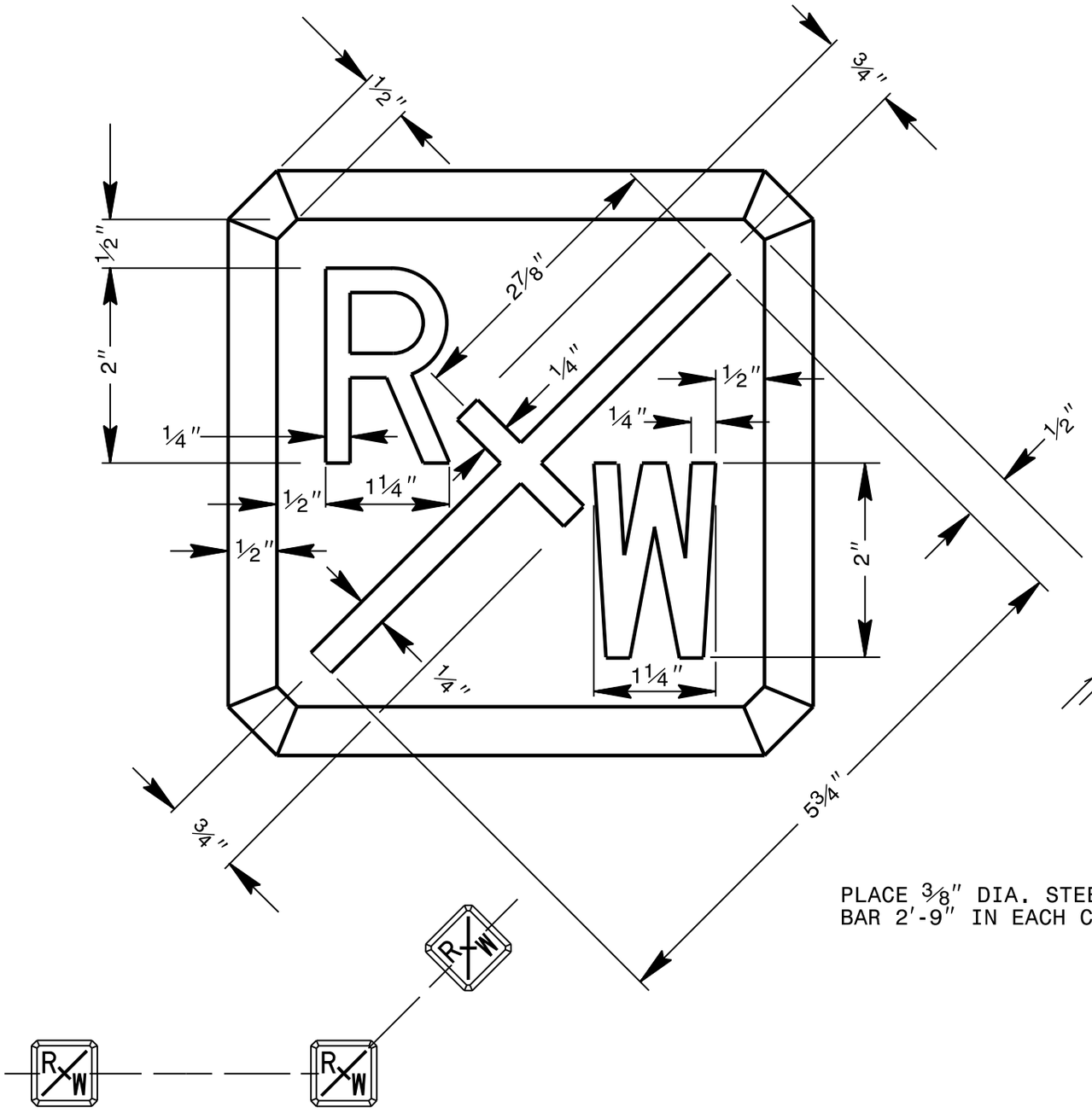
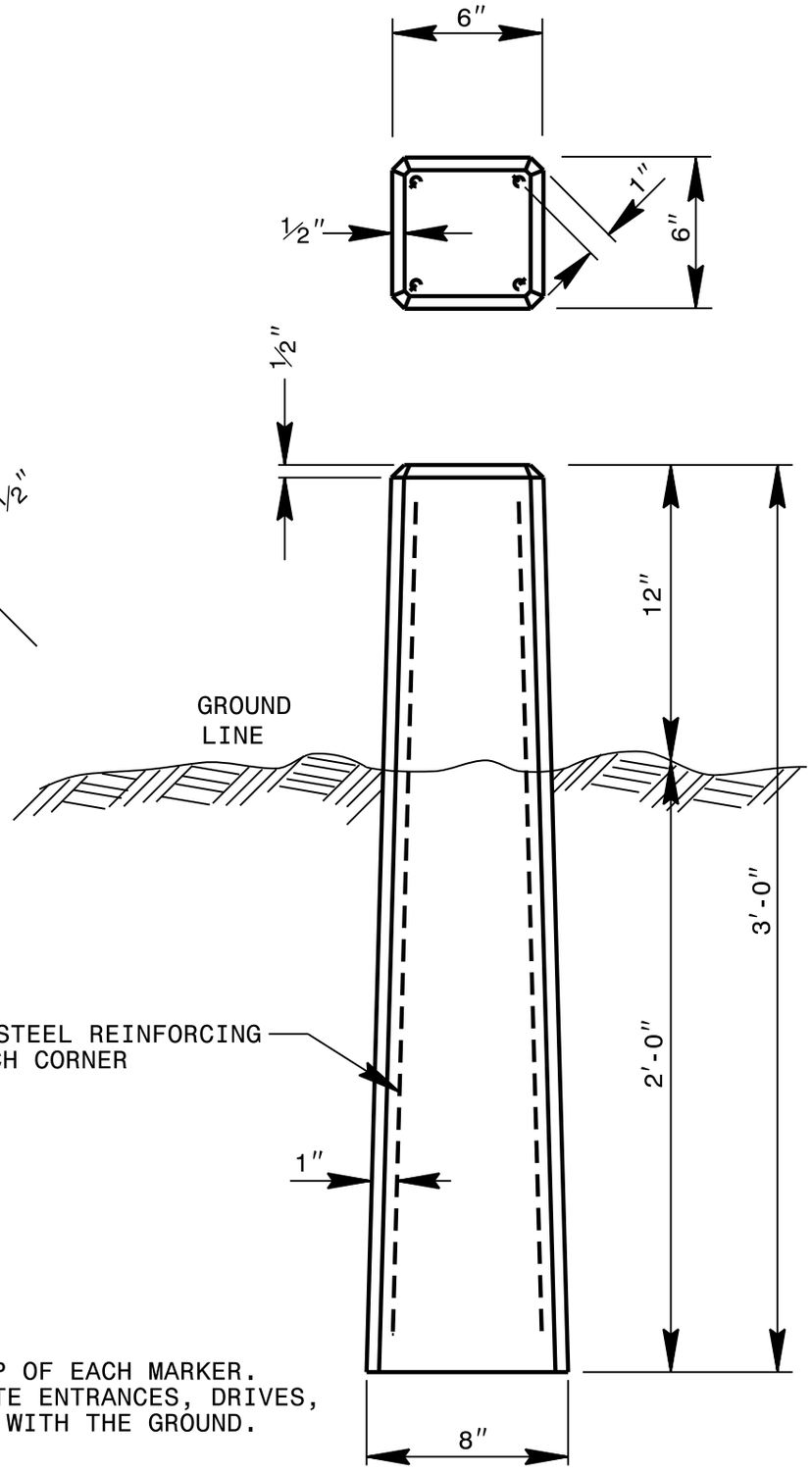


SET RIGHT-OF-WAY MARKER SO THAT THE RIGHT-OF-WAY LINE PASSES THROUGH THE INTERSECTION OF THE 'X' ON THE TOP OF THE MARKER.

NOTES:
INDENT THE LETTERS 'R/W' IN THE TOP OF EACH MARKER.
IN LOCATIONS SUCH AS LAWNS, PRIVATE ENTRANCES, DRIVES, ETC. CONSTRUCT 'R/W' MARKER FLUSH WITH THE GROUND.



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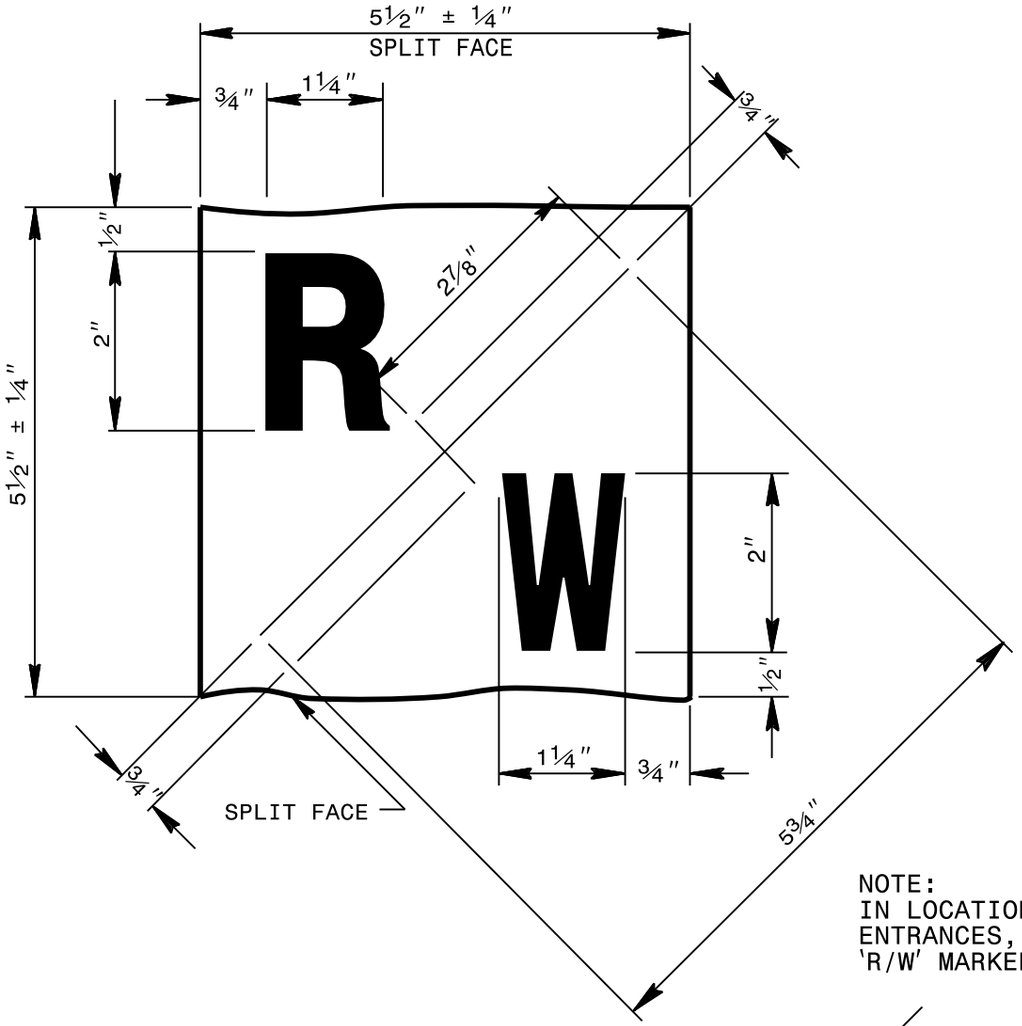
ROADWAY STANDARD DRAWING FOR

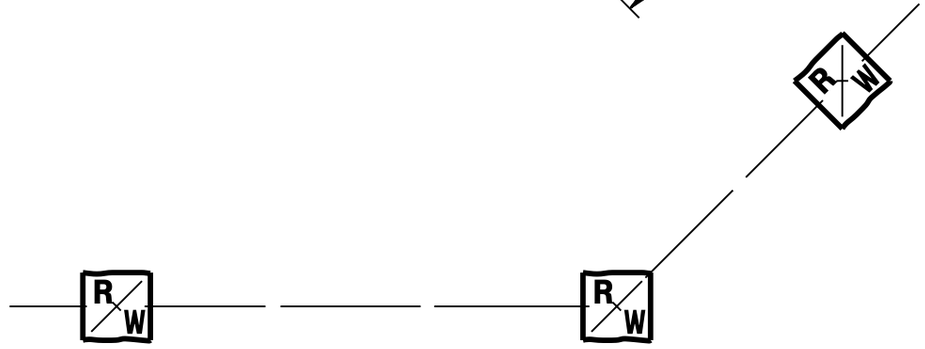
CONCRETE RIGHT-OF-WAY MARKER

SHEET 1 OF 1

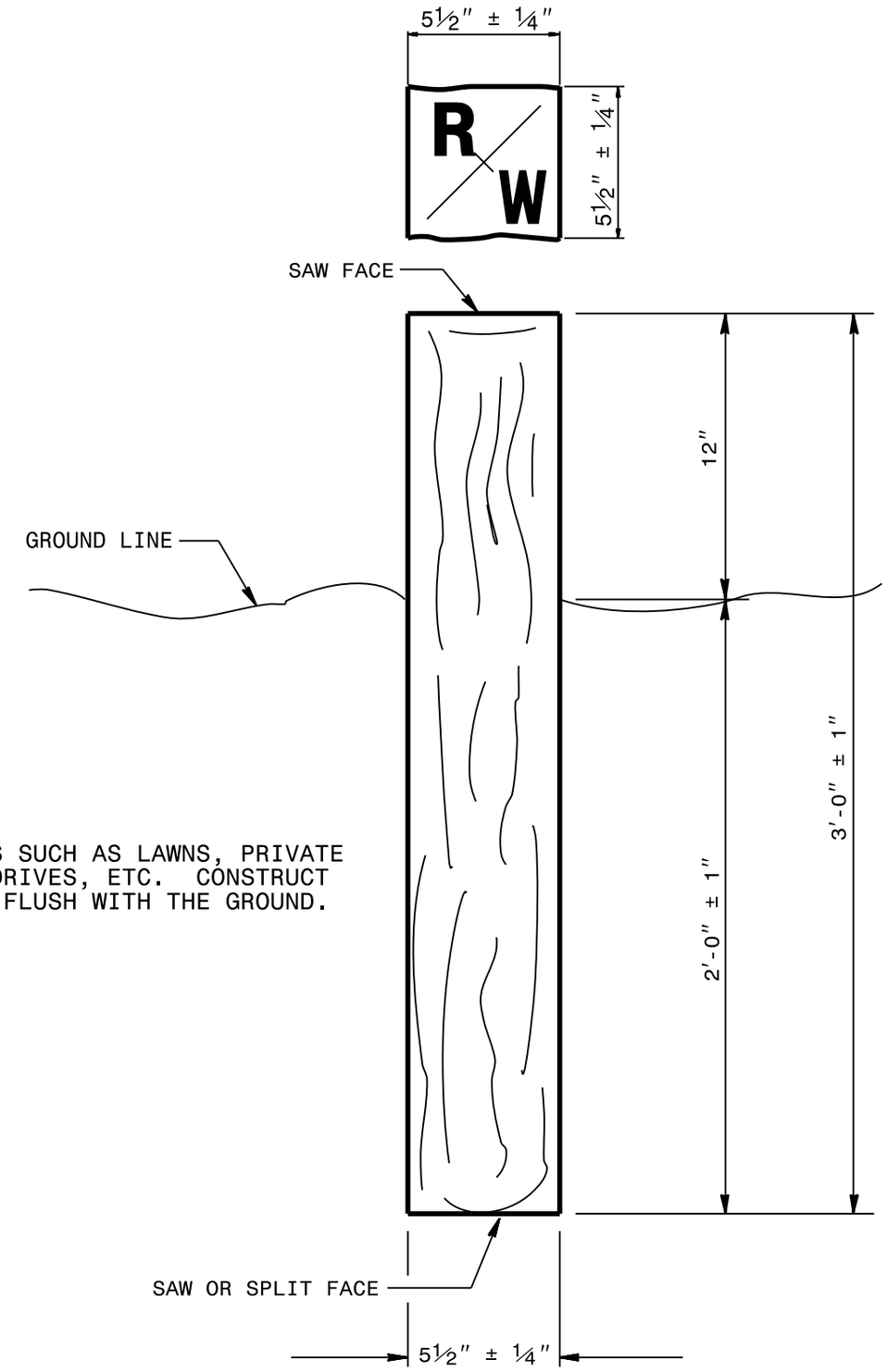
806.01



NOTE:
IN LOCATIONS SUCH AS LAWNS, PRIVATE ENTRANCES, DRIVES, ETC. CONSTRUCT 'R/W' MARKER FLUSH WITH THE GROUND.



SET RIGHT-OF-WAY MARKER SO THAT THE RIGHT-OF-WAY LINE PASSES THROUGH THE INTERSECTION OF THE 'X' ON THE TOP OF THE MARKER.



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DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

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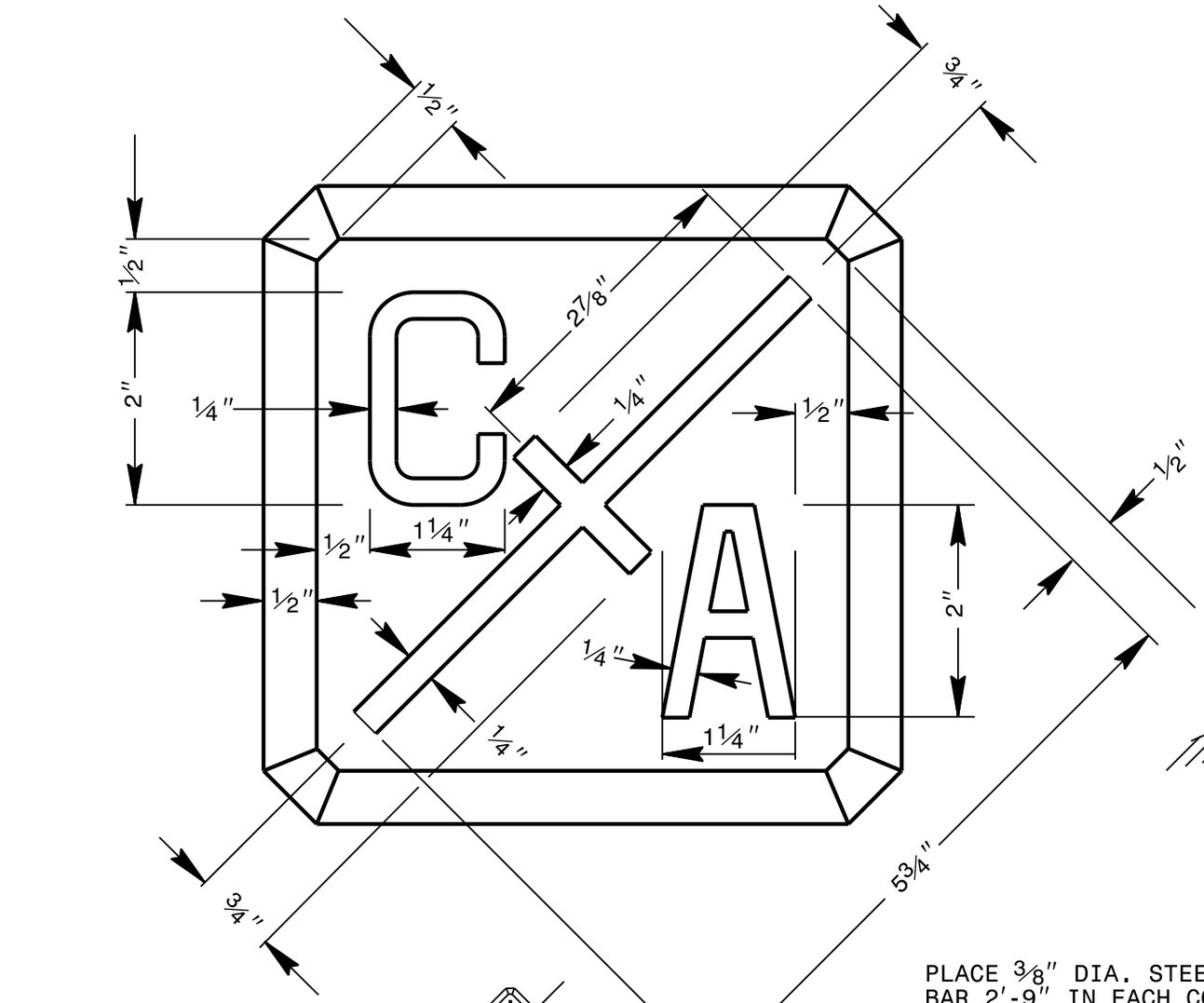
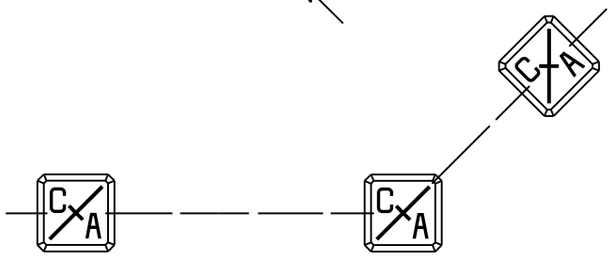
ROADWAY STANDARD DRAWING FOR

GRANITE RIGHT-OF-WAY MARKER

SHEET 1 OF 1

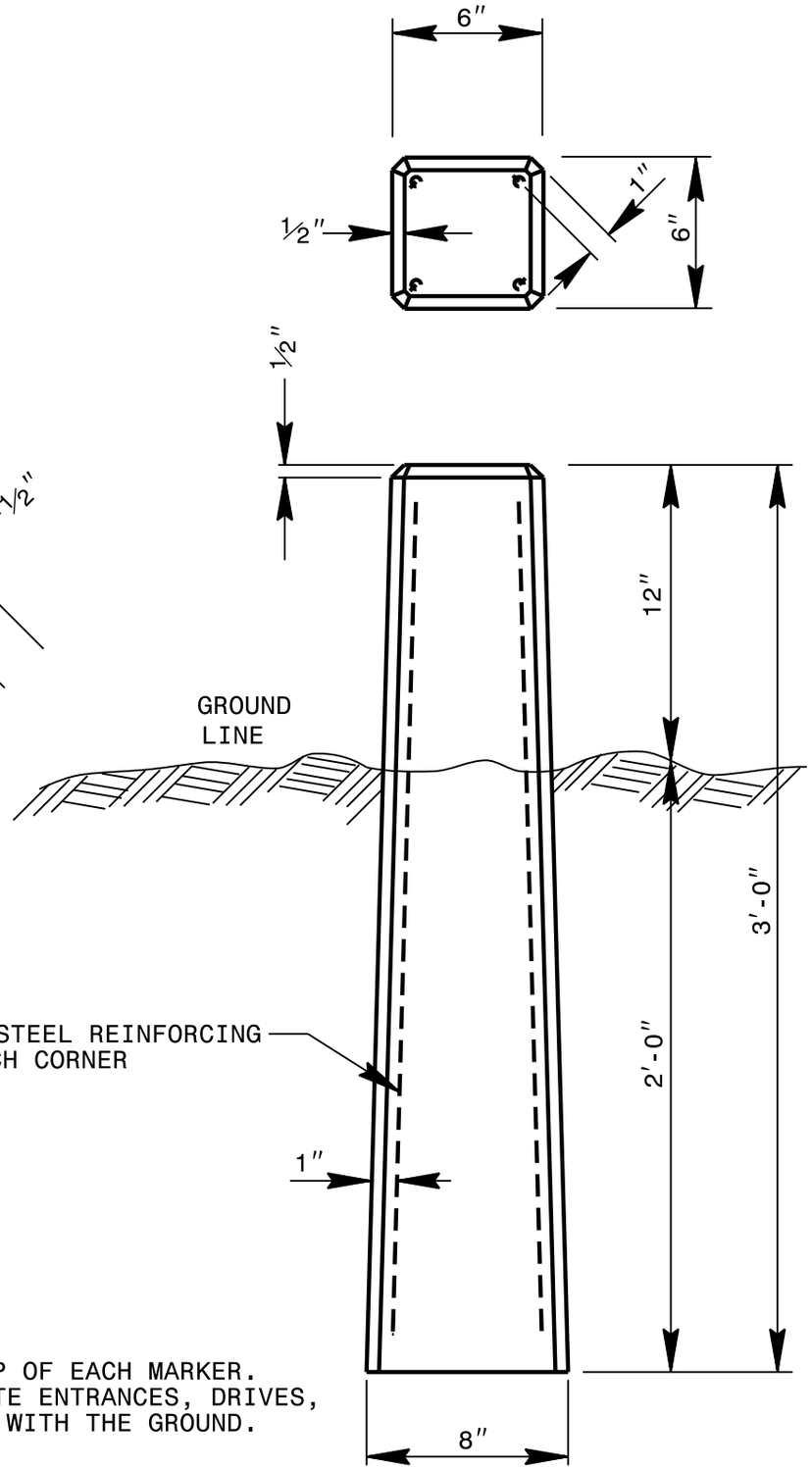
806.02





SET CONTROL-OF-ACCESS MARKER SO THAT THE CONTROL-OF-ACCESS LINE PASSES THROUGH THE INTERSECTION OF THE 'X' ON THE TOP OF THE MARKER.

NOTES:
INDENT THE LETTERS 'C/A' IN THE TOP OF EACH MARKER.
IN LOCATIONS SUCH AS LAWNS, PRIVATE ENTRANCES, DRIVES, ETC. CONSTRUCT 'C/A' MARKER FLUSH WITH THE GROUND.



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ROADWAY STANDARD DRAWING FOR

CONCRETE CONTROL-OF-ACCESS MARKER

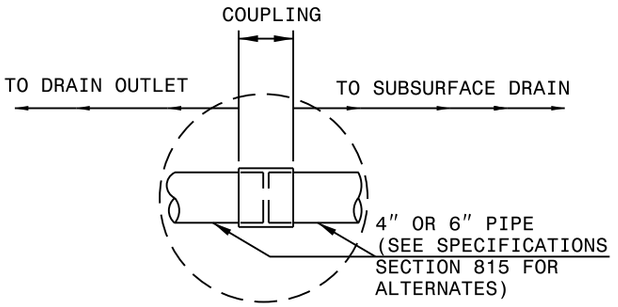
SHEET 1 OF 1

806.03

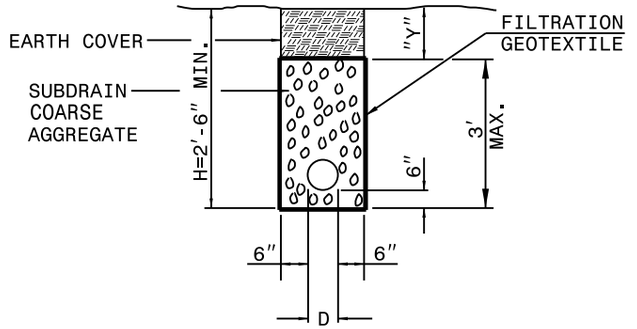
NOTES:
REFER TO SECTION 815 OF THE STANDARD SPECIFICATIONS FOR INSTALLATION DEPTHS OF DRAINAGE PIPES.

CONNECT PIPE OUTLET INTO DRAINAGE STRUCTURE WHEREVER POSSIBLE. IF NOT CONNECTED TO DRAINAGE STRUCTURE, PROTECT END OF PIPE BY CONCRETE PAD FOR OUTLET END OF DRAIN. PADS ARE NEEDED AT LOCATIONS WHERE PIPE IS NOT PLACED IN DRAINAGE STRUCTURE TO FACILITATE MAINTENANCE AND AID IN IDENTIFICATION. OUTLETS ARE REQUIRED EVERY 500′ OR AS DIRECTED BY THE ENGINEER

PROVIDE POSITIVE DRAINAGE TOWARD OUTLETS ON ALL SUBSURFACE DRAINAGE PIPES

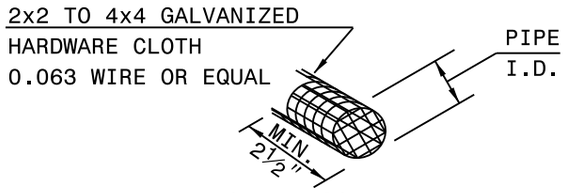


AUXILIARY VIEW

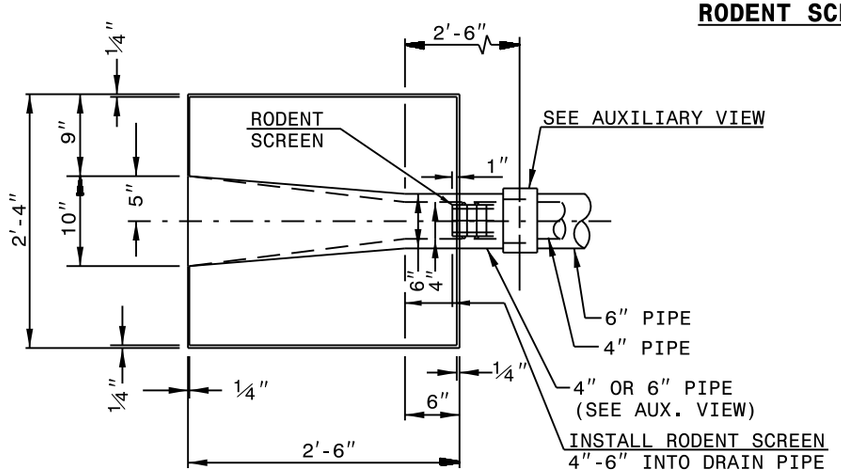


SUBSURFACE DRAIN

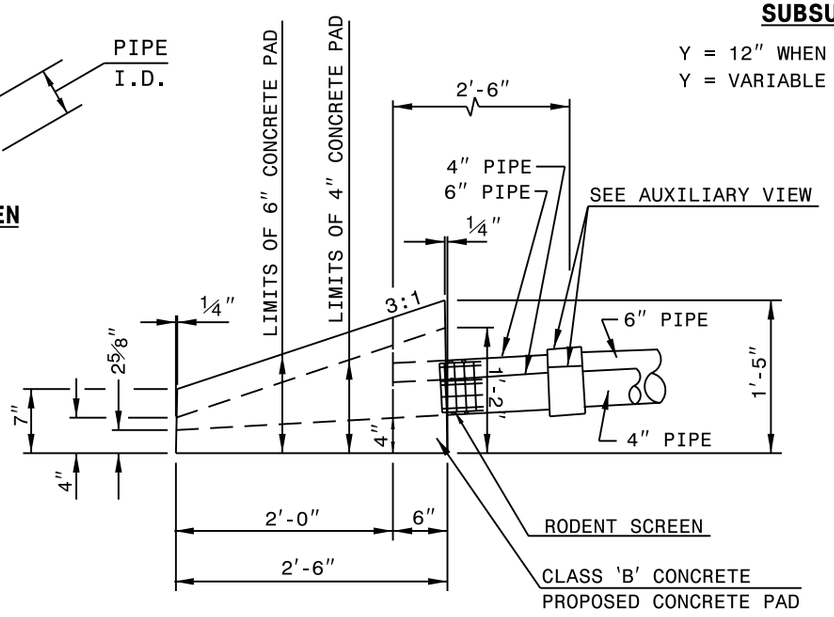
Y = 12″ WHEN "H" IS 4′-0″ OR LESS
Y = VARIABLE WHEN "H" IS OVER 4′-0″



RODENT SCREEN



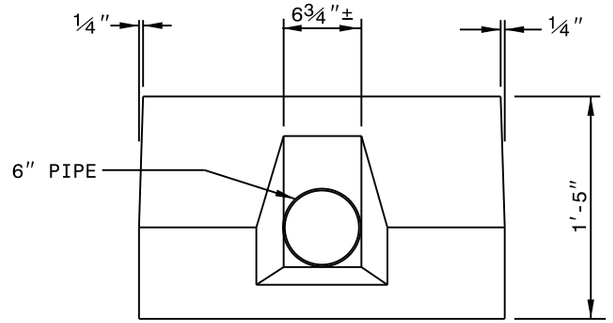
PLAN VIEW



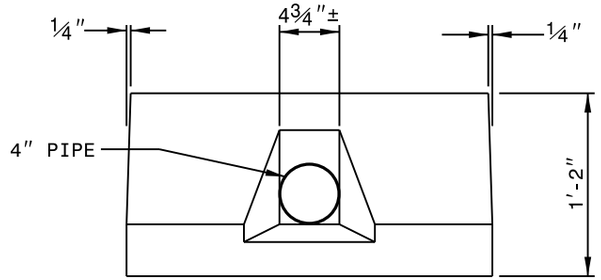
ELEVATION VIEW

SUBDRAIN QUANTITIES
EXCAV. OR COURSE AGGREGATE CU. YDS. PER FT. DEPTH/LIN. FT.
0.056

THE CONCRETE PAD CONSISTS OF 4″ DRAIN 0.137 CUBIC YARDS, 6″ DRAIN 0.177 CUBIC YARDS CLASS "B" CONCRETE.



END ELEVATION VIEW



END ELEVATION VIEW

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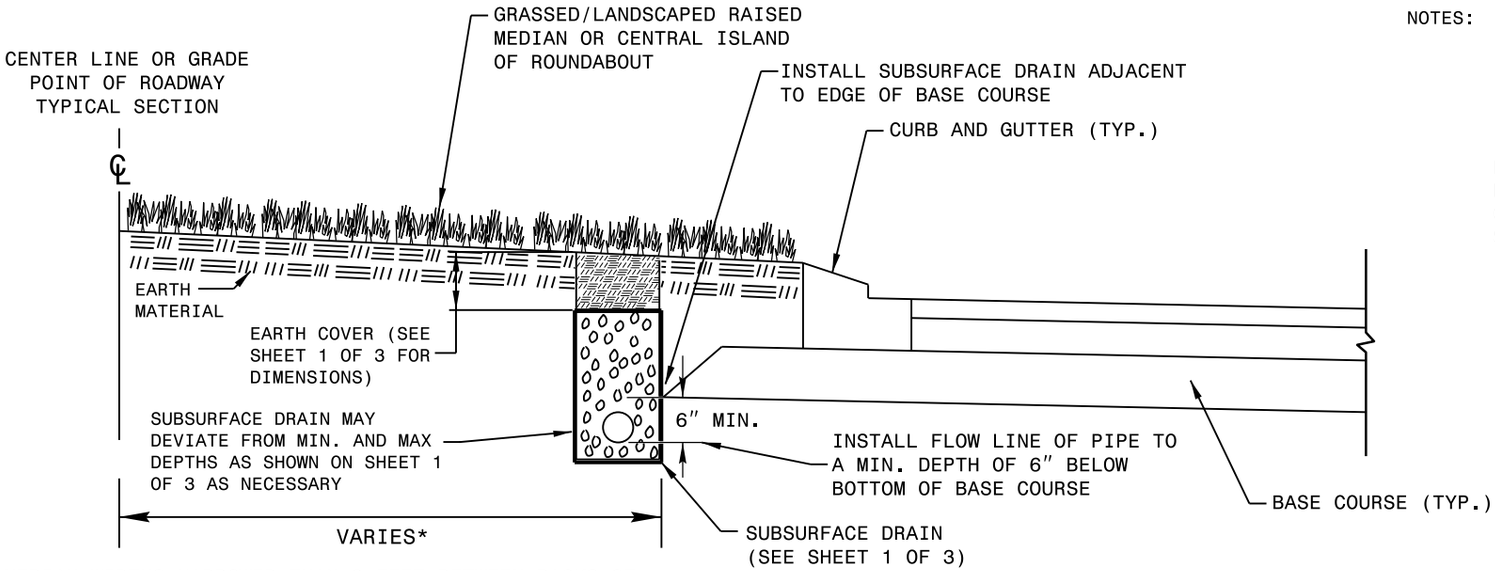
ROADWAY STANDARD DRAWING FOR

SUBSURFACE DRAIN

SHEET 1 OF 3

815.02



*FOR MEDIAN WIDTHS NARROWER THAN 8 FEET BETWEEN BACKS OF CURB, ONE ROW OF SUBSURFACE DRAIN IS TO BE PLACED IN THE CENTER OF THE MEDIAN, RATHER THAN TWO ROWS AT THE EDGES OF THE BASE COURSE; OR AS DIRECTED BY ENGINEER (SEE PLANS FOR EXACT LOCATIONS)

CROSS SECTION VIEW

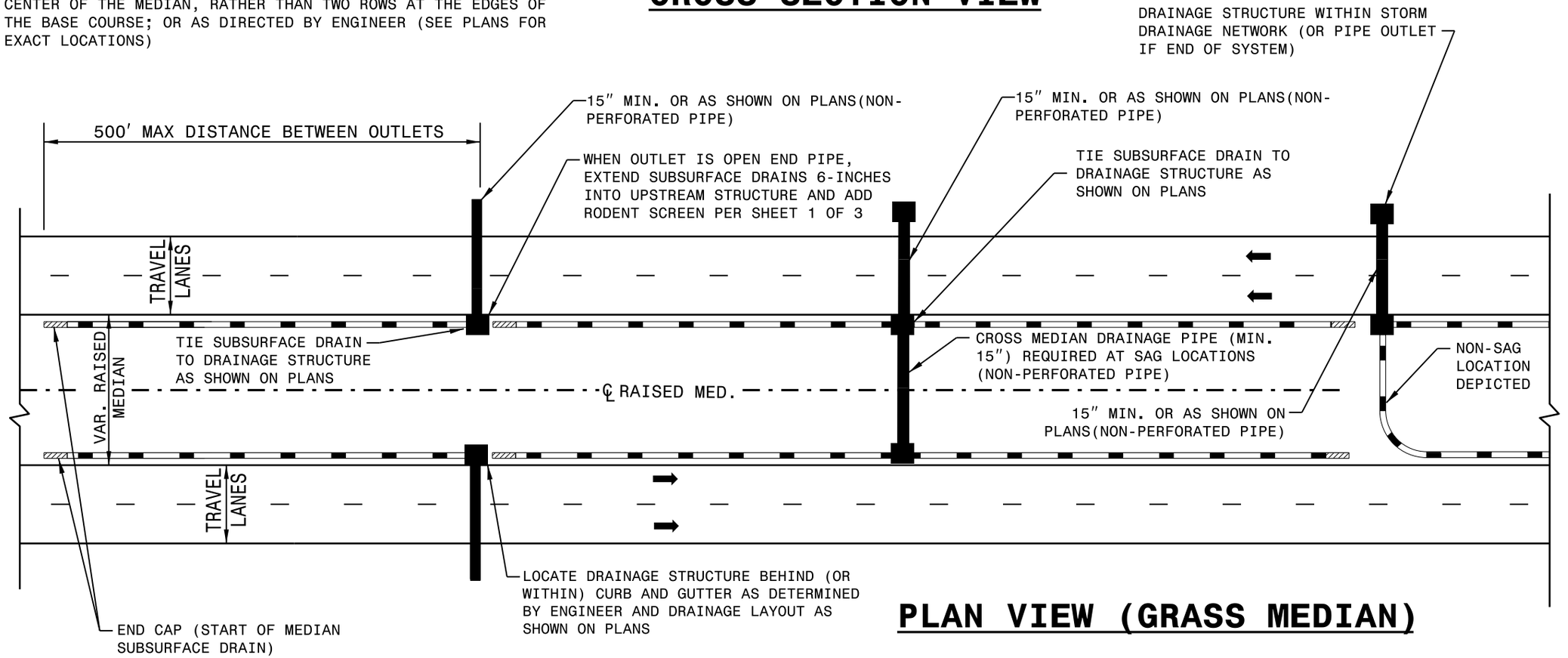
NOTES: MEDIAN APPLICATION OF SUBSURFACE DRAIN APPLIES ONLY TO RAISED MEDIANS (DOES NOT APPLY TO GRASSED MEDIAN DITCH SECTIONS)

DOES NOT APPLY TO CONCRETE CAPPED MEDIANS OR ISLANDS

INSTALL SUBSURFACE DRAINS ADJACENT TO EDGE OF BASE COURSE, BEHIND MEDIAN CURB, ON BOTH SIDES OF RAISED GRASS MEDIAN. THIS APPLIES TO BOTH NORMAL CROWN AND SUPERELEVATED ROADWAY SECTIONS OR AS SHOWN ON PLANS

SUBSURFACE DRAIN PIPE MUST DISCHARGE TO DRAINAGE STRUCTURE, WHICH DISCHARGES TO MIN. 15" PIPE PRIOR TO CROSSING TRAVEL LANES

PROVIDE POSITIVE DRAINAGE TOWARD OUTLETS ON ALL SUBSURFACE DRAINAGE PIPES



PLAN VIEW (GRASS MEDIAN)

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ROADWAY STANDARD DRAWING FOR

SUBSURFACE DRAIN

INSTALLATION IN GRASS MEDIANS AND ROUNDABOUTS

815.02

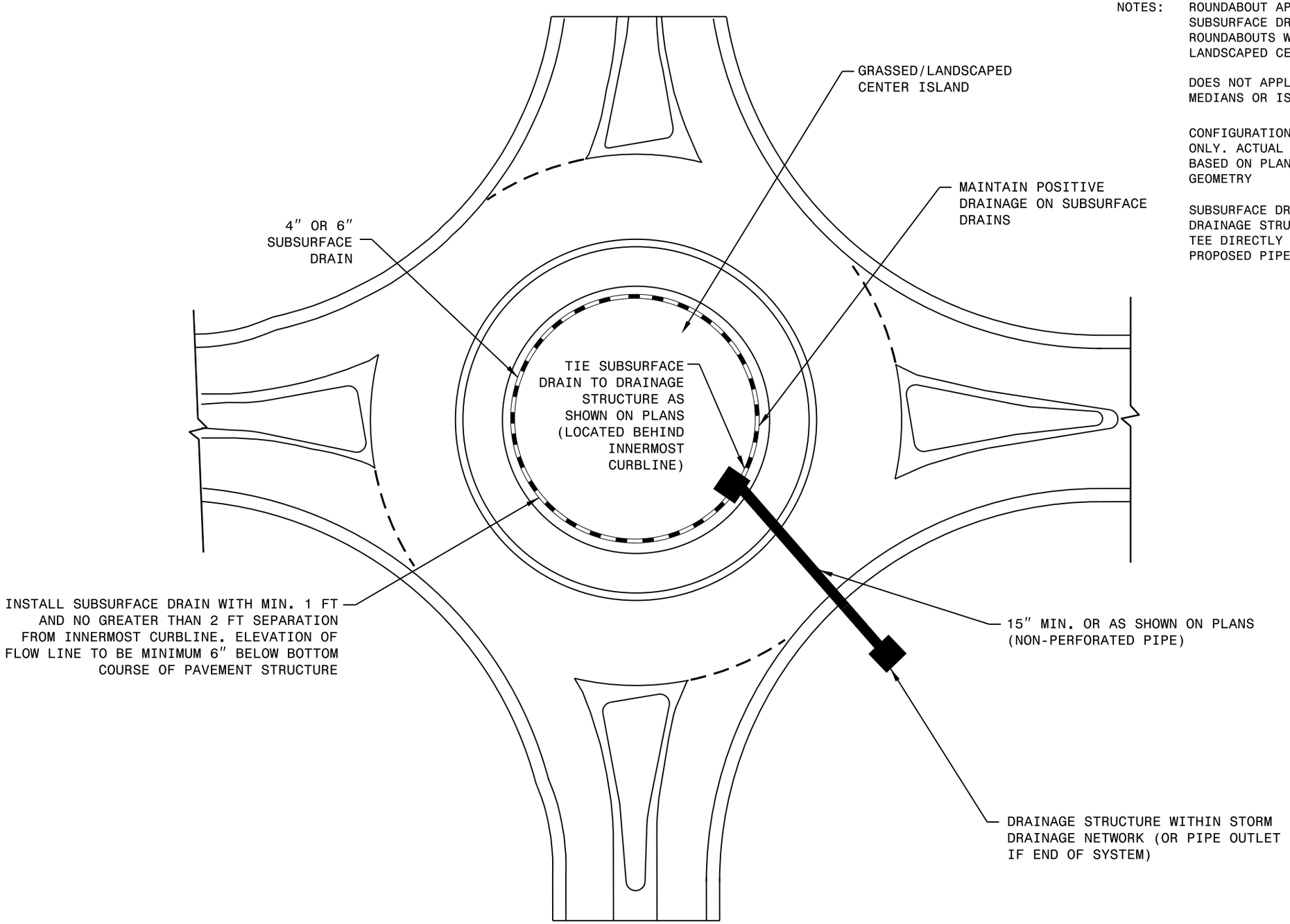
NOTES:

ROUNDABOUT APPLICATION OF SUBSURFACE DRAIN APPLIES TO ROUNDABOUTS WITH GRASS OR LANDSCAPED CENTER ISLANDS

DOES NOT APPLY TO CONCRETE CAPPED MEDIANS OR ISLANDS

CONFIGURATION SHOWN IS FOR EXAMPLE ONLY. ACTUAL DESIGN WILL VARY BASED ON PLANS AND ROUNDABOUT GEOMETRY

SUBSURFACE DRAIN MUST CONNECT TO DRAINAGE STRUCTURE AND MAY NOT TEE DIRECTLY INTO AN EXISTING OR PROPOSED PIPE



PLAN VIEW (ROUNDABOUT)

STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

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ROADWAY STANDARD DRAWING FOR

SUBSURFACE DRAIN

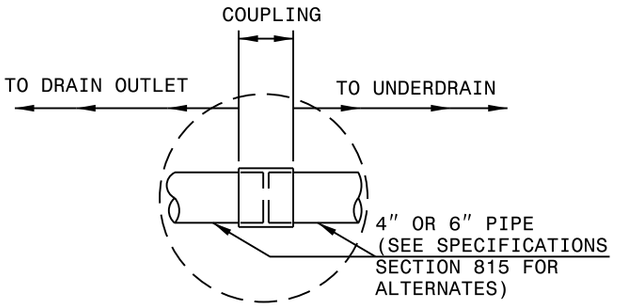
INSTALLATION IN GRASS MEDIANS AND ROUNDABOUTS

815.02

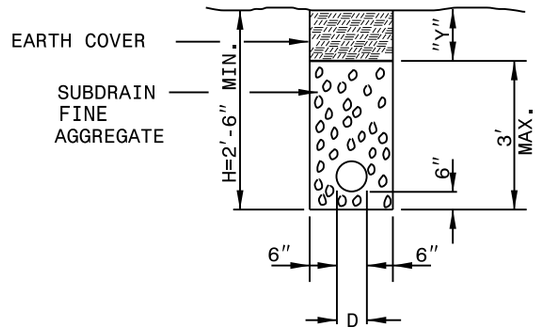
NOTES:

REFER TO SECTION 815 OF THE STANDARD SPECIFICATIONS FOR INSTALLATION DEPTHS OF DRAINAGE PIPES.

CONNECT PIPE OUTLET INTO DRAINAGE STRUCTURE WHEREVER POSSIBLE. IF NOT CONNECTED TO DRAINAGE STRUCTURE, PROTECT END OF PIPE BY CONCRETE PAD FOR OUTLET END OF DRAIN. PADS ARE NEEDED AT LOCATIONS WHERE PIPE IS NOT PLACED IN DRAINAGE STRUCTURE TO FACILITATE MAINTENANCE AND AID IN IDENTIFICATION. OUTLETS ARE REQUIRED EVERY 500' OR AS DIRECTED BY THE ENGINEER.

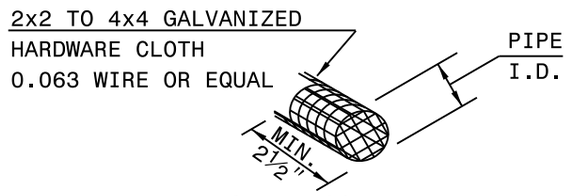


AUXILIARY VIEW

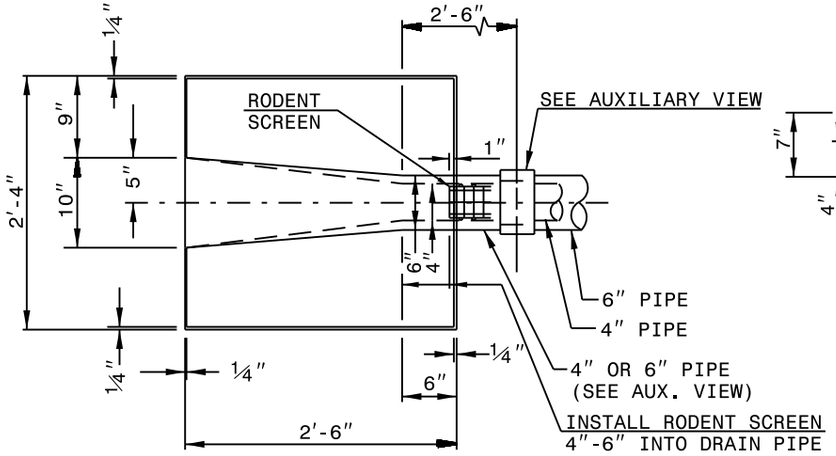


PIPE UNDERDRAIN

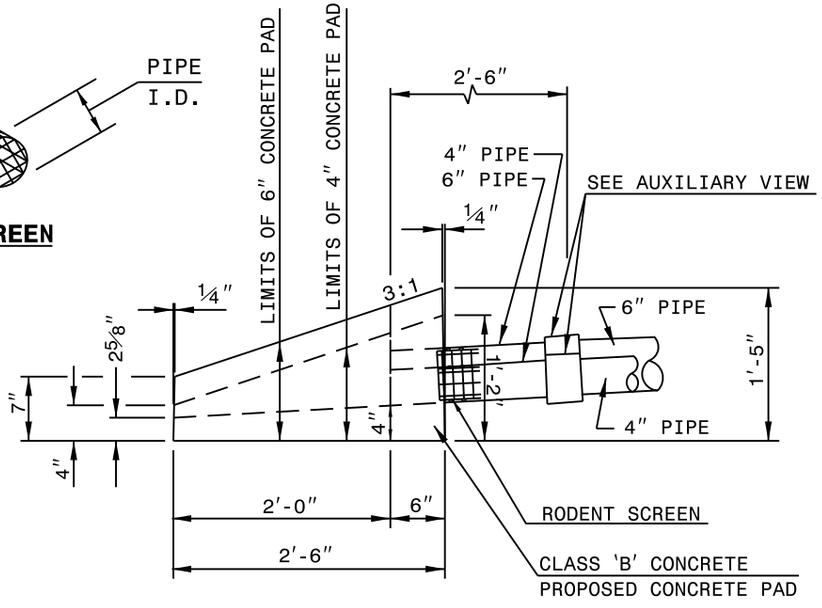
Y = 12" WHEN "H" IS 4'-0" OR LESS
Y = VARIABLE WHEN "H" IS OVER 4'-0"



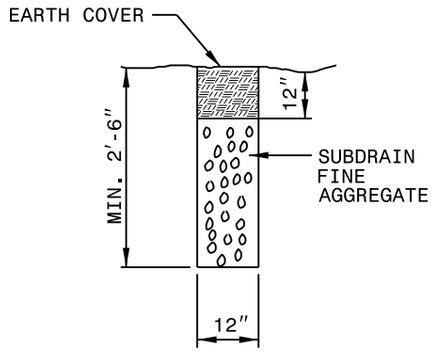
RODENT SCREEN



PLAN VIEW



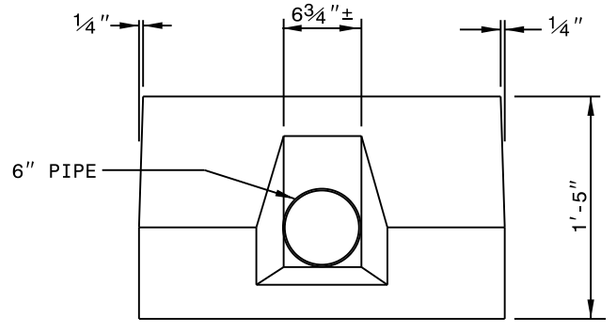
ELEVATION VIEW



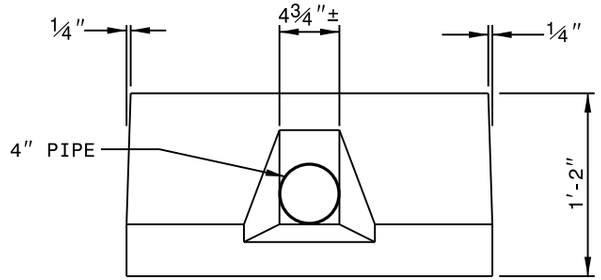
BLIND DRAIN

SUBDRAIN QUANTITIES	
TYPE	EXCAV. OR FINE AGGR. CU. YDS. PER FT. DEPTH/LIN. FT.
UNDER DRAIN	0.056
BLIND DRAIN	0.037

THE CONCRETE PAD CONSISTS OF 4" DRAIN 0.137 CUBIC YARDS, 6" DRAIN 0.177 CUBIC YARDS CLASS "B" CONCRETE.



END ELEVATION VIEW



END ELEVATION VIEW

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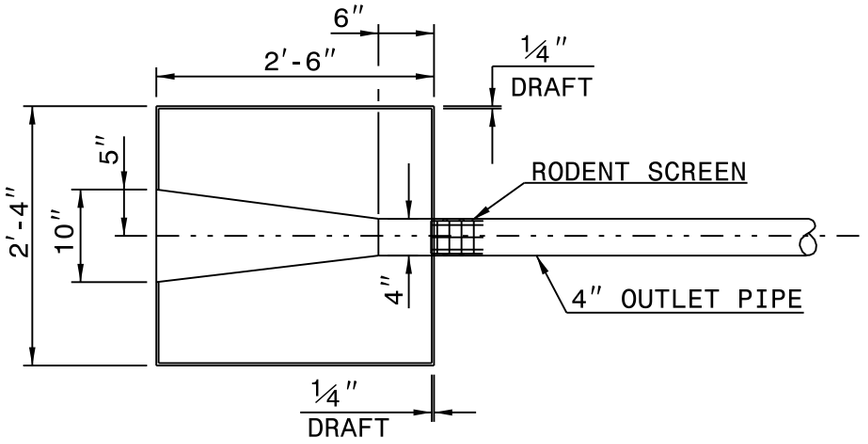
ROADWAY STANDARD DRAWING FOR

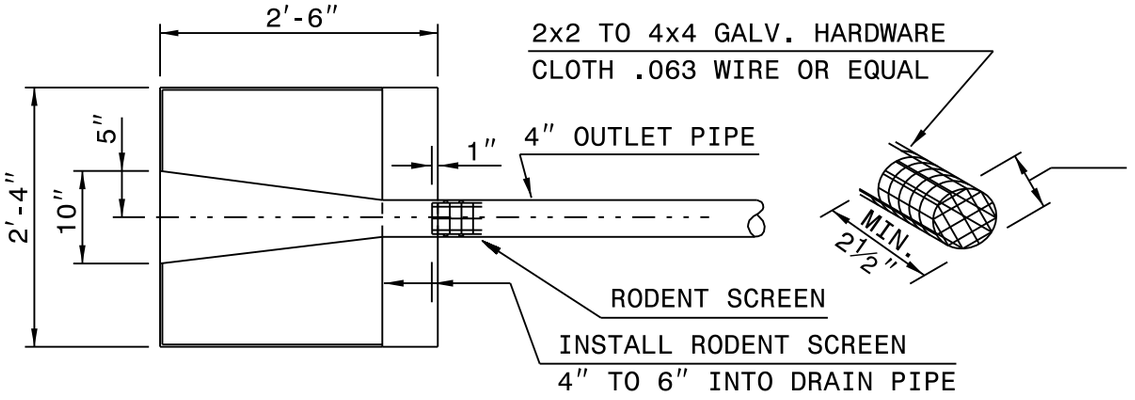
PIPE UNDERDRAIN AND BLIND DRAIN

SHEET 1 OF 1

815.03

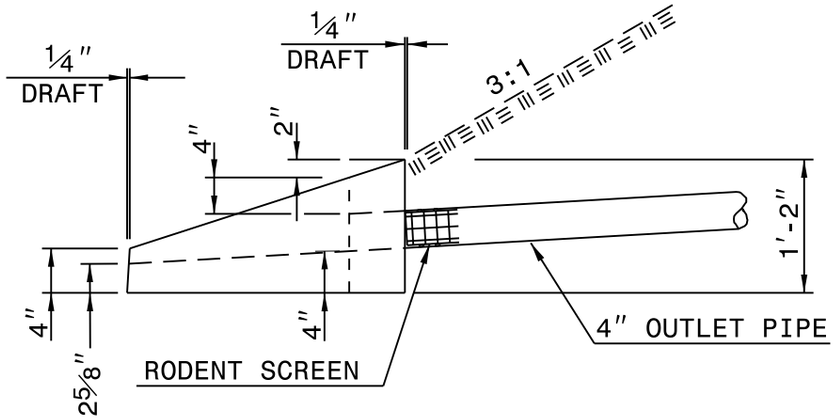


PLAN VIEW

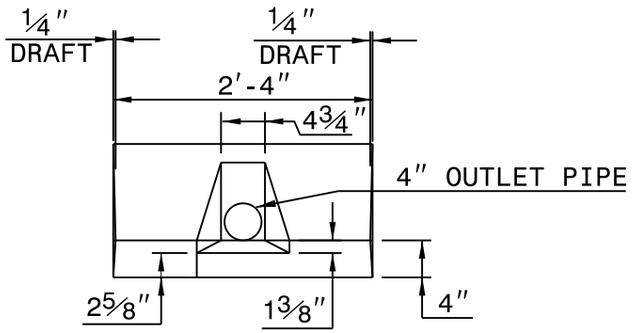


TOP VIEW

PARTIAL DETAIL OF RODENT SCREEN



ELEVATION VIEW



END ELEVATION VIEW

THE CONCRETE PAD CONSISTS OF 0.137 CUBIC YARDS OF CLASS "B" CONCRETE.

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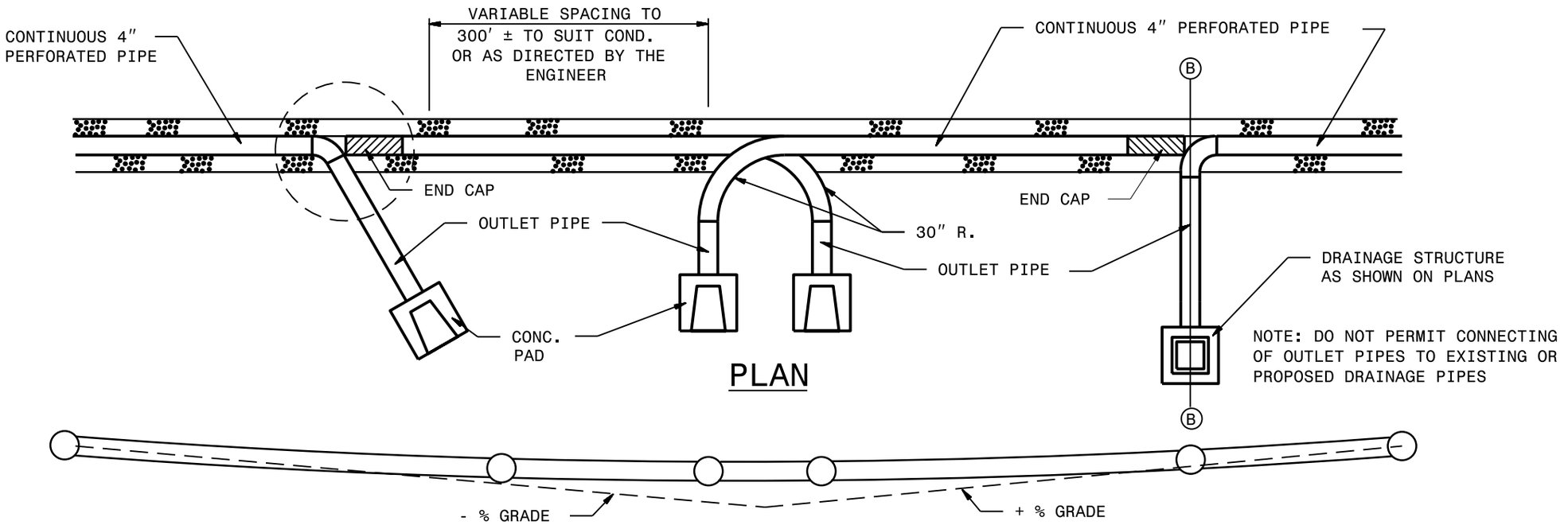
ROADWAY STANDARD DRAWING FOR

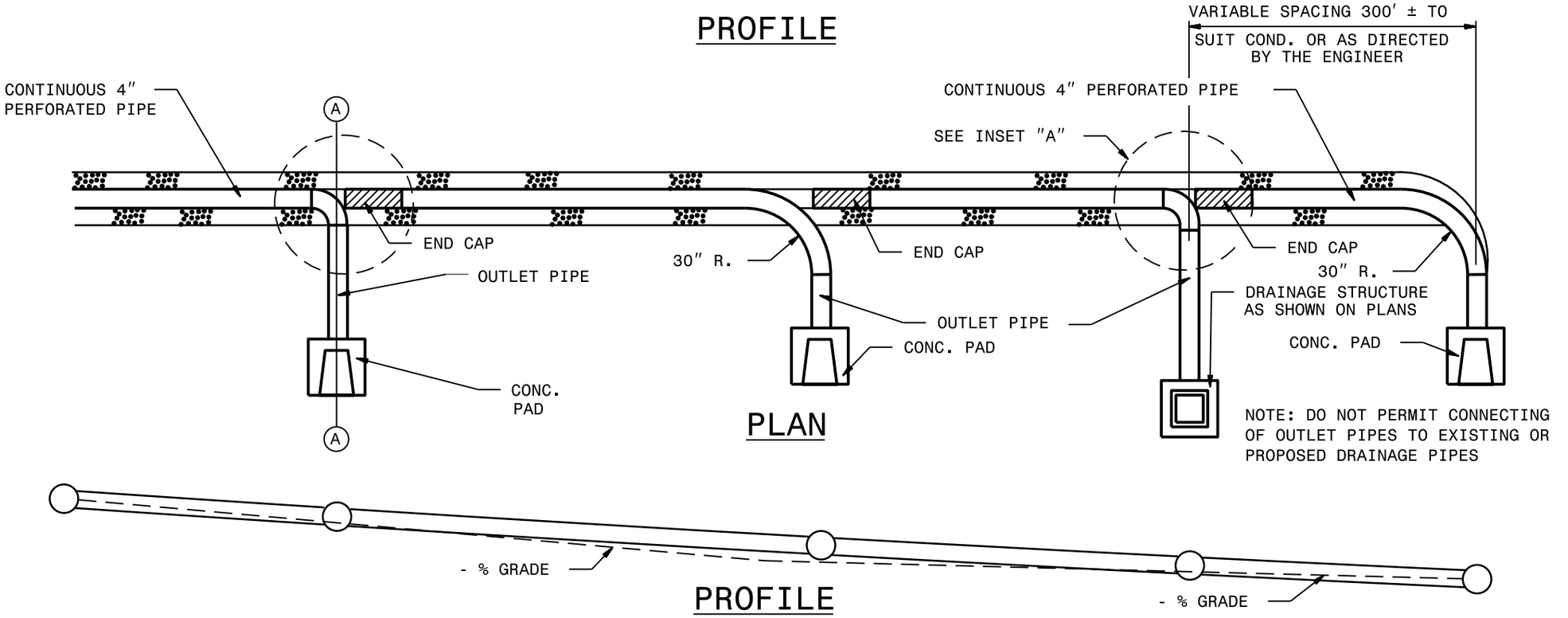
CONCRETE PADS

FOR SHOULDER DRAIN INSTALLATION

SHEET 1 OF 1

816.01





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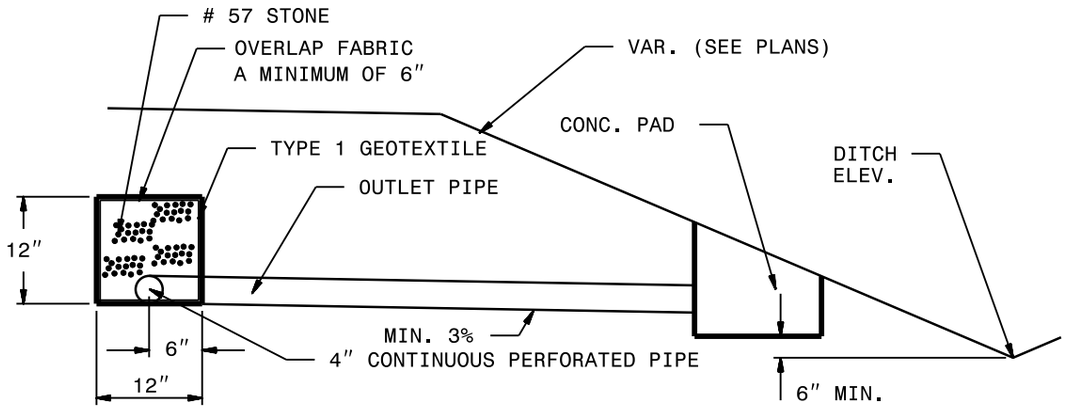
ROADWAY STANDARD DRAWING FOR

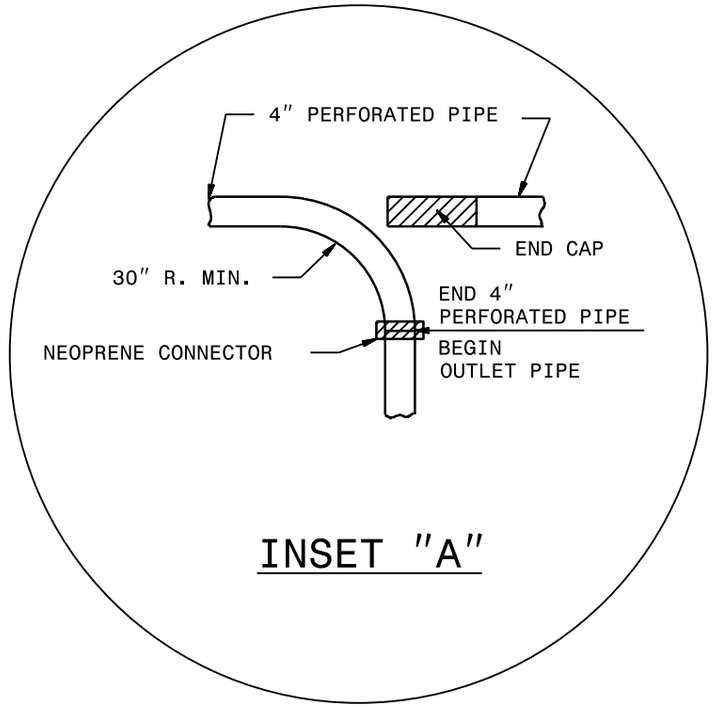
AGGREGATE SHOULDER DRAIN

SHEET 1 OF 2

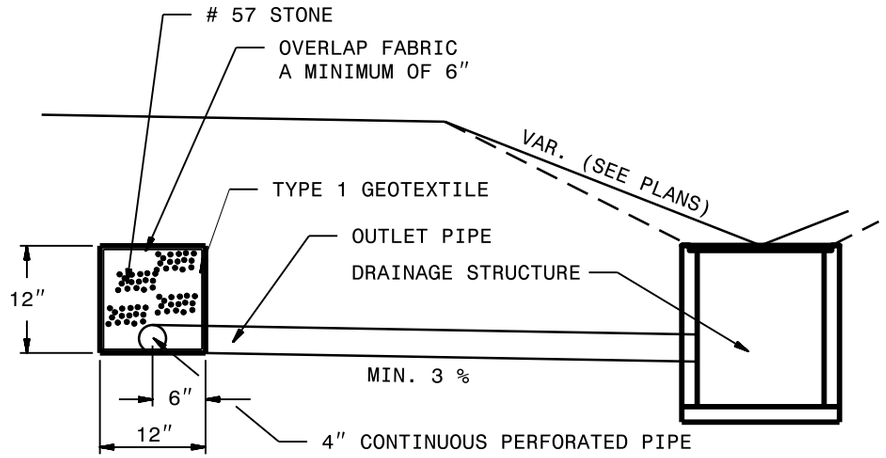
816.02



TYPICAL SECTION A-A



INSET "A"



TYPICAL SECTION B-B

GENERAL NOTES:

USE THE FOLLOWING CRITERIA AS A GUIDE FOR THE LOCATION, QUANTITY AND INSTALLATION OF AGGREGATE SHOULDER DRAIN.

(1) INSTALL ON LOW SIDE OF PAVEMENT IN AREAS WITH GRADES FLATTER THAN 1% , AND SAG VERTICAL CURVES.

(2) OTHER LOCATIONS AS DIRECTED BY THE ENGINEER.

(3) PLACE OUTLETS AT THE LOW POINTS AND SPACE AS SHOWN ON THE PLAN VIEW.

(4) CONNECT OUTLET PIPE INTO DRAINAGE STUCTURE WHERE POSSIBLE. IF NOT CONNECTED TO DRAINAGE STRUCTURE, PROTECT END OF PIPE BY CONCRETE PAD. SEE DETAIL OF CONCRETE PAD.

(5) OUTLET PIPE GRADE MIN. 3%.

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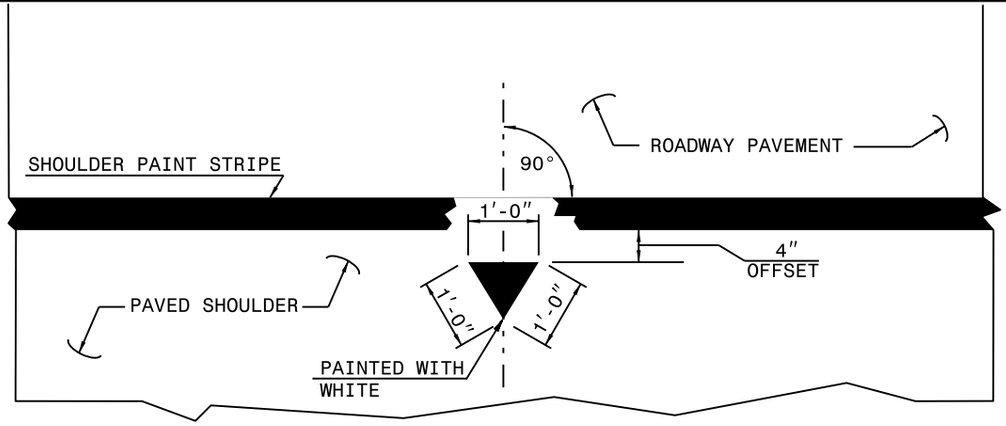
ROADWAY STANDARD DRAWING FOR

AGGREGATE SHOULDER DRAIN

ADDITIONAL INFORMATION

816.02



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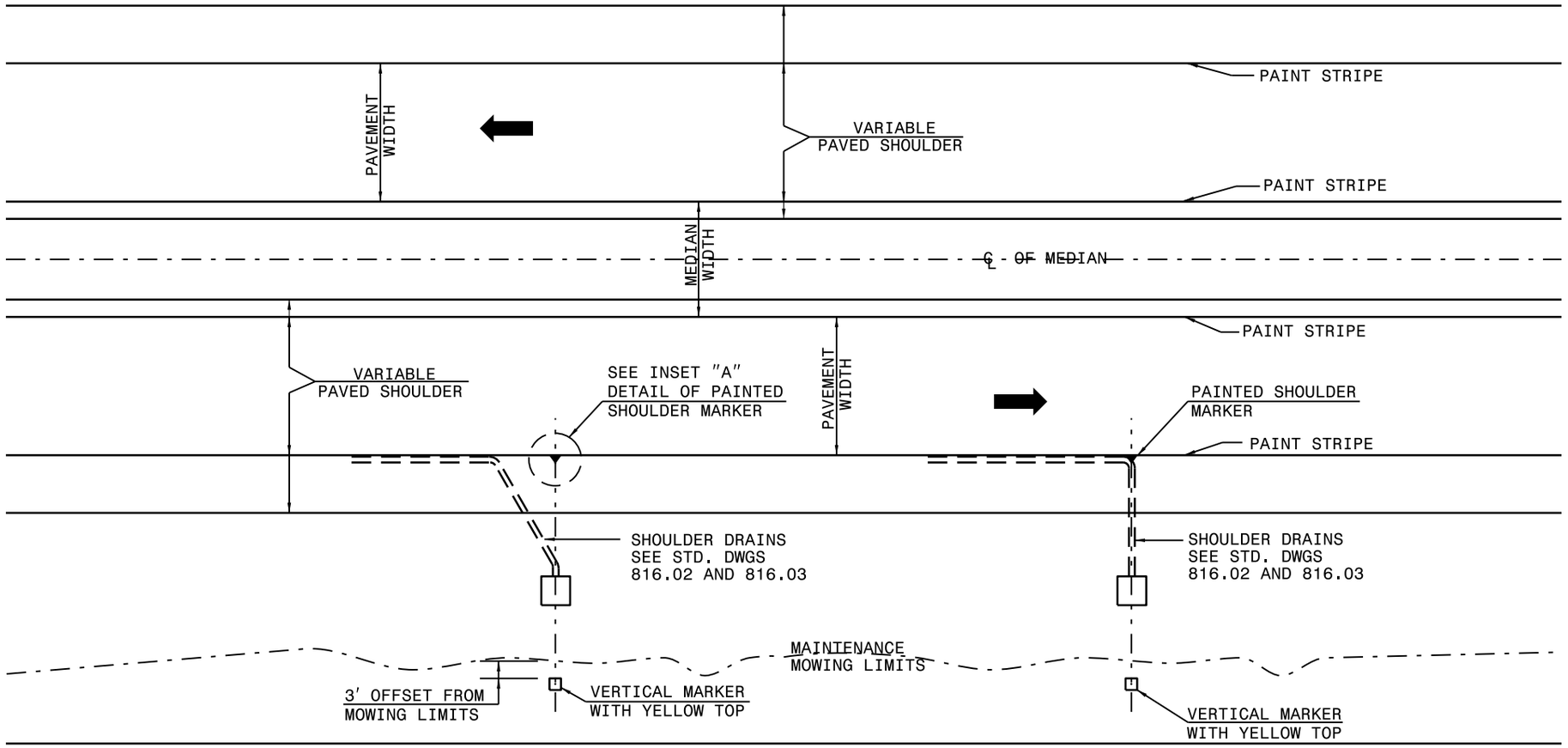

PAINTED SHOULDER AND VERTICAL MARKER

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DIVISION OF HIGHWAYS
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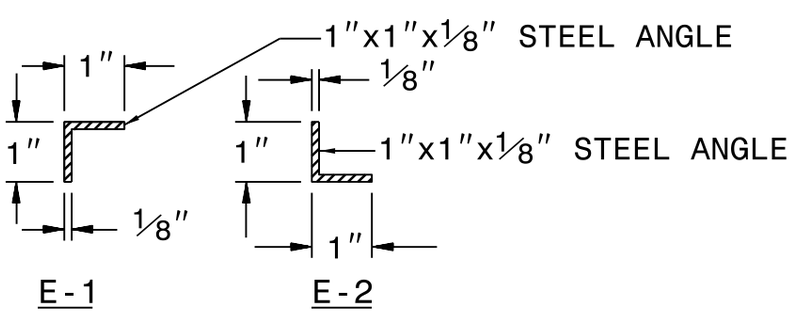
ROADWAY STANDARD DRAWING FOR

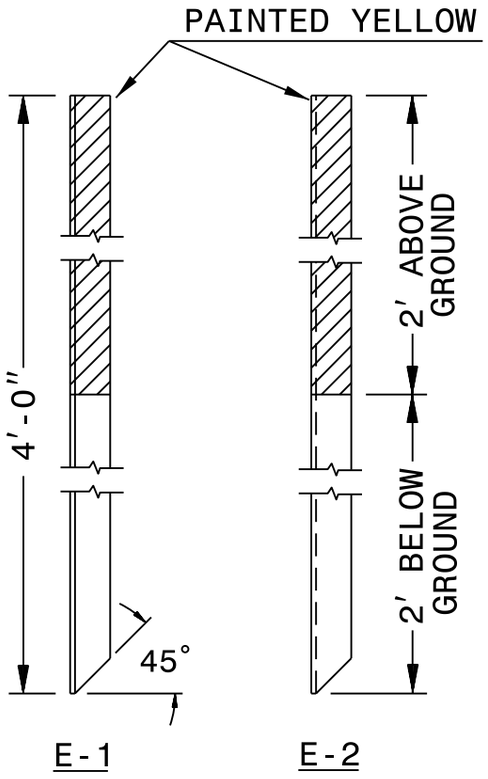
MARKERS FOR DRAINAGE STRUCTURE AND CONCRETE PAD

SHEET 1 OF 2

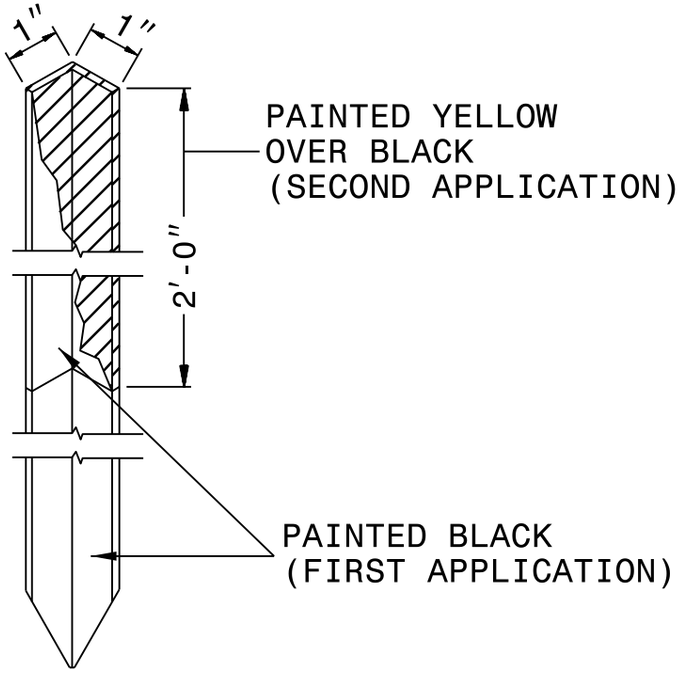
816.04



PLAN



ELEVATION



ISOMETRIC VIEW

LEGEND

YELLOW PAINT

BLACK PAINT

GENERAL NOTES:

USE A36 GRADE STEEL. USE FLAT BLACK PAINT AS FIRST APPLICATION.

