES 1 AND 2



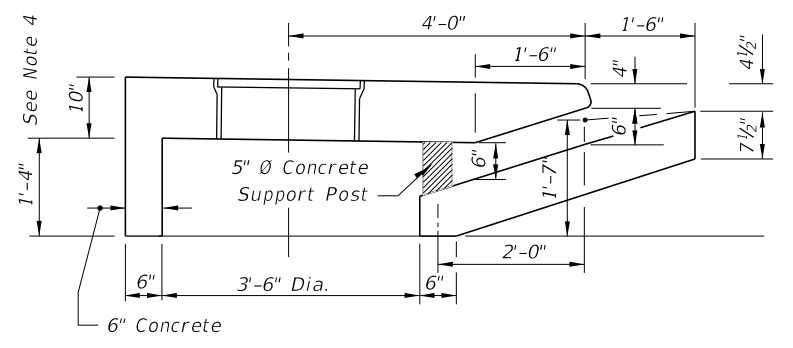
SECTION BB (INLET TYPE 4 SYMMETRICAL ABOUT CL)
INLETS TYPES 3 AND 4



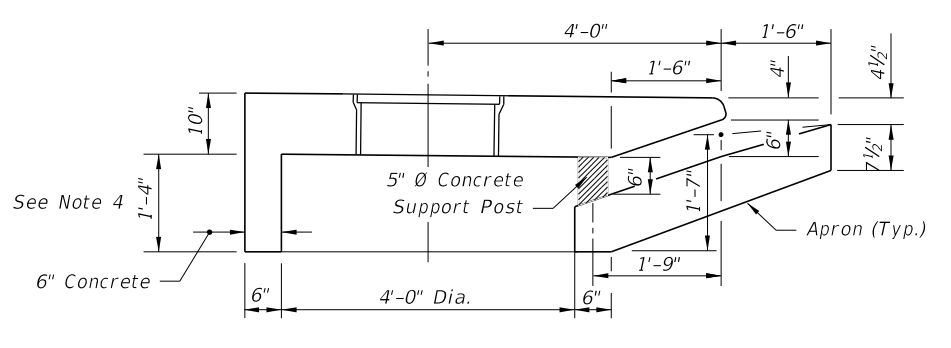
INLETS TYPES 2 AND 4
SLAB REINFORCING

GENERAL NOTES

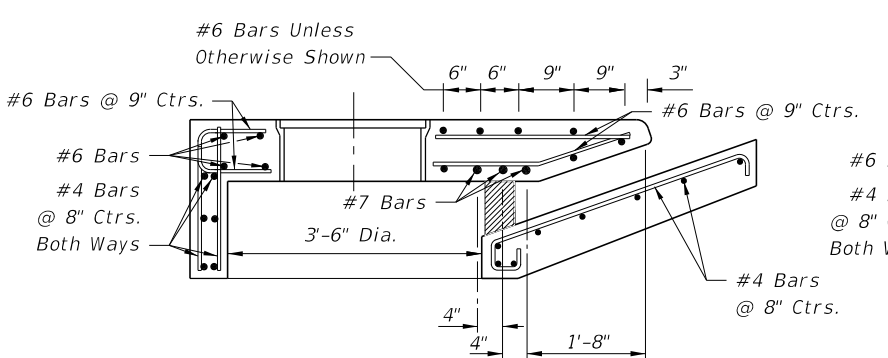
1. The finished grade and slope of the inlet tops are to conform with the finished cross slope and grade of the proposed sidewalk and/or border.
2. When inlets are to be constructed on a curve, refer to the plans to determine the radius and, where necessary, modify the inlet details accordingly. Bend steel when necessary.
3. All steel in inlet top shall have 1/4" 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 425-001 "OPTIONAL CONSTRUCTION JOINTS".
5. For supplemental details see Index 425-001.
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 425-010.
9. Inlet to be paid for under the contract unit price for inlets (Curb) (Type_), Each.



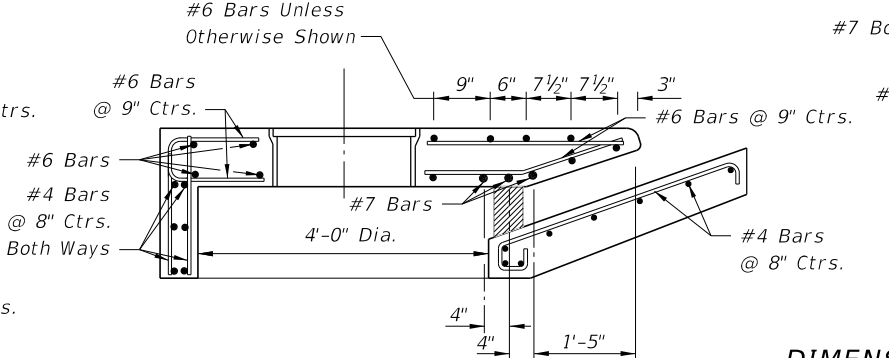
DIMENSIONAL SECTION



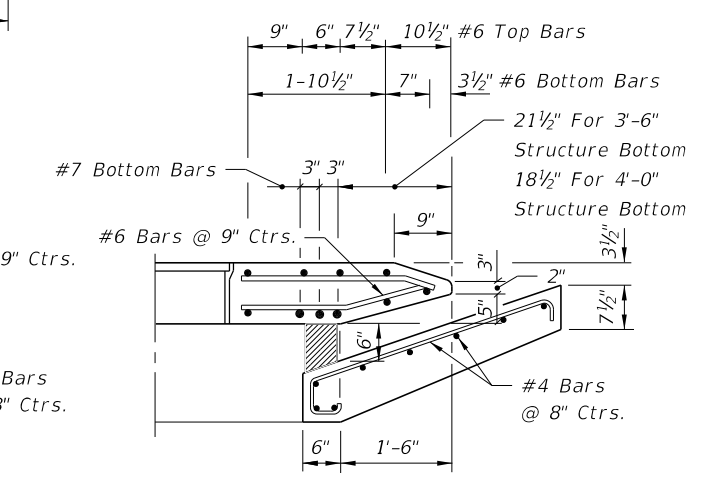
DIMENSIONAL SECTION



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



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

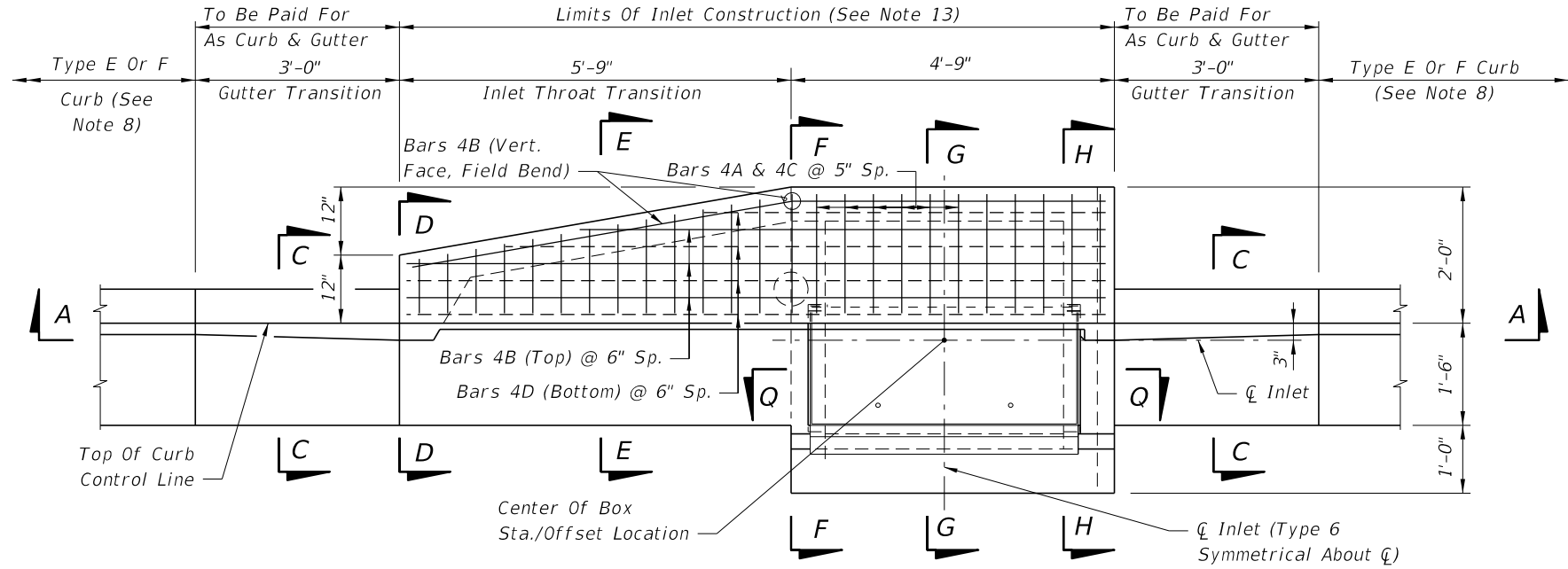


DIMENSION & REINFORCING HALF SECTION
TYPES A & E CURB (HALF SECTION AA)
(TYPE E GUTTER SHOWN)

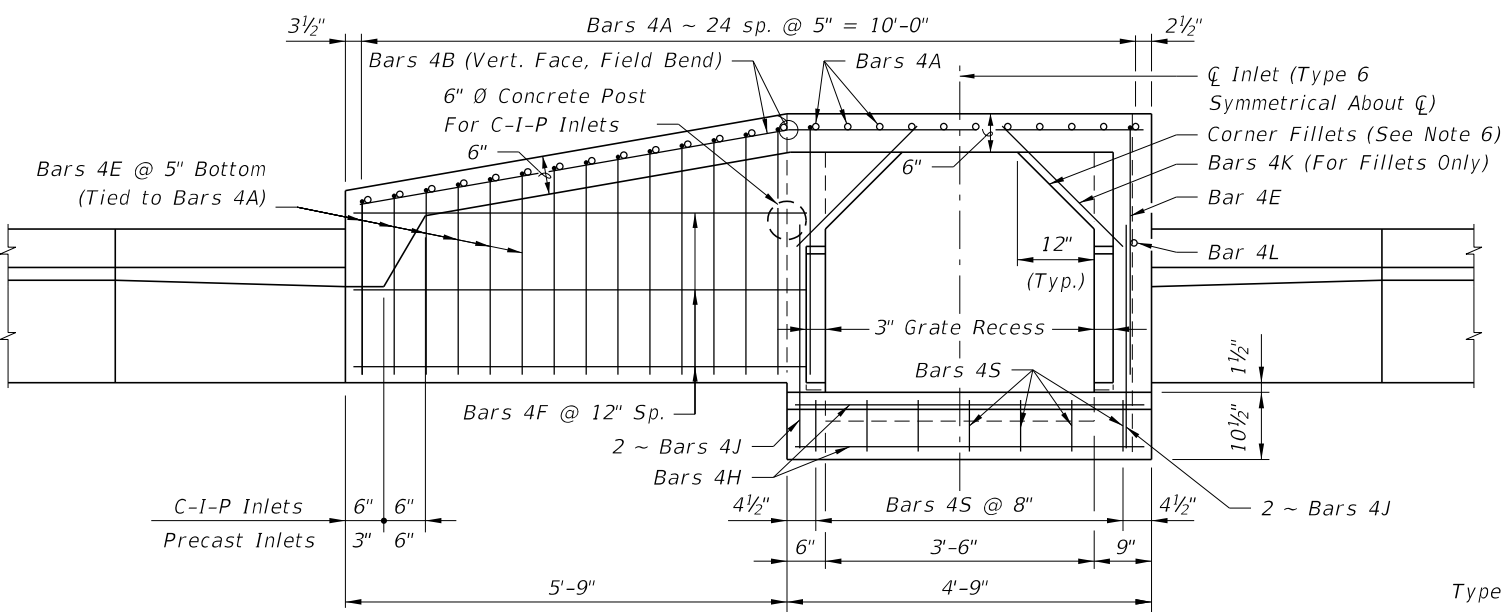
TRANSVERSE SECTIONS FOR INLETS TYPES 1, 2, 3 & 4

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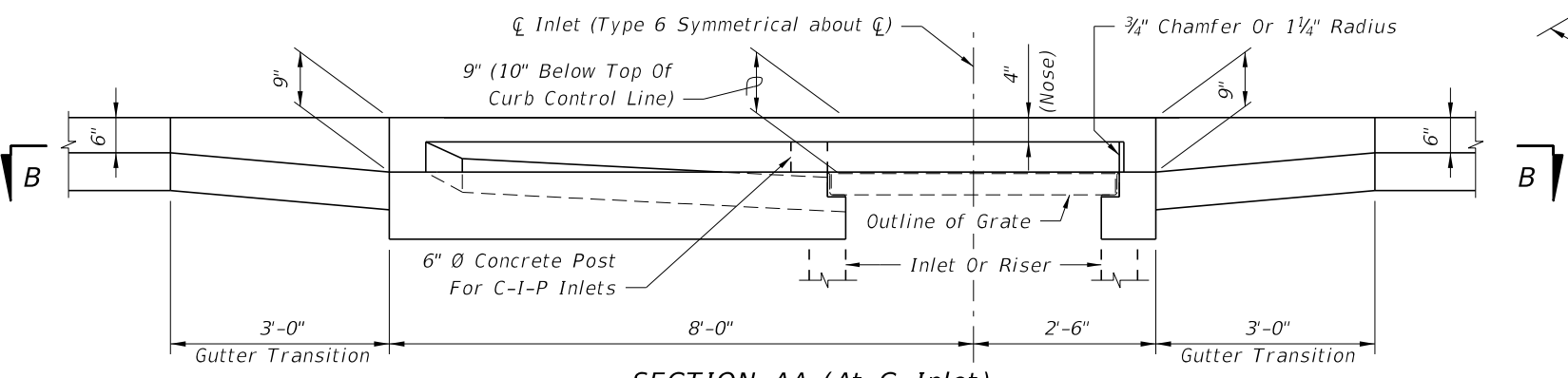
LAST REVISION 11/01/17	DESCRIPTION:	 FY 2020-21 STANDARD PLANS	CURB INLET TOPS TYPES 1, 2, 3 AND 4	INDEX 425-020	SHEET 1 of 1
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TOP VIEW

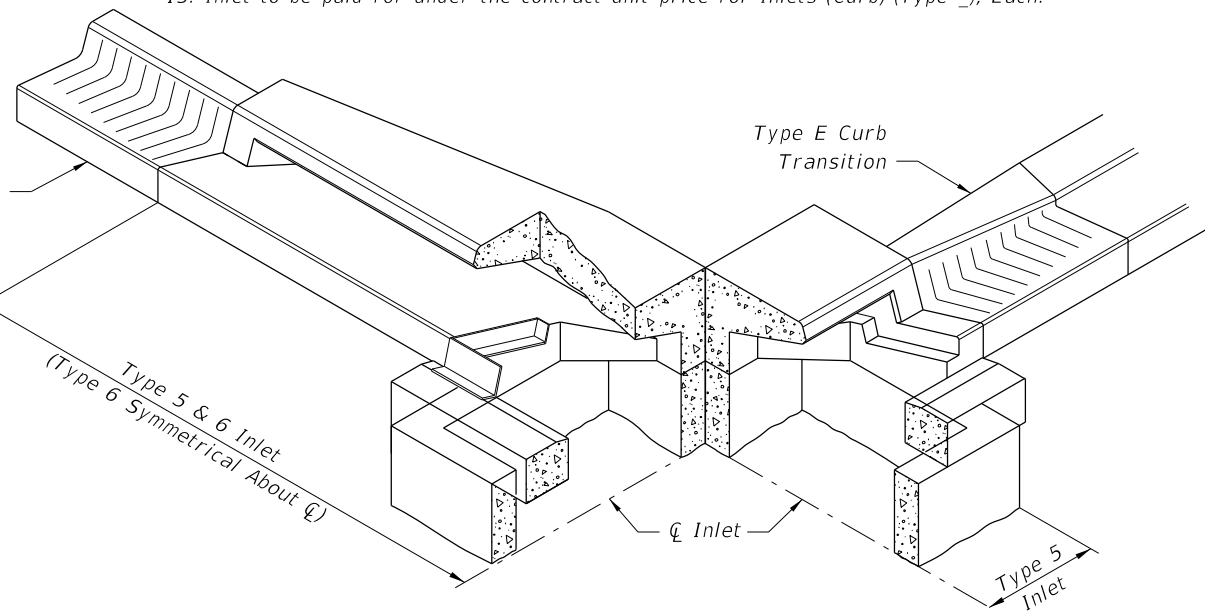


SECTION BB



SECTION AA (At ̄ Inlet)

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



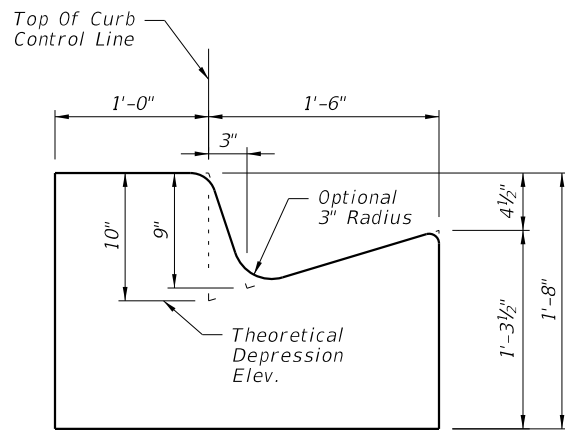
SKETCH SHOWING FRAME SEAT AND THROAT RECESS

GENERAL NOTES

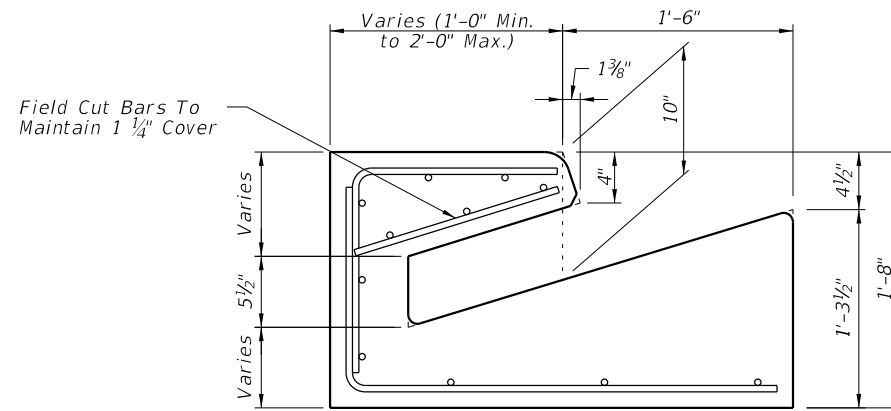
1. The finished grade and slope of the inlet tops are to conform with the finished cross slope and grade of the proposed sidewalk and/or border.
2. For inlets constructed on a curve, refer to the plans to determine the radius, and modify the inlet details accordingly. Bend steel when necessary.
3. All reinforcing steel to be Grade 60 bars with 1 1/4" 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 drawings. 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 425-010. 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 425-001 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.

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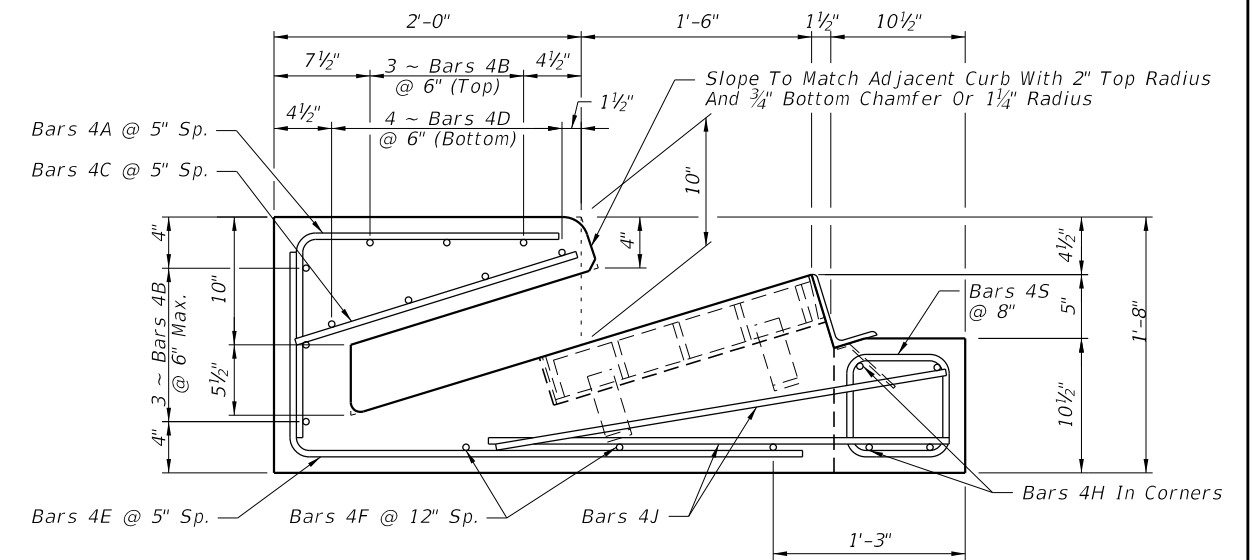
LAST REVISION 11/01/17	REVISION	DESCRIPTION:	 FY 2020-21 STANDARD PLANS	CURB INLET TOPS TYPES 5 AND 6	INDEX 425-021	SHEET 1 of 5
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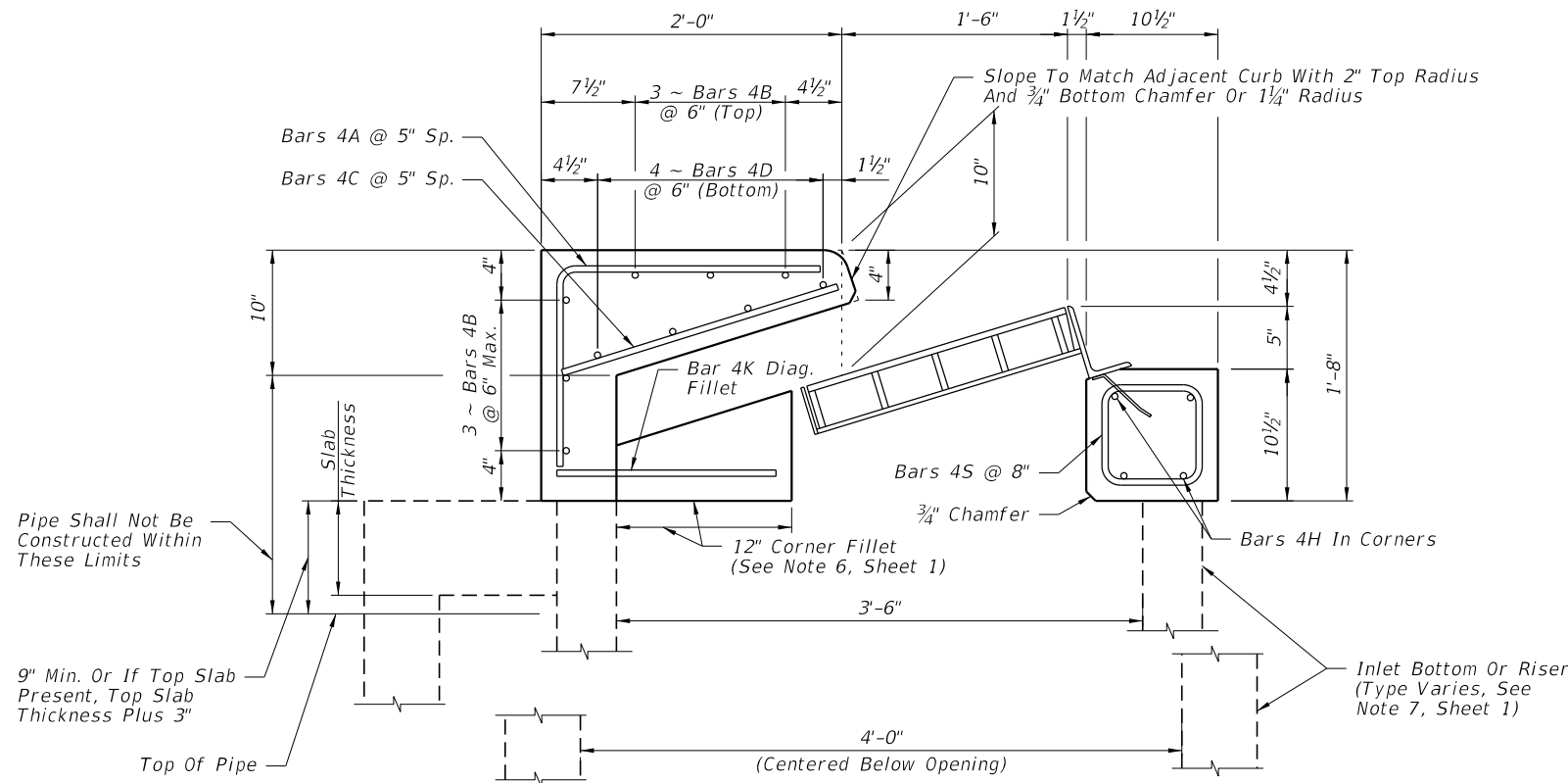
SECTION DD
(End View Of Inlet)



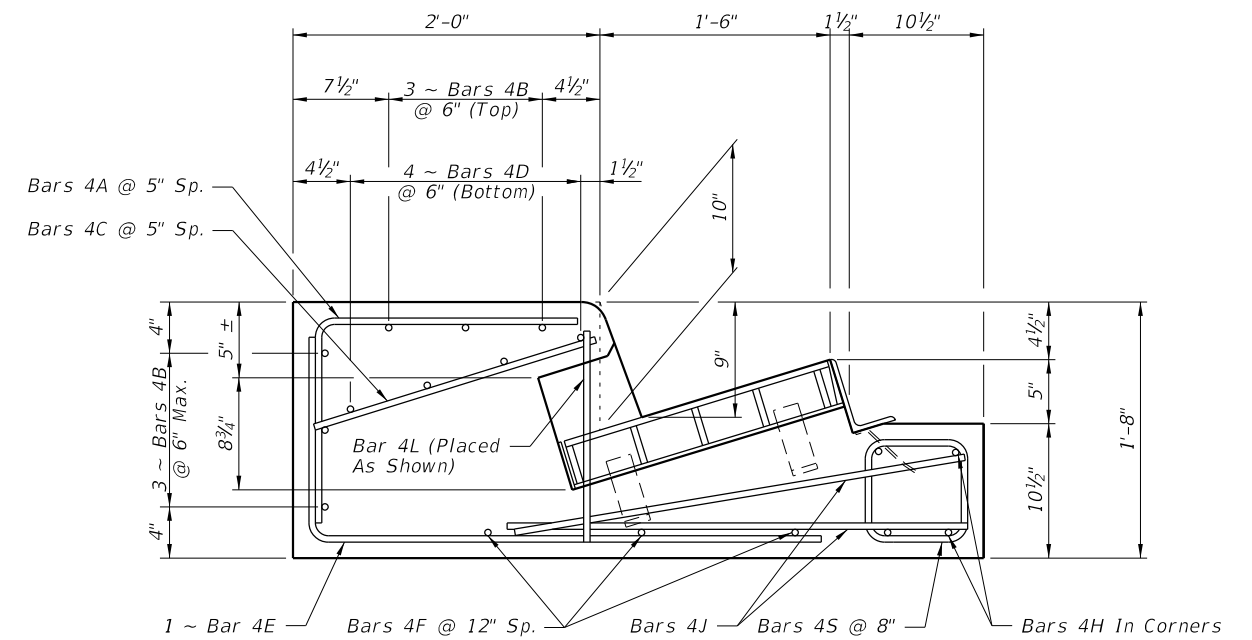
SECTION EE



SECTION FF



SECTION GG



SECTION HH
(Type 5 Inlet Only)

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

PRECAST DETAILS

10/29/2019 8:15:20 AM

LAST REVISION 11/01/17	DESCRIPTION:
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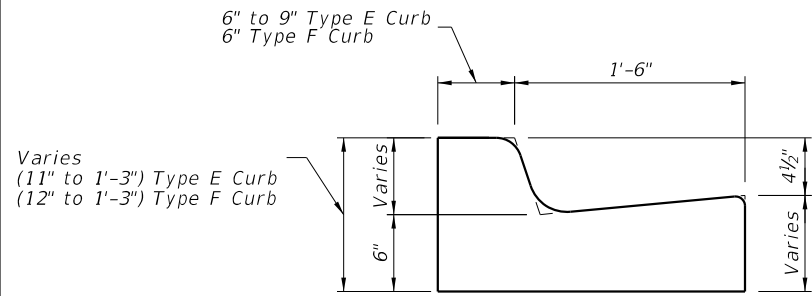


FY 2020-21
STANDARD PLANS

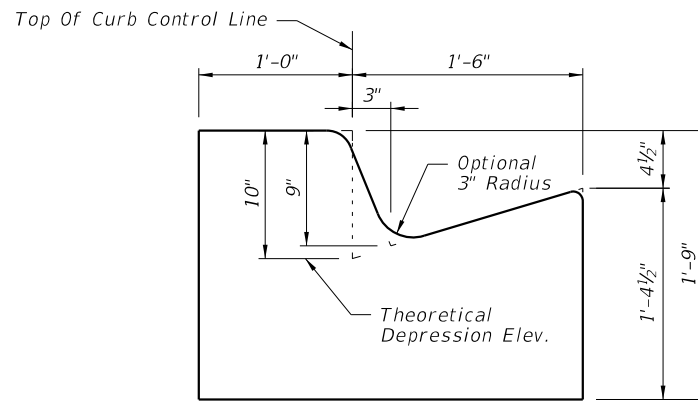
CURB INLET TOPS TYPES 5 AND 6

INDEX
425-021

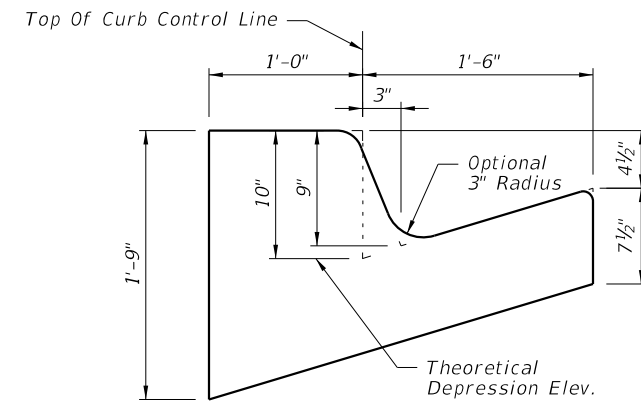
SHEET
2 of 5



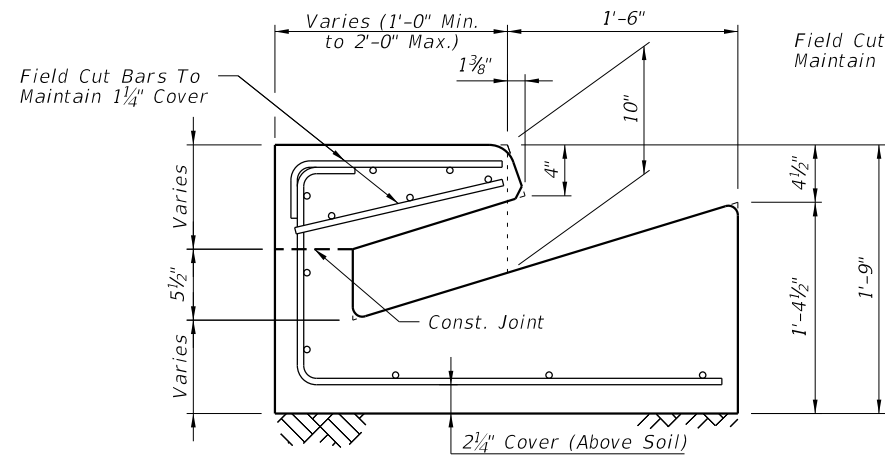
SECTION CC
(Gutter Transition
Type F Shown, Type E Similar)



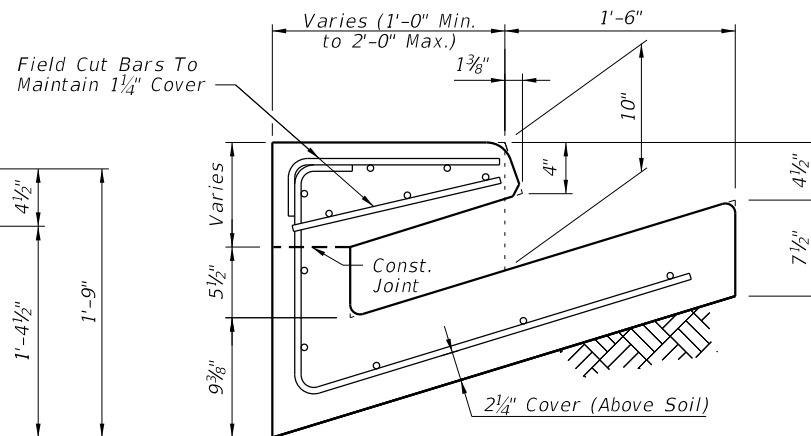
SECTION DD (OPTION A)
(End View Of Inlet)



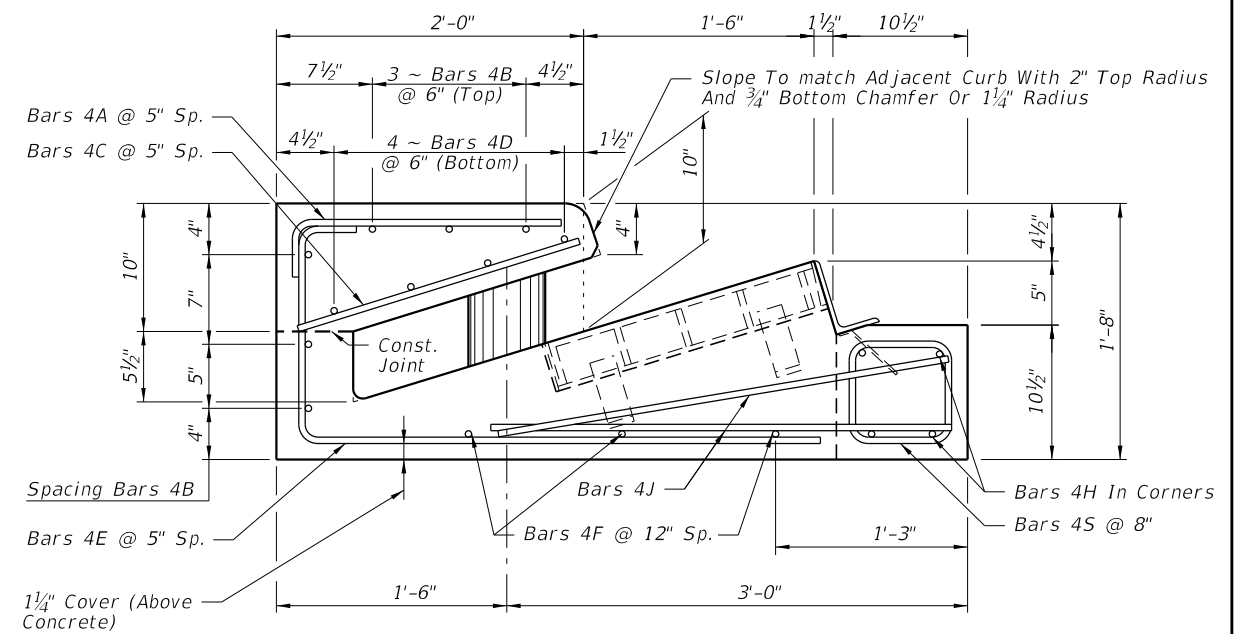
SECTION DD (OPTION B)
(End View Of Inlet)



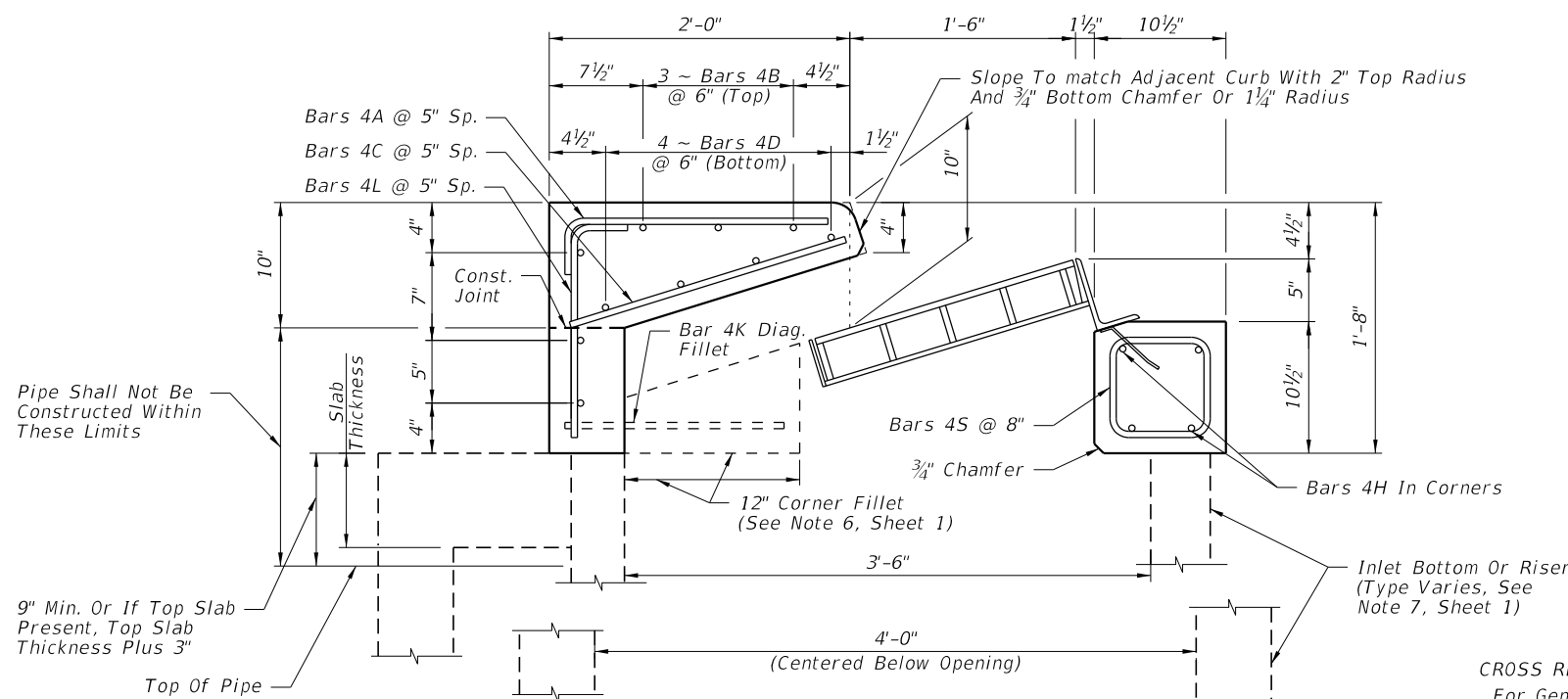
SECTION EE (OPTION A)



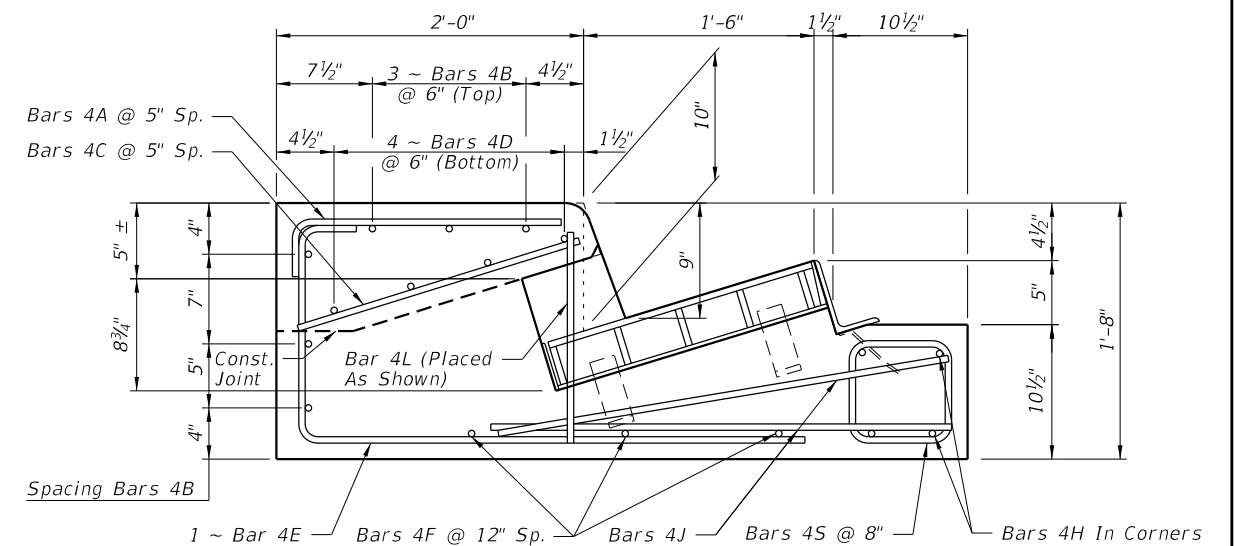
SECTION EE (OPTION B)



SECTION FF



SECTION GG



SECTION HH (Type 5 Inlet Only)

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

CAST-IN-PLACE DETAILS

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LAST REVISION 11/01/17	DESCRIPTION:
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FY 2020-21
STANDARD PLANS

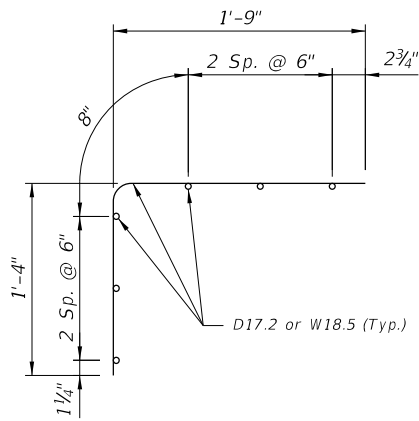
CURB INLET TOPS TYPES 5 AND 6

INDEX
425-021

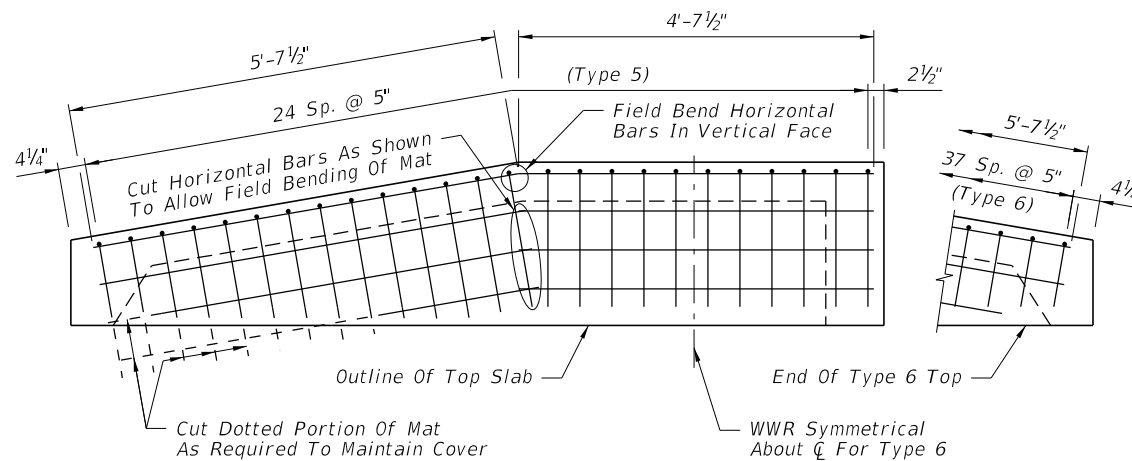
SHEET
3 of 5

ALTERNATE REINFORCING STEEL DETAILS FOR WELDED WIRE REINFORCEMENT (WWR)

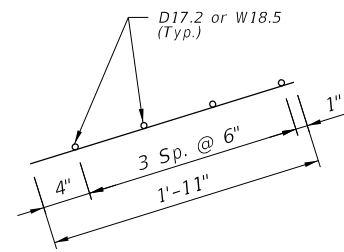
CONVENTIONAL REINFORCING STEEL BENDING DIAGRAMS



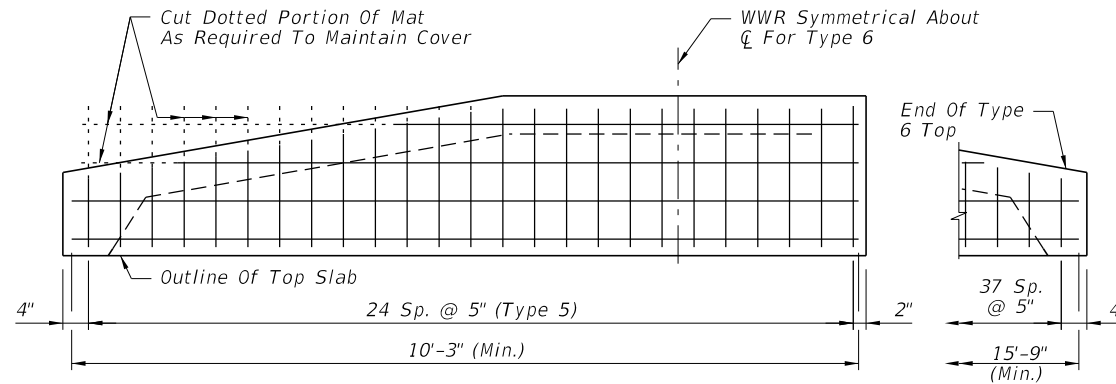
WELDED WIRE REINFORCEMENT
PIECE NO. 1



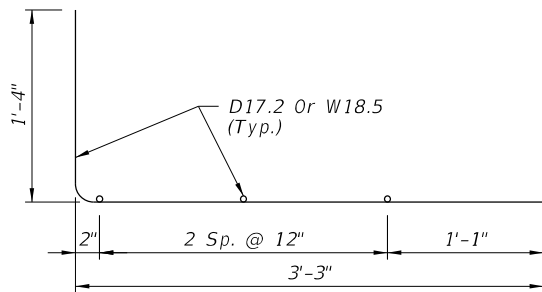
PLACEMENT SCHEMATIC FOR WELDED
WIRE REINFORCEMENT PIECE NO. 1



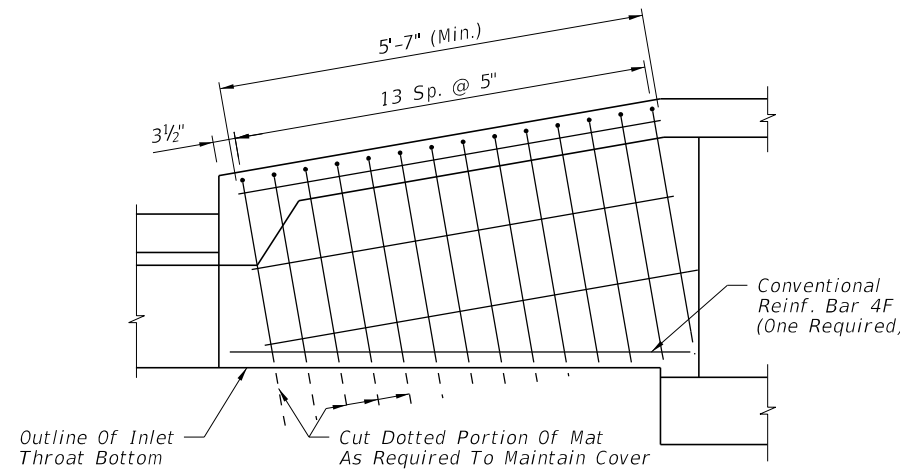
WELDED WIRE REINFORCEMENT
PIECE NO. 2



PLACEMENT SCHEMATIC FOR WELDED
WIRE REINFORCEMENT PIECE NO. 2



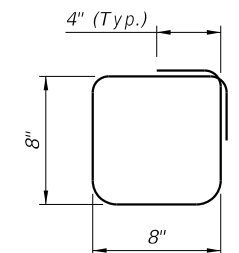
WELDED WIRE REINFORCEMENT
PIECE NO. 3



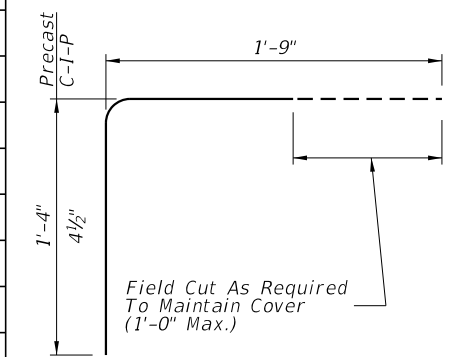
PLACEMENT SCHEMATIC FOR WELDED
WIRE REINFORCEMENT PIECE NO. 3

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'-1 1/2"	38	2'-1 1/2"
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'-11 1/2"	30	4'-11 1/2"
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"



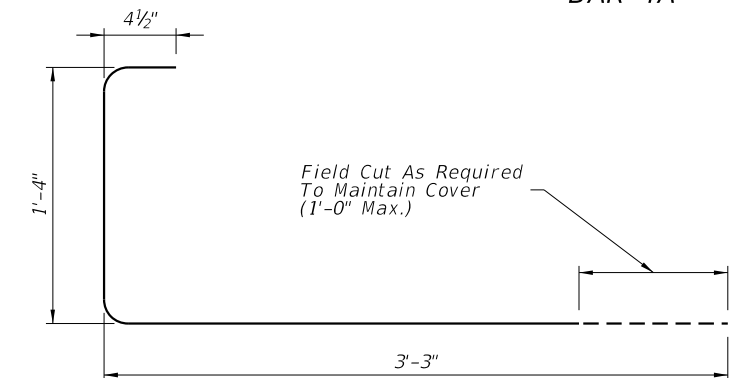
BAR 4S



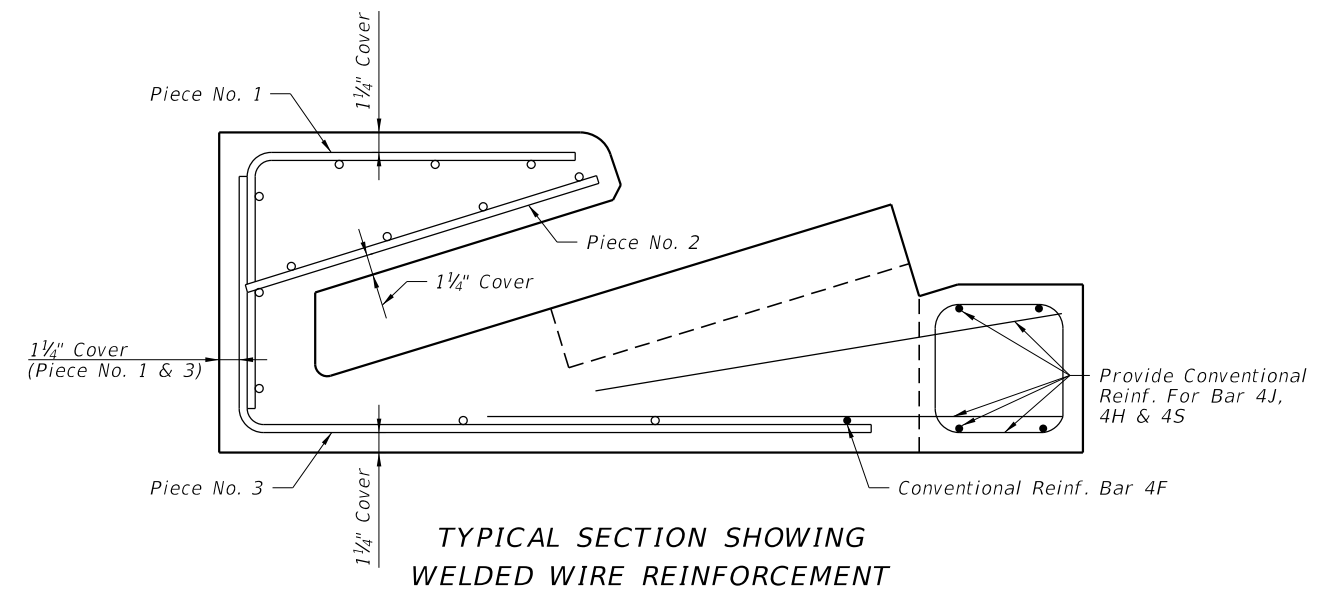
BAR 4A

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 consists of Smooth or Deformed wire meeting the requirements of Specification Section 931.



BAR 4E



TYPICAL SECTION SHOWING
WELDED WIRE REINFORCEMENT

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LAST REVISION	DESCRIPTION:
11/01/17	

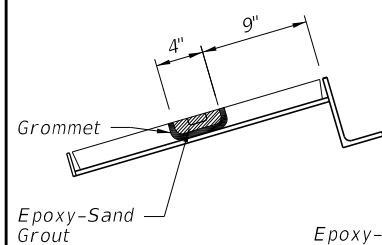


FY 2020-21
STANDARD PLANS

CURB INLET TOPS TYPES 5 AND 6

INDEX
425-021

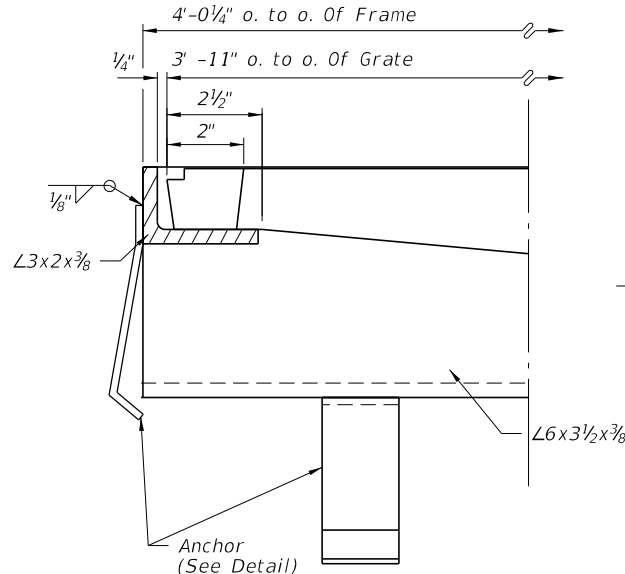
SHEET
4 of 5



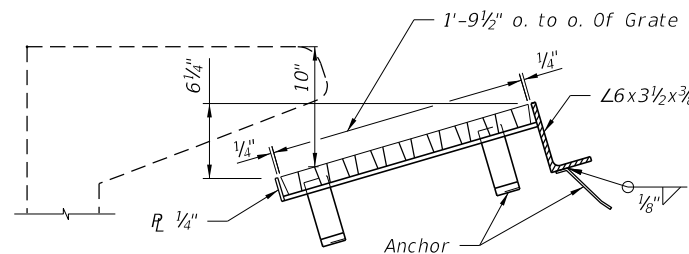
SECTION NN

Epoxy-Sand Grout Each Side

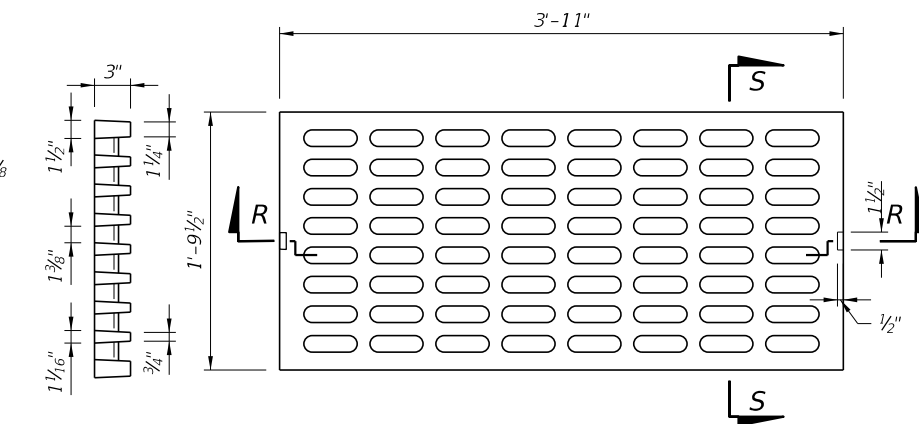
TOP VIEW
CAST IRON GRATE



SECTION QQ

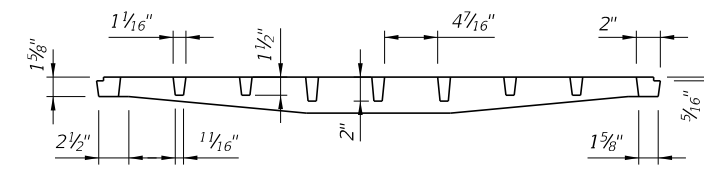


SECTION GG



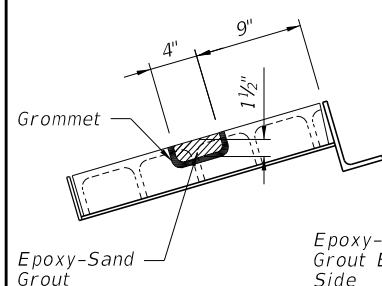
SECTION SS

TOP VIEW



SECTION RR

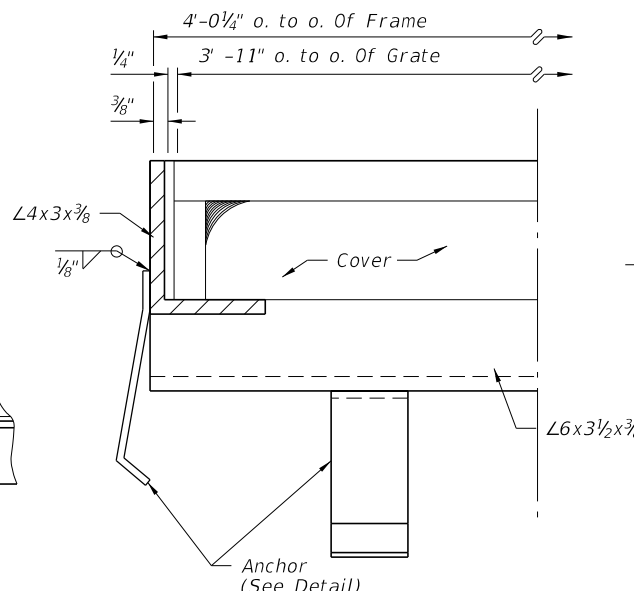
CAST IRON GRATE



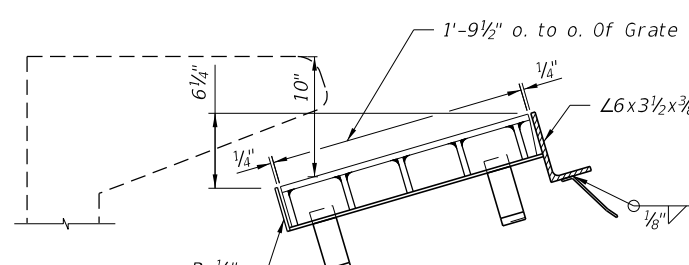
SECTION MM

Epoxy-Sand Grout Each Side

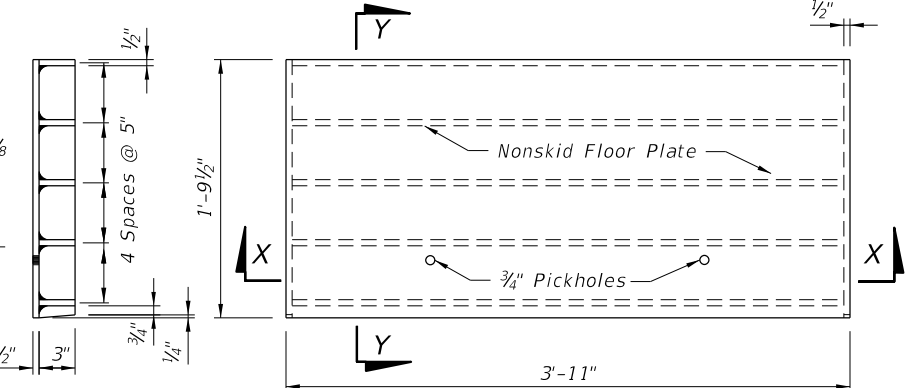
TOP VIEW
STEEL GRATE



SECTION QQ

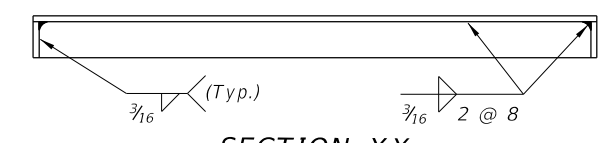


SECTION GG



SECTION YY

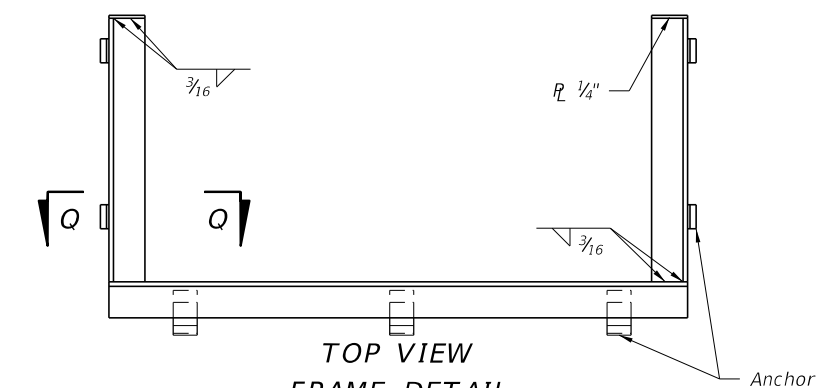
TOP VIEW



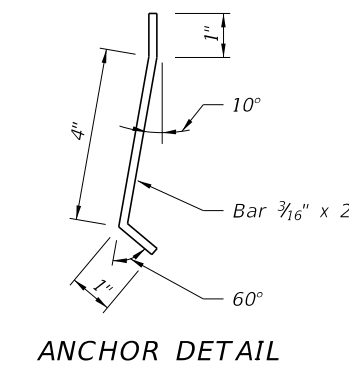
SECTION XX

STEEL GRATE

GROUTING DETAILS



TOP VIEW
FRAME DETAIL

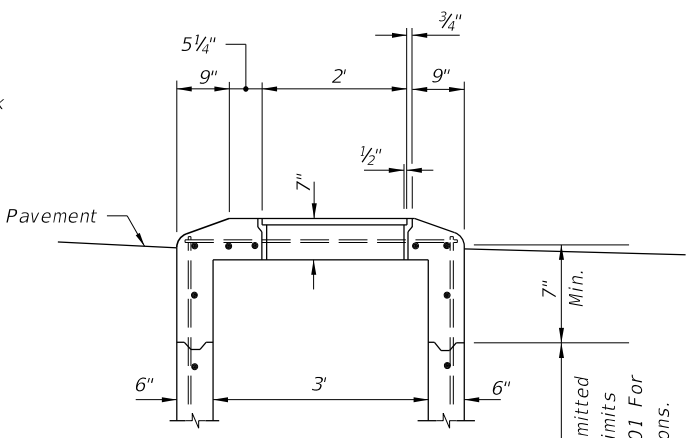
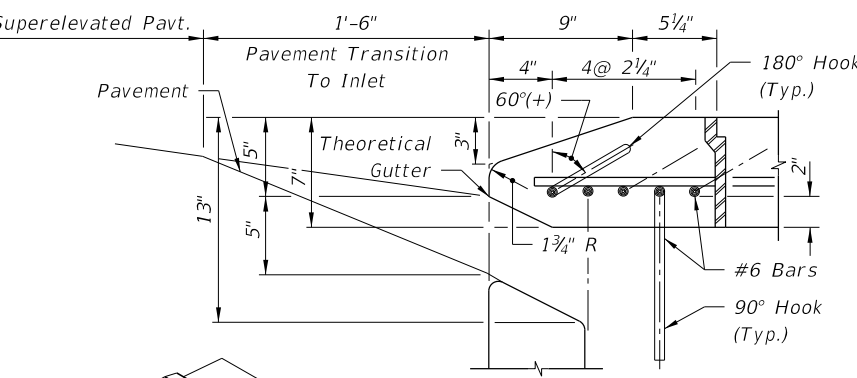
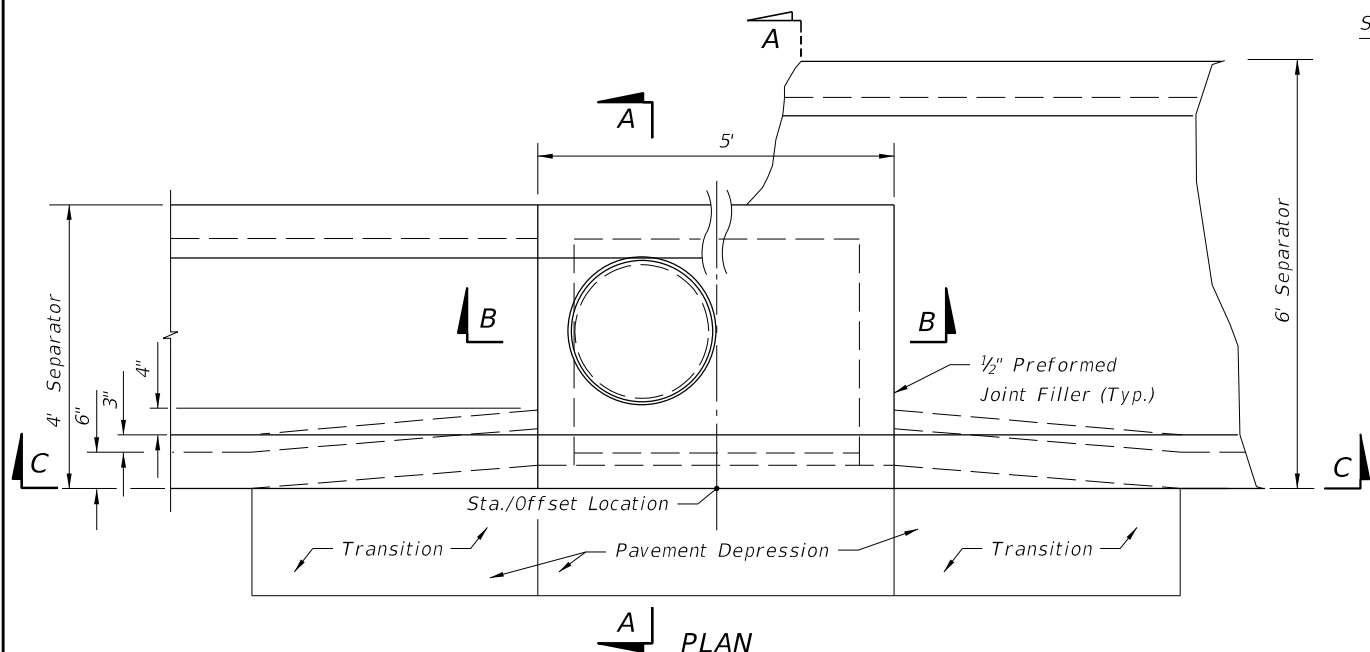


ANCHOR DETAIL

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

10/29/2019 8:15:31 AM

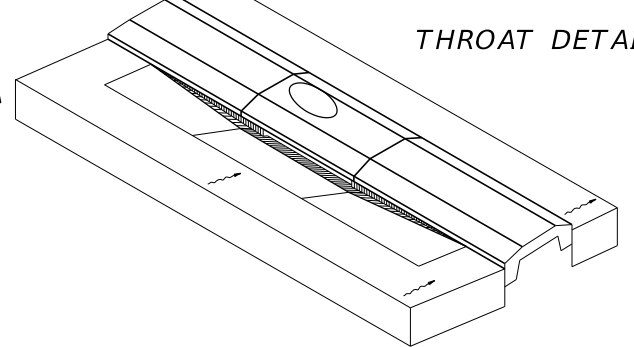
LAST REVISION 11/01/17	REVISION	DESCRIPTION:	 FY 2020-21 STANDARD PLANS	CURB INLET TOPS TYPES 5 AND 6	INDEX 425-021	SHEET 5 of 5
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MODIFICATION WHEN USED AS A MANHOLE

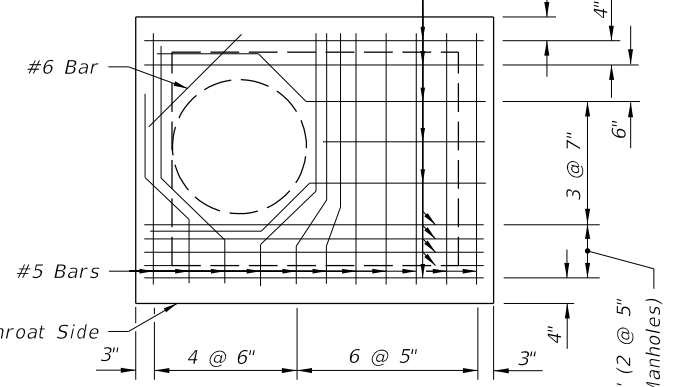
#6 Bars ACI Std. Hooks Required Each End of Straight Bars and Right End of Bent Bars: 180° Hooks, Canted 60°(+), on Odd Bars; 90° Hooks, Down, on Even Bars Numbered from Throat Side.

Const. Joints Permitted Between These Limits See Index 425-001 For Minimum Dimensions.



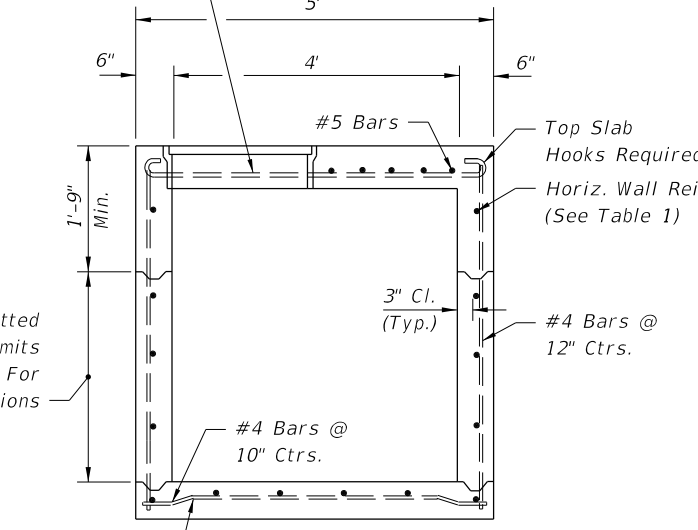
HORIZONTAL WALL REINFORCING SCHEDULE (TABLE 1)

WALL DEPTH	SCHEDULE	AREA (in. ² /ft.)	MAX. SPACING	
			BARS	WWR
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	5 1/2"	5"



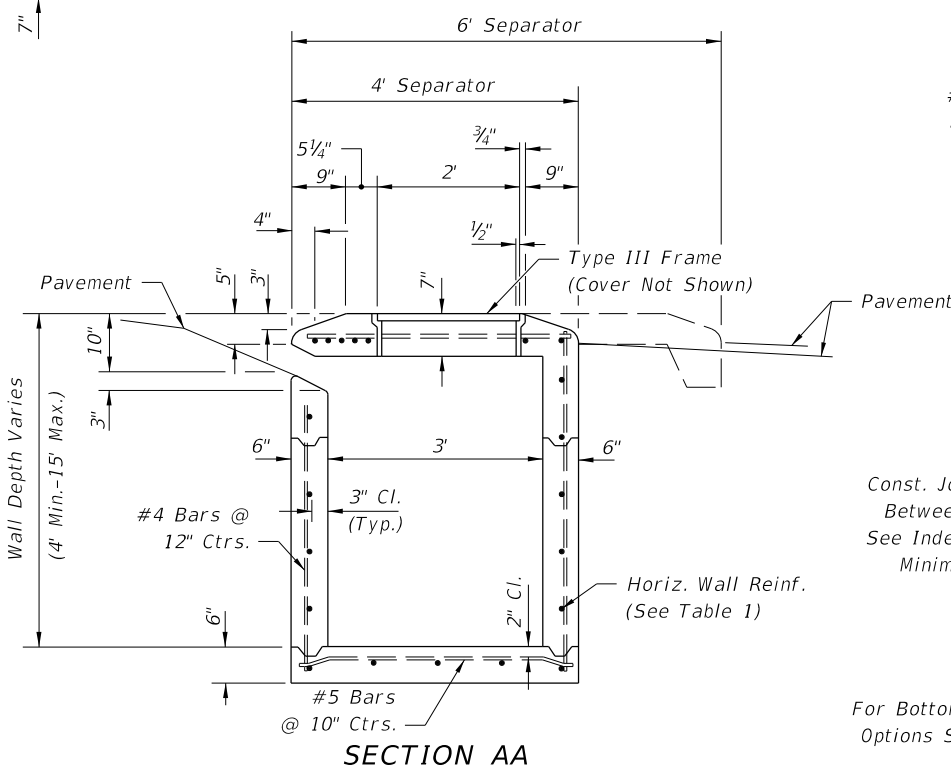
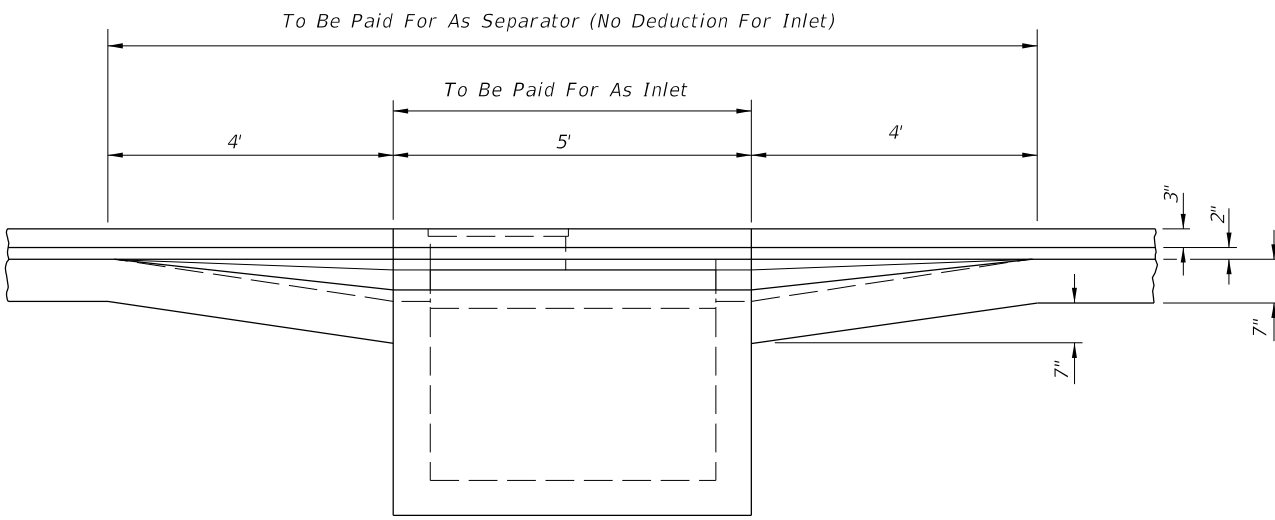
REINFORCING STEEL DIAGRAM TOP SLAB OF INLETS

#6 Bars - See Throat Detail and Reinforcing Diagram for Hook Arrangement



SECTION BB

For Bottom Slab Rebar Embedment Options See Optional Construction Joints, Index 425-001



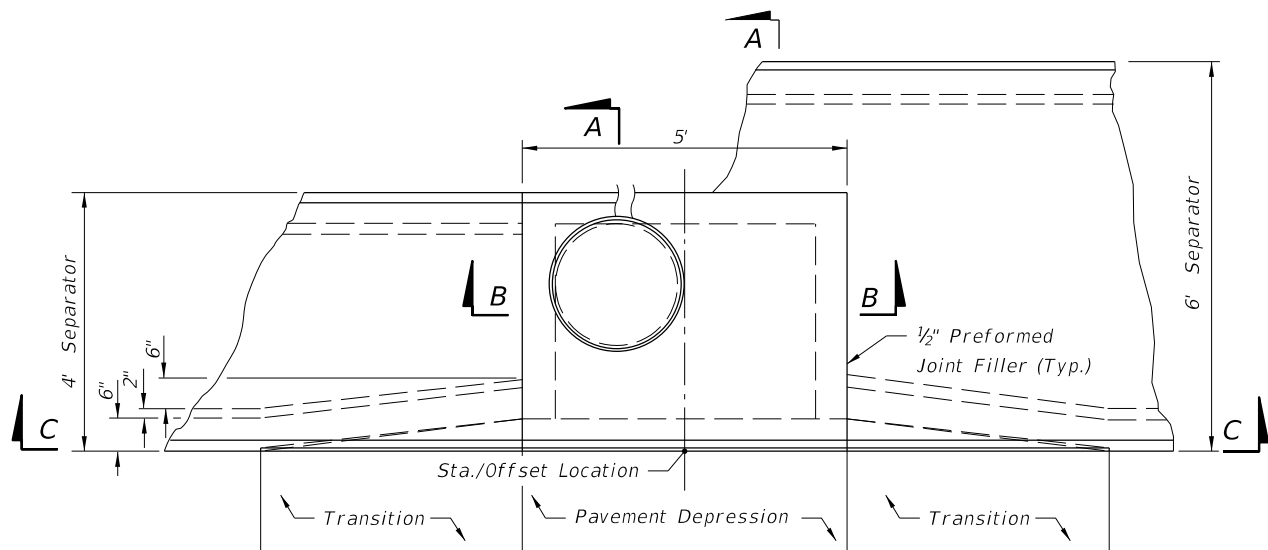
SECTION AA

Const. Joints Permitted Between These Limits See Index 425-001 For Minimum Dimensions

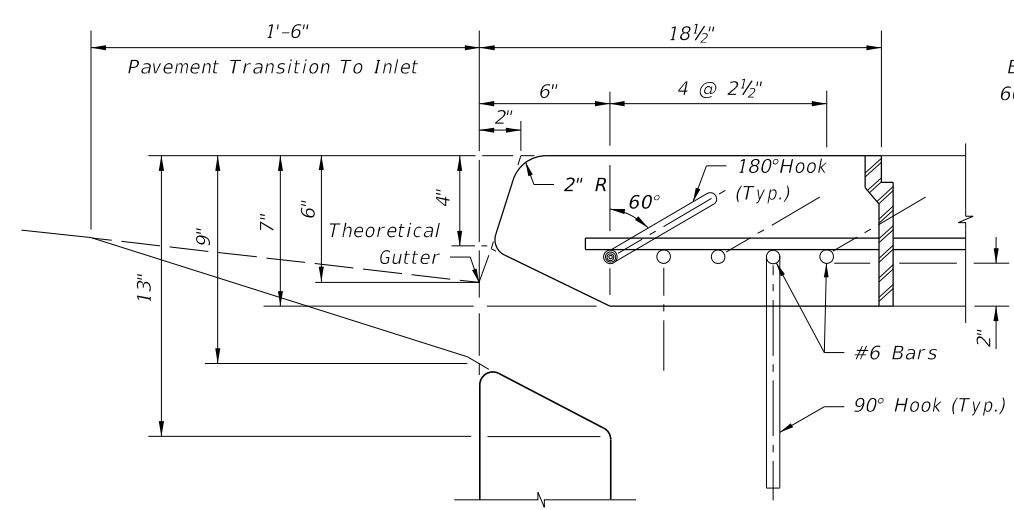
GENERAL NOTES

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 425-001 for equivalent area of welded wire fabric. Cut or bend bars out of way of pipe when necessary. Bars to clear pipe by 1 1/2"
3. Recommended maximum pipe sizes are 24" longitudinal and 30" transverse. For larger pipe, inlets with Alt. B bottoms, Index 425-010 are recommended.
4. For supplementary details see Index 425-001.
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.

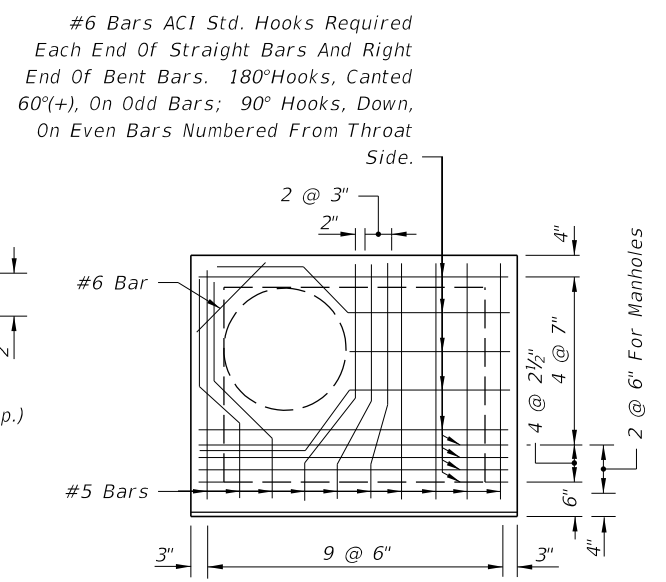
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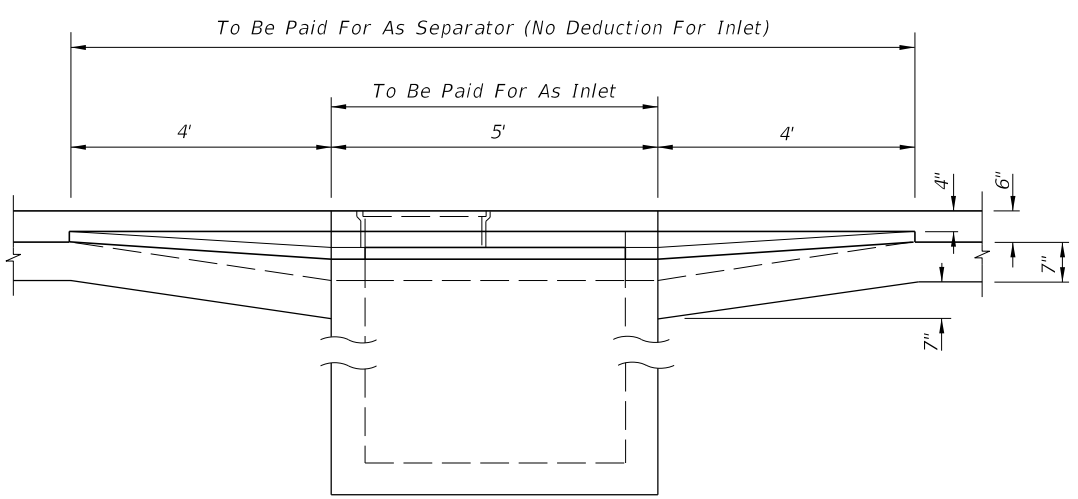
PLAN



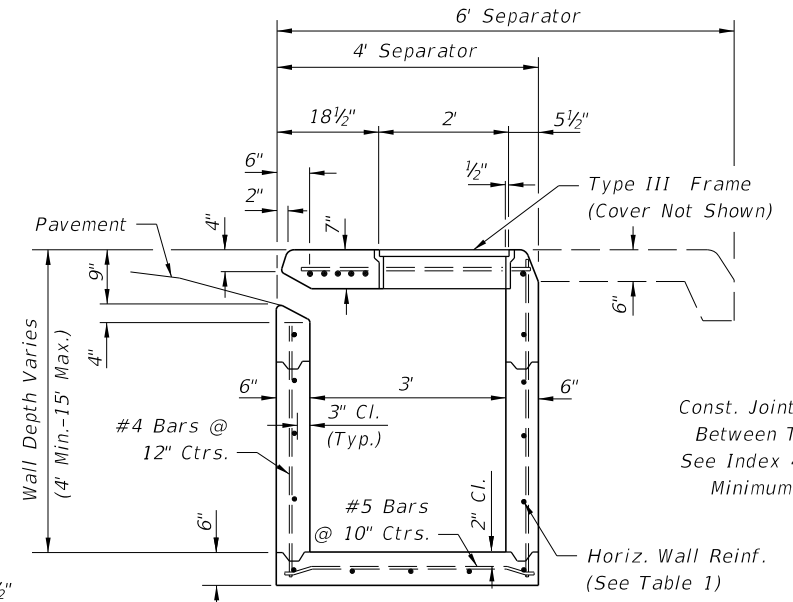
THROAT DETAIL (SECTION AA)



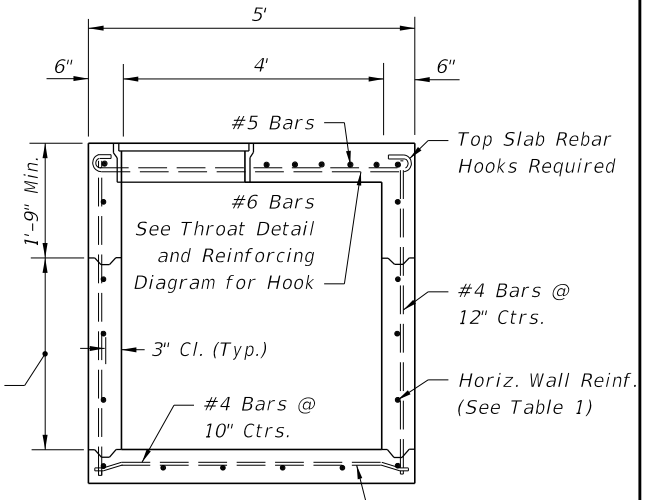
REINFORCING STEEL DIAGRAM TOP SLAB OF INLET



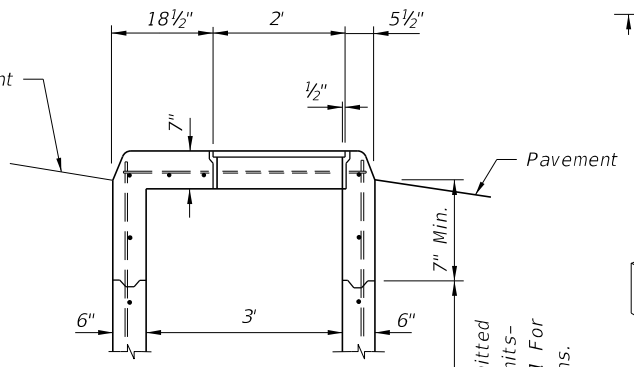
SECTION CC



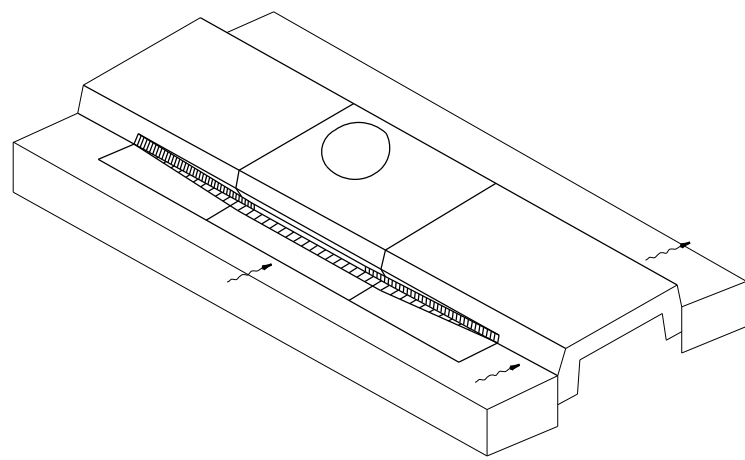
SECTION AA



SECTION BB



MODIFICATION WHEN USED AS A MANHOLE



GENERAL NOTES

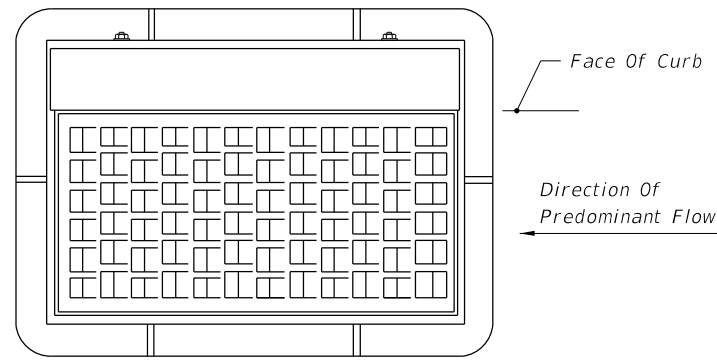
1. This inlet is to be used only in Traffic Separators Types IV and V; or, in separators constructed with Curbs Types D and F and sidewalk paving, which cannot accommodate Inlets Types 1, 2, 3, 4, 5 or 6. Use of this inlet on the through traffic side of the separator should be avoided in medians constructed 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 425-001 for equivalent area of welded wire fabric. Cut or bend bars out of way of pipe when necessary. Bars to clear pipe by 1 1/2".
3. Recommended maximum pipe sizes are 24" longitudinal and 30" transverse. For larger pipe, inlets with Alt. B bottoms, Index 425-010 are recommended.
4. For supplemental details and notes see Index 425-001.
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.

Const. Joints Permitted Between These Limits- See Index 425-001 For Minimum Dimensions.

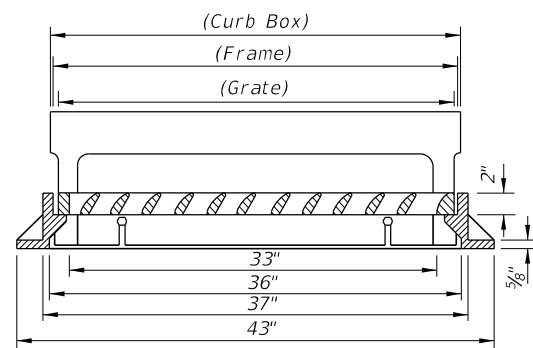
HORIZONTAL WALL REINFORCING SCHEDULE (TABLE 1)

WALL DEPTH	SCHEDULE	AREA (in. ² /ft.)	MAX. SPACING BARS	WWR
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	5 1/2"	5"

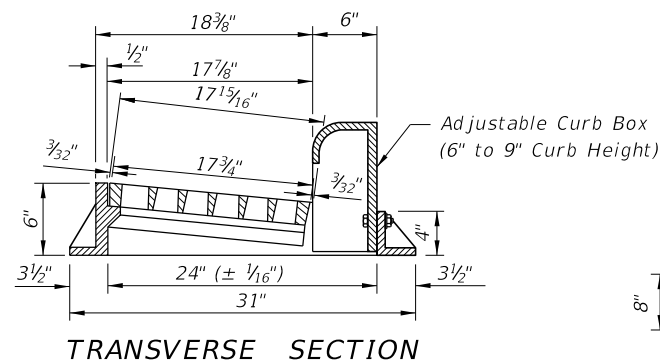
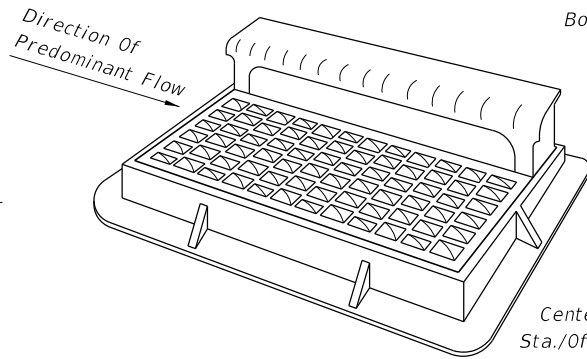
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TOP VIEW

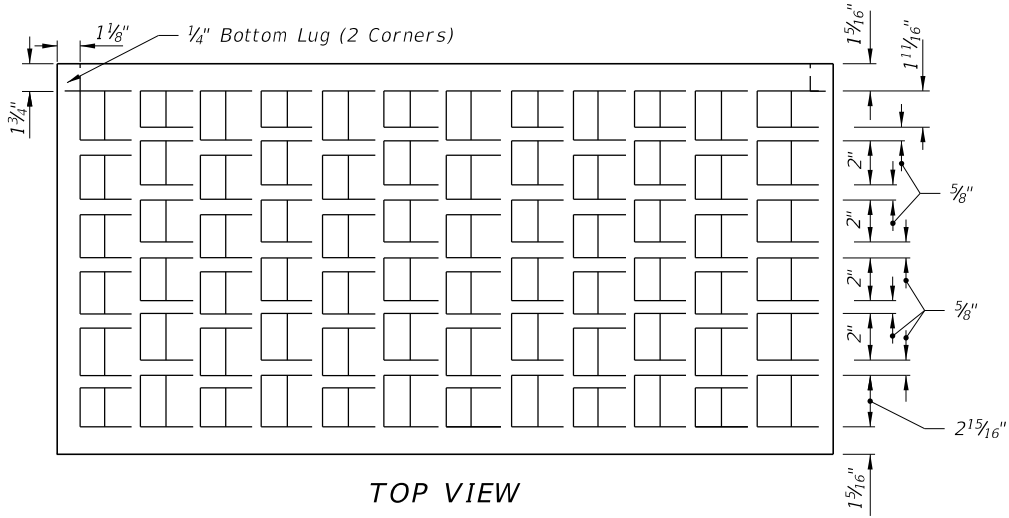


LONGITUDINAL SECTION



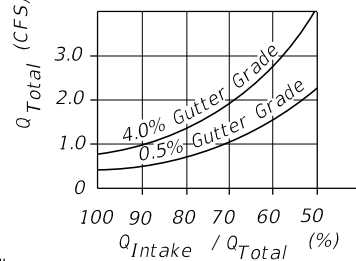
TRANSVERSE SECTION

FRAME AND GRATE

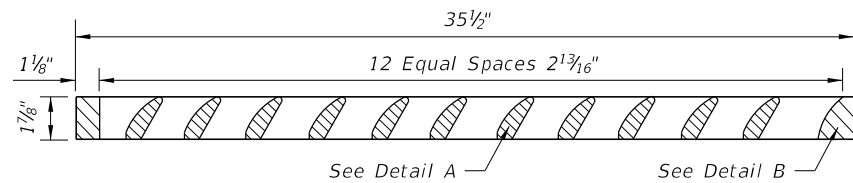


TOP VIEW

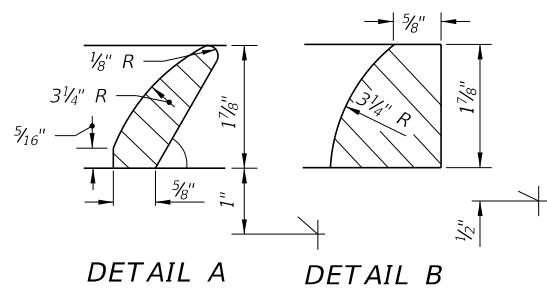
Approximate Debris Free Capacity
(0.02 Pavement Cross Slope)



EFFICIENCY CURVE



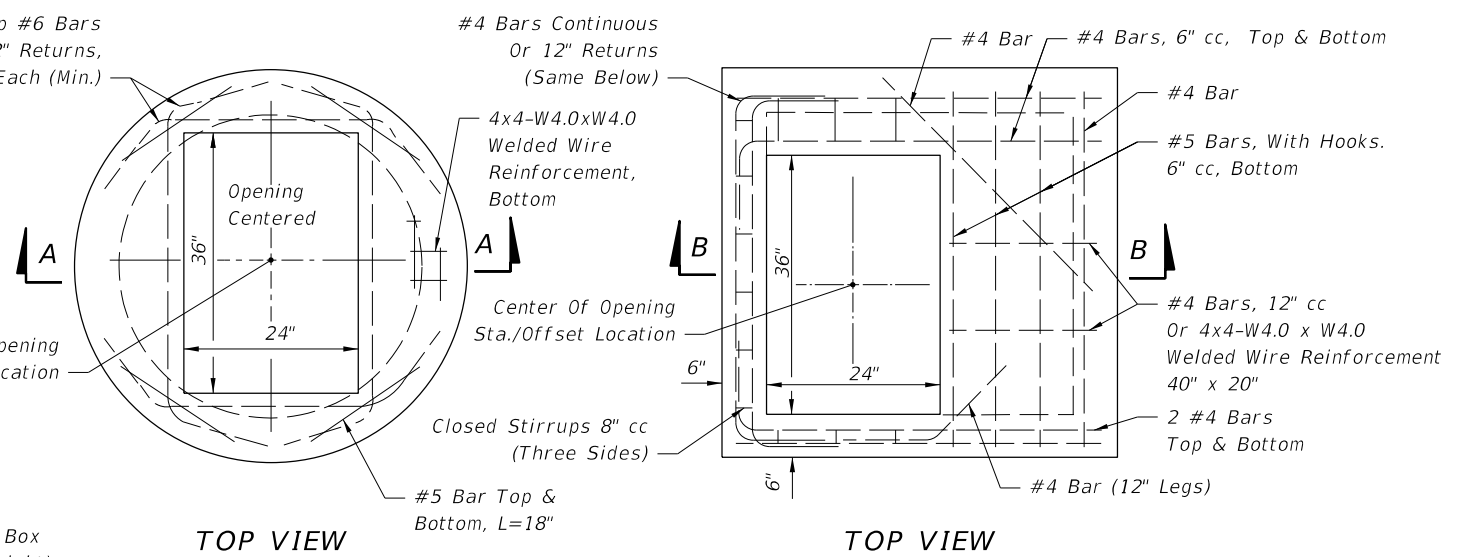
SECTION



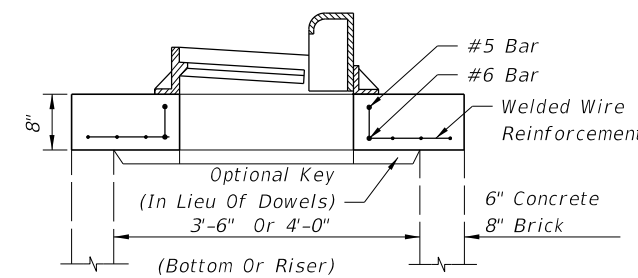
DETAIL A

DETAIL B

GRATE DETAIL

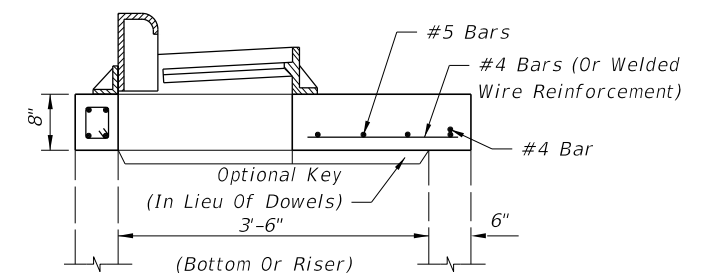


TOP VIEW



SECTION AA
(SEE NOTE 6 BELOW)

TOP SLABS



SECTION BB
(SEE NOTE 6 BELOW)

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 425-010. For supplemental details see Index 425-001.
4. All steel in slab tops shall have 1 1/4" 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 425-010 with the slab opening adjusted to 24"x36". The "Special Top Slab" on Index 425-010 is not permitted.
7. Frame may be adjusted with one to six courses of brick.
8. Vaned grates with approximately equal openings will be permitted that satisfy AASHTO HL-93 loading. Grates shall be reversible, right or left.

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LAST REVISION 11/01/17	DESCRIPTION:
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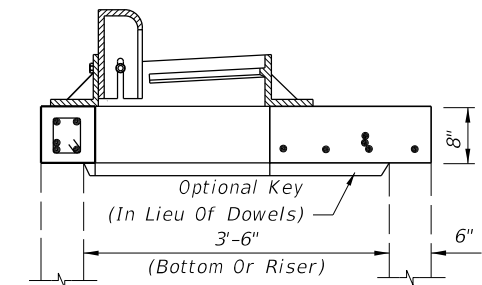
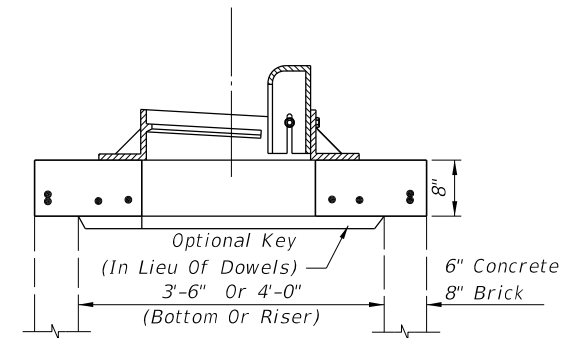
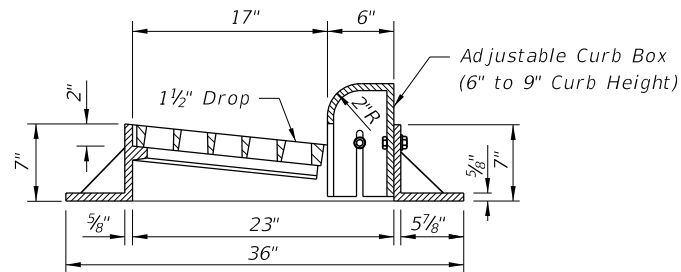
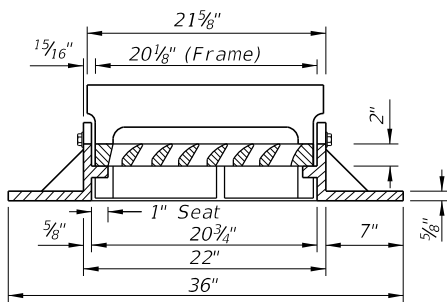
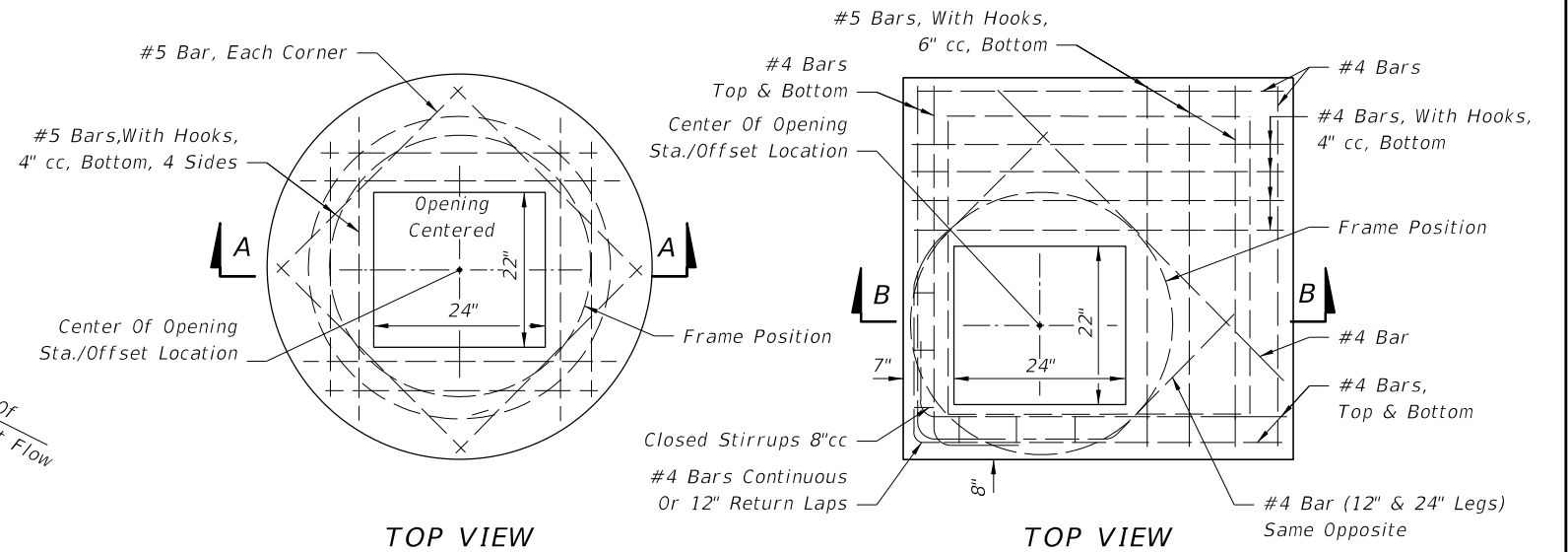
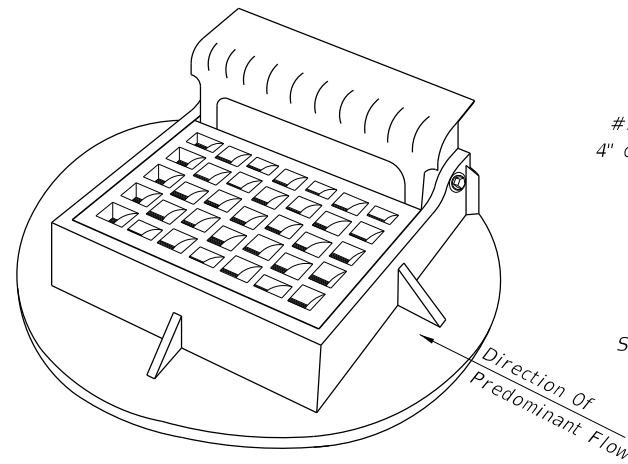
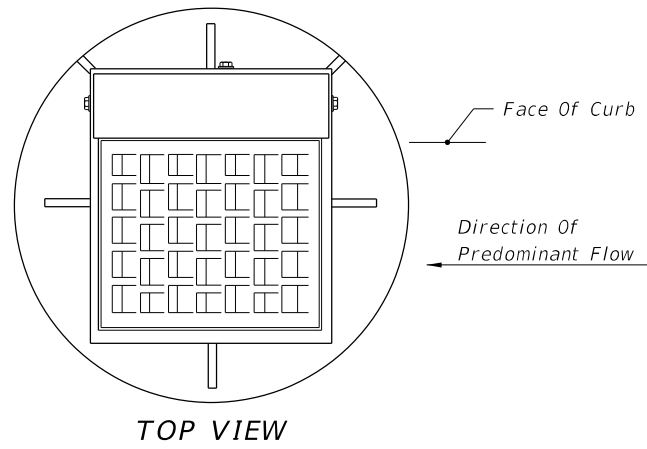


FY 2020-21
STANDARD PLANS

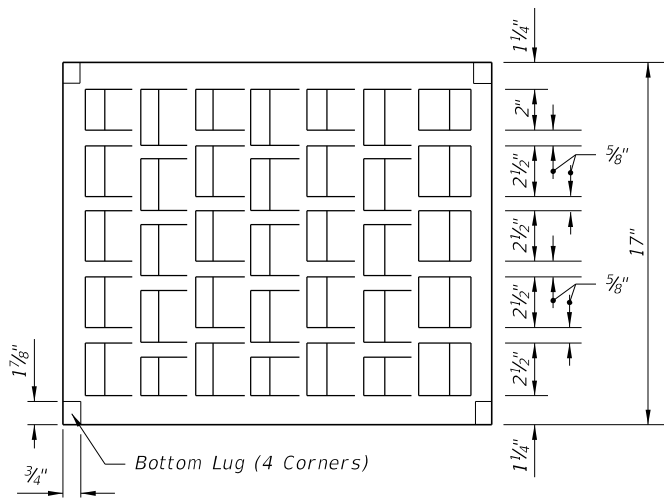
CURB INLET TOP TYPE 9

INDEX
425-024

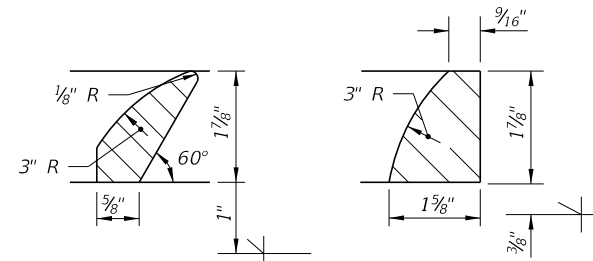
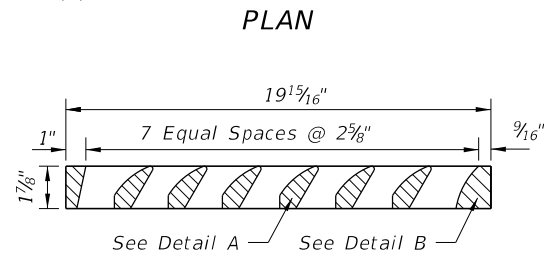
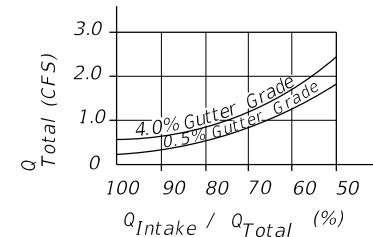
SHEET
1 of 1



FRAME AND GRATE



Approximate Debris Free Capacity (0.02 Pavement Cross Slope)



GRATE DETAIL

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 425-010. For supplemental details see Index 425-001.
4. All steel in slab tops shall have 1 1/4" 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 425-010 with the slab opening adjusted to 22"x24". The "Special Top Slab" on Index 425-010 is not permitted.
7. Frame may be adjusted with one to six courses of brick.
8. Vaned grates with approximately equal openings will be permitted that satisfy AASHTO HL-93 loading. Grates shall be reversible.

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LAST REVISION 11/01/17	DESCRIPTION:
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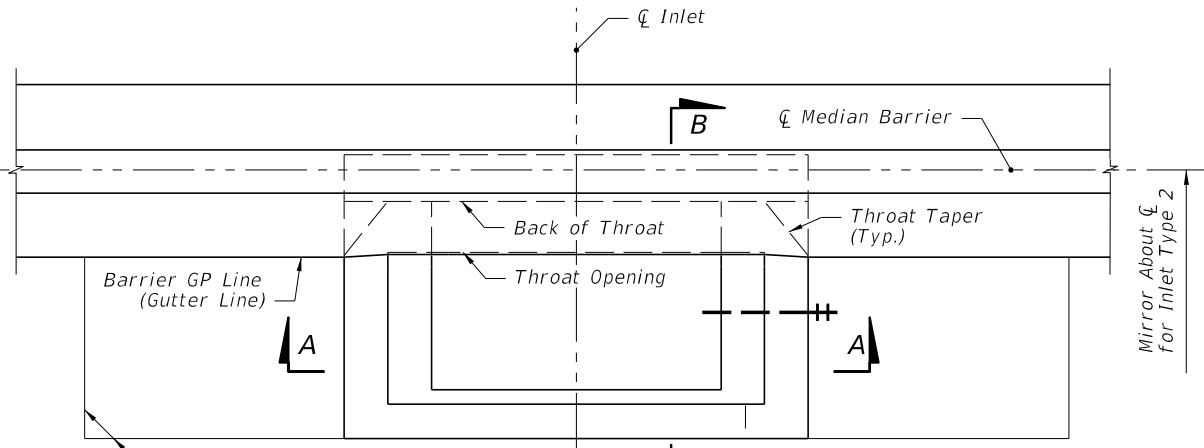


FY 2020-21
STANDARD PLANS

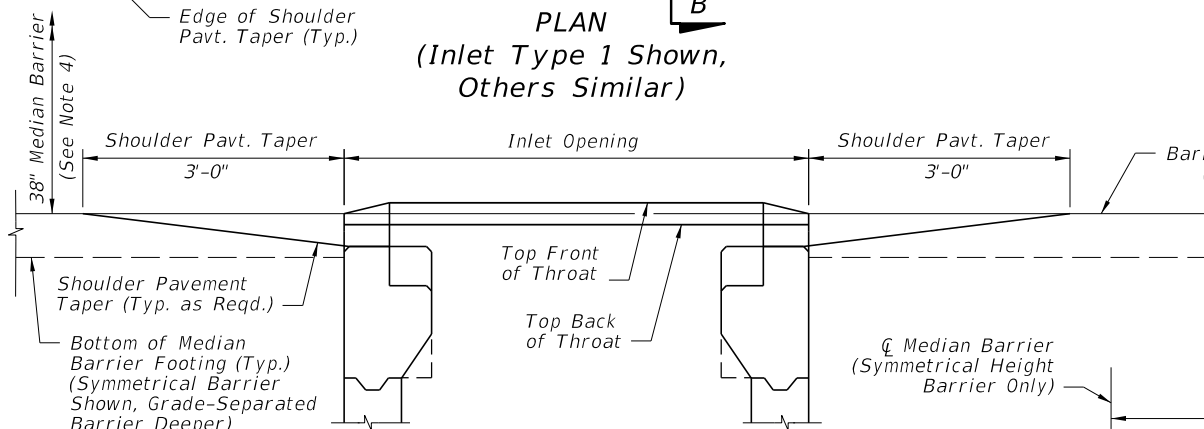
CURB INLET TOP TYPE 10

INDEX
425-025

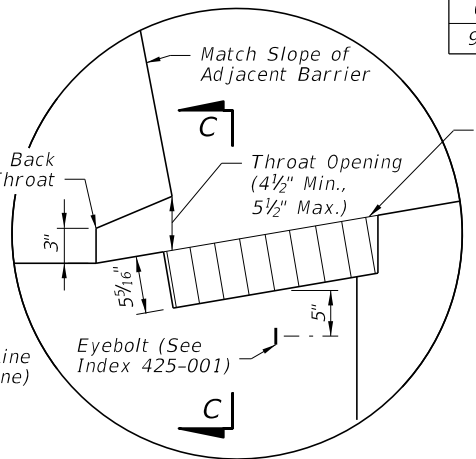
SHEET
1 of 1



PLAN
(Inlet Type 1 Shown,
Others Similar)



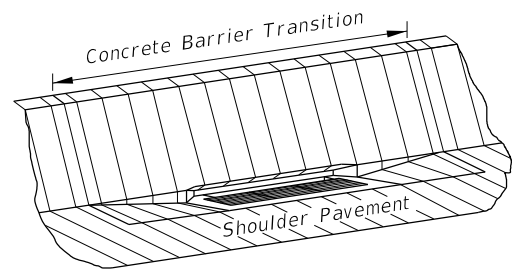
ELEVATION - VIEW C-C
(Grate Not Shown for Clarity)



INLET DETAIL

TABLE 1: HORIZONTAL WALL REINFORCING SCHEDULE

WALL DEPTH	SCHEDULE	AREA (in. ² /ft.)	MAX. BARS	MAX. SPACING WWR
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"

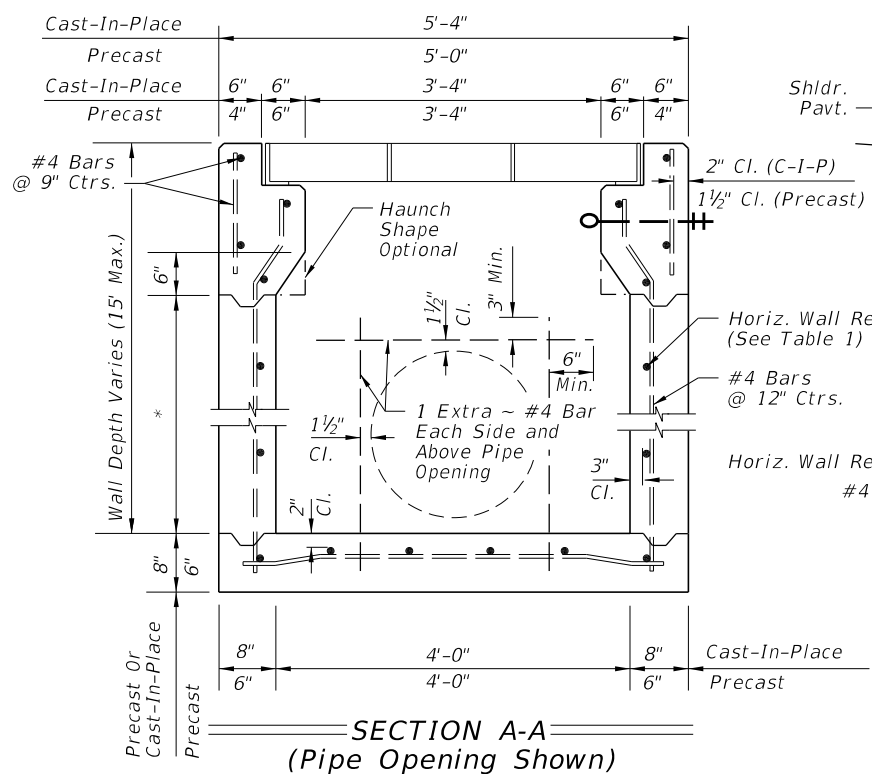


ISOMETRIC VIEW

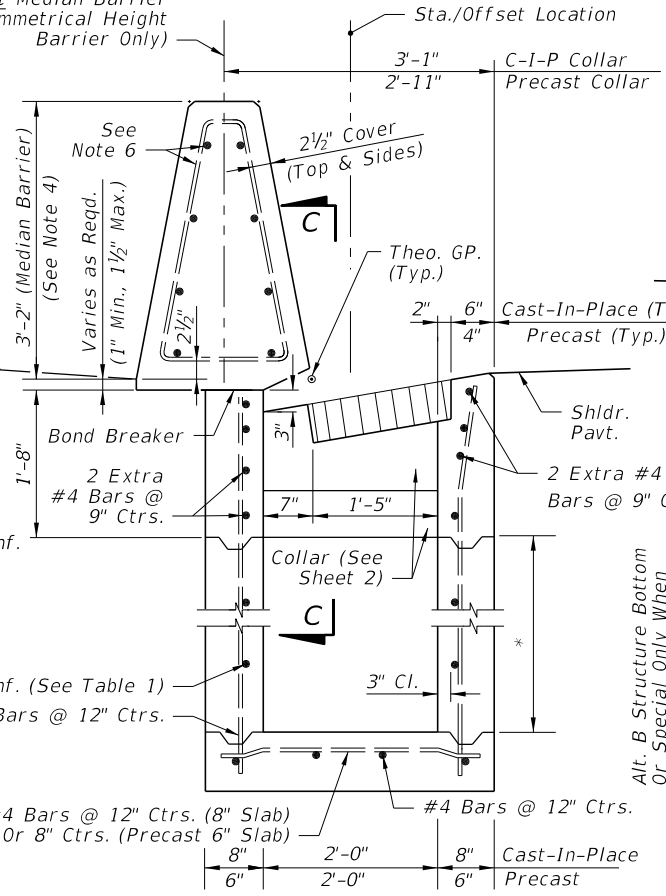
GENERAL NOTES:

- Where called for in the Plans, use this inlet in conjunction with Median Barrier per Index 521-001.

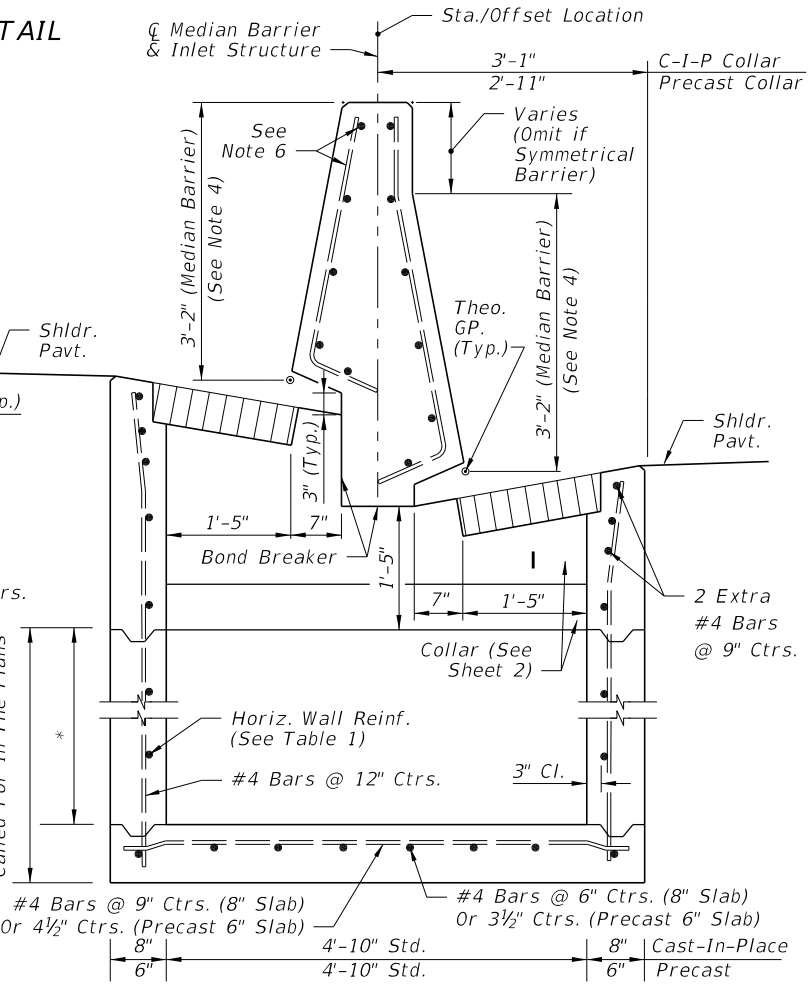
Inlet Descriptions:
Type 1: Inlet on one side of Median Barrier
Type 2: Inlet on both sides of Median Barrier
- For grate details, see Index 425-040. The parallel bar grate shall be used unless the reticuline grate is called for in the plans. The reticuline grate shall be specified where bicycle traffic is anticipated. Used in areas of occasional pedestrian traffic. Not suitable for use in pedestrian traffic or bicycle way.
- All exposed edges and corners shall be 3/4" chamfer or tooled to 1/4" radius.
- For standard Median Barrier dimensions and requirements, see Index 521-001.
- Inlet wall reinforcing is Grade 60 #4 bars. The horizontal wall reinforcing must be positioned 3" from the inside face unless otherwise shown. Per Index 425-001, the equivalent area of welded wire fabric is permitted.
- Barrier reinforcing is Grade 60 #4 bars or #5 bars, as required to match the stirrups and longitudinal steel of the adjacent Concrete Barrier per Index 521-001. Barrier reinforcing steel cover may be either 2" or 2½" as needed to match the adjacent barrier reinforcing cover, unless otherwise shown. Match the stirrup spacing of the adjacent barrier. Run Longitudinal steel bars over the full length of the Concrete Barrier Transition and run continuously with the longitudinal steel of the adjacent barriers; use lap splices as required.
- For supplemental details see Index 425-001.
- All dimensions are for both precast and cast-in-place inlets unless otherwise noted.
- Inlets to be paid for under the contract unit price for Inlets (Median Barrier Type_), EA. Concrete Barrier to be paid for under the contract unit price for Concrete Barrier, LF.
- Bond Breaker: One layer of ASTM D6380 Class S, Type III organic felt between inlet and barrier, including footings.



SECTION A-A
(Pipe Opening Shown)



SECTION FOR INLET TYPE 1
(SYMMETRICAL HEIGHT BARRIER ONLY)

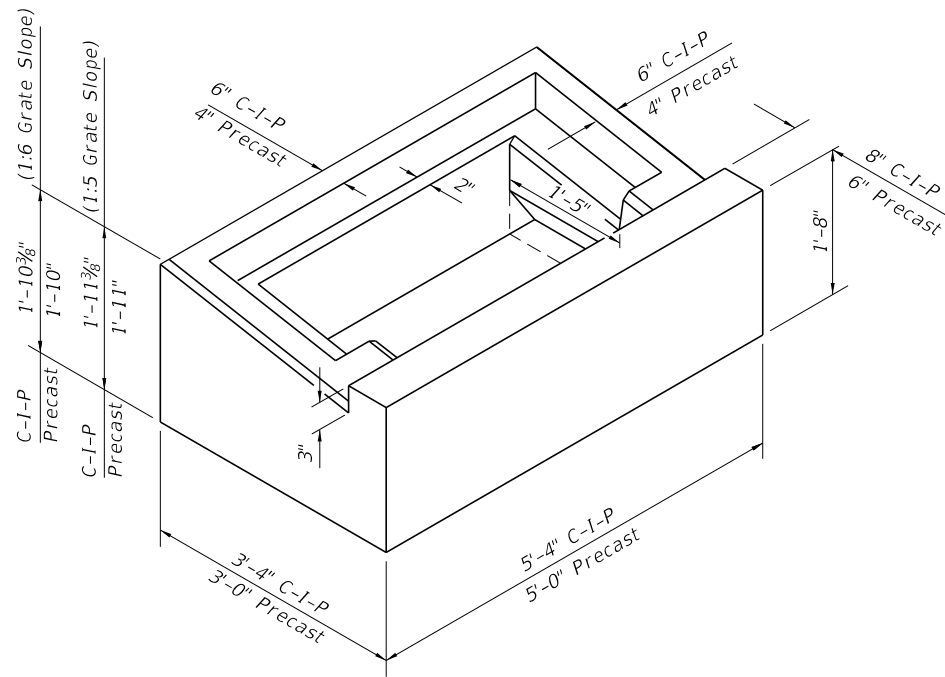


SECTION FOR INLET TYPE 2
(GRADE-SEPARATED BARRIER SHOWN,
SYMMETRICAL HEIGHT BARRIER SIMILAR)

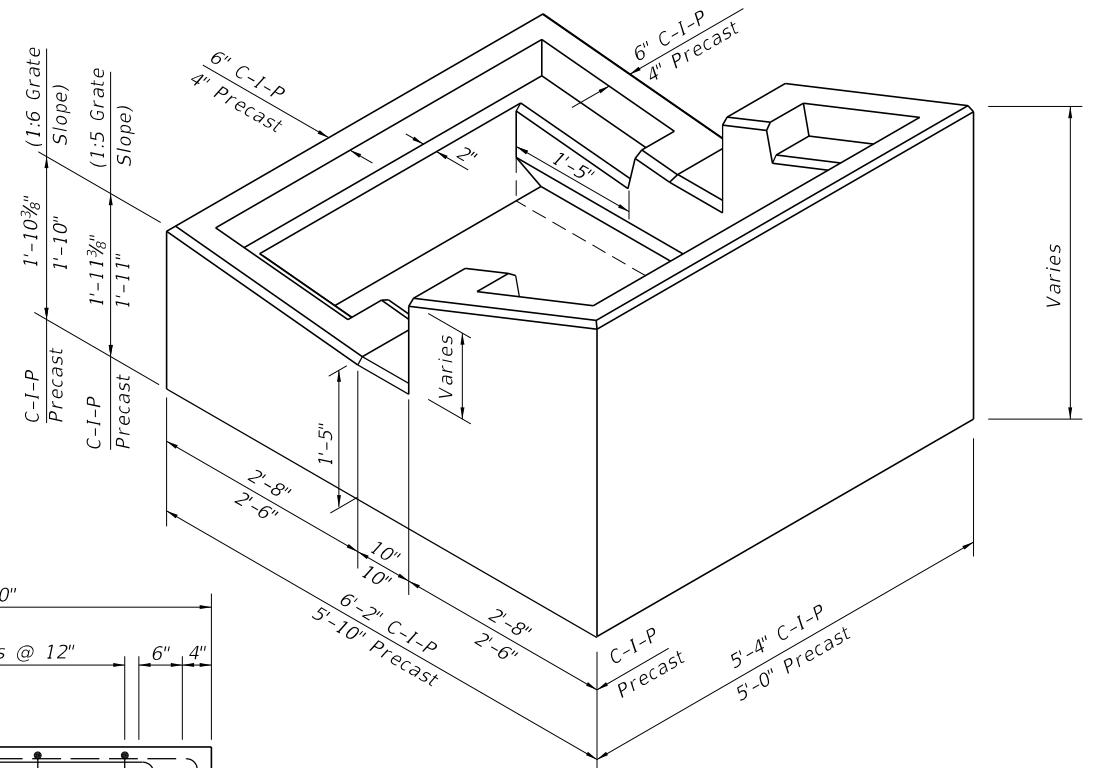
* Const. Joint Permitted Between These Limits See Index 425-001 For Min. Dimensions

SECTION B-B
(Pipe Opening Not Shown)

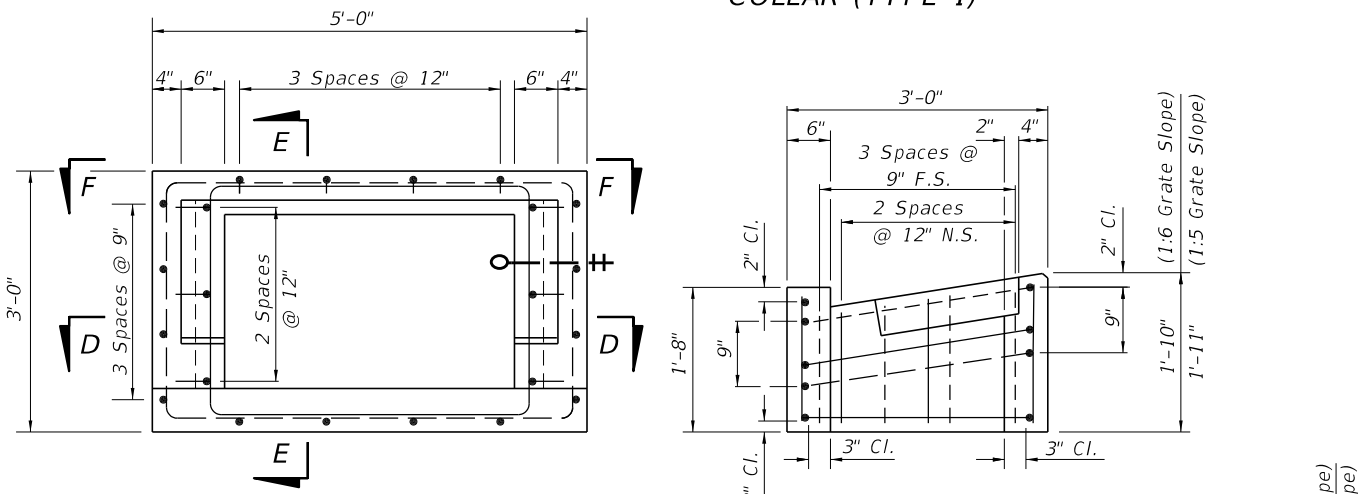
11/25/2019 12:32:43 PM



ISOMETRIC VIEW OF INLET COLLAR (TYPE 1)

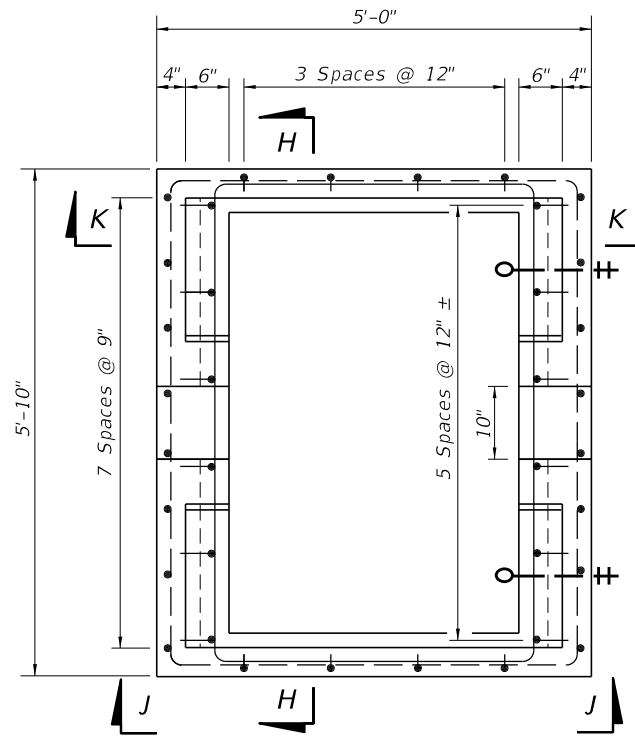


ISOMETRIC VIEW OF INLET COLLAR (TYPE 2)



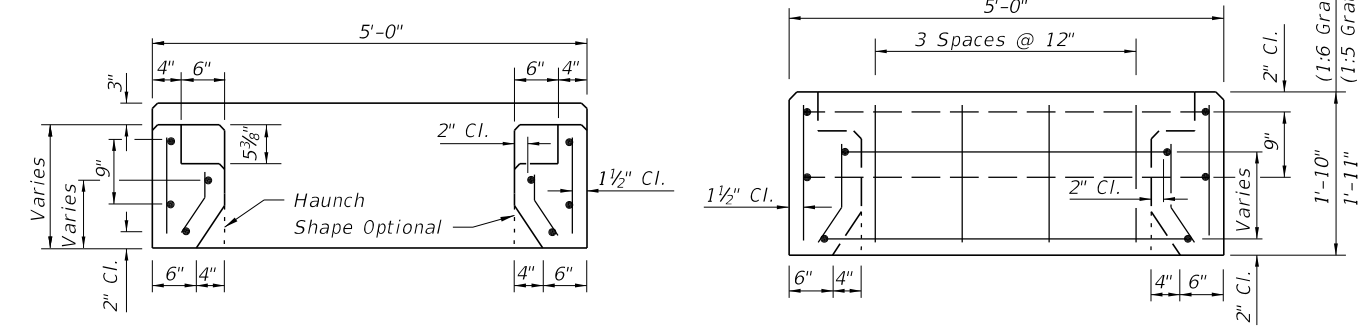
TOP VIEW OF INLET COLLAR WITHOUT GRATE

SECTION EE



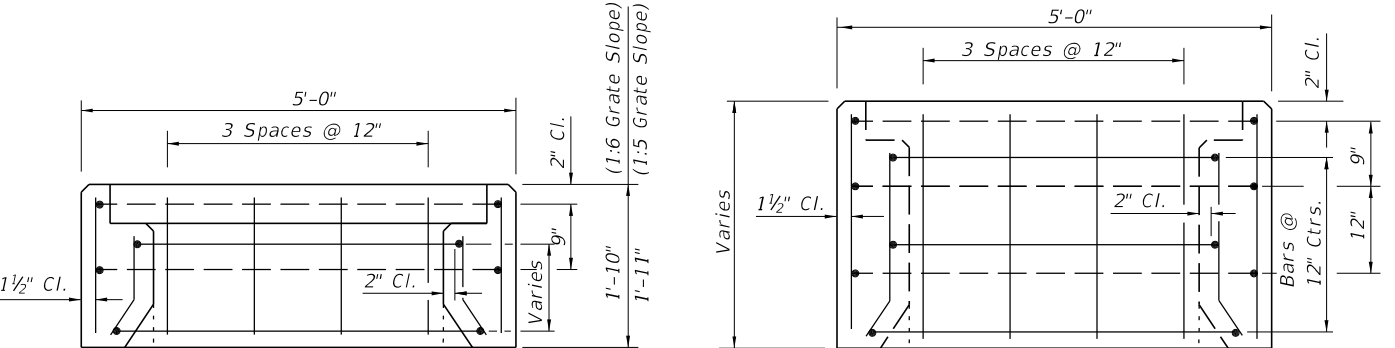
TOP VIEW OF INLET COLLAR WITHOUT GRATE

SECTION HH



SECTION DD

VIEW FF



VIEW KK

VIEW JJ

PRECAST COLLAR REINFORCING DETAILS (TYPE 1)
(C-I-P COLLAR REINFORCING DETAILS SIMILAR)

PRECAST COLLAR REINFORCING DETAILS (TYPE 2)
(C-I-P COLLAR REINFORCING DETAILS SIMILAR)

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LAST REVISION 11/01/17

REVISION DESCRIPTION:

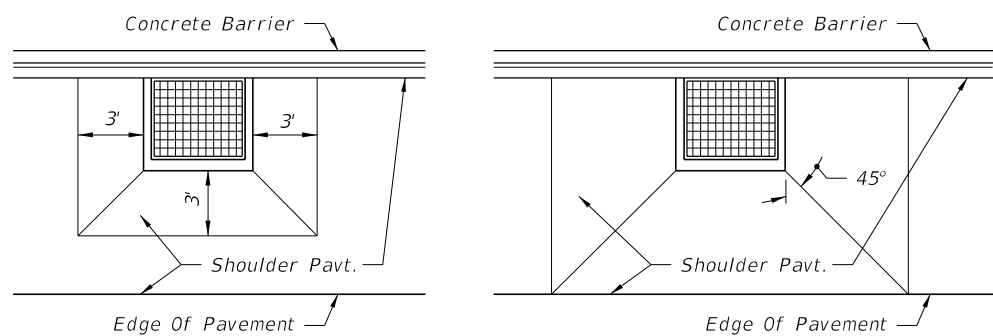


FY 2020-21 STANDARD PLANS

MEDIAN BARRIER INLETS TYPES 1 AND 2

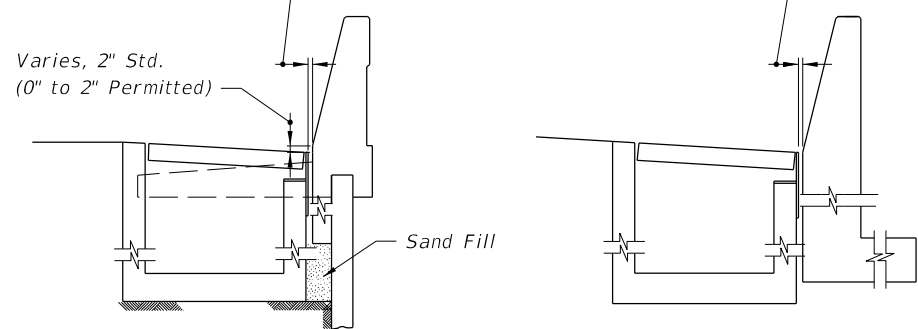
INDEX 425-030

SHEET 2 of 2



LOW SIDE SUPERELEVATION PAVEMENT WARP FOR SHOULDERS IN SUPERELEVATION
HIGH SIDE TRANSITION PAVEMENT WARP FOR SHOULDERS IN SUPERELEVATION

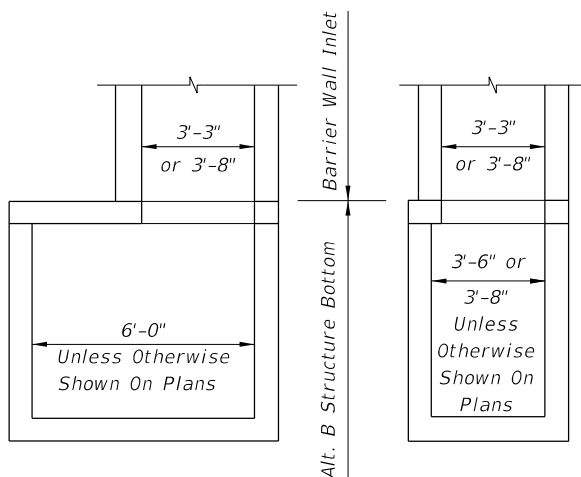
Joint And Bond Breaker:
Cast-In-Place Inlets:
One layer ASTM D6380 Class S, Type III
Organic Felt bond breaker between inlet and
barrier, including footings.
Precast Inlets:
Joint width 1" max. Seal with backer rod and
Department-approved pavement joint sealant.
See Section BB For Other Barrier Shape.