USE YELLOW AS SECOND APPLICATION FOR THE TOP HALF OF THE MARKER. USE EXTERIOR OIL BASE FOR ALL PAINT.

USE MARKERS FOR SUBSURFACE AND SHOULDER DRAIN CONCRETE PADS. PLACE MARKERS FOR OUTLETS AT DRAINAGE STRUCTURES WHERE APPLICABLE.

STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

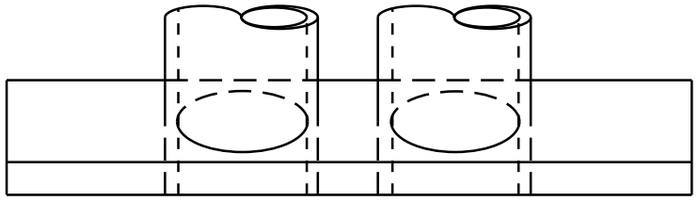
1-24

ROADWAY STANDARD DRAWING FOR

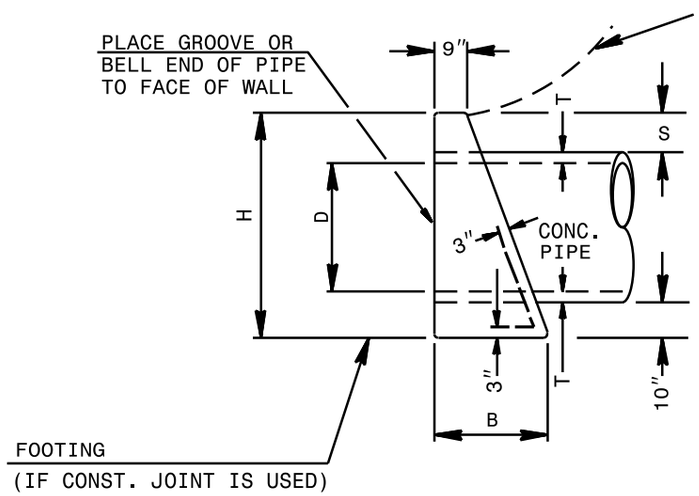
MARKERS FOR DRAINAGE STRUCTURE AND CONCRETE PAD

SHEET 2 OF 2

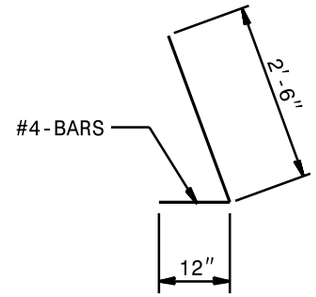
816.04



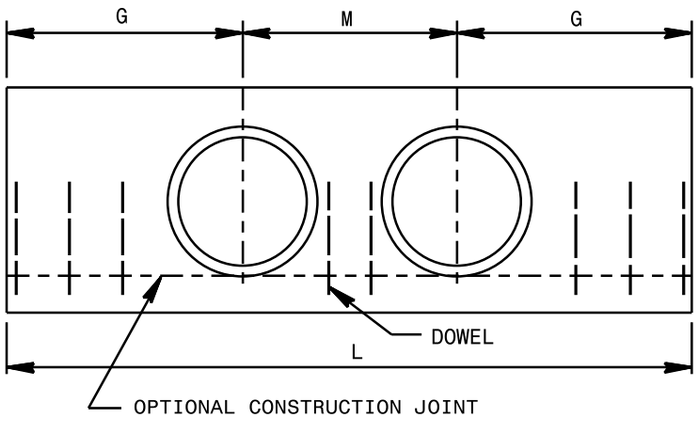
PLAN



END ELEVATION



DOWEL
BAR-″X″



ELEVATION

DOWELS IN ENDWALL WITH REINFORCED CONCRETE PIPE																			
LOC.	PIPE	SINGLE PIPE								DOUBLE PIPE									
	DIA.	15″	18″	24″	30″	36″	42″		48″		15″	18″	24″	30″	36″	42″		48″	
	BARS	″X″	″X″	″X″	″X″	″X″	″X″	Y*	″X″	Y*	″X″	″X″	″X″	″X″	″X″	″X″	Y*	″X″	Y*
G	QTY.	2	2	3	3	4	4	2	5	2	2	2	3	3	4	4	2	5	2
M	QTY.	-	-	-	-	-	-		-		1	1	2	2	2	2		3	
G	QTY.	2	2	3	3	4	4		5		2	2	3	3	4	4		5	
TOTAL LBS.		9	9	14	14	19	55		65		12	12	19	19	23	77		92	

DIMENSIONS AND CONCRETE QUANTITIES										
USING CONCRETE PIPE										
	COMMON DIMENSIONS					SINGLE PIPE		DOUBLE PIPE		
D	H	B	G	T	S	L	YD^3	M	L	YD^3
15″	3′-3″	1′-8″	2′-9″	2¼″	9½″	5′-6″	0.7	2′-2″	7′-8″	1.0
18″	3′-7″	1′-10″	3′-2″	2½″	10″	6′-4″	1.0	2′-7″	8′-11″	1.3
24″	4′-2″	2′-1″	4′-0″	3″	10″	8′-0″	1.5	3′-5″	11′-5″	2.0
30″	5′-0″	2′-6″	4′-7″	4¼″	11½″	9′-2″	2.3	4′-3″	13′-5″	3.1
36″	5′-8″	2′-8″	5′-6″	4¾″	11½″	11′-0″	3.4	5′-0″	16′-0″	4.5
42″	6′-2″	3′-1″	6′-4″	5¼″	11½″	12′-8″	4.5	5′-10″	18′-6″	6.0
48″	6′-9″	3′-5″	7′-2″	5¾″	11½″	14′-4″	6.0	6′-8″	21′-0″	8.0

*SEE SHEET 3

STATE OF
NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

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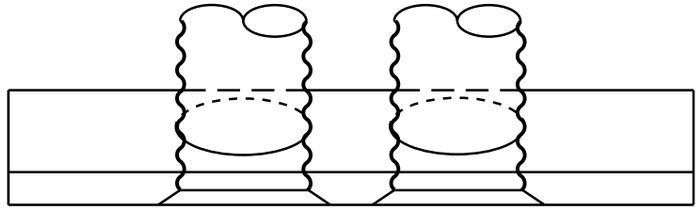
ROADWAY STANDARD DRAWING FOR

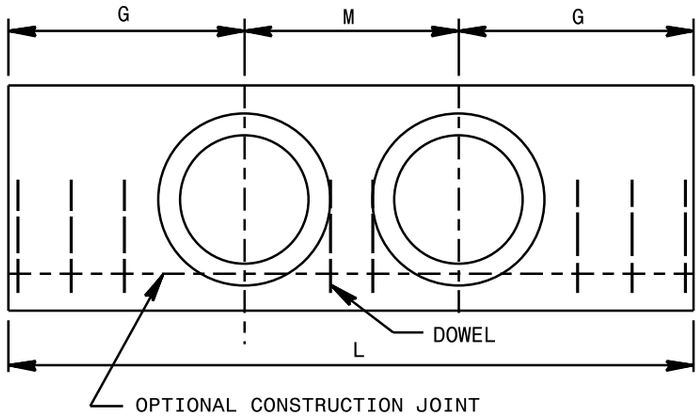
CONCRETE ENDWALL FOR SINGLE AND DOUBLE PIPE CULVERTS

15″ THRU 48″ PIPE - 90° SKEW

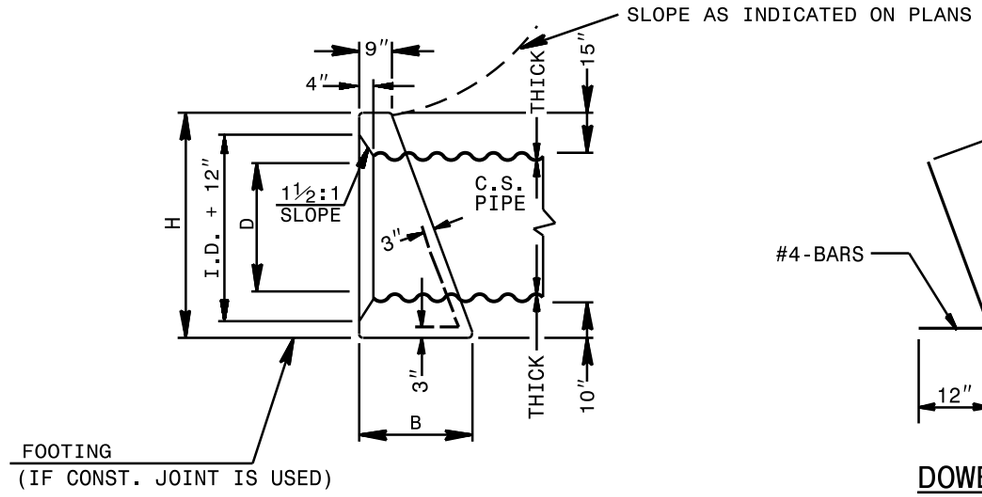
838.01



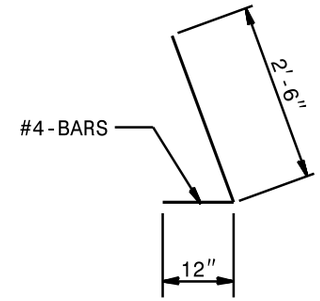
PLAN



ELEVATION



END ELEVATION



DOWEL
BAR-″X″

DOWELS IN ENDWALL WITH C. S. PIPE																			
LOC.	PIPE DIA.	SINGLE PIPE								DOUBLE PIPE									
		15″	18″	24″	30″	36″	42″		48″		15″	18″	24″	30″	36″	42″		48″	
	BARS	″X″	″X″	″X″	″X″	″X″	″X″	Y*	″X″	Y*	″X″	″X″	″X″	″X″	″X″	″X″	Y*	″X″	Y*
G	QTY.	2	2	3	3	4	4	2	5	2	2	2	3	3	4	4	2	5	2
M	QTY.	-	-	-	-	-	-		-		1	1	1	2	2	2		2	
G	QTY.	2	2	3	3	4	4		5		2	2	3	3	4	4		5	
TOTAL LBS.		9	9	14	14	19	53		62		12	12	16	19	23	73		85	

DIMENSIONS AND CONCRETE QUANTITIES								
USING CORRUGATED STEEL PIPE								
	COMMON			SINGLE PIPE		DOUBLE PIPE		
D	H	B	G	L	YD^3	M	L	YD^3
15″	3′-4″	1′-8″	2′-6″	5′-0″	0.7	1′-11″	6′-11″	1.0
18″	3′-7″	1′-10″	2′-11″	5′-10″	1.0	2′-3″	8′-1″	1.2
24″	4′-1″	2′-1″	3′-8″	7′-4″	1.4	3′-0″	10′-4″	1.9
30″	4′-7″	2′-4″	4′-5″	8′-10″	2.0	3′-9″	12′-7″	2.7
36″	5′-1″	2′-7″	5′-2″	10′-4″	2.8	4′-6″	14′-10″	3.8
42″	5′-7″	2′-10″	5′-11″	11′-10″	3.8	5′-3″	17′-1″	5.0
48″	6′-1″	3′-1″	6′-8″	13′-4″	4.9	6′-0″	19′-4″	7.5

*SEE SHEET 3

1-24
STATE OF
NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

ROADWAY STANDARD DRAWING FOR

CONCRETE ENDWALL FOR SINGLE AND DOUBLE PIPE CULVERTS

15″ THRU 48″ PIPE - 90° SKEW

GENERAL NOTES:

CHAMFER ALL CORNERS 1″ OR HAVE A RADIUS OF 1″.

PLACE 2 #6 ″Y″ BARS IN THE TOP OF ALL ENDWALL FOR PIPE CULVERTS 42″ AND OVER WITH A MINIMUM OF 3″ COVER AND A LENGTH OF 6″ LESS THAN ENDWALL LENGTH.

CONSTRUCT BOTTOM SLAB WITH FORMS.

DO NOT INTERPRET WALL THICKNESS (T) SHOWN FOR THE THICKNESS ACCEPTABLE, BUT IS USED IN COMPUTING ENDWALL QUANTITIES.

WHEN THE CONTRACTOR ELECTS TO USE A CONSTRUCTION JOINT AT THE BOTTOM OF THE PIPE, PLACE BAR ″X″ DOWELS IN THE BASE AS SHOWN ON PLANS. SPACE BARS APPROXIMATELY ON 12″ CENTERS UNLESS OTHERWISE DIRECTED BY THE ENGINEER.

WHEN THE CONTRACTOR ELECTS TO USE A CONSTRUCTION JOINT AT THE BOTTOM OF THE PIPE AND POUR THE BASE SEPARATELY LEAVE THE POUR ROUGH.

USE CLASS ″B″ CONCRETE.

STATE OF
NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

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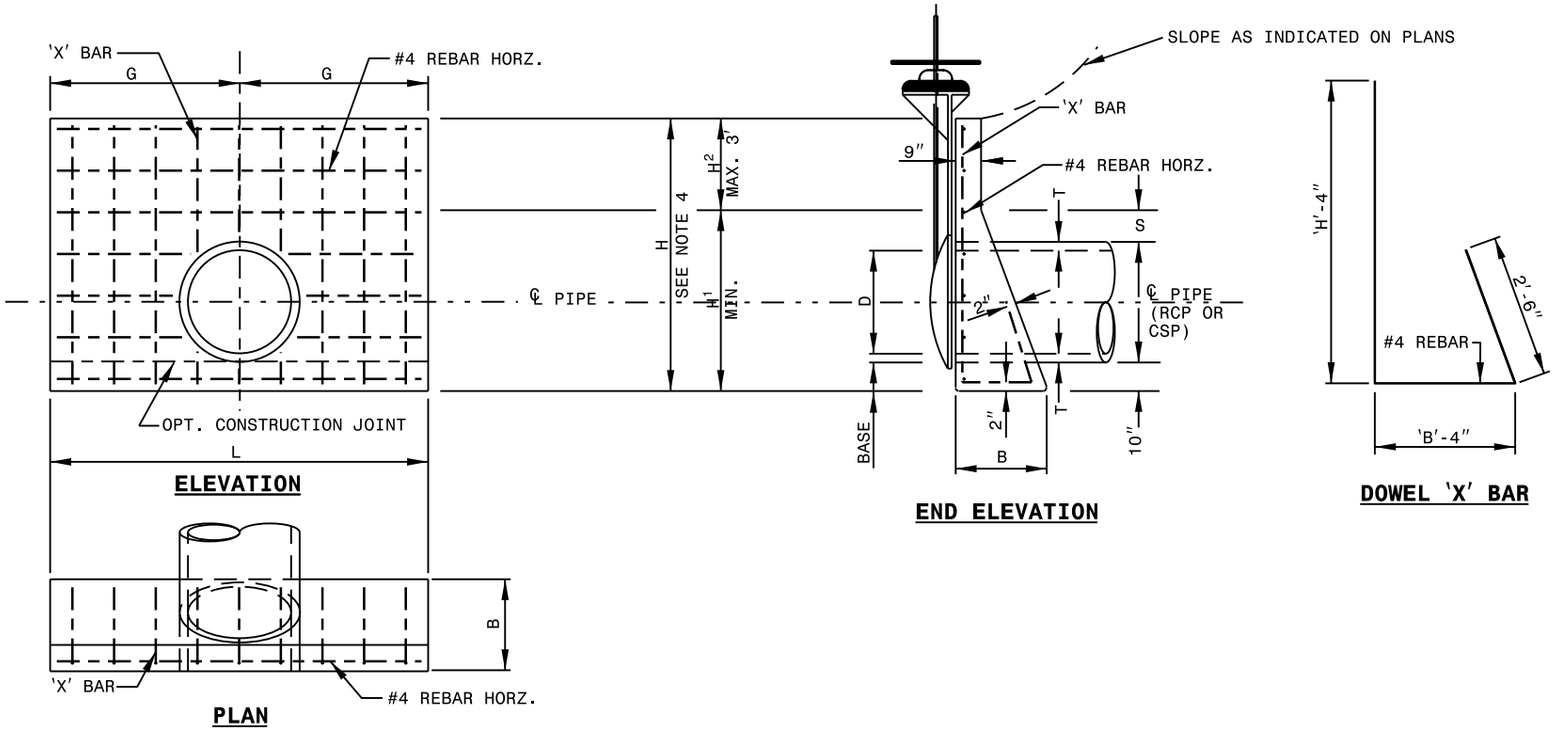
ROADWAY STANDARD DRAWING FOR

CONCRETE ENDWALL FOR SINGLE AND DOUBLE PIPE CULVERTS

15″ THRU 48″ PIPE - 90° SKEW



ELEVATION

PLAN

END ELEVATION

DOWEL 'X' BAR

DIMENSIONS AND QUANTITIES FOR RCP OR CSP							
CALCULATIONS BASED ON CONCRETE PIPE							
PIPE DIA.	H^1 MINIMUM DIMENSIONS						
D	H^1	B	G	T	S	L	CONC YD^3
15"	3'-3"	1'-8"	2'-9"	2¼"	9½"	5'-6"	0.7
18"	3'-7"	1'-10"	3'-2"	2½"	10"	6'-4"	1.0
24"	4'-2"	2'-1"	4'-0"	3"	10"	8'-0"	1.5
30"	5'-0"	2'-6"	4'-7"	4¼"	11½"	9'-2"	2.3
36"	5'-8"	2'-8"	5'-6"	4¾"	12½"	11'-0"	3.4

H^2 QUANTITES		
PIPE DIA.	PER 1' ADDTIONAL HEIGHT	
D	STEEL LBS.	CONC YD^3
15"	7.5	0.2
18"	8.7	0.2
24"	11.1	0.2
30"	12.6	0.3
36"	15.1	0.3

REBAR IN ENDWALL (H^1 MIN.)							
USE WITH RC OR CS PIPE	PIPE DIA.						
	15"	18"	24"	30"	36"	42"	48"
	QTY	QTY	QTY	QTY	QTY	QTY	QTY
'X' BARS	6	7	9	10	12	14	15
HORZ BARS	4	4	5	6	7	7	8
TOTAL LBS.	41	50	74	112	131	161	195

GENERAL NOTES:

1. THIS STANDARD FOR THE SLUICE GATE PROVIDES ONLY BASIC INFORMATION FOR PLACEMENT.
2. INSTALL THE SLUICE GATE IN ACCORDANCE WITH THE MANUFACTURER'S DIMENSIONS AND SPECIFICATIONS.
3. SEE PLANS FOR LOCATIONS AND PIPE SIZES.
4. LIMIT VARIABLE HEIGHT DIMENSION (H) TO FRAME HEIGHT OF SLUICE GATE, 3' ABOVE THE H^1 DIMENSION OR 10' WHICHEVER IS LESS. FRAME HEIGHT OF SLUICE GATE TO BE PROVIDED BY MANUFACTURER OR FABICATOR.
5. ATTACHMENT OF GATE MAY REQUIRE SPECIFIC POSTIONING OF PIPE AND/OR MODIFICATION OF ENDWALL. CONFIRMATION OF GATE DIMENSIONS AND ATTACHMENT METHOD IS RECOMMENDED PRIOR TO CONSTRUCTION OF ENDWALL.
6. PLACE NO. 4 REBAR ON 12" HORIZONTAL AND VERTICAL CENTERS WITH 2" MINIMUM CONCRETE COVERAGE.
7. CONSTRUCT 1" CHAMFER OR RADIUS ON ALL EXTERIOR CORNERS.
8. USE FORMS TO CONSTRUCT THE BOTTOM SLAB.
9. WALL THICKNESS (T) IS USED TO COMPUTE QUANTITIES, NOT TO INFER SIZE.
10. WHEN THE BASE IS POURED SEPARATELY, LEAVE THE POUR ROUGH.
11. USE CLASS 'B' CONCRETE.
12. CUT OR BEND REBARS AS NEEDED TO ACCOMMODATE PIPE.
13. MAKE ADJUSTMENTS IF NECESSARY TO ALLOW SLUICE GATE TO OPERATE THROUGH FULL RANGE OF MOTION, FROM FULLY OPEN TO FULLY CLOSED.

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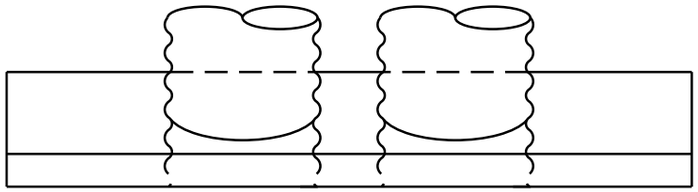
STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

ROADWAY STANDARD DRAWING FOR

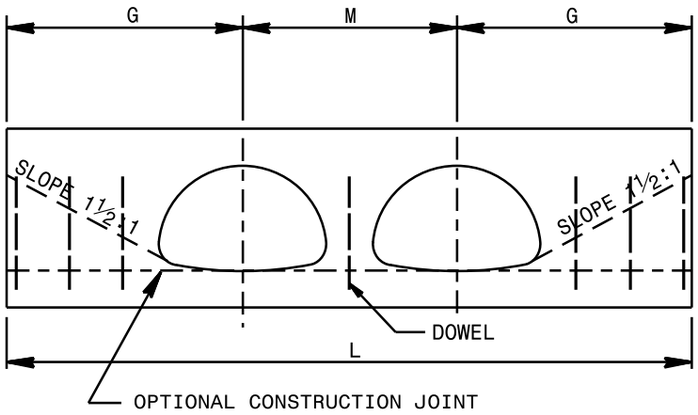
CONCRETE ENDWALL AND SLUICE GATE

15" THRU 36" PIPE - 90° SKEW

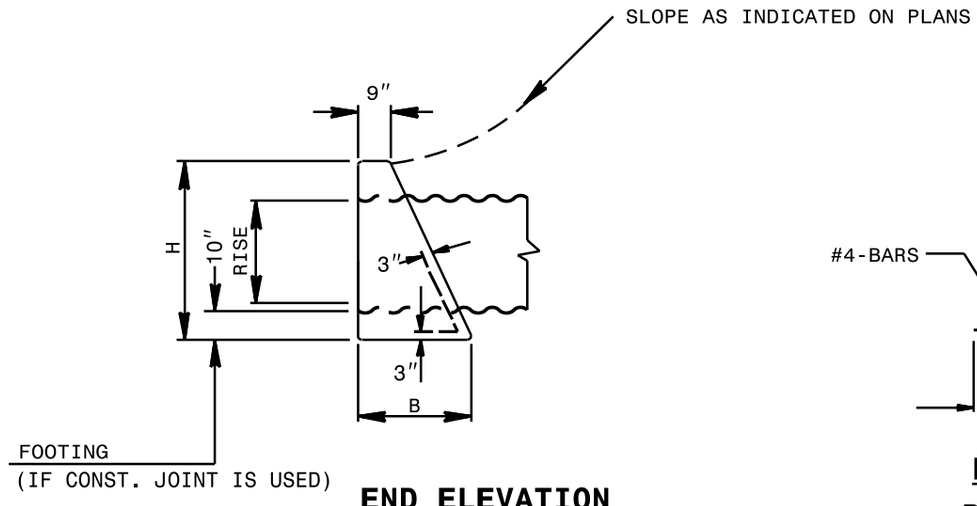


PLAN

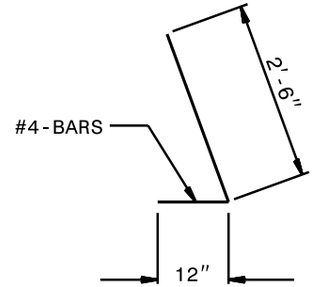
GENERAL NOTES:
-CHAMFER ALL CORNERS 1″. USE CLASS ″B″ CONCRETE.
-PLACE 2 #6 ″Y″ BARS IN THE TOP OF ALL ENDWALL FOR PIPE CULVERTS 42″ AND OVER WITH A MINIMUM OF 3″ COVER AND A LENGTH OF 6″ LESS THAN ENDWALL LENGTH.
-CONSTRUCT BOTTOM SLAB WITH FORMS.
-WHEN THE CONTRACTOR ELECTS TO USE A CONSTRUCTION JOINT AT THE BOTTOM OF THE PIPE, PLACE BAR ″X″ DOWELS IN THE BASE AS SHOWN ON PLANS. SPACE BARS APPROXIMATELY ON 12″ CENTERS UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
-WHEN THE CONTRACTOR ELECTS TO USE A CONSTRUCTION JOINT AT THE BOTTOM OF THE PIPE AND POUR THE BASE SEPARATELY LEAVE THE POUR ROUGH.
-DO NOT INTERPRET WALL THICKNESS (T) SHOWN FOR THE THICKNESS ACCEPTABLE, BUT IS USED IN COMPUTING ENDWALL QUANTITIES.



ELEVATION



END ELEVATION



DOWEL
BAR-″X″

LOC.	PIPE DIA.	DOWELS IN ENDWALL: SINGLE PIPE 18″	22″	25″	29″	36″	43″	50″	58″	65″	72″	DOUBLE PIPE 18″	22″	25″	29″	36″	43″	50″	58″	65″	72″
	BARS	″X″	″X″	″X″	″X″	″X″	″X″	″X″	″X″	″X″	″X″	″X″	″X″	″X″	″X″	″X″	″X″	″X″	″X″	″X″	″X″
G	QTY.	2	2	2	3	3	4	4	4	5	5	2	2	2	3	3	4	4	4	5	5
M	QTY.	-	-	-	-	-	-	-	-	-	-	1	1	1	1	1	1	2	2	2	2
G	QTY.	2	2	2	3	3	4	4	4	5	5	2	2	2	3	3	4	4	4	5	5
TOTAL LBS.		9	9	9	14	14	19	19	19	23	23	12	12	12	16	16	21	23	23	28	28

DIMENSIONS AND CONCRETE QUANTITIES: COMMON DIMENSIONS USING C.S. PIPE ARCH SPAN	RISE	THICK.	H	B	G	M	SINGLE PIPE L	SINGLE PIPE YD³	DOUBLE PIPE L	DOUBLE PIPE YD³
17″	13″	0.064	2′-9″	1′-5″	2′-7″	1′-11″	5′-2″	0.526	7′-0″	0.684
21″	15″	0.064	2′-11″	1′-6″	3′-0″	2′-4″	6′-0″	0.663	8′-4″	0.880
24″	18″	0.064	3′-2″	1′-7″	3′-5″	2′-8″	6′-10″	0.840	9′-6″	1.110
28″	20″	0.079	3′-4″	1′-8″	3′-9″	3′-1″	7′-5″	0.994	10′-6″	1.316
35″	24″	0.079	3′-8″	1′-10″	4′-6″	3′-11″	9′-0″	1.368	12′-11″	1.844
42″	29″	0.079	4′-1″	2′-1″	5′-4″	4′-8″	10′-8″	1.950	15′-4″	2.614
49″	33″	0.109	4′-5″	2′-3″	6′-0″	5′-5″	12′-0″	2.461	17′-5″	3.307
57″	38″	0.109	4′-10″	2′-6″	6′-10″	6′-4″	13′-8″	3.290	20′-0″	4.446
64″	43″	0.138	5′-3″	2′-8″	7′-8″	7′-1″	15′-4″	4.189	22′-5″	5.637
71″	47″	0.138	5′-7″	2′-10″	8′-4″	7′-11″	16′-8″	5.007	24′-7″	6.772

STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

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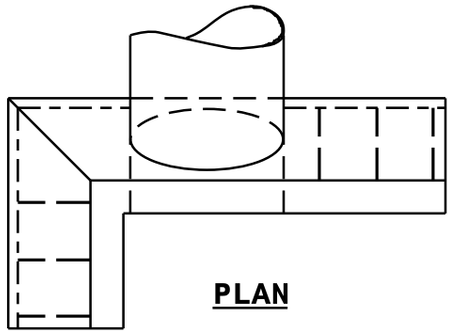
ROADWAY STANDARD DRAWING FOR

CONCRETE ENDWALL FOR SINGLE AND DOUBLE PIPE CULVERTS

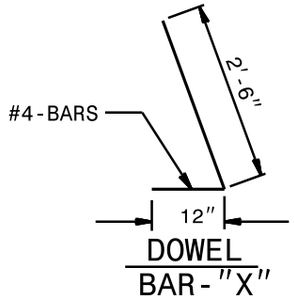
17″ X 13″ THRU 71″ X 47″ PIPE ARCH 2 2/3″ X ½″ CORRUGATIONS - 90° SKEW

SHEET 1 OF 1

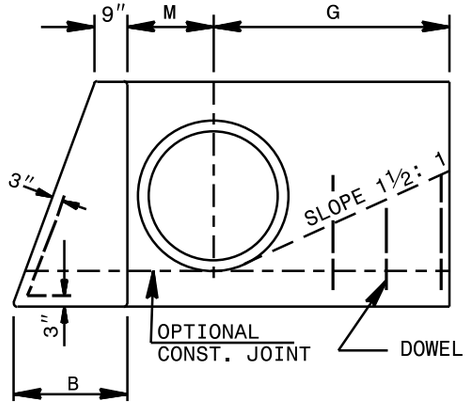
838.04



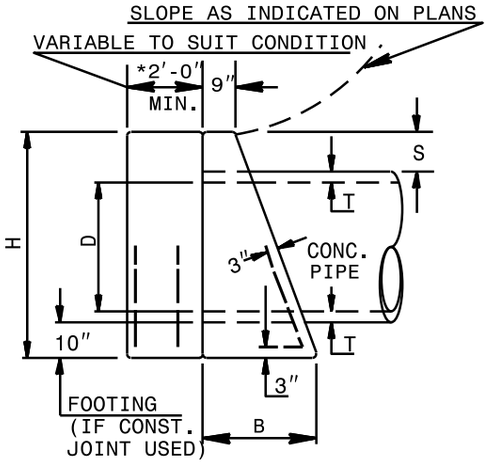
PLAN



DOWEL
BAR-"X"



ELEVATION



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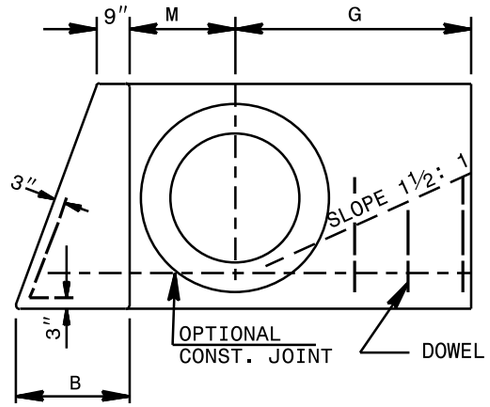

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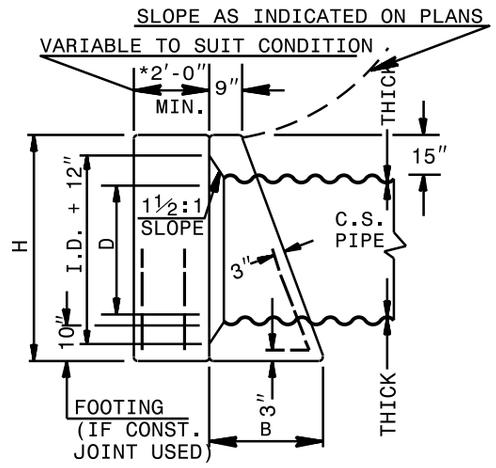

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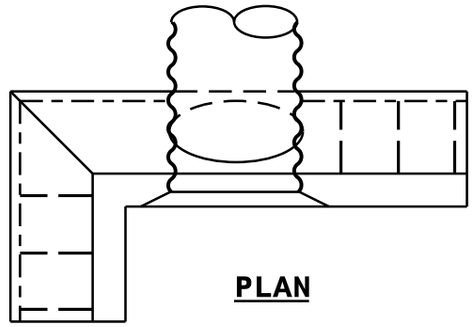
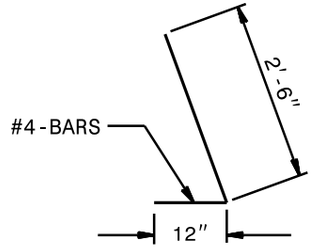


PLAN



DOWEL
BAR-"X"

GENERAL NOTES:
-CHAMFER ALL CORNERS 1". USE CLASS "B" CONCRETE.
-PLACE 2 #6 "Y" BARS IN THE TOP OF ALL ENDWALL FOR PIPE CULVERTS 42" AND OVER WITH A MINIMUM OF 3" COVER AND A LENGTH OF 6" LESS THAN ENDWALL LENGTH.
-CONSTRUCT BOTTOM SLAB WITH FORMS.
-WHEN THE CONTRACTOR ELECTS TO USE A CONSTRUCTION JOINT AT THE BOTTOM OF THE PIPE, PLACE BAR "X" DOWELS IN THE BASE AS SHOWN ON PLANS. SPACE BARS APPROXIMATELY ON 12" CENTERS UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
-WHEN THE CONTRACTOR ELECTS TO USE A CONSTRUCTION JOINT AT THE BOTTOM OF THE PIPE AND POUR THE BASE SEPARATELY LEAVE THE POUR ROUGH.
-DO NOT INTERPRET WALL THICKNESS (T) SHOWN FOR THE THICKNESS ACCEPTABLE, BUT IS USED IN COMPUTING ENDWALL QUANTITIES.

REINFORCING QUANTITIES													
DIA.	15"	18"	24"	30"	36"	42" C.S.		42" R.C.		48" C.S.		48" R.C.	
BARS	"X"	"X"	"X"	"X"	"X"	"X"	"Y"	"X"	"Y"	"X"	"Y"	"X"	"Y"
QTY.	5	5	6	6	7	7	2	7	2	8	2	8	2
LBS.	12	12	14	14	16	47		49		52		55	

*QUANTITIES BASED ON 2'-0"

DIMENSIONS AND CONCRETE QUANTITIES												
	R.C.P. DIMENSIONS AND VOLUMES							C.S.P. DIMENSIONS AND VOLUMES				
D	H	B	G	M	S	T	YD^3	H	B	G	M	YD^3
15"	3'-4"	1'-8"	2'-6"	1'-1"	10½"	2¼"	1.0	3'-4"	1'-8"	2'-5"	1'-5"	1.0
18"	3'-7"	1'-10"	2'-11"	1'-3"	10"	2½"	1.2	3'-7"	1'-10"	2'-9"	1'-6"	1.3
24"	4'-2"	2'-1"	3'-9"	1'-6"	10"	3"	1.7	4'-1"	2'-1"	3'-6"	1'-9"	1.8
30"	4'-9"	2'-5"	4'-8"	1'-10"	10"	3½"	2.5	4'-7"	2'-4"	4'-3"	2'-0"	2.4
36"	5'-5"	2'-9"	5'-8"	2'-2"	9½"	4¾"	3.6	5'-1"	2'-7"	5'-0"	2'-3"	3.1
42"	6'-0"	3'-0"	6'-7"	2'-5"	9½"	5¼"	4.6	5'-7"	2'-10"	5'-9"	2'-6"	4.0
48"	6'-7"	3'-4"	7'-5"	2'-9"	9½"	5¾"	6.0	6'-1"	3'-1"	6'-6"	2'-9"	5.1

STATE OF
NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

1-24

ROADWAY STANDARD DRAWING FOR

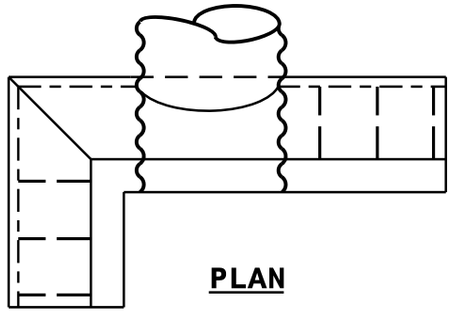
CONCRETE "L" ENDWALL FOR SINGLE PIPE CULVERTS

15" THRU 48" PIPE

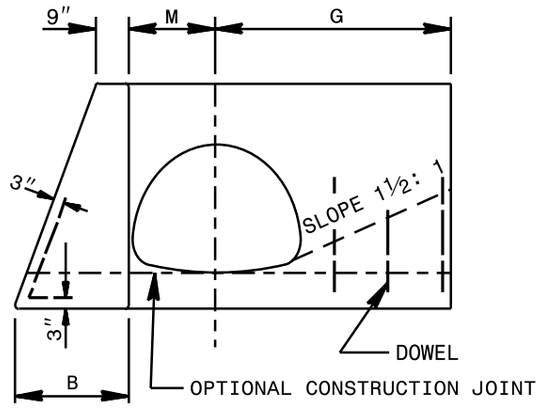
SHEET 1 OF 1

838.05

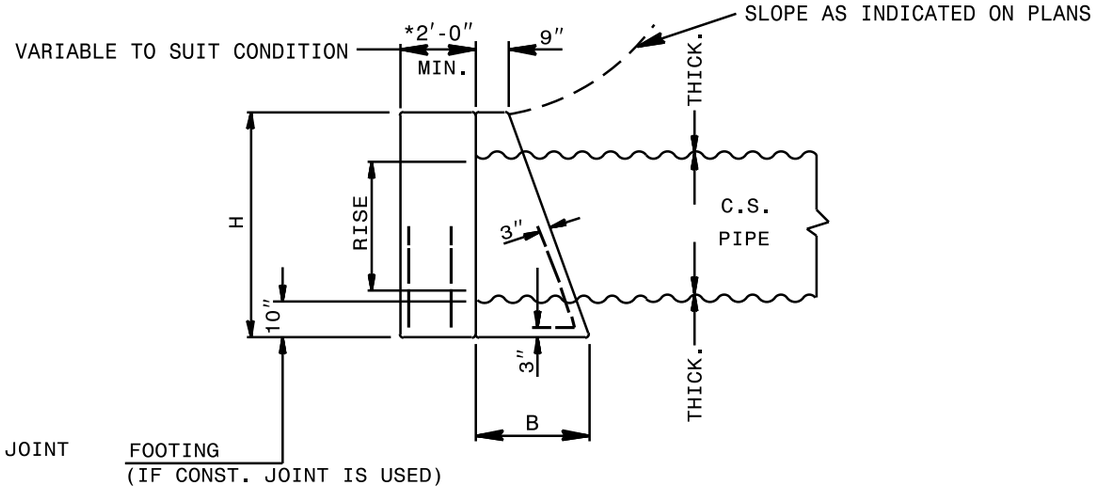
GENERAL NOTES:
-CHAMFER ALL CORNERS 1″. USE CLASS ″B″ CONCRETE.
-PLACE 2 #6 ″Y″ BARS IN THE TOP OF ALL ENDWALLS FOR PIPE CULVERTS 42″ AND OVER WITH A MINIMUM OF 3″ COVER AND A LENGTH OF 6″ LESS THAN ENDWALL LENGTH.
-CONSTRUCT BOTTOM SLAB WITH FORMS.
-WHEN THE CONTRACTOR ELECTS TO USE A CONSTRUCTION JOINT AT THE BOTTOM OF THE PIPE, PLACE BAR ″X″ DOWELS IN THE BASE AS SHOWN ON PLANS. SPACE BARS APPROXIMATELY ON 12″ CENTERS UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
-WHEN THE CONTRACTOR ELECTS TO USE A CONSTRUCTION JOINT AT THE BOTTOM OF THE PIPE AND POUR THE BASE SEPARATELY LEAVE THE POUR ROUGH.
-DO NOT INTERPRET WALL THICKNESS (T) SHOWN FOR THE THICKNESS ACCEPTABLE, BUT IS USED IN COMPUTING ENDWALL QUANTITIES.



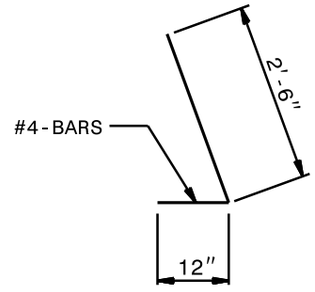
PLAN



ELEVATION



END ELEVATION



DOWEL
BAR-″X″

REINFORCING QUANTITIES										
DIA.	18″	22″	25″	29″	36″	43″	50″	58″	65″	72″
BARS	″X″	″X″	″X″	″X″	″X″	″X″	″Y″	″X″	″Y″	″X″
QTY.	5	5	5	6	6	7	7	7	8	8
LBS.	12	12	12	14	14	16	16	16	19	19

*QUANTITIES BASED ON 2′-0″

DIMENSIONS AND CONCRETE QUANTITIES							
COMMON DIMENSIONS							TOTAL CONC.
SPAN	RISE	THICK	H	B	G	M	YD^3
17″	13″	0.064	2′-9″	1′-5″	2′-7″	1′-0″	0.695
21″	15″	0.064	2′-11″	1′-6″	3′-0″	1′-2″	0.825
24″	18″	0.064	3′-2″	1′-7″	3′-5″	1′-3″	0.984
28″	20″	0.079	3′-4″	1′-8″	3′-9″	1′-5″	1.133
35″	24″	0.079	3′-8″	1′-10″	4′-6″	1′-9″	1.476
42″	29″	0.079	4′-1″	2′-1″	5′-4″	2′-0″	1.990
49″	33″	0.109	4′-5″	2′-3″	6′-0″	2′-4″	2.450
57″	38″	0.109	4′-10″	2′-6″	6′-10″	2′-8″	3.178
64″	43″	0.138	5′-3″	2′-8″	7′-8″	2′-11″	3.902
71″	47″	0.138	5′-7″	2′-10″	8′-4″	3′-3″	4.603

STATE OF NORTH CAROLINA
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DIVISION OF HIGHWAYS
RALEIGH, N.C.

1-24

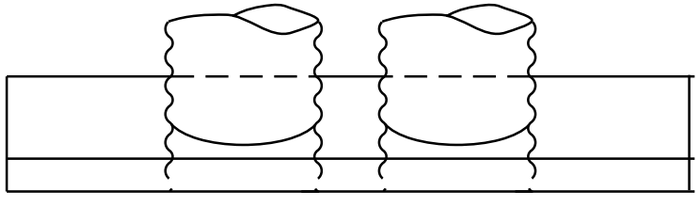
ROADWAY STANDARD DRAWING FOR

CONCRETE ″L″ ENDWALL FOR SINGLE PIPE CULVERTS

17″ X 13″ THRU 71″ X 47″ PIPE ARCH 2 2/3″ X 1/2″ CORRUGATIONS

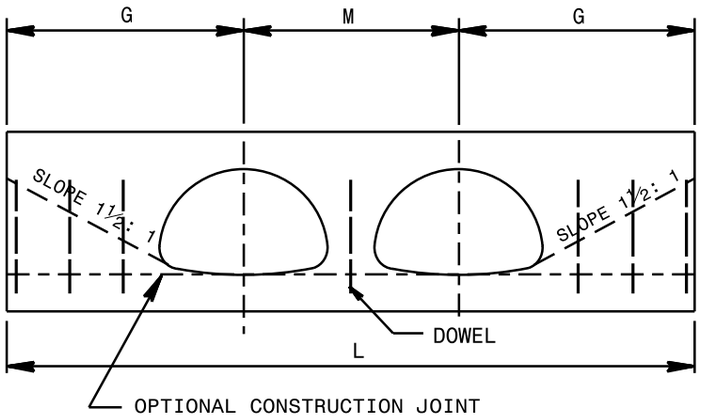
SHEET 1 OF 1

838.06

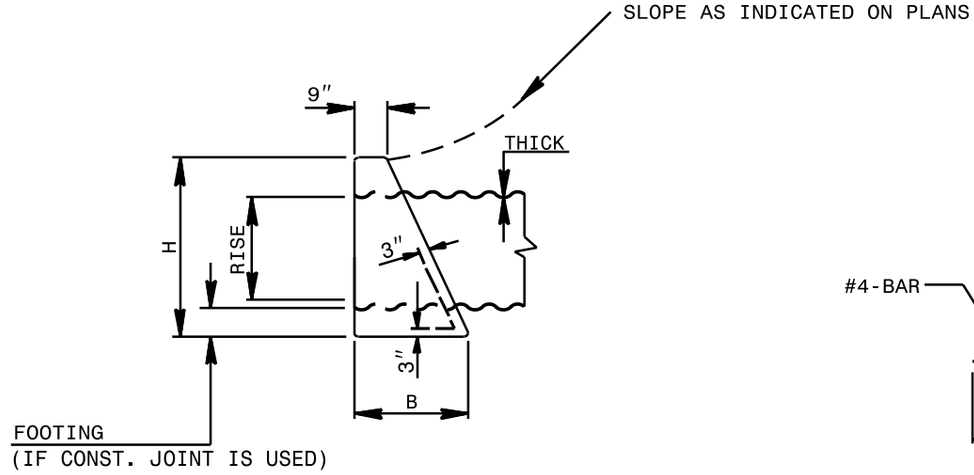


PLAN

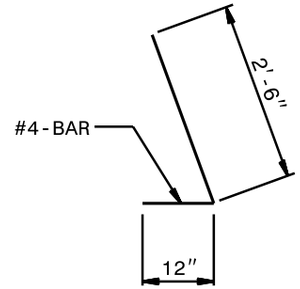
GENERAL NOTES:
-CHAMFER ALL CORNERS 1″. USE CLASS ″B″ CONCRETE.
-PLACE 2 #6 ″Y″ BARS IN THE TOP OF ALL ENDWALL FOR PIPE CULVERTS 42″ AND OVER WITH A MINIMUM OF 3″ COVER AND A LENGTH OF 6″ LESS THAN ENDWALL LENGTH.
-CONSTRUCT BOTTOM SLAB WITH FORMS.
-WHEN THE CONTRACTOR ELECTS TO USE A CONSTRUCTION JOINT AT THE BOTTOM OF THE PIPE, PLACE BAR ″X″ DOWELS IN THE BASE AS SHOWN ON PLANS. SPACE BARS APPROXIMATELY ON 12″ CENTERS UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
-WHEN THE CONTRACTOR ELECTS TO USE A CONSTRUCTION JOINT AT THE BOTTOM OF THE PIPE AND POUR THE BASE SEPARATELY LEAVE THE POUR ROUGH.
-DO NOT INTERPRET WALL THICKNESS (T) SHOWN FOR THE THICKNESS ACCEPTABLE, BUT IS USED IN COMPUTING ENDWALL QUANTITIES.



ELEVATION



END ELEVATION



DOWEL
BAR-″X″

DOWELS IN ENDWALL											
LOC.	PIPE SPAN	SINGLE PIPE					DOUBLE PIPE				
		40″	46″	53″	60″	66″	40″	46″	53″	60″	66″
	BARS	″X″	″X″	″X″	″X″	″X″	″X″	″X″	″X″	″X″	″X″
G	QTY.	4	4	4	5	5	4	4	4	5	5
M	QTY.	-	-	-	-	-	1	2	2	2	2
G	QTY.	4	4	4	5	5	4	5	5	5	5
TOT. LBS.		19	19	19	23	23	21	23	23	28	28

DIMENSIONS AND CONCRETE QUANTITIES										
COMMON DIMENSIONS USING C.S. PIPE ARCH							SINGLE PIPE		DOUBLE PIPE	
SPAN	RISE	THICK.	H	B	G	M	L	YD³	L	YD³
40″	31″	0.079	4′-3″	2′-2″	5′-6″	4′-5″	11′-0″	2.179	15′-5″	2.848
46″	36″	0.109	4′-8″	2′-4″	6′-3″	5′-1″	12′-6″	2.834	17′-7″	3.692
53″	41″	0.109	5′-1″	2′-7″	7′-1″	5′-10″	14′-2″	3.742	20′-0″	4.868
60″	46″	0.109	5′-6″	2′-9″	7′-11″	6′-10″	15′-10″	4.717	22′-8″	6.234
66″	51″	0.109	5′-11″	3′-0″	8′-9″	7′-4″	17′-6″	5.968	24′-10″	7.759

STATE OF NORTH CAROLINA
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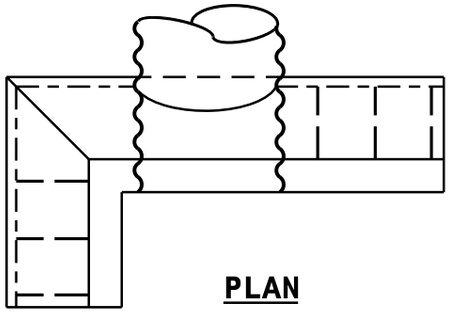
ROADWAY STANDARD DRAWING FOR

CONCRETE ENDWALL FOR SINGLE AND DOUBLE PIPE CULVERTS

40″ X 31″ THRU 66″ X 51″ PIPE ARCH 3″ X 1″ CORRUGATIONS - 90° SKEW

SHEET 1 OF 1

838.07



PLAN

GENERAL NOTES:
-CHAMFER ALL CORNERS 1". USE CLASS "B" CONCRETE.
-PLACE 2 #6 "Y" BARS IN THE TOP OF ALL ENDWALL FOR PIPE CULVERTS 42" AND OVER WITH A MINIMUM OF 3" COVER AND A LENGTH OF 6" LESS THAN ENDWALL LENGTH.
-CONSTRUCT BOTTOM SLAB WITH FORMS.
-WHEN THE CONTRACTOR ELECTS TO USE A CONSTRUCTION JOINT AT THE BOTTOM OF THE PIPE, PLACE BAR "X" DOWELS IN THE BASE AS SHOWN ON PLANS. SPACE BARS APPROXIMATELY ON 12" CENTERS UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
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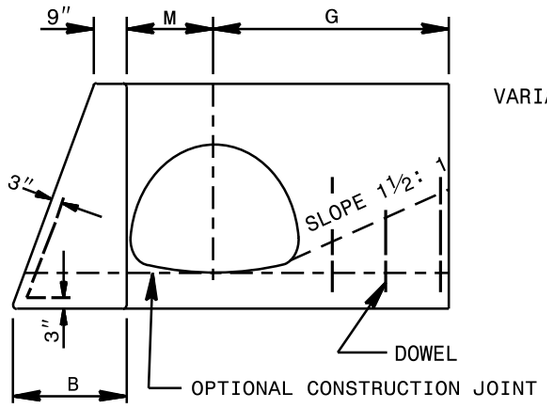
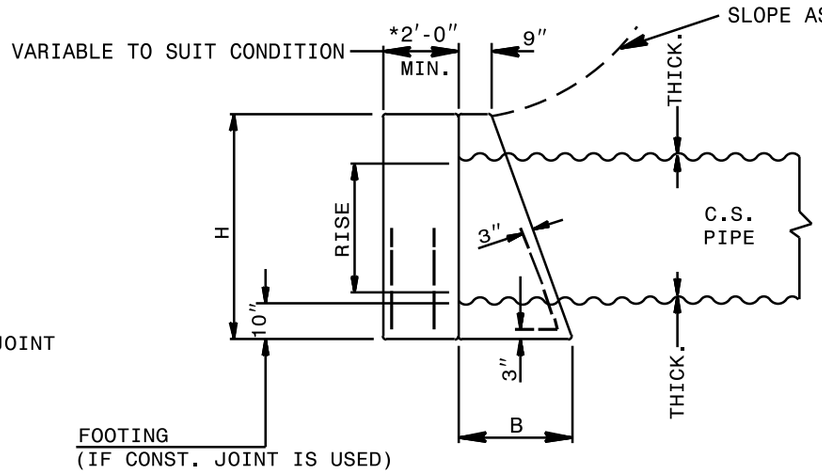
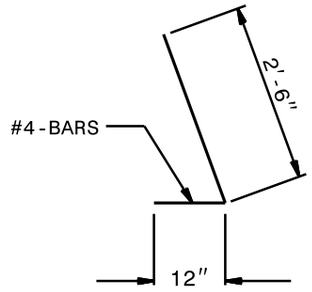
-DO NOT INTERPRET WALL THICKNESS (T) SHOWN FOR THE THICKNESS ACCEPTABLE, BUT IS USED IN COMPUTING ENDWALL QUANTITIES.



ELEVATION



END ELEVATION



DOWEL

BAR-"X"

DOWELS IN ENDWALL					
DIA.	40"	46"	53"	60"	66"
BARS	"X"	"X"	"X"	"X"	"X"
QTY.	7	7	7	8	8
LBS.	16	16	16	19	19

DIMENSIONS AND CONCRETE QUANTITIES							
COMMON DIMENSIONS							TOTAL CONC.
SPAN	RISE	THICK	H	B	G	M	YD^3
40"	31"	0.079	4'-3"	2'-2"	5'-6"	1'-11"	2.187
46"	36"	0.109	4'-8"	2'-4"	6'-3"	2'-2"	2.739
53"	41"	0.109	5'-1"	2'-7"	7'-1"	2'-6"	3.524
60"	46"	0.109	5'-6"	2'-9"	7'-11"	2'-9"	4.302
66"	51"	0.109	5'-11"	3'-0"	8'-9"	3'-0"	5.345

STATE OF NORTH CAROLINA
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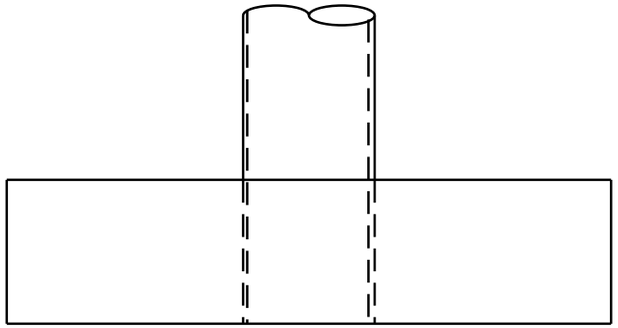
ROADWAY STANDARD DRAWING FOR

CONCRETE "L" ENDWALL FOR SINGLE PIPE CULVERTS

40" X 31" THRU 66" X 51" PIPE ARCH 3" X 1" CORRUGATIONS

SHEET 1 OF 1

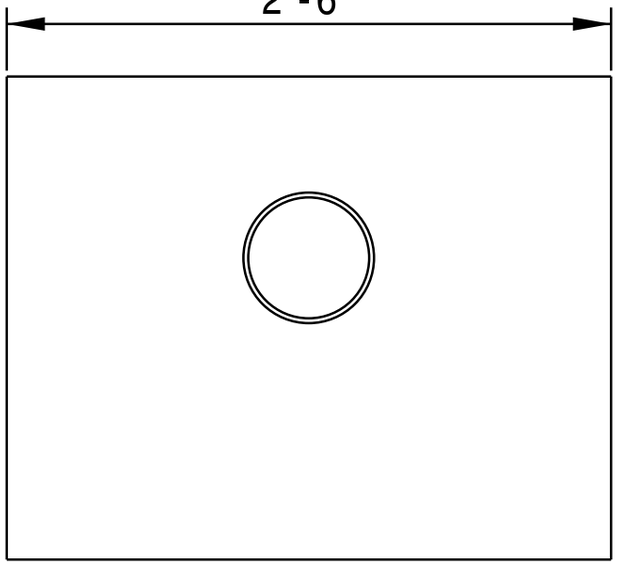
838.08



PLAN

GENERAL NOTES:
CHAMFER ALL CORNERS 1″.
USE CLASS "B" CONCRETE.

CONCRETE QUANTITIES			
D	REINF. CONC.	BIT. FIBER	CORR. PLASTIC OR METAL
	YD^3	YD^3	YD^3
4″	0.082	0.083	0.083
6″	0.087	0.088	0.089
8″	0.091	0.092	0.094



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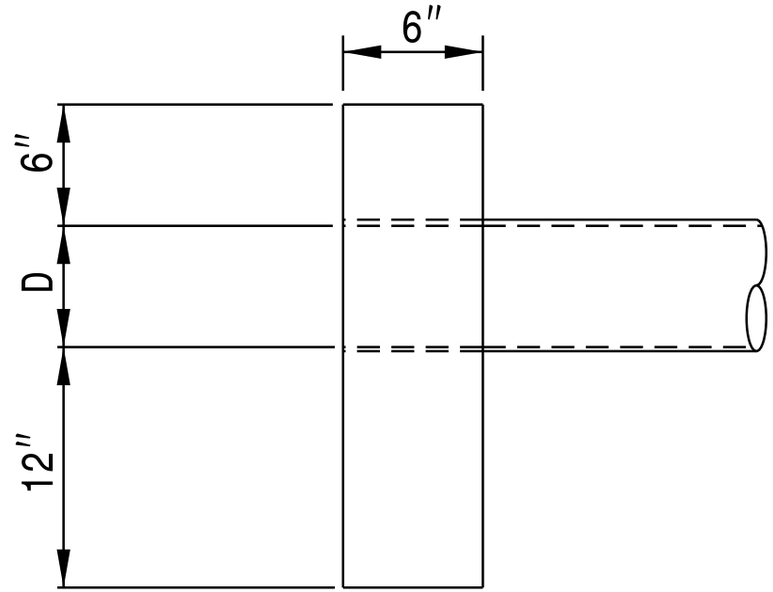


END ELEVATION

STATE OF
NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

1-24

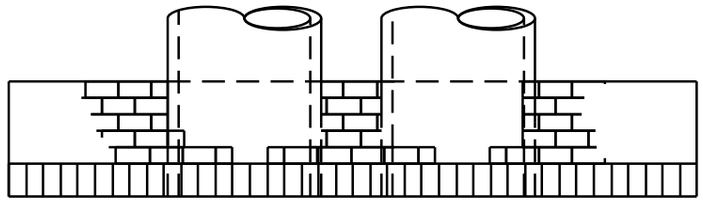
ROADWAY STANDARD DRAWING FOR

CONCRETE ENDWALL FOR OUTFALL

4″, 6″ OR 8″ PIPE

SHEET 1 OF 1

838.10



PLAN

GENERAL NOTES:

-ALL MORTAR JOINTS ARE ½″ ± ⅛″.

-BOND BRICKWORK WITH FULL HEADERS EVERY THREE COURSES.

-CONCAVE TOOL ALL EXPOSED JOINTS.

-DO NOT INTERPRET WALL THICKNESS (T) SHOWN AS THE THICKNESS ACCEPTABLE, BUT IS USED ONLY IN COMPUTING ENDWALL DIMENSIONS AND QUANTITIES.

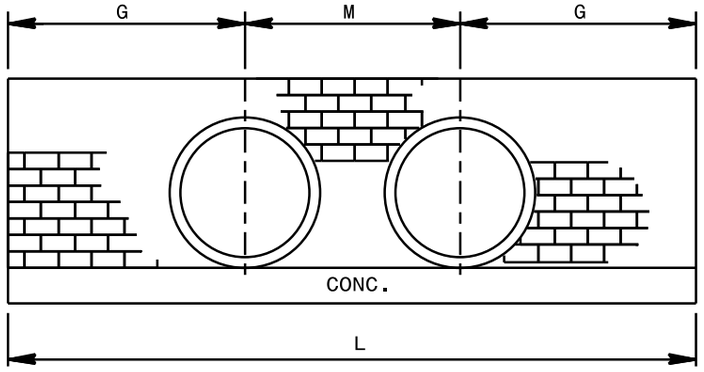
-CONSTRUCT THE BASE WITH FORMS.

-USE CLASS 'B' CONCRETE.

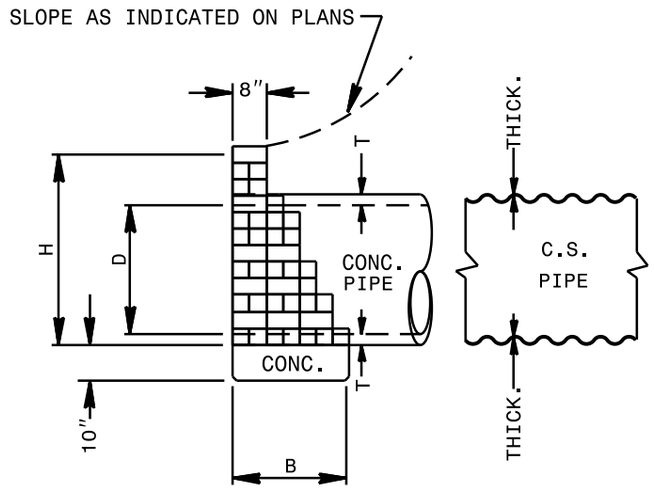
-PAY FOR CONCRETE AS BRICK MASONRY.

-CONCRETE BRICK MAY BE USED IN LIEU OF CLAY BRICK.

-JUMBO BRICK WILL BE PERMITTED.



ELEVATION



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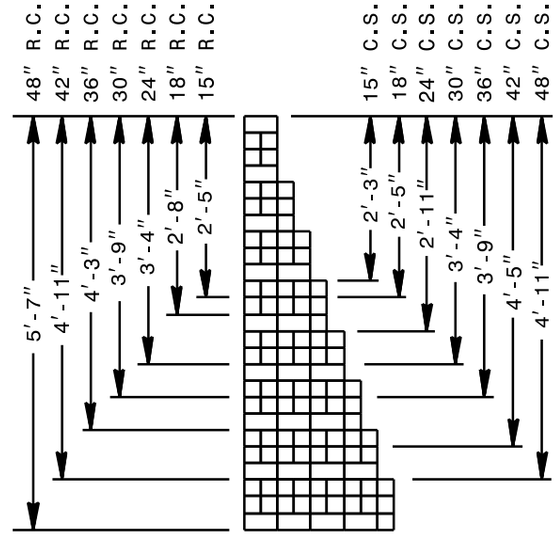

TYPICAL SECTION THRU WALL

DIMENSIONS AND QUANTITIES

USING CONCRETE PIPE												USING CORRUGATED METAL PIPE											
	COMMON DIMS.				SINGLE PIPE			DOUBLE PIPE					COMMON DIMS.				SINGLE PIPE			DOUBLE PIPE			
D	H	B	G	T	L	BRICK YD³	CONC. YD³	M	L	BRICK YD³	CONC. YD³	D	H	B	G	L	L	BRICK YD³	CONC. YD³	M	L	BRICK YD³	CONC. YD³
15″	2′-5″	1′-8″	2′-10″	1⅞″	5′-8″	0.441	0.291	2′-2″	7′-10″	0.555	0.403	15″	2′-3″	1′-4″	2′-9″	5′-6″	5′-6″	0.384	0.226	1′-11″	7′-5″	0.482	0.305
18″	2′-8″	1′-8″	3′-2″	2″	6′-4″	0.562	0.326	2′-7″	8′-11″	0.722	0.459	18″	2′-5″	1′-8″	3′-0″	6′-0″	6′-0″	0.478	0.309	2′-3″	8′-3″	0.605	0.424
24″	3′-4″	2′-0″	4′-1″	3″	8′-2″	1.008	0.504	3′-5″	11′-7″	1.285	0.715	24″	2′-11″	1′-8″	3′-9″	7′-6″	7′-6″	0.749	0.386	3′-0″	10′-6″	0.954	0.540
30″	3′-9″	2′-4″	4′-8″	3½″	9′-4″	1.391	0.672	4′-3″	13′-7″	1.820	0.978	30″	3′-4″	2′-0″	4′-5″	8′-10″	8′-10″	1.090	0.545	3′-9″	12′-7″	1.399	0.777
36″	4′-3″	2′-4″	5′-5″	4″	10′-10″	1.895	0.780	5′-0″	15′-10″	2.462	1.140	36″	3′-9″	2′-4″	5′-0″	10′-0″	10′-0″	1.503	0.720	4′-6″	14′-6″	1.965	1.044
42″	4′-11″	2′-8″	6′-4″	5¼″	12′-8″	2.867	1.043	5′-10″	18′-6″	3.729	1.523	42″	4′-5″	2′-8″	6′-0″	12′-0″	12′-0″	2.373	0.988	5′-3″	17′-3″	3.062	1.420
48″	5′-7″	3′-0″	7′-3″	5¾″	14′-6″	4.032	1.343	6′-8″	21′-2″	5.184	1.960	48″	4′-11″	2′-8″	6′-9″	13′-6″	13′-6″	3.102	1.111	6′-0″	19′-6″	4.002	1.606

STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

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ROADWAY STANDARD DRAWING FOR

BRICK ENDWALL FOR SINGLE AND DOUBLE PIPE CULVERTS

15″ THRU 48″ PIPE - 90° SKEW

SHEET 1 OF 1

838.11

GENERAL NOTES:

-ALL MORTAR JOINTS ARE ½″ ± ⅛″.

-BOND BRICKWORK WITH FULL HEADERS EVERY THREE COURSES.

-CONCAVE TOOL ALL EXPOSED JOINTS.

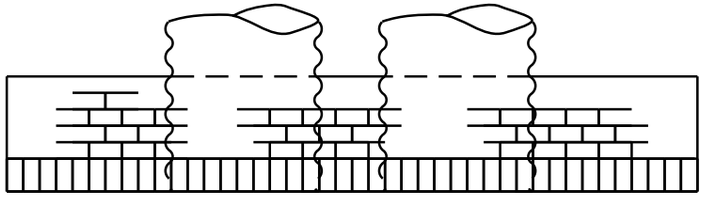
-CONSTRUCT THE BASE WITH FORMS.

-USE CLASS 'B' CONCRETE.

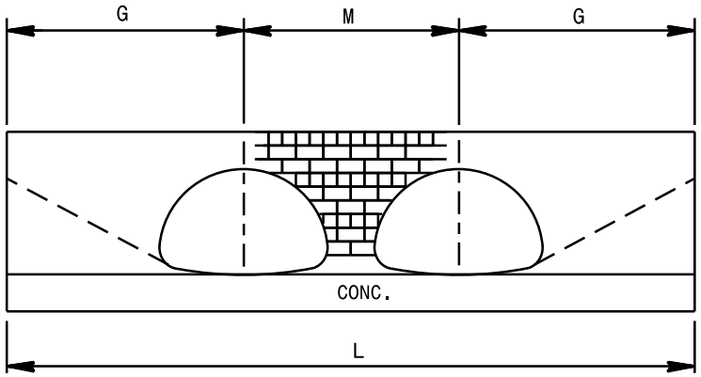
-PAY FOR CONCRETE AS BRICK MASONRY.

-CONCRETE BRICK MAY BE USED IN LIEU OF CLAY BRICK.

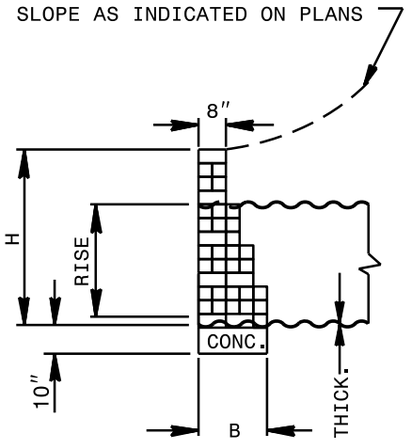
-JUMBO BRICK WILL BE PERMITTED.



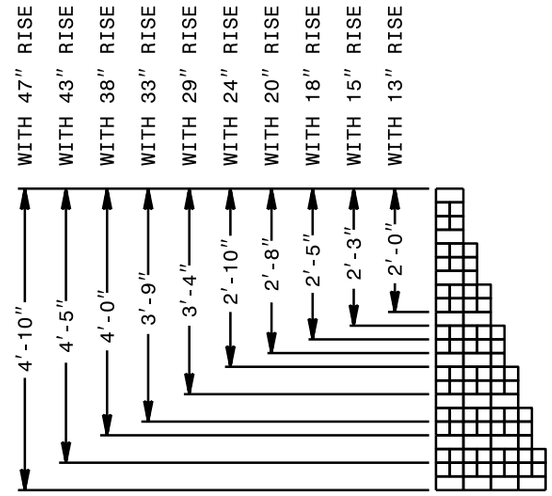
PLAN



ELEVATION



END ELEVATION



TYPICAL SECTION THRU WALL

DIMENSIONS AND BRICK QUANTITIES

COMMON DIMENSIONS						SINGLE PIPE			DOUBLE PIPE			
SPAN	RISE	GAGE	H	B	G	L	BRICK YD³	CONC. TD³	M	L	BRICK YD³	CONC. YD³
17″	13″	16	2′-0″	1′-4″	2′-9″	5′-6″	0.331	0.226	1′-10″	7′-4″	0.411	0.302
21″	15″	16	2′-3″	1′-4″	3′-1″	6′-2″	0.421	0.254	2′-4″	8′-6″	0.538	0.350
24″	18″	16	2′-5″	1′-8″	3′-7″	7′-2″	0.568	0.369	2′-8″	9′-10″	0.715	0.506
28″	20″	14	2′-8″	1′-8″	3′-11″	7′-10″	0.704	0.403	3′-1″	10′-11″	0.900	0.562
35″	24″	14	2′-10″	1′-8″	4′-7″	9′-2″	0.889	0.472	3′-10″	13′-0″	1.135	0.669
42″	29″	14	3′-4″	2′-0″	5′-5″	10′-10″	1.320	0.669	4′-8″	15′-6″	1.692	0.957
49″	33″	12	3′-9″	2′-4″	6′-1″	12′-2″	2.000	0.876	5′-5″	17′-7″	2.610	1.266
57″	38″	12	4′-0″	2′-4″	6′-11″	13′-10″	2.428	0.996	6′-4″	20′-2″	3.170	1.452
64″	43″	10	4′-5″	2′-8″	7′-9″	15′-6″	3.209	1.276	7′-1″	22′-7″	4.178	1.859
71″	47″	10	4′-10″	2′-8″	8′-10″	17′-8″	4.282	1.454	7′-10″	25′-6″	5.515	2.100

STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

1-24

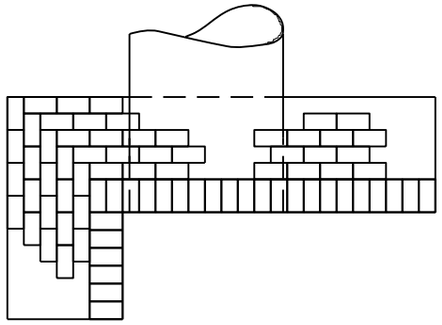
ROADWAY STANDARD DRAWING FOR

BRICK ENDWALL FOR SINGLE AND DOUBLE PIPE CULVERTS

17″ X 13″ THRU 71″ X 47″ PIPE ARCH 2 2/3 ″ X ½″ CORRUGATIONS - 90° SKEW

SHEET 1 OF 1

838.14



PLAN

GENERAL NOTES:

-ALL MORTAR JOINTS ARE ½" ± ⅛".

-BOND BRICKWORK WITH FULL HEADERS EVERY THREE COURSES.

-CONCAVE TOOL ALL EXPOSED JOINTS.

-DO NOT INTERPRET WALL THICKNESS (T) SHOWN AS THE THICKNESS ACCEPTABLE, BUT IS USED ONLY IN COMPUTING ENDWALL DIMENSIONS AND QUANTITIES.

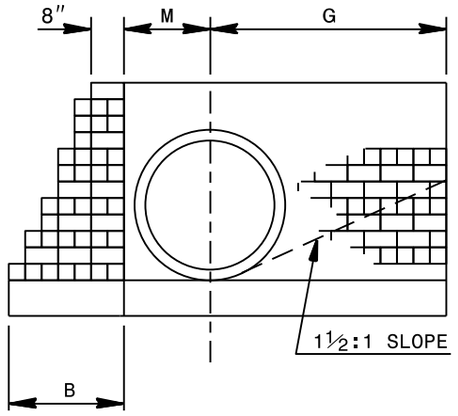
-CONSTRUCT THE BASE WITH FORMS.

-USE CLASS 'B' CONCRETE.

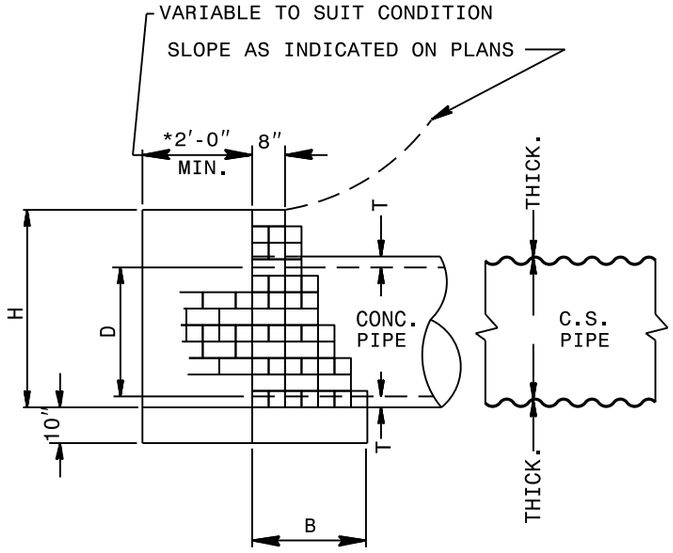
-PAY FOR CONCRETE AS BRICK MASONRY.

-CONCRETE BRICK MAY BE USED IN LIEU OF CLAY BRICK.

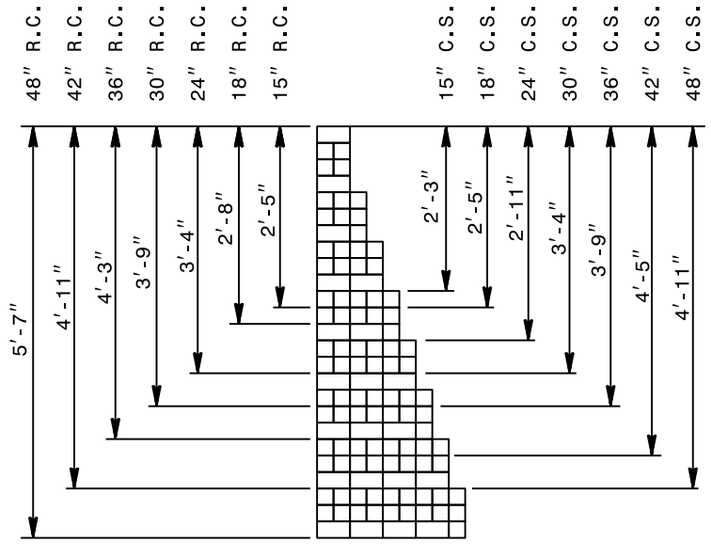
-JUMBO BRICK WILL BE PERMITTED.



ELEVATION



END ELEVATION



TYPICAL SECTION THRU WALL

*QUANTITIES BASED ON 2'-0"

DIMENSIONS AND CONCRETE QUANTITIES													
COMMON DIMENSIONS						USING R.C.P.		COMMON DIMENSIONS				USING C.S.P.	
D	H	B	G	M	T	BRICK YD³	CONC. YD³	H	B	G	M	BRICK YD³	CONC. YD³
15"	2'-5"	1'-8"	2'-10"	1'-0"	1⅞"	0.562	0.386	2'-3"	1'-4"	2'-9"	0'-11"	0.480	0.288
18"	2'-8"	1'-8"	3'-2"	1'-2"	2"	0.691	0.412	2'-5"	1'-8"	3'-0"	1'-0"	0.581	0.394
24"	3'-4"	2'-0"	4'-1"	1'-5"	3"	1.123	0.586	2'-11"	1'-8"	3'-9"	1'-3"	1.840	0.446
30"	3'-9"	2'-4"	4'-8"	1'-9"	3½"	1.513	0.774	3'-4"	2'-0"	4'-5"	1'-6"	1.167	0.612
36"	4'-3"	2'-4"	5'-5"	2'-0"	4"	1.958	0.846	3'-9"	2'-4"	5'-0"	1'-9"	1.562	0.798
42"	4'-11"	2'-8"	6'-4"	2'-4"	5¼"	2.841	1.097	4'-5"	2'-8"	6'-0"	2'-0"	2.318	1.043
48"	5'-7"	3'-0"	7'-3"	2'-8"	5¾"	3.865	1.381	4'-11"	2'-8"	6'-9"	2'-3"	2.929	1.125

1-24

STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

ROADWAY STANDARD DRAWING FOR

BRICK "L" ENDWALL FOR SINGLE PIPE CULVERTS

15" THRU 48" PIPE

GENERAL NOTES:

-ALL MORTAR JOINTS ARE ½" ± ⅛".

-BOND BRICKWORK WITH FULL HEADERS EVERY THREE COURSES.

-CONCAVE TOOL ALL EXPOSED JOINTS.

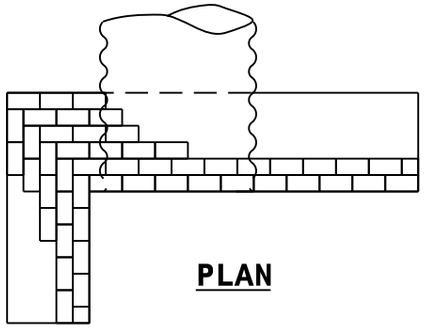
-CONSTRUCT THE BASE WITH FORMS.

-USE CLASS 'B' CONCRETE.

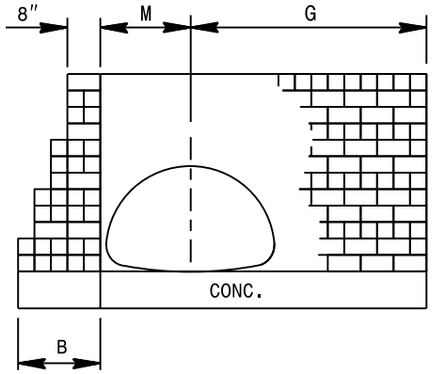
-PAY FOR CONCRETE AS BRICK MASONRY.

-CONCRETE BRICK MAY BE USED IN LIEU OF CLAY BRICK.

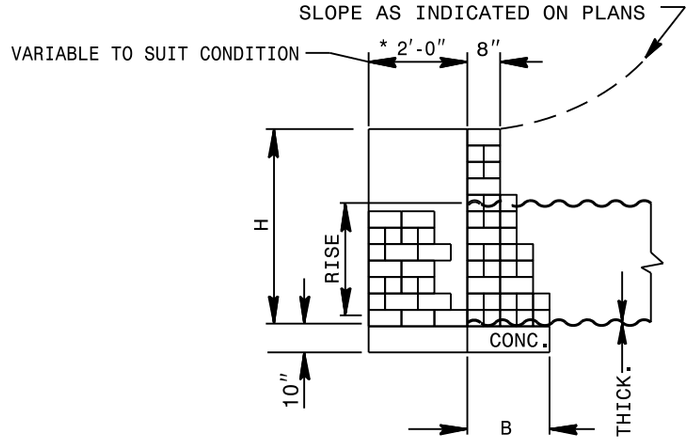
-JUMBO BRICK WILL BE PERMITTED.



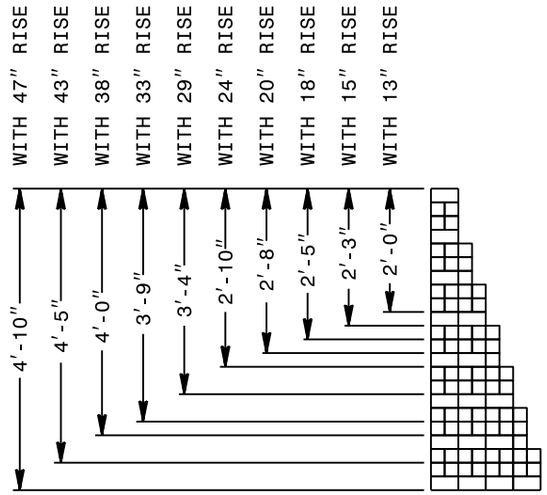
PLAN



ELEVATION



END ELEVATION



TYPICAL SECTION THRU WALL

DIMENSIONS AND QUANTITIES

COMMON DIMENSIONS							QUANTITIES	
SPAN	RISE	GAGE	H	B	C	M	BRICK YD^3	CONC. YD^3
17"	13"	16	2'-0"	1'-4"	2'-9"	1'-0"	0.417	0.291
21"	15"	16	2'-3"	1'-4"	3'-1"	1'-2"	0.511	0.312
24"	18"	16	2'-5"	1'-8"	3'-7"	1'-3"	0.643	0.437
28"	20"	14	2'-8"	1'-8"	3'-11"	1'-5"	0.780	0.463
35"	24"	14	2'-10"	1'-8"	4'-7"	1'-9"	0.940	0.514
42"	29"	14	3'-4"	2'-0"	5'-5"	2'-0"	1.320	0.705
49"	33"	12	3'-9"	2'-4"	6'-1"	2'-4"	1.763	0.918
57"	38"	12	4'-0"	2'-4"	6'-11"	2'-8"	2.124	1.002
64"	43"	10	4'-5"	2'-8"	7'-9"	2'-11"	2.690	1.262
71"	47"	10	4'-10"	2'-8"	8'-10"	3'-3"	3.500	1.379

* QUANTITIES BASED ON 2'-0"

STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

1-24

ROADWAY STANDARD DRAWING FOR

BRICK "L" ENDWALL FOR SINGLE PIPE CULVERTS

17" X 13" THRU 71" X 47" PIPE ARCH 2 2/3 " X 1/2" CORRUGATIONS

SHEET 1 OF 1

838.16

GENERAL NOTES:

-ALL MORTAR JOINTS ARE ½" ± ⅛".

-BOND BRICKWORK WITH FULL HEADERS EVERY THREE COURSES.

-CONCAVE TOOL ALL EXPOSED JOINTS.

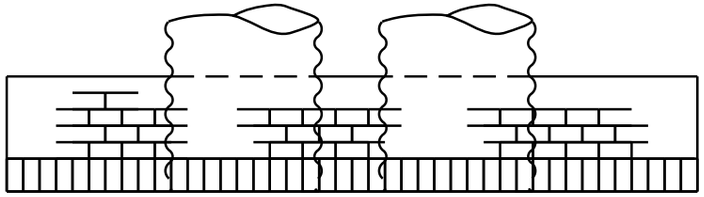
-CONSTRUCT THE BASE WITH FORMS.

-USE CLASS 'B' CONCRETE.

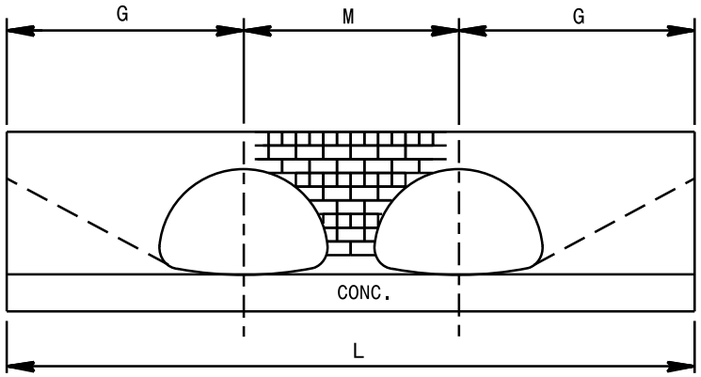
-PAY FOR CONCRETE AS BRICK MASONRY.

-CONCRETE BRICK MAY BE USED IN LIEU OF CLAY BRICK.

-JUMBO BRICK WILL BE PERMITTED.



PLAN



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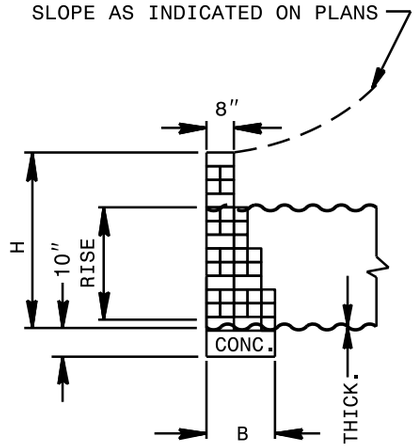

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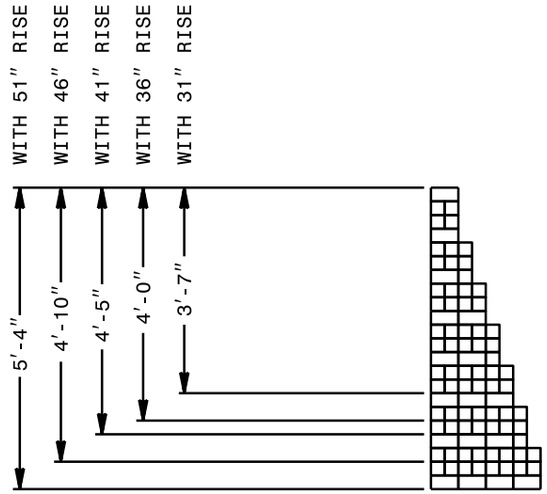

TYPICAL SECTION THRU WALL

DIMENSIONS AND BRICK QUANTITIES

COMMON DIMENSIONS						SINGLE PIPE			DOUBLE PIPE			
SPAN	RISE	GAGE	H	B	G	L	BRICK YD^3	CONC. YD^3	M	L	BRICK YD^3	CONC. YD^3
40"	31"	0.109	3'-7"	2'-0"	5'-8"	11'-4"	1.572	0.700	4'-5"	15'-9"	1.968	0.972
46"	36"	0.109	4'-0"	2'-4"	6'-5"	12'-10"	2.154	0.924	5'-1"	17'-11"	2.692	1.290
53"	41"	0.109	4'-5"	2'-8"	7'-2"	14'-4"	2.848	1.180	5'-10"	20'-2"	3.575	1.660
60"	46"	0.109	4'-10"	2'-8"	8'-0"	16'-0"	3.726	1.317	6'-8"	22'-8"	4.712	1.866
66"	51"	0.109	5'-4"	3'-0"	8'-10"	17'-8"	4.787	1.636	7'-4"	25'-0"	6.031	2.315

STATE OF NORTH CAROLINA
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ROADWAY STANDARD DRAWING FOR

BRICK ENDWALL FOR SINGLE AND DOUBLE PIPE CULVERTS

40"X31" THRU 66"X51" PIPE ARCH 3"X1" CORRUGATIONS - 90° SKEW

SHEET 1 OF 1

838.17

GENERAL NOTES:

-ALL MORTAR JOINTS ARE ½" ± ⅛".

-BOND BRICKWORK WITH FULL HEADERS EVERY THREE COURSES.

-CONCAVE TOOL ALL EXPOSED JOINTS.

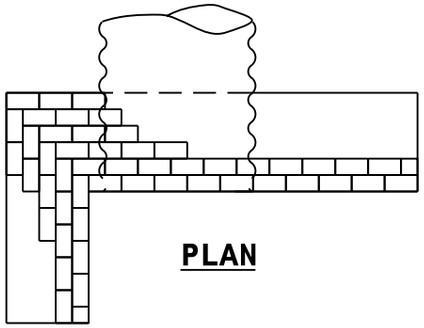
-CONSTRUCT THE BASE WITH FORMS.

-USE CLASS 'B' CONCRETE.

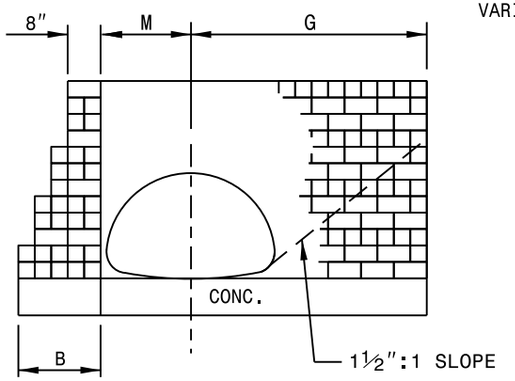
-PAY FOR CONCRETE AS BRICK MASONRY.

-CONCRETE BRICK MAY BE USED IN LIEU OF CLAY BRICK.

-JUMBO BRICK WILL BE PERMITTED.



PLAN



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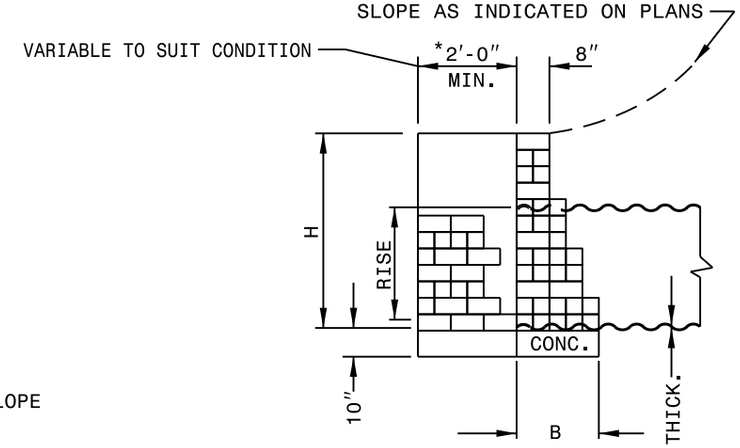

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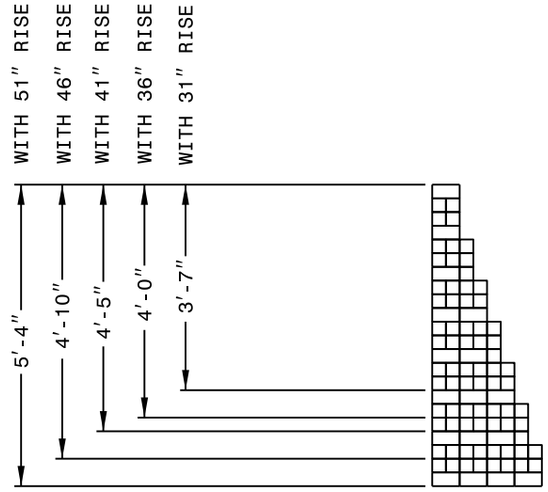


TYPICAL SECTION THRU WALL

* QUANTITIES BASED ON 2'-0"

DIMENSIONS AND QUANTITIES								
COMMON DIMENSIONS							QUANTITIES	
SPAN	RISE	THICK	H	B	G	M	BRICK YD³	CONC. YD³
40"	31"	0.109	3'-7"	2'-0"	5'-8"	1'-11"	1.525	0.715
46"	36"	0.109	4'-0"	2'-4"	6'-5"	2'-2"	2.025	0.930
53"	41"	0.109	4'-5"	2'-8"	7'-2"	2'-6"	2.626	1.180
60"	46"	0.109	4'-10"	2'-8"	8'-0"	2'-9"	3.332	1.269
66"	51"	0.109	5'-4"	3'-0"	8'-10"	3'-0"	4.074	1.560

1-24

STATE OF
NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

ROADWAY STANDARD DRAWING FOR

BRICK ENDWALL FOR SINGLE PIPE CULVERTS

40"X31" THRU 66"X51" PIPE ARCH 3"X1" CORRUGATIONS

SHEET 1 OF 1

838.18

GENERAL NOTES:

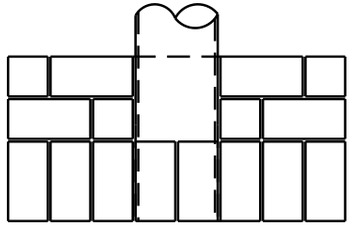
-ALL MORTAR JOINTS ARE ½" ± ⅛".

-BOND BRICKWORK WITH FULL HEADERS EVERY THREE COURSES.

-CONCAVE TOOL ALL EXPOSED JOINTS.

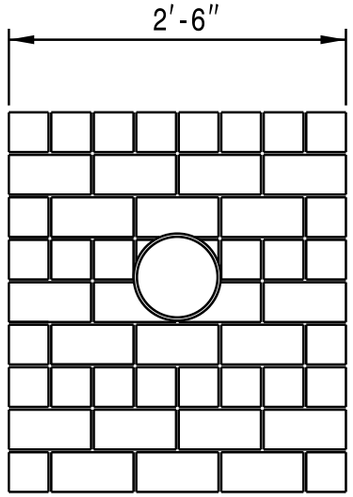
-CONCRETE BRICK MAY BE USED IN LIEU OF CLAY BRICK.

-JUMBO BRICK WILL BE PERMITTED.



PLAN

CONCRETE QUANTITIES				
D	H	REINF. CONC.	BIT. FIBER	CORR. PLASTIC OR METAL
		YD^3	YD^3	YD^3
4"	1'-9"	0.140	0.141	0.142
6"	2'-0"	0.163	0.164	0.166
8"	2'-3"	0.186	0.187	0.190



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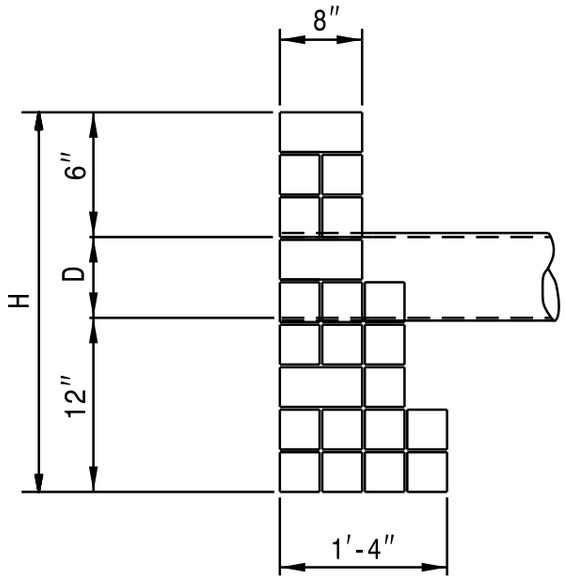

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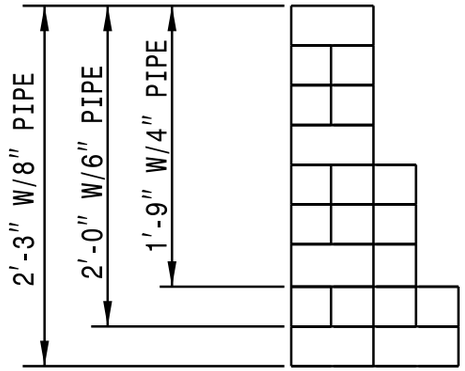


TYPICAL SECTION THRU WALL

STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

1-24

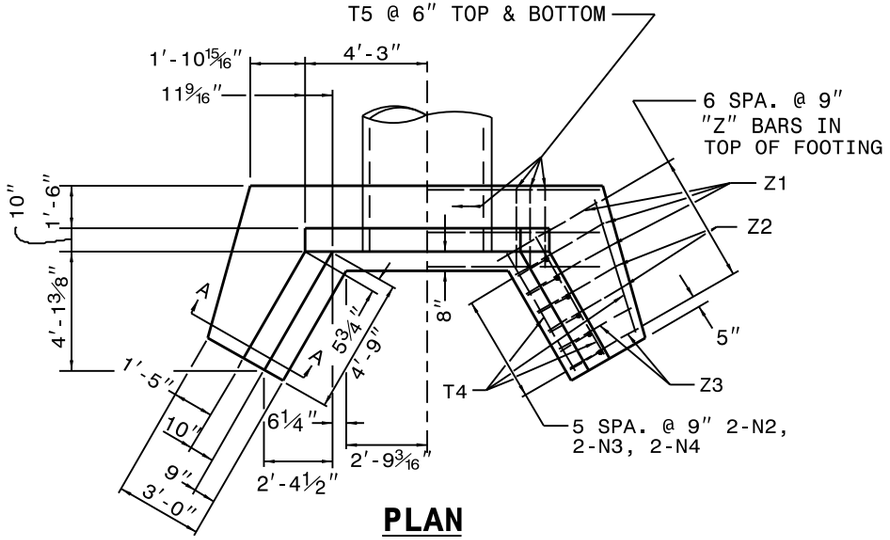
ROADWAY STANDARD DRAWING FOR

BRICK ENDWALL FOR OUTFALL

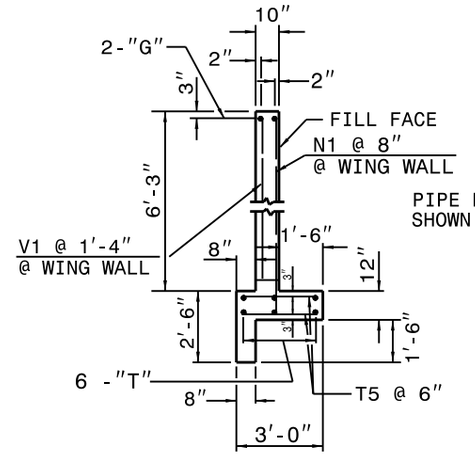
4", 6" OR 8" PIPE

SHEET 1 OF 1

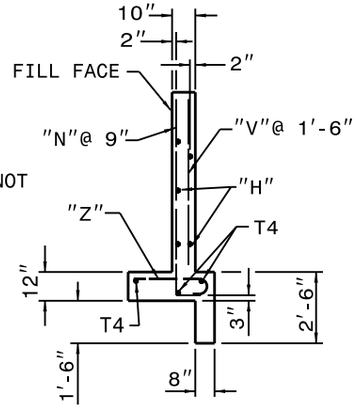
838.20



PLAN

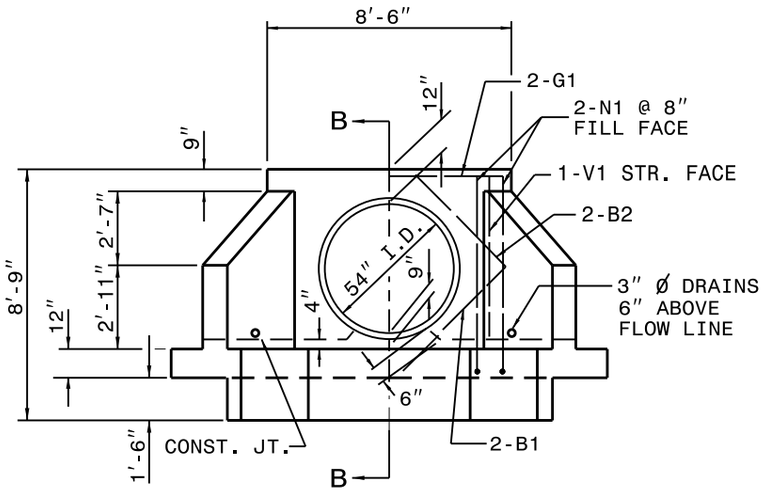


SECTION - BB



SECTION - AA

SEE STD. DWG. 838.45 FOR GENERAL NOTES.



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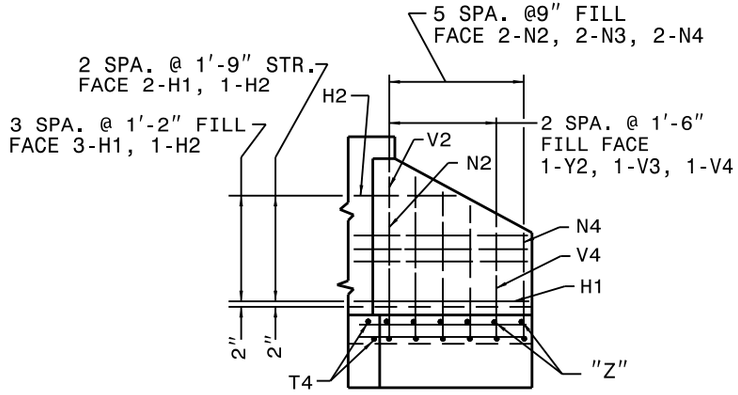
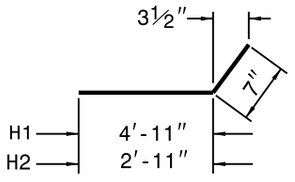
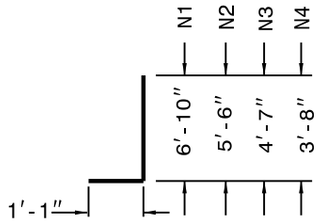


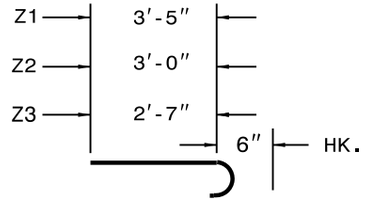
WING ELEVATION



"H" BARS



"N" BARS



"Z" BARS

"H", "N", & "Z" BAR DIMENSIONS ARE OUT TO OUT.

BILL OF MATERIAL FOR ENDWALL

REINF. STEEL			1 PIPE	
BAR	SIZE	LENGTH	NO.	WEIGHT
B1	#4	5'-6"	4	15
B2	#4	4'-6"	4	12
G1	#7	8'-2"	2	33
H1	#4	5'-6"	10	37
H2	#4	3'-6"	4	9
N1	#4	7'-11"	4	21
N2	#4	6'-7"	4	18
N3	#4	5'-8"	4	15
N4	#4	4'-9"	4	13
T1	#4	11'-10"	6	47
T4	#4	5'-3"	6	21
T5	#4	2'-6"	34	57
V1	#4	5'-9"	2	8
V2	#4	4'-10"	2	6
V3	#4	3'-11"	2	5
V4	#4	3'-1"	2	4
Z1	#4	3'-11"	6	16
Z2	#4	3'-6"	4	9
Z3	#4	3'-1"	4	8
REINF. STEEL LBS.			X	354
CON./R.C. CU. YDS			5.0	

STATE OF
NORTH CAROLINA
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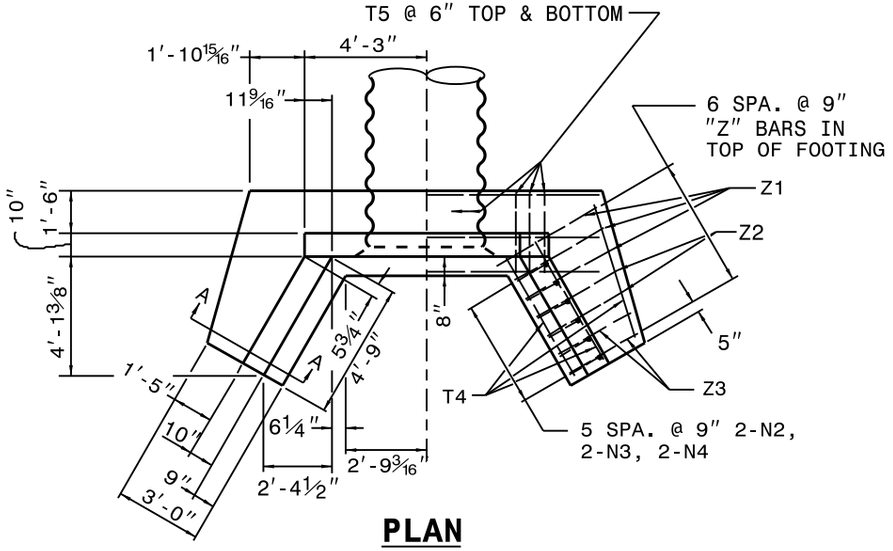
ROADWAY STANDARD DRAWING FOR

REINFORCED CONCRETE ENDWALL

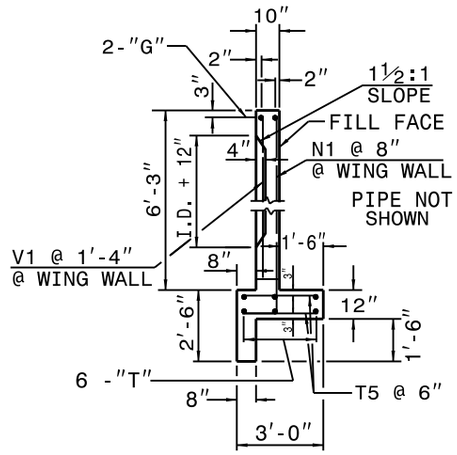
FOR SINGLE 54" PIPE - 90° SKEW

SHEET 1 OF 2

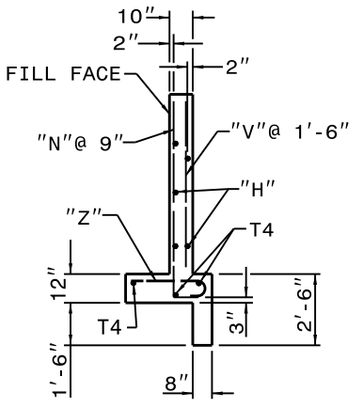
838.21



PLAN



SECTION - BB

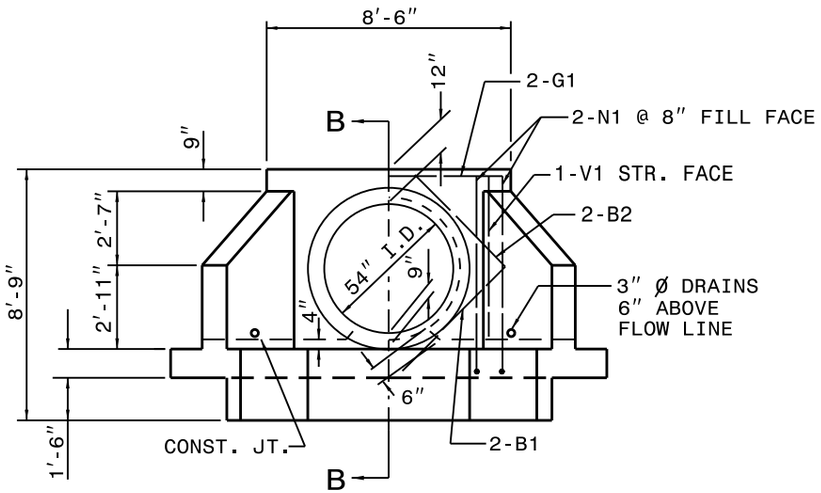


SECTION - AA

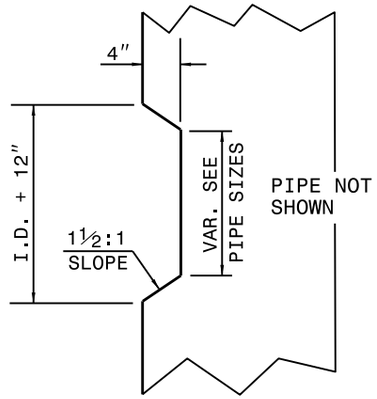
SEE STD. DWG. 838.45 FOR GENERAL NOTES.

BILL OF MATERIAL FOR ENDWALL

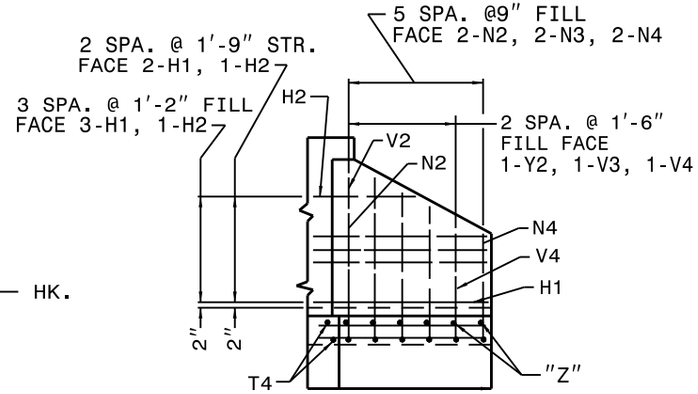
REINF. STEEL			1 PIPE	
BAR	SIZE	LENGTH	NO.	WEIGHT
B1	#4	5'-6"	4	15
B2	#4	4'-6"	4	12
G1	#7	8'-2"	2	33
H1	#4	5'-6"	10	37
H2	#4	3'-6"	4	9
N1	#4	7'-11"	4	21
N2	#4	6'-7"	4	18
N3	#4	5'-8"	4	15
N4	#4	4'-9"	4	13
T1	#4	11'-10"	6	47
T4	#4	5'-3"	6	21
T5	#4	2'-6"	34	57
V1	#4	5'-9"	2	8
V2	#4	4'-10"	2	6
V3	#4	3'-11"	2	5
V4	#4	3'-1"	2	4
Z1	#4	3'-11"	6	16
Z2	#4	3'-6"	4	9
Z3	#4	3'-1"	4	8
REINF. STEEL LBS.			X	354
CON./C.S. CU. YDS			5.2	



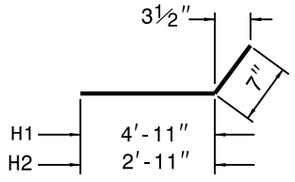
ELEVATION



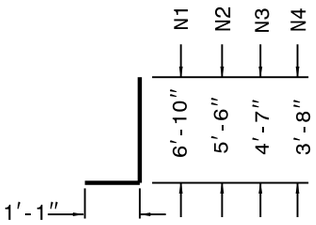
TAPER DETAIL



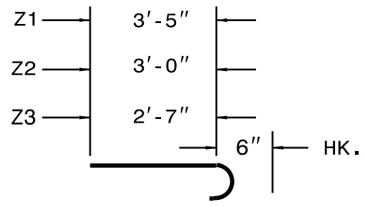
WING ELEVATION



"H" BARS



"N" BARS



"Z" BARS

"H", "N", & "Z" BAR DIMENSIONS ARE OUT TO OUT.

STATE OF
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RALEIGH, N.C.

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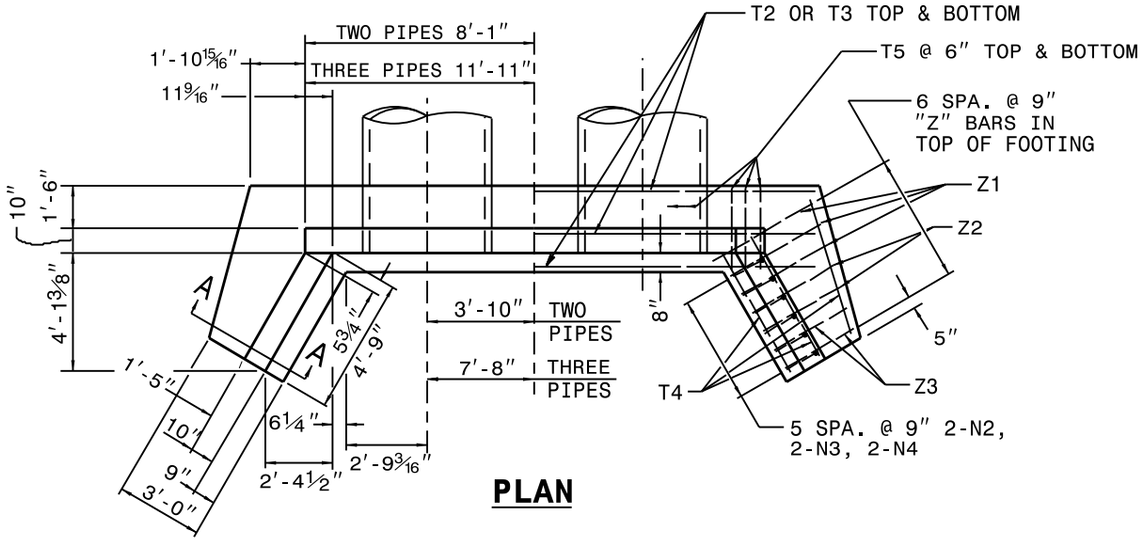
ROADWAY STANDARD DRAWING FOR

REINFORCED CONCRETE ENDWALL

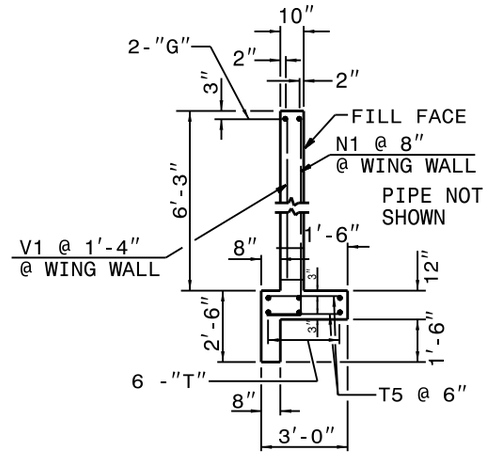
FOR SINGLE 54" PIPE - 90° SKEW

SHEET 2 OF 2

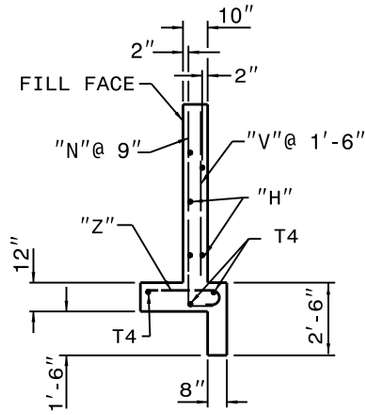
838.21



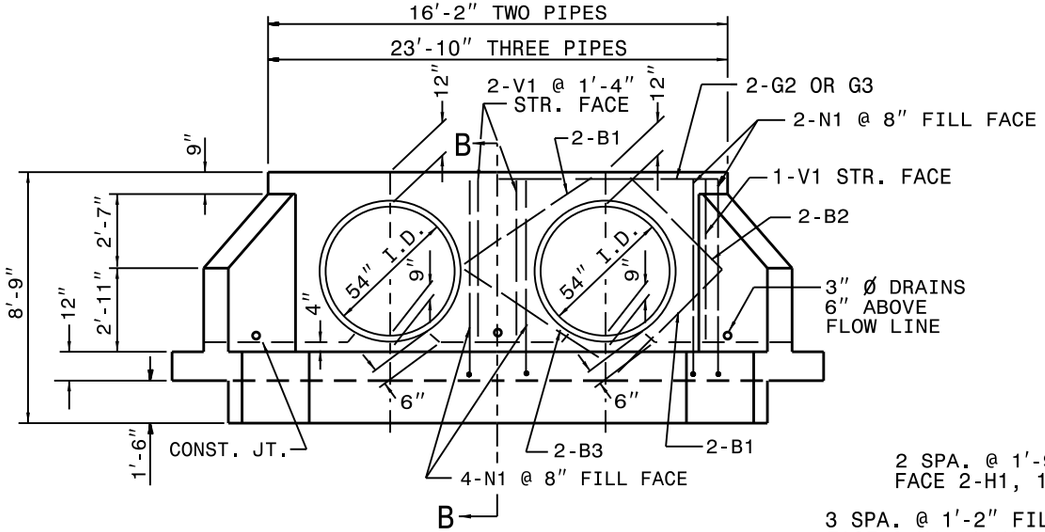
PLAN



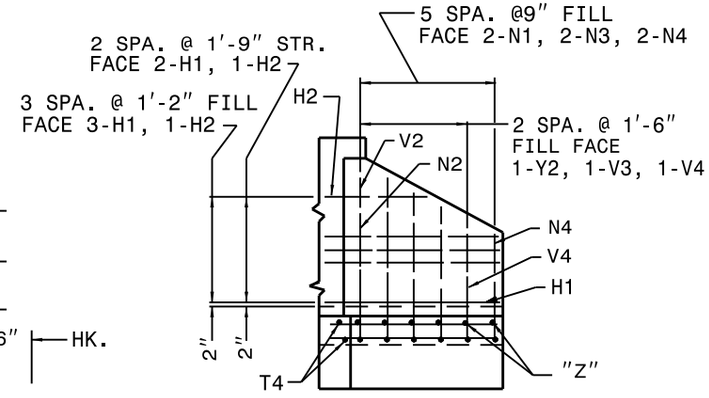
SECTION - BB



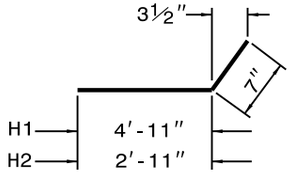
SECTION - AA



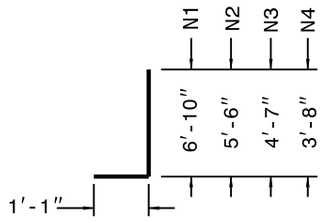
ELEVATION



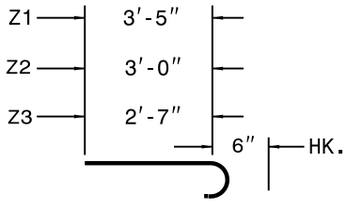
WING ELEVATION



"H" BARS



"N" BARS



"Z" BARS

"H", "N", & "Z" BAR DIMENSIONS ARE OUT TO OUT.

SEE STD. # 838.45 FOR GENERAL NOTES.

BILL OF MATERIAL FOR ENDWALL

REINF. STEEL			2 PIPES		3 PIPES	
BAR	SIZE	LENGTH	NO.	WEIGHT	NO.	WEIGHT
B1	#4	5′-6″	8	29	12	44
B2	#4	4′-6″	4	12	4	12
B3	#4	6′-0″	4	16	8	32
G1	#7	8′-2″	-	-	-	-
G2	#7	15′-10″	2	65	-	-
G3	#7	23′-6″	-	-	2	96
H1	#4	5′-6″	10	37	10	37
H2	#4	3′-6″	4	9	4	9
N1	#4	7′-11″	8	42	12	63
N2	#4	6′-7″	4	18	4	18
N3	#4	5′-8″	4	15	4	15
N4	#4	4′-9″	4	13	4	13
T1	#4	11′-10″	-	-	-	-
T2	#4	19′-6″	6	78	-	-
T3	#4	27′-2″	-	-	6	109
T4	#4	5′-3″	6	21	6	21
T5	#4	2′-6″	64	107	96	160
V1	#4	5′-9″	12	46	18	69
V2	#4	4′-10″	6	19	6	19
V3	#4	3′-11″	6	16	6	16
V4	#4	3′-1″	6	12	6	12
Z1	#4	3′-11″	6	16	6	16
Z2	#4	3′-6″	4	9	4	9
Z3	#4	3′-1″	4	8	4	8
REINF. STEEL LBS.				588		778
CON./R.C. CU. YDS				6.9		8.8

STATE OF
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RALEIGH, N.C.

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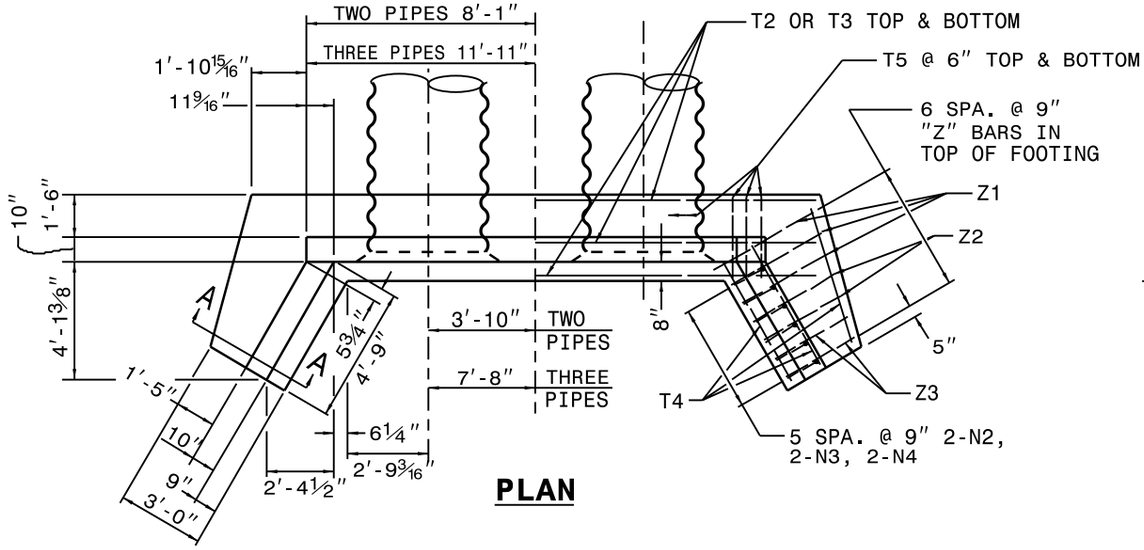
ROADWAY STANDARD DRAWING FOR

REINFORCED CONCRETE ENDWALL

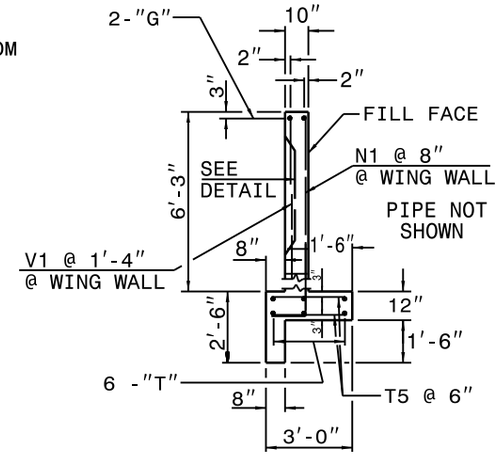
FOR DOUBLE & TRIPLE 54″ PIPE - 90° SKEW

SHEET 1 OF 2

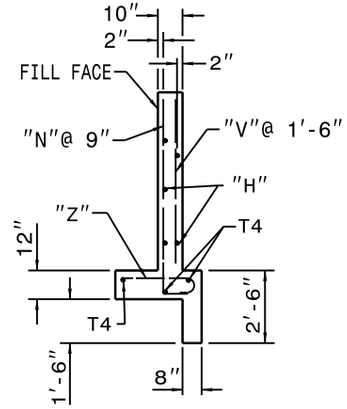
838.22



PLAN

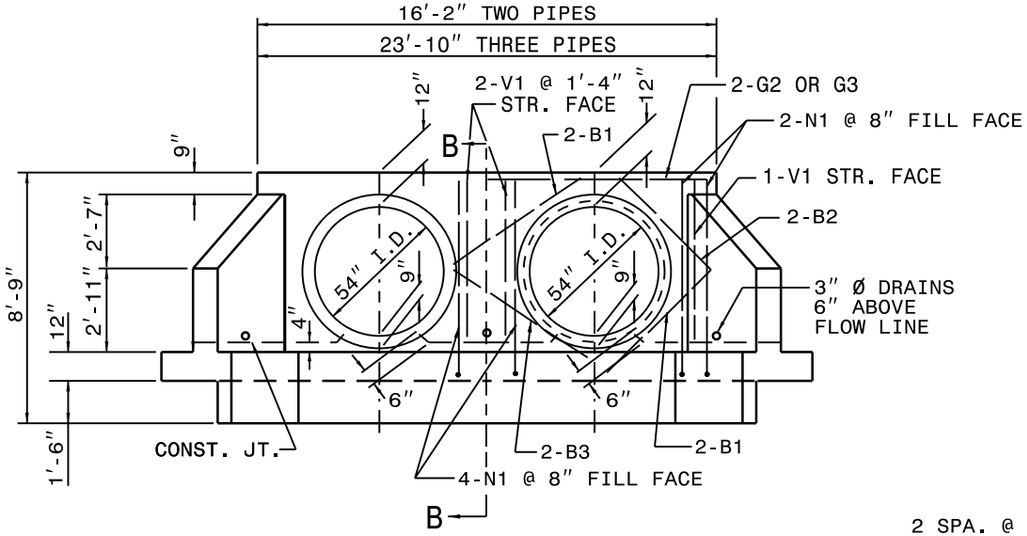


SECTION - BB

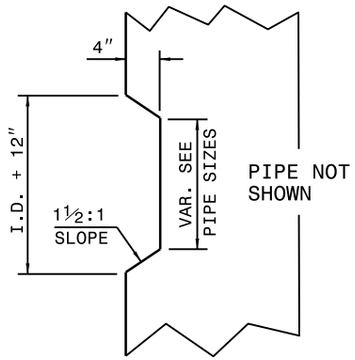


SECTION - AA

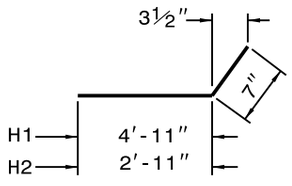
SEE STD. # 838.45 FOR GENERAL NOTES.



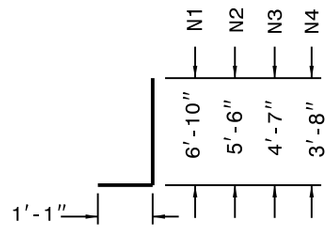
ELEVATION



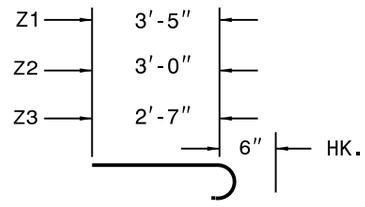
TAPER DETAIL



"H" BARS

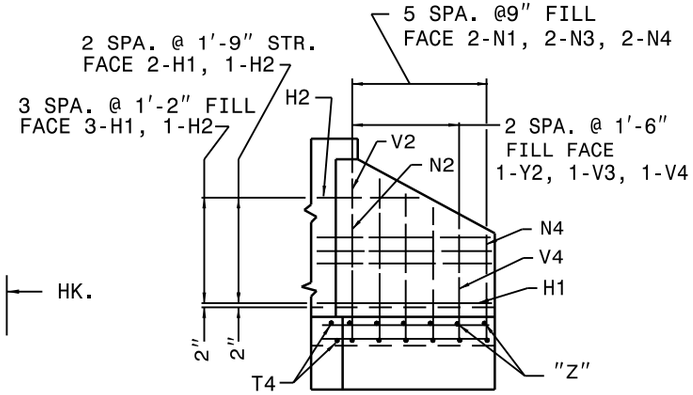


"N" BARS



"Z" BARS

"H", "N", & "Z" BAR DIMENSIONS ARE OUT TO OUT.



WING ELEVATION

BILL OF MATERIAL FOR ENDWALL

REINF. STEEL			2 PIPES		3 PIPES	
BAR	SIZE	LENGTH	NO.	WEIGHT	NO.	WEIGHT
B1	#4	5'-6"	8	29	12	44
B2	#4	4'-6"	4	12	4	12
B3	#4	6'-0"	4	16	8	32
G1	#7	8'-2"	-	-	-	-
G2	#7	15'-10"	2	65	-	-
G3	#7	23'-6"	-	-	2	96
H1	#4	5'-6"	10	37	10	37
H2	#4	3'-6"	4	9	4	9
N1	#4	7'-11"	8	42	12	63
N2	#4	6'-7"	4	18	4	18
N3	#4	5'-8"	4	15	4	15
N4	#4	4'-9"	4	13	4	13
T1	#4	11'-10"	-	-	-	-
T2	#4	19'-6"	6	78	-	-
T3	#4	27'-2"	-	-	6	109
T4	#4	5'-3"	6	21	6	21
T5	#4	2'-6"	64	107	96	160
V1	#4	5'-9"	12	46	18	69
V2	#4	4'-10"	6	19	6	19
V3	#4	3'-11"	6	16	6	16
V4	#4	3'-1"	6	12	6	12
Z1	#4	3'-11"	6	16	6	16
Z2	#4	3'-6"	4	9	4	9
Z3	#4	3'-1"	4	8	4	8
REINF. STEEL LBS.				588		778
CON./C.S. CU. YDS				7.3		9.4

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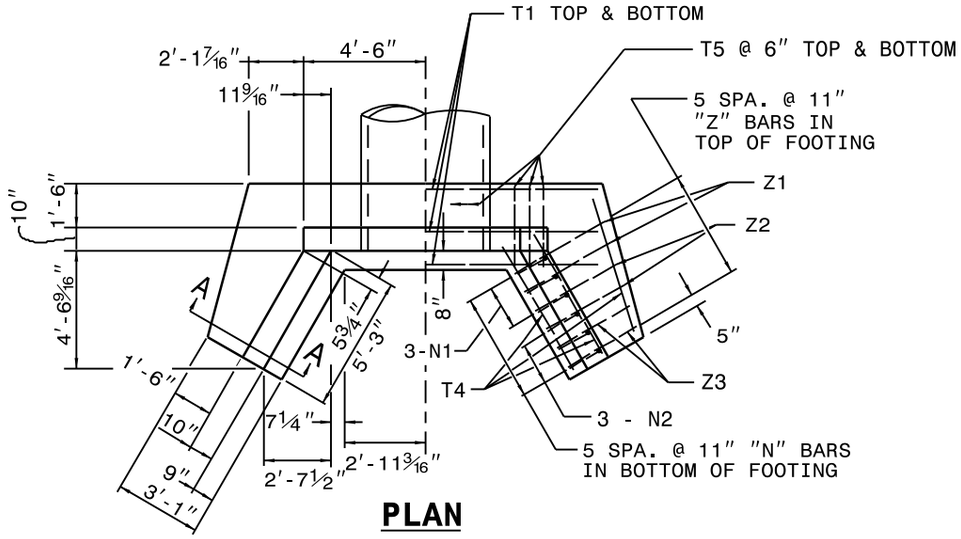
ROADWAY STANDARD DRAWING FOR

REINFORCED CONCRETE ENDWALL

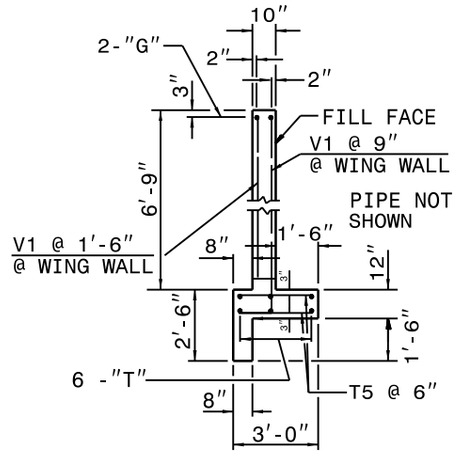
FOR DOUBLE & TRIPLE 54" PIPE - 90° SKEW

SHEET 2 OF 2

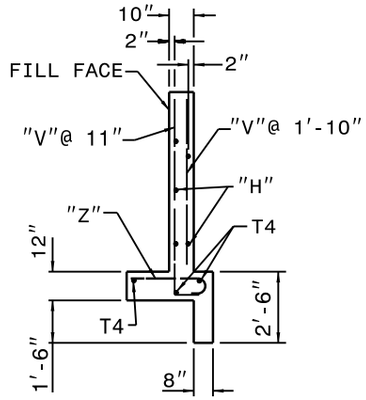
838.22



PLAN

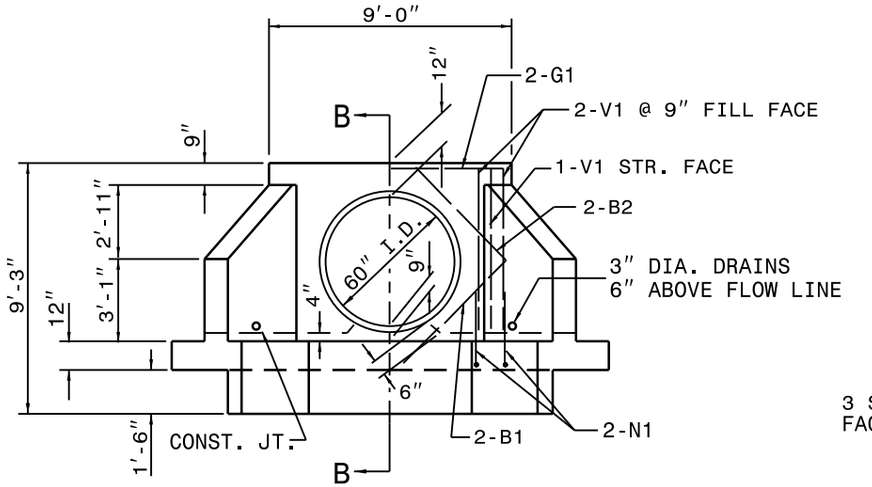


SECTION - BB

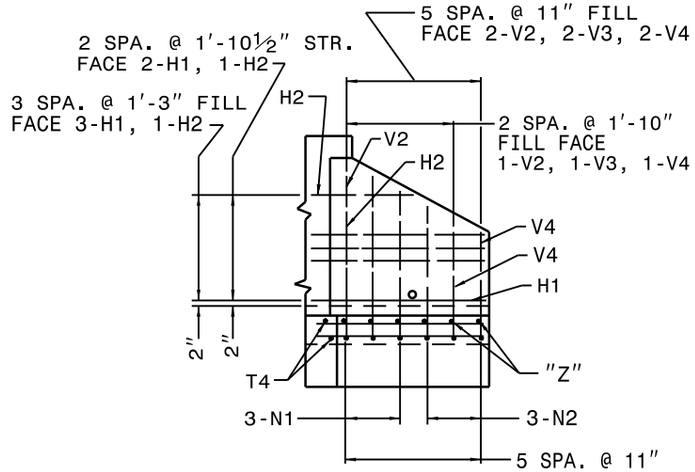


SECTION - AA

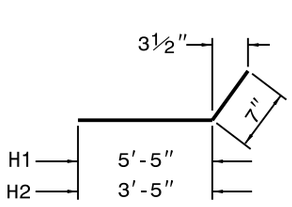
SEE STD. # 838.45 FOR GENERAL NOTES.



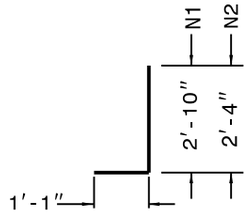
ELEVATION



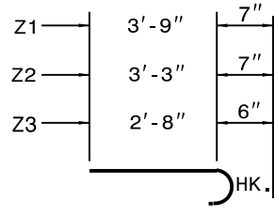
WING ELEVATION



"H" BARS



"N" BARS



"Z" BARS

"H", "N", & "Z" BAR DIMENSIONS ARE OUT TO OUT.

BILL OF MATERIAL FOR ENDWALL

REINF. STEEL			1 PIPE	
BAR	SIZE	LENGTH	NO.	WEIGHT
B1	#4	5'-6"	4	15
B2	#4	4'-6"	4	12
G1	#7	8'-8"	2	35
H1	#4	6'-0"	10	40
H2	#4	4'-0"	4	11
N1	#5	3'-11"	10	41
N2	#4	3'-5"	6	14
T1	#4	12'-8"	6	51
T4	#4	5'-6"	6	22
T5	#4	2'-6"	36	60
V1	#4	6'-3"	6	25
V2	#4	5'-1"	6	20
V3	#4	3'-11"	6	16
V4	#4	2'-9"	6	11
Z1	#5	4'-4"	4	18
Z2	#4	3'-10"	4	10
Z3	#4	3'-2"	4	8
REINF. STEEL LBS.				409
CON./R.C. CU. YDS				5.6

STATE OF NORTH CAROLINA
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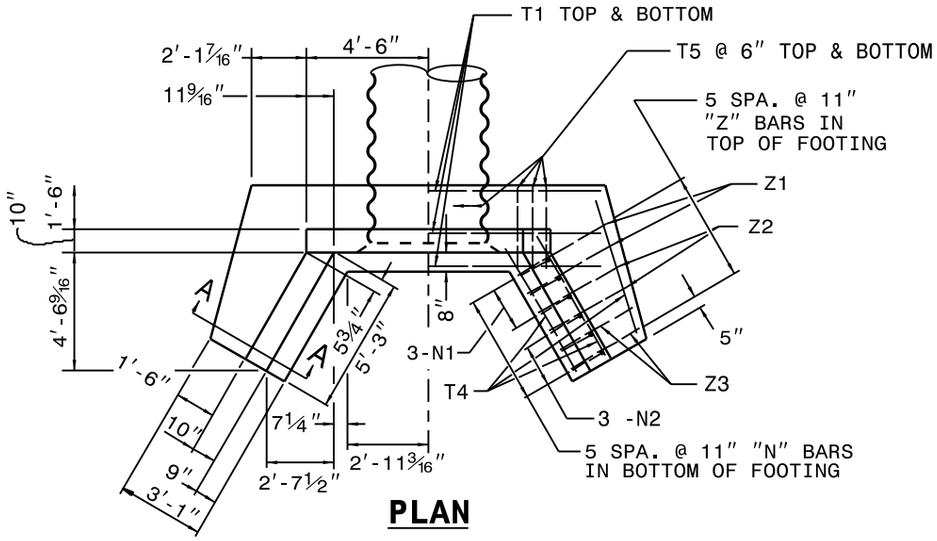
ROADWAY STANDARD DRAWING FOR

REINFORCED CONCRETE ENDWALL

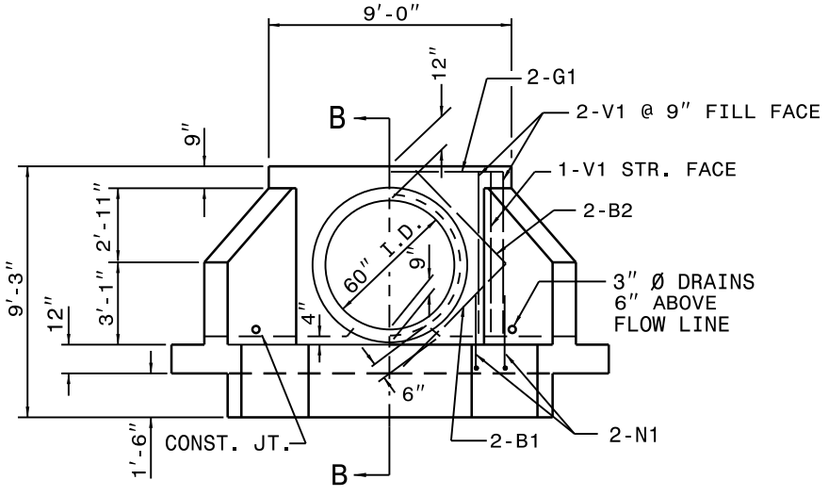
FOR SINGLE 60" PIPE - 90° SKEW

SHEET 1 OF 2

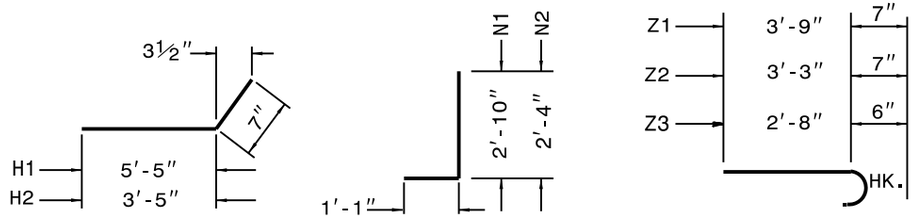
838.27



PLAN

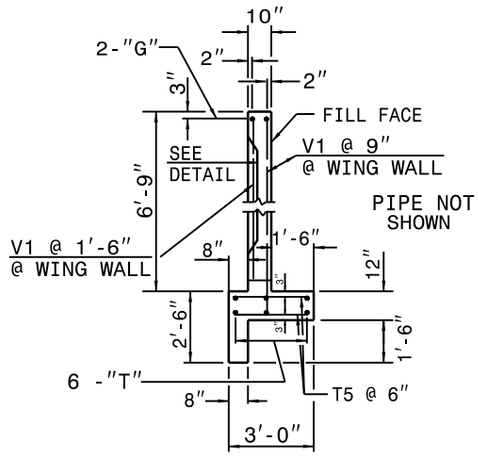


ELEVATION

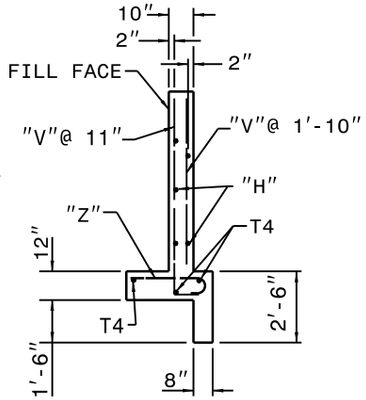


"H" BARS **"N" BARS** **"Z" BARS**

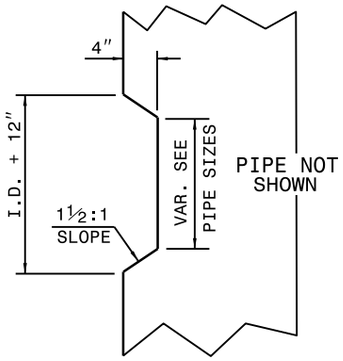
"H", "N", & "Z" BAR DIMENSIONS ARE OUT TO OUT.



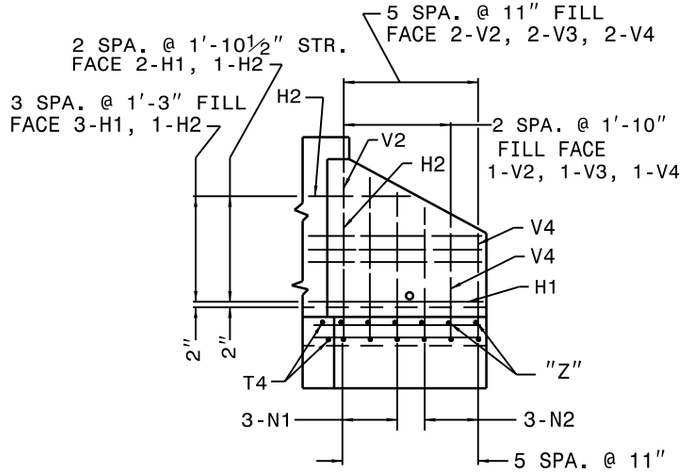
SECTION - BB



SECTION - AA



TAPER DETAIL



WING ELEVATION

SEE STD. # 838.45 FOR GENERAL NOTES.

BILL OF MATERIAL FOR ENDWALL

REINF. STEEL			1 PIPE	
BAR	SIZE	LENGTH	NO.	WEIGHT
B1	#4	5'-6"	4	15
B2	#4	4'-6"	4	12
G1	#7	8'-8"	2	35
H1	#4	6'-0"	10	40
H2	#4	4'-0"	4	11
N1	#5	3'-11"	10	41
N2	#4	3'-5"	6	14
T1	#4	12'-8"	6	51
T4	#4	5'-6"	6	22
T5	#4	2'-6"	36	60
V1	#4	6'-3"	6	25
V2	#4	5'-1"	6	20
V3	#4	3'-11"	6	16
V4	#4	2'-9"	6	11
Z1	#5	4'-4"	4	18
Z2	#4	3'-10"	4	10
Z3	#4	3'-2"	4	8
REINF. STEEL LBS.				409
CON./C.S. CU. YDS			5.9	

STATE OF NORTH CAROLINA
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ROADWAY STANDARD DRAWING FOR

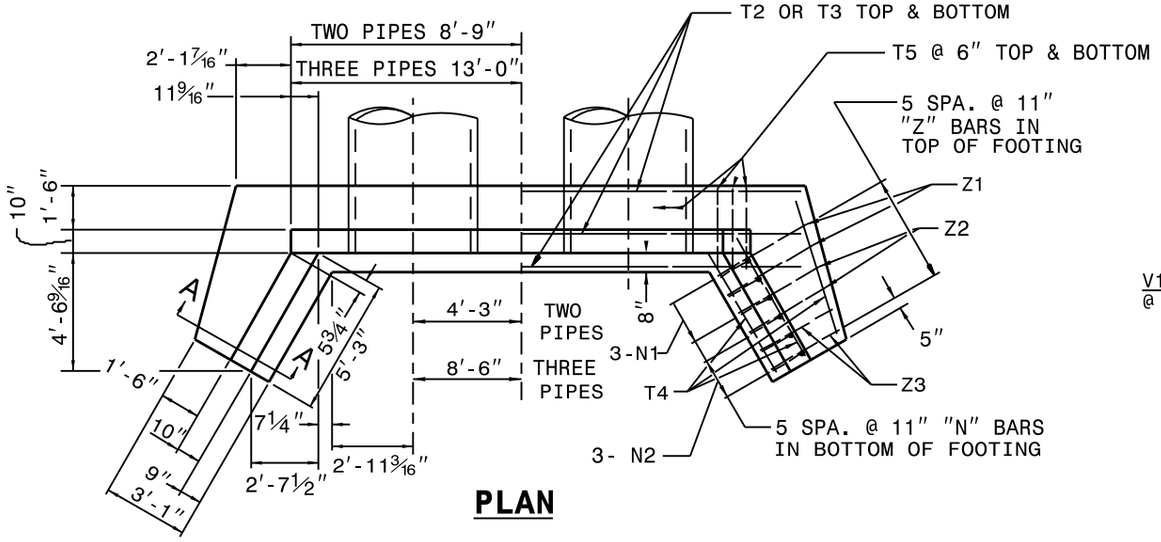
REINFORCED CONCRETE ENDWALL

FOR SINGLE 60" PIPE - 90° SKEW

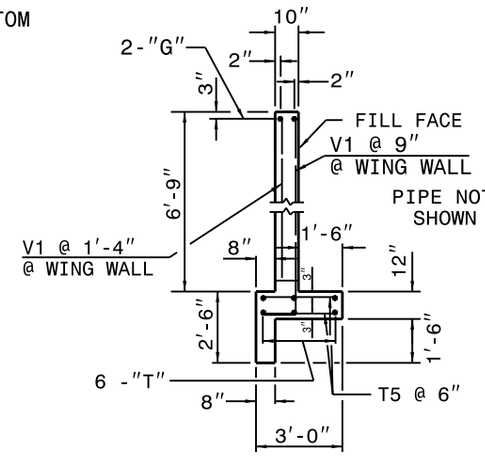
SHEET 2 OF 2

838.27

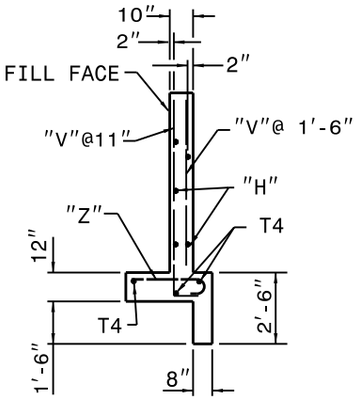
SEE STD. # 838.45 FOR GENERAL NOTES.



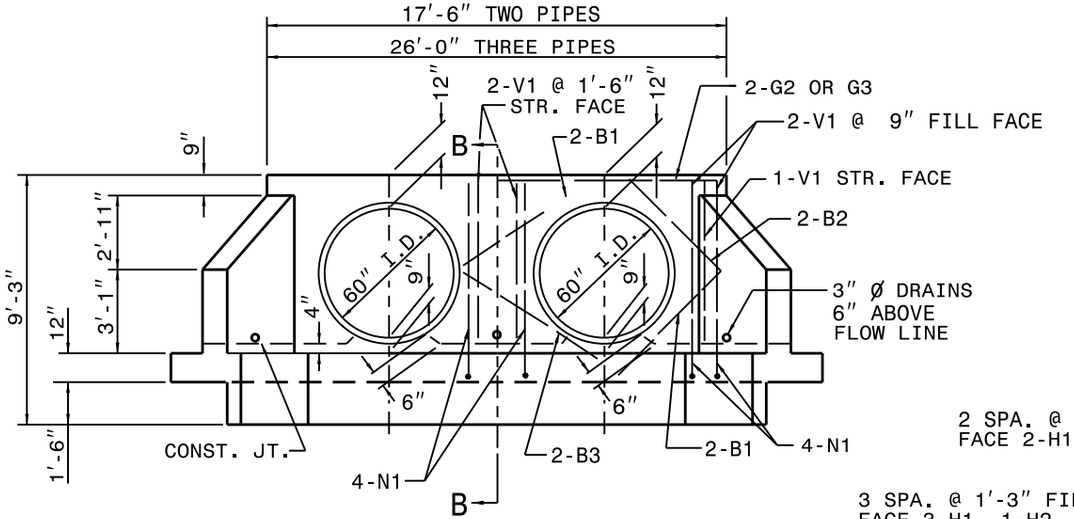
PLAN



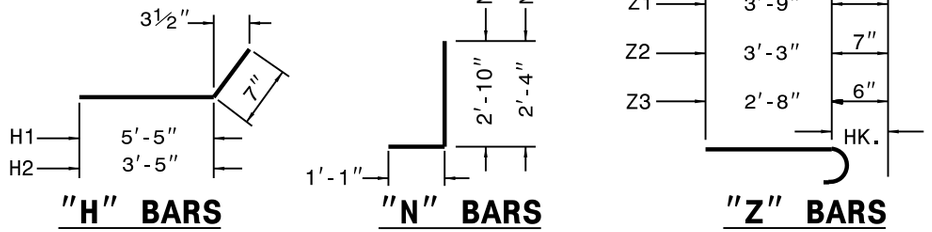
SECTION - BB



SECTION - AA



ELEVATION

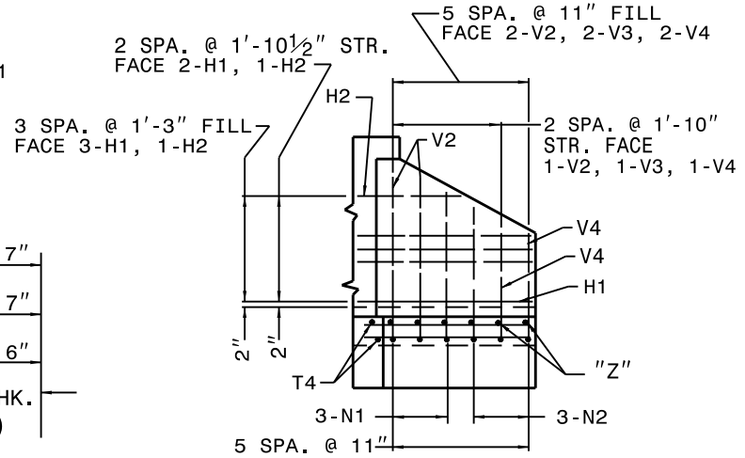


"H" BARS

"N" BARS

"Z" BARS

"H", "N", & "Z" BAR DIMENSIONS ARE OUT TO OUT.



WING ELEVATION

BILL OF MATERIAL FOR ENDWALL

REINF. STEEL			2 PIPES		3 PIPES	
BAR	SIZE	LENGTH	NO.	WEIGHT	NO.	WEIGHT
B1	#4	5′-6″	8	29	12	44
B2	#4	4′-6″	4	12	4	12
B3	#4	6′-6″	4	17	8	35
G2	#7	17′-2″	2	70	-	-
G3	#7	25′-8″	-	-	2	105
H1	#4	6′-0″	10	40	10	40
H2	#4	4′-0″	4	11	4	11
N1	#4	3′-11″	14	57	18	74
N2	#4	3′-5″	6	14	6	14
T1	#4	21′-2″	6	85	-	-
T2	#4	29′-8″			6	119
T4	#4	5′-6″	6	22	6	22
T5	#4	2′-6″	70	117	104	174
V1	#4	6′-3″	12	50	18	75
V2	#4	5′-1″	6	20	6	20
V3	#4	3′-11″	6	16	6	16
V4	#4	2′-9″	6	11	6	11
Z1	#5	4′-4″	4	18	4	18
Z2	#4	3′-10″	4	10	4	10
Z3	#4	3′-2″	4	8	4	8
REINF. STEEL LBS.				607		808
CON./R.C. CU. YDS			7.9		9.9	

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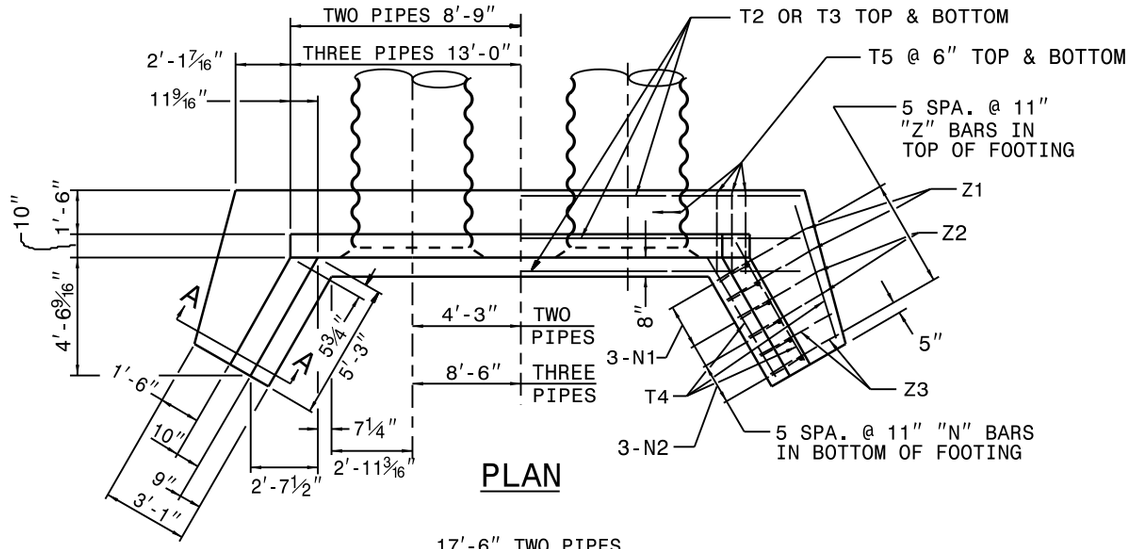
ROADWAY STANDARD DRAWING FOR

REINFORCED CONCRETE ENDWALL

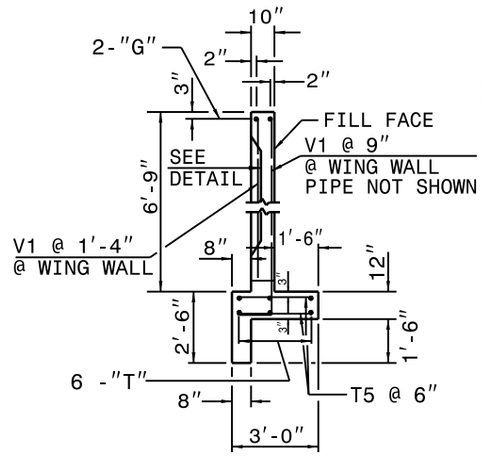
FOR DOUBLE & TRIPLE 60″ PIPE - 90° SKEW

SHEET 1 OF 2

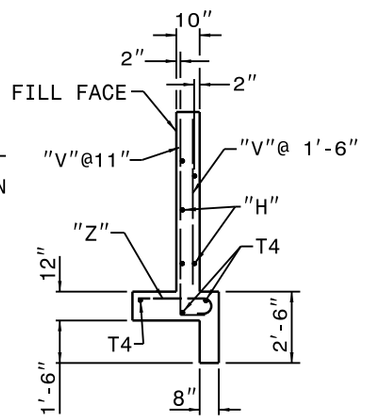
838.28



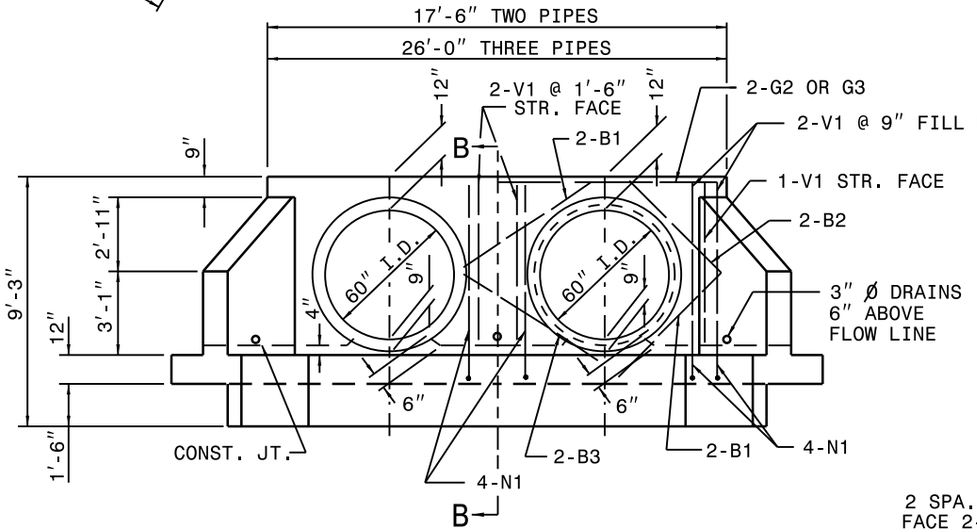
PLAN



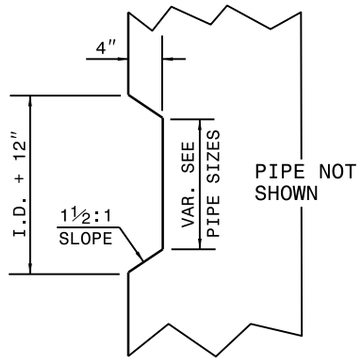
SECTION - BB



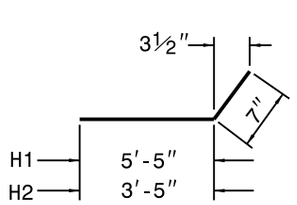
SECTION - AA



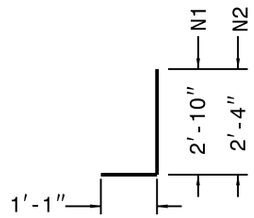
ELEVATION



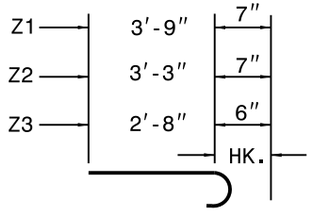
TAPER DETAIL



"H" BARS

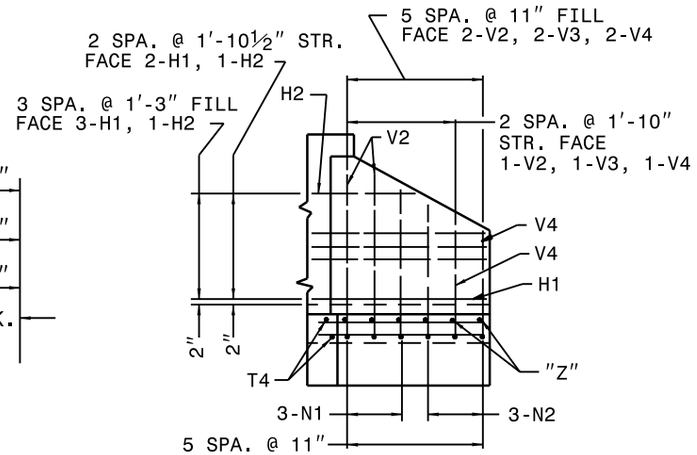


"N" BARS



"Z" BARS

"H", "N", & "Z" BAR DIMENSIONS ARE OUT TO OUT.