BARRIER WITH JUNCTION SLAB AND WALL COPING

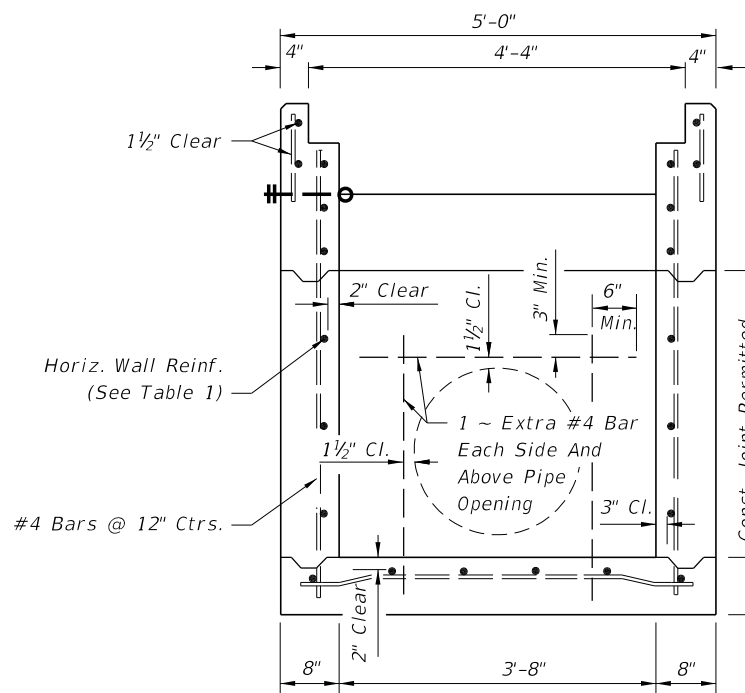
BARRIER WITH STEM AND FOOTING

INLET SECTIONS -
EXAMPLE BARRIER TYPES

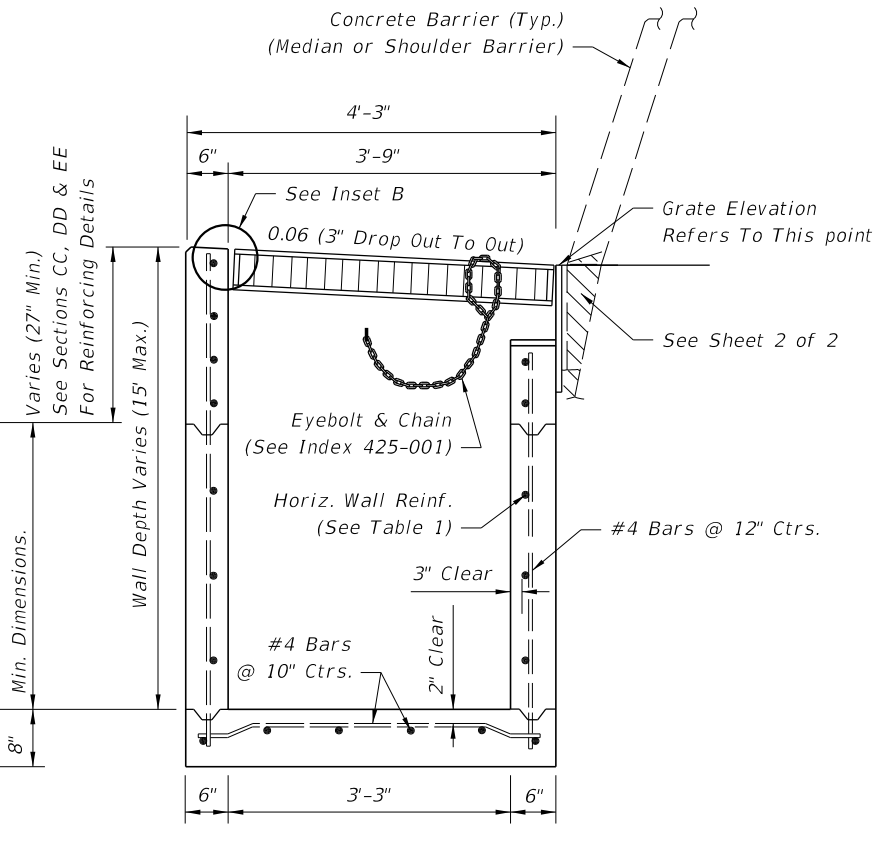


Note: Alt. B Structure Bottom Only. See Index 425-010

INLET WITH STRUCTURE BOTTOM



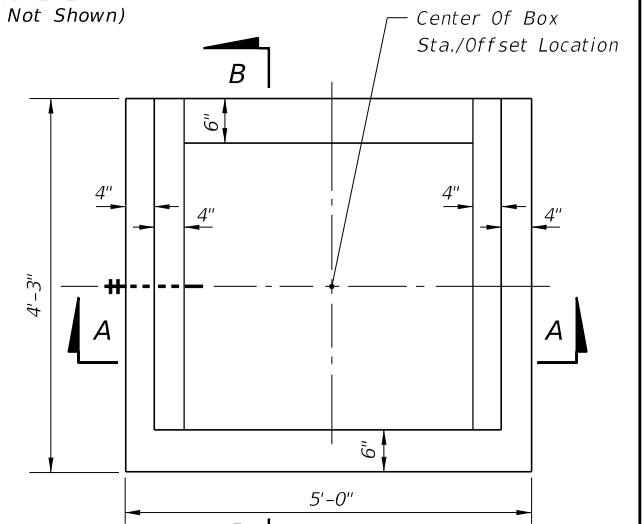
SECTION A-A (WITHOUT GRATE)
(Pipe Opening Shown)



SECTION B-B
(Pipe Opening Not Shown)

GENERAL NOTES:

- Where called for in the Plans, use this inlet in conjunction with median or shoulder barrier per Index 521-001 or a barrier with junction slab and wall coping per Index 521-610. 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.
- 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.
- 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.
- All exposed edges and corners shall be 3/4" chamfer or tooled to 1/4" radius.
- 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.
- All reinforcing is Grade 60 bars. See Index 425-001 for equivalent area of welded wire fabric.
- All dimensions are for both precast and cast-in-place inlets unless otherwise noted.
- For supplemental details see Indexes 425-001 and 425-010.
- Inlets to be paid for under the contract unit for Inlets (Concrete Barrier), Ea.



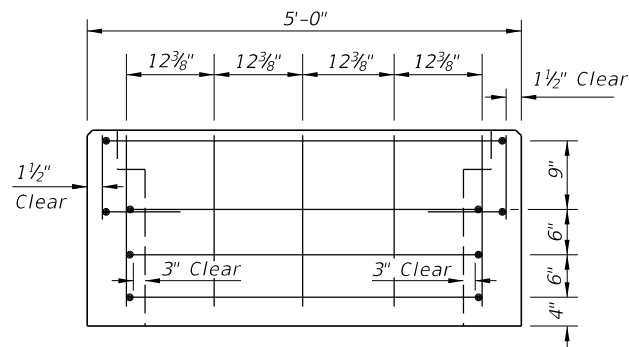
TOP VIEW (WITHOUT GRATE)

TABLE 1: HORIZONTAL
WALL REINFORCING SCHEDULE

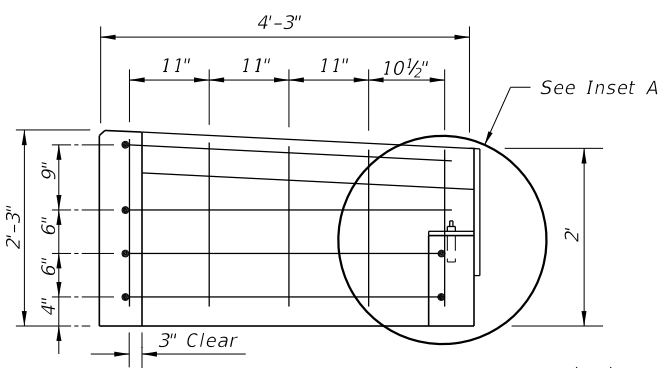
WALL DEPTH	SCHEDULE	AREA (in. ² /ft.)	MAX. SPACING	
			BARS	WWR
0'-5'	A12	0.20	12"	8"
5'-10'	A6	0.20	6"	5"
10'-15'	A4	0.20	4"	3"
10'-15'	B5.5	0.24	5 1/2"	5"

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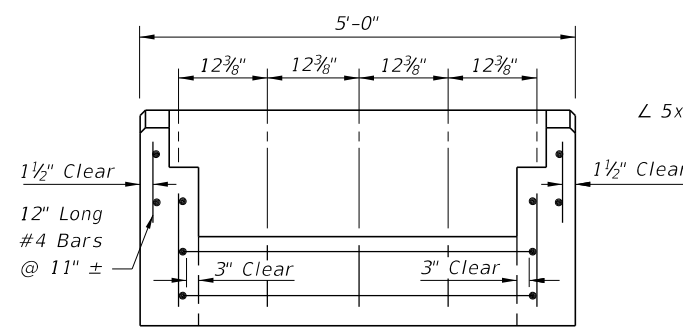
LAST REVISION	DESCRIPTION:
11/01/19	



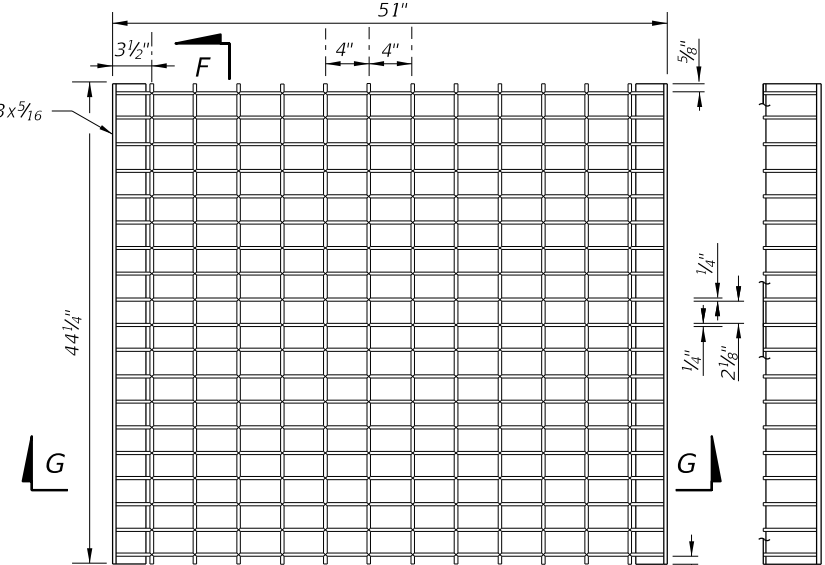
SECTION C-C



SECTION D-D



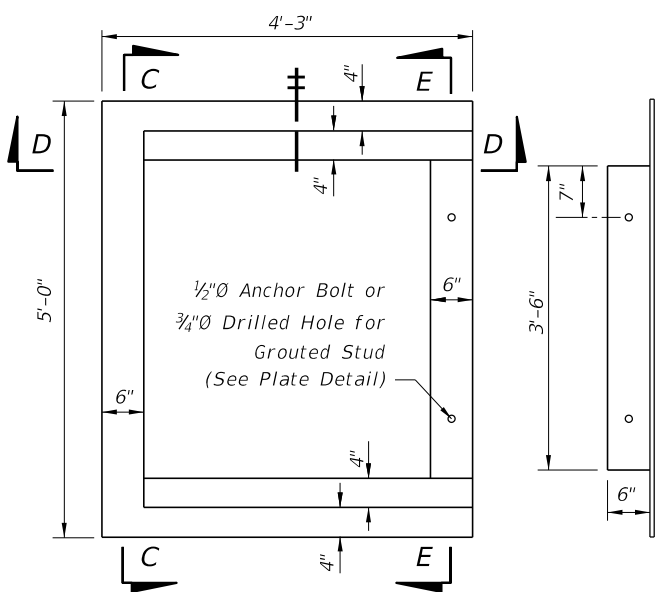
SECTION E-E



SECTION F-F

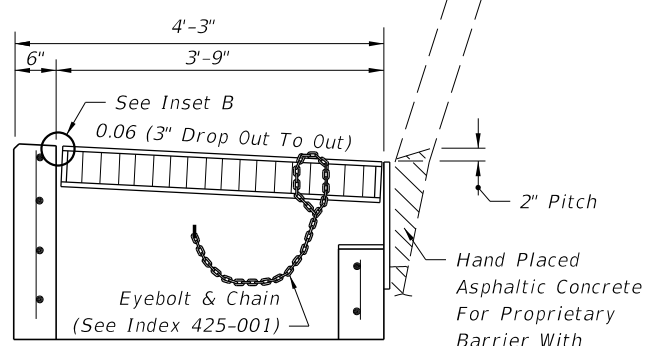
Main Bars: 5"x1/4"
 Cross Bars: Either 3/8"Ø Electroformed or 1/2"Ø Welded

TOP VIEW

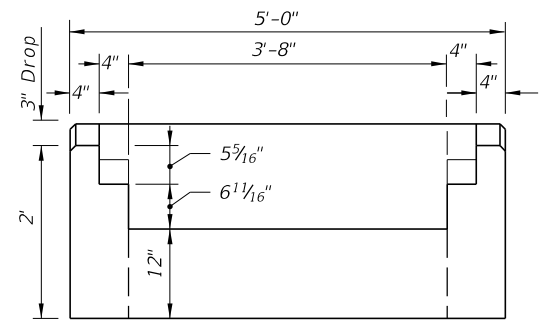


TOP VIEW OF INLET WITHOUT GRATE

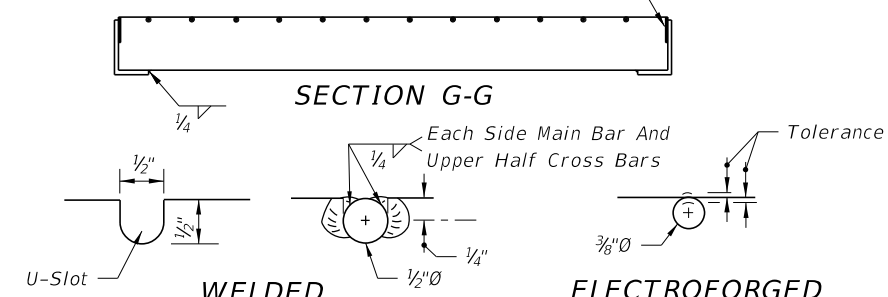
TOP VIEW OF METAL PLATE



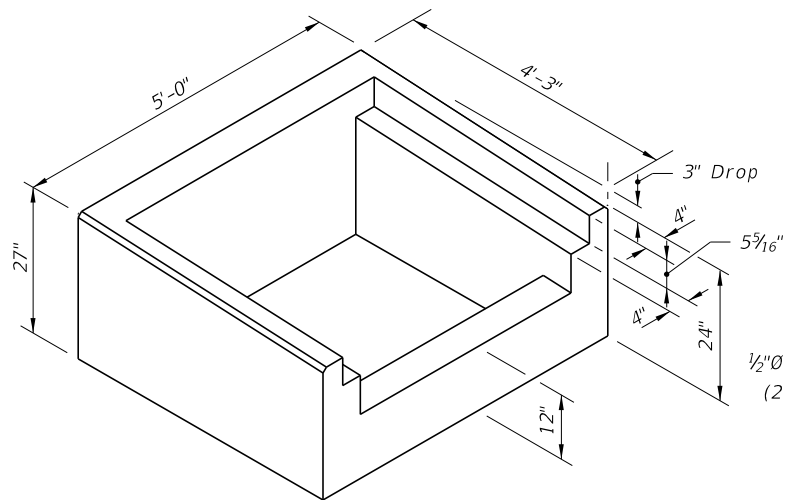
TRANSVERSE SECTION WITH GRATE & PLATE



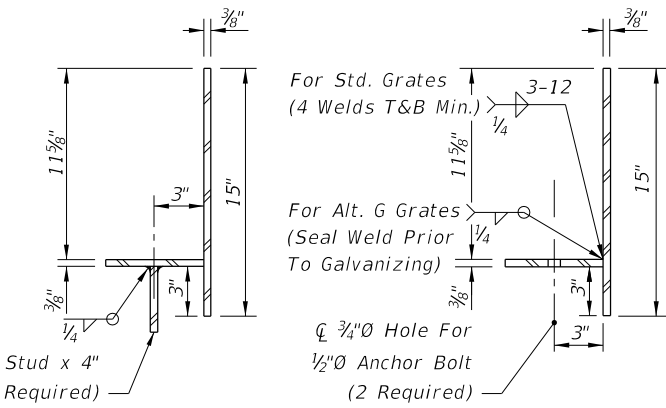
BACK VIEW WITHOUT BACK PLATE



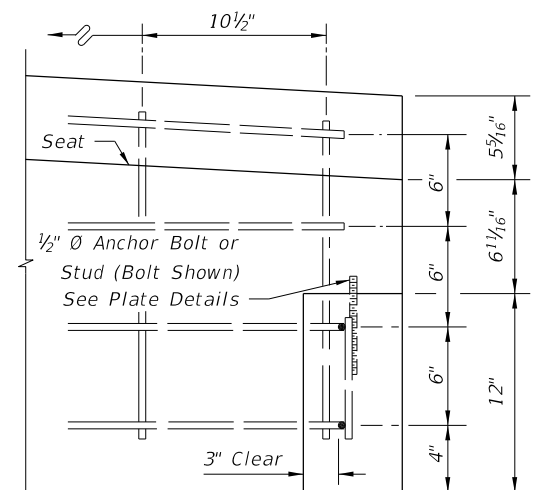
CROSS BAR OPTIONS STEEL GRATE



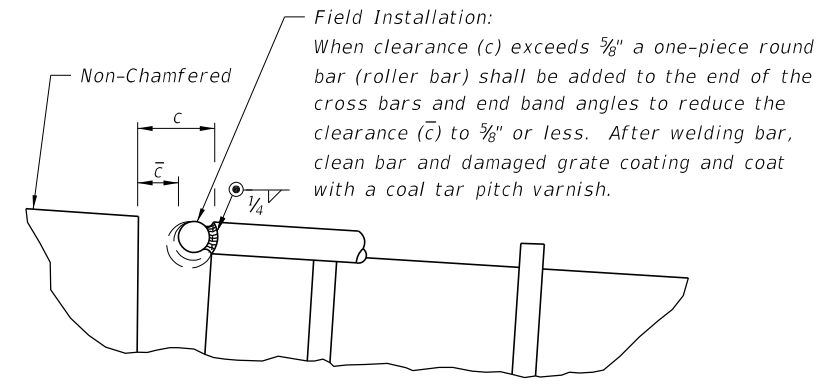
PICTORIAL VIEW OF INLET COLLAR



TRANSVERSE SECTIONS THRU BACKWALL PLATE



INSET A



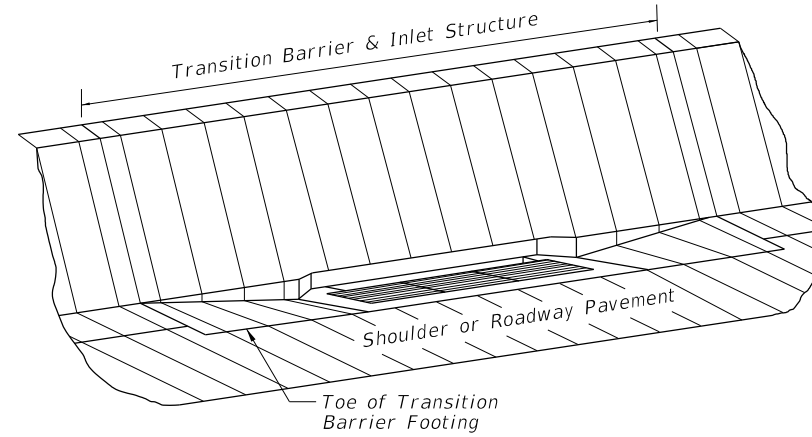
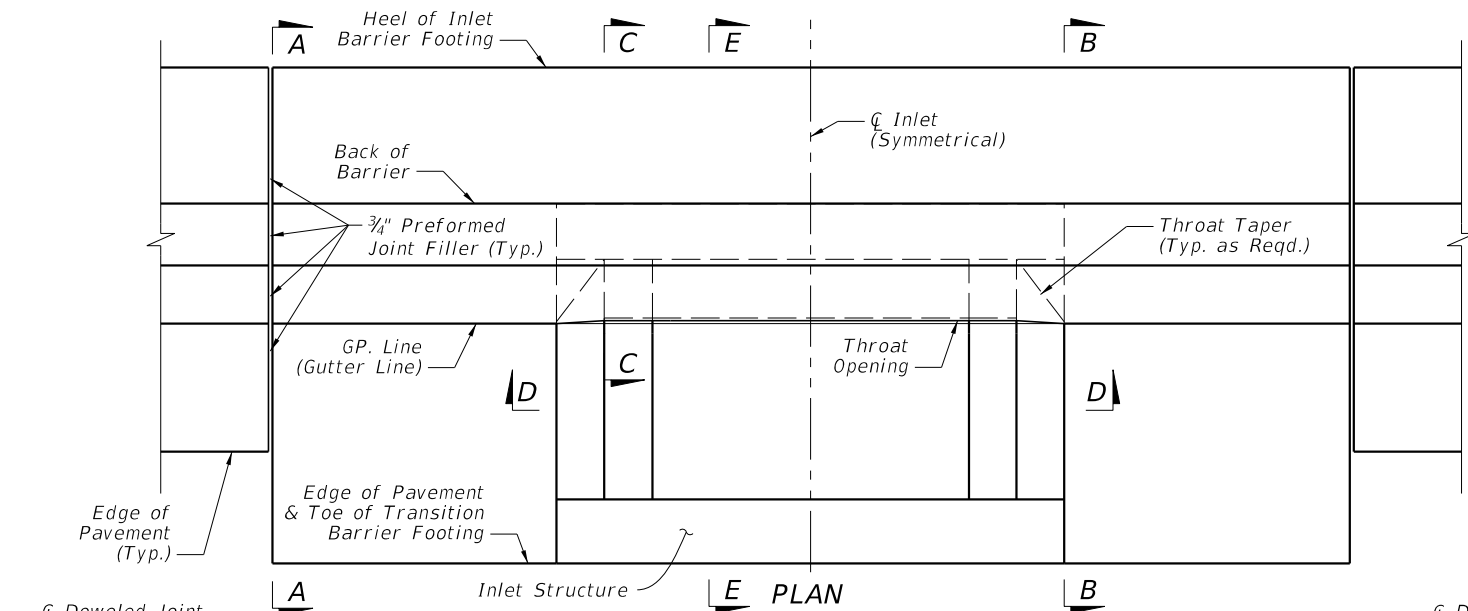
INSET B (See Sheet 1, General Note 1)

NOTES

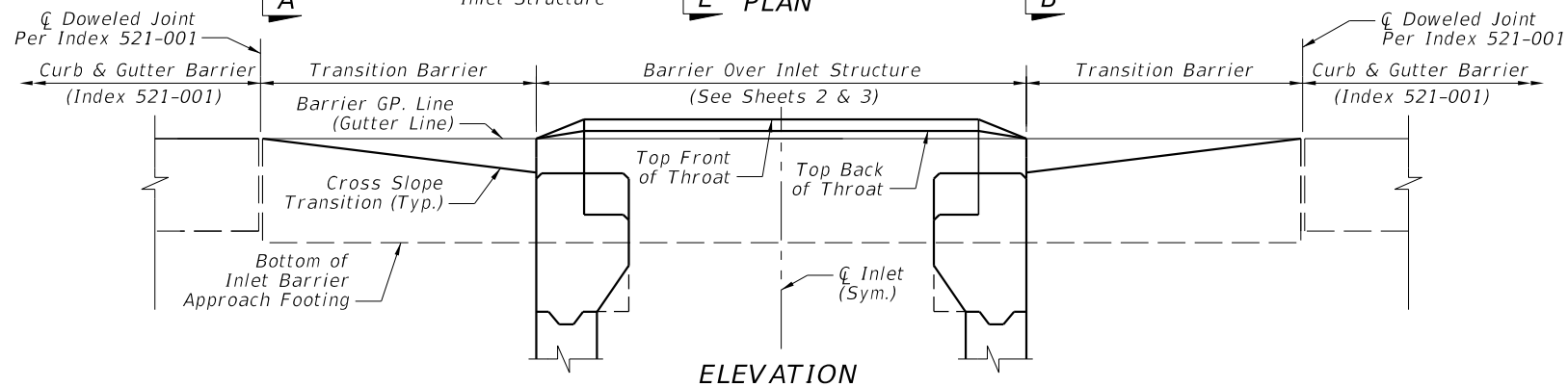
- All reinforcing steel bars shown are #4 bars.
- Anchor bolts shall be either ASTM A307 hex head bolts cast-in-place, or ASTM A36 or F1554 (Grade 36) galvanized fully threaded rod, adhesive bonded anchors installed in accordance with Specification Section 416. Bolts or rods shall be 6" long (4" min. 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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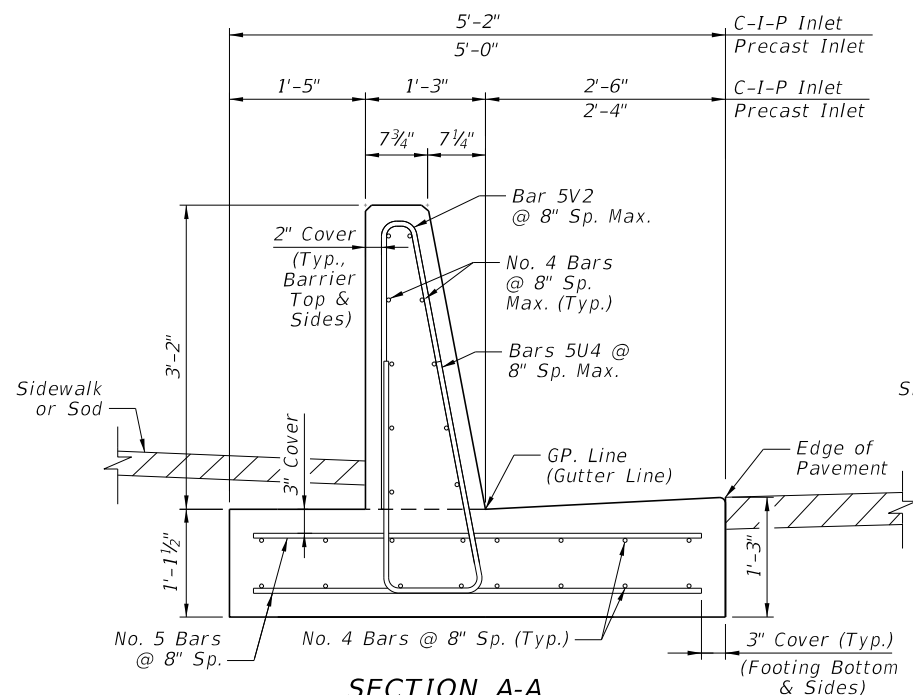
LAST REVISION 11/01/19	REVISION	DESCRIPTION:	 FY 2020-21 STANDARD PLANS	ADJACENT BARRIER INLET	INDEX 425-031	SHEET 2 of 2
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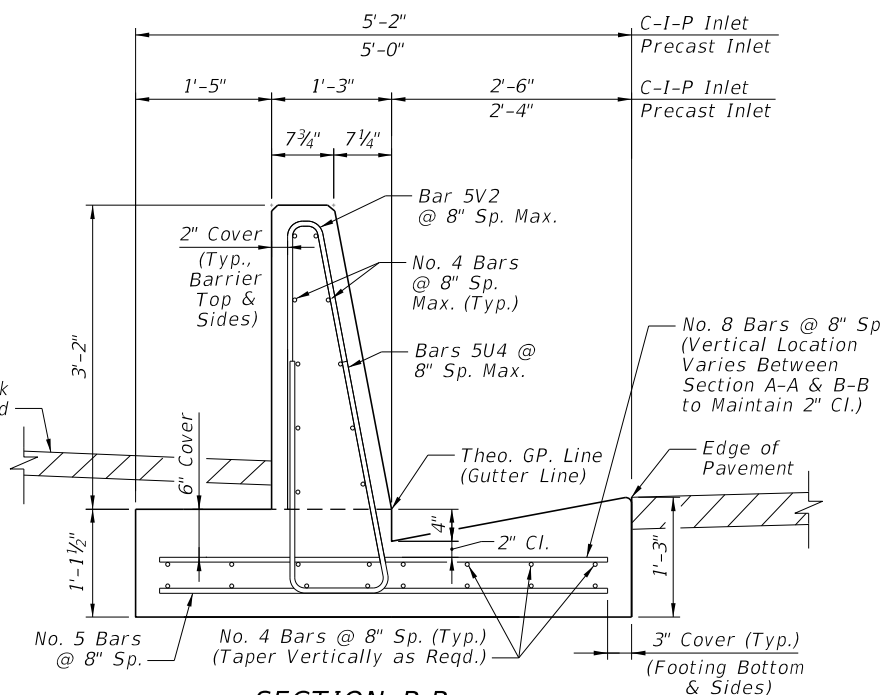
ISOMETRIC VIEW



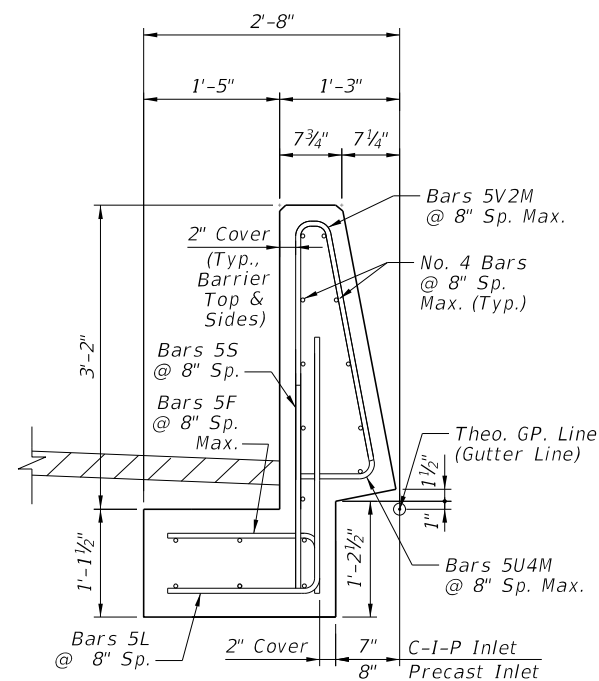
ELEVATION



SECTION A-A
TRANSITION BARRIER
BEGIN CROSS-SLOPE TRANSITION
(ALIGN WITH CURB AND GUTTER
BARRIER, SEE INDEX 521-001)



SECTION B-B
TRANSITION BARRIER
END CROSS-SLOPE TRANSITION
(ALIGN WITH INLET STRUCTURE)



SECTION C-C
BARRIER OVER INLET STRUCTURE
(THROAT FULLY TRANSITIONED)

GENERAL NOTES:

- Where called for in the Plans, use this inlet in conjunction with Curb and Gutter Barrier per Index 521-001. Construct Barrier segments shown herein in accordance with requirements of Index 521-001, including connections to adjacent barrier segments using the Doweled Joint.
- Reinforcing shown is grade 60 steel bars. For the equivalent area of welded wire reinforcement for the inlet, see Index 425-001. Reinforcing shall have 2" minimum cover unless otherwise shown. Trim or bend bars to provide 1 1/2" clearance around pipe openings. The cost for additional reinforcing in the barrier is included in the cost of the concrete barrier.
- For Bar Bending Details of Bars 5V2 & 5U4, see Index 521-001. For all others, see Sheet 2 & 3.
- All barrier is Class II or IV concrete per Index 521-001.
- Apply a 3/4" chamfer or 1/4" radius to all exposed concrete edges.
- For pipe connections to inlet structure bottoms, the recommended maximum pipe sizes are 18" longitudinal and 30" transverse. For larger pipe, use Alternate B bottoms, Index 425-010.
- Grates may be fabricated with reticulate bars or with either 1/2" dia welded or 3/8" dia electroforged cross bars and bearing bars as detailed on Sheet 3.
- When Alternate G grate is specified in the plans, the grate is to be hot-dip galvanized after fabrication, in accordance with Specification 962-9.
- For Pay Item purposes, the depth of the barrier inlet shall be computed using the center of box grate elevation, minus either the flow line elevation of the lowest pipe flow line or the top of the sump floor elevation.
- All dimensions are for both precast and cast in place (C-I-P) inlets unless otherwise indicated.
- For inlets placed in areas of bicycle traffic, provide the extended crossbar or bar stub (See Insets "B" and "B ALTERNATE").
- Inlets to be paid for under the contract unit price for Inlets, Barrier Rigid, Curb and Gutter, Each.
- Concrete Barrier to be paid for under the contract unit price for Shoulder Concrete Barrier, Rigid-Curb & Gutter, LF.

BARRIER SECTIONS

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LAST REVISION 11/01/17	DESCRIPTION:
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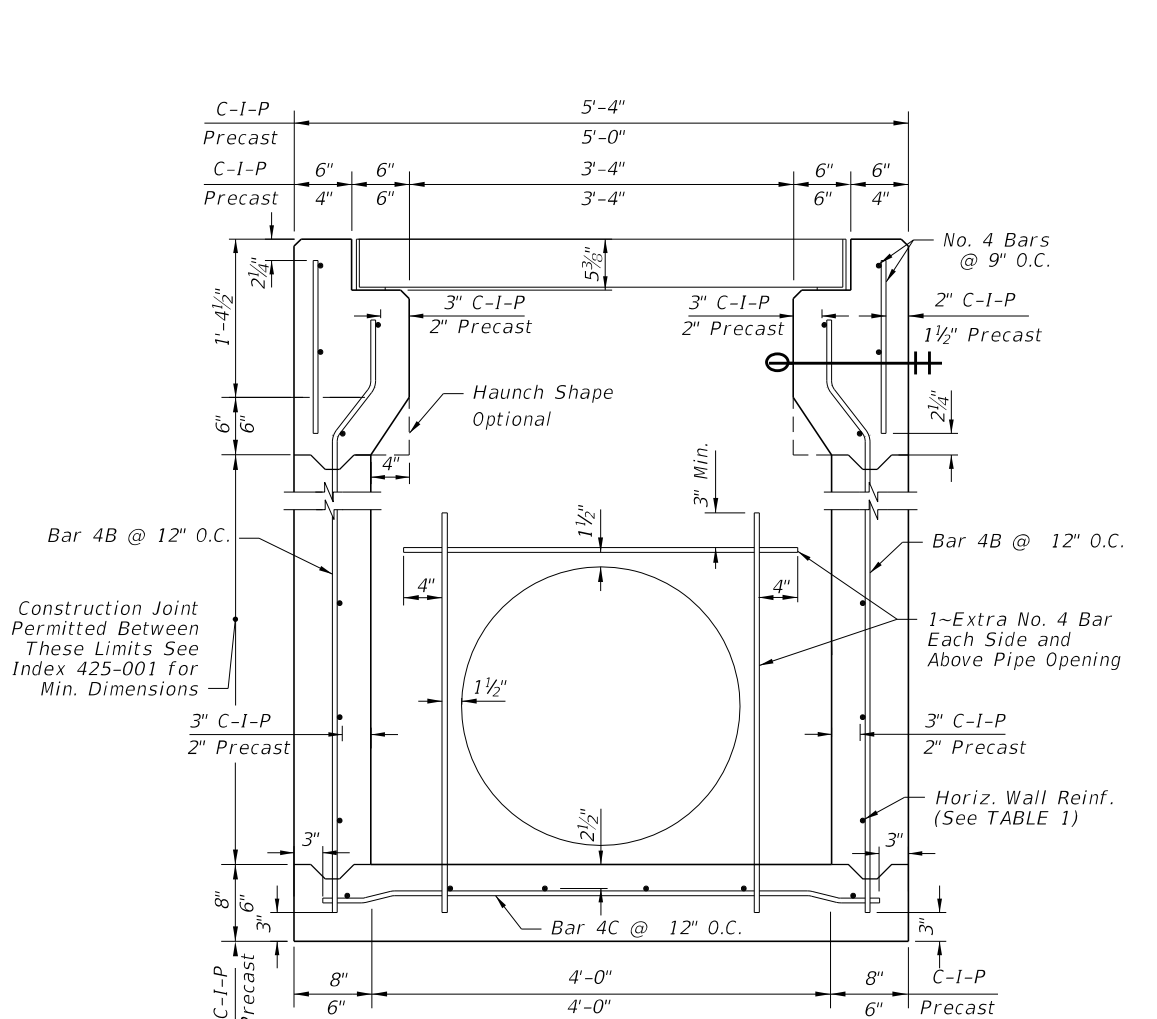


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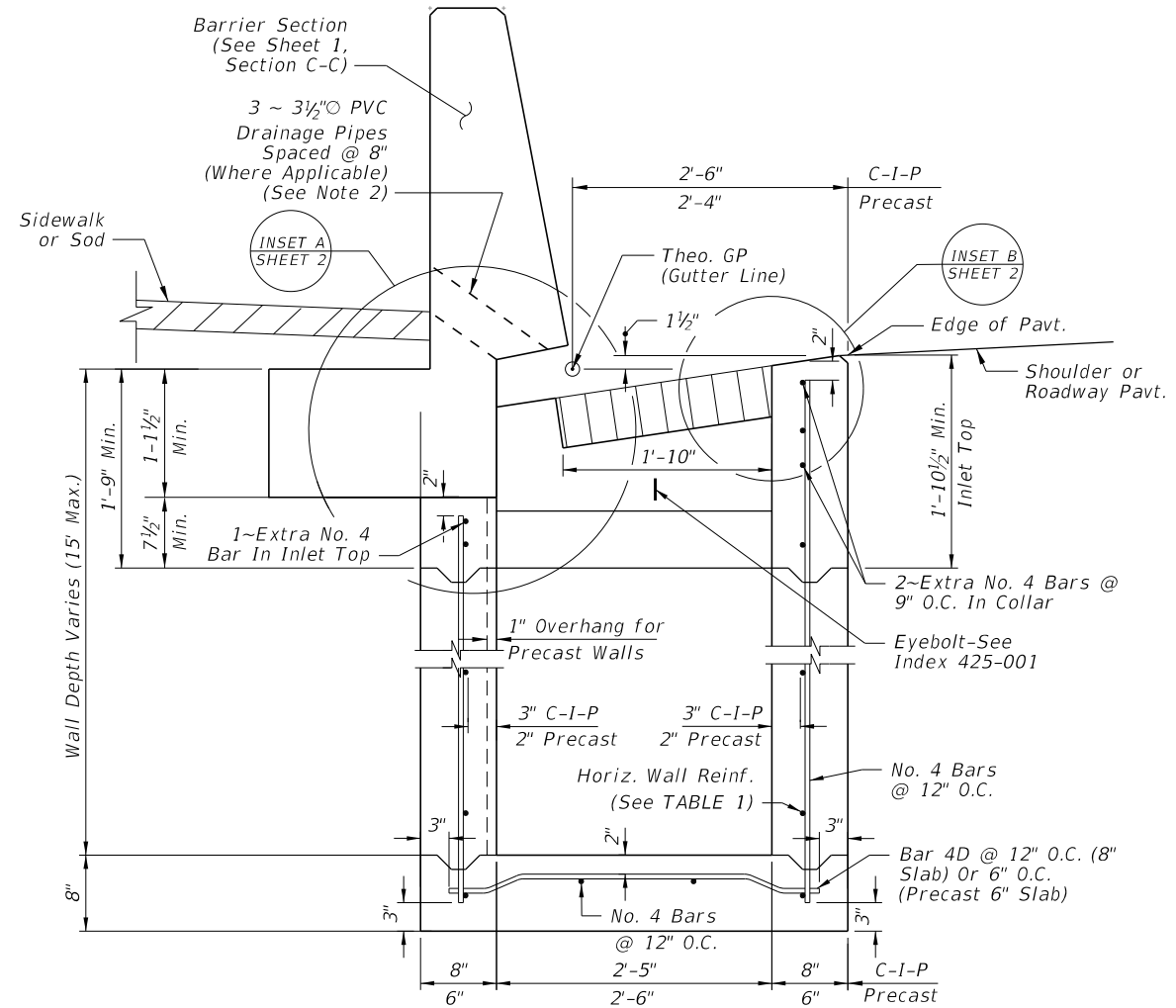
CURB AND GUTTER BARRIER INLET

INDEX 425-032	SHEET 1 of 3
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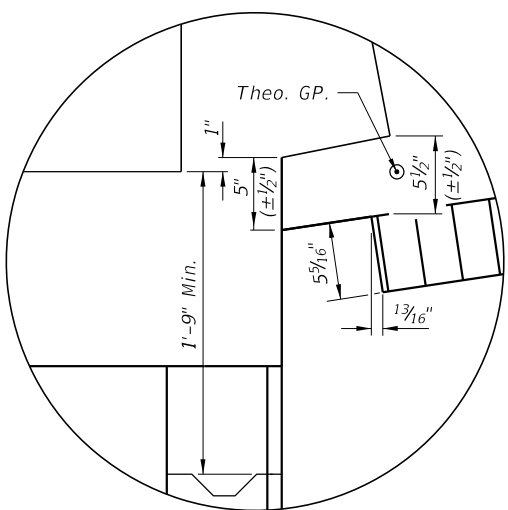
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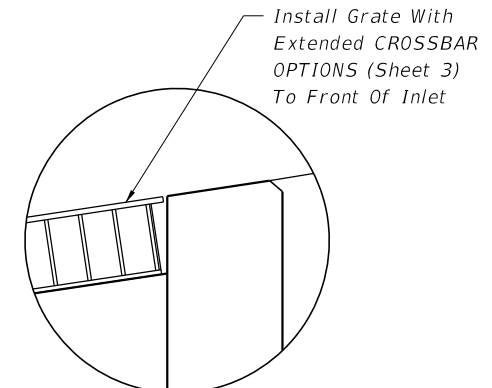
**SECTION D-D
INLET STRUCTURE**
(18" Dia. Pipe Opening Shown)



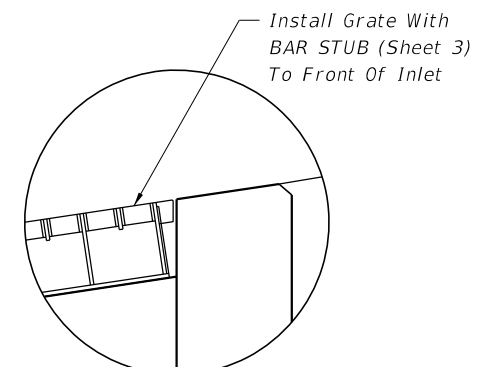
SECTION E-E
(Pipe Opening Not Shown)
(Barrier Reinforcing Steel Not Shown,
See Sheet 1, Section C-C)



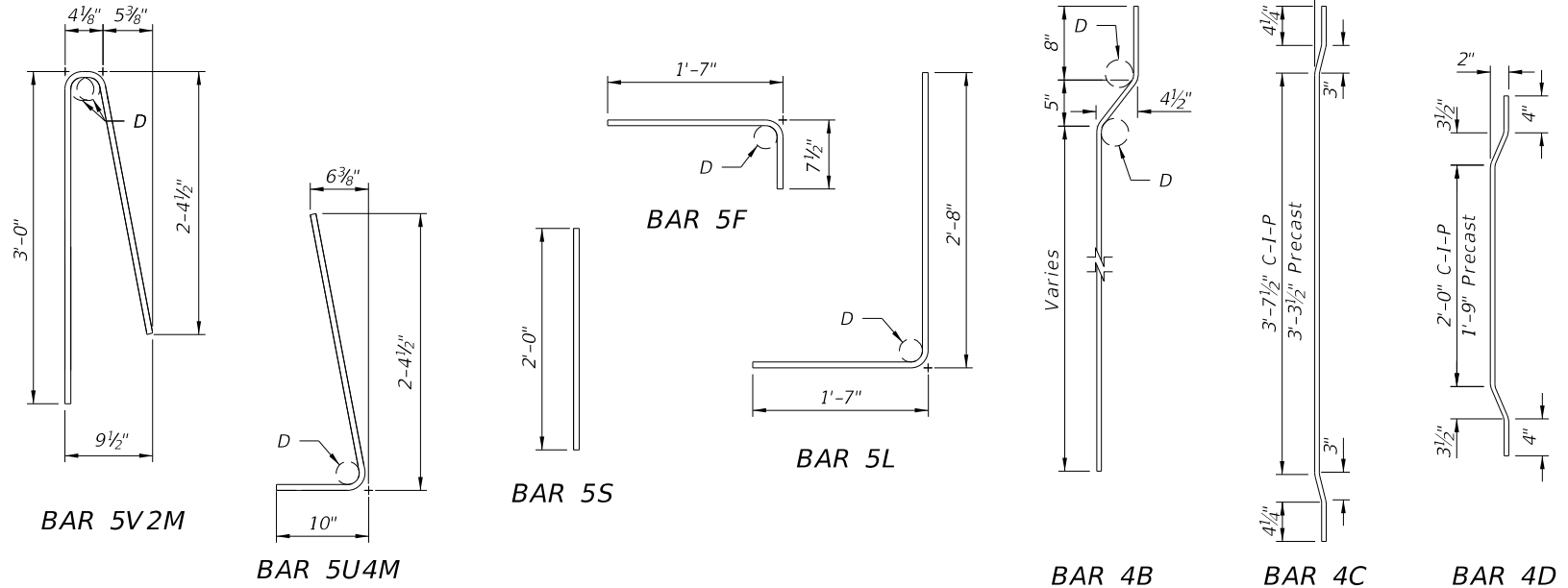
INSET A



INSET B
(See General Note 10)



INSET B ALTERNATE
(See General Note 10)



BAR BENDING DIAGRAMS

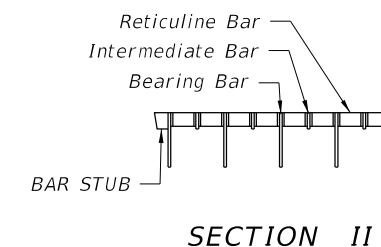
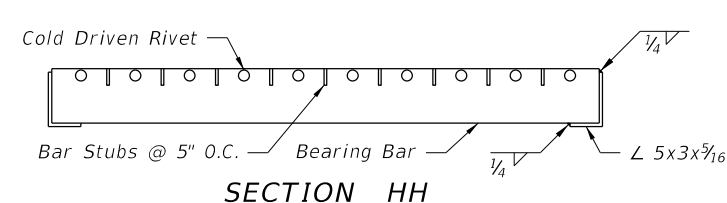
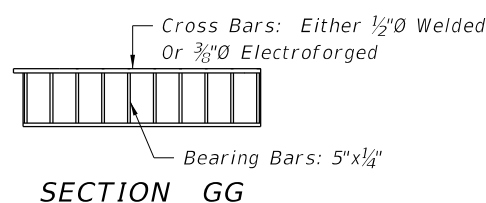
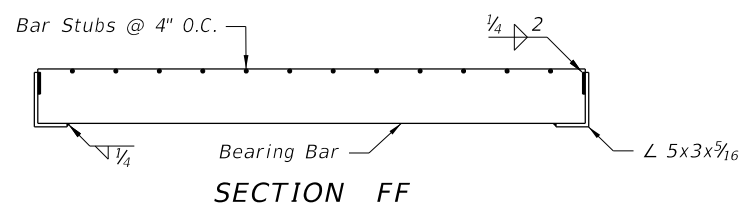
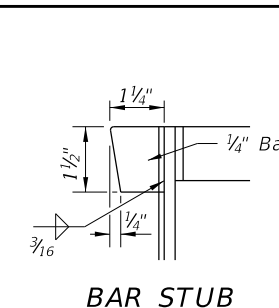
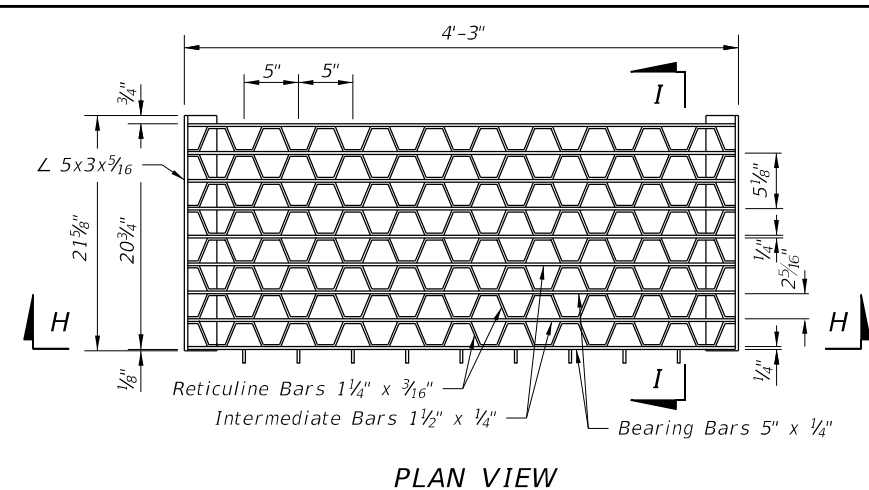
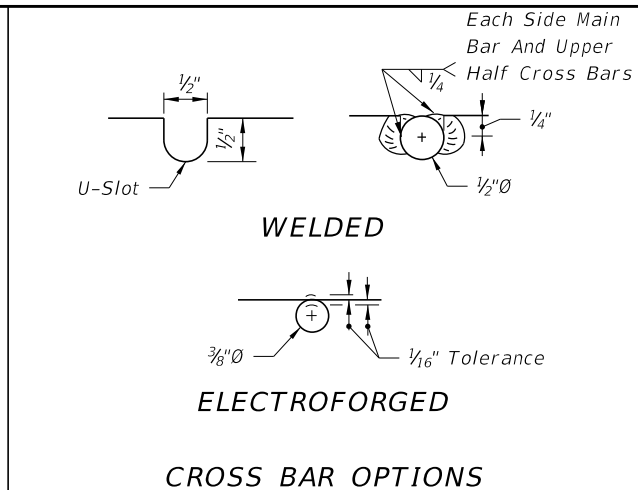
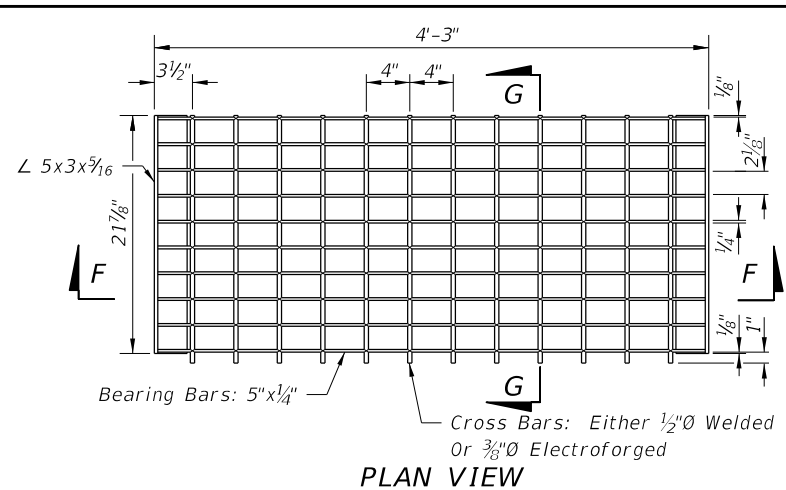
WALL DEPTH C-I-P PRECAST	SCHEDULE	AREA (in. ² /ft.)	MAX. SPACING BARS	WWR
0'-4"	0'-3"	A12	12"	8"
4'-9"	3'-6"	A6	6"	5"
9'-15"	6'-10"	B5.5	5 1/2"	5"
10'-15"	C6.5	0.37	6 1/2"	6"

**TABLE 1: HORIZONTAL
WALL REINFORCING SCHEDULE**

NOTES:

- For Bar Bending Diagrams of Bars 5V2 & 5U4, See Index 521-001. Bars 5V2M, 5U4M, & 5S may be field cut from Bars 5V2 & 5U4.
- Install PVC drainage pipes at the inlet centerline when the inlet is located in a sag curve or when drainage pipes are called for in the plans. Install a quantity of 3 ~ 3 1/2" (I.D.) NPS Schedule 40 Pipes longitudinally spaced at 8", with the center pipe as near to the inlet centerline as practical without conflicting with the steel reinforcing.

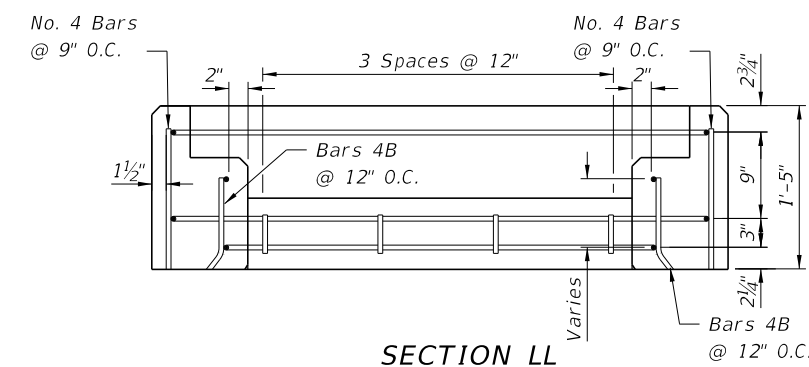
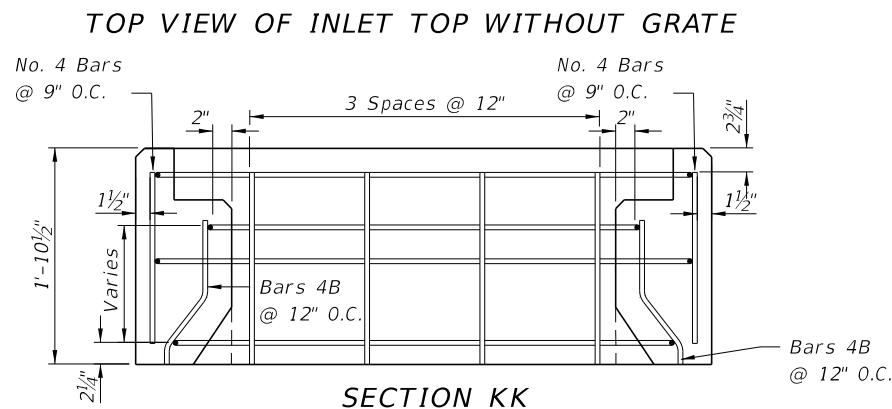
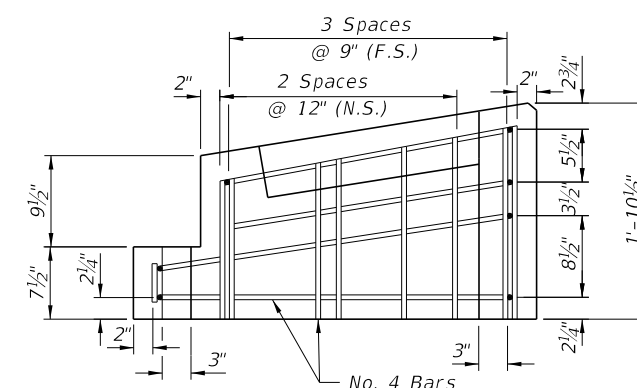
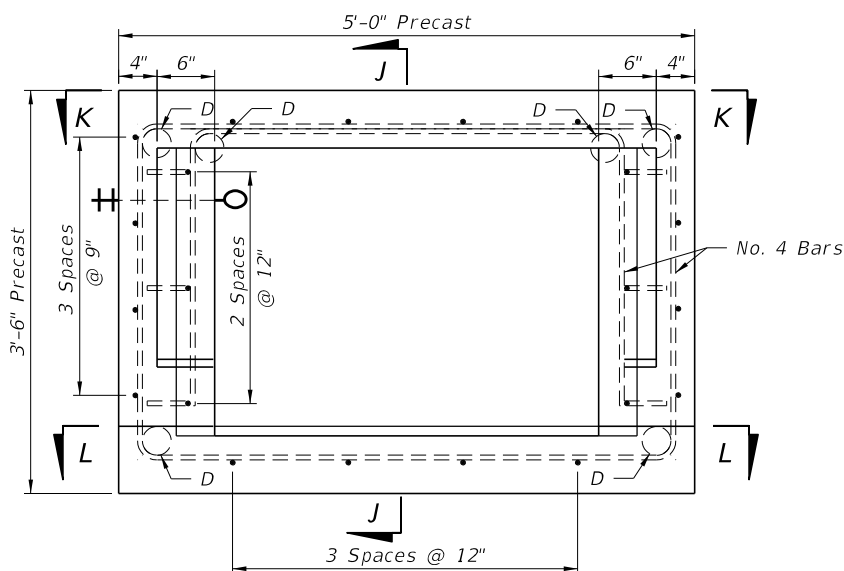
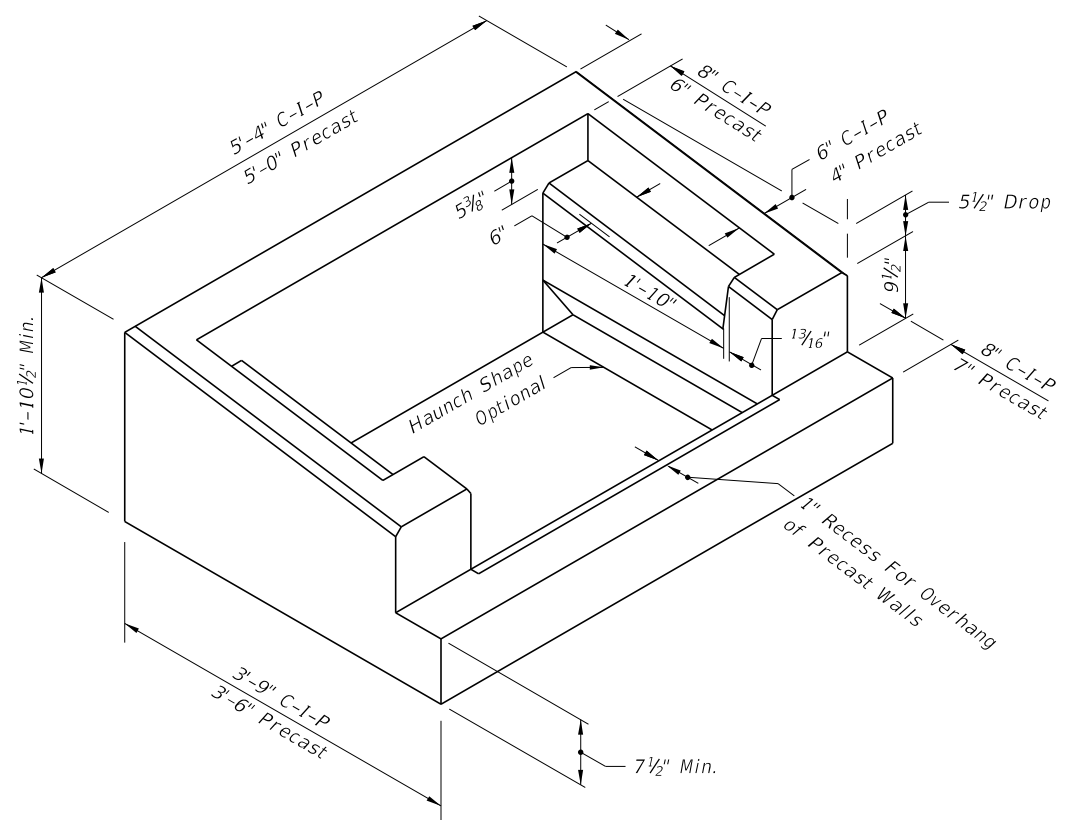
LAST REVISION 11/01/17	DESCRIPTION:
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CROSS BAR GRATE

OPTIONAL STEEL GRATES

RETICULINE GRATE



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

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LAST REVISION 11/01/17	DESCRIPTION:
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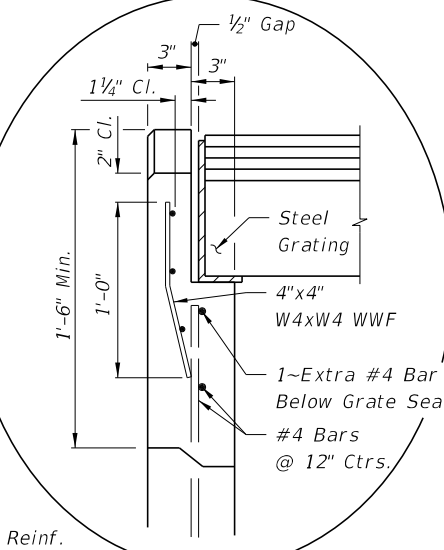
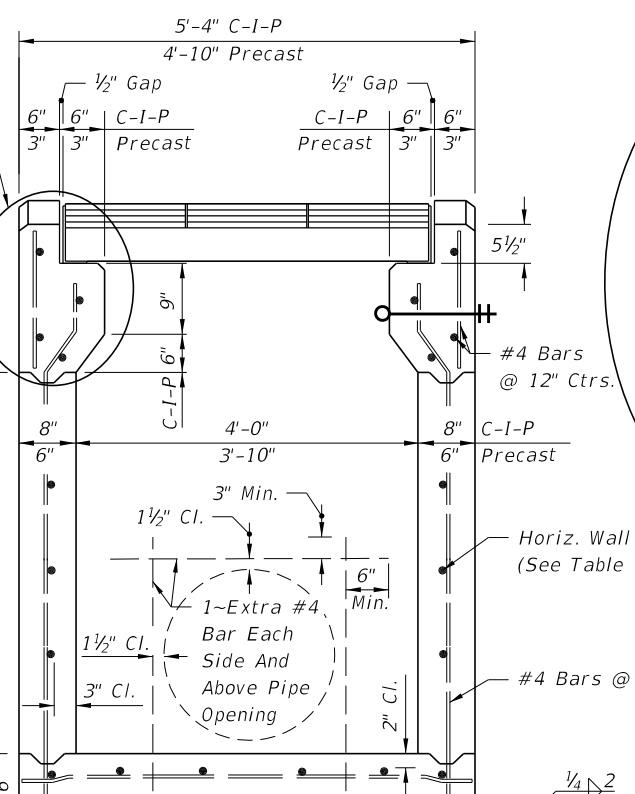
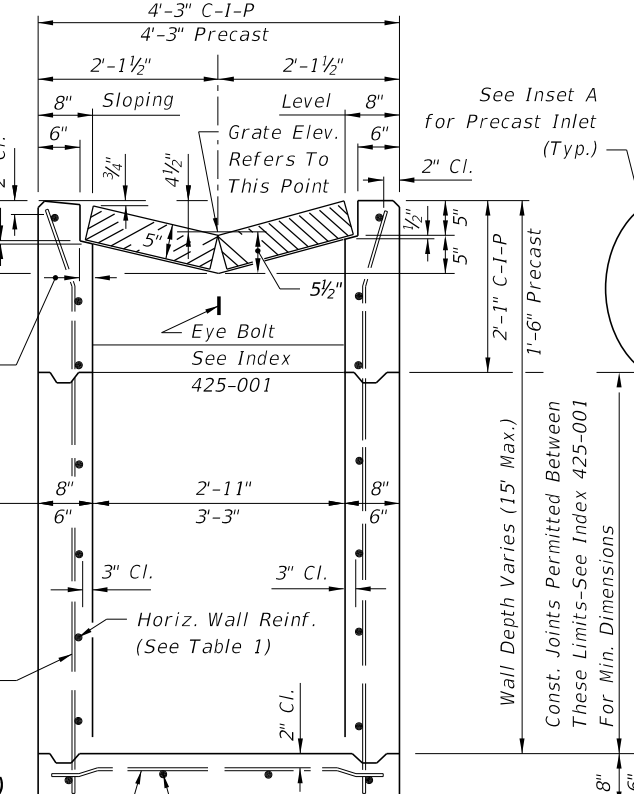
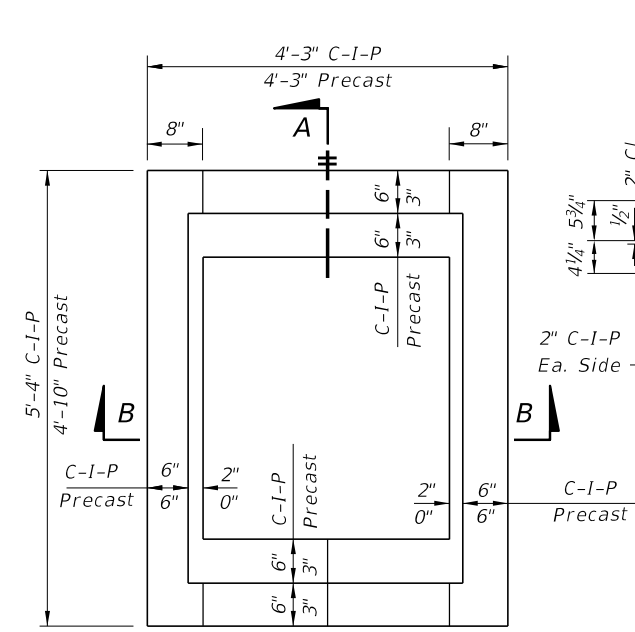


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CURB AND GUTTER BARRIER INLET

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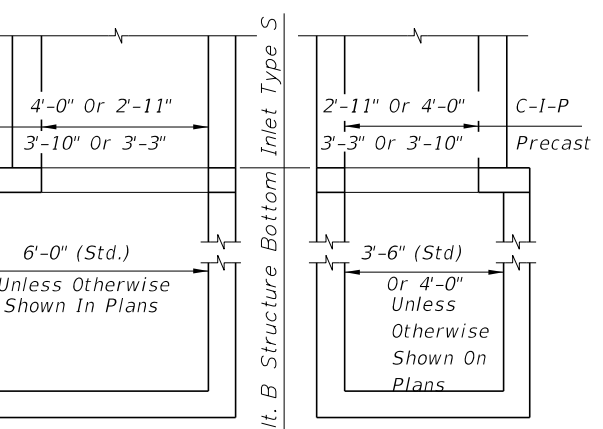
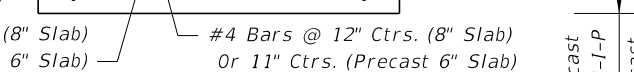
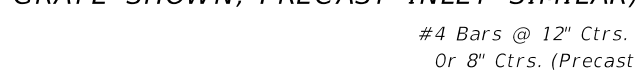
SHEET
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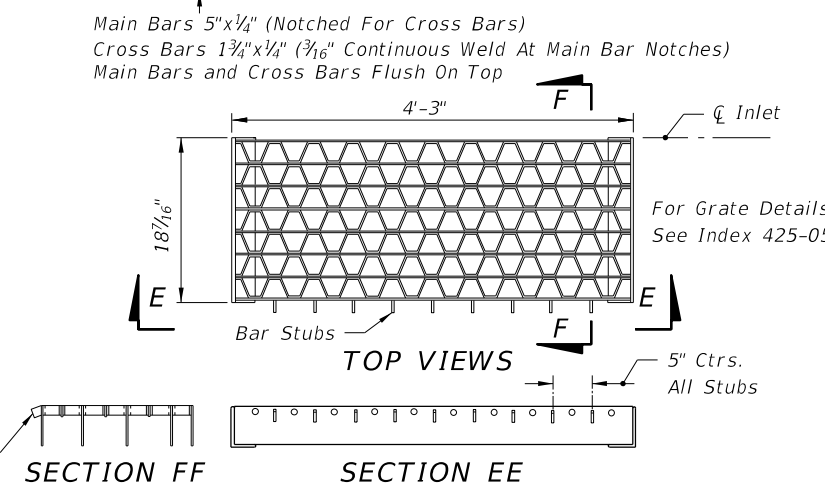
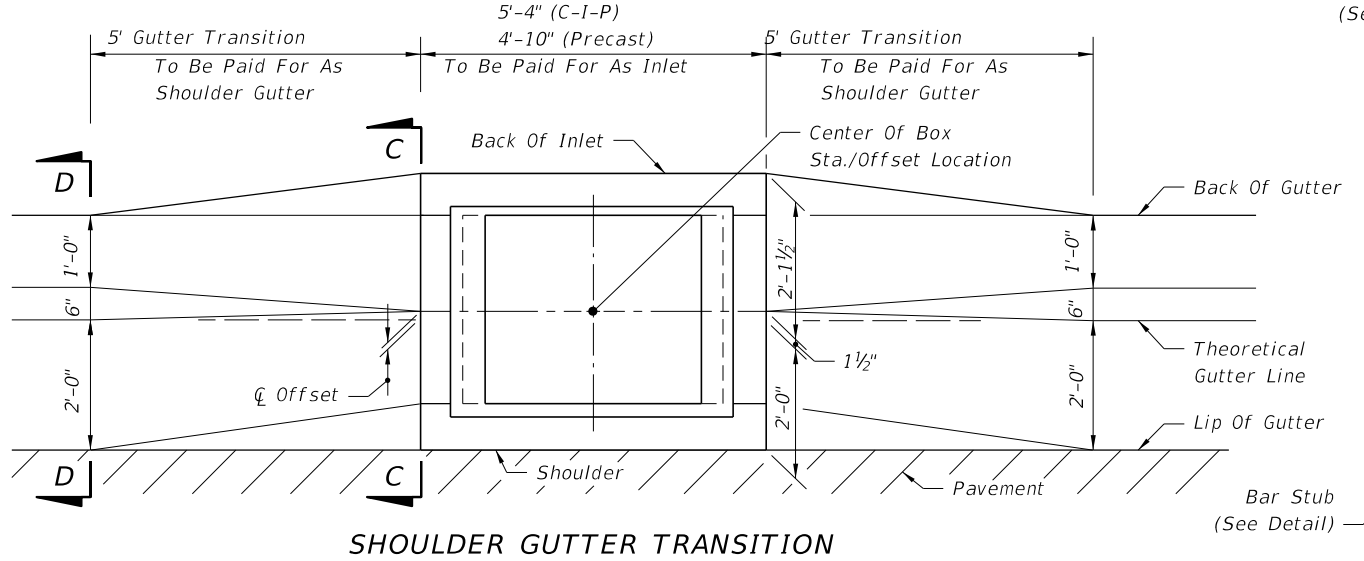
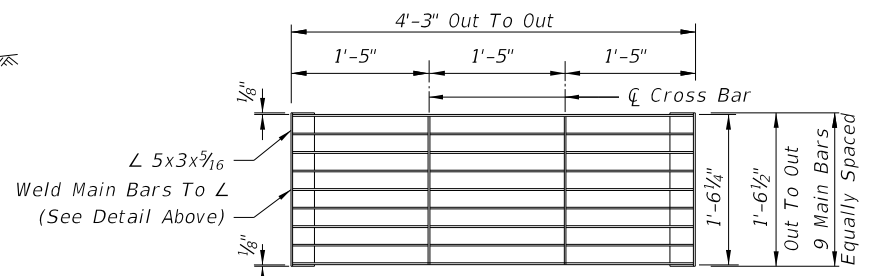
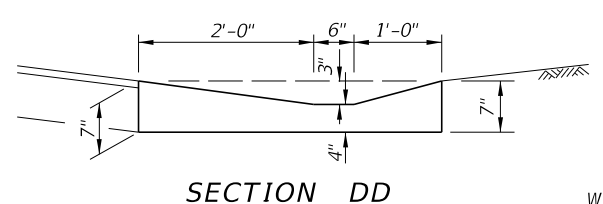
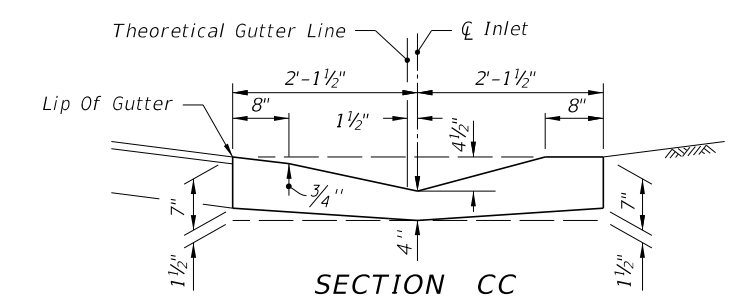
RECOMMENDED MAXIMUM PIPE SIZES	
INLET INSIDE WIDTH	PIPE SIZE
2'-11" or 3'-3"	24"
4'-0" or 3'-10"	30"

Note: Recommended sizes are for concrete pipe. Sizes for other types of pipe must be verified for fit in accordance with Index 425-001. For larger pipe see bottom detail below and Index 425-010.

HORIZONTAL WALL REINFORCING SCHEDULE (TABLE 1)				
WALL DEPTH	SCHEDULE	AREA (in ² /ft)	MAX. SPACING	
			BARS	WWR
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"

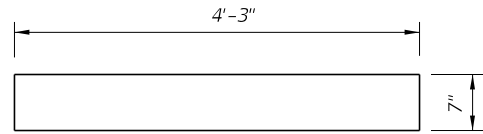


NOTE: Alt. B Structure Bottom Only. See Index 425-010 for structure bottom details and hole reinforcement.

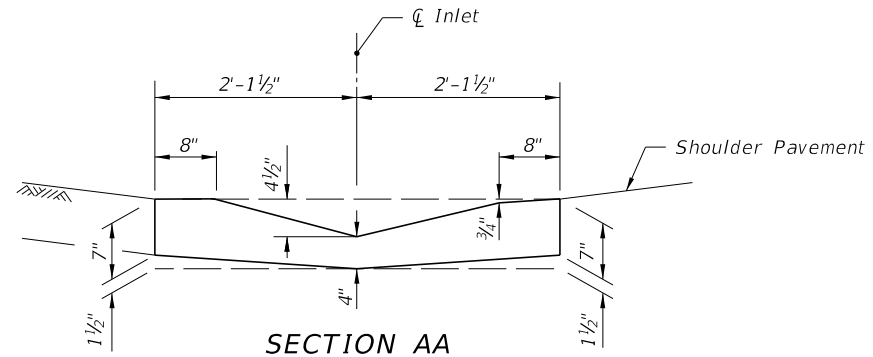


- GENERAL NOTES**
1. This inlet is intended for use in shoulder gutter on facilities subject to heavy wheel loads.
 2. All reinforcing is Grade 60 bars with 2" min. cover unless otherwise noted. See Index 425-001 for equivalent area of welded wire fabric. Bars to be cut or bent for 1½" minimum clearance around pipe.
 3. All exposed edges and corners must 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 Indexes 425-001 and 425-010.
 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.

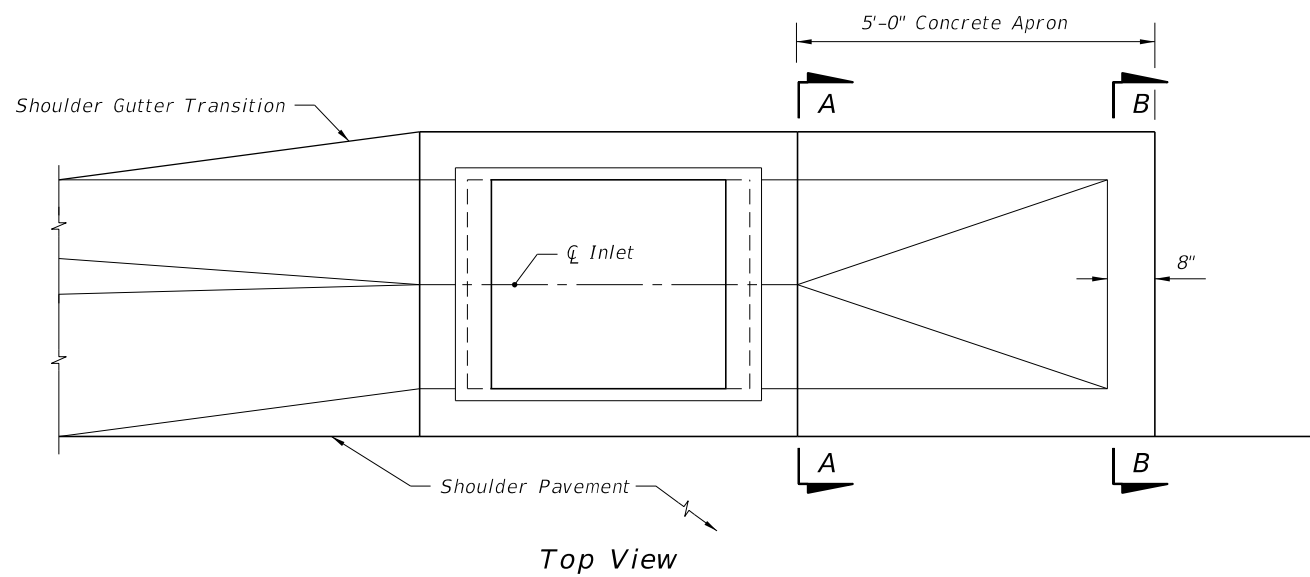
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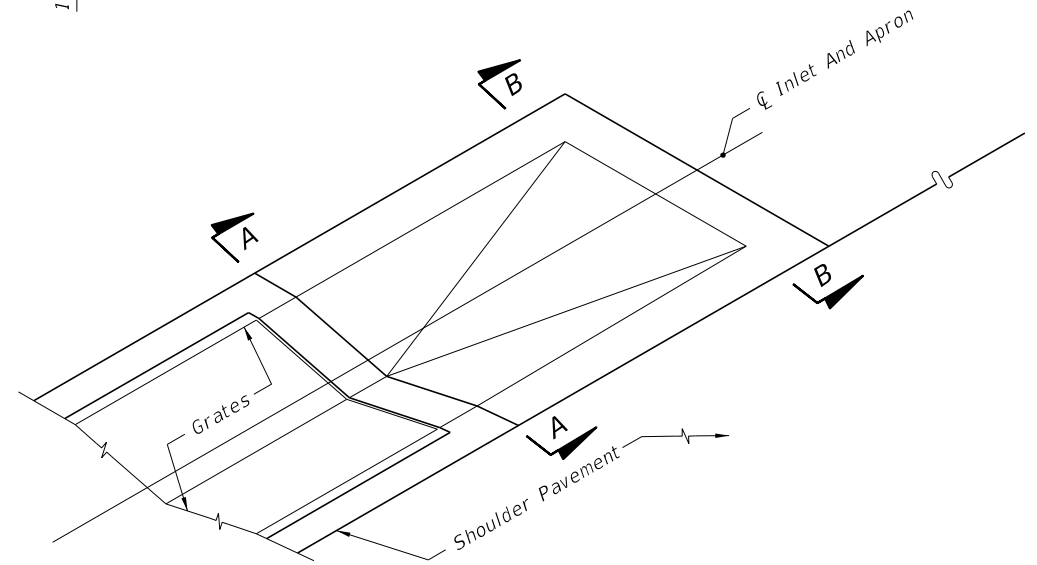
SECTION BB
(Enlarged)



SECTION AA
(Enlarged)




Top View

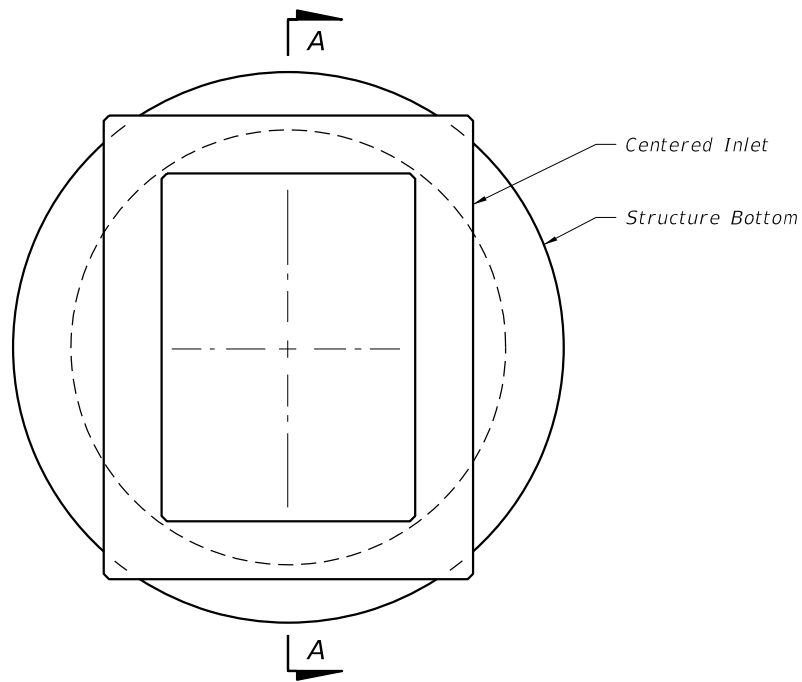


PICTORIAL VIEW

Apron To be Constructed At The Most Downstream Inlet In A Run Of Shoulder Gutter
CONCRETE APRON AT TERMINAL INLETS

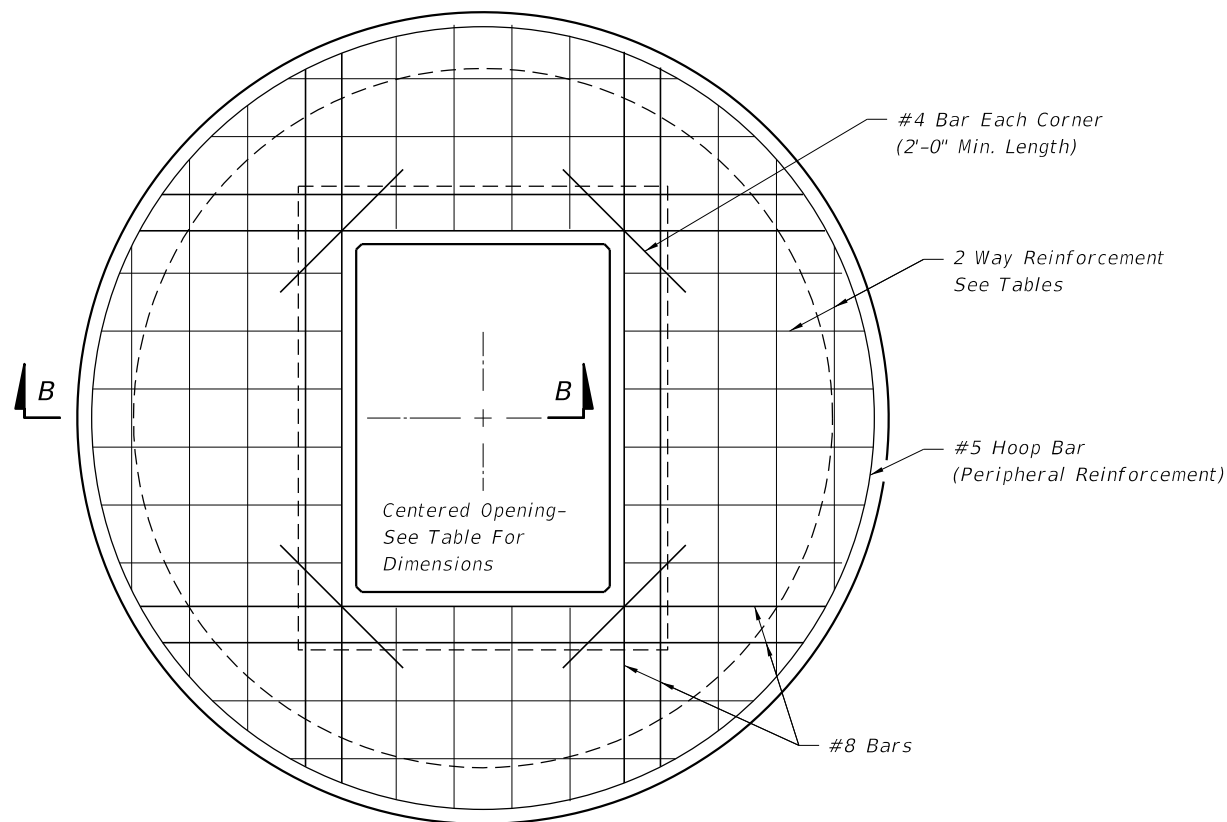
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TOP VIEW

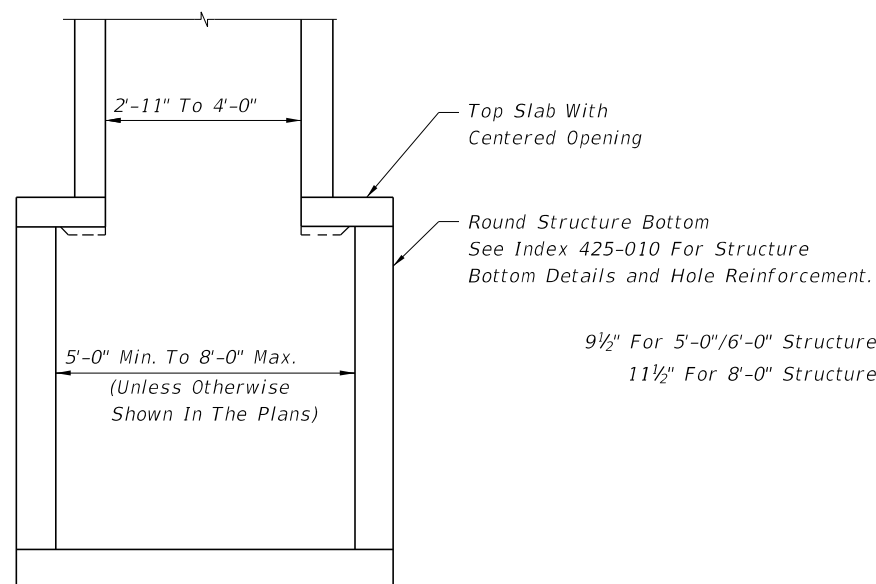
TOP SLAB OPENINGS		
DIAMETER	OPENING SIZE	
	MIN.	MAX.
5'-0" To 8'-0"	2'-11" x 4'-0"	3'-3" x 3'-10"



TOP SLAB REINFORCING DIAGRAM

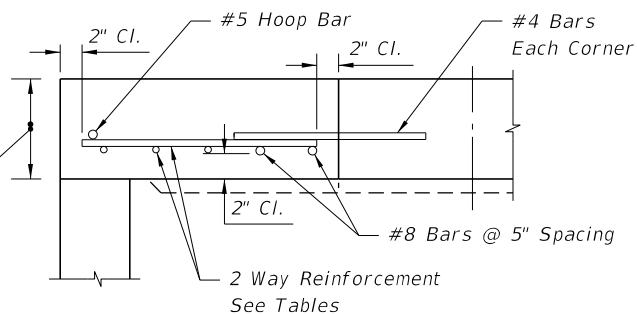
TOP SLAB REINFORCING SCHEDULE	
GRADE 60 (BAR) OR 65 KSI & 70 KSI (WIRE FABRIC)	
SCHEDULE	In ² /ft.
A	0.20
B	0.24
C	0.37
D	0.53
E	0.73
F	1.06
G	1.45

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

9½" For 5'-0"/6'-0" Structure Bottoms
11½" For 8'-0" Structure Bottoms



SECTION BB

ALT. A STRUCTURE BOTTOM FOR INLET TYPE S

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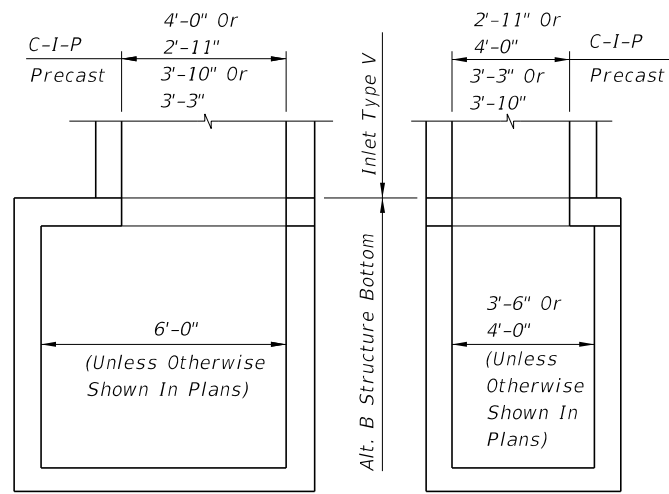


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GUTTER INLET TYPE S

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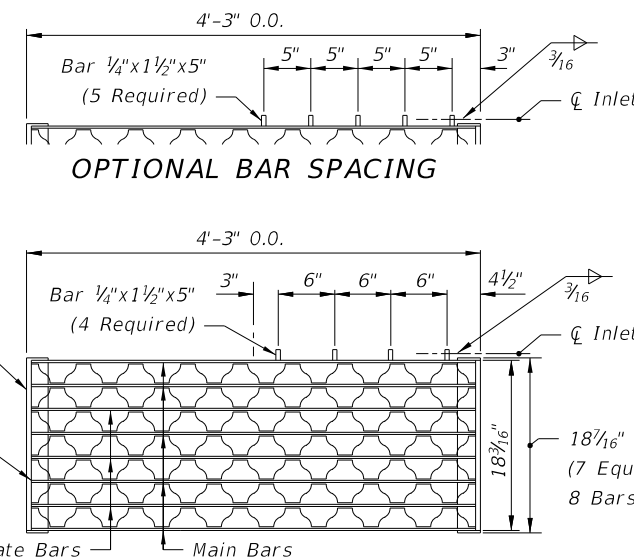


NOTE: Alt. B Structure Bottom Only. See Index 425-010 for structure bottom details and hole reinforcement.
(For Pipes 30" Dia. And Larger)
INLET WITH STRUCTURE BOTTOM

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 425-001. For larger pipe see bottom detail above and Index 425-010.



TWO REQUIRED PER INLET

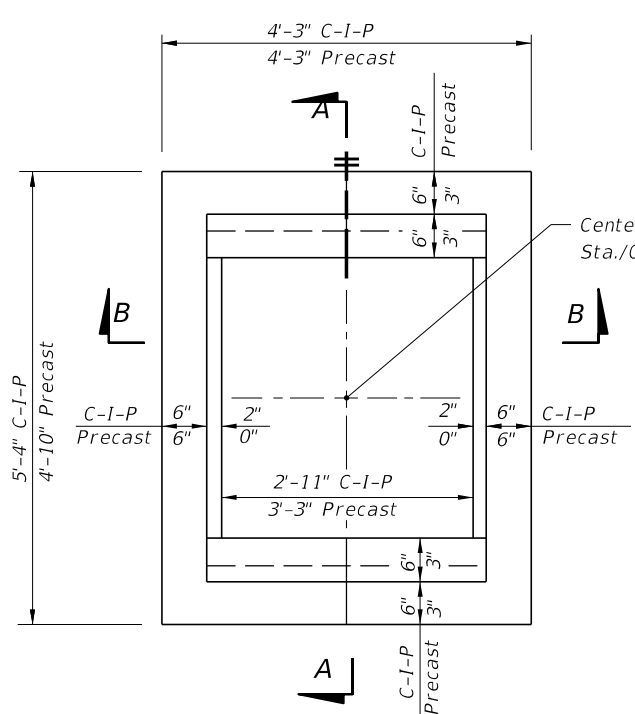
5" Steel Grate: Main Bars 5"x1/4"
Intermediate Bars 1 1/2"x1/4"
Reticuline Bars 1 1/4"x3/16"

GENERAL NOTES

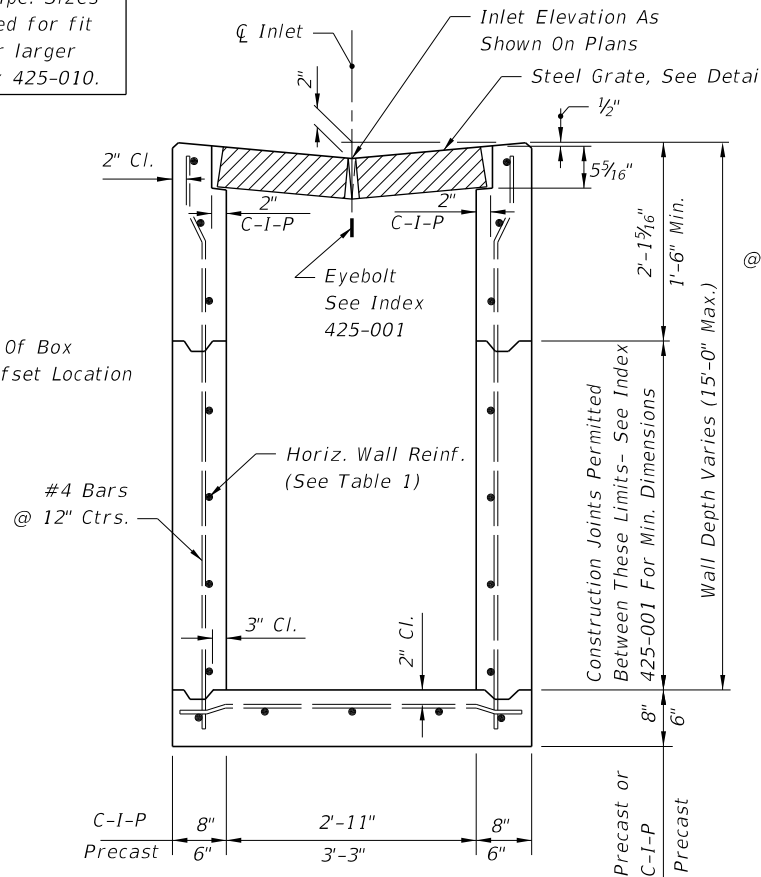
1. This inlet is suitable for village swales, ditches, or other areas subject to heavy wheel loads, minimum debris. This inlet may be placed in areas subject to occasional pedestrian traffic such as landscaped areas and pavement areas where pedestrians can walk around the inlet. This inlet is not for 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 425-001 for equivalent area of welded wire fabric. Cut or bend bars out of way of pipe to clear pipe 1 1/2".
4. All exposed edges and corners shall be 3/4" chamfer or tooled to 1/4" radius.
5. All dimensions are for both precast and cast-in-place inlets unless otherwise noted.
6. For supplementary details see Index 425-001.
7. Inlet to be paid for under the contract unit price for Inlets (Gutter Type V), EA

HORIZONTAL WALL REINFORCING SCHEDULE (TABLE 1)

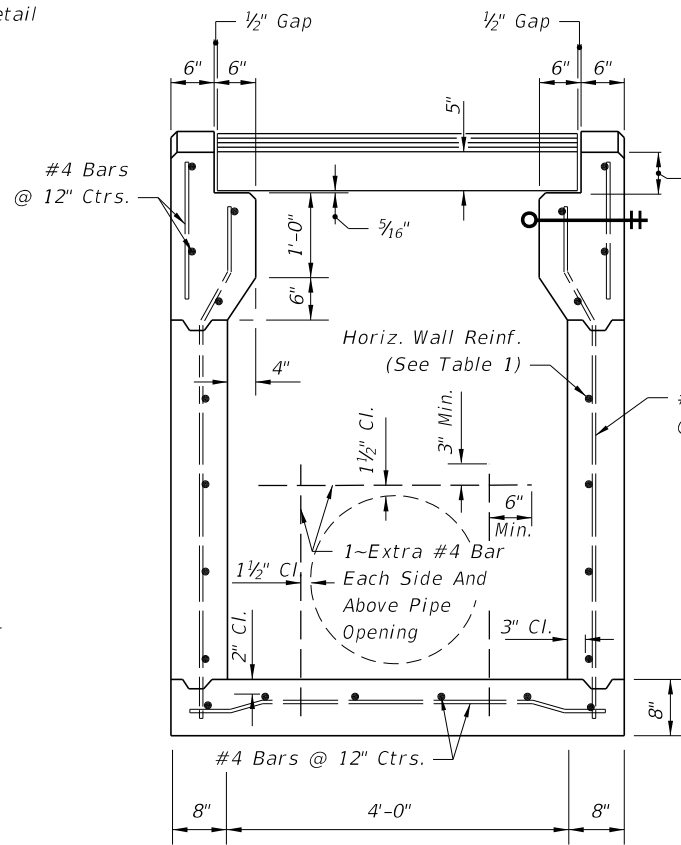
WALL DEPTH	SCHEDULE	AREA (in. ² /ft.)	MAX. SPACING	
			BARS	WWR
0' - 5'	A12	0.20	12"	8"
5' - 9'	A6	0.20	6"	5"
9' - 12'	A4	0.20	4"	3"
9' - 15'	B5.5	0.24	5 1/2"	5"



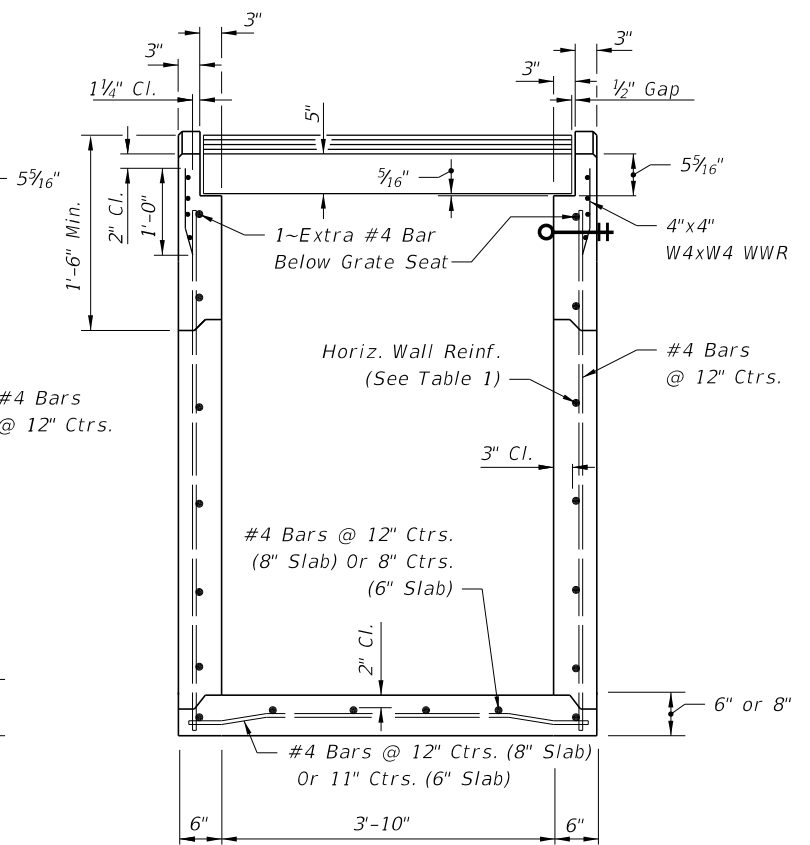
PLAN
(CAST-IN-PLACE INLET SHOWN WITHOUT GRATE; PRECAST INLET SIMILAR)



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

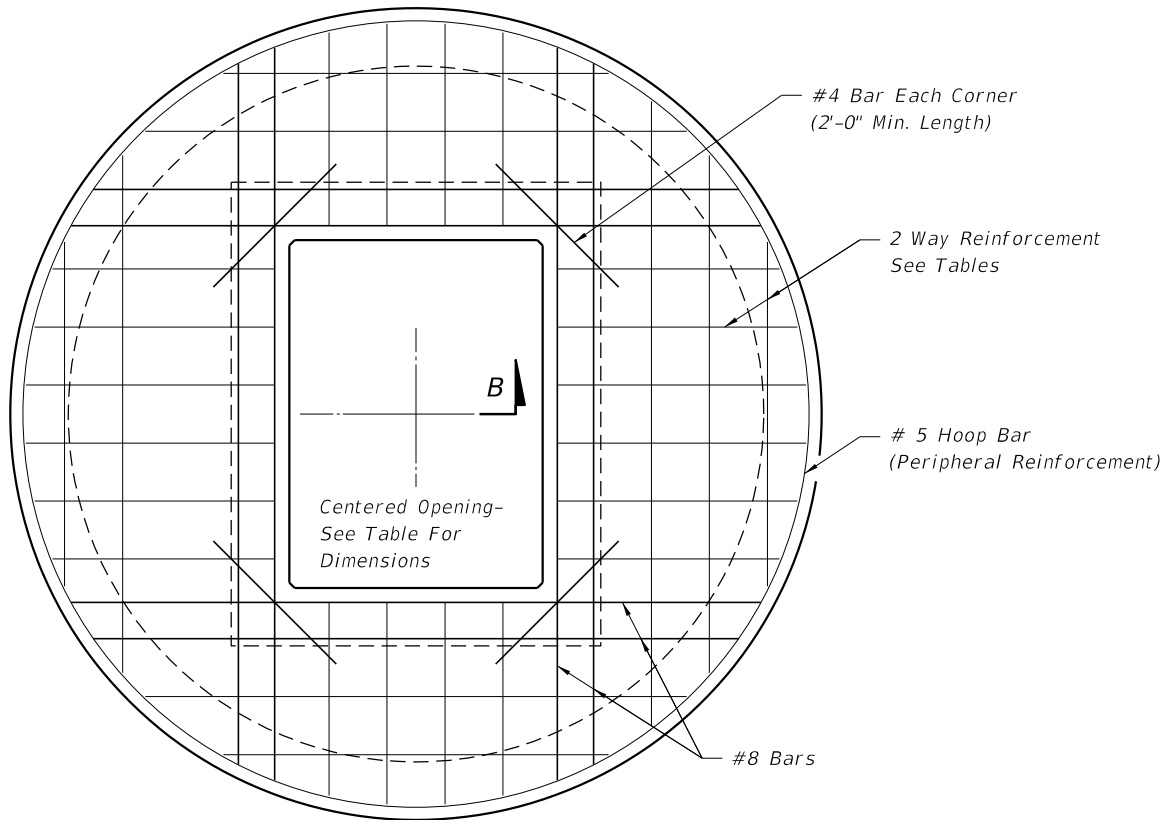
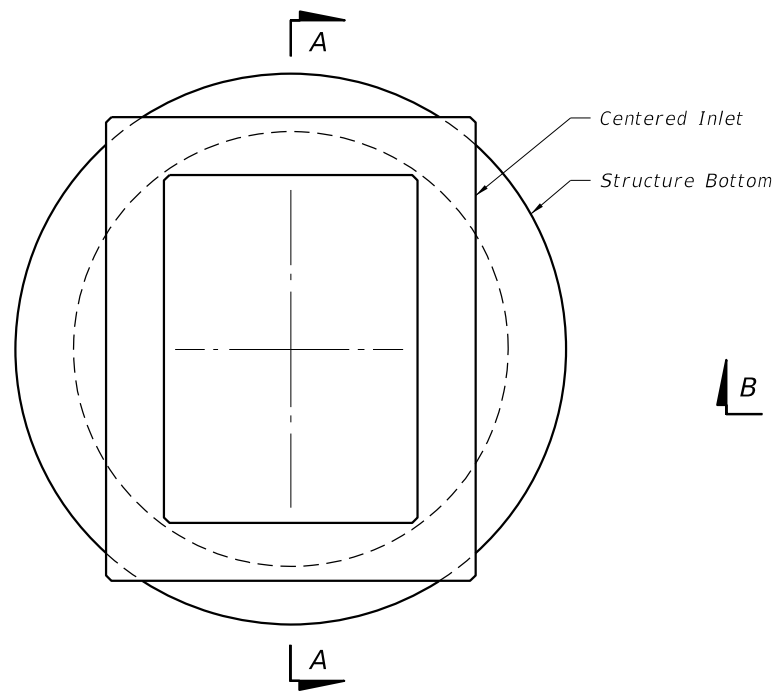


SECTION AA
(CAST-IN-PLACE INLET)



SECTION AA
(PRECAST INLET)

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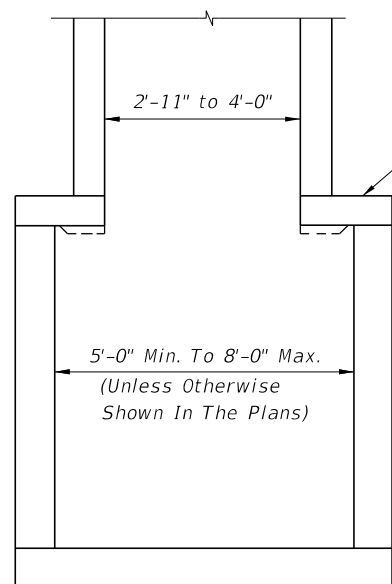


TOP SLAB REINFORCING DIAGRAM

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 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

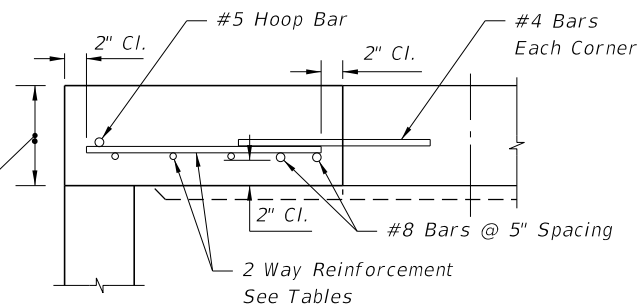
TOP SLAB WITH CENTERED OPENING		
SLAB DEPTH	SLAB THICKNESS	REINFORCING (2 WAYS) SCHEDULE
SIZE: 5'-0"		
≥0.5' < 30'	9½"	C
30'-40'	9½"	D
SIZE: 6'-0"		
0.5' < 8'	9½"	B
8' < 18'	9½"	C
18' < 30'	9½"	D
30' < 37'	9½"	E
37'-40'	9½"	G
SIZE: 8'-0"		
≥0.5' < 9'	11½"	C
9' < 15'	11½"	D
15' < 23'	11½"	E
23' < 33'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



SECTION AA

Top Slab With Centered Opening
Round Structure Bottom See Index 425-010 For Structure Bottom Details and Hole Reinforcement.

9½" For 5'-0"/6'-0" Structure Bottoms
11½" For 8'-0" Structure Bottoms



SECTION BB

ALT. A STRUCTURE BOTTOM FOR INLET TYPE V

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LAST REVISION
11/01/17

REVISION DESCRIPTION:

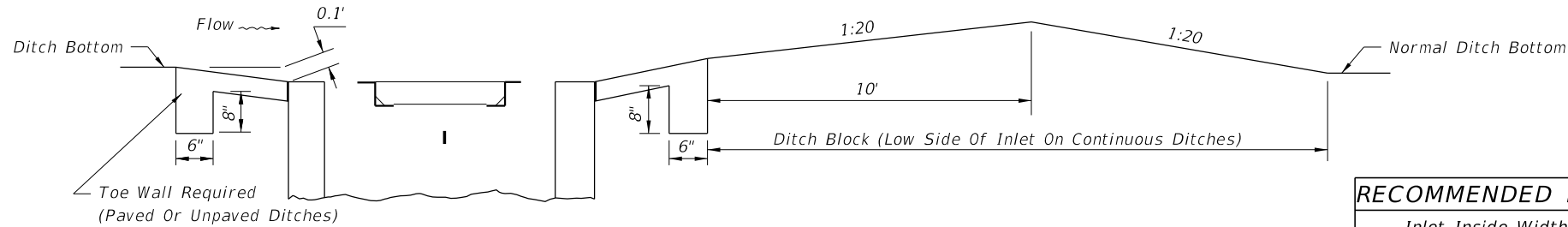


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GUTTER INLET TYPE V

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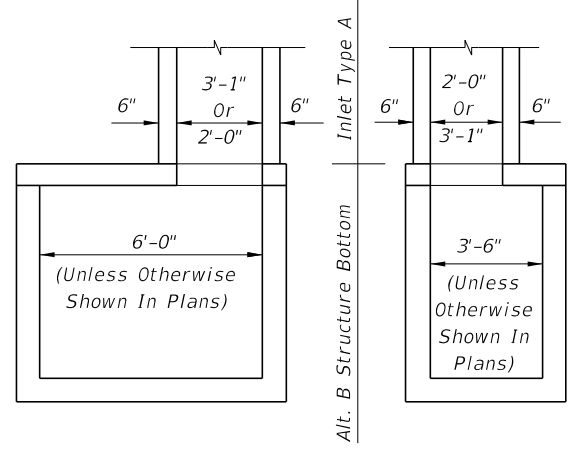
SHEET
2 of 2



SECTION DD

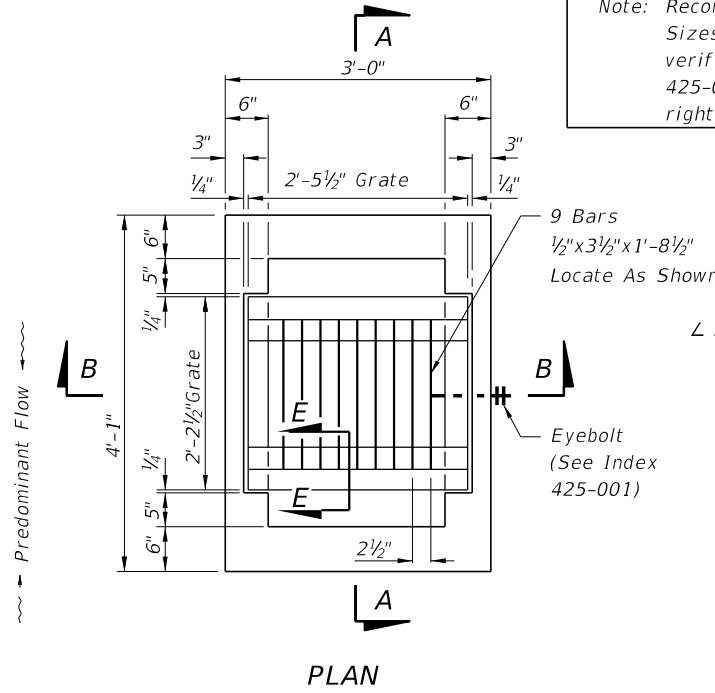
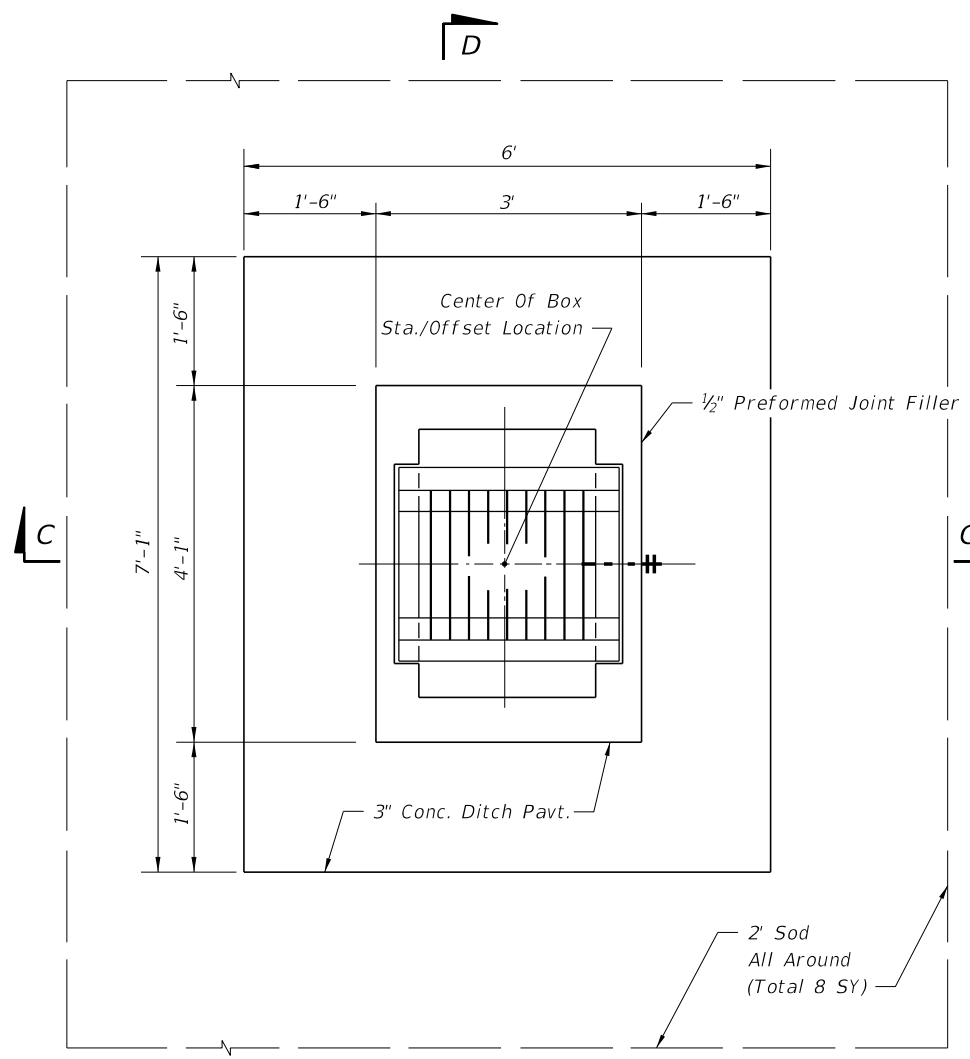
RECOMMENDED MAXIMUM PIPE SIZES	
Inlet Inside Width	Pipe Size
2'-0"	18"
3'-1"	24" 18" Where An 18" pipe Enters A 2'-0" Wall

Note: Recommended sizes are for concrete pipe. Sizes for other types of pipe must be verified for fit in accordance with Index 425-001. For larger pipe see bottom detail right and Index 425-010.

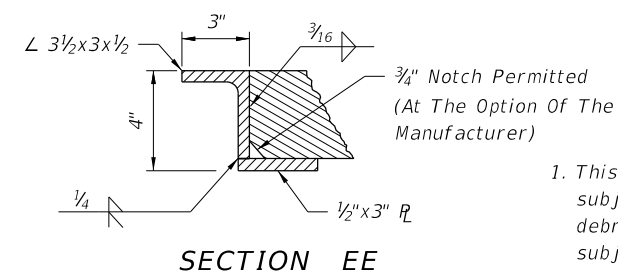


NOTE: Alt. B Structure Bottom Only. See Index 425-010 for Structure Bottom Details And Hole Reinforcement.

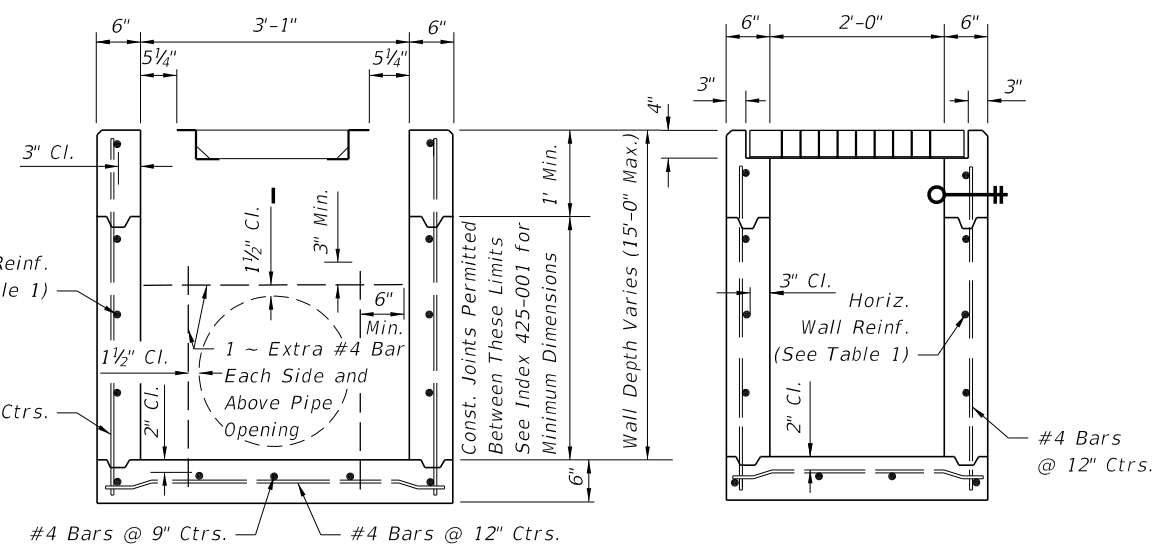
INLET WITH STRUCTURE BOTTOM



PLAN



SECTION EE



(Pipe Opening Shown) SECTION AA

(Pipe Opening Not Shown) SECTION BB

GENERAL NOTES

- 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.
- 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 1 1/2". See Index 425-001 for equivalent area of welded wire fabric.
- All exposed edges and corners shall be 3/4" chamfer or tooled to 1/4" radius.
- When alternate "G" grate is specified in plans, the grate is to be hot-dip galvanized after fabrication.
- 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.
- For supplemental details see Index 425-001.
- All dimensions are for both precast and cast-in-place inlets unless otherwise noted.
- 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	WWR
0' - 10'	A12	0.20	12"	8"
10' - 15'	A6	0.20	6"	5"

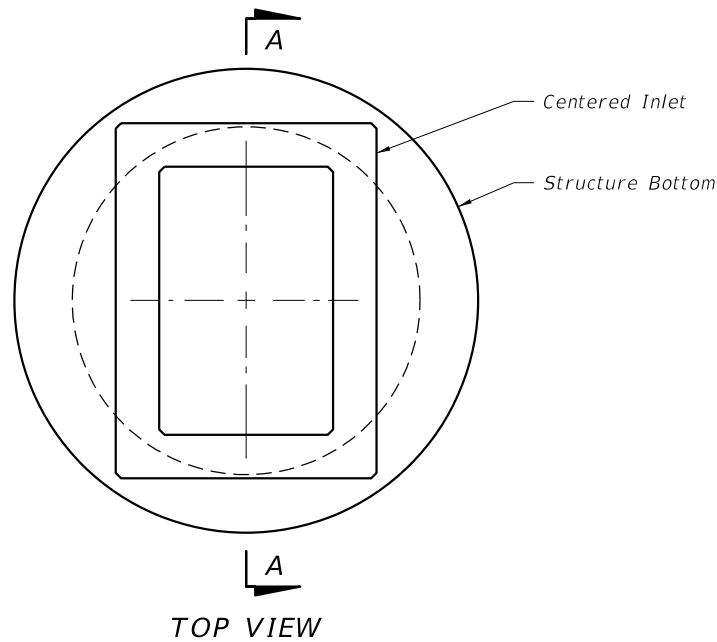
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LAST REVISION 11/01/17	DESCRIPTION:
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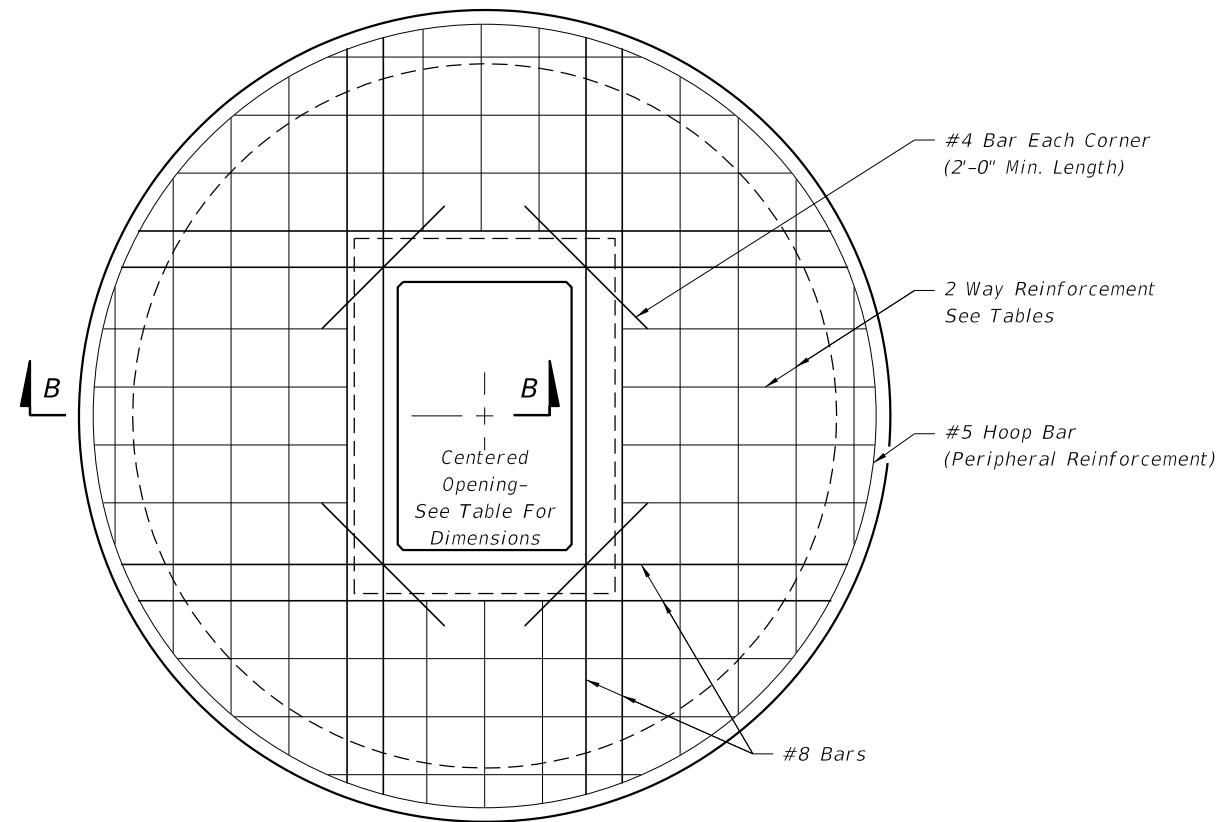
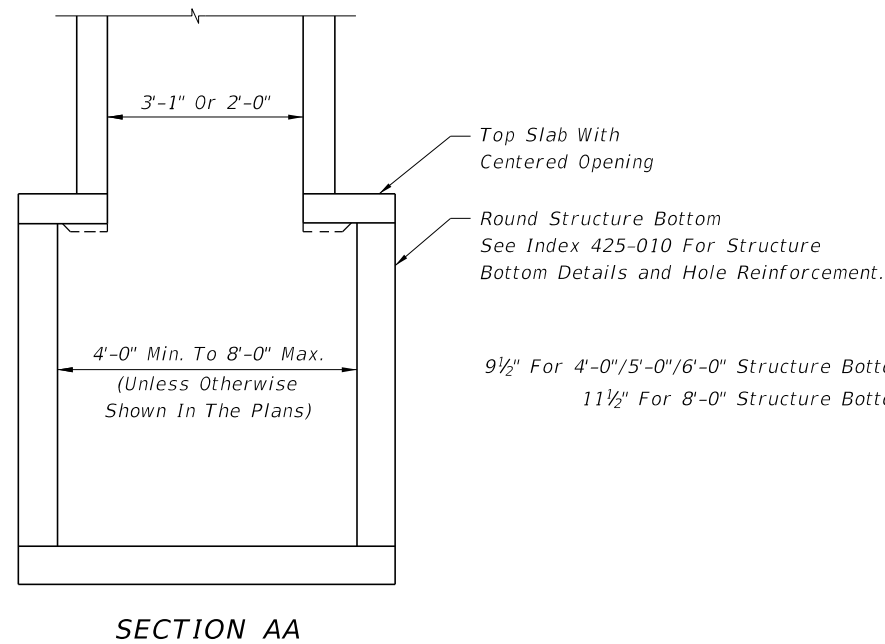
**FY 2020-21
STANDARD PLANS**

DITCH BOTTOM INLET TYPE A

INDEX 425-050	SHEET 1 of 2
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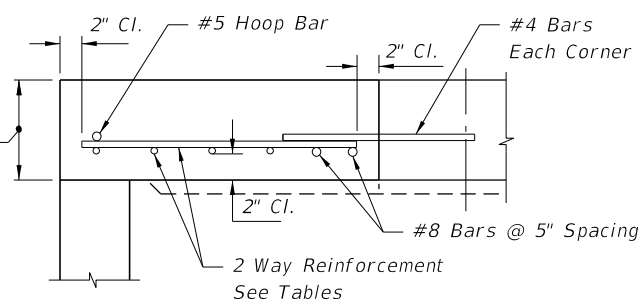
TOP SLAB OPENINGS	
DIAMETER	OPENING SIZE
	MIN.
4'-0" To 8'-0"	2'-0" x 3'-1"



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: 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

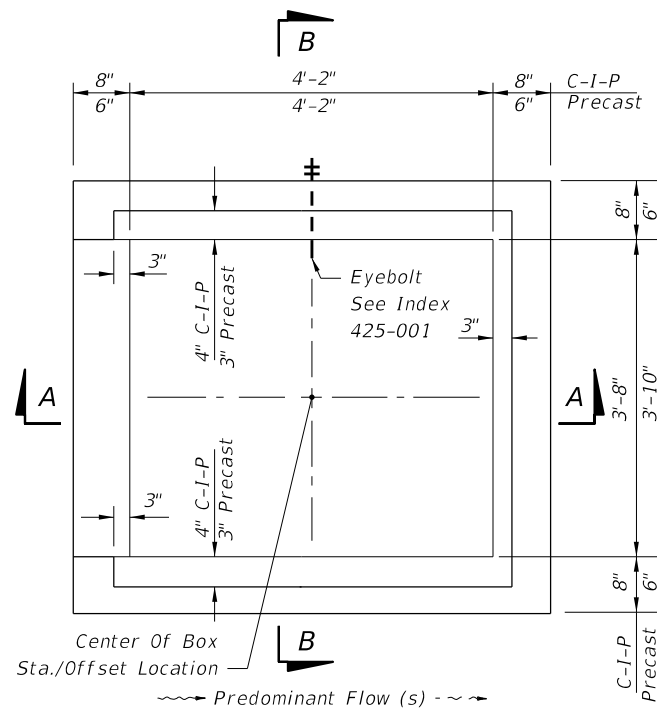


SECTION BB

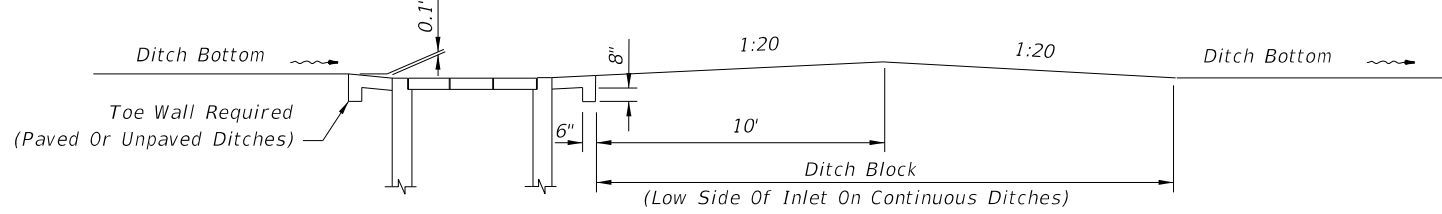
ALT. A STRUCTURE BOTTOM FOR INLET TYPE A

10/29/2019 8:15:46 AM

LAST REVISION 11/01/17	DESCRIPTION:	 FY 2020-21 STANDARD PLANS	DITCH BOTTOM INLET TYPE A	INDEX 425-050	SHEET 2 of 2
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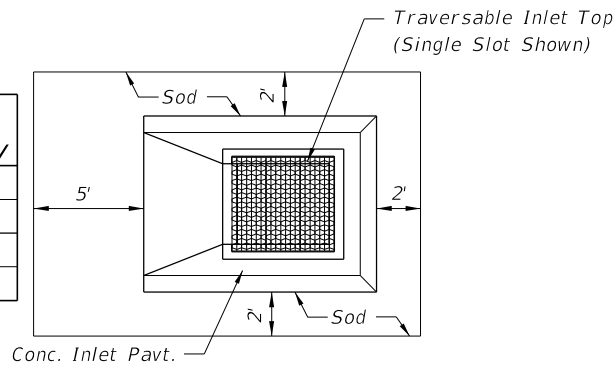
(Grate, Apron And Slot Not Shown)
PLAN



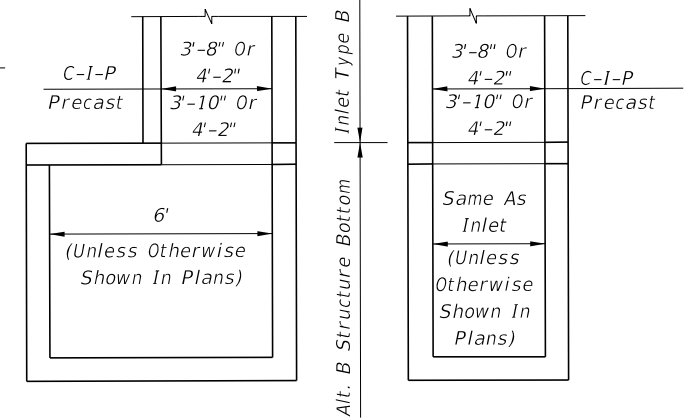
**SECTION EE
DITCH BLOCK**

**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



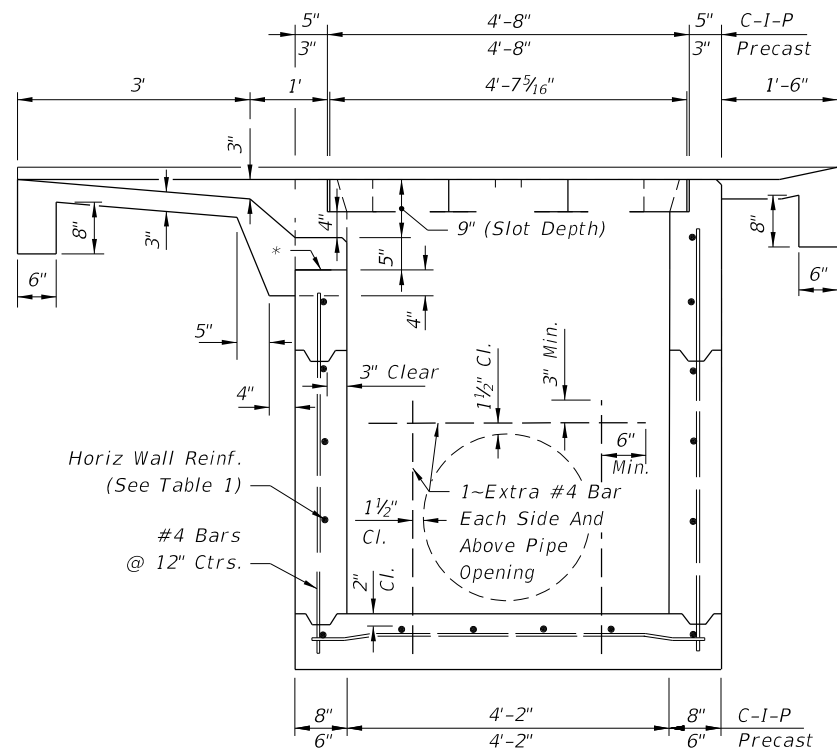
CONCRETE INLET PAVEMENT AND SODDING



NOTE: Alt. B Structure Bottom Only. See Index 425-010 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 425-001. For larger pipe see bottom detail above and Index 425-010.

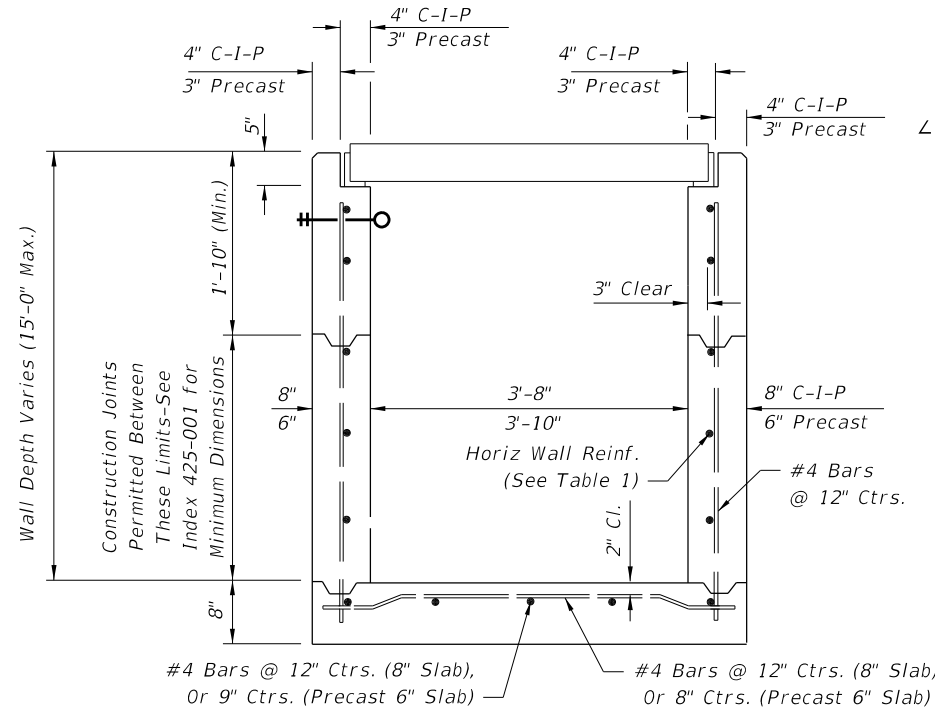


SECTION AA

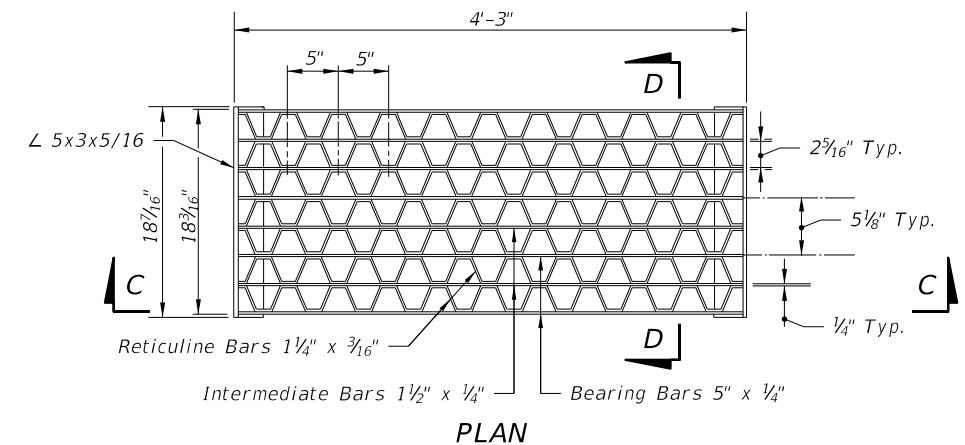
*See Sheet 2 of 3

**HORIZONTAL WALL REINFORCING
SCHEDULE (TABLE 1)**

WALL DEPTH	SCHEDULE	AREA (in. ² /ft.)	MAX. SPACING	
			BARS	WWR
0' - 5'	A12	0.20	12"	8"
5' - 9'	A6	0.20	6"	5"
9' - 13'	B5.5	0.24	5 1/2"	5"
13' - 15'	Special	0.267	5"	4"



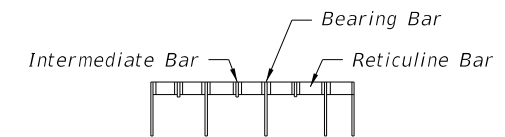
SECTION BB



PLAN



SECTION CC



**SECTION DD
STEEL GRATE**

10/29/2019 8:15:47 AM

LAST REVISION	DESCRIPTION:
11/01/17	



FY 2020-21
STANDARD PLANS

DITCH BOTTOM INLET TYPE B

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425-051

SHEET
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GENERAL NOTES

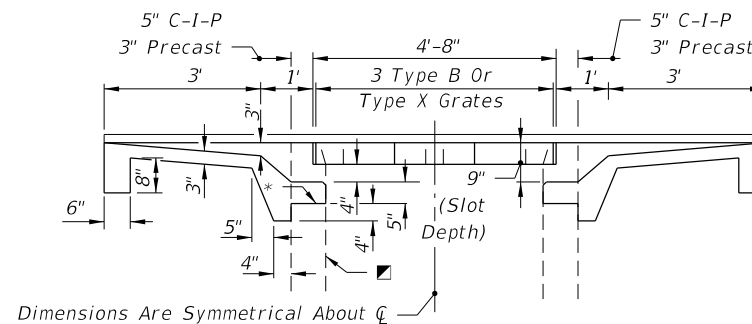
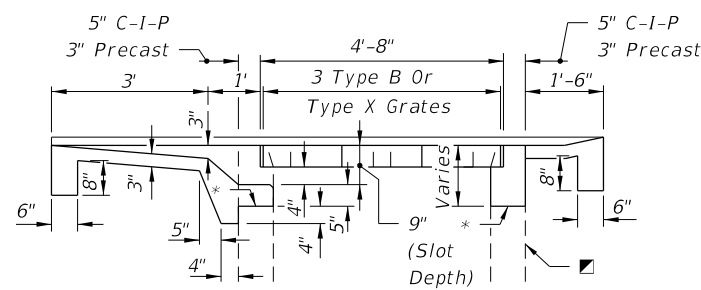
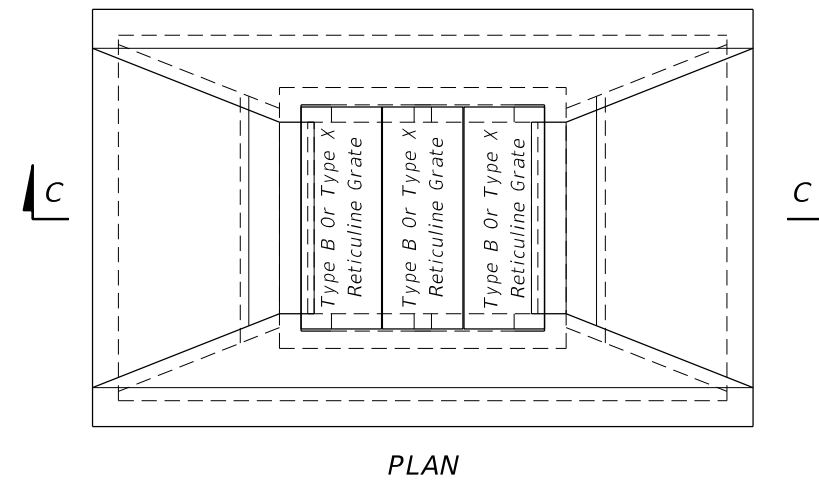
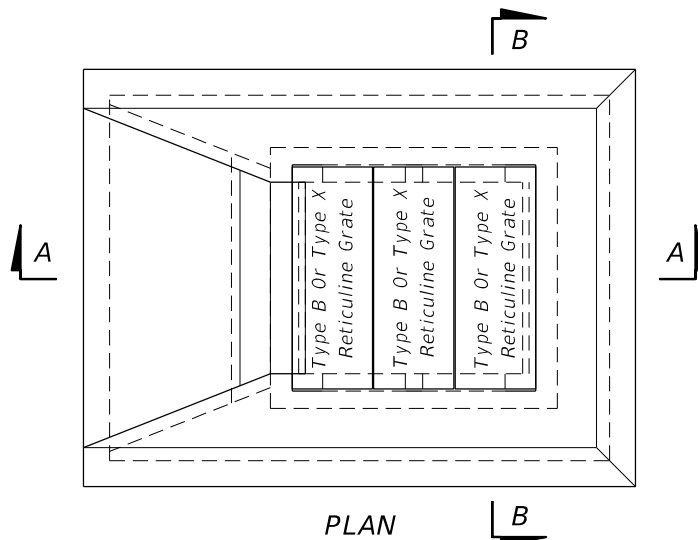
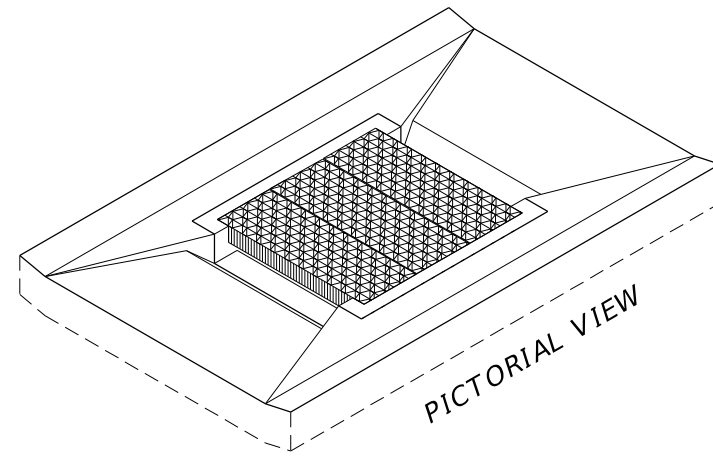
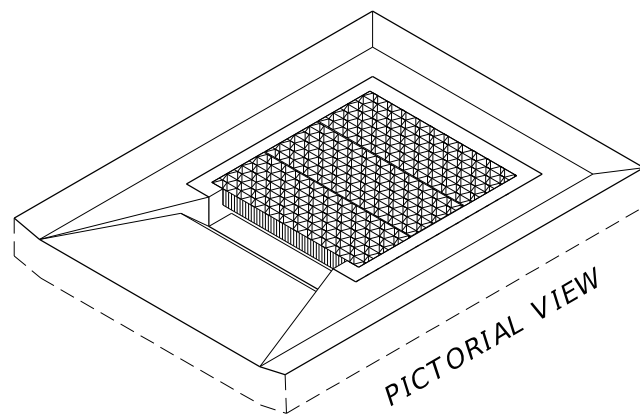
- The general purpose of the inlet top designs are:
 - For ditches, medians or other areas subject to heavy wheel loads. This inlet may be placed in areas subject to occasional pedestrian traffic such as landscaped areas and pavement areas where pedestrians can walk around the inlet. Inlet not suitable for bicycle traffic.
 - Provide full grate and horizontal slot designs for new construction.
 - 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.
- All reinforcing is Grade 60 bars with 2" min. cover unless otherwise noted. See Index 425-001 for equivalent area of welded wire fabric. Bars to be cut or bent for min. 1½" clearance around pipe.
- All exposed edges and corners shall be ¾" chamfer or tooled to ¼" radius.
- When Alternate G grates are specified in the plans, the grates are to be hot-dip galvanized after fabrication.
- 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.
- 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.
- Sod will be paid for under the contract unit price for Performance Turf, SY.
- For supplementary details see Index 425-001.
- All dimensions are for both precast and cast-in-place inlets unless otherwise noted.

DESIGN NOTES

- 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.
- 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

- 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.

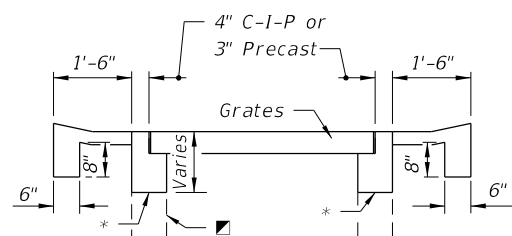


**SECTION AA
SINGLE SLOT**

**SECTION CC
DOUBLE SLOT**

■ 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 425-001 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.

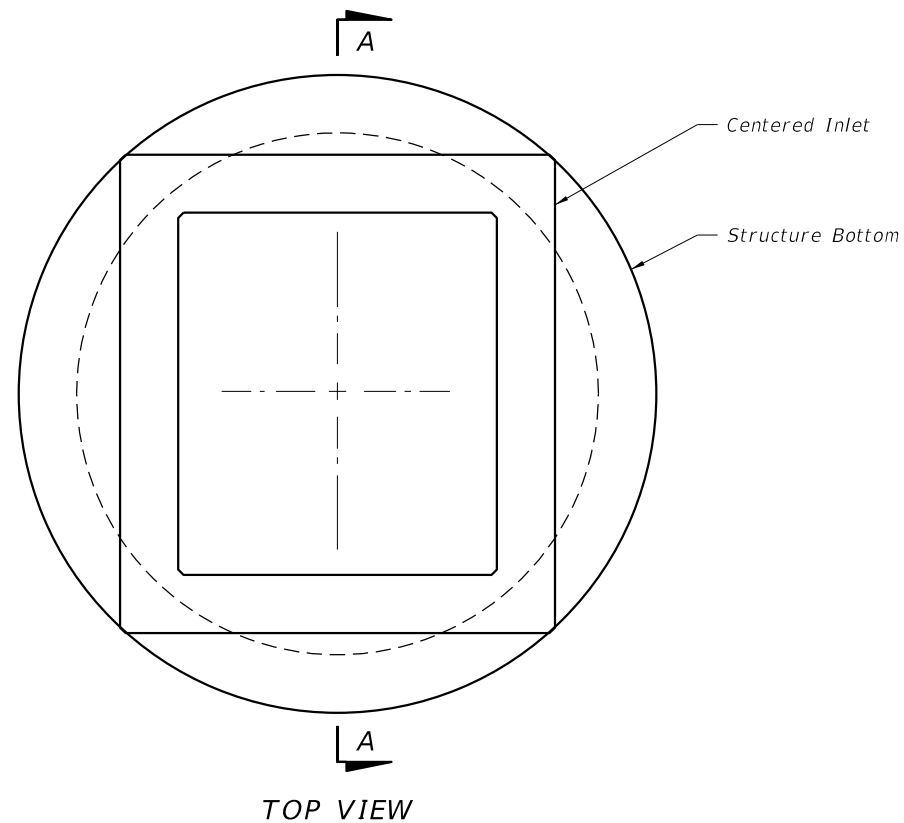


SECTION BB

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

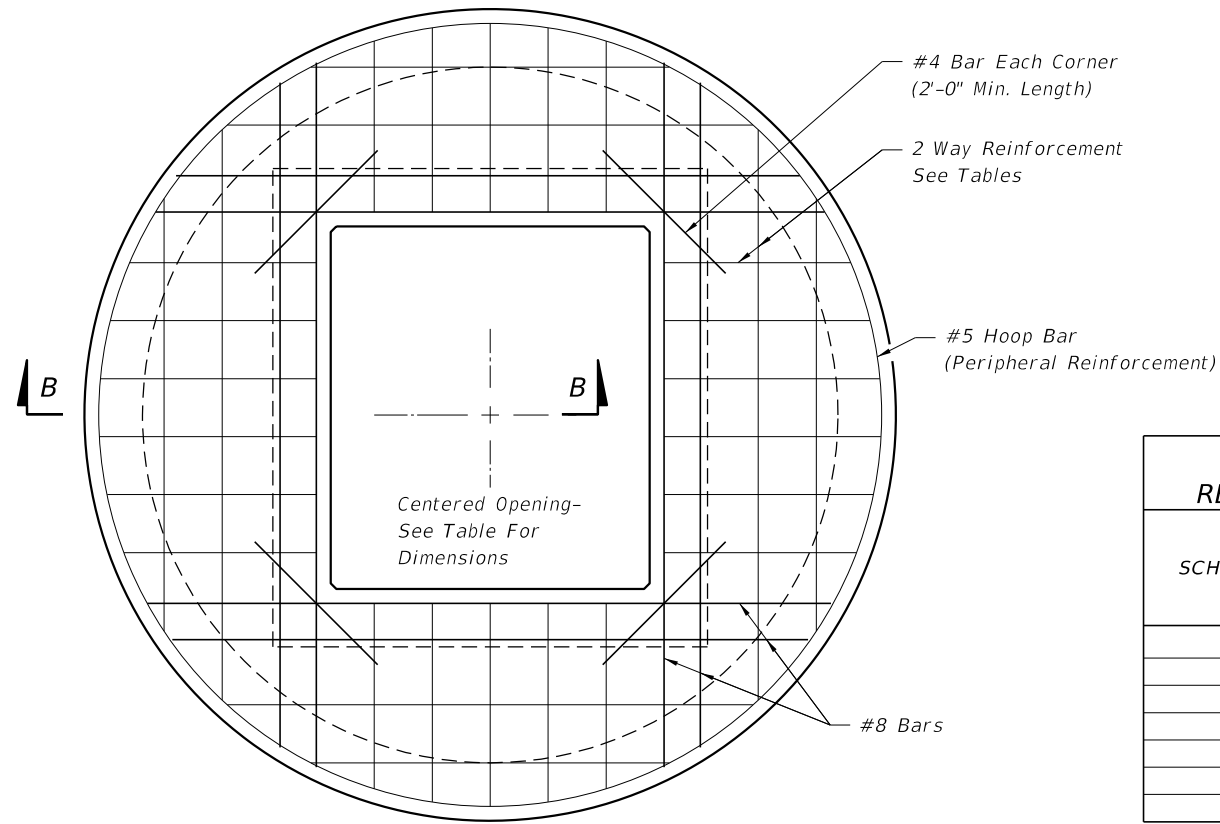
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LAST REVISION 11/01/17	REVISION	DESCRIPTION:	<p>FY 2020-21 STANDARD PLANS</p>	<p>DITCH BOTTOM INLET TYPE B</p>	<p>INDEX 425-051</p>	<p>SHEET 2 of 3</p>
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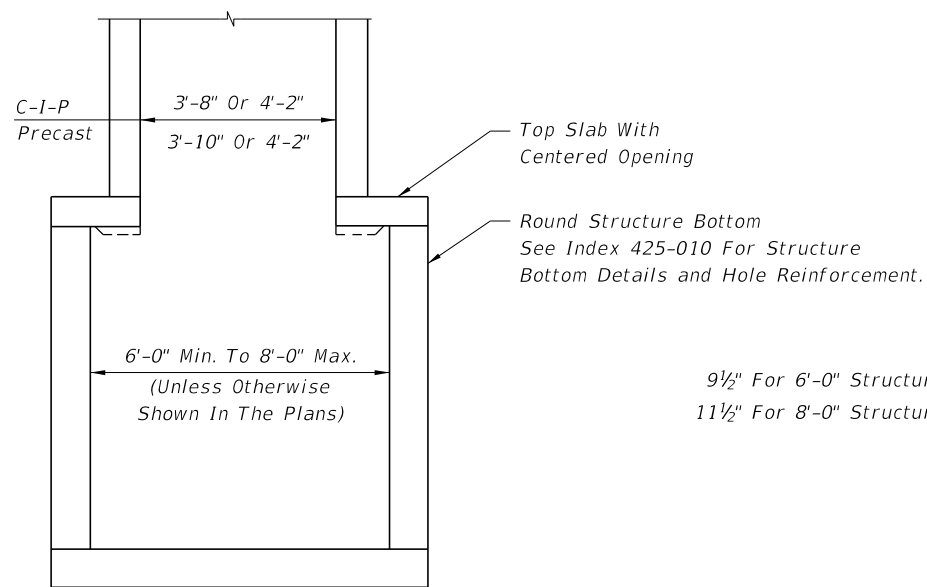
TOP VIEW

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



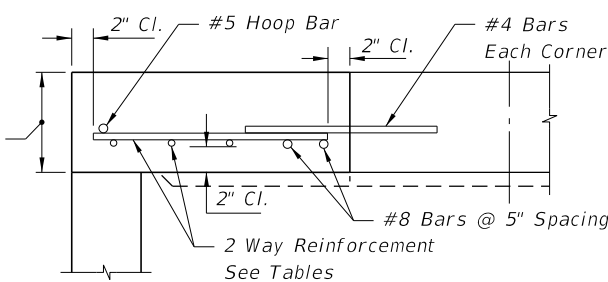
TOP SLAB REINFORCING DIAGRAM

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



SECTION AA

9½" For 6'-0" Structure Bottoms
11½" For 8'-0" Structure Bottoms



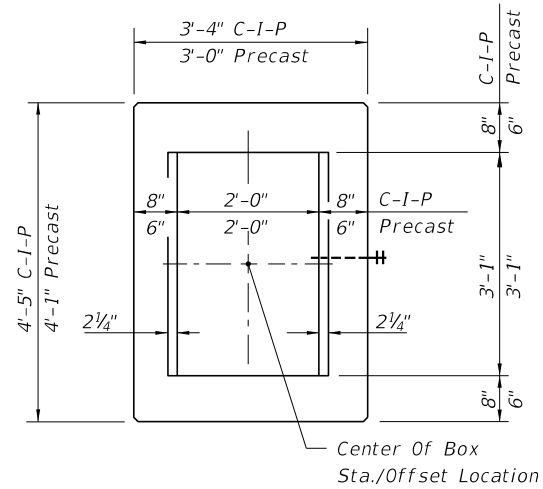
SECTION BB

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

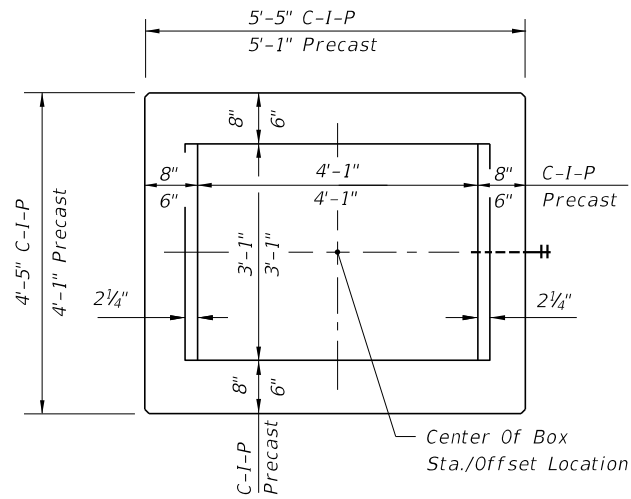
ALT. A STRUCTURE BOTTOM FOR INLET TYPE B

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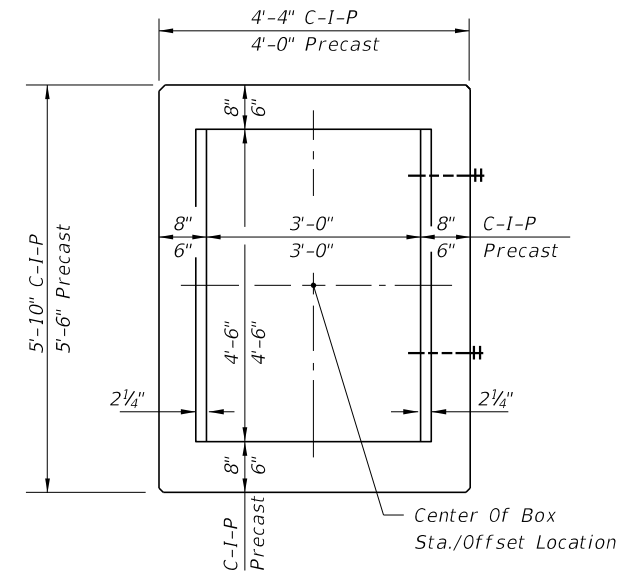
LAST REVISION 11/01/17	REVISION	DESCRIPTION:		FY 2020-21 STANDARD PLANS	DITCH BOTTOM INLET TYPE B	INDEX 425-051	SHEET 3 of 3
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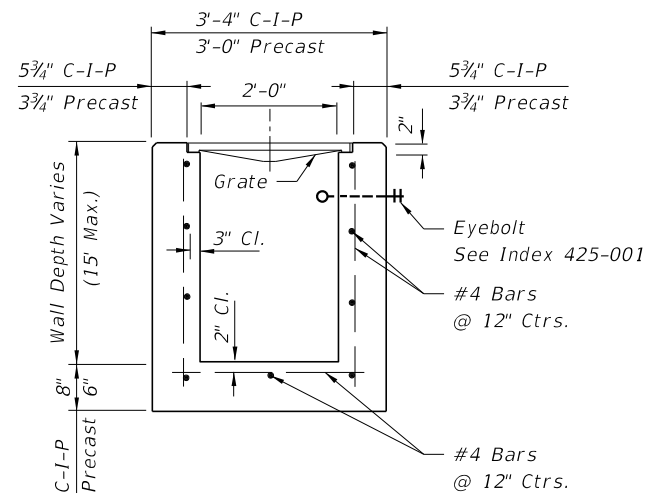
PLAN



PLAN



PLAN



SECTION

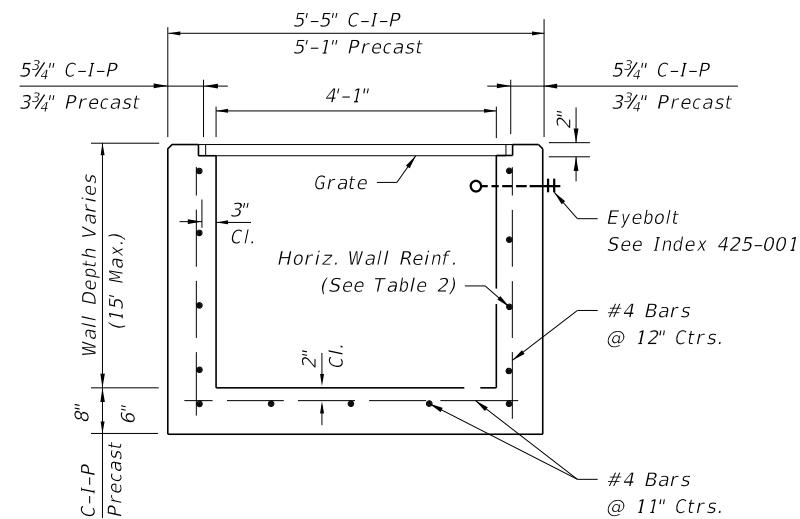
HORIZONTAL WALL REINFORCING SCHEDULES (TABLE 1)

WALL DEPTH	SCHEDULE	AREA (in. ² /ft.)	MAX. SPACING	
			BARS	WWR
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)



SECTION

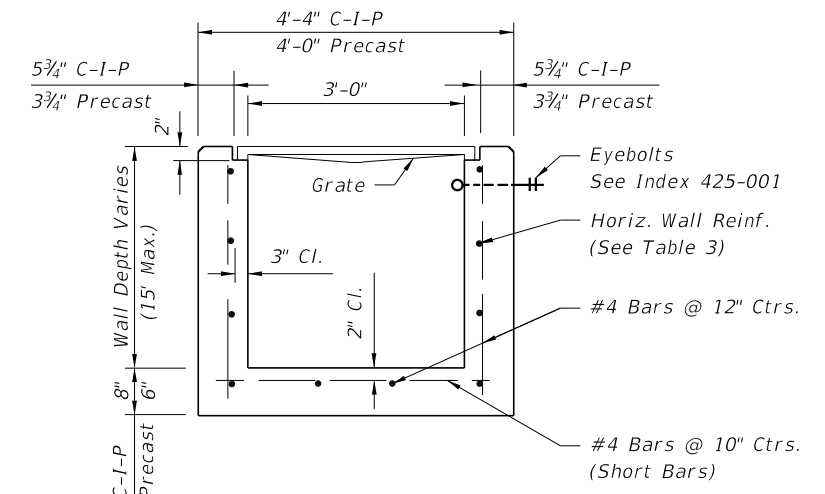
HORIZONTAL WALL REINFORCING SCHEDULES (TABLE 2)

WALL DEPTH	SCHEDULE	AREA (in. ² /ft.)	MAX. SPACING	
			BARS	WWR
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	5 1/2"	5"

TYPE D

Recommended Maximum Pipe Size:

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



SECTION

HORIZONTAL WALL REINFORCING SCHEDULES (TABLE 3)

WALL DEPTH	SCHEDULE	AREA (in. ² /ft.)	MAX. SPACING	
			BARS	WWR
0'-5'	A12	0.20	12"	8"
0'-7.5'	A6	0.20	6"	5"
7.5'-10'	B5.5	0.24	5 1/2"	5"
10'-15'	C6.5	0.37	6 1/2"	6"

TYPE E

Recommended Maximum Pipe Size:

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

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LAST REVISION 11/01/17	DESCRIPTION:
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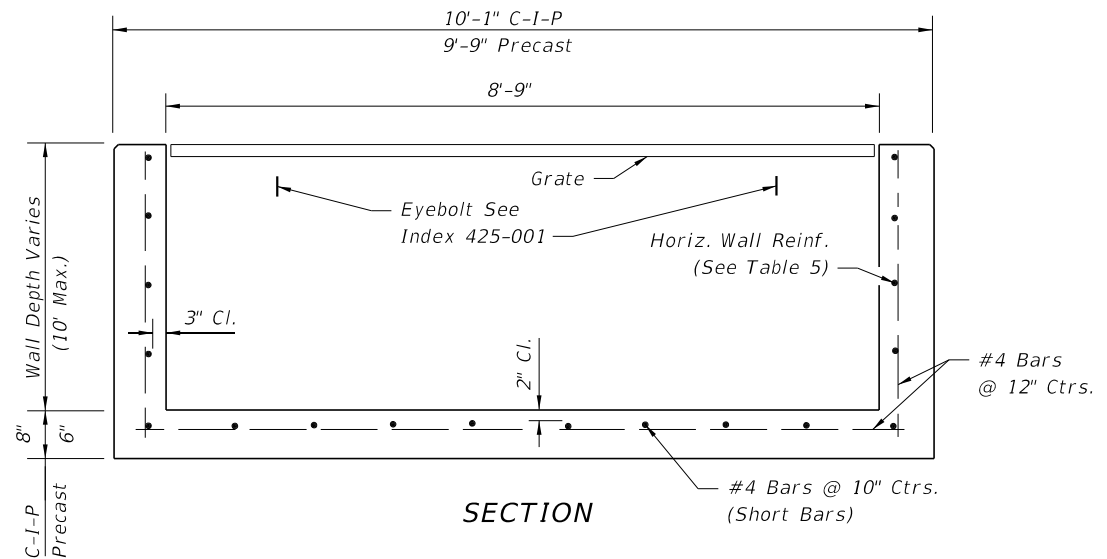
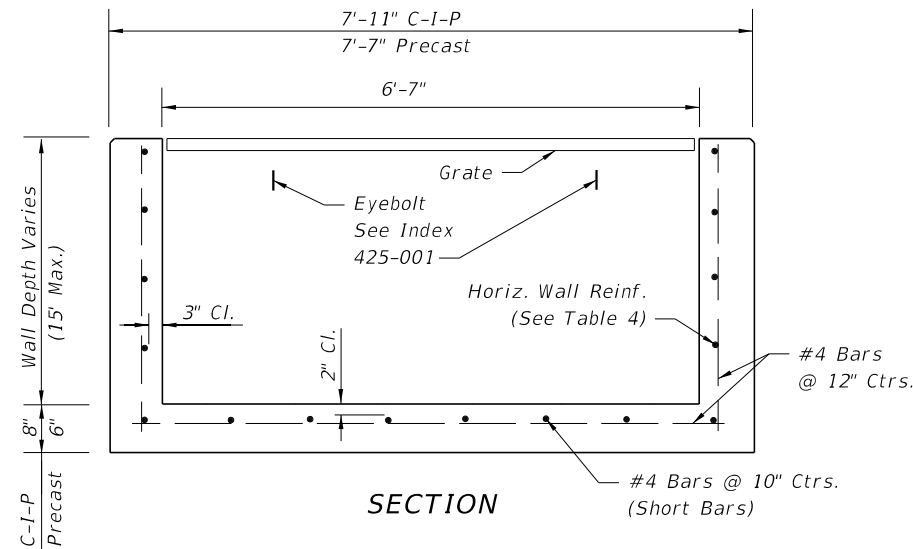
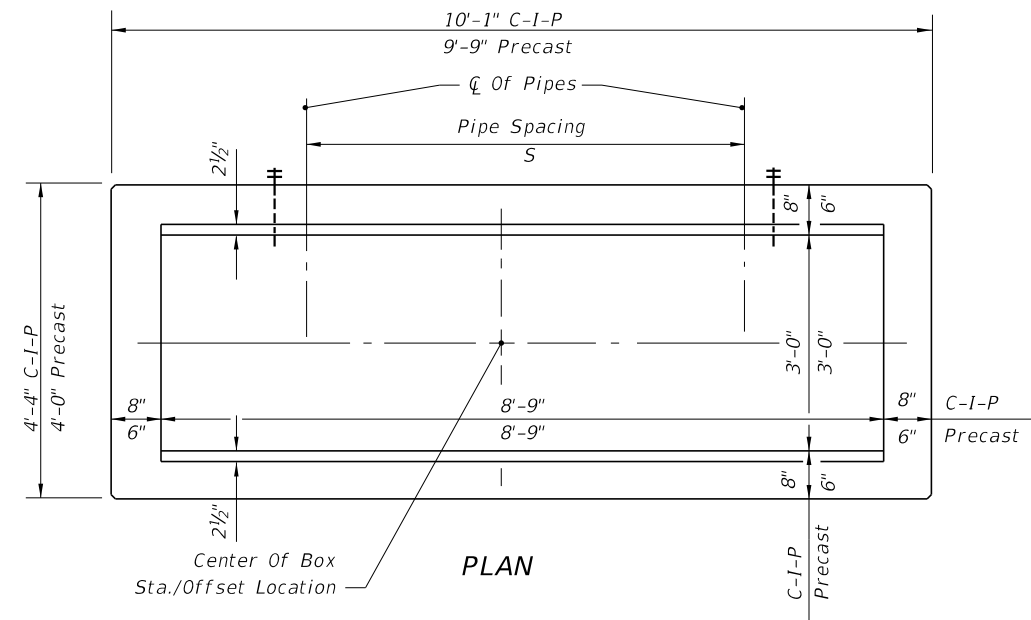
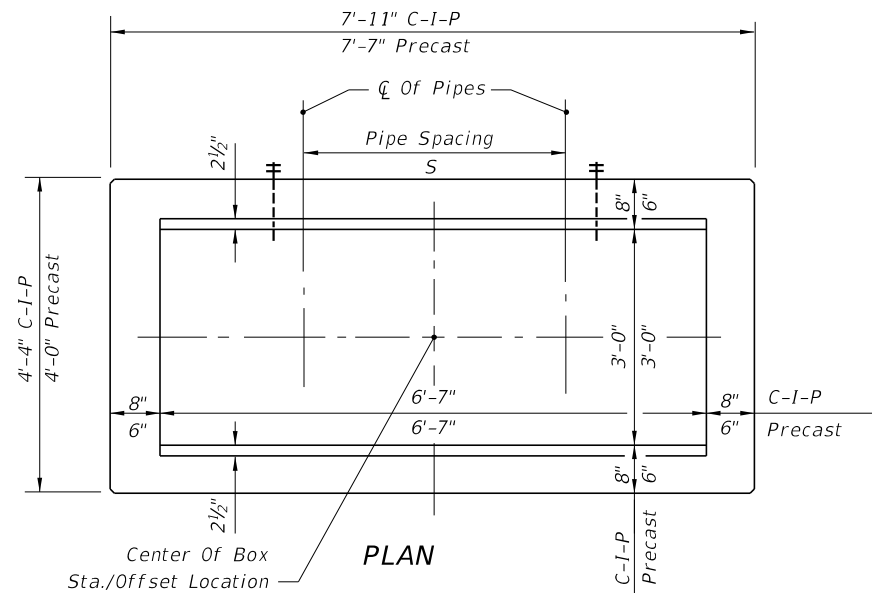


FY 2020-21
STANDARD PLANS

DITCH BOTTOM INLET TYPES C, D, E AND H

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425-052

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HORIZONTAL WALL REINFORCING SCHEDULES (TABLE 4)

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

HORIZONTAL WALL REINFORCING SCHEDULES (TABLE 5)

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

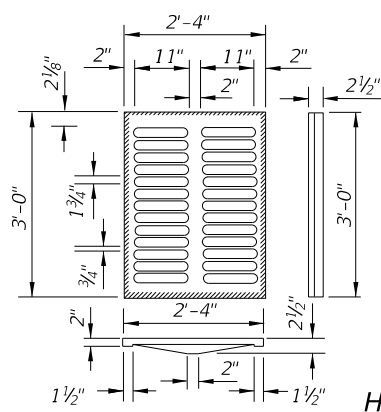
TYPE H (4-GRATE INLET)

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.

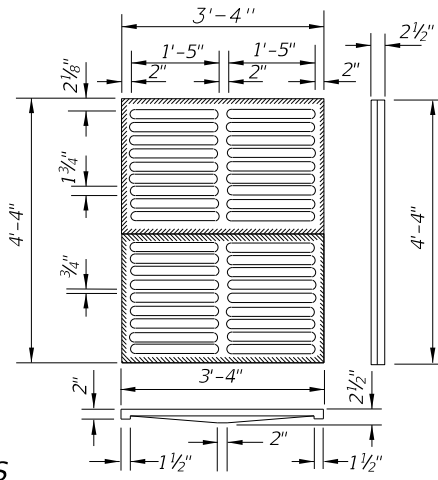
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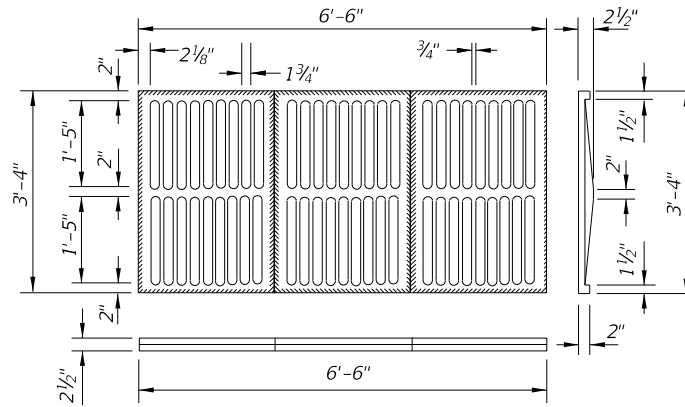


HALF SECTION CAST IRON GRATES

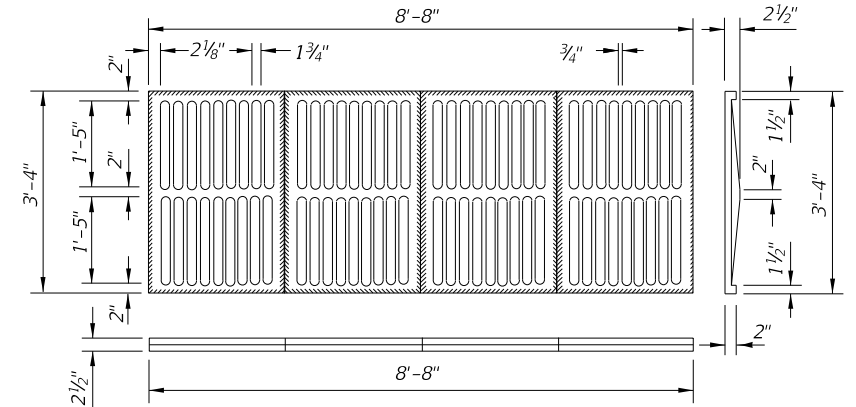
TYPE C
Approx. Weight 235 Lbs.



TYPE E
Approx. Weight 465 Lbs.

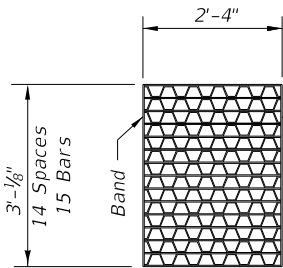


TYPE H (3-GRATE INLET)
Approx. Weight 725 Lbs.



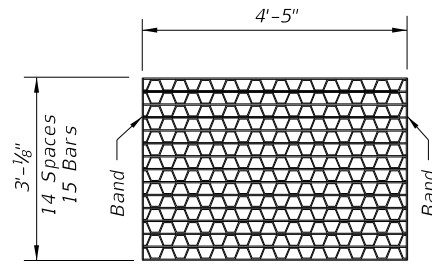
TYPE H (4-GRATE INLET)
Approx. Weight 967 Lbs.

CAST IRON GRATES



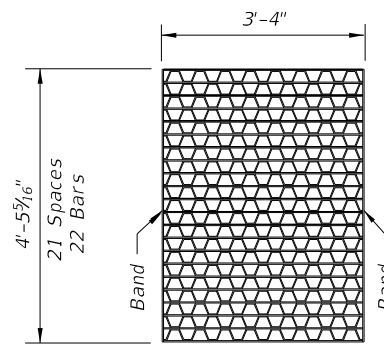
TYPE C

Straight Bars 2" x 1/4"
Reticuline Bars 1 1/4" x 3/16"
Bands 2" x 1/4"
Approx. Weight 104 Lbs.



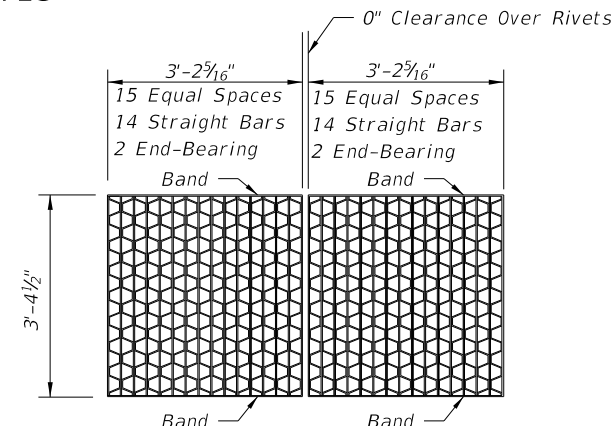
TYPE D

Straight Bars 2" x 1/4"
Reticuline Bars 1 1/4" x 3/16"
Bands 2" x 1/4"
Approx. Weight 190 Lbs.



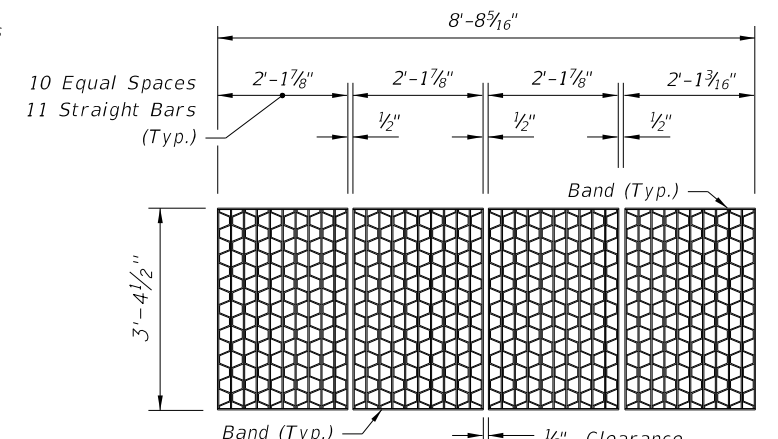
TYPE E

Straight Bars 2" x 1/4"
Reticuline Bars 1 1/4" x 3/16"
Bands 2" x 1/4"
Approx. Weight 215 Lbs.



TYPE H (2-GRATE INLET)

Straight End-Bearing Bars 2" x 3/8" Banding Bars 2" x 1/4"
Straight Bearing Bars 2" x 1/4" Approx. Total Weight 310 Lbs.
Reticuline Bars 1 1/4" x 3/16"



TYPE H (4-GRATE INLET)

Straight End-Bearing Bars 2" x 1/4"
Reticuline Bars 1 1/4" 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

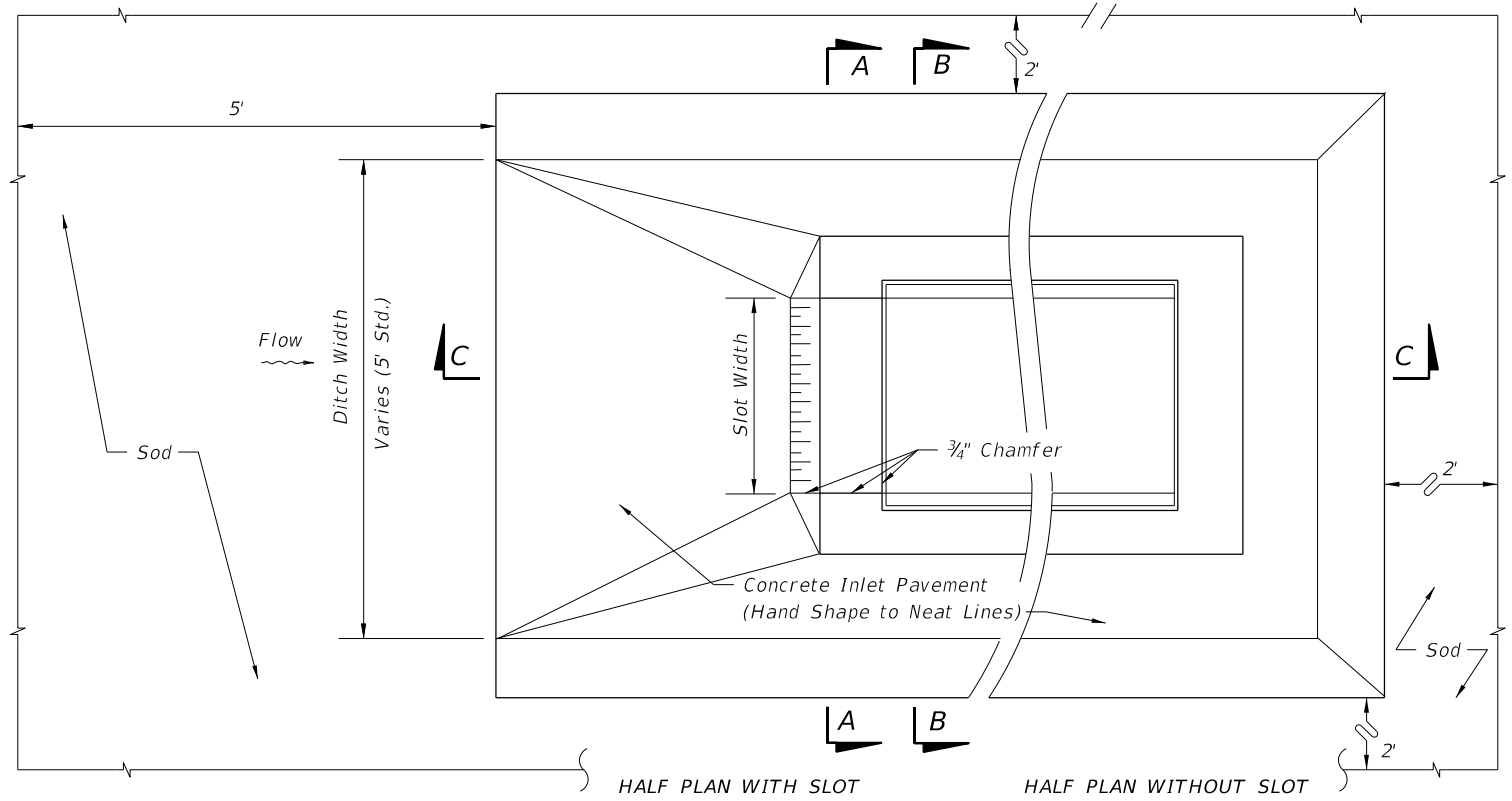
- These inlets are suitable for bicycle traffic and are to be used in ditches, medians and other areas subject to infrequent traffic loadings but are not to be placed in areas subject to any heavy wheel loads. These inlets may be placed in areas subject to occasional pedestrian traffic such as landscaped areas and pavement areas where pedestrians can walk around the inlet.
- 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.
- 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.
- Recommended maximum pipe sizes shown are for concrete pipe. Size for other types of pipe must be checked for fit.
- All exposed edges and corners shall be 3/4" chamfer or tooled to 1/4" radius.
- 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.
- 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'.

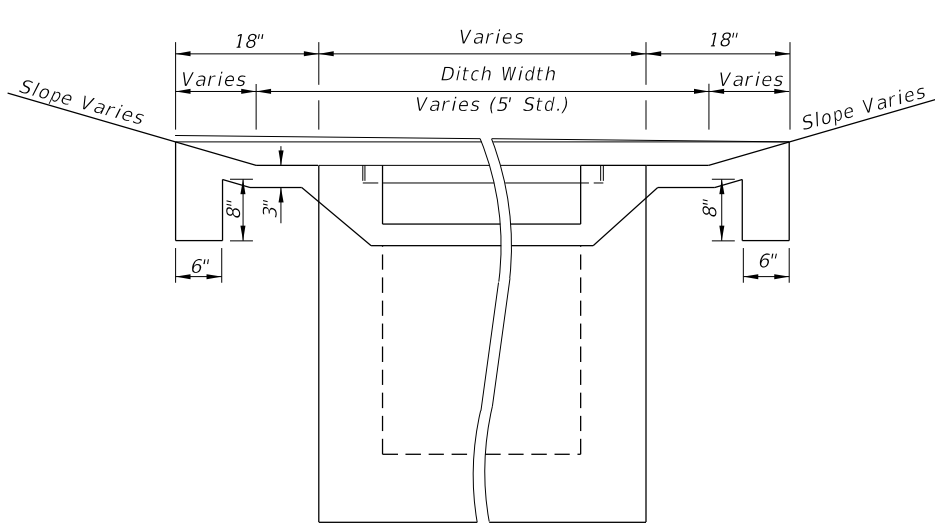
- Sodding to be used on all inlets not located in paved areas and paid for under contract unit price for Performance Turf, SY.
- For supplementary details see Index 425-001.
- All reinforcing is Grade 60 bars with 2" min. cover unless otherwise noted. Bars to be cut or bent for 1 1/2" clearance around pipe opening. Provide one additional #4 bar above and at each side of pipe opening.

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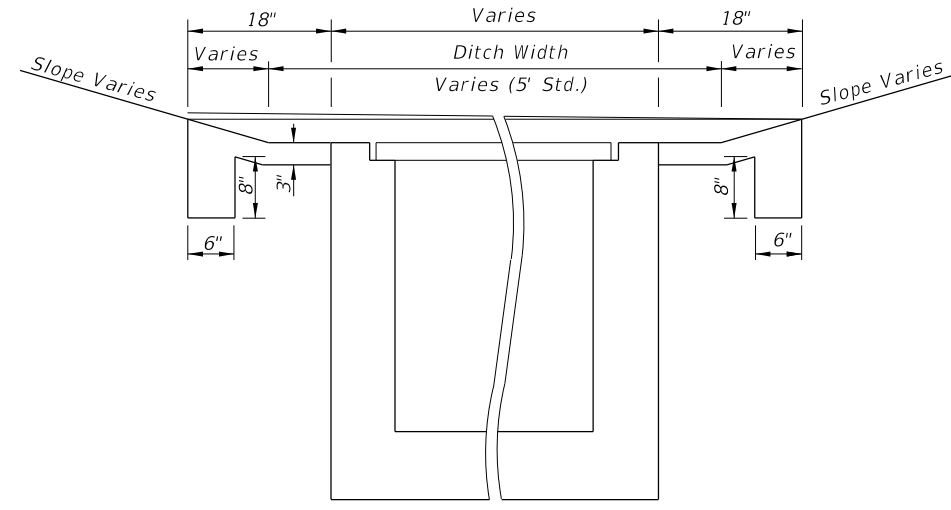
LAST REVISION 11/01/17	DESCRIPTION:	 FY 2020-21 STANDARD PLANS	DITCH BOTTOM INLET TYPES C, D, E AND H	INDEX 425-052	SHEET 3 of 7
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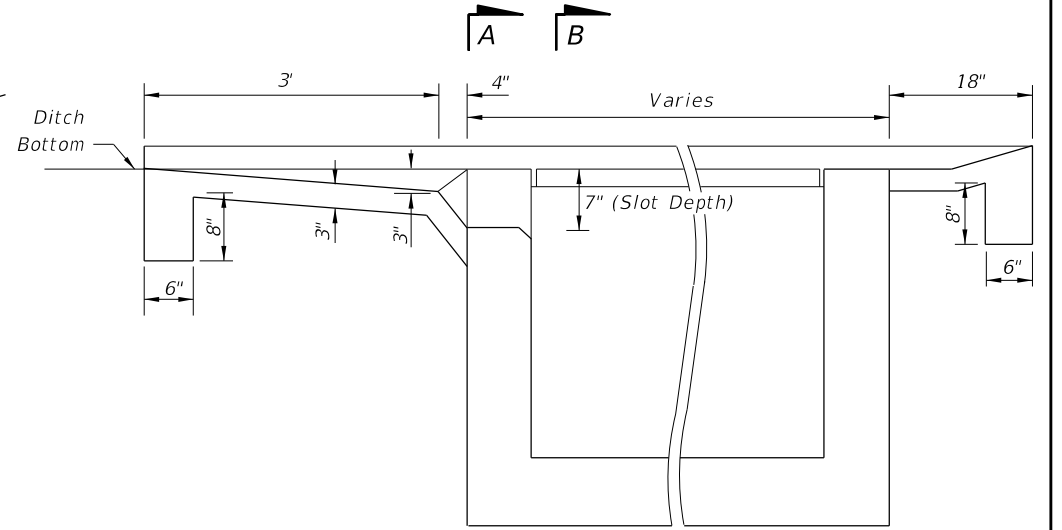
PLAN VIEW



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

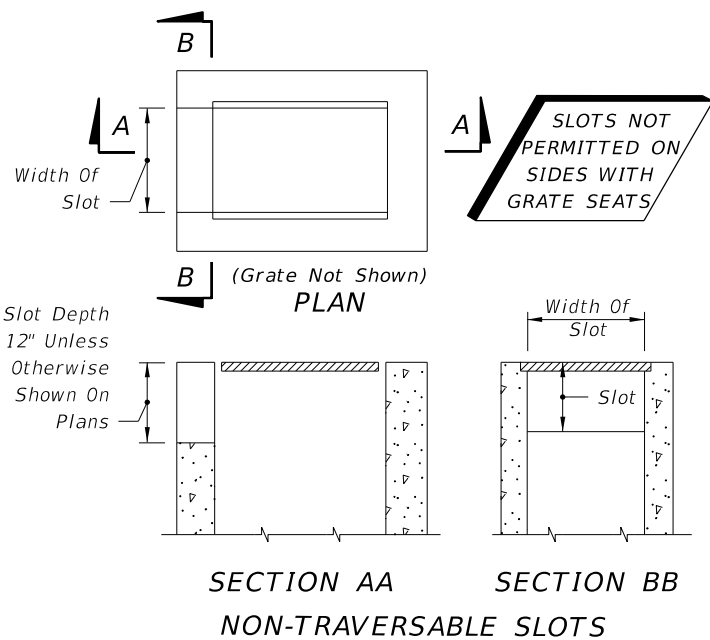
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LAST REVISION 11/01/17	DESCRIPTION:
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FY 2020-21
 STANDARD PLANS

DITCH BOTTOM INLET TYPES C, D, E AND H

INDEX 425-052	SHEET 4 of 7
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SOD ONLY

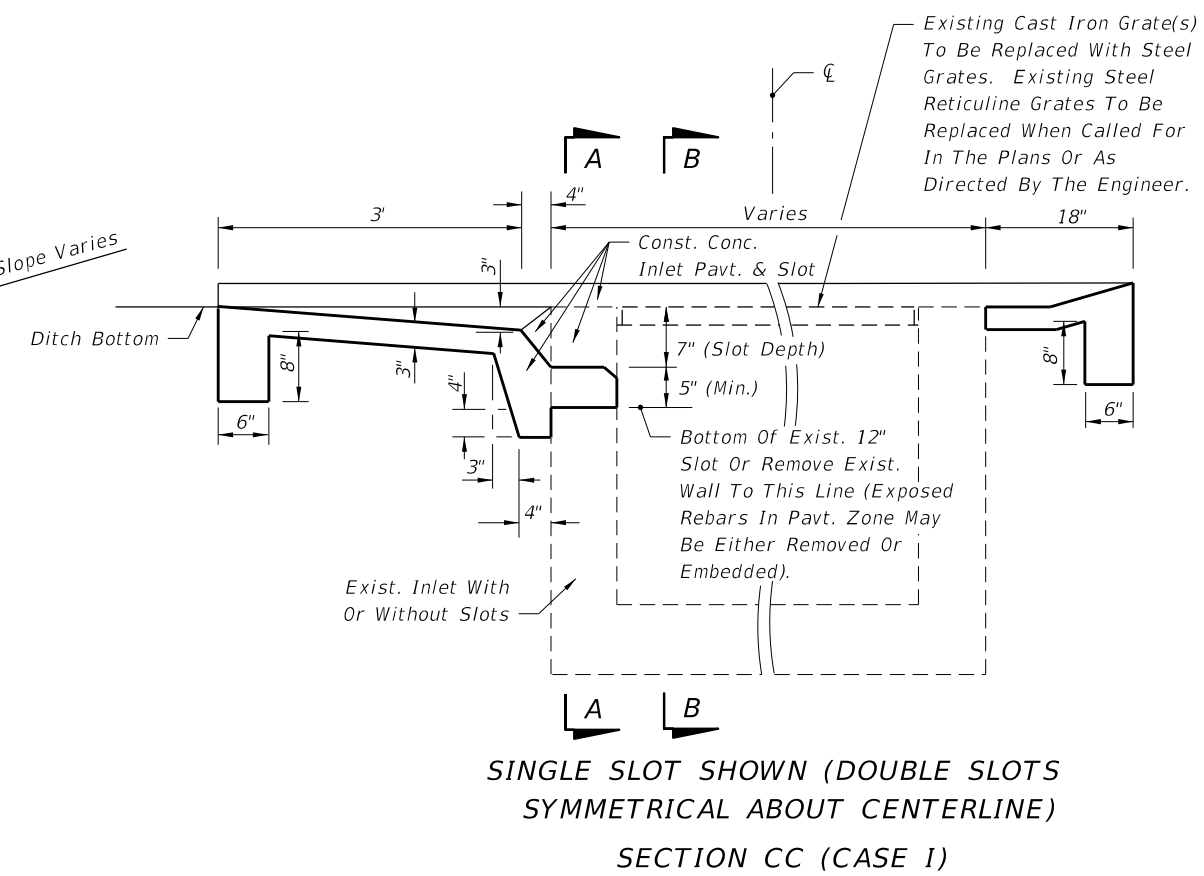
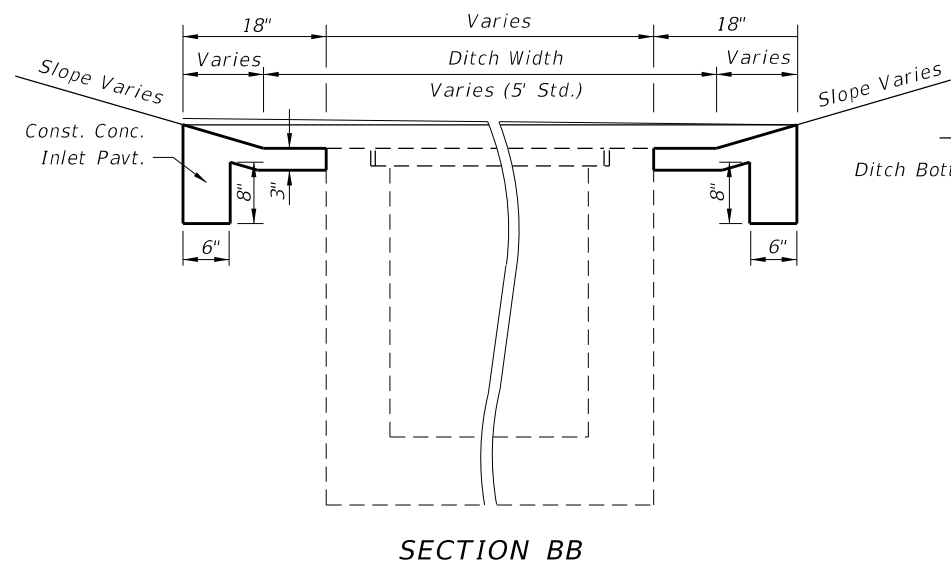
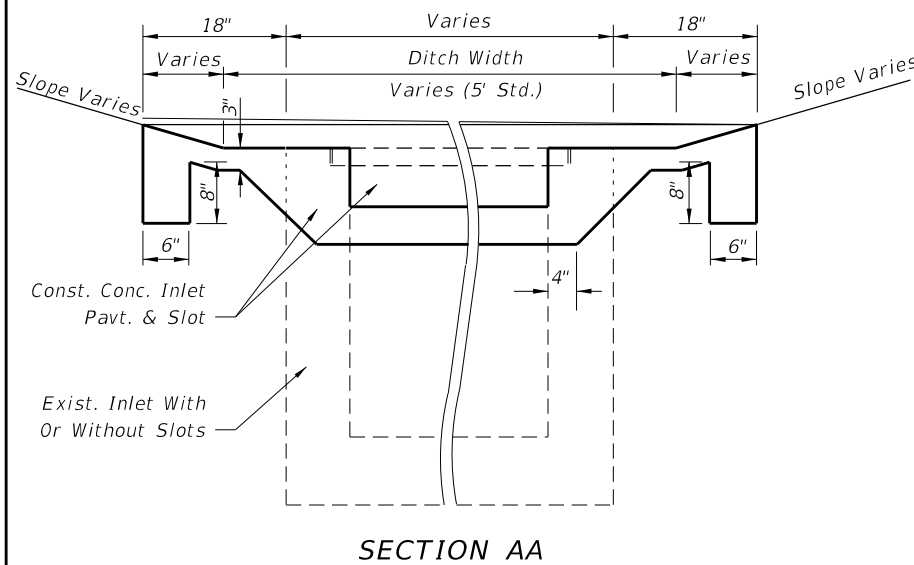
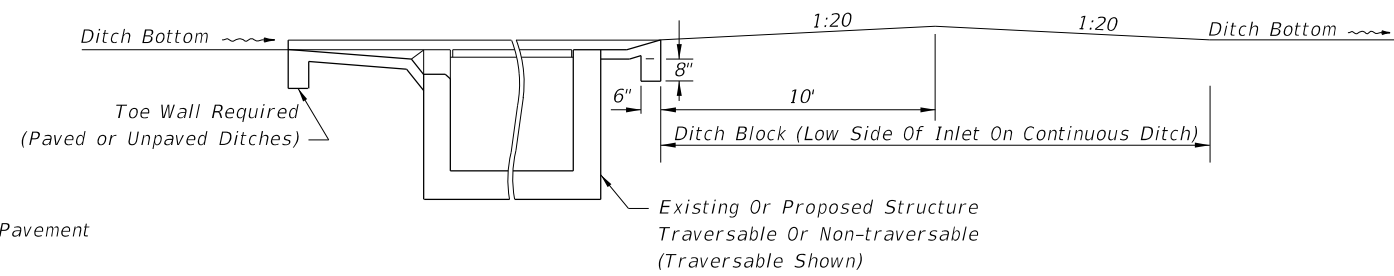
Inlet	Sod SY
C	6
D	6
E	7
H	8

PAVT. AND SOD

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

1'-6" Sod
3" Concrete Inlet Pavement

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



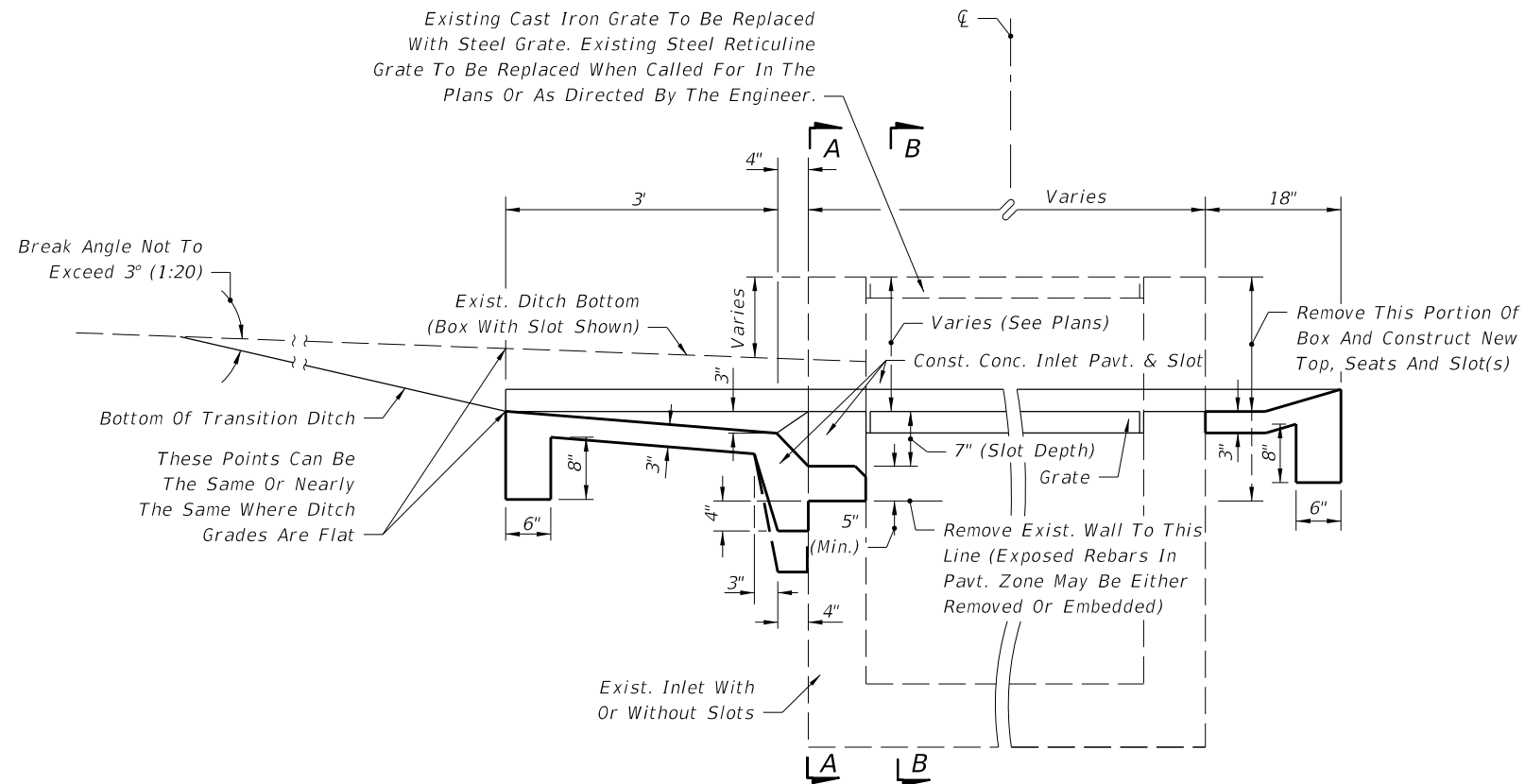
PAVEMENT AND SODDING QUANTITIES FOR TRAVERSABLE SLOTS

Inlet	Pavement		Sod	
	Single Slot SY	Double Slot CY	Single Slot SY	Double Slot SY
C	4.87	0.83	6.16	1.05
D	5.99	1.01	7.70	1.30
E	5.88	0.99	7.37	1.24

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

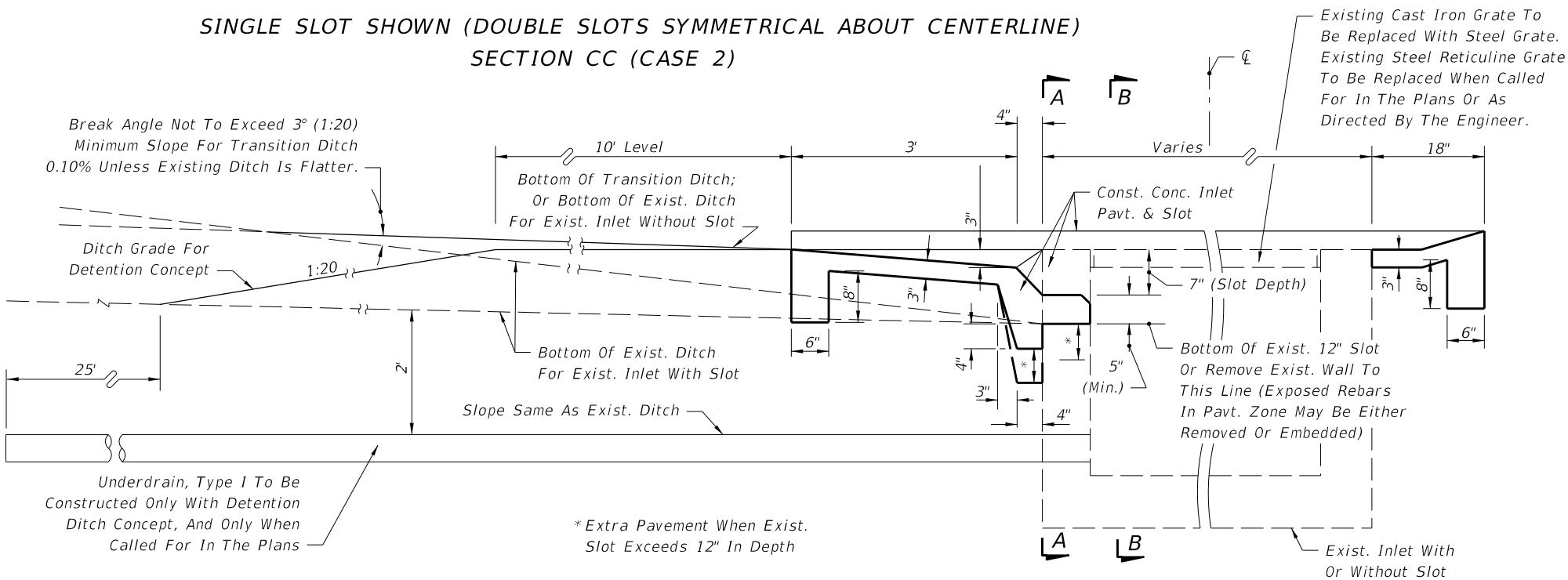
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Existing Cast Iron Grate To Be Replaced With Steel Grate. Existing Steel Reticuline Grate To Be Replaced When Called For In The Plans Or As Directed By The Engineer.



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

Break Angle Not To Exceed 3° (1:20)
Minimum Slope For Transition Ditch
0.10% Unless Existing Ditch Is Flatter.



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 1 in the plans.

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

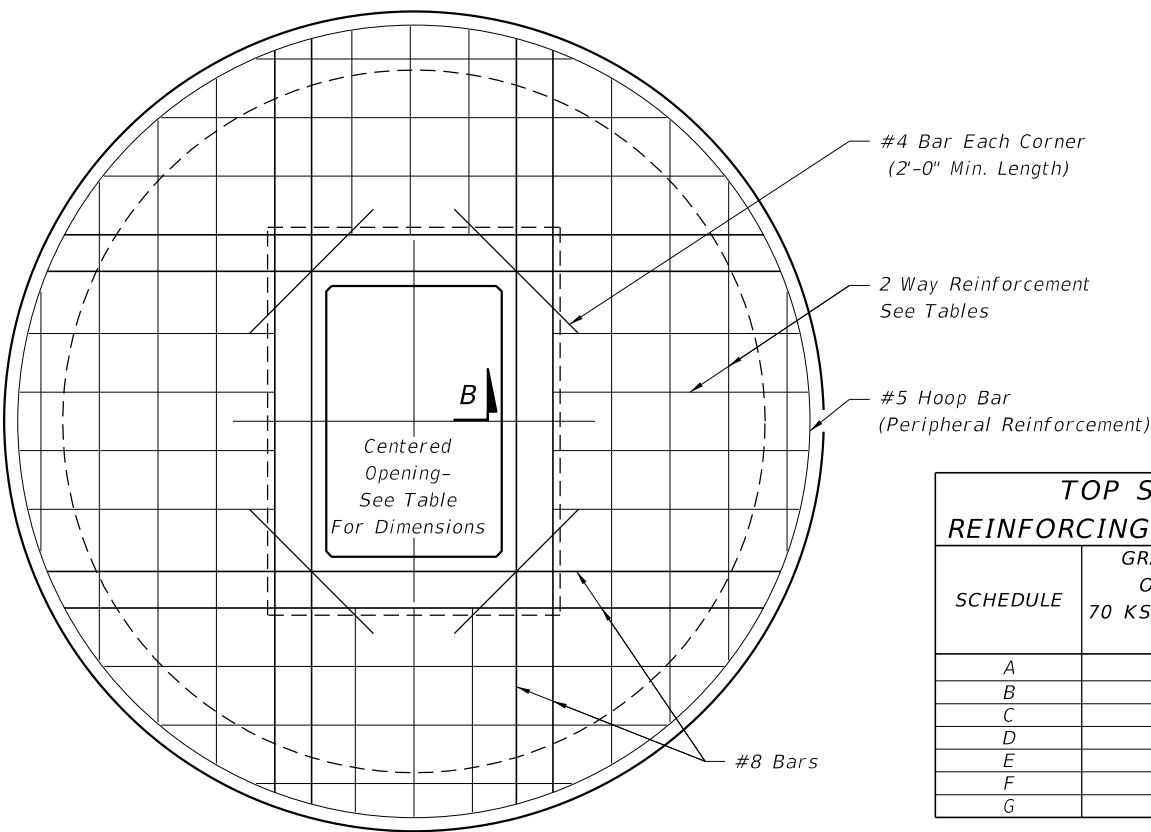
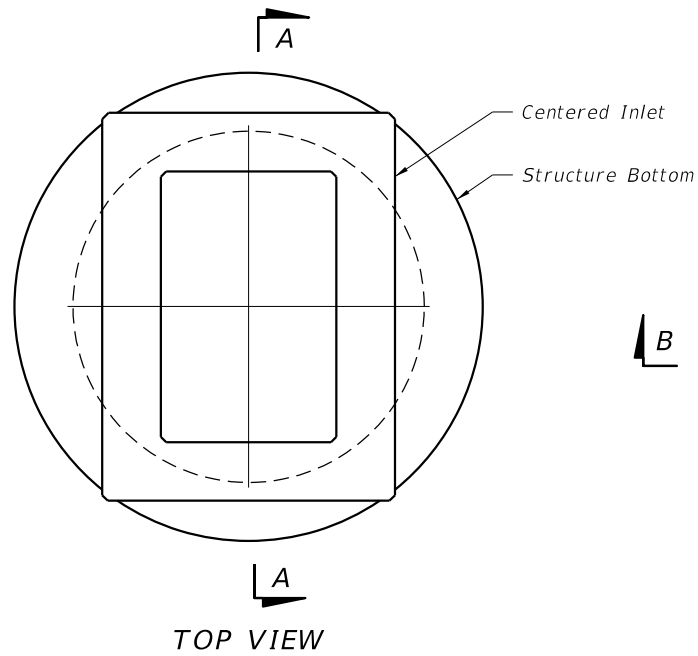
1. Existing inlets converted to traversable slot tops under Cases 1, 2 and 3 shall be paid for as inlets partial, each. Case shall not be included in the pay item description.
2. All ditch reconstruction work within 35 feet of each traversable slot conversion, whether required by these details or as 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 11/01/17	DESCRIPTION:	FDOT FY 2020-21 STANDARD PLANS	DITCH BOTTOM INLET TYPES C, D, E AND H	INDEX 425-052	SHEET 6 of 7
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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"

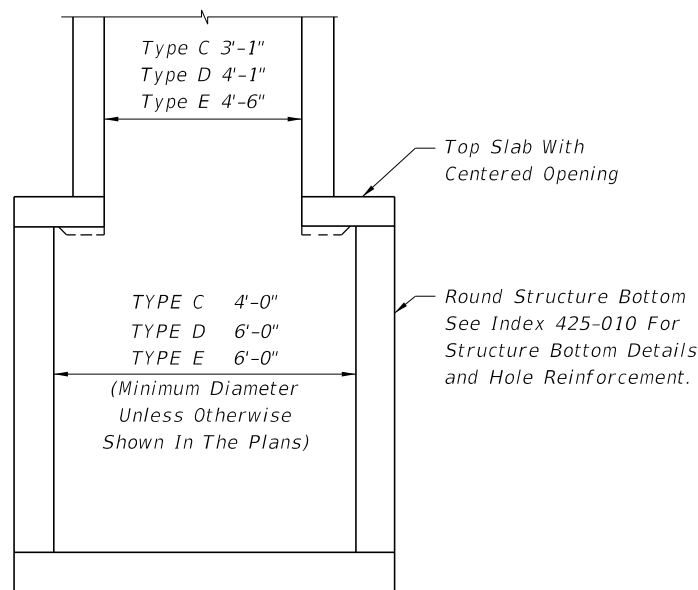
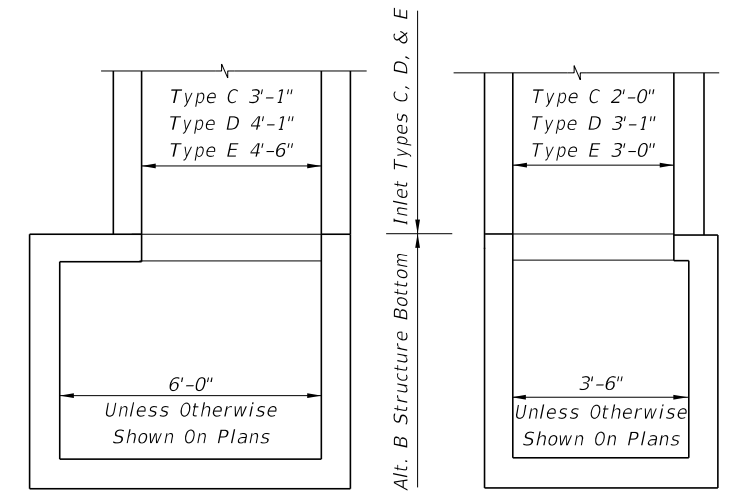
TOP SLAB REINFORCING DIAGRAM

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

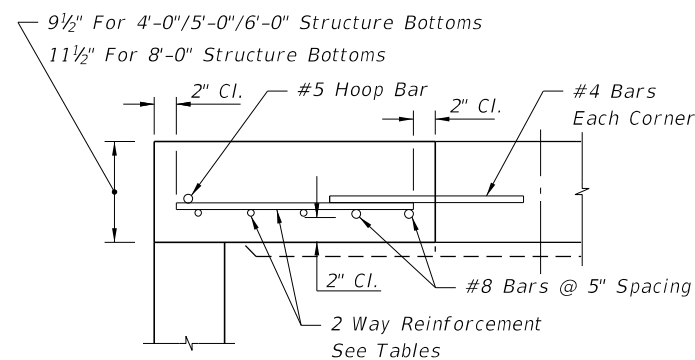
TOP SLAB WITH CENTERED OPENING		
SLAB DEPTH	SLAB THICKNESS	REINFORCING (2 WAYS) SCHEDULE
SIZE: 4'-0"		
≥0.5'-40'	9½"	C
SIZE: 5'-0"		
≥0.5' < 30'	9½"	C
30'-40'	9½"	D
SIZE: 6'-0"		
0.5' < 8'	9½"	B
8' < 18'	9½"	C
18' < 30'	9½"	D
30' < 37'	9½"	E
37'-40'	9½"	G
SIZE: 8'-0"		
≥0.5' < 9'	11½"	C
9' < 15'	11½"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

See Index 425-010 for structure bottom details and hole reinforcement.

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

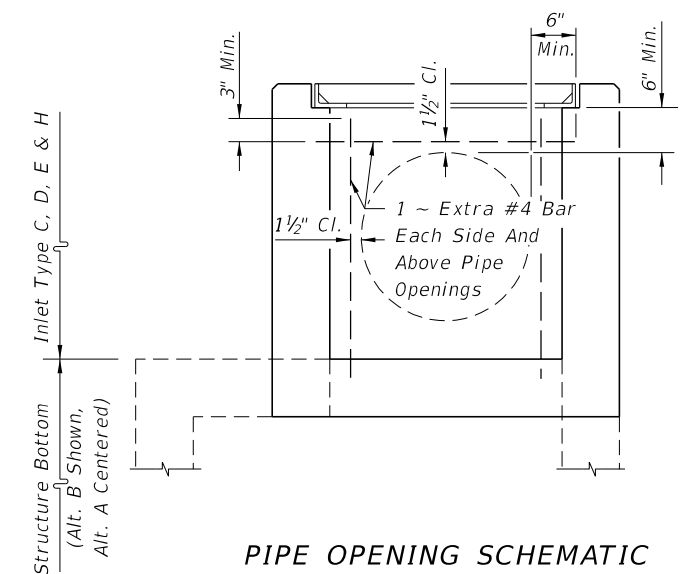


SECTION AA



SECTION BB

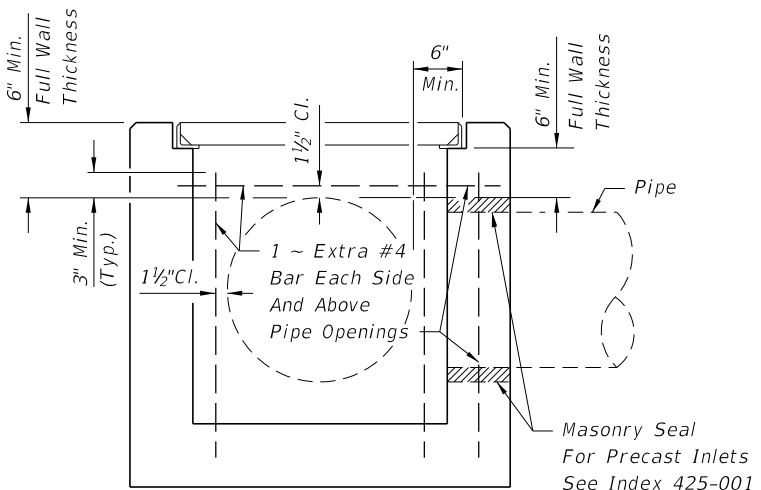
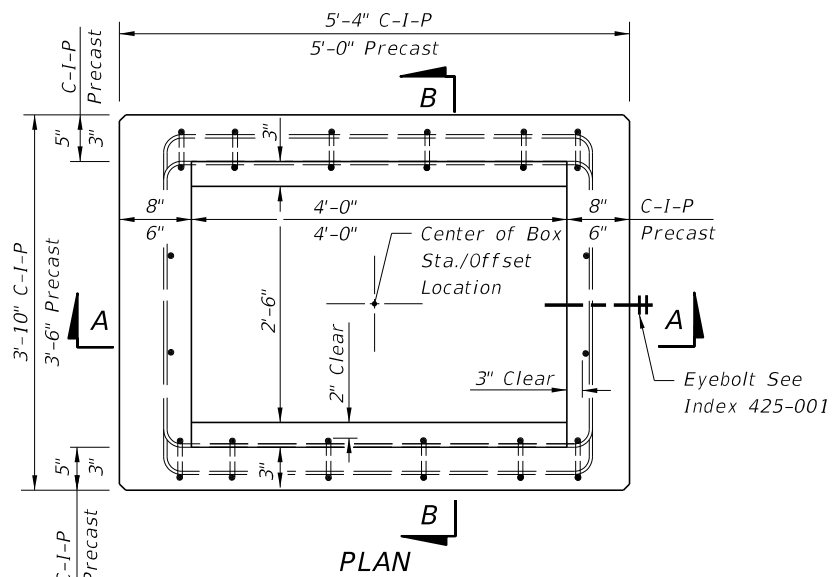
ALT. A STRUCTURE BOTTOM FOR INLETS TYPE C, D AND E



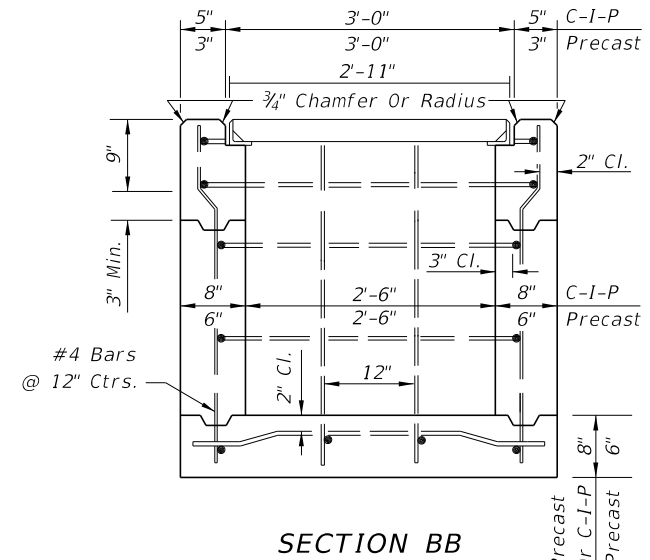
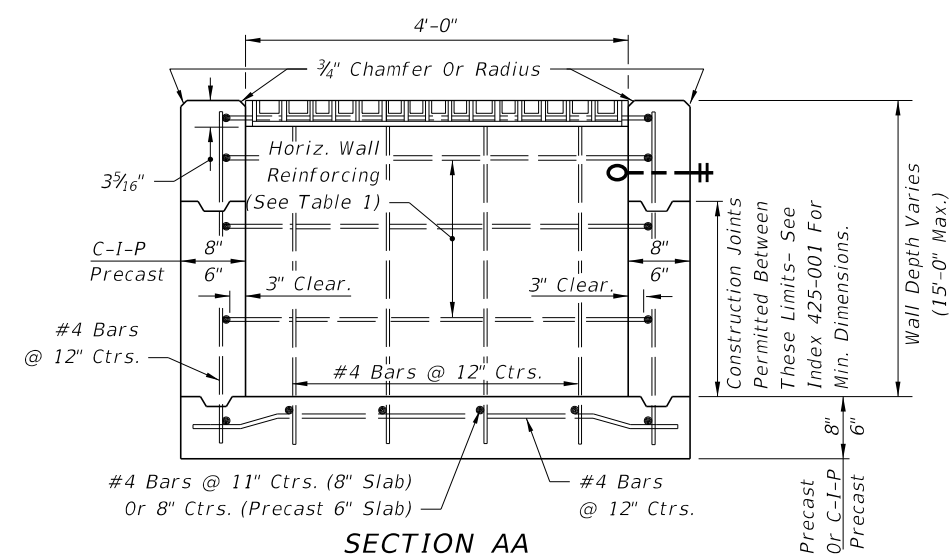
PIPE OPENING SCHEMATIC

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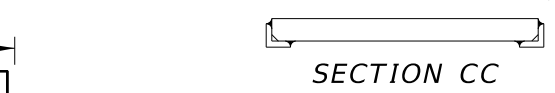
LAST REVISION 11/01/17	DESCRIPTION:
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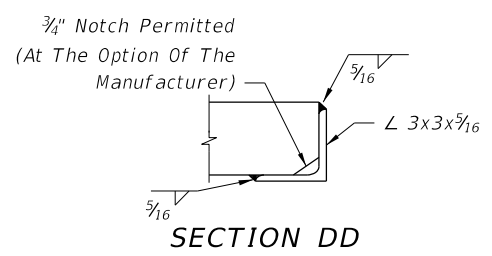
(TYPE F SHOWN, TYPE G SIMILAR)
PIPE OPENING SCHEMATIC



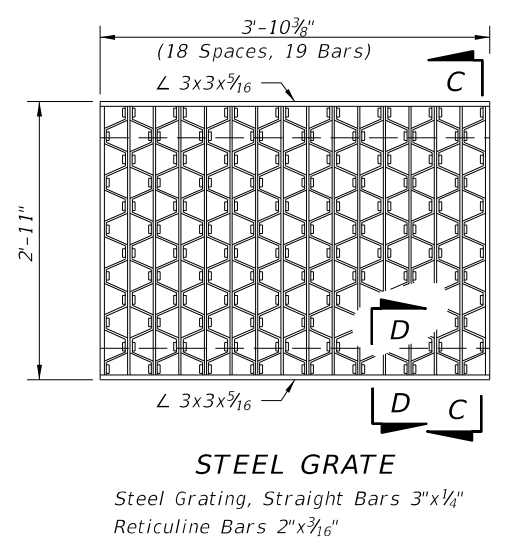
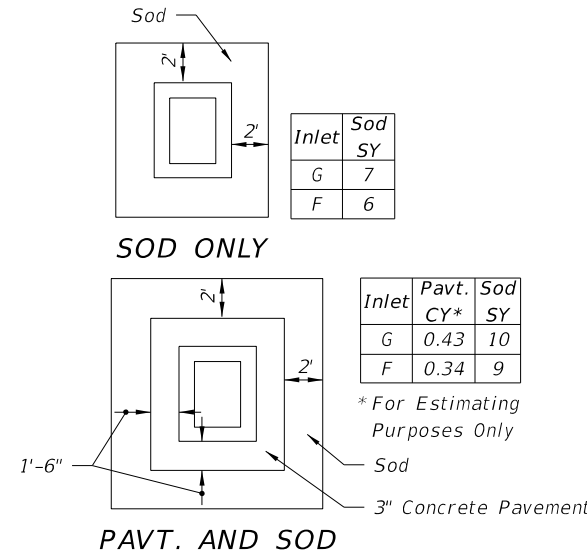
SECTION BB



SECTION CC



SECTION DD



TYPE F

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

WALL DEPTH	SCHEDULE	AREA (in ² /ft)	MAX. SPACING	
			BARS	WWR
0' - 4'	A12	0.20	12"	8"
4' - 7'	A6	0.20	6"	5"
7' - 12'	B5.5	0.24	5 1/2"	5"
12' - 15'	Special 1	0.267	5"	4"

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 5/8" as shown in Index 425-031.
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 425-010. 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 3/4" chamfer or tool to 1/4" radius.
5. For supplemental details, see Index 425-001.
6. All reinforcing is Grade 60 bars with 2" min. cover unless otherwise noted. Bars to be cut or bent for 1 1/2" 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.

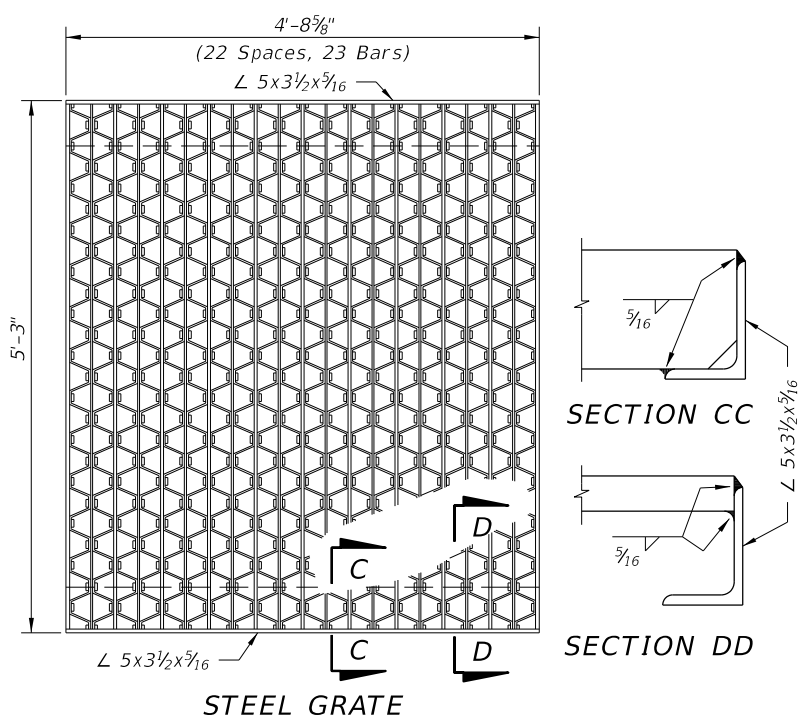
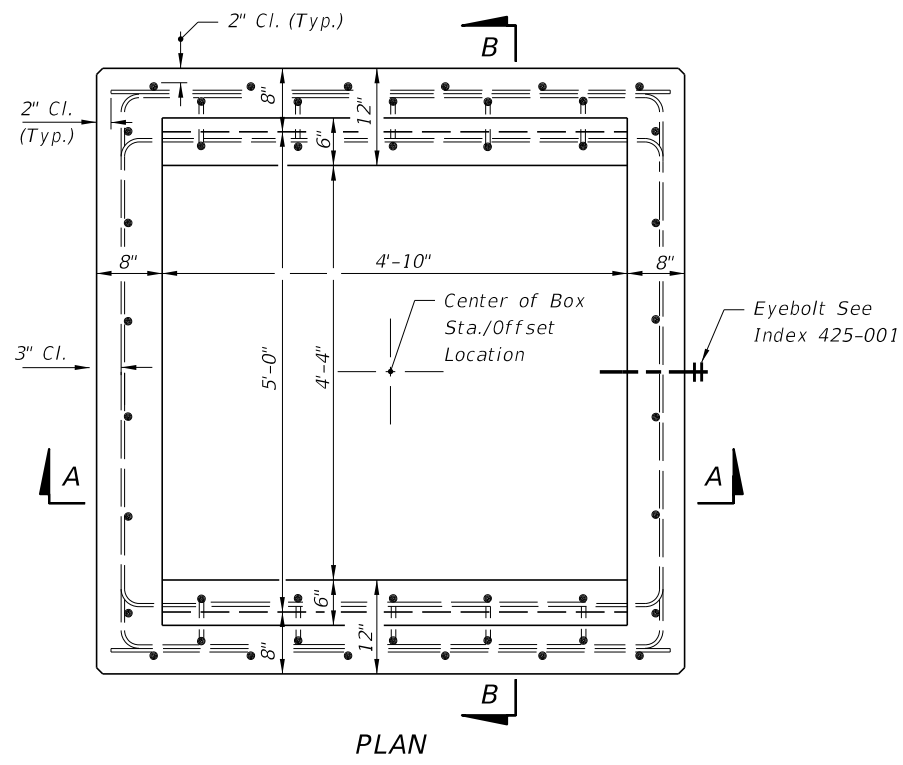
RECOMMENDED MAXIMUM PIPE SIZES	
INLET INSIDE WIDTH	PIPE SIZE
2'-6" (Type F)	18"
4'-0" (Type F)	30"
4'-10" / 5'-0" (Type G)	42"

Note: Recommended sizes are for concrete pipe. Sizes for other types of pipe must be verified for fit in accordance with Index 425-001. For larger pipe sizes see Note 3.

- 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.

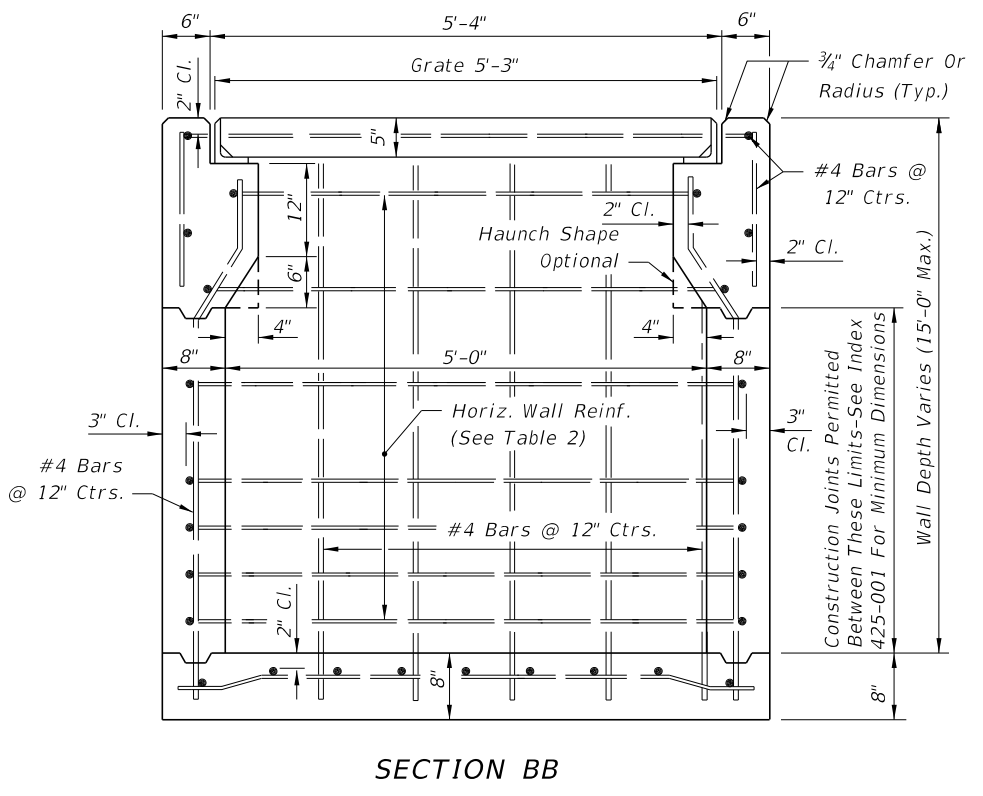
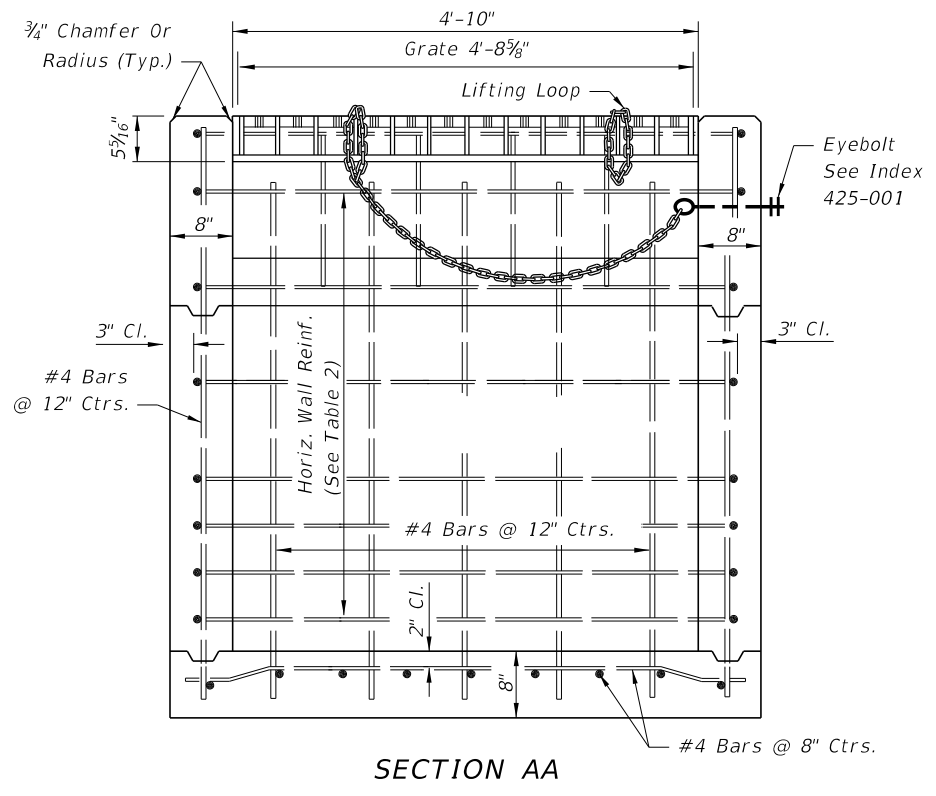
PAVEMENT AND SODDING

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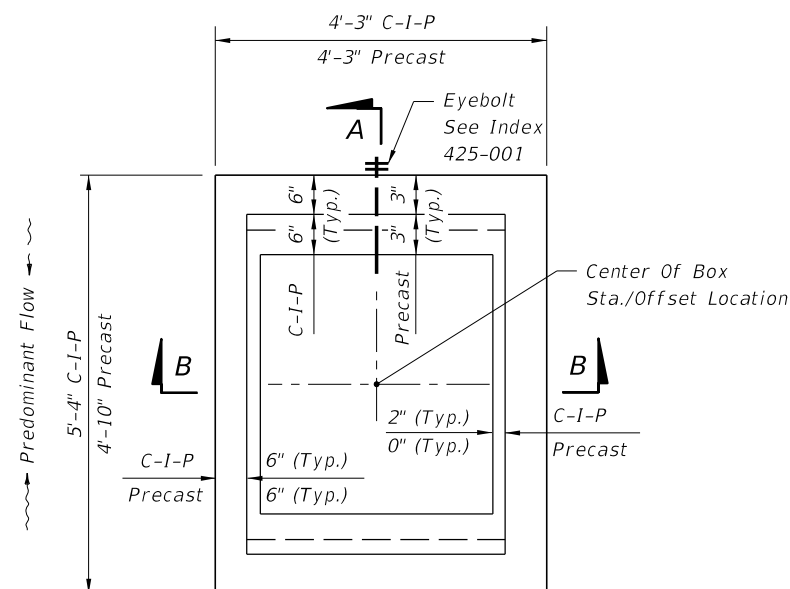
TYPE G INLET (TABLE 2)

WALL DEPTH	SCHEDULE	AREA (in ² /ft)	MAX. SPACING	
			BARS	WWR
0' - 3'	A12	0.20	12"	8"
3' - 7'	A6	0.20	6"	5"
7' - 10'	B5.5	0.24	5 $\frac{1}{2}$ "	5"
10' - 15'	C6.5	0.37	6 $\frac{1}{2}$ "	6"

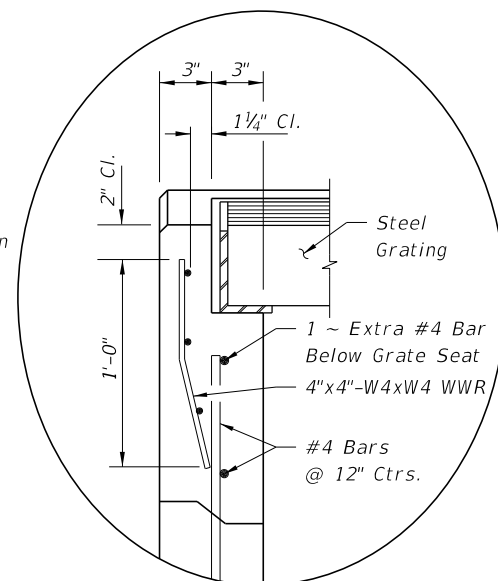


TYPE G

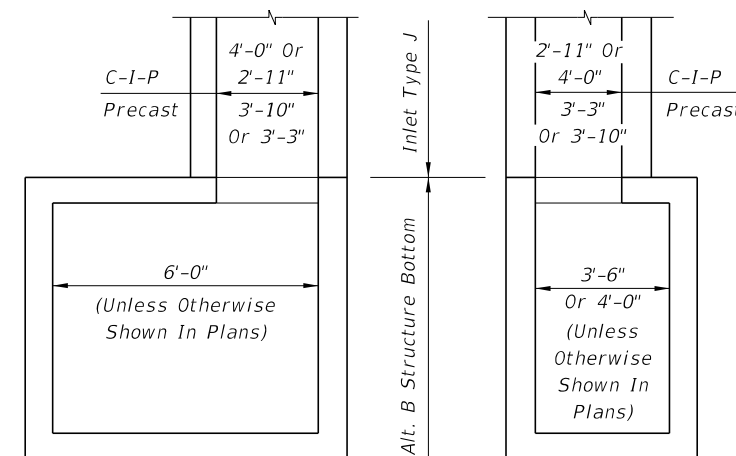
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PLAN
(CAST-IN-PLACE INLET SHOWN, WITHOUT
GRATE, PRECAST INLET SIMILAR)



INSET A
(PRECAST OPTION)



NOTE: Alt. B Structure Bottom Only. See Index 425-010 for structure bottom details and hole reinforcement.

INLET WITH STRUCTURE BOTTOM

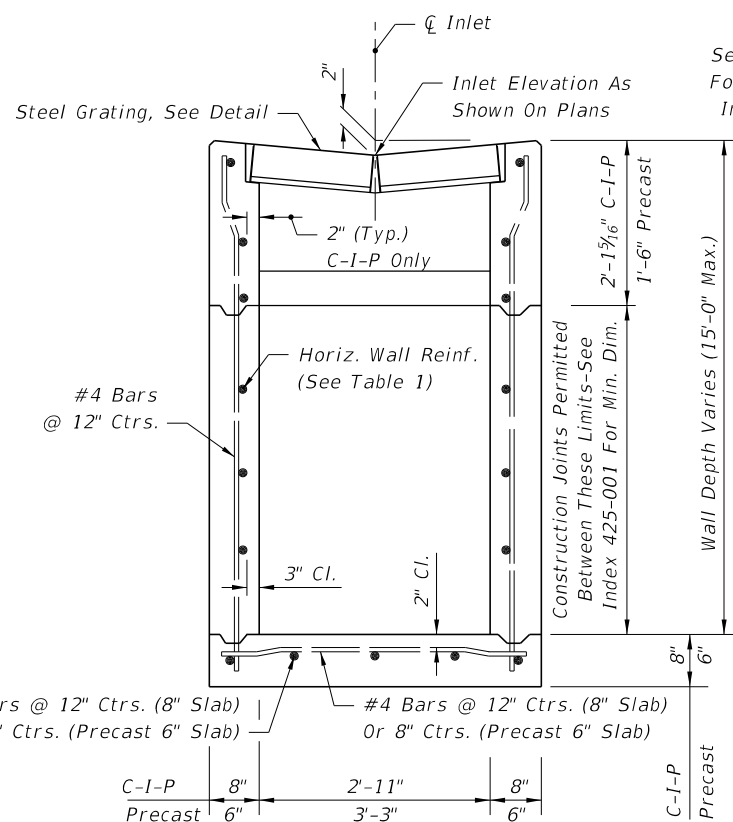
**HORIZONTAL WALL REINFORCING
SCHEDULE (TABLE 1)**

WALL DEPTH	SCHEDULE	AREA (In ² /ft)	MAX. SPACING	
			BARS	WWR
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	5 1/2"	5"

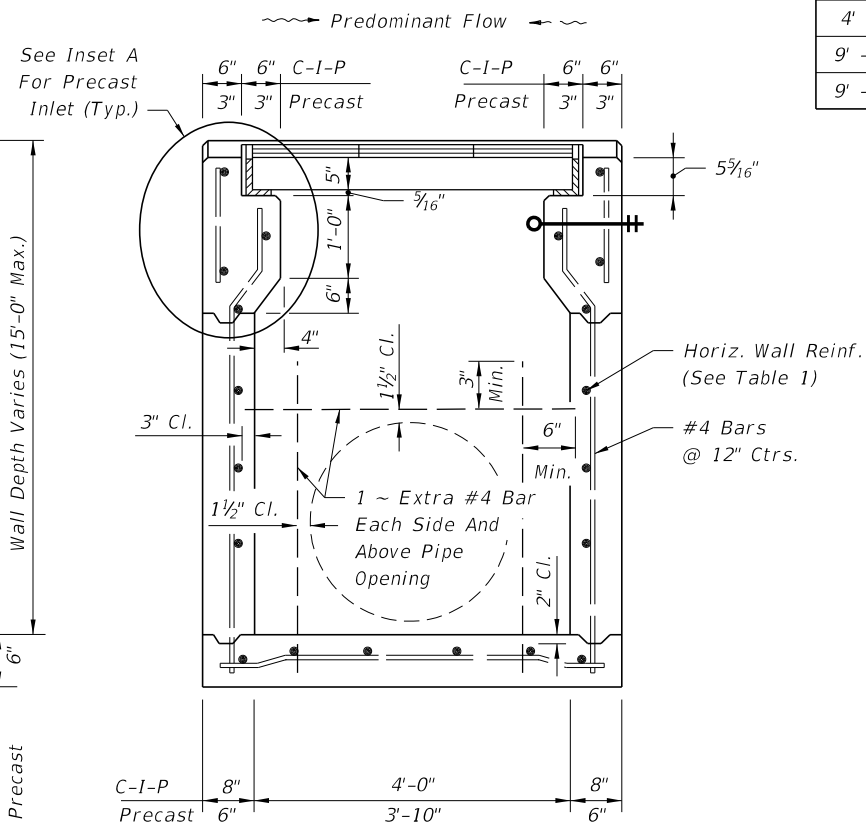
RECOMMENDED MAXIMUM PIPE SIZES

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 425-001. For larger pipe, see Structure Bottom detail above and Index 425-010.



(Pipe Opening Not Shown)
SECTION BB

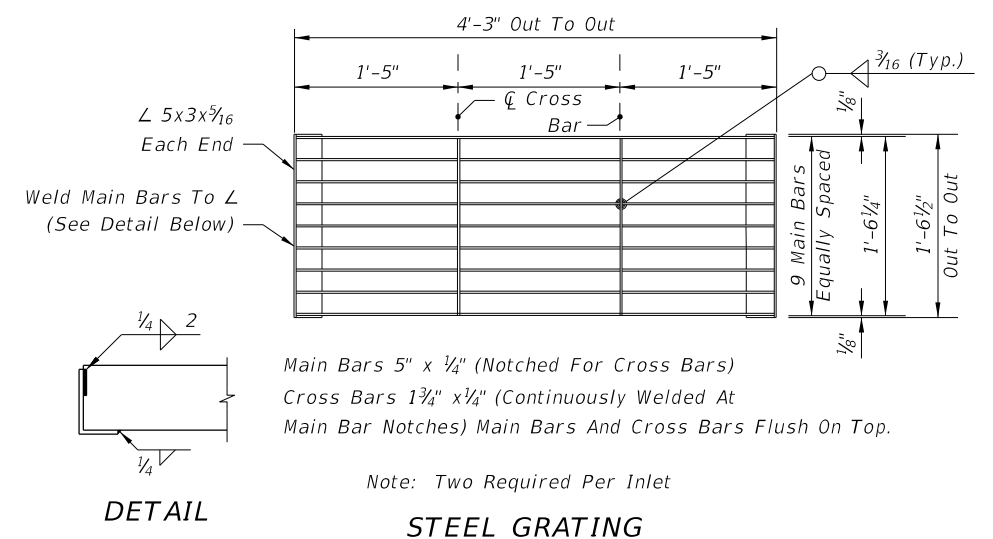
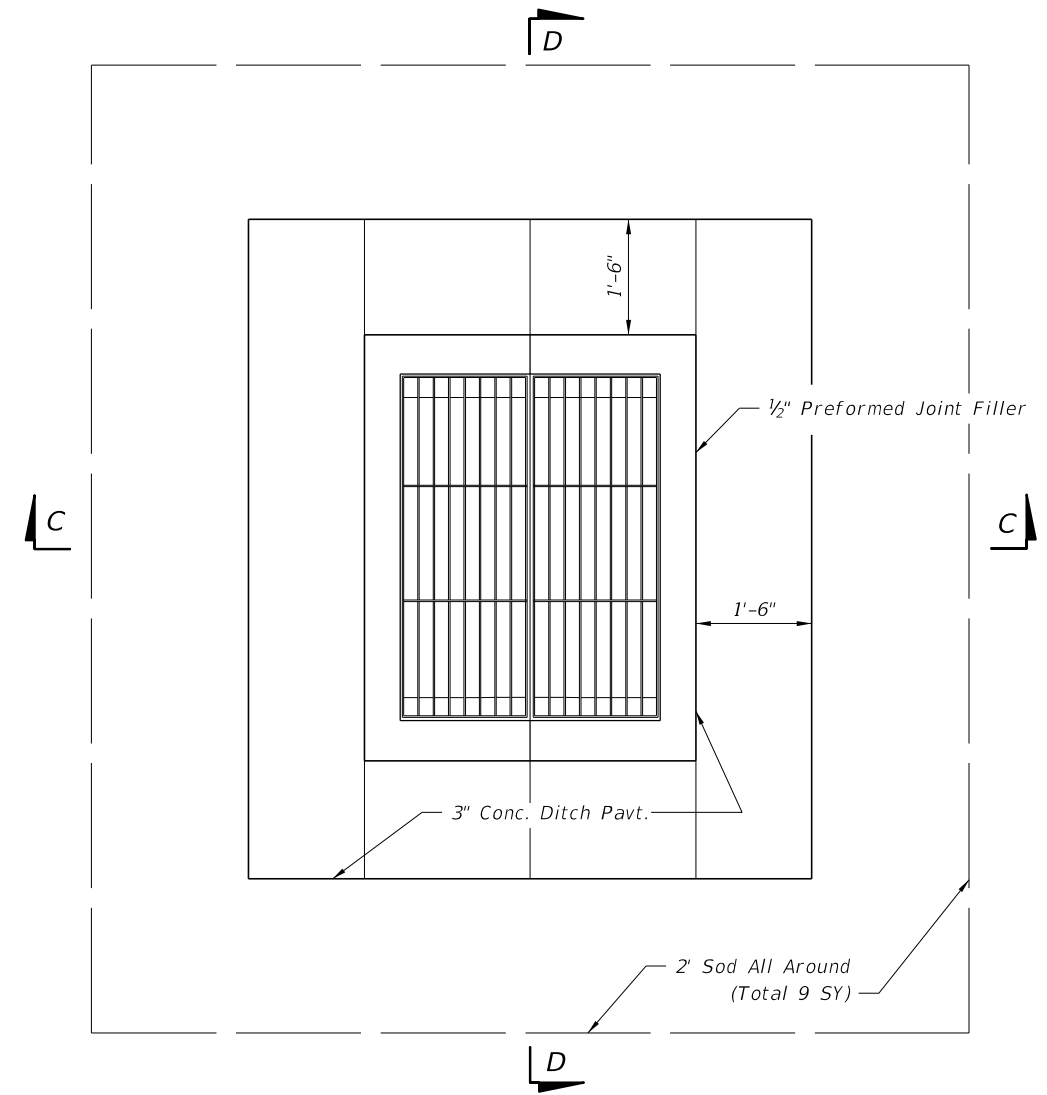
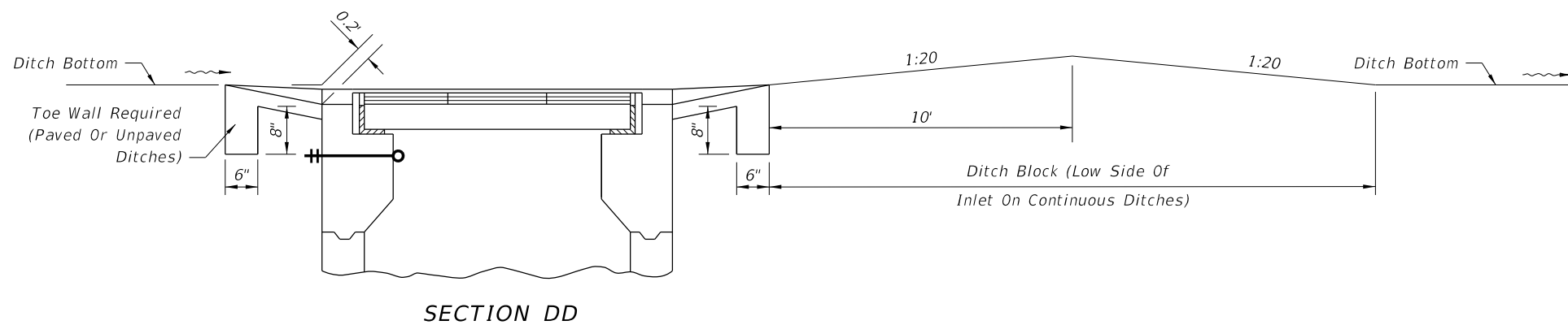
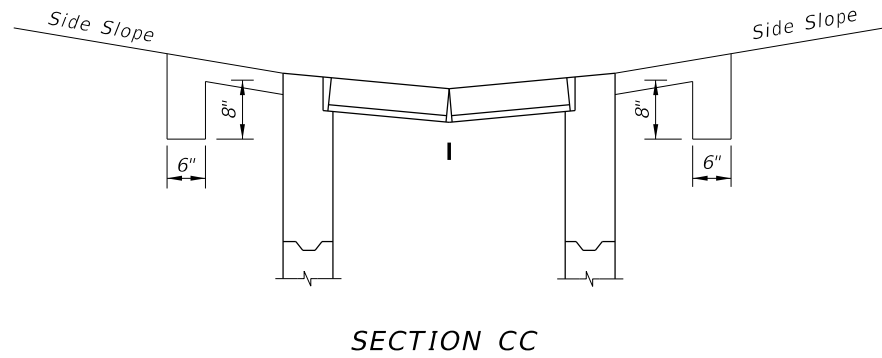


(Pipe Opening Shown)
SECTION AA

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 425-001 for equivalent area of welded wire fabric. Cut or bend bars out of way of pipe when necessary; bars to clear pipe by 1 1/2".
3. All exposed edges and corners shall be 3/4" chamfer or tooled to 1/4" 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 425-001.
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	DESCRIPTION:
11/01/17	

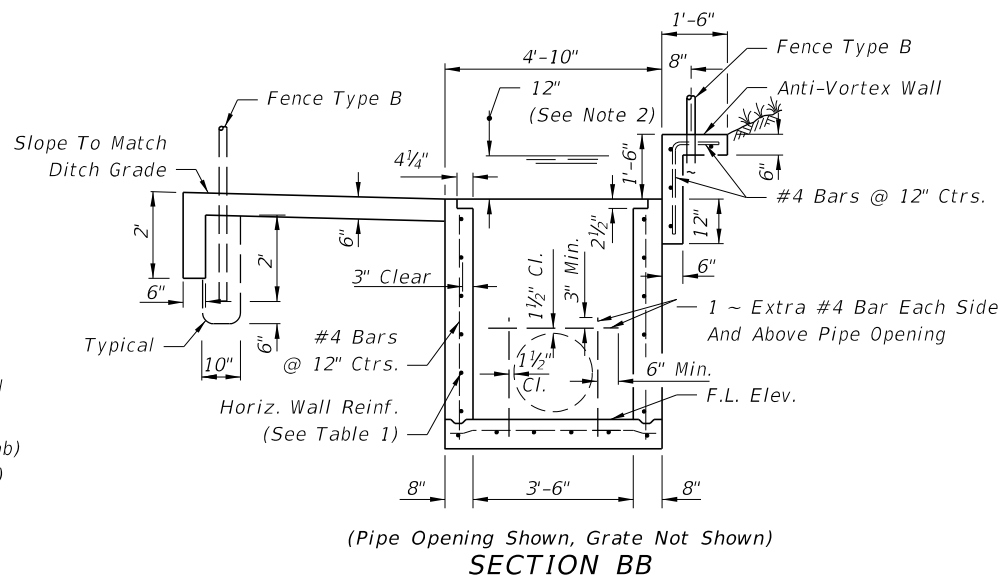
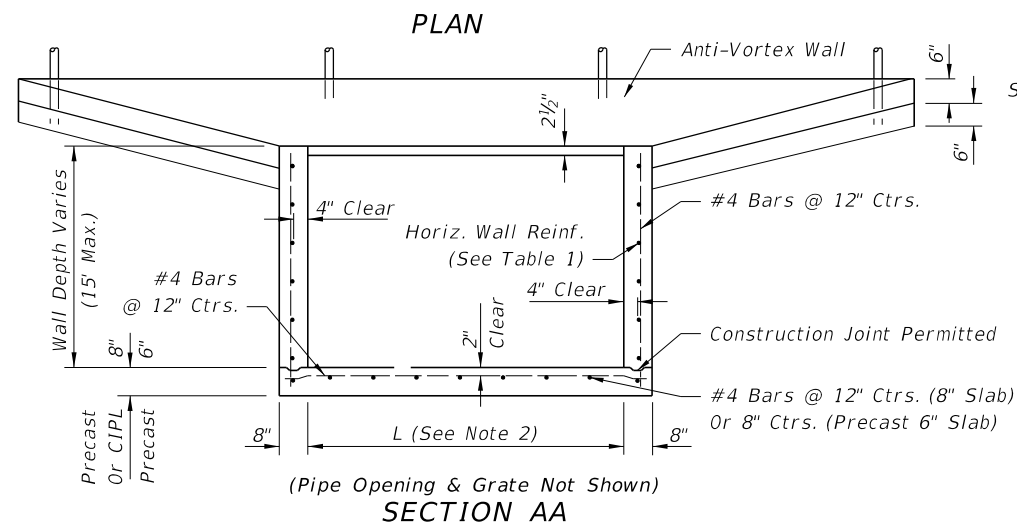
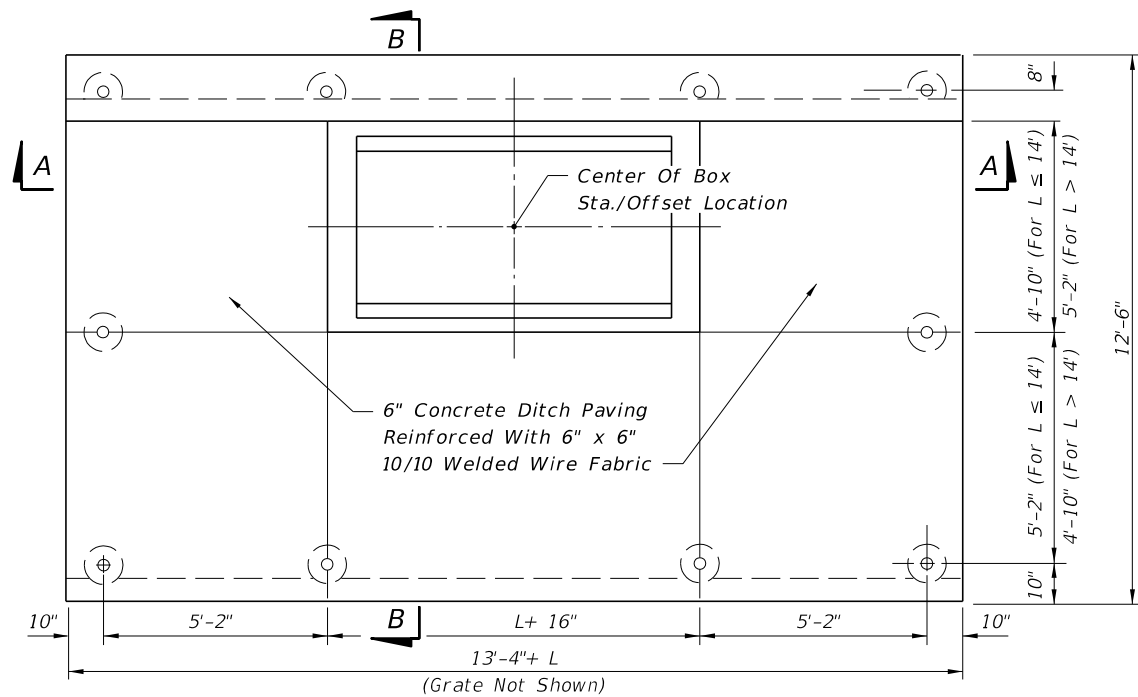


FY 2020-21
STANDARD PLANS

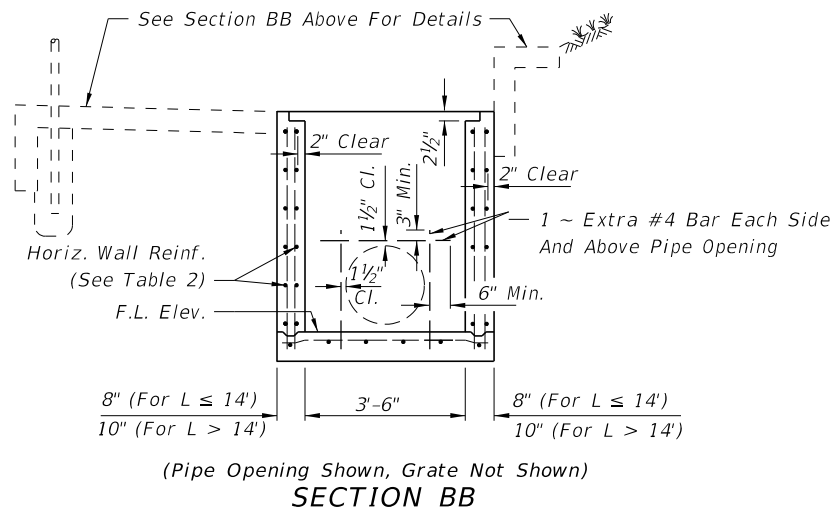
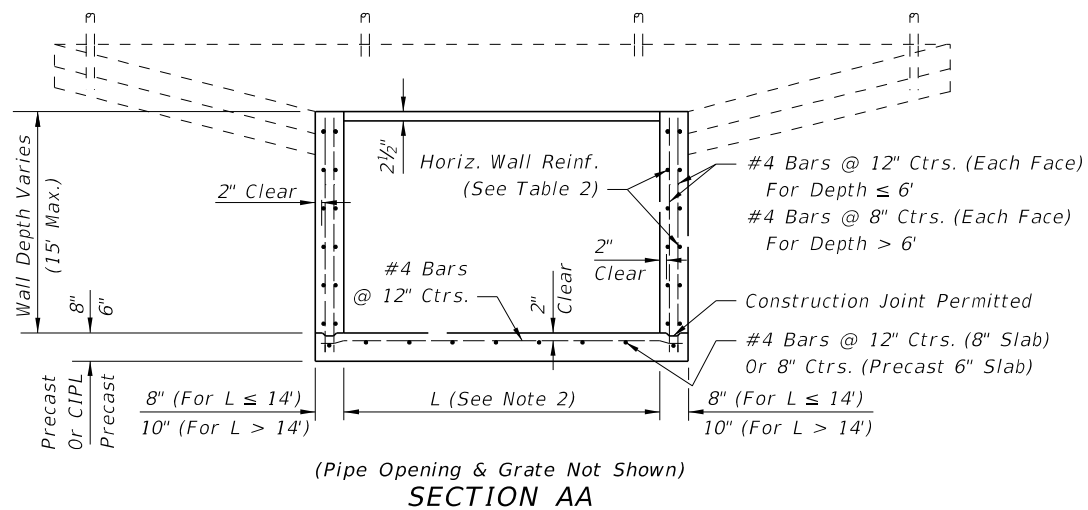
DITCH BOTTOM INLET TYPE J

INDEX
425-054

SHEET
2 of 2



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



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 425-010 structure bottoms.
4. All exposed edges and corners shall be 3/4" chamfer or tooled to 1/4" 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 425-001 for equivalent area of welded wire reinforcing (WWR). Bars to be cut or bent for 1 1/2" 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 975.
9. Fence enclosure shall be Fence Type B (Index 550-002). 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 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.

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LAST REVISION 11/01/17	DESCRIPTION:	 FY 2020-21 STANDARD PLANS	DITCH BOTTOM INLET TYPE K	INDEX 425-055	SHEET 1 of 2
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HORIZONTAL WALL REINFORCING SCHEDULES

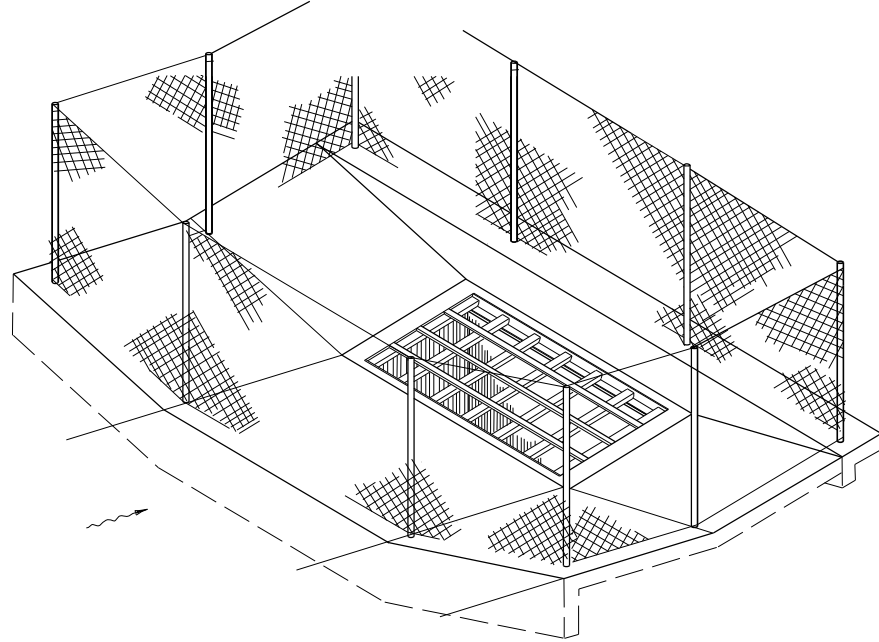
WALL DEPTH	SCH.	AREA (in ² /ft)	MAX. SPACING BARS	WWR
SIZE: L = 5'-0"				
0'-5'	A12	0.20	12"	8"
5'-8'	A6	0.20	6"	5"
8'-15'	B5.5	0.24	5½"	5"
SIZE: L = 6'-0"				
0'-4'	A12	0.20	12"	8"
4'-6'	B5.5	0.24	5½"	5"
6'-9'	C6.5	0.37	6½"	6"
9'-15'	C3.5	0.37	3½"	3"
SIZE: L = 7'-0"				
0'-4'	B5.5	0.24	5½"	5"
4'-7'	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"

WALL DEPTH	SCH.	AREA (in ² /ft)	MAX. SPACING BARS	WWR
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"

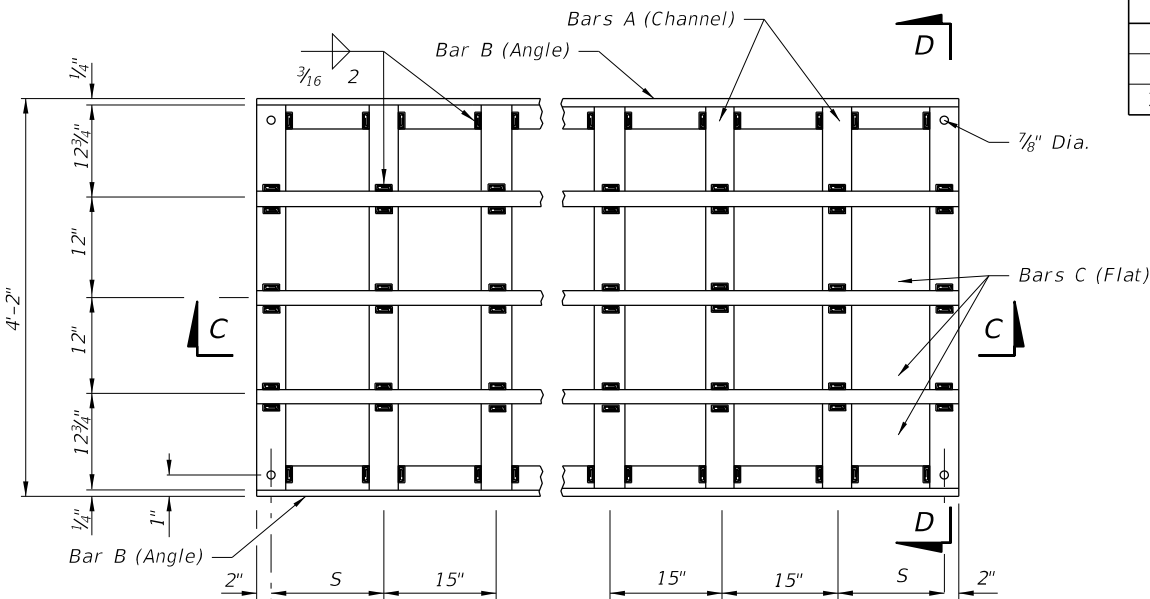
GRATE QUANTITIES

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

Table Notes:
See Sheet 1 for dimension "L" location.
See steel grate Plan View for dimension "S" location.