WING ELEVATION

SEE STD. # 838.45 FOR GENERAL NOTES.

BILL OF MATERIAL FOR ENDWALL

REINF. STEEL			2 PIPES		3 PIPES	
BAR	SIZE	LENGTH	NO.	WEIGHT	NO.	WEIGHT
B1	#4	5'-6"	8	29	12	44
B2	#4	4'-6"	4	12	4	12
B3	#4	6'-6"	4	17	8	35
G2	#7	17'-2"	2	70	-	-
G3	#7	25'-8"	-	-	2	105
H1	#4	6'-0"	10	40	10	40
H2	#4	4'-0"	4	11	4	11
N1	#4	3'-11"	14	57	18	74
N2	#4	3'-5"	6	14	6	14
T1	#4	21'-2"	6	85	-	-
T2	#4	29'-8"			6	119
T4	#4	5'-6"	6	22	6	22
T5	#4	2'-6"	70	117	104	174
V1	#4	6'-3"	12	50	18	75
V2	#4	5'-1"	6	20	6	20
V3	#4	3'-11"	6	16	6	16
V4	#4	2'-9"	6	11	6	11
Z1	#5	4'-4"	4	18	4	18
Z2	#4	3'-10"	4	10	4	10
Z3	#4	3'-2"	4	8	4	8
REINF. STEEL LBS.				607		808
CON./C.S. CU. YDS			8.3		10.7	

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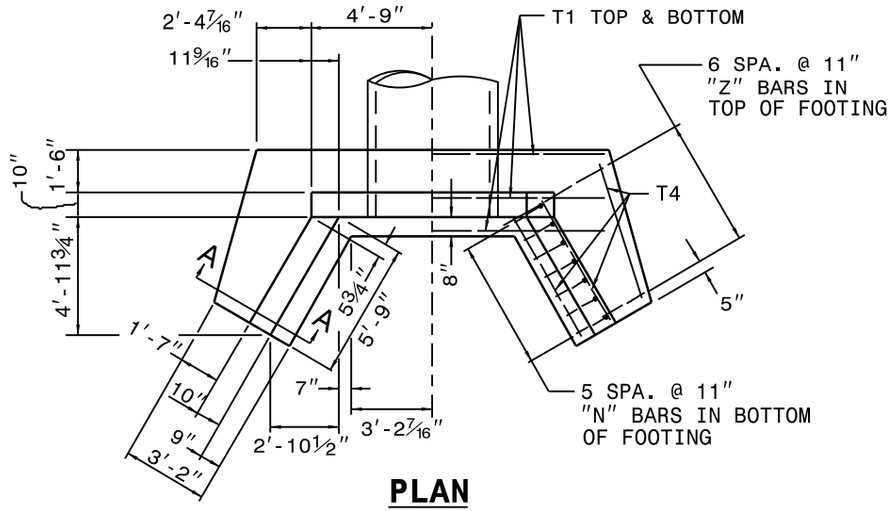
ROADWAY STANDARD DRAWING FOR

REINFORCED CONCRETE ENDWALL

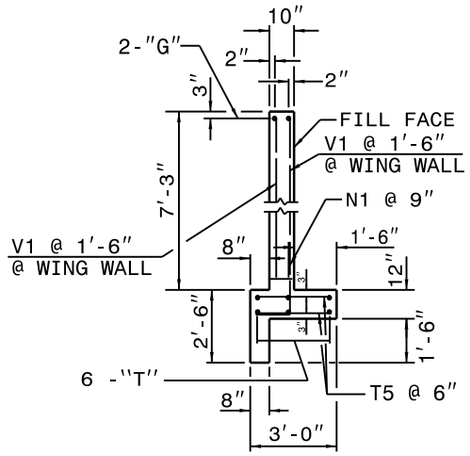
FOR DOUBLE & TRIPLE 60" PIPE - 90° SKEW

SHEET 2 OF 2

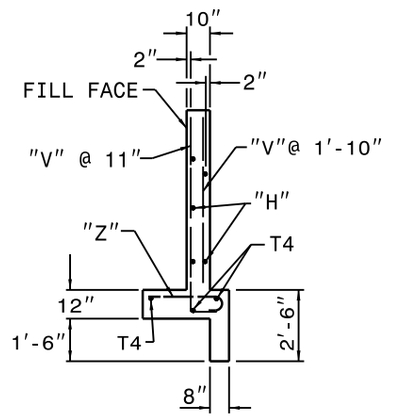
838.28



PLAN

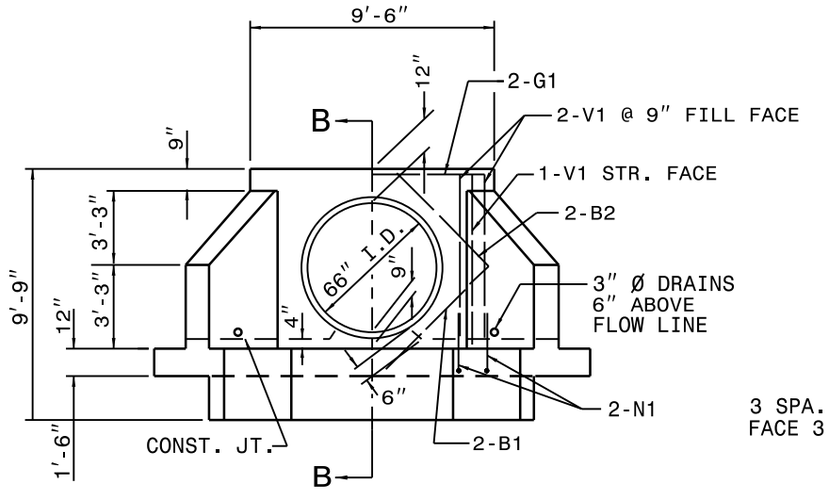


SECTION - BB

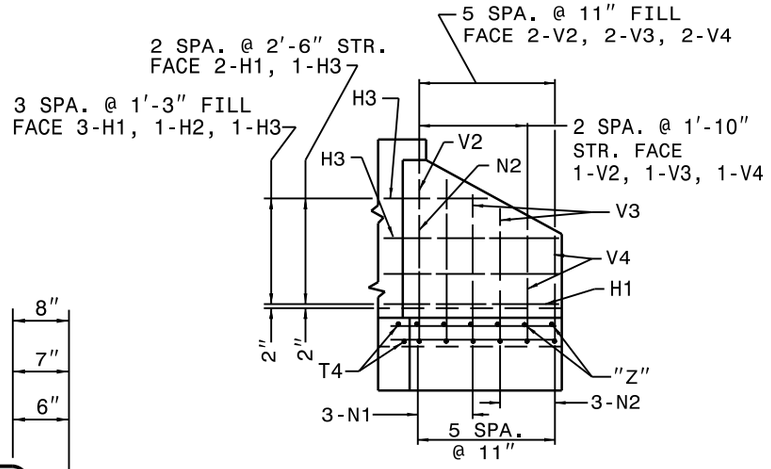


SECTION - AA

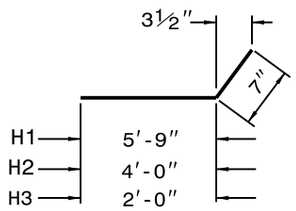
SEE STD. DWG. 838.45 FOR GENERAL NOTES.



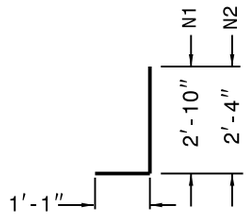
ELEVATION



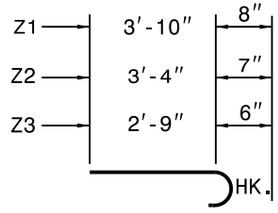
WING ELEVATION



"H" BARS



"N" BARS



"Z" BARS

"H", "N", & "Z" BAR DIMENSIONS ARE OUT TO OUT.

BILL OF MATERIAL FOR ENDWALL

REINF. STEEL			1 PIPE	
BAR	SIZE	LENGTH	NO.	WEIGHT
B1	#4	5'-6"	4	15
B2	#4	4'-6"	4	12
G1	#7	9'-2"	2	37
H1	#4	6'-4"	10	42
H2	#4	4'-7"	2	6
H3	#4	2'-7"	4	7
N1	#5	3'-11"	10	41
N2	#4	3'-5"	6	14
T1	#4	13'-8"	6	55
T4	#4	6'-0"	6	24
T5	#4	2'-6"	38	63
V1	#4	6'-9"	6	27
V2	#4	5'-2"	6	21
V3	#4	4'-1"	6	16
V4	#4	2'-11"	6	12
Z1	#6	4'-6"	6	41
Z2	#5	3'-11"	4	16
Z3	#4	3'-3"	4	9
REINF. STEEL LBS.				458
CON./R.C. CU. YDS			6.3	

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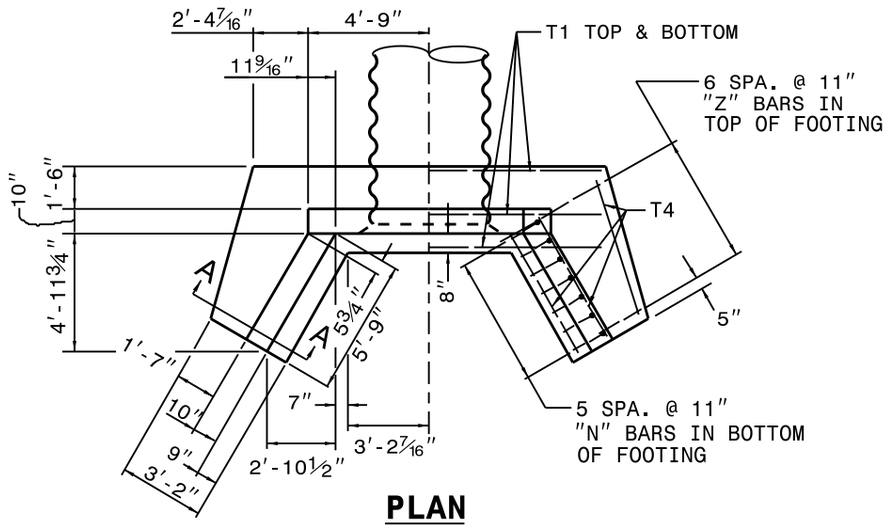
ROADWAY STANDARD DRAWING FOR

REINFORCED CONCRETE ENDWALL

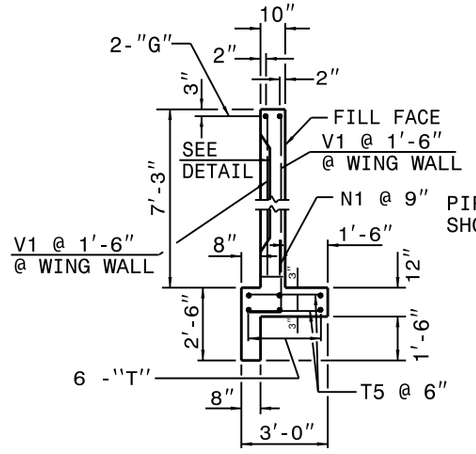
FOR SINGLE 66" PIPE - 90° SKEW

SHEET 1 OF 2

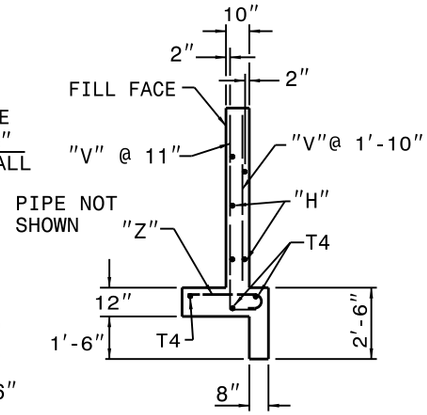
838.33



PLAN



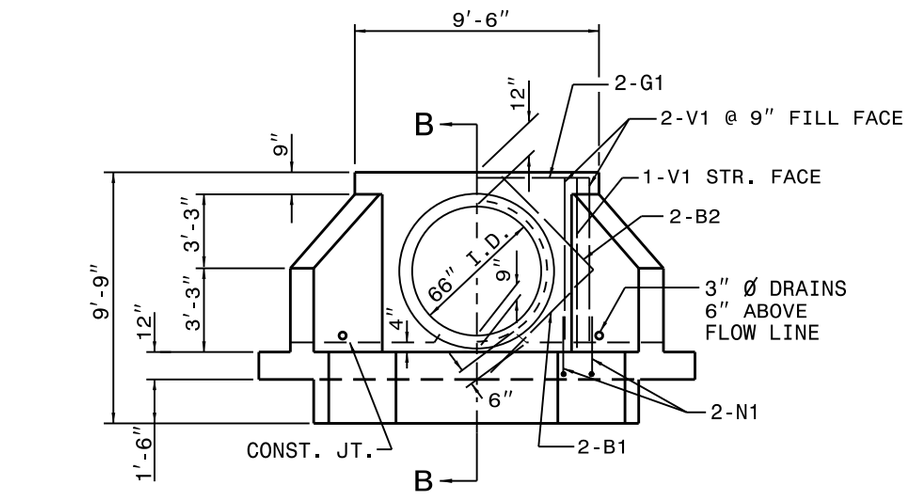
SECTION - BB



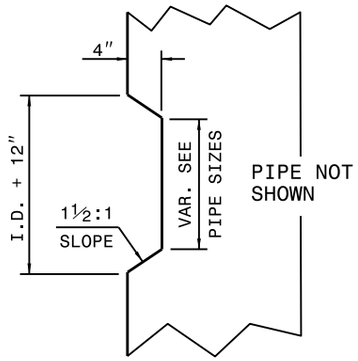
SECTION - AA

SEE STD.# 838.45 FOR GENERAL NOTES.

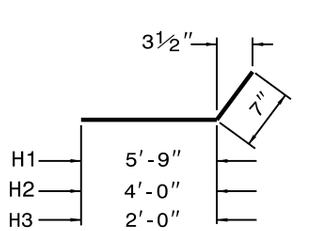
BILL OF MATERIAL FOR ENDWALL				
REINF. STEEL			1 PIPE	
BAR	SIZE	LENGTH	NO.	WEIGHT
B1	#4	5'-6"	4	15
B2	#4	4'-6"	4	12
G1	#7	9'-2"	2	37
H1	#4	6'-4"	10	42
H2	#4	4'-7"	2	6
H3	#4	2'-7"	4	7
N1	#5	3'-11"	10	41
N2	#4	3'-5"	6	14
T1	#4	13'-8"	6	55
T4	#4	6'-0"	6	24
T5	#4	2'-6"	38	63
V1	#4	6'-9"	6	27
V2	#4	5'-2"	6	21
V3	#4	4'-1"	6	16
V4	#4	2'-11"	6	12
Z1	#6	4'-6"	6	41
Z2	#5	3'-11"	4	16
Z3	#4	3'-3"	4	9
REINF. STEEL LBS.			X	458
CON./C.S. CU. YDS			6.6	



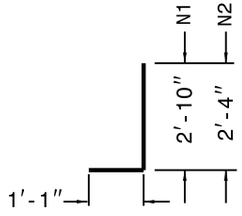
ELEVATION



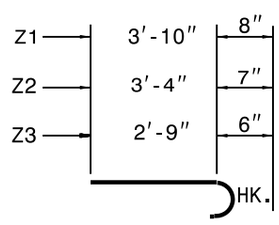
TAPER DETAIL



"H" BARS

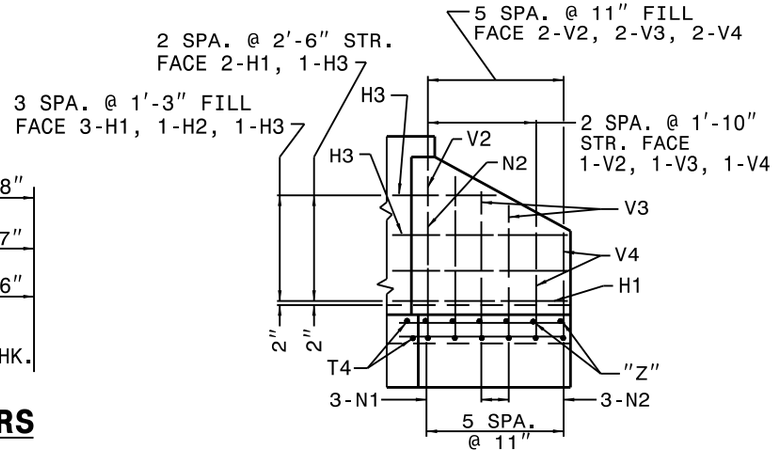


"N" BARS



"Z" BARS

"H", "N", & "Z" BAR DIMENSIONS ARE OUT TO OUT.



WING ELEVATION

STATE OF
NORTH CAROLINA
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DIVISION OF HIGHWAYS
RALEIGH, N.C.

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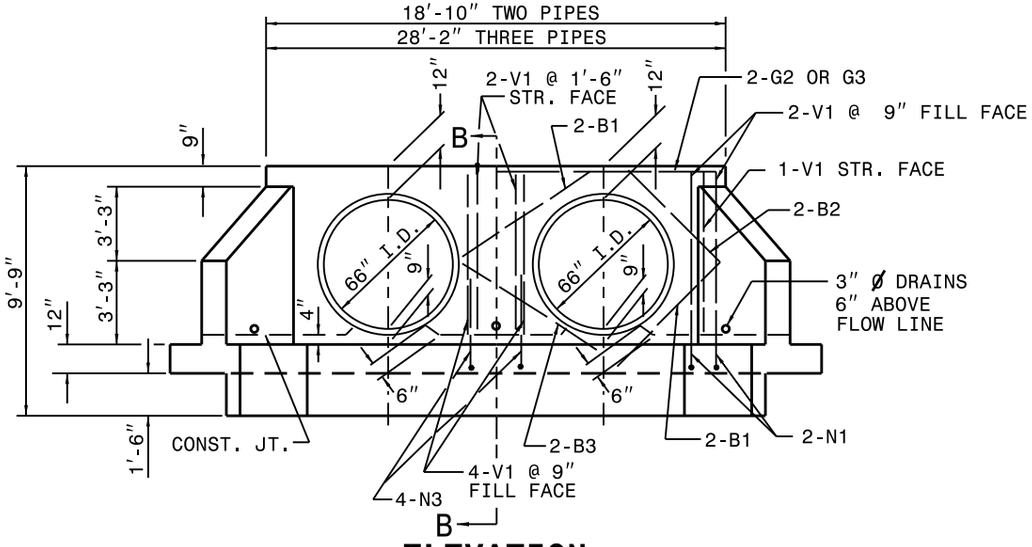
ROADWAY STANDARD DRAWING FOR

REINFORCED CONCRETE ENDWALL

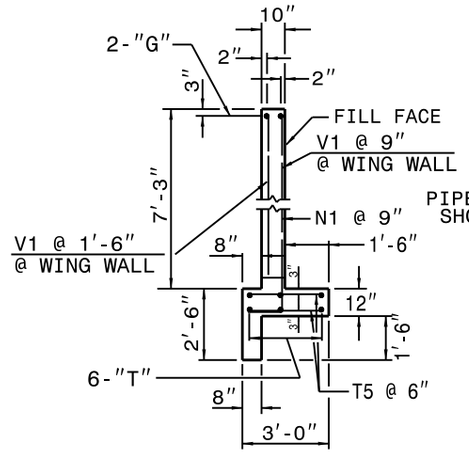
FOR SINGLE 66" PIPE - 90° SKEW

SHEET 2 OF 2

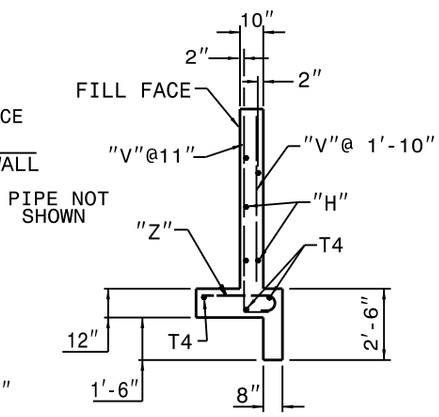
838.33



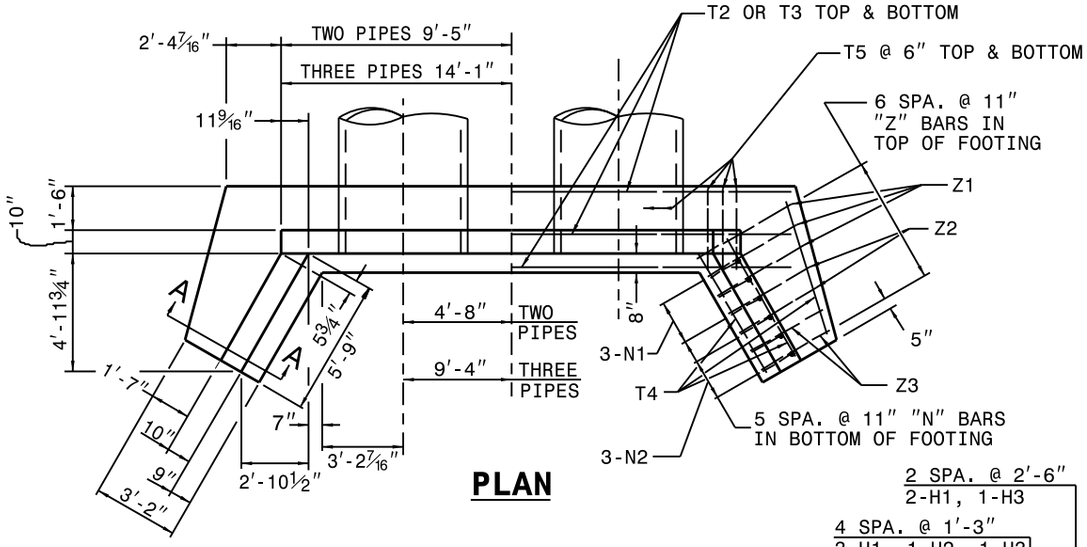
ELEVATION



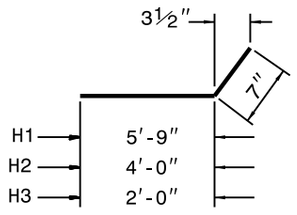
SECTION - BB



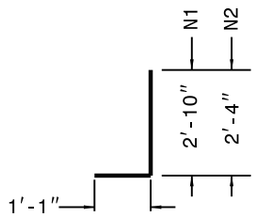
SECTION - AA



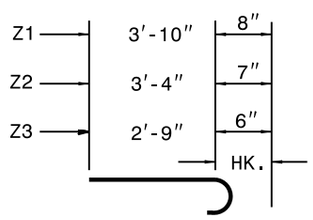
PLAN



"H" BARS

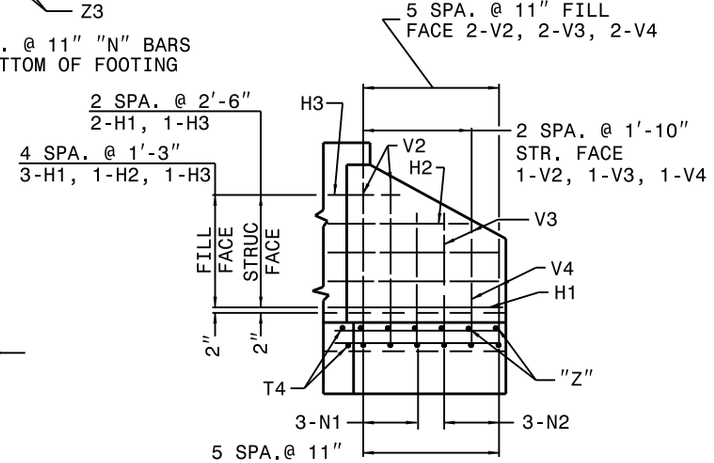


"N" BARS



"Z" BARS

"H", "N", & "Z" BAR DIMENSIONS ARE OUT TO OUT.



WING ELEVATION

SEE STD. # 838.45 FOR GENERAL NOTES.

BILL OF MATERIAL FOR ENDWALL

REINF. STEEL			2 PIPES		3 PIPES	
BAR	SIZE	LENGTH	NO.	WEIGHT	NO.	WEIGHT
B1	#4	5′-6″	8	29	12	44
B2	#4	4′-6″	4	12	4	12
B3	#4	7′-0″	4	19	8	37
G2	#7	18′-6″	2	76	-	-
G3	#7	27′-10″	-	-	2	114
H1	#4	6′-4″	10	42	10	42
H2	#4	4′-7″	2	6	2	6
H3	#4	2′-7″	4	7	4	7
N1	#5	3′-11″	14	57	18	74
N2	#4	3′-5″	6	14	6	14
T2	#4	23′-0″	6	92		
T3	#4	16′-10″			12	135
T4	#4	6′-0″	6	24	6	24
T5	#4	2′-6″	76	127	112	187
V1	#4	6′-9″	12	54	18	81
V2	#4	5′-2″	6	21	6	21
V3	#4	4′-1″	6	16	6	16
V4	#4	2′-11″	6	12	6	12
Z1	#6	4′-6″	6	41	6	41
Z2	#6	3′-11″	4	16	4	16
Z3	#4	3′-3″	4	9	4	9
REINF. STEEL LBS.				674		892
CON./R.C. CU. YDS				8.7		11.1

STATE OF NORTH CAROLINA
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RALEIGH, N.C.

1-24

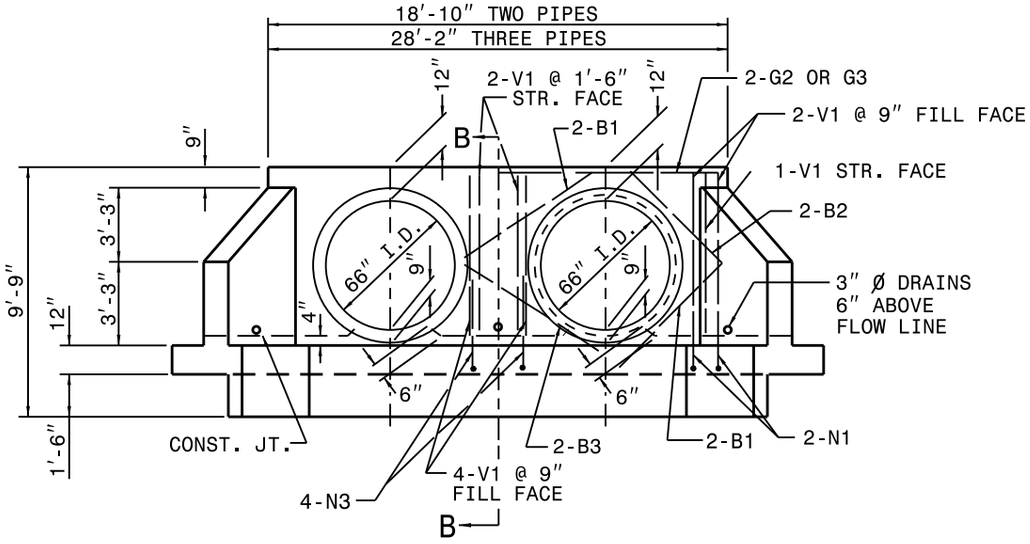
ROADWAY STANDARD DRAWING FOR

REINFORCED CONCRETE ENDWALL

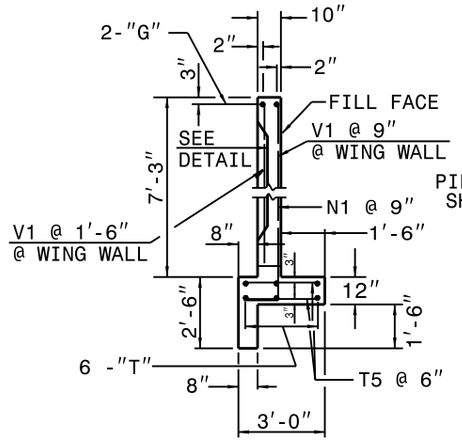
FOR DOUBLE & TRIPLE 66″ PIPE - 90° SKEW

SHEET 1 OF 2

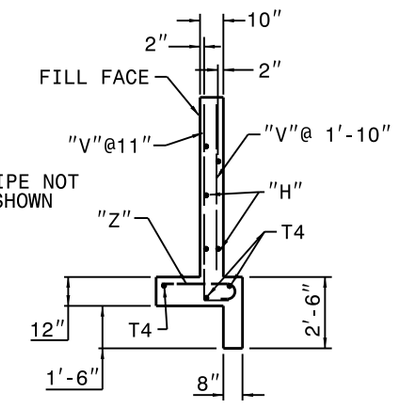
838.34



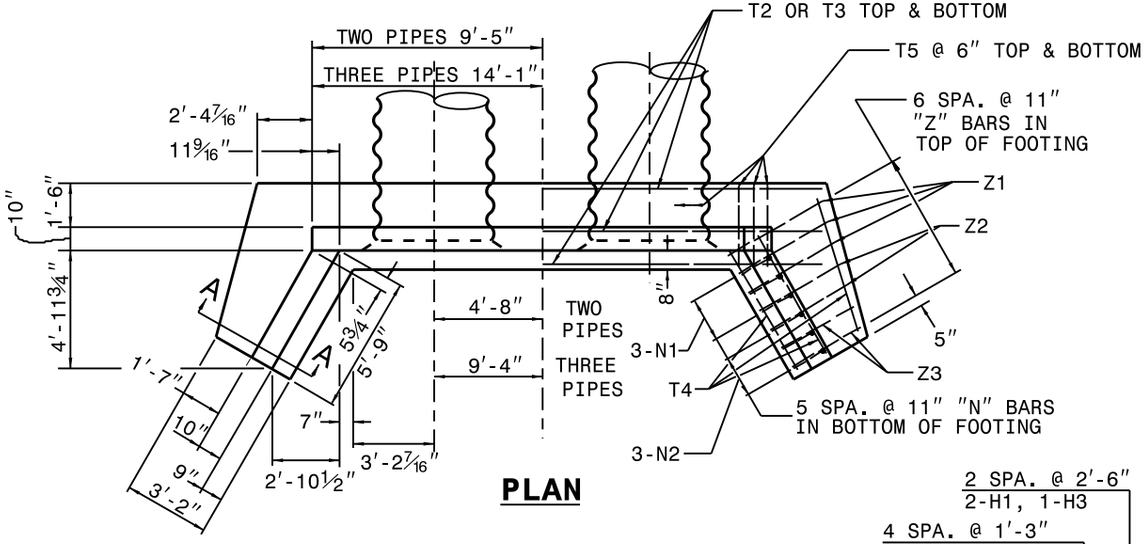
ELEVATION



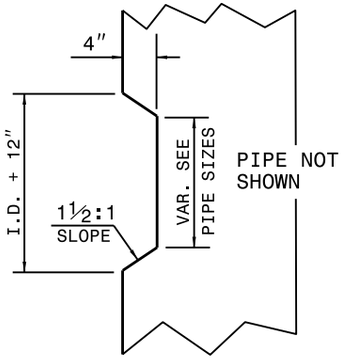
SECTION - BB



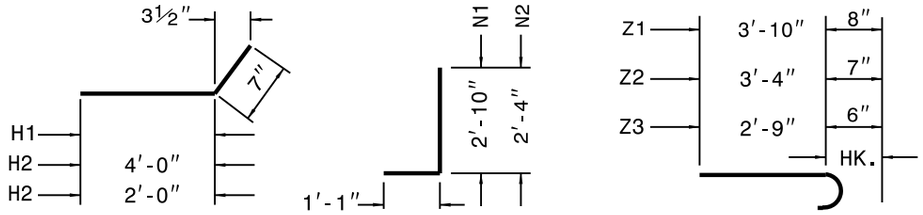
SECTION - AA



PLAN

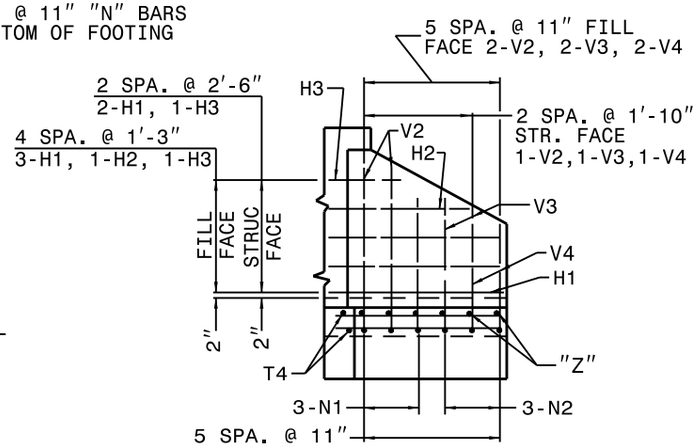


TAPER DETAIL



"H" BARS "N" BARS "Z" BARS

"H", "N", & "Z" BAR DIMENSIONS ARE OUT TO OUT.



WING ELEVATION

SEE STD. # 838.45 FOR GENERAL NOTES.

BILL OF MATERIAL FOR ENDWALL

REINF. STEEL			2 PIPES		3 PIPES	
BAR	SIZE	LENGTH	NO.	WEIGHT	NO.	WEIGHT
B1	#4	5'-6"	8	29	12	44
B2	#4	4'-6"	4	12	4	12
B3	#4	7'-0"	4	19	8	37
G2	#7	18'-6"	2	76	-	-
G3	#7	27'-10"	-	-	2	114
H1	#4	6'-4"	10	42	10	42
H2	#4	4'-7"	2	6	2	6
H3	#4	2'-7"	4	7	4	7
N1	#5	3'-11"	14	57	18	74
N2	#4	3'-5"	6	14	6	14
T2	#4	23'-0"	6	92		
T3	#4	16'-10"			12	135
T4	#4	6'-0"	6	24	6	24
T5	#4	2'-6"	76	127	112	187
V1	#4	6'-9"	12	54	18	81
V2	#4	5'-2"	6	21	6	21
V3	#4	4'-1"	6	16	6	16
V4	#4	2'-11"	6	12	6	12
Z1	#6	4'-6"	6	41	6	41
Z2	#6	3'-11"	4	16	4	16
Z3	#4	3'-3"	4	9	4	9
REINF. STEEL LBS.				674		892
CON./C.S. CU. YDS				9.3		12.0

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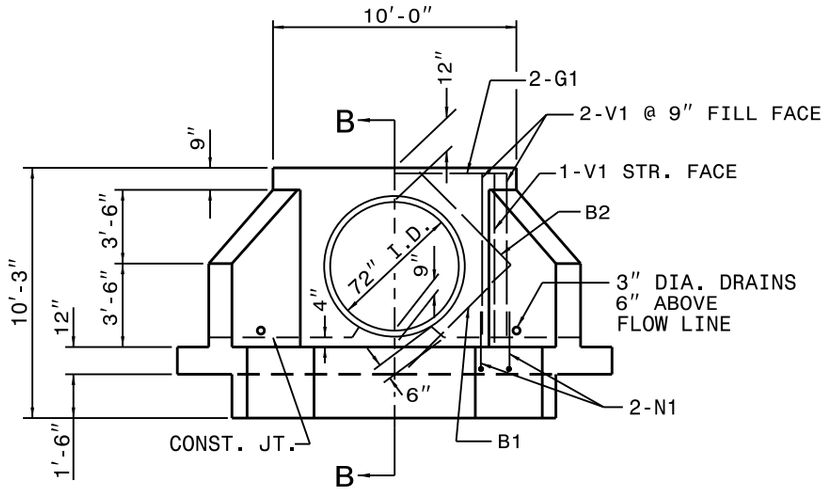
ROADWAY STANDARD DRAWING FOR

REINFORCED CONCRETE ENDWALL

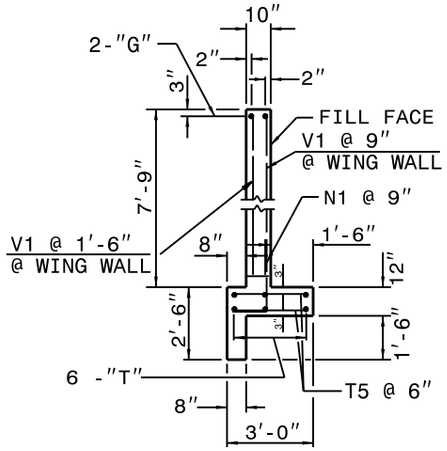
FOR DOUBLE & TRIPLE 66" PIPE - 90° SKEW

SHEET 2 OF 2

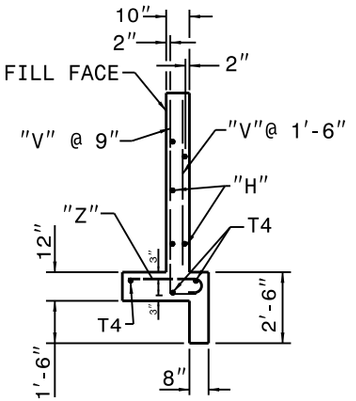
838.34



ELEVATION



SECTION - BB

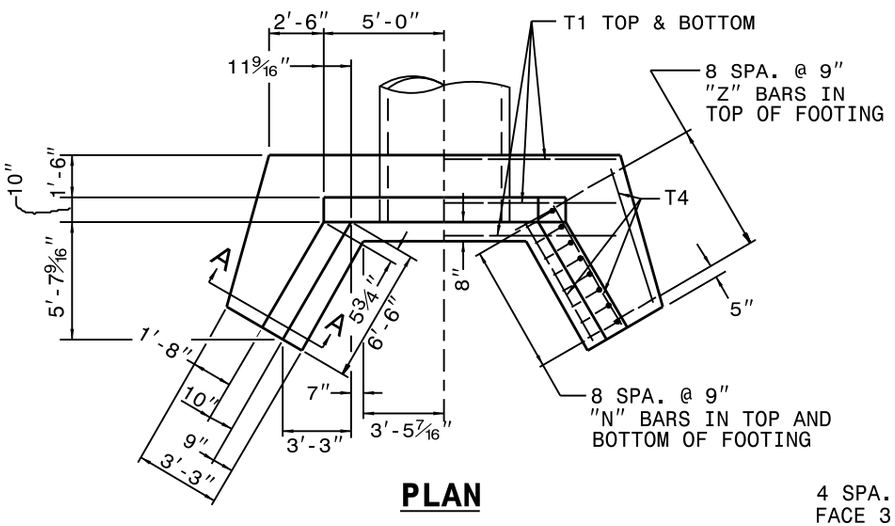


SECTION - AA

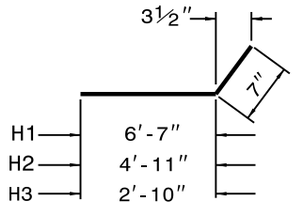
SEE STD.# 838.45 FOR GENERAL NOTES.

BILL OF MATERIAL FOR ENDWALL

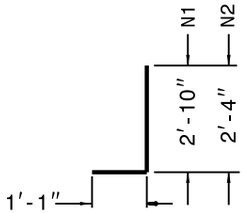
REINF. STEEL			1 PIPE	
BAR	SIZE	LENGTH	NO.	WEIGHT
B1	#4	5'-6"	4	15
B2	#4	4'-6"	4	12
G1	#7	9'-8"	2	40
H1	#4	7'-2"	10	48
H2	#4	5'-6"	2	7
H3	#4	3'-5"	4	9
N1	#5	3'-11"	14	57
N2	#4	3'-5"	8	18
T1	#4	14'-6"	6	58
T4	#4	6'-9"	6	27
T5	#4	2'-6"	40	67
V1	#4	7'-3"	6	29
V2	#4	5'-10"	10	39
V3	#4	5'-0"	6	20
V4	#4	4'-1"	6	16
V5	#4	3'-2"	6	13
Z1	#6	4'-8"	6	42
Z2	#5	4'-0"	6	25
Z3	#4	3'-4"	6	13
REINF. STEEL LBS.			X	555
CON./R.C. CU. YDS				7.1



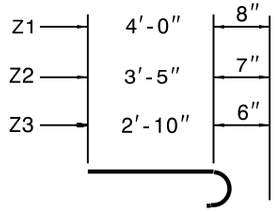
PLAN



"H" BARS

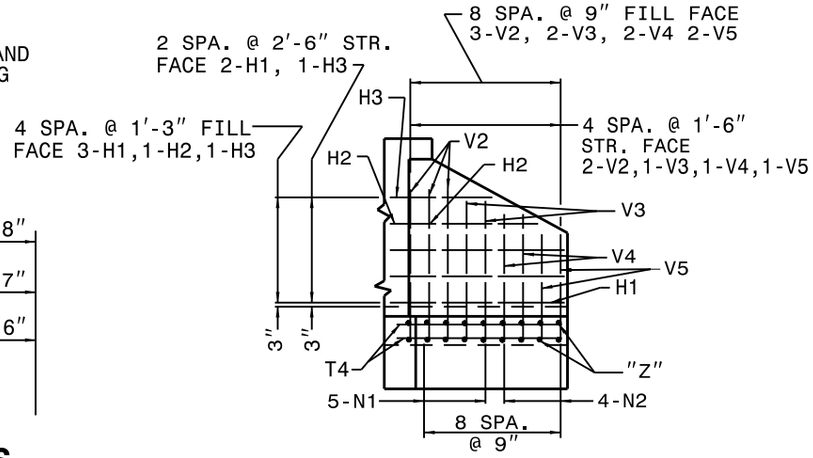


"N" BARS



"Z" BARS

"H", "N", & "Z" BAR DIMENSIONS ARE OUT TO OUT.



WING ELEVATION

STATE OF
NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

1-24

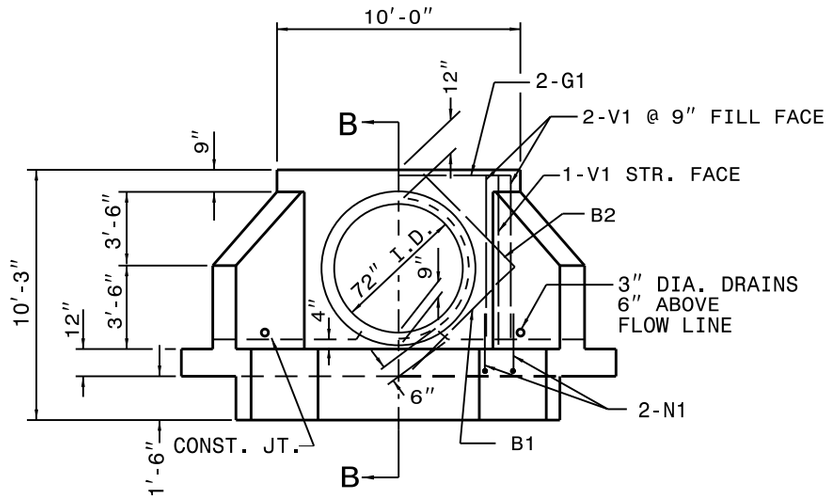
ROADWAY STANDARD DRAWING FOR

REINFORCED CONCRETE ENDWALL

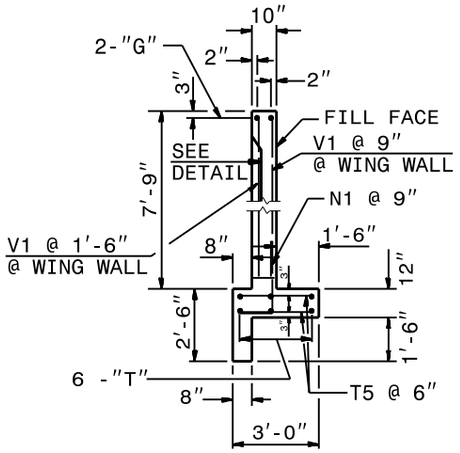
FOR SINGLE 72" PIPE - 90° SKEW

SHEET 1 OF 2

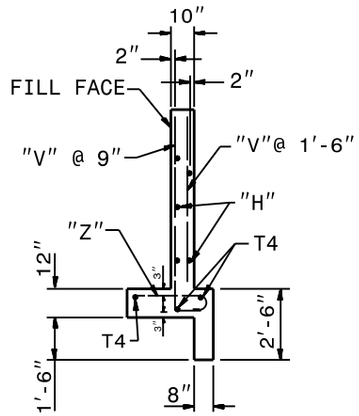
838.39



ELEVATION

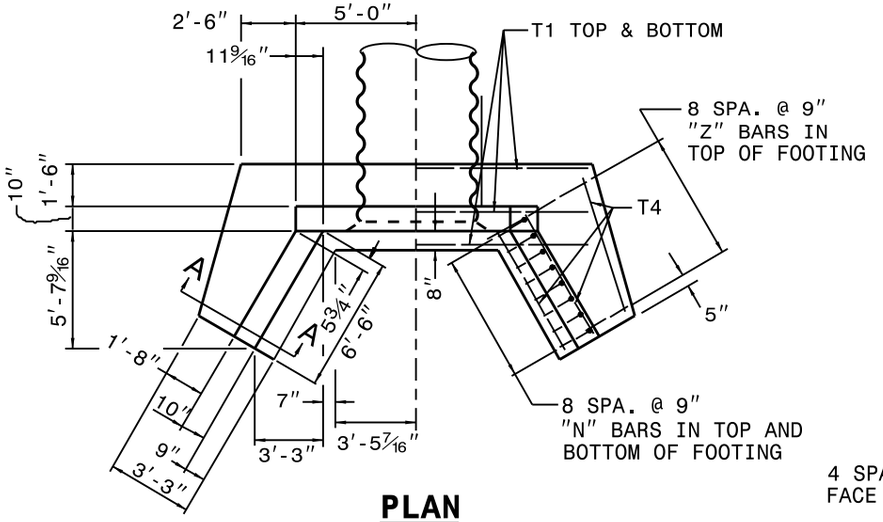


SECTION - BB

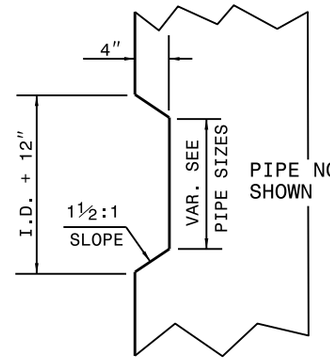


SECTION - AA

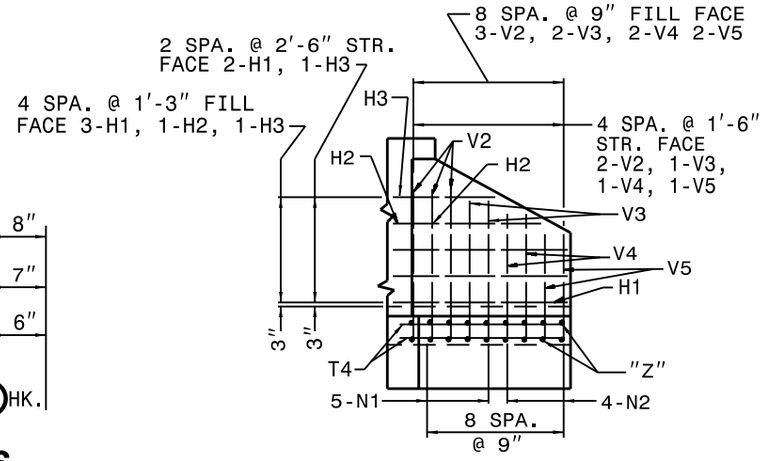
SEE STD.# 838.45 FOR GENERAL NOTES.



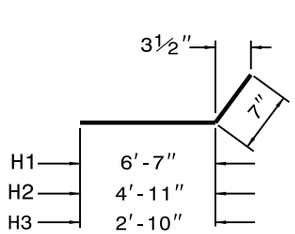
PLAN



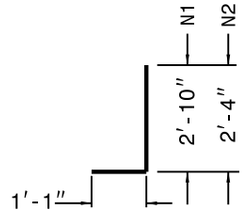
TAPER DETAIL



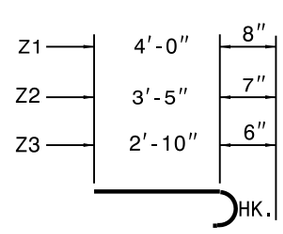
WING ELEVATION



″H″ BARS



″N″ BARS



″Z″ BARS

″H″, ″N″, & ″Z″ BAR DIMENSIONS ARE OUT TO OUT.

BILL OF MATERIAL FOR ENDWALL

REINF. STEEL			1 PIPE	
BAR	SIZE	LENGTH	NO.	WEIGHT
B1	#4	5′-6″	4	15
B2	#4	4′-6″	4	12
G1	#7	9′-8″	2	40
H1	#4	7′-2″	10	48
H2	#4	5′-6″	2	7
H3	#4	3′-5″	4	9
N1	#5	3′-11″	14	57
N2	#4	3′-5″	8	18
T1	#4	14′-6″	6	58
T4	#4	6′-9″	6	27
T5	#4	2′-6″	40	67
V1	#4	7′-3″	6	29
V2	#4	5′-10″	10	39
V3	#4	5′-0″	6	20
V4	#4	4′-1″	6	16
V5	#4	3′-2″	6	13
Z1	#6	4′-8″	6	42
Z2	#5	4′-0″	6	25
Z3	#4	3′-4″	6	13
REINF. STEEL LBS.				555
CON./C.S. CU. YDS				7.5

STATE OF
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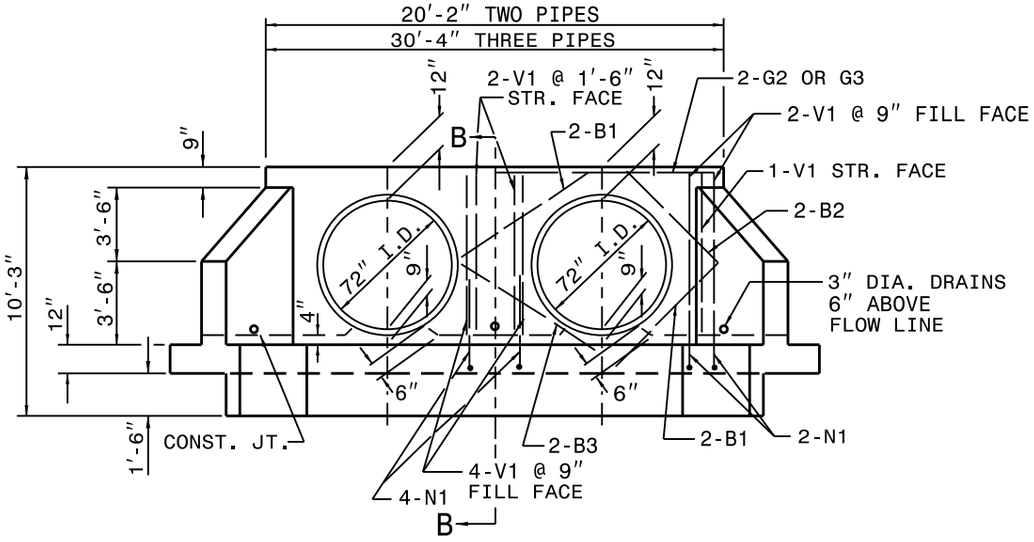
ROADWAY STANDARD DRAWING FOR

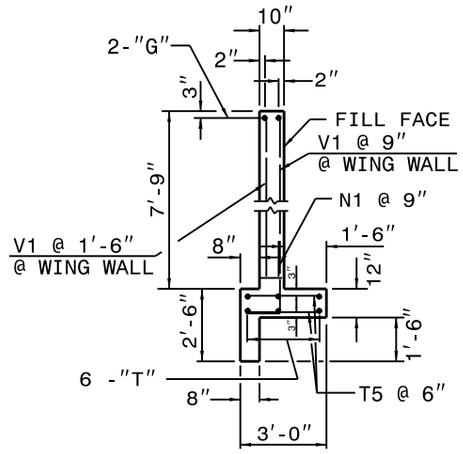
REINFORCED CONCRETE ENDWALL

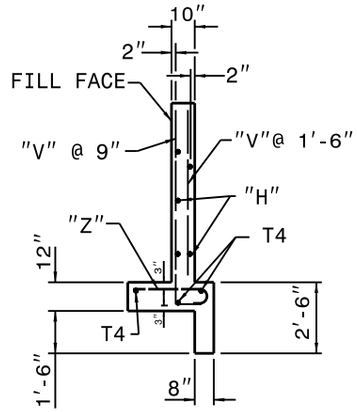
FOR SINGLE 72″ PIPE - 90° SKEW

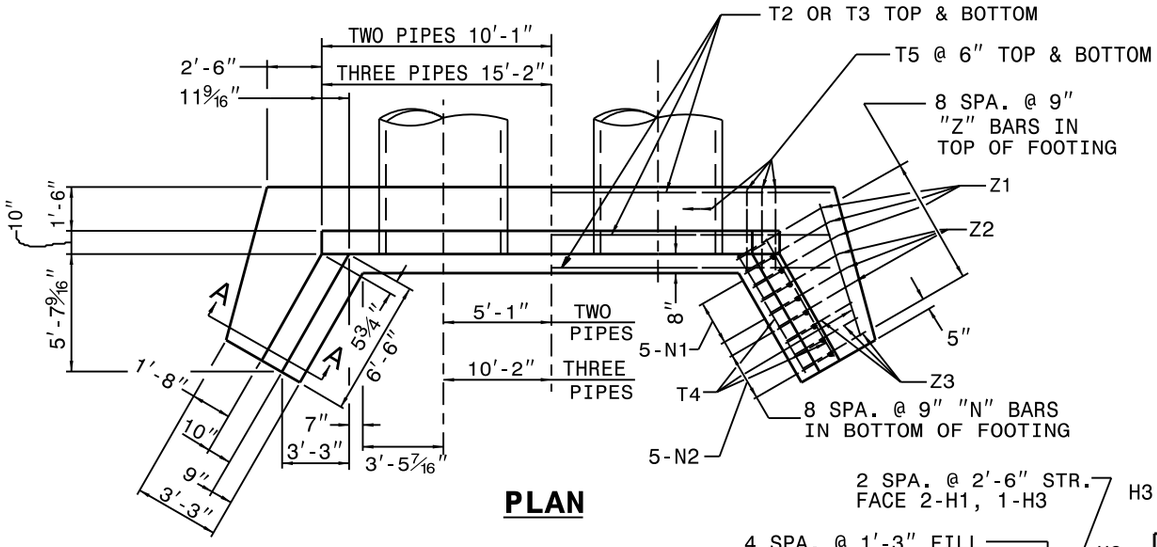
SHEET 2 OF 2

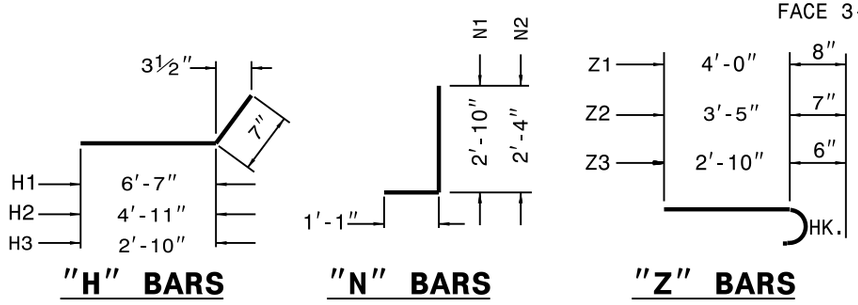
838.39



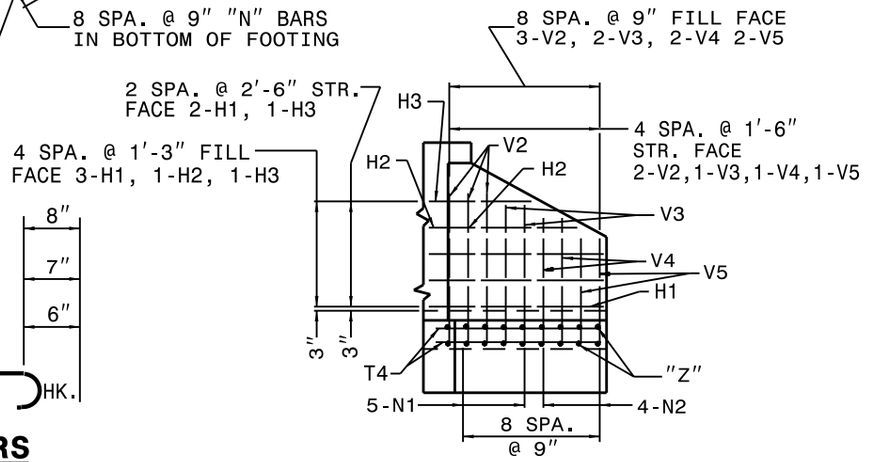








"H", "N", & "Z" BAR DIMENSIONS ARE OUT TO OUT.



SEE STD. # 838.45 FOR GENERAL NOTES.

BILL OF MATERIAL FOR ENDWALL

REINF. STEEL			2 PIPES		3 PIPES	
BAR	SIZE	LENGTH	NO.	WEIGHT	NO.	WEIGHT
B1	#4	5′-6″	8	29	12	44
B2	#4	4′-6″	4	12	4	12
B3	#4	7′-0″	4	19	8	37
G2	#7	19′-10″	2	81	-	-
G3	#7	30′-0″	-	-	2	123
H1	#4	7′-2″	10	48	10	48
H2	#4	5′-6″	2	7	2	7
H3	#4	3′-5″	4	9	4	9
N1	#5	3′-11″	18	74	22	90
N2	#4	3′-5″	8	18	8	18
T2	#4	24′-8″	6	99		
T3	#4	18′-1″			12	145
T4	#4	6′-9″	6	22	6	27
T5	#4	2′-6″	80	134	122	204
V1	#4	7′-3″	12	58	18	87
V2	#4	5′-10″	10	39	10	39
V3	#4	5′-0″	6	20	6	20
V4	#4	4′-1″	6	16	6	16
V5	#4	3′-2″	6	13	6	13
Z1	#6	4′-8″	6	42	6	42
Z2	#5	4′-0″	6	25	6	25
Z3	#4	3′-4″	6	13	6	13
REINF. STEEL LBS.				783		1019
CON./R.C. CU. YDS			9.8		12.5	

STATE OF NORTH CAROLINA
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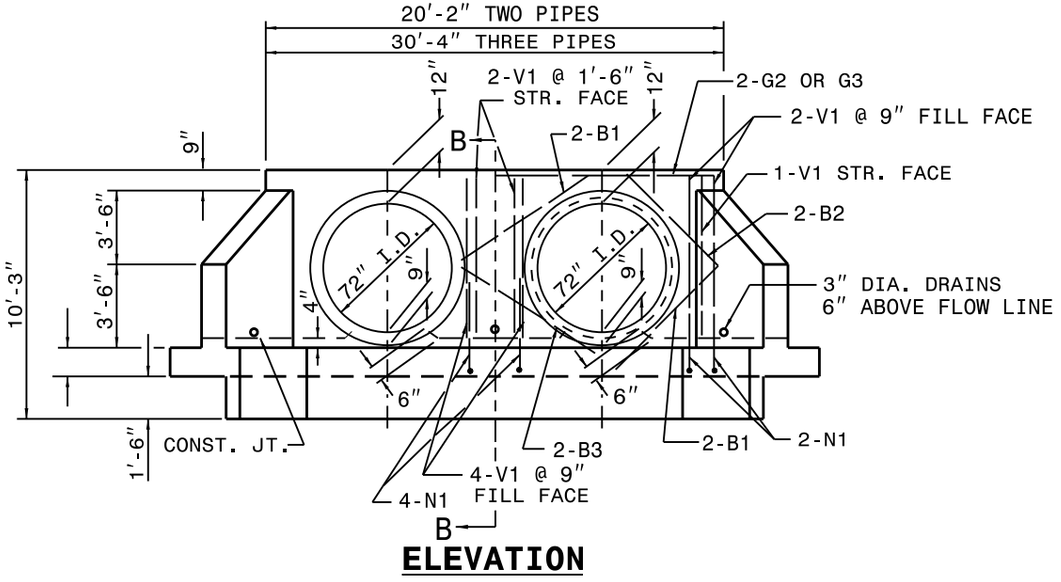
ROADWAY STANDARD DRAWING FOR

REINFORCED CONCRETE ENDWALL

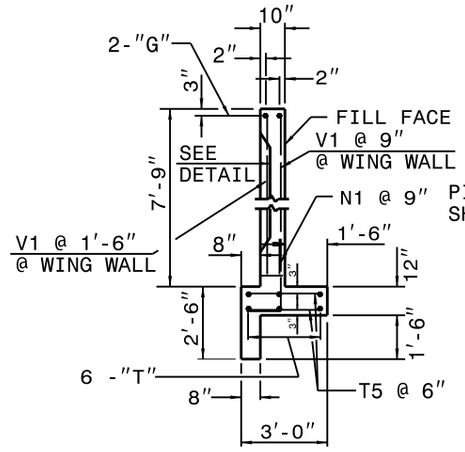
FOR DOUBLE AND TRIPLE 72″ PIPE - 90° SKEW

SHEET 1 OF 2

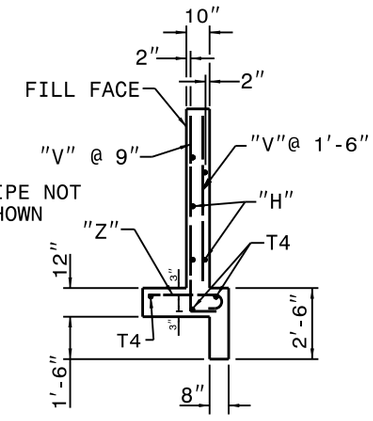
838.40



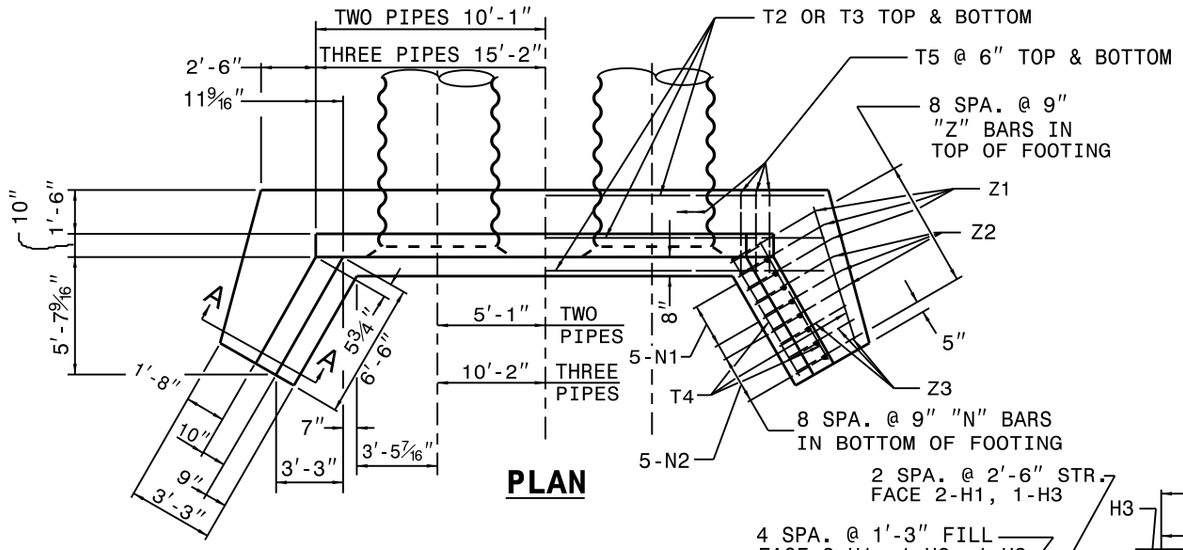
ELEVATION



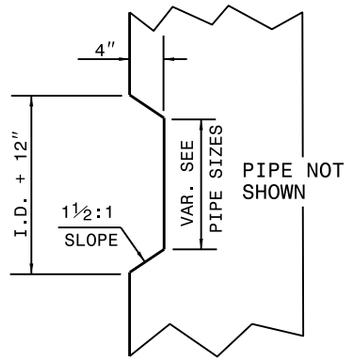
SECTION - BB



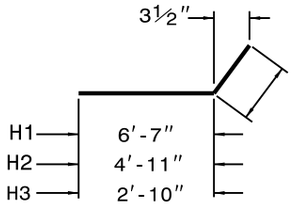
SECTION - AA



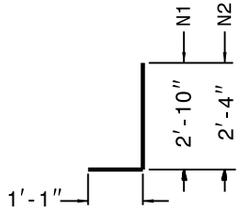
PLAN



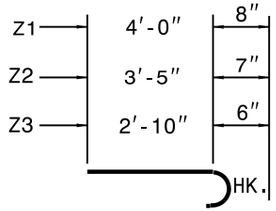
TAPER DETAIL



″H″ BARS

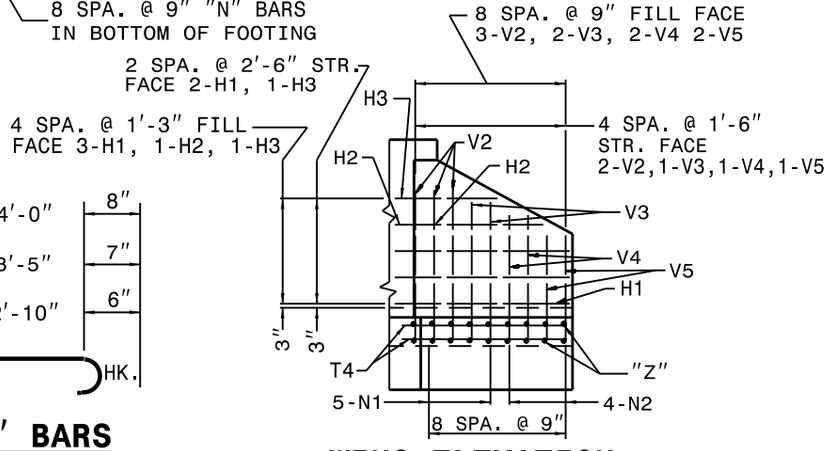


″N″ BARS



″Z″ BARS

"H", "N", & "Z" BAR DIMENSIONS ARE OUT TO OUT.



WING ELEVATION

SEE STD. # 838.45 FOR GENERAL NOTES.

BILL OF MATERIAL FOR ENDWALL

REINF. STEEL			2 PIPES		3 PIPES	
BAR	SIZE	LENGTH	NO.	WEIGHT	NO.	WEIGHT
B1	#4	5′-6″	8	29	12	44
B2	#4	4′-6″	4	12	4	12
B3	#4	7′-0″	4	19	8	37
G2	#7	19′-10″	2	81	-	-
G3	#7	30′-0″	-	-	2	123
H1	#4	7′-2″	10	48	10	48
H2	#4	5′-6″	2	7	2	7
H3	#4	3′-5″	4	9	4	9
N1	#5	3′-11″	18	74	22	90
N2	#4	3′-5″	8	18	8	18
T2	#4	24′-8″	6	99		
T3	#4	18′-1″			12	145
T4	#4	6′-9″	6	22	6	27
T5	#4	2′-6″	80	134	122	204
V1	#4	7′-3″	12	58	18	87
V2	#4	5′-10″	10	39	10	39
V3	#4	5′-0″	6	20	6	20
V4	#4	4′-1″	6	16	6	16
V5	#4	3′-2″	6	13	6	13
Z1	#6	4′-8″	6	42	6	42
Z2	#5	4′-0″	6	25	6	25
Z3	#4	3′-4″	6	13	6	13
REINF. STEEL LBS.				783		1019
CON./C.S. CU. YDS			10.5		13.6	

STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

1-24

ROADWAY STANDARD DRAWING FOR

REINFORCED CONCRETE ENDWALL

FOR DOUBLE AND TRIPLE 72″ PIPE - 90° SKEW

SHEET 2 OF 2

838.40

GENERAL NOTES:

USE CLASS "A" CONCRETE.

CHAMFER ALL EXPOSED CORNERS 1".

ALL DIMENSIONS RELATIVE TO PLACEMENT OF REINFORCING STEEL ARE TO CENTERS OF BARS.

COVER WEEP HOLES WITH HARDWARE CLOTH IN ACCORDANCE WITH ARTICLE 420-11 OF THE STANDARD SPECIFICATIONS. PLACE A STONE DRAIN CONSISTING OF ONE (1) CUBIC FOOT OF NUMBER 78M STONE CONTAINED IN A BAG OF TYPE 1 GEOTEXTILE AT EACH WEEP HOLE. PLACE SUBDRAIN FINE AGGREGATE BENEATH, AROUND AND OVER THE STONE DRAIN SO THE STONE DRAIN IS COMPLETELY COVERED BY A LAYER OF SUBDRAIN FINE AGGREGATE AT LEAST ONE (1) FOOT THICK. WHERE THERE IS MORE THAN ONE WEEP HOLE IN A WING WALL, PLACE A HORIZONTAL DRAIN OF SUBDRAIN FINE AGGREGATE AT LEAST ONE (1) FOOT SQUARE IN CROSS SECTION TO CONNECT ALL STONE DRAINS. PLACE A VERTICAL DRAIN OF SUBDRAIN FINE AGGREGATE AT LEAST ONE (1) FOOT SQUARE IN CROSS SECTION AT EACH WEEP HOLE TO AN ELEVATION OF TWO (2) FEET BELOW THE SURFACE OF THE EMBANKMENT.

STATE OF
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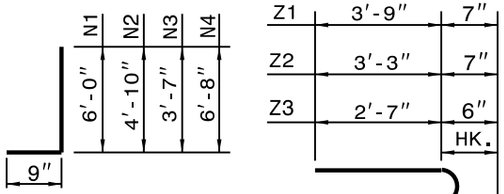
DIVISION OF HIGHWAYS
RALEIGH, N.C.

1-24

ROADWAY STANDARD DRAWING FOR

NOTES FOR REINFORCED CONCRETE ENDWALL

STANDARD DRAWINGS 838.21 THRU 838.40



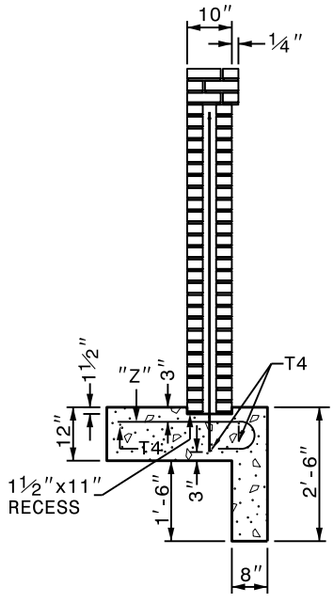
"N" BARS

"Z" BARS

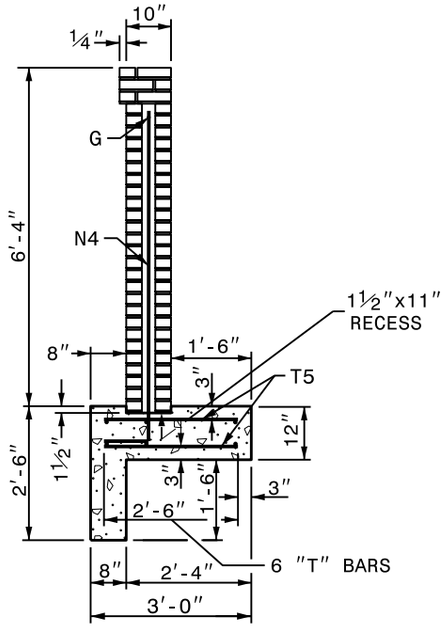
"N" & "Z" BAR DIMENSIONS ARE OUT TO OUT.