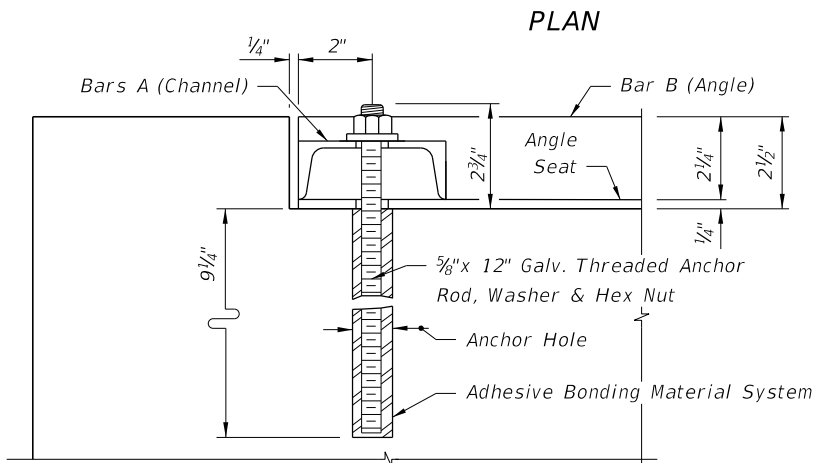


ISOMETRIC OF INLET FENCE ENCLOSURE

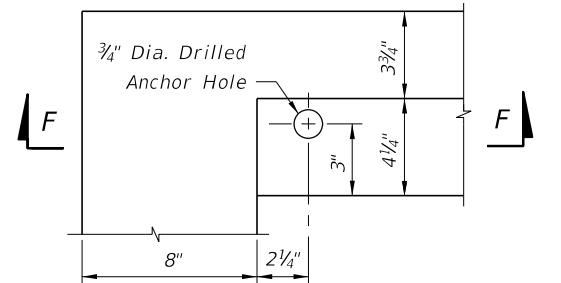


SINGLE LAYER REINFORCING (TABLE 1)

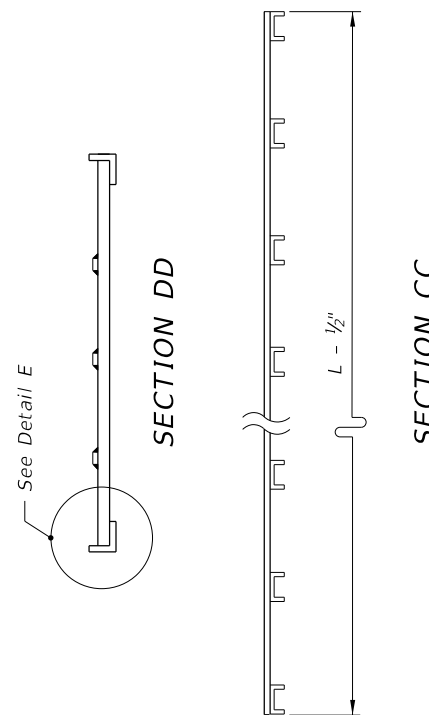
DOUBLE LAYER REINFORCING (TABLE 2)



SECTION FF

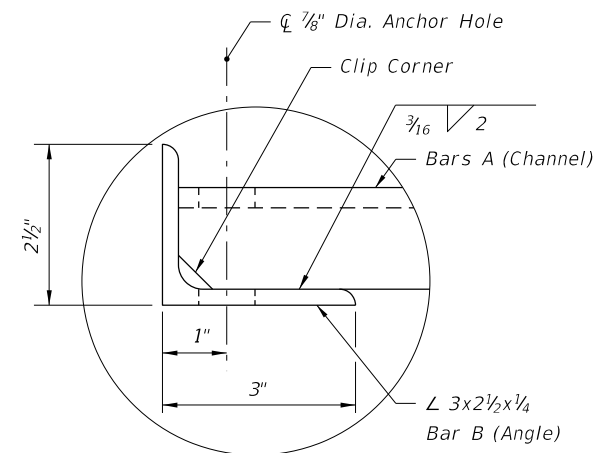


GRATE SEAT AND ANCHOR HOLE PLAN



SECTION DD

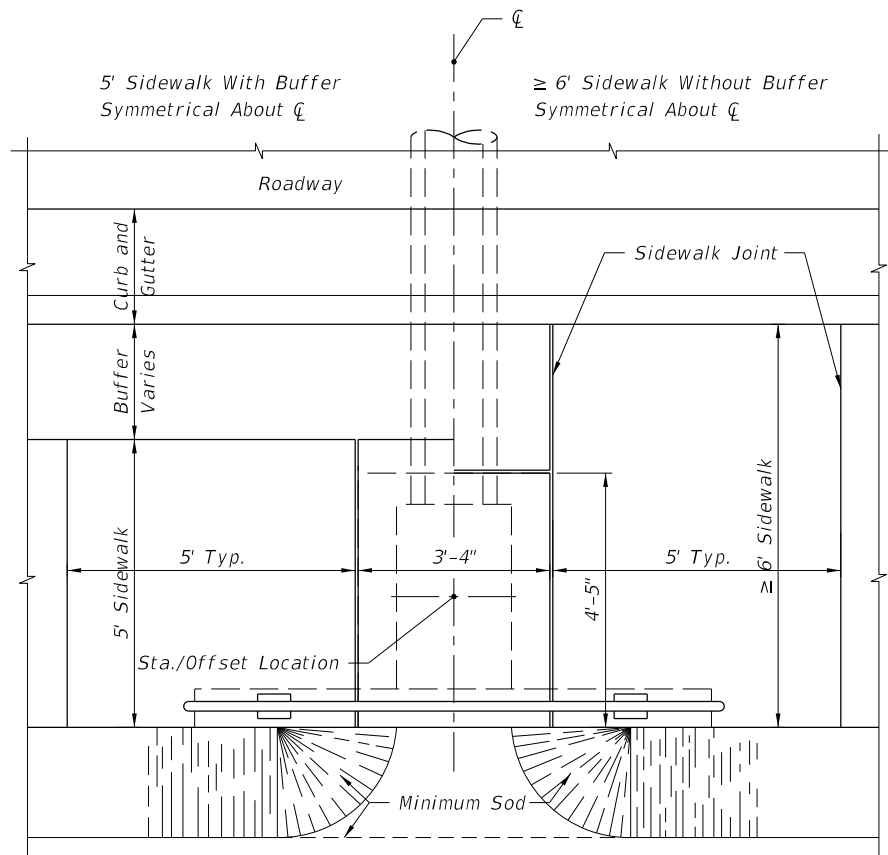
SECTION CC



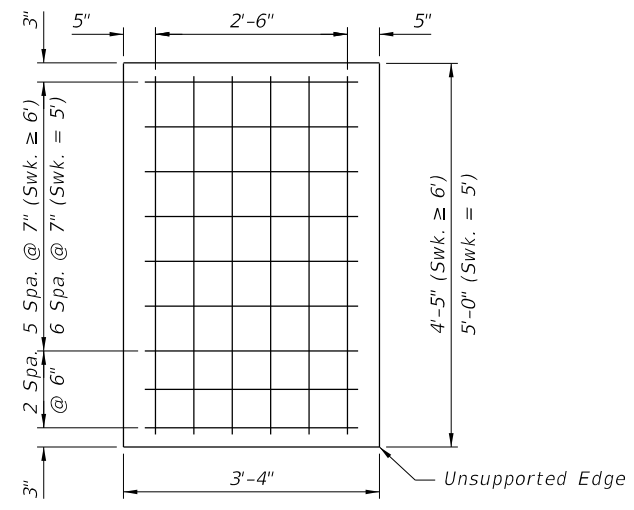
DETAIL E

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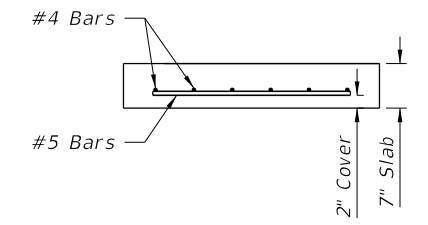
LAST REVISION 11/01/17	DESCRIPTION:
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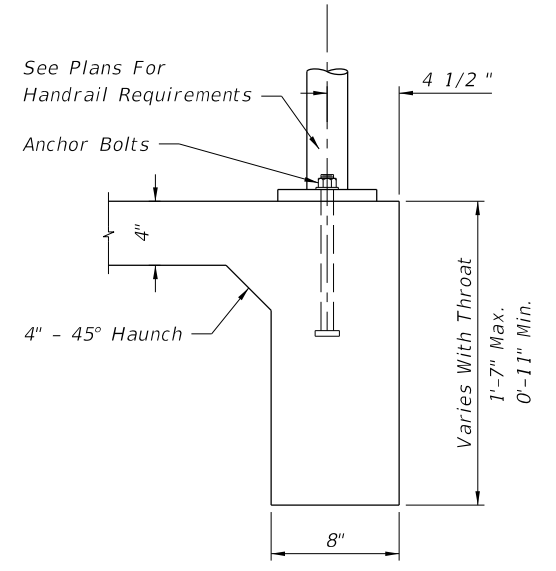
PLAN



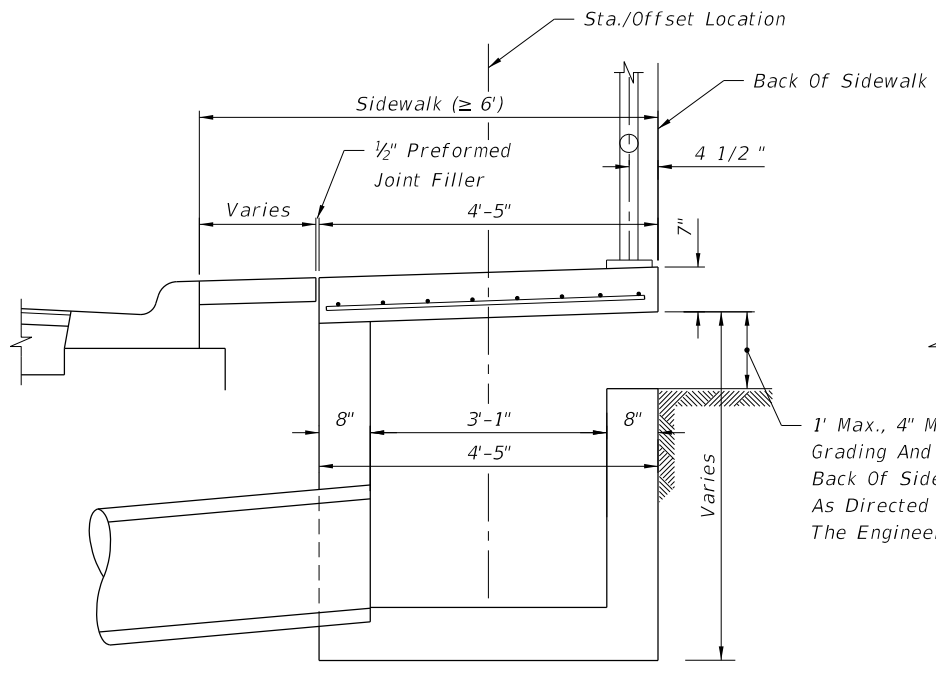
SLAB REINFORCEMENT



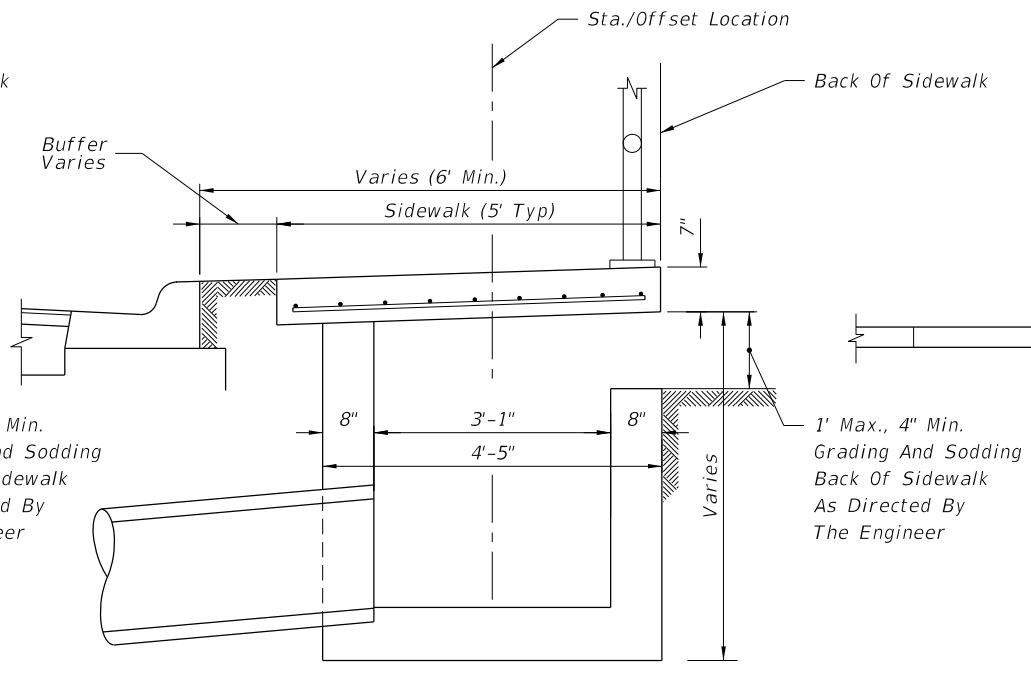
SLAB SECTION



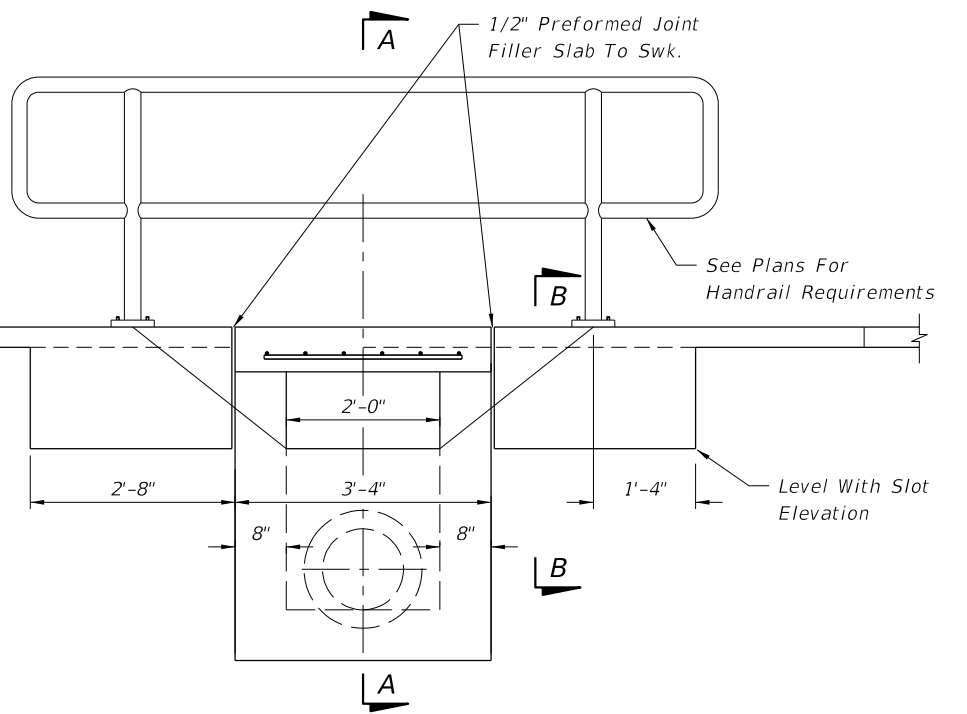
SECTION BB



≥ 6' SIDEWALK SECTION AA



5' SIDEWALK SECTION AA



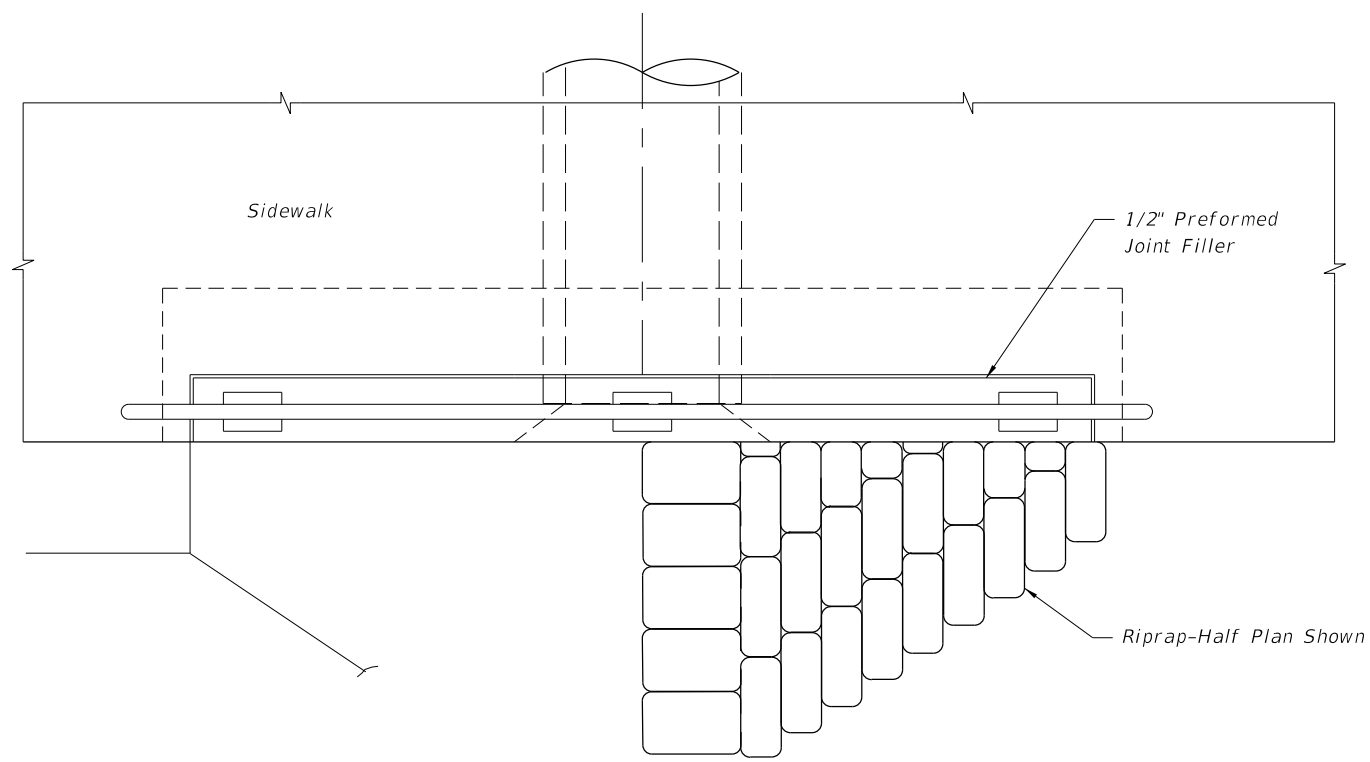
FRONT ELEVATION

- Notes:
1. For additional details see Index 425-052.
 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.

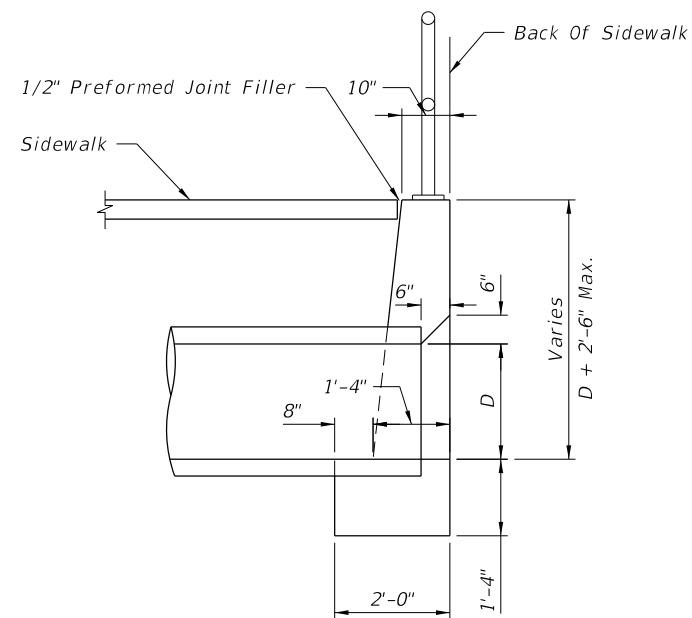
INLET TYPE C (MODIFIED)

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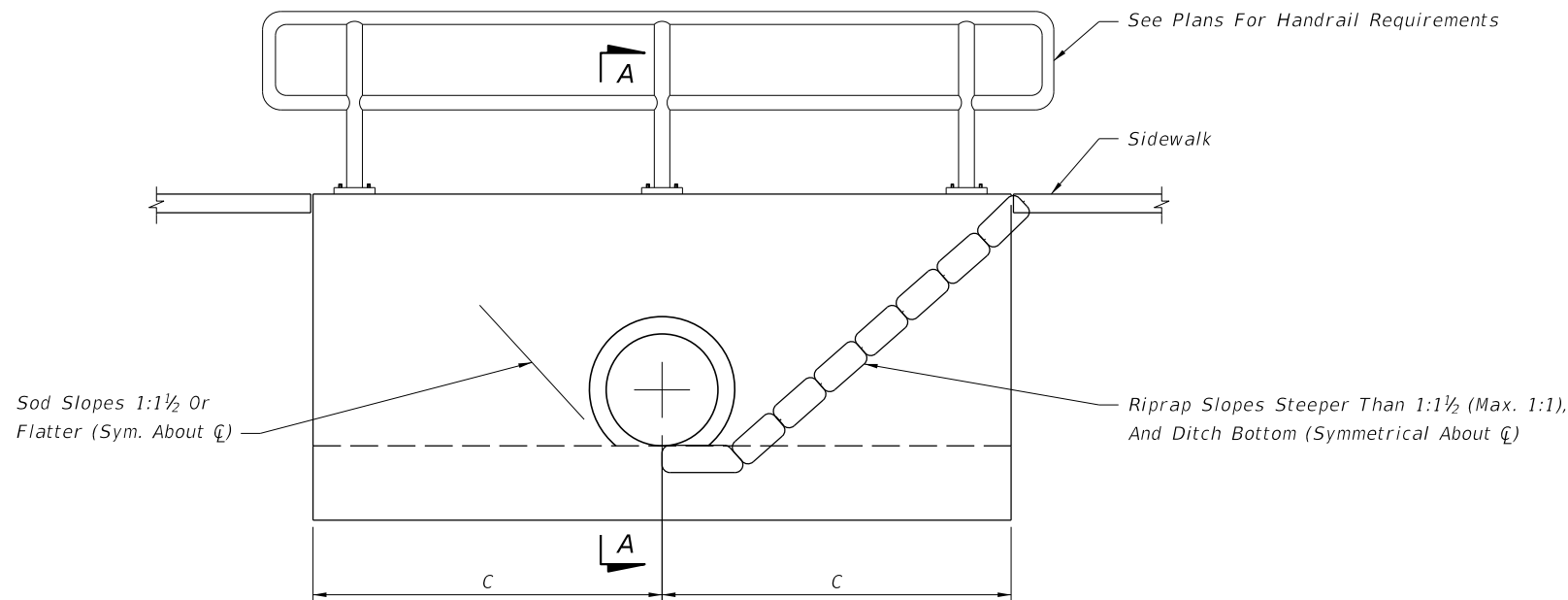
LAST REVISION 11/01/17	DESCRIPTION:	 FY 2020-21 STANDARD PLANS	BACK OF SIDEWALK DRAINAGE	INDEX 425-060	SHEET 1 of 3
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PLAN



SECTION AA



FRONT ELEVATION

- 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.

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

SPECIAL CONCRETE ENDWALL

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LAST REVISION	DESCRIPTION:
11/01/17	

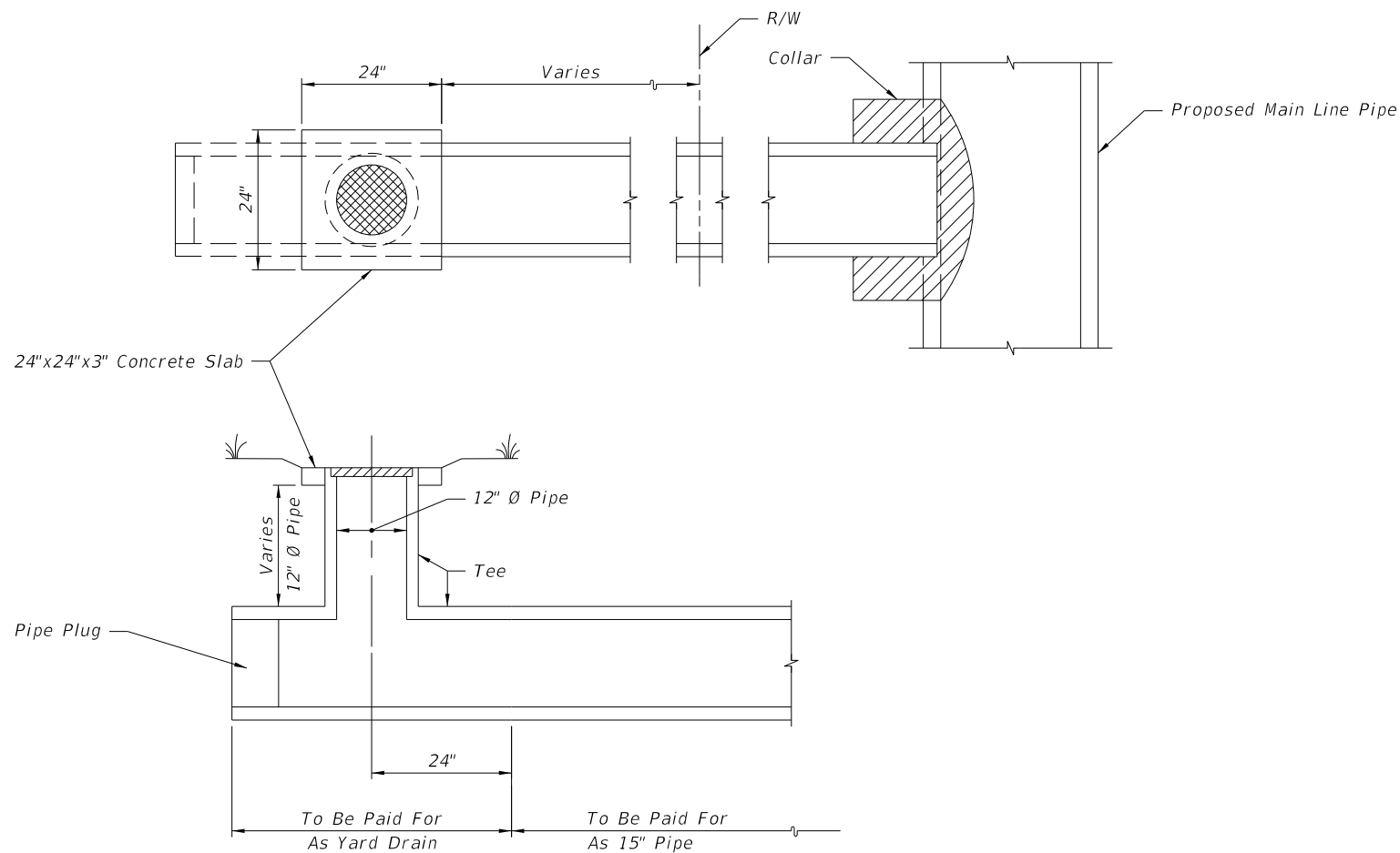


FY 2020-21
STANDARD PLANS

BACK OF SIDEWALK DRAINAGE

INDEX
425-060

SHEET
2 of 3

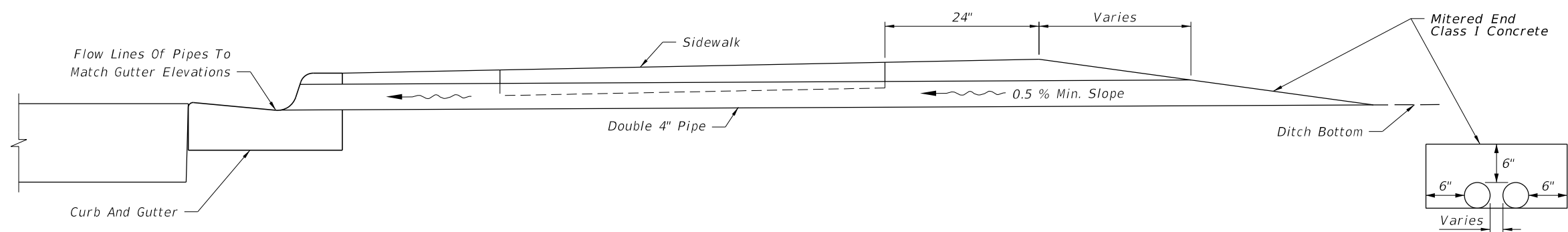


YARD DRAIN ITEM INCLUDES:

1. 15" x 15" x 12" Concrete or PVC Tee 4' long.
2. Grate diameter = 14-1/4"
Thickness = 2-1/2"
Flow area = 45 sq in min.
Light Duty Cast Iron, see Specification Section 962.
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 430-001.
 4. Yard drains to be paid for under the contract unit price for Yard Drains, EA.

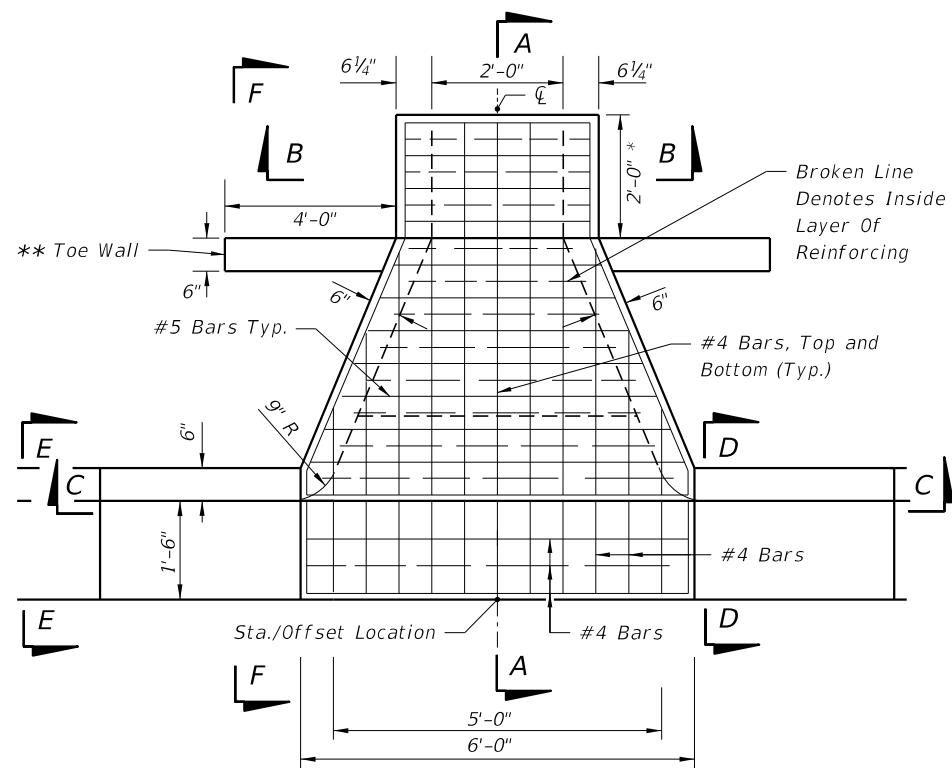


SHALLOW DITCHES

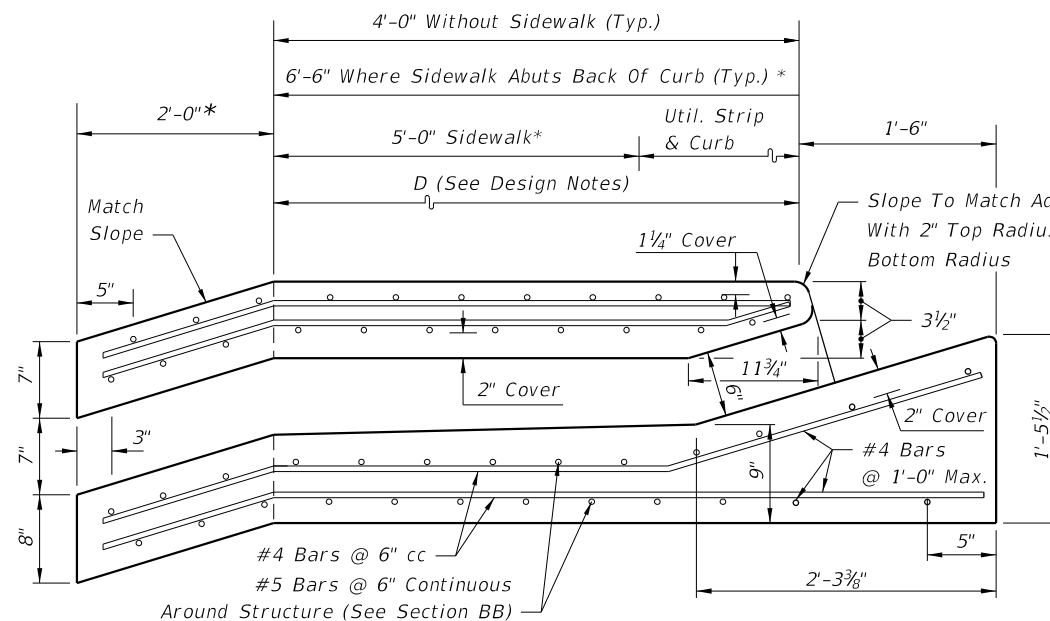
- Notes:
1. To be constructed at locations as directed by the Engineer.
 2. Either cast iron pipe or PVC rigid conduit, U.L. listed for direct sunlight exposure, Schedule 40, may be used.
 3. Pipe and Mitered End to be paid for under the contract unit price for either Cast Iron Soil Pipe (Standard) (4"), LF or PVC Pipe For Back Of Sidewalk Drainage (4"), LF.

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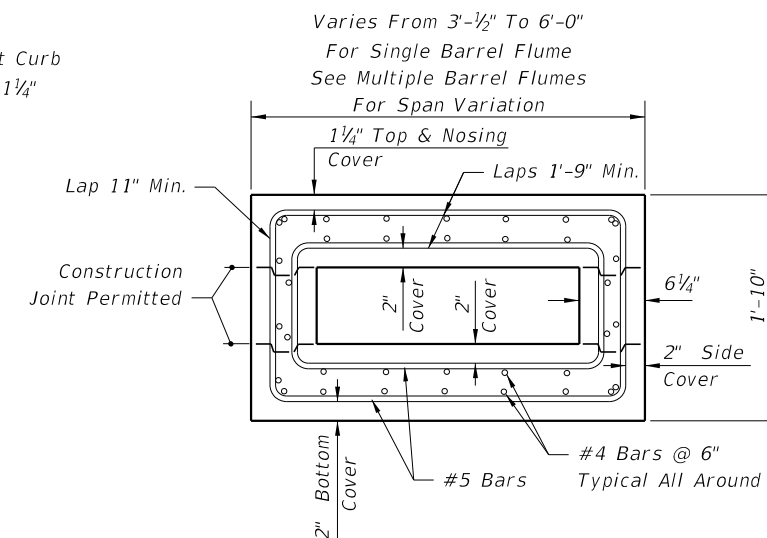
LAST REVISION 11/01/17	REVISION	DESCRIPTION:	 FY 2020-21 STANDARD PLANS	BACK OF SIDEWALK DRAINAGE	INDEX 425-060	SHEET 3 of 3
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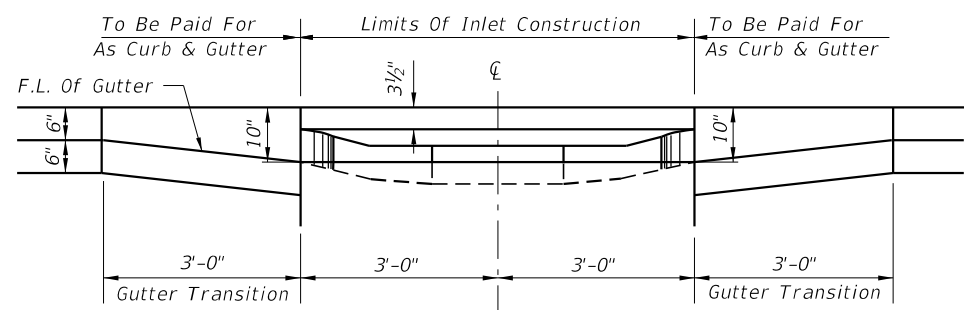
TOP VIEW



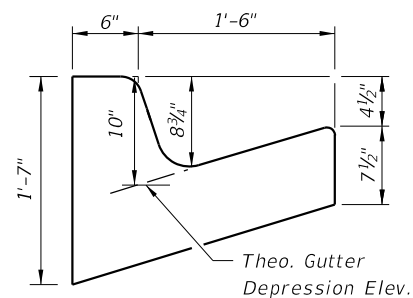
SECTION AA



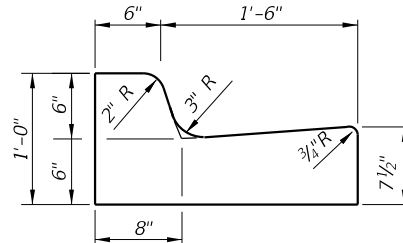
SECTION BB



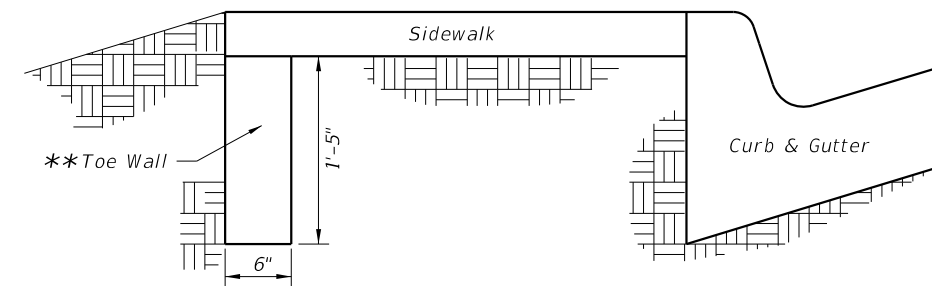
SECTION CC



SECTION DD



SECTION EE
(Curb And Gutter Type F)



SECTION FF

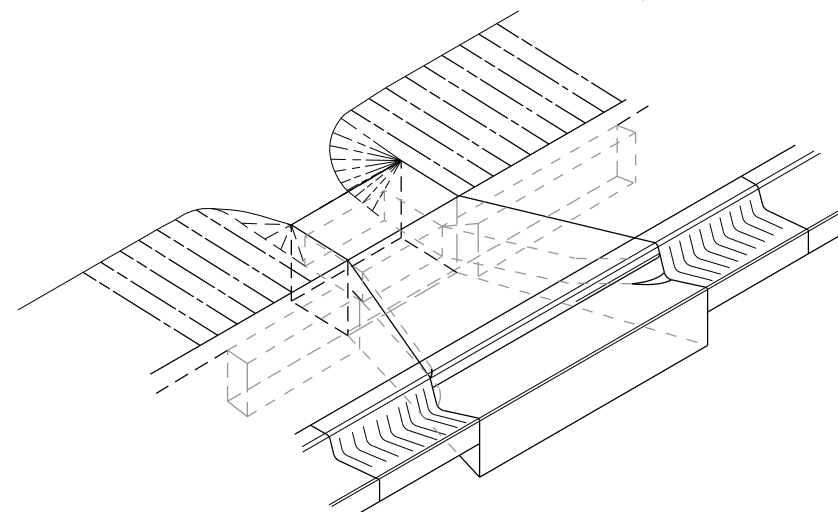
* Sloped Section to be used w/sidewalk applications only.

** Toe Walls as depicted to be used with sidewalk application only. For endwall without sidewalk see detail on Sheet 2.

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.



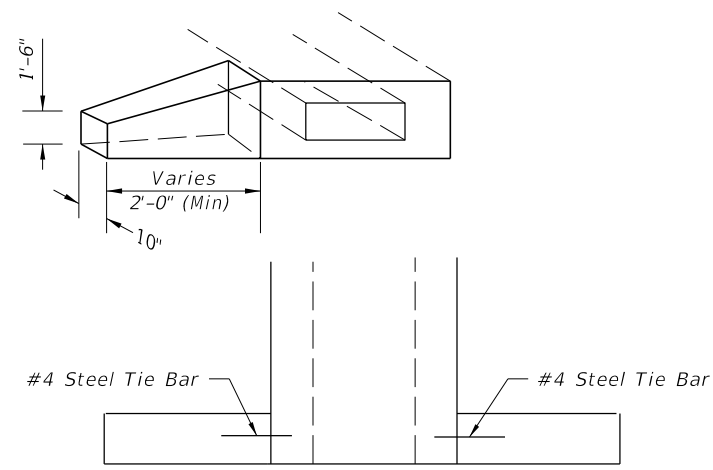
FLUME W/SIDEWALK INLET (CLOSED FLUME) TYPE I
SINGLE BARREL FLUME DEPICTED

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 2" minimum cover unless otherwise shown. Inlets can be either cast-in-place or precast concrete. Chamfer all exposed edges 3/4".
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.

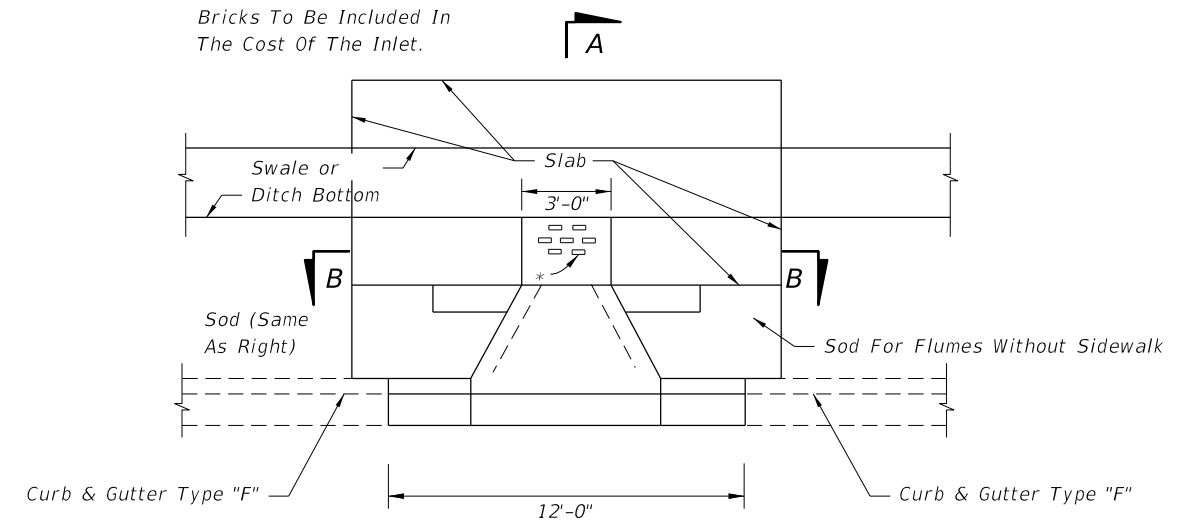
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LAST REVISION 11/01/17	REVISION	DESCRIPTION:		FY 2020-21 STANDARD PLANS	CLOSED FLUME INLET	INDEX 425-061	SHEET 1 of 3
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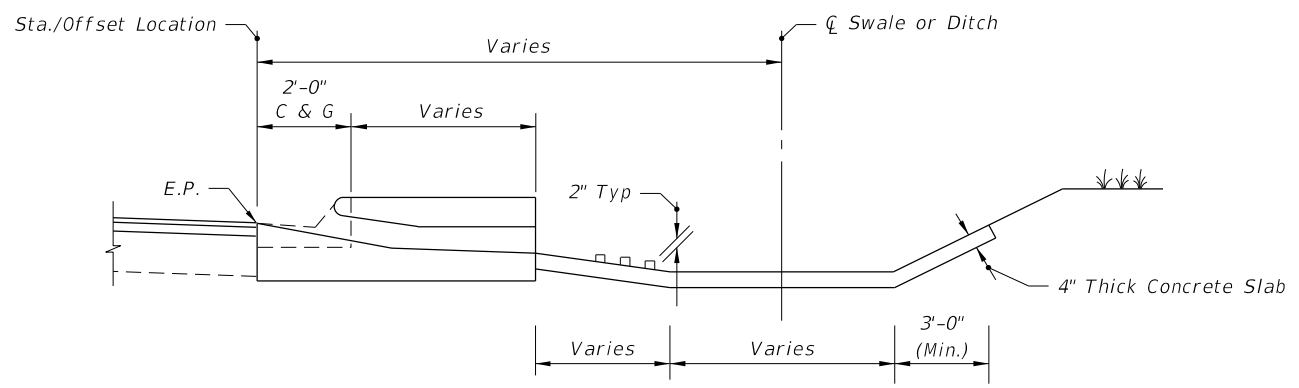


ENDWALL

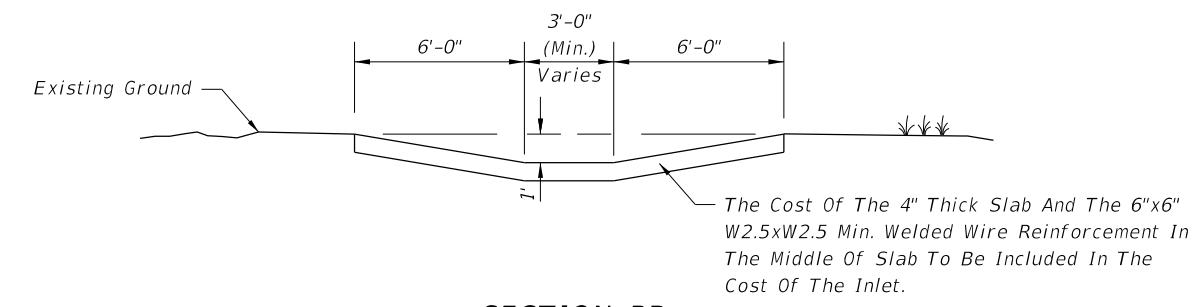
*Bricks to Dissipate Energy
When Called For In Plans.
Bricks To Be Included In
The Cost Of The Inlet.



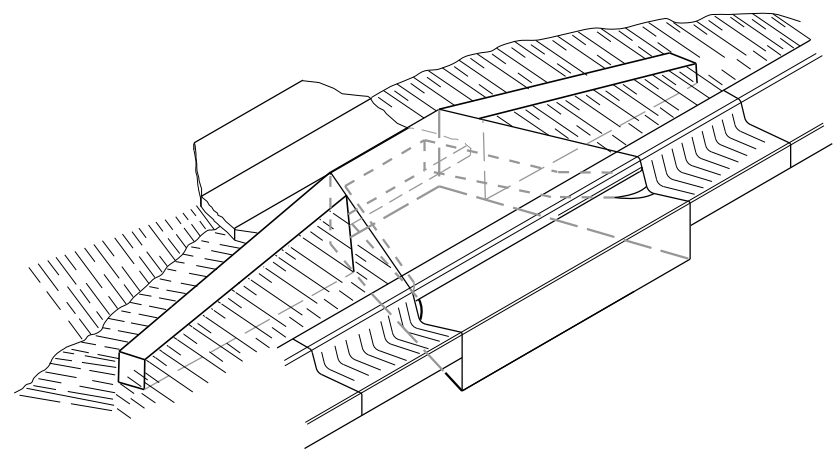
PLAN



SECTION AA



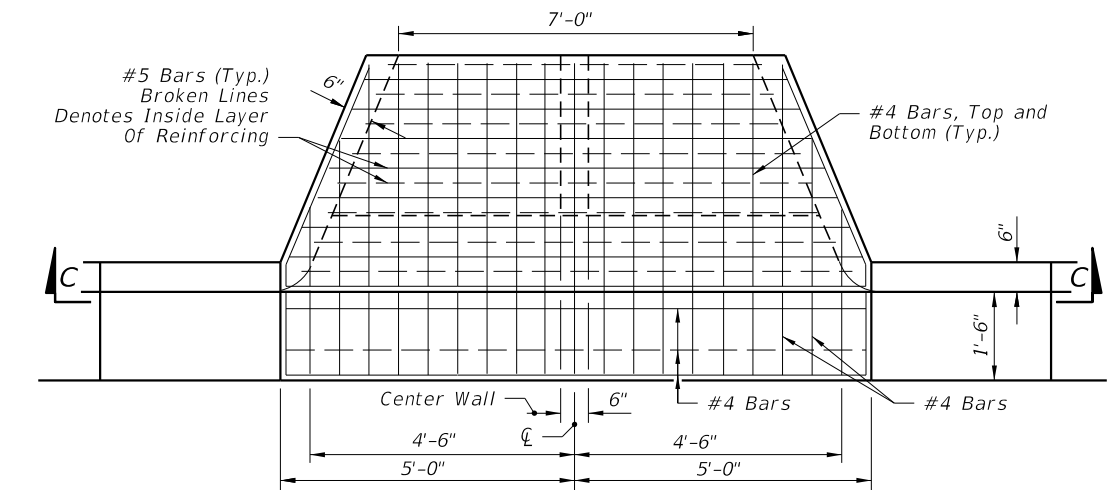
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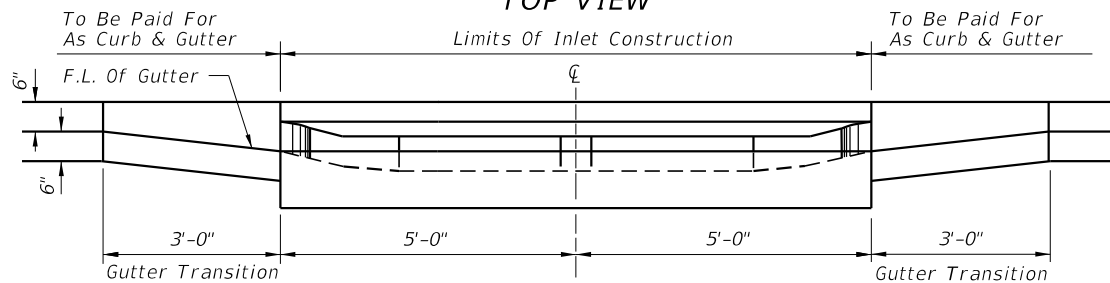
FLUME W/O SIDEWALK INLET (CLOSED FLUME) TYPE II
SINGLE BARREL FLUME DEPICTED

10/29/2019 8:16:06 AM

LAST REVISION 11/01/17	REVISION	DESCRIPTION:	 FY 2020-21 STANDARD PLANS	CLOSED FLUME INLET	INDEX 425-061	SHEET 2 of 3
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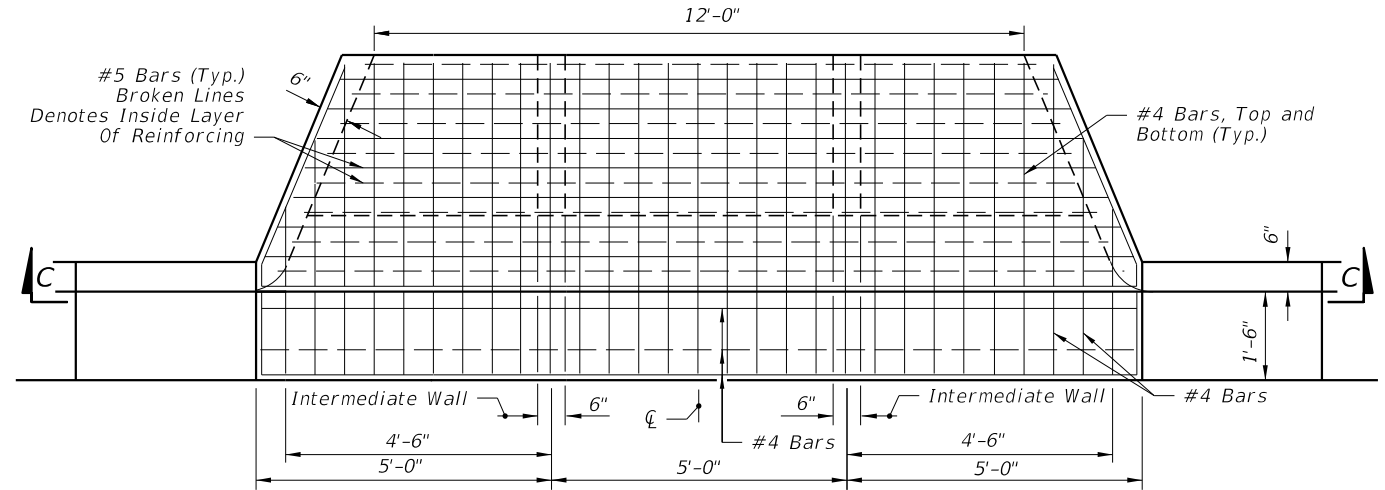


TOP VIEW

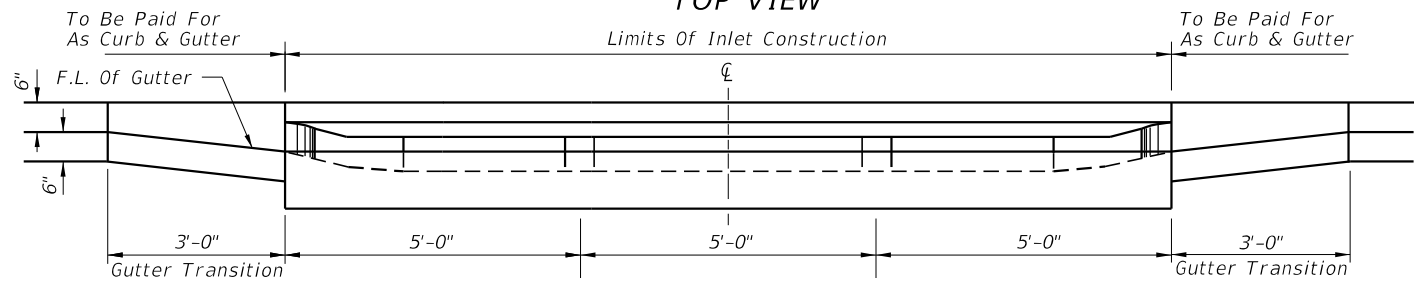


SECTION CC

DOUBLE BARREL FLUME

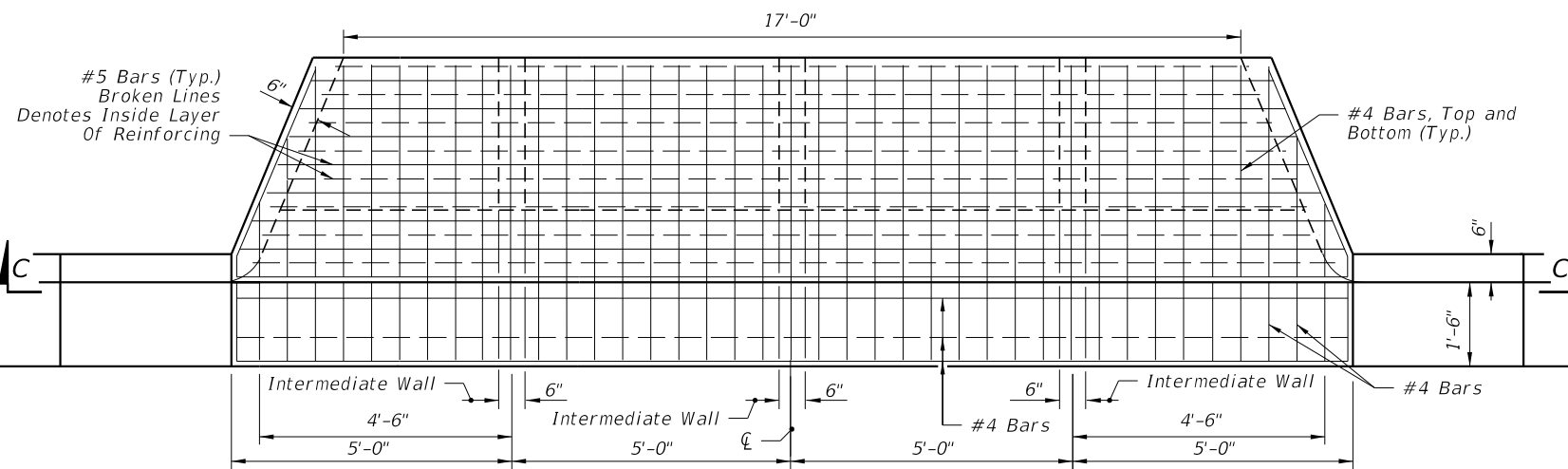


TOP VIEW

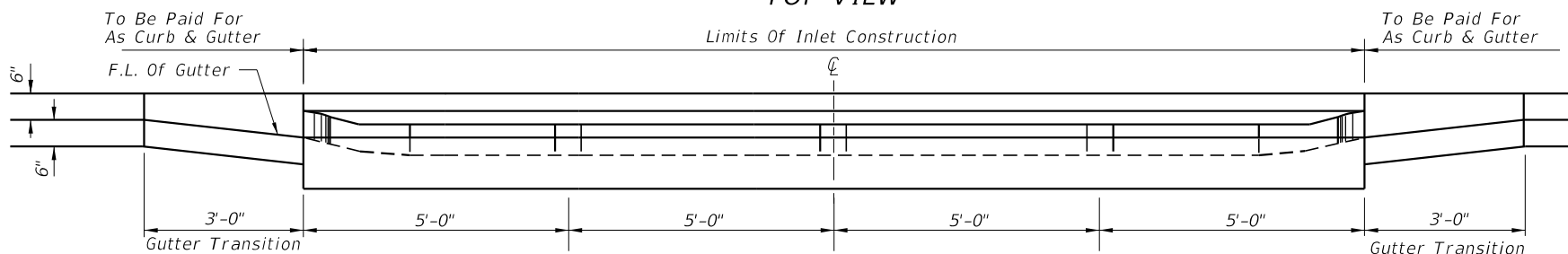


SECTION CC

TRIPLE BARREL FLUME

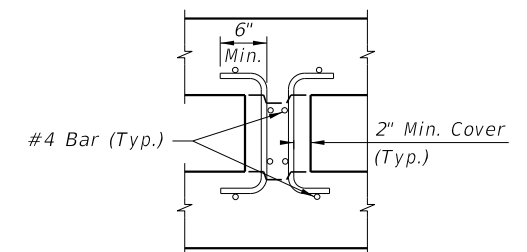


TOP VIEW



SECTION CC

QUADRUPLE BARREL FLUME

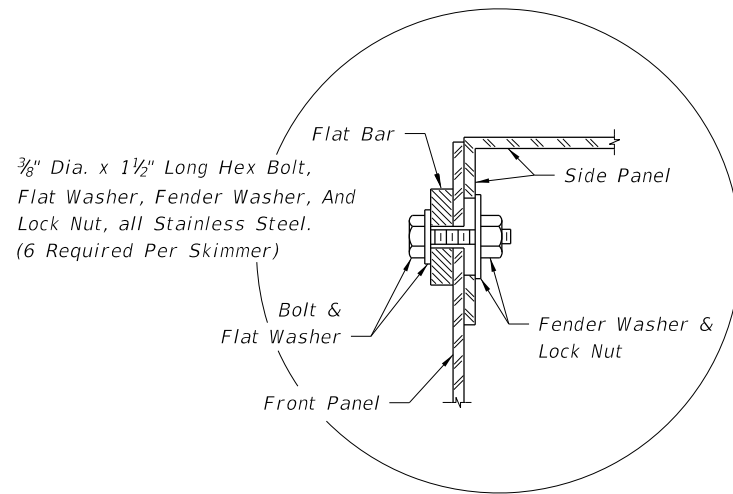


INTERMEDIATE-WALL REINFORCING

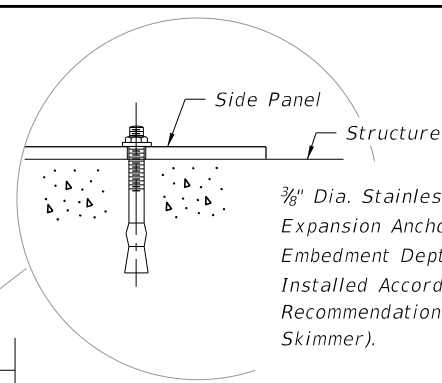
NOTE: See Barrel Flume For Base Dimensions.

10/29/2019 8:16:06 AM

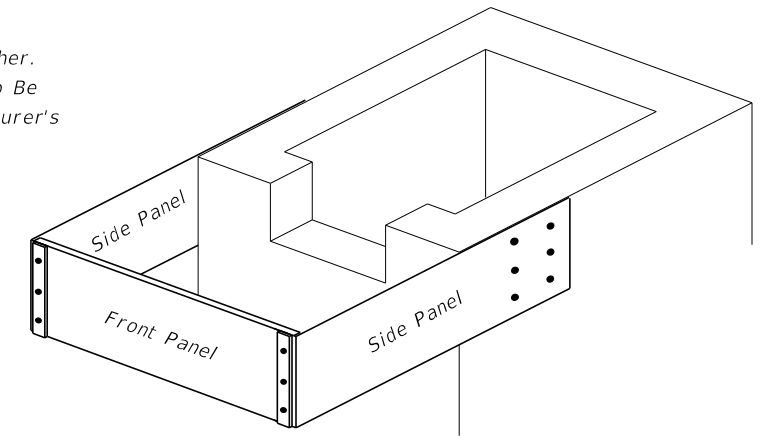
LAST REVISION 11/01/17	DESCRIPTION:		FY 2020-21 STANDARD PLANS	CLOSED FLUME INLET	INDEX 425-061	SHEET 3 of 3
REVISION						



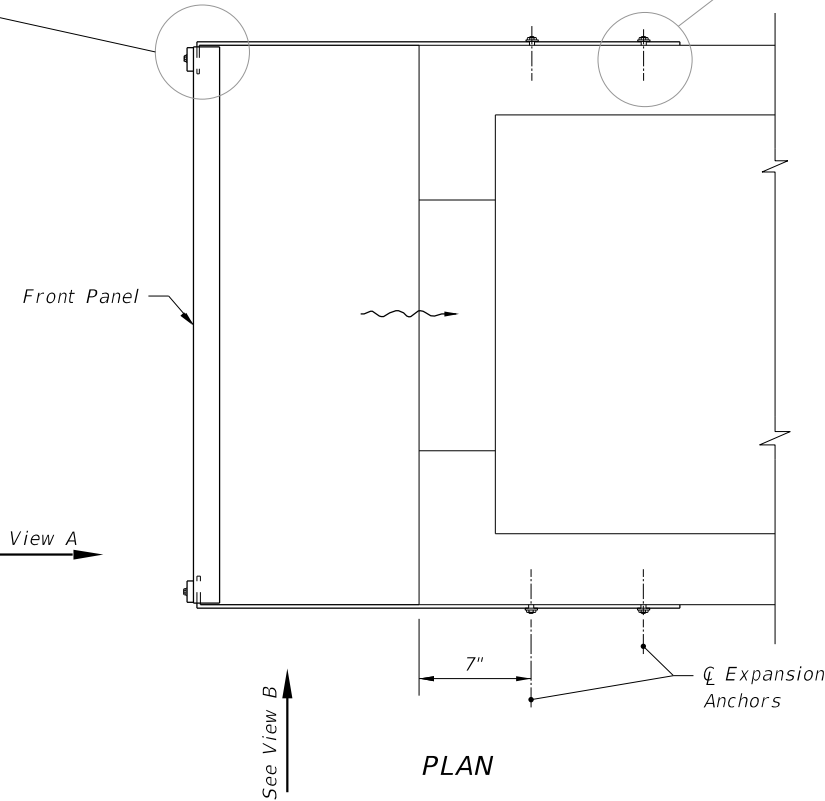
3/8" Dia. x 1 1/2" Long Hex Bolt, Flat Washer, Fender Washer, And Lock Nut, all Stainless Steel. (6 Required Per Skimmer)



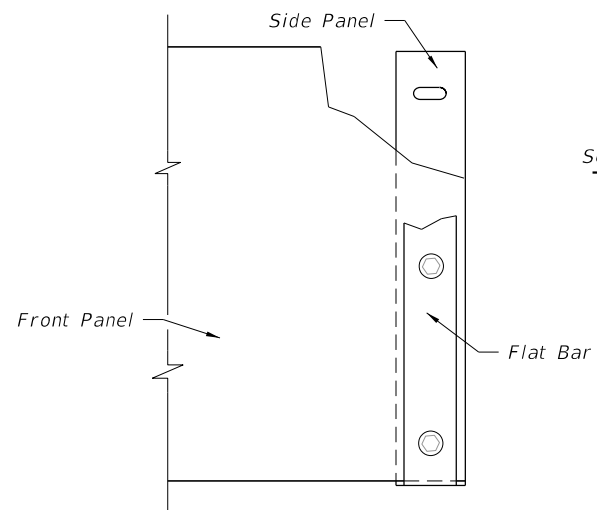
3/8" Dia. Stainless Steel Stud Type Expansion Anchor With Nut And Washer. Embedment Depth = 2 1/2". Anchors To Be Installed According To The Manufacturer's Recommendations (12 Required Per Skimmer).



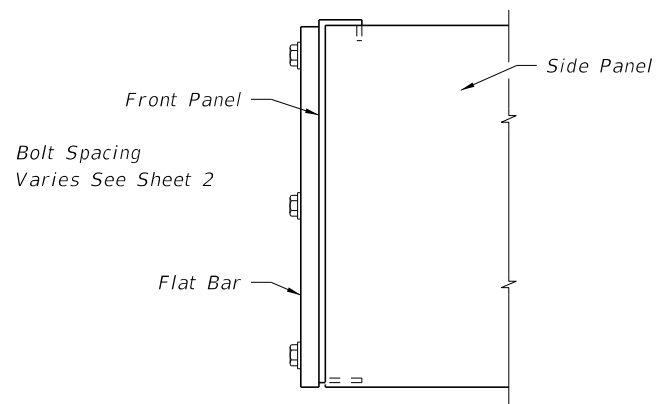
PICTORIAL VIEW



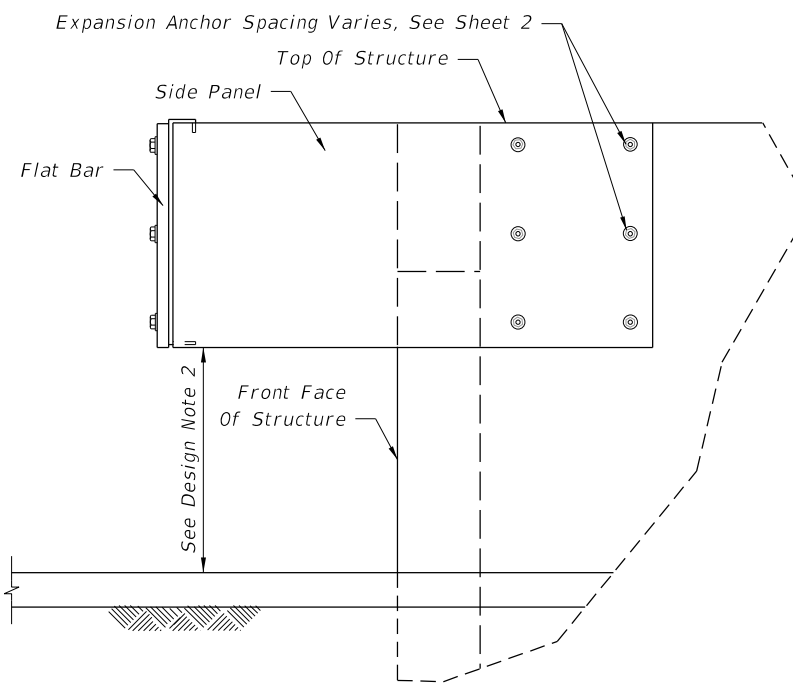
PLAN



VIEW A



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.

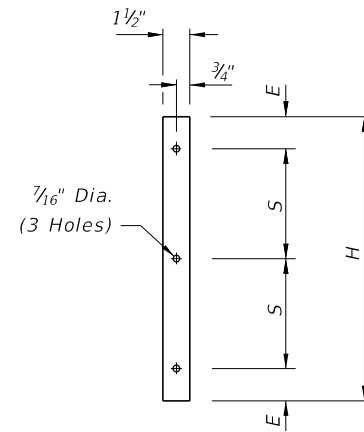
DESIGN NOTES

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.

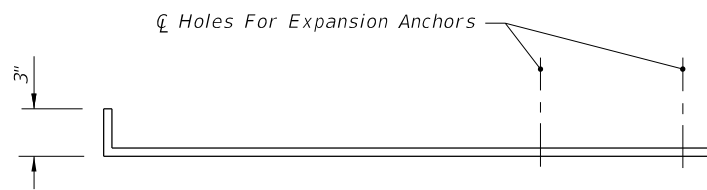
10/29/2019 8:16:07 AM

LAST REVISION 11/01/17	DESCRIPTION:	 FY 2020-21 STANDARD PLANS	SKIMMER FOR OUTLET CONTROL STRUCTURES	INDEX 425-070	SHEET 1 of 2
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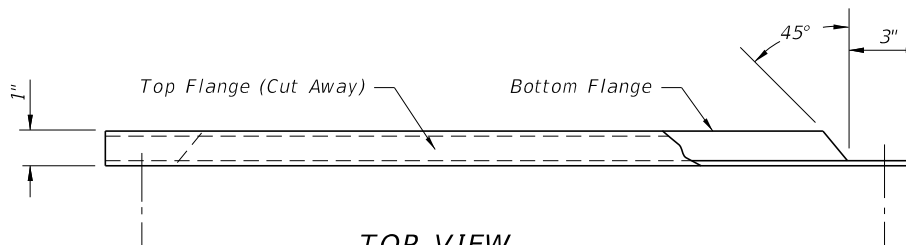
DIMENSIONS				
Skimmer Height as Specified in the Plans				Bolt Spacing
H	D	E	L	S
Inches				
12	3 ³ / ₁₆	3	28	3
14	3 ³ / ₁₆	3	28	4
16	3 ³ / ₁₆	3	28	5
18	3 ³ / ₁₆	3	28	6
20	4 ³ / ₁₆	4	31	6
22	4 ³ / ₁₆	4	31	7
24	4 ³ / ₁₆	4	31	8
26	4 ³ / ₁₆	4	31	9
28	4 ³ / ₁₆	4	31	10
30	5 ³ / ₁₆	5	31	10
32	5 ³ / ₁₆	5	31	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



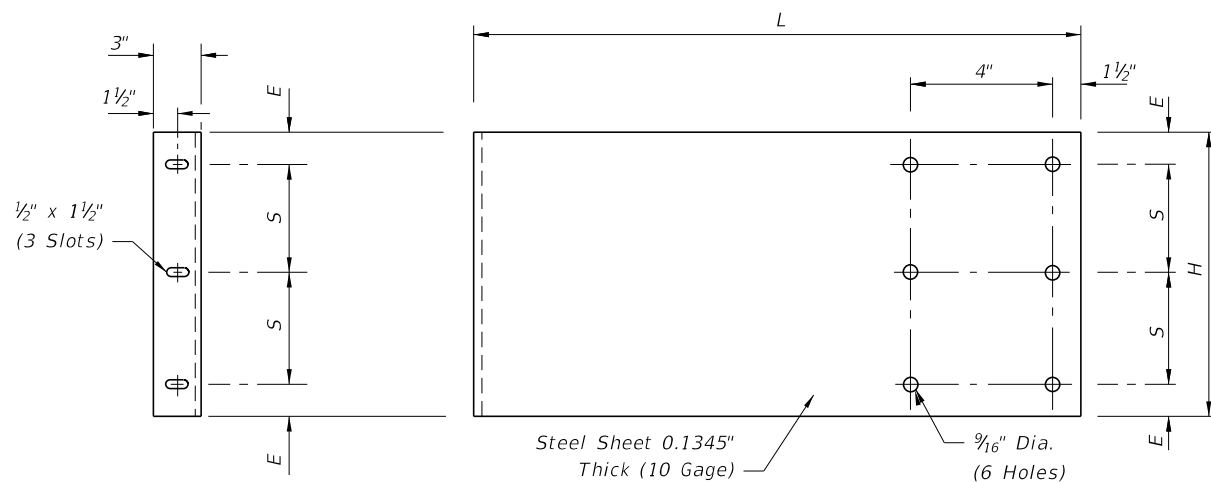
1/4" Thick x 1 1/2" Wide
FLAT BAR



TOP VIEW



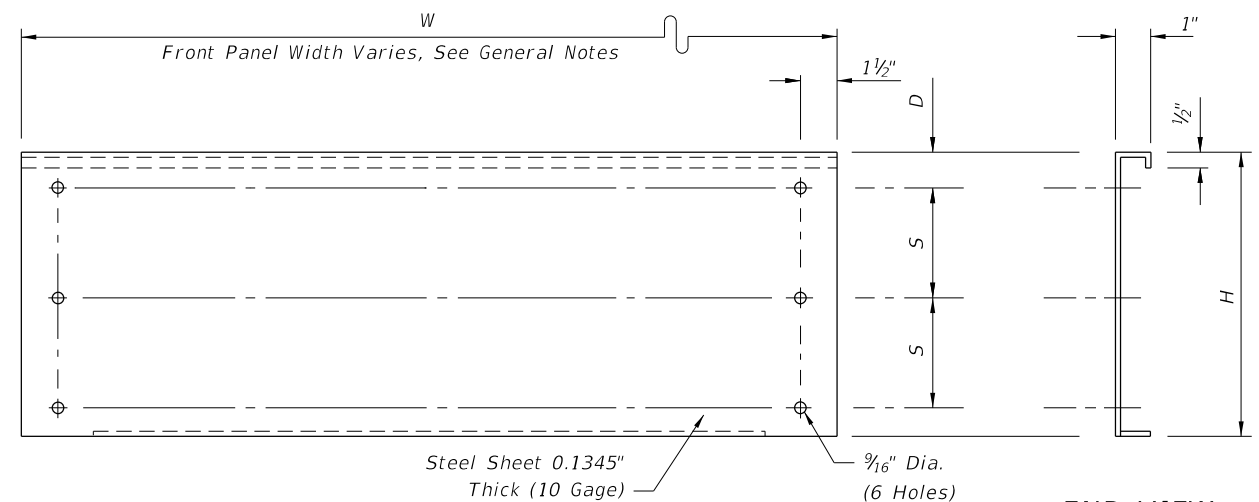
TOP VIEW



END VIEW (FRONT)

SIDE VIEW

SIDE PANEL



FRONT VIEW

END VIEW

FRONT PANEL

10/29/2019 8:16:08 AM

LAST REVISION 11/01/17	DESCRIPTION:
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FY 2020-21
STANDARD PLANS

SKIMMER FOR OUTLET CONTROL STRUCTURES

INDEX
425-070

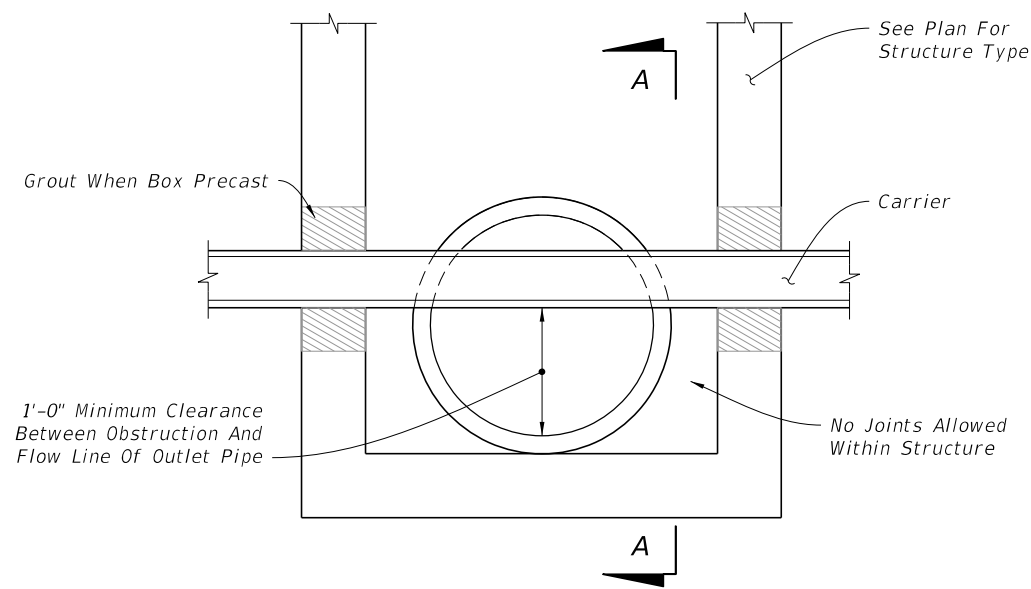
SHEET
2 of 2

NOTES:

1. These details are for construction field expediency to resolve utility conflicts that cannot be remedied by relocation. For conflicts determined during design, use the construction shop drawings for structure details.
2. Concrete used in conflict structures shall be as specified in ASTM C478. 4000 psi may be used in lieu of Class I concrete.
3. Maximum opening for pipe shall be the pipe OD plus 6". Mortar used to seal the pipe into the opening will be of such mix that shrinkage will not cause leakage into or out of the structure.
4. If the conflict structure is round or there are multiple inlet or outlet pipes, then the wall section should be reviewed for strength.
5. If during construction or the plans design process it is determined that a potable water supply line must pass through a storm drain structure, it must be in compliance with Chapter 62-555.314 (3) F.A.C. and shown on the design or construction plans and submitted to the Florida Department of Environmental Protection (FDEP) Administrator For Drinking Water in the respective FDEP District for review and comment. This index and rule citation provide accepted methods for addressing conflicts when and where they cannot be reasonably avoided. To be submitted along with the plans shall be a justification describing inordinate cost and the impracticality of avoidance. If identified, properly justified, and accomplished in accordance with this index, approval is granted. Upon request, the Utility Agency Owner (UAO) must provide support data on the cost of relocation or adjustment to the FDOT for submittal to the FDEP. See the following web site for District FDEP Drinking Water Contacts: www.dep.state.fl.us/water/drinkingwater/index.htm and click on "Organization" on the menu to the right.

DESIGNER'S NOTES:

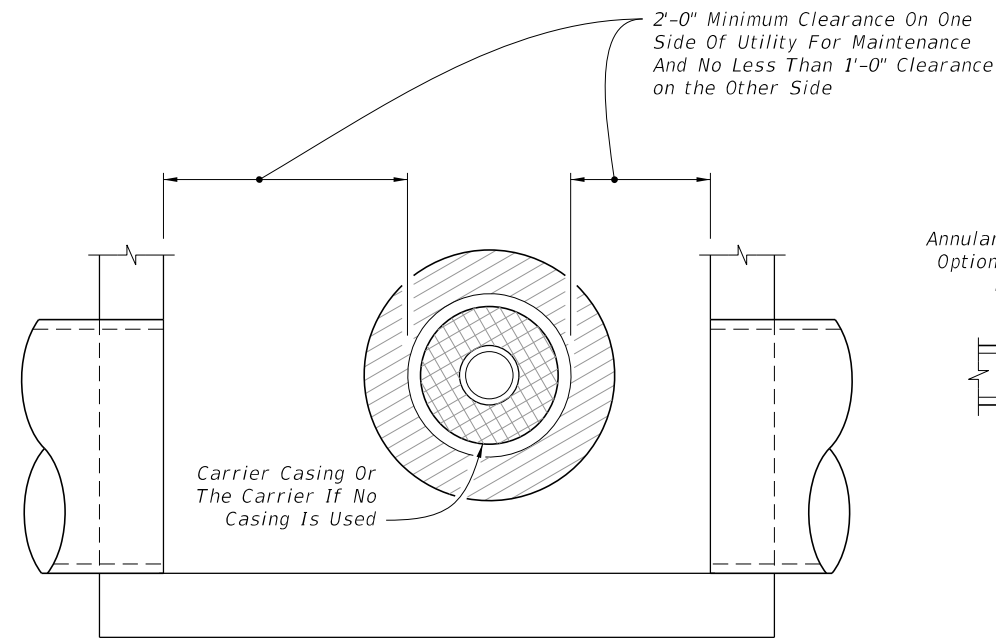
"Sumped" conflict manholes shall not be used unless the system is hydraulically designed to account for the headloss generated if the sump is completely blocked



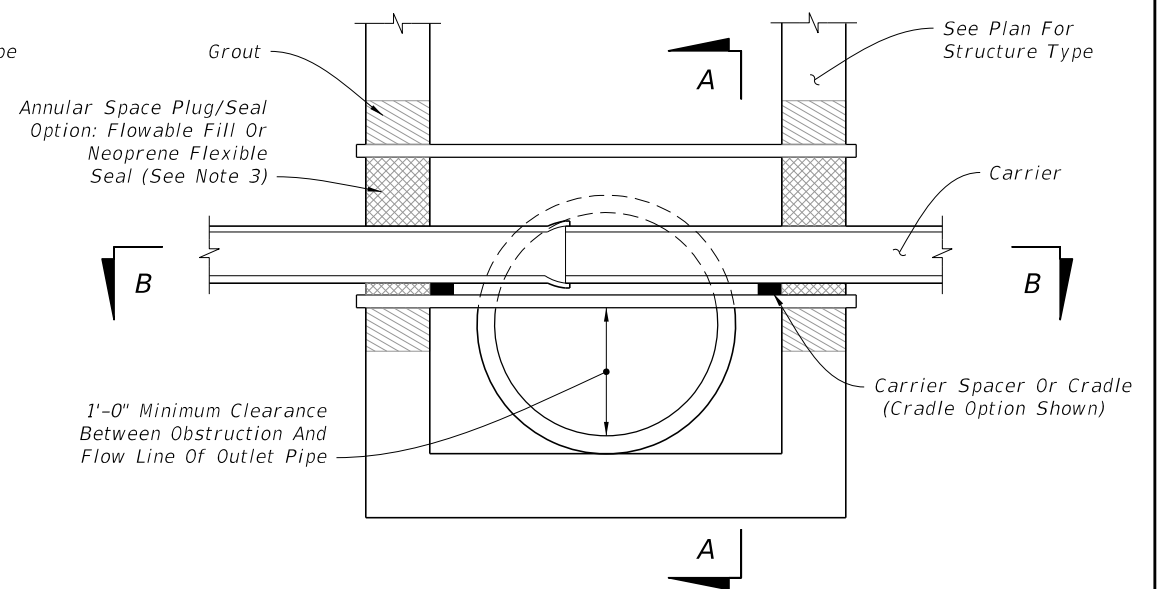
SECTION LONGITUDINAL TO CARRIER PIPE

UTILITY CONFLICT CONDITION I

(Nonpressure Or Nonfluid Carrier Installations)



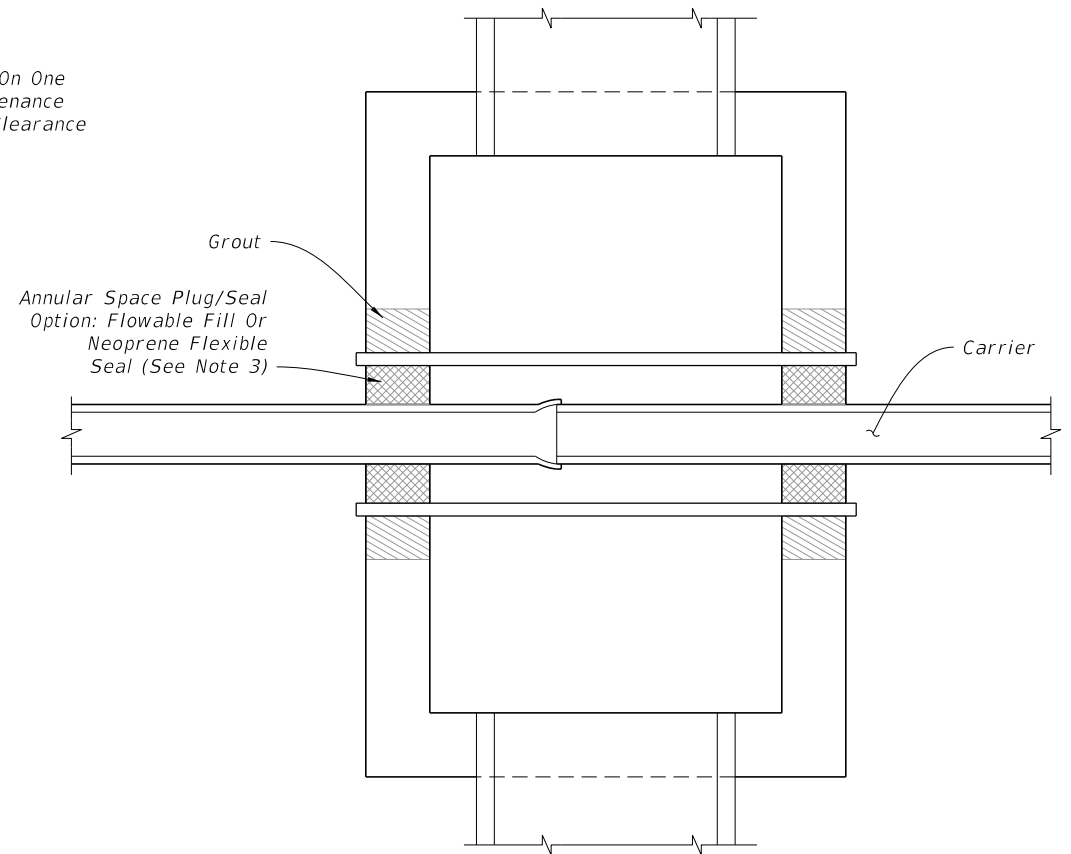
SECTION A-A



SECTION LONGITUDINAL TO CARRIER PIPE

UTILITY CONFLICT CONDITION II


(Pressure Or Fluid Carrier Installations)

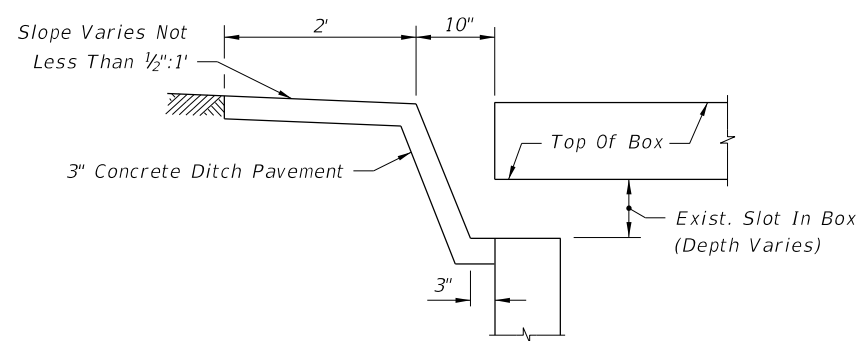


SECTION B-B

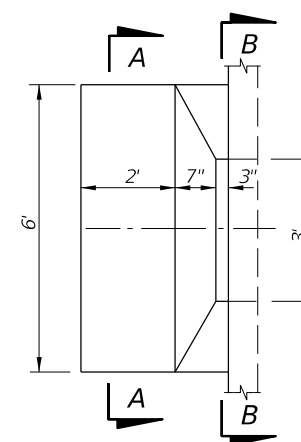
UTILITY CONFLICT PIPES THRU STORM DRAIN STRUCTURES

10/29/2019 8:16:08 AM

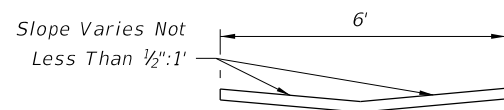
LAST REVISION 11/01/17	REVISION	DESCRIPTION:	 FY 2020-21 STANDARD PLANS	UTILITY CONFLICTS THRU DRAINAGE STRUCTURES	INDEX 425-080	SHEET 1 of 1
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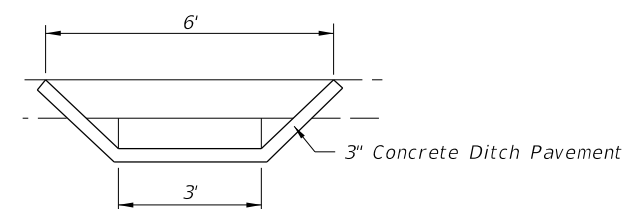
LONGITUDINAL SECTION



PLAN




SECTION AA



SECTION BB

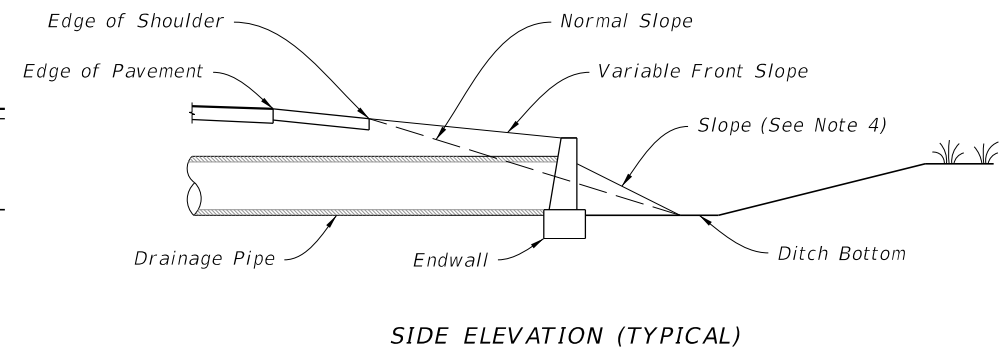
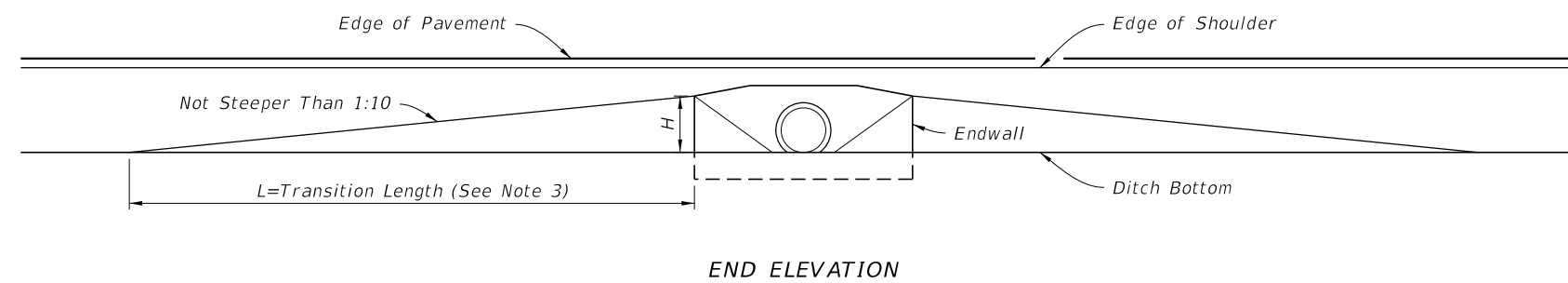
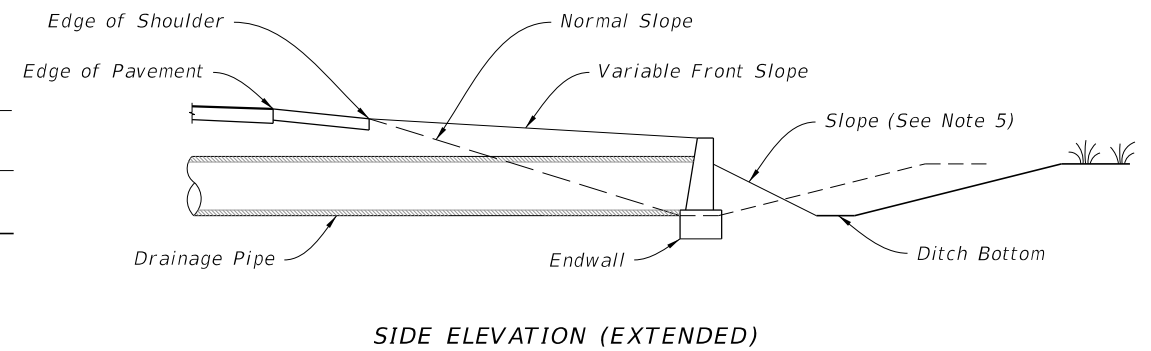
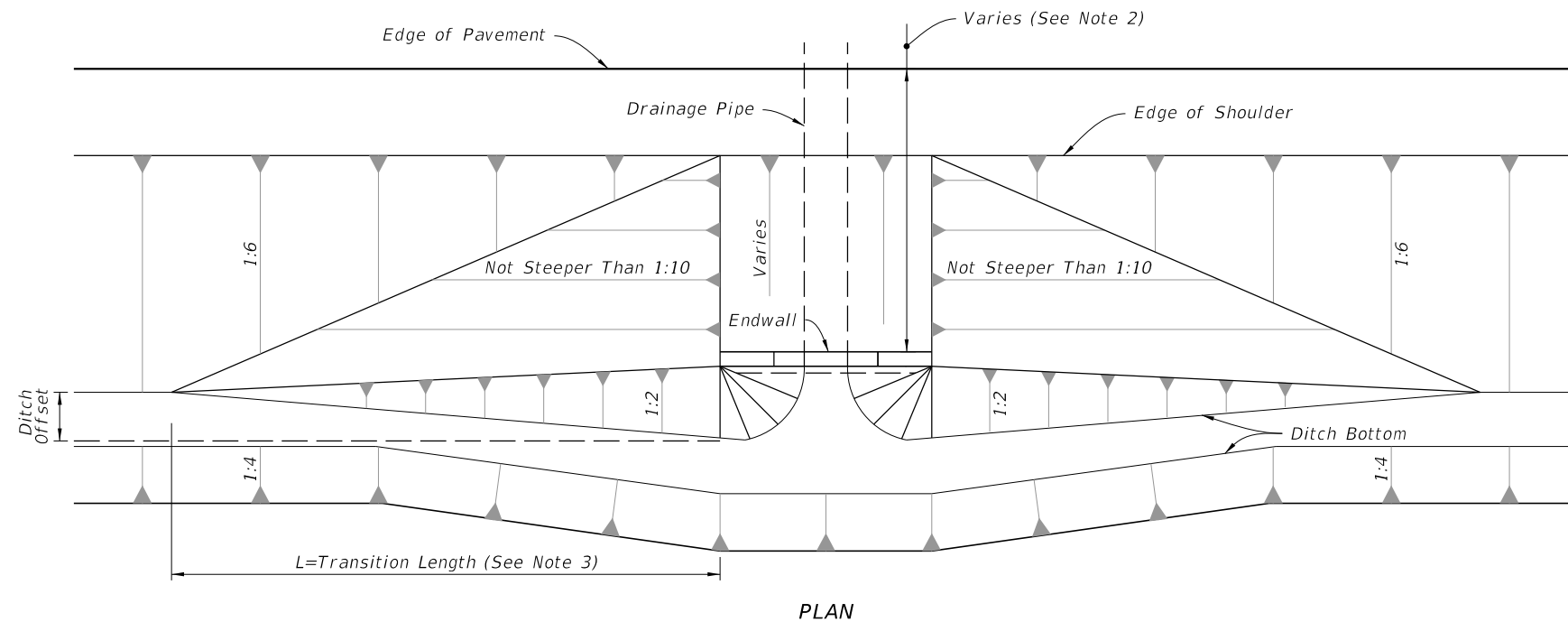
SAFETY MODIFICATION FOR INLETS IN BOX CULVERTS

10/29/2019 8:16:09 AM

LAST REVISION 11/01/17	REVISION DESCRIPTION:	 FY 2020-21 STANDARD PLANS	SAFETY MODIFICATIONS FOR INLET IN BOX CULVERTS	INDEX 425-090	SHEET 1 of 1
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NOTES:

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



FRONT SLOPES AT DRAINAGE STRUCTURES

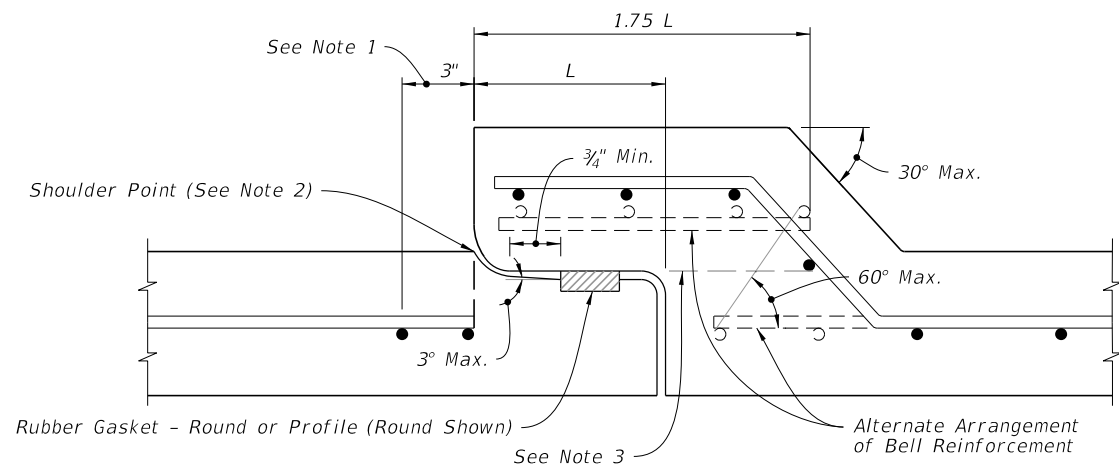
TABLE OF CONTENTS:

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

LIMITS OF VARIABLE FRONT SLOPES AT DRAINAGE STRUCTURES

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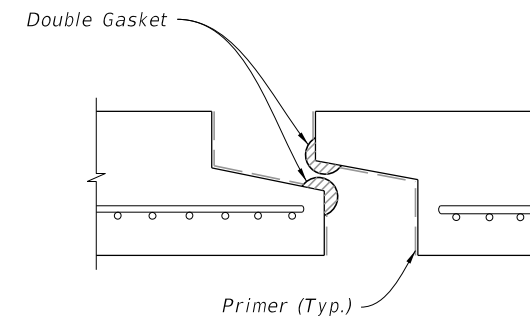
SCHEDULE OF BELL REINFORCEMENT
Classes II,III,IV,V; Wall A,B,C

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

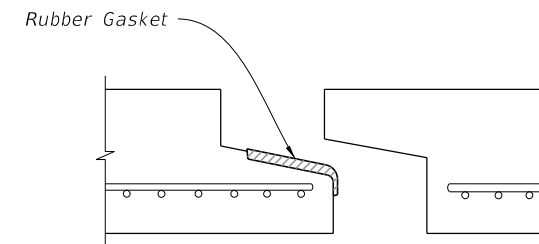
NOTES:

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

=====**ROUND CONCRETE PIPE JOINT DETAIL**=====



PREFORMED PLASTIC JOINT



PROFILE RUBBER GASKET

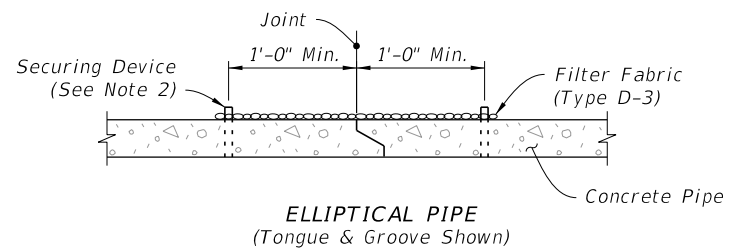
NOTES:

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

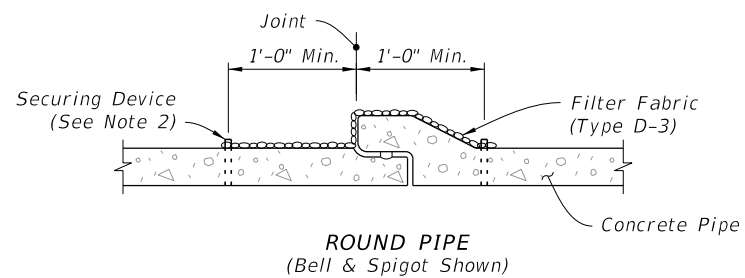
=====**ELLIPTICAL CONCRETE PIPE JOINT DETAIL**=====

ROUND AND ELLIPTICAL CONCRETE PIPE JOINT

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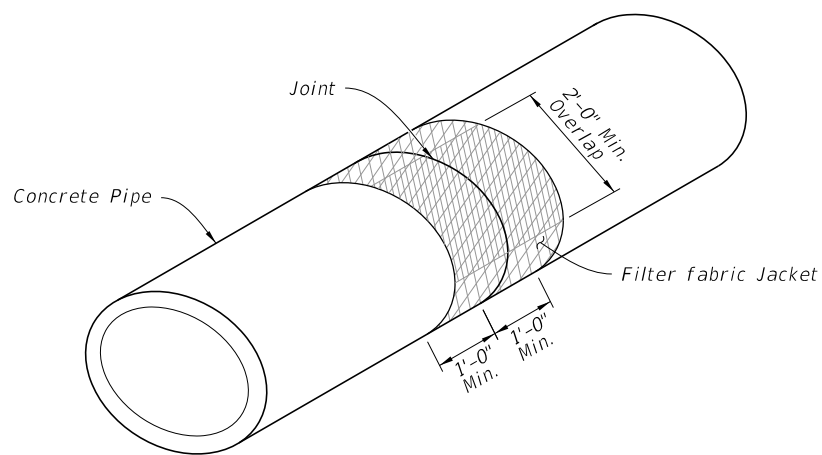


ELLIPTICAL PIPE
(Tongue & Groove Shown)



ROUND PIPE
(Bell & Spigot Shown)

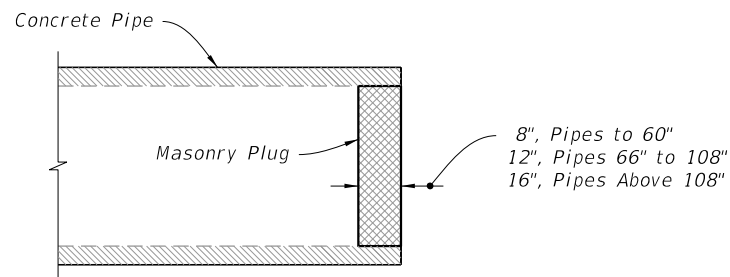
SECTION VIEW



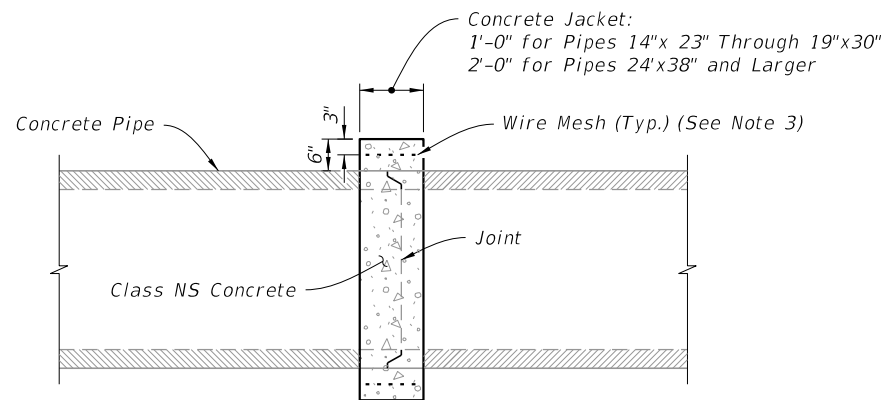
ISOMETRIC VIEW

FILTER FABRIC JACKET

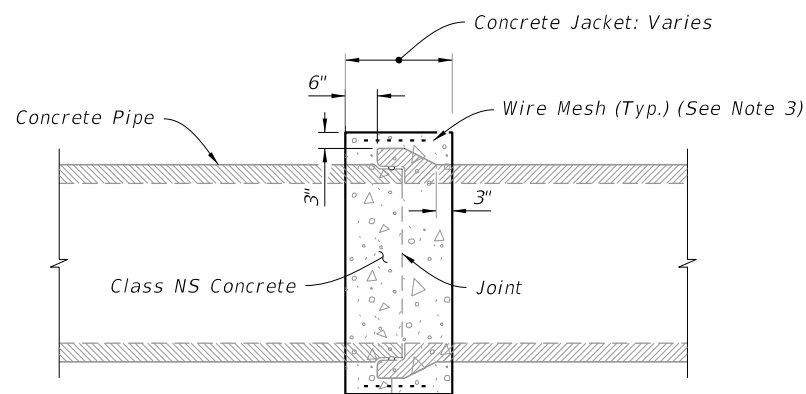
(For All Pipe Types - Concrete Elliptical Pipe Shown)



PIPE PLUG



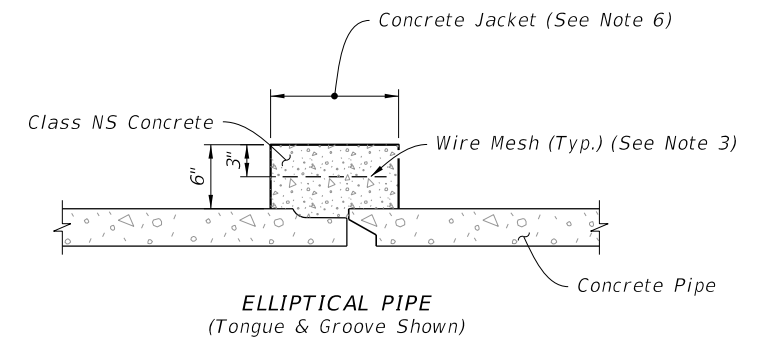
ELLIPTICAL PIPE



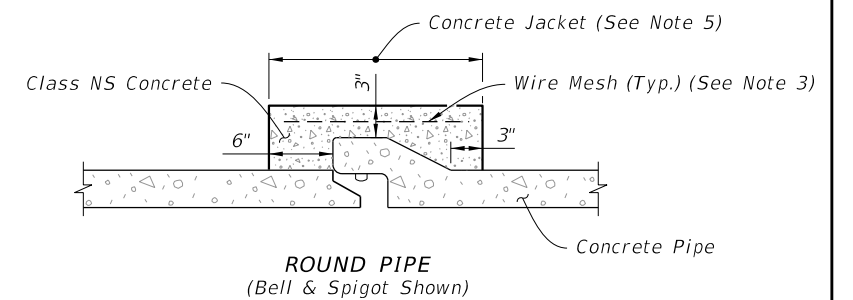
ROUND PIPE

SIMILAR TYPES

(Only When Called For In The Plans)

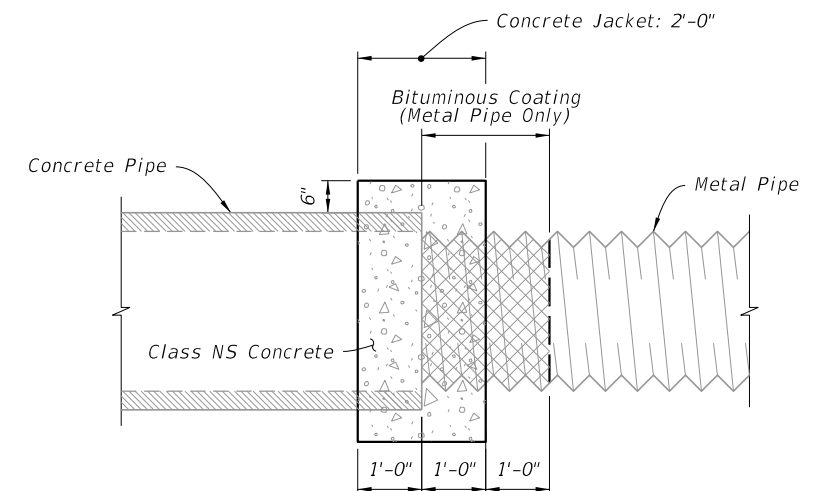


ELLIPTICAL PIPE
(Tongue & Groove Shown)



ROUND PIPE
(Bell & Spigot Shown)

DISSIMILAR JOINTS



CONCRETE AND METAL PIPE SHOWN
(Others Similar)

DISSIMILAR TYPES

CONCRETE JACKET

NOTES:

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

FILTER FABRIC JACKET, CONCRETE JACKET, AND PIPE PLUG

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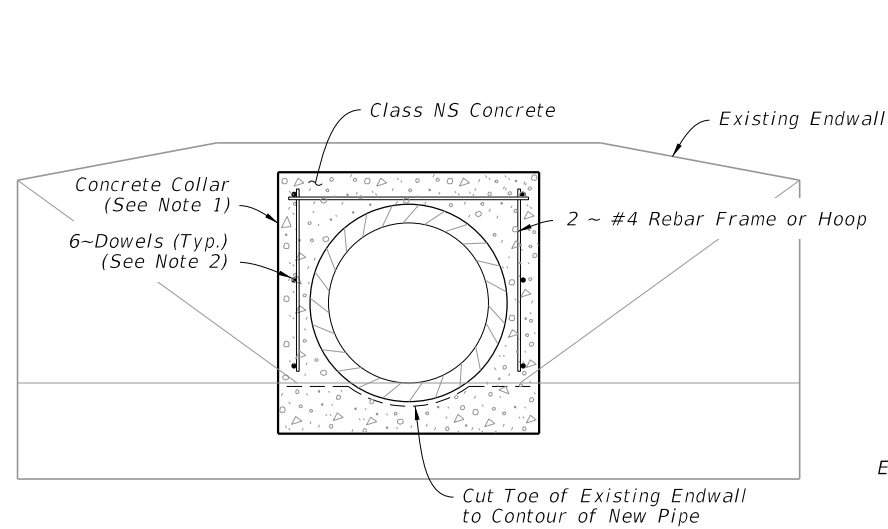


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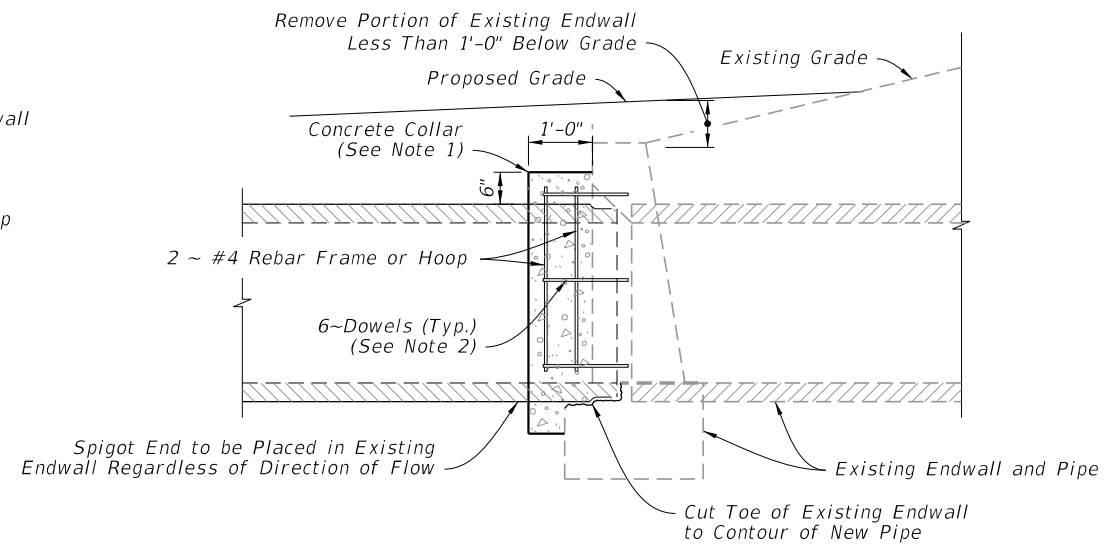
MISCELLANEOUS DRAINAGE DETAILS

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430-001

SHEET
3 of 6

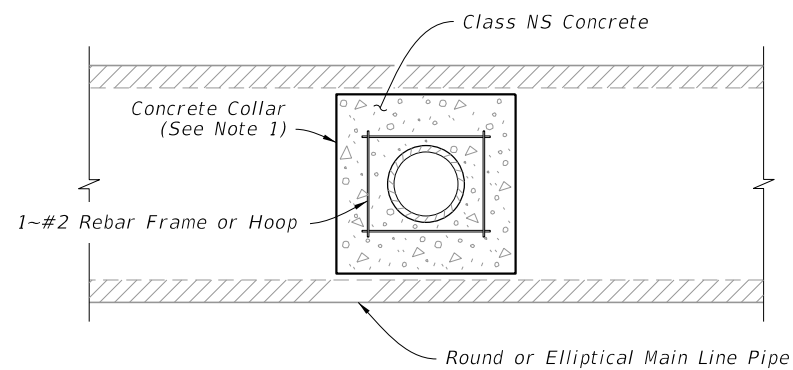


END ELEVATION

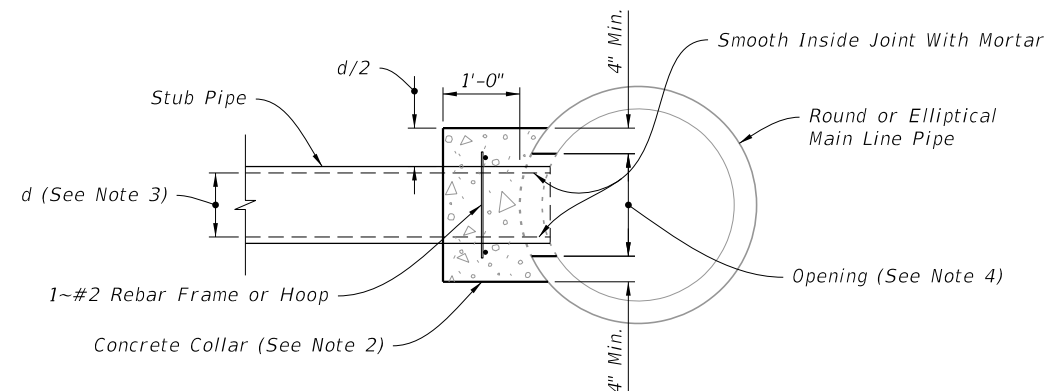


SIDE ELEVATION

EXTENSION OF EXISTING PIPE CULVERTS



STUB END ELEVATION



SIDE ELEVATION

JOINING MAINLINE PIPE TO STUB PIPE

NOTES:

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

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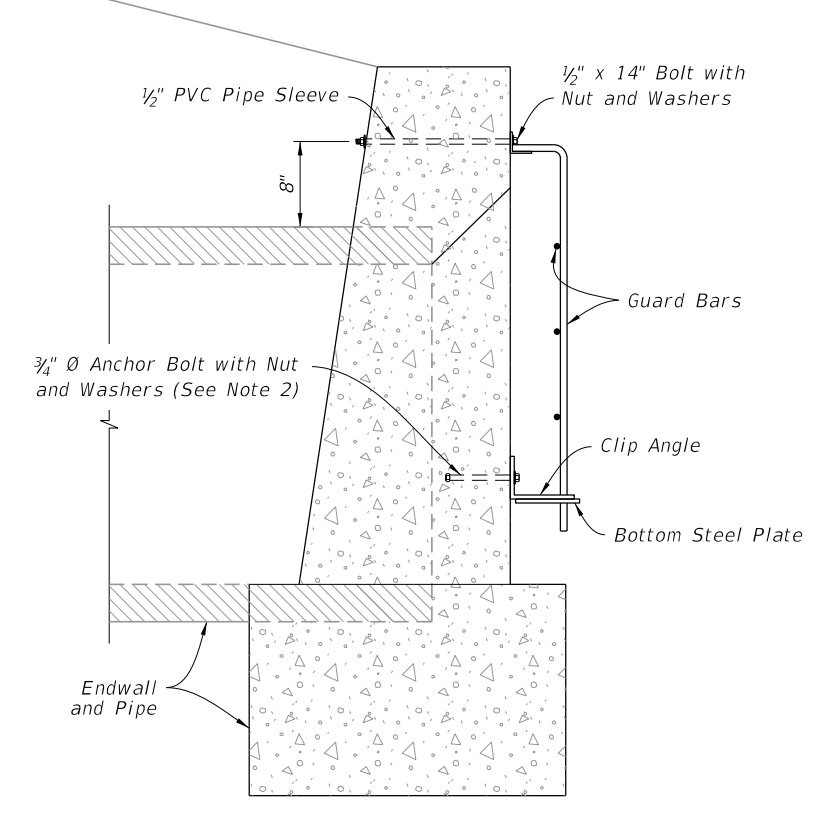
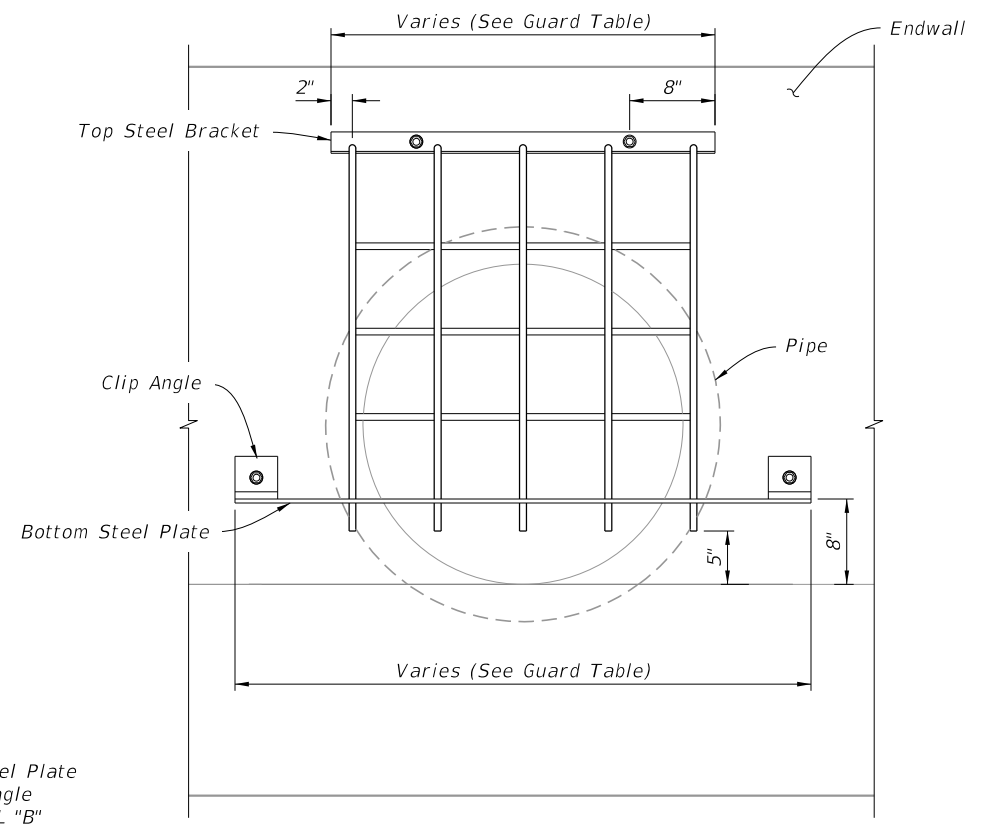
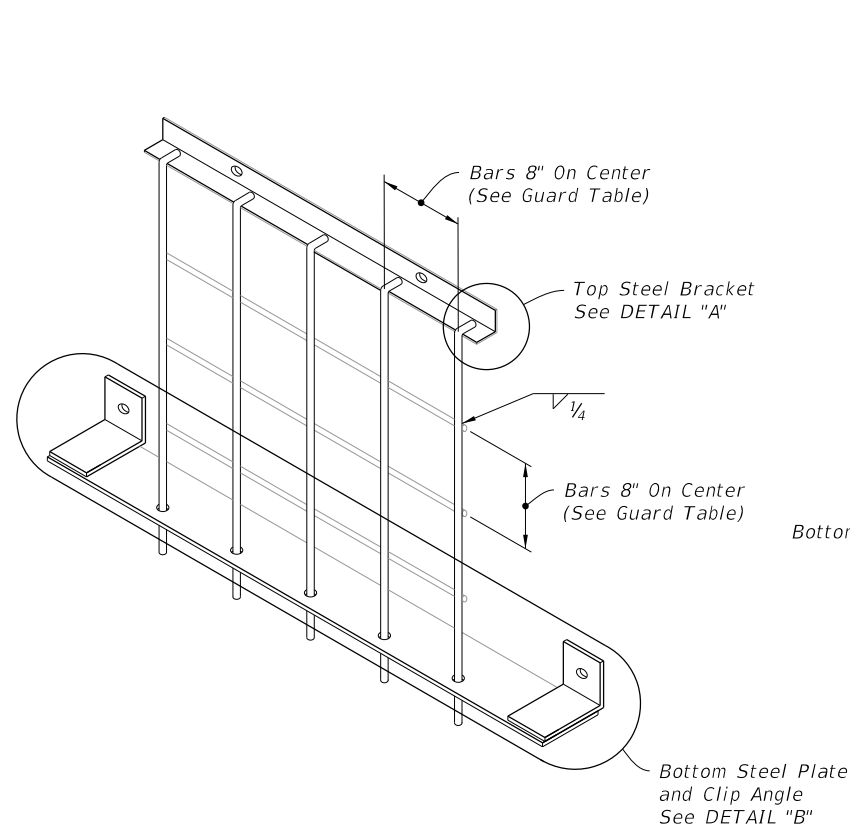


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STANDARD PLANS

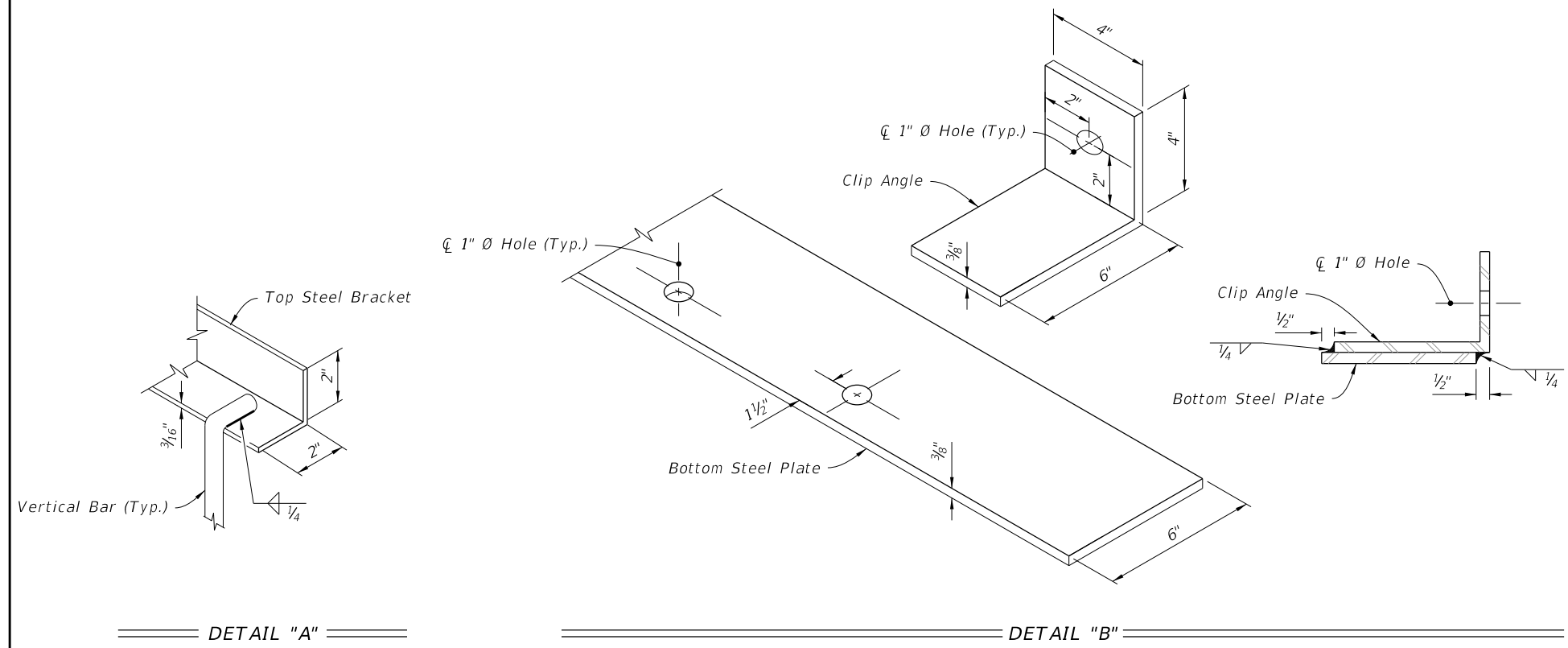
MISCELLANEOUS DRAINAGE DETAILS

CONCRETE COLLARS

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GUARD

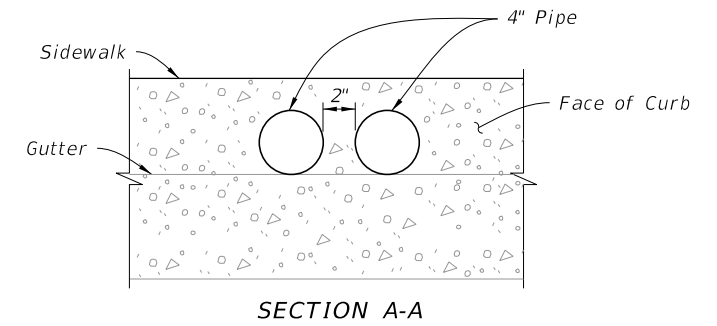
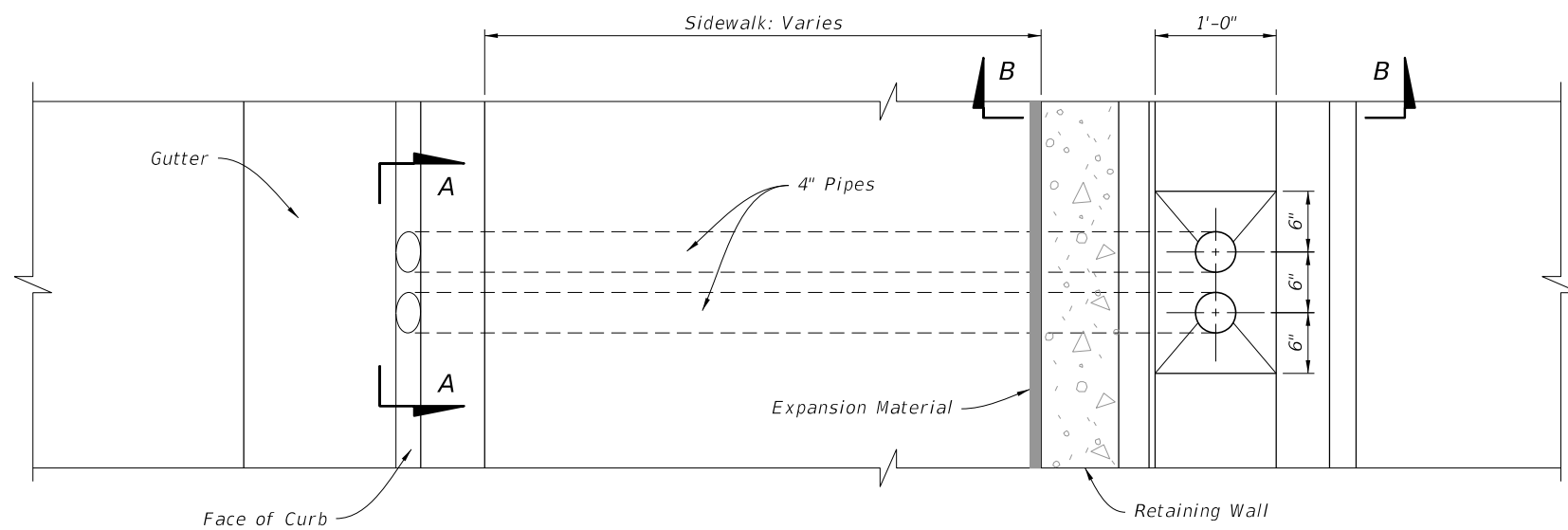


GUARD TABLE						
Pipe Dia.	Top Steel Bracket	Bottom Steel Plate	Number of Vert. Bars and Plate Holes	Number of Horiz. Bars	Bars Size	Weight lbs.
18"	2'-4"	3'-6"	4	1	1/2"	48
24"	3'-0"	4'-0"	5	2	1/2"	58
30"	3'-0"	4'-6"	5	3	5/8"	74
36"	3'-8"	5'-0"	6	4	5/8"	90
42"	4'-4"	5'-6"	7	5	5/8"	111

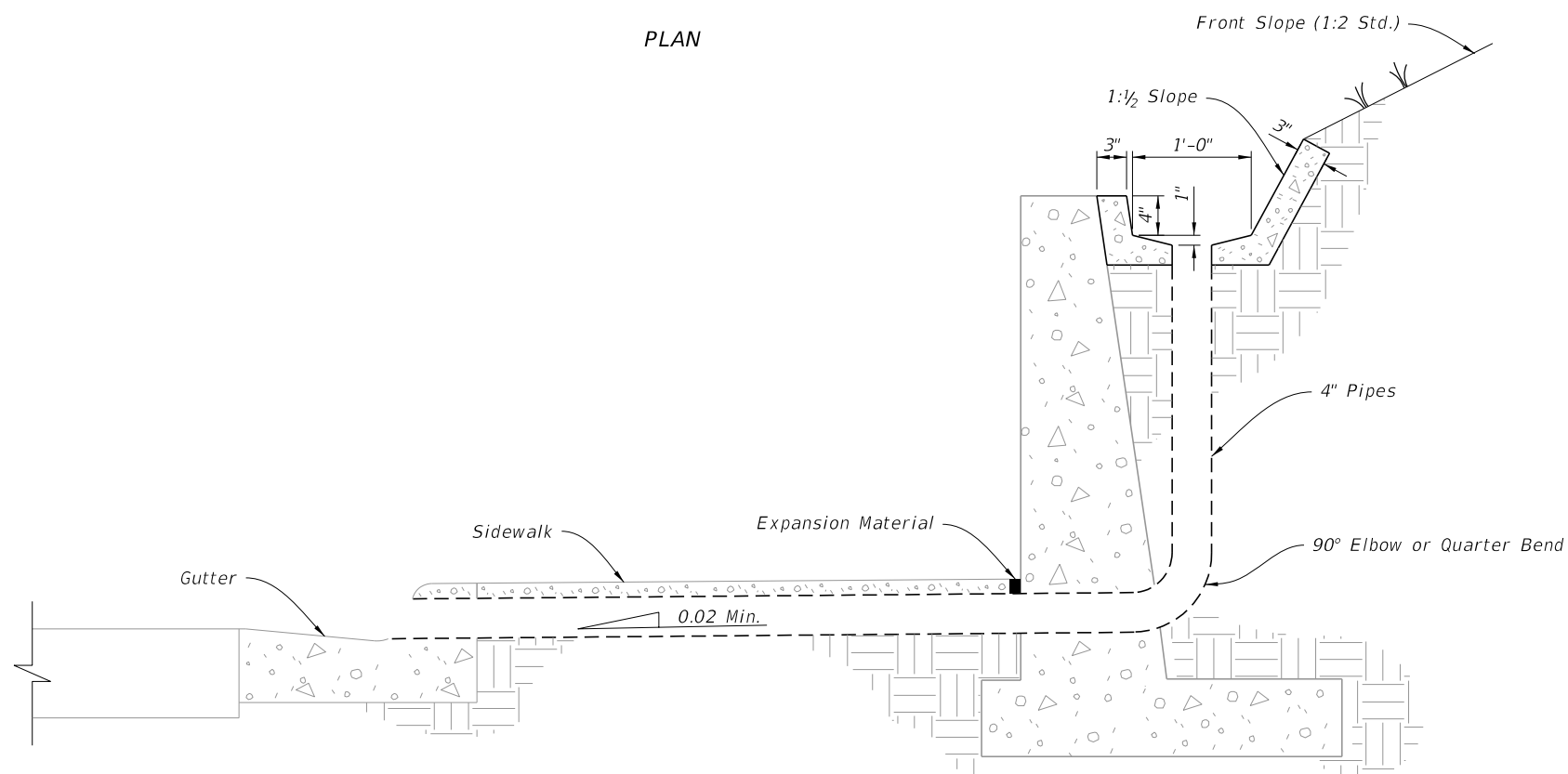
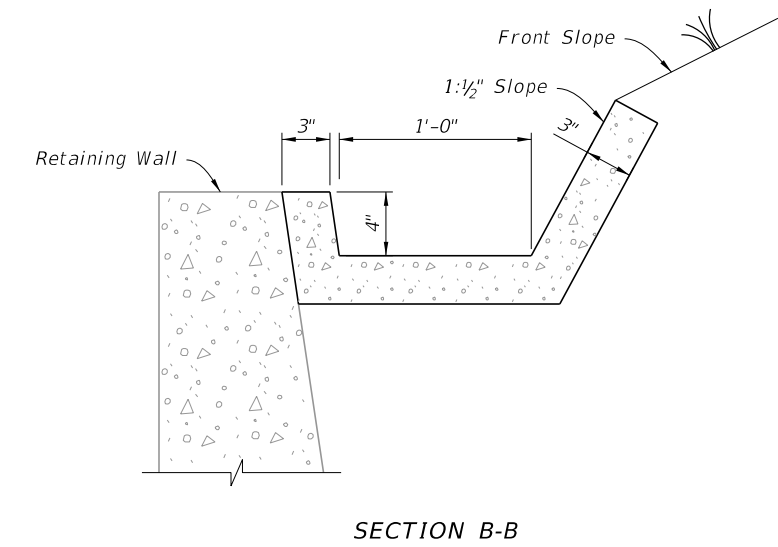
- NOTES:**
- Construct guards only at locations specifically called for in Plans.
 - Install anchor bolt to a 1/2" minimum embedment. Hex Bolt: cast-in-place. Adhesive-bonded anchor: fully threaded rod installed in accordance with Specification 416.

10/29/2019 8:16:12 AM

PIPE END GUARD



PLAN



ELEVATION

GUTTER AND DRAINS

RETAINING WALL CONCRETE GUTTER AND DRAINS

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STANDARD PLANS

MISCELLANEOUS DRAINAGE DETAILS

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430-001

SHEET
6 of 6

GENERAL NOTES:

1. Use Class I concrete.
2. Reinforcing steel: All bars are size #4. Spacing's shown are center to center. Laps to be 1'-5" minimum. Cover 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. Endwall may be cast in place or precast concrete. Construct precast units to dimensions shown, or as shown in approved shop drawings. Use Index 425-001 for opening and grouting details.
4. Quantities shown are for estimating purposes only.