*PAY FOR CONCRETE AS BRICK MASONRY

BILL OF MATERIAL FOR ENDWALL				
REINF. STEEL			1 PIPE	
BAR	SIZE	LENGTH	NO.	WEIGHT
B1	#5	5'-3"	2	11
B2	#5	3'-9"	2	8
G1	#5	7'-8"	2	31
H1	#4	5'-3"	6	21
H2	#4	3'-6"	2	5
N1	#5	6'-9"	2	14
N2	#5	5'-7"	4	23
N3	#4	4'-4"	4	12
N4	#4	7'-5"	6	30
T1	#4	12'-0"	6	48
T4	#4	4'-11"	6	20
T5	#4	2'-6"	34	57
Z1	#5	4'-4"	4	18
Z2	#5	3'-10"	4	16
Z3	#5	3'-1"	4	8
REINF. STEEL LBS.				322
*CL. "A" CONC. FOOT. C.Y.			2.8	
BR. MASONRY/C.S. C.Y.			2.5	
BR. MASONRY/R.C. C.Y.			2.3	

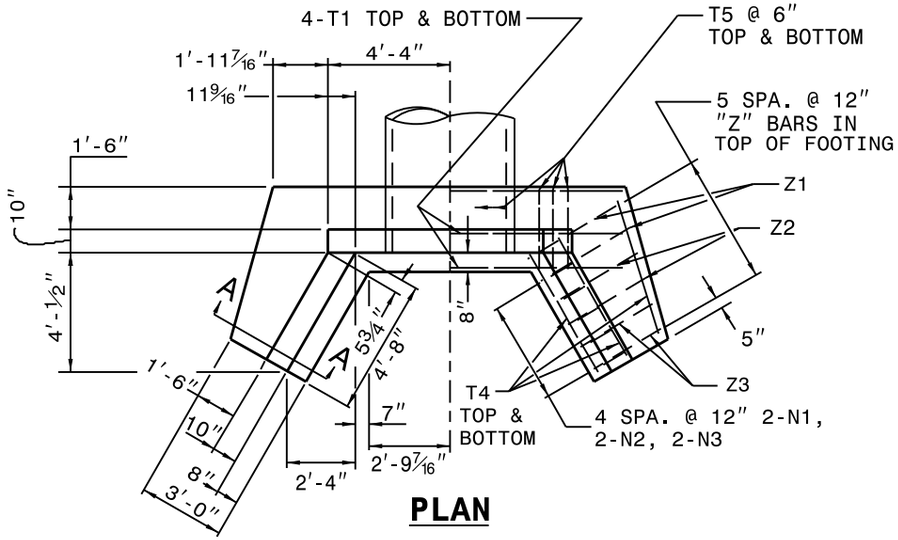


SECTION A-A

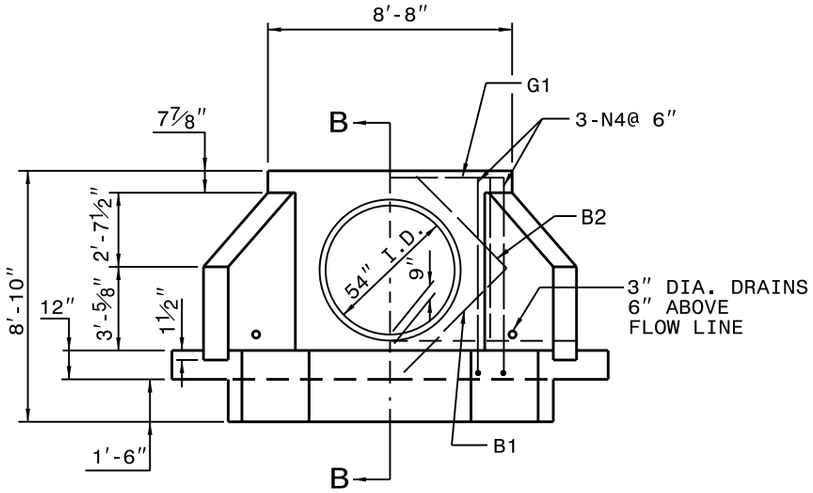


SECTION B-B

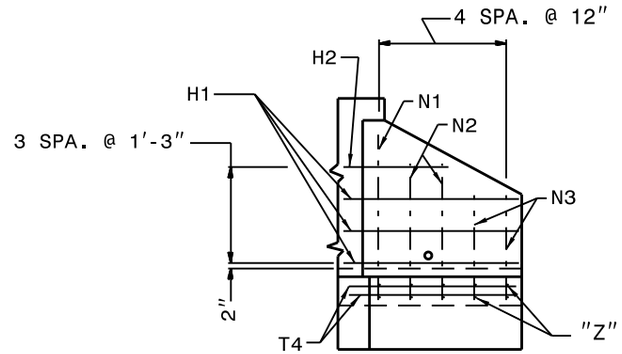
SEE STD. DWG. NO. 838.75 FOR GENERAL NOTES.



PLAN



ELEVATION



WING ELEVATION

STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

1-24

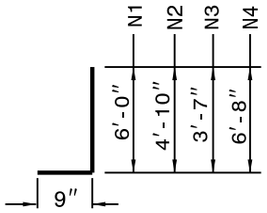
ROADWAY STANDARD DRAWING FOR

REINFORCED BRICK ENDWALL

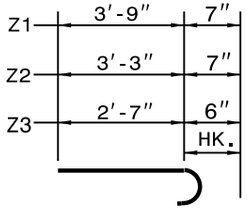
FOR SINGLE 54" PIPE - 90° SKEW

SHEET 1 OF 1

838.51



"N" BARS



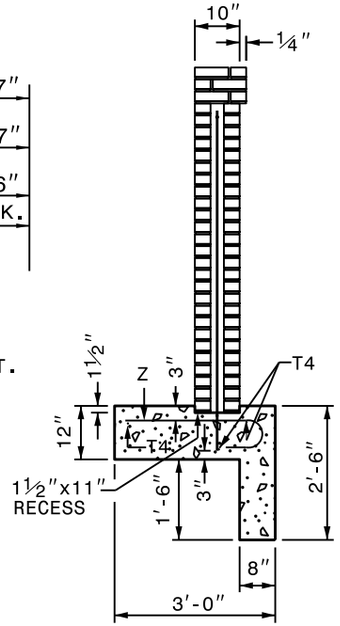
"Z" BARS

"N" & "Z" BAR DIMENSIONS ARE OUT TO OUT.

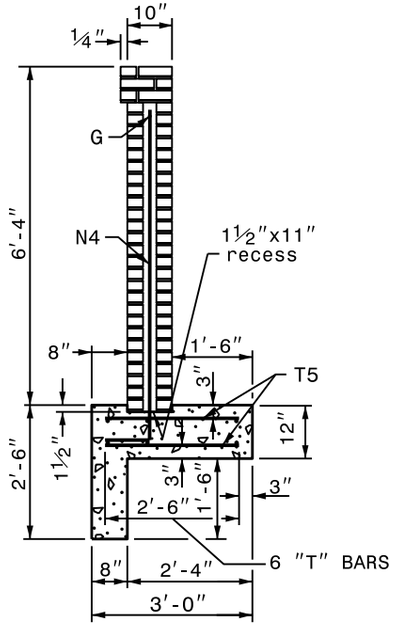
*PAY FOR CONCRETE AS BRICK MASONRY

BILL OF MATERIAL FOR ENDWALL

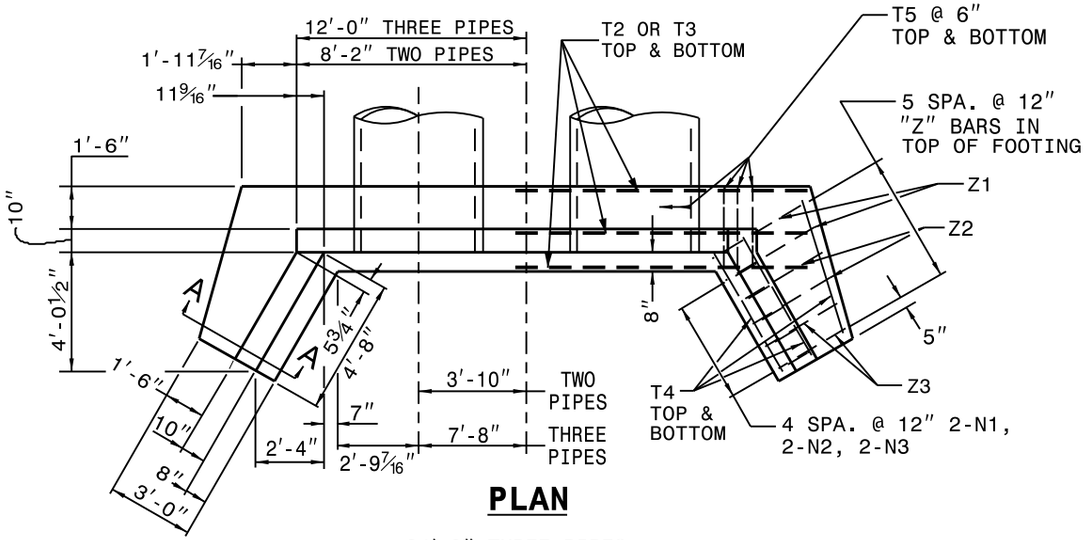
REINF. STEEL			2 PIPES		3 PIPES	
BAR	SIZE	LENGTH	NO.	WEIGHT	NO.	WEIGHT
B1	#5	5'-3"	4	22	6	33
B2	#5	3'-9"	2	8	2	8
B3	#5	6'-0"	2	13	4	25
G2	#7	15'-4"	2	63	-	-
G3	#7	23'-0"	-	-	2	94
H1	#4	5'-3"	6	21	6	21
H2	#4	3'-6"	2	5	2	5
N1	#5	6'-9"	2	14	2	14
N2	#5	5'-7"	4	23	4	23
N3	#4	4'-4"	4	12	4	12
N4	#4	7'-5"	11	54	16	79
T2	#4	19'-8"	6	79	-	-
T3	#4	27'-4"	-	-	6	110
T4	#4	4'-11"	6	20	6	20
T5	#4	2'-6"	66	110	96	160
Z1	#5	4'-4"	4	18	4	18
Z2	#5	3'-10"	4	16	4	16
Z3	#4	3'-1"	4	8	4	8
REINF. STEEL LBS.				486		646
*CL. "A" CONC. FOOT. C.Y.				4.0		5.1
BR. MASONRY/C.S. C.Y.				3.5		4.5
BR. MASONRY/R.C. C.Y.				3.1		3.9



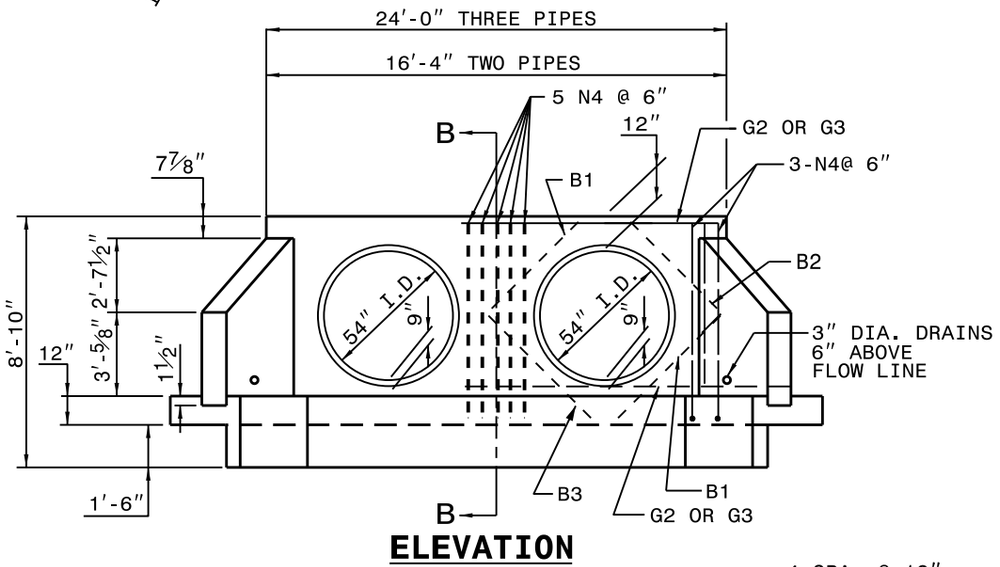
SECTION A-A



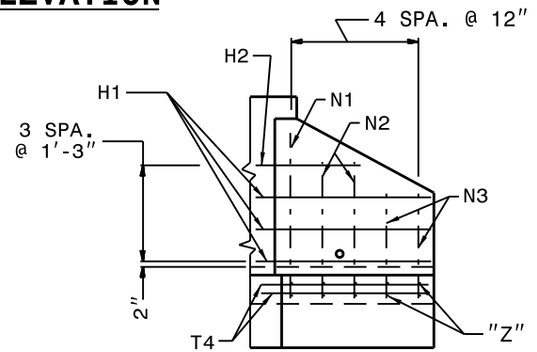
SECTION B-B



PLAN



ELEVATION



WING ELEVATION

SEE STD. DWG. NO. 838.75 FOR GENERAL NOTES.

STATE OF
NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

1-24

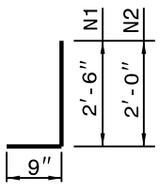
ROADWAY STANDARD DRAWING FOR

REINFORCED BRICK ENDWALL

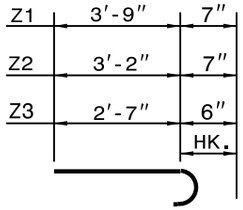
FOR DOUBLE AND TRIPLE 54" PIPES - 90° SKEW

SHEET 1 OF 1

838.52



"N" BARS

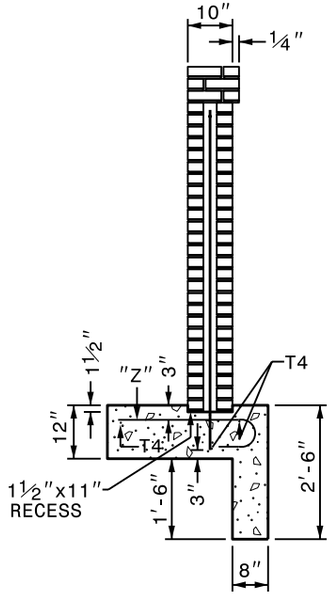


"Z" BARS

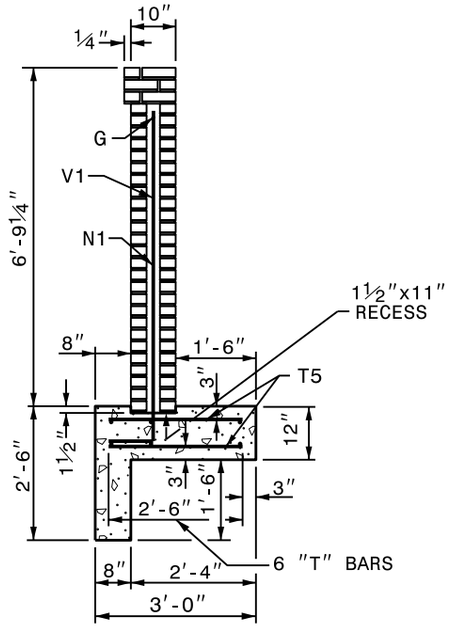
"N" & "Z" BAR DIMENSIONS ARE OUT TO OUT.

*PAY FOR CONCRETE AS BRICK MASONRY

BILL OF MATERIAL FOR ENDWALL				
REINF. STEEL			1 PIPE	
BAR	SIZE	LENGTH	NO.	WEIGHT
B1	#5	5'-3"	2	11
B2	#5	3'-9"	2	8
G1	#7	8'-0"	2	33
H1	#4	5'-9"	6	23
H2	#4	4'-0"	2	5
H3	#4	2'-1"	2	3
N1	#5	3'-3"	12	41
N2	#4	2'-9"	6	11
T1	#4	13'-0"	6	52
T4	#4	5'-8"	6	23
T5	#4	2'-6"	36	60
V1	#4	6'-4"	6	25
V2	#4	5'-2"	4	14
V3	#4	3'-11"	4	10
V4	#4	2'-9"	4	7
Z1	#5	4'-4"	6	27
Z2	#5	3'-9"	4	16
Z3	#5	3'-1"	4	8
REINF. STEEL LBS.				377
*CL. "A" CONC. FOOT. C.Y.			3.1	
BR. MASONRY/C.S. C.Y.			2.8	
BR. MASONRY/R.C. C.Y.			2.6	

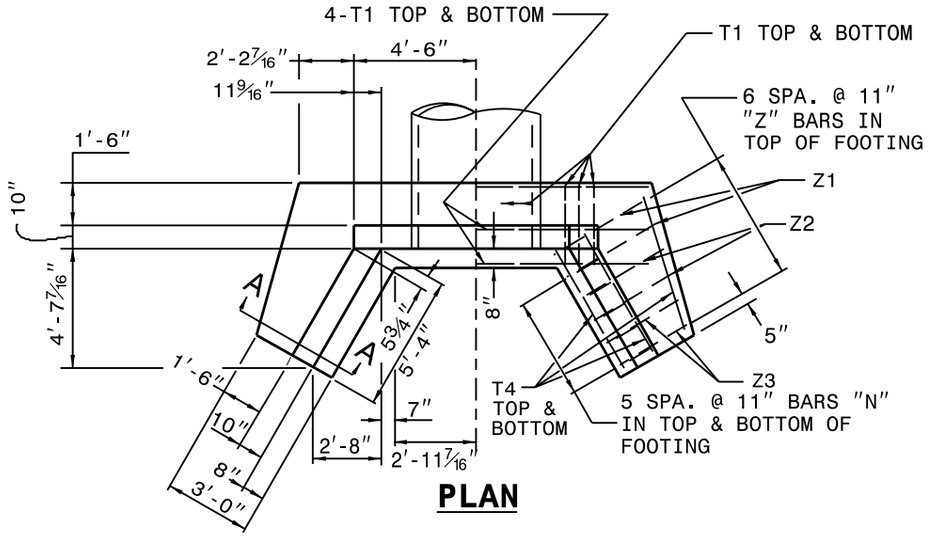


SECTION A-A

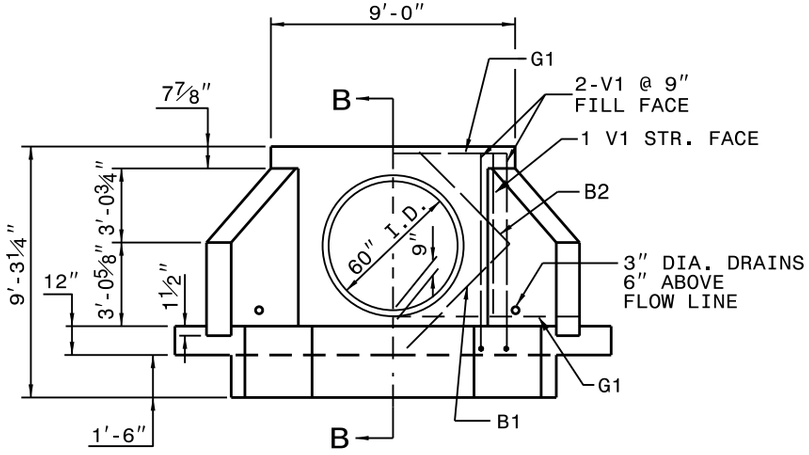


SECTION B-B

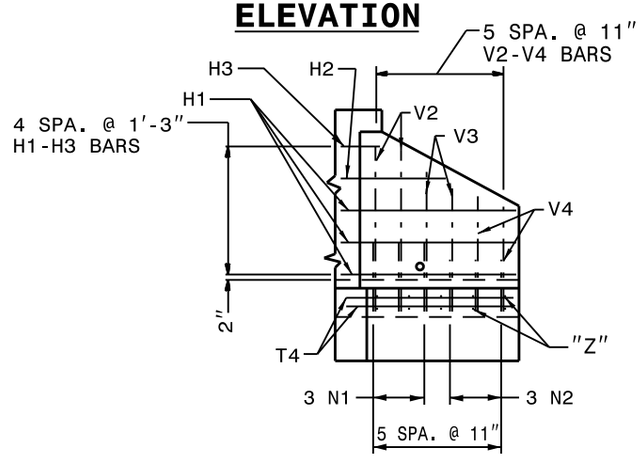
SEE STD. DWG. NO. 838.75 FOR GENERAL NOTES.



PLAN



ELEVATION



WING ELEVATION

STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

1-24

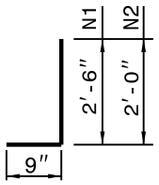
ROADWAY STANDARD DRAWING FOR

REINFORCED BRICK ENDWALL

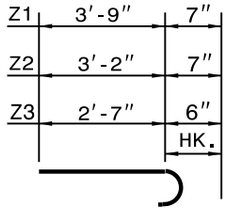
FOR SINGLE 60" PIPE - 90° SKEW

SHEET 1 OF 1

838.57



"N" BARS



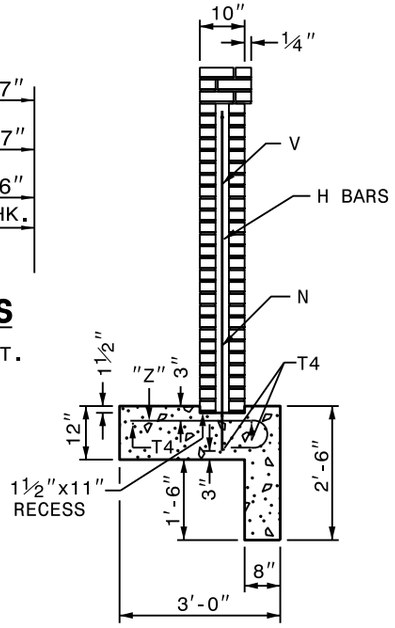
"Z" BARS

"N" & "Z" BAR DIMENSIONS ARE OUT TO OUT.

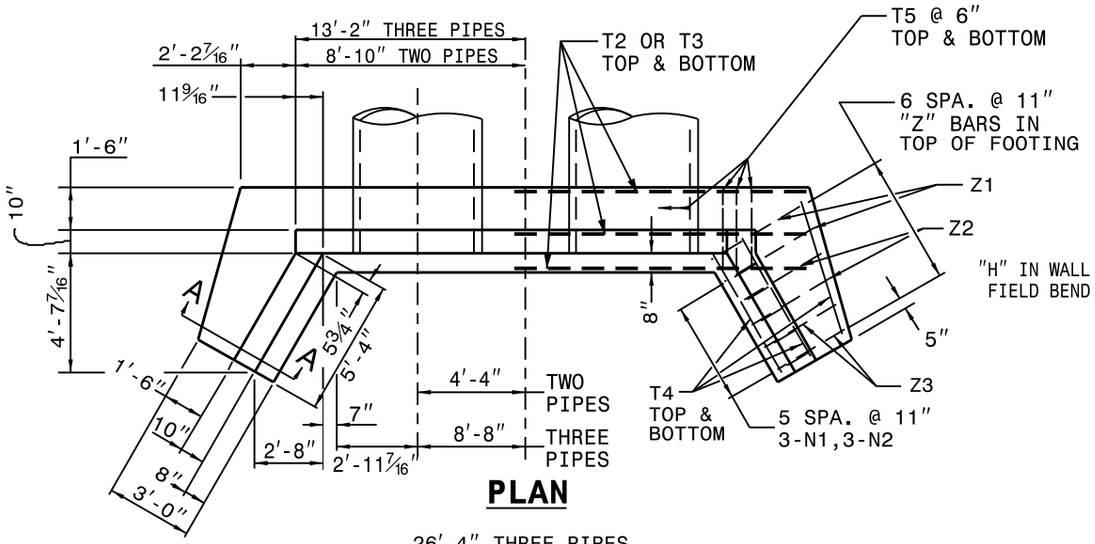
*PAY FOR CONCRETE AS BRICK MASONRY

BILL OF MATERIAL FOR ENDWALL						
REINF. STEEL			2 PIPES		3 PIPES	
BAR	SIZE	LENGTH	NO.	WEIGHT	NO.	WEIGHT
B1	#5	5'-3"	4	22	6	33
B2	#5	3'-9"	2	8	2	8
B3	#5	6'-3"	2	13	4	26
G2	#7	16'-8"	2	68	-	-
G3	#7	25'-4"	-	-	2	104
H1	#4	5'-9"	6	23	6	23
H2	#4	4'-0"	2	5	2	5
H3	#4	2'-1"	2	3	2	3
N1	#5	3'-3"	17	58	22	75
N2	#4	2'-9"	6	11	6	11
T2	#4	21'-8"	6	87	-	-
T3	#4	15'-10"	-	-	12	127
T4	#4	5'-8"	6	23	6	23
T5	#4	2'-6"	70	117	106	177
V1	#4	6'-4"	11	47	16	68
V2	#4	5'-2"	4	14	4	14
V3	#4	3'-11"	4	10	4	10
V4	#4	2'-9"	4	7	4	7
Z1	#5	4'-4"	6	27	6	27
Z2	#5	3'-9"	4	16	4	16
Z3	#4	3'-1"	4	8	4	8
REINF. STEEL LBS.			X	567		765
					X	
*CL. "A" CONC. FOOT. C.Y.			4.4		X	5.6
BR. MASONRY/C.S. C.Y.			4.0		X	5.3
BR. MASONRY/R.C. C.Y.			3.5		X	4.5

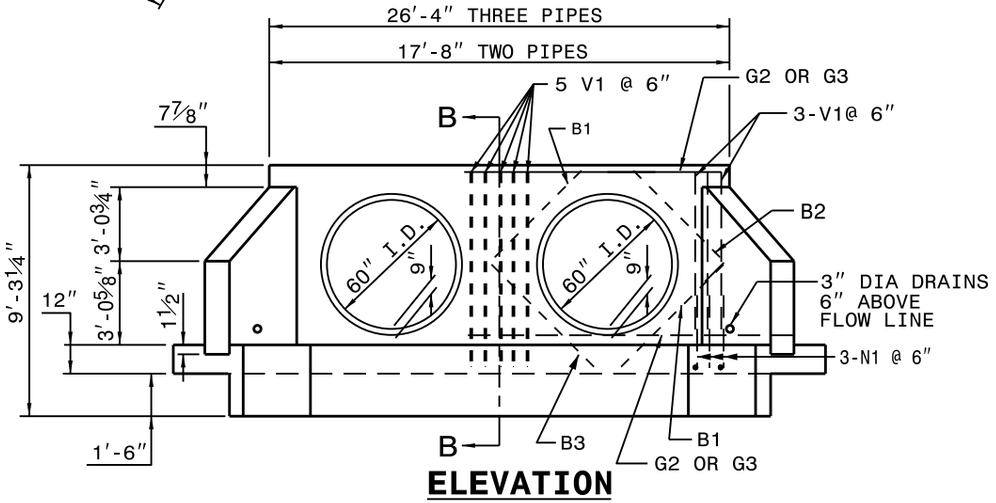
SEE STD. DWG. NO. 838.75 FOR GENERAL NOTES.



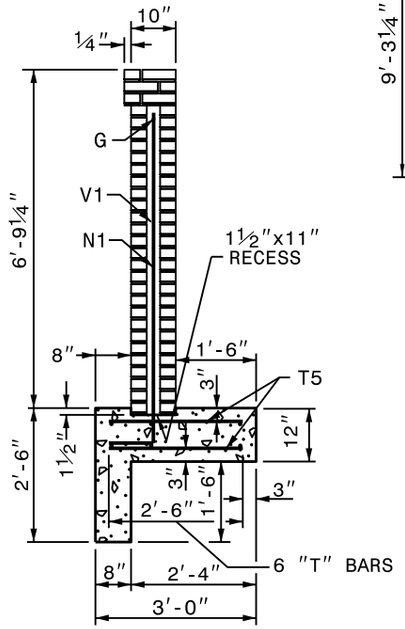
SECTION A-A



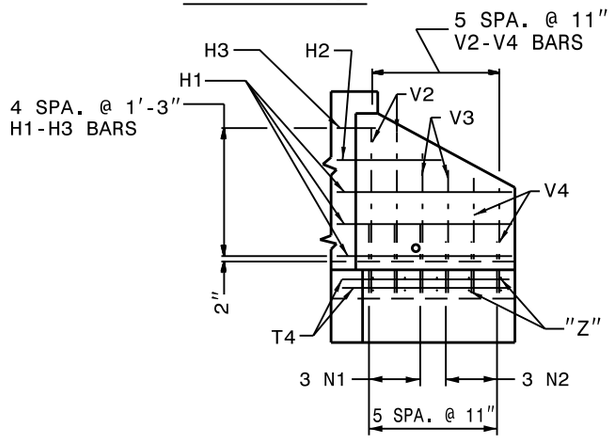
PLAN



ELEVATION



SECTION B-B



WING ELEVATION

1-24

STATE OF
NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

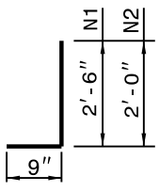
ROADWAY STANDARD DRAWING FOR

REINFORCED BRICK ENDWALL

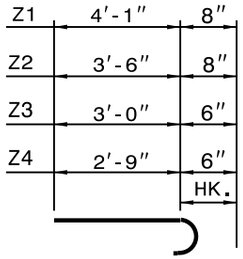
FOR DOUBLE AND TRIPLE 60" PIPES - 90° SKEW

SHEET 1 OF 1

838.58



"N" BARS



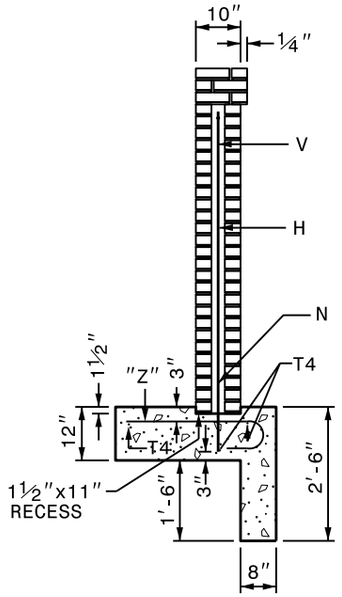
"Z" BARS

"N" & "Z" BAR DIMENSIONS ARE OUT TO OUT.

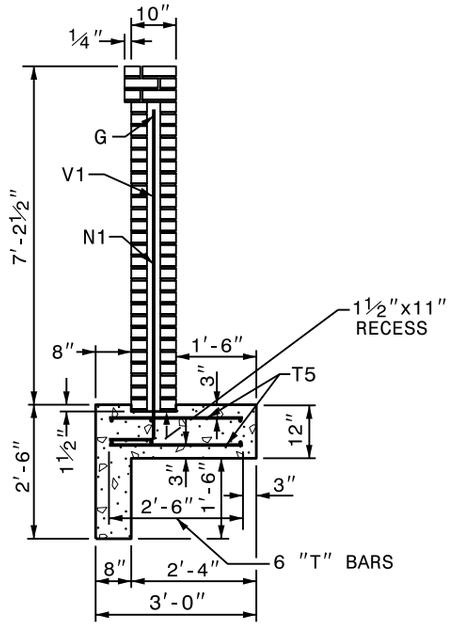
*PAY FOR CONCRETE AS BRICK MASONRY

BILL OF MATERIAL FOR ENDWALL				
REINF. STEEL			1 PIPE	
BAR	SIZE	LENGTH	NO.	WEIGHT
B1	#5	5'-3"	2	11
B2	#5	4'-0"	2	8
G1	#7	8'-8"	2	35
H1	#4	6'-3"	6	25
H2	#4	5'-0"	2	7
H3	#4	3'-0"	2	4
N1	#5	3'-3"	14	47
N2	#4	2'-9"	6	11
T1	#4	13'-10"	6	55
T4	#4	5'-9"	6	23
T5	#4	2'-6"	36	60
V1	#4	6'-11"	6	27
V2	#4	6'-2"	2	8
V3	#4	5'-3"	4	14
V4	#4	4'-2"	4	11
V5	#4	3'-2"	4	8
Z1	#6	4'-9"	6	43
Z2	#6	4'-2"	4	25
Z3	#4	3'-6"	4	9
Z4	#4	3'-3"	2	4
REINF. STEEL LBS.				435
*CL. "A" CONC. FOOT. C.Y.			3.4	
BR. MASONRY/C.S. C.Y.			3.2	
BR. MASONRY/R.C. C.Y.			2.8	

SEE STD. DWG. NO. 838.75 FOR GENERAL NOTES.



SECTION A-A



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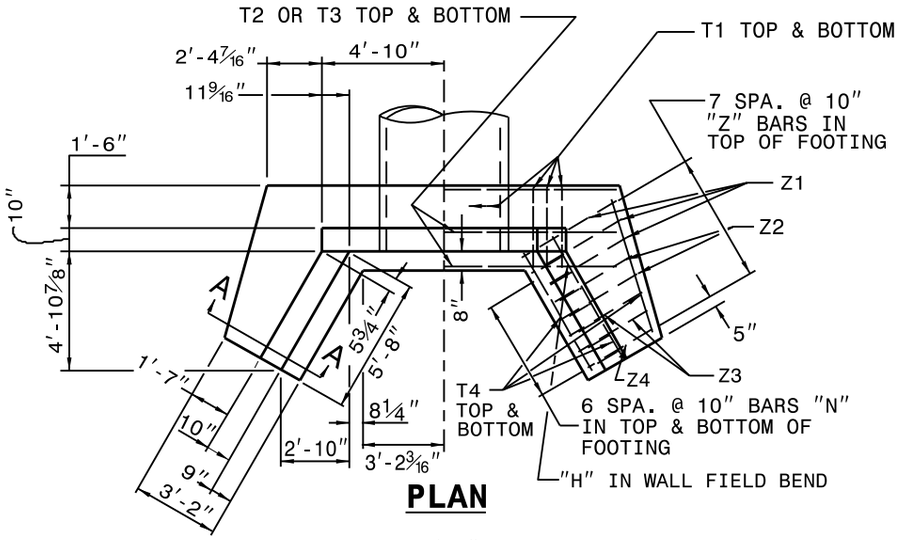
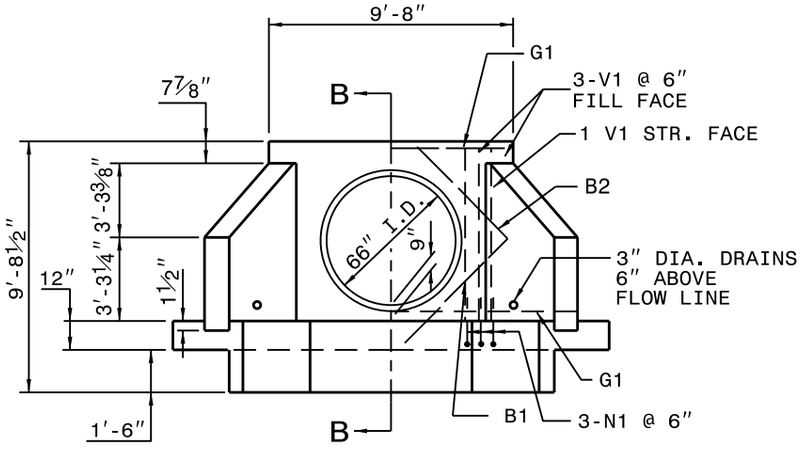
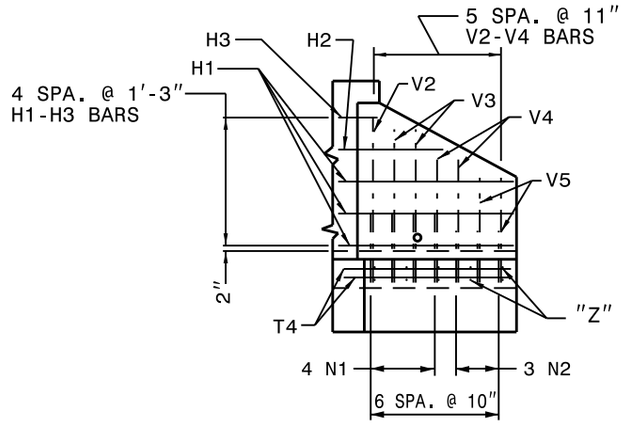


PLAN



ELEVATION



WING ELEVATION

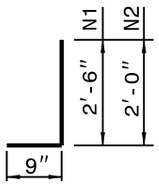
STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

1-24

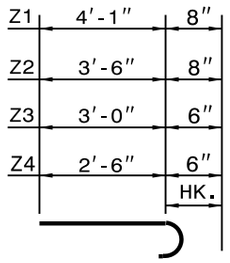
ROADWAY STANDARD DRAWING FOR

REINFORCED BRICK ENDWALL

FOR SINGLE 66" PIPE - 90° SKEW



"N" BARS



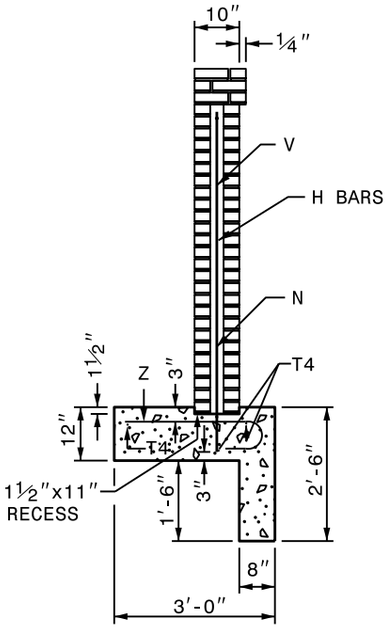
"Z" BARS

"N" & "Z" BAR DIMENSIONS ARE OUT TO OUT.

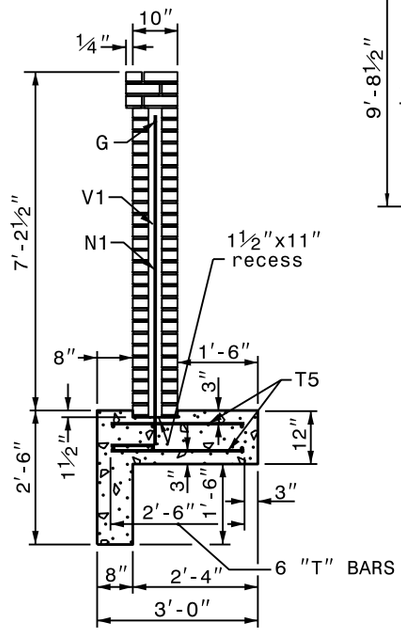
*PAY FOR CONCRETE AS BRICK MASONRY

BILL OF MATERIAL FOR ENDWALL						
REINF. STEEL			2 PIPES		3 PIPES	
BAR	SIZE	LENGTH	NO.	WEIGHT	NO.	WEIGHT
B1	#5	5'-3"	4	22	6	33
B2	#5	4'-0"	2	8	2	8
B3	#5	7'-0"	2	15	4	29
G2	#7	18'-0"	2	74	-	-
G3	#7	27'-4"	-	-	2	112
H1	#4	6'-3"	6	25	6	25
H2	#4	5'-0"	2	7	2	7
H3	#4	3'-0"	2	4	2	4
N1	#5	3'-3"	19	64	24	81
N2	#4	2'-9"	6	11	6	11
T2	#4	23'-2"	6	93	-	-
T3	#4	16'-11"	-	-	12	136
T4	#4	5'-9"	6	23	6	23
T5	#4	2'-6"	76	127	112	187
V1	#4	6'-11"	11	51	16	74
V2	#4	6'-2"	2	8	2	8
V3	#4	5'-3"	4	14	4	14
V4	#4	4'-2"	4	11	4	11
V5	#4	3'-2"	4	8	4	8
Z1	#6	4'-9"	6	43	6	43
Z2	#6	4'-2"	4	25	4	25
Z3	#4	3'-6"	4	9	4	9
Z4	#4	3'-3"	2	4	2	4
REINF. STEEL LBS.			X	646	X	852
*CL. "A" CONC. FOOT. C.Y.				4.8	X	6.1
BR. MASONRY/C.S. C.Y.				4.5	X	5.9
BR. MASONRY/R.C. C.Y.				3.9	X	5.0

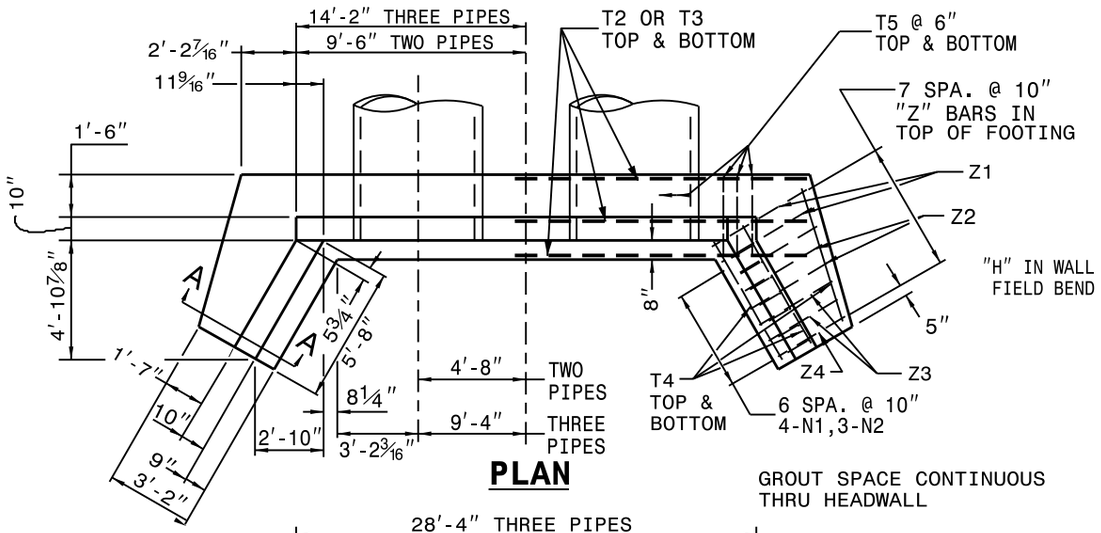
SEE STD. DWG. NO. 838.75 FOR GENERAL NOTES.



SECTION A-A

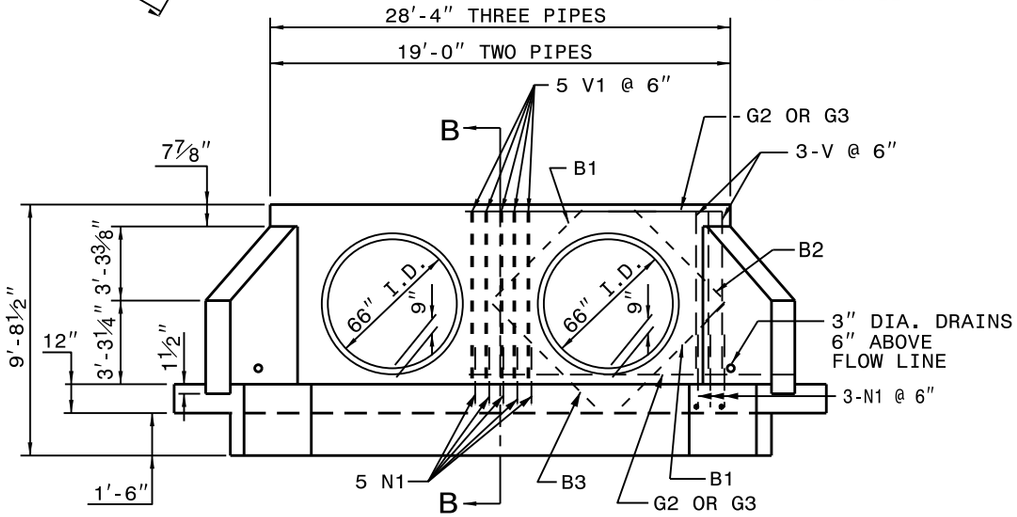


SECTION B-B

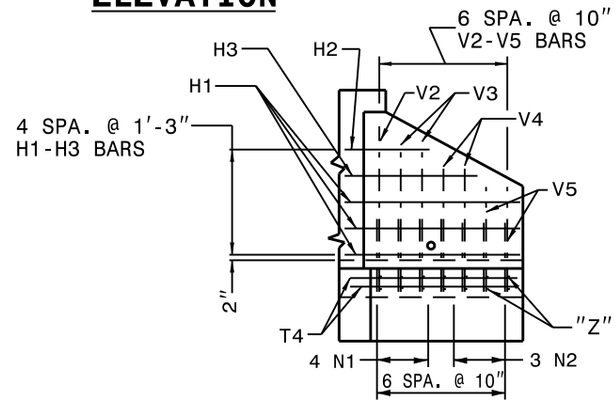


PLAN

GROUT SPACE CONTINUOUS
THRU HEADWALL



ELEVATION



WING ELEVATION

STATE OF
NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

1-24

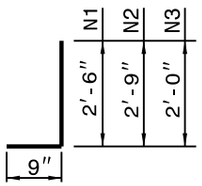
ROADWAY STANDARD DRAWING FOR

REINFORCED BRICK ENDWALL

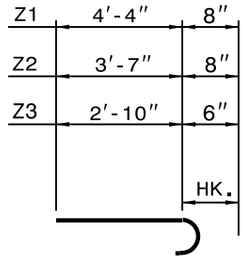
FOR DOUBLE AND TRIPLE 66" PIPES - 90° SKEW

SHEET 1 OF 1

838.64



"N" BARS



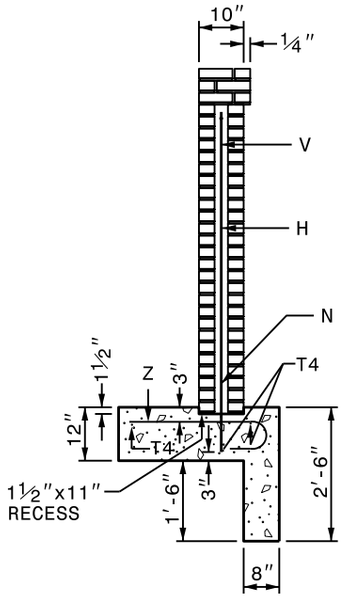
"Z" BARS

"N" & "Z" BAR DIMENSIONS ARE OUT TO OUT.

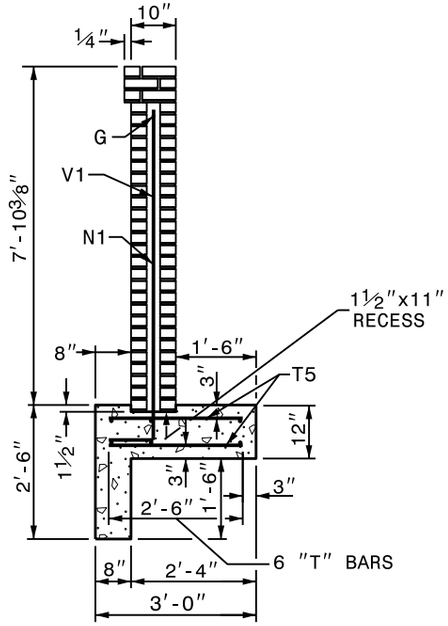
*PAY FOR CONCRETE AS BRICK MASONRY

BILL OF MATERIAL FOR ENDWALL				
REINF. STEEL			1 PIPE	
BAR	SIZE	LENGTH	NO.	WEIGHT
B1	#5	5'-6"	2	11
B2	#5	4'-3"	2	9
G1	#7	9'-0"	2	37
H1	#4	6'-9"	6	27
H2	#4	5'-8"	2	8
H3	#4	3'-8"	2	5
N1	#5	3'-3"	6	20
N2	#6	3'-6"	8	42
N3	#4	2'-9"	8	15
T1	#4	14'-8"	6	59
T4	#4	6'-6"	6	26
T5	#4	2'-6"	38	67
V1	#4	7'-6"	6	30
V2	#4	6'-7"	4	18
V3	#4	5'-6"	4	15
V4	#4	4'-9"	4	12
V5	#4	3'-5"	4	9
Z1	#6	5'-0"	6	45
Z2	#6	4'-3"	6	38
Z3	#4	3'-4"	6	13
REINF. STEEL LBS.				506
*CL. "A" CONC. FOOT. C.Y.			3.8	
BR. MASONRY/C.S. C.Y.			3.7	
BR. MASONRY/R.C. C.Y.			3.3	

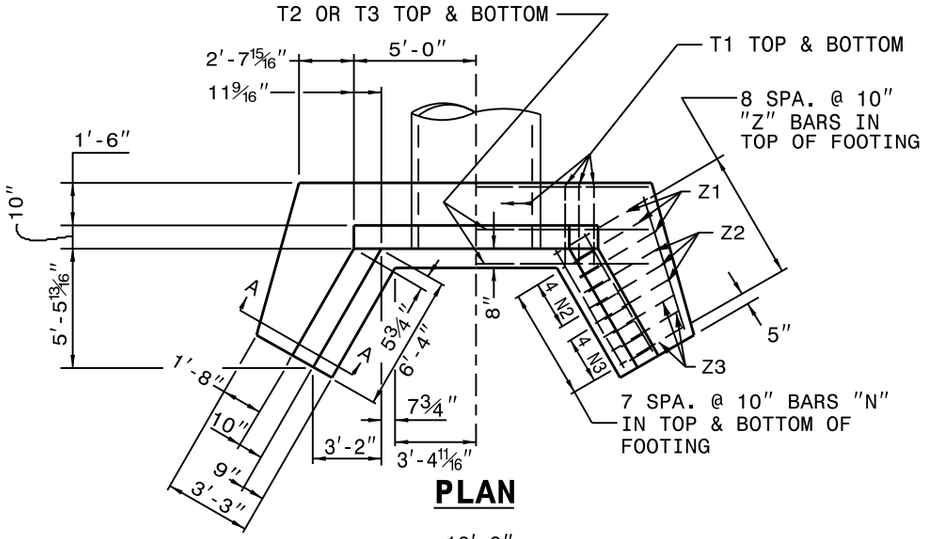
SEE STD. DWG. NO. 838.75 FOR GENERAL NOTES.



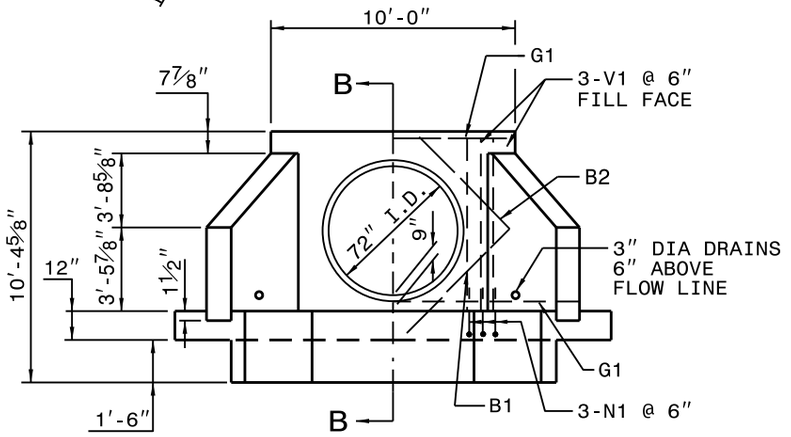
SECTION A-A



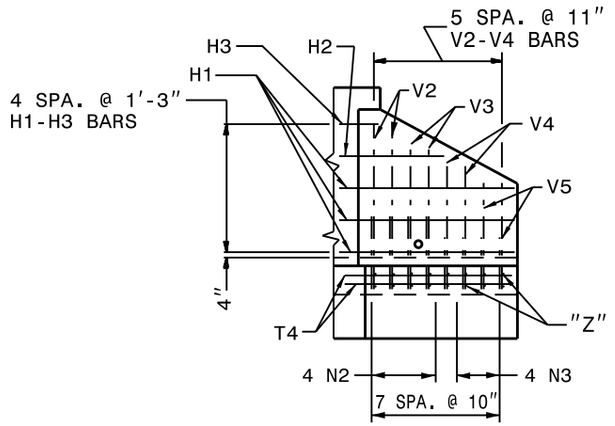
SECTION B-B



PLAN



ELEVATION



WING ELEVATION

STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

1-24

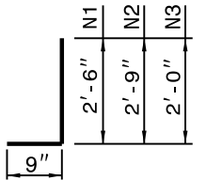
ROADWAY STANDARD DRAWING FOR

REINFORCED BRICK ENDWALL

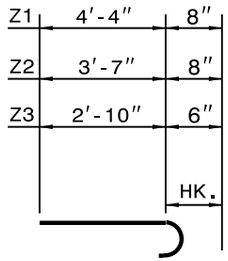
FOR SINGLE 72" PIPE - 90° SKEW

SHEET 1 OF 1

838.69



"N" BARS



"Z" BARS

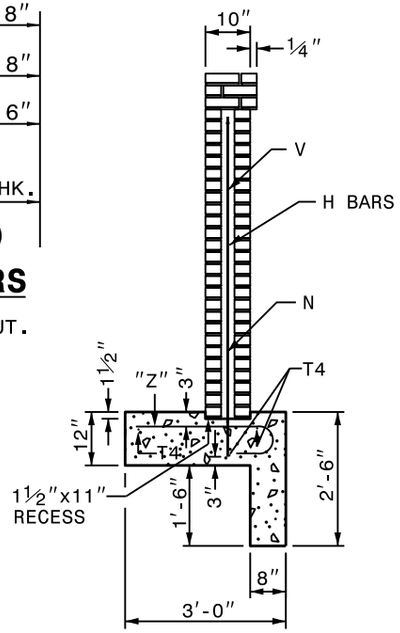
"N" & "Z" BARS DIMENSIONS ARE OUT TO OUT.

*PAY FOR CONCRETE AS BRICK MASONRY

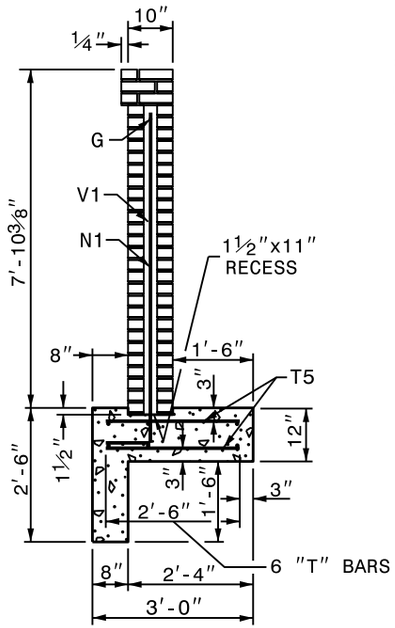
BILL OF MATERIAL FOR ENDWALL

REINF. STEEL			2 PIPES		3 PIPES	
BAR	SIZE	LENGTH	NO.	WEIGHT	NO.	WEIGHT
B1	#5	5'-6"	4	23	6	34
B2	#5	4'-3"	2	9	2	9
B3	#5	7'-3"	2	15	4	30
G2	#7	19'-4"	2	79	-	-
G3	#7	29'-8"	-	-	2	121
H1	#4	6'-9"	6	27	6	27
H2	#4	5'-8"	2	8	2	8
H3	#4	3'-8"	2	5	2	5
N1	#5	3'-3"	11	37	16	54
N2	#6	3'-6"	8	42	8	42
N3	#4	2'-9"	8	15	8	15
T2	#4	25'-0"	6	100	-	-
T3	#4	18'-4"	-	-	12	147
T4	#4	6'-6"	6	26	6	26
T5	#4	2'-6"	82	137	122	204
V1	#4	7'-6"	11	55	16	80
V2	#4	6'-7"	4	18	4	18
V3	#4	5'-6"	4	15	4	15
V4	#4	4'-6"	4	12	4	12
V5	#4	3'-5"	4	9	4	9
Z1	#6	5'-0"	6	45	6	45
Z2	#6	4'-3"	6	38	6	38
Z3	#4	3'-4"	6	13	6	13
REINF. STEEL LBS.				728		952
*CL. "A" CONC. FOOT. C.Y.				5.3		6.8
BR. MASONRY/C.S. C.Y.				5.3		7.0
BR. MASONRY/R.C. C.Y.				4.6		5.9

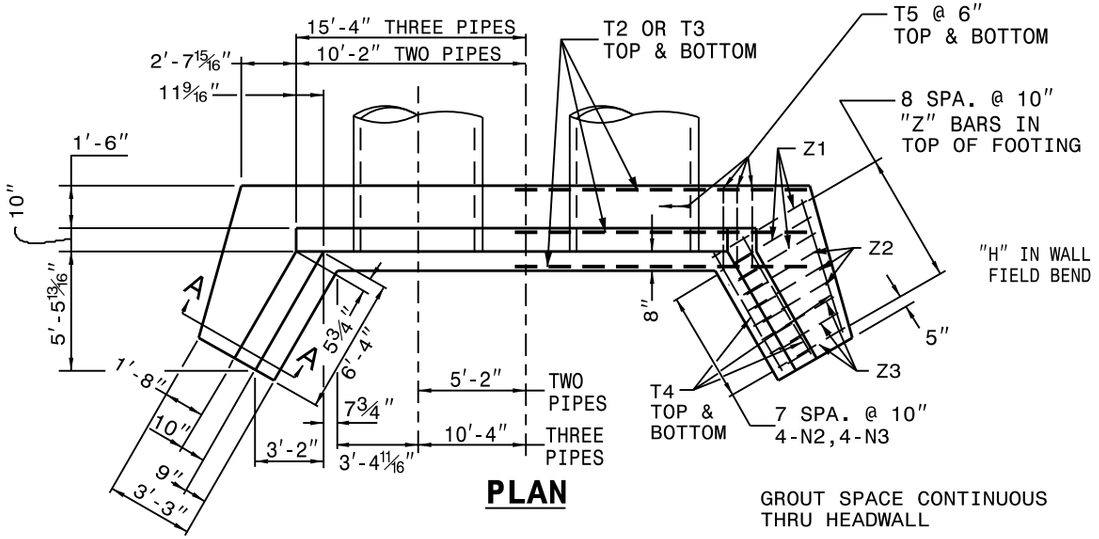
SEE STD. DWG. NO. 838.75 FOR GENERAL NOTES.



SECTION A-A

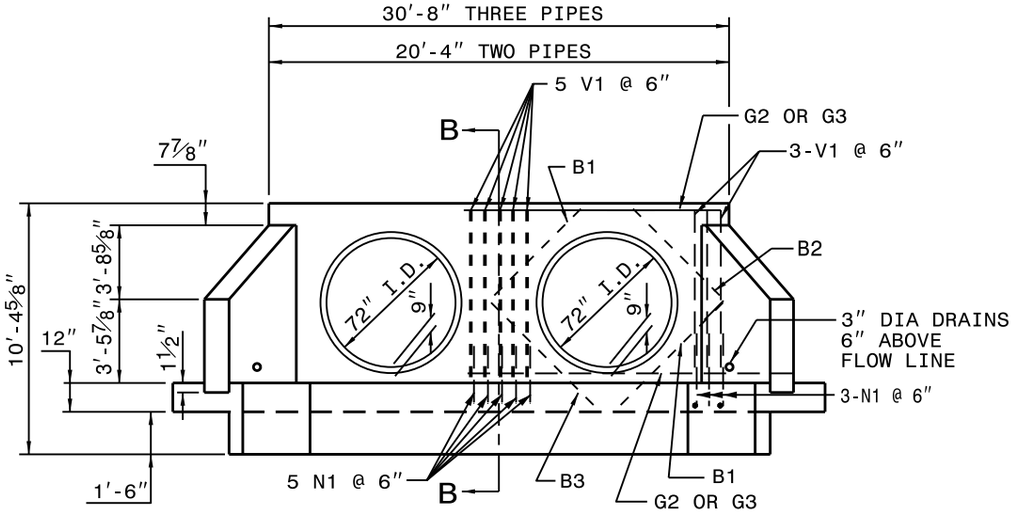


SECTION B-B

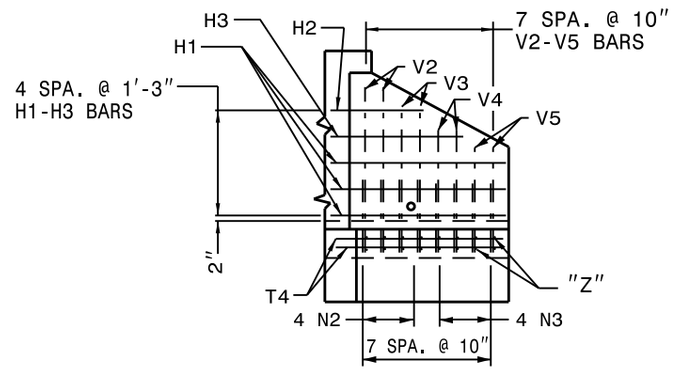


PLAN

GROUT SPACE CONTINUOUS
THRU HEADWALL



ELEVATION



WING ELEVATION

STATE OF
NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

1-24

ROADWAY STANDARD DRAWING FOR

REINFORCED BRICK ENDWALL

FOR DOUBLE AND TRIPLE 72" PIPES - 90° SKEW

SHEET 1 OF 1

838.70

DESIGN DATA

SPECIFICATIONS	AASHTO
STEEL IN TENSION	20,000 PSI
CONCRETE IN COMPRESSION	1,200 PSI
BRICK MASONRY IN COMPRESSION	1,000 PSI
CONCRETE IN SHEAR	90 PSI
BRICK MASONRY IN SHEAR	50 PSI
EQUIVALENT FLUID PRESSURE OF EARTH	30 LBS. PER CU. FT.

GENERAL NOTES:

SELECT BRICK FROM SAMPLES SUBMITTED TO THE ENGINEER PRIOR TO BEGINNING CONSTRUCTION. USE BRICK OF SIZE 2¼″x 3⅝″x 7⅝″. CONTRACTOR MAY SUBSTITUTE A LARGER BRICK BUT NOT EXCEEDING 3⅝″ X 3⅝″ X 11⅝″. IF A LARGER SIZE IS USED, KEEP BRICK FALL WITHIN NEAT LINES SHOWN ON PLANS. USE ONLY ONE SIZE BRICK IN ANY ONE STRUCTURE. USE CLASS ″B″ OR BETTER CONCRETE TO FILL THE CAVITY AREA AT INTERVALS FROM ONE TO NOT MORE THAN FOUR BRICK COURSES AT A TIME. STOP EACH CONCRETE PLACEMENT AT LEAST 1″ BELOW TOP OF BRICK COURSE AND ROD TO ENSURE FILLING OF ALL VOIDS.

DO NOT PERMIT HEADERS TO CROSS THE CONCRETE FILLED AREA. PLACE HORIZONTAL REINFORCEMENT LOOSE IN THE CONCRETE FILLED SPACE AS WORK PROGRESSES. PLACE VERTICAL REINFORCEMENT IN THE CENTER OF THE CONCRETE FILLED SPACE. PERMANENT TIES ARE NOT NECESSARY. USE TEMPORARY TIES TO HOLD VERTICAL BARS IN PLACE. CONSTRUCT NEITHER SIDE OF OF THE WALL ABOVE THE OTHER SIDE TO A HEIGHT EXCEEDING SIX (6) COURSES. CONCAVE ALL EXPOSED JOINTS.

USE CLASS 'A' CONCRETE IN THE FOOTINGS.

CONSTRUCT ALL MORTAR JOINTS ⅜″ ± ⅛″.

COVER WEEP HOLES WITH HARDWARE CLOTH IN ACCORDANCE WITH ARTICLE 420-11 OF THE STANDARD SPECIFICATIONS. PLACE A STONE DRAIN CONSISTING OF ONE (1) CUBIC FOOT OF NUMBER 78M STONE CONTAINED IN A BAG OF TYPE 1 GEOTEXTILE AT EACH WEEP HOLE. PLACE SUBDRAIN FINE AGGREGATE BENEATH, AROUND AND OVER THE STONE DRAIN SO THE STONE DRAIN IS COMPLETELY COVERED BY A LAYER OF SUBDRAIN FINE AGGREGATE AT LEAST ONE (1) FOOT THICK. WHERE THERE IS MORE THAN ONE WEEP HOLE IN A WING WALL, PLACE A HORIZONTAL DRAIN OF SUBDRAIN FINE AGGREGATE AT LEAST ONE (1) FOOT SQUARE IN CROSS SECTION TO CONNECT ALL STONE DRAINS. PLACE A VERTICAL DRAIN OF SUBDRAIN FINE AGGREGATE AT LEAST ONE (1) FOOT SQUARE IN CROSS SECTION AT EACH WEEP HOLE TO AN ELEVATION OF TWO (2) FEET BELOW THE SURFACE OF THE EMBANKMENT.

STATE OF
NORTH CAROLINA
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DIVISION OF HIGHWAYS
RALEIGH, N.C.

1-24

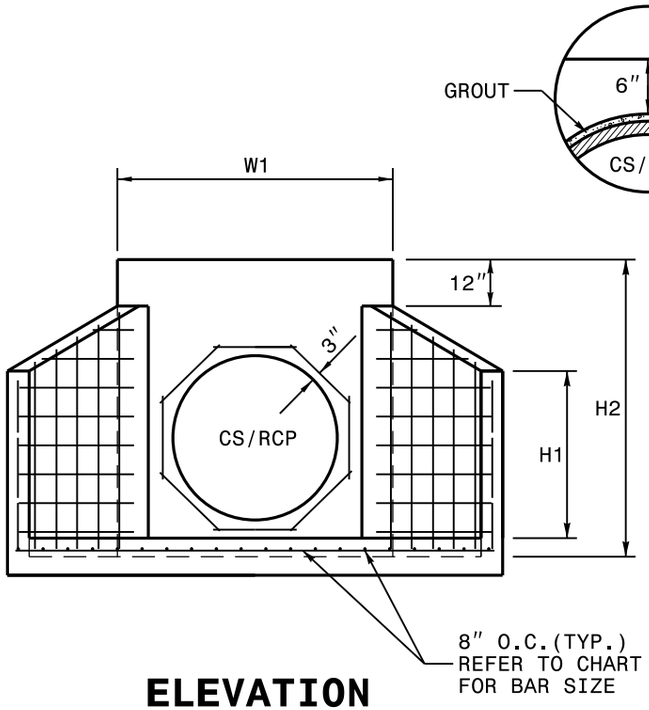
ROADWAY STANDARD DRAWING FOR

NOTES FOR REINFORCED BRICK ENDWALL

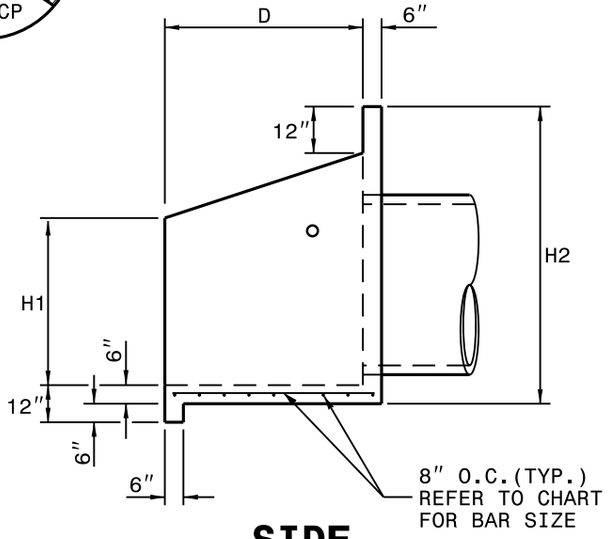
STANDARD DRAWINGS 838.51 THRU 838.70

SHEET 1 OF 1

838.75



ELEVATION

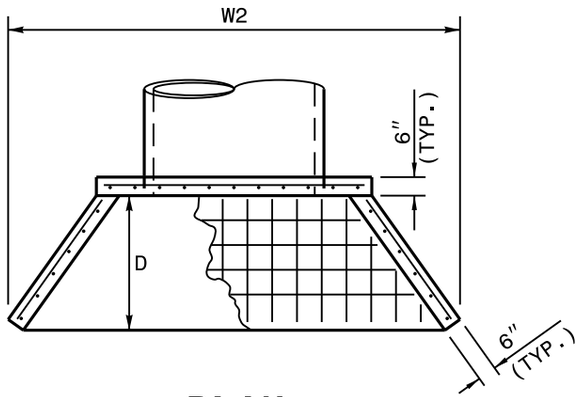


SIDE

NOTES:

* THIS PRECAST ENDWALL MAY BE USED FOR THE FOLLOWING STANDARDS: 838.01, 838.11, 838.21, 838.27, 838.33, 838.39, 838.51, 838.57, 838.63 AND 838.69.
* INSTALL PRECAST ENDWALLS WITH WINGS AND PAY FOR IN ACCORDANCE WITH SPECIFICATION SECTION 838.
* USE 4000 PSI CONCRETE.
* PROVIDE ALL REINFORCING STEEL WHICH MEETS ASTM A615 FOR GRADE 60 AND WELDED WIRE FABRIC CONFORMING TO ASTM A185 WITH 2" MIN. CLEARANCE.
* PLACE LIFT HOLES OR PINS IN ACCORDANCE WITH OSHA STANDARD 1926.704.
* PIPE TO BE GROUTED INTO ENDWALL AT JOB SITE BY CONTRACTOR.
* ALL ELEMENTS PRECAST TO MEET ASTM C913.
* WELDED WIRE FABRIC MAY BE SUBSTITUTED FOR REBAR AS LONG AS THE SAME AREA OF STEEL IS PROVIDED.
* CHAMFER ALL CORNERS 1" OR HAVE A RADIUS OF 1".

NOTE: THE MINIMUM BAR SIZE SHALL BE #5 BARS AT 8" CTS.THE CONTRACTOR WILL HAVE THE OPTION TO INCREASE THIS BAR SIZE AS NEEDED.



PLAN

ENDWALL DIMENSIONS

	MINIMUM	MIN./MAX.	MIN./MAX.	MIN./MAX.	MIN./MAX.	MIN./MAX.
PIPE DIA.	BAR SIZE	H1	H2	D	W1	W2
12"	#5 @ 8"	15"/24"	33"/45"	15"/21"	36"/45"	66"/72"
15"	#5 @ 8"	15"/24"	37"/45"	15"/24"	42"/45"	78"/81"
18"	#5 @ 8"	15"/24"	40"/51"	15"/30"	42"/45"	78"/81"
24"	#5 @ 8"	18"/32"	47"/57"	21"/30"	48"/51"	90"/99"
30"	#5 @ 8"	30"/42"	54"/72"	24"/36"	54"/66"	120"/138"
36"	#5 @ 8"	36"/42"	61"/72"	33"/42"	63"/69"	138"/141"
42"	#5 @ 8"	39"/52"	68"/81"	39"/42"	72"/81"	144"/159"
48"	#5 @ 8"	42"/52"	75"/84"	39"/42"	78"/81"	156"/159"
54"	#5 @ 8"	48"/60"	82"/102"	39"/48"	84"/111"	162"/189"
60"	#5 @ 8"	54"/60"	89"/102"	39"/48"	89"/111"	165"/189"
66"	#5 @ 8"	54"/60"	96"/102"	39"/48"	96"/111"	168"/189"
72"	#5 @ 8"	54"/60"	103"/108"	39"/48"	103"/111"	177"/201"

STATE OF NORTH CAROLINA
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RALEIGH, N.C.

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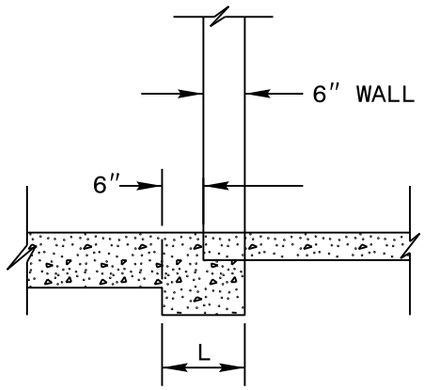
ROADWAY STANDARD DRAWING FOR

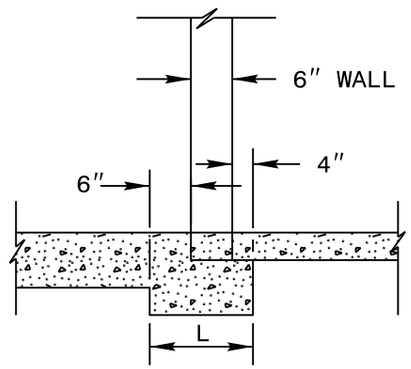
PRECAST CONCRETE ENDWALL

FOR SINGLE 12" THRU 72" PIPE - 90° SKEW

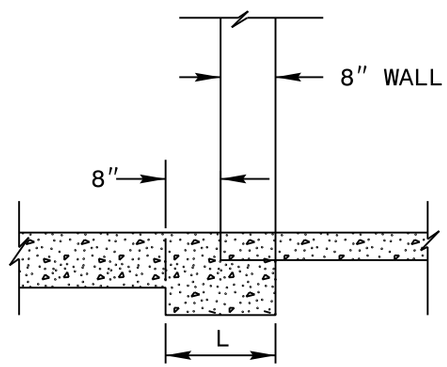
838.80



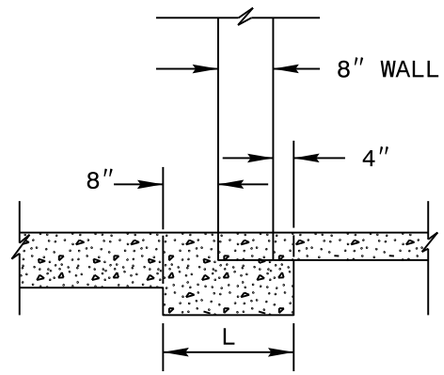
PART SECTION
6" WALL



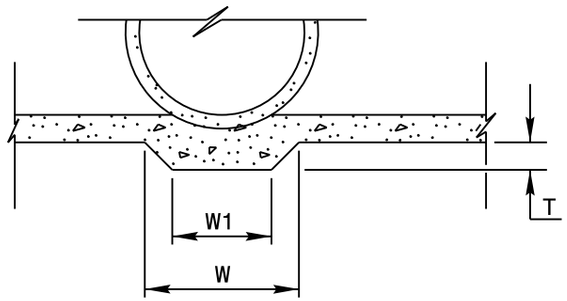
PART SECTION
6" WALL WITH 4" LIP



PART SECTION
8" WALL



PART SECTION
8" WALL WITH 4" LIP



PART SECTION
OF END ELEVATION

TABLES OF QUANTITIES FOR PIPE SET IN PAD

PIPE	"W"	"W1"	"T"	*C.Y. QUANTITIES WHEN L IS*		
D	*DIM*	*DIM*	*DIM*	12″	16″	20″
12″	1′-1⅞″	0′-7⅞″	0′-2″	0.005	0.007	0.008
15″	1′-3⅝″	0′-9⅛″	0′-2″	0.006	0.008	0.010
18″	1′-5¼″	0′-10⅜″	0′-2″	0.007	0.010	0.012
24″	1′-8¾″	1′-0⅛″	0′-3″	0.011	0.014	0.018
30″	2′-0¼″	1′-2¾″	0′-3½″	0.014	0.018	0.023
36″	2′-3¾″	1′-5⅜″	0′-4″	0.017	0.023	0.025
42″	2′-7⅛″	1′-7″	0′-5¼″	0.025	0.030	0.038
48″	2′-10⅝″	1′-8¾″	0′-5¾″	0.028	0.038	0.047
54″	3′-2⅛″	1′-10½″	0′-6¼″	0.035	0.047	0.058
60″	3′-5⅝″	2′-0¼″	0′-6¾″	0.042	0.056	0.071
66″	3′-9″	2′-2¼″	0′-7¼″	0.050	0.067	0.084
72″	4′-0½″	2′-3¾″	0′-7¾″	0.059	0.078	0.098

GENERAL NOTES:

USE THIS STANDARD WITH ALL DRAINAGE STRUCTURES USING REINFORCED CONCRETE PIPE SET IN BASE SLAB.

1-24

STATE OF
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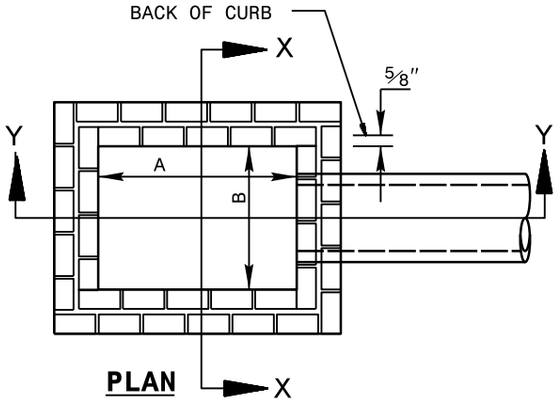
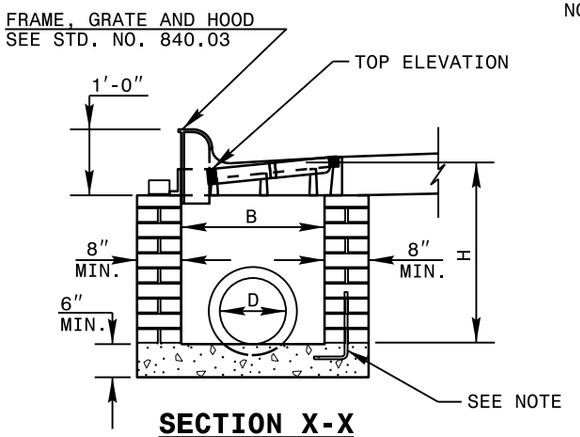
RALEIGH, N.C.