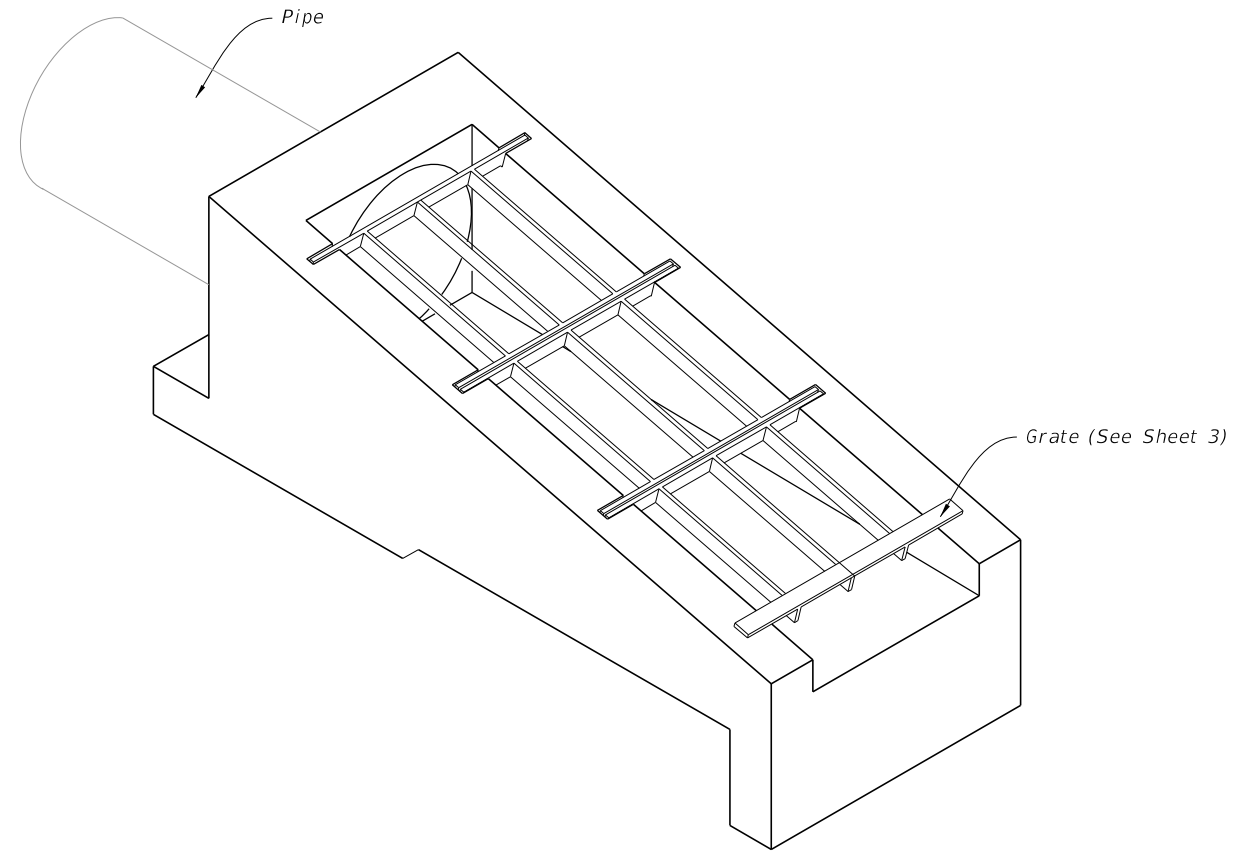
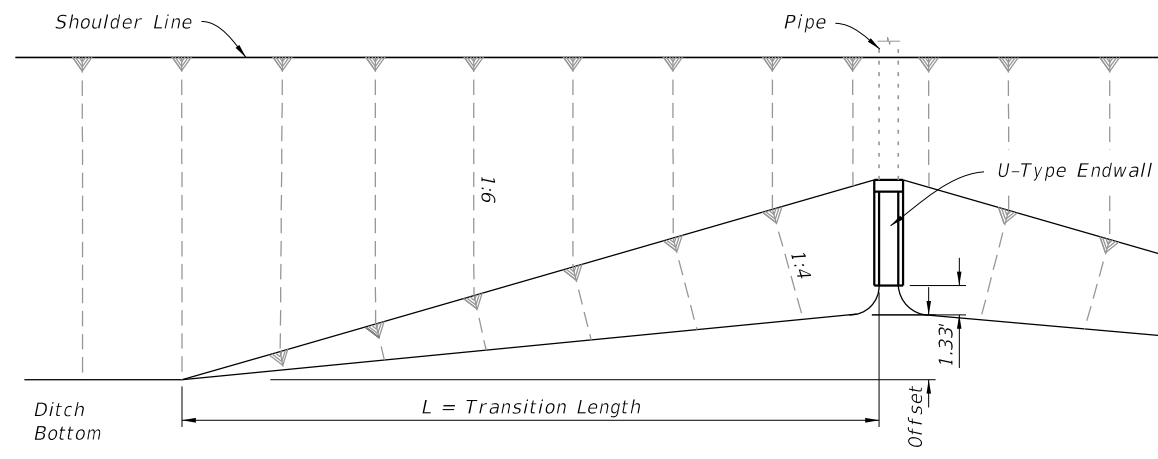


TABLE OF CONTENTS:	
Sheet	Description
1	General Notes and Contents
2	Dimensional and Reinforcing Details
3	Type 1 and Type 2 Grate Details

U-TYPE CONCRETE ENDWALLS 15" TO 30" PIPES WITH GRATES
(24" Pipe Shown)



Slope	Pipe Dia.	Offset (Ft.)	L (Ft.)
1:4	15"	4.2	42
	18"	4.8	48
	24"	5.8	58
	30"	6.9	69

FRONT SLOPE TRANSITION AT ENDWALL

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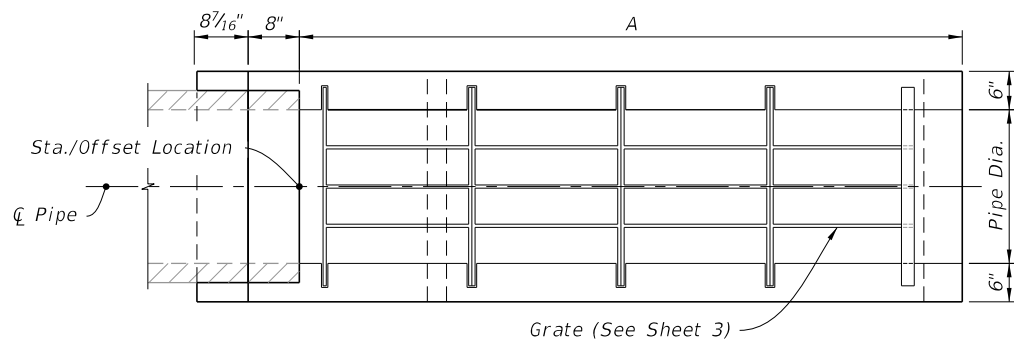


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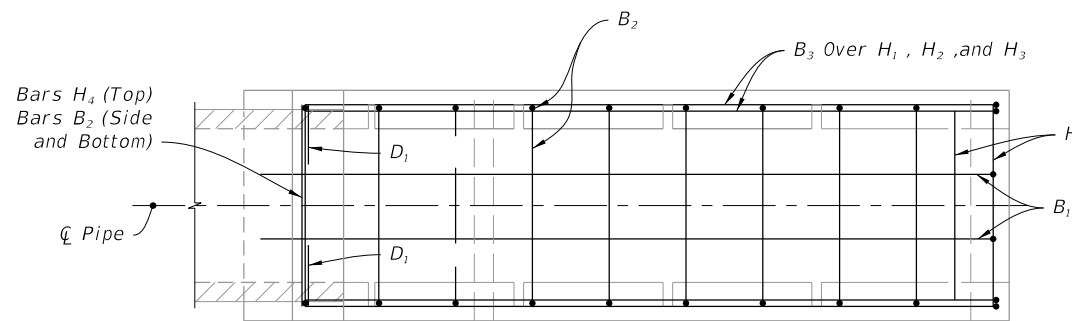
U-TYPE CONCRETE ENDWALLS
15" TO 30" PIPES WITH GRATES

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SHEET
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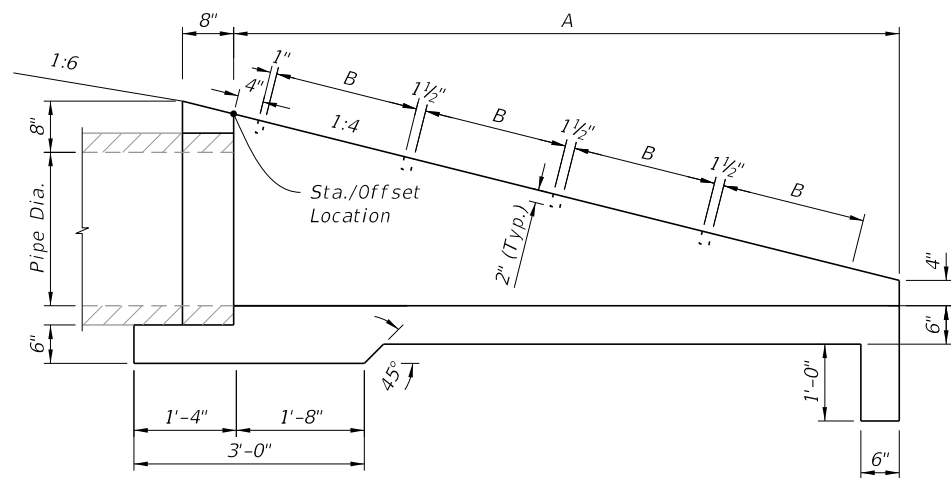


PLAN

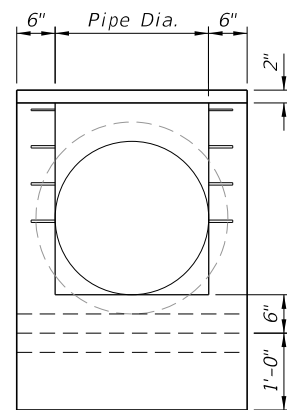


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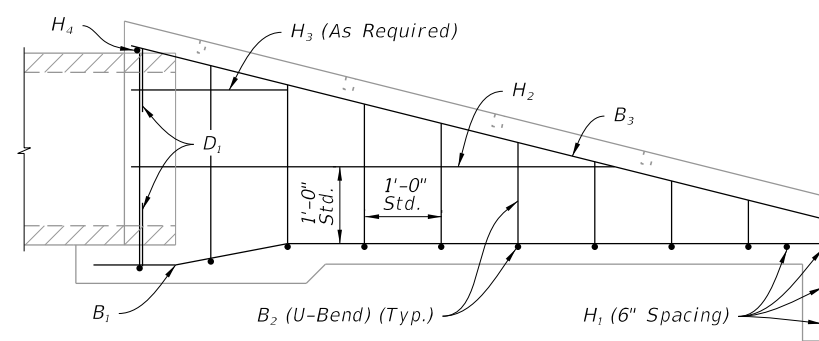
LEGEND:
 H = Horizontal Bars
 V = Vertical Bars
 B = Bent Bars
 D = Dowels or Diagonal Bars



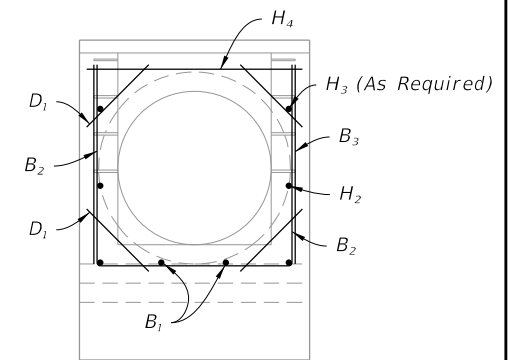
ELEVATION



END VIEW



ELEVATION



END VIEW

DIMENSIONAL DETAIL

REINFORCING DETAIL

	Pipe Dia.	A (Ft.)	B (Ft.)	Class I Conc. (CY)	Reinf. Steel (lbs.)
Slope 1:4	15"	5.67	2.38	0.85	56
	18"	6.67	1.875	1.01	73
	24"	8.67	1.875	1.65	97
	30"	10.67	1.875	2.33	129

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LAST REVISION 11/01/19	DESCRIPTION:
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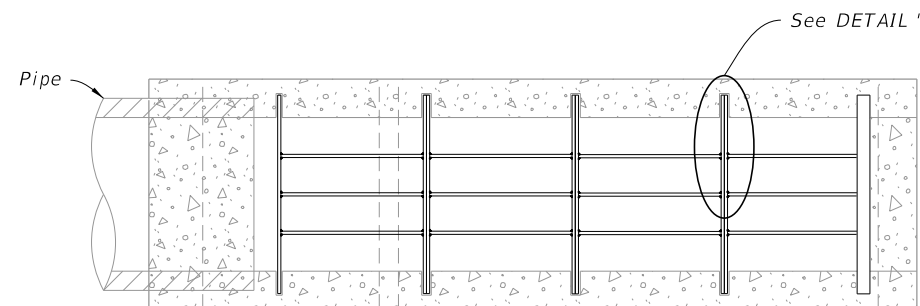
FY 2020-21
STANDARD PLANS

U-TYPE CONCRETE ENDWALLS
15" TO 30" PIPES WITH GRATES

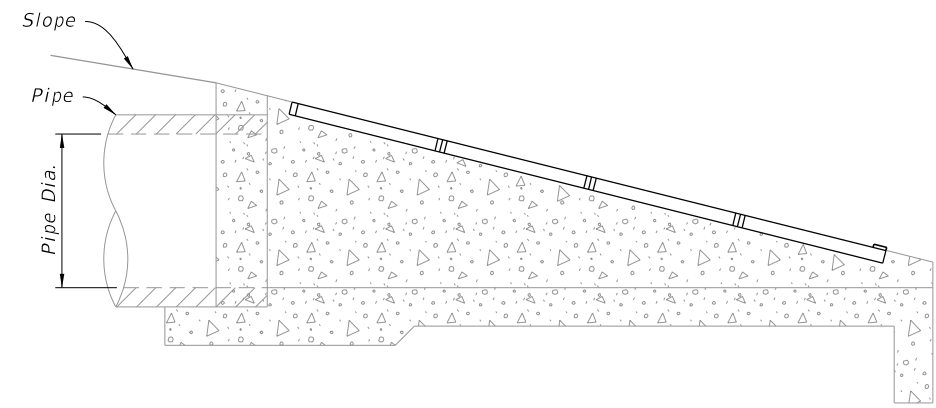
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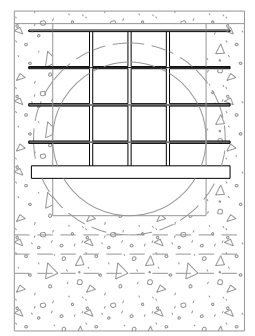
DIMENSIONAL AND REINFORCING DETAILS



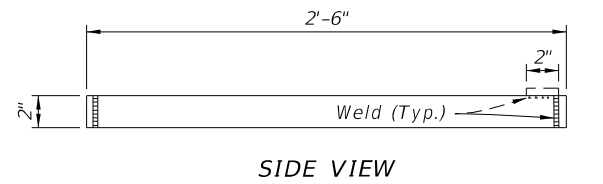
PLAN



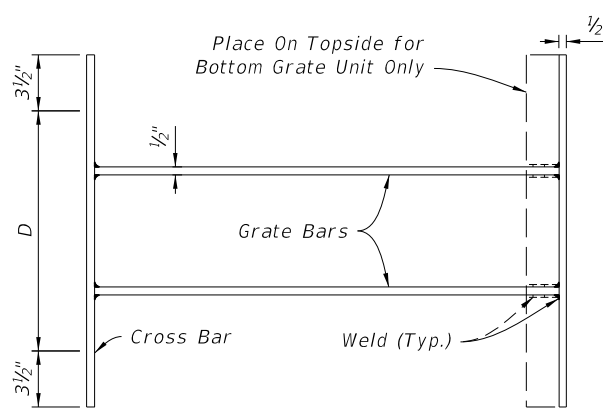
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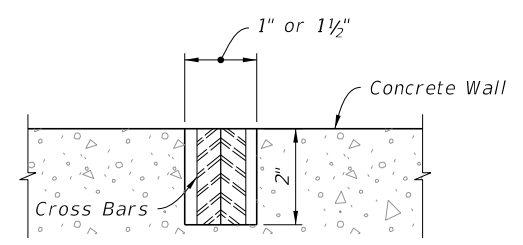
END VIEW



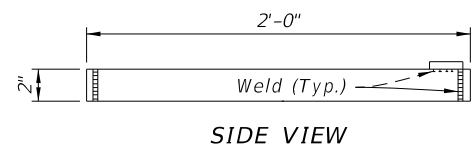
SIDE VIEW



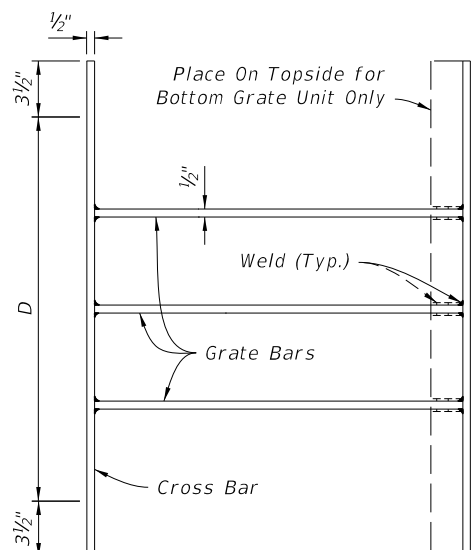
TOP VIEW
TYPE 1



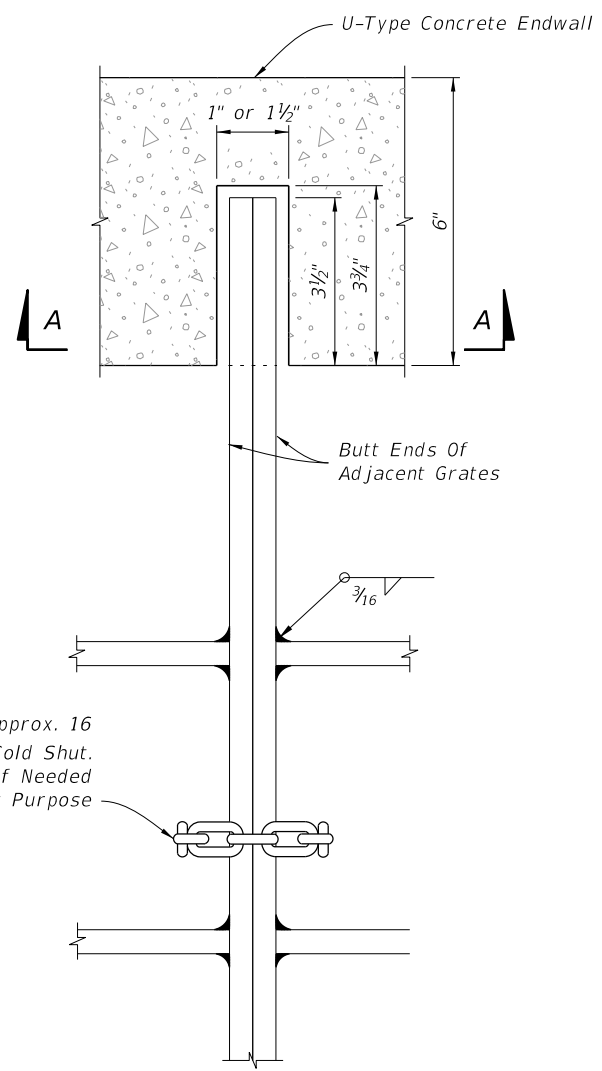
SECTION A-A



SIDE VIEW



TOP VIEW
TYPE 2



GRATE, SEAT, WELD & CHAIN DETAIL

NOTES:

1. Install grate bars evenly spaced across dimension D.
2. All bars and grate bars are 1/2" x 2".

TABLE 3 NUMBER OF GRATE BARS AND GRATES REQUIRED						
Pipe Dia. D	Grate Bars Req'd.		Grate Wt. (lbs.)	Grate Req'd.		Total Grate Wt. (lbs.)
	Type No. 1	Type No. 2		Type No. 1	Type No. 2	
15"	2	0	28.93	2	0	57.86
18"	0	3	33.69	0	3	101.08
24"	0	4	43.63	0	4	174.52
30"	0	5	53.55	0	5	267.75

TYPE 1 AND TYPE 2 GRATE DETAILS

DETAIL "A"

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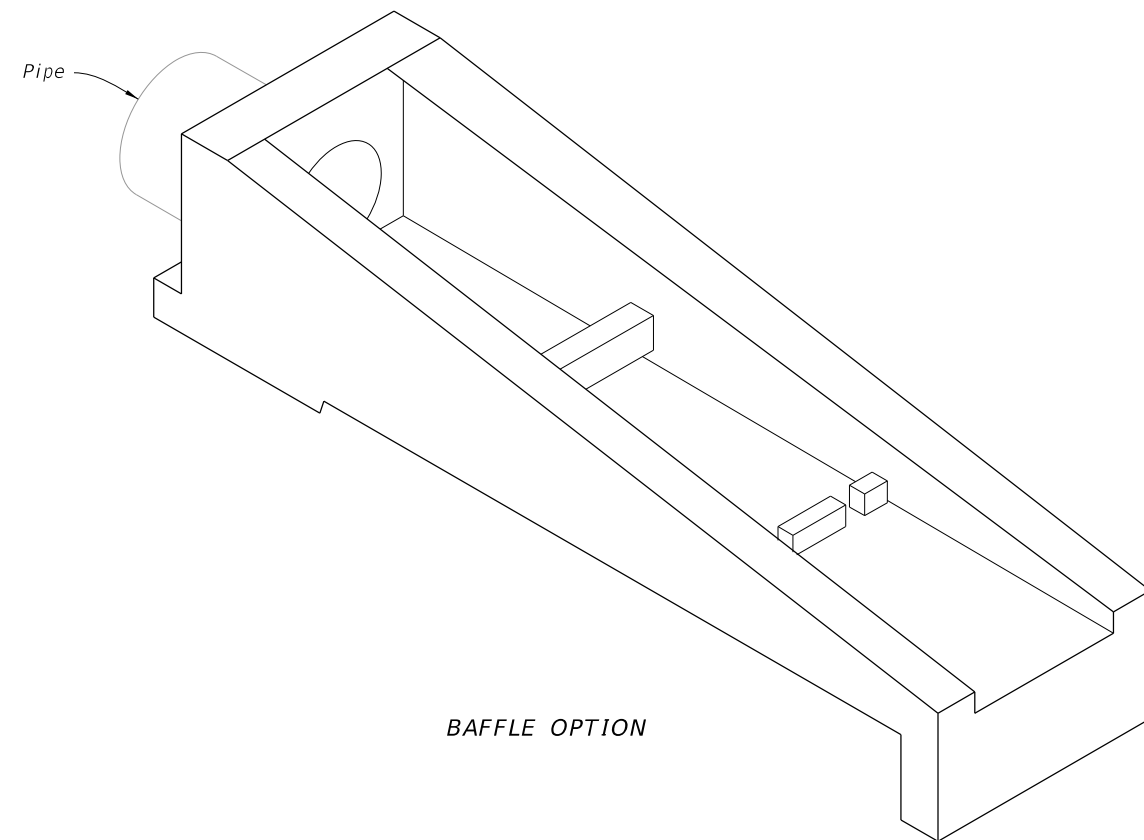
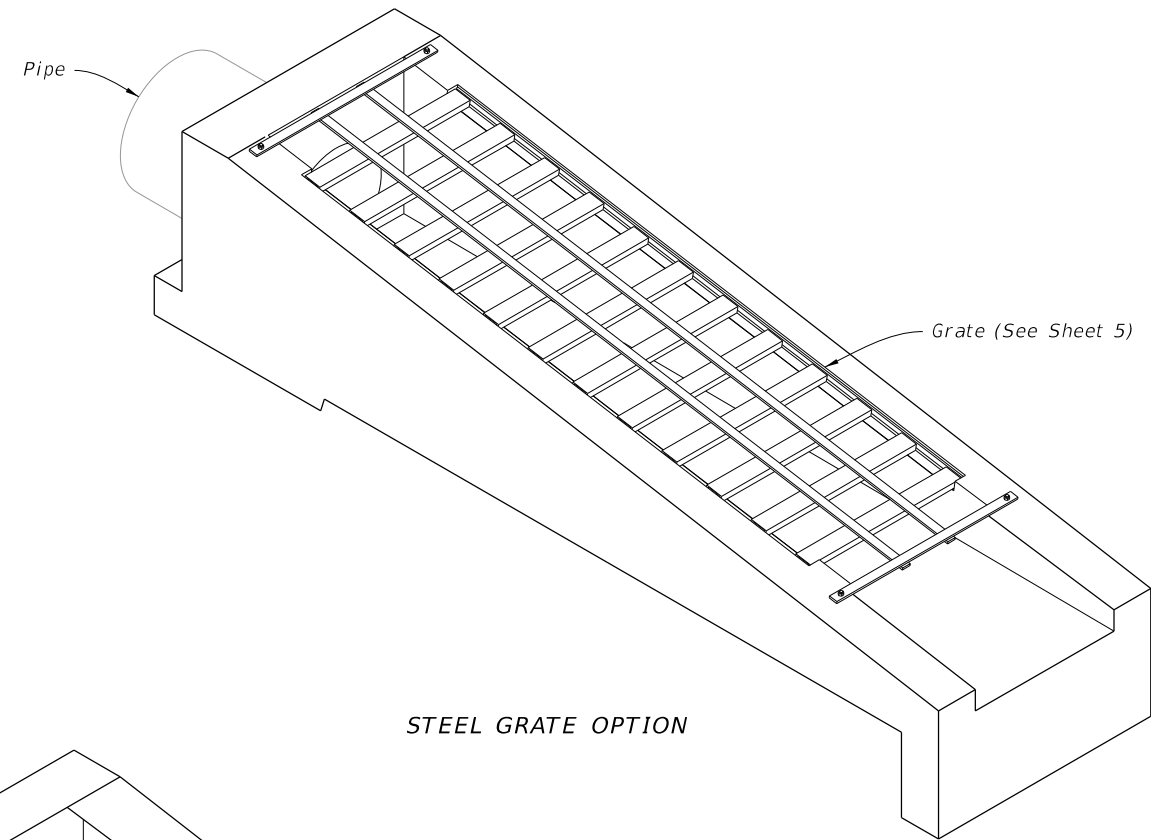
TYPE 1 AND TYPE 2 GRATE DETAILS

LAST REVISION 11/01/19	REVISION	DESCRIPTION:		FY 2020-21 STANDARD PLANS	U-TYPE CONCRETE ENDWALLS 15" TO 30" PIPES WITH GRATES	INDEX 430-010	SHEET 3 of 3
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GENERAL NOTES:

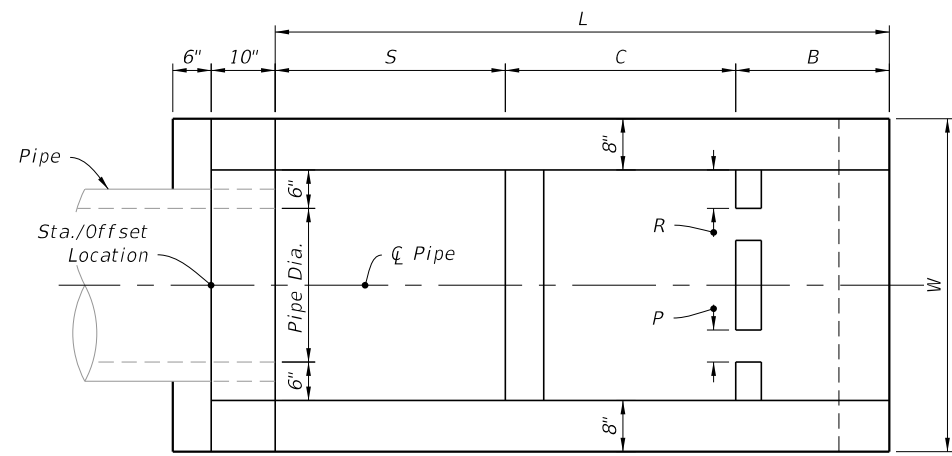
1. Use Class I concrete
2. Construct Baffles only when called for in Plans.
3. See Sheet 5 when steel grating is required on endwall.
4. All reinforcing #4 bars with 2" clearance except as noted.
5. Channel section C 3x6 may be substituted for C 4x5.4 channel.
6. Endwall may be cast in place or precast concrete. Construct precast units to dimensions shown, or as shown in approved shop drawings. Submit requests for shop drawing approvals to the Engineer. Use Index 425-001 for opening and grouting details.
7. Quantities shown are for estimating purposes only.

TABLE OF CONTENTS:	
Sheet	Description
1	General Notes and Contents
2	Endwalls for 1:2 Slopes With Baffles
3	Endwalls for 1:2 Slopes Without Baffles and Bending Bar Diagram
4	Endwalls for 1:3, 1:4, and 1:6 Slopes
5	Steel Grate Option

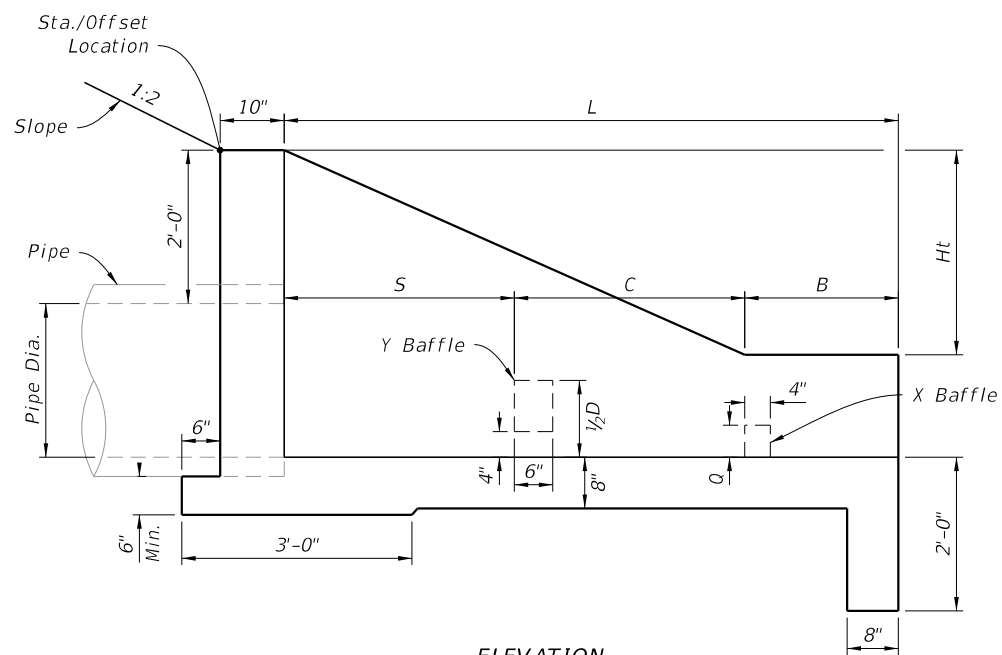


U-TYPE CONCRETE ENDWALLS

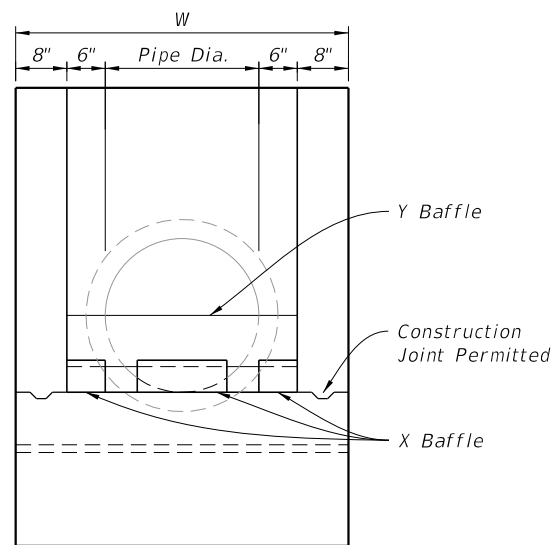
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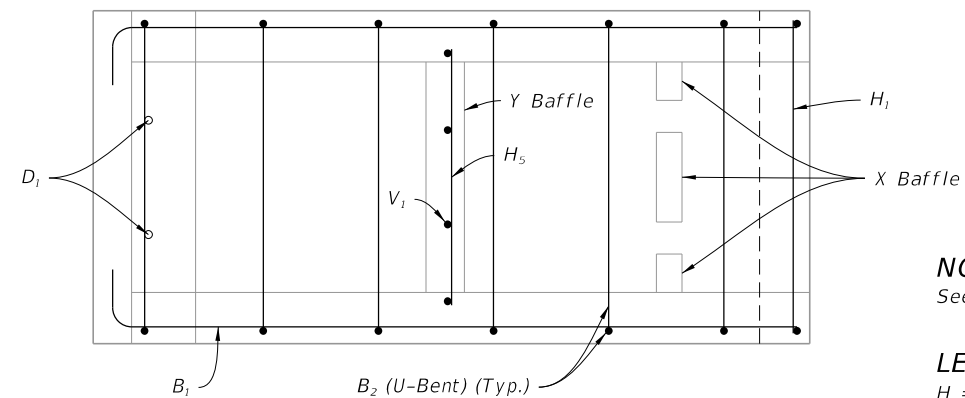
PLAN



ELEVATION



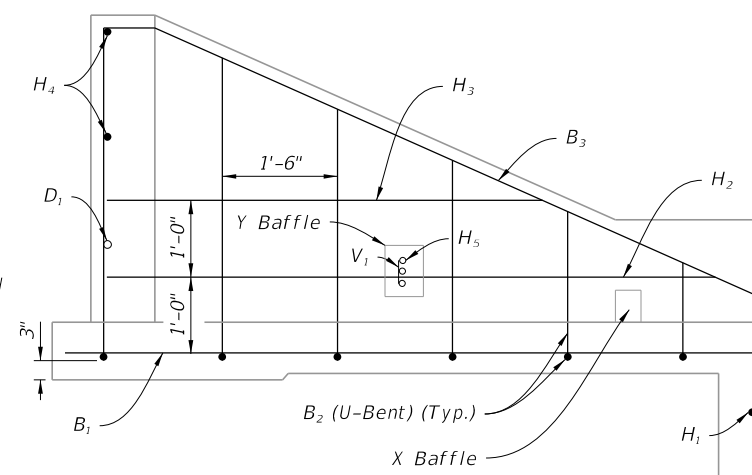
FRONT VIEW



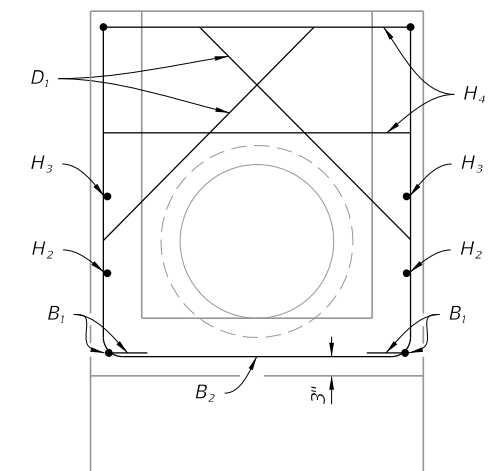
PLAN

NOTE:
See Sheet 3 for Bar Bending Diagram.

LEGEND:
H = Horizontal Bars
V = Vertical Bars
B = Bent Bars
D = Dowels or Diagonal Bars



ELEVATION



BACK VIEW

DIMENSIONAL DETAILS

REINFORCING DETAILS

DIMENSIONS AND QUANTITIES FOR ONE U-ENDWALL														
Pipe		L	Ht	W	S	B	C	X Baffle			Y Baffle Reinf. Steel		Class I Conc. Cu. Yd.	Reinf. Steel lbs.
Dia.	Area Sq. Ft.							P	Q	R	Bars V ₁	Bars H ₅		
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

ENDWALLS FOR 1:2 SLOPES WITH BAFFLES

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LAST REVISION 11/01/19	DESCRIPTION:
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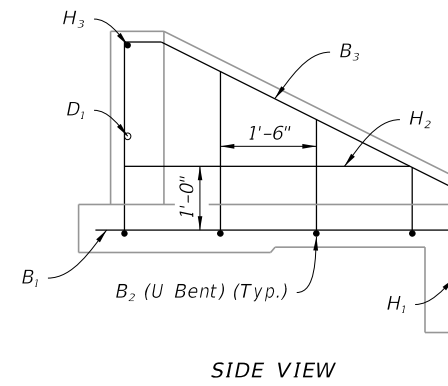
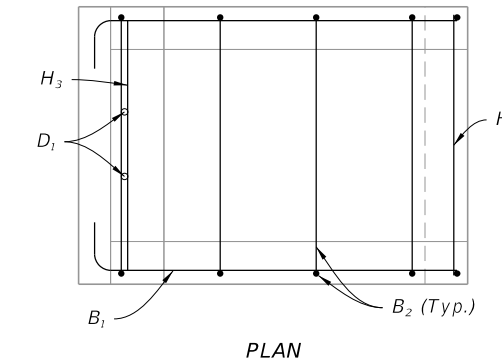
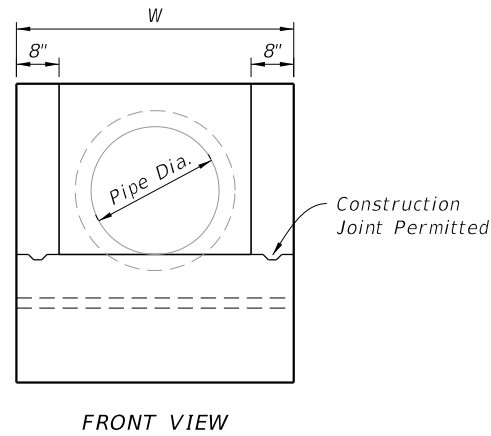
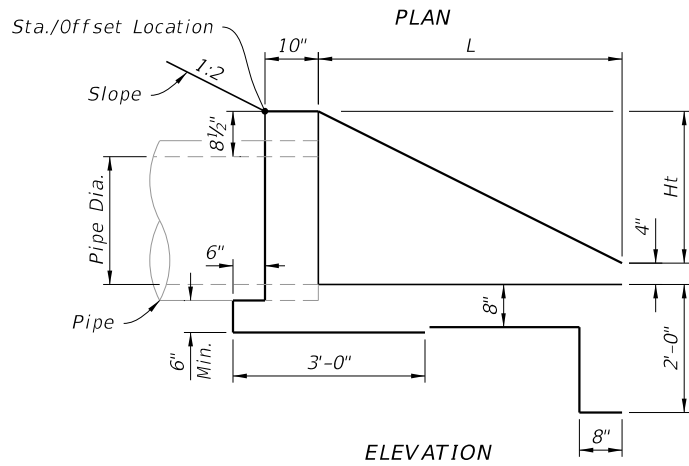
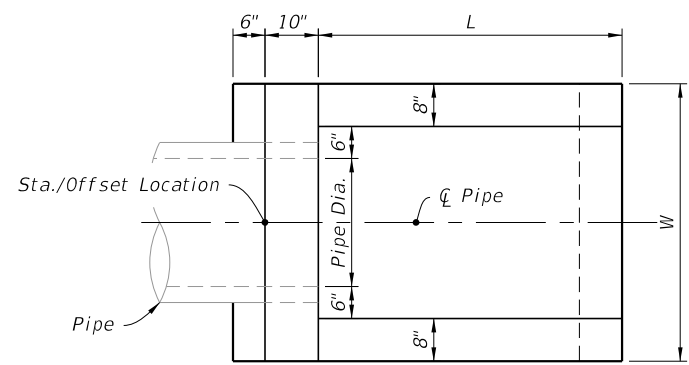


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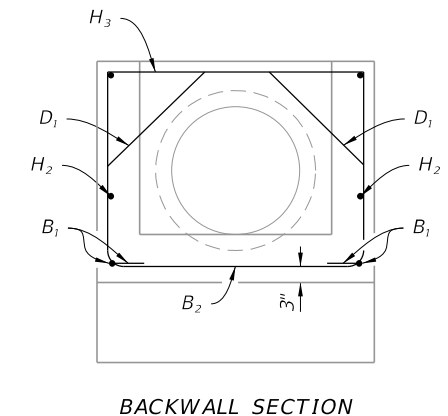
U-TYPE CONCRETE ENDWALLS BAFFLES
& GRATE OPTIONAL 15" TO 30" PIPE

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LEGEND:
 H = Horizontal Bars
 V = Vertical Bars
 B = Bent Bars
 D = Dowels or Diagonal Bars

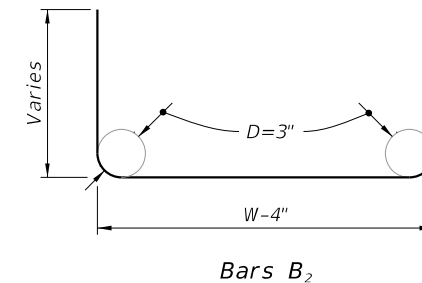
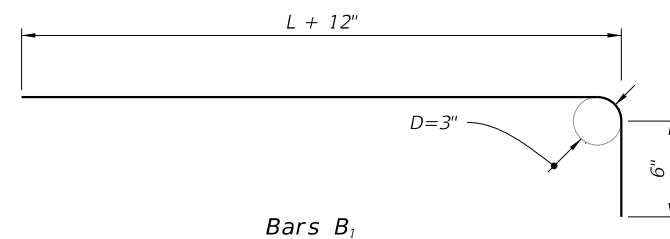


DIMENSIONAL DETAILS

REINFORCING DETAILS

Pipe		L	Ht	W	Class I Conc. Cu. Yd.	Reinf. Steel lbs.
Dia.	Area Sq. Ft.					
15"	1.23	3'-3"	1'-7 1/2"	3'-7"	0.89	39
18"	1.77	3'-9"	1'-10 1/2"	3'-10"	1.05	43
24"	3.14	4'-9"	2'-4 1/2"	4'-4"	1.40	55
30"	4.91	5'-9"	2'-10 1/2"	4'-10"	1.88	64

ENDWALL WITHOUT BAFFLES



BENDING DIAGRAM

ENDWALLS FOR 1:2 SLOPES WITHOUT BAFFLES AND BAR BENDING DIAGRAM

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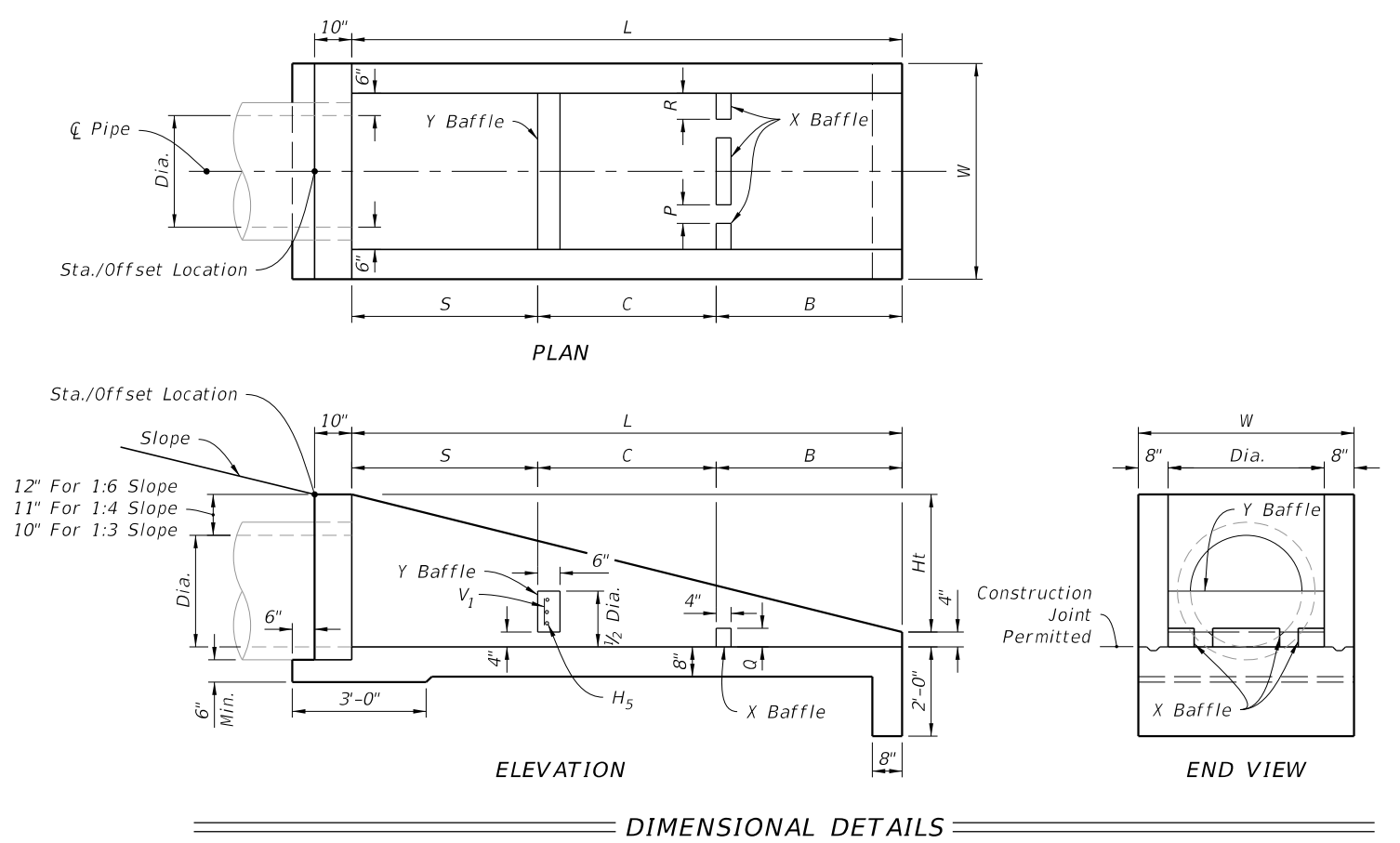
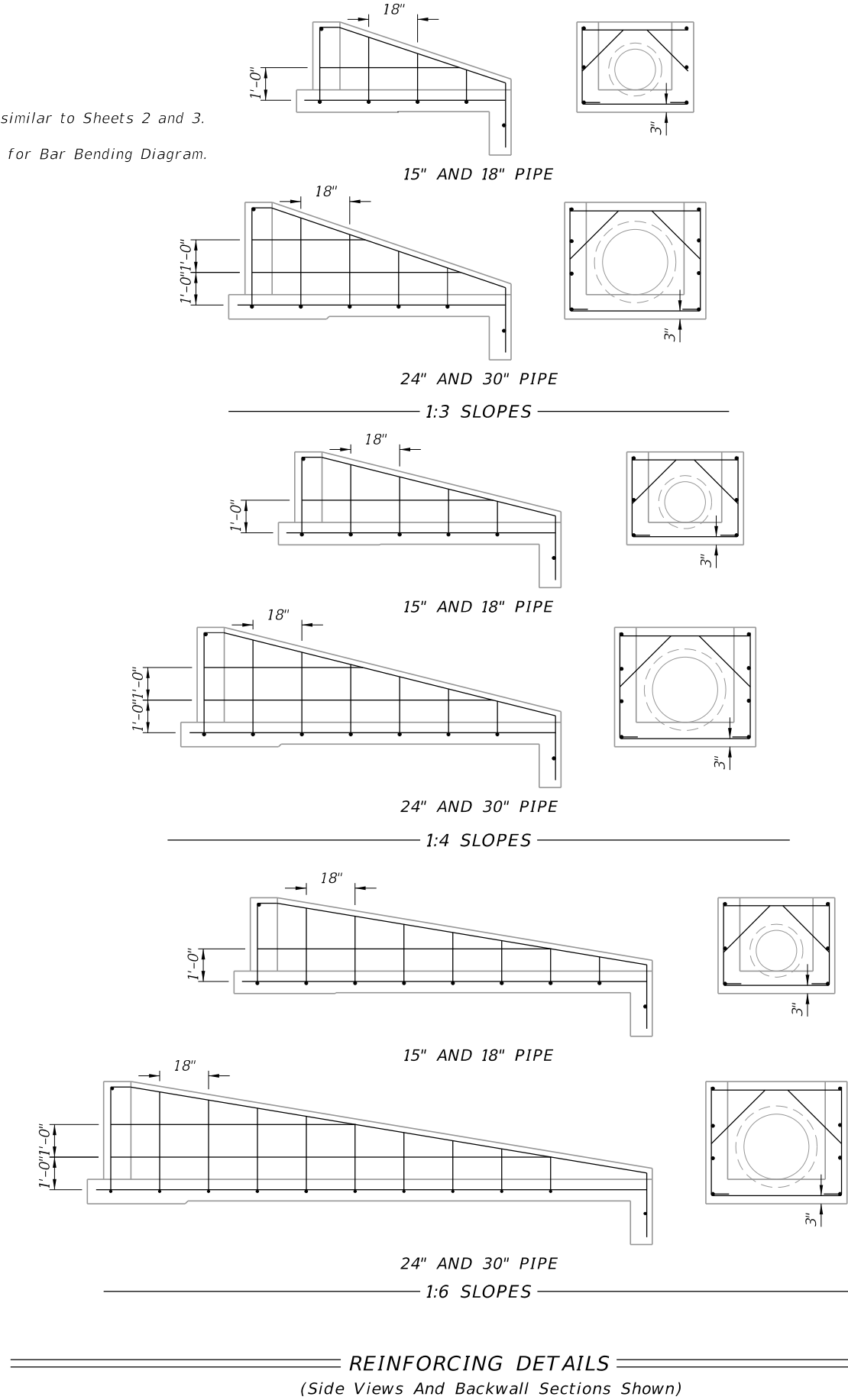
U-TYPE CONCRETE ENDWALLS BAFFLES
& GRATE OPTIONAL 15" TO 30" PIPE

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SHEET
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NOTE:

1. Reinforcing similar to Sheets 2 and 3.
2. See Sheet 3 for Bar Bending Diagram.



DIMENSIONS AND QUANTITIES FOR BAFFLES							
Pipe Dia.	X Baffle			Y Baffle Reinf. Steel		Class I Concrete Cu. Yd.	Reinf. Steel lbs.
	P Width	Q Height	R Length	Bar V ₁	Bar H ₅		
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

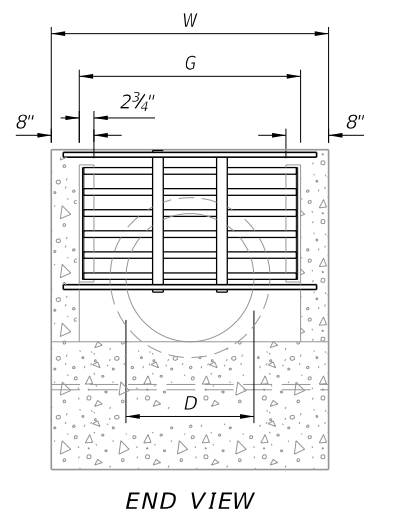
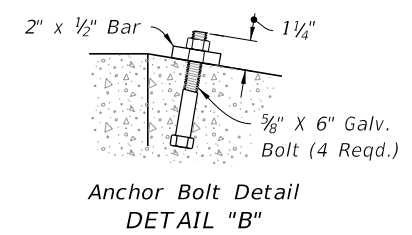
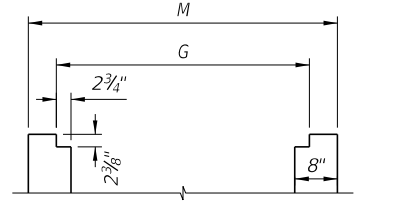
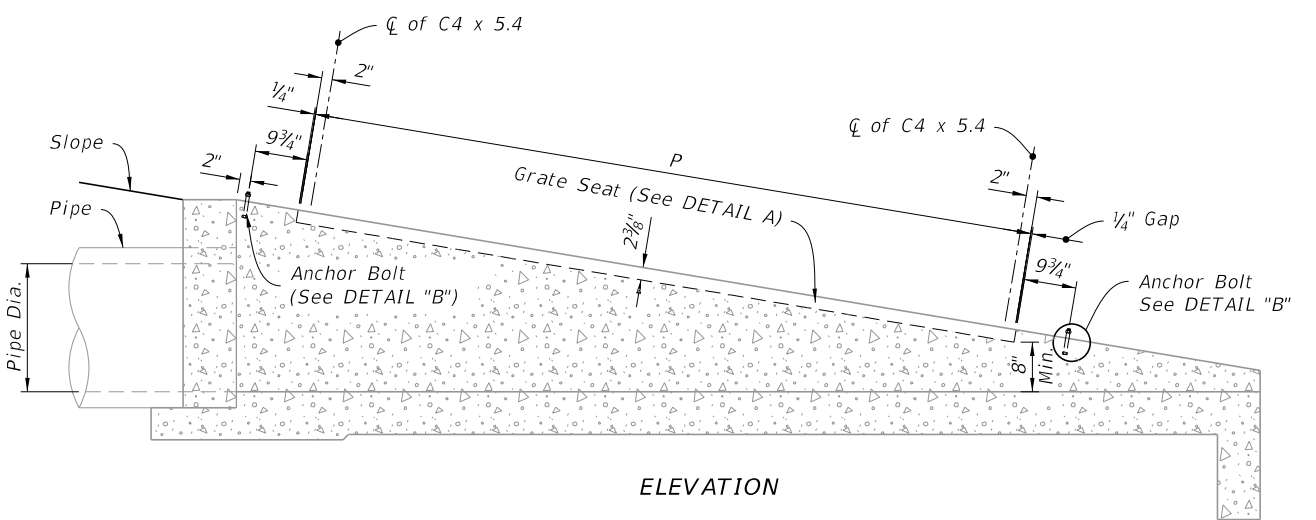
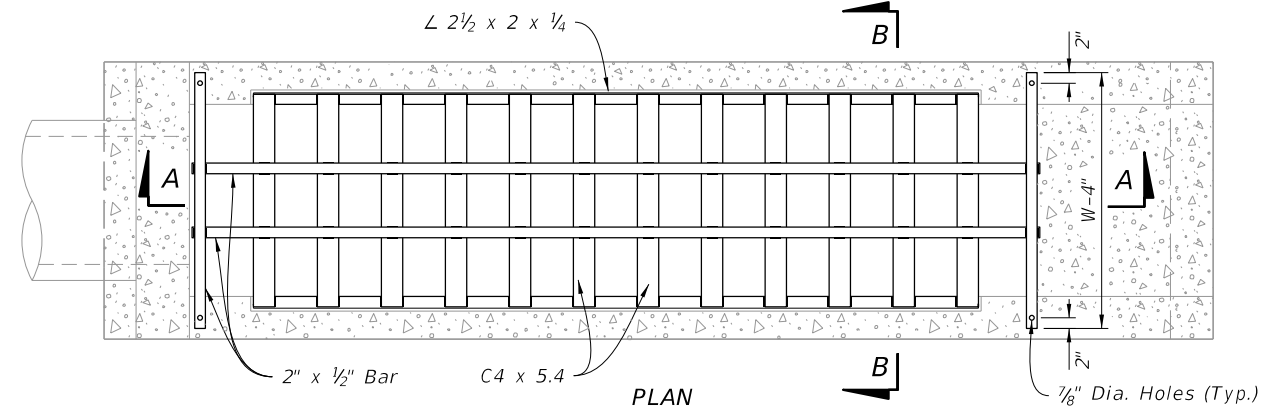
DIMENSIONS AND QUANTITIES FOR ONE U-ENDWALL										
Rate Of Slope	Pipe		L	Ht	W	Baffle Locations (When Required)			Class I Concrete Cu. Yd.	Reinf. Steel lbs.
	Dia.	Area (Sq. Ft.)				S	B	C		
1 : 3	15"	1.23	5'-3"	1'-9"	3'-7"	1'-9"	1'-9"	1'-9"	1.19	51
	18"	1.77	6'-0"	2'-0"	3'-10"	2'-0"	2'-0"	2'-0"	1.42	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
1 : 6	15"	1.23	12'-4"	3'-1"	4'-10"	4'-2"	4'-2"	4'-0"	3.34	124
	18"	1.77	11'-6"	1'-11"	3'-7"	3'-10"	3'-10"	3'-10"	2.19	89
	24"	3.14	13'-0"	2'-2"	3'-10"	4'-4"	4'-4"	4'-4"	2.63	103
	30"	4.91	16'-0"	2'-8"	4'-4"	5'-4"	5'-4"	5'-4"	3.59	143
			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

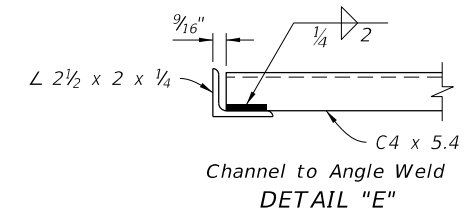
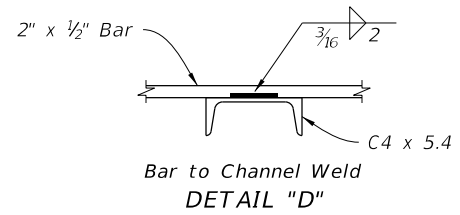
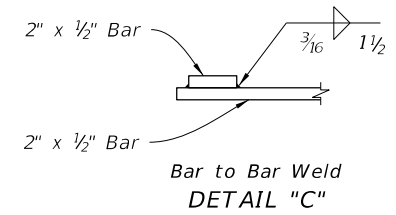
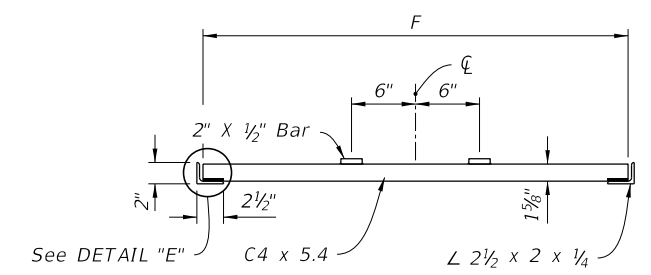
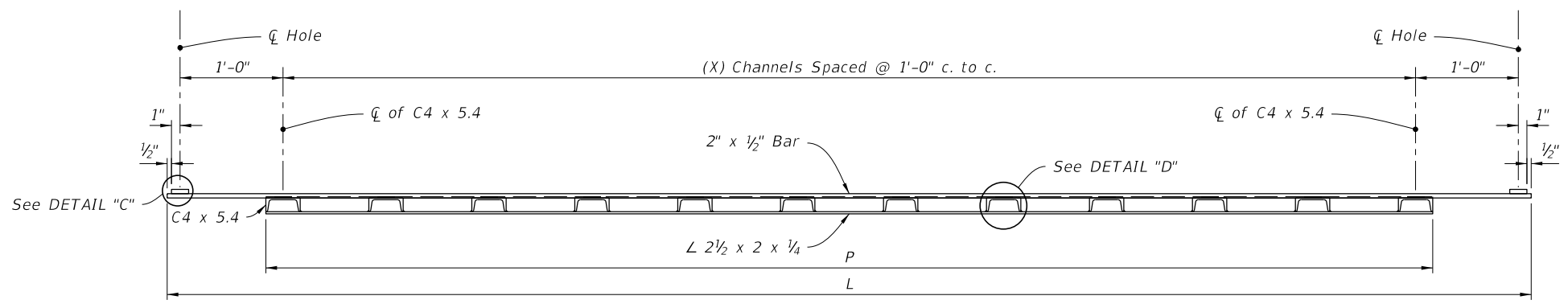
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TABLE OF DIMENSIONS AND QUANTITIES FOR ONE GRATE

Rate of Slope	Size Dia.	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"	lbs	(X)	F	lbs	P	lb	
1:3	15"	2' -8 1/2"	4'-3"	3'-3"	51	3	2' -6 7/8"	42	2'-4"	17	110
	18"	2' -11 1/2"	5'-3"	3'-6"	60	4	2' -9 7/8"	61	3'-4"	24	145
	24"	3' -5 1/2"	6'-3"	4'-0"	70	5	3' -3 7/8"	90	4'-4"	31	191
	30"	3' -11 1/2"	8'-3"	4'-6"	87	7	3' -9 7/8"	145	6'-4"	46	278
1:4	15"	2' -8 1/2"	6'-3"	3'-3"	65	5	2' -6 7/8"	70	4'-4"	32	167
	18"	2' -11 1/2"	7'-3"	3'-6"	73	6	2' -9 7/8"	92	5'-4"	39	204
	24"	3' -5 1/2"	9'-3"	4'-0"	90	8	3' -3 7/8"	144	7'-4"	53	287
	30"	3' -11 1/2"	11'-3"	4'-6"	107	10	3' -9 7/8"	206	9'-4"	68	381
1:6	15"	2' -8 1/2"	9'-3"	3'-3"	85	8	2' -6 7/8"	111	7'-4"	53	249
	18"	2' -11 1/2"	10'-3"	3'-6"	94	9	2' -9 7/8"	137	8'-4"	62	292
	24"	3' -5 1/2"	13'-3"	4'-0"	117	12	3' -3 7/8"	215	11'-4"	82	414
	30"	3' -11 1/2"	16'-3"	4'-6"	141	15	3' -9 7/8"	310	14'-4"	104	555



STEEL GRATE MOUNTING



STEEL GRATE DETAILS

STEEL GRATE OPTION

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LAST REVISION 11/01/19	REVISION	DESCRIPTION:
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FDOT
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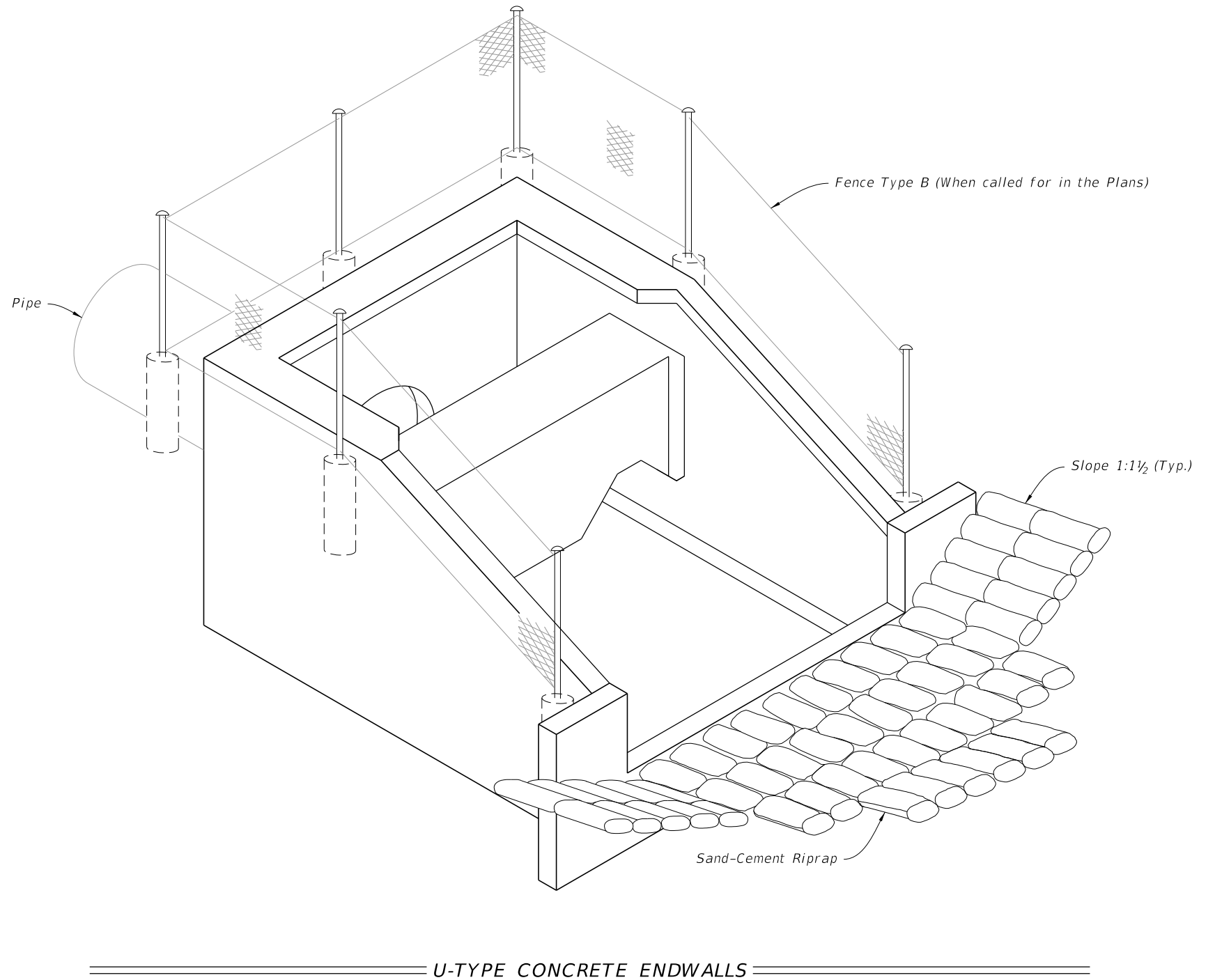
U-TYPE CONCRETE ENDWALLS BAFFLES
& GRATE OPTIONAL 15" TO 30" PIPE

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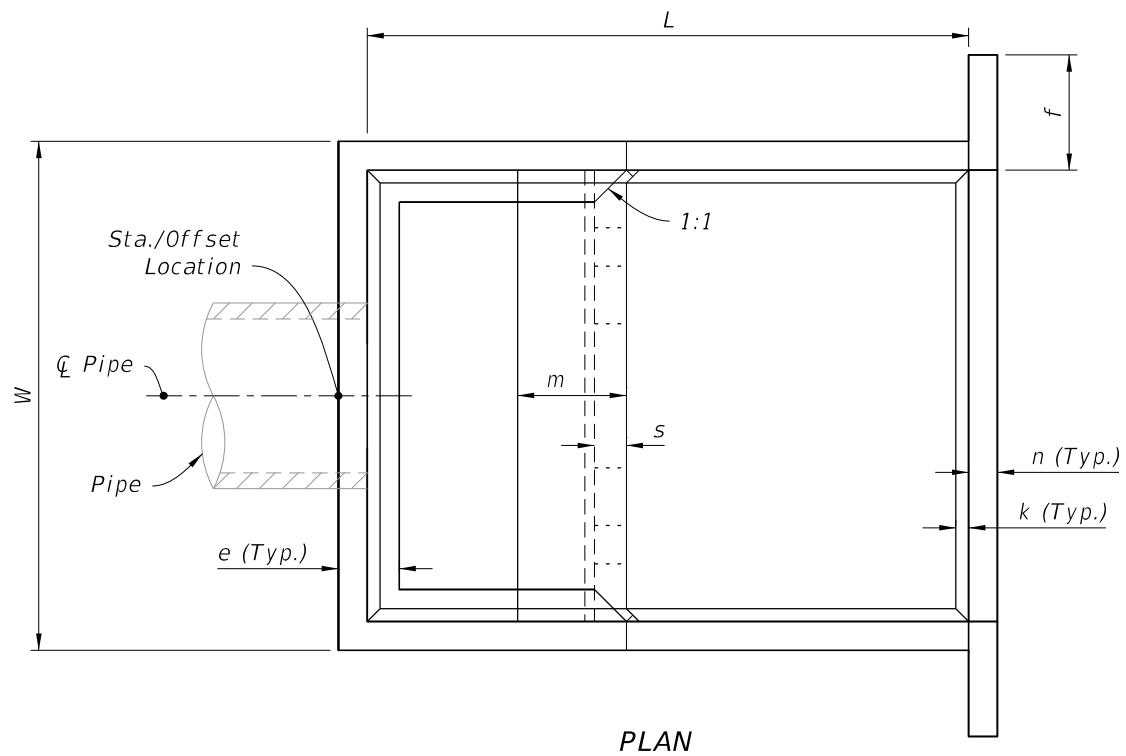
GENERAL NOTES:

1. Use Class I concrete.
2. Chamfer all exposed edges $\frac{3}{4}$ ".
3. See Index 550-002 for details of Type B fencing.
4. Quantities shown are for estimating purposes only.

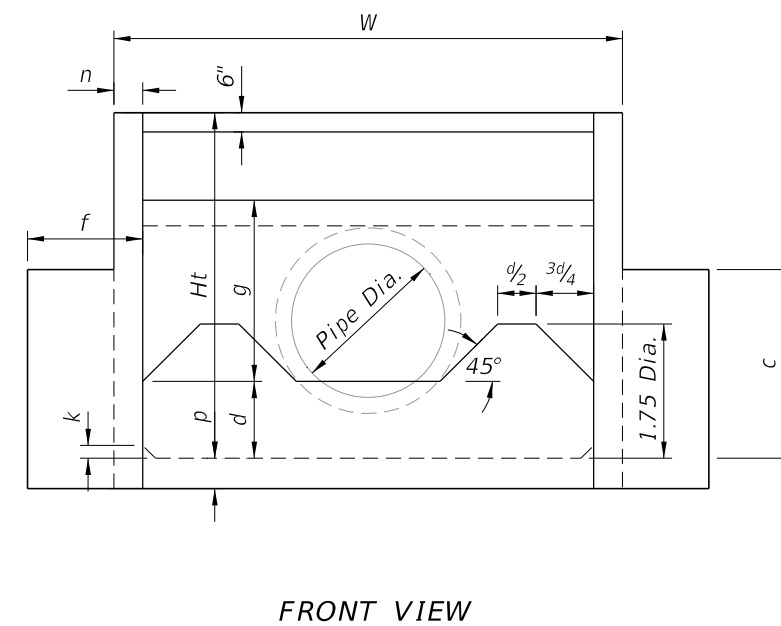
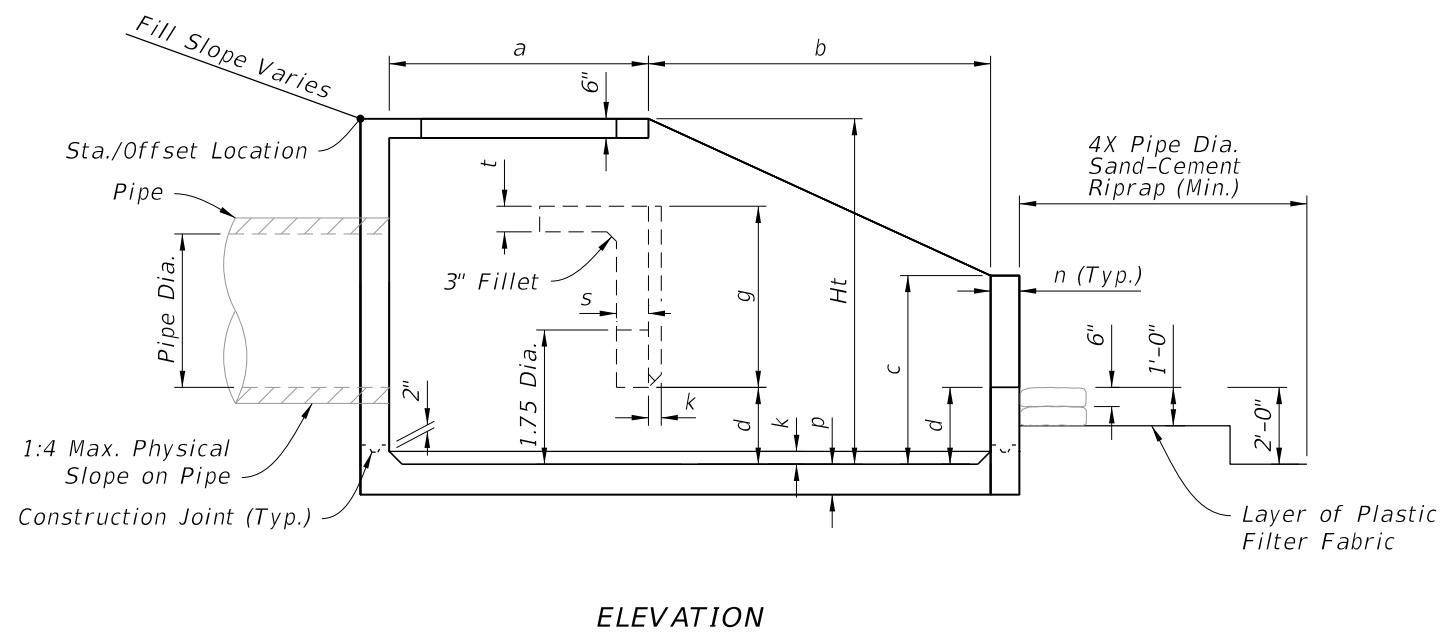
TABLE OF CONTENTS:	
Sheet	Description
1	General Notes and Contents
2	Dimensional Details
3	Reinforcing Details and Bending Diagram



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Pipe		DIMENSION TABLE																Concrete (CY)	Reinf. Steel (lb)	Sand-Cement Riprap (Nom.) (CY)
Dia.	Area (SF)	Feet - Inches										Inches								
		W	Ht	L	a	b	c	d	e	f	g	m	n	p	s	t	k			
30"	4.91	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	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	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	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	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	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	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	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



DIMENSIONAL DETAILS

DIMENSIONAL DETAILS

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STANDARD PLANS

U-TYPE CONCRETE ENDWALL
ENERGY DISSIPATOR 30" TO 72" PIPE

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NOTES:

1. All bar dimensions are measured out to out.
2. All Bars are size #4 unless otherwise noted.
3. Install reinforcing steel with a minimum of 2" cover.
4. Bars B6 and B7 (N.S. and F.S.) equivalent in size to B₅ (cut and bend as required)
5. Bars V₁, V₂, V₃, V₄, V₅, H₁, H₂, H₃, H₄, and H₅ are straight bars.

LEGEND:

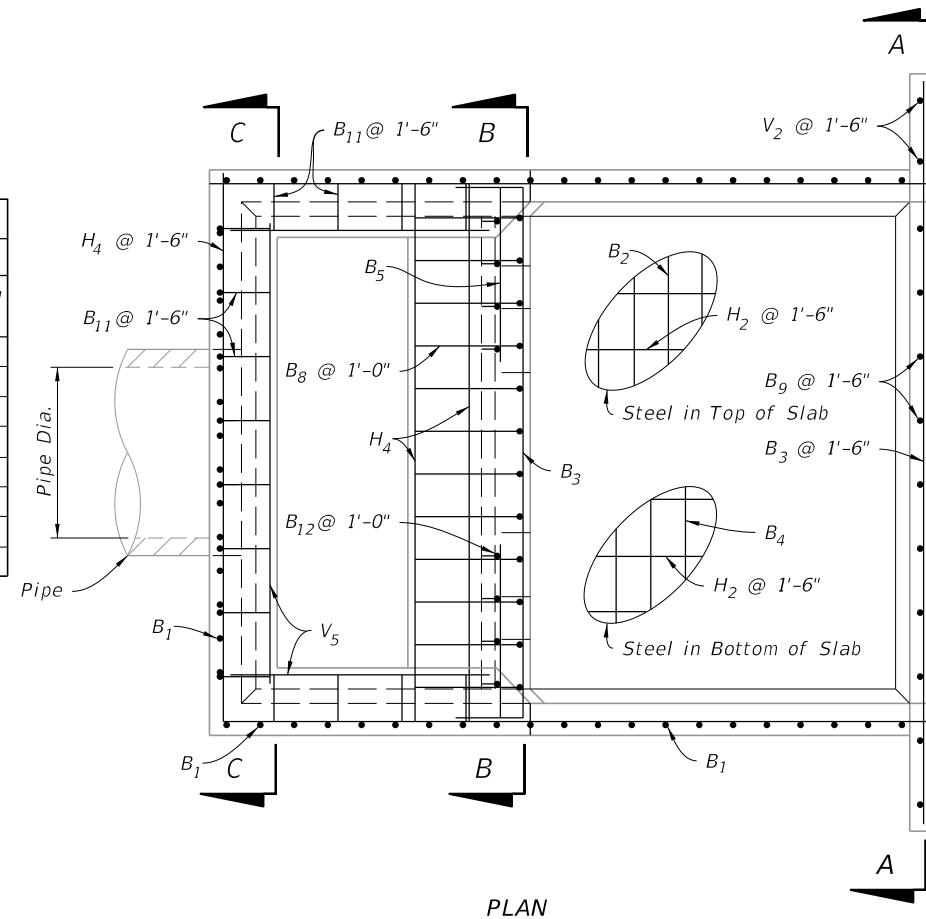
- H = Horizontal Bars
- V = Vertical Bars
- B = Bent Bars
- D = Dowels or Diagonal Bars

BENT BARS TABLE												
Pipe	B ₁		B ₂		B ₃		B ₃		B ₅		B ₁₀	
	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

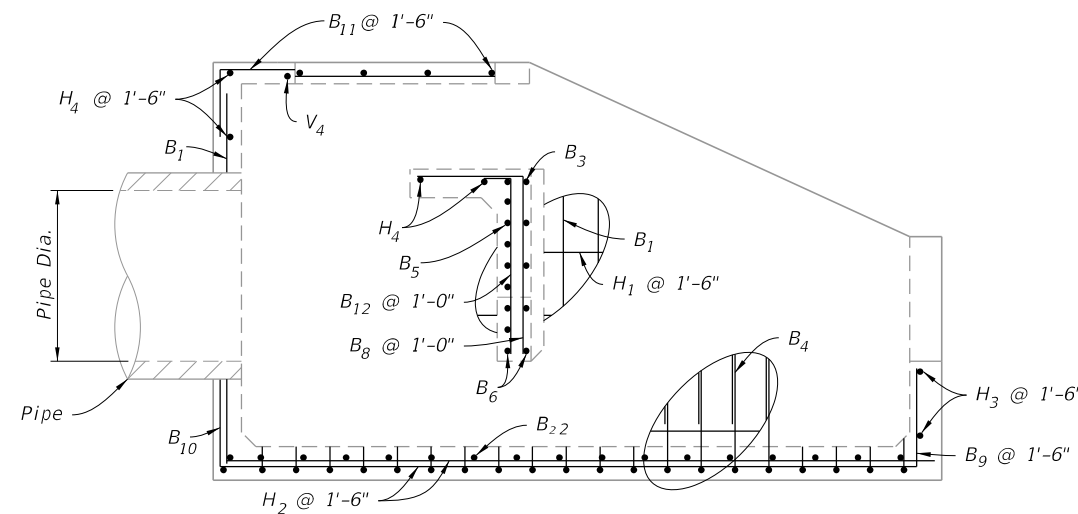
BARS B₅ B₈ B₁₀ B₁₁ B₁₂



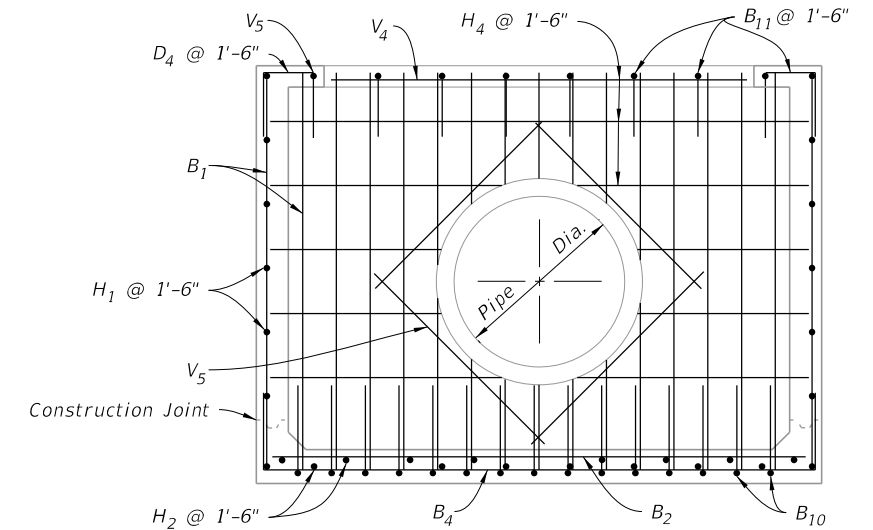
BAR B₄



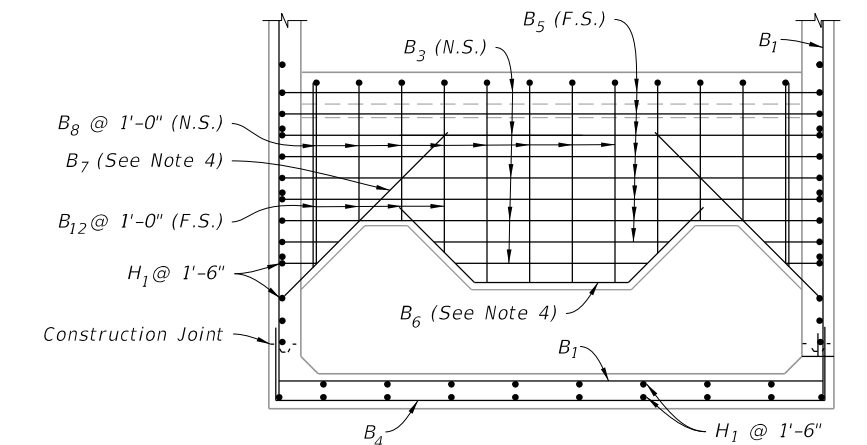
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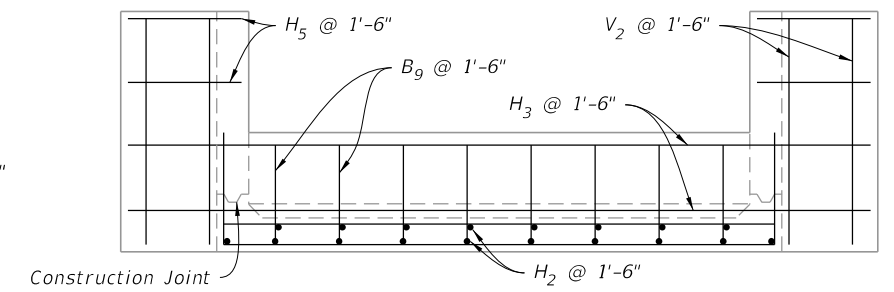
ELEVATION



SECTION C-C



SECTION B-B



SECTION A-A

BENDING DIAGRAM

REINFORCING DETAILS

REINFORCING DETAILS AND BENDING DIAGRAM

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LAST REVISION 11/01/19	DESCRIPTION:
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FY 2020-21
STANDARD PLANS

U-TYPE CONCRETE ENDWALL
ENERGY DISSIPATOR 30" TO 72" PIPE

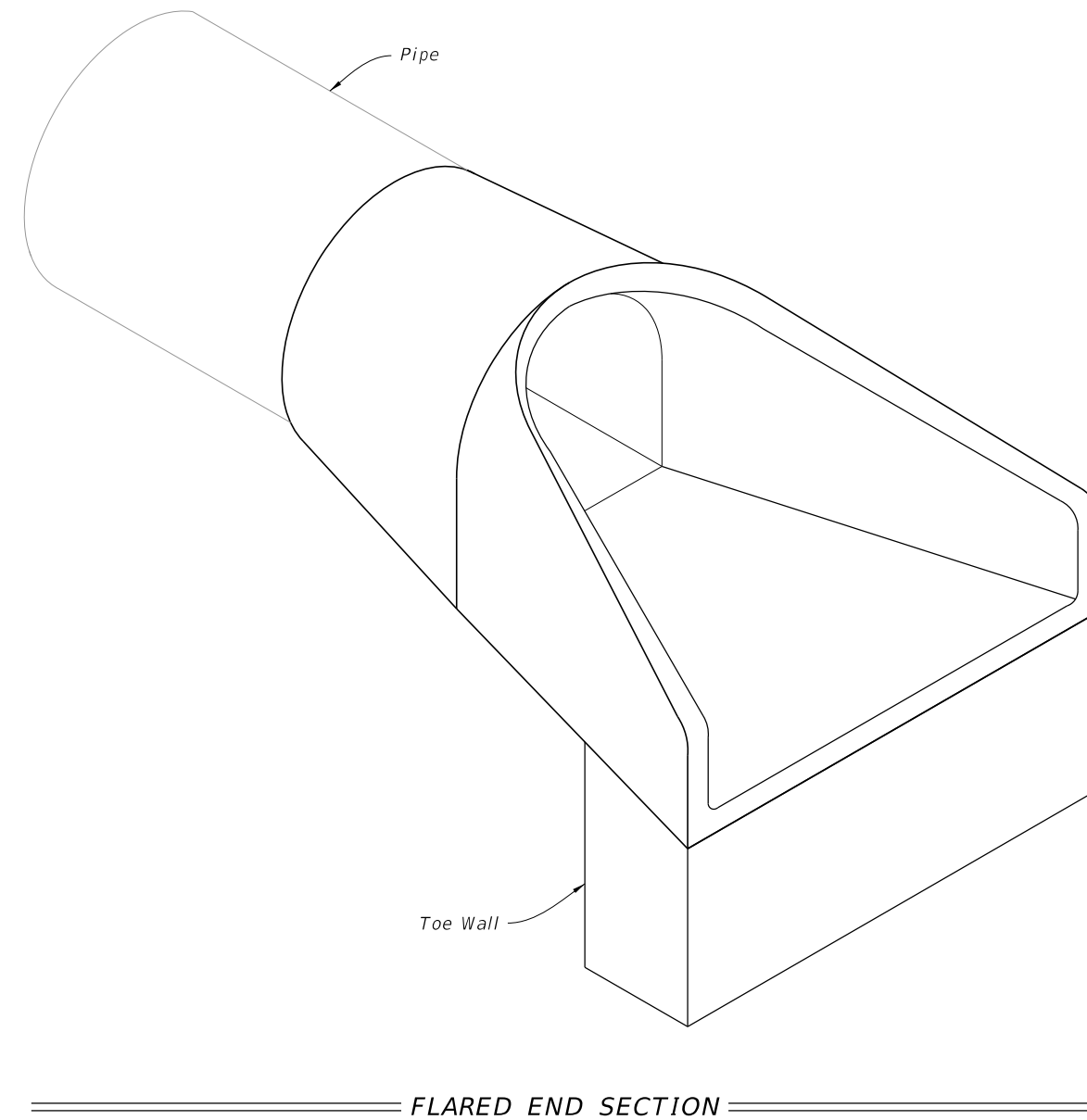
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GENERAL NOTES:

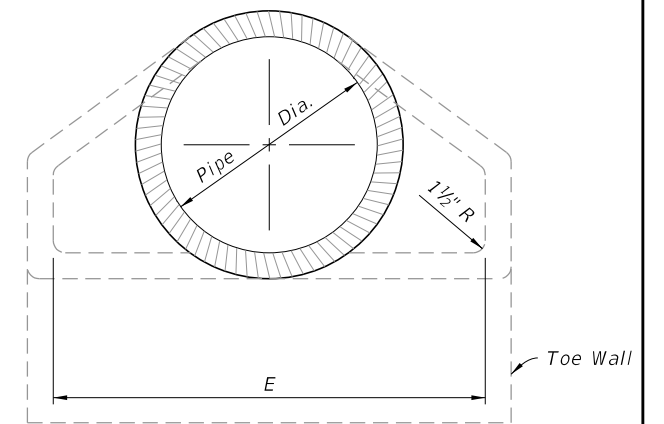
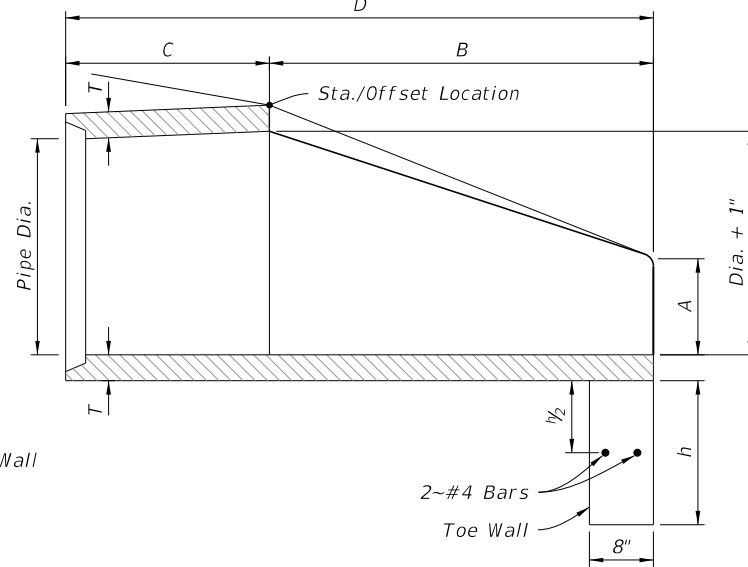
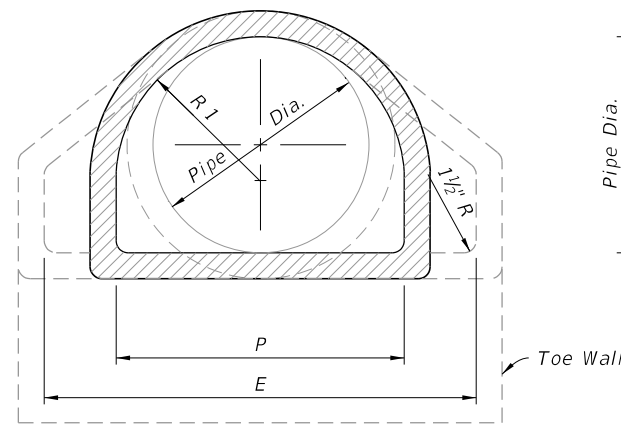
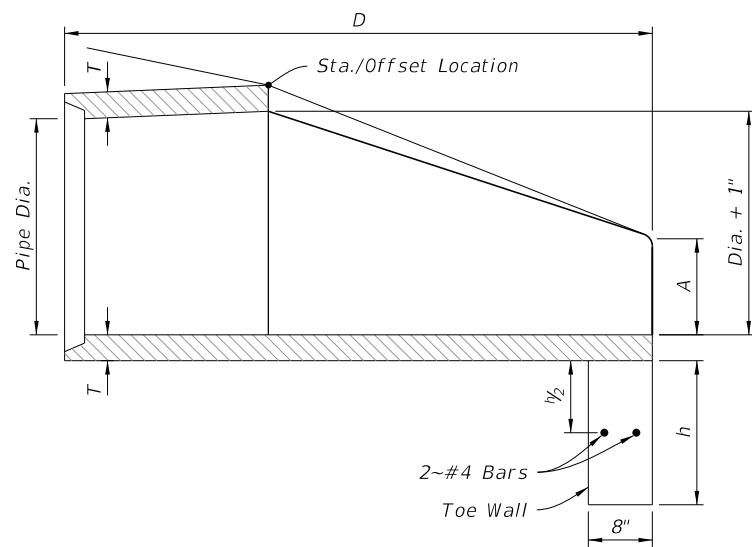
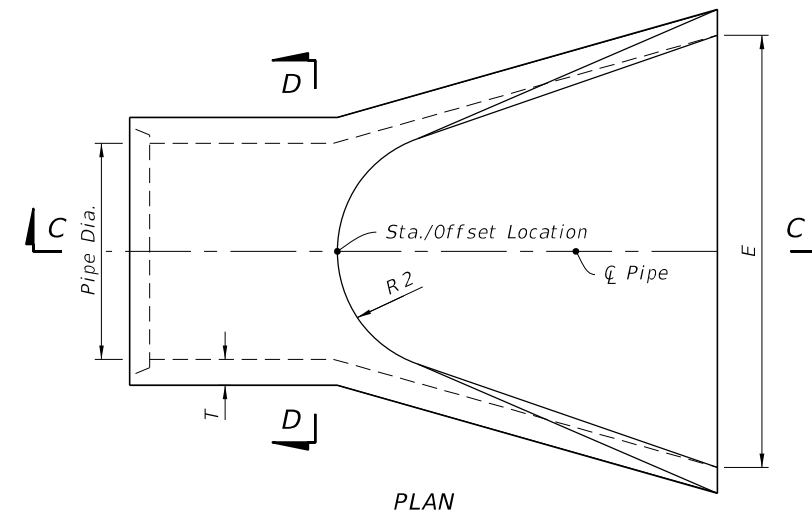
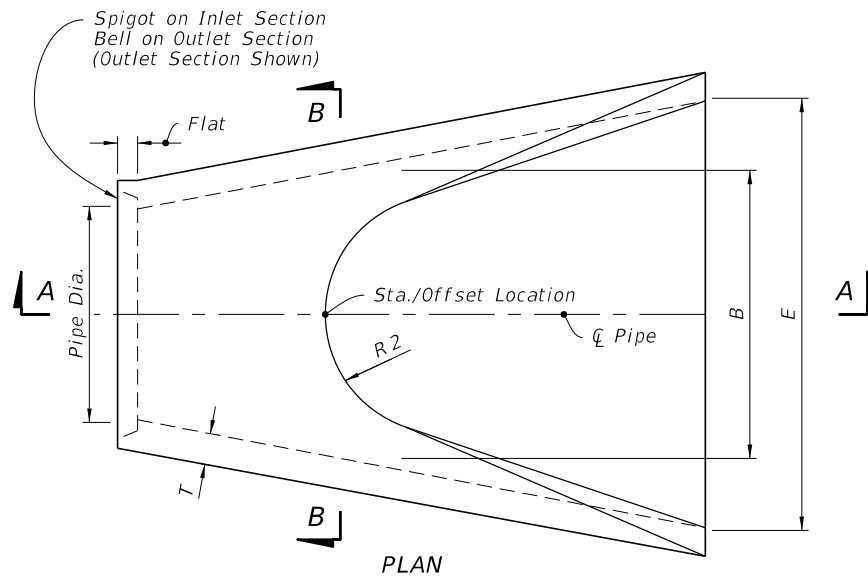
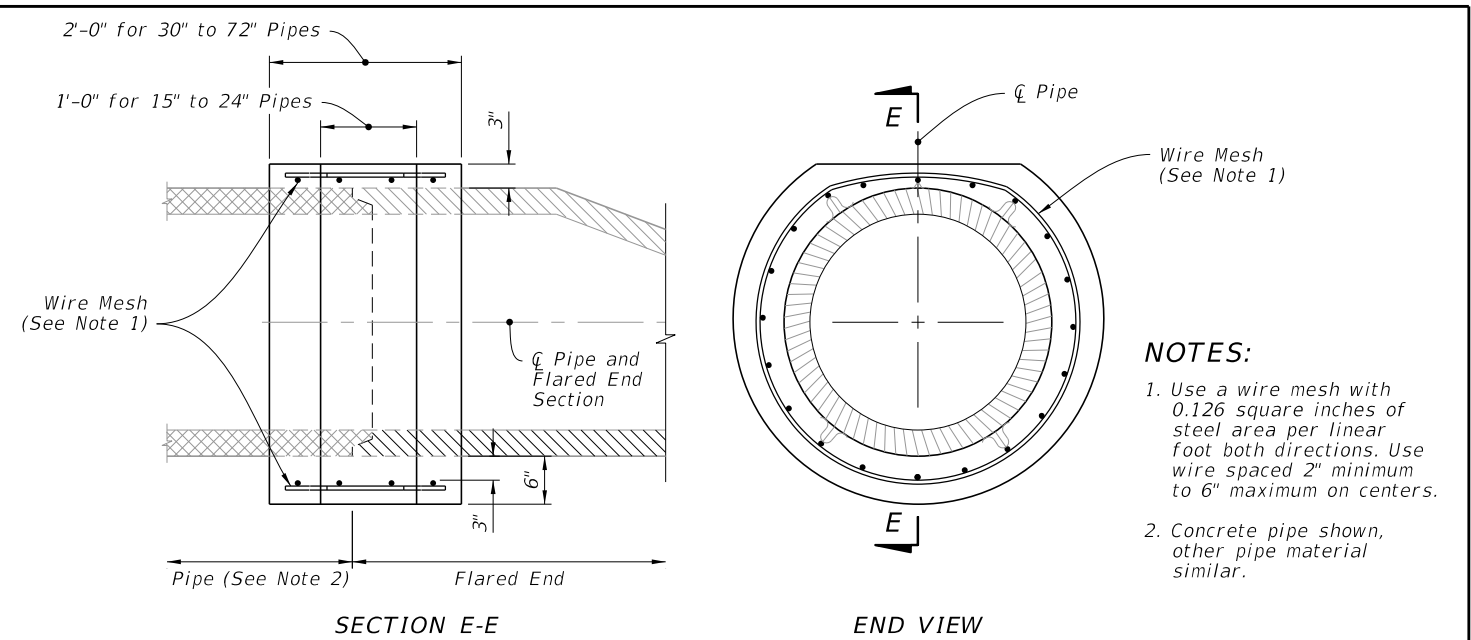
1. Provide flared end sections meeting the requirements of ASTM C76 with the exception that dimensions and reinforcement meet the criteria in the table on sheet 2. Circumferential reinforcement may consist of either one cage or two cages of steel. Use concrete compressive strength of 4000 psi.
2. Connections 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 manufacturer of the flared end sections must certify the compatibility of joint designs.
 - b. Joints sealed with preformed plastic gaskets. Use gaskets that meet the requirements Specification 942-2 of the Standard Specifications and the minimum sizes for gaskets as specified for equivalent sizes of elliptical pipe.
 - c. Reinforced concrete jackets, as detailed on sheet 2. When non-coated corrugated metal pipe is called for in the Plans, use bituminous coated pipe in the jacketed area as specified on Index 430-001. Construct concrete jacket as specified in Index 430-001.
3. Toe walls are to be cast-in-place using Class 1 Concrete.
4. On skewed pipe culverts place the flared end sections in line with the pipe culvert. Warp the side slopes as required to fit the flared end sections.
5. Quantities shown are for estimating purposes only.

TABLE OF CONTENTS:	
Sheet	Description
1	General Notes and Contents
2	Straight Flare and Optional Shape Details



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Pipe Dia.	T	Reinf. sq. in. Per Foot	Bell or Spigot	A	B	C	D	E	P	R 1	R 2	FLAT	h	Toe Wall Class I Conc. (CY.)
12"	2"	0.07	1½"	4"	2'-0"	4'-0⅞"	6'-0⅞"	2'-0"	19½⅞"	10½"	9"	3½"	12"	.06
15"	2¼"	0.07	2"	6"	2'-3"	3'-10"	6'-1"	2'-6"	24½⅞"	12½"	11"	3½"	12"	.07
18"	2½"	0.07	2½"	9"	2'-3"	3'-10"	6'-1"	3'-0"	29"	15½"	12"	4"	15"	.11
21"	2¾"	0.07	2¼"	9"	2'-11"	3'-2"	6'-1"	3'-6"	31⅞"	16½"	13"	4"	15"	.12
24"	3"	0.07	2½"	9½"	3'-7½"	2'-6"	6'-1½"	4'-0"	33¾"	16¾"	14"	4½"	18"	.17
27"	3¼"	0.148	2½"	10½"	4'-0"	2'-1½"	6'-1½"	4'-6"	36"	18⅞"	14½"	4½"	18"	.19
30"	3½"	0.148	3"	1'-0"	4'-6"	1'-7¾"	6'-1¾"	5'-0"	37"	18½"	15"	5"	21"	.24
36"	4"	0.148	3½"	1'-3"	5'-3"	2'-10¾"	8'-1¾"	6'-0"	47½⅞"	24½"	20"	5½"	21"	.29
42"	4½"	0.148	3¾"	1'-9"	5'-3"	2'-11"	8'-2"	6'-6"	53⅞"	27½"	22"	5½"	24"	.36
48"	5"	0.148	4¼"	2'-0"	6'-0"	2'-2"	8'-2"	7'-0"	56½"	28½"	22"	5¾"	24"	.39
54"	5½"	0.174	4¾"	2'-3"	5'-5"	2'-11"	8'-4"	7'-6"	65½"	33⅞"	24"	6¼"	24"	.42
60"	6"	0.174	5"	2'-6"	5'-0"	3'-3"	8'-3"	8'-0"	72½"	36½"	24"	6¾"	24"	.44
66"	6½"	0.174	5½"	2'-0"	6'-6"	1'-9"	8'-3"	8'-6"	72"	36⅞"	24"	7¼"	24"	.47
72"	7"	0.174	6"	2'-0"	6'-6"	1'-9"	8'-3"	9'-0"	77½⅞"	38½"	24"	7¾"	24"	.50



STRAIGHT FLARE

OPTIONAL SHAPE

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LAST REVISION 11/01/19

DESCRIPTION:



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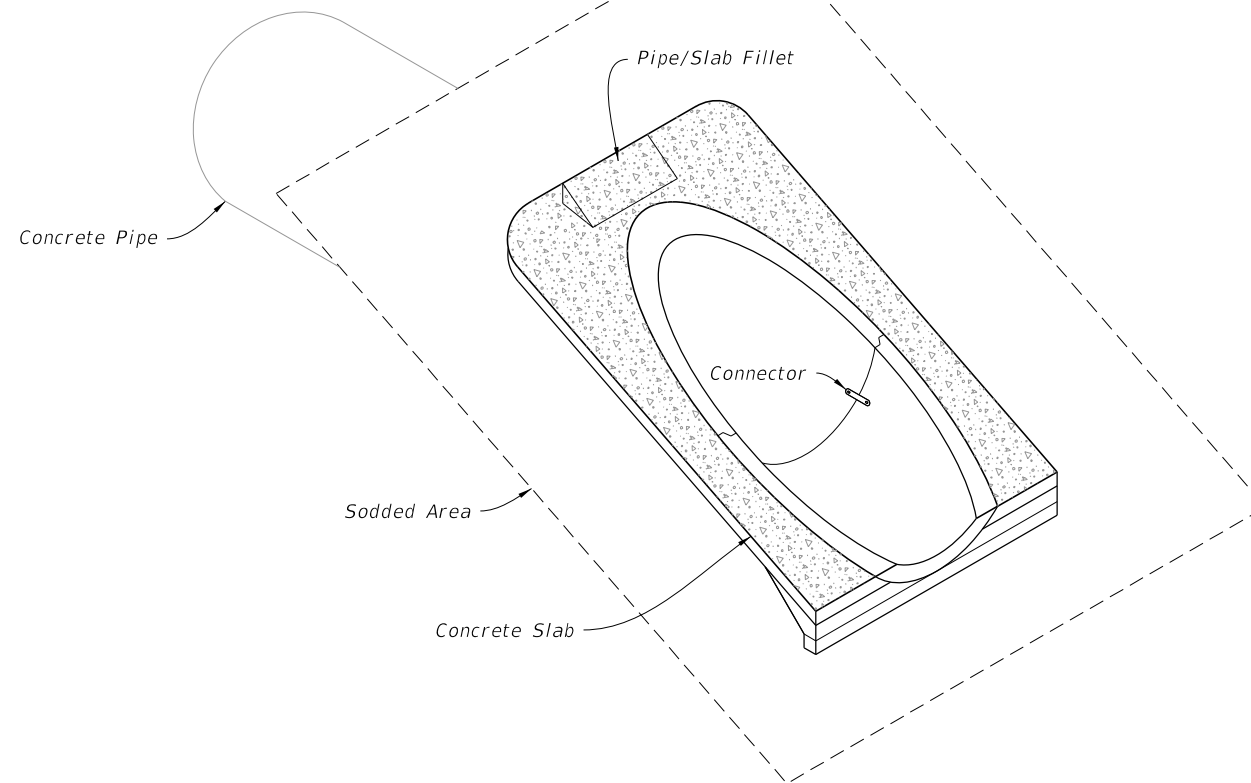
FLARED END SECTION

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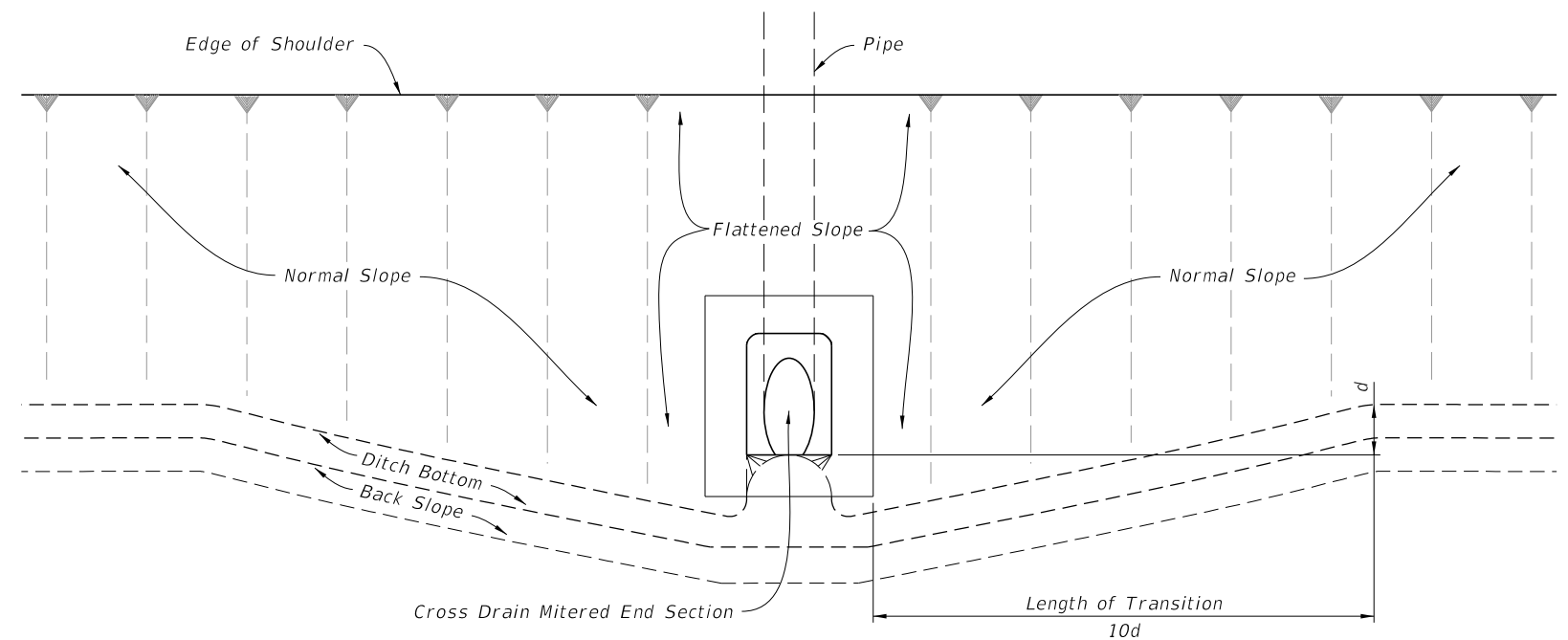
GENERAL NOTES:

1. Unless otherwise designated in the plans, concrete pipe mitered end sections may be used with any type of 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, construct the mitered end sections with like pipe or concrete pipe. When the mitered end section pipe is dissimilar to the cross 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 PP pipe, with metal pipe. When used in conjunction with a concrete mitered end sections, construct concrete jacket in accordance with Index 430-001.
3. Class NS concrete cast-in-place reinforced slabs are required for all sizes of cross drain pipes. Construct slabs at 5½" thick, unless 3" thickness is called for in the Plans.
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 cross 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 \bar{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 \bar{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.



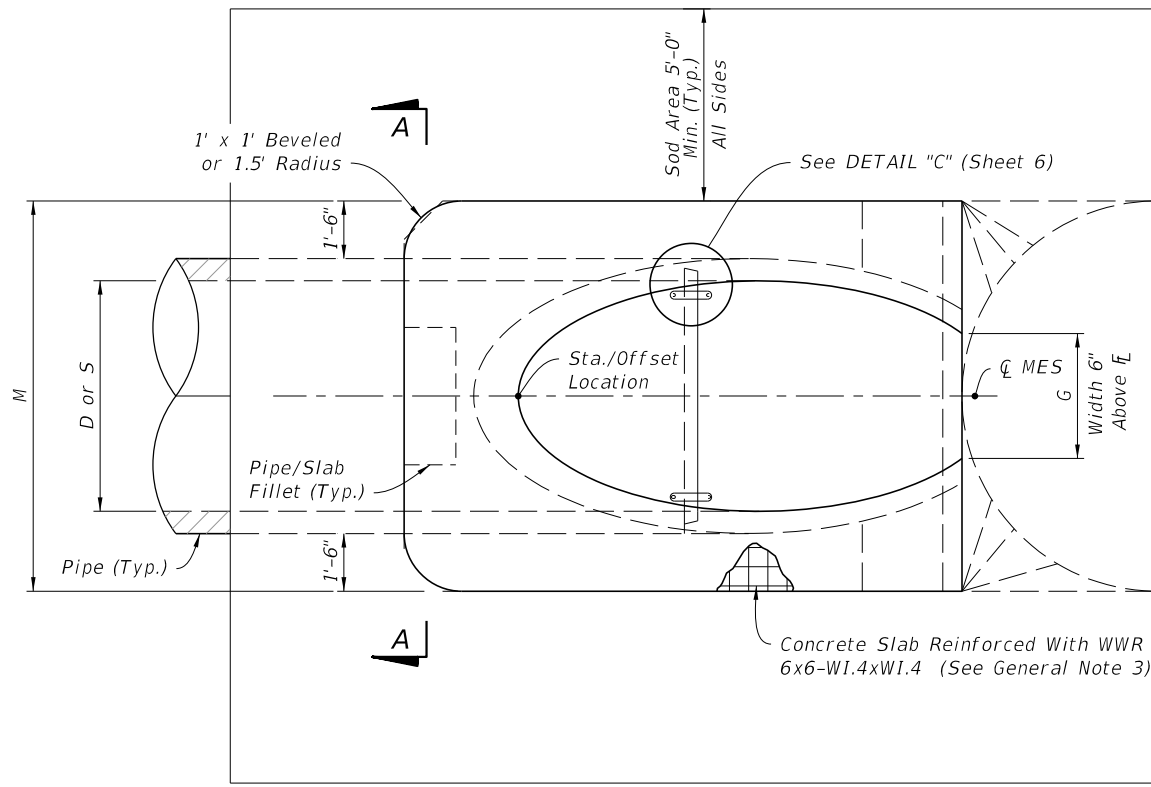
CROSS DRAIN MITERED END SECTION
(Concrete Pipe Shown, Corrugated Metal Pipe Similar)

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Sheet	Description
1	General Notes and Contents
2	Single and Multiple Concrete Pipe
3	Concrete Pipe Dimensions and Quantities
4	Single and Multiple Corrugated Metal Pipe
5	Corrugated Metal Pipe Dimensions and Quantities
6	Concrete Pipe Connections and Corrugated Metal Pipe (CMP) Anchor Detail

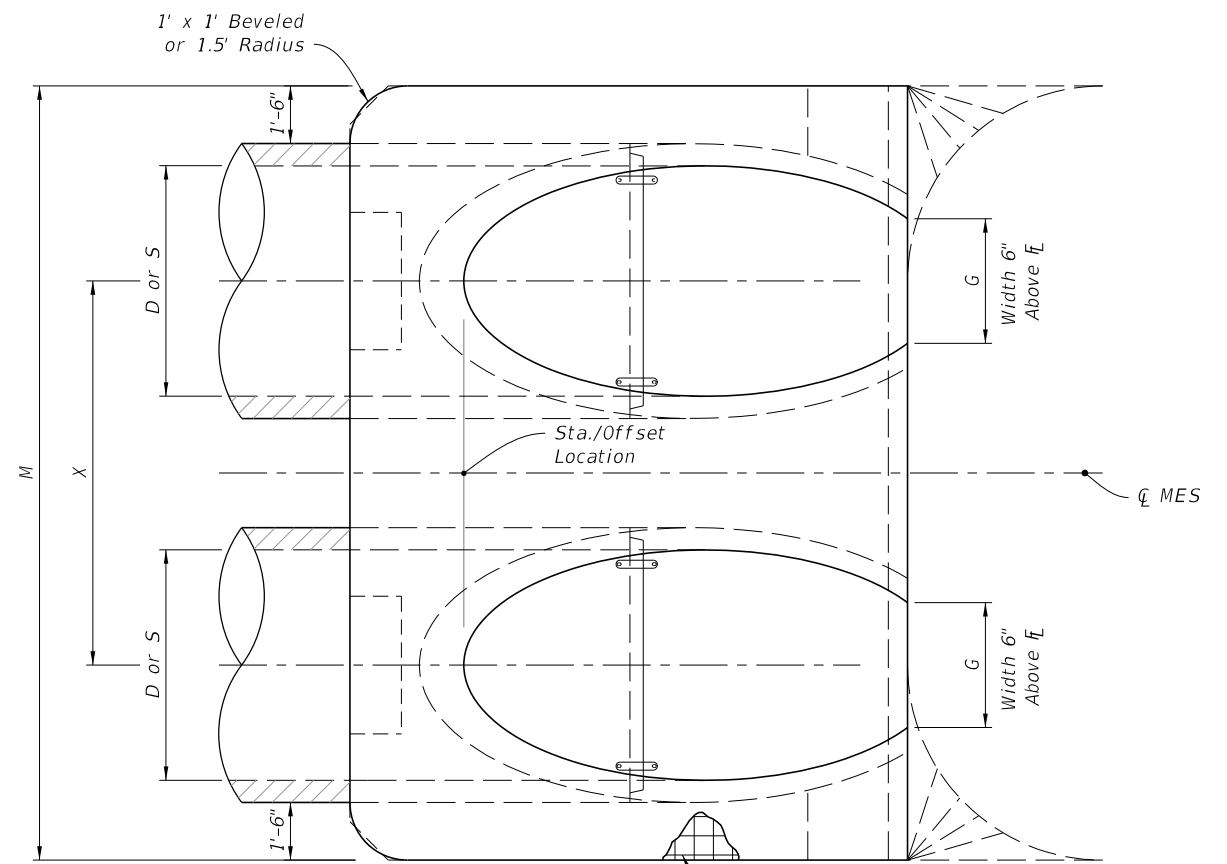


SLOPE AND DITCH TRANSITIONS

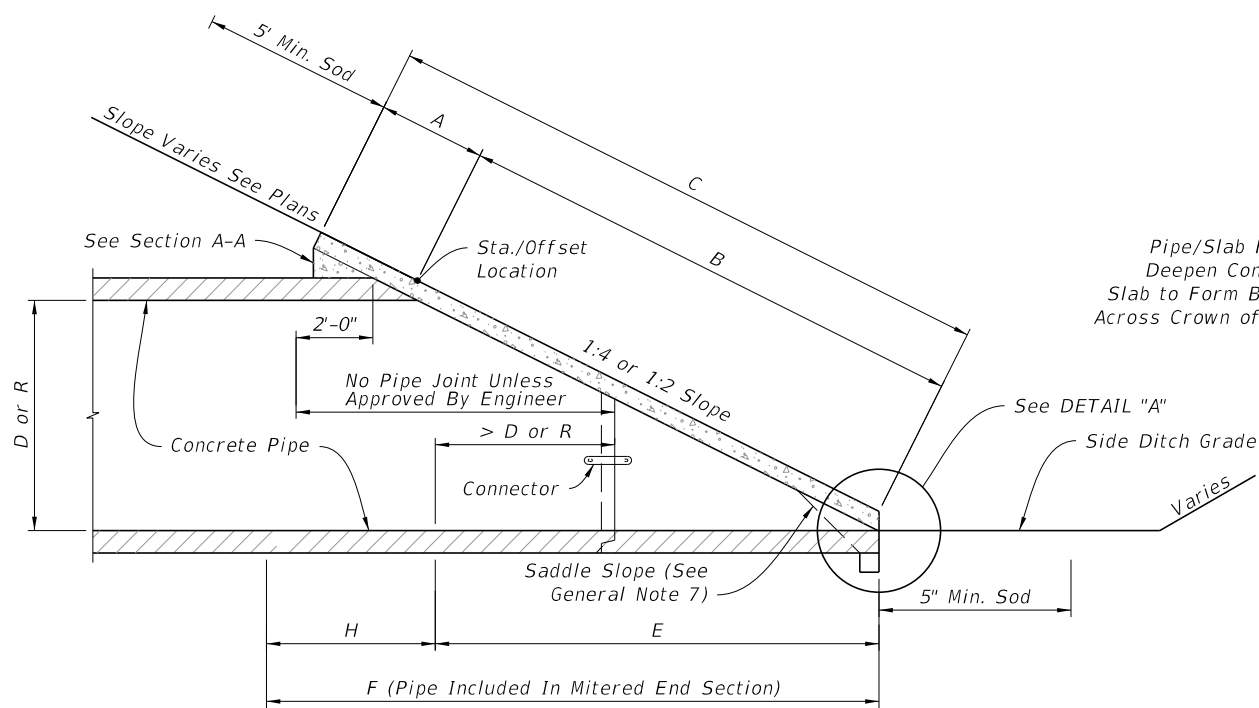
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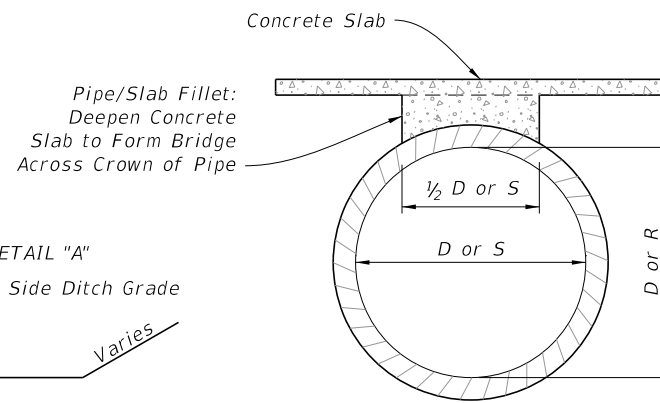
PLAN - SINGLE PIPE



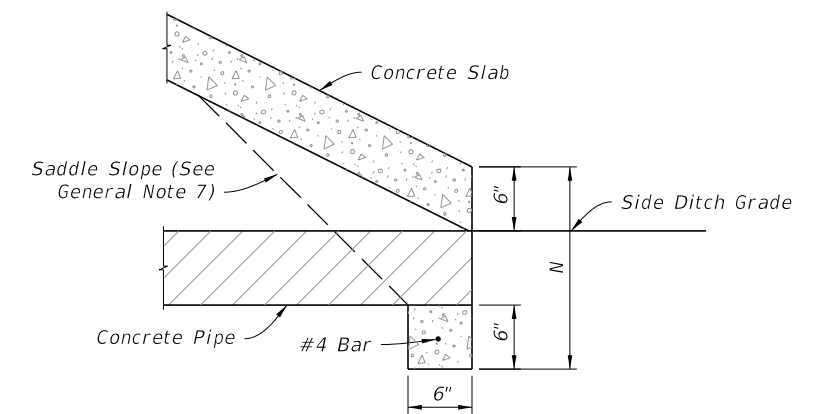
PLAN - MULTIPLE PIPE



ELEVATION



SECTION A-A
(Pipe/Slab Fillet)



DETAIL "A"

ROUND CONCRETE PIPE
(Elliptical Pipe Similar)

NOTE: See Table 1 on Sheet 3 for Dimensions and Quantities.

SINGLE AND MULTIPLE CONCRETE PIPE

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LAST REVISION 11/01/19	DESCRIPTION:
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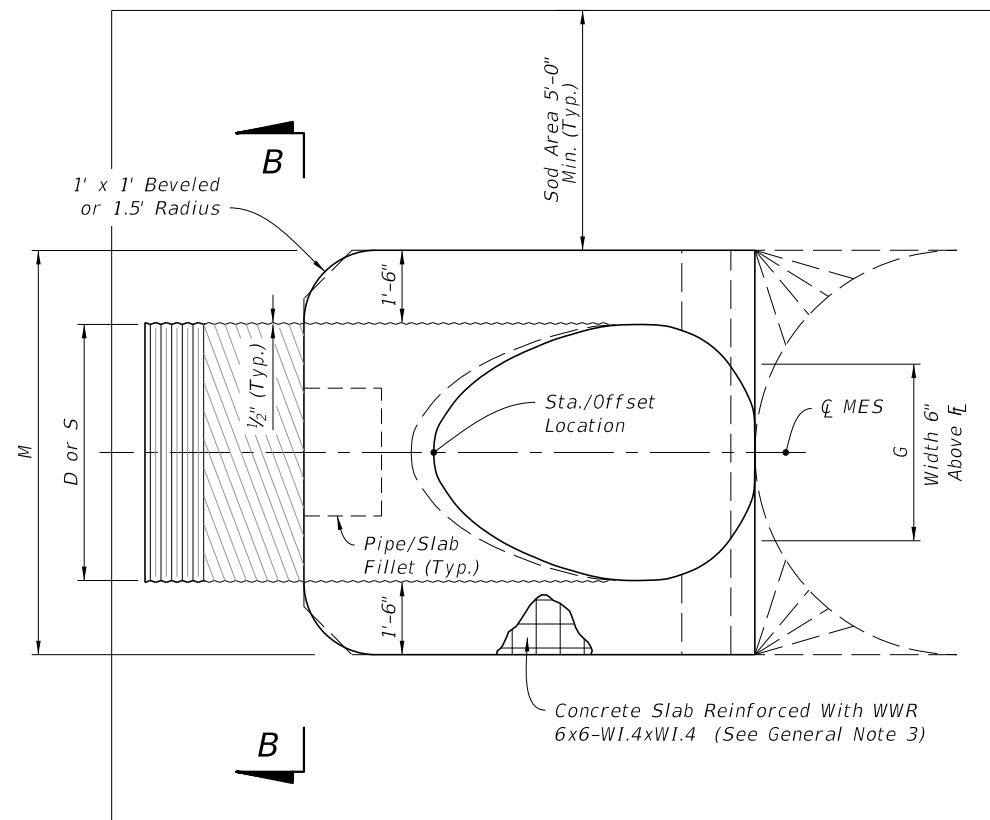


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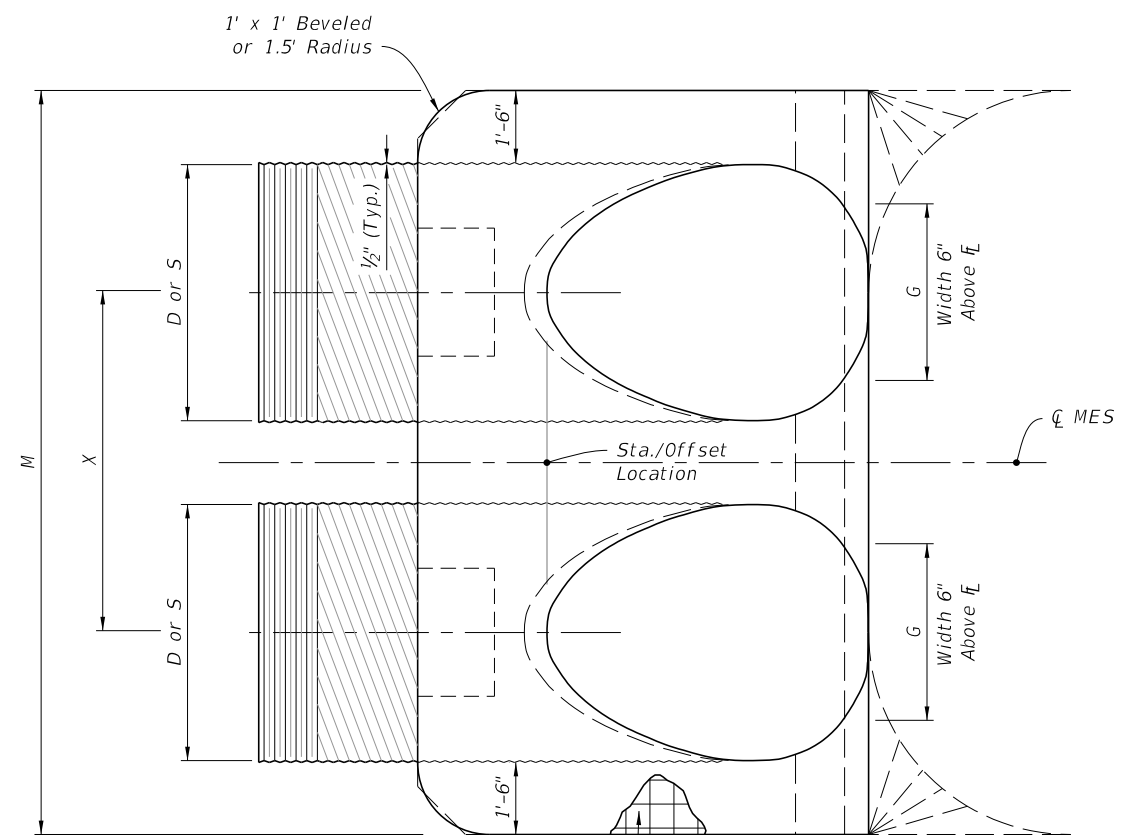
CROSS DRAIN MITERED END SECTION

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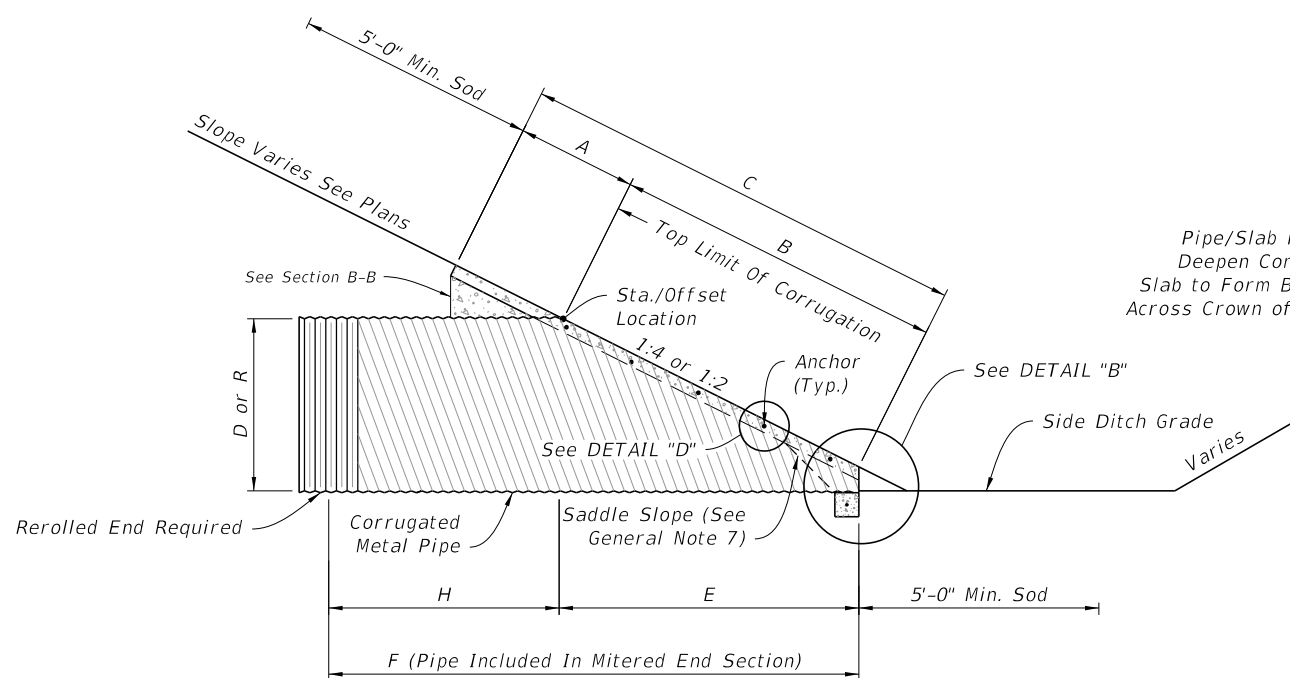
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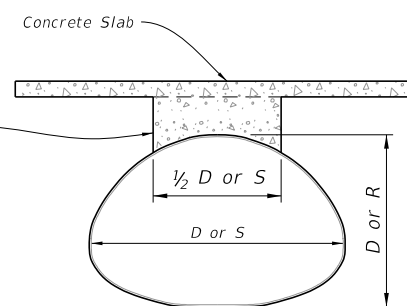
PLAN - SINGLE PIPE



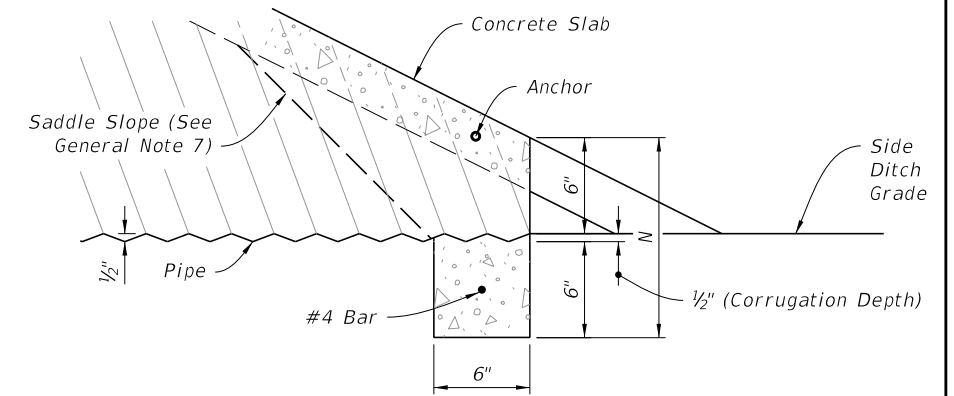
PLAN - MULTIPLE PIPE



ELEVATION



SECTION B-B
(Pipe/Slab Fillet)



DETAIL "B"

ARCHED CORRUGATED METAL PIPE
(Round Pipe Similar)

NOTE: See Table 2 on Sheet 5 for Dimensions and Quantities.

SINGLE AND MULTIPLE CORRUGATED METAL PIPE

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**TABLE 2
SINGLE AND MULTIPLE CORRUGATED METAL PIPE DIMENSIONS AND QUANTITIES**

	Dia. D	Rise R	Span S	X	A	B	C	E	F	G	H	M				N	5 1/2" CONC. SLAB (CY) (See General Note 3)				3" CONC. SLAB (CY) (See General Note 3)				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	Single Pipe	Double Pipe	Triple Pipe	Quad. Pipe	
Round Corrugated Metal 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	0.24	0.37	0.51	0.64	21	24	27	29
		18"	---	---	2'-10"	2.5'	2.24'	4.74'	2.0'	6.0'	1.41'	4.0'	4.58'	7.42'	10.25'	13.08'	1.04'	0.38	0.62	0.87	1.12	0.26	0.43	0.61	0.78	22	25	28	31
		24"	---	---	3'-5"	2.5'	3.35'	5.85'	3.0'	7.0'	1.73'	4.0'	5.08'	8.50'	11.92'	15.33'	1.04'	0.47	0.76	1.05	1.34	0.32	0.52	0.72	0.91	23	27	31	35
		30"	---	---	4'-3"	2.5'	4.47'	6.97'	4.0'	8.0'	2.00'	4.0'	5.58'	9.83'	14.08'	18.33'	1.04'	0.57	0.96	1.37	1.77	0.38	0.64	0.91	1.18	25	30	35	39
		36"	---	---	5'-1"	2.5'	5.59'	8.09'	5.0'	9.0'	2.24'	4.0'	6.08'	11.17'	16.25'	21.33'	1.04'	0.67	1.19	1.72	2.26	0.44	0.78	1.13	1.48	27	33	38	44
		42"	---	---	6'-0"	2.5'	6.71'	9.21'	6.0'	10.0'	2.45'	4.0'	6.58'	12.58'	18.58'	24.58'	1.04'	0.78	1.48	2.17	2.87	0.51	0.96	1.41	1.87	29	36	42	49
		48"	---	---	6'-9"	2.5'	7.83'	10.33'	7.0'	11.0'	2.65'	4.0'	7.08'	13.83'	20.58'	27.33'	1.04'	0.89	1.71	2.54	3.36	0.57	1.09	1.63	2.15	31	38	46	53
		54"	---	---	7'-8"	2.5'	8.94'	11.44'	8.0'	12.0'	2.83'	4.0'	7.58'	15.25'	22.92'	30.58'	1.04'	1.02	2.06	3.10	4.14	0.65	1.32	1.99	2.66	33	41	50	58
	60"	---	---	8'-6"	2.5'	10.06'	12.56'	9.0'	13.0'	3.00'	4.0'	8.08'	16.58'	25.08'	33.58'	1.04'	1.14	2.38	3.63	4.89	0.71	1.49	2.28	3.07	34	44	53	63	
	1:4 Slope	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'	0.44	0.68	0.91	1.15	0.31	0.47	0.63	0.79	22	25	28	31
		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'	0.49	0.77	1.03	1.31	0.34	0.53	0.71	0.90	24	27	30	33
		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'	0.65	1.09	1.38	1.77	0.44	0.69	0.92	1.18	27	30	34	38
		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'	0.81	1.34	1.90	2.44	0.53	0.88	1.25	1.60	29	34	39	44
		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'	0.97	1.68	2.41	3.14	0.62	1.07	1.53	2.00	32	38	44	49
		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'	1.13	2.08	3.06	4.02	0.71	1.30	1.92	2.52	35	42	48	55
		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'	1.29	2.49	3.69	4.88	0.80	1.54	2.29	3.02	38	46	53	60
		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'	1.48	2.98	4.47	5.98	0.91	1.83	2.74	3.67	41	49	58	66
	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'	1.66	3.49	5.31	7.13	1.02	2.15	3.27	4.39	44	53	63	72	
Corrugated Metal Pipe Arch	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	0.33	0.49	0.65	0.81	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	0.33	0.50	0.67	0.83	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	0.37	0.56	0.76	0.95	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	0.40	0.62	0.84	1.07	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	0.43	0.70	0.98	1.25	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	0.49	0.82	1.15	1.48	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	0.55	0.95	1.35	1.75	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	0.62	1.10	1.57	2.05	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	0.69	1.24	1.80	2.35	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	0.38	0.56	0.74	0.92	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	0.39	0.59	0.80	0.95	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	0.43	0.64	0.88	1.10	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	0.49	0.77	1.05	1.33	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	0.57	0.92	1.27	1.62	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	0.65	1.08	1.50	1.93	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	0.76	1.30	1.83	2.37	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	0.87	1.55	2.18	2.83	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	0.95	1.68	2.43	3.17	40	48	57	66		

CORRUGATED METAL PIPE DIMENSIONS AND QUANTITIES

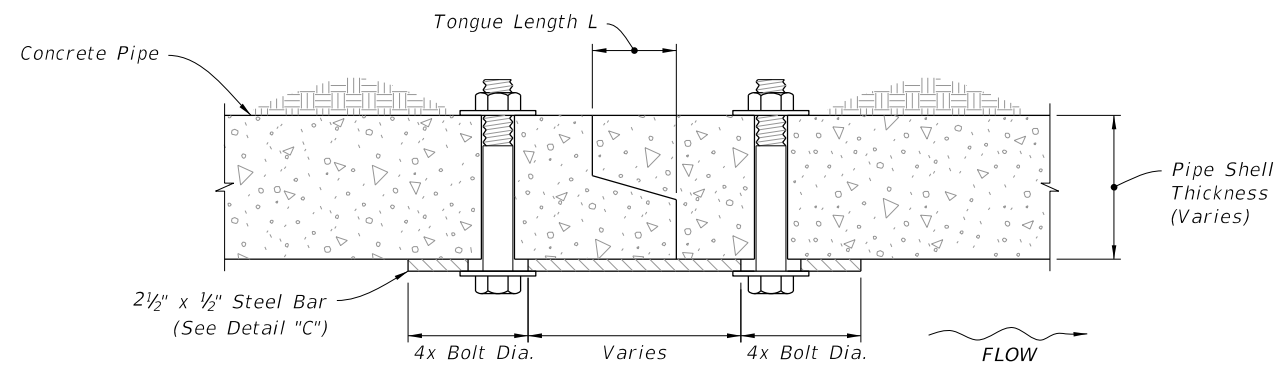
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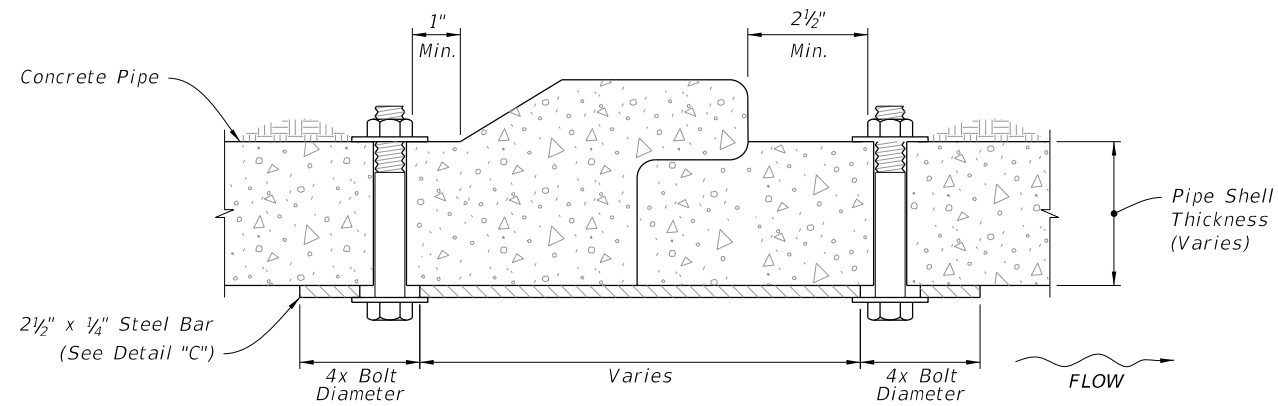


CROSS DRAIN MITERED END SECTION

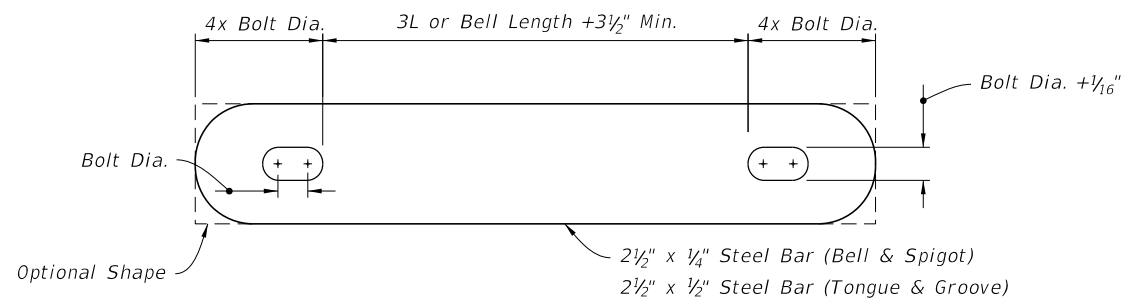
INDEX 430-021	SHEET 5 of 6
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TONGUE AND GROOVE CONNECTOR DETAIL



BELL AND SPIGOT CONNECTOR DETAIL



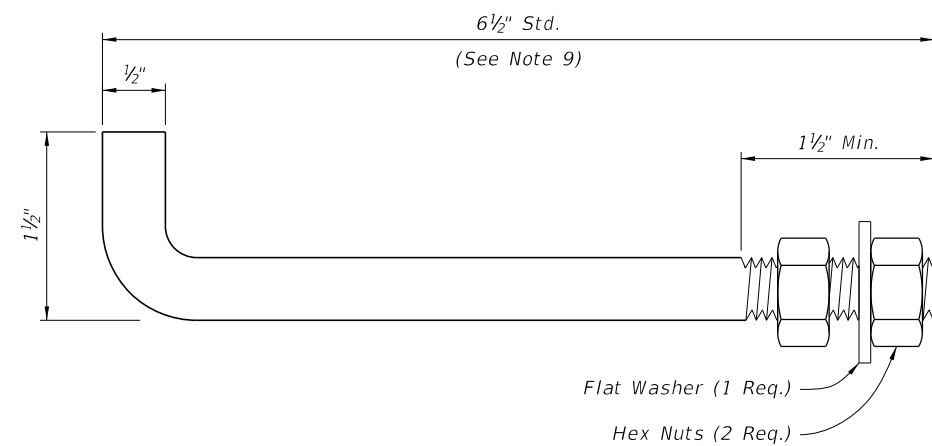
STEEL BAR

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

CROSS DRAIN MITERED END SECTION

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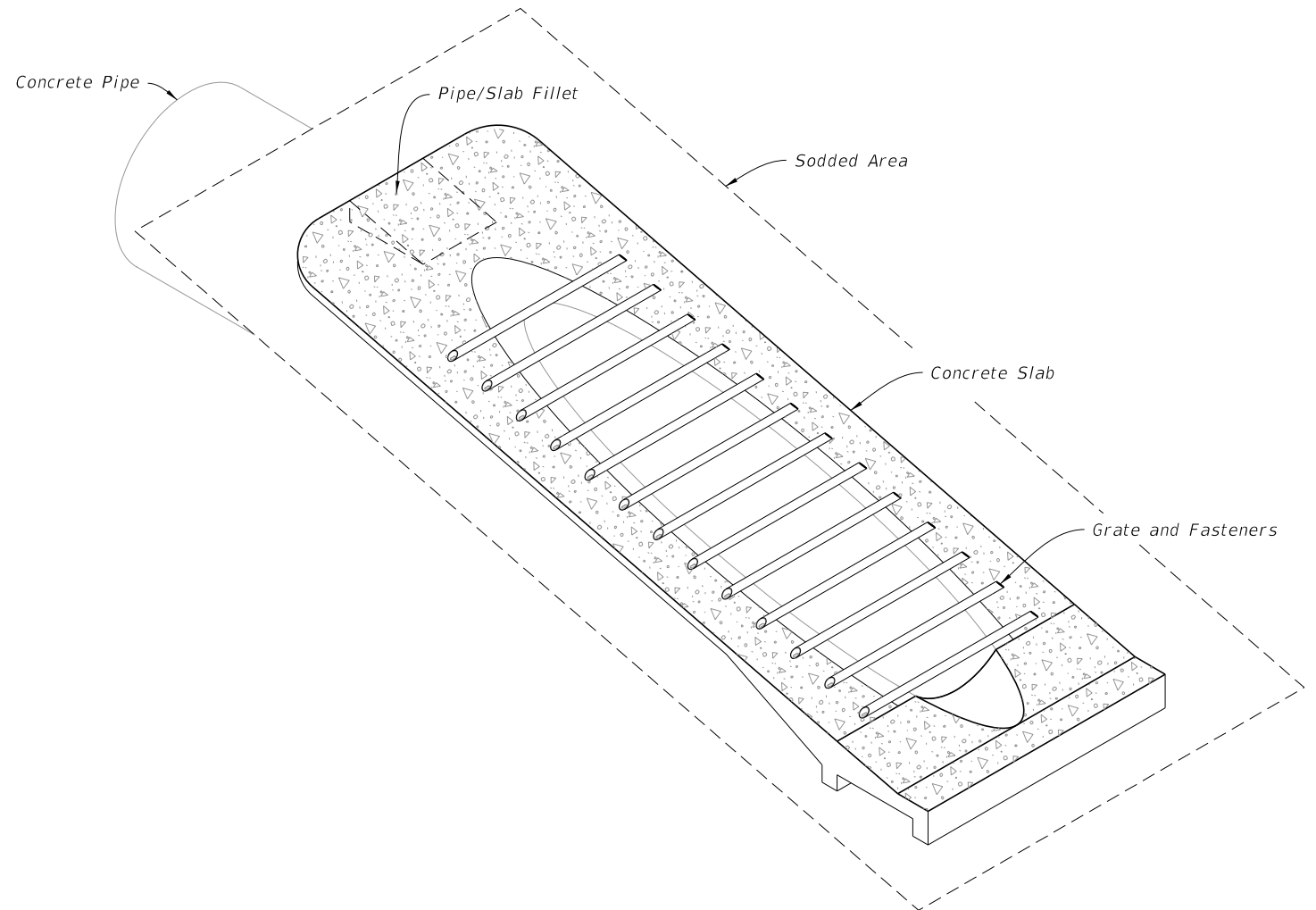
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11/01/19	



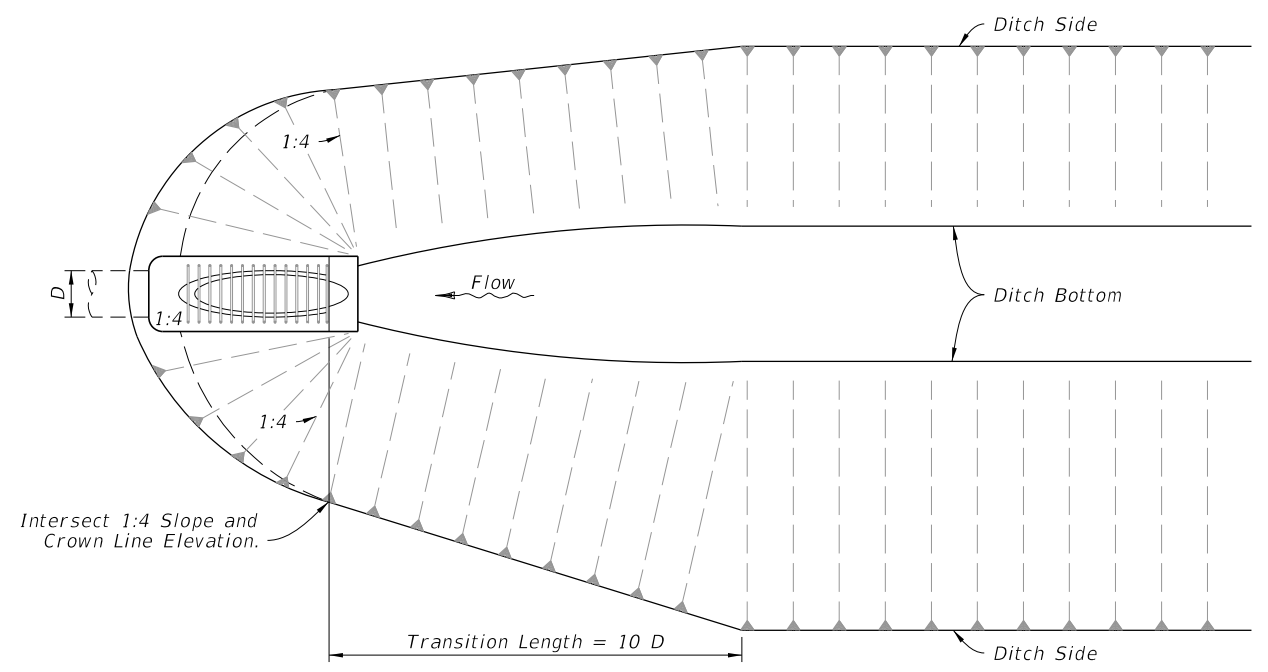
FY 2020-21
STANDARD PLANS

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.