ROADWAY STANDARD DRAWING FOR

CONCRETE BASE PAD FOR DRAINAGE STRUCTURES

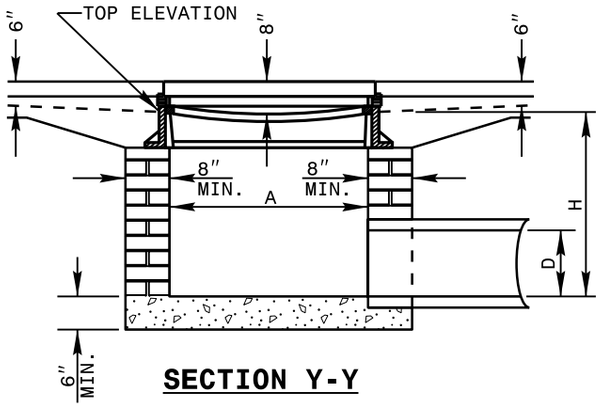


PLAN

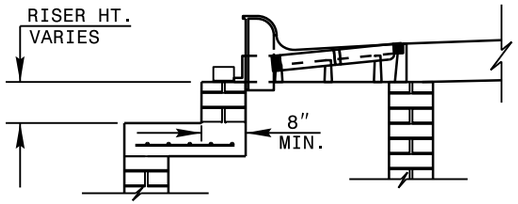


SECTION X-X

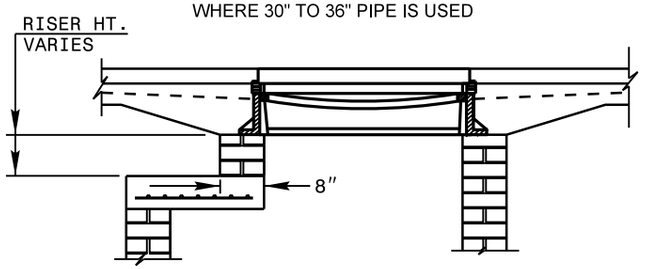
NOTES:
MORTAR JOINTS ½" +/- ⅛" THICK.
USE CLASS "B" CONCRETE THROUGHOUT.
USE FORMS FOR CONSTRUCTION OF THE BOTTOM SLAB.
DEDUCT FOR PIPE(S) FROM TOTAL CU. YDS. OF BRICK MASONRY.
USE #4 BAR DOWELS AT 12" CENTERS FOR ALL PIPE SIZES.
PROVIDE ALL CATCH BASINS OVER 3'-6" IN DEPTH WITH STEPS 12" ON CENTER. USE STEPS WHICH COMPLY WITH STD. DRAWING 840.66.
USE TYPE "E", "F" AND "G" GRATES UNLESS OTHERWISE INDICATED.
USE BRICK OR CONCRETE BLOCK WHICH COMPLIES WITH THE REQUIREMENTS OF SECTION 840 OF THE STANDARD SPECIFICATIONS.
IF REINFORCED CONCRETE PIPE IS SET IN BOTTOM SLAB OF BOX, ADD TO SLAB AS SHOWN ON STD. NO. 840.00.
FOR 8'-0" IN HEIGHT OR LESS, USE 8" WALL. OVER 8'-0" IN HEIGHT, USE 12" WALL TO 6'-0" FROM TOP OF WALL AND 8" WALL FOR THE REMAINING 6'-0". QUANTITES TO BE ADJUSTED ACCORDINGLY.
MAXIMUN DEPTH OF THIS STRUCTURE FROM TOP OF BOTTOM SLAB TO TOP ELEVATION IS 12'-0". STD. NO. 840.45 CONTROLS MAXIMUM DEPTH OF PRECAST BOX IF USED.
CONSTRUCT WITH PIPE CROWNS MATCHING.
CHAMFER ALL EXPOSED CORNERS 1".
DRAWING NOT TO SCALE.



SECTION Y-Y

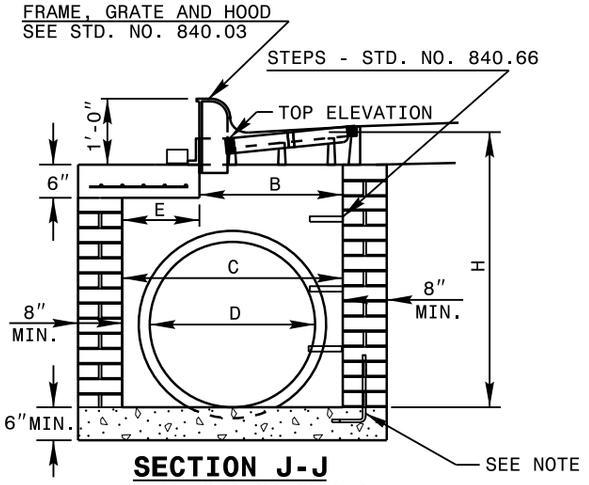


WHERE 30" TO 36" PIPE IS USED



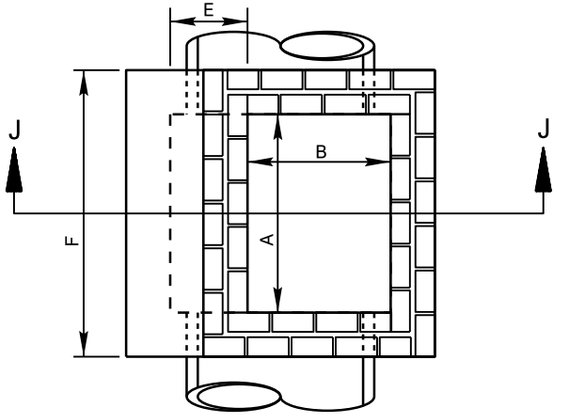
WHERE 42" TO 54" PIPE IS USED

DETAIL SHOWING METHOD OF RISER CONSTRUCTION

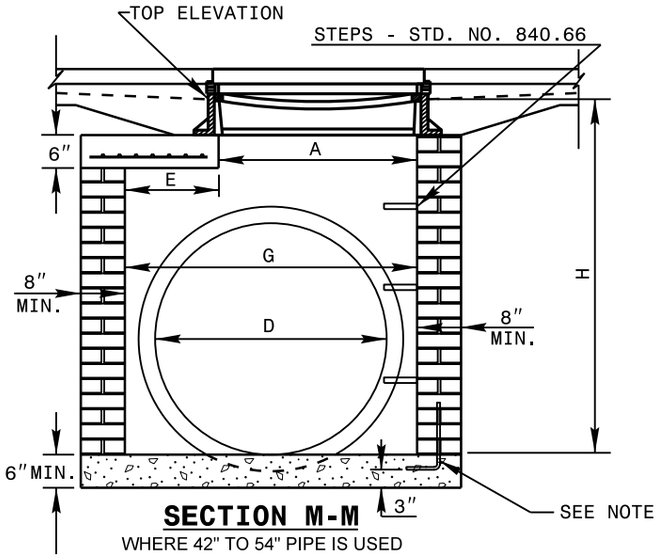


SECTION J-J

WHERE 30" TO 36" PIPE IS USED

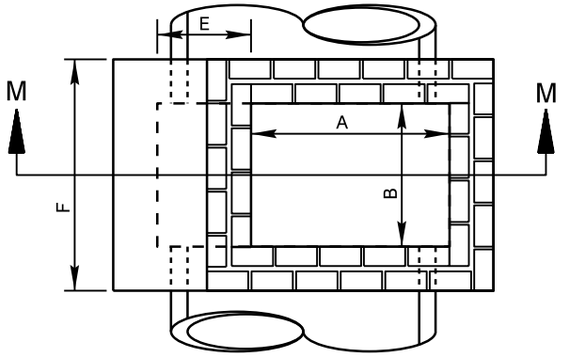


PLAN



SECTION M-M

WHERE 42" TO 54" PIPE IS USED



PLAN

STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

1-24

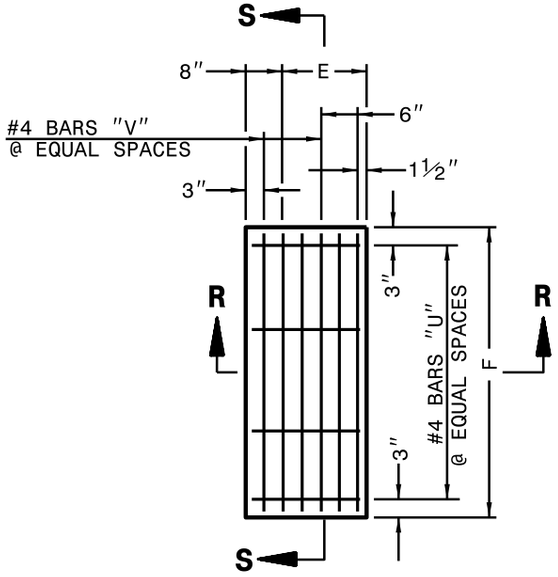
ROADWAY STANDARD DRAWING FOR

BRICK CATCH BASIN

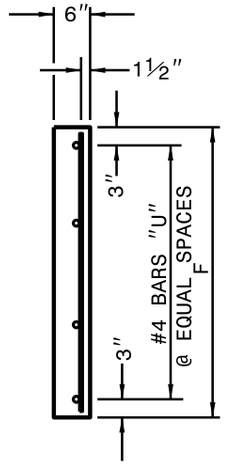
12" THRU 54" PIPE

SHEET 1 OF 2

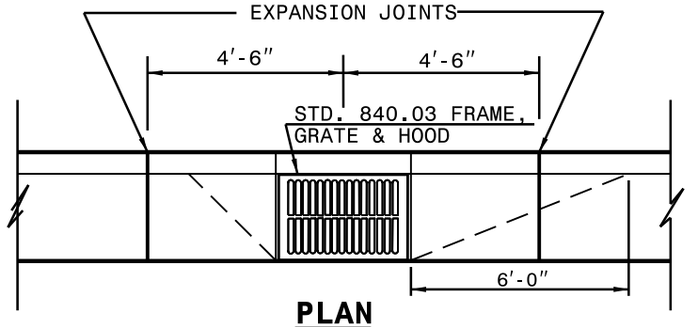
840.01



PLAN OF TOP SLAB

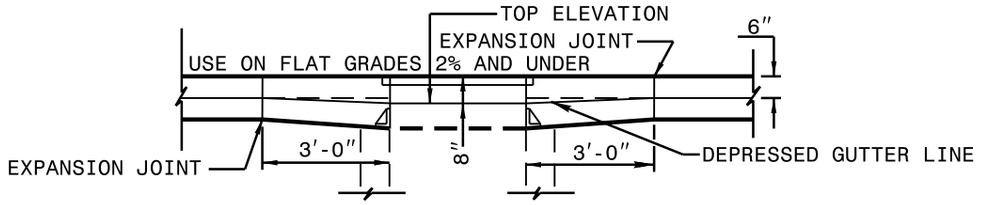


SECTION S-S



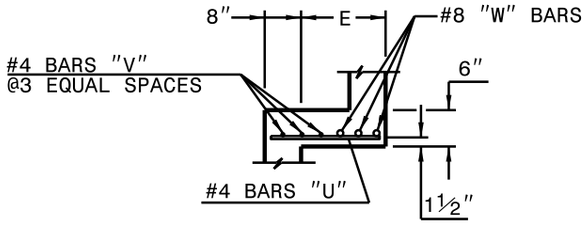
PLAN

CURB AND GUTTER WITH CATCH BASIN ON STEEP GRADES

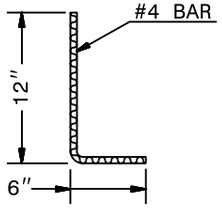


ELEVATION

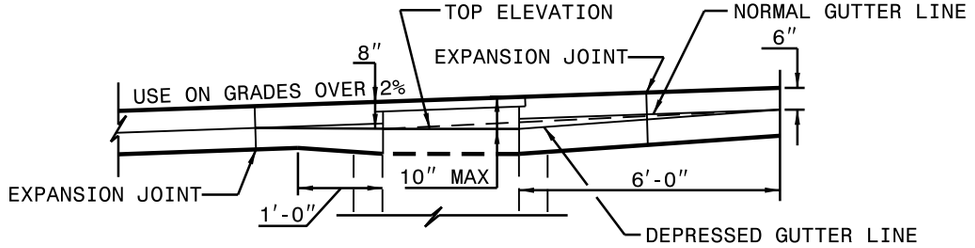
NORMAL CURB AND GUTTER ON LIGHT GRADES



SECTION R-R



DOWEL



ELEVATION

NORMAL CURB AND GUTTER ON STEEP GRADES

MINIMUM DIMENSIONS AND QUANTITIES FOR BRICK CATCH BASIN(BASED ON MIN. HEIGHT, H, WITH NO RISER)*

DIMENSIONS OF BOX AND PIPE						TOP SLAB DIMENSIONS		BARS-U		BARS-V		BARS-W		TOTAL LBS.	CU.YDS. CONC. IN BOX			BRICK MASONRY		DEDUCTIONS ONE PIPE	
PIPE	SPAN	WIDTH	WIDTH	SPAN	MIN. HEIGHT			NO.	LENGTH	NO.	LENGTH	NO.	LENGTH		TOP SLAB	BOTTOM SLAB	TOTAL CONC.	BRICK MSNR. IN WALLS	TOTAL BRICK AND CONCRETE	C.M.	R.C.
D	A	B	C	G	H	E	F														
12"	3'-0"	2'-2"	--	--	2'-9"	--	--	--	--	--	--	--	--	--	--	0.281	0.281	0.883	1.164	0.020	0.042
15"	3'-0"	2'-2"			3'-0"											0.281	0.281	0.963	1.244	0.031	0.047
18"	3'-0"	2'-2"			3'-3"											0.281	0.281	1.043	1.324	0.044	0.065
24"	3'-0"	2'-2"			3'-9"											0.281	0.281	1.204	1.485	0.078	0.121
30"	3'-0"	2'-2"	3'-4"		4'-3"	1'-2"	4'-4"	4	1'-6"	3	4'-1"	3	4'-1"	45	0.147	0.374	0.521	1.606	2.217	0.122	0.184
36"	3'-0"	2'-2"	3'-10"		4'-9"	1'-8"	4'-4"	4	2'-0"	4	4'-1"	3	4'-1"	49	0.187	0.415	0.602	1.914	2.516	0.176	0.261
42"	3'-0"	2'-2"		4'-5"	5'-3"	1'-5"	3'-6"	4	1'-9"	3	3'-3"	3	3'-3"	38	0.135	0.373	0.508	2.152	2.660	0.240	0.371
48"	3'-0"	2'-2"		5'-0"	5'-9"	2'-0"	3'-6"	4	2'-6"	4	3'-3"	3	3'-3"	41	0.173	0.410	0.583	2.415	2.998	0.313	0.477
54"	3'-0"	2'-2"		5'-7"	6'-3"	2'-7"	3'-6"	4	3'-0"	6	3'-3"	3	3'-3"	47	0.211	0.448	0.659	2.806	3.465	0.396	0.595

* RISER HAS .321 CUBIC YARDS OF BRICK MASONRY PER FOOT HEIGHT

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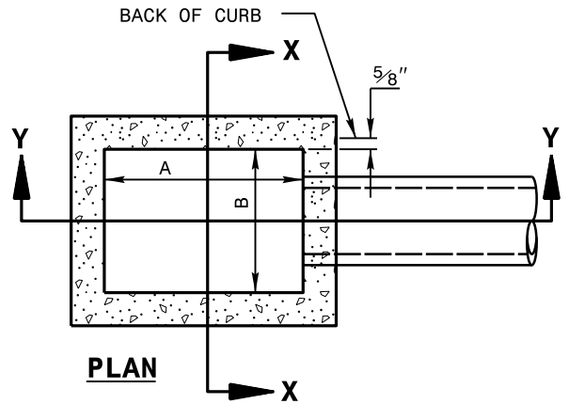
ROADWAY STANDARD DRAWING FOR

BRICK CATCH BASIN

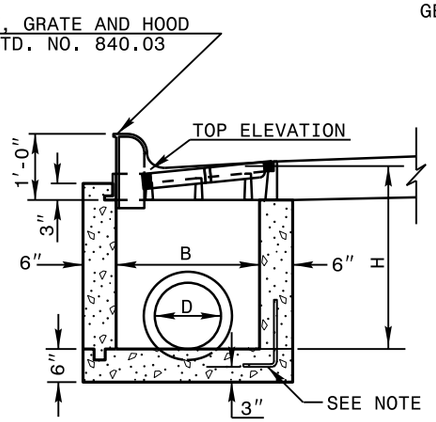
12" THRU 54" PIPE

SHEET 2 OF 2

840.01



PLAN



SECTION X-X

GENERAL NOTES:

USE CLASS "B" CONCRETE THROUGHOUT.

PROVIDE ALL CATCH BASINS OVER 3'-6" IN DEPTH WITH STEPS 12" ON CENTER. USE STEPS WHICH COMPLY WITH STD. DRAWING 840.66.

OPTIONAL CONSTRUCTION - MONOLITHIC POUR, 2" KEYWAY, OR #4 BAR DOWELS AT 12" CENTERS AS DIRECTED BY THE ENGINEER.

USE FORMS FOR THE CONSTRUCTION OF THE BOTTOM SLAB.

IF REINFORCED CONCRETE PIPE IS SET IN BOTTOM SLAB OF BOX, ADD TO SLAB AS SHOWN ON STD. NO. 840.00.

USE TYPE "E", "F" AND "G" GRATES UNLESS OTHERWISE INDICATED.

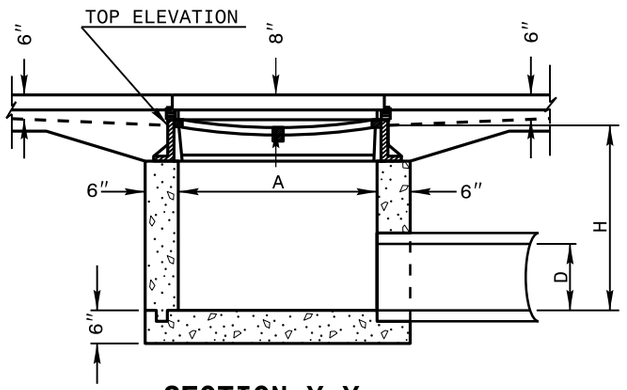
FOR 8'-0" IN HEIGHT OR LESS USE 6" WALLS AND BOTTOM SLAB. OVER 8'-0" TO 16'-0" IN HEIGHT USE 8" WALLS AND BOTTOM SLAB. ADJUST QUANTITIES ACCORDINGLY.

MAXIMUM DEPTH OF THIS STRUCTURE FROM TOP OF BOTTOM SLAB TO TOP ELEVATION IS 16'-0". STD. NO. 840.45 CONTROLS MAXIMUM DEPTH IF PRECAST BOX IS USED.

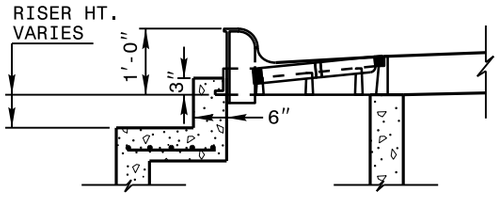
CONSTRUCT WITH PIPE CROWNS MATCHING.

CHAMFER ALL EXPOSED CORNERS 1".

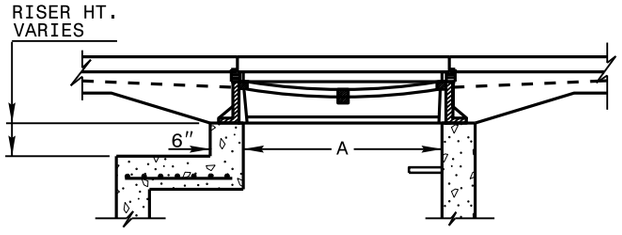
DRAWING NOT TO SCALE.



SECTION Y-Y

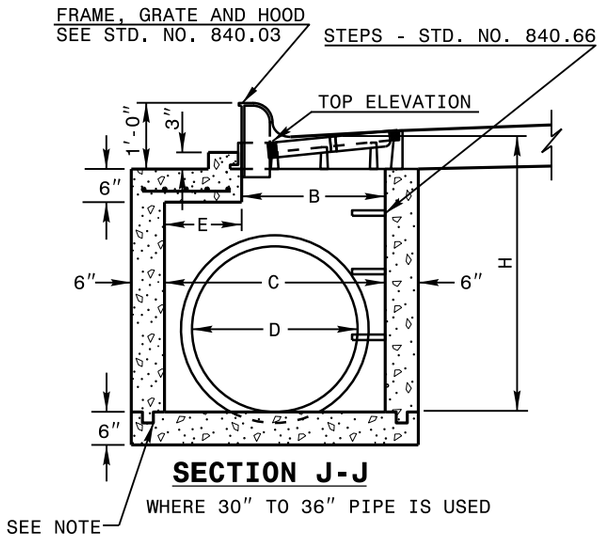


WHERE 30" TO 36" PIPE IS USED



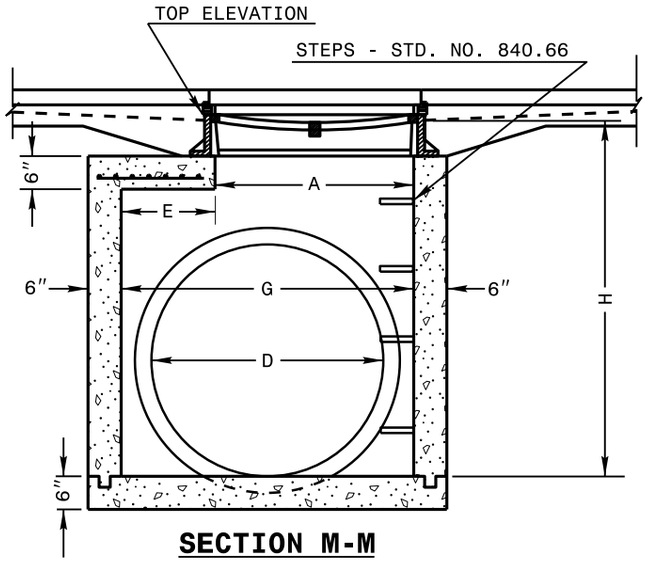
WHERE 42" TO 54" PIPE IS USED

DETAIL SHOWING METHOD OF RISER CONSTRUCTION



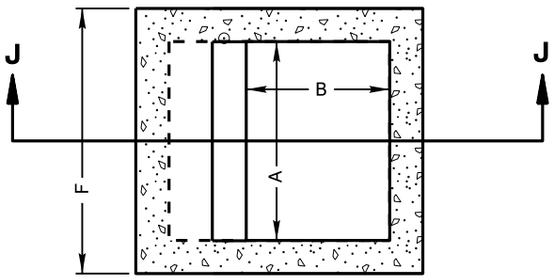
SECTION J-J

WHERE 30" TO 36" PIPE IS USED

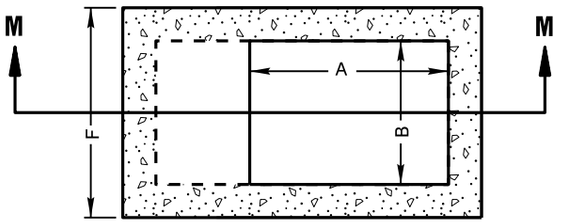


SECTION M-M

WHERE 42" TO 54" PIPE IS USED



PLAN



PLAN

STATE OF NORTH CAROLINA
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DIVISION OF HIGHWAYS
RALEIGH, N.C.

1-24

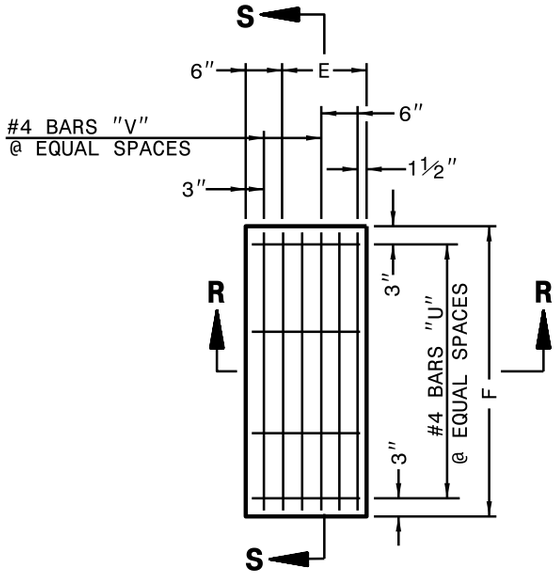
ROADWAY STANDARD DRAWING FOR

CONCRETE CATCH BASIN

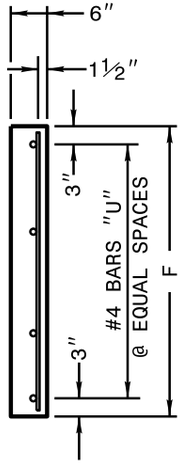
12" THRU 54" PIPE

SHEET 1 OF 2

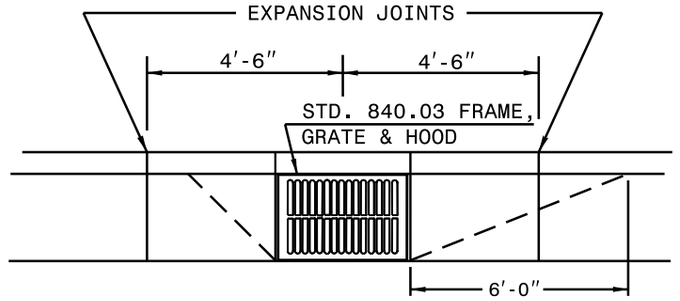
840.02



PLAN OF TOP SLAB

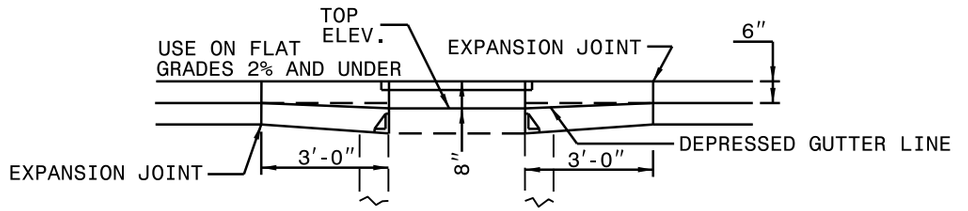


SECTION S-S



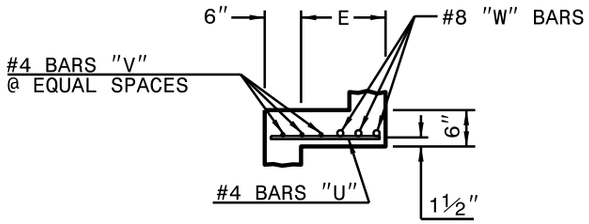
PLAN

CURB AND GUTTER WITH CATCH BASIN ON STEEP GRADES

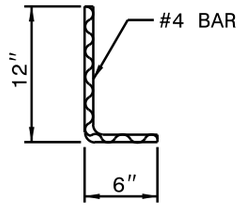


ELEVATION

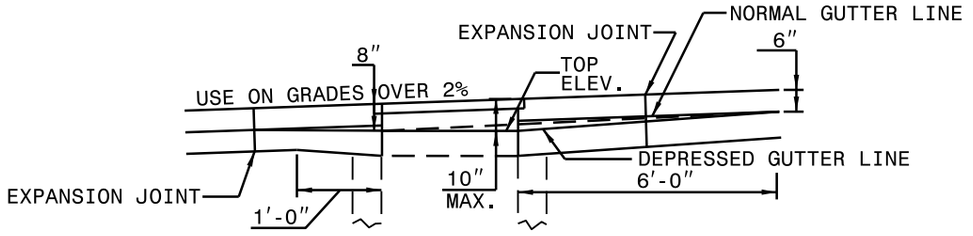
NORMAL CURB AND GUTTER ON LIGHT GRADES



SECTION R-R



DOWEL



ELEVATION

NORMAL CURB AND GUTTER ON STEEP GRADES

MINIMUM DIMENSIONS AND QUANTITIES FOR CONCRETE CATCH BASIN(BASED ON MIN. HEIGHT, H, WITH NO RISER) *

DIMENSIONS OF BOX AND PIPE						COVER DIMENSION		BARS-U		BARS-V		BARS-W		TOTAL LBS.	CU.YDS. CONC. IN BOX			DEDUCTIONS ONE PIPE	
PIPE	SPAN	WIDTH	WIDTH	SPAN	MIN. HEIGHT										TOP SLAB	BOTTOM SLAB	TOT. CONC. FOR MINIMUM HEIGHT, H		
D	A	B	C	G	H	E	F	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH					C.M.	R.C.
12″	3′-0″	2′-2″	--	--	2′-9″	--	--	--	--	--	--	--	--	--	--	0.235	0.772	0.015	0.026
15″	3′-0″	2′-2″			3′-0″											0.235	0.829	0.023	0.036
18″	3′-0″	2′-2″			3′-3″											0.235	0.887	0.033	0.049
24″	3′-0″	2′-2″			3′-9″											0.235	1.001	0.059	0.085
30″	3′-0″	2′-2″	3′-4″		4′-3″	1′-2″	4′-0″	4	1′-5″	2	3′-9″	3	3′-9″	39	0.123	0.321	1.433	0.092	0.127
36″	3′-0″	2′-2″	3′-10″		4′-9″	1′-8″	4′-0″	4	1′-11″	3	3′-9″	3	3′-9″	43	0.161	0.358	1.714	0.132	0.178
42″	3′-0″	2′-2″		4′-5″	5′-3″	1′-5″	3′-2″	4	1′-8″	2	2′-11″	3	2′-11″	32	0.112	0.318	1.738	0.180	0.243
48″	3′-0″	2′-2″		5′-0″	5′-9″	2′-0″	3′-2″	4	2′-3″	3	2′-11″	3	2′-11″	35	0.145	0.352	2.052	0.235	0.317
54″	3′-0″	2′-2″		5′-7″	6′-3″	2′-7″	3′-2″	4	2′-10″	5	2′-11″	3	2′-11″	41	0.180	0.386	2.387	0.297	0.401

* RISER HAS .228 CUBIC YARDS OF CONCRETE PER FOOT HEIGHT

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ROADWAY STANDARD DRAWING FOR

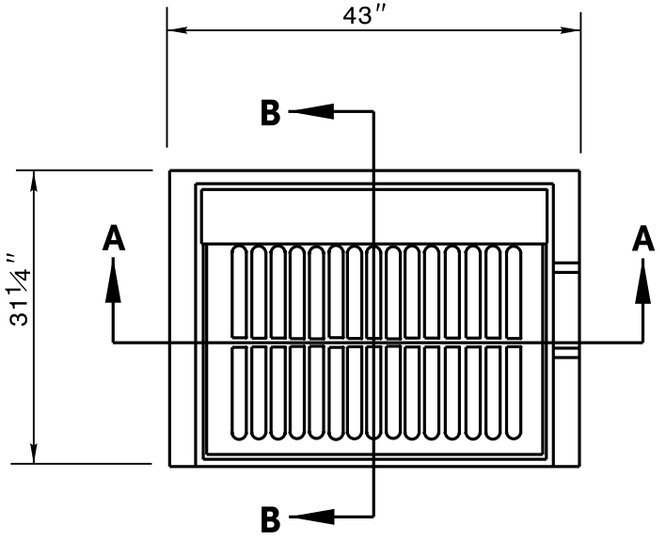
CONCRETE CATCH BASIN

12″ THRU 54″ PIPE

SHEET 2 OF 2

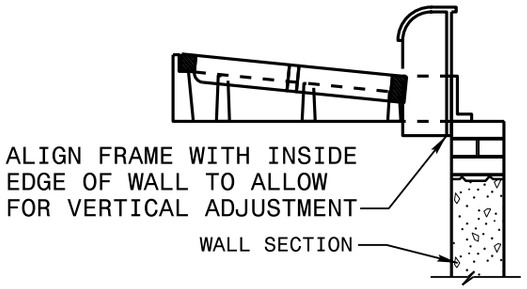
840.02

NOTE: USE TYPE "E", "F" AND "G" GRATE UNLESS OTHERWISE NOTED.

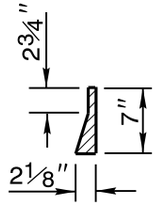


PLAN

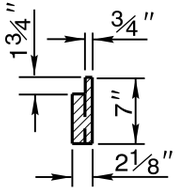
FRAME,GRATE, & HOOD ASS'Y



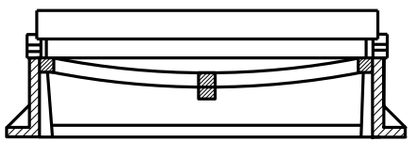
SECTION - BB



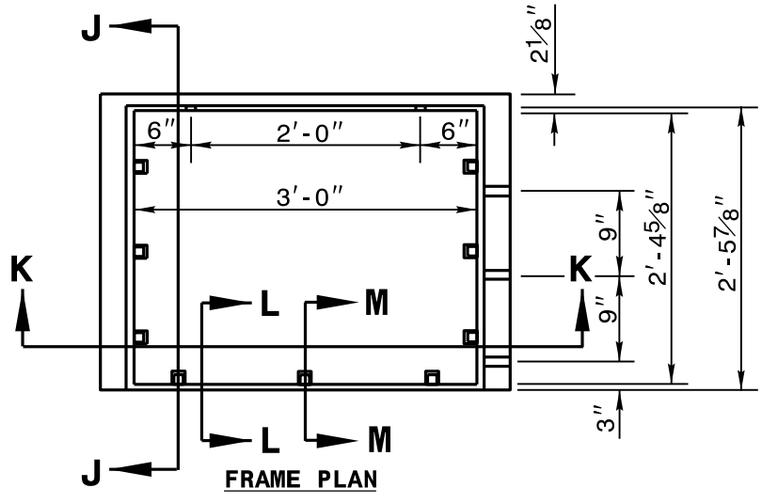
SECTION - LL



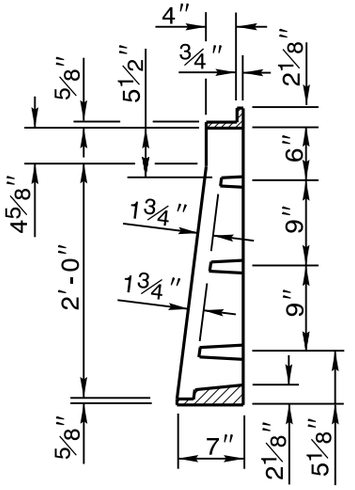
SECTION - MM



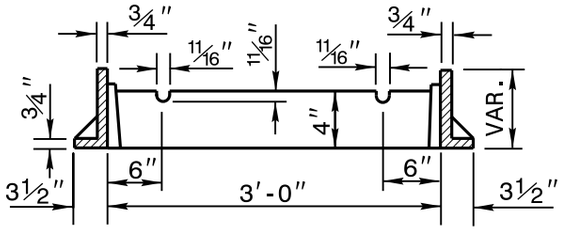
SECTION - AA



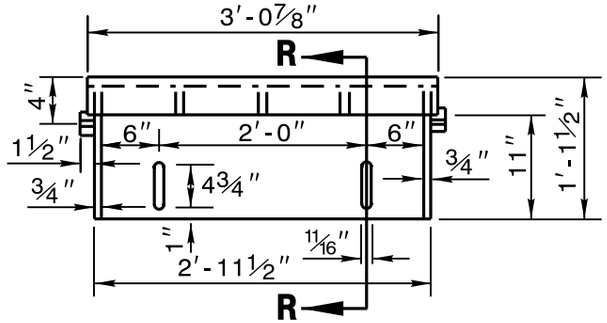
FRAME PLAN



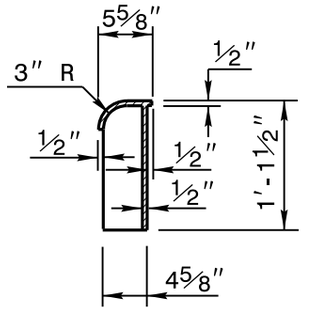
SECTION - JJ



SECTION - KK



HOOD ELEVATION



SECTION - RR

STATE OF
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DIVISION OF HIGHWAYS
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ROADWAY STANDARD DRAWING FOR

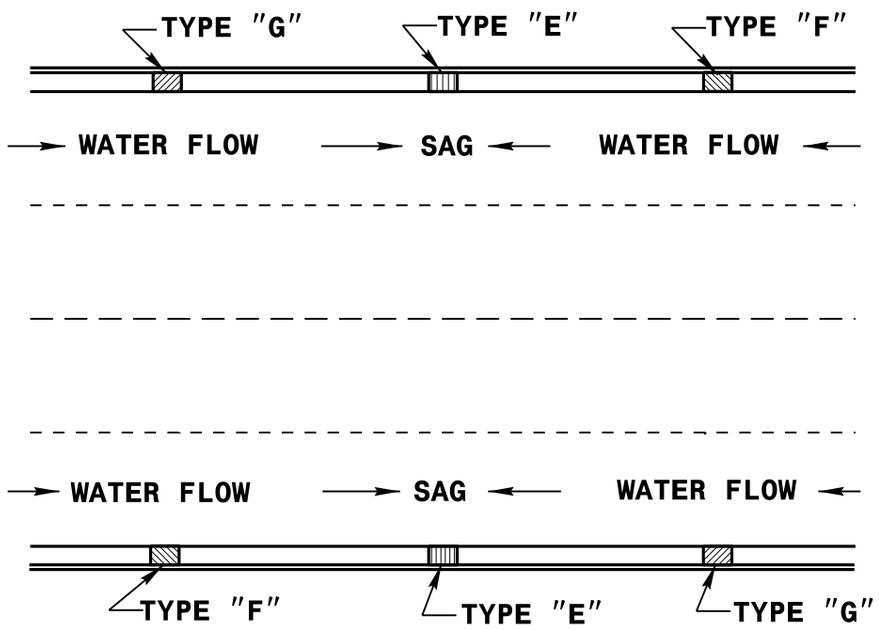
FRAME, GRATES, AND HOOD

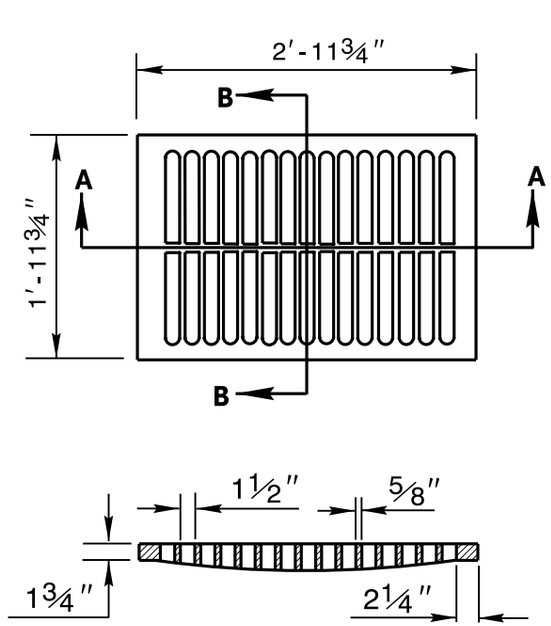
FOR USE ON STANDARD CATCH BASIN

SHEET 1 OF 2

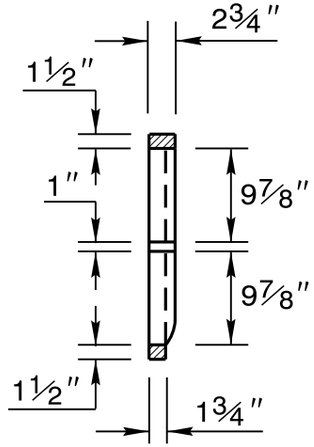
840.03

DETAIL SHOWING TYPES OF GRATES
USE ACCORDING TO WATER FLOW.



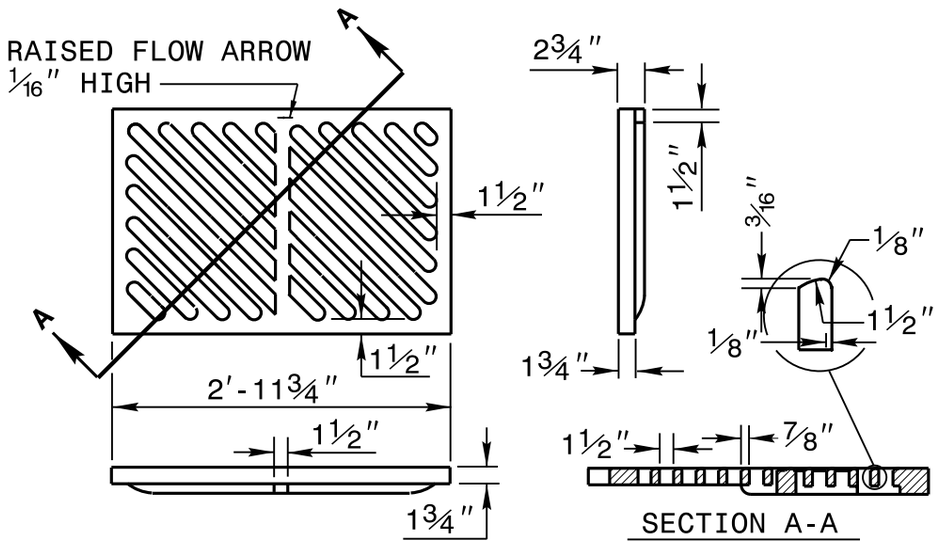


SECTION A-A

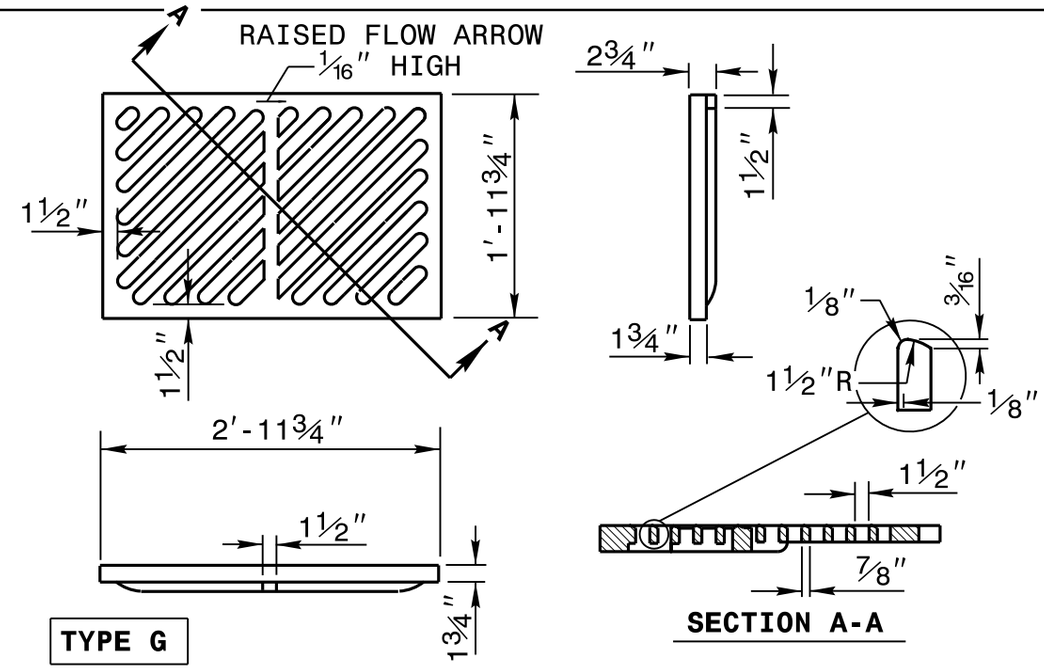


SECTION B-B

TYPE - E



TYPE - F



TYPE G

STATE OF
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RALEIGH, N.C.

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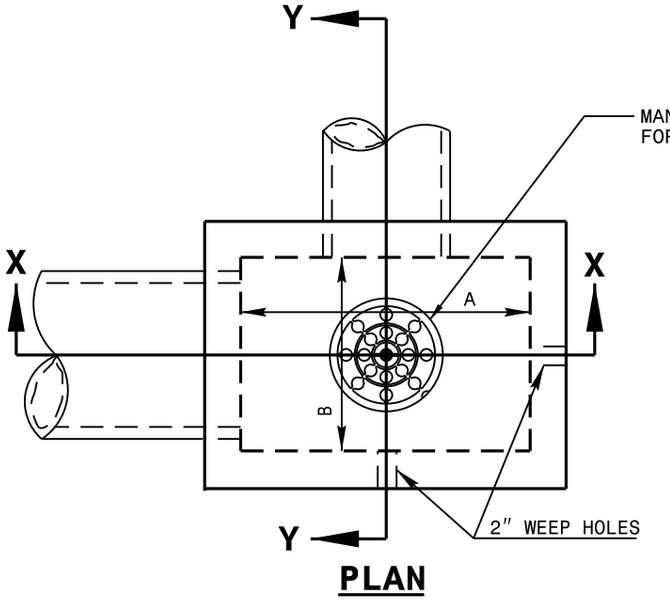
ROADWAY STANDARD DRAWING FOR

FRAME, GRATES, AND HOOD

FOR USE ON STANDARD CATCH BASIN

SHEET 2 OF 2

840.03



PLAN

NOTES: USE CLASS "B" CONCRETE THROUGHOUT.

PROVIDE ALL CATCH BASINS OVER 3'-6" IN DEPTH WITH STEPS 12" ON CENTER. USE STEPS WHICH COMPLY WITH STD. DRAWING 840.66.

USE #4 BAR DOWELS AT 12" CENTERS

USE FORMS FOR THE CONSTRUCTION OF THE BOTTOM SLAB.

IF REINFORCED CONCRETE PIPE IS SET IN BOTTOM SLAB OF BOX, ADD TO SLAB AS SHOWN ON STD. NO. 840.00.

FOR 8'-0" IN HEIGHT OR LESS USE 6" WALLS AND BOTTOM SLAB. OVER 8'-0" TO 16'-0" IN HEIGHT USE 8" WALLS AND BOTTOM SLAB. ADJUST QUANTITIES ACCORDINGLY.

MAX. DEPTH OF THIS STRUCTURE FROM TOP OF BOTTOM SLAB TO TOP ELEVATION IS 16'-0". STD. DWG. 840.45 OR 840.46 CONTROLS MAX. DEPTH IF PRECAST BOX IS USED.

CONSTRUCT WITH PIPE CROWNS MATCHING.

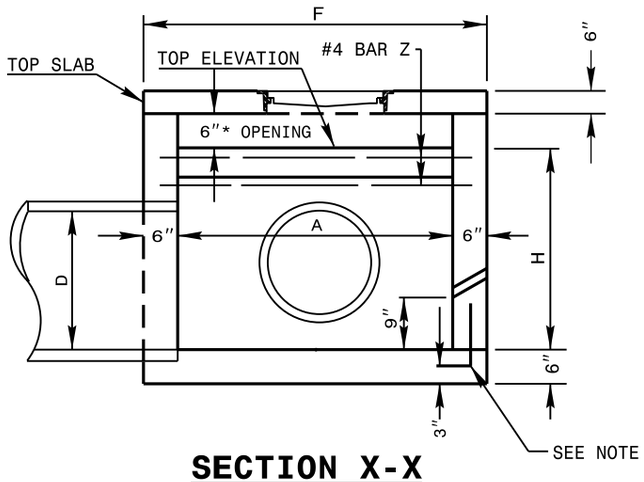
INSTALL 2" WEEPHOLES AS DIRECTED BY THE ENGINEER.

INSTALL STONE DRAINS, OF A MINIMUM OF 1 CUBIC FOOT OF NO. 78M STONE IN A POROUS FABRIC BAG OR WRAP, AT EACH WEEP HOLE OR AS DIRECTED BY THE ENGINEER.

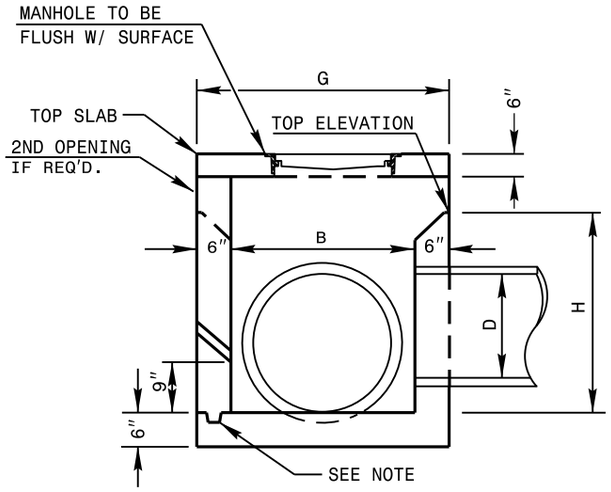
CHAMFER ALL EXPOSED CORNERS 1".

DRAWING NOT TO SCALE.

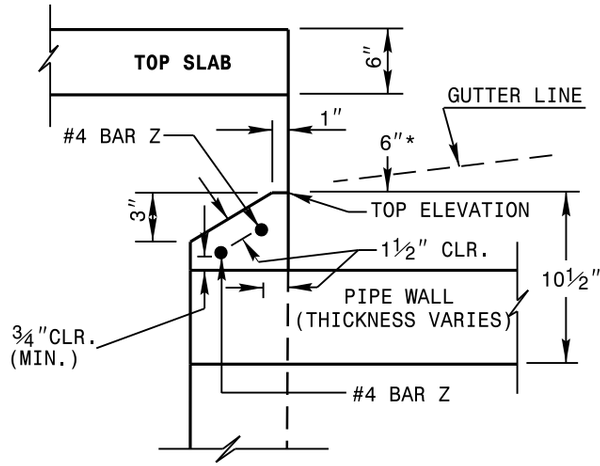
* INCREASE THE SIZE OF THE 6" OPENING TO 8" MAX., AS DIRECTED BY THE ENGINEER BY ADDING 2" TO THE WALL HIEGHT ABOVE THE TOP ELEVATION. ADJUST QUANTITIES ACCORDINGLY.



SECTION X-X



SECTION Y-Y



PART SECTION Y-Y

SHOWING DETAILS AT OPENING

MIN. DIMENSIONS AND QUANTITIES FOR CONCRETE CATCH BASIN (BASED ON MIN. HEIGHT, H)

DIM'S OF BOX & PIPE				REINFORCING								TOP & BOT. SLAB DIMENSIONS		CU. YDS. CONC. IN BOX			TOTAL QUANTITIES BOX & SLABS		DEDUCTION ONE PIPE		DED. ONE 6" THROAT OPENING
PIPE	SPAN	WIDTH	HEIGHT	BARS - W		BARS - X		BARS - Y		BARS - Z											
D	A	B	H	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	F	G	TOP SLAB	BOT. SLAB	WALL/FT. HT.	LBS. REINF.	YD^3 (MIN H)	C.S.	R.C.	YD^3
12"	3'-6"	2'-3"	1'-10"	8	3'-8"	4	3'-0"	6	4'-3"	2	4'-3"	4'-6"	3'-3"	0.207	0.271	0.250	47	1.046	0.015	0.032	0.046
15"	3'-6"	2'-3"	2'-1"	8	3'-8"	4	3'-0"	6	4'-3"	2	4'-3"	4'-6"	3'-3"	0.207	0.271	0.250	47	1.108	0.023	0.036	0.046
18"	4'-0"	2'-8"	2'-4"	8	5'-0"	5	3'-5"	7	4'-9"	2	4'-9"	5'-0"	3'-8"	0.275	0.340	0.284	61	1.379	0.033	0.049	0.053
24"	4'-0"	2'-8"	2'-10"	8	5'-0"	5	3'-5"	7	4'-9"	2	4'-9"	5'-0"	3'-8"	0.275	0.340	0.284	61	1.521	0.059	0.085	0.053
30"	4'-0"	3'-6"	3'-4"	8	6'-2"	5	4'-3"	9	4'-9"	2	4'-9"	5'-0"	4'-6"	0.353	0.417	0.315	77	1.916	0.092	0.127	0.053
36"	4'-6"	4'-0"	3'-10"	8	7'-7"	5	4'-9"	10	5'-3"	2	5'-3"	5'-6"	5'-0"	0.445	0.510	0.352	94	2.390	0.132	0.178	0.059
42"	5'-0"	4'-6"	4'-4"	8	9'-0"	5	5'-3"	12	5'-9"	2	5'-9"	6'-0"	5'-6"	0.547	0.611	0.389	119	2.914	0.180	0.243	0.066
48"	5'-0"	5'-0"	4'-10"	8	9'-8"	5	5'-9"	13	5'-9"	2	5'-9"	6'-0"	6'-0"	0.603	0.666	0.407	128	3.298	0.235	0.317	0.066

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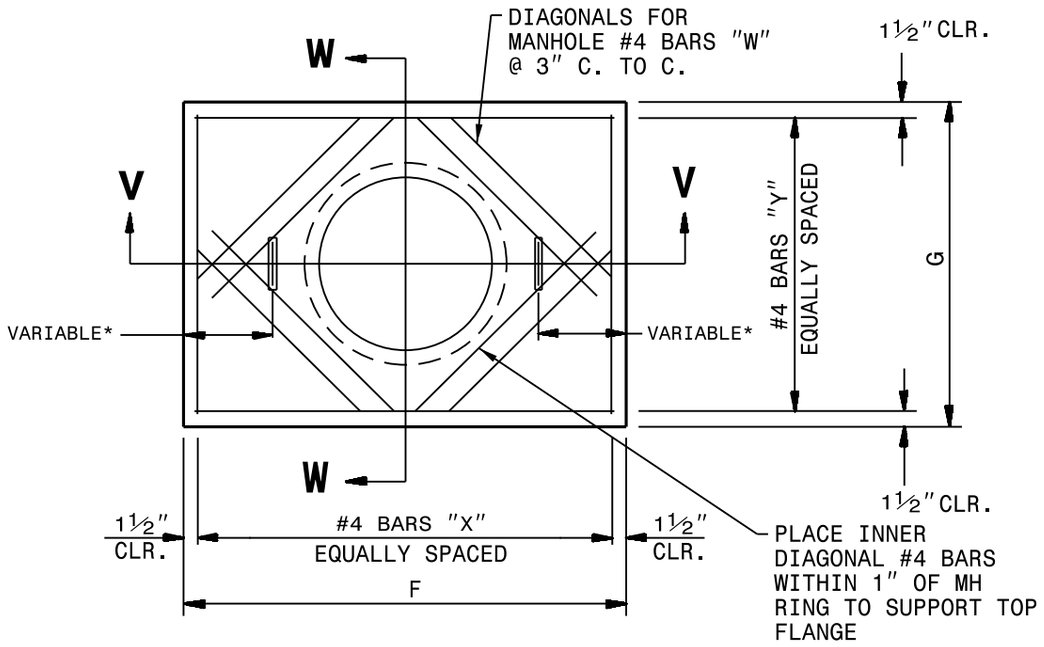
ROADWAY STANDARD DRAWING FOR

CONCRETE OPEN THROAT CATCH BASIN

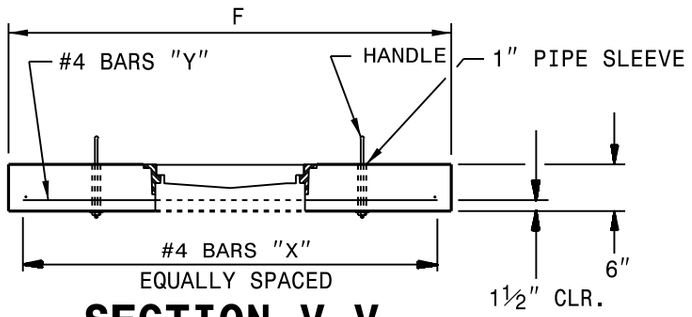
(WITH MANHOLE)
12" THRU 48" PIPE

840.04

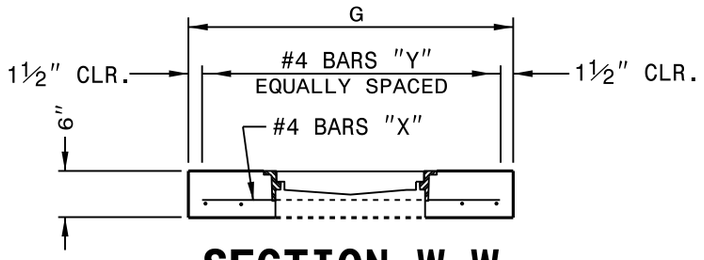


PLAN

PRECAST OR CAST IN PLACE TOP SLAB

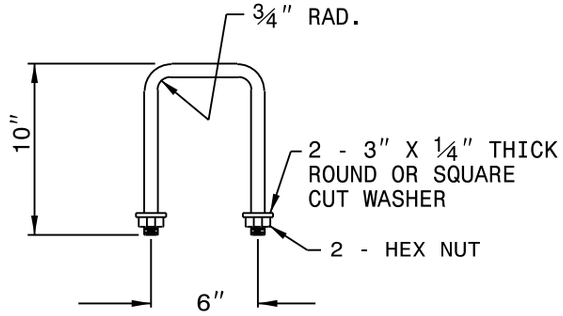


SECTION V-V

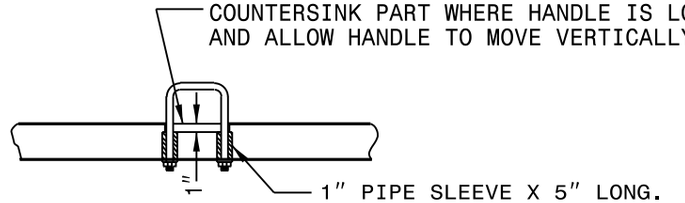


SECTION W-W

*PLACE HANDLES A MINIMUM 8" FROM OUTSIDE EDGE AND IN A MANNER TO AVOID REINFORCEMENT BARS AS DIRECTED BY THE ENGINEER

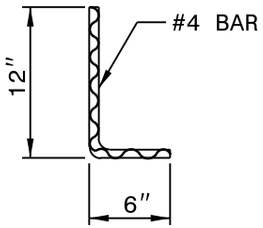


DETAIL OF HANDLE



PART SECTION

THRU COVER SHOWING HANDLE



DOWEL

STATE OF NORTH CAROLINA
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1-24

ROADWAY STANDARD DRAWING FOR

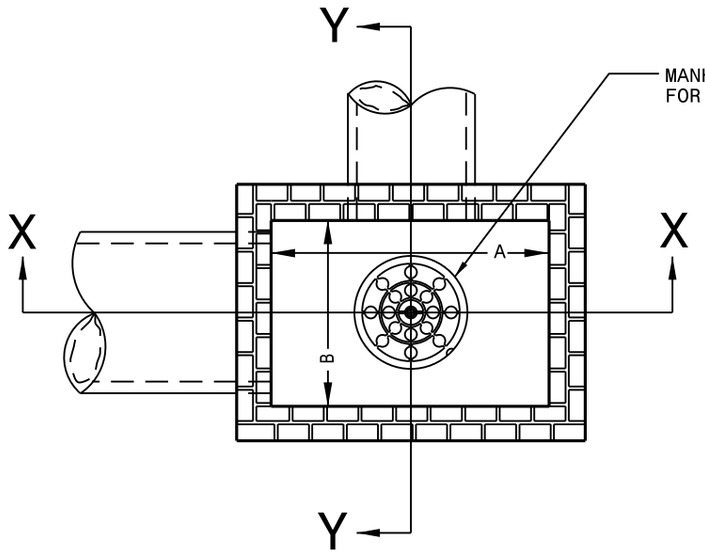
CONCRETE OPEN THROAT CATCH BASIN

(WITH MANHOLE)

12" THRU 48" PIPE

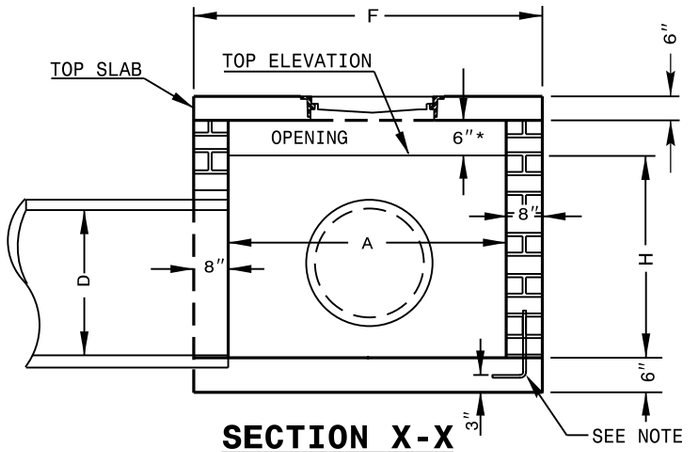
SHEET 2 OF 2

840.04

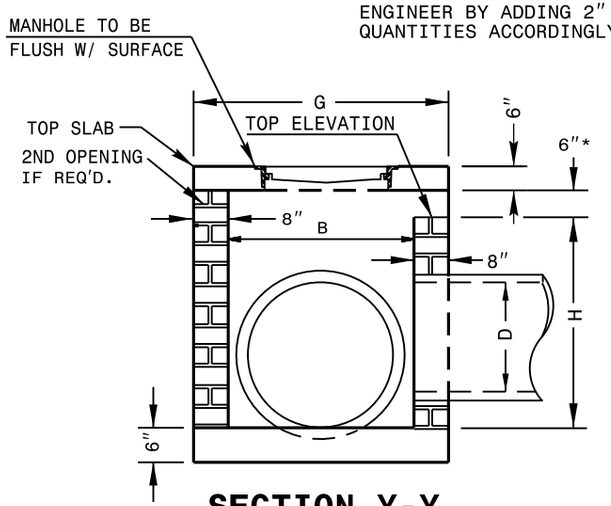


PLAN

NOTES:
- MORTAR JOINTS ½″ +/- ⅛″ THICK.
- USE CLASS "B" CONCRETE THROUGHOUT.
- USE FORMS FOR CONSTRUCTION OF THE BOTTOM SLAB.
- USE #4 BAR DOWELS AT 12″ CENTERS.
- DEDUCT FOR PIPE(S) FROM TOTAL CU. YDS. OF BRICK MASONRY.
- PROVIDE ALL CATCH BASINS OVER 3′-6″ IN DEPTH WITH STEPS 12″ ON CENTER. USE STEPS WHICH COMPLY WITH STD. DRAWING 840.66.
- CONCAVE TOOL ALL EXPOSED MORTAR JOINTS.
- USE BRICK OR CONCRETE BLOCK WHICH COMPLIES WITH THE REQUIREMENTS OF SECTION 840 OF THE STANDARD SPECIFICATIONS.
- IF REINFORCED CONCRETE PIPE IS SET IN BOTTOM SLAB OF BOX, ADD TO SLAB AS SHOWN ON STD. NO. 840.00.
- FOR 8′-0″ IN HEIGHT OR LESS USE 6″ WALLS AND BOTTOM SLAB. OVER 8′-0″ TO 16′-0″ IN HEIGHT USE 8″ WALLS AND BOTTOM SLAB. ADJUST QUANTITIES ACCORDINGLY.
- MAX. DEPTH OF THIS STRUCTURE FROM TOP OF BOTTOM SLAB TO TOP ELEVATION IS 16′-0″. STD. DWG. 840.45 OR 840.46 CONTROLS MAX. DEPTH IF PRECAST BOX IS USED.
- CONSTRUCT WITH PIPE CROWNS MATCHING.
- CHAMFER ALL EXPOSED CORNERS 1″.
- DRAWING NOT TO SCALE.
- * INCREASE THE SIZE OF THE 6″ OPENING TO 8″ MAX., AS DIRECTED BY THE ENGINEER BY ADDING 2″ TO THE WALL HIEGHT ABOVE THE TOP ELEVATION. ADJUST QUANTITIES ACCORDINGLY.



SECTION X-X



SECTION Y-Y

MIN. DIMENSIONS AND QUANTITIES FOR CATCH BASIN (BASED ON MIN. HEIGHT, H)

DIM'S OF BOX & PIPE				REINFORCING							SLAB DIMENSIONS		CU. YDS. CONC. IN BOX			TOTAL BRICK MASONRY		DEDUCTION ONE PIPE		DED. ONE 6″ THROAT OPENING
PIPE	SPAN	WIDTH	HEIGHT	BARS - W		BARS - X		BARS - Y		TOTAL										
D	A	B	H	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	LBS	F	G	TOP SLAB	BOT. SLAB	TOTAL	PER FT. HT.	TOT. FOR H	C.S.	R.C.	CU.YDS.
12″	3′-6″	2′-3″	1′-10″	8	3′-8″	5	3′-4″	7	4′-7″	49	4′-10″	3′-7″	0.257	0.321	0.535	0.350	0.656	0.020	0.037	0.043
15″	3′-6″	2′-3″	2′-1″	8	3′-8″	5	3′-4″	7	4′-7″	49	4′-10″	3′-7″	0.257	0.321	0.535	0.350	0.744	0.031	0.059	0.043
18″	4′-0″	2′-8″	2′-4″	8	5′-0″	6	3′-9″	8	5′-1″	64	5′-4″	4′-0″	0.331	0.395	0.658	0.395	0.938	0.044	0.081	0.049
24″	4′-0″	2′-8″	2′-10″	8	5′-0″	6	3′-9″	8	5′-1″	64	5′-4″	4′-0″	0.331	0.395	0.658	0.395	1.136	0.078	0.134	0.049
30″	4′-0″	3′-6″	3′-4″	8	6′-2″	6	4′-7″	10	5′-1″	81	5′-4″	4′-10″	0.414	0.477	0.795	0.436	1.472	0.122	0.199	0.049
36″	4′-6″	4′-0″	3′-10″	8	7′-7″	6	5′-1″	11	5′-7″	98	5′-10″	5′-4″	0.512	0.576	0.960	0.485	1.879	0.176	0.278	0.056
42″	5′-0″	4′-6″	4′-4″	8	9′-0″	6	5′-7″	13	6′-1″	124	6′-4″	5′-10″	0.620	0.684	1.140	0.535	2.340	0.240	0.371	0.062
48″	5′-0″	5′-0″	4′-10″	8	9′-8″	6	6′-1″	14	6′-1″	134	6′-4″	6′-4″	0.679	0.743	1.238	0.559	2.725	0.313	0.476	0.062

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DIVISION OF HIGHWAYS
RALEIGH, N.C.

1-24

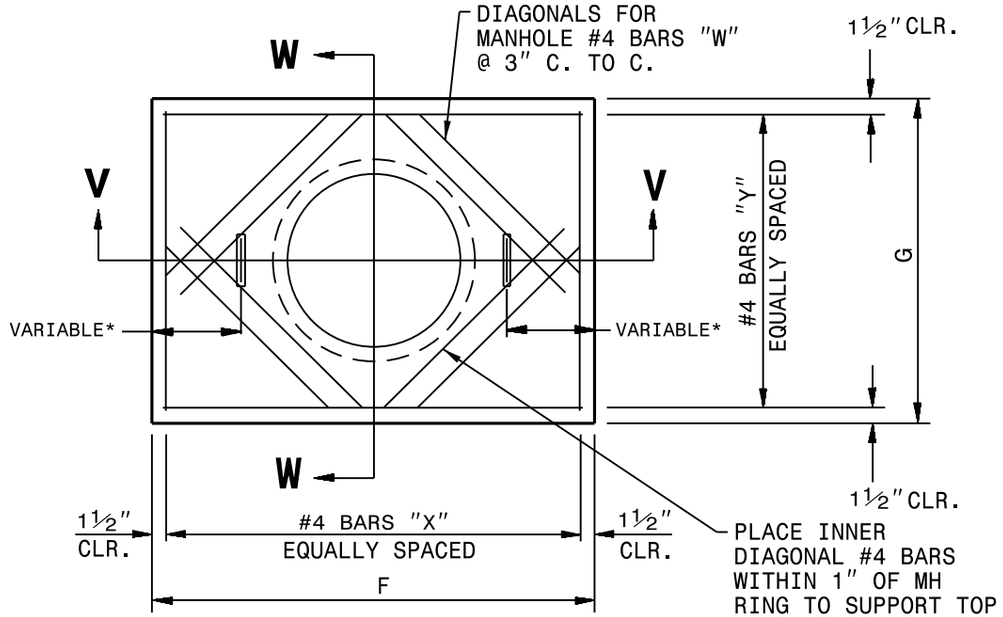
ROADWAY STANDARD DRAWING FOR

BRICK OPEN THROAT CATCH BASIN

(WITH MANHOLE)

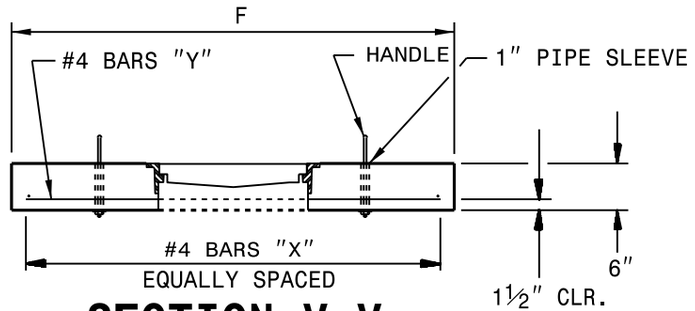
12″ THRU 48″ PIPE

840.05

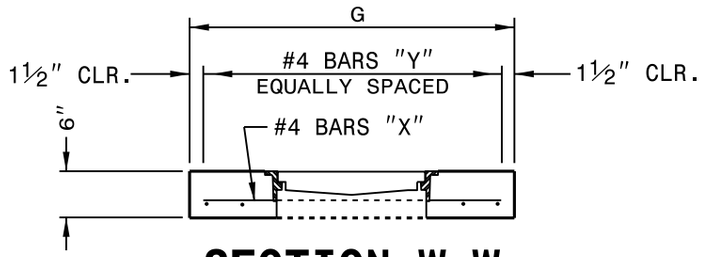


PLAN

PRECAST OR CAST IN PLACE TOP SLAB

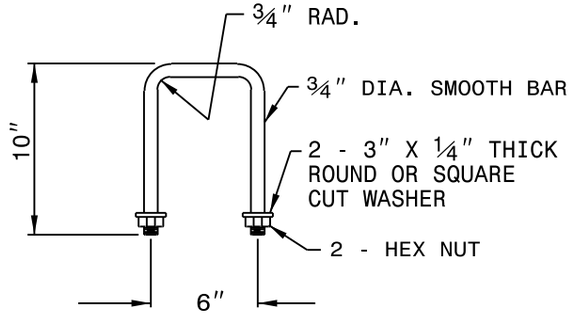


SECTION V-V

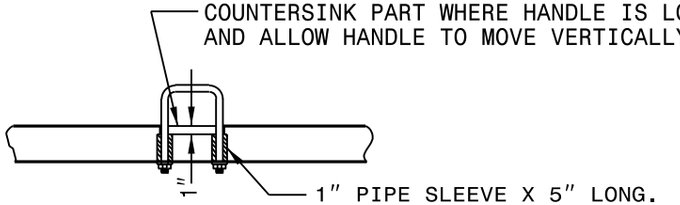


SECTION W-W

*PLACE HANDLES A MINIMUM 8" FROM OUTSIDE EDGE AND IN A MANNER TO AVOID REINFORCEMENT BARS AS DIRECTED BY THE ENGINEER

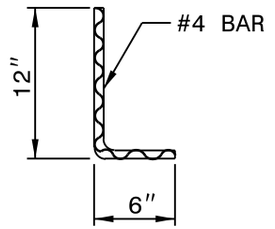


DETAIL OF HANDLE



PART SECTION

THRU COVER SHOWING HANDLE



DOWEL

STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

1-24

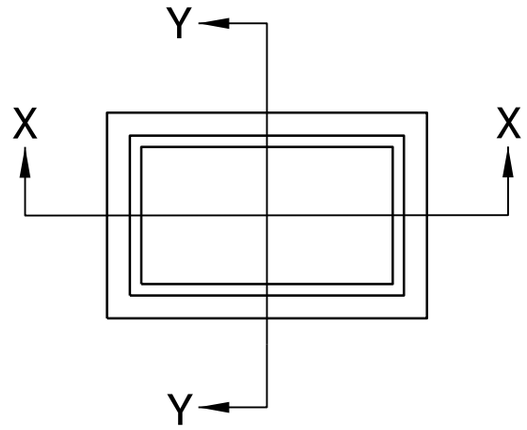
ROADWAY STANDARD DRAWING FOR

BRICK CATCH BASIN WITH SINGLE AND MULTIPLE PIPES

(WITH MANHOLE)12" THRU 48" PIPE

SHEET 2 OF 2

840.05



PLAN

GENERAL NOTES:

USE CLASS "B" CONCRETE THROUGHOUT.

PROVIDE ALL DROP INLETS OVER 3'-6" IN DEPTH WITH STEPS 12" ON CENTER. USE STEPS WHICH COMPLY WITH STD. DRAWING 840.66.

OPTIONAL CONSTRUCTION - MONOLITHIC POUR, 2" KEYWAY, OR #4 BAR DOWELS AT 12" CENTERS AS DIRECTED BY THE ENGINEER.

USE FORMS FOR THE CONSTRUCTION OF THE BOTTOM SLAB.

IF REINFORCED CONCRETE PIPE IS SET IN BOTTOM SLAB OF BOX, ADD TO SLAB AS SHOWN ON STD. NO. 840.00.

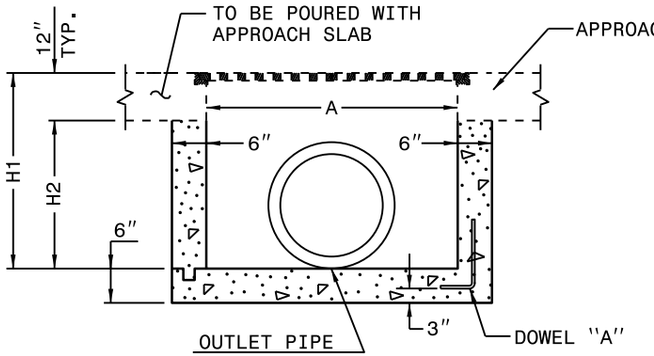
#4 BAR DOWELS "B" AT 12" CENTERS.

MAX. DEPTH OF THIS STRUCTURE FROM TOP OF BOTTOM SLAB TO TOP ELEVATION IS 12'-0". STD. NO. 840.45 CONTROLS MAXIMUM DEPTH IF PRECAST BOX IS USED.

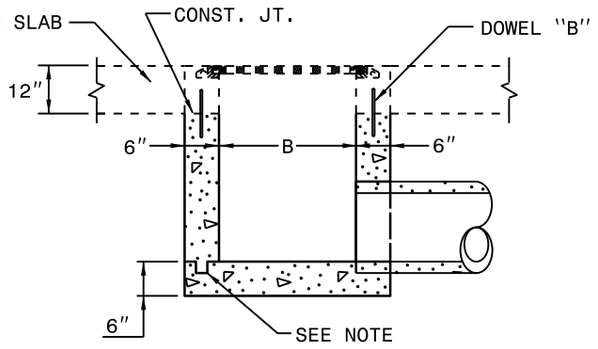
FOR LOCATIONS OF DROP INLET, SEE BRIDGE APPROACH SLABS IN THE STRUCTURE PLANS.

CONSTRUCT WITH PIPE CROWNS MATCHING.

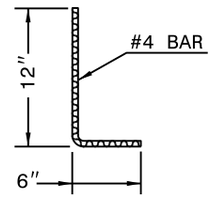
DRAWING NOT TO SCALE.



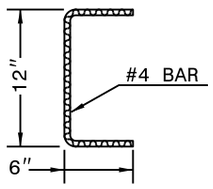
SECTION X-X



SECTION Y-Y



DOWEL "A"



DOWEL "B"

MINIMUM DIMENSIONS AND QUANTITIES FOR CONCRETE DROP INLET

PIPE	SPAN	WIDTH	HEIGHT	HEIGHT	CUBIC YARDS OF CONCRETE IN BOX				DEDUCTIONS FOR ONE PIPE	
D	A	B	H1	H2	BOTTOM SLAB	H PER FT. HT.	H MIN. TOTAL	TOTAL	C.S.	R.C.
12"	3'-8"	2'-0"	2'-6"	1'-6"	0.259	0.247	0.597	0.856	0.020	0.032
15"	3'-8"	2'-0"	2'-9"	1'-9"	0.259	0.247	0.659	0.918	0.023	0.036
18"	3'-8"	2'-0"	3'-0"	2'-0"	0.259	0.247	0.720	0.979	0.033	0.049
24"	3'-8"	2'-0"	3'-6"	2'-6"	0.259	0.247	0.865	1.124	0.059	0.085

STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
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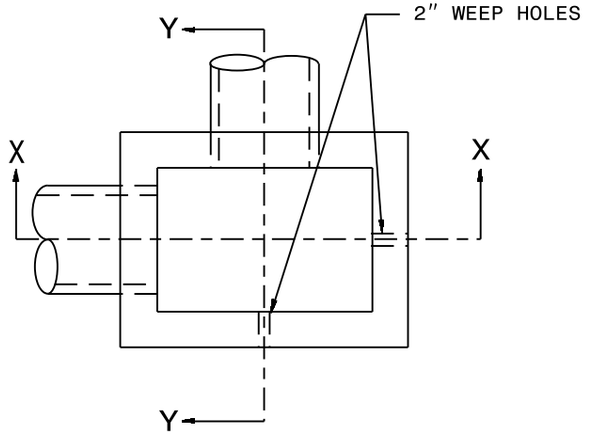
ROADWAY STANDARD DRAWING FOR

CONCRETE BRIDGE APPROACH DROP INLET

12" THRU 24" PIPE

SHEET 1 OF 1

840.13



PLAN

WITH GRATE & FRAME REMOVED

GENERAL NOTES:

USE CLASS "B" CONCRETE THROUGHOUT.

PROVIDE ALL DROP INLETS OVER 3′-6″ IN DEPTH WITH STEPS 12″ ON CENTER. USE STEPS WHICH COMPLY WITH STD. DRAWING 840.66.

OPTIONAL CONSTRUCTION - MONOLITHIC POUR 2″ KEYWAY OR #4 BAR DOWELS AT 12″ CENTERS AS DIRECTED BY THE ENGINEER.

USE FORMS FOR THE CONSTRUCTION OF THE BOTTOM SLAB.

IF REINFORCED CONCRETE PIPE IS SET IN BOTTOM SLAB OF BOX, ADD TO SLAB AS SHOWN ON STD. NO. 840.00.

MAX.DEPTH OF THIS STRUCTURE FROM TOP OF BOTTOM SLAB TO TOP ELEVATION IS 12′-0″. STD. DWG. 840.45 OR 840.46 CONTROLS MAXIMUM DEPTH IF PRECAST BOX IS USED.

CONSTRUCT WITH PIPE CROWNS MATCHING.

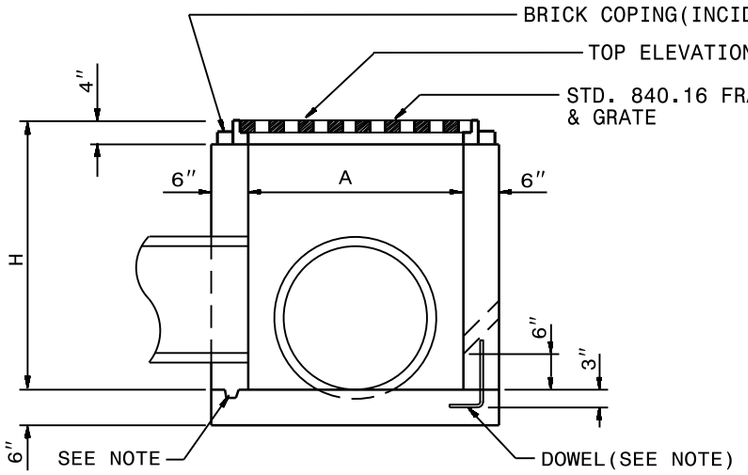
SEE STANDARD DRAWING 840.25 FOR ATTACHMENT OF FRAMES AND GRATES NOT SHOWN.

INSTALL 2″ WEEPHOLES AS DIRECTED BY THE ENGINEER.

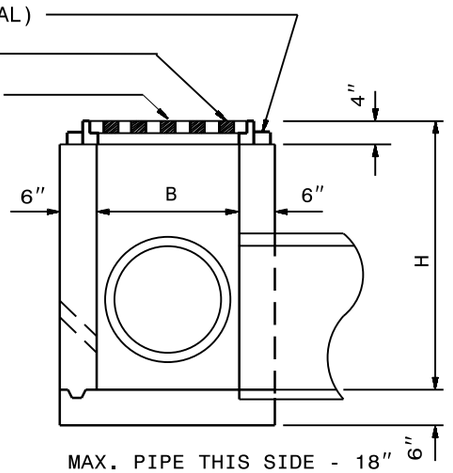
INSTALL STONE DRAINS, OF A MINIMUM OF 1 CUBIC FOOT OF NO. 78M STONE IN A POROUS FABRIC BAG OR WRAP, AT EACH WEEP HOLE OR AS DIRECTED BY THE ENGINEER.

CHAMFER ALL EXPOSED CORNERS 1″.

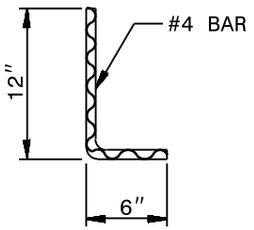
DRAWING NOT TO SCALE.



SECTION X-X



SECTION Y-Y



DOWEL

DIMENSIONS AND QUANTITIES FOR DROP INLET(BASED ON MIN. HEIGHT, H)								
DIMENSIONS OF BOX & PIPE				CUBIC YARDS CONC. IN BOX			DEDUCTIONS FOR ONE PIPE	
PIPE	SPAN	WIDTH	MIN. HEIGHT					
D	A	B	H	BOTTOM SLAB	WALL PER FT. HT.	TOTAL CONCRETE FOR MINIMUM HEIGHT, H	C.M.	R.C.
12″	3′-0″	2′-0″	2′-0″	0.222	0.222	0.592	0.015	0.026
15″	〃	〃	2′-3″	〃	〃	0.648	0.023	0.036
18″	〃	〃	2′-6″	〃	〃	0.703	0.033	0.049
24″	〃	〃	3′-0″	〃	〃	0.814	0.059	0.085
30″	3′-0″	2′-0″	3′-6″	0.222	0.222	0.925	0.092	0.127

STATE OF NORTH CAROLINA
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RALEIGH, N.C.

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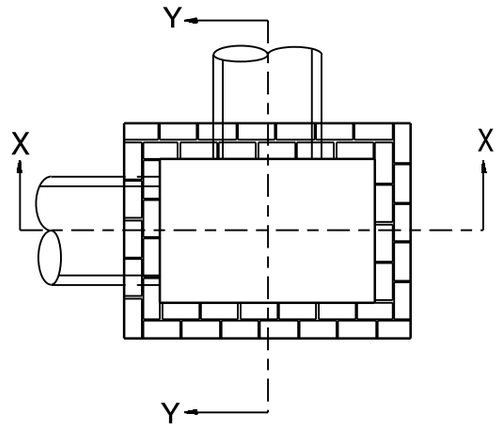
ROADWAY STANDARD DRAWING FOR

CONCRETE DROP INLET

12″ THRU 30″ PIPE

SHEET 1 OF 1

840.14



PLAN

WITH COPING REMOVED

GENERAL NOTES:

MORTAR JOINTS ½″ +/- ⅛″ THICK.

USE CLASS "B" CONCRETE THROUGHOUT.

USE FORMS FOR CONSTRUCTION OF THE BOTTOM SLAB.

USE #4 BAR DOWELS AT 12″ CENTERS.

DEDUCT FOR PIPE(S) FROM TOTAL CU. YDS. OF BRICK MASONRY.

PROVIDE ALL CATCH BASINS OVER 3′-6″ IN DEPTH WITH STEPS 12″ ON CENTER. USE STEPS WHICH COMPLY WITH STD. DRAWING 840.66.

USE BRICK OR CONCRETE BLOCK WHICH COMPLIES WITH THE REQUIREMENTS OF SECTION 840 OF THE STANDARD SPECIFICATIONS.

IF REINFORCED CONCRETE PIPE IS SET IN BOTTOM SLAB OF BOX, ADD TO SLAB AS SHOWN ON STD. NO. 840.00.

FOR 8′-0″ IN HEIGHT OR LESS, USE 8″ WALL. OVER 8′-0″ IN HEIGHT, USE 12″ WALL TO 6′-0″ FROM TOP OF WALL AND 8″ WALL FOR THE REMAINING 6′-0″. QUANTITES TO BE ADJUSTED ACCORDINGLY.

MAX.DEPTH OF THIS STRUCTURE FROM TOP OF BOTTOM SLAB TO TOP ELEVATION IS 12′-0″. STD. DWG. 840.45 OR 840.46 CONTROLS MAXIMUM DEPTH IF PRECAST BOX IS USED.

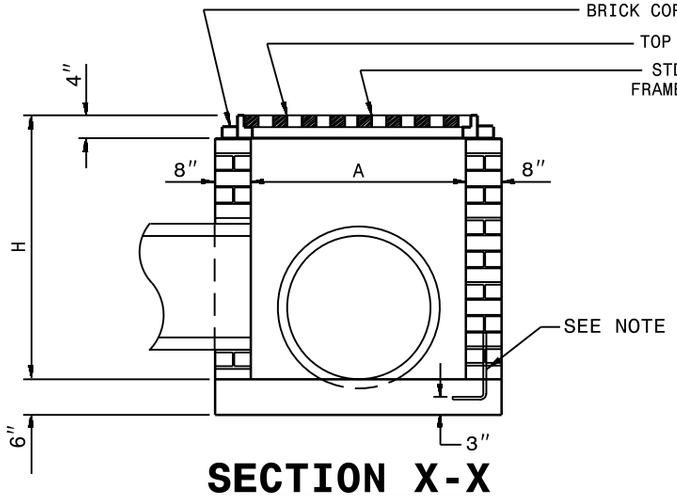
CONSTRUCT WITH PIPE CROWNS MATCHING.

SEE STANDARD DRAWING 840.25 FOR ATTACHMENT OF FRAMES AND GRATES.

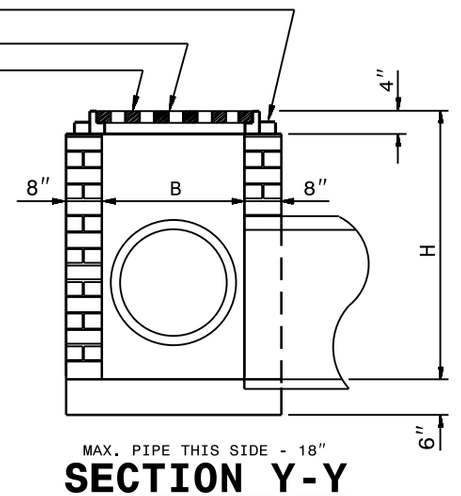
DO NOT USE BRICK MASONRY DROP INLET IN LOCATIONS SUBJECT TO TRAFFIC.

CHAMFER ALL EXPOSED CORNERS 1″.

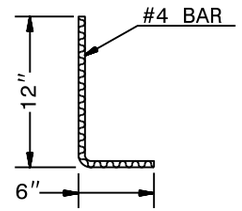
DRAWING NOT TO SCALE.



SECTION X-X



SECTION Y-Y



DOWEL

DIMENSIONS AND QUANTITIES FOR DROP INLET(BASED ON MIN. HEIGHT, H)

DIMENSIONS OF BOX & PIPE				CUBIC YARDS CONCRETE	CUBIC YARDS BRICK MASONRY		DEDUCTIONS FOR ONE PIPE	
PIPE	SPAN	WIDTH	MIN. HEIGHT					
D	A	B	H	BOTTOM SLAB	WALL PER FOOT HT.	TOTAL BRICK MASONRY FOR MIN. HEIGHT, H	C.S.	R.C.
12″	3′-0″	2′-0″	2′-0″	0.268	0.313	0.522	0.020	0.032
15″			2′-3″	0.268	0.313	0.600	0.031	0.047
18″			2′-6″	0.268	0.313	0.678	0.044	0.065
24″			3′-0″	0.268	0.313	0.835	0.078	0.113
30″	3′-0″	2′-0″	3′-6″	0.268	0.313	0.991	0.122	0.170

STATE OF NORTH CAROLINA
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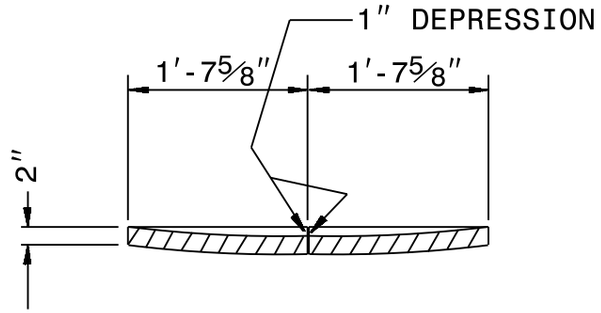
ROADWAY STANDARD DRAWING FOR

BRICK DROP INLET

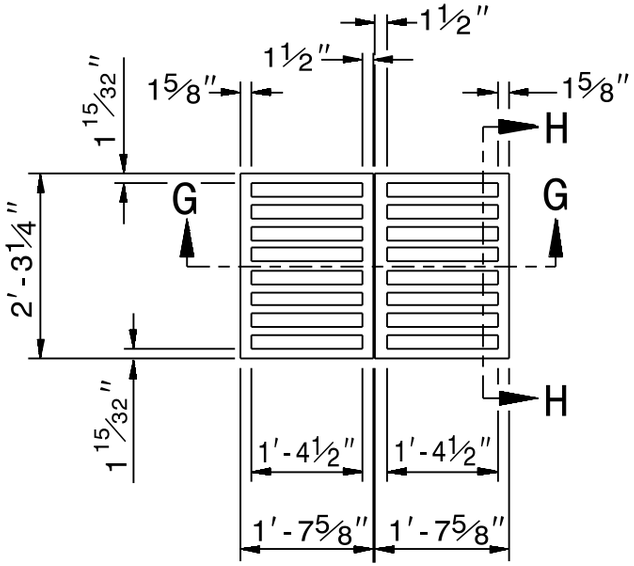
12″ THRU 30″ PIPE

SHEET 1 OF 1

840.15

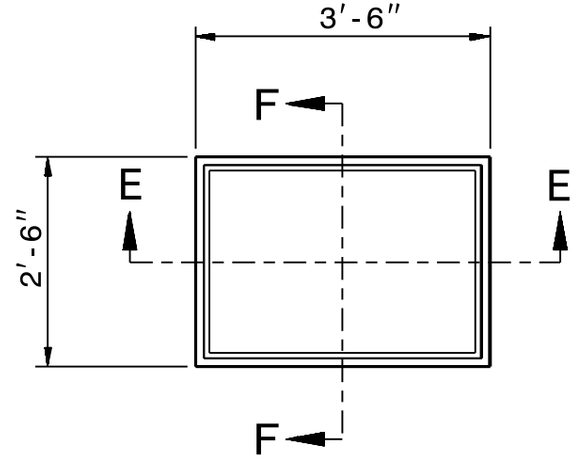


SECTION G-G



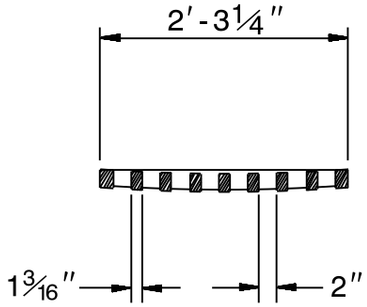
PLAN OF GRATING

CAST IRON

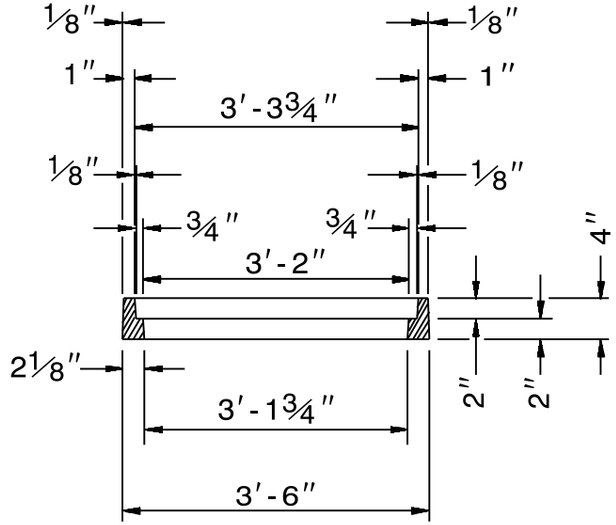


PLAN OF FRAME

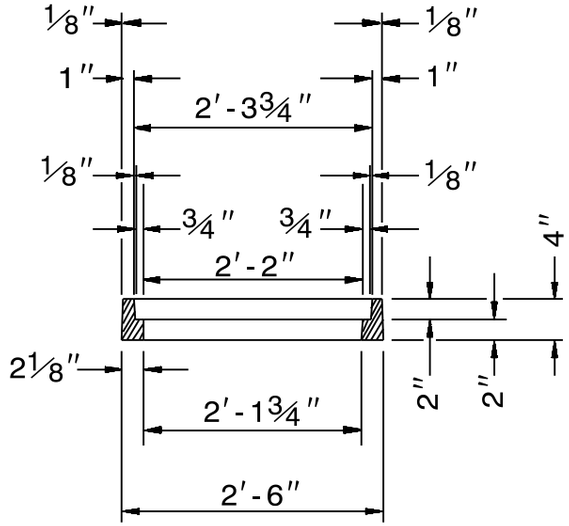
CAST IRON



SECTION H-H



SECTION E-E



SECTION F-F

STATE OF
NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

1-24

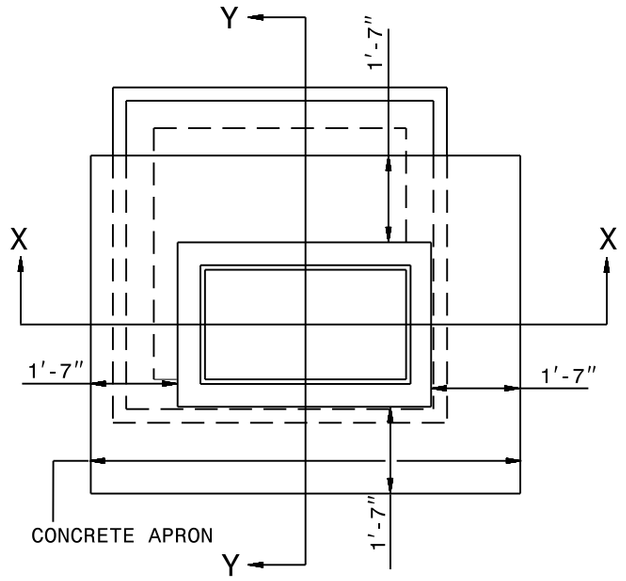
ROADWAY STANDARD DRAWING FOR

DROP INLET FRAME AND GRATES

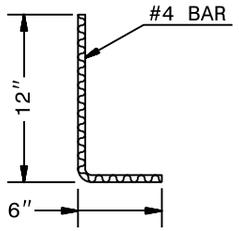
FOR USE WITH STD. DWG.S 840.14 AND 840.15

SHEET 1 OF 1

840.16



PLAN



DOWEL-A

GENERAL NOTES:

USE CLASS "B" CONCRETE THROUGHOUT.

PROVIDE ALL GRATED DROP INLETS OVER 3'-6" IN DEPTH WITH STEPS 12" ON CENTER. USE STEPS WHICH COMPLY WITH STD. DRAWING 840.66.

OPTIONAL CONSTRUCTION - MONOLITHIC POUR, 2" KEYWAY, OR #4 BAR DOWELS AT 12" CENTERS AS DIRECTED BY THE ENGINEER.

USE FORMS FOR THE CONSTRUCTION OF THE BOTTOM SLAB.

IF REINFORCED CONCRETE PIPE IS SET IN BOTTOM SLAB OF BOX, ADD TO SLAB AS SHOWN ON STD. NO. 840.00.

MAX. DEPTH OF THIS STRUCTURE FROM TOP OF BOTTOM SLAB TO TOP ELEVATION IS 12 FEET. STD. DWG. 840.45 CONTROLS MAXIMUM DEPTH IF PRECAST BOX IS USED.

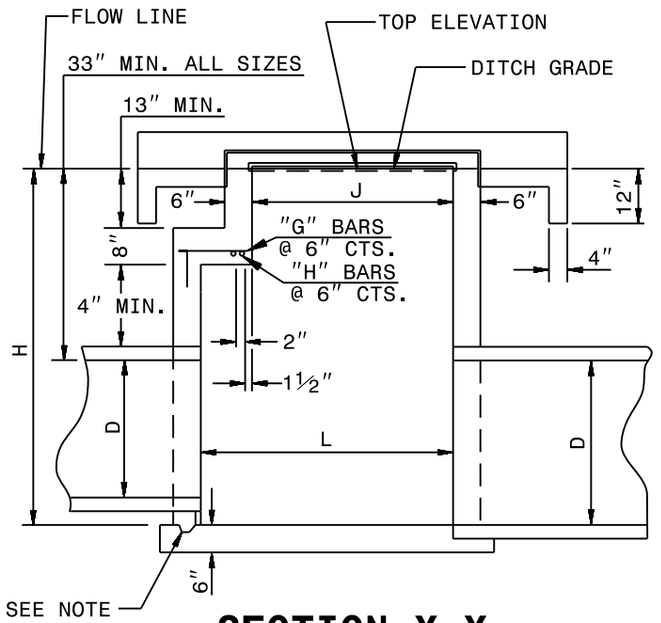
CONSTRUCT WITH PIPE CROWNS MATCHING.

USE STANDARD FRAMES AND GRATES 840.22 (SHOWN), 840.24(SHOWN), 840.20 (NOT SHOWN) OR 840.29 (NOT SHOWN).

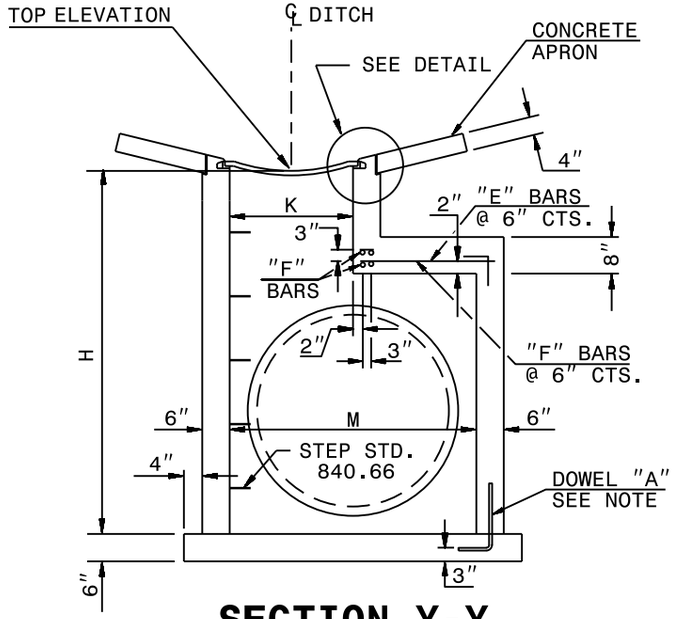
SEE STANDARD DRAWING 840.25 FOR ATTACHMENT OF FRAMES AND GRATES.

CHAMFER ALL EXPOSED CORNERS 1".

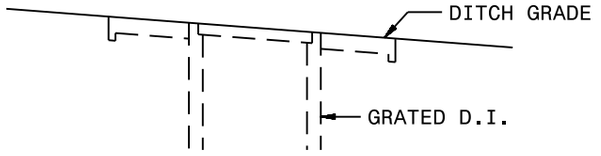
DRAWING NOT TO SCALE.

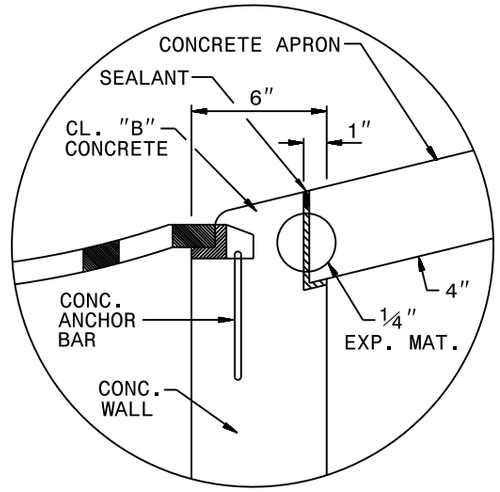


SECTION X-X



SECTION Y-Y





DETAIL

(APRON SUPPORT NOTCH)

STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

1-24

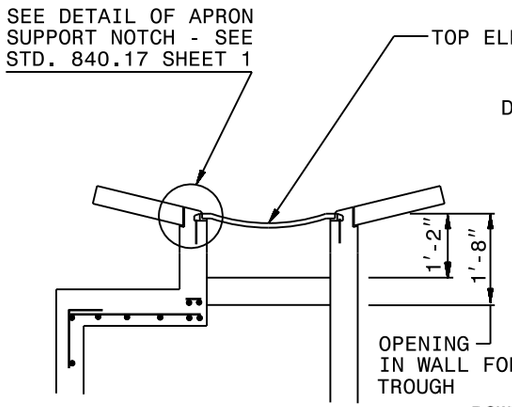
ROADWAY STANDARD DRAWING FOR

CONCRETE GRATED DROP INLET TYPE 'A'

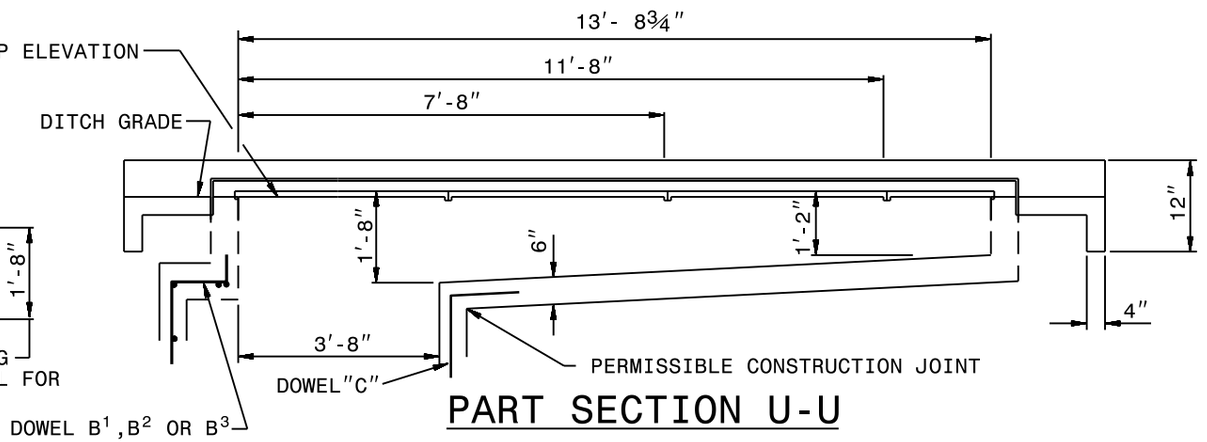
12" THRU 72" PIPE

SHEET 1 OF 2

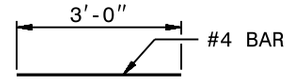
840.17



PART SECTION V-V

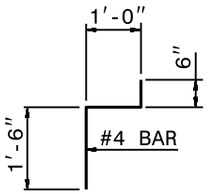


PART SECTION U-U



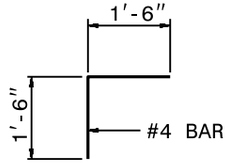
DOWEL-B¹

FOR 15" THRU 36" INLET

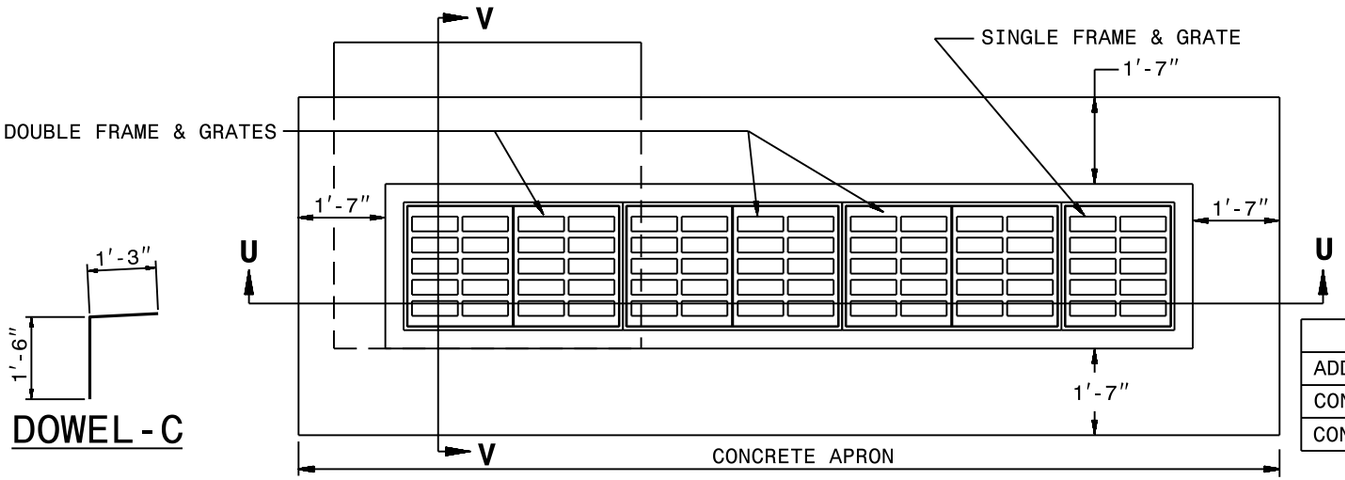


DOWEL-B²

FOR 42" INLET



DOWEL-B³



DOWEL-C

QUANTITY TO BE ADDED FOR EACH 2' INCREMENT INLET OPENING						
ADDITIONAL INLETS	2'-0"	4'-0"	6'-0"	8'-0"	10'-0"	12'-0"
CONCRETE CU. YDS.	0.191	0.417	0.665	0.897	1.145	1.380
CONCRETE APRON CU. YDS.	0.074	0.148	0.222	0.296	0.370	0.444

MIN. DIMENSIONS AND QUANTITIES FOR CONCRETE GRATED DROP INLET(BASED ON MIN. HEIGHT, H)

DIMENSIONS OF BOX AND PIPE						REINFORCING STEEL - NO. 4 BARS									CU YDS CONC. IN BOX					DEDUCTIONS FOR ONE PIPE	
PIPE	SPAN	WIDTH	SPAN	WIDTH	HEIGHT	BARS E		BARS F		BARS G		BARS H		TOTAL	BOTTOM	H	H PER	APRON	TOTAL		
D	J	K	L	M	H	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	LBS.	SLAB	TOTAL	FT HT			C.S.	R.C.
12"	3'-8"	2'-0"	3'-8"	2'-0"	3'-9"	—	—	—	—	—	—	—	—	—	0.362	0.926	0.247	0.395	1.683	0.015	0.024
15"	3'-8"	2'-0"	3'-8"	2'-0"	4'-0"	—	—	—	—	—	—	—	—	—	0.362	0.988	0.247	0.395	1.745	0.023	0.036
18"				2'-0"	4'-3"	—	—	—	—	—	—	—	—	—	0.362	1.050	0.247		1.807	0.033	0.049
24"				2'-10"	4'-9"	8	1'-5"	6	4'-9"	—	—	—	—	27	0.444	1.362	0.278		2.201	0.059	0.085
30"			3'-8"	3'-5"	5'-3"	8	2'-0"	7	4'-9"	—	—	—	—	33	0.502	1.644	0.288		2.541	0.092	0.127
36"			4'-0"	4'-0"	5'-9"	8	2'-5"	8	4'-11"	4	0'-9"	2	4'-11"	47	0.560	1.931	0.321		2.920	0.132	0.178
42"			4'-10"	4'-10"	6'-3"	10	3'-1"	9	5'-7"		1'-5"	3	5'-7"	67	0.704	2.500	0.370		3.677	0.180	0.243
48"			5'-4"	5'-4"	6'-9"	11	3'-7"	10	6'-1"		1'-11"	4	6'-1"	87	0.823	3.013	0.407		4.315	0.235	0.317
54"			6'-0"	6'-0"	7'-3"	12	4'-1"	11	6'-7"		2'-5"	5	6'-7"	107	0.951	3.589	0.444		5.072	0.297	0.401
60"			6'-6"	6'-6"	7'-9"	13	4'-9"	12	7'-3"		3'-1"	6	7'-3"	135	1.311	4.539	0.494		6.170	0.367	0.495
66"			7'-2"	7'-2"	8'-3"	14	5'-4"	14	7'-10"		3'-7"	7	7'-10"	168	1.136	5.061	0.537		6.901	0.444	0.599
72"	3'-8"	2'-0"	7'-8"	7'-8"	8'-9"	15	5'-11"	15	8'-5"	4	4'-3"	8	8'-5"	199	1.500	5.860	0.580	0.395	7.868	0.528	0.713

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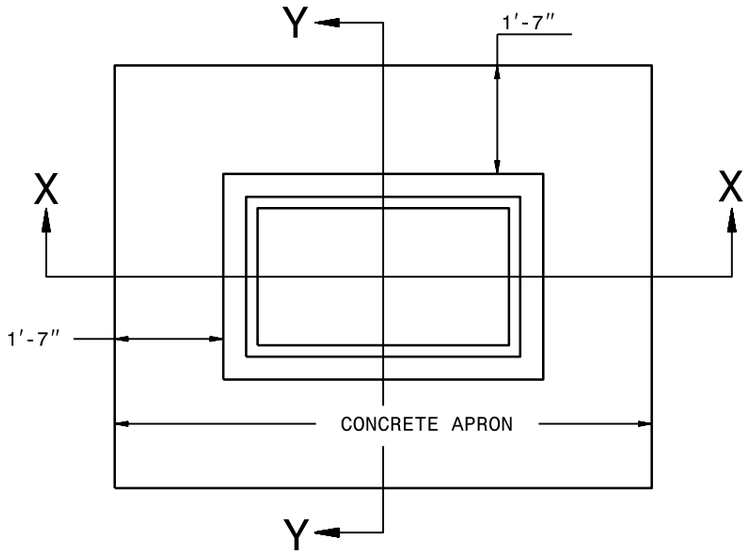
ROADWAY STANDARD DRAWING FOR

CONCRETE GRATED DROP INLET TYPE 'A'

12" THRU 72" PIPE

SHEET 2 OF 2

840.17



PLAN

GENERAL NOTES:

USE CLASS "B" CONCRETE THROUGHOUT.

PROVIDE ALL GRATED DROP INLETS OVER 3'-6" IN DEPTH WITH STEPS 12" ON CENTER. USE STEPS WHICH COMPLY WITH STD. DRAWING 840.66.

OPTIONAL CONSTRUCTION - MONOLITHIC POUR, 2" KEYWAY, OR #4 BAR DOWELS AT 12" CENTERS AS DIRECTED BY THE ENGINEER.

USE FORMS FOR THE CONSTRUCTION OF THE BOTTOM SLAB.

IF REINFORCED CONCRETE PIPE IS SET IN BOTTOM SLAB OF BOX, ADD TO SLAB AS SHOWN ON STD. NO. 840.00.

CONSTRUCT WITH PIPE CROWNS MATCHING.

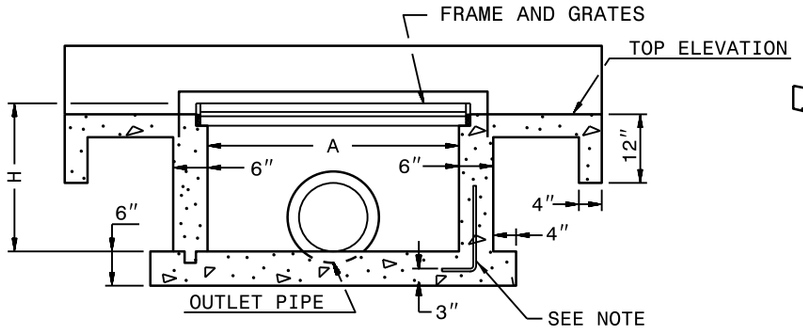
MAX. DEPTH OF THIS STRUCTURE FROM TOP OF BOTTOM SLAB TO TOP ELEVATION IS 12 FEET. STD. DWG. 840.45 CONTROLS MAXIMUM DEPTH IF PRECAST BOX IS USED.

USE STANDARD FRAMES AND GRATES 840.22 (SHOWN), 840.24(SHOWN), 840.20, 840.29, AND 840.33.

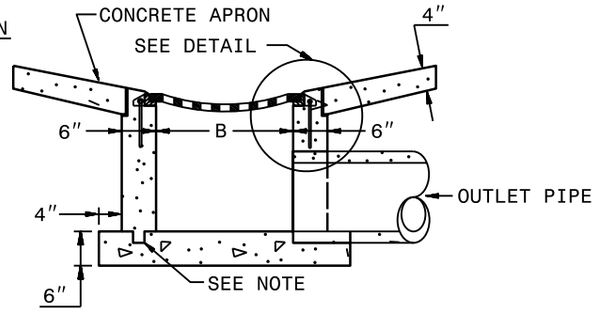
SEE STANDARD DRAWING 840.25 FOR ATTACHMENT OF FRAMES AND GRATES NOT SHOWN.

CHAMFER ALL EXPOSED CORNERS 1".

DRAWING NOT TO SCALE.

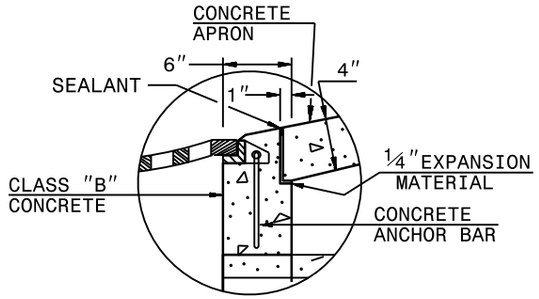


SECTION X-X



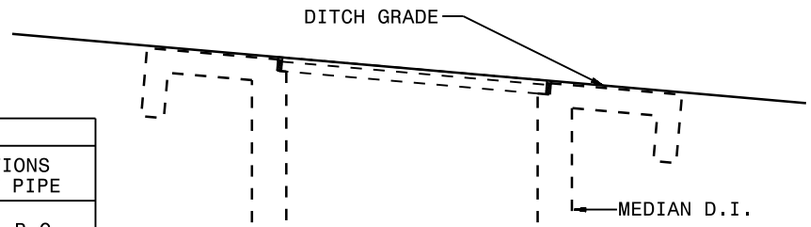
MAX. PIPE THIS SIDE - 18"

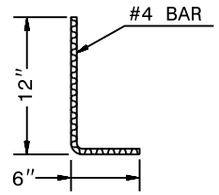
SECTION Y-Y



DETAIL

(APRON SUPPORT NOTCH)





DOWEL "A"

MINIMUM DIMENSIONS AND QUANTITIES FOR CONCRETE GRATED DROP INLET									
PIPE	SPAN	WIDTH	HEIGHT	CUBIC YARDS OF CONCRETE IN BOX				DEDUCTIONS FOR ONE PIPE	
D	A	B	H	BOTTOM SLAB	H PER FT. HT.	H MIN. TOTAL	TOTAL	C.S.	R.C.
12"	3'-8"	2'-0"	2'-6"	0.362	0.247	0.597	0.958	0.020	0.032
15"	3'-8"	2'-0"	2'-9"	0.362	0.247	0.659	1.021	0.023	0.036
18"	3'-8"	2'-0"	3'-0"	0.362	0.247	0.720	1.082	0.033	0.049
24"	3'-8"	2'-0"	3'-6"	0.362	0.247	0.865	1.227	0.059	0.085
30"	3'-8"	2'-0"	4'-0"	0.362	0.247	0.988	1.350	0.092	0.127
36"	3'-8"	2'-0"	4'-6"	0.362	0.247	1.112	1.474	0.132	0.178

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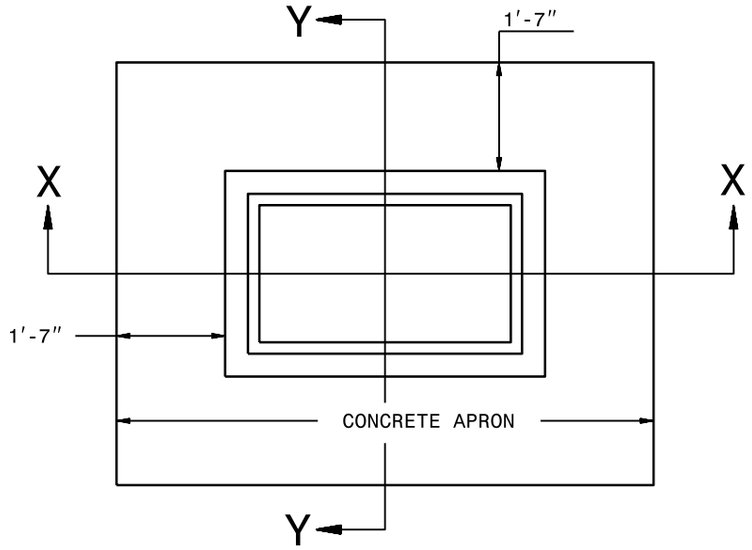
ROADWAY STANDARD DRAWING FOR

CONCRETE GRATED DROP INLET TYPE 'B'

12" THRU 36" PIPE

SHEET 1 OF 1

840.18



PLAN

GENERAL NOTES:

USE CLASS "B" CONCRETE THROUGHOUT.

PROVIDE ALL DROP INLETS OVER 3'-6" IN DEPTH WITH STEPS 12" ON CENTER. USE STEPS WHICH COMPLY WITH STD. DRAWING 840.66.

OPTIONAL CONSTRUCTION - MONOLITHIC POUR, 2" KEYWAY, OR #4 BAR DOWELS AT 12" CENTERS AS DIRECTED BY THE ENGINEER.

USE FORMS FOR THE CONSTRUCTION OF THE BOTTOM SLAB.

IF REINFORCED CONCRETE PIPE IS SET IN BOTTOM SLAB OF BOX, ADD TO SLAB AS SHOWN ON STD. NO. 840.00.

CONSTRUCT WITH PIPE CROWNS MATCHING.

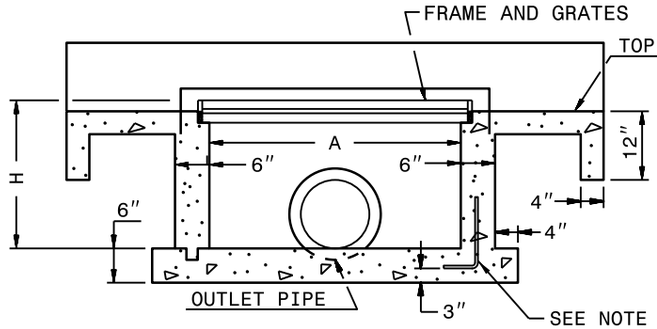
MAX. DEPTH OF THIS STRUCTURE FROM TOP OF BOTTOM SLAB TO TOP ELEVATION IS 12"-0". STD. DWG. 840.45 CONTROLS MAXIMUM DEPTH IF PRECAST BOX IS USED.

USE STANDARD FRAMES AND GRATES 840.22 (SHOWN), 840.24(SHOWN), 840.20, 840.29, AND 840.33.

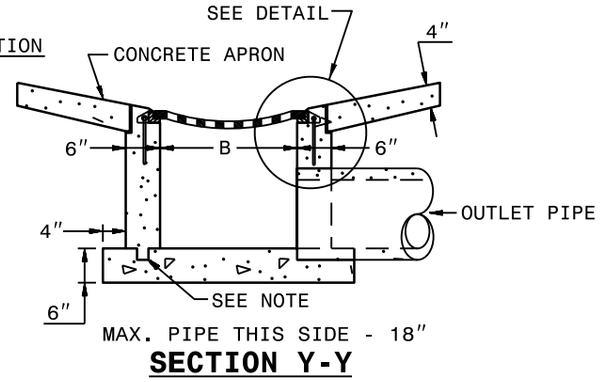
SEE STANDARD DRAWING 840.25 FOR ATTACHMENT OF FRAMES AND GRATES NOT SHOWN.

CHAMFER ALL EXPOSED CORNERS 1".

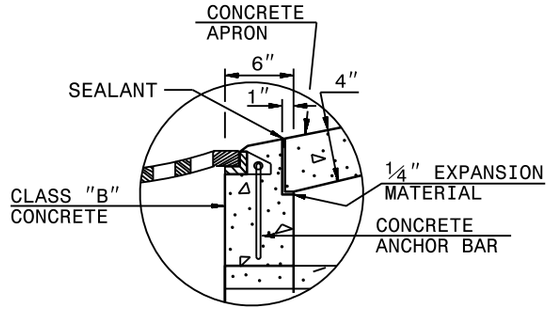
DRAWING NOT TO SCALE.



SECTION X-X

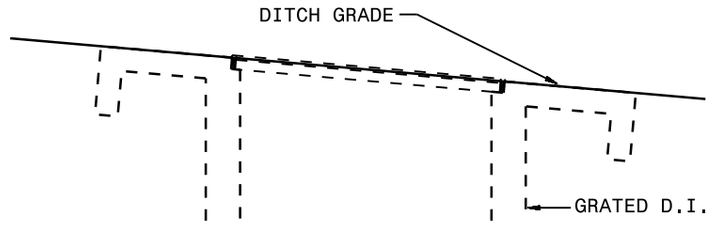


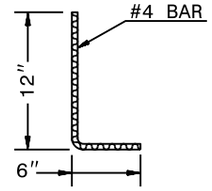
SECTION Y-Y



DETAIL

(APRON SUPPORT NOTCH)





DOWEL "A"

MINIMUM DIMENSIONS AND QUANTITIES FOR CONCRETE GRATED DROP INLET

PIPE	SPAN	WIDTH	HEIGHT	CUBIC YARDS OF CONCRETE IN BOX				DEDUCTIONS FOR ONE PIPE	
D	A	B	H	BOTTOM SLAB	H PER FT. HT.	H MIN. TOTAL	TOTAL	C.S.	R.C.
12"	3'-8"	2'-0"	1'-8"	0.362	0.247	0.391	0.753	0.020	0.032
15"	3'-8"	2'-0"	1'-11"	0.362	0.247	0.453	0.815	0.023	0.036
18"	3'-8"	2'-0"	2'-2"	0.362	0.247	0.515	0.877	0.033	0.049
24"	3'-8"	2'-0"	2'-8"	0.362	0.247	0.659	1.021	0.059	0.085
30"	3'-8"	2'-0"	3'-2"	0.362	0.247	0.782	1.144	0.092	0.127
36"	3'-8"	2'-0"	3'-8"	0.362	0.247	0.906	1.268	0.132	0.178

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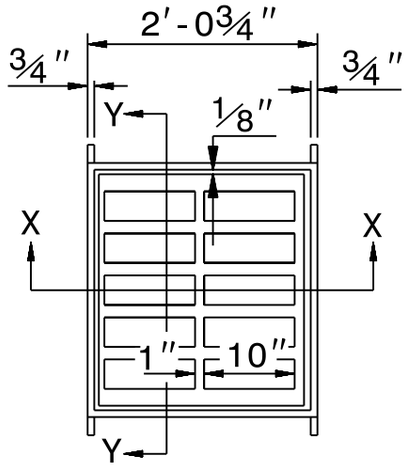
ROADWAY STANDARD DRAWING FOR

CONCRETE GRATED DROP INLET TYPE 'D'

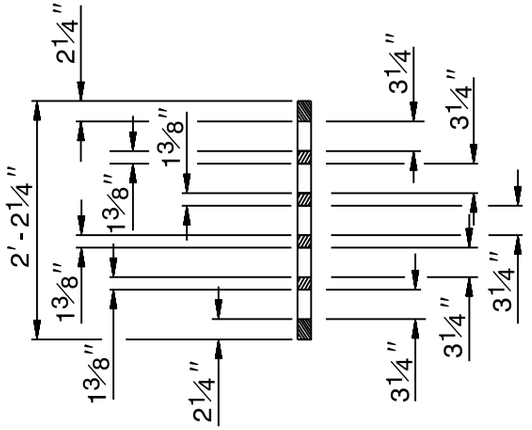
12" THRU 36" PIPE

SHEET 1 OF 1

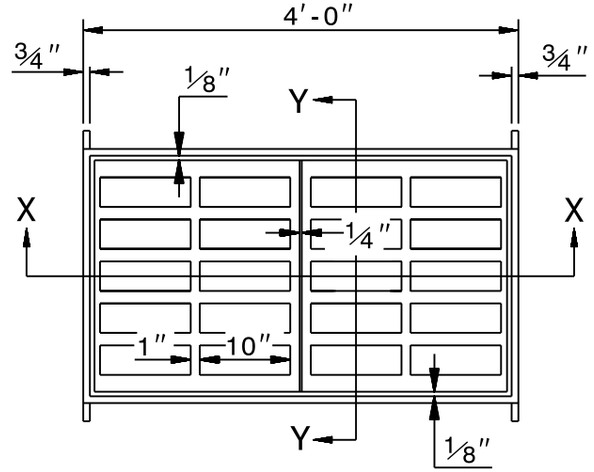
840.19



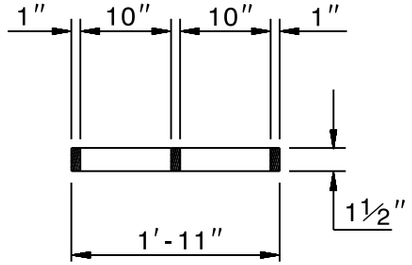
PLAN



GRATE SECTION Y-Y

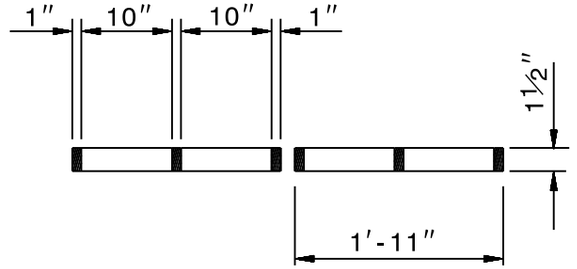


PLAN

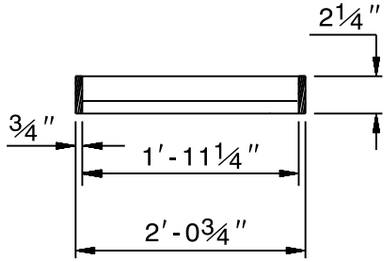


GRATE SECTION X-X

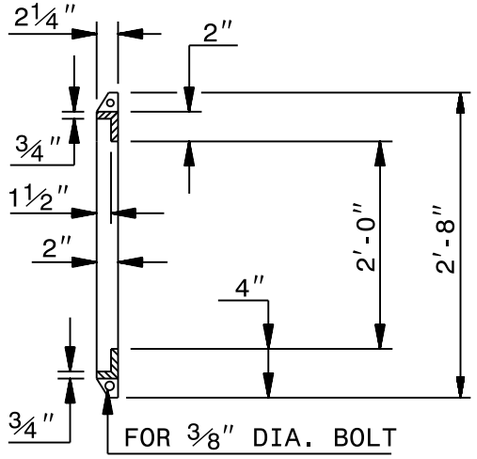
NOTE:
SEE STD. DWG. 840.25
FOR FRAME ANCHORAGE.



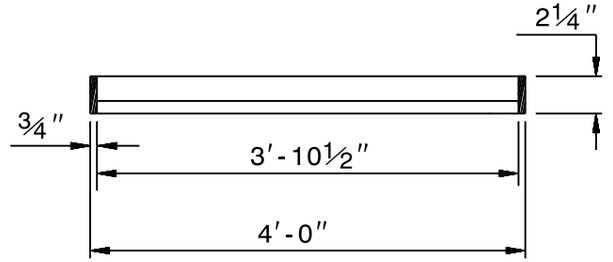
GRATE SECTION X-X



FRAME SECTION X-X



FRAME SECTION Y-Y



FRAME SECTION X-X

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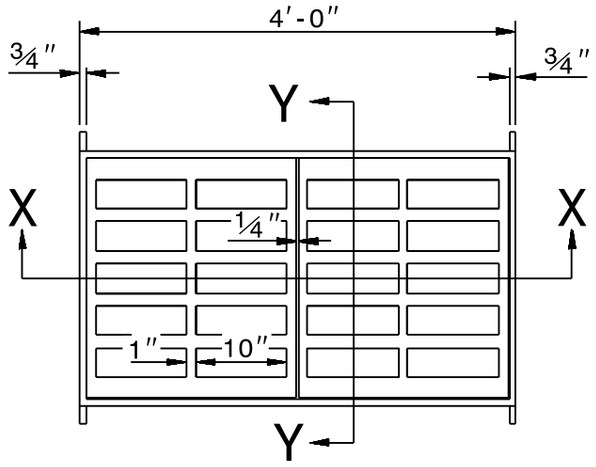
ROADWAY STANDARD DRAWING FOR

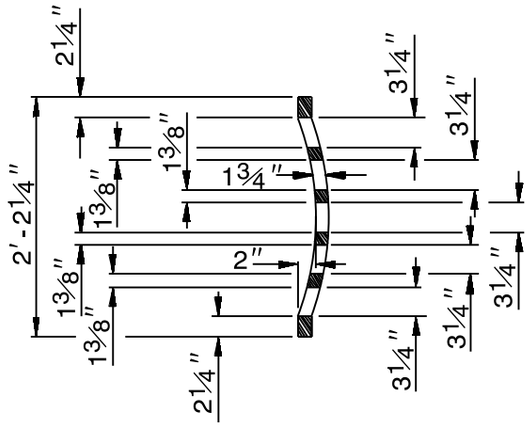
FRAMES AND WIDE SLOT FLAT GRATES

SHEET 1 OF 1

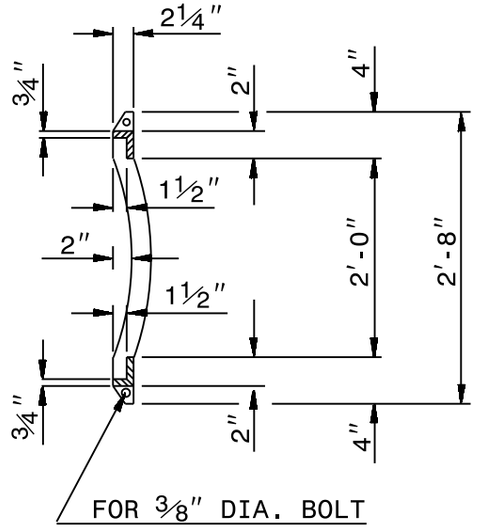
840.20



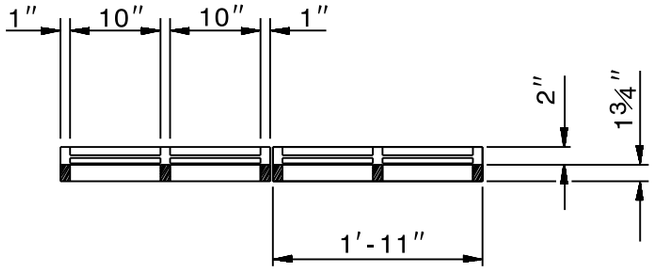
PLAN



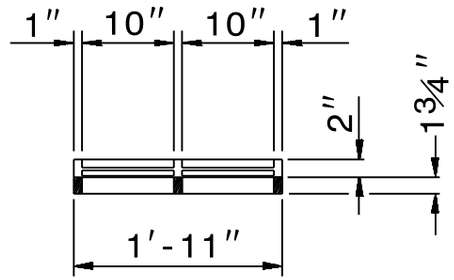
GRATE SECTION Y-Y



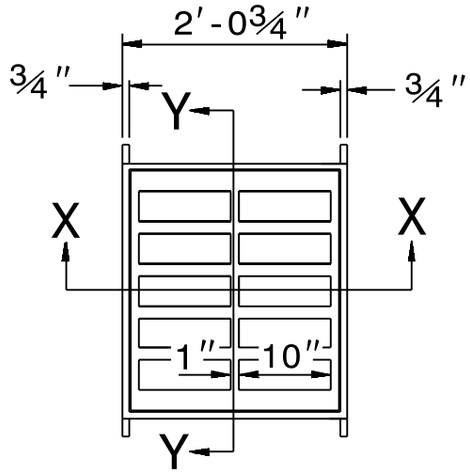
FRAME SECTION Y-Y



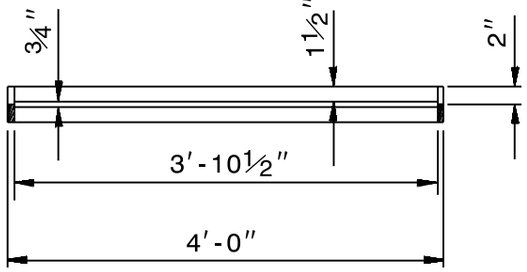
GRATE SECTION X-X



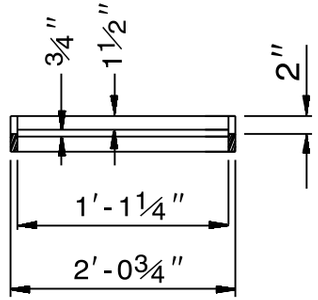
GRATE SECTION X-X



PLAN



FRAME SECTION X-X



FRAME SECTION X-X

NOTE:
SEE STD. DWG. 840.25
FOR FRAME ANCHORAGE.

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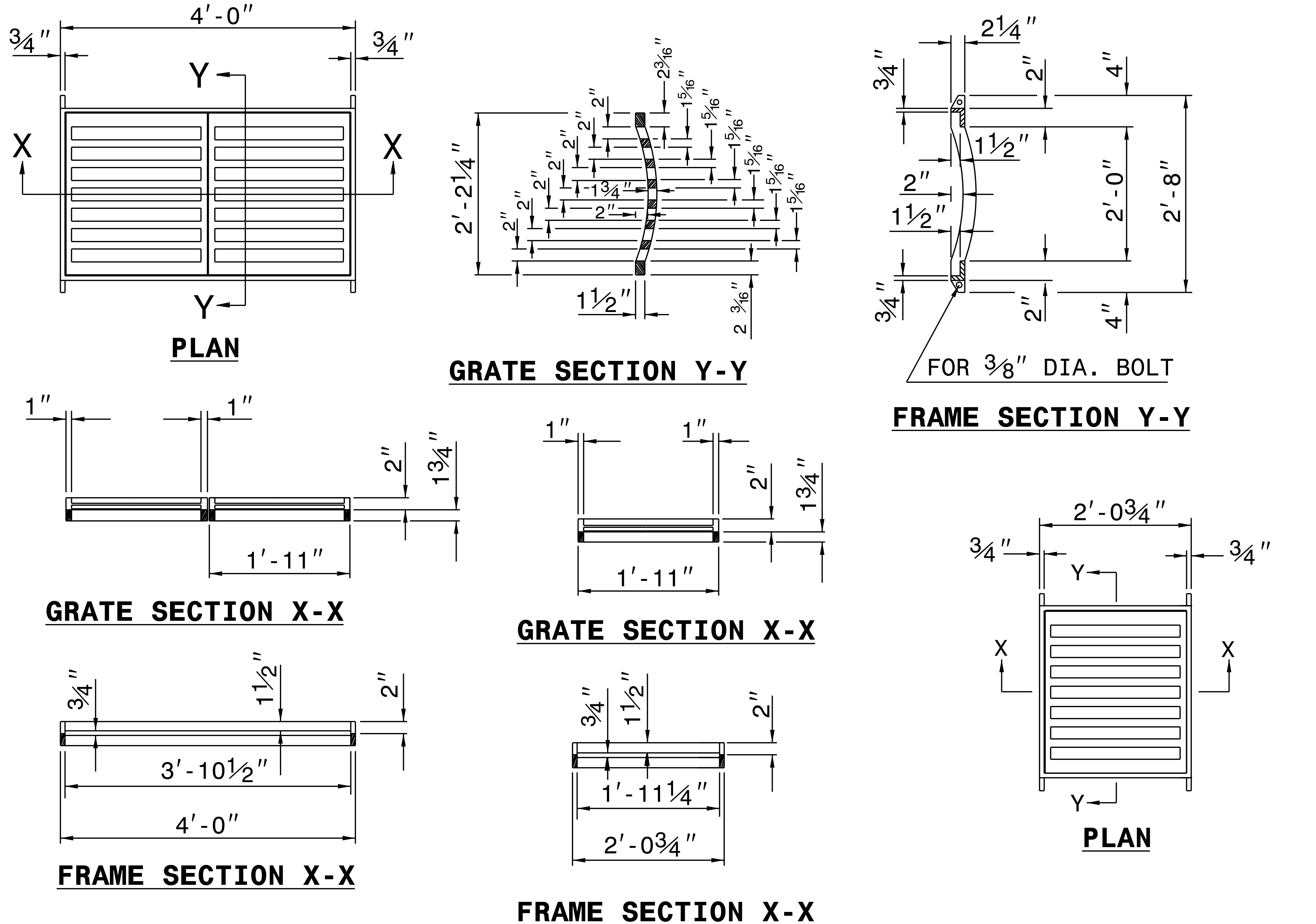
ROADWAY STANDARD DRAWING FOR

FRAMES AND WIDE SLOT SAG GRATES

SHEET 1 OF 1

840.22



NOTE:
SEE STD. DWG. 840.25
FOR FRAME ANCHORAGE.

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RALEIGH, N.C.

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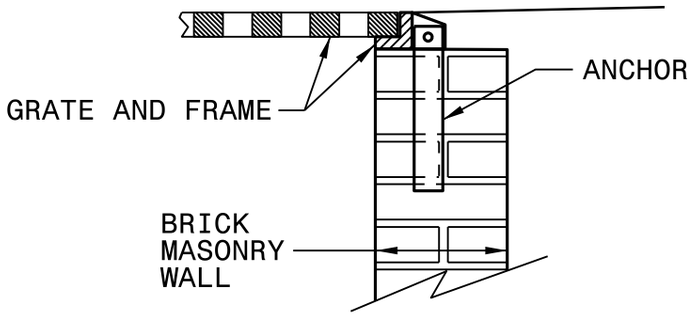
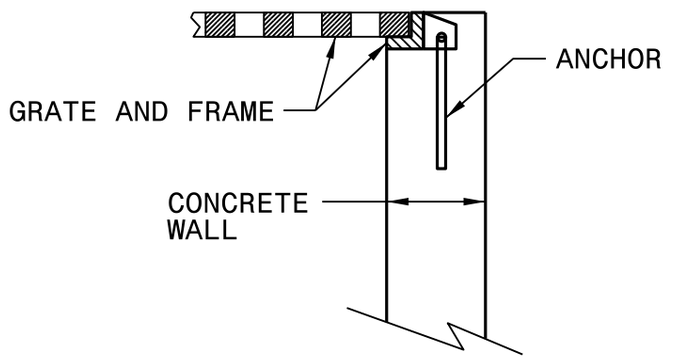
ROADWAY STANDARD DRAWING FOR
FRAMES AND NARROW SLOT SAG GRATES

SHEET 1 OF 1

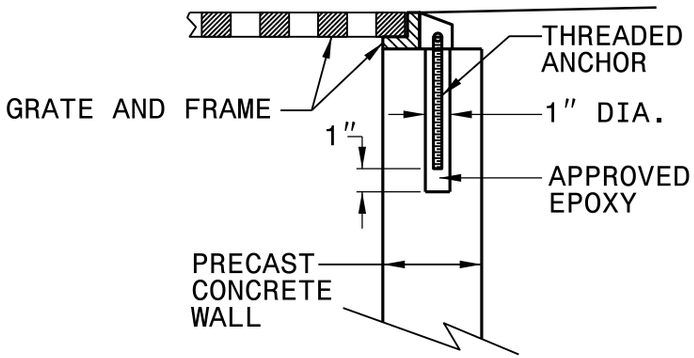
840.24



BRICK MASONRY CONSTRUCTION



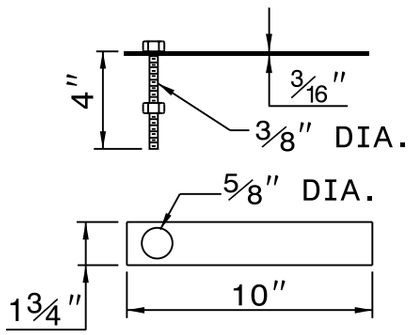
CONCRETE CONSTRUCTION



PRECAST CONCRETE CONSTRUCTION

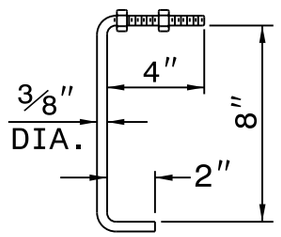
DETAIL SHOWING ANCHORAGE OF FRAME FOR GRATED DROP INLET

NOTE:
CONSTRUCT GRATED DROP INLET TO COINCIDE WITH NORMAL OR SUPERELEVATED SHOULDER OR PAVEMENT SLOPE.



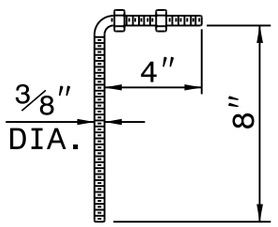
MASONRY ANCHOR

3/8″ DIA. BOLT WITH PLATE



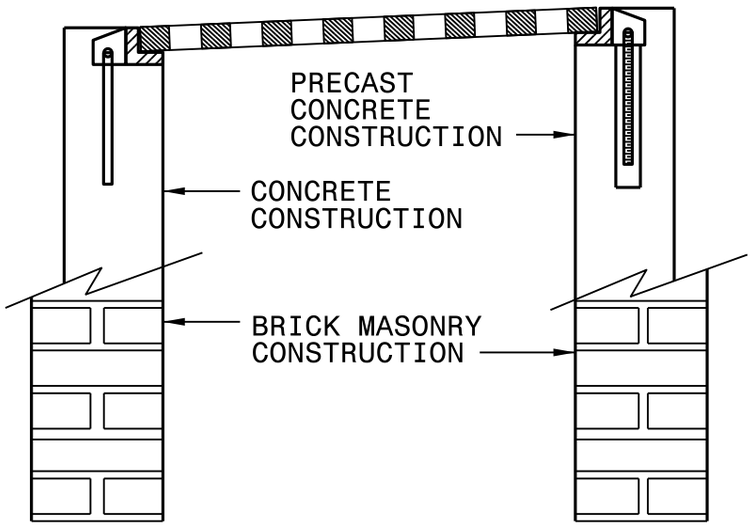
CONCRETE ANCHOR

3/8″ DIA. BENT BAR



PRECAST CONCRETE ANCHOR

3/8″ DIA. BENT BAR



FRAME AND GRATE INSTALLATION FOR NORMAL CROWN AND SUPERELEVATED SECTIONS

STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

1-24

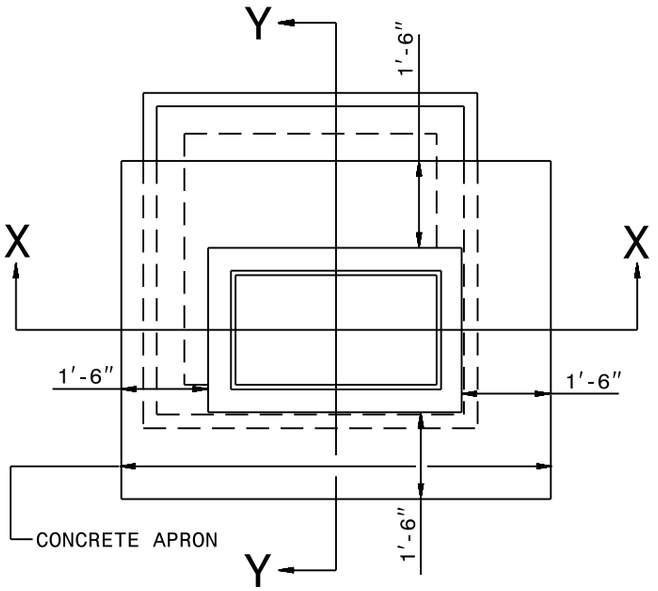
ROADWAY STANDARD DRAWING FOR

ANCHORAGE FOR FRAMES

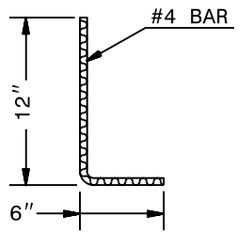
BRICK/CONCRETE/PRECAST CONCRETE

SHEET 1 OF 1

840.25



PLAN



DOWEL-A

GENERAL NOTES:

USE CLASS "B" CONCRETE THROUGHOUT.

JUMBO BRICK WILL BE PERMITTED. CONCRETE BRICK OR 4" SOLID CONCRETE BLOCKS MAY BE USED IN LIEU OF CLAY BRICKS.

PROVIDE ALL DROP INLETS OVER 3'-6" IN DEPTH WITH STEPS 12" ON CENTER. USE STEPS WHICH COMPLY WITH STD. DRAWING 840.66.

USE #4 BAR DOWELS AT 12" CENTERS.

USE FORMS FOR THE CONSTRUCTION OF THE BOTTOM SLAB.

IF REINFORCED CONCRETE PIPE IS SET IN BOTTOM SLAB OF BOX, ADD TO SLAB AS SHOWN ON STD. NO. 840.00.

CONSTRUCT WITH PIPE CROWNS MATCHING.

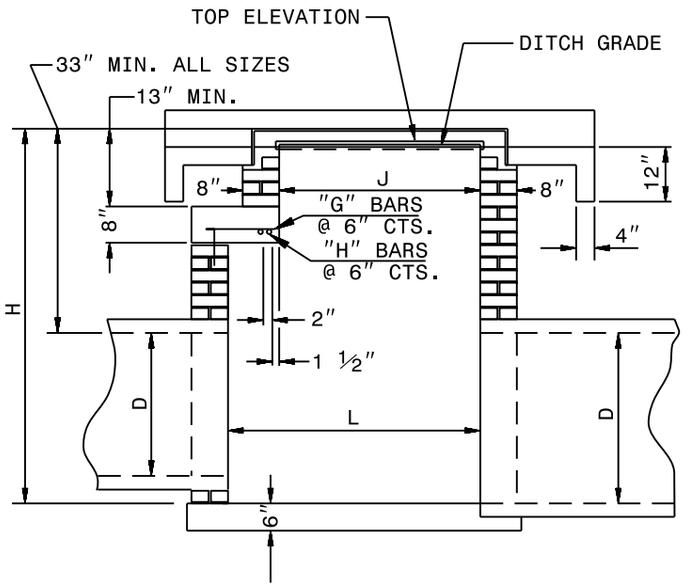
MAX. DEPTH OF THIS STRUCTURE FROM TOP OF BOTTOM SLAB TO TOP ELEVATION IS 12'-0". STANDARD DRAWING 840.45 CONTROLS MAXIMUM DEPTH IF PRECAST BOX IS USED.

USE STANDARD FRAMES AND GRATES 840.22 (SHOWN), 840.24(SHOWN), 840.20, 840.29, AND 840.33.

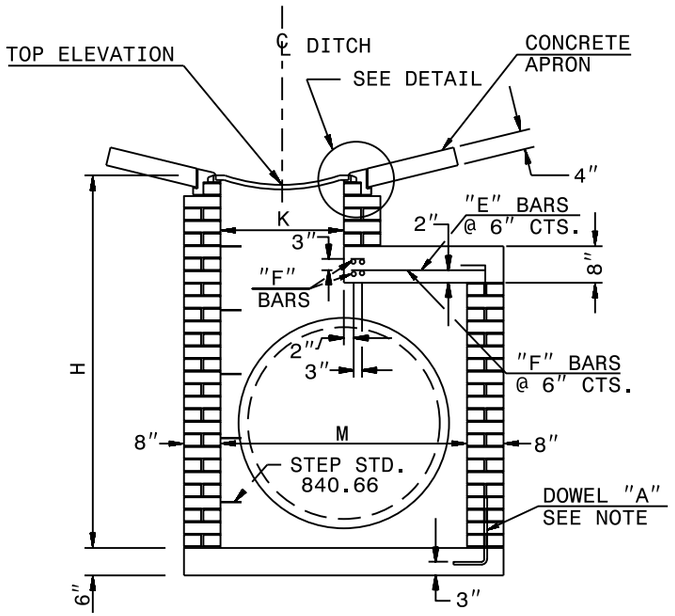
SEE STANDARD DRAWING 840.25 FOR ATTACHMENT OF FRAMES AND GRATES NOT SHOWN.

CHAMFER ALL EXPOSED CORNERS 1".

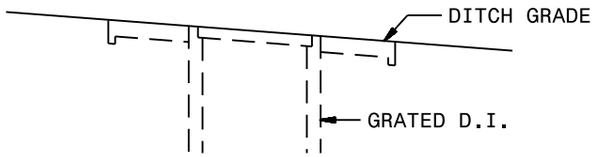
DRAWING NOT TO SCALE.

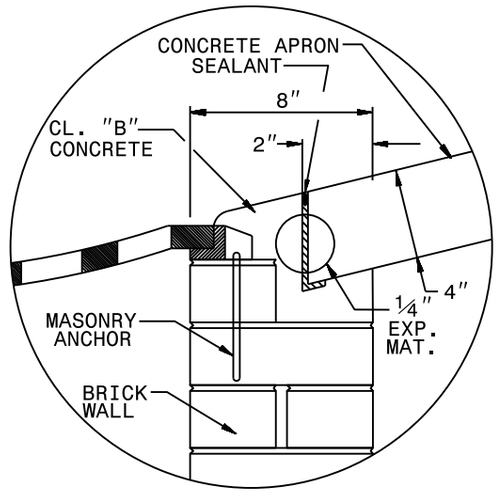


SECTION X-X



SECTION Y-Y





DETAIL

(APRON SUPPORT NOTCH)

STATE OF
NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

1-24

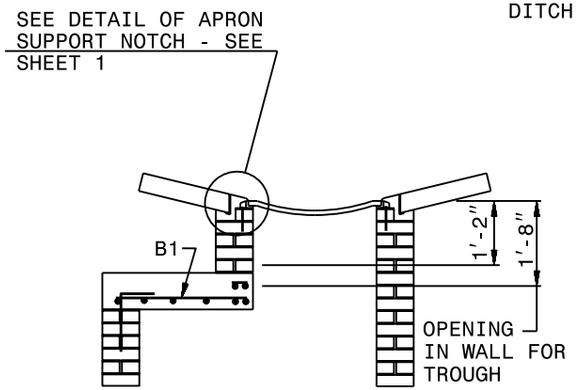
ROADWAY STANDARD DRAWING FOR

BRICK GRATED DROP INLET TYPE 'A'

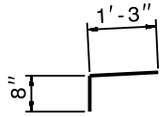
12" THRU 72" PIPE

SHEET 1 OF 2

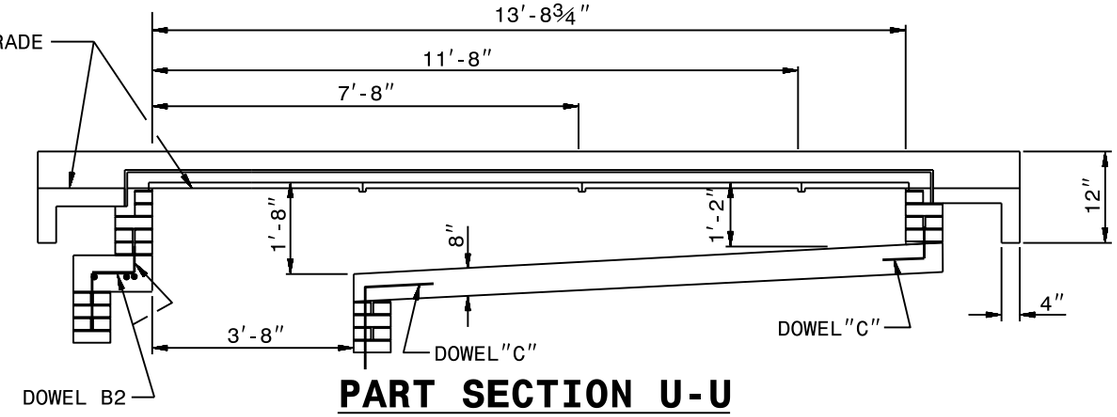
840.26



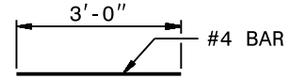
PART SECTION V-V



DOWEL-C

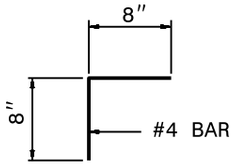


PART SECTION U-U

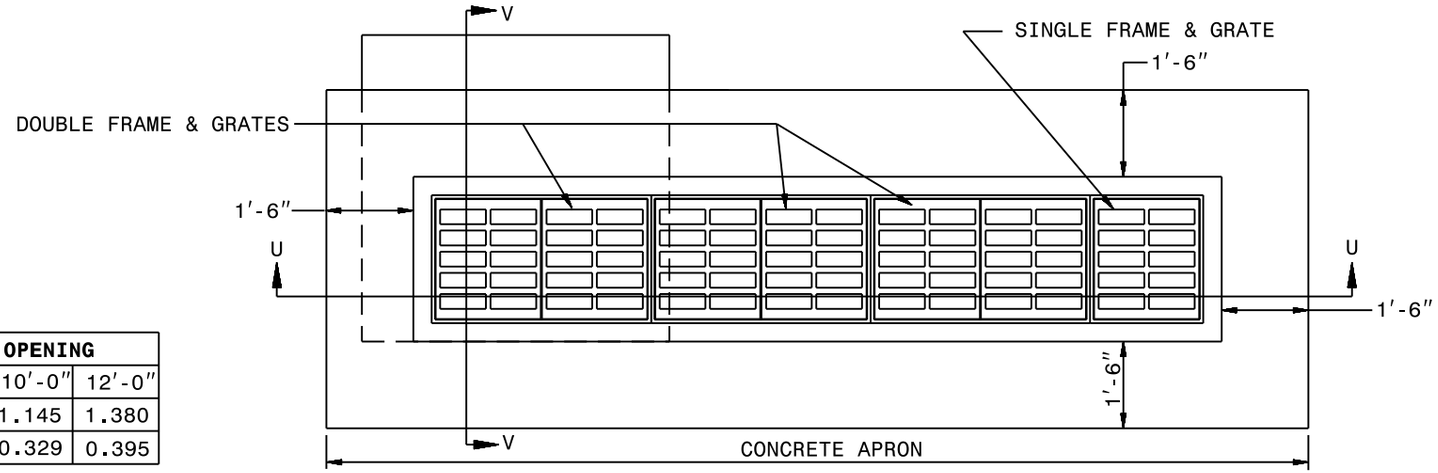


DOWEL-B1

FOR 12" THRU 36" INLET



DOWEL-B2



QUANTITY TO BE ADDED FOR EACH 2' INCREMENT INLET OPENING						
ADDITIONAL INLETS	2'-0"	4'-0"	6'-0"	8'-0"	10'-0"	12'-0"
CONCRETE CU. YDS.	0.191	0.417	0.665	0.897	1.145	1.380
CONCRETE APRON CU. YDS.	0.065	0.132	0.198	0.263	0.329	0.395

DIMENSIONS AND QUANTITIES FOR BRICK GRATED DROP INLET (BASED ON MIN. HEIGHT, H)

DIMENSIONS OF BOX AND PIPE						REINFORCING STEEL - NO. 4 BARS									CU.YDS. CONC. IN BOX				CU.YDS. BRICK MASONRY IN BOX		BRICK AND CONC.	DEDUCTIONS FOR ONE PIPE	
PIPE	SPAN	WIDTH	SPAN	WIDTH	HEIGHT	BARS E		BARS F		BARS G		BARS H		TOTAL LBS.	TOP SLAB	BOTTOM SLAB	APRON	TOTAL	H TOTAL	H PER FT HT	TOTAL	C.S.	R.C.
D	J	K	L	M	H	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH										
12"	3'-8"	2'-0"	3'-8"	2'-0"	3'-9"	—	—	—	—	—	—	—	—	—	—	0.308	0.351	0.659	1.301	0.346 ABOVE MIN H	1.960	0.020	0.032
15"	3'-8"	2'-0"	3'-8"	2'-0"	4'-0"	—	—	—	—	—	—	—	—	—	—	0.308	0.351	0.659	1.407		2.066	0.031	0.047
18"				2'-0"	4'-3"	—	—	—	—	—	—	—	—	—	—	0.308		0.659	1.471		2.130	0.044	0.065
24"				2'-10"	4'-9"	8	1'-3"	6	4'-9"	—	—	—	—	26	0.185	0.386		0.922	1.646	0.346	2.568	0.078	0.113
30"			3'-8"	3'-5"	5'-3"	8	1'-10"	7	4'-9"	—	—	—	—	32	0.301	0.410		1.062	1.936		2.998	0.122	0.170
36"			3'-10"	3'-10"	5'-9"	8	2'-3"	8	4'-10"	4	0'-7"	2	4'-11"	46	0.374	0.494		1.219	2.187		3.406	0.176	0.238
42"			4'-6"	4'-6"	6'-3"	10	2'-11"	9	5'-7"		1'-3"	3	5'-7"	68	0.555	0.630		1.536	2.717		4.253	0.240	0.323
48"			5'-0"	5'-0"	6'-9"	11	3'-5"	10	6'-1"		1'-9"	4	6'-1"	87	0.705	0.743		1.799	3.221	H	5.020	0.313	0.422
54"			5'-6"	5'-6"	7'-3"	12	3'-11"	11	6'-7"		2'-3"	5	6'-7"	108	0.868	0.865		2.084	3.786		5.870	0.396	0.535
60"			6'-2"	6'-2"	7'-9"	13	4'-7"	12	7'-3"		2'-11"	6	7'-3"	135	1.104	1.042		2.497	4.701		7.198	0.489	0.660
66"			6'-9"	6'-9"	8'-3"	14	5'-2"	14	7'-10"		3'-6"	7	7'-10"	168	1.328	1.210		2.889	5.189		8.078	0.591	0.798
72"	3'-8"	2'-0"	7'-4"	7'-4"	8'-9"	15	5'-9"	15	8'-5"	4	4'-1"	8	8'-5"	198	1.569	1.391	0.351	3.311	5.954	0.346	8.905	0.704	0.950

STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

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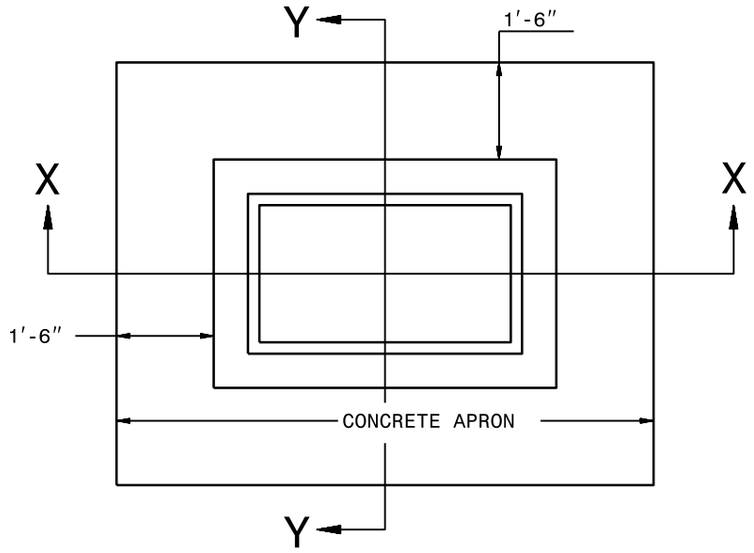
ROADWAY STANDARD DRAWING FOR

BRICK GRATED DROP INLET TYPE 'A'

12" THRU 72" PIPE

SHEET 2 OF 2

840.26



PLAN

GENERAL NOTES:

USE CLASS "B" CONCRETE THROUGHOUT.