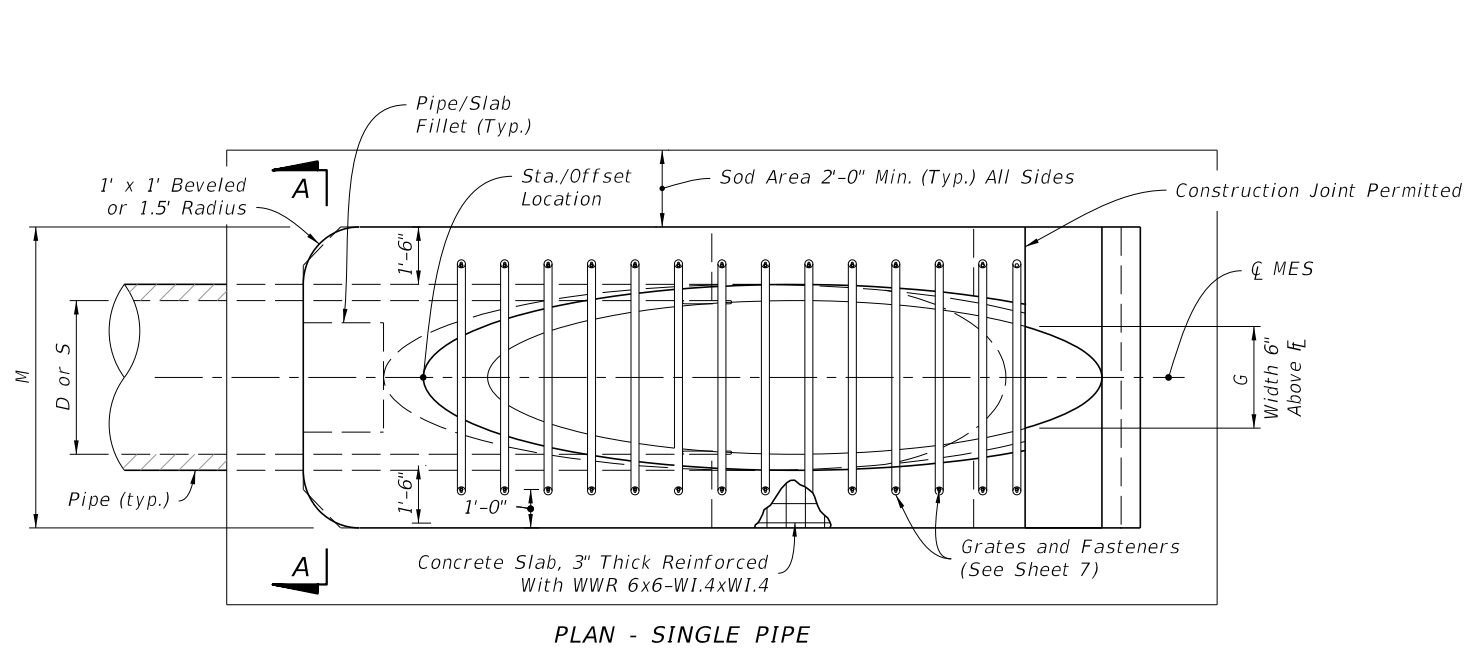
SIDEDRAIN MITERED END SECTION
(Concrete Pipe Shown, Corrugated Metal Pipe Similar)



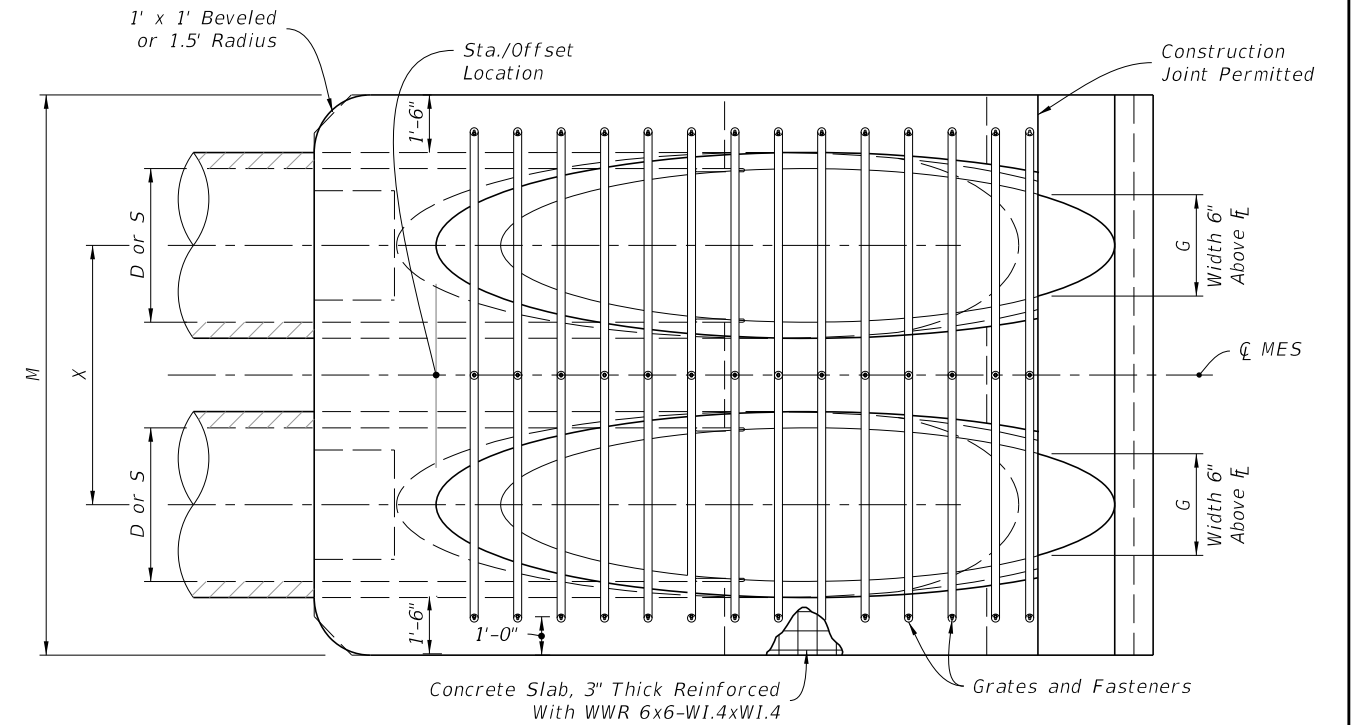
DITCH TRANSITION

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

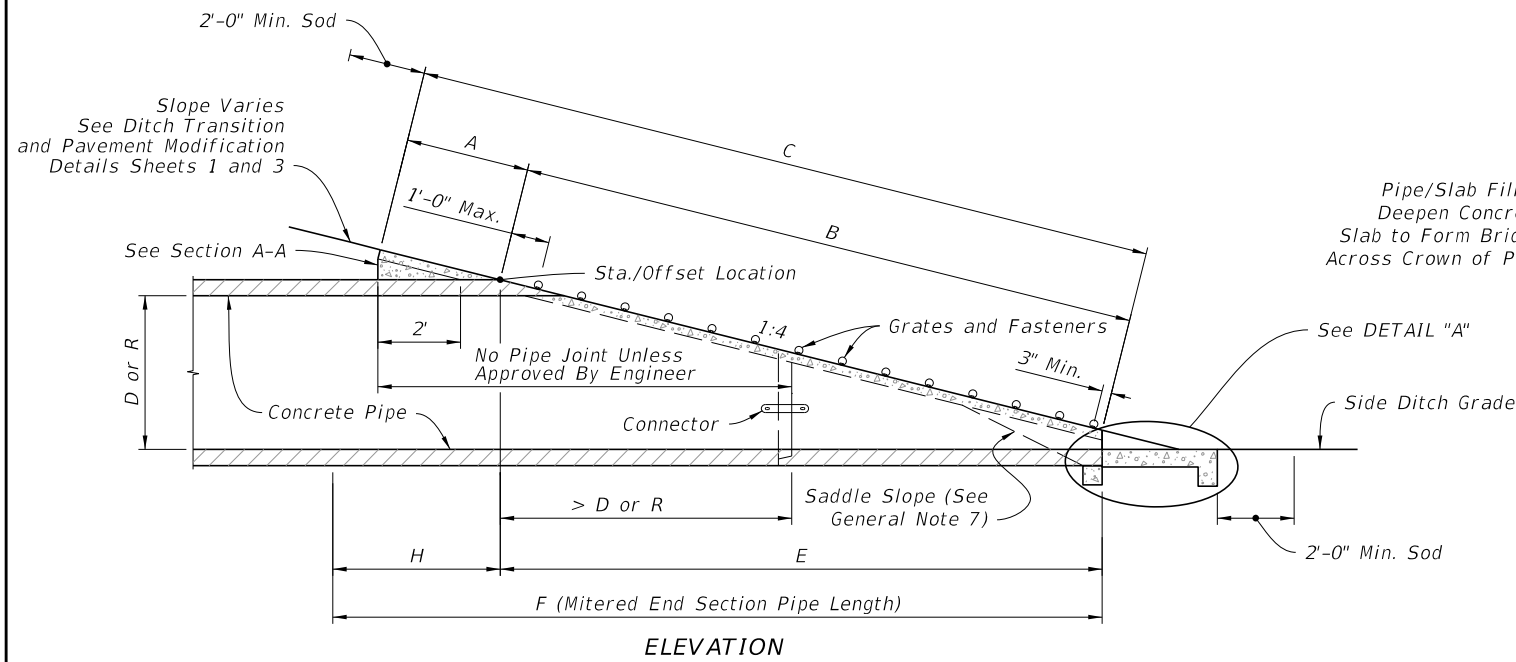
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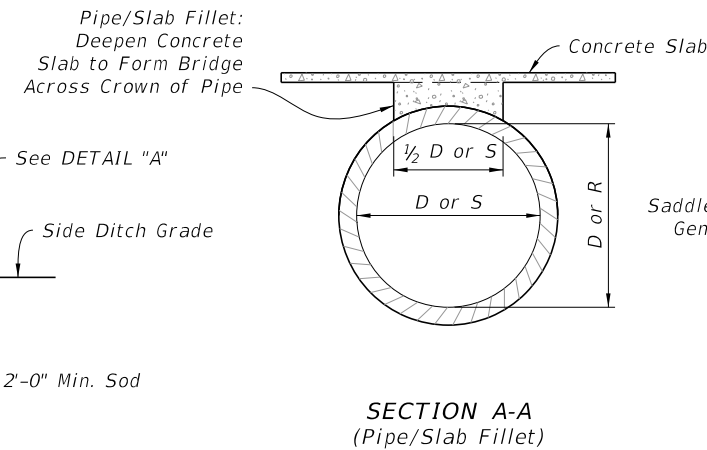
PLAN - SINGLE PIPE



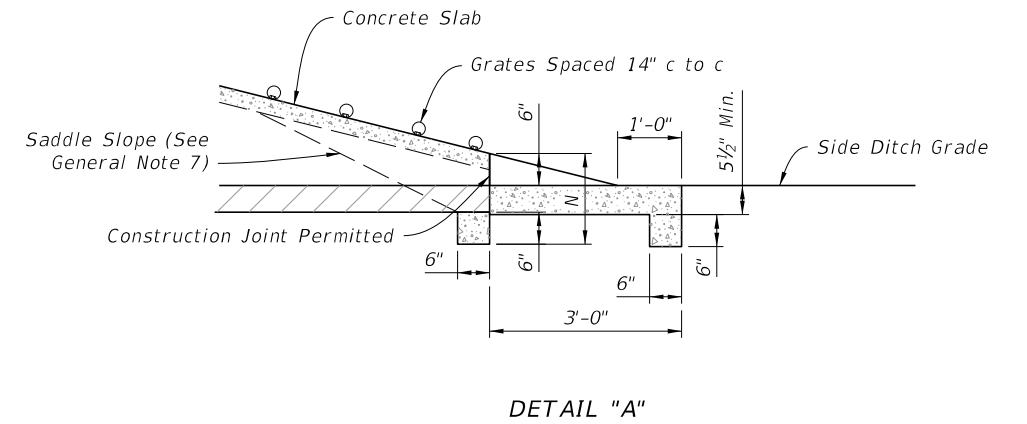
PLAN - MULTIPLE PIPE



ELEVATION



SECTION A-A
(Pipe/Slab Fillet)



DETAIL "A"

ROUND CONCRETE PIPE
(Elliptical Pipe Similar)

SINGLE AND MULTIPLE CONCRETE PIPE

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LAST REVISION 11/01/18	DESCRIPTION:
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**FY 2020-21
STANDARD PLANS**

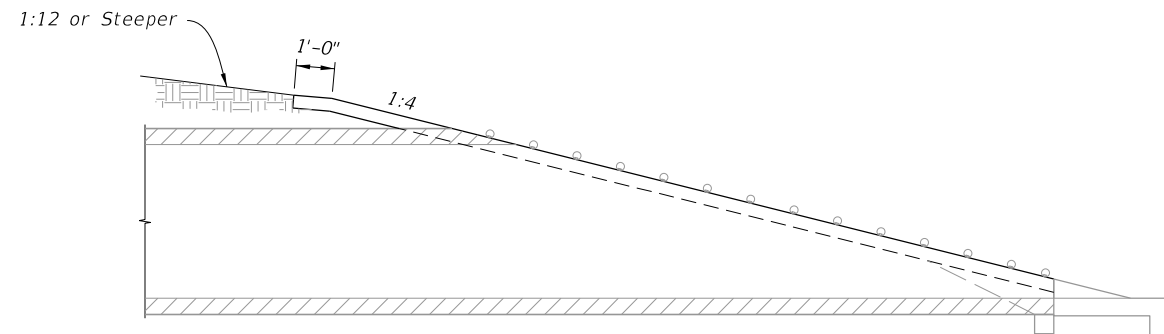
SIDE DRAIN MITERED END SECTION

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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
Elliptical Concrete	—	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'		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	

△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.

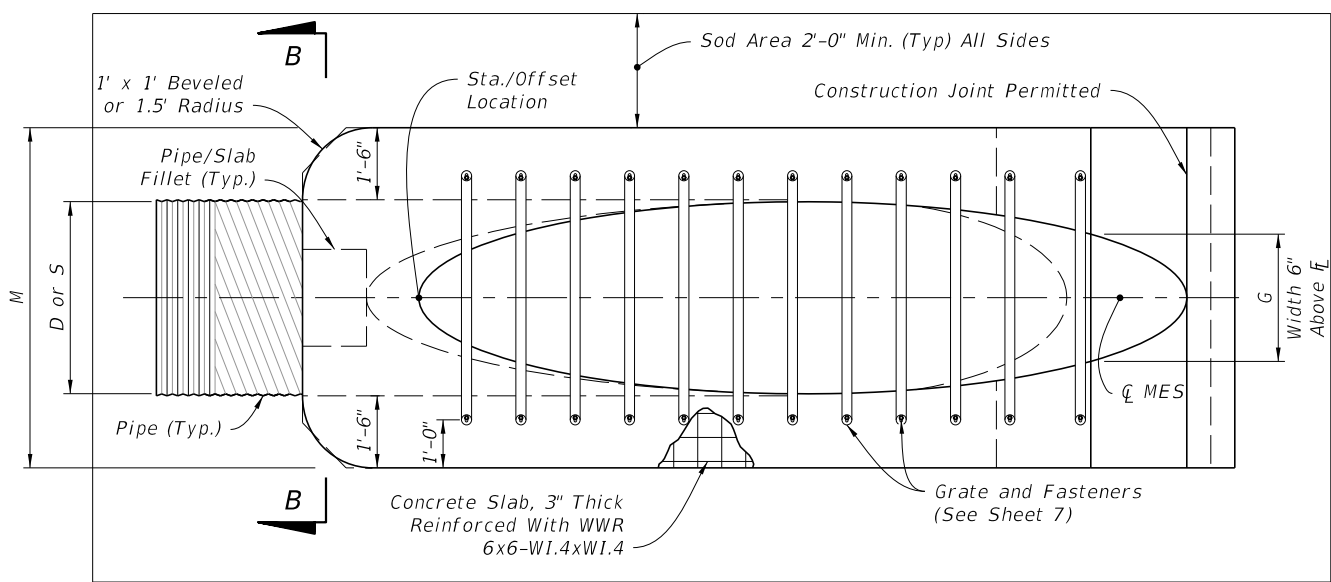


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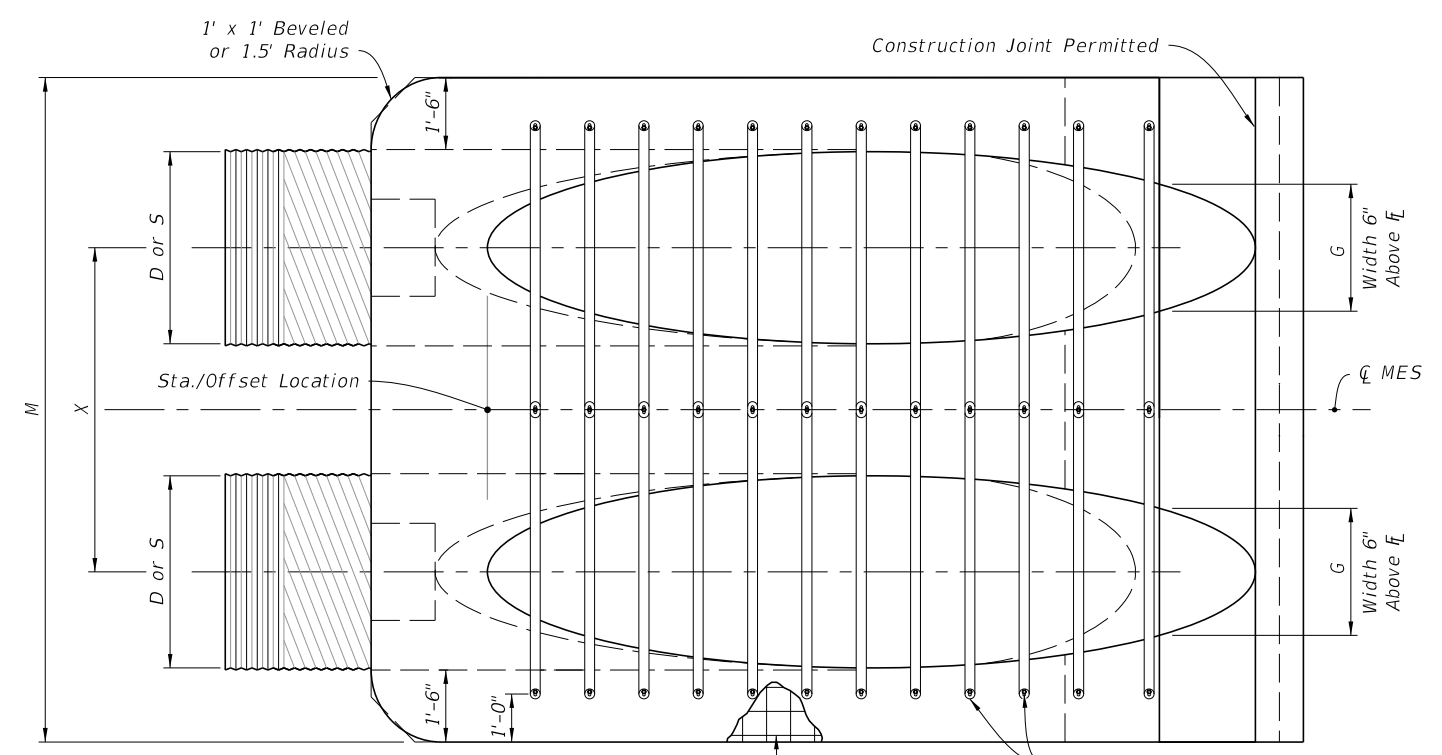
**CONCRETE PIPE DIMENSIONS AND QUANTITIES
AND PERMISSIBLE PAVEMENT MODIFICATION**

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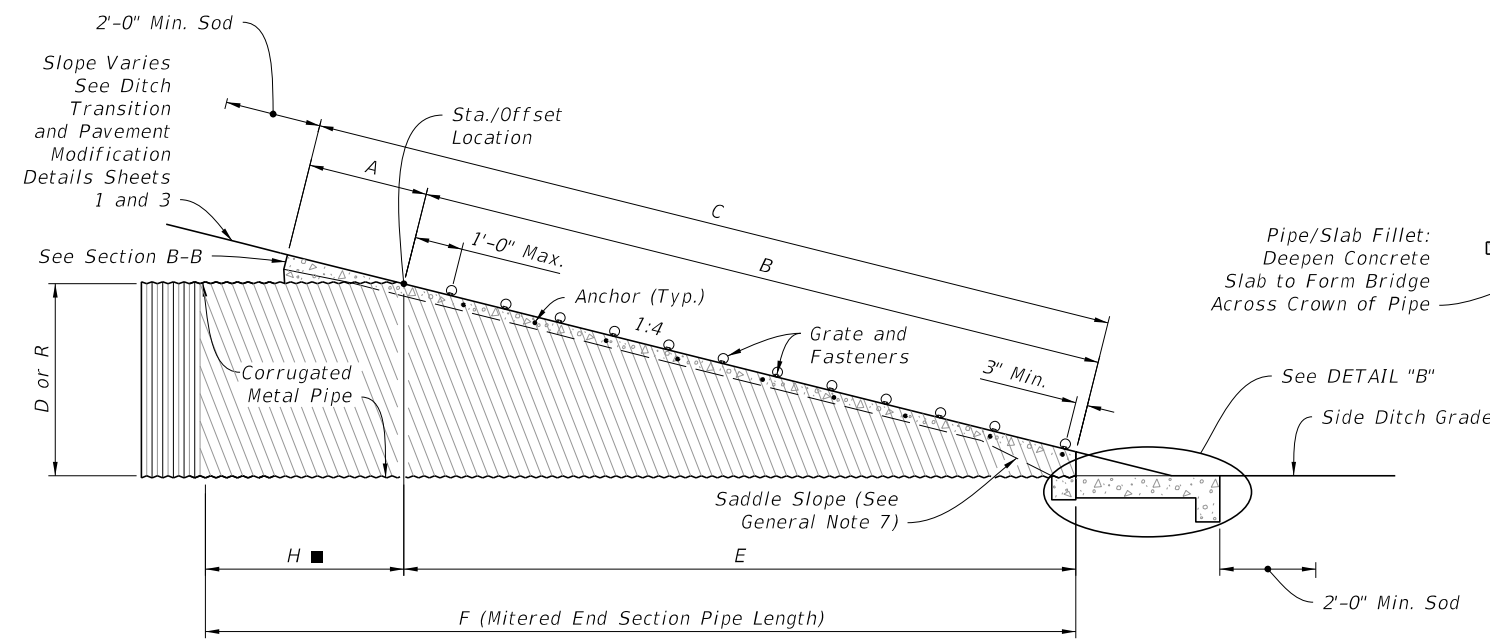
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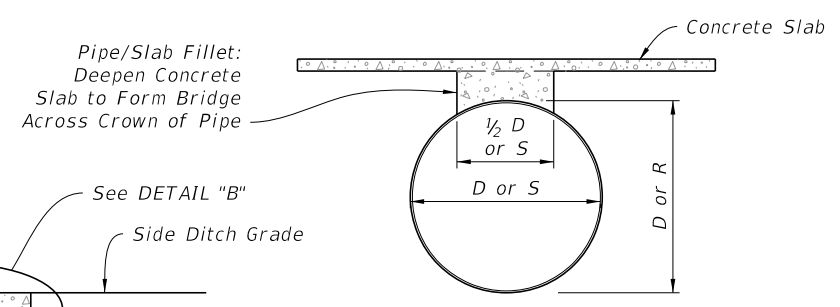
PLAN - SINGLE PIPE



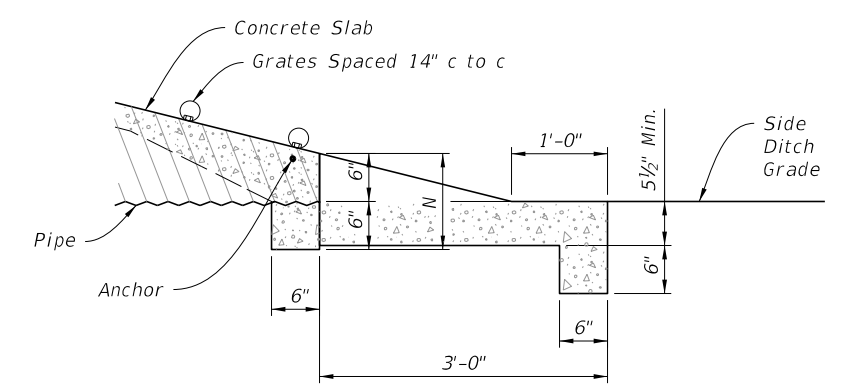
PLAN - MULTIPLE PIPE



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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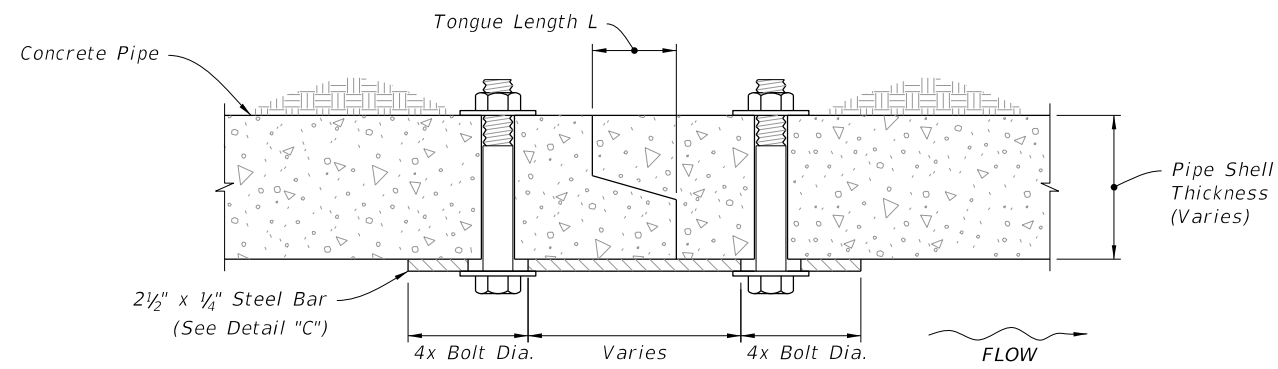
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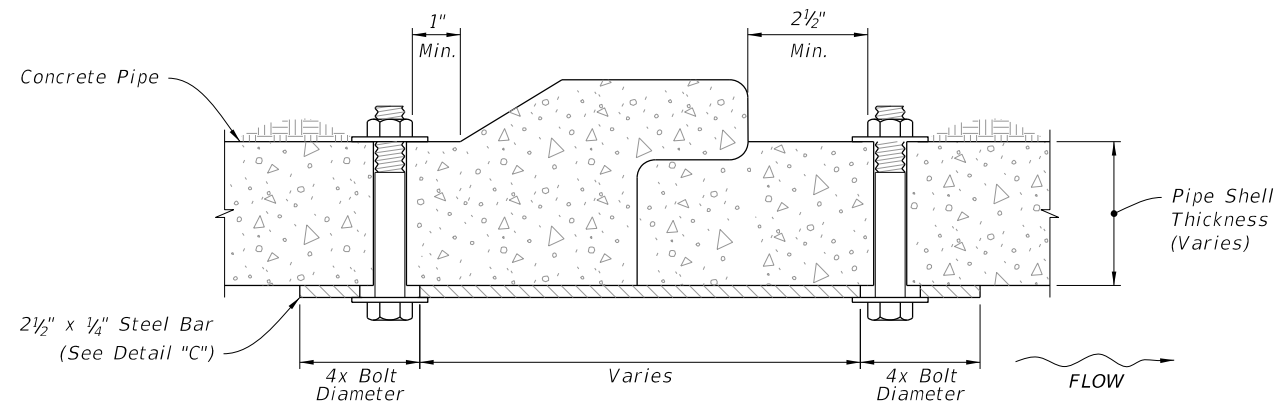
SINGLE AND MULTIPLE CORRUGATED METAL PIPE DIMENSIONS AND QUANTITIES																										
Pipe	Dia. D	Rise R	Span S	X	A	B	C	E	F	G	H	M				N	GRATE SIZES		3" CONC. SLAB (CY)				SODDING (SY)			
												Single Pipe	Double Pipe	Triple Pipe	Quad. Pipe		STANDARD WEIGHT PIPE	EXTRA STRONG PIPE	Single Pipe	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

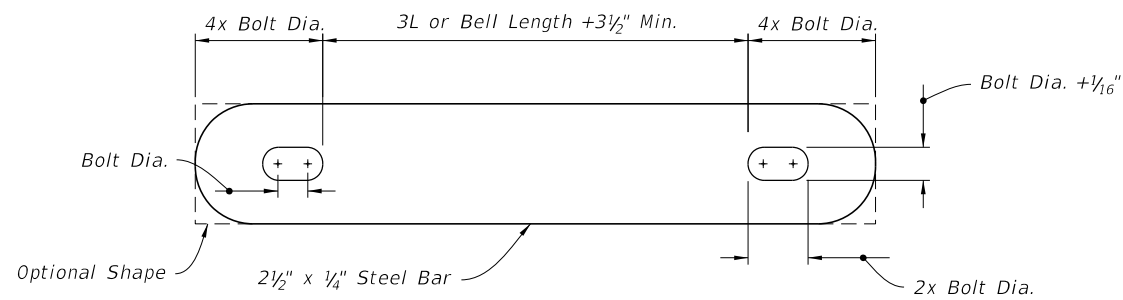
LAST REVISION 11/01/19	DESCRIPTION:	 FY 2020-21 STANDARD PLANS	SIDE DRAIN MITERED END SECTION	INDEX 430-022	SHEET 5 of 7
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TONGUE AND GROOVE CONNECTOR DETAIL



BELL AND SPIGOT CONNECTOR DETAIL



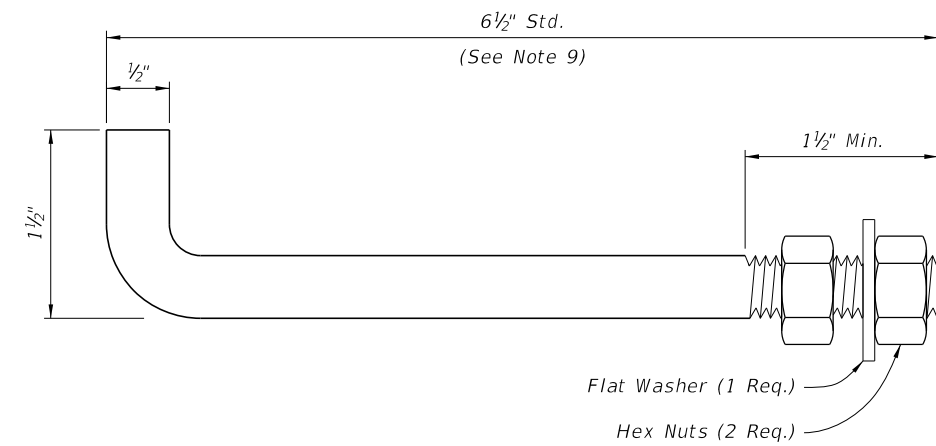
STEEL BAR

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

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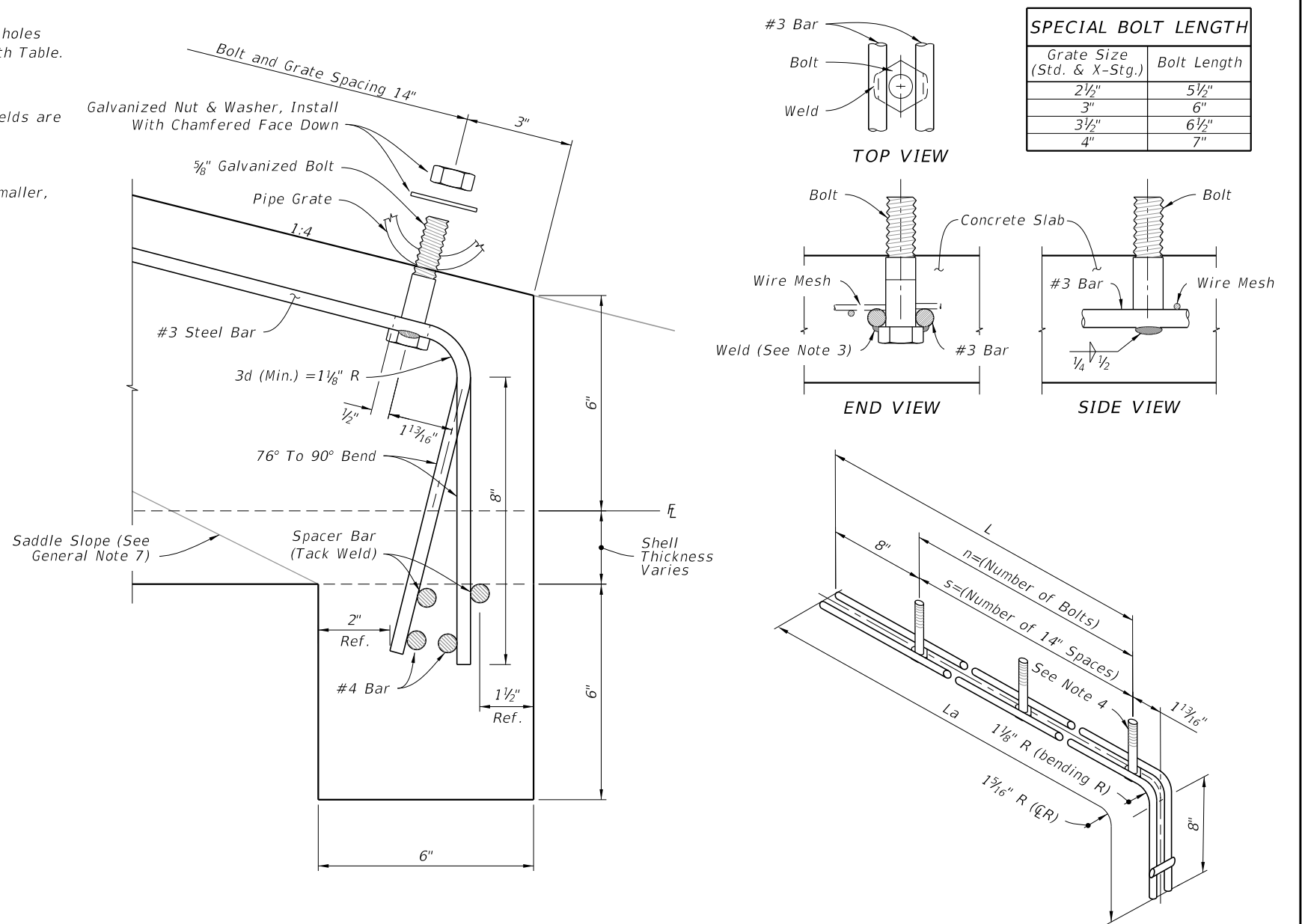
NOTES:

1. 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. 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



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"

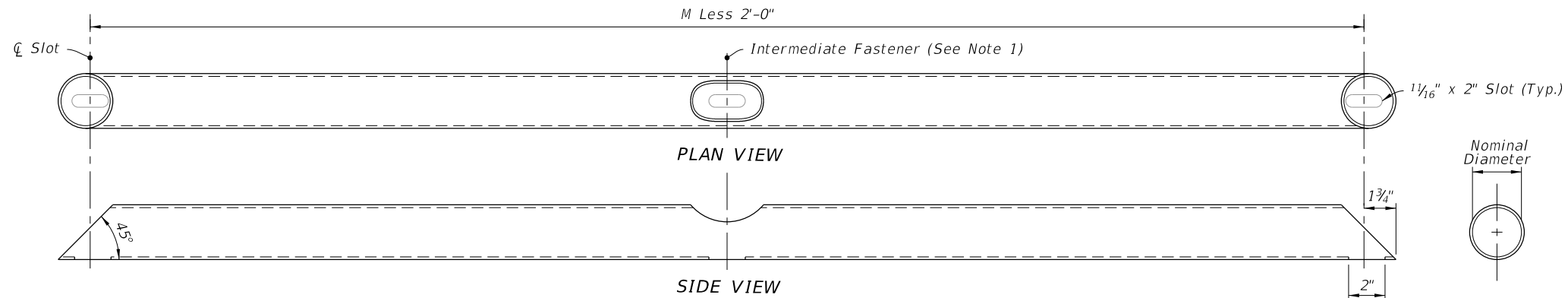
MULTIPLE FASTENER UNIT DETAIL
(For Single and Multiple Pipes)

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)

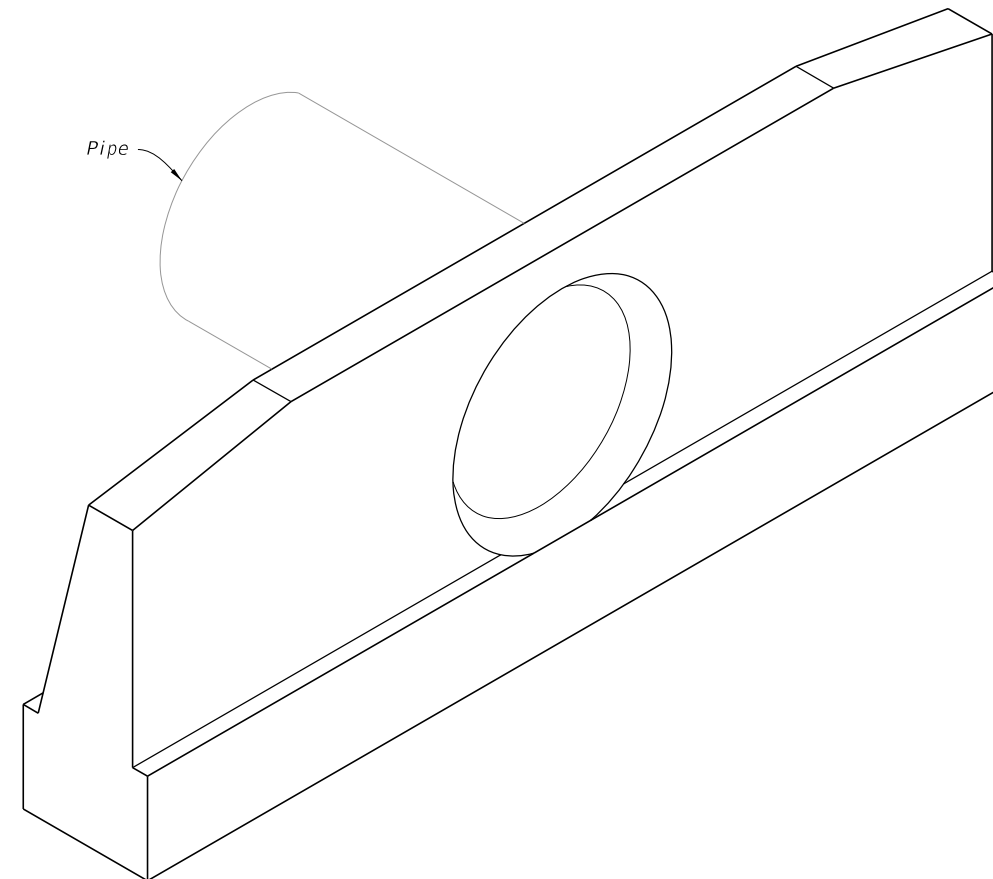
FASTENER UNIT AND GRATE DETAILS

10/29/2019 8:16:34 AM

GENERAL NOTES:

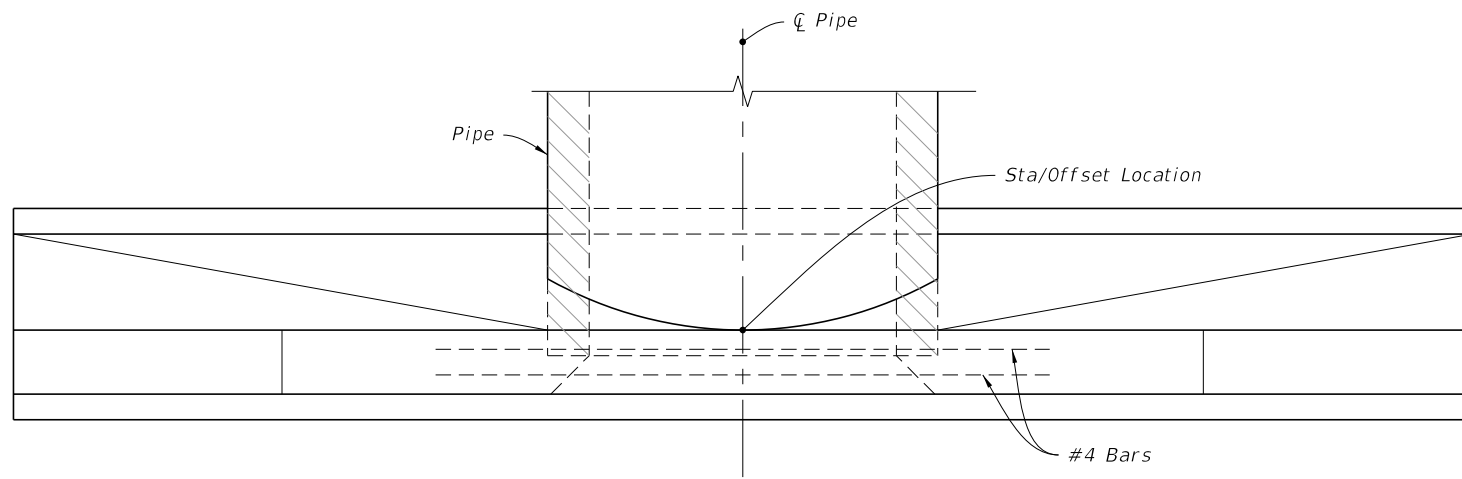
1. Use Class I concrete.
2. Reinforcing steel is either Grade 40 or 60.
3. Endwalls may be cast in place or precast concrete. (Additional reinforcement necessary for handling precast units will be determined by the Contractor or the supplier).
4. Chamfer all exposed edges and corners to $\frac{3}{4}$ ".
5. 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.
6. On outfall ditches with side slopes flatter than 1:1.5 provide 20' transitions from the endwall to the flatter side slopes, right of way permitting.
7. Construct front slope and ditch transitions in accordance with Index 430-001.
8. Quantities shown are for estimating purposes only.

TABLE OF CONTENTS:	
Sheet	Description
1	General Notes and Contents
2	Concrete Endwall Details
3	Concrete and Metal Pipe Tables
4	Spacing For Multiple Pipes

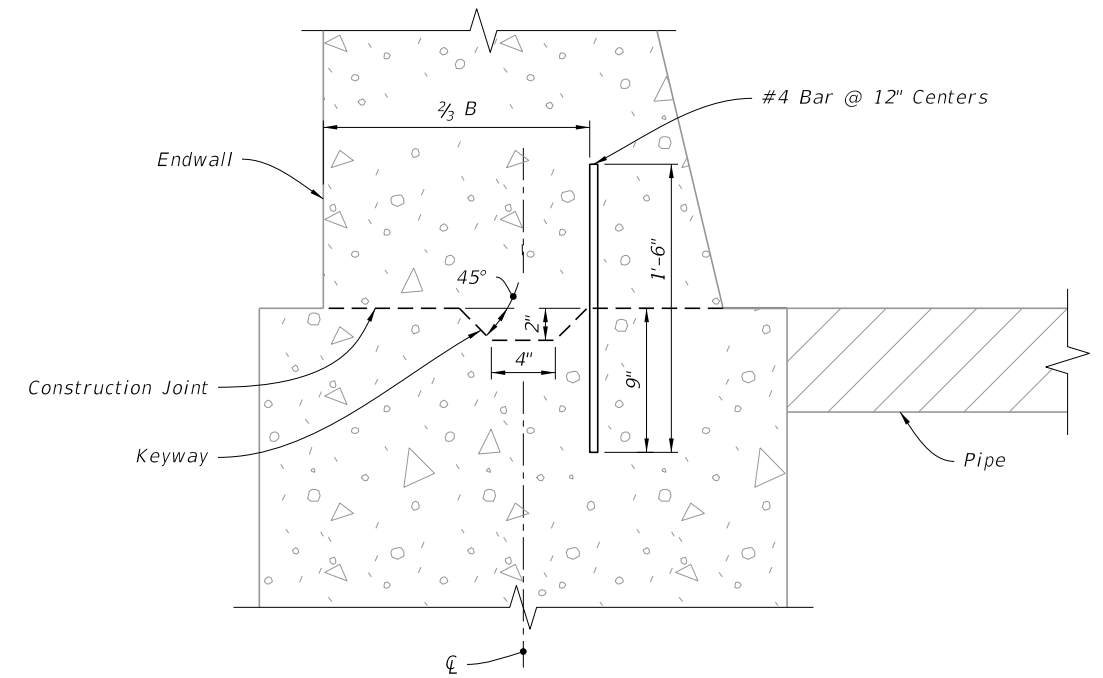


=====**STRAIGHT CONCRETE ENDWALL**=====

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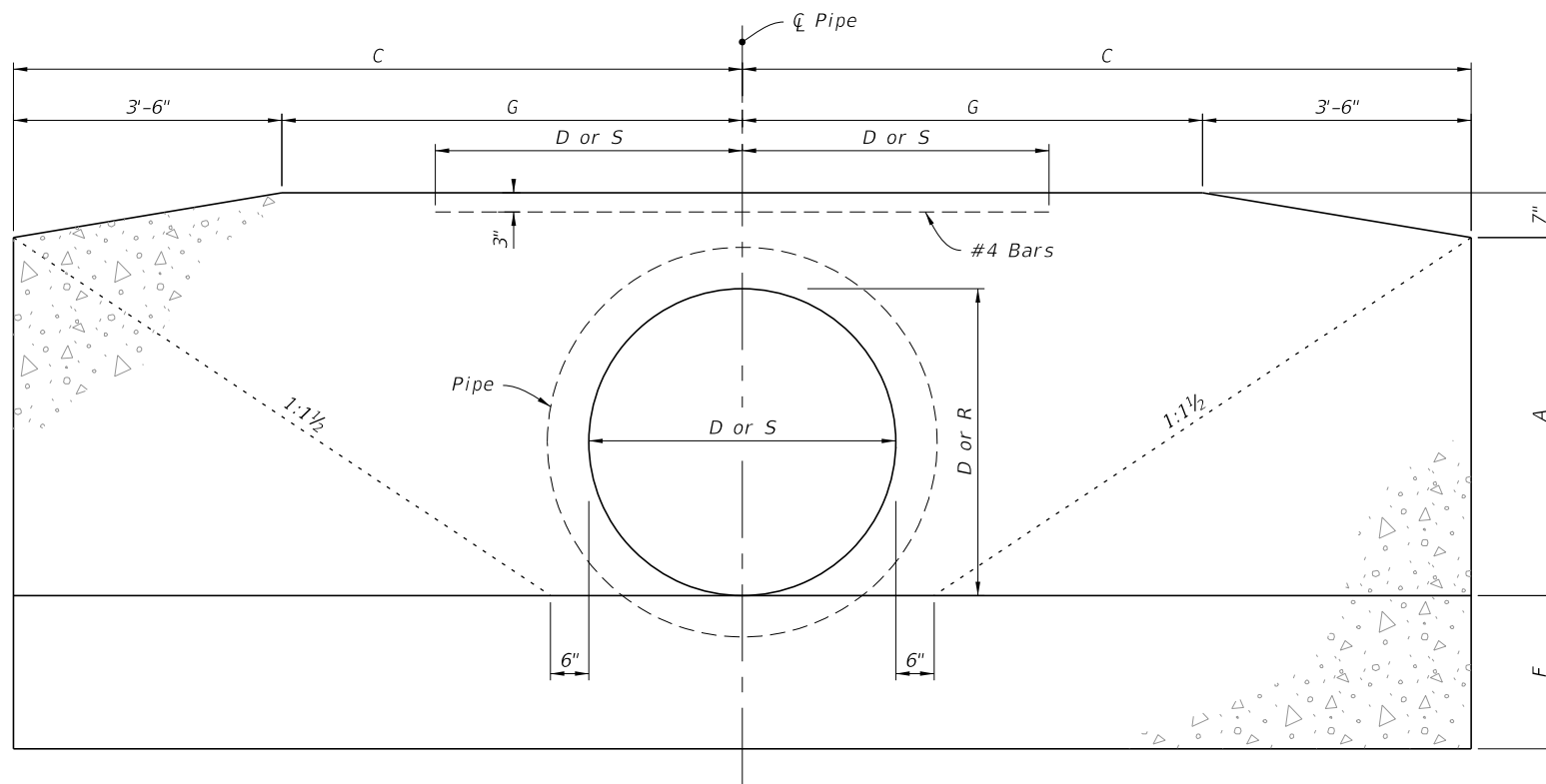


PLAN

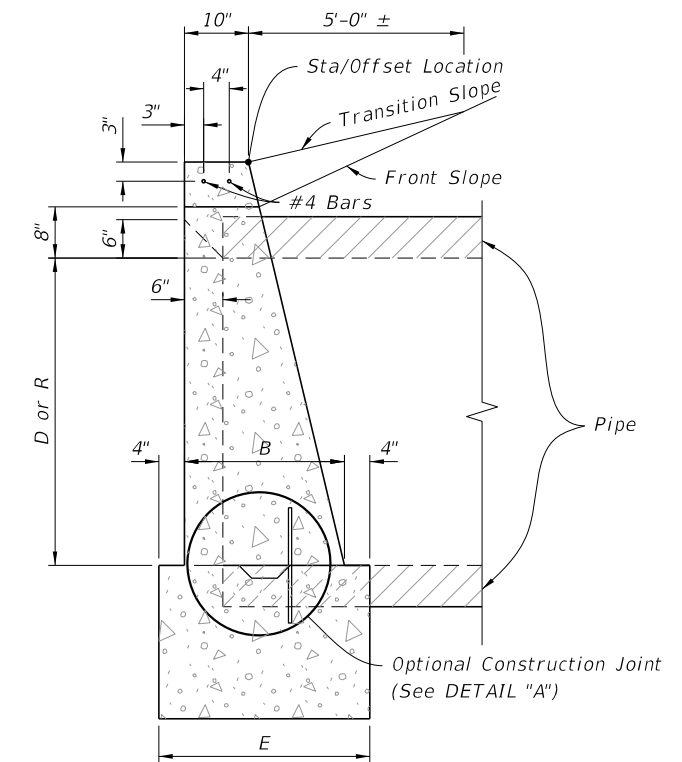


NOTE: Keyway and Dowels are required for optional construction joint.

DETAIL "A"



FRONT ELEVATION



SIDE ELEVATION

CONCRETE ENDWALL DETAILS

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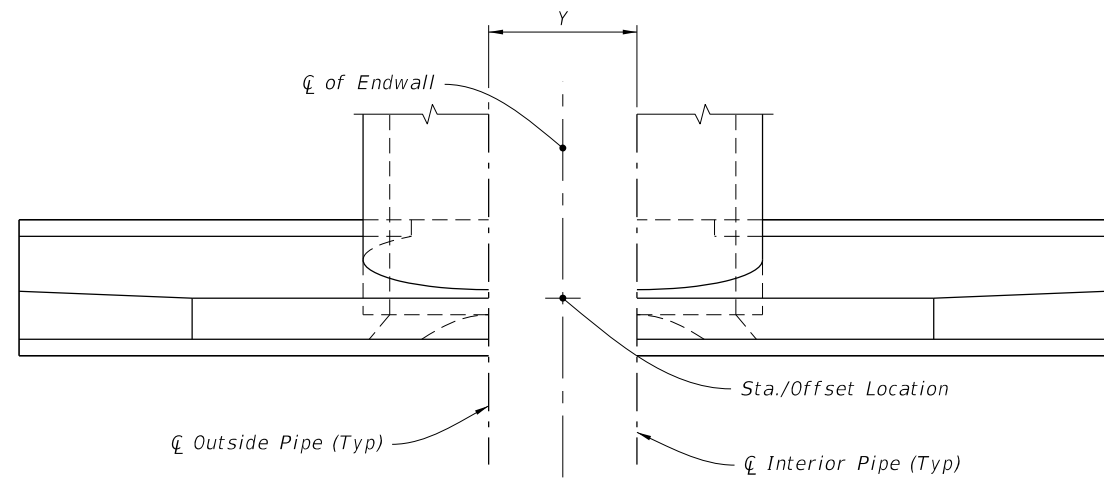


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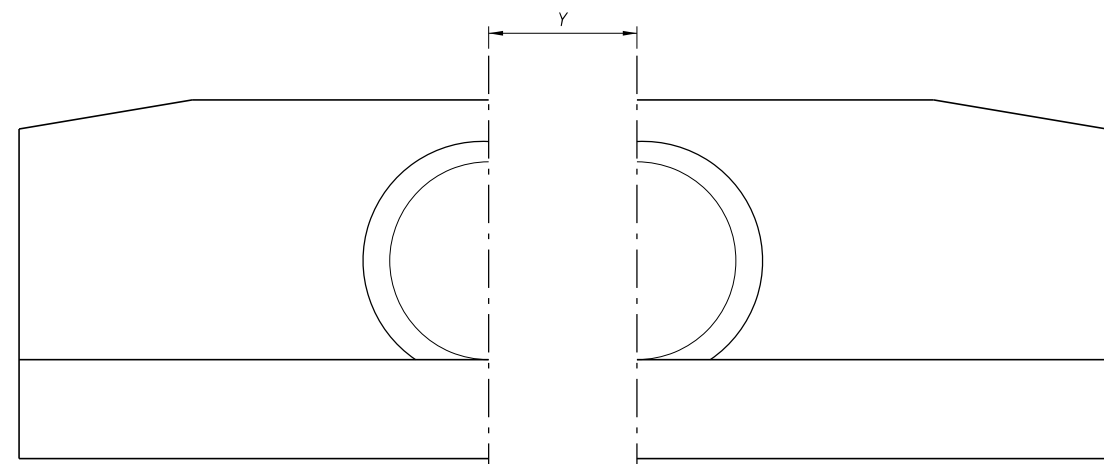
STRAIGHT CONCRETE ENDWALLS
SINGLE AND MULTIPLE PIPE

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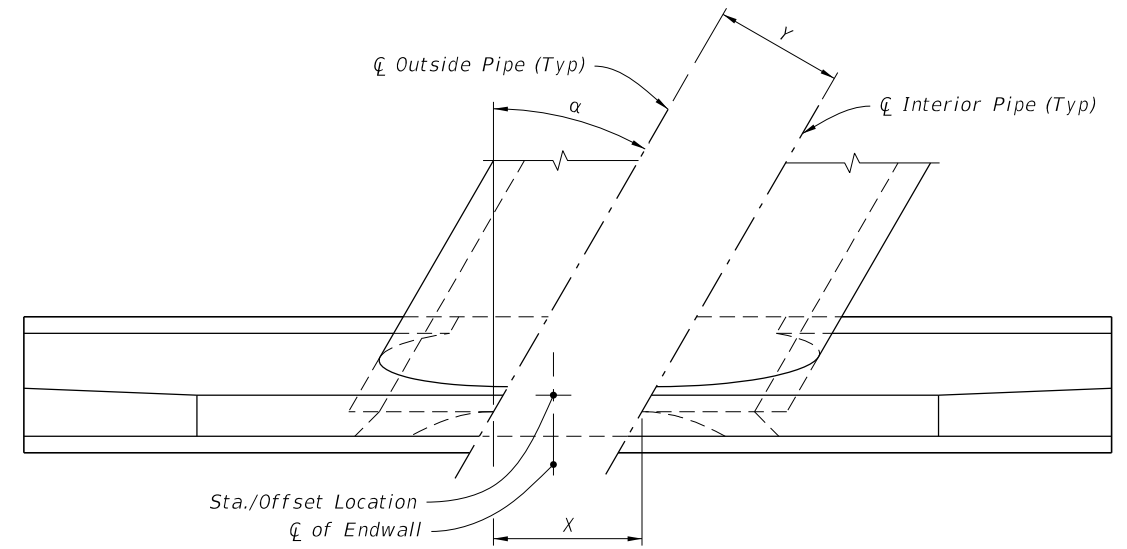


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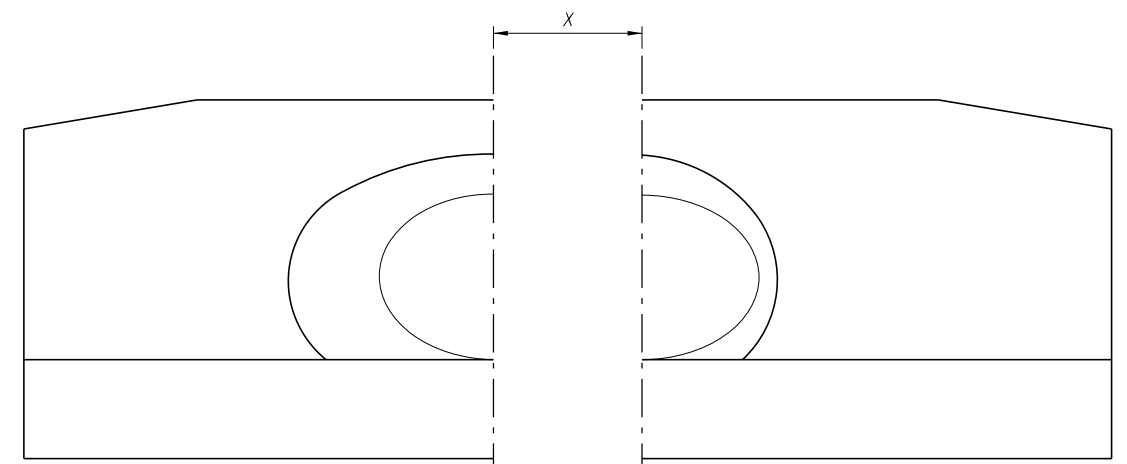


FRONT ELEVATION

NORMAL PIPE



PLAN



FRONT ELEVATION

SKEWED PIPE

(Multiple Pipe Shown, Single Pipe Similar)

LEGEND:

- α Pipe Skew Angle
- Y Center to Center between pipes
- X Center to Center along front of Headwall

SPACING FOR MULTIPLE PIPES

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STRAIGHT CONCRETE ENDWALLS
SINGLE AND MULTIPLE PIPE

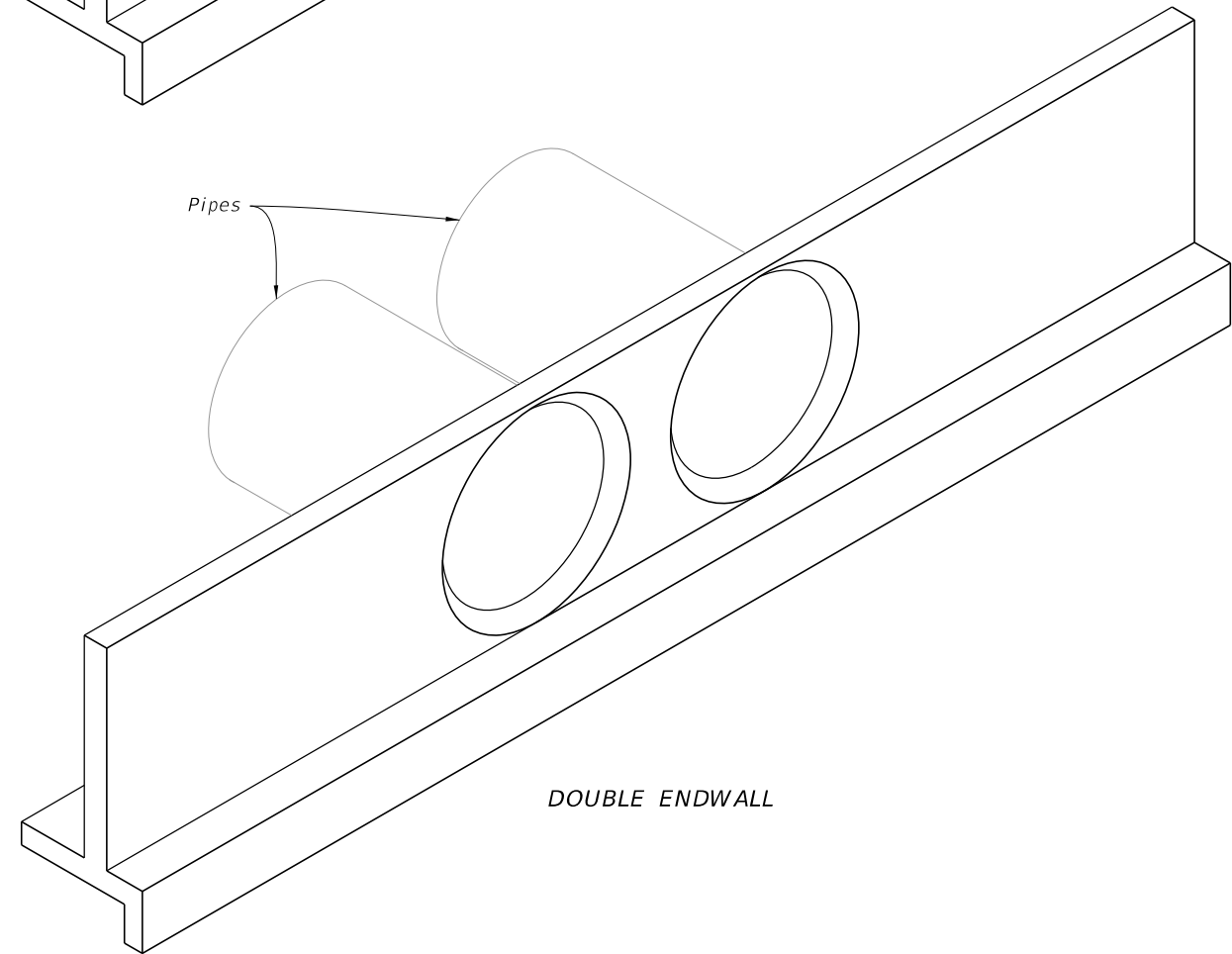
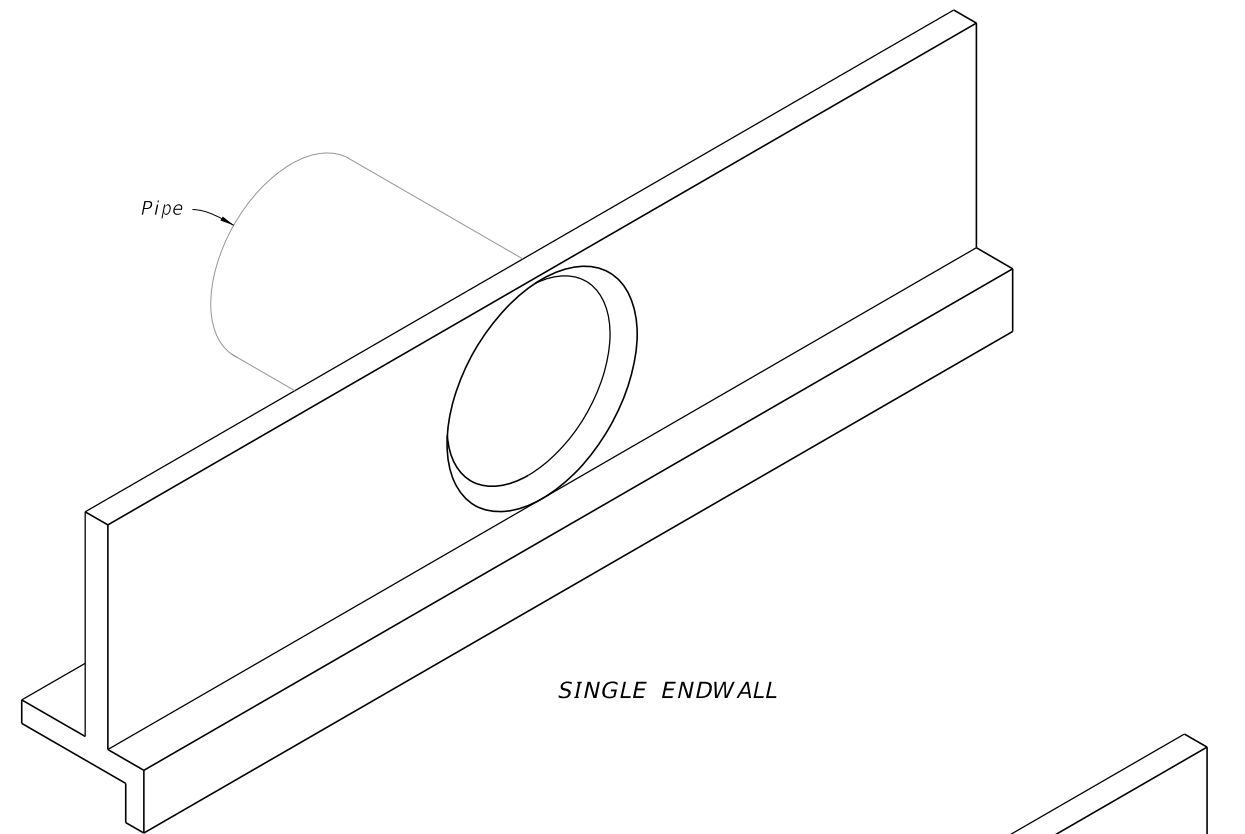
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GENERAL NOTES:

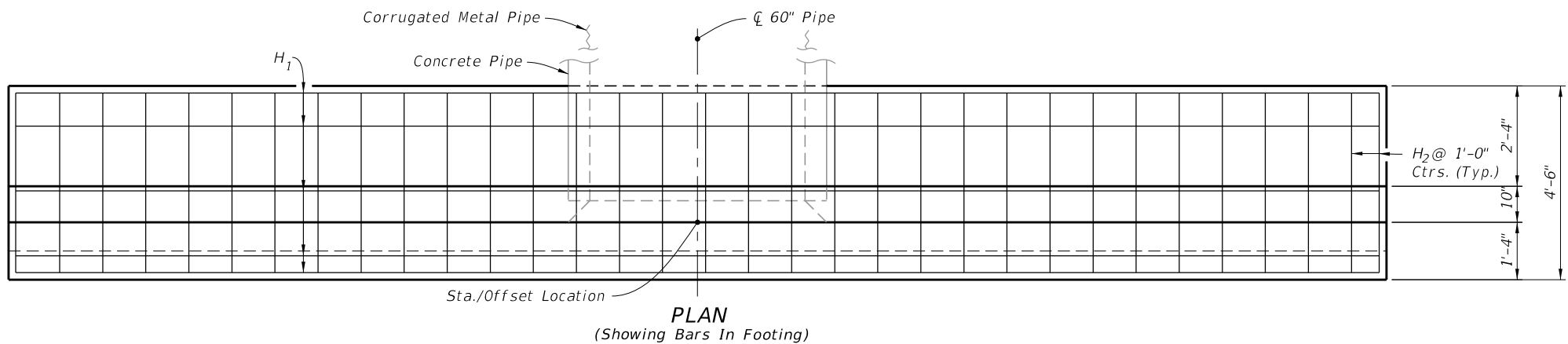
1. Use Class II concrete.
2. Reinforcing steel is either Grade 40 or 60.
3. Endwalls may be cast in place or precast concrete. The Contractor or the Supplier will determine the additional reinforcement necessary for handling precast units.
4. Chamfer all exposed edges and corners $\frac{3}{4}$ " unless otherwise shown.
5. Quantities shown are for estimating purposes only.

TABLE OF CONTENTS:	
Sheet	Description
1	General Notes and Contents
2	Single 60" Pipe Endwall Details
3	Double 60" Pipe Endwall Details



===== STRAIGHT CONCRETE ENDWALLS 60" PIPE =====

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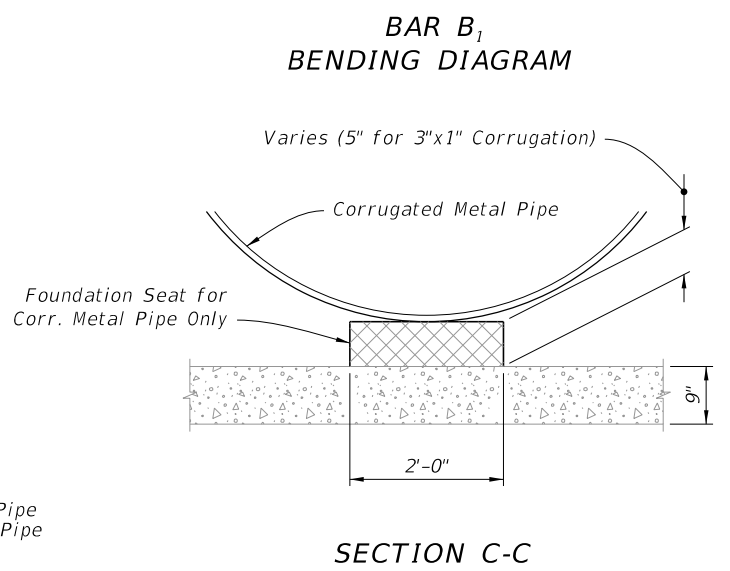
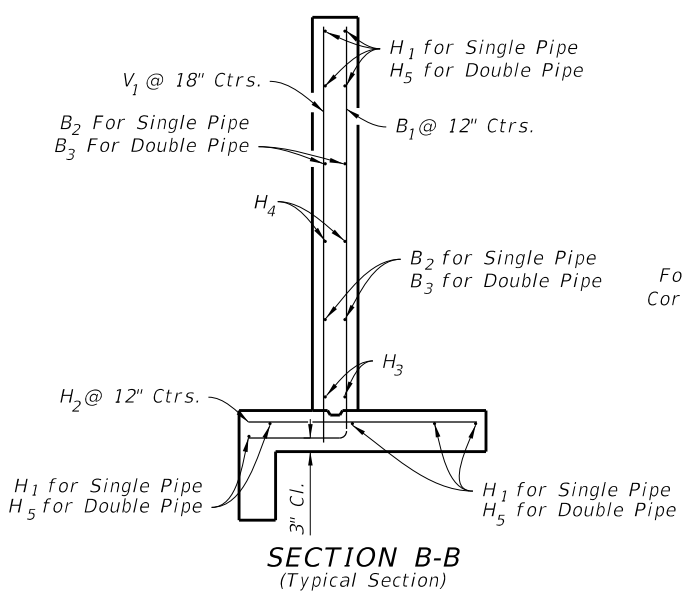
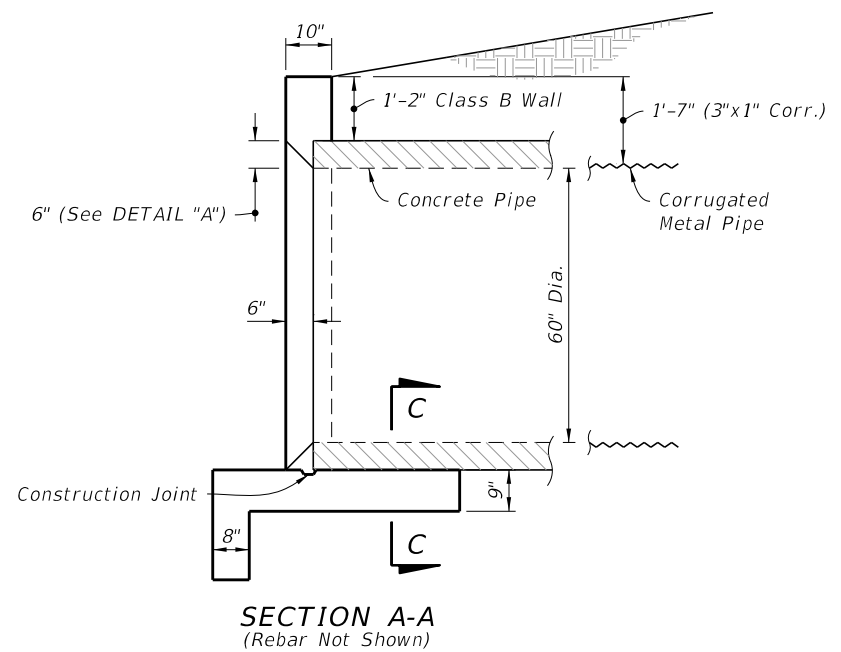
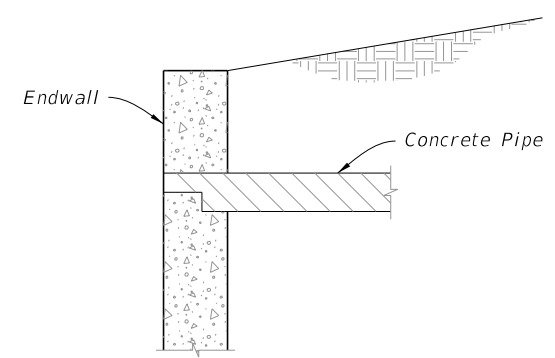
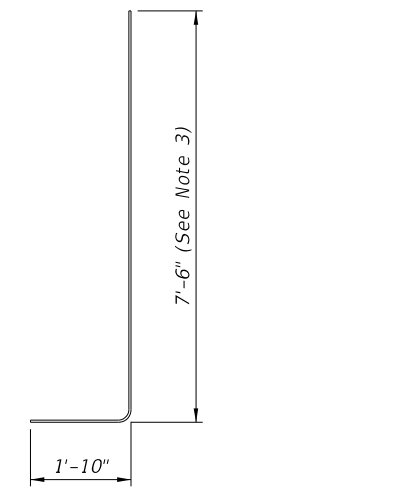
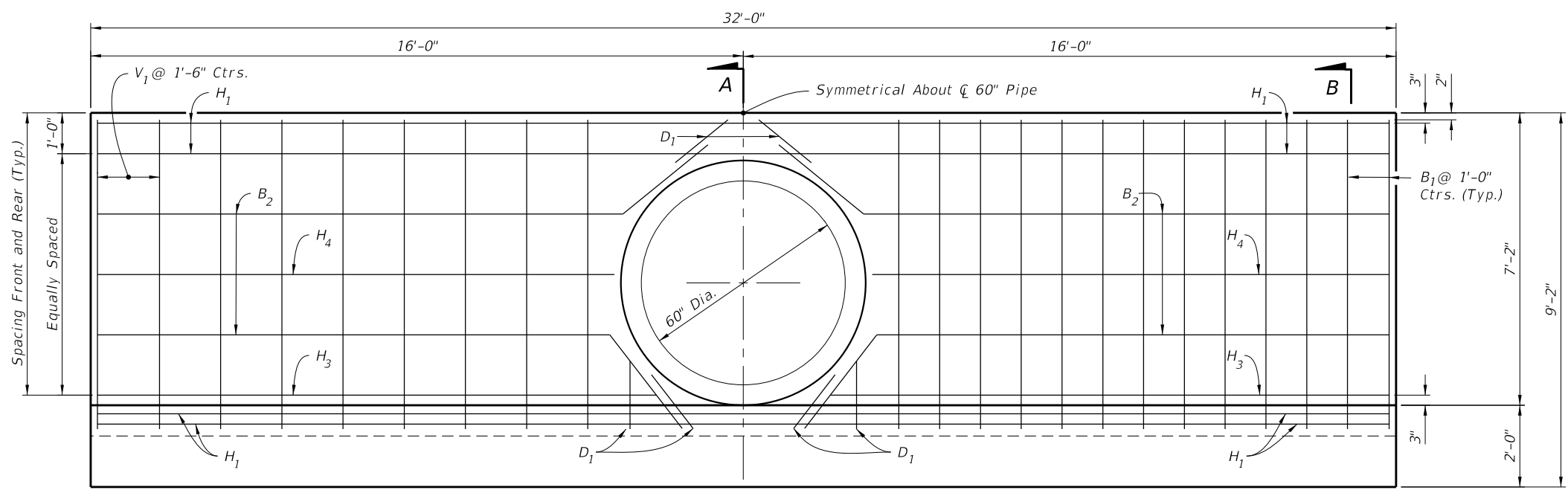
NOTES:

- 2" clearance on all reinforcement, unless otherwise shown.
- Cut and bend B₂ and B₃ Bars as shown.
- All bar dimensions are out to out.

LEGEND:
 H = Horizontal Bars B = Bent Bars
 V = Vertical Bars D = Dowels or Diagonal Bars

SINGLE 60" PIPE ESTIMATED QUANTITIES			
ITEM	UNIT	RCP	CMP
Class II Concrete	Cu. Yd.	11.3	11.4
Reinforcing Steel	Lb.	695	695

BILL OF REINFORCING STEEL			
MARK	SIZE	NO. REQD.	LENGTH
H ₁	4	9	31'-8"
H ₂	4	32	4'-2"
H ₃	4	4	13'-9"
H ₄	4	4	12'-4"
V ₁	4	18	7'-6"
B ₁	4	26	9'-4"
B ₂	4	4	31'-8"
D ₁	4	8	1'-8"



SINGLE 60" PIPE ENDWALL DETAILS

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NOTES:

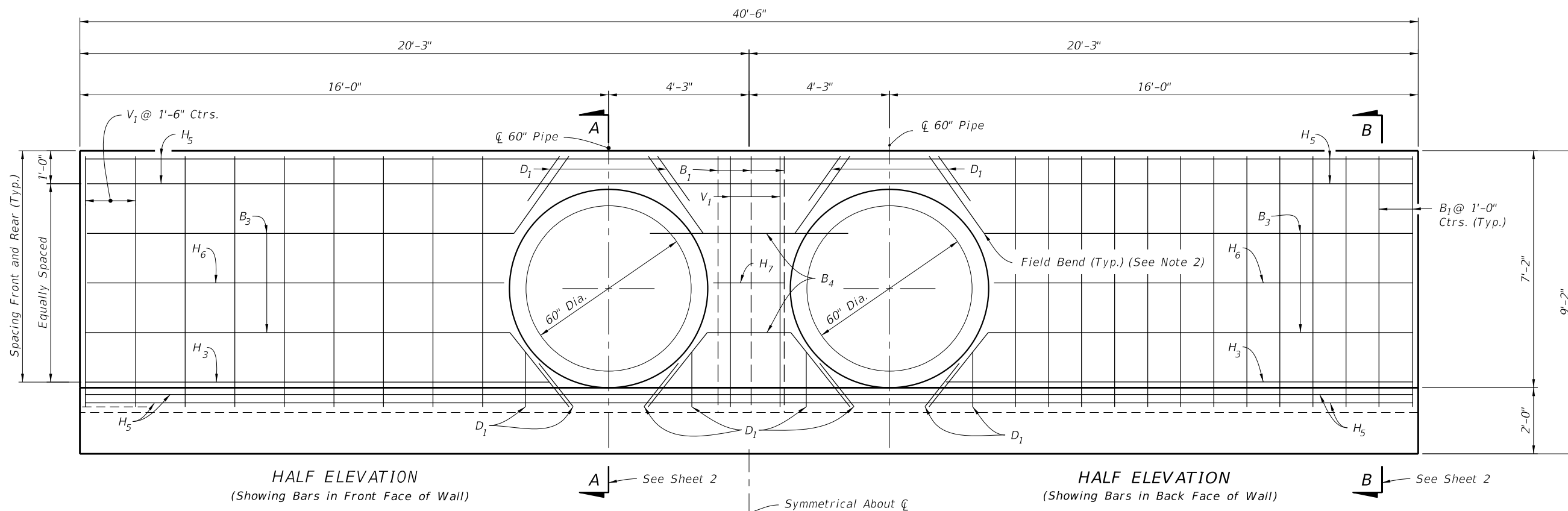
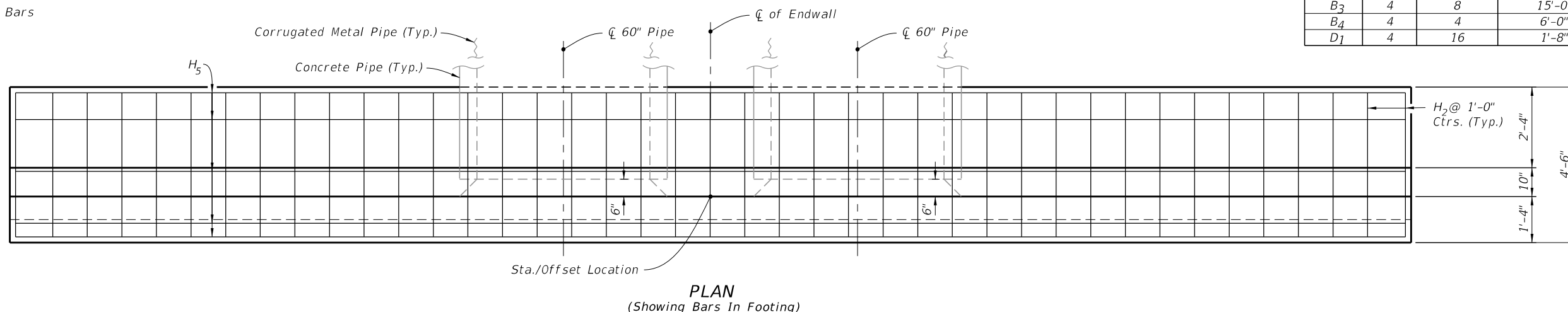
- 2" clearance on all reinforcement, unless otherwise shown.
- Cut and bend B₃ Bars as shown.
- All bar dimensions are out to out.

LEGEND:

- H = Horizontal Bars
- V = Vertical Bars
- B = Bent Bars
- D = Dowels or Diagonal Bars

DOUBLE 60" PIPE ESTIMATED QUANTITIES			
ITEM	UNIT	RCP	CMP
Class II Concrete	Cu. Yd.	13.7	13.8
Reinforcing Steel	Lb.	824	824

BILL OF REINFORCING STEEL			
MARK	SIZE	NO. REQD.	LENGTH
H ₂	4	41	4'-2"
H ₃	4	4	13'-9"
H ₅	4	9	40'-2"
H ₆	4	4	12'-6"
H ₇	4	2	2'-2"
V ₁	4	20	7'-6"
B ₁	4	29	9'-4"
B ₃	4	8	15'-0"
B ₄	4	4	6'-0"
D ₁	4	16	1'-8"



DOUBLE 60" PIPE ENDWALL DETAILS

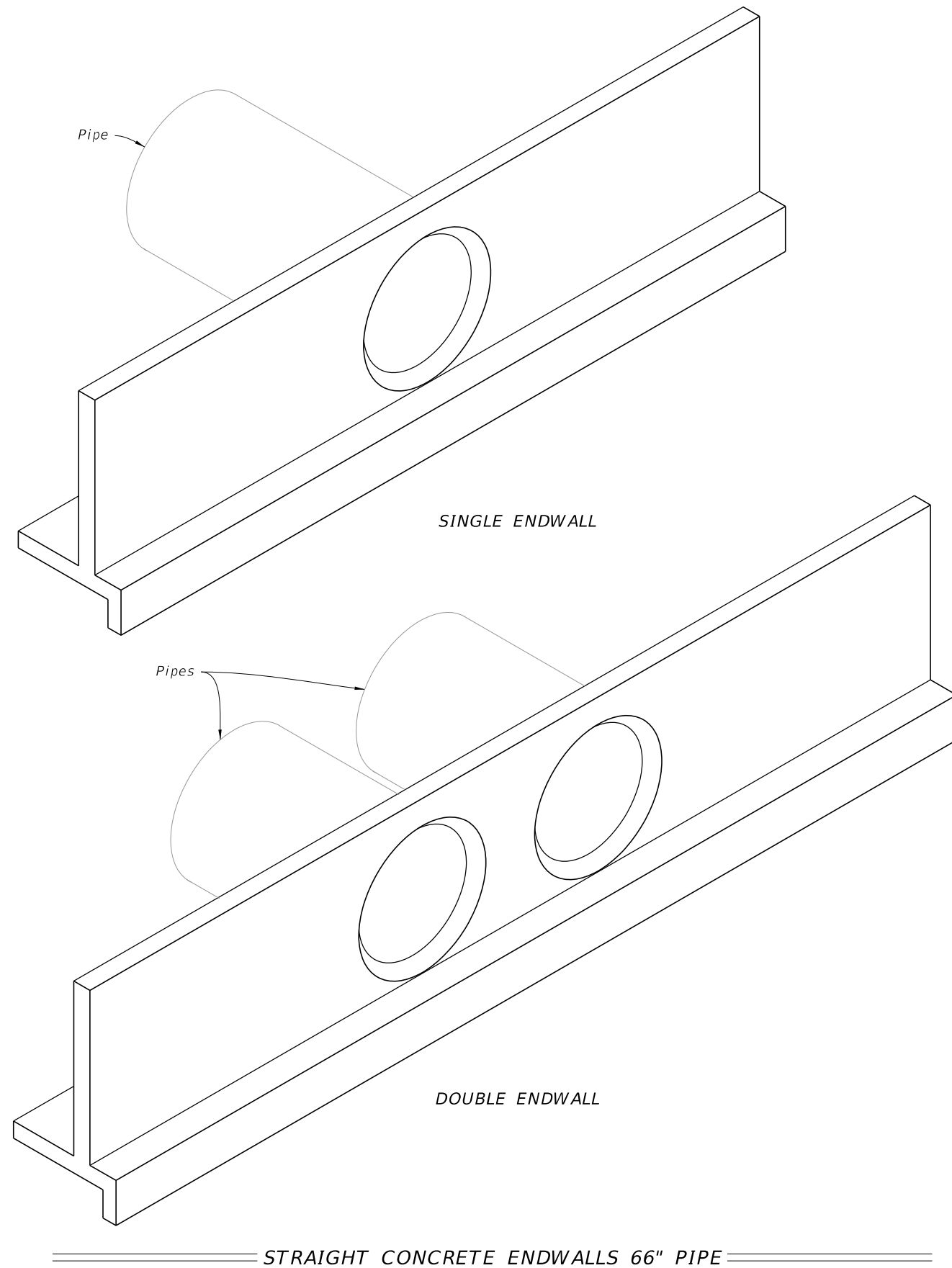
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LAST REVISION 11/01/19	DESCRIPTION:		FY 2020-21 STANDARD PLANS	STRAIGHT CONCRETE ENDWALLS SINGLE AND DOUBLE 60" PIPE	INDEX 430-031	SHEET 3 of 3
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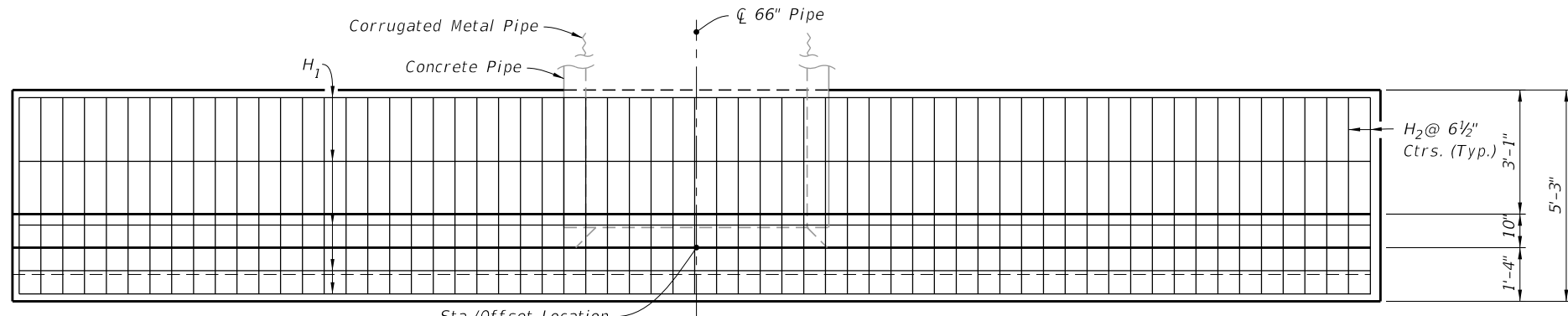
GENERAL NOTES:

1. Use Class II concrete.
2. Reinforcing steel is either Grade 40 or 60.
3. Endwalls may be cast in place or precast concrete. The Contractor or the Supplier will determine the additional reinforcement necessary for handling precast units.
4. Chamfer all exposed edges and corners $\frac{3}{4}$ " unless otherwise shown.
5. Quantities shown are for estimating purposes only.

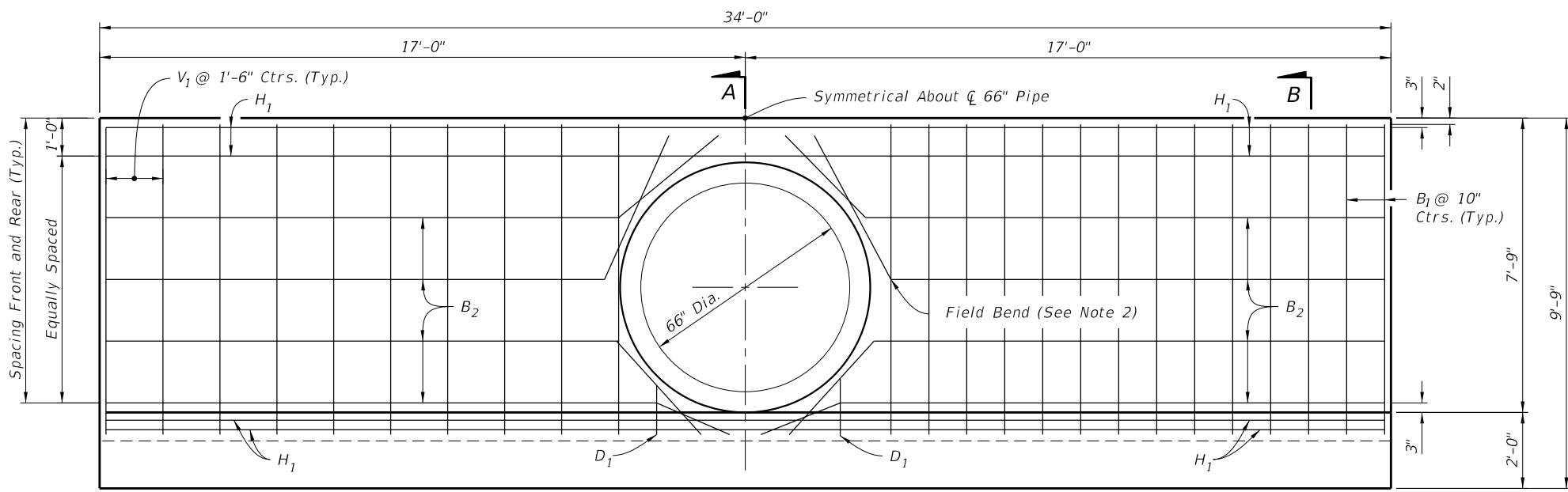
TABLE OF CONTENTS:	
Sheet	Description
1	General Notes and Contents
2	Single 66" Pipe Endwall Details
3	Double 66" Pipe Endwall Details



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PLAN
(Showing Bars In Footing)



HALF ELEVATION
(Showing Bars in Front Face of Wall)

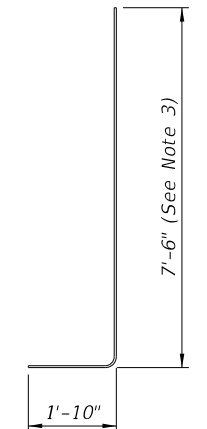
HALF ELEVATION
(Showing Bars in Back Face of Wall)

- NOTES:**
- 2" clearance on all reinforcement, unless otherwise shown.
 - Cut and bend B₂ Bars as shown.
 - All bar dimensions are out to out.

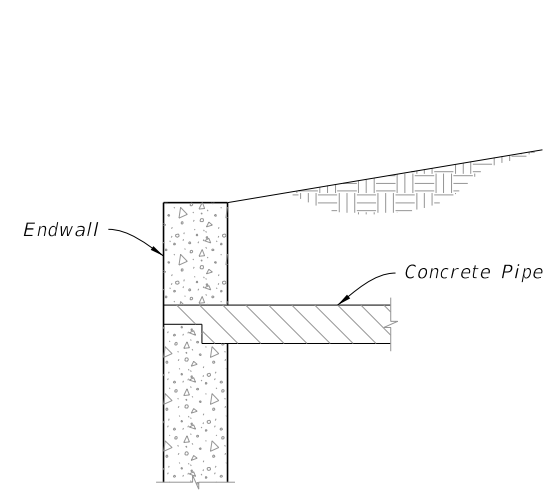
LEGEND:
H = Horizontal Bars B = Bent Bars
V = Vertical Bars D = Dowels or Diagonal Bars

SINGLE 66" PIPE ENDWALL ESTIMATED QUANTITIES			
ITEM	UNIT	RCP	CMP
Class II Concrete	Cu. Yd.	13.2	13.3
Reinforcing Steel	Lb.	1,170	1,170

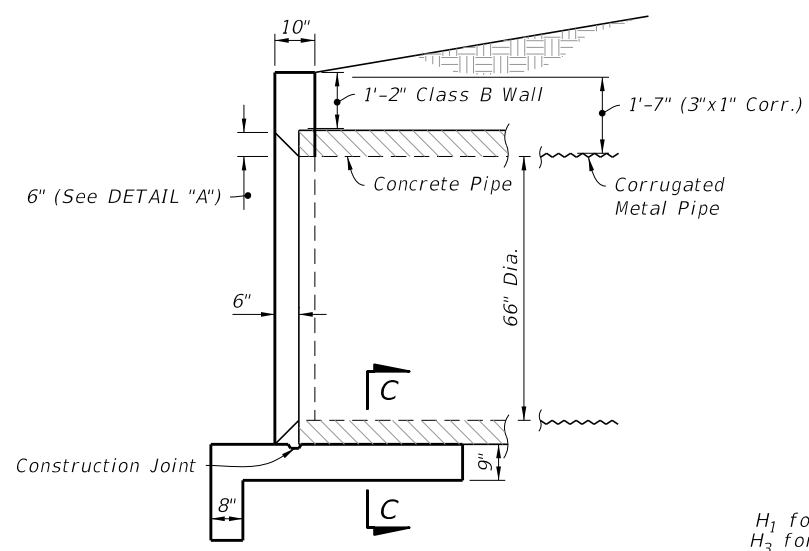
BILL OF REINFORCING STEEL			
MARK	SIZE	NO. REQD.	LENGTH
H ₁	4	9	33'-8"
H ₂	5	63	4'-11"
V ₁	4	20	8'-1"
B ₁	5	34	9'-11"
B ₂	4	8	33'-8"
D ₁	4	4	1'-8"



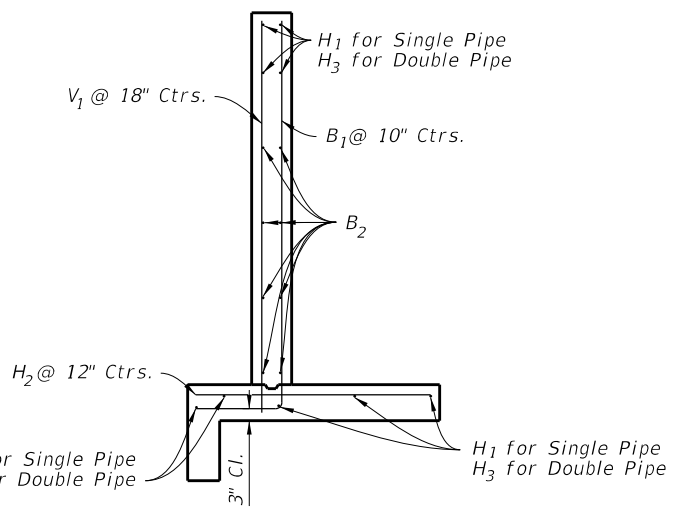
BAR B₁ BENDING DIAGRAM



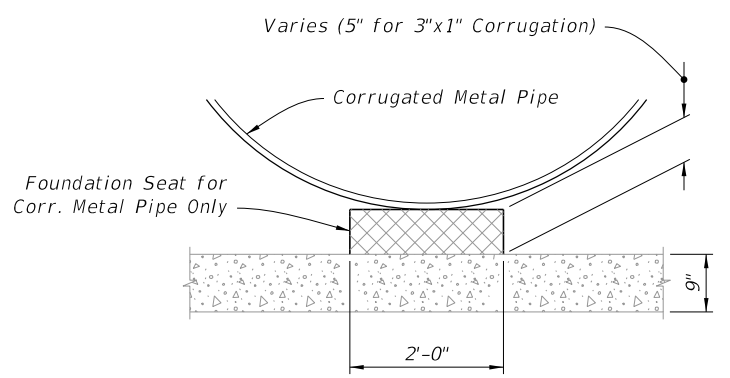
DETAIL "A"
(Concrete Pipe Optional Entrance)



SECTION A-A
(Rebar Not Shown)



SECTION B-B
(Typical Section)



SECTION C-C

SINGLE 66" PIPE ENDWALL DETAILS

10/29/2019 8:16:41 AM

LAST REVISION 11/01/19	DESCRIPTION:	 FY 2020-21 STANDARD PLANS	STRAIGHT CONCRETE ENDWALLS SINGLE AND DOUBLE 66" PIPE	INDEX 430-032	SHEET 2 of 3
---------------------------	--------------	----------------------------------	--	------------------	-----------------

DOUBLE 66" PIPE ENDWALL ESTIMATED QUANTITIES

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

BILL OF REINFORCING STEEL

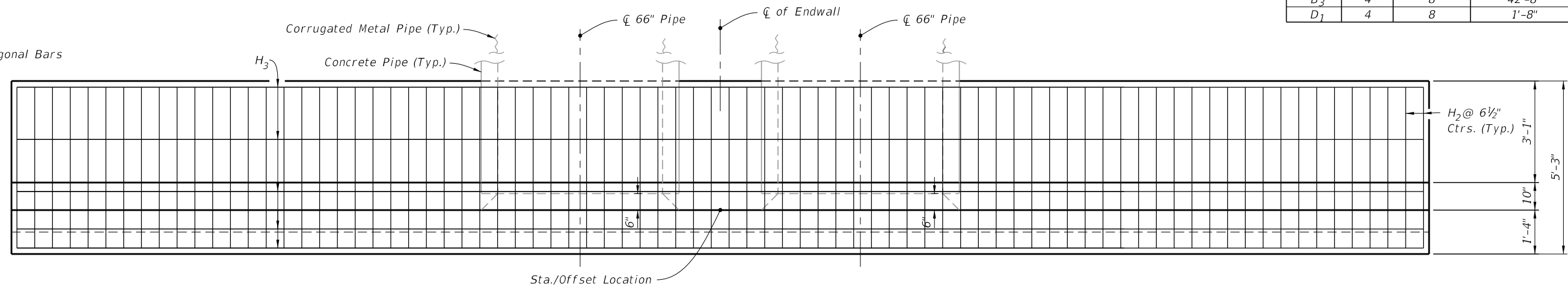
MARK	SIZE	NO. REQD.	LENGTH
H ₂	5	80	4'-11"
H ₃	4	9	42'-8"
V ₁	4	22	8'-1"
B ₁	5	37	9'-11"
B ₃	4	8	42'-8"
D ₁	4	8	1'-8"

NOTES:

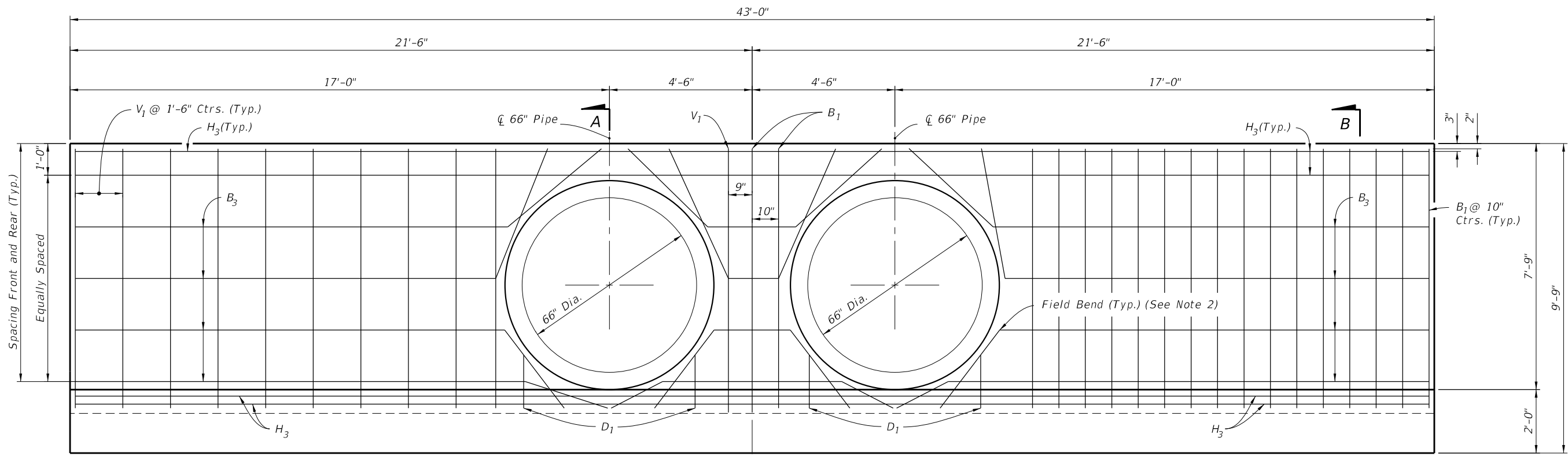
- 2" clearance on all reinforcement, unless otherwise shown.
- Cut and bend B₃ Bars as shown.
- All bar dimensions are out to out.

LEGEND:

- H = Horizontal Bars
- V = Vertical Bars
- B = Bent Bars
- D = Dowels or Diagonal Bars



PLAN
(Showing Bars In Footing)



HALF ELEVATION
(Showing Bars in Front Face of Wall)

HALF ELEVATION
(Showing Bars in Back Face of Wall)

10/29/2019 8:16:42 AM

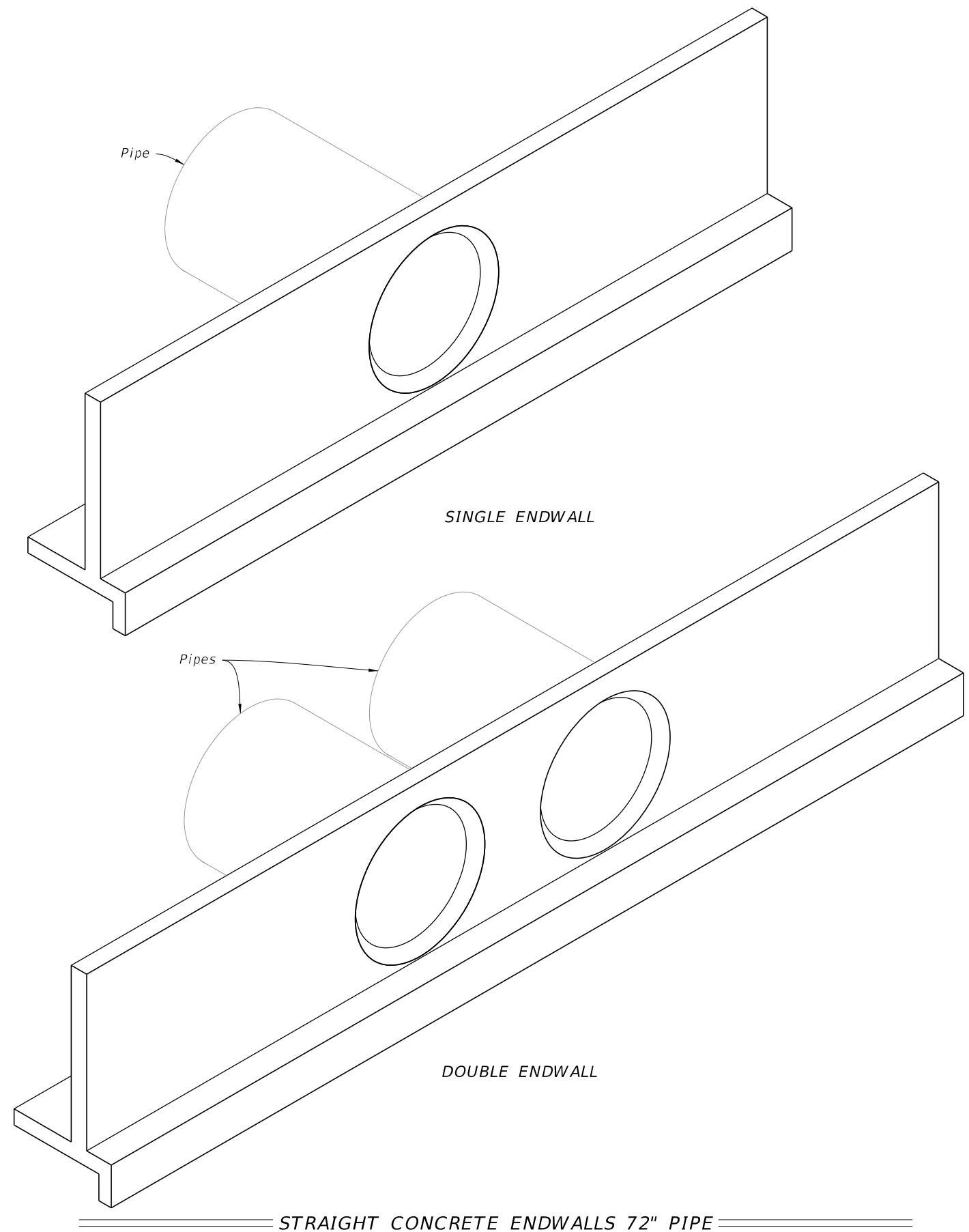
DOUBLE 66" PIPE ENDWALL DETAILS

LAST REVISION 11/01/19	DESCRIPTION:	 FY 2020-21 STANDARD PLANS	STRAIGHT CONCRETE ENDWALLS SINGLE AND DOUBLE 66" PIPE	INDEX 430-032	SHEET 3 of 3
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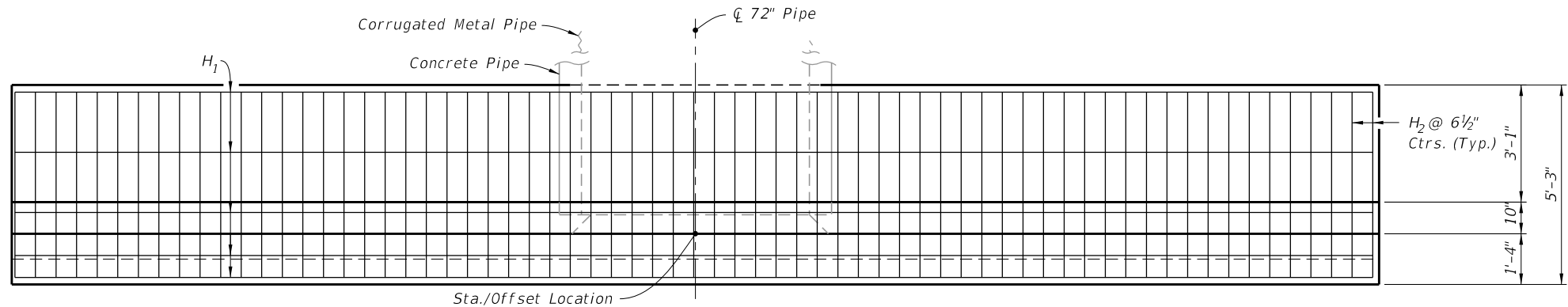
GENERAL NOTES:

1. Use Class II concrete.
2. Reinforcing steel is either Grade 40 or 60.
3. Endwalls may be cast in place or precast concrete. The Contractor or the Supplier will determine the additional reinforcement necessary for handling precast units.
4. Chamfer all exposed edges and corners $\frac{3}{4}$ " unless otherwise shown.
5. Quantities shown are for estimating purposes only.

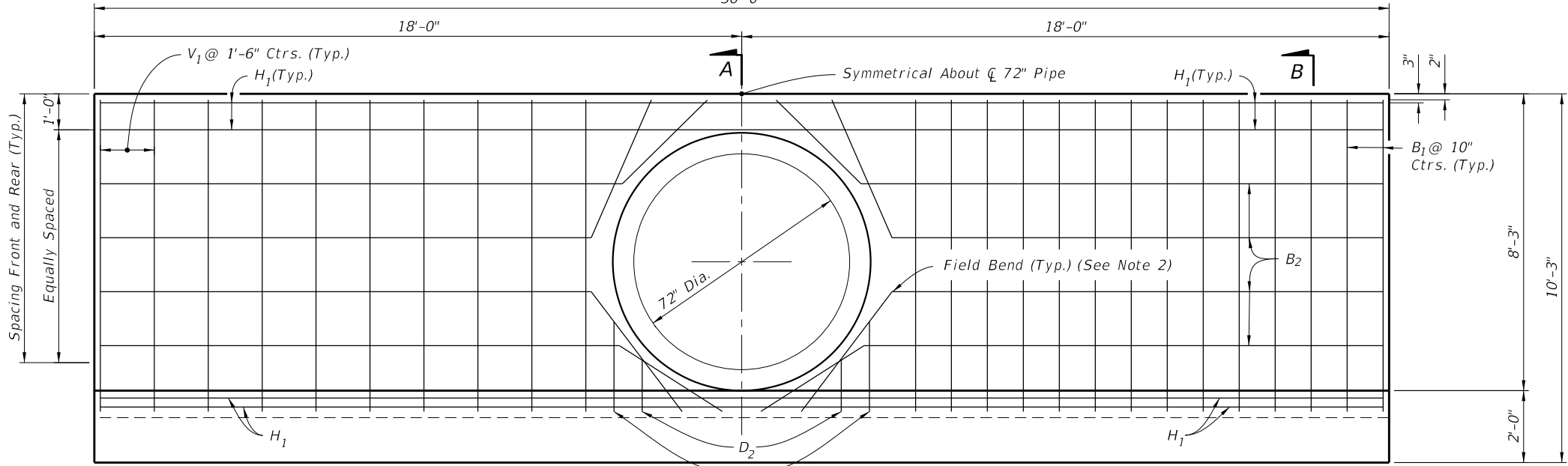
TABLE OF CONTENTS:	
Sheet	Description
1	General Notes and Contents
2	Single 72" Pipe Endwall Details
3	Double 72" Pipe Endwall Details



10/29/2019 8:16:43 AM



PLAN
(Showing Bars In Footing)
36'-0"



HALF ELEVATION
(Showing Bars in Front Face of Wall)

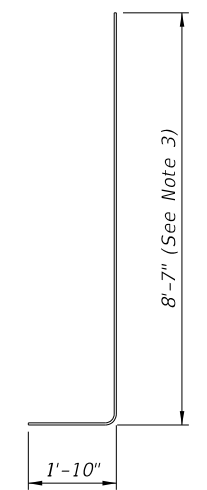
HALF ELEVATION
(Showing Bars in Back Face of Wall)

- NOTES:**
- 2" clearance on all reinforcement, unless otherwise shown.
 - Cut and bend B₂ Bars as shown.
 - All bar dimensions are out to out.

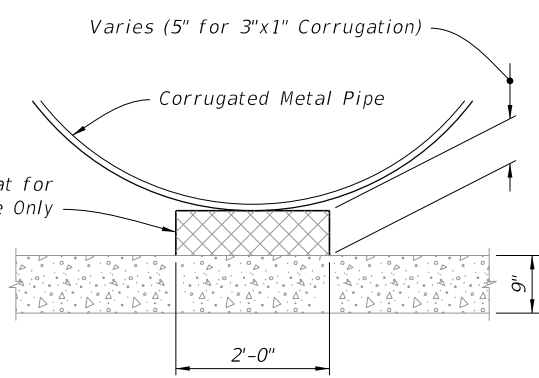
- LEGEND:**
- H = Horizontal Bars B = Bent Bars
V = Vertical Bars D = Dowels or Diagonal Bars

SINGLE 72" PIPE ENDWALL ESTIMATED QUANTITIES			
ITEM	UNIT	RCP	CMP
Class II Concrete	Cu. Yd.	14.4	14.5
Reinforcing Steel	Lb.	1249	1249

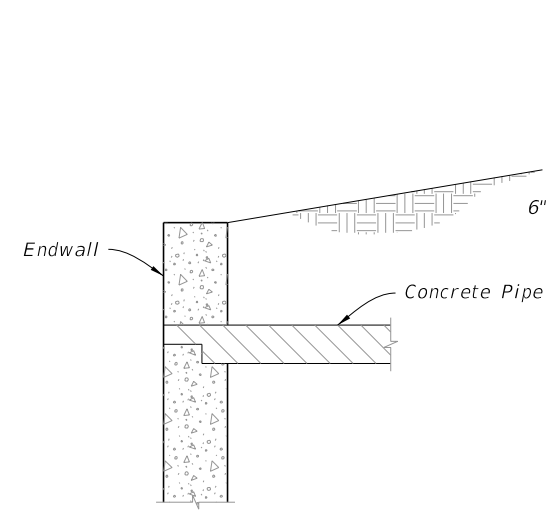
BILL OF REINFORCING STEEL			
MARK	SIZE	NO. REQD.	LENGTH
H ₁	4	9	35'-8"
H ₂	5	68	4'-11"
V ₁	4	20	8'-7"
B ₁	5	34	10'-5"
B ₂	4	8	35'-8"
D ₁	4	4	2'-6"
D ₂	4	4	1'-6"



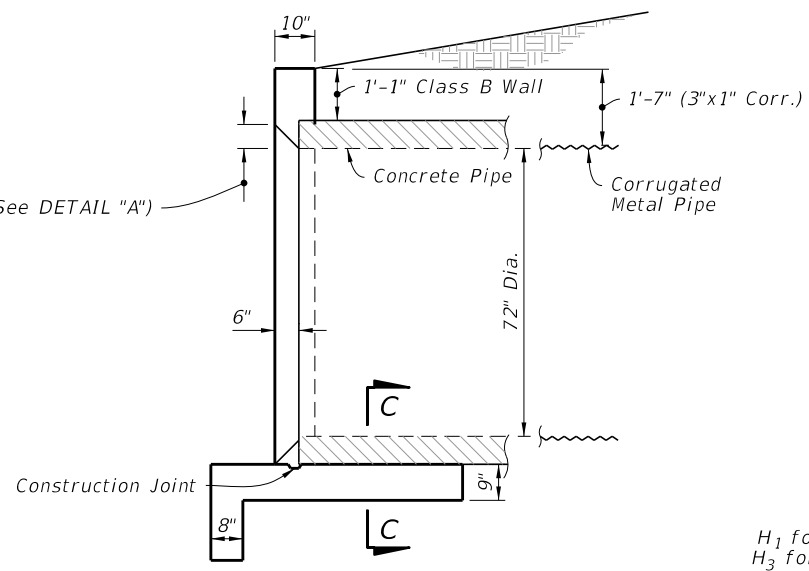
BAR B₁
BENDING DIAGRAM



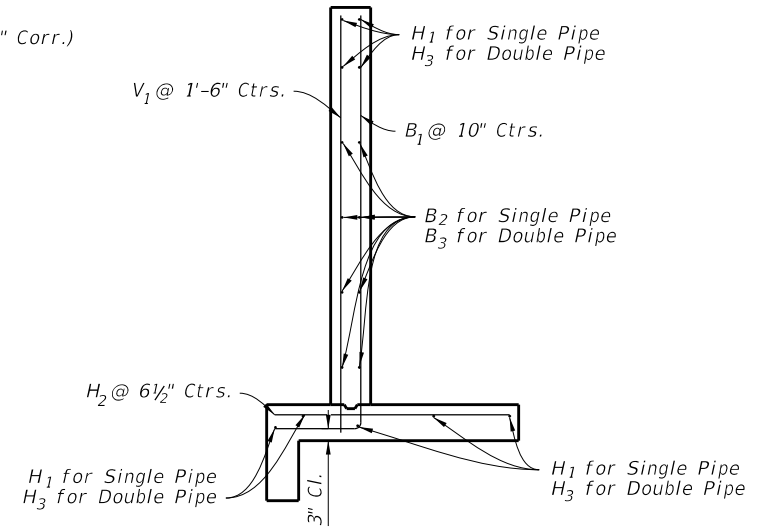
SECTION C-C



DETAIL "A"
(Concrete Pipe Optional Entrance)



SECTION A-A
(Rebar Not Shown)



SECTION B-B
(Typical Section)

SINGLE 72" PIPE ENDWALL DETAILS

10/29/2019 8:16:44 AM

LAST REVISION 11/01/19	DESCRIPTION:	 FY 2020-21 STANDARD PLANS	STRAIGHT CONCRETE ENDWALLS SINGLE AND DOUBLE 72" PIPE	INDEX 430-033	SHEET 2 of 3
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**DOUBLE 72" PIPE ENDWALL
ESTIMATED QUANTITIES**

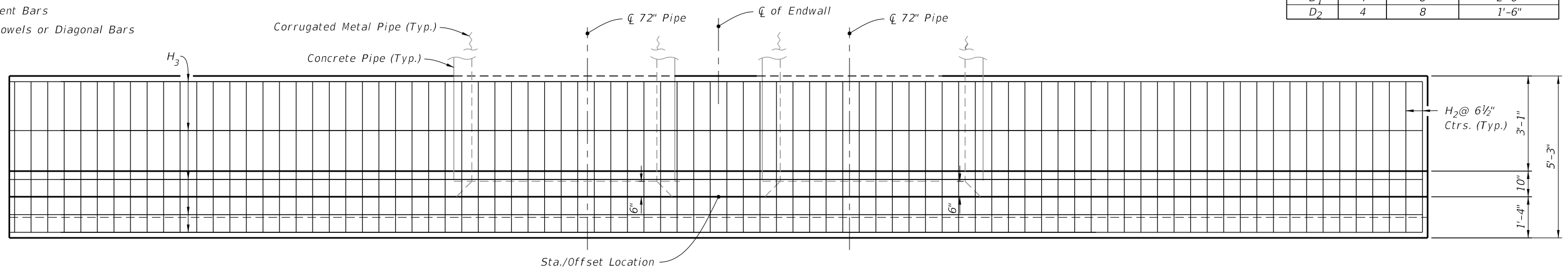
ITEM	UNIT	RCP	CMP
Class II Concrete	Cu. Yd.	17.5	17.8
Reinforcing Steel	Lb.	1519	1519

BILL OF REINFORCING STEEL

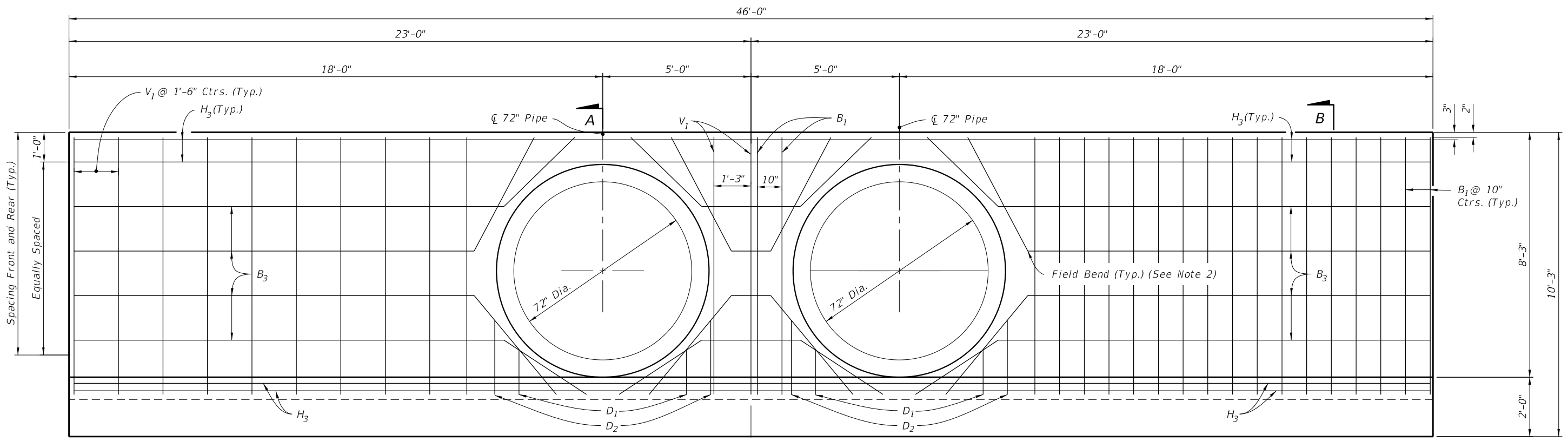
MARK	SIZE	NO. REQD.	LENGTH
H ₂	5	85	4'-11"
H ₃	4	9	45'-8"
V ₁	4	23	8'-7"
B ₁	5	38	10'-5"
B ₃	4	8	45'-8"
D ₁	4	8	2'-6"
D ₂	4	8	1'-6"

- NOTES:**
- 2" clearance on all reinforcement, unless otherwise shown.
 - Cut and bend B₃ Bars as shown.
 - All bar dimensions are out to out.

- LEGEND:**
- H = Horizontal Bars
 - V = Vertical Bars
 - B = Bent Bars
 - D = Dowels or Diagonal Bars



PLAN
(Showing Bars In Footing)



HALF ELEVATION
(Showing Bars in Front Face of Wall)

HALF ELEVATION
(Showing Bars in Back Face of Wall)

DOUBLE 72" PIPE ENDWALL DETAILS

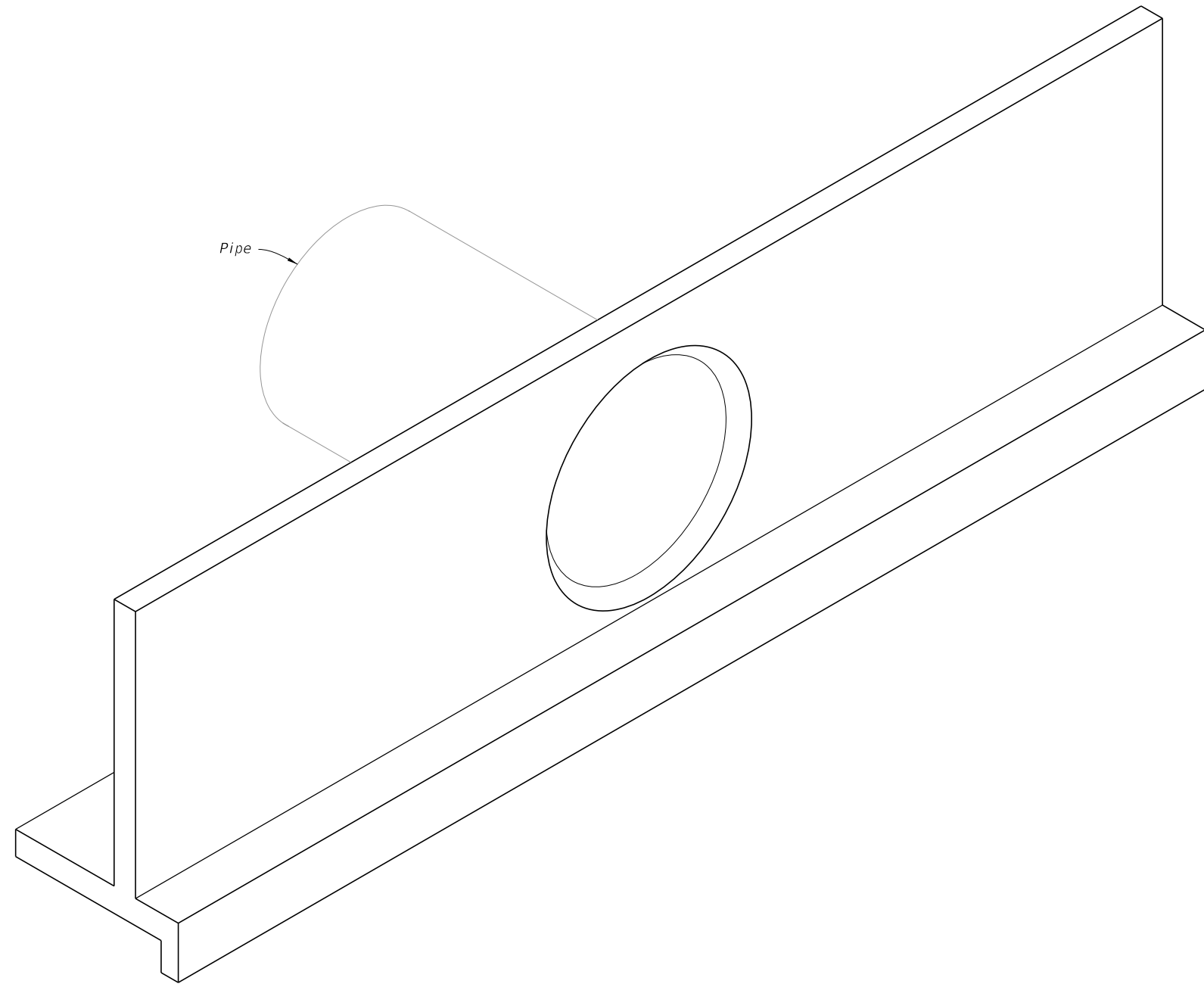
10/29/2019 8:16:45 AM

LAST REVISION 11/01/19	DESCRIPTION:	 FY 2020-21 STANDARD PLANS	STRAIGHT CONCRETE ENDWALLS SINGLE AND DOUBLE 72" PIPE	INDEX 430-033	SHEET 3 of 3
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GENERAL NOTES:

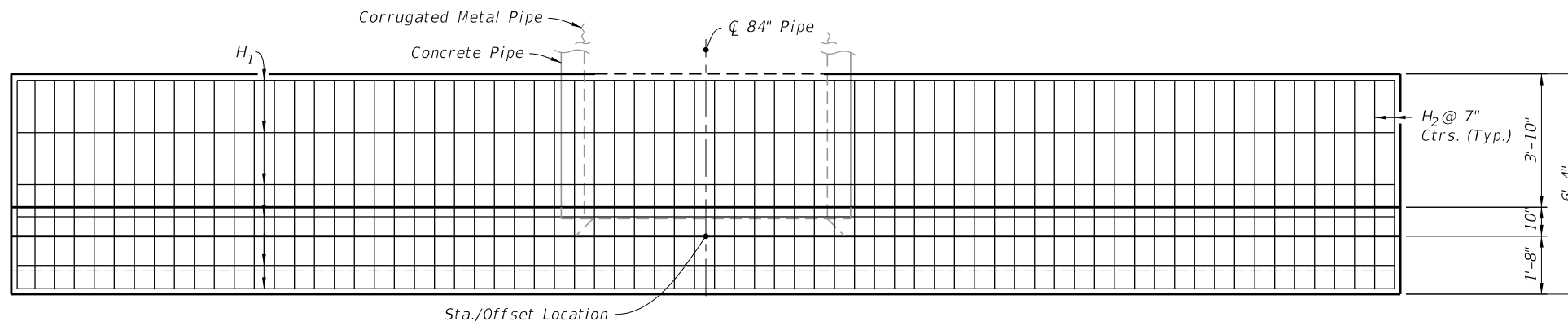
1. Use Class II concrete.
2. Reinforcing steel is either Grade 40 or 60.
3. Endwalls may be cast in place or precast concrete. The Contractor or the Supplier will determine the additional reinforcement necessary for handling precast units.
4. Chamfer all exposed edges and corners $\frac{3}{4}$ " unless otherwise shown.
5. Quantities shown are for estimating purposes only.

TABLE OF CONTENTS:	
Sheet	Description
1	General Notes and Contents
2	Single 84" Pipe Endwall Details

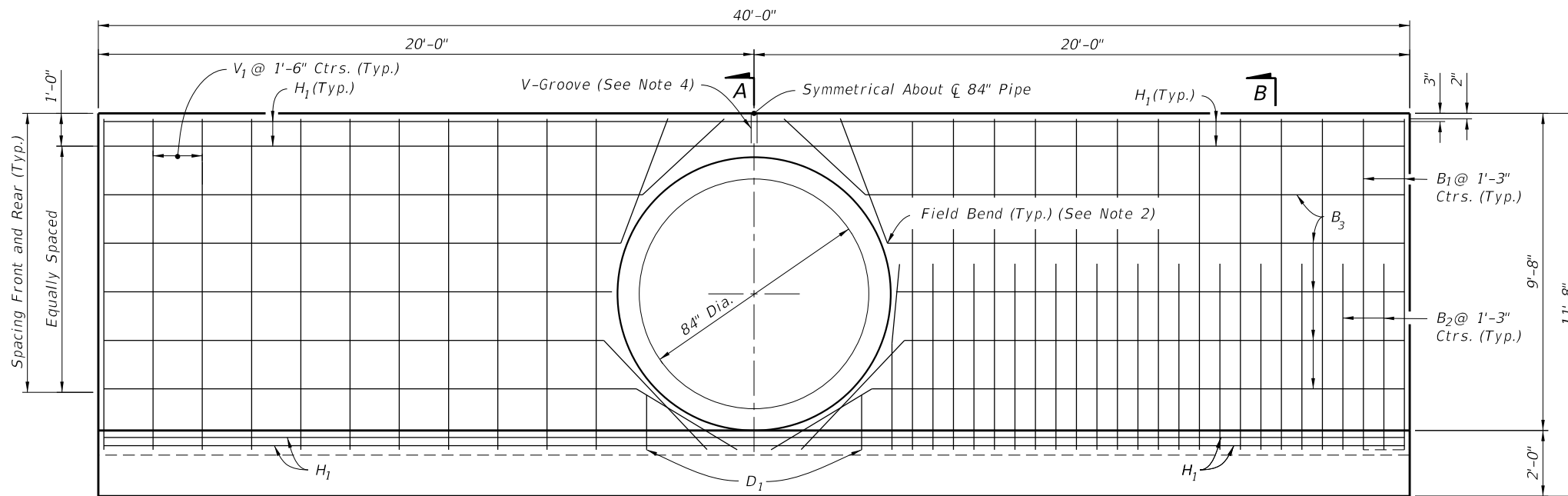


=====**STRAIGHT CONCRETE ENDWALL SINGLE 84" PIPE**=====

10/29/2019 8:16:45 AM

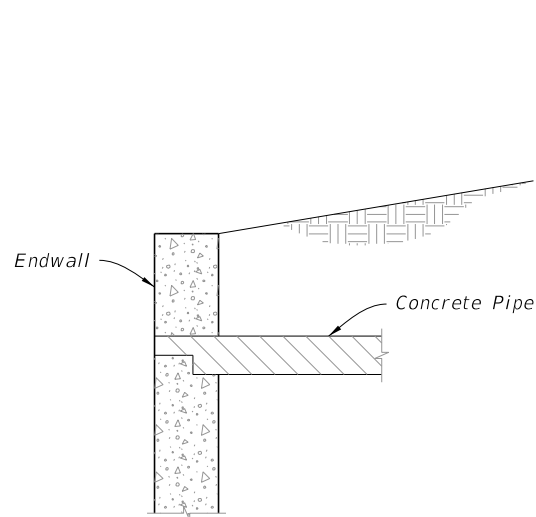


PLAN
(Showing Bars In Footing)

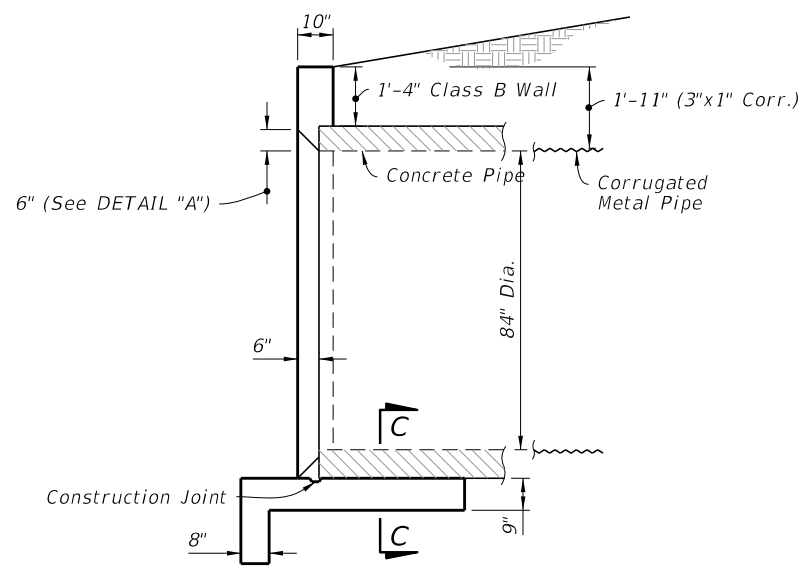


HALF ELEVATION
(Showing Bars in Front Face of Wall)

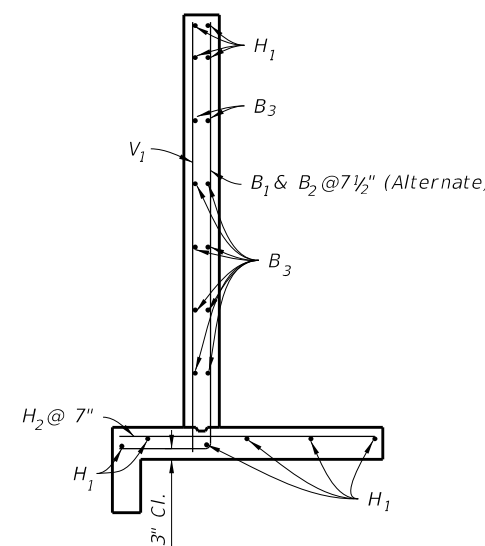
HALF ELEVATION
(Showing Bars in Back Face of Wall)



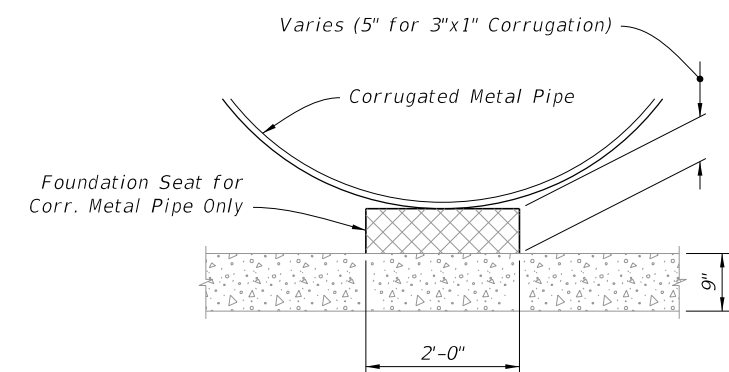
DETAIL "A"
(Concrete Pipe Optional Entrance)



SECTION A-A
(Rebar Not Shown)



SECTION B-B
(Typical Section)



SECTION C-C

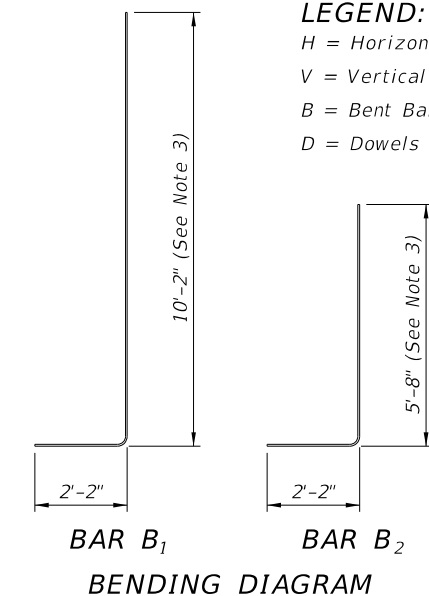
SINGLE 84" PIPE ENDWALL DETAILS

- NOTES:**
- 2" clearance on all reinforcement, unless otherwise shown.
 - Cut and/or bend B₃ Bars as shown.
 - All bar dimensions are out to out.
 - Install a 3/4" V-Groove at the top, front and back.

SINGLE 84" PIPE ENDWALL ESTIMATED QUANTITIES			
ITEM	UNIT	RCP	CMP
Class II Concrete	Cu. Yd.	20.0	20.2
Reinforcing Steel	Lb.	2,095	2,095

BILL OF REINFORCING STEEL			
MARK	SIZE	NO. REQD.	LENGTH
H ₁	4	6	39'-8"
H ₂	6	69	6'-0"
V ₁	4	22	10'-2"
B ₁	6	26	12'-4"
B ₂	6	26	7'-10"
B ₃	4	14	39'-8"
D ₁	4	4	2'-0"

- LEGEND:**
- H = Horizontal Bars
 - V = Vertical Bars
 - B = Bent Bars
 - D = Dowels or Diagonal Bars



BAR B₁
BAR B₂
BENDING DIAGRAM

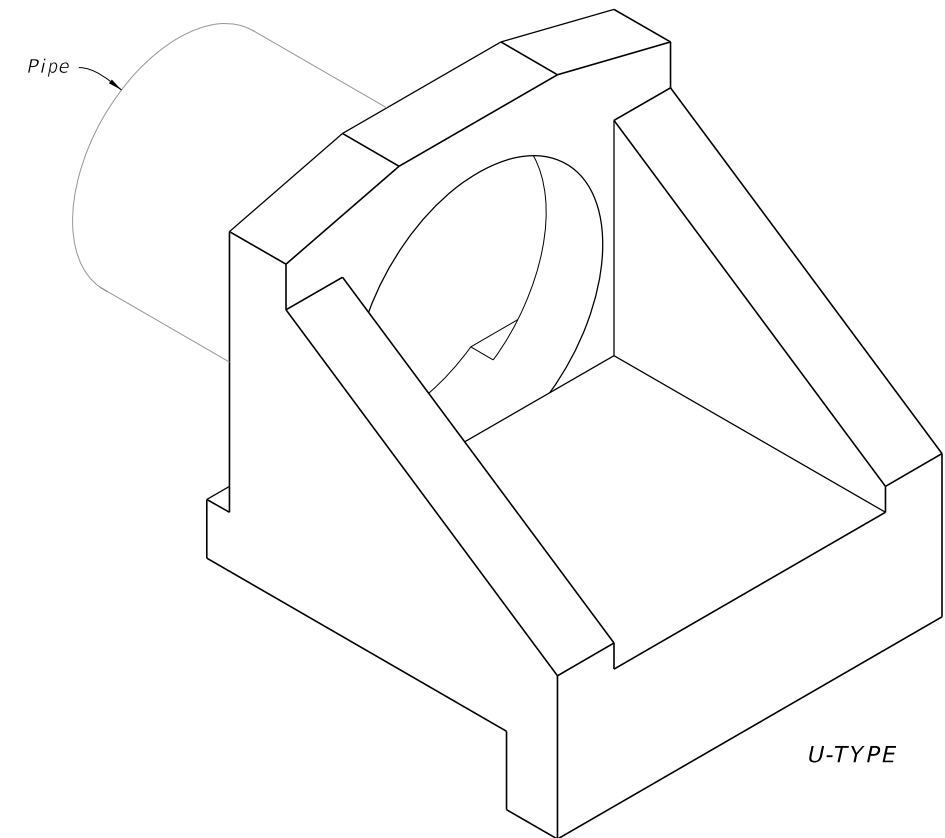
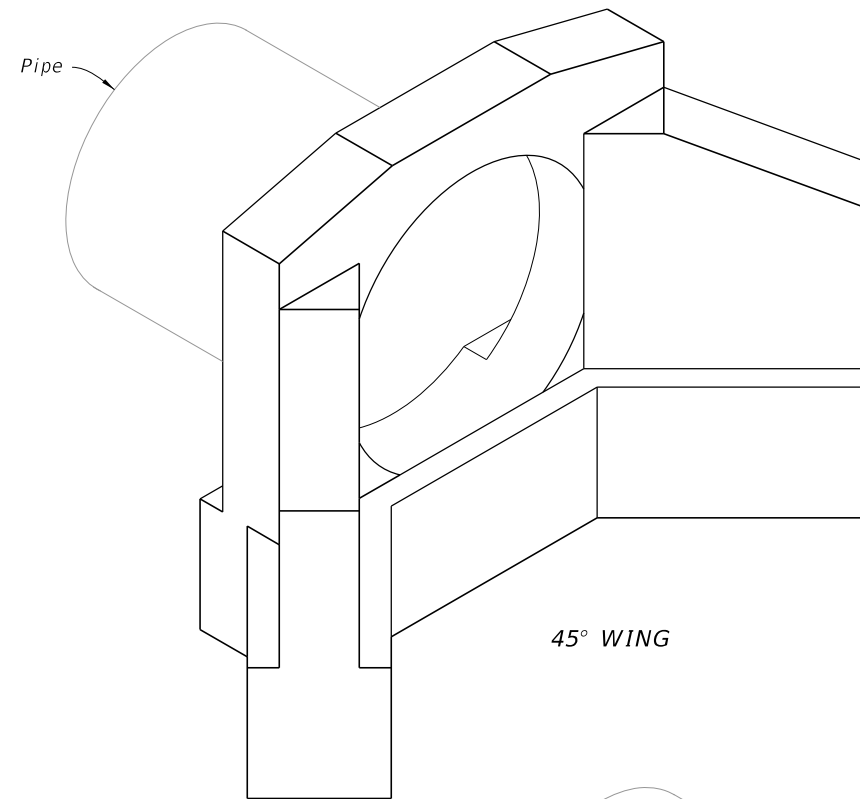
10/29/2019 8:16:46 AM

LAST REVISION	DESCRIPTION:
11/01/19	

GENERAL NOTES:

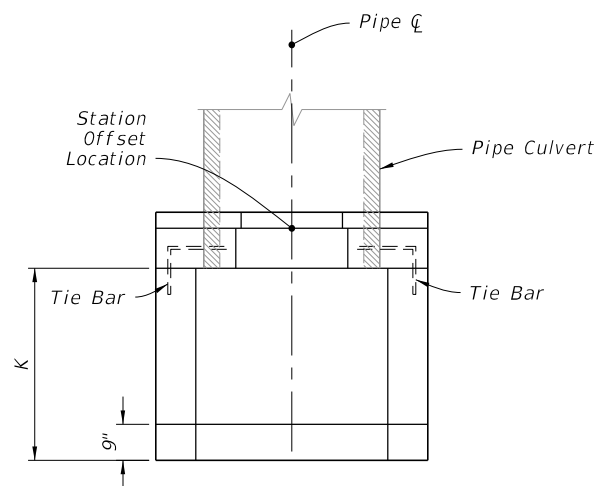
1. Use Class I concrete.
2. Chamfer all exposed edges and corners $\frac{3}{4}$ " unless otherwise shown.
3. Quantities shown are for estimating purposes only.

TABLE OF CONTENTS:	
Sheet	Description
1	General Notes and Contents
2	U-Type and 45° Endwalls

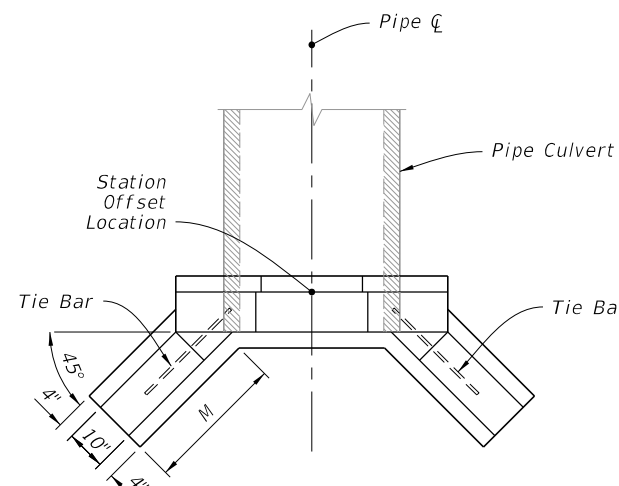


===== WINGED CONCRETE ENDWALLS =====

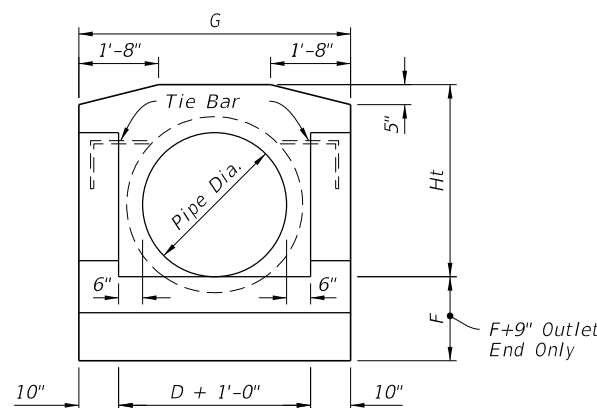
10/29/2019 8:16:47 AM



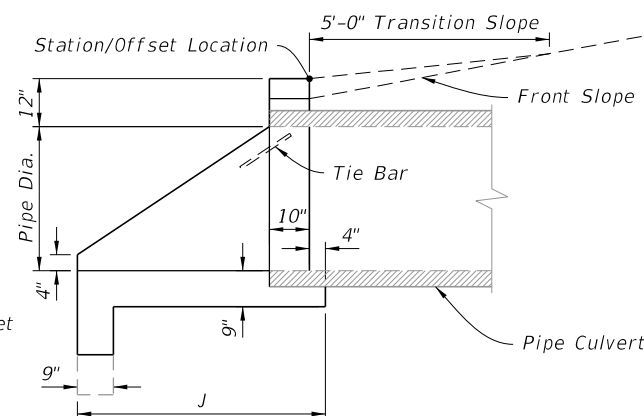
PLAN



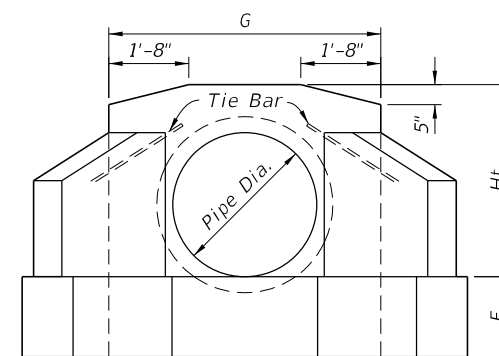
PLAN



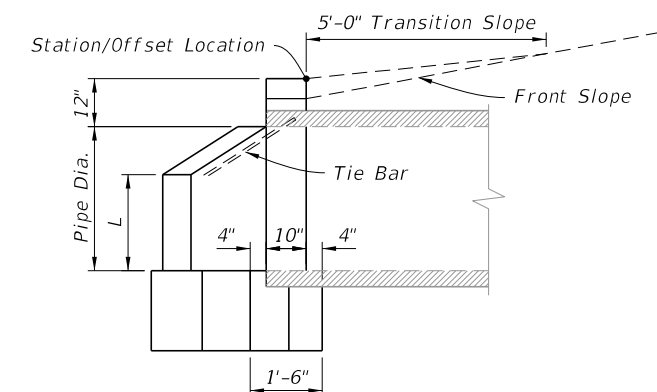
FRONT ELEVATION



SIDE ELEVATION



FRONT ELEVATION



SIDE ELEVATION

DIMENSIONS AND ESTIMATED QUANTITIES PIPE CULVERT ENDWALLS WITH U-TYPE WINGS													
DIMENSIONS							QUANTITIES IN ONE ENDWALL						
Pipe Dia. D	Area (ft ²)	Wall			Footing		Concrete, Class I, Total (CY)						Steel Tie Bars
		G	Ht	K	F	J	RCP		CMP		CIP		
							Inlet	Outlet	Inlet	Outlet	Inlet	Outlet	
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"

ENDWALL WITH U-TYPE WINGS

DIMENSIONS AND ESTIMATED QUANTITIES PIPE CULVERT ENDWALLS WITH 45° WINGS											
DIMENSIONS							QUANTITIES IN ONE ENDWALL				
Pipe Dia. D	Area (ft ²)	Ht	Wall			Footing F	Concrete, Class I			Steel Tie Bars	
			G	L	M		Total (CY)				
						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"	

ENDWALL WITH 45° WINGS

10/29/2019 8:16:47 AM

U-TYPE AND 45° ENDWALLS

LAST REVISION 11/01/19	DESCRIPTION:
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**FY 2020-21
STANDARD PLANS**

WINGED CONCRETE ENDWALLS

INDEX 430-040	SHEET 2 of 2
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GENERAL NOTES:

1. Use Class I Concrete.
2. Channel section C3 x 6.0 may be substituted for the C4 x 5.4 channel.
3. All steel reinforcing bars are #4 with 2" cover except as noted. Spacing shown are center to center. Lap bars 1'-5" minimum. Welded wire fabric (two cages max.) with an equivalent cross section area (0.20 sq. in.) may be substituted for bar reinforcement.
4. Drill 1/4" holes 8" deep with a rotary drill in existing endwall for dowel bars. Thoroughly clean holes prior to installing Adhesive-Bonded Dowels.
5. Quantities shown are for estimating purposes only.
6. For supplemental details, see Index 425-001.

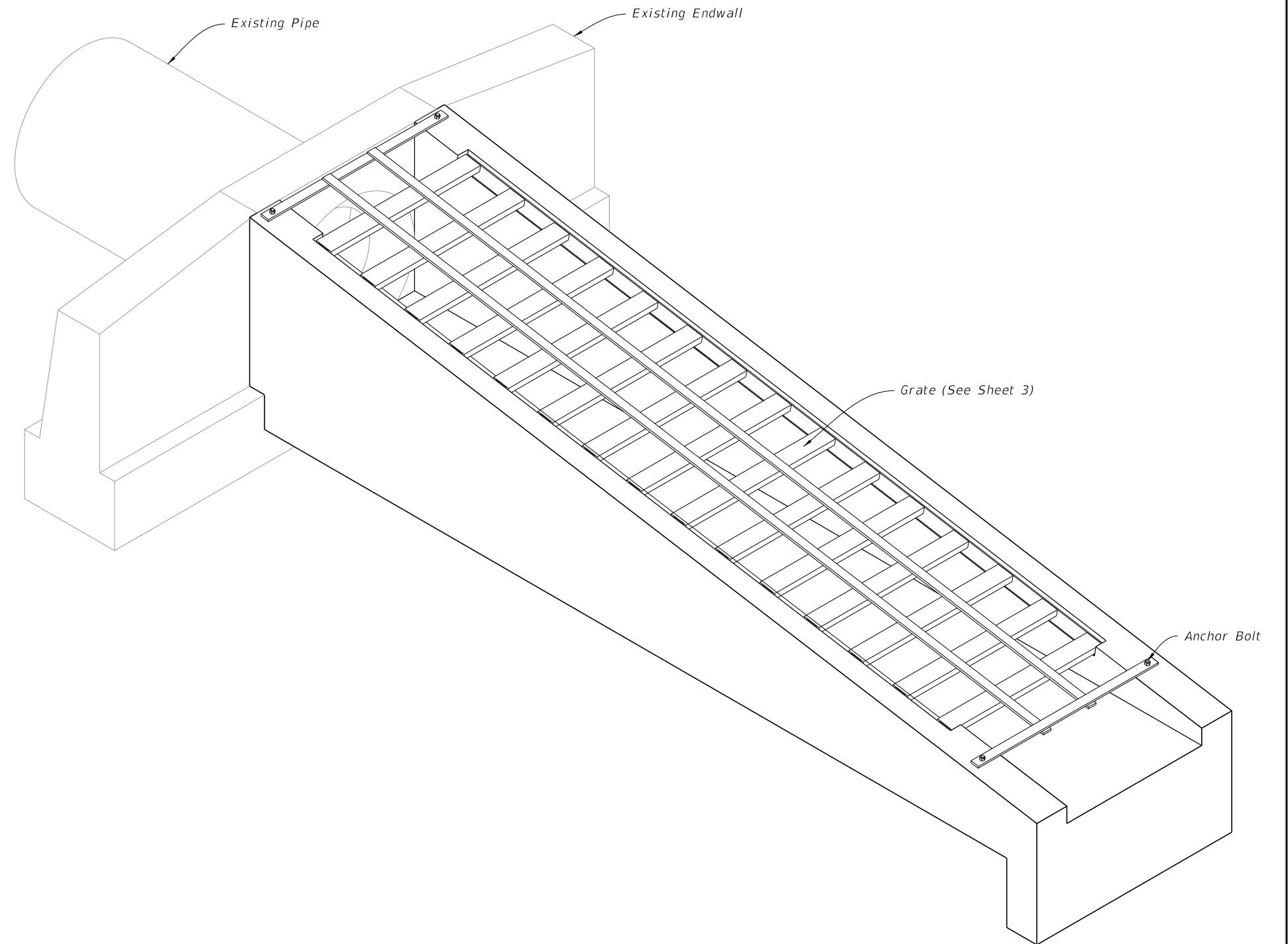
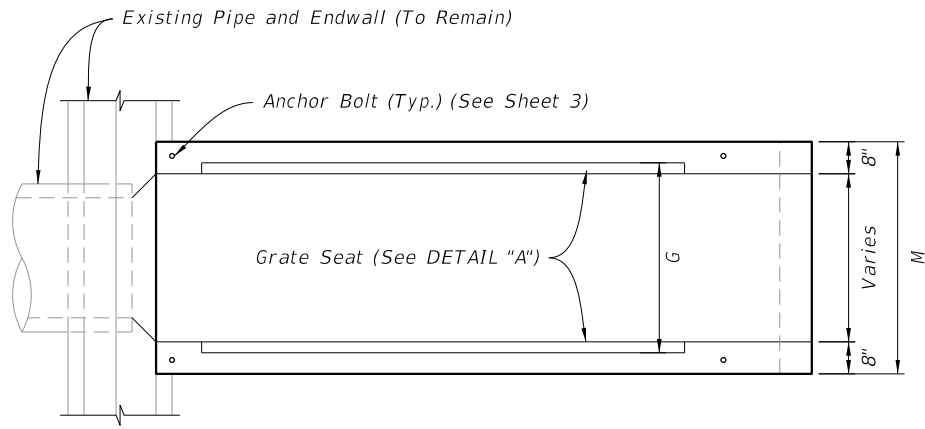


TABLE OF CONTENTS:

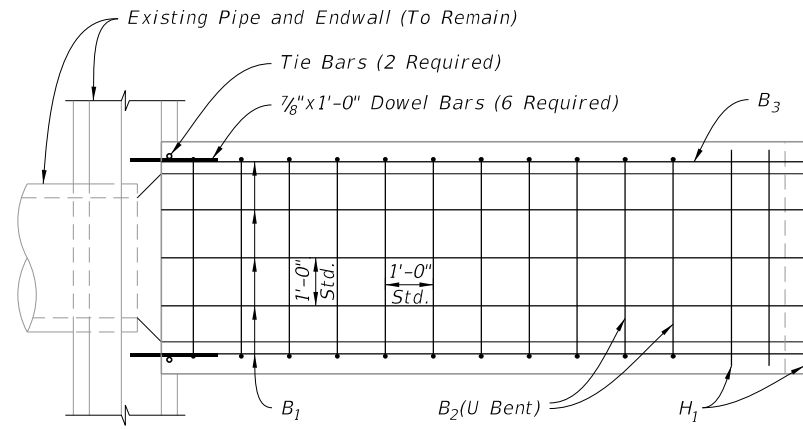
Sheet	Description
1	General Notes and Contents
2	Endwalls for 1:4 and 1:6 Slopes
3	Steel Grate

SAFETY MODIFICATIONS

10/29/2019 8:16:48 AM

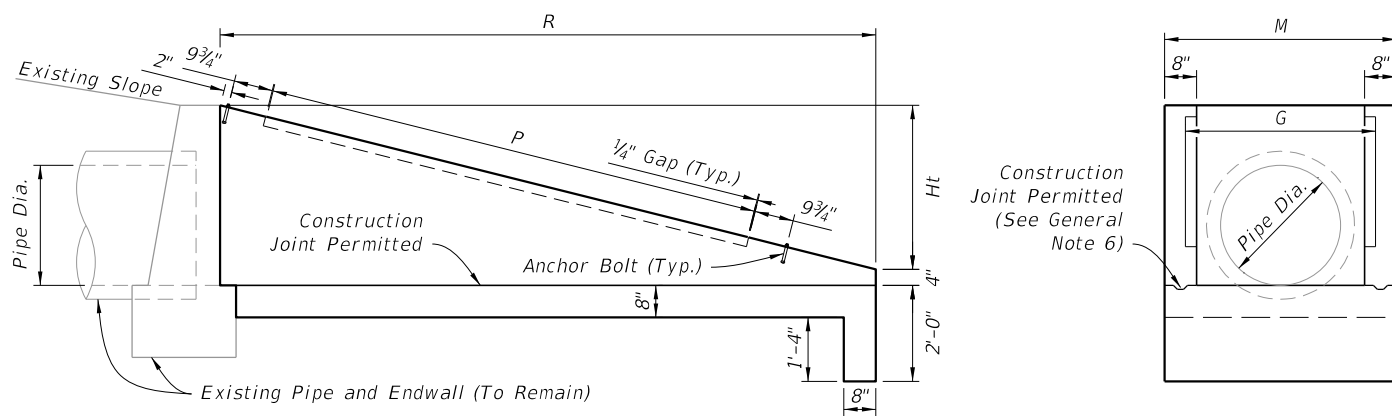


PLAN



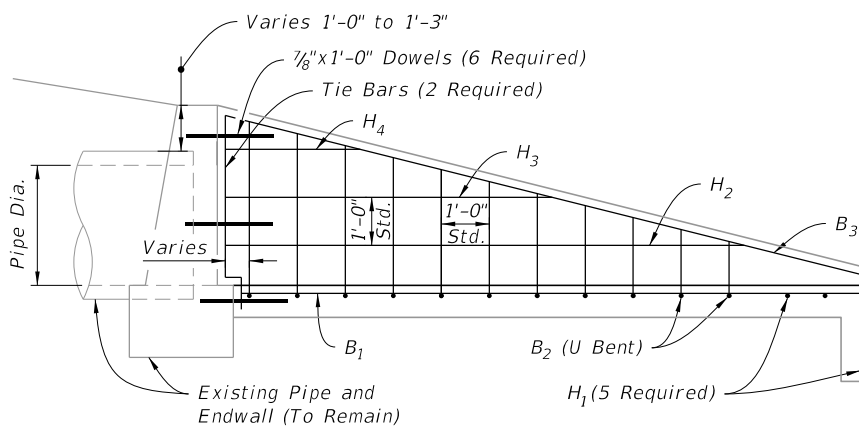
PLAN

LEGEND:
 H = Horizontal Bars
 B = Bent Bars

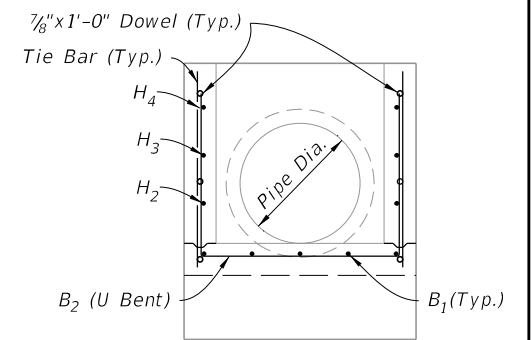


ELEVATION

END VIEW



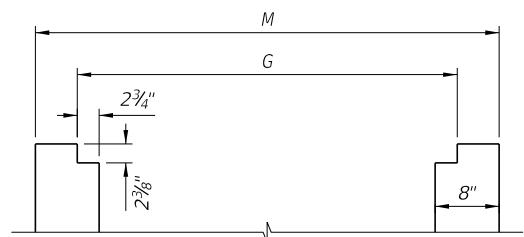
ELEVATION



BACK VIEW

DIMENSIONAL DETAILS

REINFORCING DETAILS



GRATE SEAT

DETAIL "A"

TABLE 1
 U-ENDWALL DIMENSIONS AND QUANTITIES

Slope	Pipe Dia.	G	M	Ht	R	P	Class I Concrete-CY	Reinforcing Steel-lbs.	Sod SY
1:6	15"	2'-8 1/2"	3'-7"	2'-2"	13'-0"	9'-4"	2.12	167	23
	18"	2'-11 1/2"	3'-10"	2'-5"	14'-6"	11'-4"	2.53	173	25
	24"	3'-5 1/2"	4'-4"	2'-11"	17'-6"	14'-4"	3.48	238	29
	30"	3'-11 1/2"	4'-10"	3'-5"	20'-6"	17'-4"	4.57	315	32
1:4	15"	2'-8 1/2"	3'-7"	2'-2"	8'-8"	5'-4"	1.44	120	19
	18"	2'-11 1/2"	3'-10"	2'-5"	9'-8"	6'-4"	1.72	130	20
	24"	3'-5 1/2"	4'-4"	2'-11"	11'-8"	8'-4"	2.36	167	22
	30"	3'-11 1/2"	4'-10"	3'-5"	13'-8"	10'-4"	3.09	225	25

ENDWALLS FOR 1:4 AND 1:6 SLOPES

10/29/2019 8:16:48 AM

LAST REVISION 11/01/19	DESCRIPTION:
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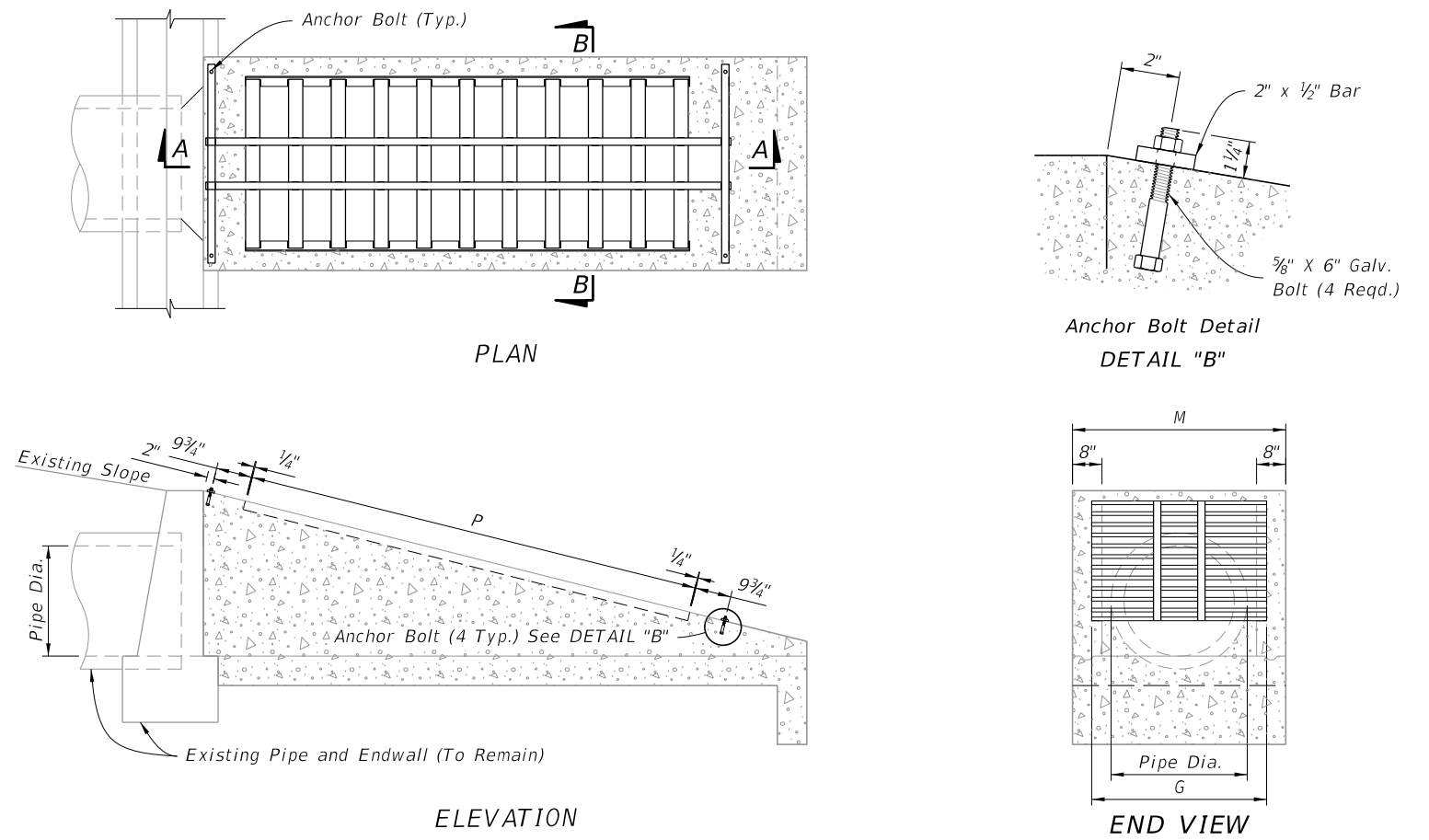
FY 2020-21
 STANDARD PLANS

SAFETY MODIFICATIONS FOR ENDWALLS

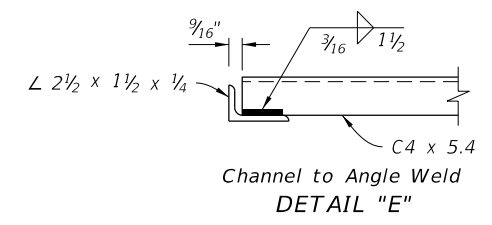
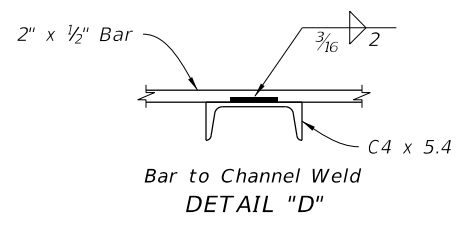
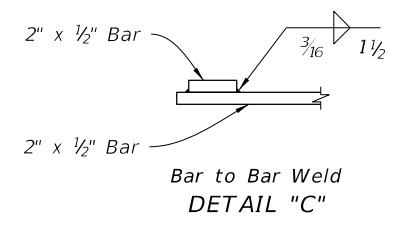
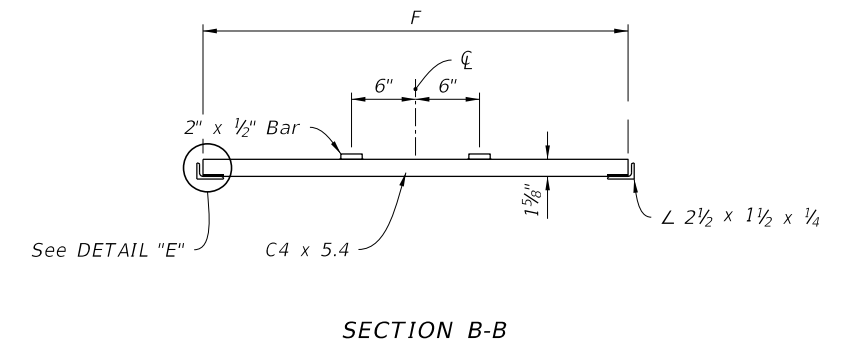
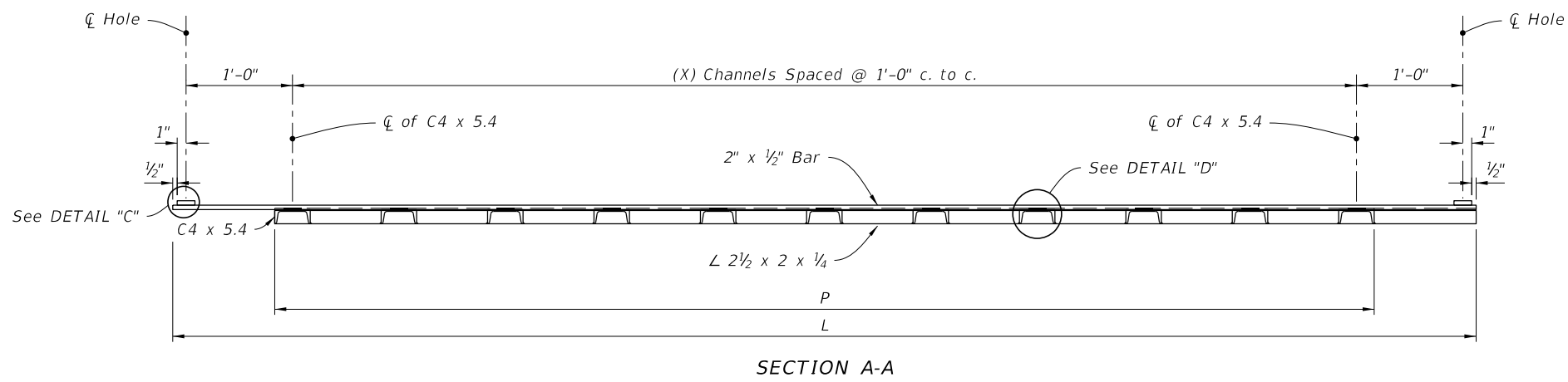
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TABLE 2 GRATE DIMENSIONS AND QUANTITIES									
Slope	Pipe Dia.	Channels @ 5.4 Lbs./LF		Bars @ 3.4 lbs/LF (2 ea.)			Angles @ 3.2 Lbs./LF		
		Quantity	F	lbs.	L	M-4"	lbs.	P	lbs.
1:6	15"	10	2'-6 ⁷ / ₈ "	139	11'-3"	3'-3"	99	9'-4"	60
	18"	12	2'-9 ⁷ / ₈ "	183	13'-3"	3'-6"	114	11'-4"	73
	24"	15	3'-3 ⁷ / ₈ "	269	16'-3"	4'-0"	138	14'-4"	92
	30"	18	3'-9 ⁷ / ₈ "	372	19'-3"	4'-6"	162	17'-4"	111
1:4	15"	6	2'-6 ⁷ / ₈ "	83	7'-3"	3'-3"	71	5'-4"	34
	18"	7	2'-9 ⁷ / ₈ "	107	8'-3"	3'-6"	80	6'-4"	41
	24"	9	3'-3 ⁷ / ₈ "	161	10'-3"	4'-0"	97	8'-4"	53
	30"	11	3'-9 ⁷ / ₈ "	227	12'-3"	4'-6"	114	10'-4"	66



STEEL GRATE MOUNTING



STEEL GRATE DETAILS

STEEL GRATE

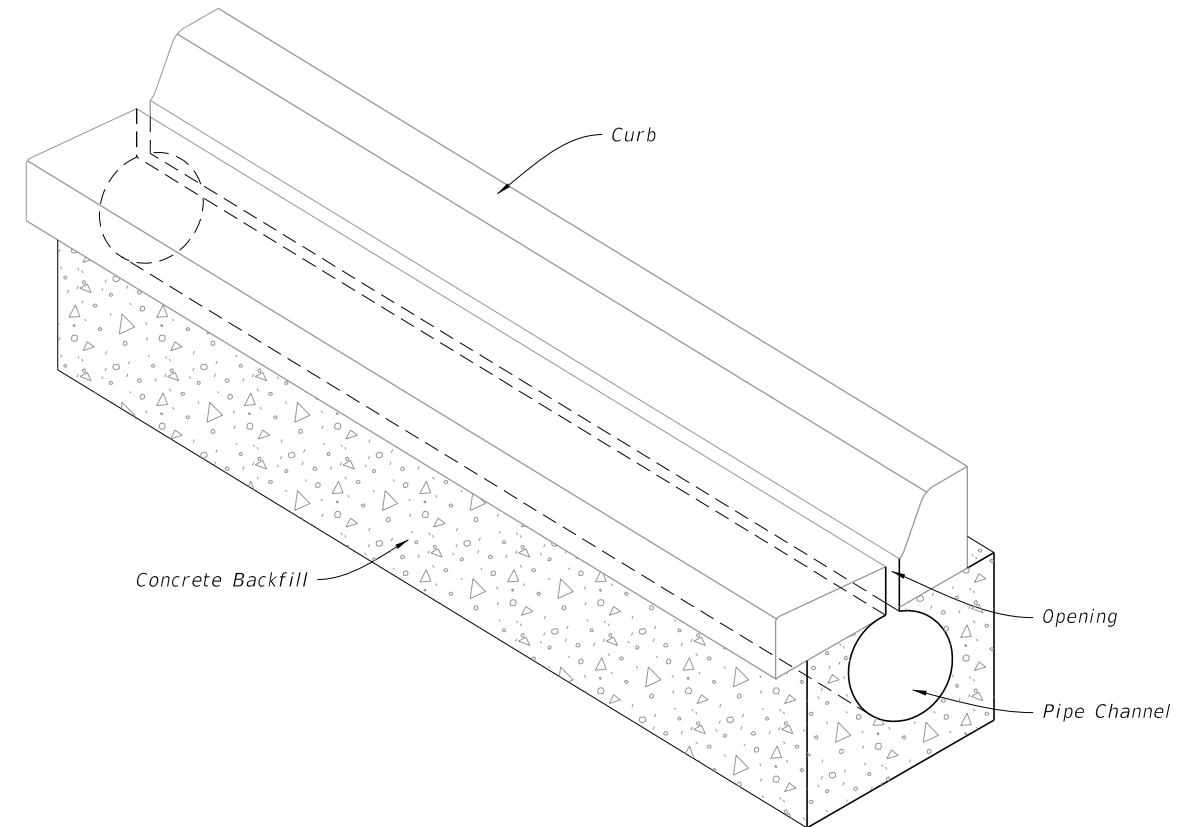
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GENERAL NOTES:


1. Install outlet pipes and preformed channel inverts with a slope of 0.6% or steeper toward the outlet regardless of the surface slope, unless shown different in the Plans.
2. Stub trench drain directly into drainage structures or install outlet pipes to connect trench drain to drainage structures.
3. Provide a cleanout port compatible with the manufactured system for Type I drains at the upstream end and at intervals of 50 feet maximum. Provide a cleanout port with an opening of 6" to 10" wide (transverse to the trench drain length) and 18" to 24" long. Form curbs or separators around the cleanout when cleanouts are placed adjacent to raised curb or separator. Install the cleanout with a removable load resistant cover or grate.
4. Excavate trench to allow for a minimum of 6" of concrete to be placed under and alongside the trench drain channel system. Install concrete backfill in accordance with Specification 347. Install concrete backfill extending a minimum of 6" past the end of the drain opening at the end of all Type I or II units.
5. Install transverse bars spaced 4" to 6" on center for Type I Trench Drain.

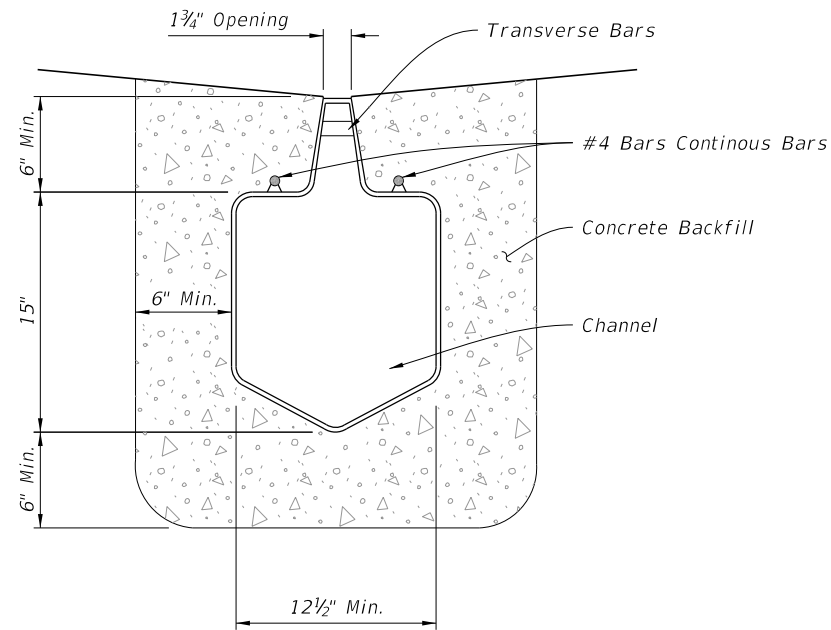
TABLE OF CONTENTS:	
Sheet	Description
1	General Notes and Contents
2	Type I - Nonremovable Grate
3	Type II - Removable Grate



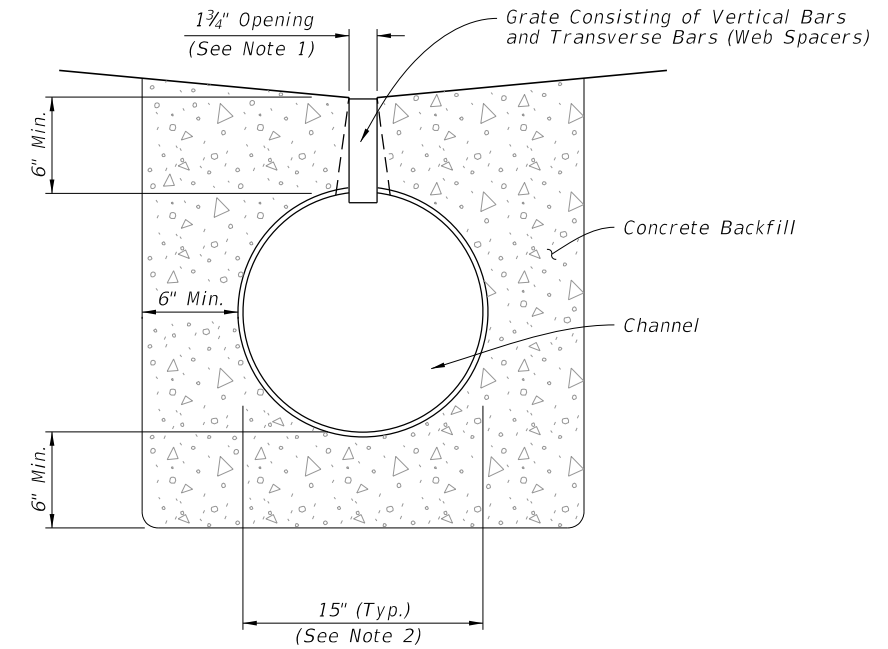
=====**TRENCH DRAIN ASSEMBLY**=====

10/29/2019 8:16:50 AM

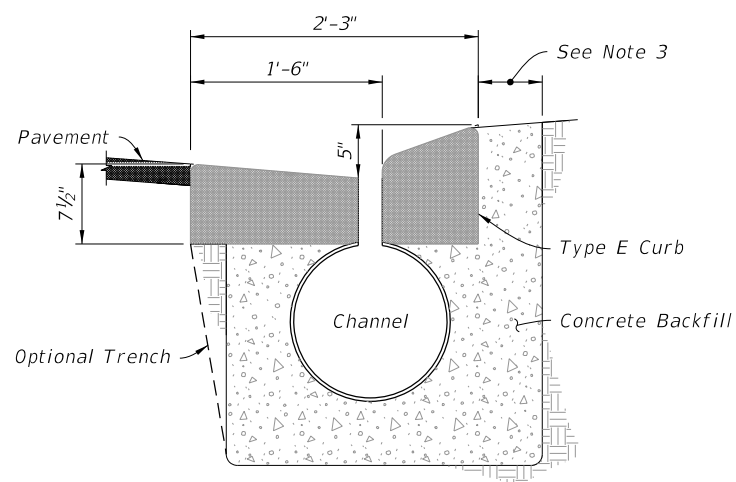
LAST REVISION 11/01/19	REVISION	DESCRIPTION:	 FY 2020-21 STANDARD PLANS	TRENCH DRAIN	INDEX 436-001	SHEET 1 of 3
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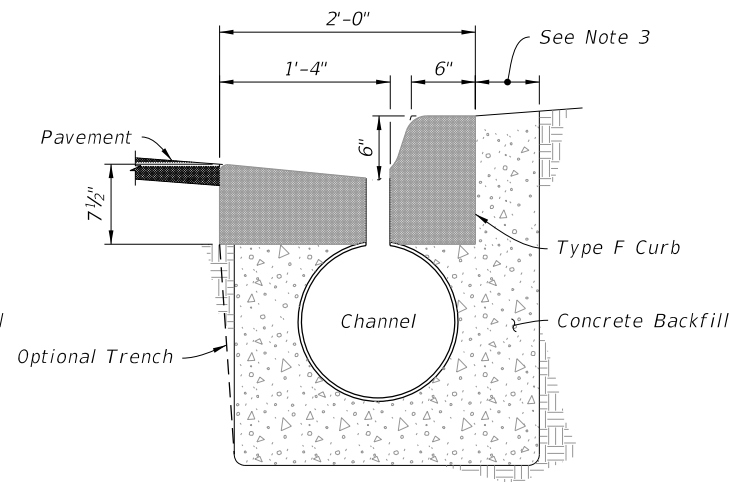
PREFORMED POLYETHYLENE CHANNEL



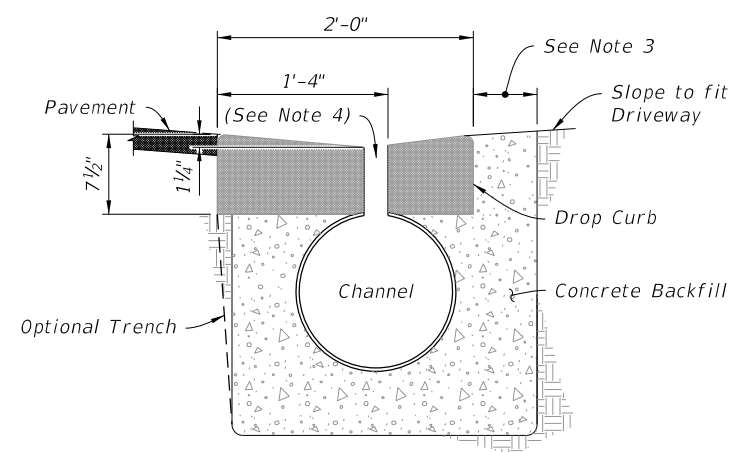
ROUND PIPE CHANNEL



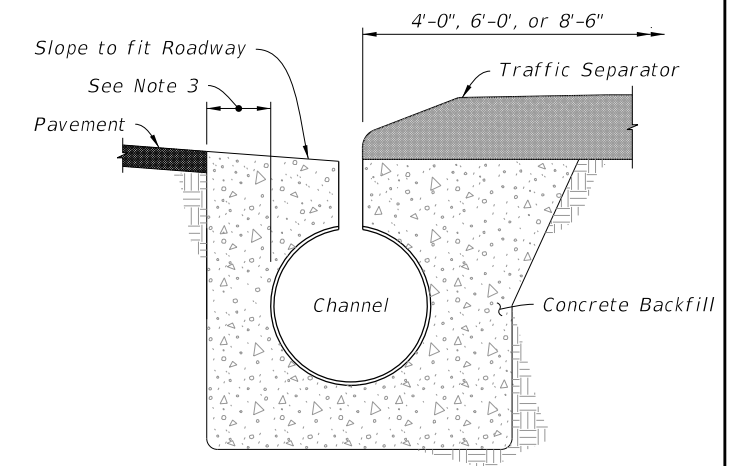
WITHIN TYPE E CURB



WITHIN TYPE F CURB



WITHIN DROP CURB



ADJACENT TO TRAFFIC SEPARATOR

TYPICAL LOCATIONS

(Round Channel Shown, Preformed Polyethylene Similar)

NOTES:

1. Opening for fixed height grates. Opening at the pipe can be 3".
2. The Round Pipe Channel is 15" in diameter, unless otherwise shown in the Plans.
3. Provide a minimum 6" concrete on this side of the drain.
4. Install grates on preformed polyethylene channel at driveways.

TYPE I - NONREMOVABLE GRATE

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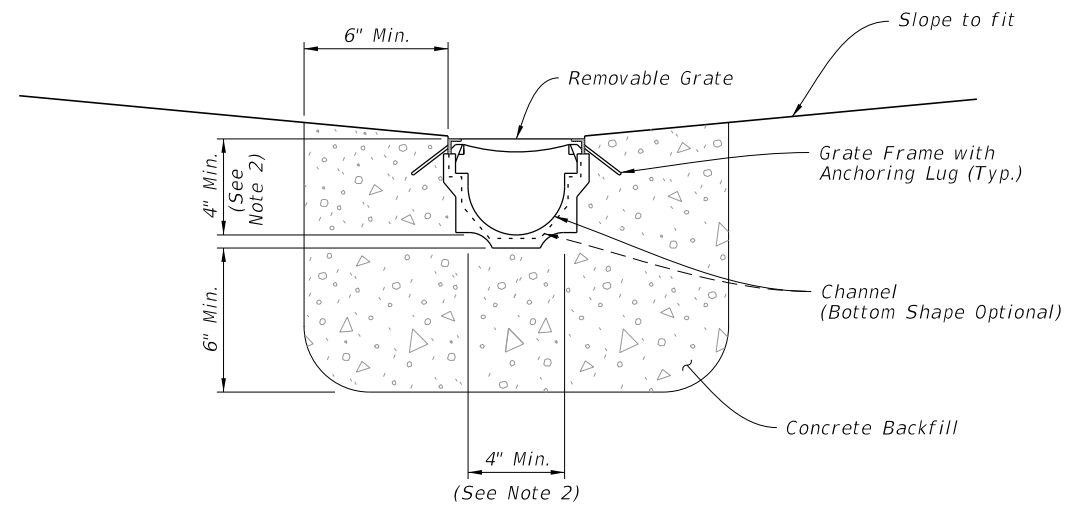


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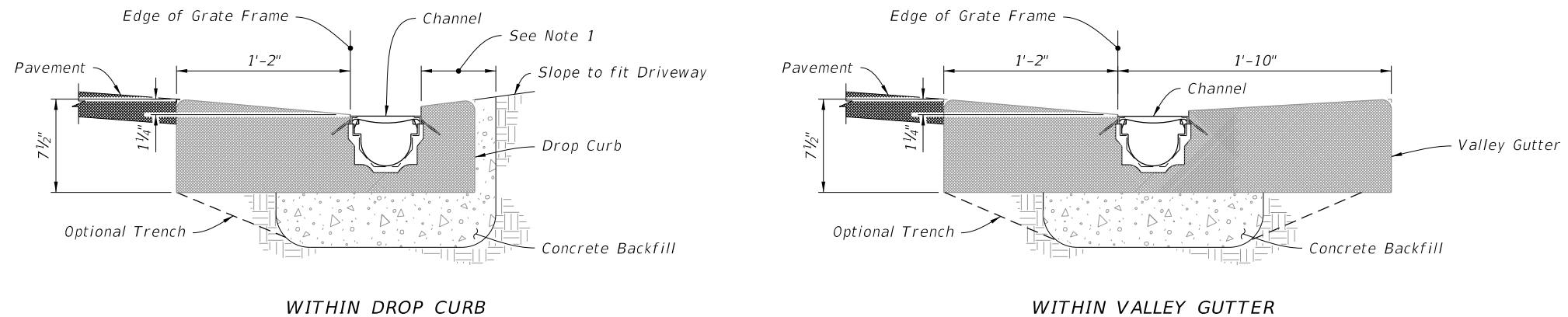
TRENCH DRAIN

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PREFORMED CHANNEL WITH REMOVABLE GRATE




TYPICAL LOCATIONS

NOTES:

1. Provide minimum 6" of concrete on this side of the drain.
2. 4" Minimum unless otherwise shown in Plans.

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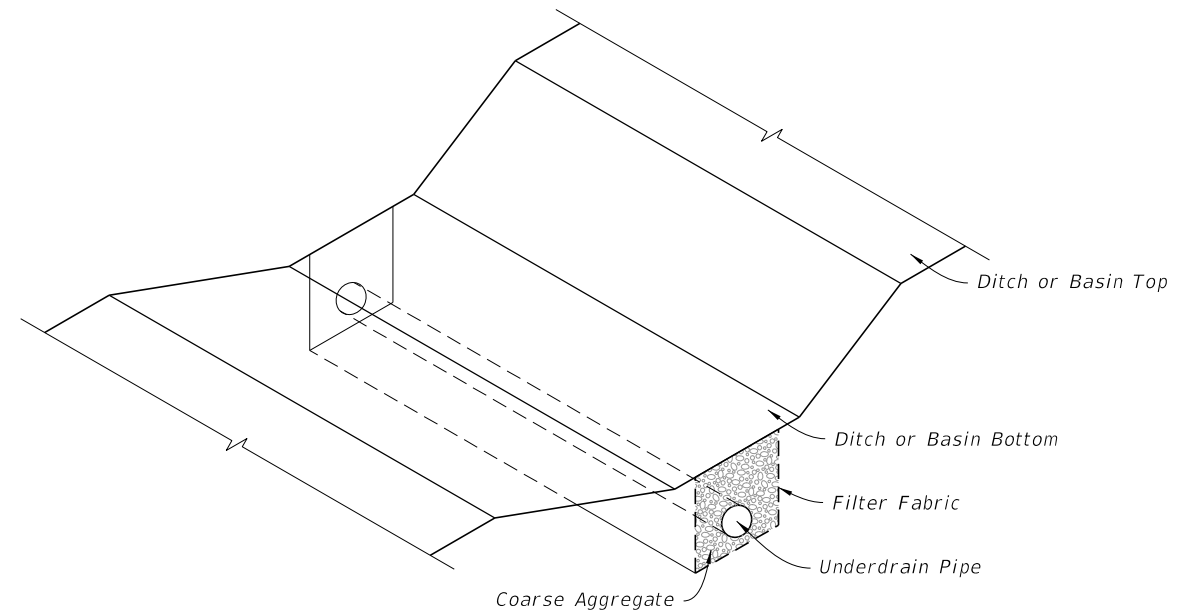
TYPE II - REMOVABLE GRATE

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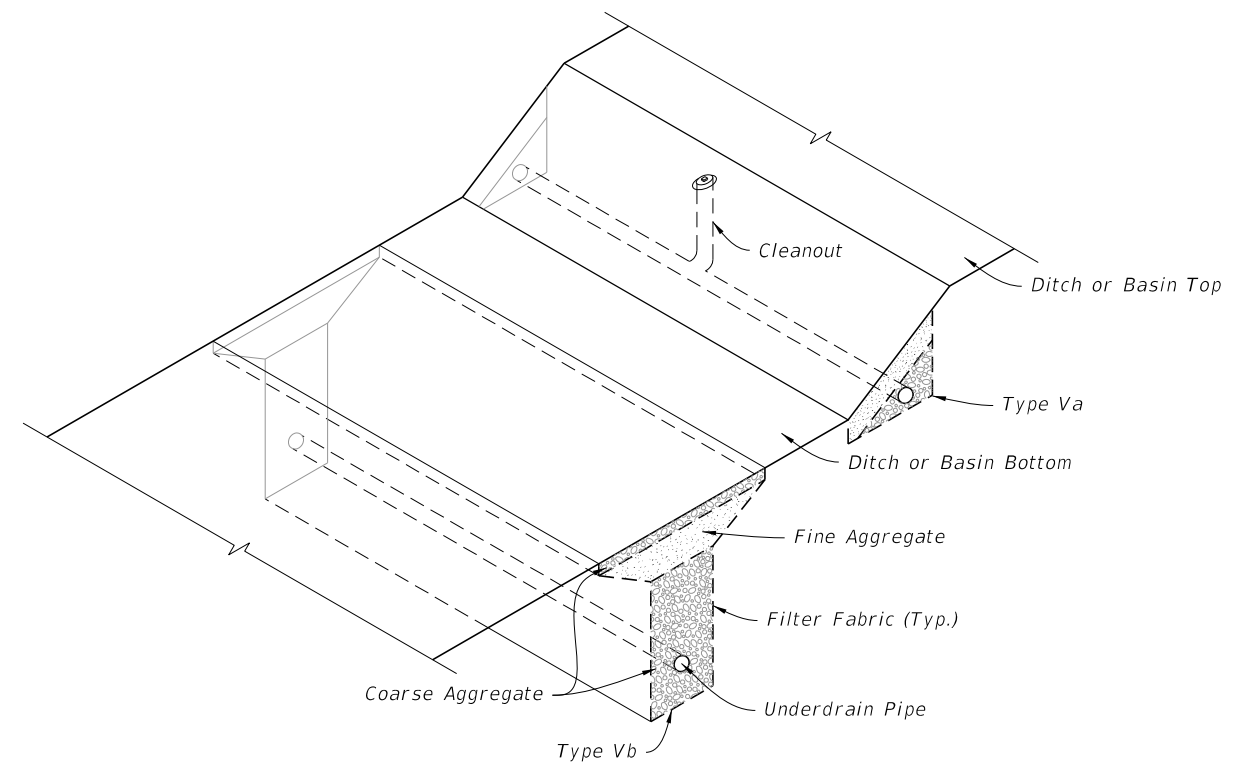
GENERAL NOTES:

1. Install underdrain pipe that is 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 is quartz sand meeting the requirements of Specifications 902-4.
3. Coarse aggregate is gravel or stone meeting the requirements of Specification 901-2 or 901-3. The gradation is in accordance with Specifications 901, Grades 4, 467, 5, 56 or 57 stone unless otherwise shown restricted in the Plans.
4. Install Underdrain Type I, II, III and V in accordance with Specification 440.
5. Install filter fabric Type D-3 in accordance with Specifications 985. The internal filter fabric of Type V underdrain has a permittivity of 0.7 /sec. and an AOS of #40 sieve.
6. When Type I is used, use a filter fabric sock in accordance with Specification 948.
7. See Index 120-002 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. Install filter fabric joints with a overlap a minimum of 1'. Install the internal filter fabric of Type V underdrain with an overlap into the coarse aggregate or the fine aggregate a minimum of 1'.
9. Use nonperforated pipes for underdrain outlet and make all bends using 1/8 (45 deg.) elbows. Construct 90 deg. bends with two 1/8 elbows separated by at least 1' of straight pipe. Outlet pipes stubbed into inlets or other drainage structures must be a minimum 6" above the structure flow line. Install concrete aprons, hardware cloth, and sod for outlet pipes discharging to grassed areas as shown in Index 446-001 for Edgedrain Outlets.



UNDERDRAIN TYPE I, II, AND III ASSEMBLY
(Type II Shown, Others Similar)



UNDERDRAIN TYPE Va AND Vb ASSEMBLY

TABLE OF CONTENTS:

Sheet	Description
1	General Notes and Contents
2	Type I, II, and III Underdrains
3	Type Va, Vb, and Cleanout

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REVISION

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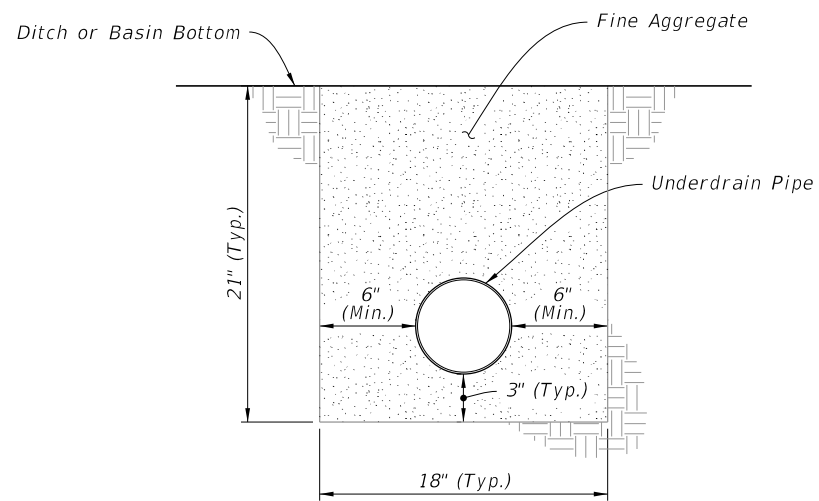


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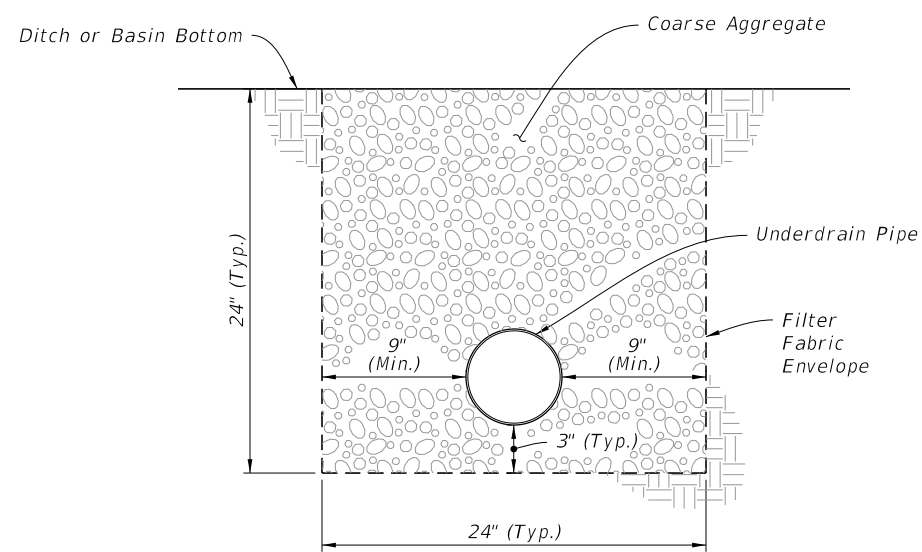
UNDERDRAIN

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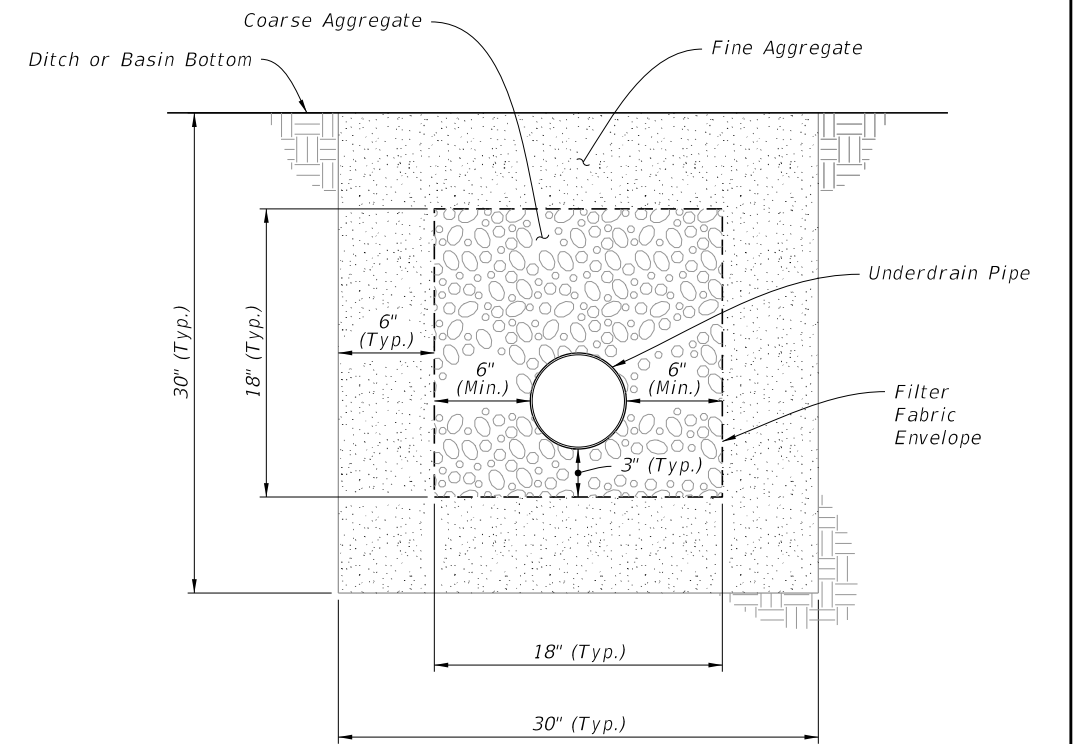
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TYPE I



TYPE II



TYPE III

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TYPE I, II, AND III

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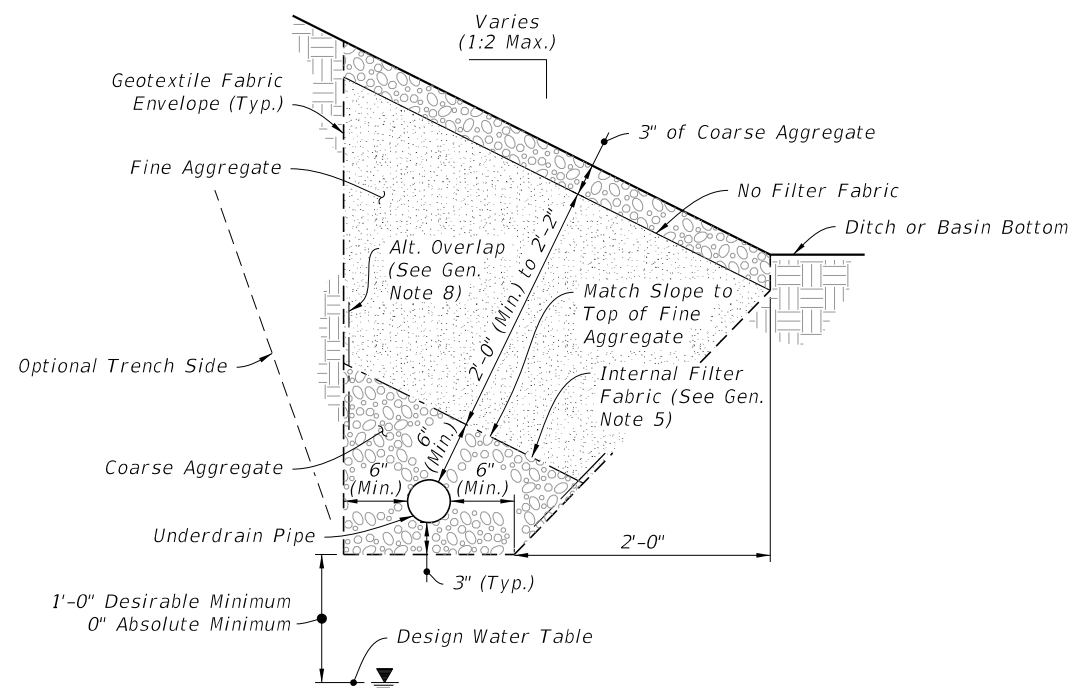


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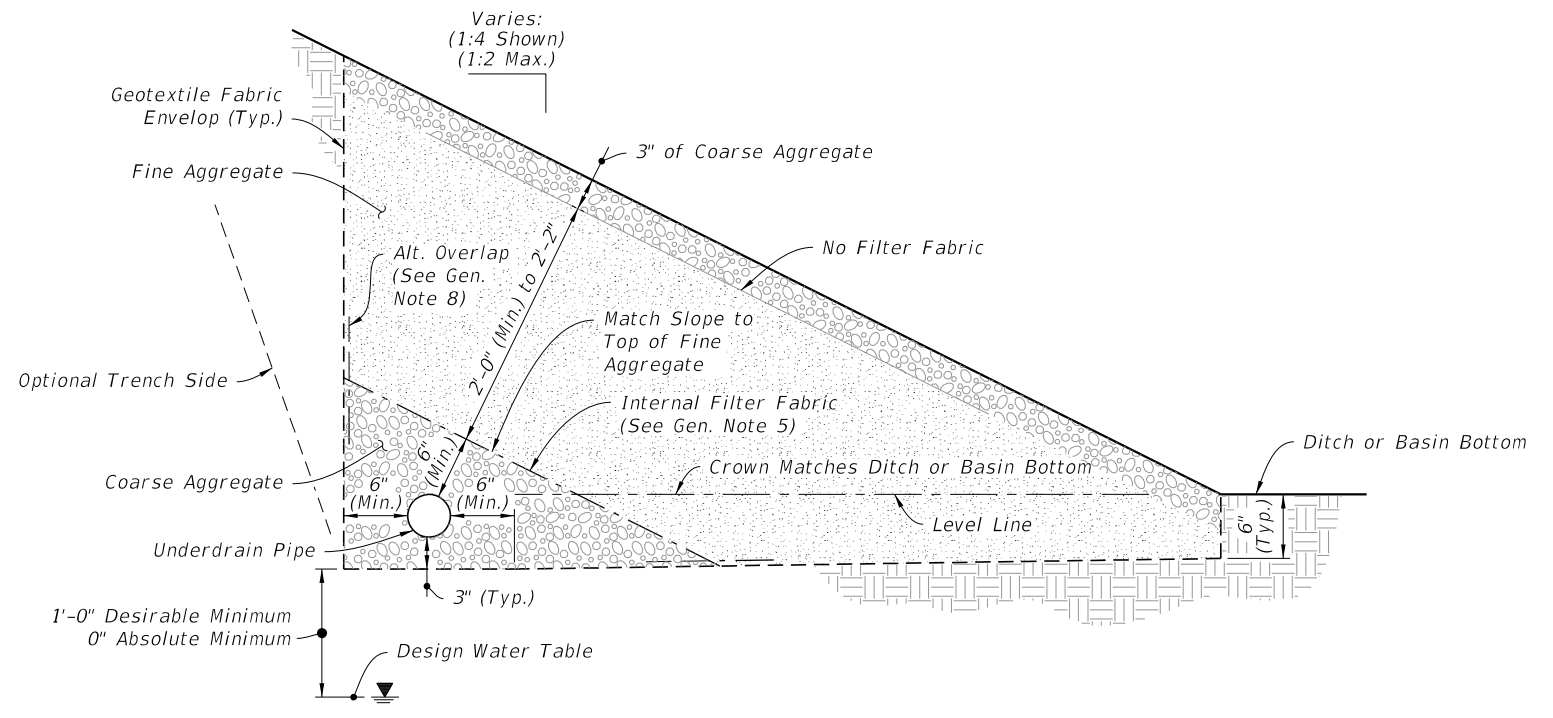
UNDERDRAIN

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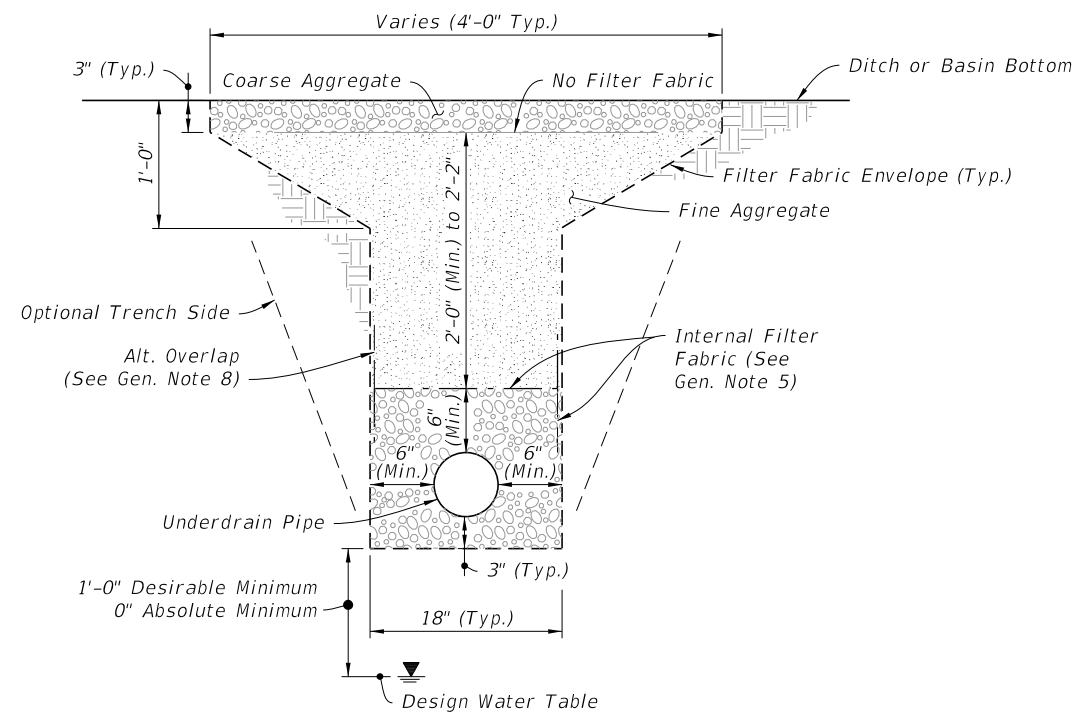


LOWER LIMITS

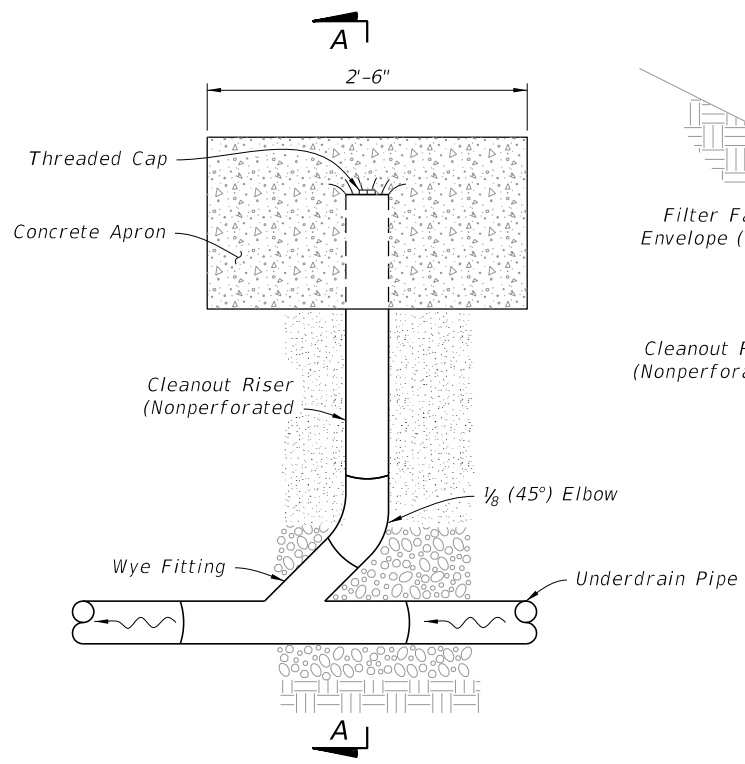


UPPER LIMITS

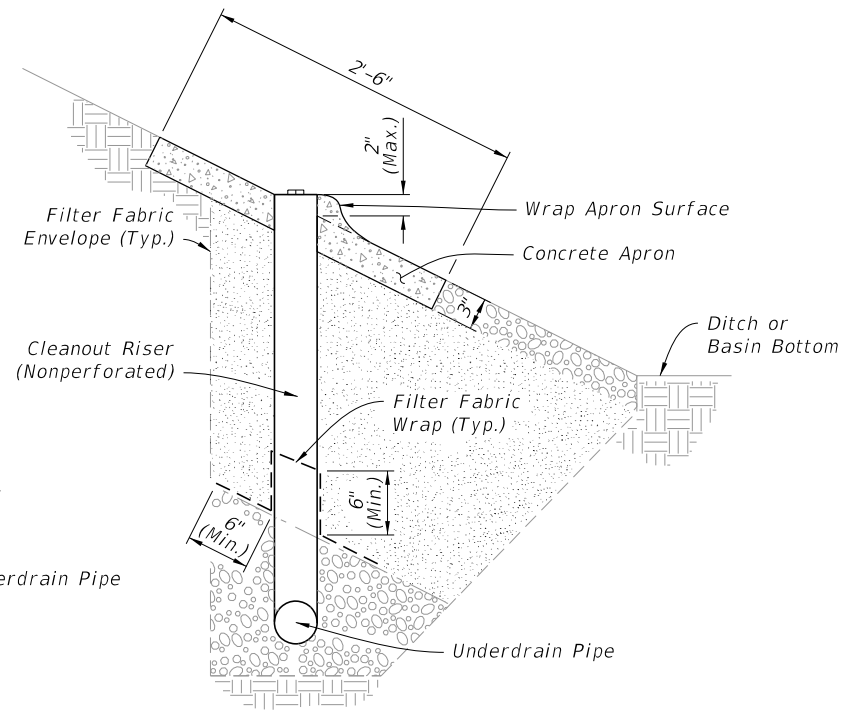
TYPE Va



TYPE Vb



TYPE V CLEANOUT



SECTION A-A

TYPE Va, Vb, AND CLEANOUT

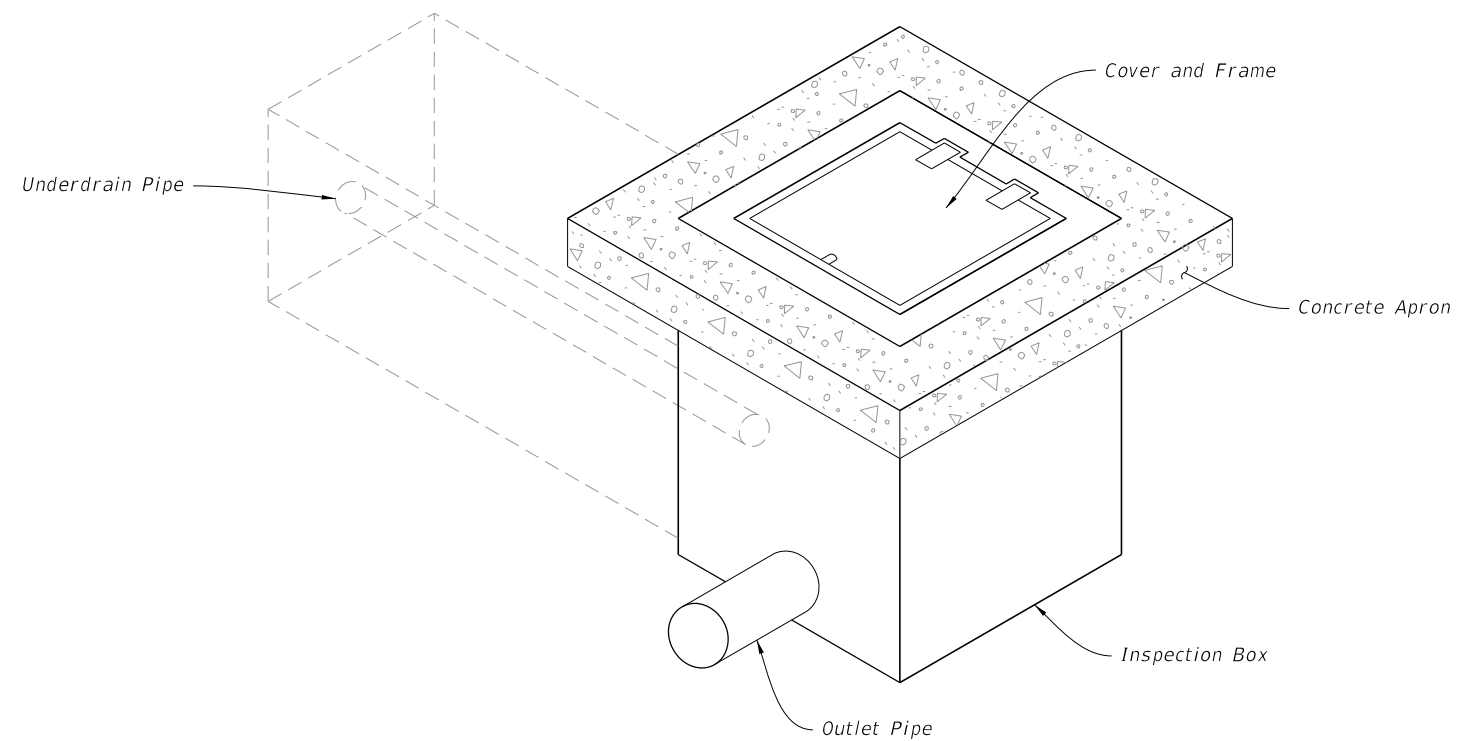
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GENERAL NOTES:

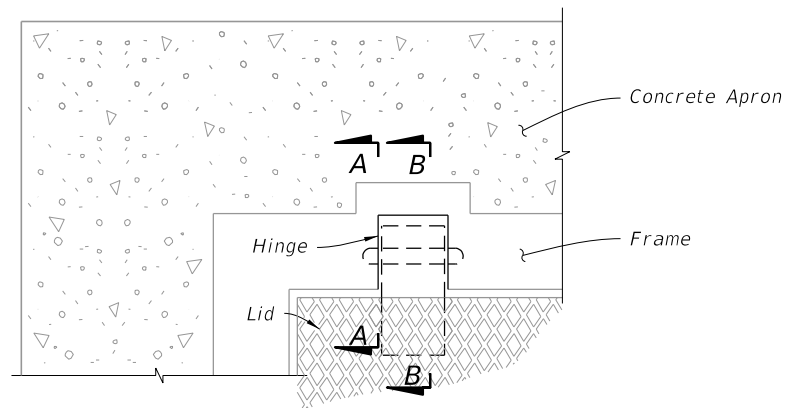
1. Install light duty cast iron cover and frame in accordance with Specifications 962.
2. Use Class I concrete. Use No. 3 bars (Grade 60) on 8" centers both ways, sides and bottom.
3. Furnish covers with pick holes. Do not use fitted lifts or handles.
4. Manhole Type P Alternate A, Index 425-010, Type I Frame and Cover, Index 425-001, may be used in lieu of the box detailed in this Index.

TABLE OF CONTENTS:	
Sheet	Description
1	General Notes and Contents
2	Typical Inspection Box Installation
3	Typical Urban, Slope, and Top Adjustment Installations

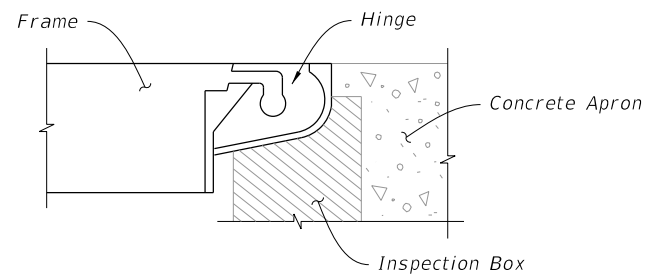


===== UNDERDRAIN INSPECTION BOX ASSEMBLY =====

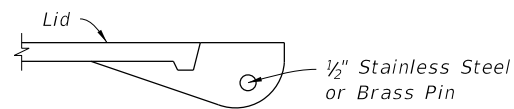
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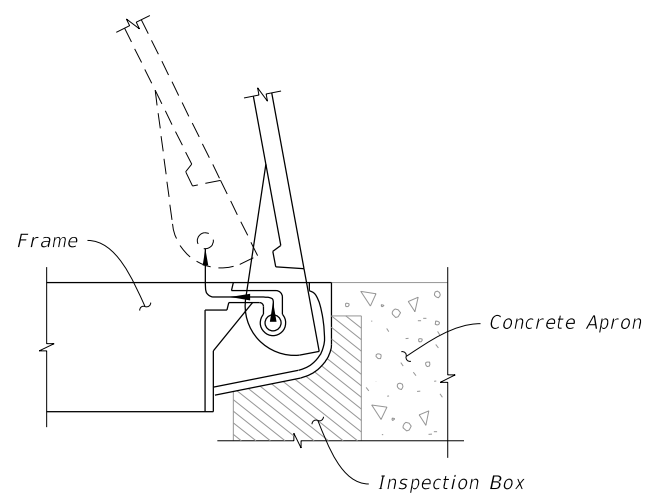
PLAN VIEW



SECTION A-A
(Frame)

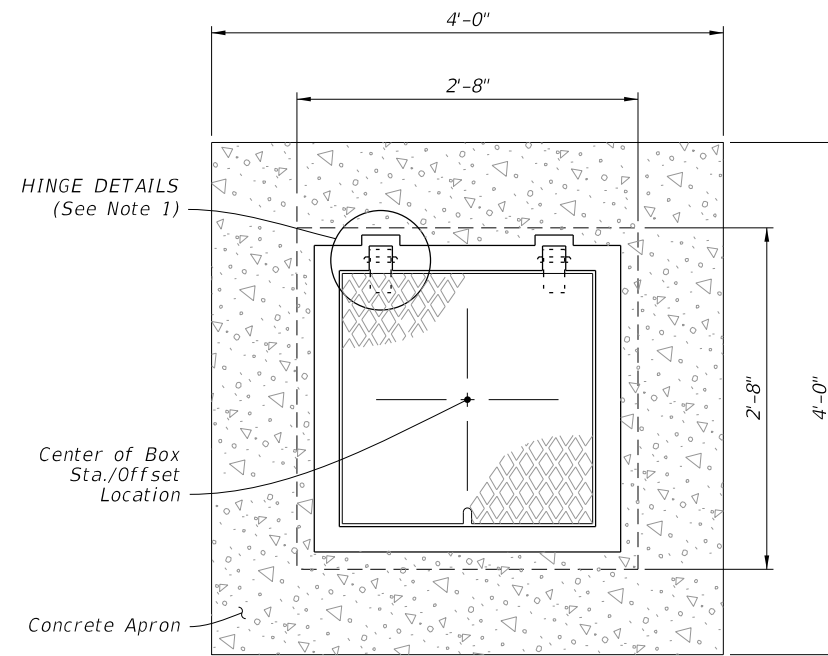


SECTION B-B
(Lid)

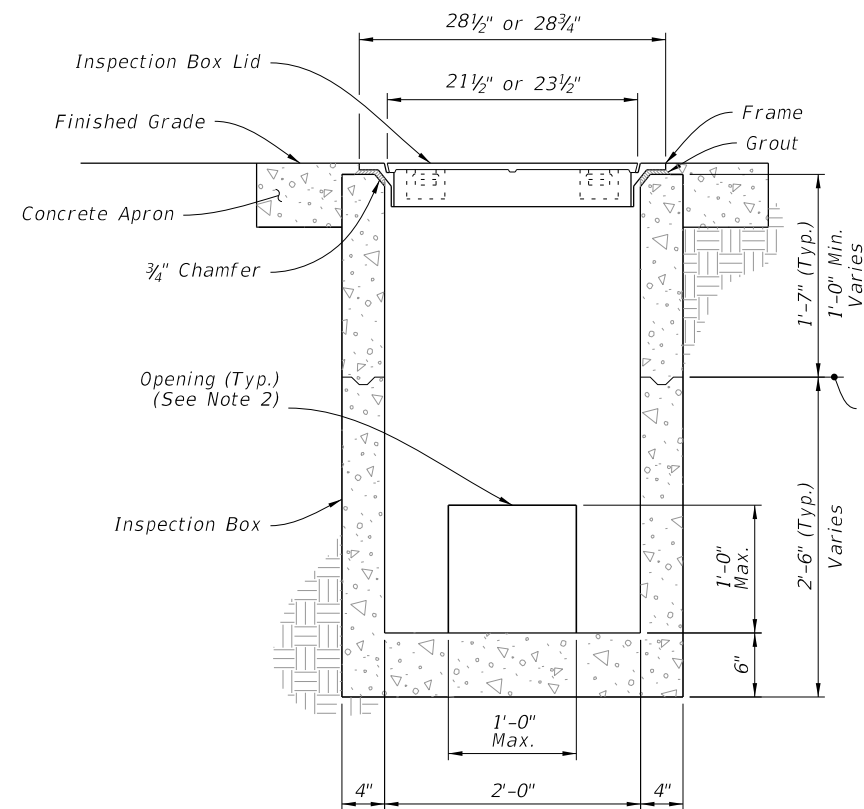


COVER REMOVAL

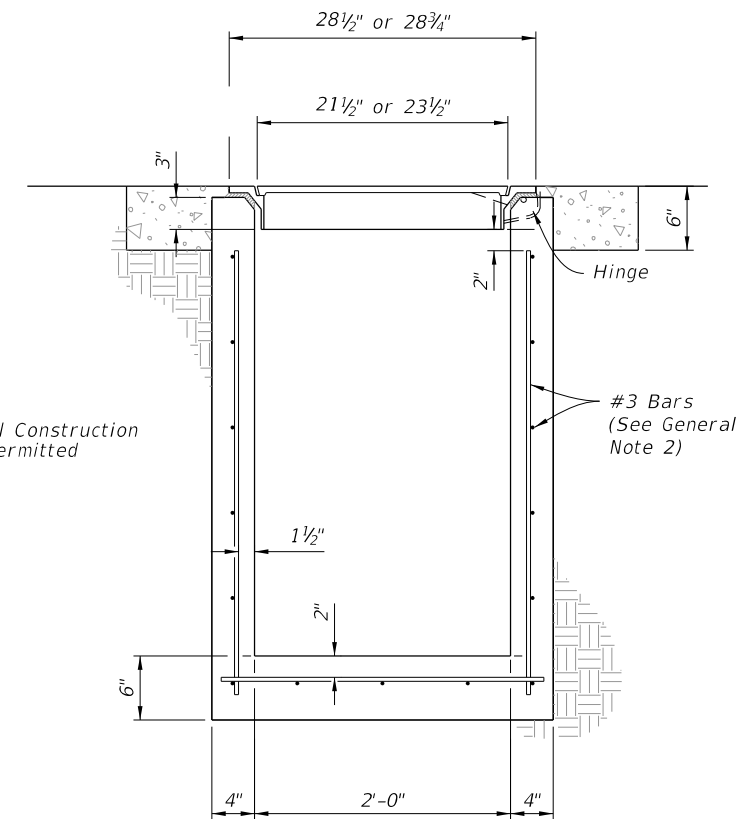
HINGE DETAIL



PLAN



ELEVATION
(FRONT VIEW)



ELEVATION
(SIDE VIEW)

NOTES:

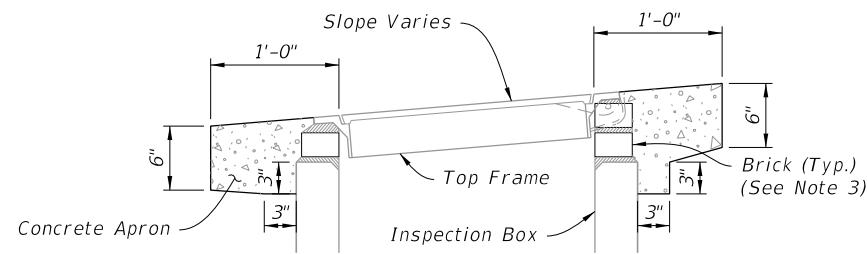
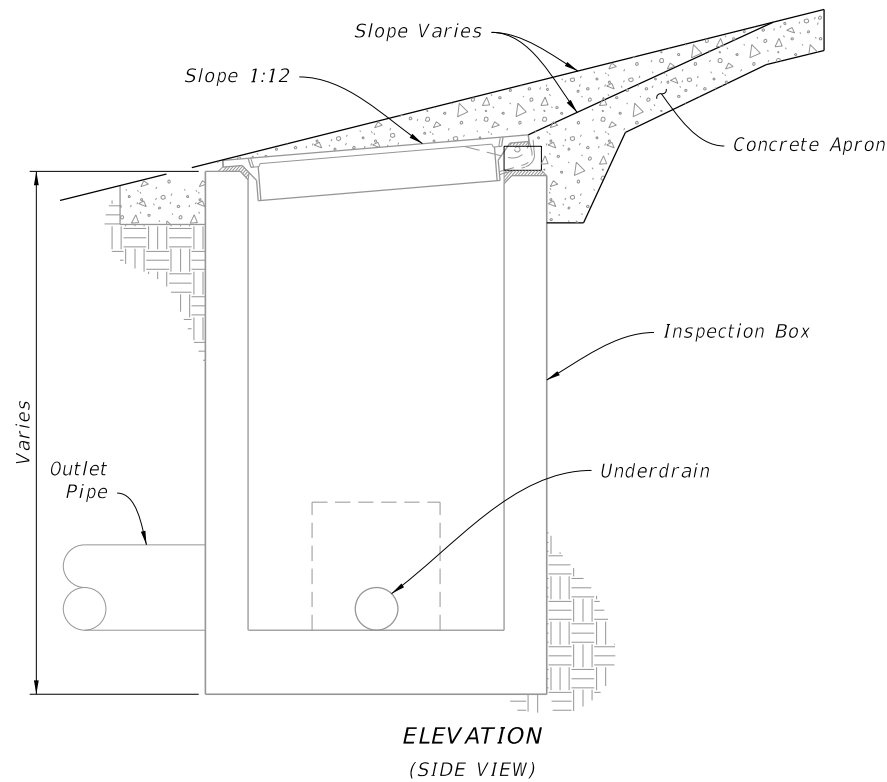
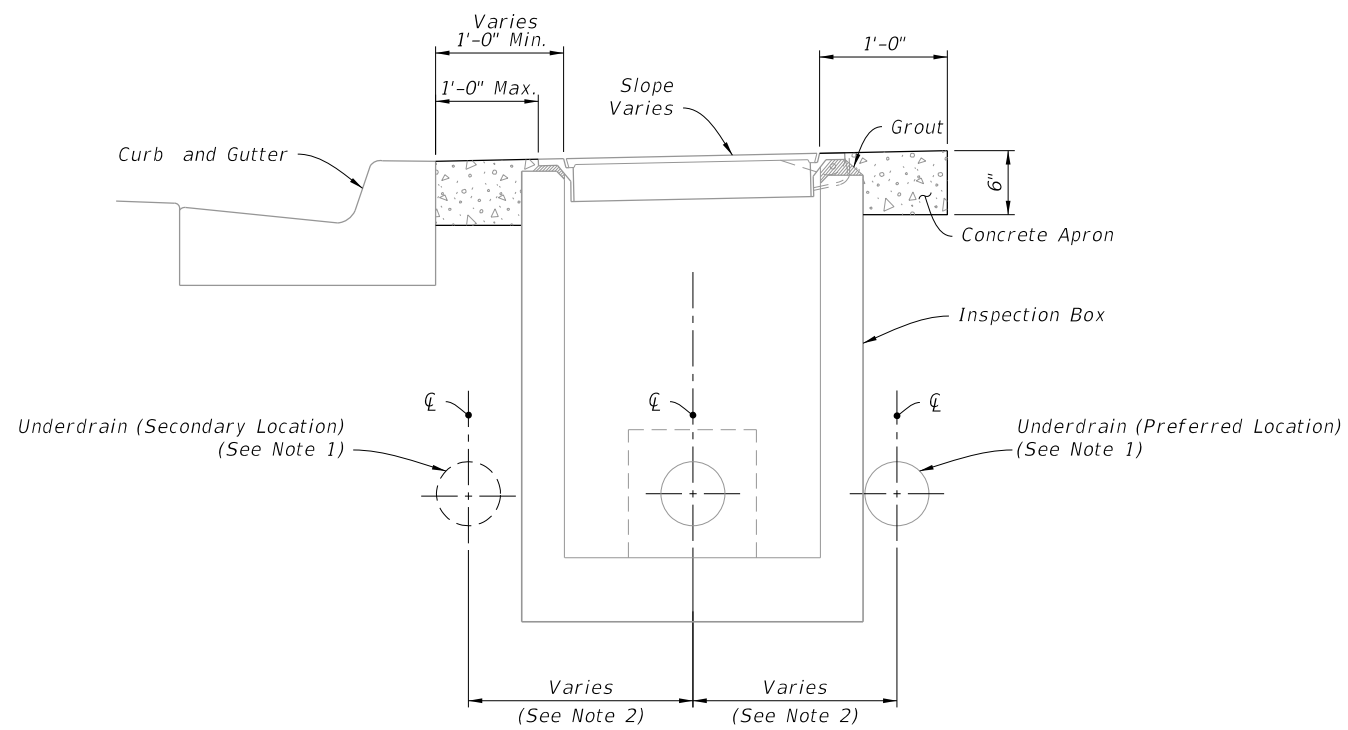
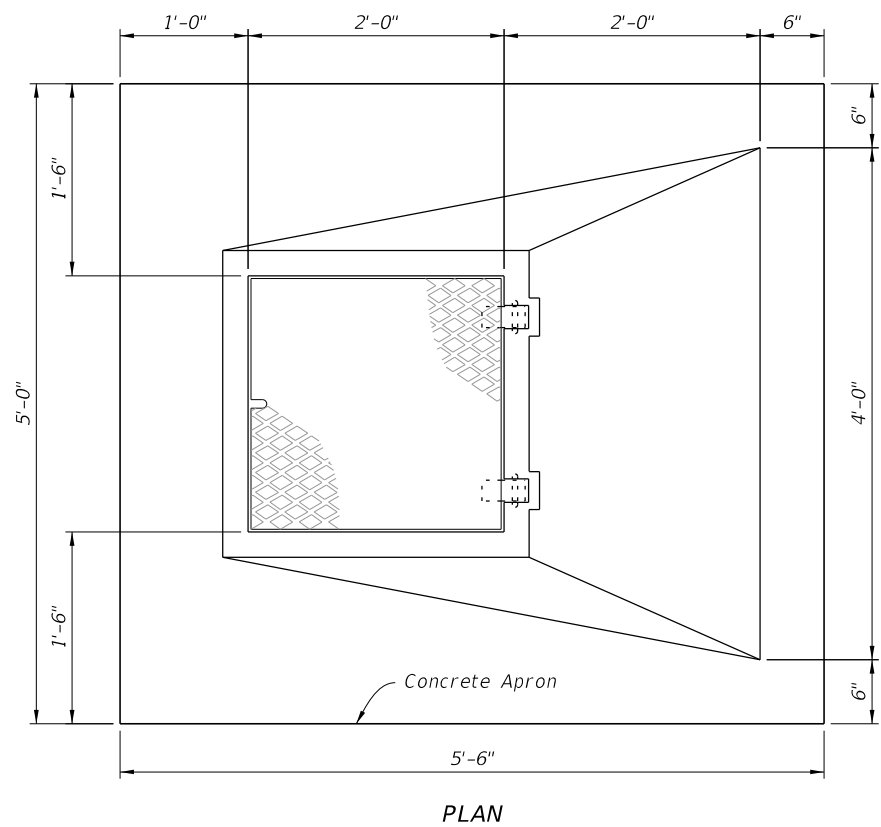
1. Cast or field cut 2 ~ 4" wide slots for hinges. Grout around hinge covers.
2. One or more sides may have an opening, see Plans for required openings. Grout around opening to seal between underdrain pipe and inspection box.

INSPECTION BOX DETAILS

TYPICAL INSPECTION BOX INSTALLATION

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NOTES:

1. See Index 120-002 for Underdrain placement.
2. Curve the Underdrain to connect to the Inspection Box.
3. A maximum of 2 adjustment courses of brick is permitted.

INSTALLATION ON SLOPE

TYPICAL URBAN, SLOPE, AND TOP ADJUSTMENT INSTALLATIONS

UNDERDRAIN INSPECTION BOX

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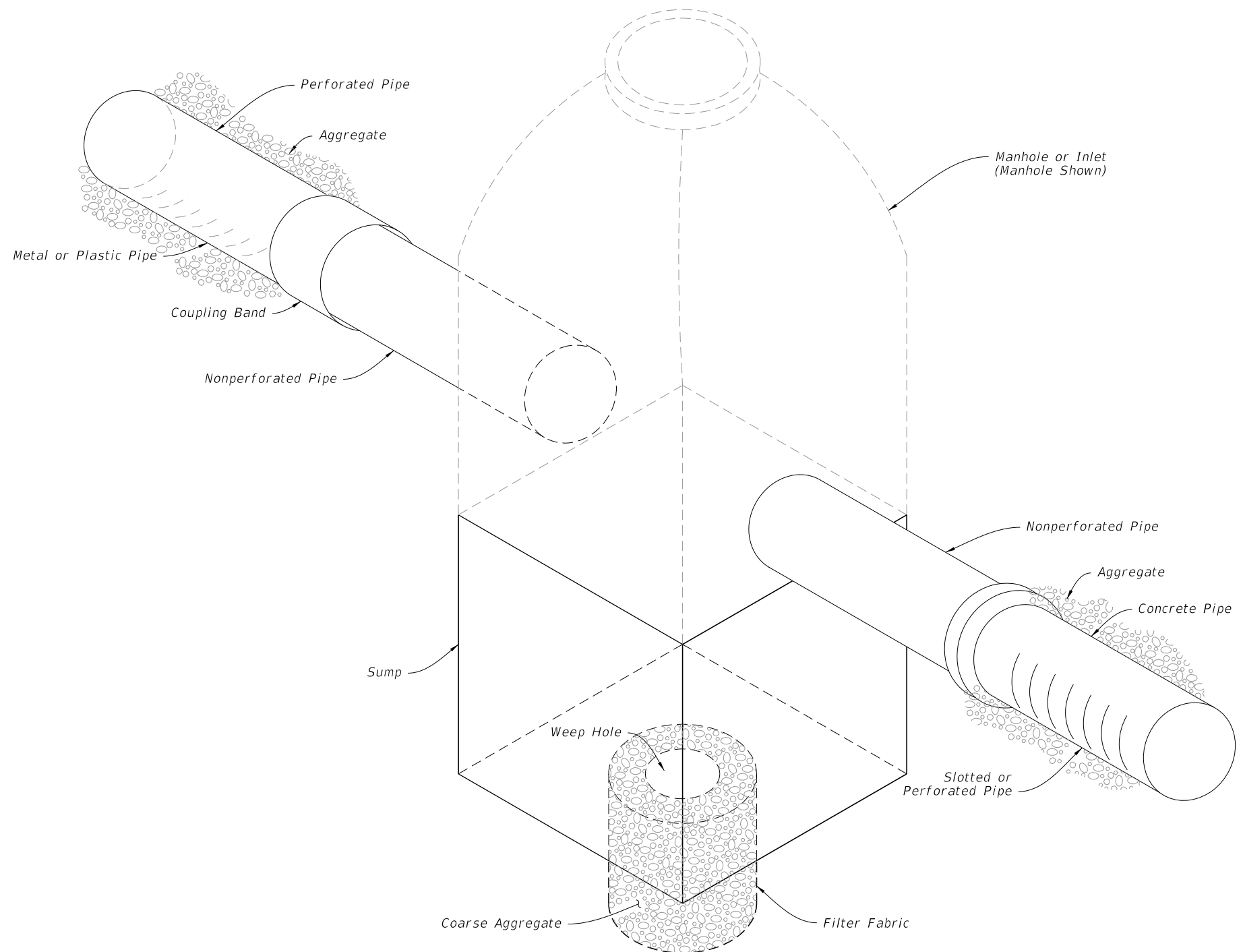


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GENERAL NOTES:

1. Place concrete pipe with the slots positioned on sides.
2. Alignment joints are standard (gaskets not required). Recorrugation of metal pipe ends not required.
3. Install Type D-3 filter fabric in accordance with Specification 985. Lap all filter fabric joints a minimum of one (1) foot.
4. Construct the standard cross section unless other section(s) described or detailed in the plans.
5. See Index 430-001 for supplemental details.
6. Take the necessary precautions to prevent contamination of the trench with sand, silt and foreign materials.

TABLE OF CONTENTS:	
Sheet	Description
1	General Notes and Contents
2	French Drain System
3	Concrete Slotted Pipe Options



FRENCH DRAIN ASSEMBLY

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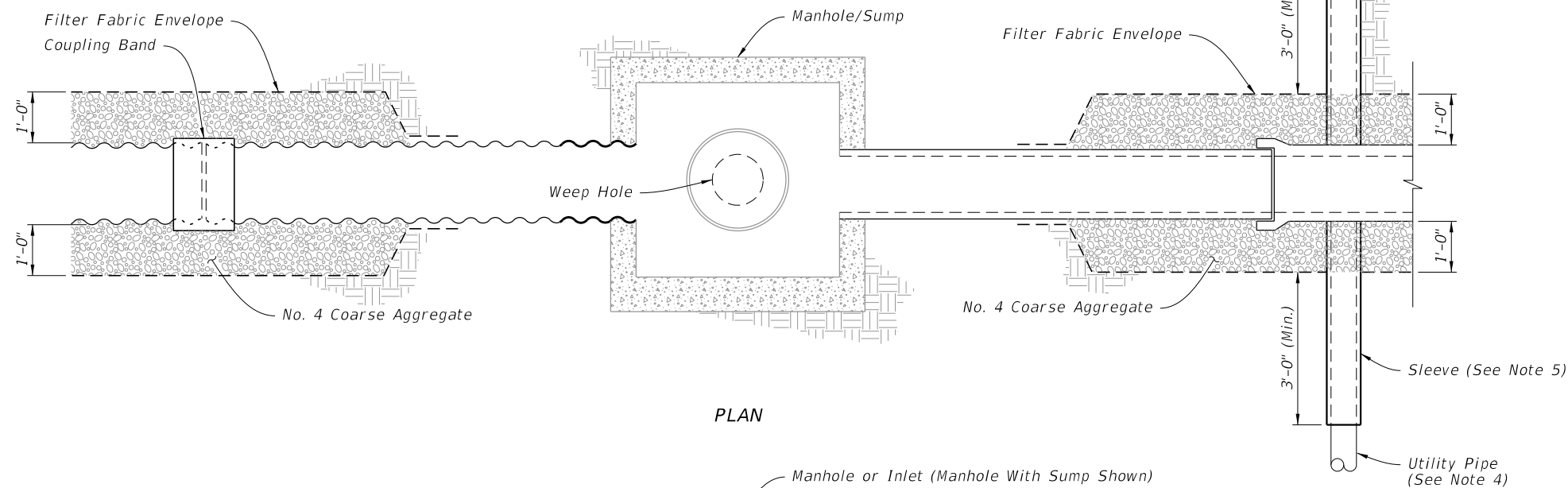
FRENCH DRAIN

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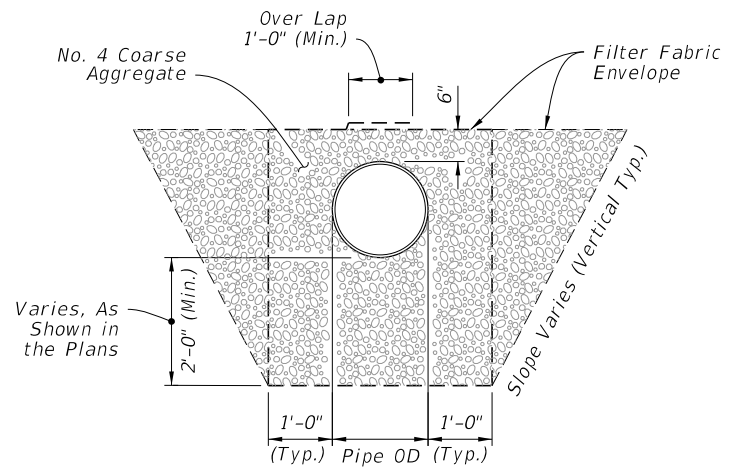
SHEET
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NOTES:

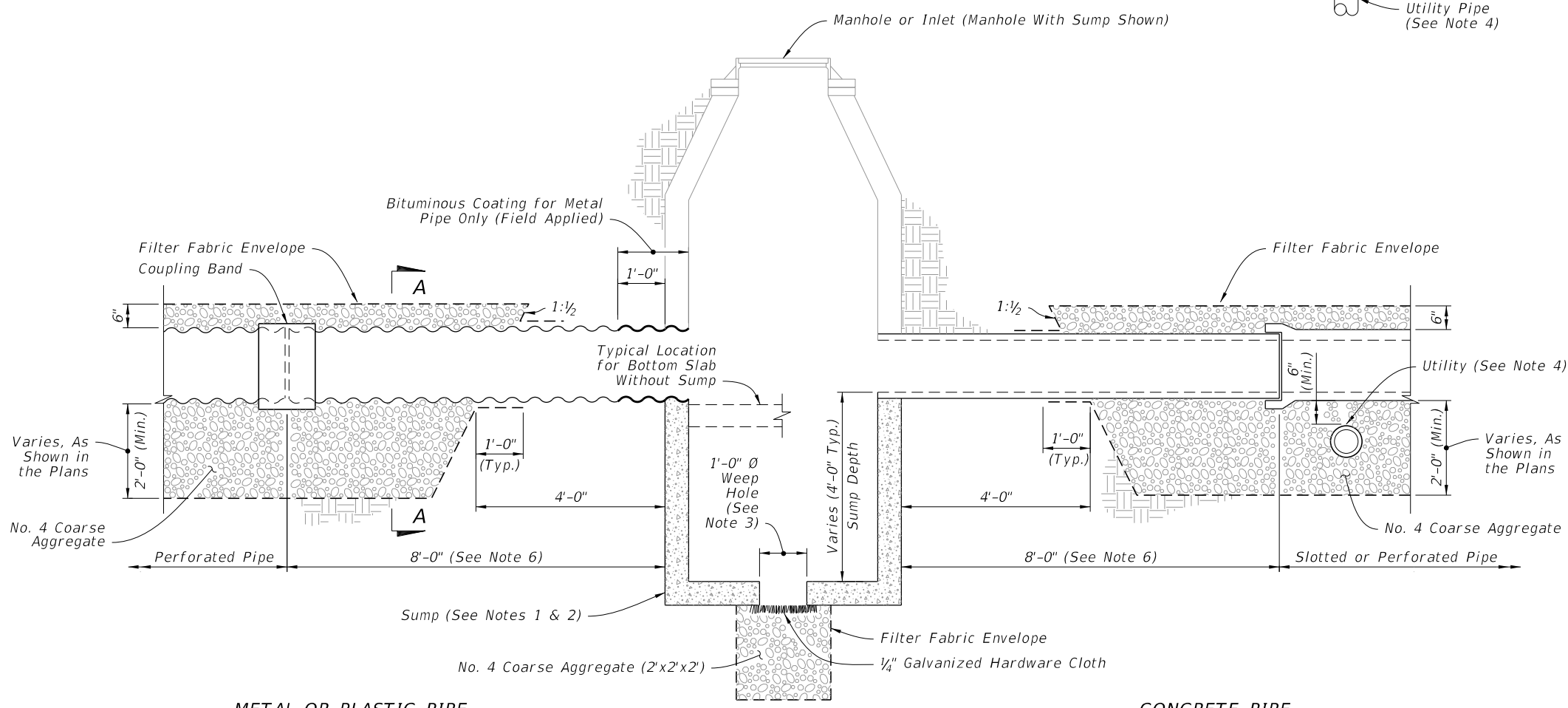
1. Construct sumps unless excluded in the Plans.
2. For additional sump bottom information see Index 425-001.
3. Construct weep holes only where called for in the Plans.
4. Only cast and ductile iron sanitary sewer, or cast iron, ductile and steel water mains will be allowed to pass directly through french drain (without sleeve).
5. Use only steel, cast or ductile iron sleeves.
6. No slots or perforations.



PLAN



SECTION A-A



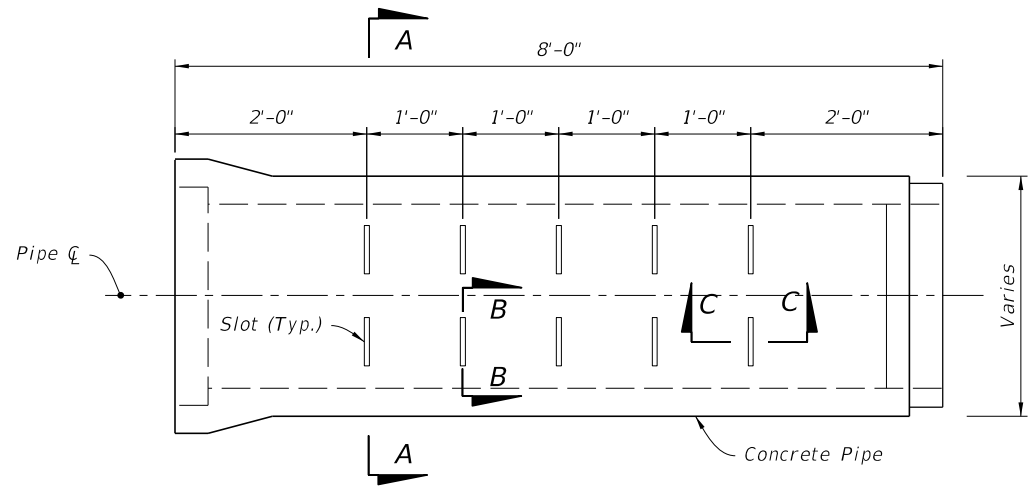
ELEVATION

FRENCH DRAIN
(Round Pipe Shown)

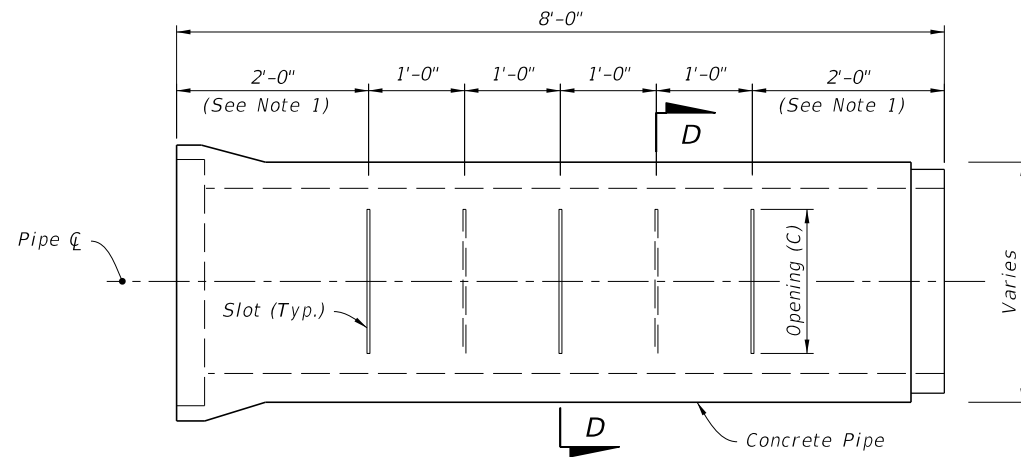
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FRENCH DRAIN SYSTEM



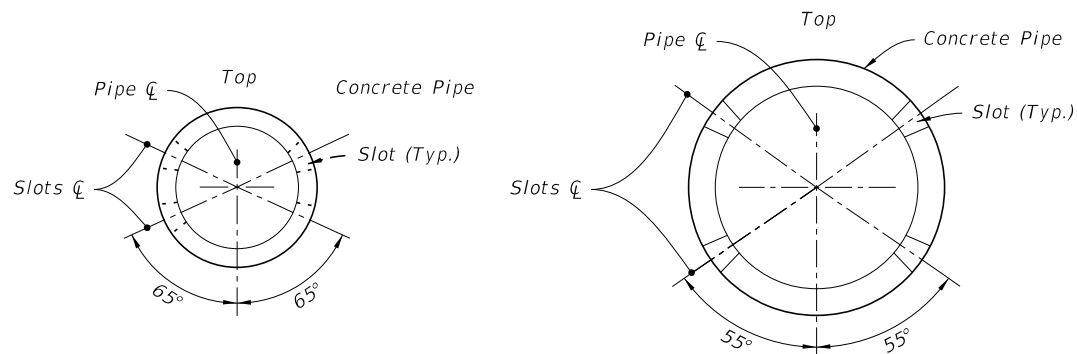
SIDE VIEW



SIDE VIEW

NOTES:

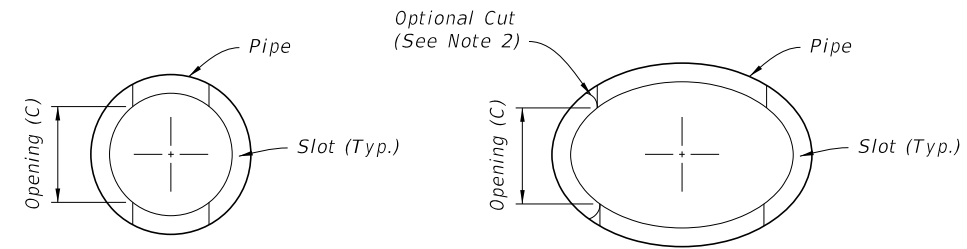
1. 2'-0" for 8'-0" joints of pipe;
2'-6" for 12'-0" joints of pipe
2. A curved cut is acceptable provided the control dimension is maintained.



15" to 30"

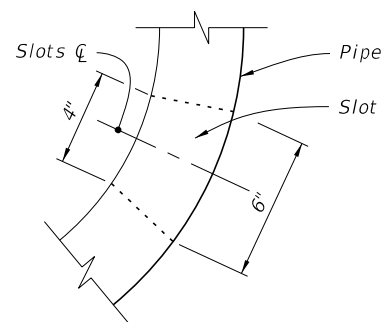
36" to 72"

SECTION A-A

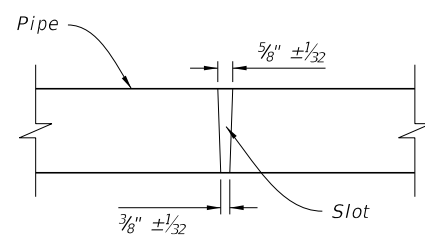


ROUND PIPE

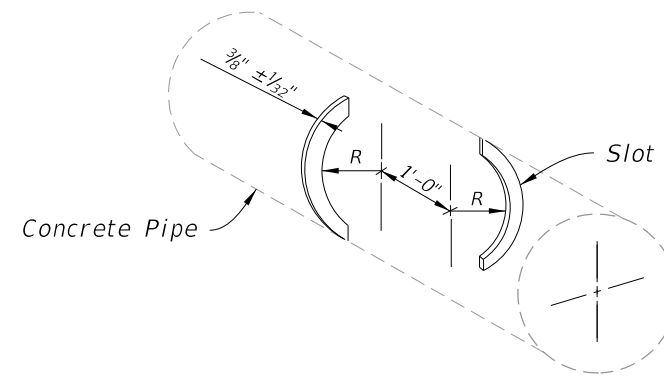
ELLIPTICAL PIPE



SECTION B-B



SECTION C-C



ISOMETRIC VIEW
(Round Pipe Shown)

SECTION D-D

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"

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"

OPTION A - ROUND PIPE

OPTION B - ROUND OR ELLIPTICAL PIPE

CONCRETE SLOTTED PIPE OPTIONS

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FRENCH DRAIN

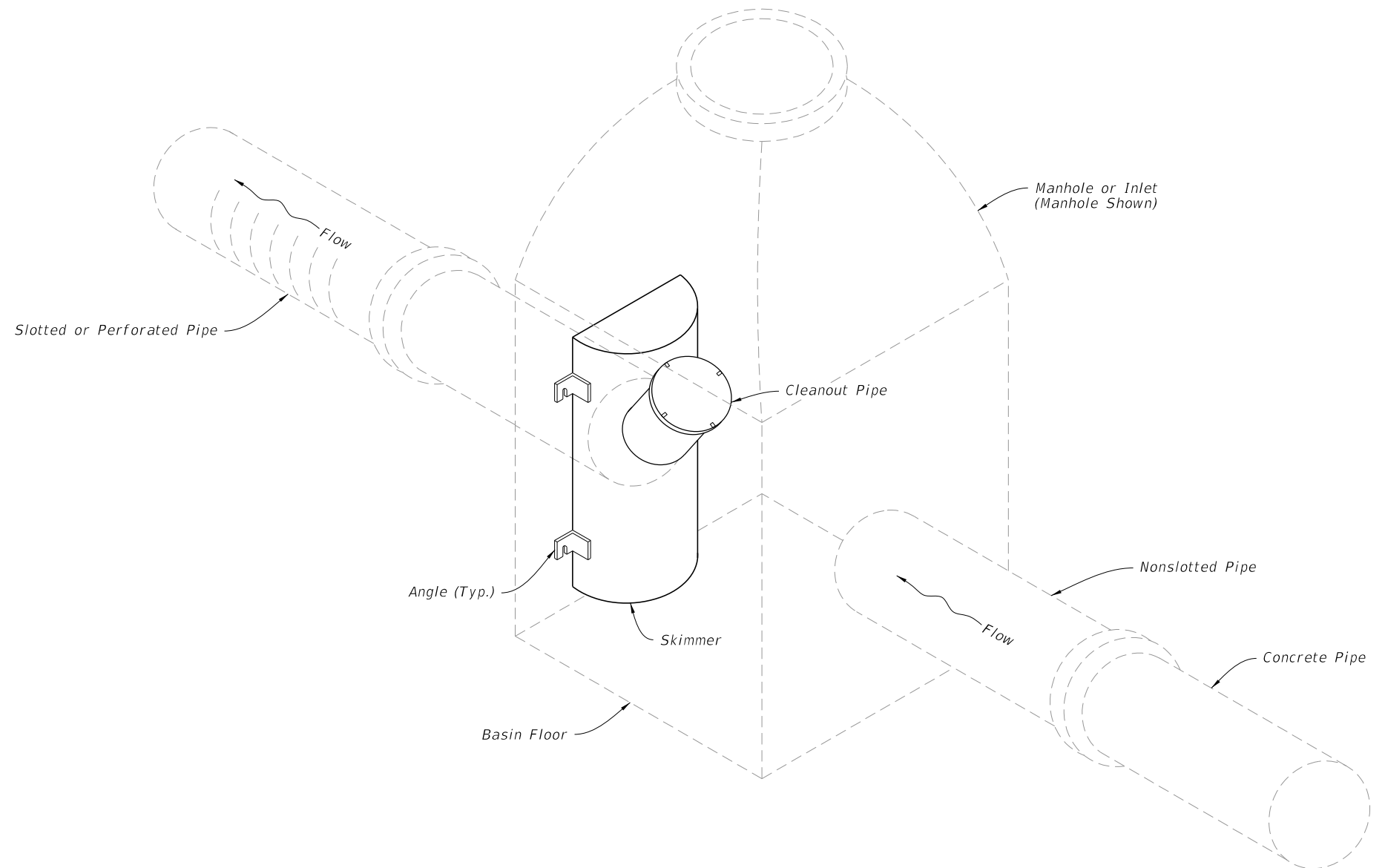
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GENERAL NOTES:

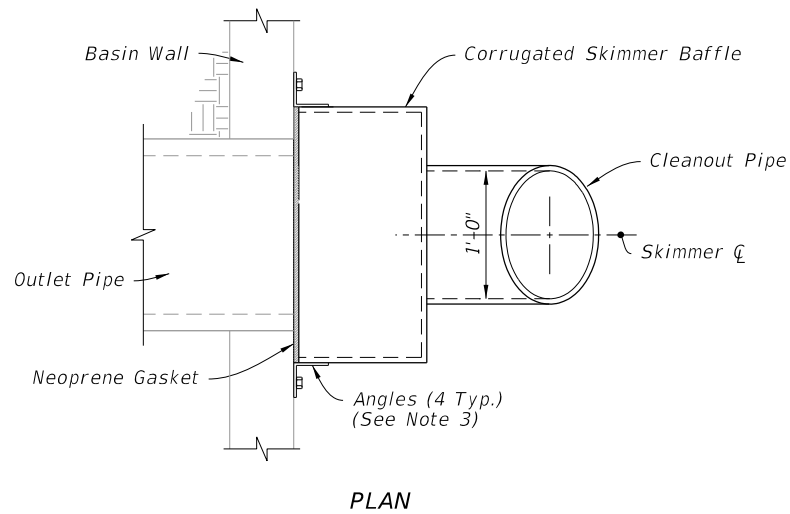
1. The French Drain Skimmer is a hooded cover, mounted over an outlet in a catchbasin, that prevents oil and floating debris from exiting the basin.
2. Place neoprene gasket material between the skimmer and the catchbasin at all points of contact. Trim the gasket to extend 1/2 inch beyond the joint on all sides.
3. Provide skimmer baffle, cleanout pipe and angles constructed of either galvanized steel, aluminum, polyvinyl chloride, polyethylene, fiberglass or acrylonitrile butadiene styrene. Provide hot-dip galvanized steel components, unless stainless.
4. Use Mounting hardware, hinges and latches made of stainless steel. Loss prevention device can use either stainless steel chain or riveted nylon strap.
5. Provide skimmer bodies (baffles) and cleanout pipe meeting Specification 943 for steel, 945 for aluminum or 948 for plastics.
6. Work this Index in accordance with Specification 425.

TABLE OF CONTENTS:	
Sheet	Description
1	General Notes and Contents
2	Type I Skimmers
3	Type II Skimmers



SKIMMER FOR FRENCH DRAIN OUTLETS ASSEMBLY

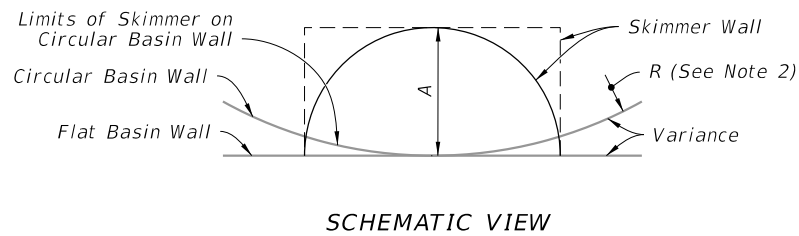
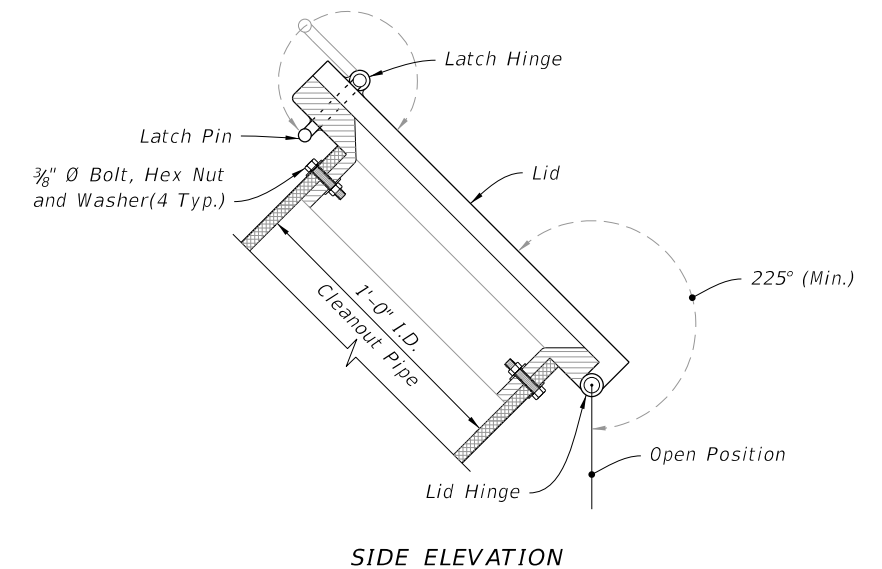
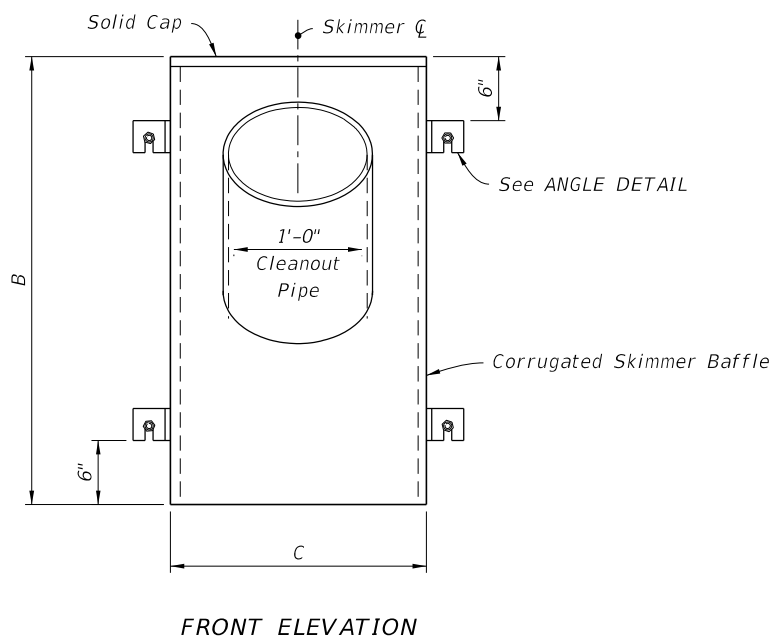
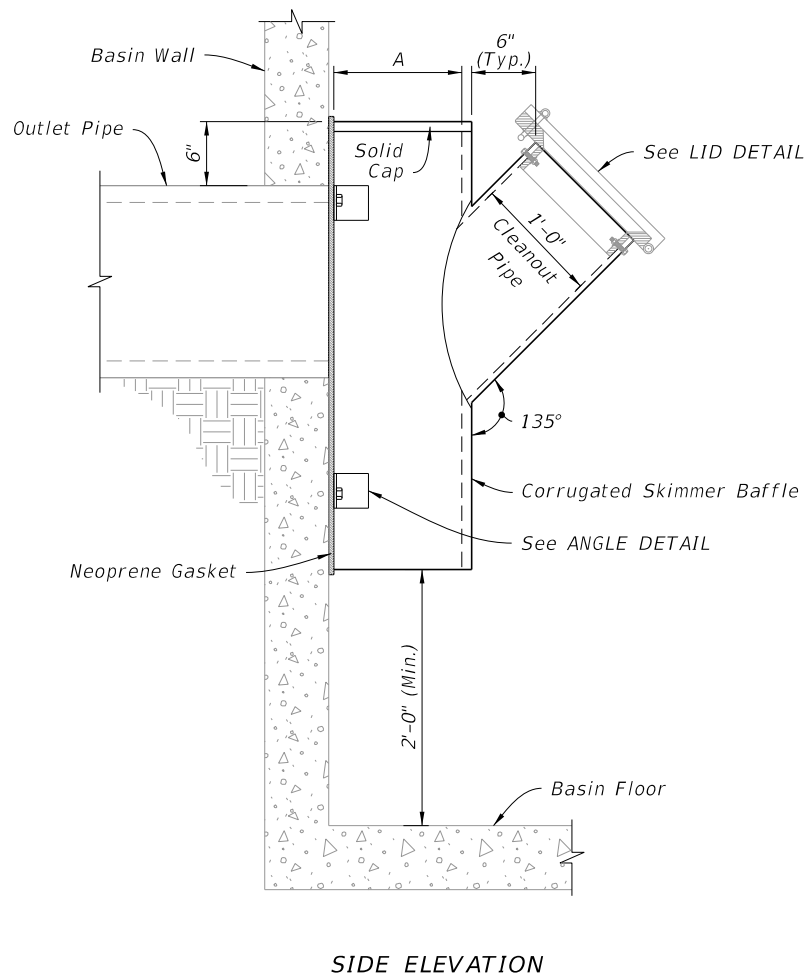
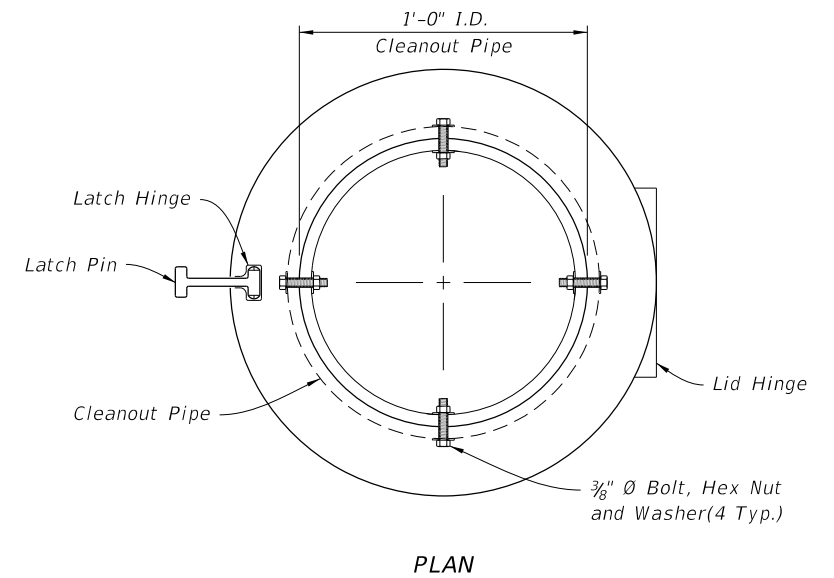
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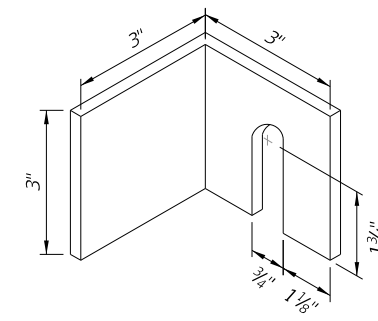
NOTES:

1. Conform the backs of skimmers to the shape of the basin walls on which they are mounted.
2. "R" is the radii required for curved back skimmers. Applies to both skimmer types. See Plans.
3. Weld Angles at all points of contact with skimmer.

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



LID DETAIL



TYPE I DETAILS

ANGLE DETAIL

TYPE I SKIMMERS

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LAST REVISION 11/01/19	DESCRIPTION:
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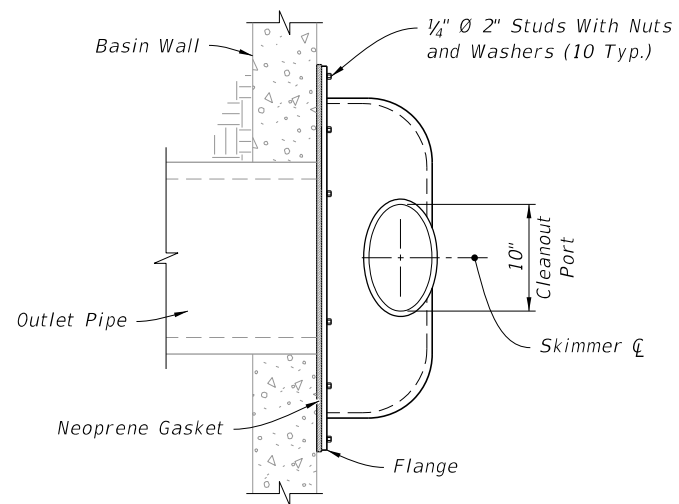


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STANDARD PLANS

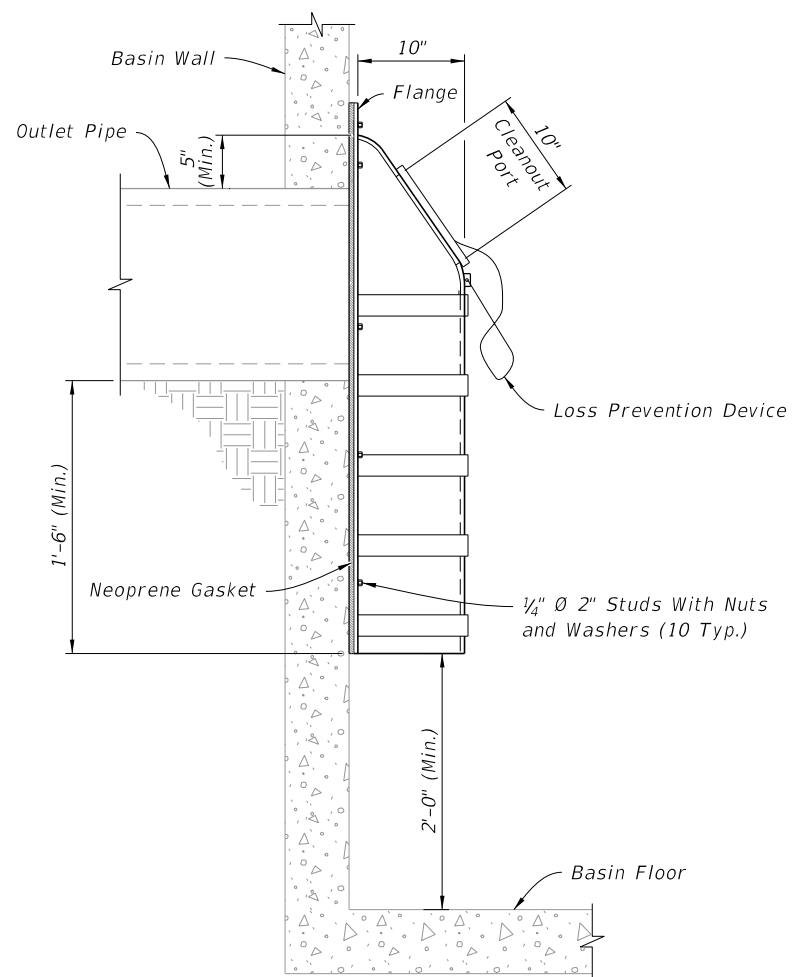
SKIMMERS FOR FRENCH DRAIN OUTLETS

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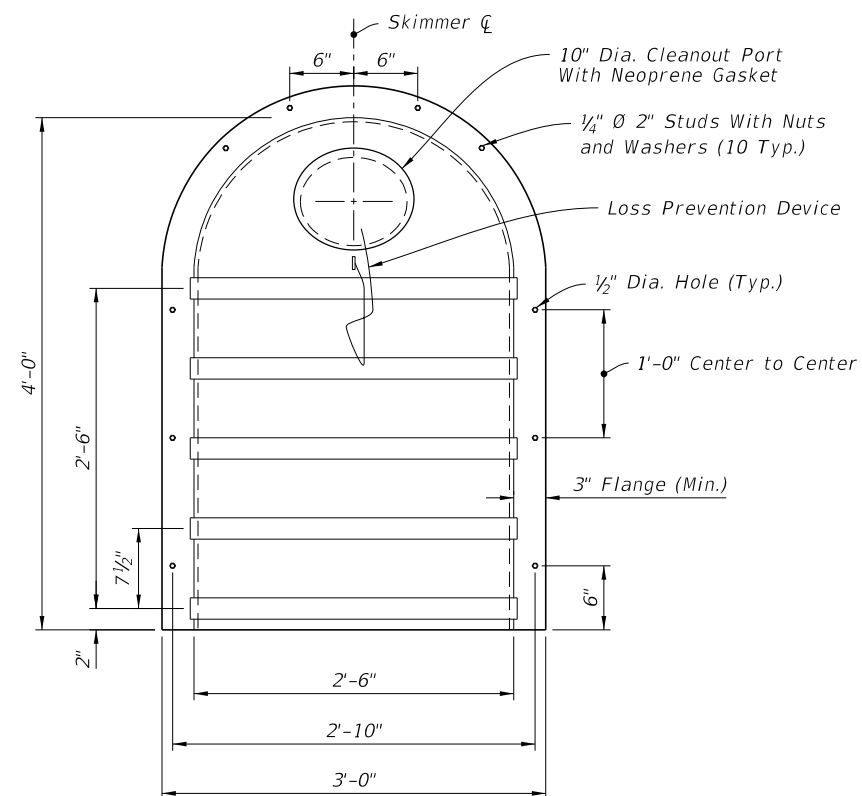
PLAN



SIDE ELEVATION

NOTE:

1. Install a gasket for the cleanout with either a threaded screw-in lid or a lid secured by four stainless steel quick-release latches.



FRONT ELEVATION

TYPE II DETAILS

TYPE II SKIMMERS

11/18/2019 9:51:39 AM

LAST REVISION 11/01/19	REVISION	DESCRIPTION:
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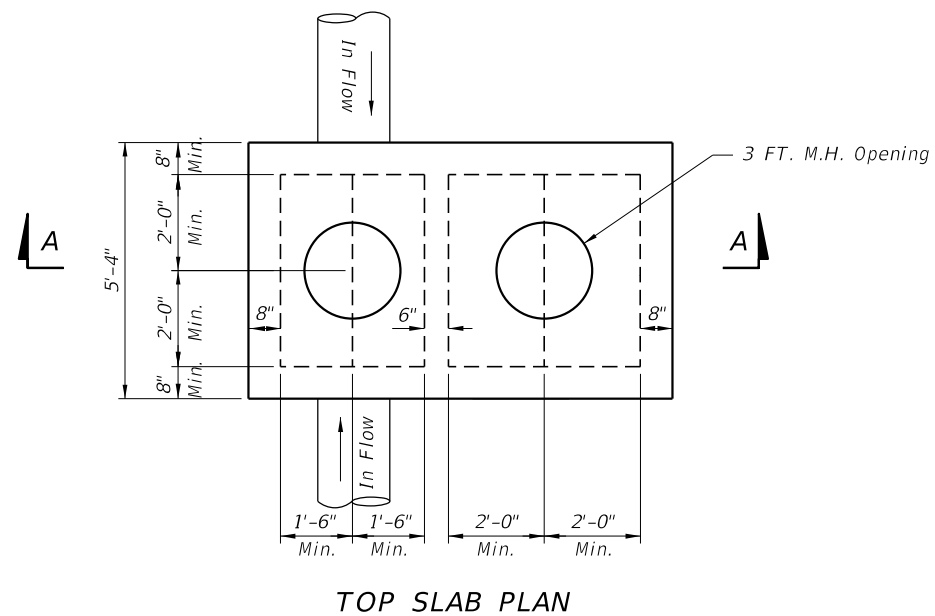


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STANDARD PLANS

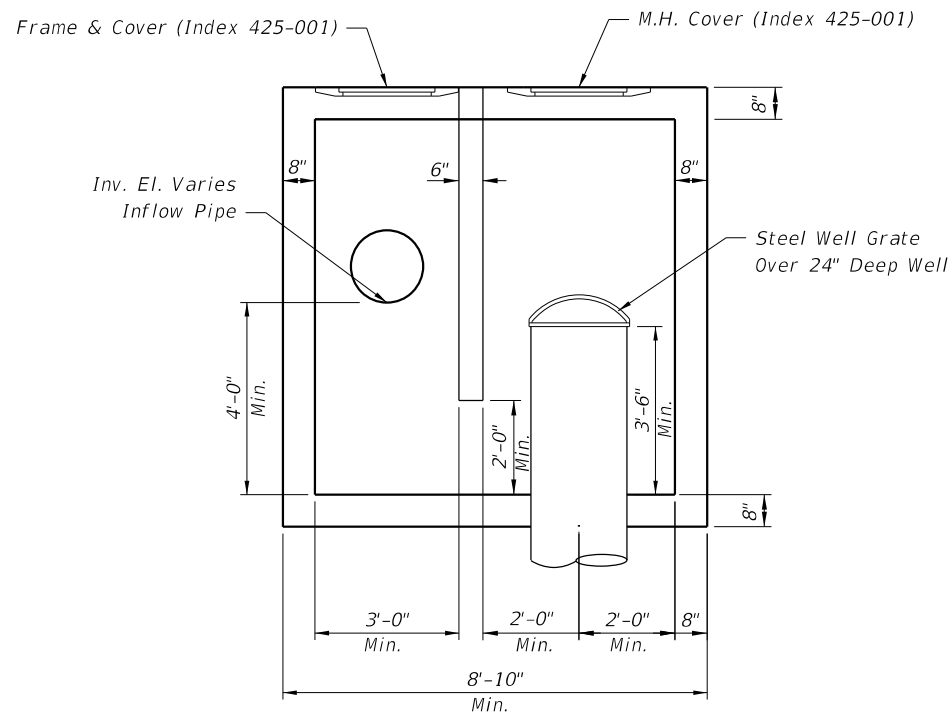
SKIMMERS FOR FRENCH DRAIN OUTLETS

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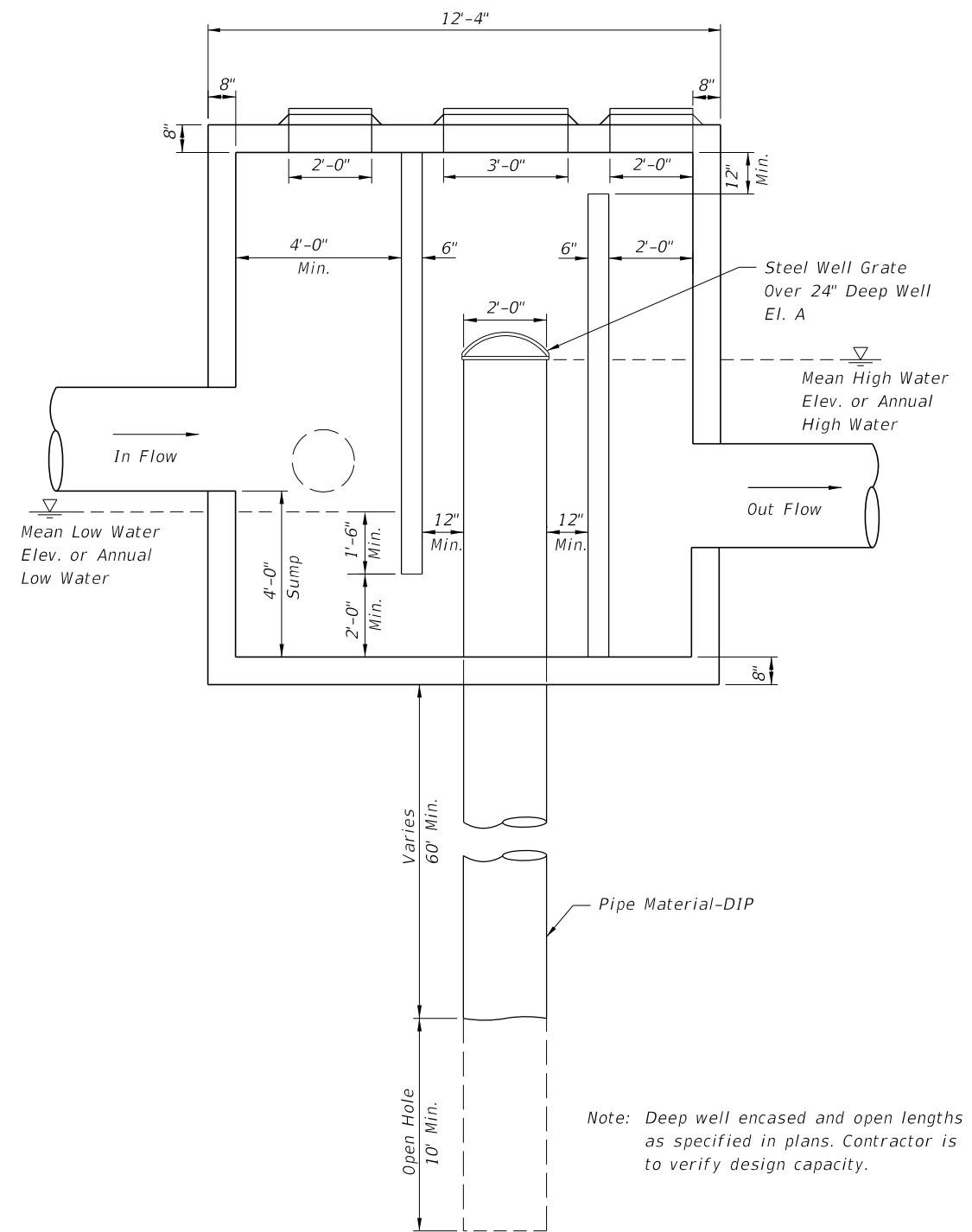


TOP SLAB PLAN



SECTION A-A

STRUCTURE WITH NO OUTFLOW



SPECIAL MANHOLE STRUCTURE
DETAIL WITH OUTFALL

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 425-010). 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.

24" STEEL WELL GRATE

Heavy duty "bee hive" grate

Openings: 1-1/2" maximum


Total Opening: 1.7 sq ft minimum

For 24" well, outer diameter = 29"

Steel well grate to be installed over 24" deep well.

Steel grate to be hot dipped galvanized after fabrication, see Specification Section 962.

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LAST REVISION 11/01/17	REVISION	DESCRIPTION:	 FY 2020-21 STANDARD PLANS	DEEP WELL INJECTION BOX	INDEX 444-T01	SHEET 1 of 1
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GENERAL NOTES:

1. Do not leave trench greater than 2' in depth overnight. Barricade trenches at all times.
2. Construct concrete pavement subdrainage adjacent to the low edge of the roadway pavement and under travel lanes, auxiliary pavement and shoulders, as called for in the plans. Extend the concrete pavement subdrainage 50' beyond and begin 50' before the flat point (100' overlap) when the low edge shifts between outside and inside edges of pavement. Place concrete pavement subdrainage on the low side of ramps for crossroad terminals.
3. Install concrete pavement subdrainage on a grade parallel with the edge of pavement profile, except on profiles flatter than one-tenth percent (0.10%) install the concrete pavement subdrainage on a minimum grade of one-tenth percent (0.10%).
4. Remove adhering base material and soil from the vertical face of the concrete immediately prior to placing the filter fabric.
5. Submit a procedure for holding the filter fabric in position on the vertical face of the trench for approval by the Engineer prior to placing draincrete.
6. Cap the upper end of each separate run of the concrete pavement subdrainage pipe.
7. Install outlet pipes at 500' maximum intervals. Use elbows or 1/8 bends to connect the outlet pipe to the concrete pavement subdrain pipe. Use elbows or bends of the same material as the outlet pipe.

Stub outlet pipes into existing inlets or into existing ditch pavements at an elevation 6" above the inlet flowline or ditch bottom when directed by the Engineer. 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.

Install a single outlet apron for separate outlet pipes of concrete pavement subdrainage from opposite directions in sag vertical curves.

Install backfill consisting of cohesive soils around outlet pipes.

8. Replace existing paved shoulder removed for the construction of outlet pipes with Type SP asphaltic concrete at the rate of 500 LB per SY.

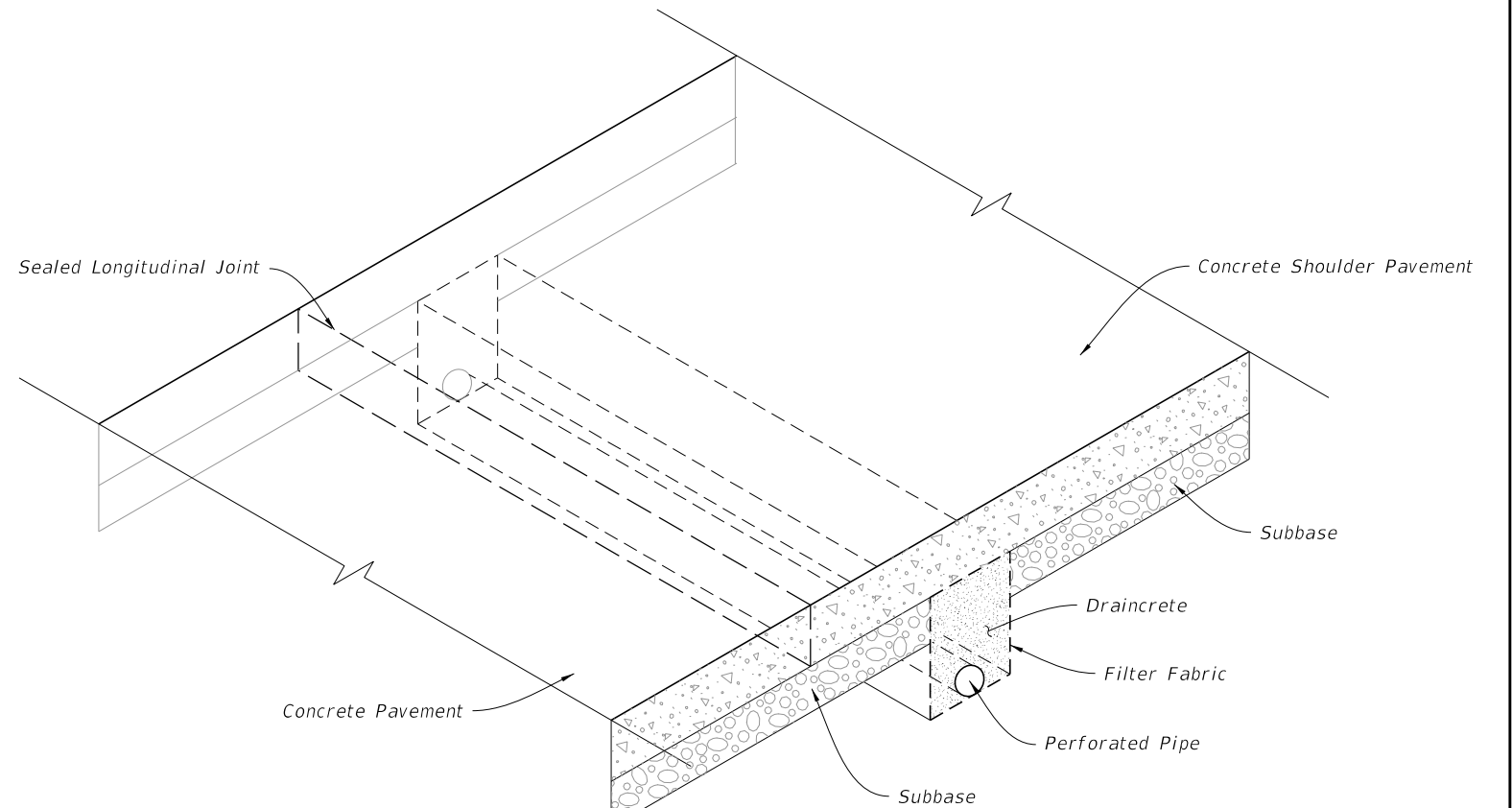
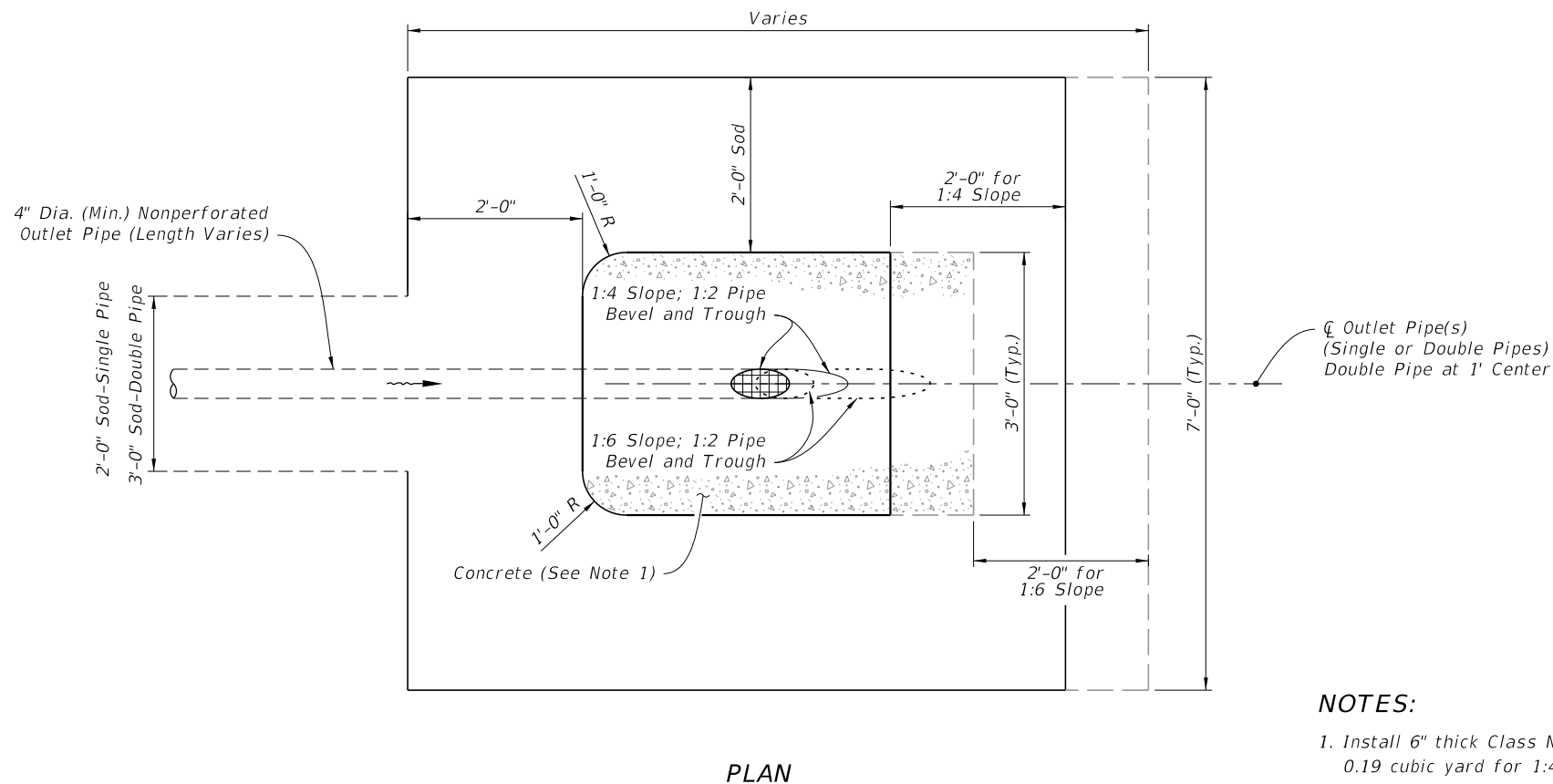
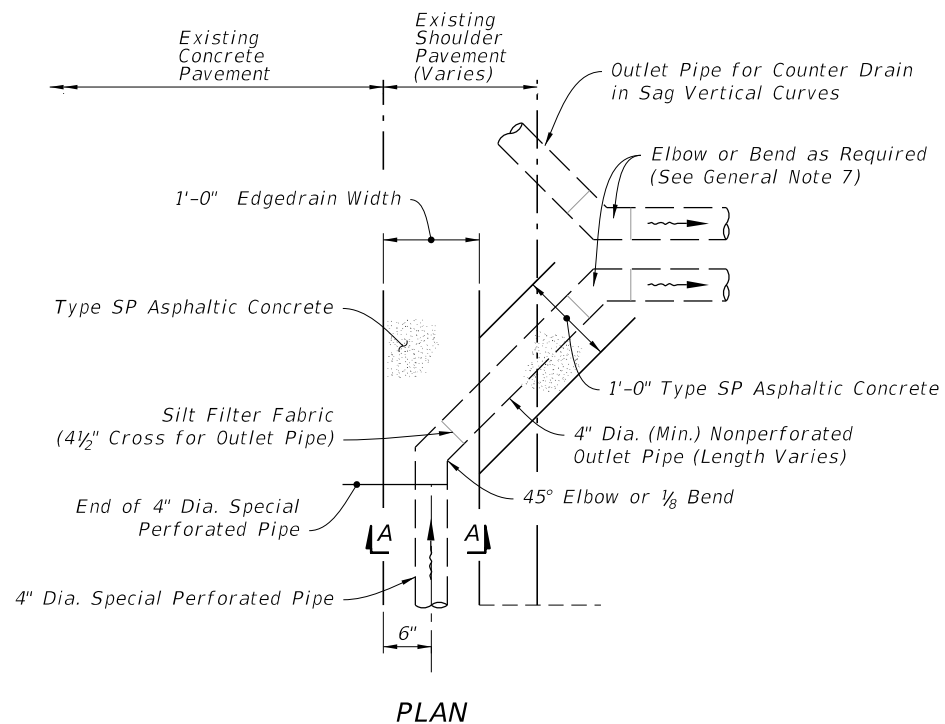


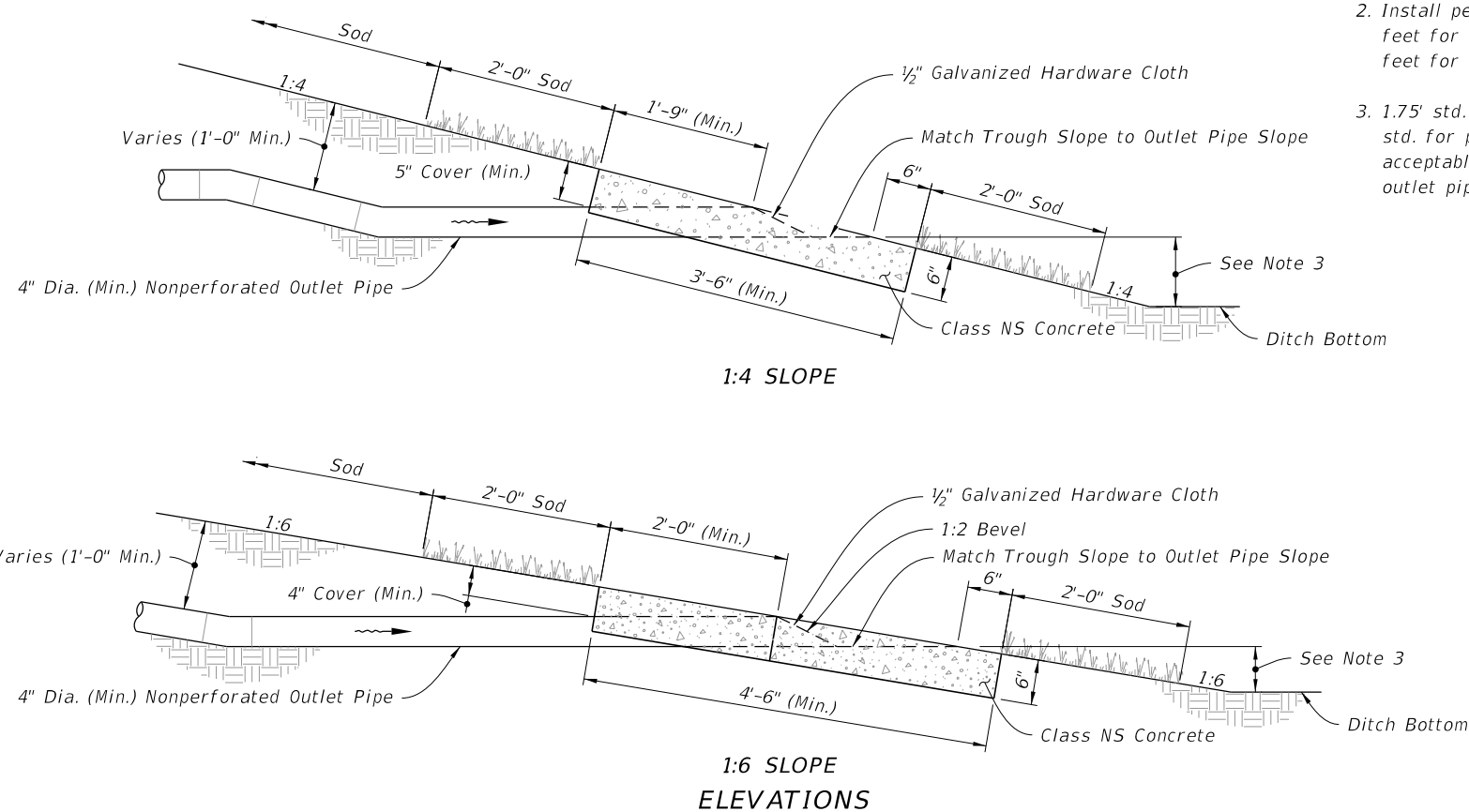
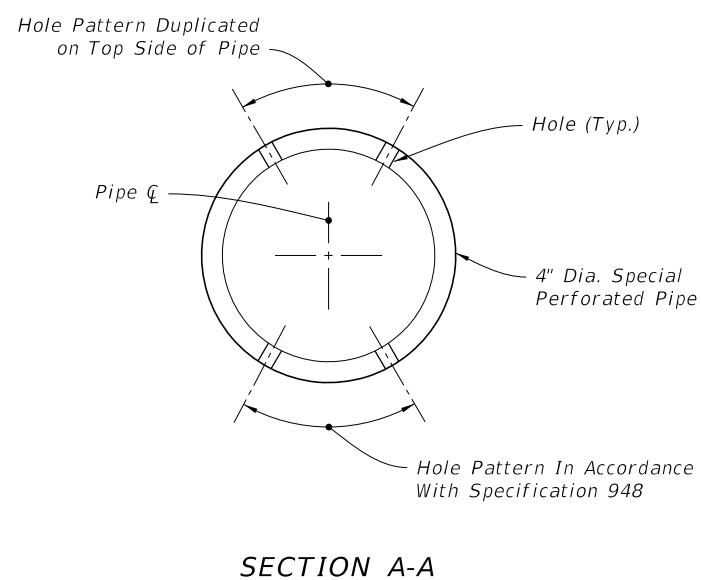
TABLE OF CONTENTS:	
Sheet	Description
1	General Notes and Contents
2	Edgedrain and Outlet
3	New Construction
4	Rehabilitation

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NOTES:

1. Install 6" thick Class NS concrete, 0.19 cubic yard for 1:4 slopes and 0.25 cubic yard for 1:6 slopes.
2. Install perimeter sod, 4.7 square feet for 1:4 slopes and 5.5 square feet for 1:6 Slopes.
3. 1.75' std. for grassed ditches; 0.5' std. for paved ditches [less is acceptable to provide minimum 0.1% outlet pipe slope]



EDGEDRAIN OUTLET

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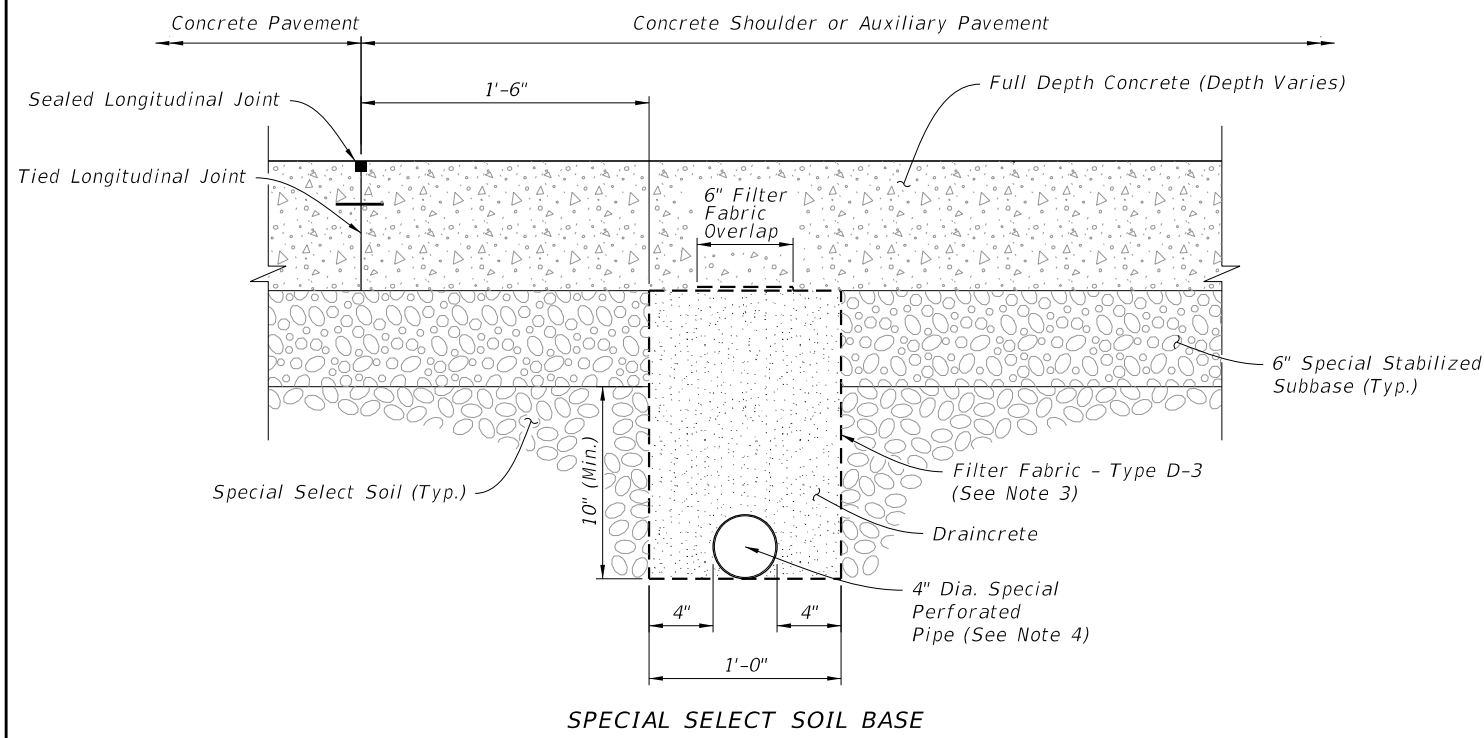


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STANDARD PLANS

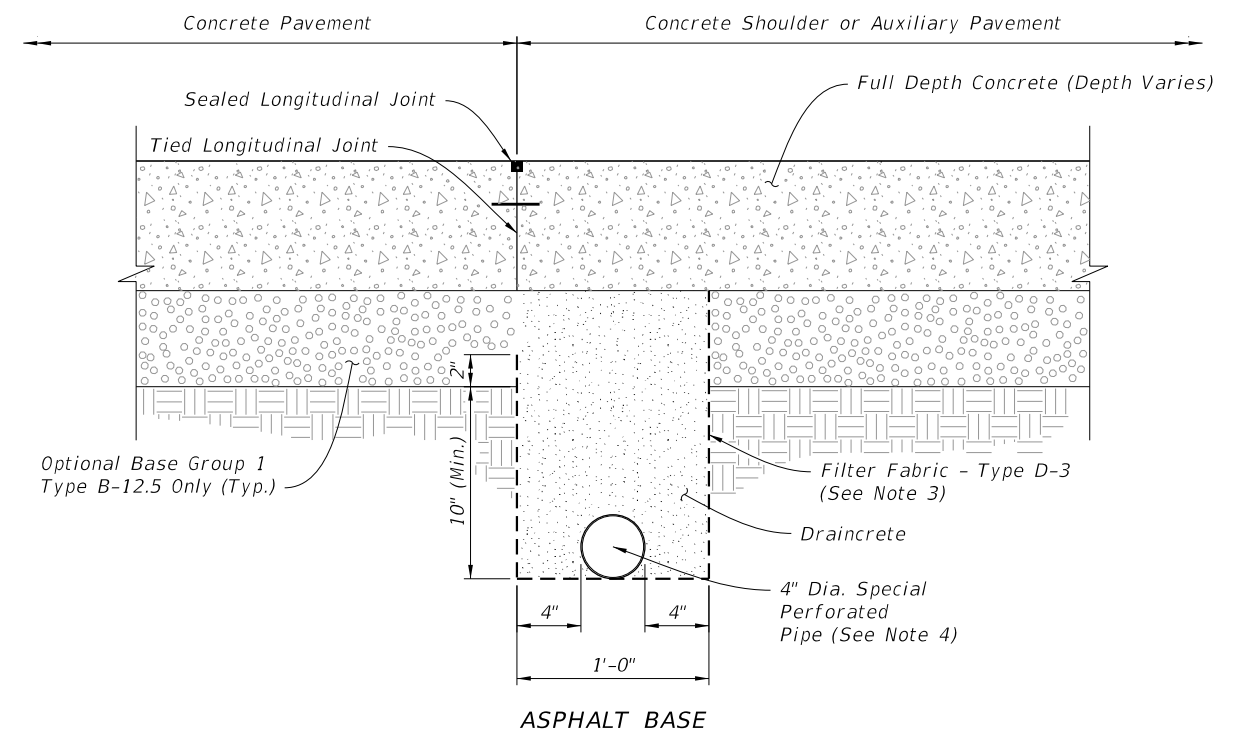
CONCRETE PAVEMENT SUBDRAINAGE

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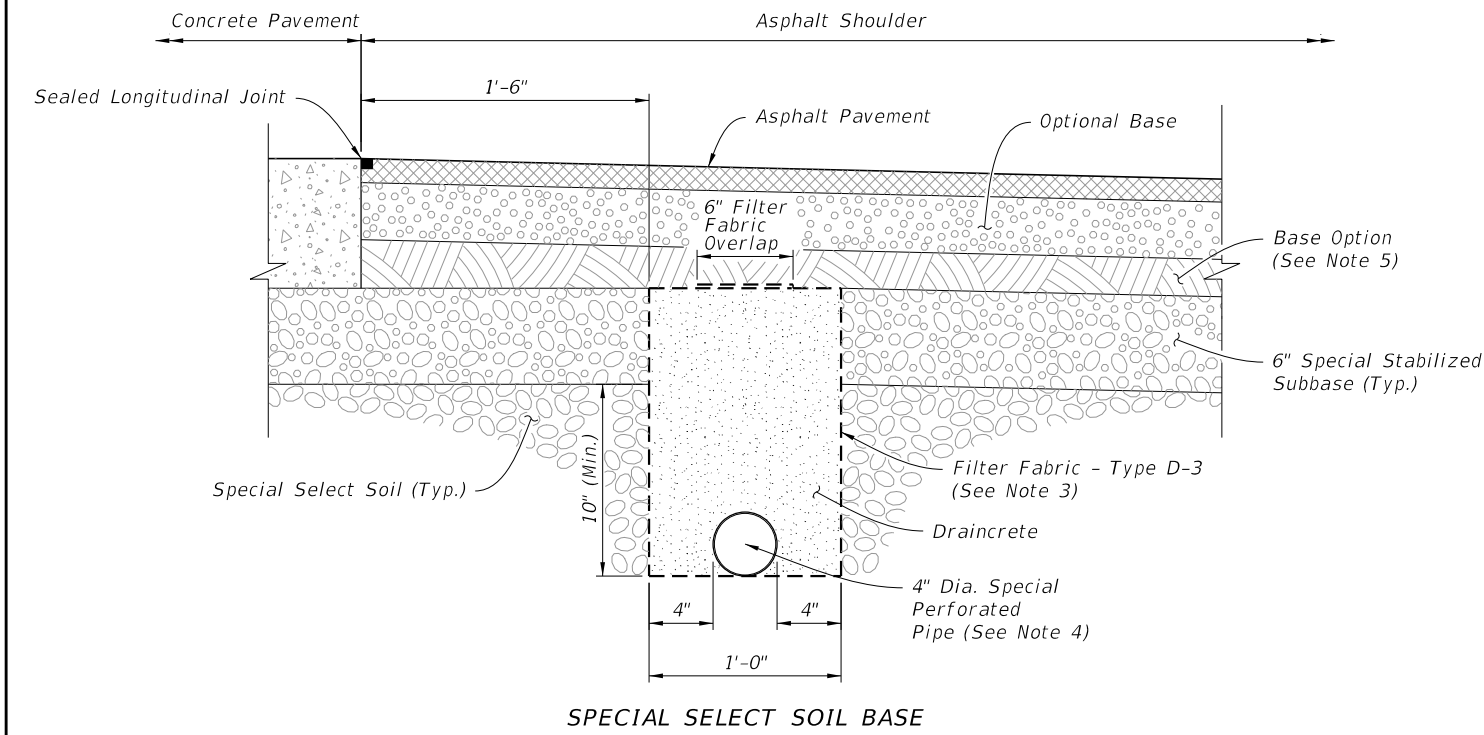


SPECIAL SELECT SOIL BASE

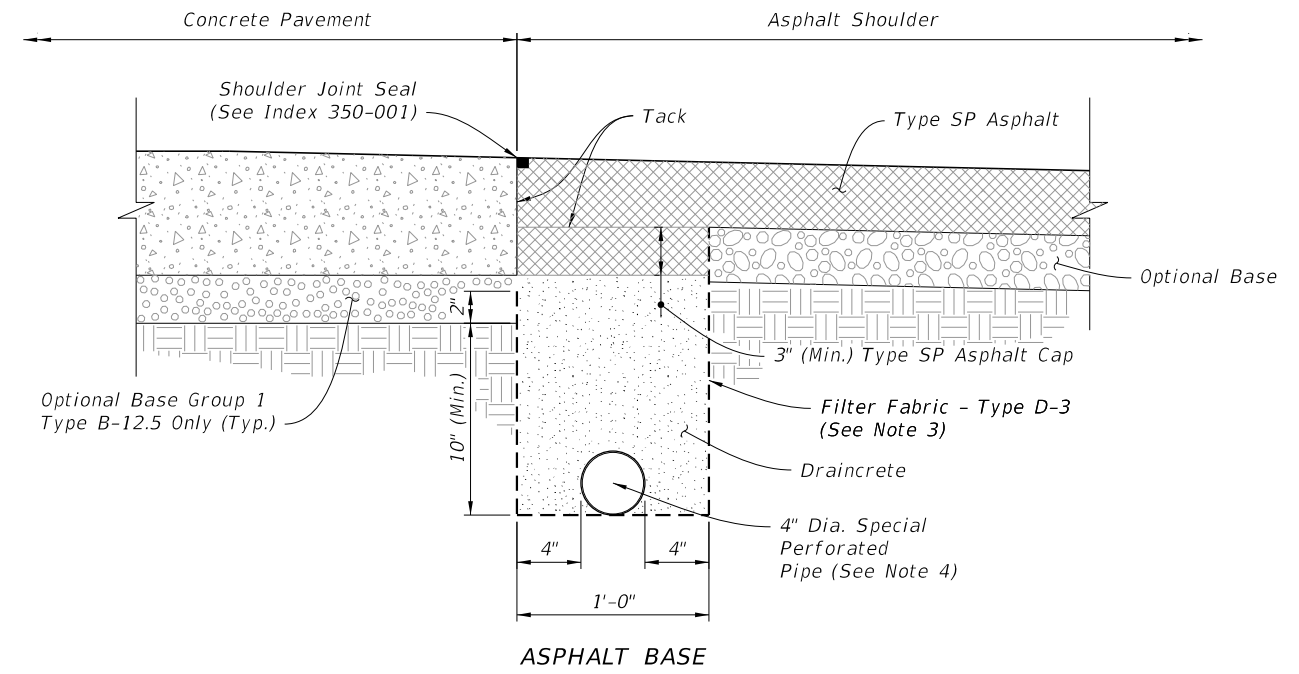


ASPHALT BASE

CONCRETE SHOULDERS AND AUXILIARY PAVEMENT



SPECIAL SELECT SOIL BASE



ASPHALT BASE

ASPHALT SHOULDERS

NOTES:

1. The edgeline sections for DRAINCRETE SUBDRAINAGE are applicable to pavement construction identified as RIGID PAVEMENT on Index 120-001.
2. Confine the construction of draincrete edgeline 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.
3. Install the filter fabric in accordance with Specification 514.
4. Install only noncorrugated or smooth lined corrugated pipe.
5. At the Contractor's option this area may be constructed of Optional Base material (Specification 285) or special stabilized subbase.

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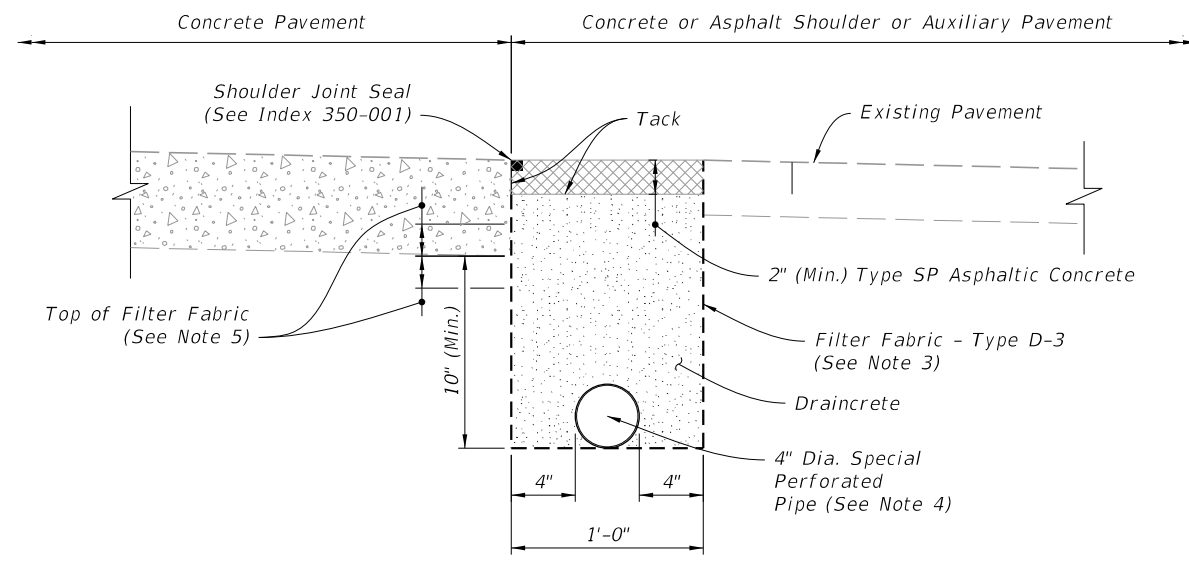
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STANDARD PLANS

CONCRETE PAVEMENT SUBDRAINAGE

NEW CONSTRUCTION

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=====**EXISTING SHOULDERS**=====

NOTES:

1. The edgedrain sections for DRAINCRETE SUBDRAINAGE are applicable to pavement construction identified as RIGID PAVEMENT on Index 120-001.
2. 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.
3. Install the filter fabric in accordance with Specification 514.
4. Install only noncorrugated or smooth lined corrugated pipe.
5. Install Filter Fabric 2" below bottom of pavement for cement stabilized, soil cement and econocrete subbases and 2" above bottom of pavement for other subbases.

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REHABILITATION

LAST REVISION 11/01/19	REVISION	DESCRIPTION:	 FY 2020-21 STANDARD PLANS	CONCRETE PAVEMENT SUBDRAINAGE	INDEX 446-001	SHEET 4 of 4
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SHEET PILE DESIGN CRITERIA AND NOTES

DESCRIPTION:
 This Index includes details for five types of piles with two thicknesses. Types "B1", "B2", "C1" and "C2" piles (corner piles) are of reinforced concrete construction, and Type "A" is of prestressed concrete construction. The piles shall be manufactured, cured and installed in accordance with the requirements of the contract documents.

MATERIALS: (for materials not listed refer to the Specifications)
CONCRETE
 Class: V (Special) for slightly and moderately aggressive environments
 V (Special) with silica fume, metakaolin or ultrafine fly ash for extremely aggressive environments
 Unit weight: 150 pcf
 Modulus of Elasticity: Based on the use of Florida limerock concrete

REINFORCING STEEL
 ASTM A615 Grade 60

PRESTRESSING STEEL
 ASTM A416 Grade 270 (Low-Relaxation Strand)

DESIGN PARAMETERS:
 Type "A"
 Concrete Compressive Strength at release of prestressing: 4000 psi minimum
 Uniform compression after prestressing losses: 1000 psi minimum
 Pick-up, Storage and Transportation: 0.0 psi tension with 1.5 times pile self weight
 Types "B1", "B2", "C1" & "C2"
 Pick-up, Storage and Transportation: Minimum compressive strength $f'_{ci} \geq 4000$ psi required.

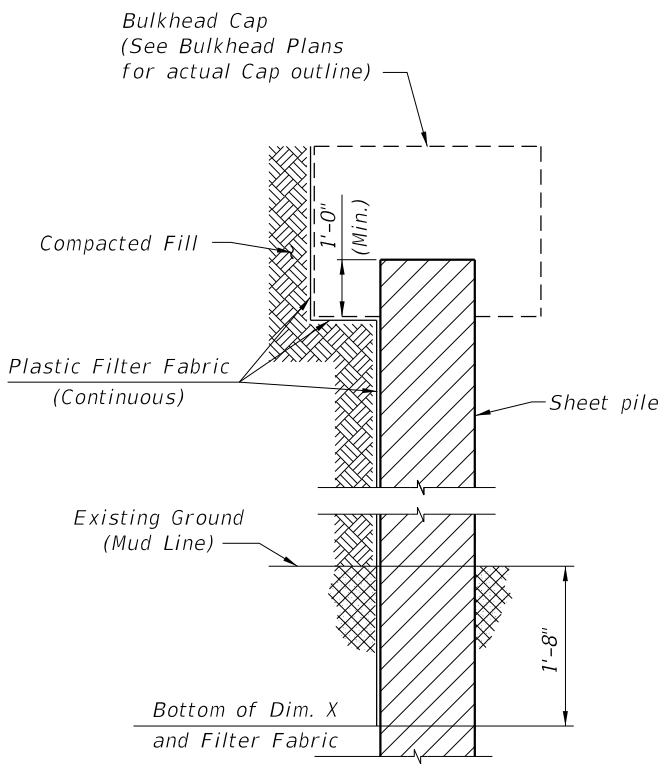
ENVIRONMENT:
 The pile designs are applicable to all Environments.

PLASTIC FILTER FABRIC:
 The plastic filter fabric shall extend to the bottom of the "X" dimension.

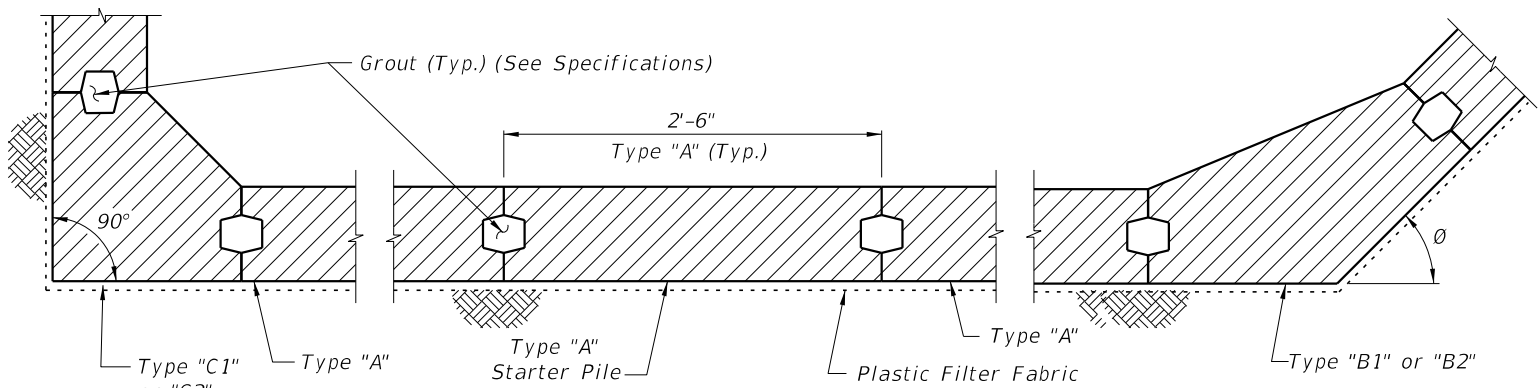
PILE PICK-UP AND HANDLING:
 Type "A"
 Pick-up of pile may be either a single point pick-up or a two point pick-up as shown below.
 Types "B1", "B2", "C1" & "C2"
 Two point pick-up for lifting out of forms & two point support for storage & transportation.
 Single point pick-up for installation only.

PILE FIT-UP:
 The 2'-6" Sheet Pile dimension is nominal. This dimension may be shortened by the Manufacturer up to 1/2" to allow for Sheet Pile fit-up in its final position. Minimum Sheet Pile width is 2'-5 1/2". No changes shall be made to the tongues or grooves.

CROSS REFERENCES:
 For Dimensions L and X see Sheet Pile Wall Data Table in Structures Plans.

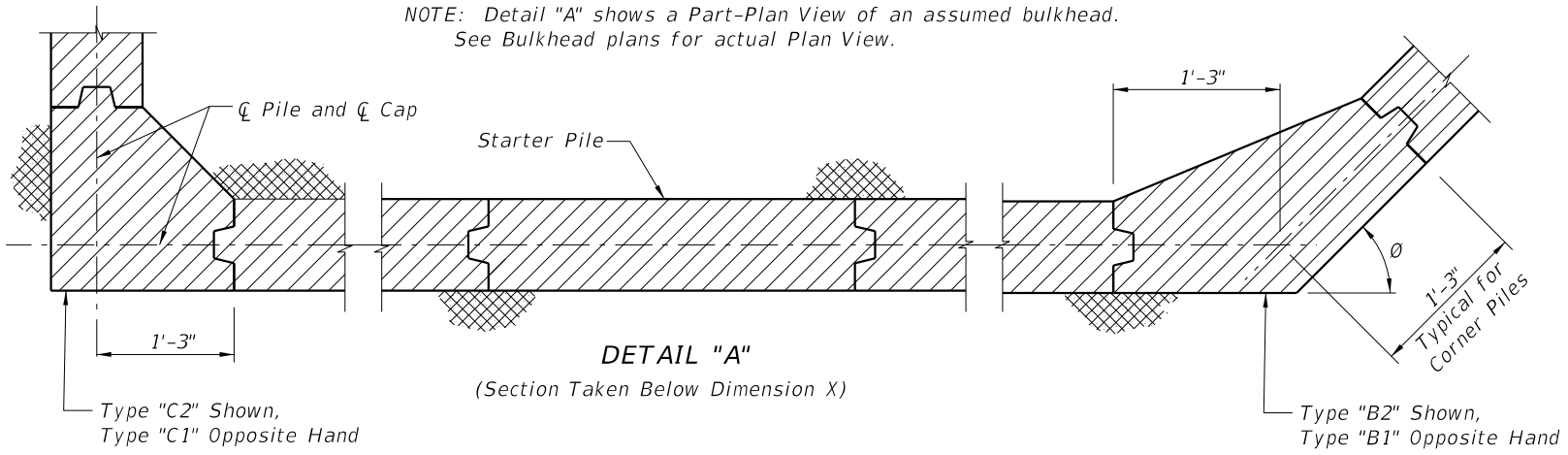


SECTION THRU BULKHEAD
 (Showing Plastic Filter Fabric)

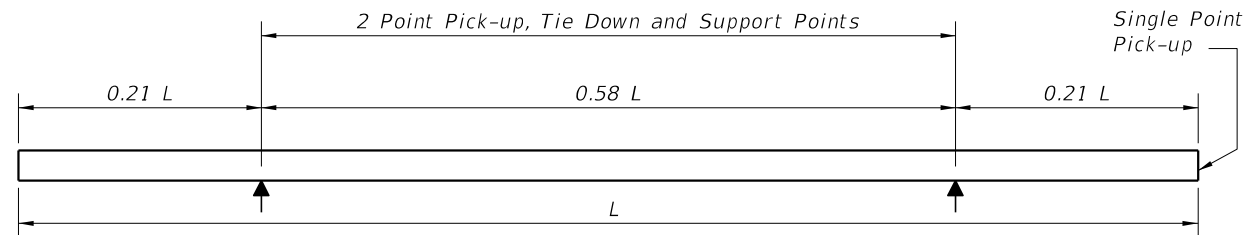


DETAIL "A"
 (Cap and Anchoring System Not Shown)
 (Section Taken Above Dimension X)

NOTE: Detail "A" shows a Part-Plan View of an assumed bulkhead. See Bulkhead plans for actual Plan View.



DETAIL "A"
 (Section Taken Below Dimension X)

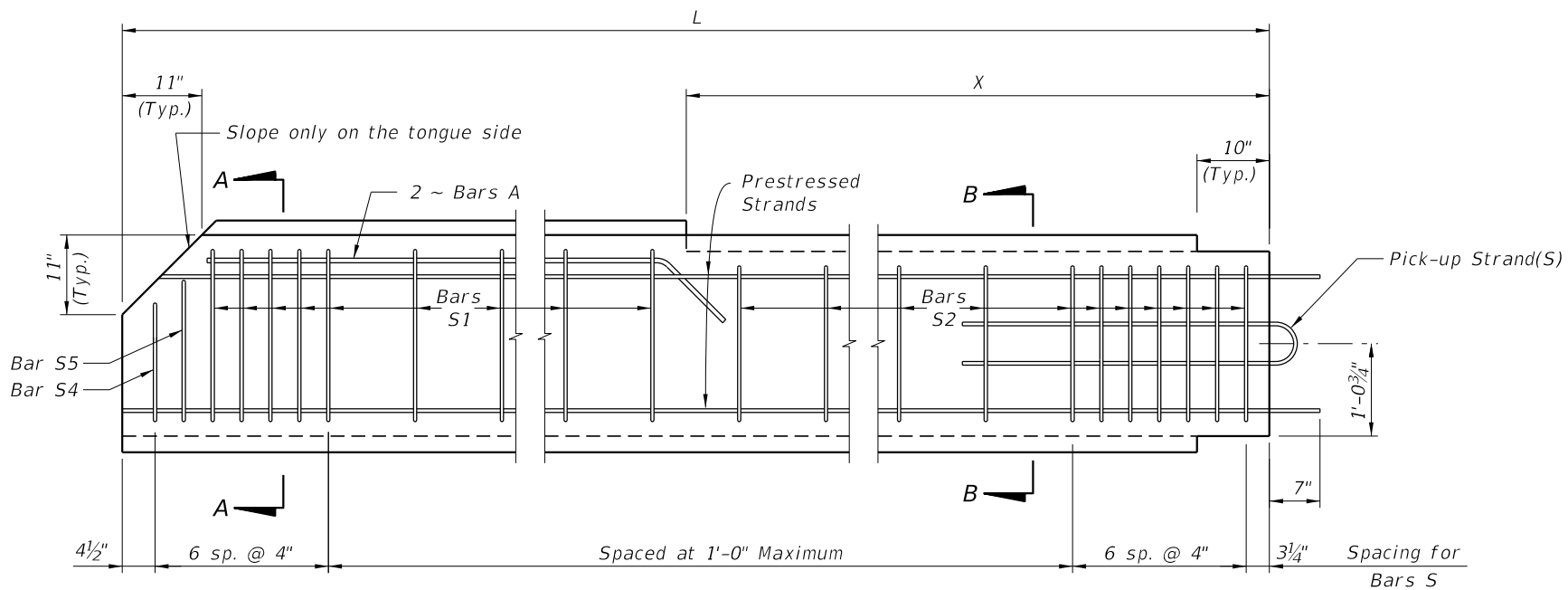


PILE STORAGE AND TRANSPORTATION SUPPORT DETAILS

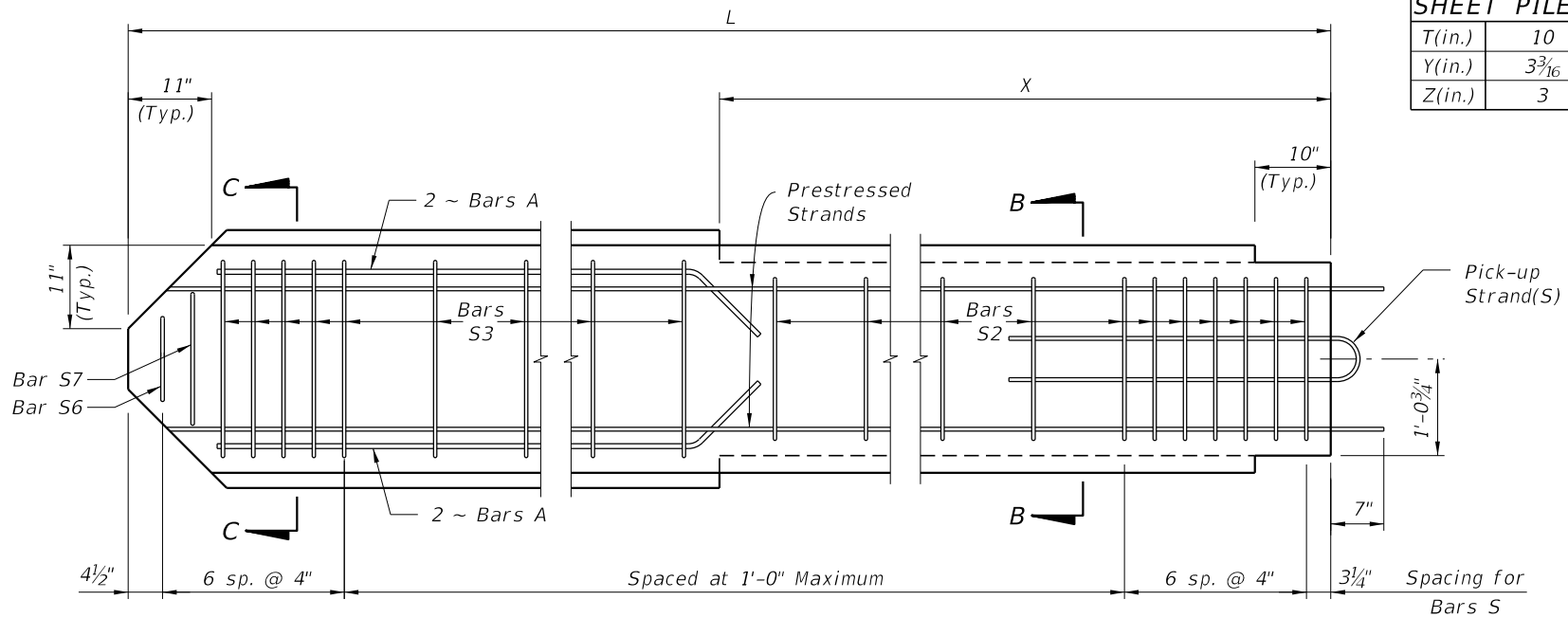
NOTES AND DETAILS

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LAST REVISION 11/01/17	DESCRIPTION:	 FY 2020-21 STANDARD PLANS	PRECAST CONCRETE SHEET PILE WALL (CONVENTIONAL)	INDEX 455-400	SHEET 1 of 4
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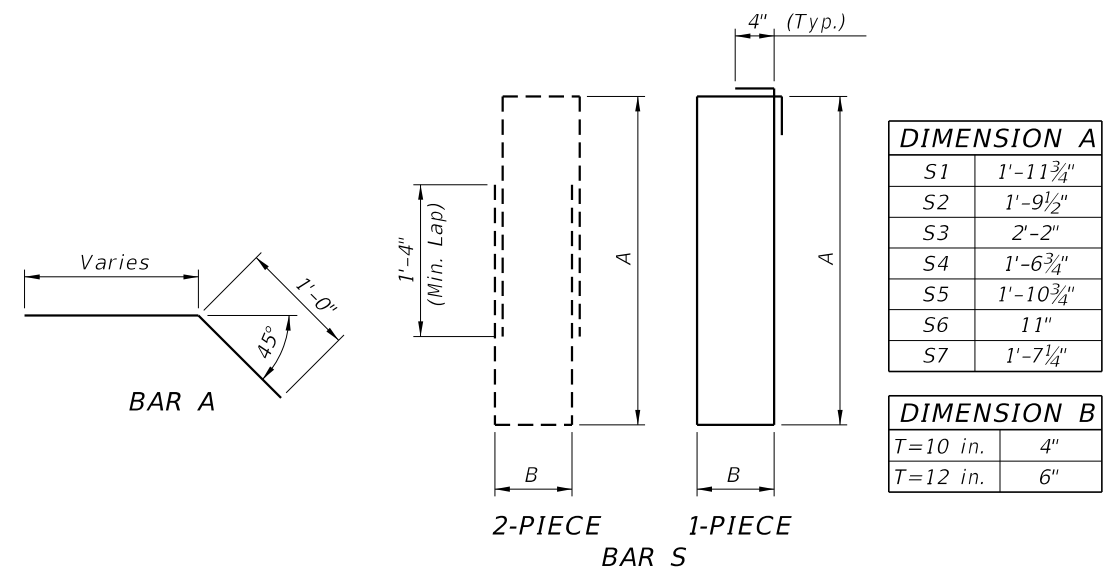
TYPICAL PILE



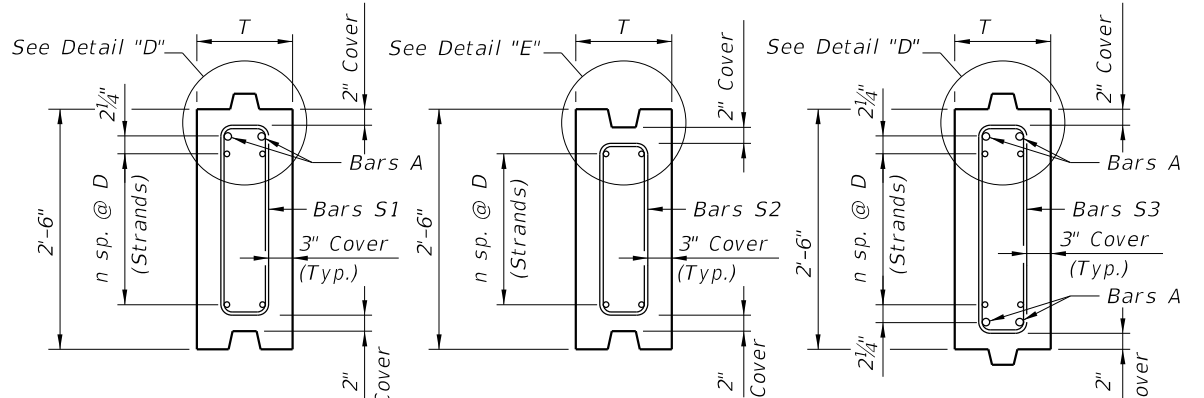
STARTER PILE

SHEET PILE DIMENSIONS		
T(in.)	10	12
Y(in.)	3 3/16	4 3/16
Z(in.)	3	4

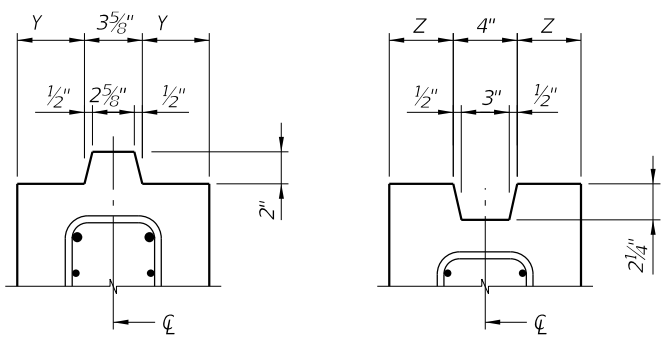
BAR BENDING DIAGRAMS



- NOTES:
- Intermediate Prestress Strands not shown in Elevations and Sections.
 - All bar dimensions are out-to-out.
 - Bars A are #5 and Bars S are #4.
 - At the Contractor's option Bars S may be fabricated as a two piece bar as shown in the Bar Bending Diagram.
 - The Contractor may use Deformed Welded Wire Reinforcement meeting the requirements of Specification Section 931 in lieu of Bars A and Bars S if the wire size and spacing provide the same area of reinforcing steel per foot as the Bars shown.
 - For Dimensions L and X see Sheet Pile Data Table in Structures Plans.



SECTION A-A SECTION B-B SECTION C-C



DETAIL "D" (Typical Tongue) DETAIL "E" (Typical Groove)

WALL THICKNESS	STRAND DIA. (in.)	MAXIMUM L	n	D (in.)	TOTAL # OF STRANDS	INITIAL (JACKING) FORCE (Kip)
T=10 in.	0.5	28'-0"	6	3 3/4	14	31
	0.6	27'-0"	4	5	10	44
T=12 in.	0.5	31'-0"	7	2 7/8	16	31
	0.6	30'-0"	5	4	12	44

TYPE "A" STANDARD SECTION

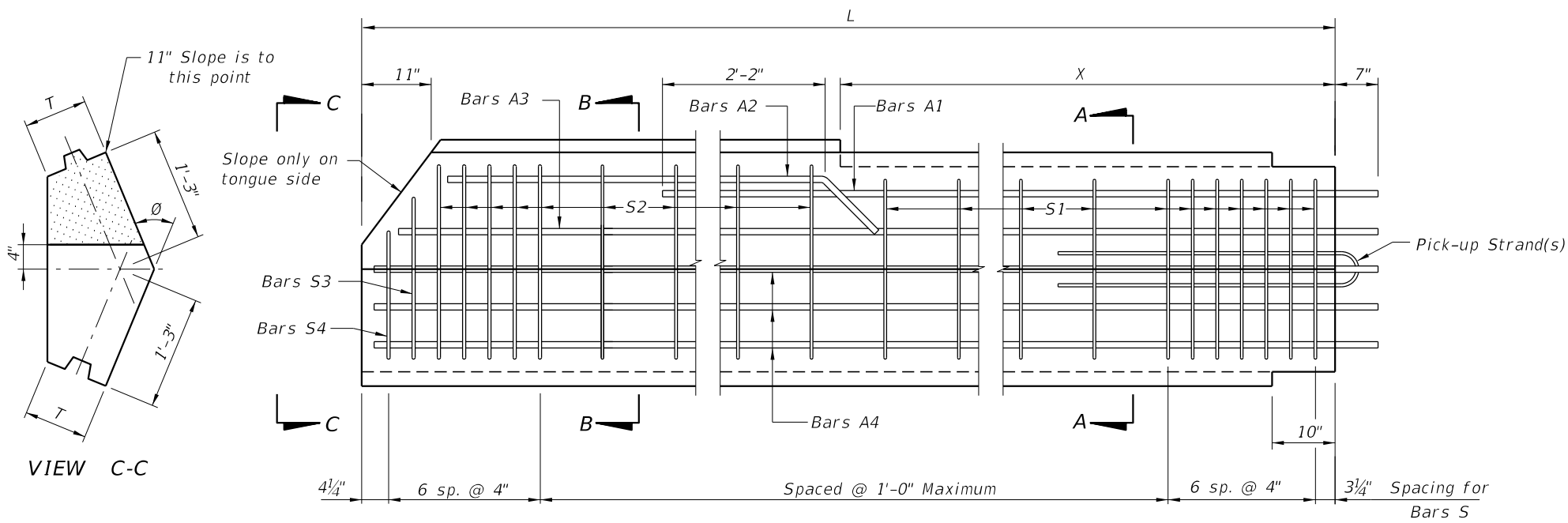
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LAST REVISION	DESCRIPTION:
11/01/18	

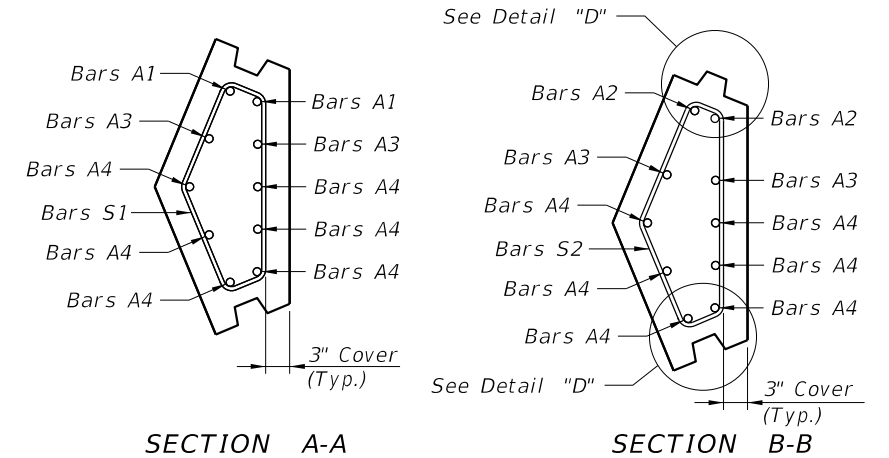
**FY 2020-21
STANDARD PLANS**

**PRECAST CONCRETE SHEET PILE WALL
(CONVENTIONAL)**

INDEX	SHEET
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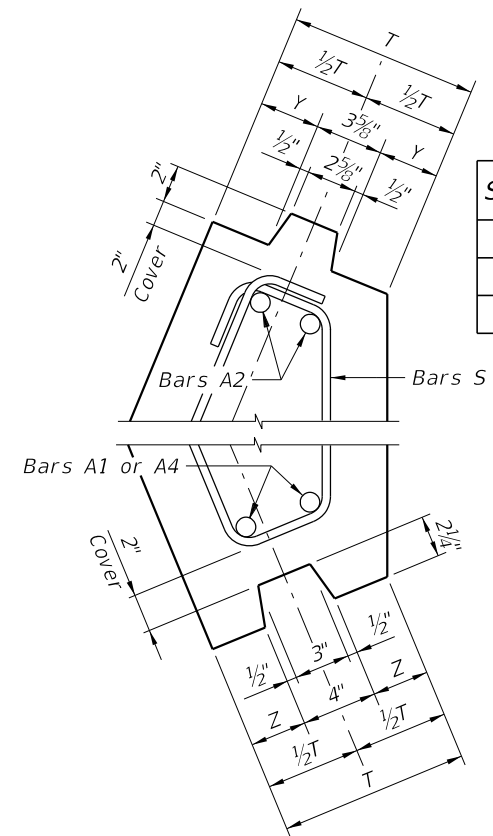


ELEVATION
(TYPE "B1" PILE SHOWN, TYPE "B2" PILE OPPOSITE HAND)



SECTION A-A

SECTION B-B



SHEET PILE DIMENSIONS		
T (in.)	10	12
Y (in.)	3 ³ / ₁₆	4 ³ / ₁₆
Z (in.)	3	4

DETAIL "D"
(TYPE "B1" PILE SHOWN, TYPE "B2" PILE OPPOSITE HAND)

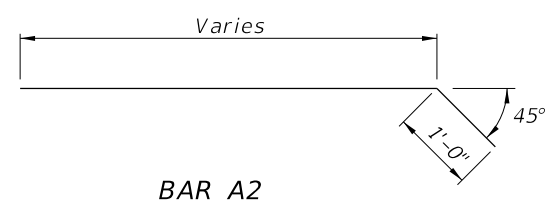
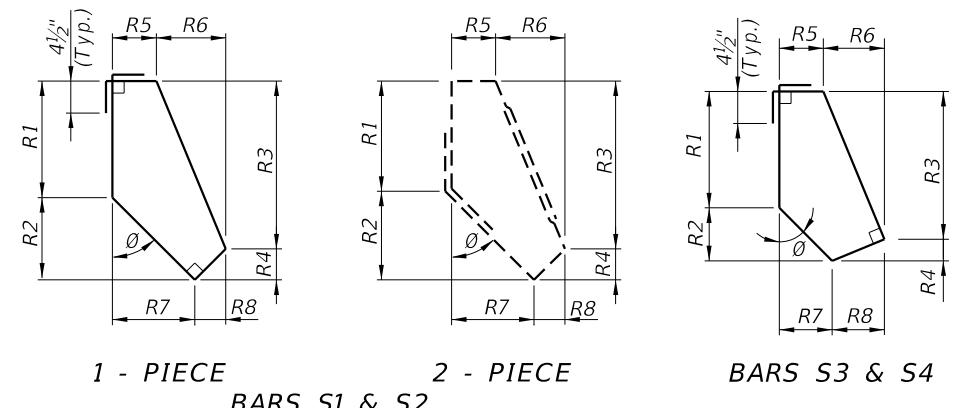
BAR BENDING DIAGRAMS

STIRRUP DIMENSIONS (T = 10")

∅	BAR MARK	R1	R2	R3	R4	R5	R6	R7	R8
30°	S1	11 1/4"	9 3/4"	1'-6 1/2"	2 1/2"	5"	4 3/4"	5 1/2"	4 1/4"
	S2	1'-1 1/2"	9 3/4"	1'-8 3/4"	2 1/2"	4 1/2"	5 1/2"	5 3/4"	4 1/4"
	S3	11 1/4"	8"	1'-6"	1 1/4"	5"	4 1/2"	4 1/2"	5"
	S4	11 1/4"	4 1/4"	1'-1 3/4"	1 3/4"	5"	3 3/4"	2 1/2"	6 1/4"
45°	S1	11 1/2"	8"	1'-4"	4"	5 1/2"	6 1/2"	8"	4"
	S2	1'-1 3/4"	8"	1'-5 3/4"	4"	4 1/2"	7 1/2"	8"	4"
	S3	11 1/2"	6 3/4"	1'-4"	2 1/4"	5 1/2"	6 3/4"	6 3/4"	5 1/2"
	S4	11 1/2"	3 1/2"	1'-0"	3"	5 1/2"	5"	3 1/2"	7"
60°	S1	1'-0"	6"	1'-0 3/4"	5 1/4"	6"	7 1/4"	10 1/4"	3"
	S2	1'-2"	6"	1'-2 3/4"	5 1/4"	4 3/4"	8 3/4"	10 1/2"	3"
	S3	1'-0"	4 3/4"	1'-1 1/2"	3 1/4"	6"	8"	8 3/4"	5 1/4"
	S4	1'-0"	2 1/2"	10"	4 1/2"	6"	5 3/4"	4"	7 1/2"

STIRRUP DIMENSIONS (T = 12")

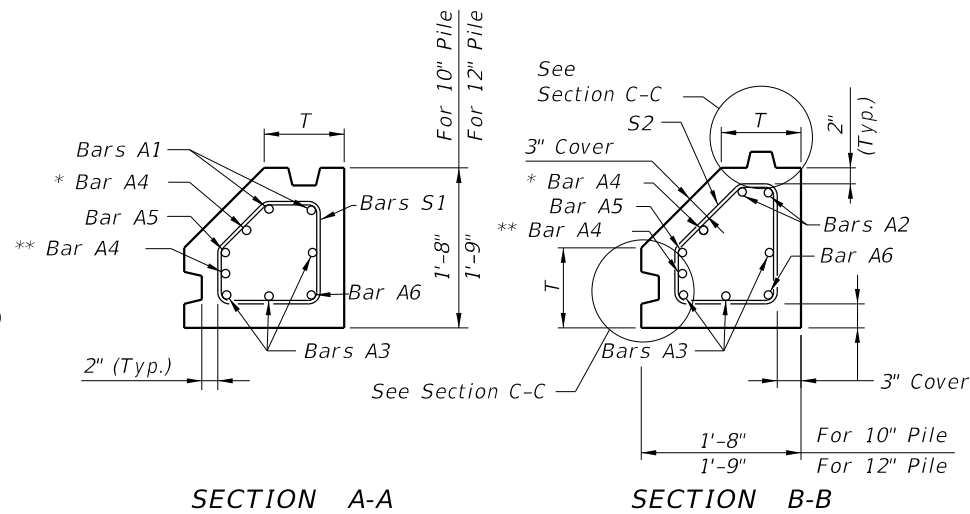
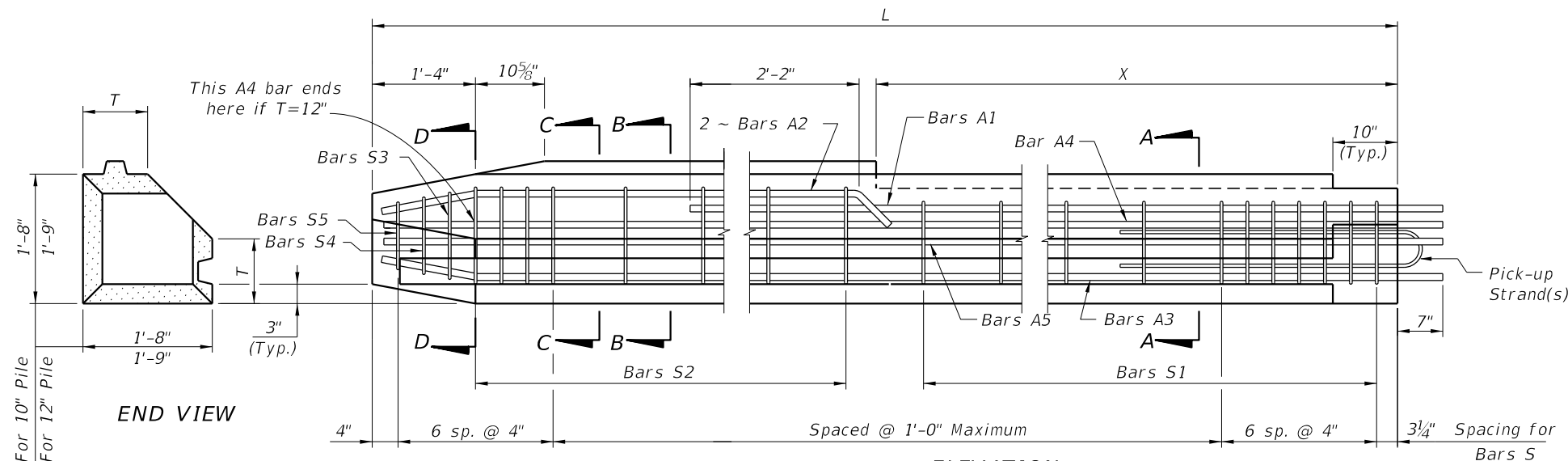
∅	BAR MARK	R1	R2	R3	R4	R5	R6	R7	R8
30°	S1	11 1/2"	10"	1'-6"	3 1/2"	7"	4 3/4"	5 3/4"	6"
	S2	1'-1 3/4"	10"	1'-8 1/4"	3 1/2"	6 1/2"	5 1/4"	5 3/4"	6"
	S3	11 1/2"	8 1/4"	1'-5 3/4"	2"	7"	4 3/4"	4 1/2"	7 1/4"
	S4	11 1/2"	4"	1'-1 1/4"	2 1/4"	7"	3 3/4"	2 1/2"	8 1/4"
45°	S1	1'-0"	8 1/2"	1'-3 1/4"	5 1/4"	7 1/2"	6 1/4"	8 1/2"	5 1/4"
	S2	1'-2 1/4"	8 1/2"	1'-5 1/2"	5 1/4"	6 1/2"	7 1/4"	8 1/2"	5 1/4"
	S3	1'-0"	7"	1'-4"	3"	7 1/2"	6 3/4"	7"	7 1/4"
	S4	1'-0"	3 1/2"	11 3/4"	3 3/4"	7 1/2"	5"	3 1/2"	9"
60°	S1	1'-0 1/2"	6 1/4"	11 3/4"	7"	8"	6 3/4"	10 3/4"	4"
	S2	1'-2 3/4"	6 1/4"	1'-2"	7"	6 3/4"	8"	10 3/4"	4"
	S3	1'-0 1/2"	5"	1'-1 1/2"	4"	8"	8"	9"	7"
	S4	1'-0 1/2"	2 1/2"	9 1/2"	5 1/2"	8"	5 1/2"	4 1/4"	9 1/4"



- NOTES:**
- This drawing includes details for precast concrete corner piles for 10" and 12" thick sheet pile systems. The details apply equally to both thicknesses.
 - The bar configurations shown in Sections A-A and B-B shall be used for ∅ angles between 15° and 75°. For ∅ angles not shown, the reinforcing bar dimensions may be interpolated or extrapolated from the stirrup dimensions shown.
 - All bar dimensions are out-to-out.
 - Bars A are #8 and Bars S are #4.
 - Values for Stirrup Dimensions are shown for ∅ equal to 30°, 45° & 60° only.
 - At the Contractor's option Bars S may be fabricated as a 2 piece bar with a minimum lap length of 1'-4", as shown in Bar Bending Diagrams.
 - If Type "B1" or "B2" pile is used as a Starter Pile show tongue on both sides of pile from Dim. X down. Show dimensions for Bars S2, S3 & S4 in shop drawings.
 - If tongue must be on the opposite side from that shown all dimensions and Bars A, S2, S3 and S4 will be the same but opposite hand.
 - For Dimensions L, X and Angle ∅, see Sheet Pile Data Table in Structures Plans.

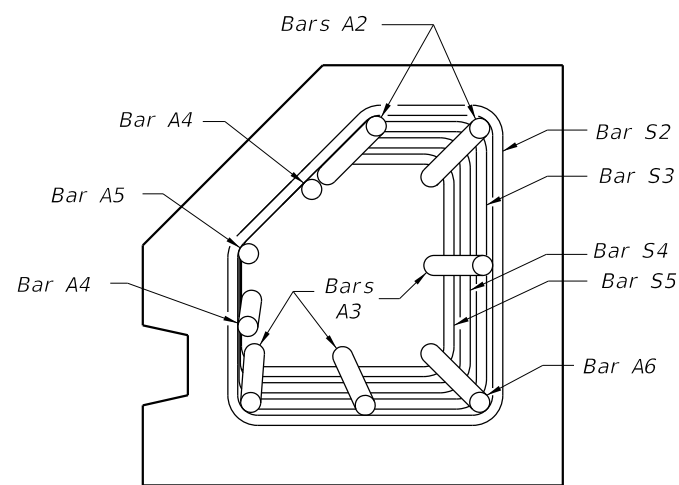
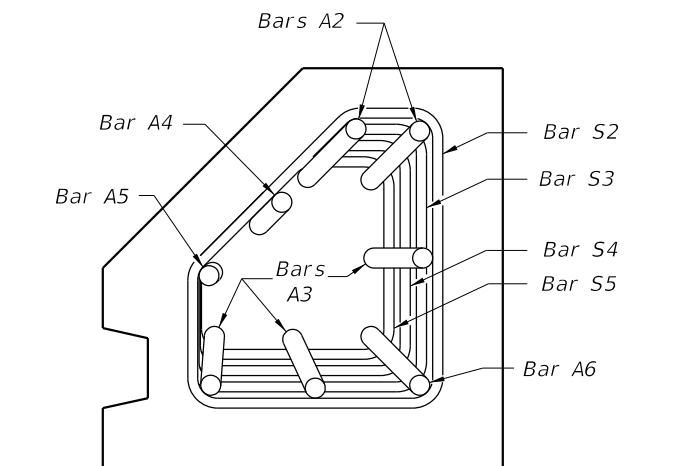
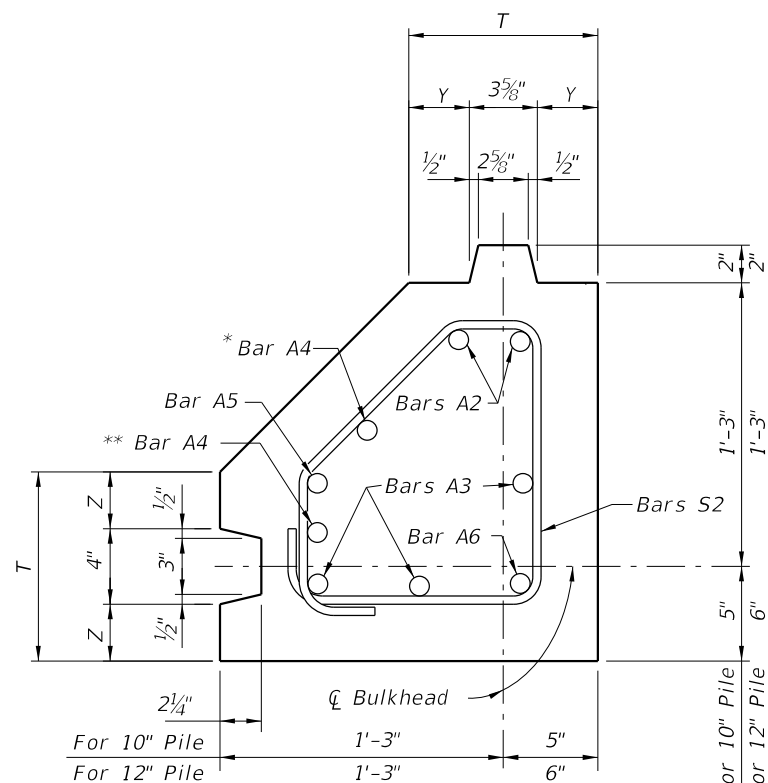
TYPE "B1" AND "B2" - VARIABLE ANGLE CORNER PILE

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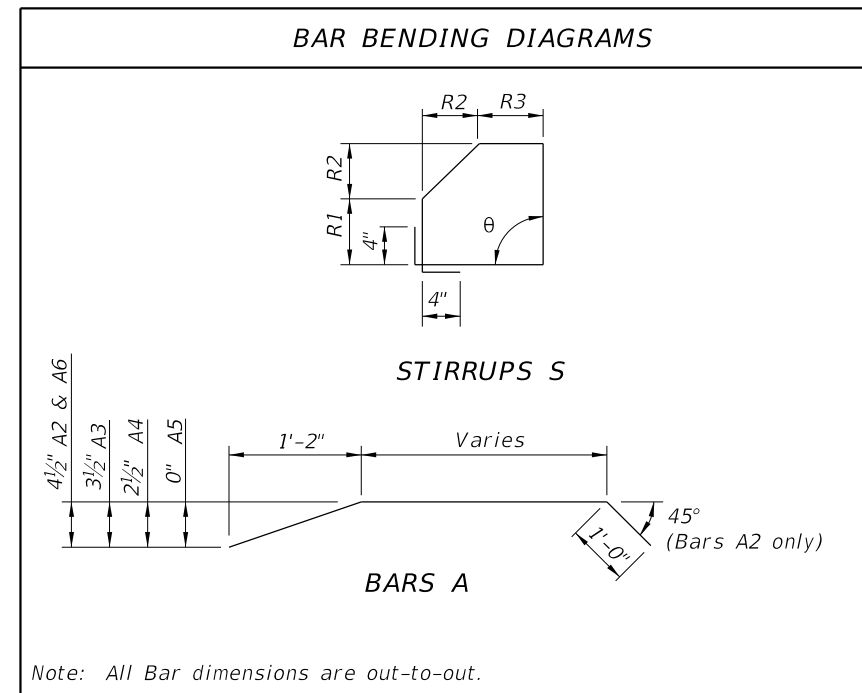
* This Bar A4 shall be 1'-2" shorter than other A4 bars for T = 12".

** This Bar A4 (not shown in elevation) is included only if T = 12".



STIRRUP DIMENSIONS					
θ	T (in.)	BAR MARK	R1	R2	R3
90°	10	S1	7"	5 3/4"	7"
		S2	7"	8"	4 3/4"
		S3	6 1/4"	7 1/4"	4 3/4"
		S4	5 1/2"	6 1/2"	4 3/4"
		S5	4 3/4"	5 3/4"	4 3/4"
90°	12	S1	9"	4 3/4"	9"
		S2	9"	7"	6 3/4"
		S3	8 1/4"	6 1/4"	6 3/4"
		S4	7 1/2"	5 1/2"	6 3/4"
		S5	6 3/4"	4 3/4"	6 3/4"

SHEET PILE DIMENSIONS		
T (in.)	10	12
Y (in.)	3 3/16	4 3/16
Z (in.)	3	4



- Notes:
- All bar dimensions are out-to-out.
 - Bars A are #8 and Bars S are #4.
 - This drawing includes information for precast Corner Piles for 10" and 12" thick Sheet Pile systems. The details apply to both thicknesses but the bar configurations change slightly according to the thickness values used.
 - If Type "C1" or "C2" pile is used as a Starter Pile show tongue on both sides of pile from Dim. X down. Show dimensions for Bars S2, S3, S4 & S5 in shop drawings.
 - If tongue must be on opposite side (Groove Side) from that shown, all dimensions and reinforcement shall follow the corresponding Tongue or Groove side.
 - For Dimensions L and X see Sheet Pile Data Table in Structures Plans.

TYPE "C1" AND "C2" - RIGHT ANGLE CORNER PILE

10/29/2019 8:17:28 AM

LAST REVISION	DESCRIPTION:
07/01/12	

FY 2020-21
STANDARD PLANS

PRECAST CONCRETE SHEET PILE WALL
(CONVENTIONAL)

INDEX SHEET
455-400 4 of 4

CFRP/GFRP SHEET PILE DESIGN CRITERIA AND NOTES

DESCRIPTION:

This Index includes details for six types of piles with two thicknesses. Type "A" is prestressed concrete construction with CFRP or HSSS strands. Types "B1", "B2", "C1" and "C2" piles (corner piles) are reinforced concrete construction. Manufacture, cure and install Sheet Piles in accordance with the requirements of the contract documents.

MATERIALS: (for materials not listed refer to the Specifications)

CONCRETE

Class: V (Special)
 Unit weight: 145 pcf
 Modulus of Elasticity: Based on the use of Florida limerock aggregate concrete

REINFORCING BARS

Glass Fiber Reinforced Polymer (GFRP) bars meeting the requirements of Specification Section 932.

PRESTRESSING STRAND

Stainless Steel: Prestressing steel shall be seven-wire HSSS, UNS S32205 (Type 2205) or UNS S31803 strand, meeting the requirements of Specification Section 933.
 Carbon FRP: Prestressing strand shall be CFRP strand, meeting the requirements of Specification Section 933.

DESIGN PARAMETERS:

Type "A"

Concrete Compressive Strength at release of prestressing: 4000 psi minimum
 Uniform compression after prestressing losses: 700 psi minimum
 Pick-up, Storage and Transportation: 450 psi tension with 1.5 times pile self weight for single-point pick-up at $f'c \geq 6000$ psi

Types "B1", "B2", "C1" & "C2"

Pick-up, Storage and Transportation: Minimum compressive strength $f'ci \geq 4000$ psi required for two-point pick-up; $f'c \geq 6000$ psi for single-point pick-up.

PLASTIC FILTER FABRIC:

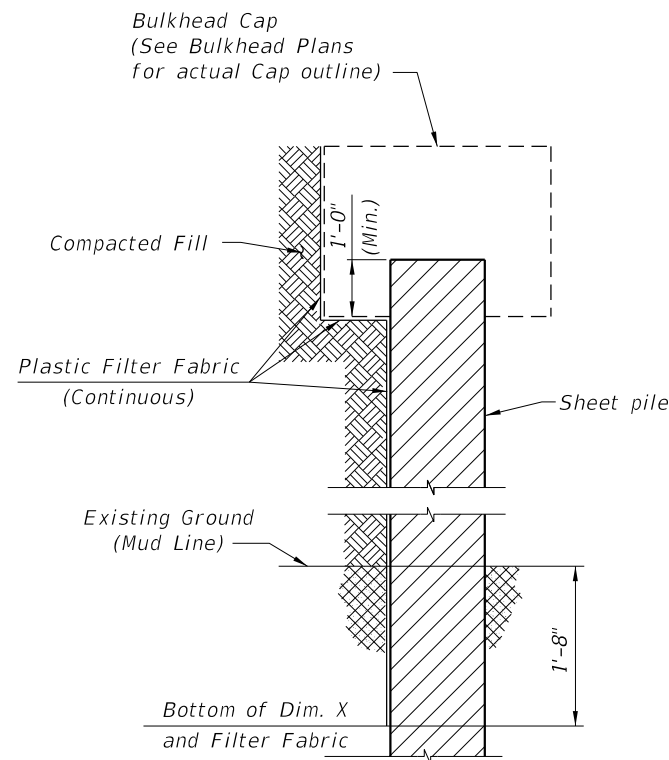
The plastic filter fabric shall extend to the bottom of the "X" dimension.

PILE PICK-UP AND HANDLING:

Two-point pick-up for lifting out of forms & two-point support for storage & transportation.
 Single-point pick-up for installation only.

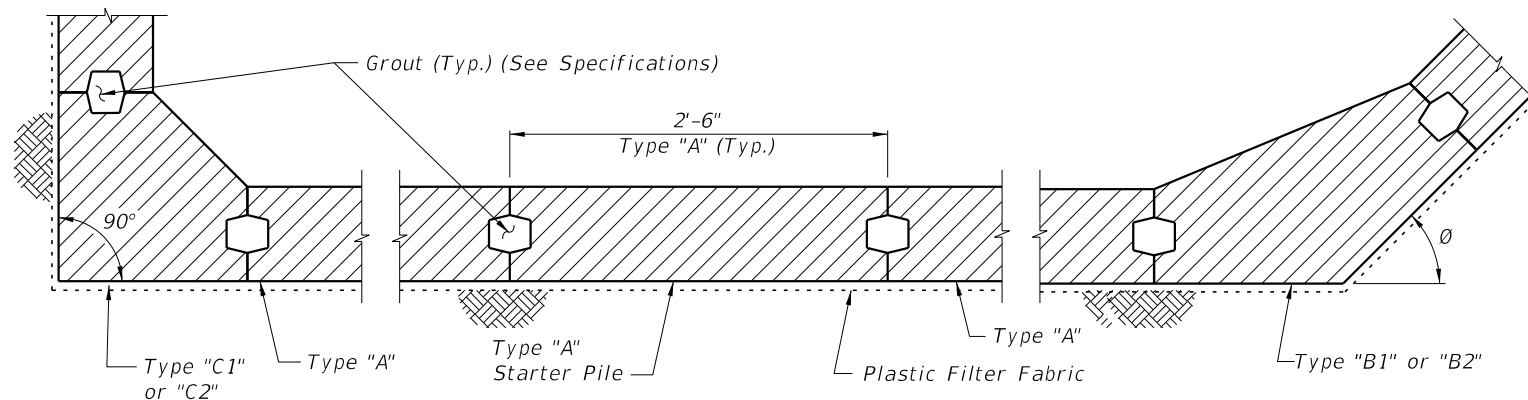
PILE FIT-UP:

The 2'-6" Sheet Pile dimension is nominal. This dimension may be shortened by the Manufacturer up to 1/2" to allow for Sheet Pile fit-up in its final position. Minimum Sheet Pile width is 2'-5 1/2". No changes shall be made to the tongues or grooves.



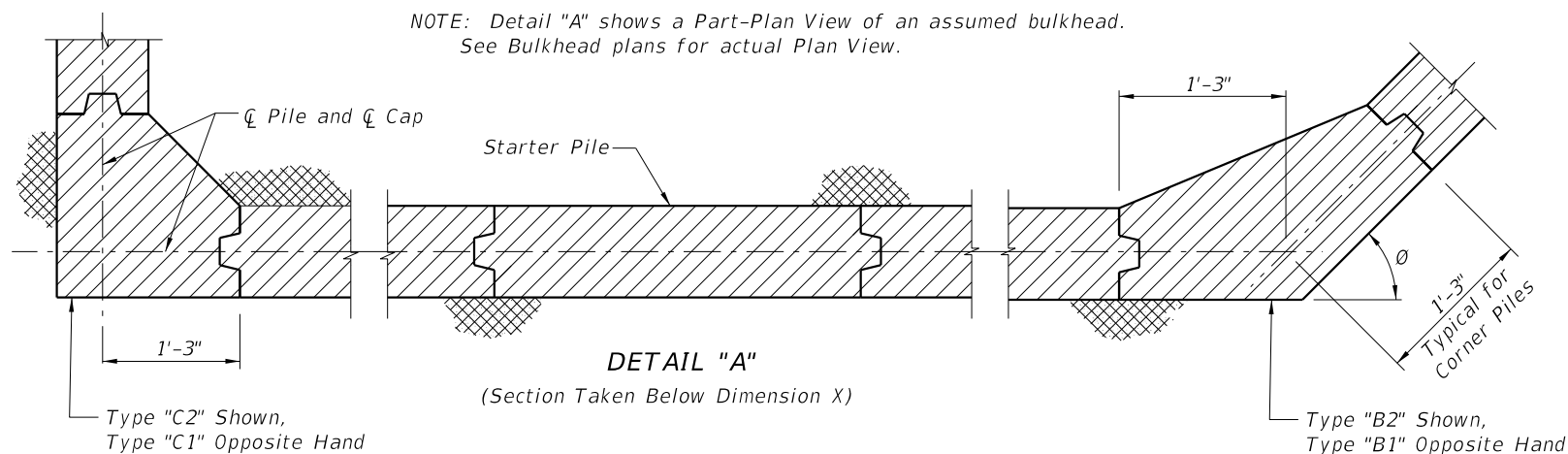
SECTION THRU BULKHEAD
 (Showing Plastic Filter Fabric)

CROSS REFERENCES:
 For Dimensions L and X see Sheet Pile Wall Data Table in Structures Plans.

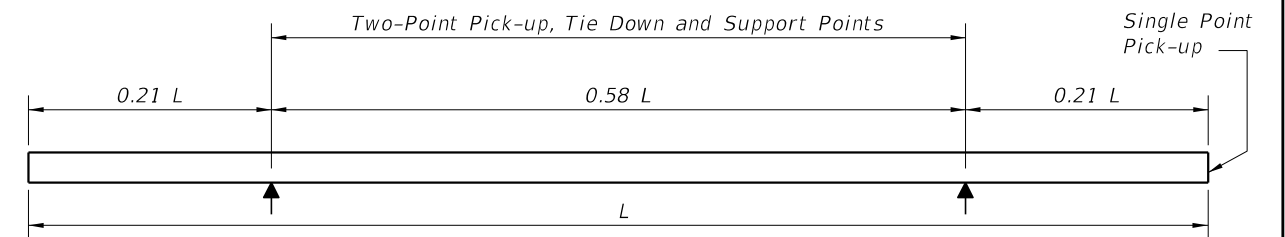


DETAIL "A"
 (Cap and Anchoring System Not Shown)
 (Section Taken Above Dimension X)

NOTE: Detail "A" shows a Part-Plan View of an assumed bulkhead. See Bulkhead plans for actual Plan View.




DETAIL "A"
 (Section Taken Below Dimension X)

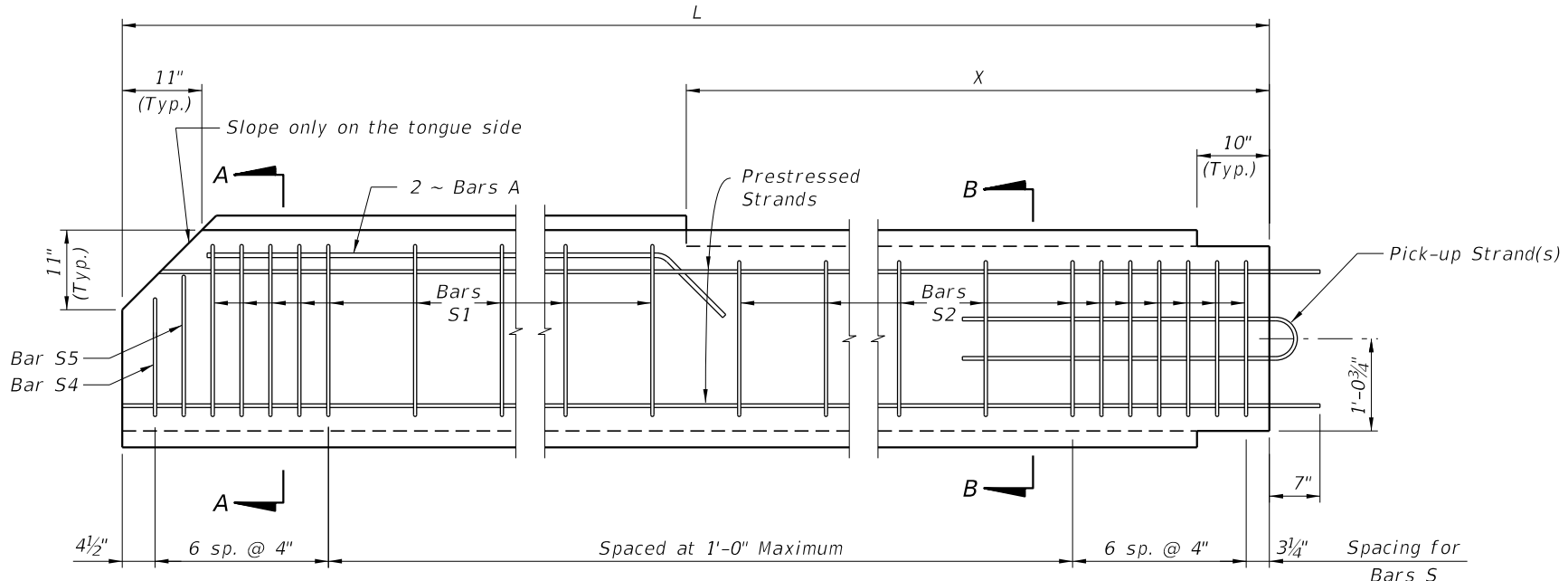


PILE STORAGE AND TRANSPORTATION SUPPORT DETAILS

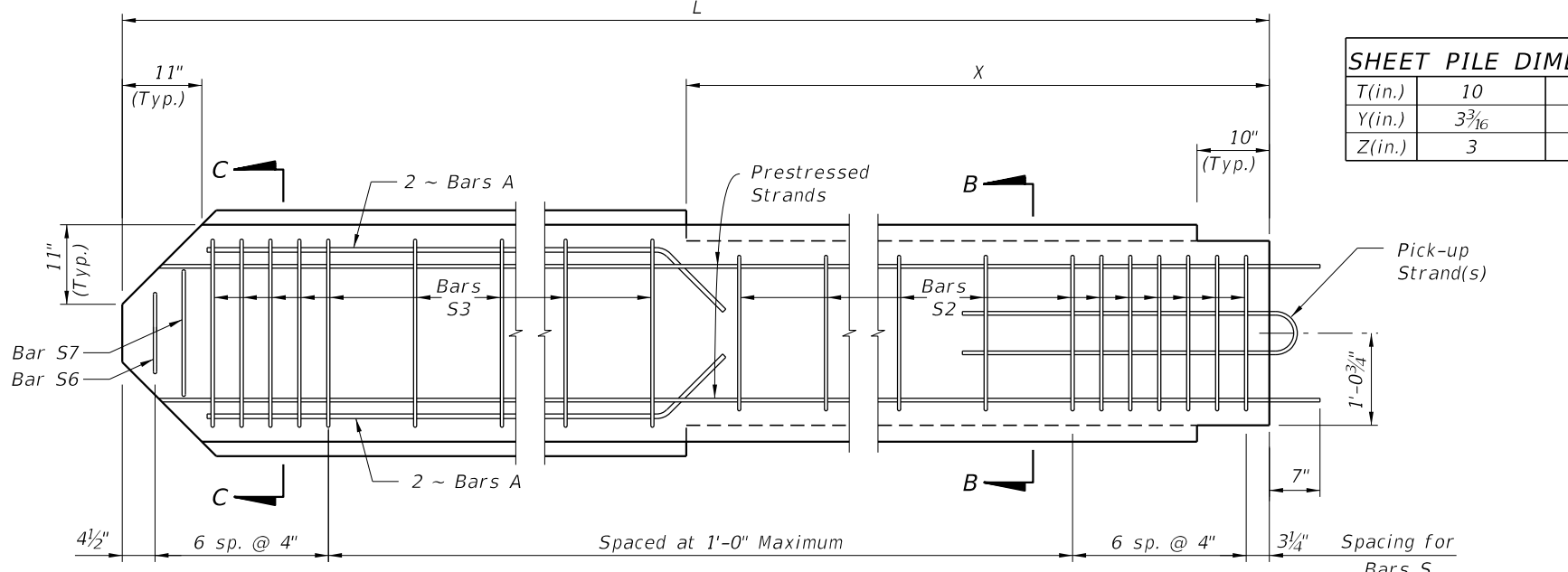
NOTES AND DETAILS

10/29/2019 8:17:29 AM

LAST REVISION 11/01/16	REVISION	DESCRIPTION:	 FY 2020-21 STANDARD PLANS	PRECAST CONCRETE SHEET PILE WALL (CFRP/GFRP & HSSS/GFRP)	INDEX 455-440	SHEET 1 of 4
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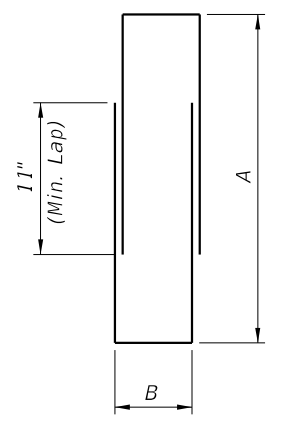
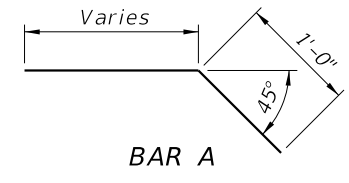
TYPICAL PILE



STARTER PILE

SHEET PILE DIMENSIONS		
T(in.)	10	12
Y(in.)	3 3/16	4 3/16
Z(in.)	3	4

BAR BENDING DIAGRAMS



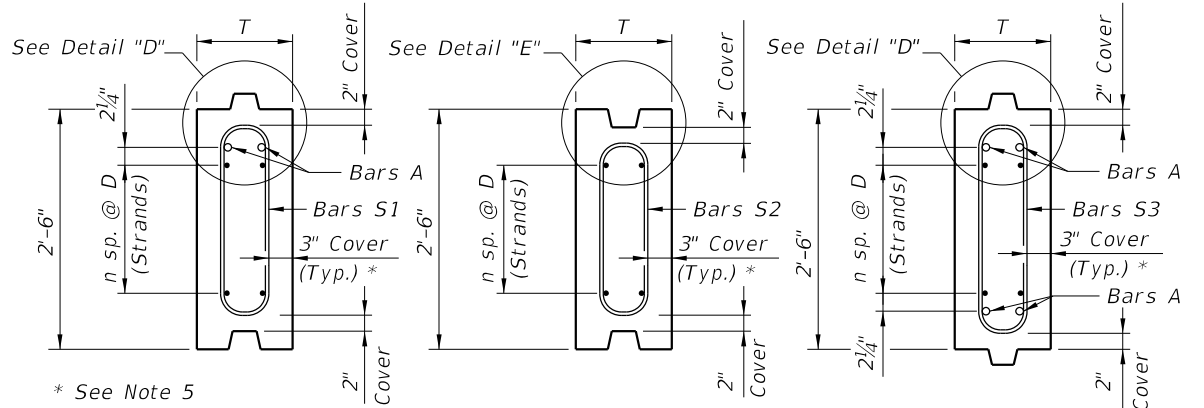
DIMENSION A	
S1	1'-11 3/4"
S2	1'-9 1/2"
S3	2'-2"
S4	1'-5 1/4"
S5	1'-9 1/4"
S6	1'-1"
S7	1'-9"

DIMENSION B	
T=10 in.	6"
T=12 in.	6"

BAR S (2-PIECE)
(See Note 4)

NOTES:

1. Intermediate Prestress Strands not shown in Elevations and Sections.
2. All bar dimensions are out-to-out.
3. Bars A are GFRP #5
4. Bars S are GFRP #4 and may be a single closed bar (hoop) with equivalent area and tensile strength.
5. For 10" thick Sheet Piles, Bars S may be tilted to achieve contact with strands or provide supplemental GFRP Bars to offset Bars S from strands and maintain 2" Nominal cover.
6. For Dimensions L and X see Sheet Pile Data Table in Structures Plans.



SECTION A-A

SECTION B-B

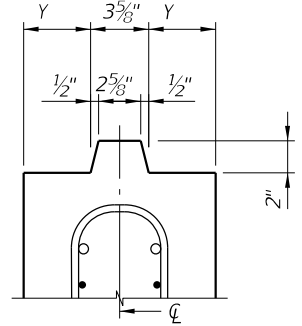
SECTION C-C

Strand Material	Wall Thickness	STRAND DIA. (in.)	MAXIMUM L *	n	D (in.)	TOTAL # OF STRANDS	Initial (Jacking) FORCE (Kip)
CFRP Strand	T=10 in.	0.49 (12.5mm)	26'-0"	4	4	10	28.7
		0.5 (12.7mm)	27'-0"	3	5 1/4 ⁽²⁾	8	41.3
		0.6 (15.2mm)	27'-0"	3	5 1/4 ⁽²⁾	8	42.7
	T=12 in.	0.49 (12.5mm)	31'-0"	5	3 1/4 ⁽¹⁾	12	28.7
		0.5 (12.7mm)	31'-0"	3	5 1/4 ⁽²⁾	8	41.3
		0.6 (15.2mm)	31'-0"	3	5 1/4 ⁽²⁾	8	42.7
HSSS Strand	T=10 in.	0.5 (12.7mm)	27'-0"	5	3 1/4 ⁽¹⁾	12	25.7
		0.6 (15.2mm)	26'-0"	3	5 1/4 ⁽²⁾	8	36.5
	T=12 in.	0.5 (12.7mm)	32'-0"	6	2 3/4 ⁽³⁾	14	25.7
		0.6 (15.2mm)	32'-0"	4	4	10	36.5

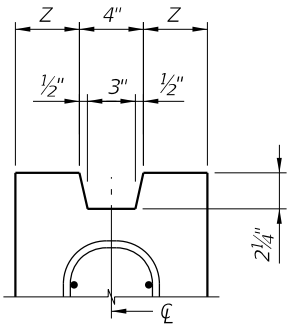
Alternate symmetrical strand patterns:

- (1) 4 sp. @ 2" & 1 sp. @ 8"
- (2) 2 sp. @ 4" & 1 sp. @ 8"
- (3) 4 sp. @ 2" & 2 sp. @ 4"

* Based on lifting using single point pick-up.



DETAIL "D"
(Typical Tongue)

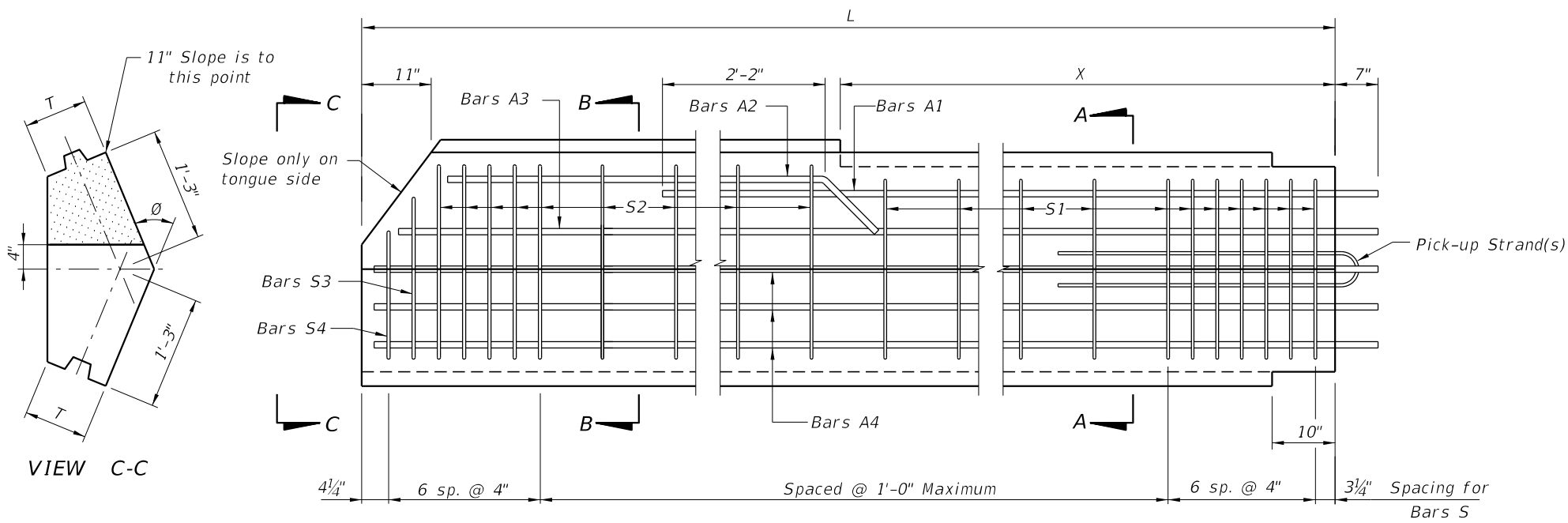


DETAIL "E"
(Typical Groove)

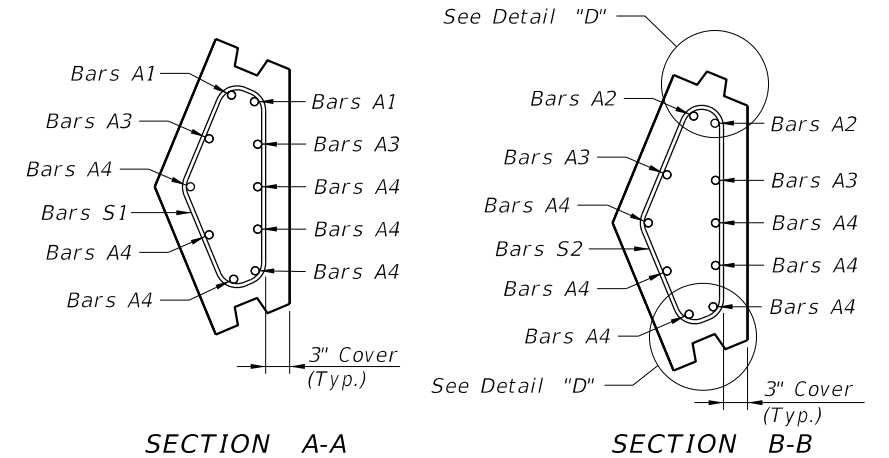
TYPE "A" STANDARD SECTION

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LAST REVISION	DESCRIPTION:
11/01/19	

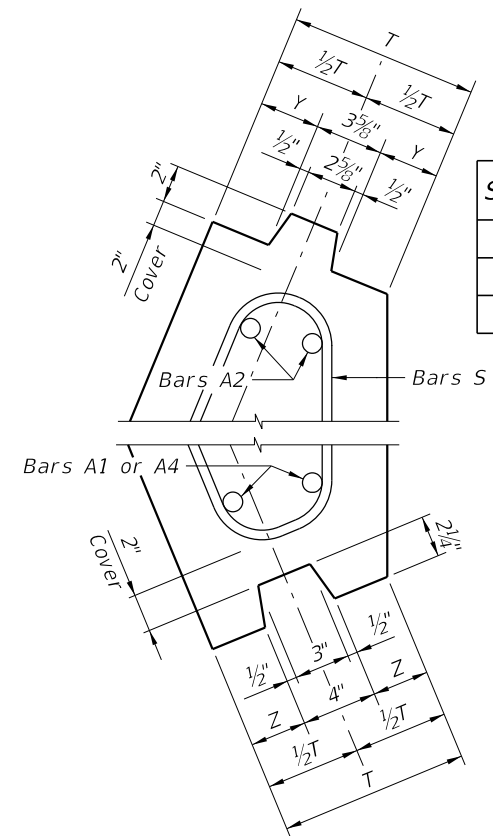


ELEVATION
(TYPE "B1" PILE SHOWN, TYPE "B2" PILE OPPOSITE HAND)



SECTION A-A

SECTION B-B



DETAIL "D"
(TYPE "B1" PILE SHOWN, TYPE "B2" PILE OPPOSITE HAND)

SHEET PILE DIMENSIONS		
T (in.)	10	12
Y (in.)	3 ³ / ₁₆	4 ³ / ₁₆
Z (in.)	3	4

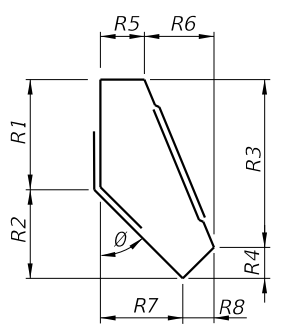
BAR BENDING DIAGRAMS

STIRRUP DIMENSIONS (T = 10")

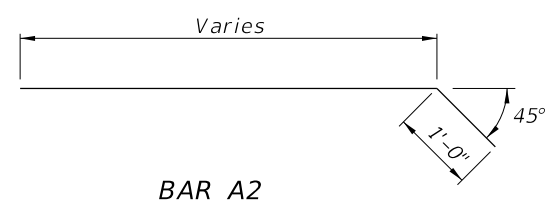
Ø	BAR MARK	R1	R2	R3	R4	R5	R6	R7	R8
30°	S1	11 1/4"	9 3/4"	1'-6 1/2"	2 1/2"	5"	4 3/4"	5 1/2"	4 1/4"
	S2	1'-1 1/2"	9 3/4"	1'-8 3/4"	2 1/2"	4 1/2"	5 1/2"	5 3/4"	4 1/4"
	S3	11 1/4"	8"	1'-6"	1 1/4"	5"	4 1/2"	4 1/2"	5"
	S4	11 1/4"	4 1/4"	1'-1 3/4"	1 3/4"	5"	3 3/4"	2 1/2"	6 1/4"
45°	S1	11 1/2"	8"	1'-4"	4"	5 1/2"	6 1/2"	8"	4"
	S2	1'-1 3/4"	8"	1'-5 3/4"	4"	4 1/2"	7 1/2"	8"	4"
	S3	11 1/2"	6 3/4"	1'-4"	2 1/4"	5 1/2"	6 3/4"	6 3/4"	5 1/2"
	S4	11 1/2"	3 1/2"	1'-0"	3"	5 1/2"	5"	3 1/2"	7"
60°	S1	1'-0"	6"	1'-0 3/4"	5 1/4"	6"	7 1/4"	10 1/4"	3"
	S2	1'-2"	6"	1'-2 3/4"	5 1/4"	4 3/4"	8 3/4"	10 1/2"	3"
	S3	1'-0"	4 3/4"	1'-1 1/2"	3 1/4"	6"	8"	8 3/4"	5 1/4"
	S4	1'-0"	2 1/2"	10"	4 1/2"	6"	5 3/4"	4"	7 1/2"

STIRRUP DIMENSIONS (T = 12")

Ø	BAR MARK	R1	R2	R3	R4	R5	R6	R7	R8
30°	S1	11 1/2"	10"	1'-6"	3 1/2"	7"	4 3/4"	5 3/4"	6"
	S2	1'-1 3/4"	10"	1'-8 1/4"	3 1/2"	6 1/2"	5 1/4"	5 3/4"	6"
	S3	11 1/2"	8 1/4"	1'-5 3/4"	2"	7"	4 3/4"	4 1/2"	7 1/4"
	S4	11 1/2"	4"	1'-1 1/4"	2 1/4"	7"	3 3/4"	2 1/2"	8 1/4"
45°	S1	1'-0"	8 1/2"	1'-3 1/4"	5 1/4"	7 1/2"	6 1/4"	8 1/2"	5 1/4"
	S2	1'-2 1/4"	8 1/2"	1'-5 1/2"	5 1/4"	6 1/2"	7 1/4"	8 1/2"	5 1/4"
	S3	1'-0"	7"	1'-4"	3"	7 1/2"	6 3/4"	7"	7 1/4"
	S4	1'-0"	3 1/2"	11 3/4"	3 3/4"	7 1/2"	5"	3 1/2"	9"
60°	S1	1'-0 1/2"	6 1/4"	11 3/4"	7"	8"	6 3/4"	10 3/4"	4"
	S2	1'-2 3/4"	6 1/4"	1'-2"	7"	6 3/4"	8"	10 3/4"	4"
	S3	1'-0 1/2"	5"	1'-1 1/2"	4"	8"	8"	9"	7"
	S4	1'-0 1/2"	2 1/2"	9 1/2"	5 1/2"	8"	5 1/2"	4 1/4"	9 1/4"



BARS S1 & S2
(2 - PIECE)



BAR A2

- NOTES:**
- This drawing includes details for precast concrete corner piles for 10" and 12" thick sheet pile systems. The details apply equally to both thicknesses.
 - The bar configurations shown in Sections A-A and B-B shall be used for Ø angles between 15° and 75°. For Ø angles not shown, the reinforcing bar dimensions may be interpolated or extrapolated from the stirrup dimensions shown.
 - All bar dimensions are out-to-out.
 - Bars A are GFRP #8 and Bars S are GFRP #4.
 - Values for Stirrup Dimensions are shown for Ø equal to 30°, 45° & 60° only.
 - Bars S are fabricated as a 2 piece stirrup with a minimum lap length of 8", as shown in Bar Bending Diagrams, or a single closed bar (hoop) when approved by the Engineer.
 - If Type "B1" or "B2" pile is used as a Starter Pile show tongue on both sides of pile from Dim. X down. Show dimensions for Bars S2, S3 & S4 in shop drawings.
 - If tongue must be on the opposite side from that shown all dimensions and Bars A, S2, S3 and S4 will be the same but opposite hand.
 - For Dimensions L, X and Angle Ø, see Sheet Pile Data Table in Structures Plans.

TYPE "B1" AND "B2" - VARIABLE ANGLE CORNER PILE

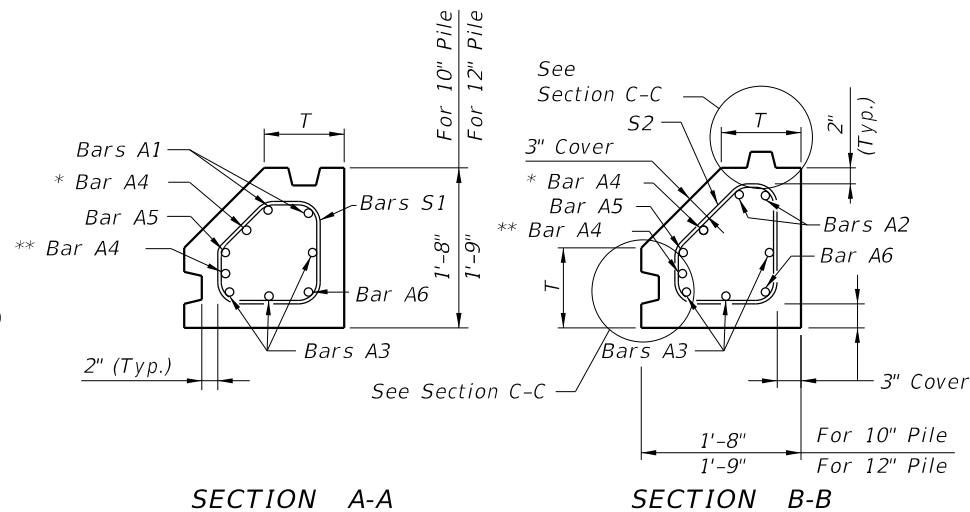
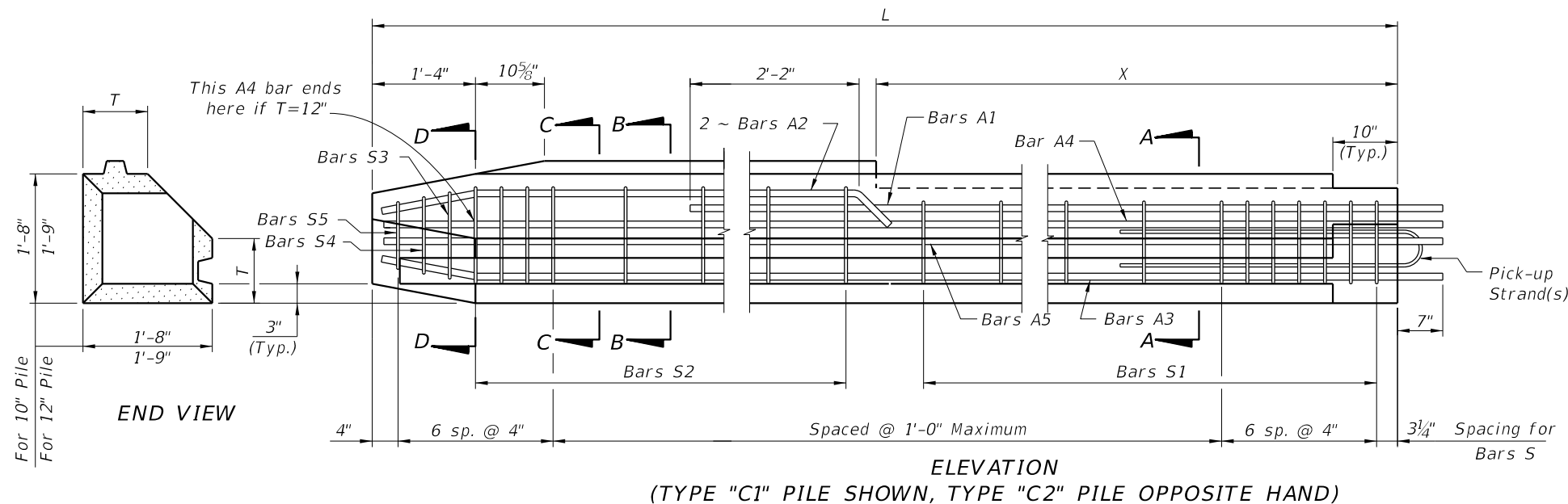
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LAST REVISION	DESCRIPTION:
11/01/16	

FY 2020-21
STANDARD PLANS

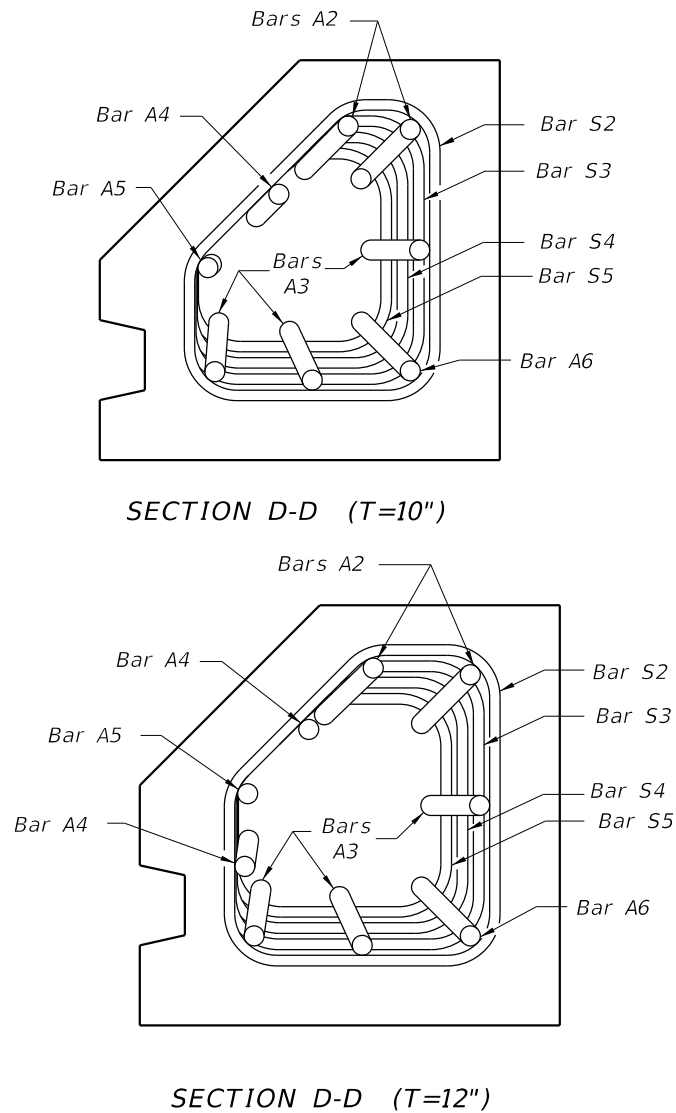
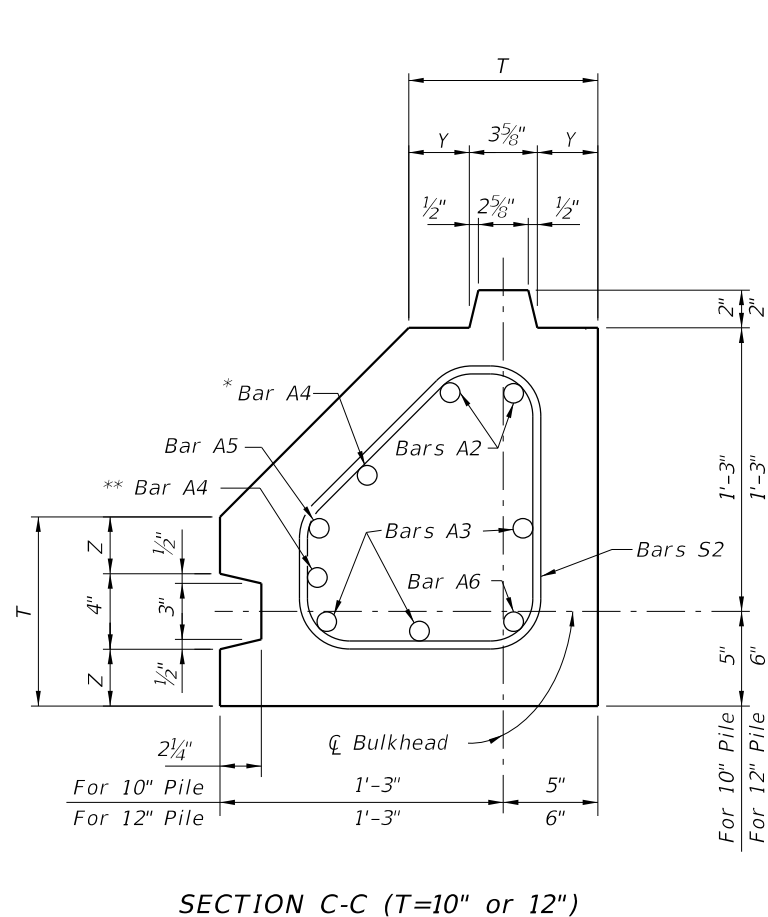
PRECAST CONCRETE SHEET PILE WALL
(CFRP/GFRP & HSSS/GFRP)

INDEX	SHEET
455-440	3 of 4



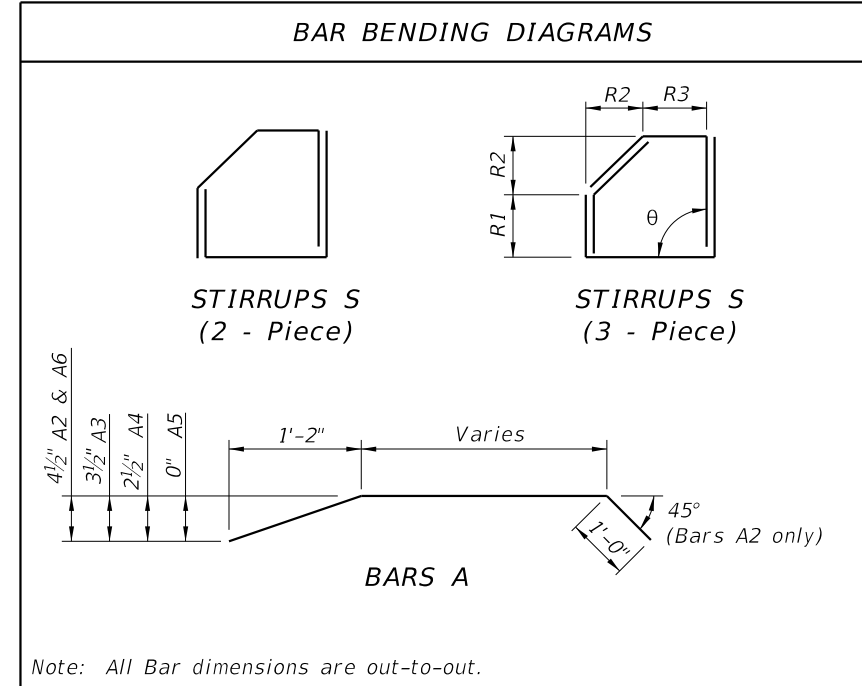
* This Bar A4 shall be 1'-2" shorter than other A4 bars for T = 12".

** This Bar A4 (not shown in elevation) is included only if T = 12".



STIRRUP DIMENSIONS					
θ	T (in.)	BAR MARK	R1	R2	R3
90°	10	S1	7"	5 ³ / ₄ "	7"
		S2	7"	8"	4 ³ / ₄ "
		S3	6 ¹ / ₄ "	7 ¹ / ₄ "	4 ³ / ₄ "
		S4	5 ¹ / ₂ "	6 ¹ / ₂ "	4 ³ / ₄ "
		S5	4 ³ / ₄ "	5 ³ / ₄ "	4 ³ / ₄ "
90°	12	S1	9"	4 ³ / ₄ "	9"
		S2	9"	7"	6 ³ / ₄ "
		S3	8 ¹ / ₄ "	6 ¹ / ₄ "	6 ³ / ₄ "
		S4	7 ¹ / ₂ "	5 ¹ / ₂ "	6 ³ / ₄ "
		S5	6 ³ / ₄ "	4 ³ / ₄ "	6 ³ / ₄ "

SHEET PILE DIMENSIONS		
T (in.)	10	12
Y (in.)	3 ³ / ₁₆	4 ³ / ₁₆
Z (in.)	3	4



- NOTES:
- All bar dimensions are out-to-out.
 - Bars A are GFRP #8 and Bars S are GFRP #4.
 - This drawing includes information for precast Corner Piles for 10" and 12" thick Sheet Pile systems. The details apply to both thicknesses but the bar configurations change slightly according to the thickness values used.
 - If Type "C1" or "C2" pile is used as a Starter Pile show tongue on both sides of pile from Dim. X down. Show dimensions for Bars S2, S3, S4 & S5 in shop drawings.
 - At the Contractor's option Bars S may be fabricated as a 2 piece or 3 piece bar with a minimum lap length of 8", as shown in Bar Bending Diagrams, or as a single closed bar (hoop) when approved by the Engineer.
 - If tongue must be on opposite side (Groove Side) from that shown, all dimensions and reinforcement shall follow the corresponding Tongue or Groove side.
 - For Dimensions L and X see Sheet Pile Data Table in Structures Plans.

TYPE "C1" AND "C2" - RIGHT ANGLE CORNER PILE

10/29/2019 8:17:32 AM

LAST REVISION	DESCRIPTION:
11/01/16	