JUMBO BRICK WILL BE PERMITTED. CONCRETE BRICK OR 4″ SOLID CONCRETE BLOCKS MAY BE USED IN LIEU OF CLAY BRICKS.

PROVIDE ALL DROP INLETS OVER 3′-6″ IN DEPTH WITH STEPS 12″ ON CENTER. USE STEPS WHICH COMPLY WITH STD. DRAWING 840.66.

USE #4 BAR DOWELS AT 12″ CENTERS.

USE FORMS FOR THE CONSTRUCTION OF THE BOTTOM SLAB.

IF REINFORCED CONCRETE PIPE IS SET IN BOTTOM SLAB OF BOX, ADD TO SLAB AS SHOWN ON STD. NO. 840.00.

CONSTRUCT WITH PIPE CROWNS MATCHING.

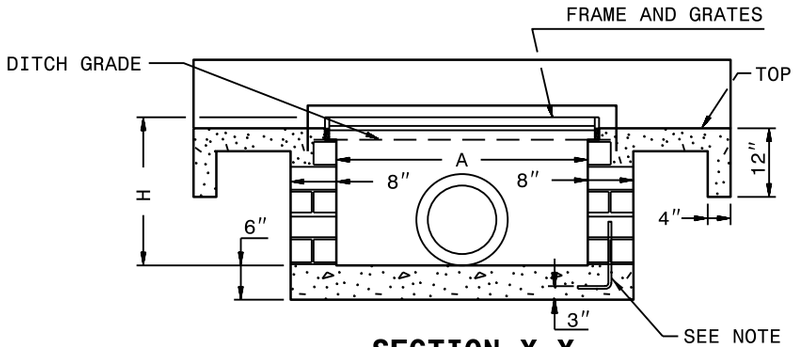
MAX. DEPTH OF THIS STRUCTURE FROM TOP OF BOTTOM SLAB TO TOP ELEVATION IS 12′-0″. STANDARD DRAWING 840.45 CONTROLS MAXIMUM DEPTH IF PRECAST BOX IS USED.

USE STANDARD FRAMES AND GRATES 840.22 (SHOWN), 840.24(SHOWN), 840.20, 840.29, AND 840.33.

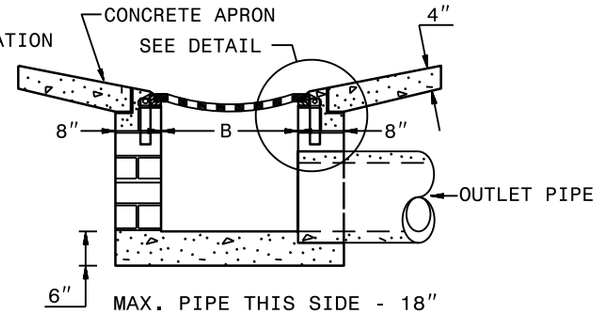
SEE STANDARD DRAWING 840.25 FOR ATTACHMENT OF FRAMES AND GRATES NOT SHOWN.

CHAMFER ALL EXPOSED CORNERS 1″.

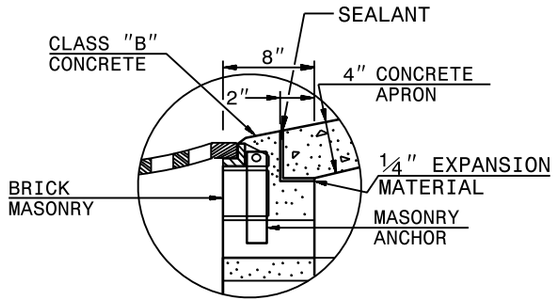
DRAWING NOT TO SCALE.



SECTION X-X

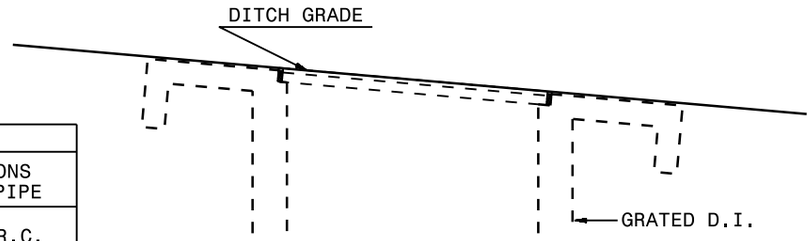


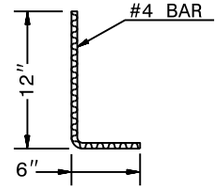
SECTION Y-Y



DETAIL

(APRON SUPPORT NOTCH)





DOWEL "A"

MINIMUM DIMENSIONS AND QUANTITIES FOR BRICK GRATED DROP INLET

PIPE	SPAN	WIDTH	HEIGHT	CU. YD. OF CONC IN BOX	CU. YD. OF BRICK MASONRY IN BOX		TOTAL CU. YD. IN BOX	DEDUCTIONS FOR ONE PIPE	
D	A	B	H	BOTTOM SLAB	H PER FT. HT.	TOTAL H		C.S.	R.C.
12″	3′-8″	2′-0″	2′-6″	0.309	0.346	0.836	1.145	0.020	0.032
15″	3′-8″	2′-0″	2′-9″	0.309	0.346	0.923	1.232	0.023	0.036
18″	3′-8″	2′-0″	3′-0″	0.309	0.346	1.009	1.318	0.033	0.049
24″	3′-8″	2′-0″	3′-6″	0.309	0.346	1.211	1.520	0.059	0.085
30″	3′-8″	2′-0″	4′-0″	0.309	0.346	1.384	1.693	0.092	0.127
36″	3′-8″	2′-0″	4′-6″	0.309	0.346	1.557	1.866	0.132	0.178

STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

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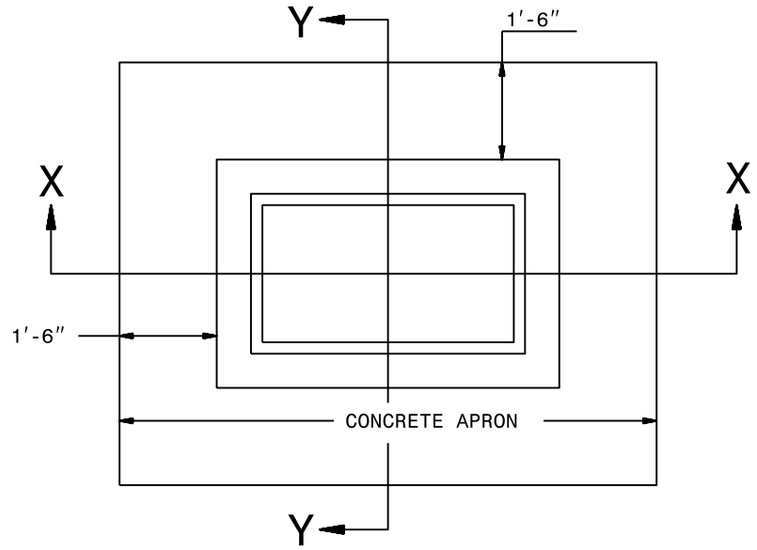
ROADWAY STANDARD DRAWING FOR

BRICK GRATED DROP INLET TYPE 'B'

12″ THRU 36″ PIPE

SHEET 1 OF 1

840.27



PLAN

GENERAL NOTES:

USE CLASS "B" CONCRETE THROUGHOUT.

JUMBO BRICK WILL BE PERMITTED. CONCRETE BRICK OR 4″ SOLID CONCRETE BLOCKS MAY BE USED IN LIEU OF CLAY BRICKS.

PROVIDE ALL DROP INLETS OVER 3′-6″ IN DEPTH WITH STEPS 12″ ON CENTER. USE STEPS WHICH COMPLY WITH STD. DRAWING 840.66.

USE #4 BAR DOWELS AT 12″ CENTERS.

USE FORMS FOR THE CONSTRUCTION OF THE BOTTOM SLAB.

IF REINFORCED CONCRETE PIPE IS SET IN BOTTOM SLAB OF BOX, ADD TO SLAB AS SHOWN ON STD. NO. 840.00.

CONSTRUCT WITH PIPE CROWNS MATCHING.

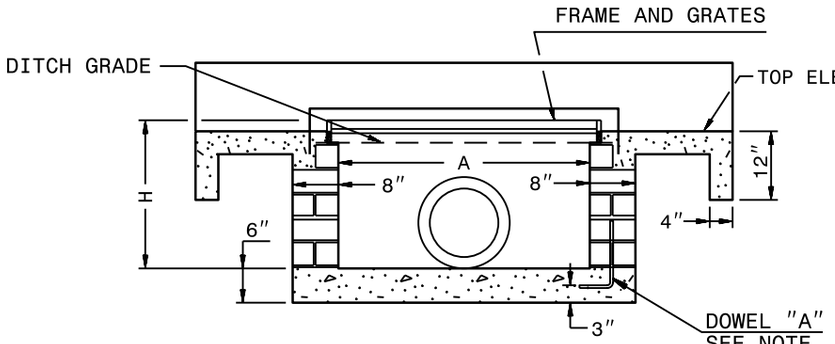
MAX. DEPTH OF THIS STRUCTURE FROM TOP OF BOTTOM SLAB TO TOP ELEVATION IS 12′-0″. STANDARD DRAWING 840.45 CONTROLS MAXIMUM DEPTH IF PRECAST BOX IS USED.

USE STANDARD FRAMES AND GRATES 840.22 (SHOWN), 840.24(SHOWN), 840.20, 840.29, AND 840.33.

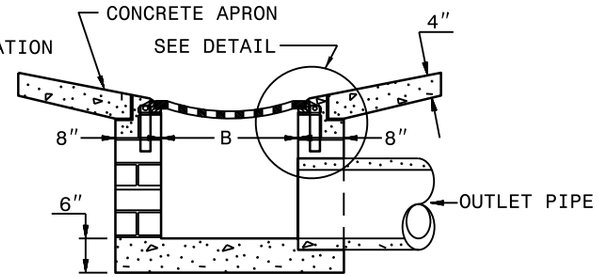
SEE STANDARD DRAWING 840.25 FOR ATTACHMENT OF FRAMES AND GRATES NOT SHOWN.

CHAMFER ALL EXPOSED CORNERS 1″.

DRAWING NOT TO SCALE.

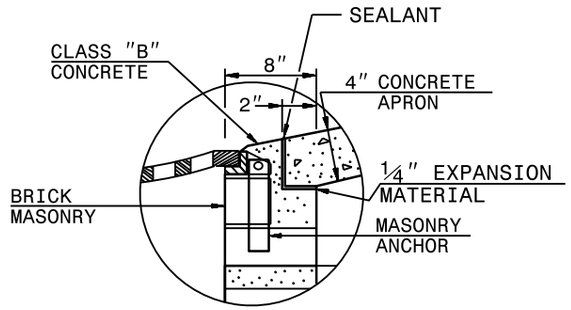


SECTION X-X



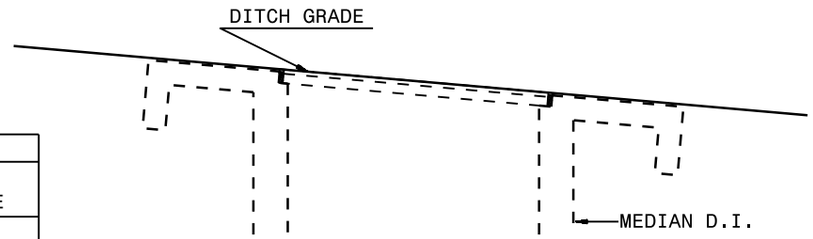
MAX. PIPE THIS SIDE - 18″

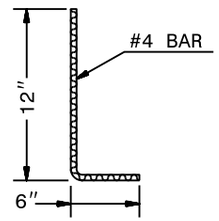
SECTION Y-Y



DETAIL

(APRON SUPPORT NOTCH)





DOWEL "A"

MINIMUM DIMENSIONS AND QUANTITIES FOR BRICK GRATED DROP INLET

PIPE	SPAN	WIDTH	HEIGHT	CU. YD. OF CONC IN BOX	CU. YD. OF BRICK MASONRY IN BOX		TOTAL CU. YD. IN BOX	DEDUCTIONS FOR ONE PIPE	
D	A	B	H	BOTTOM SLAB	H PER FT. HT.	TOTAL H		C.S.	R.C.
12″	3′-8″	2′-0″	1′-8″	0.309	0.346	0.548	0.857	0.020	0.032
15″	3′-8″	2′-0″	1′-11″	0.309	0.346	0.634	0.943	0.023	0.036
18″	3′-8″	2′-0″	2′-2″	0.309	0.346	0.721	1.030	0.033	0.049
24″	3′-8″	2′-0″	2′-8″	0.309	0.346	0.923	1.232	0.059	0.085
30″	3′-8″	2′-0″	3′-2″	0.309	0.346	1.096	1.405	0.092	0.127
36″	3′-8″	2′-0″	3′-8″	0.309	0.346	1.269	1.578	0.132	0.178

STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

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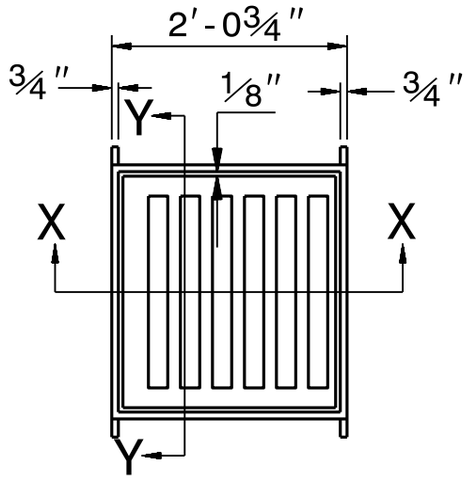
ROADWAY STANDARD DRAWING FOR

BRICK GRATED DROP INLET TYPE 'D'

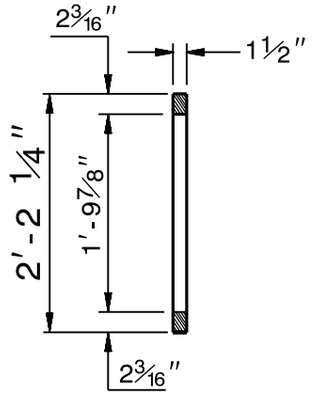
12″ THRU 36″ PIPE

SHEET 1 OF 1

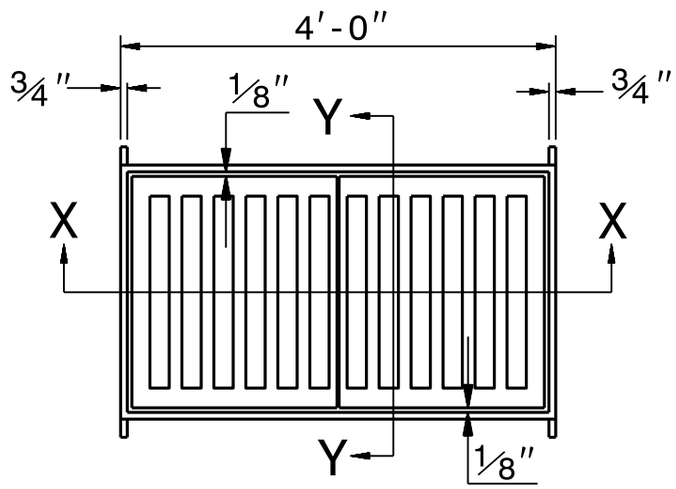
840.28



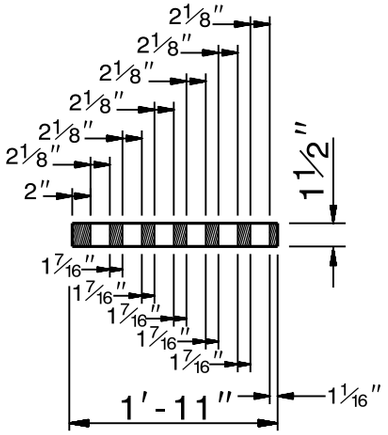
PLAN



GRATE ELEVATION Y-Y

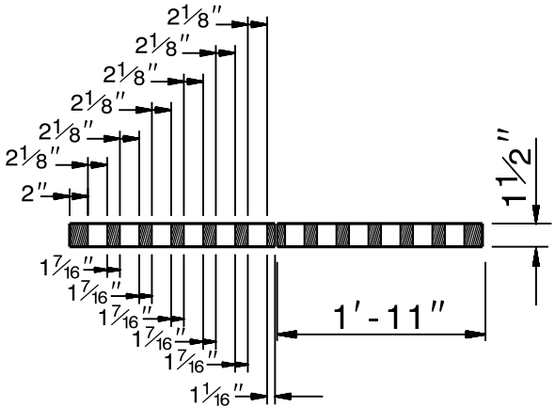


PLAN

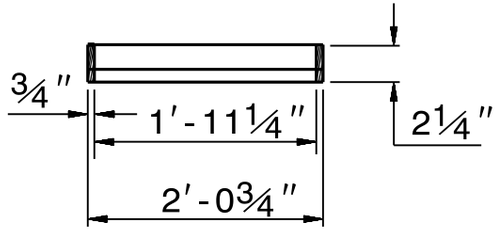


GRATE ELEVATION X-X

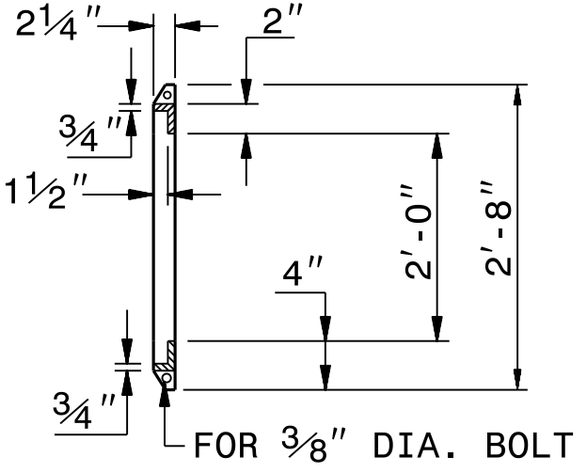
NOTE:
SEE STD. DWG. 840.25
FOR FRAME ANCHORAGE.



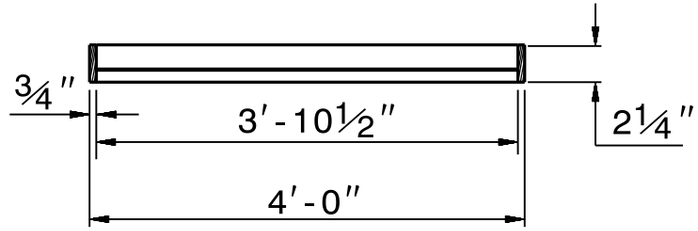
GRATE SECTION X-X



FRAME ELEVATION X-X



FRAME ELEVATION Y-Y



FRAME SECTION X-X

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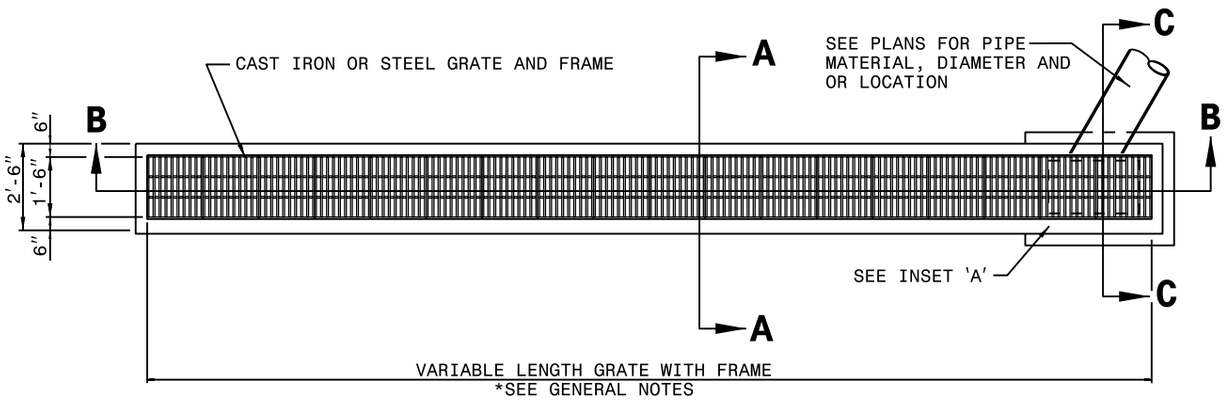
ROADWAY STANDARD DRAWING FOR

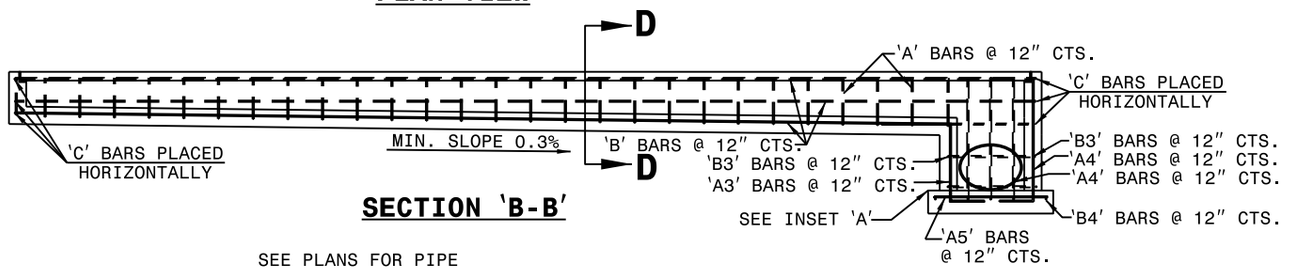
FRAMES AND NARROW SLOT FLAT GRATES

SHEET 1 OF 1

840.29



PLAN VIEW



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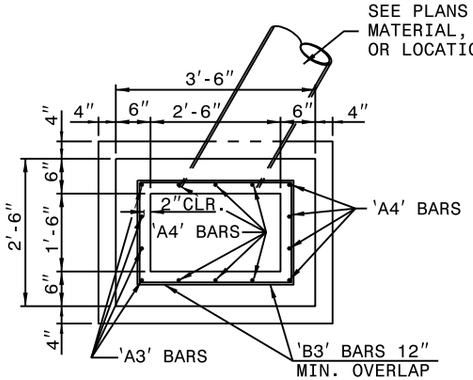
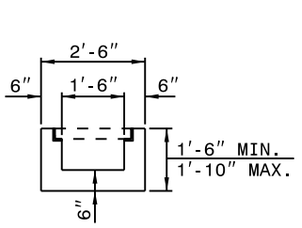


INSET 'A'



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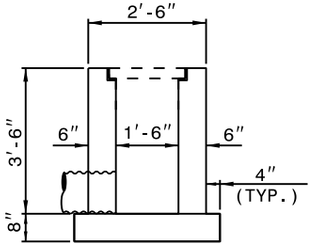

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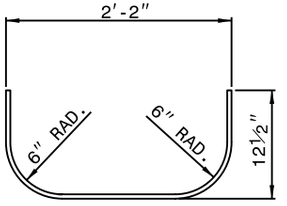
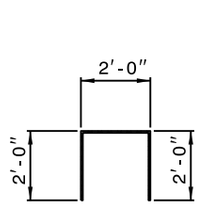


A



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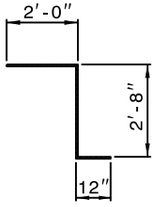

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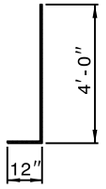

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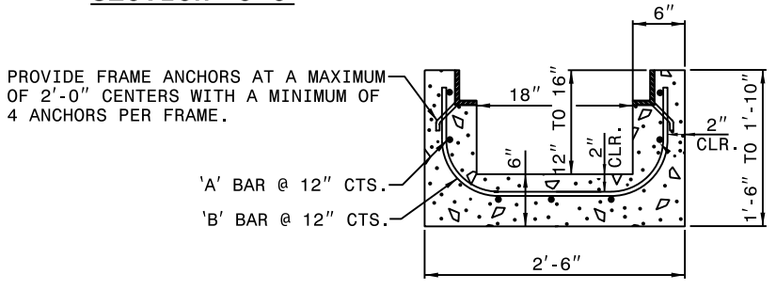

SECTION 'D-D'

GENERAL NOTES:

ALL MASONRY COMPONENTS OF THIS DRAINAGE DEVICE (EXCLUDING PIPE) ARE TO BE CONSTRUCTED WITH CLASS 'B' CONCRETE AND PAID FOR AT THE CONTRACT UNIT PRICE PER EACH FOR MASONRY DRAINAGE STRUCTURES.

* PAY FOR THE GRATE AND FRAME FOR THE DRIVEWAY DROP INLET AT THE CONTRACT UNIT PRICE PER LINEAR FOOT FOR GRATE WITH FRAME, DRIVEWAY DROP INLET. FABRICATE THE GRATE SECTION(S) TO FIT THE OPENING INDICATED IN THE PLANS.

THE CONTRACTOR MAY, AT HIS OPTION, SHORTEN LENGTHS FOR BARS 'B' AND LAP THEM TO OBTAIN THE PROPER LENGTH OF BARS. DO NOT OVERLAP BARS LESS THAN 1'-6" LONG.

INCLUDE THE COST OF ALL REINFORCING STEEL IN THE CONTRACT UNIT PRICE PER EACH FOR MASONRY DRAINAGE STRUCTURES.

DESIGN THE GRATES TO MEET HS-20 LOADING.

PROVIDE GRATES WITH A MINIMUM CLEAR WATERWAY OPENING OF 50in^2 PER 1'-0" LENGTH OF GRATE.

ADDITIONAL PER LINEAR FOOT QUANTITIES MAY BE USED TO ADJUST QUANTITIES FOR LENGTH INCREASE OR DECREASE AS INDICATED BY THE PLANS (SEE CHART BELOW).

BILL OF MATERIAL

QUANTITIES BASED ON 30' GRATE LENGTH

BAR	NO.	SIZE	LENGTH	WEIGHT
A	28	5	3'-11"	114.4
A3	4	5	5'-8"	23.6
A4	10	5	5'-0"	52.2
A5	4	5	3'-10"	16.0
B	7	5	30'-0"	219.0
B3	6	5	6'-0"	37.5
B4	5	5	2'-10"	14.8
C	6	5	2'-0"	12.5
TOTAL REINF. STEEL lbs.				490.0
CLASS 'B' CONC. cu. yds.				3.30
ADDITIONAL CONCRETE PER FT. IN CU. YDS. OVER 3'-6"				0.22
PER LINEAR FOOT QUANTITY ADJUSTMENTS FOR DRAINAGE STRUCTURES DEVIATING FROM THE 30' GRATE LENGTH				
A	1	5	3'-11"	4.1
B	7	5	1'-0"	7.3
CLASS 'B' CONC. cu. yds.				0.10

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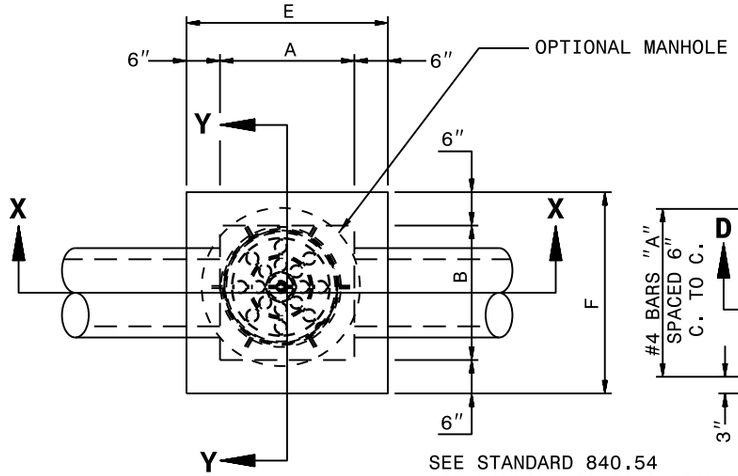
ROADWAY STANDARD DRAWING FOR

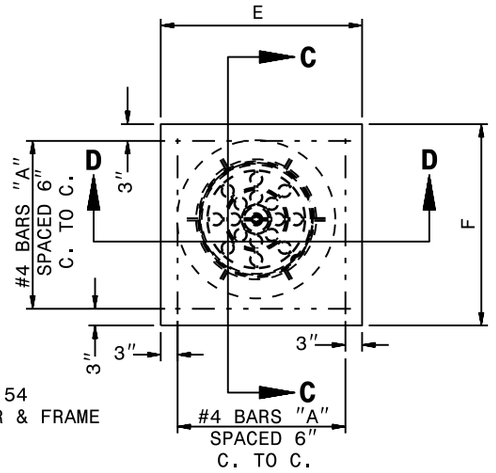
DRIVEWAY DROP INLET

SHEET 1 OF 1

840.30



PLAN



GENERAL NOTES:

CHAMFER ALL EXPOSED CORNERS 1″.

USE CLASS "B" CONCRETE THROUGHOUT.

OPTIONAL CONSTRUCTION - MONOLITHIC POUR, 2″ KEYWAY, OR #4 BAR DOWELS AT 12″ CENTERS AS DIRECTED BY THE ENGINEER.

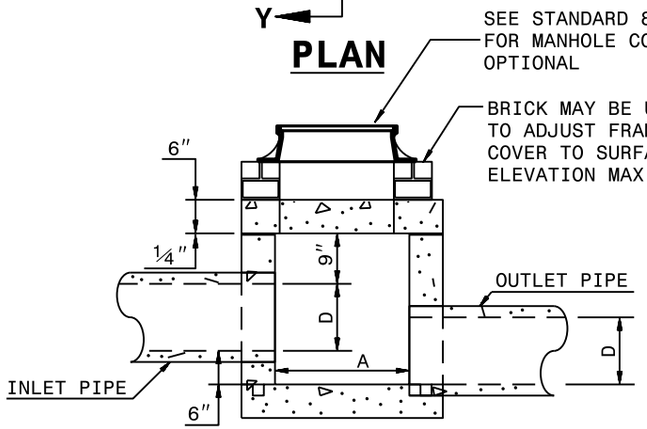
USE FORMS TO CONSTRUCT THE BOTTOM SLAB.

IF REINFORCED CONCRETE PIPE IS SET IN BASE SLAB OF BOX, ADD TO BASE AS SHOWN ON STANDARD NO. 840.00.

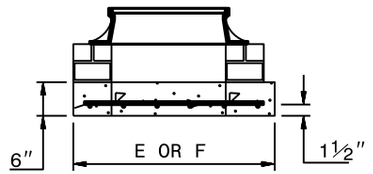
PROVIDE ALL JUNCTION BOXES OVER 3′-6″ IN DEPTH WITH STEPS 12″ ON CENTERS IN ACCORDANCE WITH STD. NO. 840.66.

ADJUST THE STEEL, CONCRETE AND BRICK MASONRY QUANTITIES TO INCLUDE THE ADDITION OF THE MANHOLE (I.E. DIAGONAL BARS SHORTENED AROUND OPENING IN TOP SLAB, ADDITIONAL VARIABLE HEIGHT BRICK MASONRY, OPENING IN TOP SLAB.)

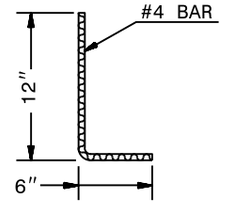
MAX. DEPTH OF THIS STRUCTURE FROM TOP OF BOTTOM SLAB TO TOP ELEVATION IS 12′-0″. STANDARD DRAWING 840.45 OR 840.46 CONTROLS MAXIMUM DEPTH IF PRECAST BOX IS USED.



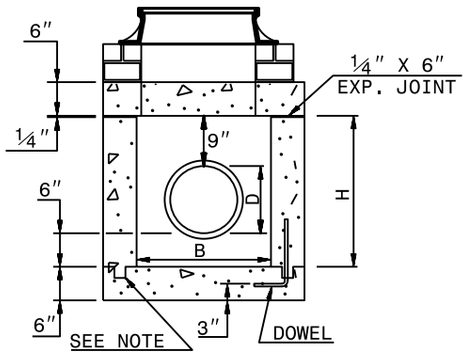
SECTION X-X



SECTION C-C OR D-D



DOWEL



SECTION Y-Y

DIMENSIONS AND QUANTITIES FOR CONCRETE JUNCTION BOXES

DIMENSIONS OF BOX AND PIPE				REINFORCEMENT BARS "A"		TOP SLAB DIMENSIONS		CUBIC YARDS IN BOX			TOTAL QUANTITIES BOX AND SLABS		DEDUCTIONS FOR ONE PIPE CU.YDS.	
PIPE	SPAN	WIDTH	HEIGHT											
D	A	B	H	NO.	LENGTH	E	F	TOP SLAB	BOTTOM SLAB	WALL/ FT. OF HT.	LBS. REINF	CU. YDS. MIN. "H"	C.S.	R.C.
12″	2′-0″	2′-0″	2′-3″	12	2′-9″	3′-0″	3′-0″	0.167	0.167	0.185	22	0.750	0.015	0.024
15″	2′-3″	2′-3″	2′-6″	12	3′-0″	3′-3″	3′-3″	0.196	0.196	0.204	24	0.902	0.023	0.036
18″	2′-6″	2′-6″	2′-9″	14	3′-3″	3′-6″	3′-6″	0.227	0.227	0.222	30	1.065	0.033	0.049
24″	3′-0″	3′-0″	3′-3″	16	3′-9″	4′-0″	4′-0″	0.296	0.296	0.259	40	1.434	0.059	0.085
30″	3′-6″	3′-6″	3′-9″	18	4′-3″	4′-6″	4′-6″	0.375	0.375	0.296	51	1.860	0.092	0.127
36″	4′-0″	4′-0″	4′-3″	20	4′-9″	5′-0″	5′-0″	0.463	0.463	0.333	64	2.341	0.132	0.178
42″	4′-6″	4′-6″	4′-9″	22	5′-3″	5′-6″	5′-6″	0.560	0.560	0.370	77	2.878	0.180	0.243
48″	5′-4″	5′-4″	5′-3″	26	6′-3″	6′-4″	6′-4″	0.743	0.743	0.407	111	3.623	0.235	0.317
54″	5′-10″	5′-10″	5′-9″	28	6′-7″	6′-10″	6′-10″	0.865	0.865	0.444	126	4.283	0.297	0.401
60″	6′-6″	6′-6″	6′-3″	30	7′-3″	7′-6″	7′-6″	1.042	1.042	0.481	145	5.090	0.367	0.495
66″	7′-1″	7′-1″	6′-9″	32	7′-10″	8′-1″	8′-1″	1.210	1.210	0.518	169	5.917	0.444	0.589

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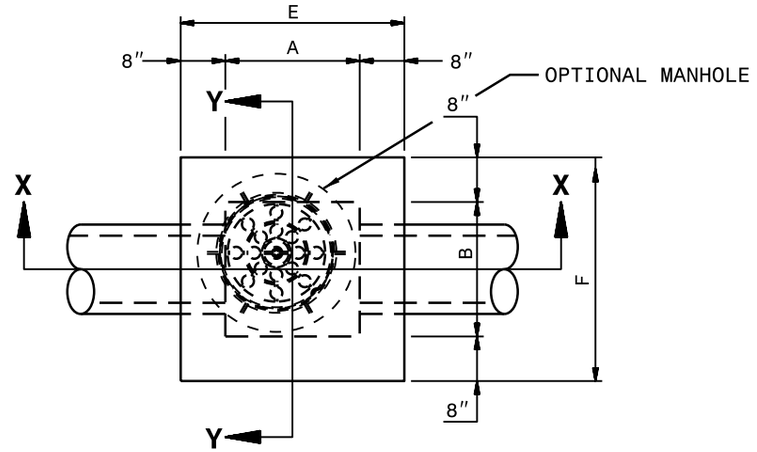
ROADWAY STANDARD DRAWING FOR

CONCRETE JUNCTION BOX

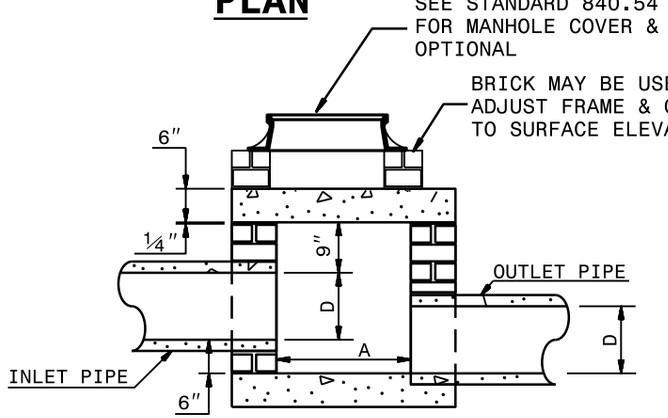
12″ THRU 66″ PIPE

SHEET 1 OF 1

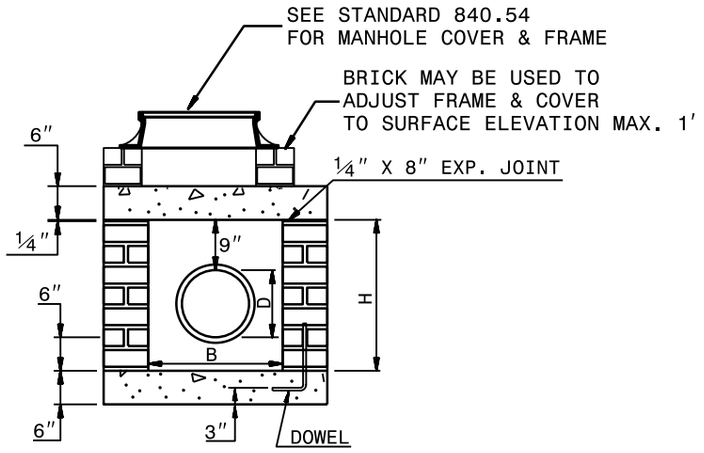
840.31



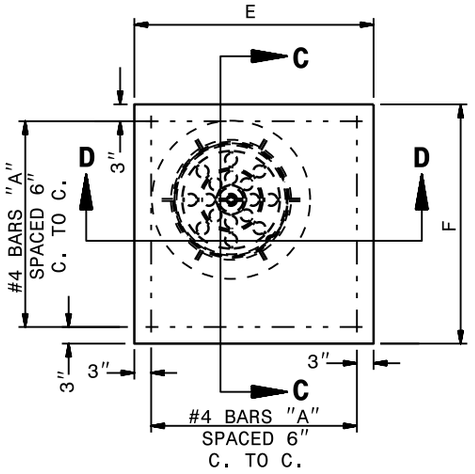
PLAN

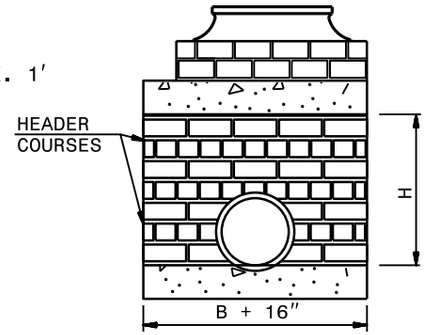


SECTION X-X



SECTION Y-Y





OUTLET ELEVATION

GENERAL NOTES:

CHAMFER ALL EXPOSED CORNERS 1″.

USE CLASS "B" CONCRETE THROUGHOUT.

USE #4 BAR DOWELS AT 12″ CENTERS.

MORTAR JOINTS ½″ ± ⅛″ THICK.

CONCAVE TOO ALL EXPOSED JOINTS.

USE FORMS TO CONSTRUCT THE BOTTOM SLAB.

JUMBO BRICK WILL BE PERMITTED. CONCRETE BRICK OR 4″ SOLID CONCRETE BLOCKS MAY BE USED IN LIEU OF CLAY BRICK.

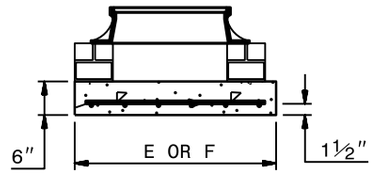
FOR 8′-0″ IN HEIGHT OR LESS, USE 8″ WALL. OVER 8′-0″ IN HEIGHT, USE 12″ WALL TO 6′-0″ FROM TOP OF WALL, AND 8″ WALL FOR THE REMAINING 6′-0″. ADJUST DIMENSIONS AND QUANTITIES ACCORDINGLY.

IF REINFORCED CONCRETE PIPE IS SET IN BASE SLAB OF BOX, ADD TO BASE AS SHOWN ON STANDARD NO. 840.00.

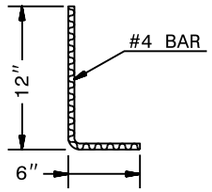
PROVIDE ALL JUNCTION BOXES OVER 3′-6″ IN DEPTH WITH STEPS 12″ ON CENTERS IN ACCORDANCE WITH STD. NO. 840.66.

ADJUST THE STEEL, CONCRETE AND BRICK MASONRY QUANTITIES TO INCLUDE THE ADDITION OF THE MANHOLE (I.E. DIAGONAL BARS SHORTENED AROUND OPENING IN TOP SLAB, ADDITIONAL VARIABLE HEIGHT BRICK MASONRY, OPENING IN TOP SLAB.)

MAX. DEPTH OF THIS STRUCTURE FROM TOP OF BOTTOM SLAB TO TOP ELEVATION IS 12′-0″. STANDARD DRAWING 840.45 OR 840.46 CONTROLS MAXIMUM DEPTH IF PRECAST BOX IS USED.



SECTION C-C OR D-D



DOWEL

DIMENSIONS AND QUANTITIES FOR BRICK JUNCTION BOXES

DIMENSIONS OF BOX AND PIPE				REINFORCEMENT BARS		TOP SLAB DIMENSIONS		CUBIC YARDS			DEDUCTIONS FOR ONE PIPE CU.YDS.	
PIPE	SPAN	WIDTH	HEIGHT					CONC.	BRICK MASONRY			
D	A	B	H	NO.	LENGTH	E	F	TOP & BOTTOM CU. YD.	MIN. HEIGHT CU. YD.	WALL PER FT. HT. CU. YD.	C.S.	R.C.
12″	2′-0″	2′-0″	2′-3″	12	3′-1″	3′-4″	3′-4″	0.412	0.591	0.263	0.020	0.032
15″	2′-0″	2′-0″	2′-6″	12	3′-1″	3′-4″	3′-4″	0.412	0.657	0.263	0.031	0.047
18″	2′-4″	2′-4″	2′-9″	14	3′-5″	3′-8″	3′-8″	0.498	0.814	0.296	0.044	0.065
24″	3′-0″	3′-0″	3′-3″	16	4′-1″	4′-4″	4′-4″	0.695	1.176	0.362	0.078	0.113
30″	3′-4″	3′-4″	3′-9″	16	4′-5″	4′-8″	4′-8″	0.807	1.481	0.395	0.122	0.170
36″	4′-0″	4′-0″	4′-3″	20	5′-1″	5′-4″	5′-4″	1.053	1.959	0.461	0.176	0.238
42″	4′-8″	4′-8″	4′-9″	22	5′-9″	6′-0″	6′-0″	1.333	2.503	0.527	0.240	0.323
48″	5′-4″	5′-4″	5′-3″	26	6′-5″	6′-8″	6′-8″	1.646	2.940	0.560	0.313	0.422
54″	5′-10″	5′-10″	5′-9″	28	6′-11″	7′-2″	7′-2″	1.902	3.502	0.609	0.396	0.535
60″	6′-6″	6′-6″	6′-3″	30	7′-7″	7′-10″	7′-10″	2.272	4.113	0.658	0.489	0.660
66″	7′-1″	7′-1″	6′-9″	32	8′-2″	8′-5″	8′-5″	2.624	4.778	0.708	0.591	0.798

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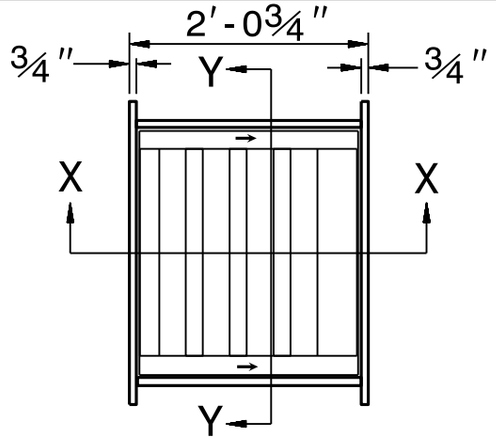
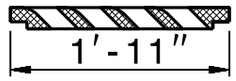
ROADWAY STANDARD DRAWING FOR

BRICK JUNCTION BOX

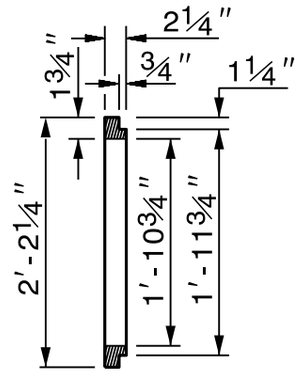
12″ THRU 66″ PIPE



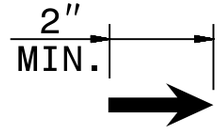
GRATE PLAN



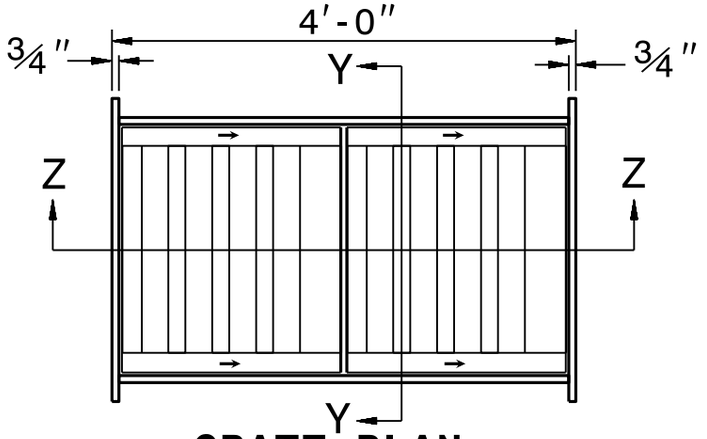
GRATE SECTION X-X



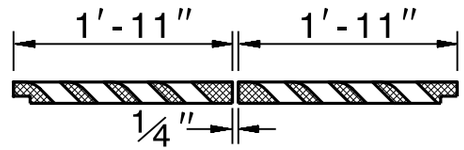
GRATE SECTION Y-Y



RAISED DIRECTIONAL FLOW INDICATOR

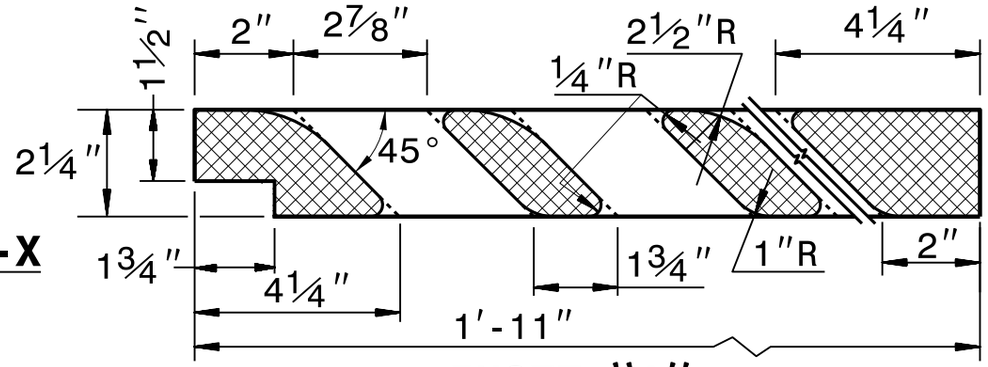


GRATE PLAN



GRATE SECTION Z-Z

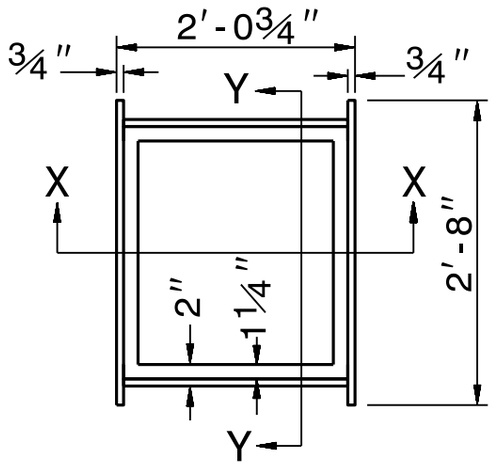
SEE INSET "A" FOR SECTION VIEW



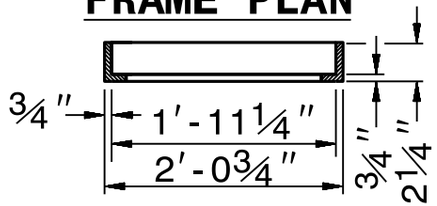
INSET "A"

(TYPICAL UNIT FOR SECTION Z-Z)

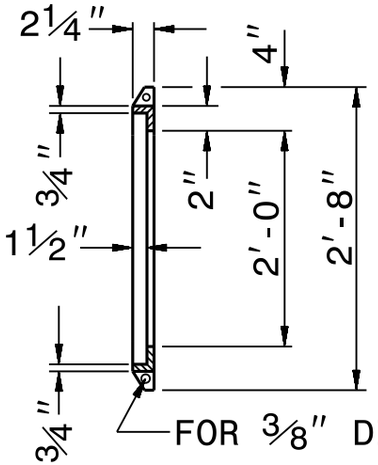
NOTE: SEE STD. DWG. 840.25 FOR FRAME ANCHORAGE.



FRAME PLAN

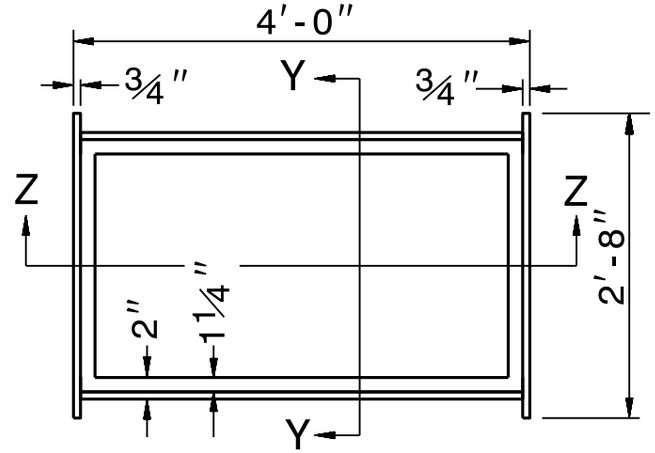


FRAME SECTION X-X

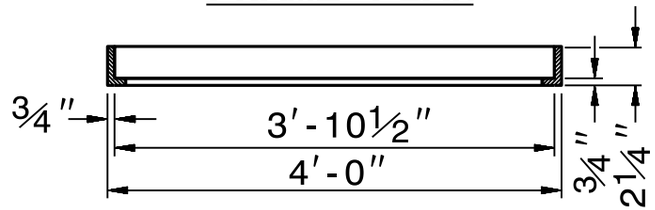


FOR ⅜″ DIA. BOLT

FRAME SECTION Y-Y



FRAME PLAN



FRAME SECTION Z-Z

STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

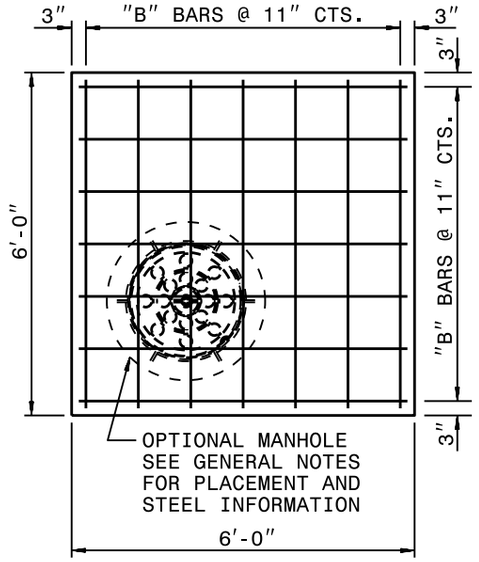
1-24

ROADWAY STANDARD DRAWING FOR

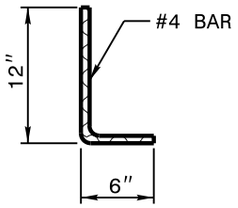
ANGLED VANE GRATES AND FRAMES

SHEET 1 OF 1

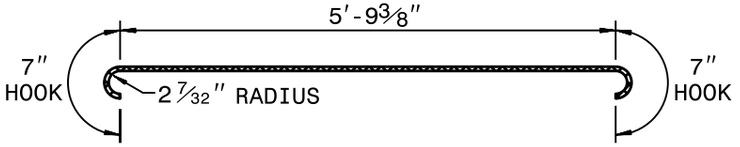
840.33



PLAN OF TOP SLAB

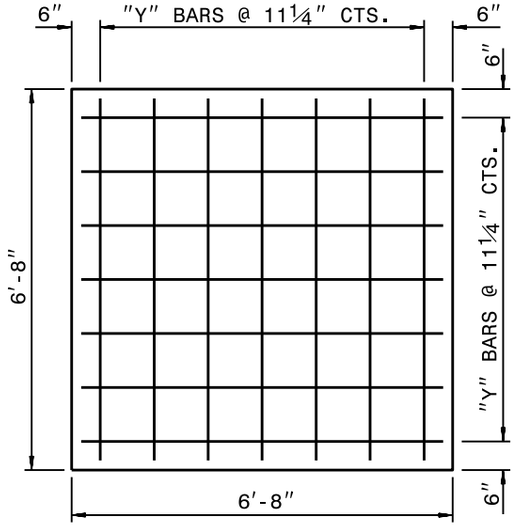


DOWEL "C"

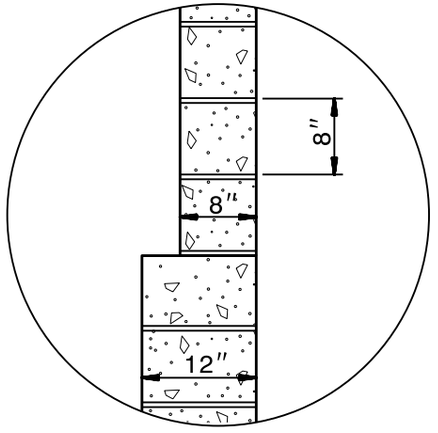


"Y" BARS

BAR DIMENSIONS ARE OUT TO OUT

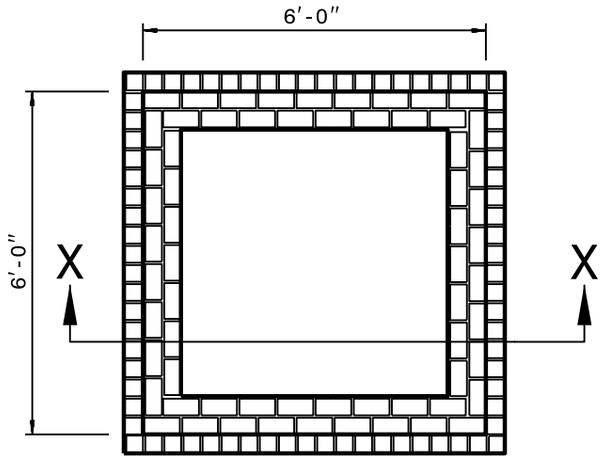


PLAN OF BOTTOM SLAB



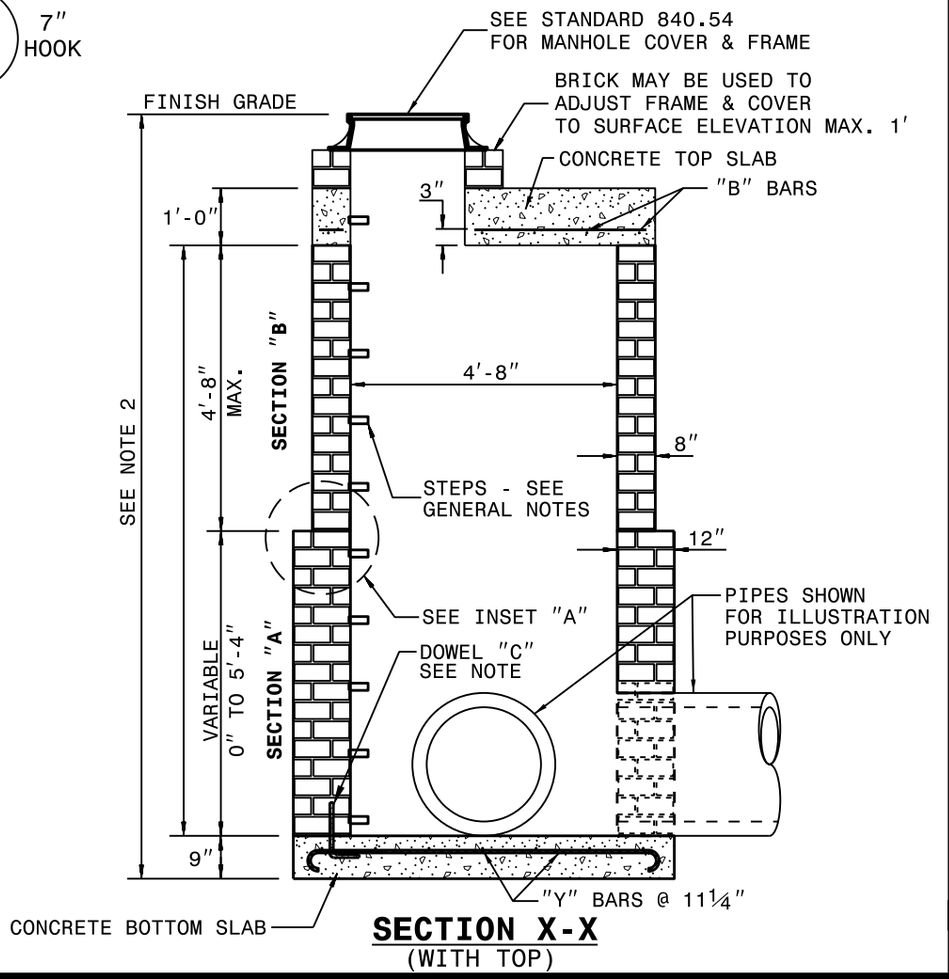
INSET "A"

CONCRETE BLOCK



PLAN

(WITHOUT TOP)



SECTION X-X

(WITH TOP)

NOTE 1: CONSTRUCT SECTION "B" OF THE PROPOSED WALL 8" THICK. AND SECTION "A" 12" THICK.

NOTE 2: IF PROPOSED STRUCTURE EXCEEDS 12'-0" VERTICAL HEIGHT A DESIGN WILL BE REQUIRED FOR APPROVAL.

NOTE 3: USE SINGLE MAT REINFORCING STEEL; EXCEPT DOUBLE MAT STEEL MAY BE USED IN LIEU OF HOOK BARS IN BASE SLAB.

1-24

STATE OF
NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

ROADWAY STANDARD DRAWING FOR

TRAFFIC BEARING JUNCTION BOX

FOR USE WITH PIPES 42" AND UNDER

GENERAL NOTES:

USE STANDARD OR JUMBO BRICK FOR WALL CONSTRUCTION. SOLID CONCRETE BRICK OR BLOCK ARE OPTIONAL WALL CONSTRUCTION MATERIAL

INCLUDE ALL ADJUSTMENTS TO WALLS, SLABS OR REINFORCING MATERIAL IN THE UNIT PRICE BID FOR EACH UNIT.

INSTALL OPTIONAL MANHOLE IN POSITION AS DIRECTED BY THE ENGINEER. CUT OR BEND ALL REBAR CROSSING THIS OPENING TO ALLOW 2″ MINIMUM CONCRETE COVERAGE. ENCLOSE THE OPENING WITH 8 "A" BARS TIED TO TO THE REBAR MAT AND SET SO A MINIMUM OF 3″ CONCRETE COVER IS ATTAINED. REFERENCE STD. NO. 840.54 FOR MANHOLE INFORMATION.

PROVIDE JUNCTION BOXES WITH MAHNOLES OVER 3′-6″ IN DEPTH WITH STEPS PLACED ON 12″ CENTERS. REFERENCE STD. NO. 840.66.

SPACE DOWEL "C" BARS AT A MAXIMUM OF 12″ CENTERS.

MAXIMUM DEPTH OF THIS UNIT AS SHOWN IS 12′-0″.
STD. DWG. 840.46 CONTROLS MAXIMUM DEPTH IF PRECAST BOX IS USED.

CONSTRUCT THE JUNCTION BOX IN ACCORDANCE WITH SECTIONS 830, 832, 834 AND 840 OF THE STANDARD SPECIFICATIONS.

BILL OF MATERIAL

BAR	QTY.	SIZE	LENGTH	WEIGHT
A	8	#5	1′-2″	9.7
B	14	#5	5′-6″	80.3
C	26	#4	1′-6″	26.1
Y	14	#5	6′-11 3/8″	101.5
STEEL TOTAL WEIGHT				217.6
CU. YDS. CLASS "AA" CONC.				2.6
CU. YDS. BRICK/FT. HT. (8″)				0.53
CU. YDS. BRICK/FT. HT. (12″)				0.84

STATE OF
NORTH CAROLINA
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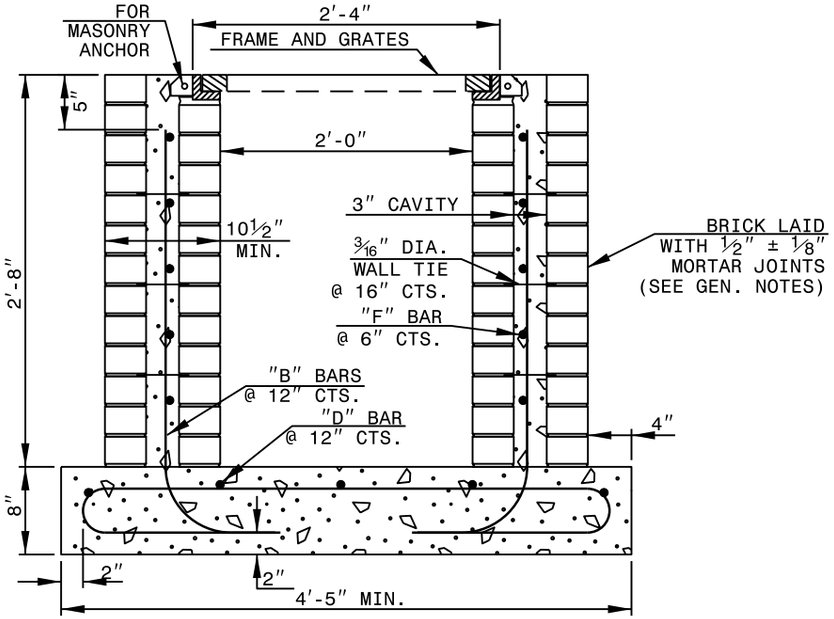
RALEIGH, N.C.

1-24

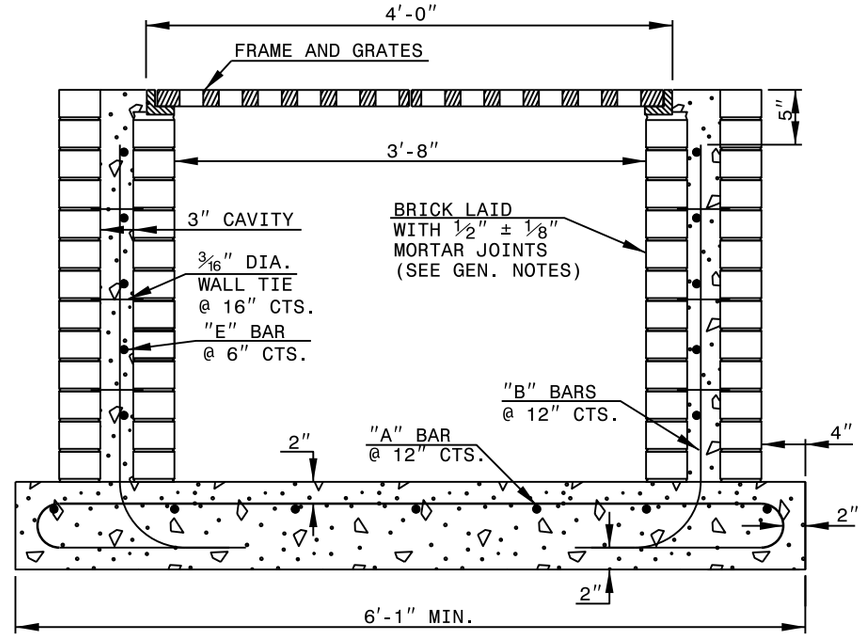
ROADWAY STANDARD DRAWING FOR

TRAFFIC BEARING JUNCTION BOX

FOR USE WITH PIPES 42″ AND UNDER



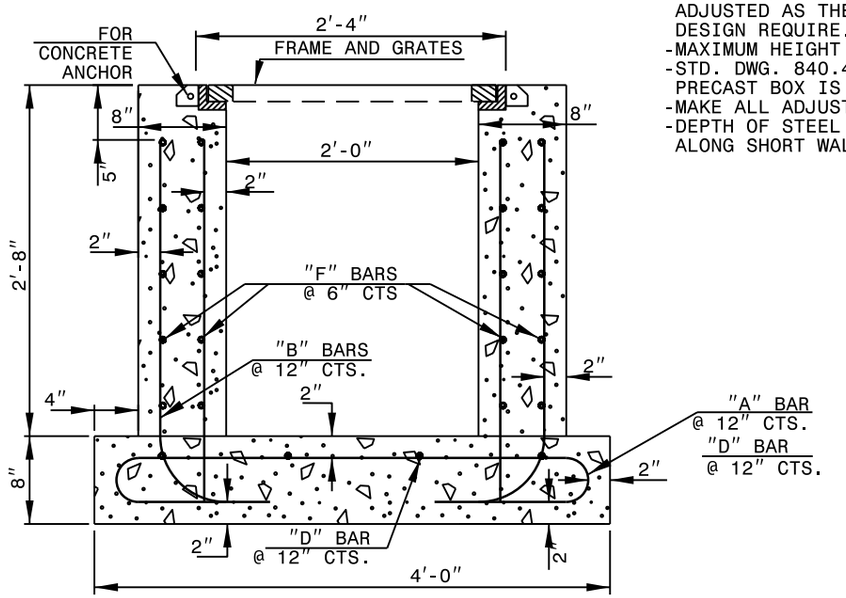
SECTION X-X



SECTION Y-Y

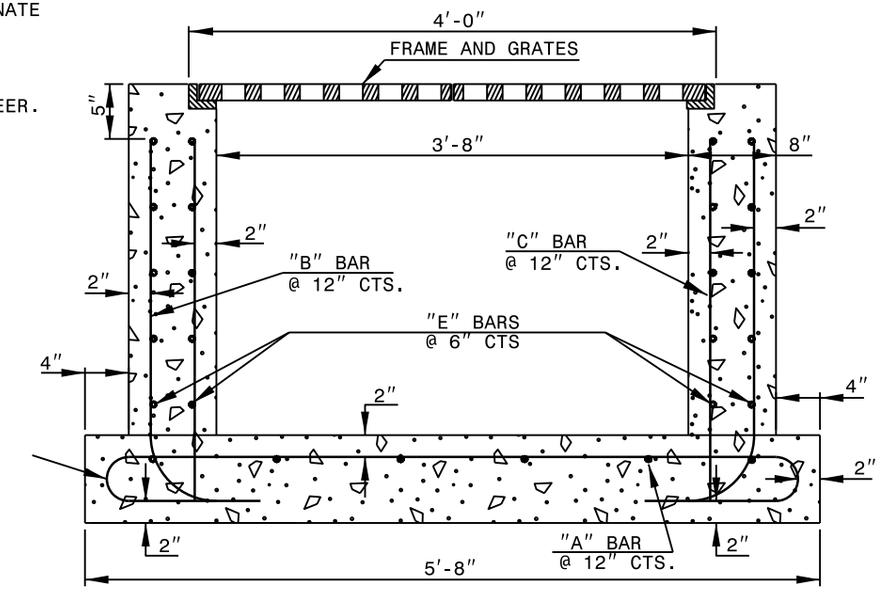
BRICK ALT.

NOTES:
- HORIZONTAL AND VERTICAL DIMENSIONS MAY BE ADJUSTED AS THE FIELD CONDITIONS AND/OR ALTERNATE DESIGN REQUIRE.
- MAXIMUM HEIGHT FOR THIS STRUCTURE IS 14'-0".
- STD. DWG. 840.46 CONTROLS MAXIMUM DEPTH IF PRECAST BOX IS USED.
- MAKE ALL ADJUSTMENTS AS DIRECTED BY THE ENGINEER.
- DEPTH OF STEEL GRATE WILL REQIURE DEEPER SEAT ALONG SHORT WALLS.



MAX. PIPE DIAMETER IS 18" R.C.P.

SECTION X-X



MAX. PIPE DIAMETER IS 36" R.C.P.

SECTION Y-Y

CONCRETE ALT.

STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

1-24

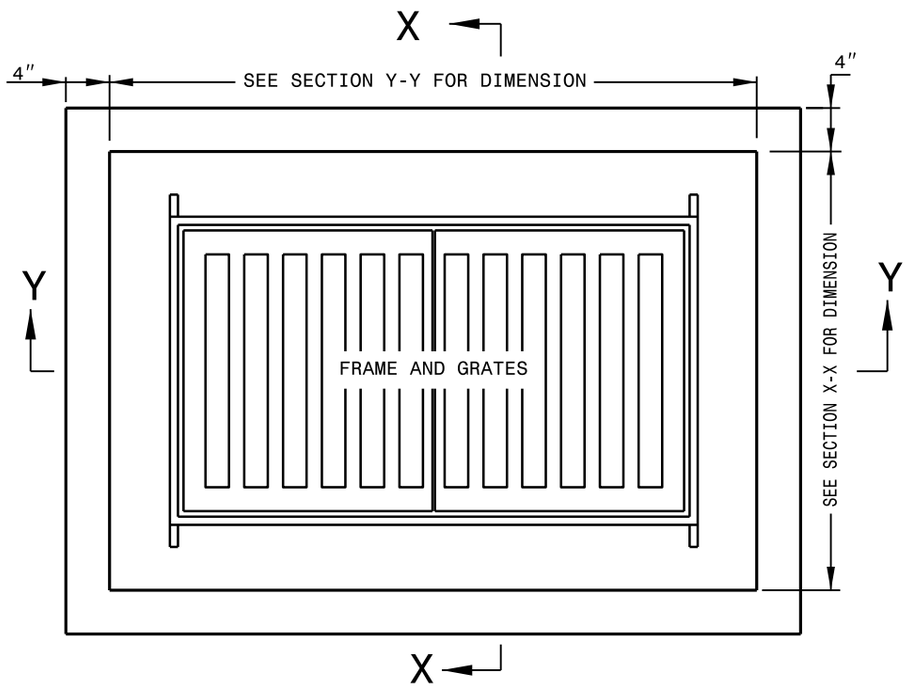
ROADWAY STANDARD DRAWING FOR

TRAFFIC BEARING GRATED DROP INLET

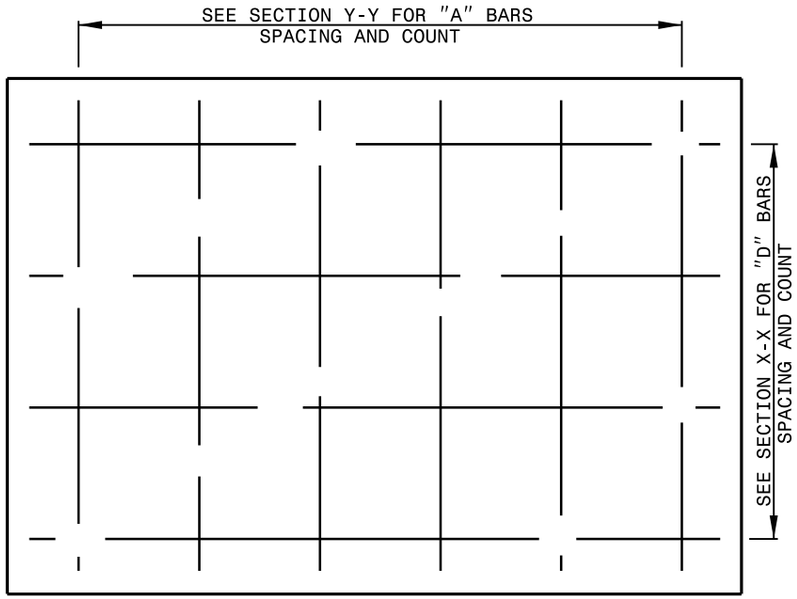
FOR DOUBLE FRAME AND GRATES

SHEET 1 OF 2

840.35



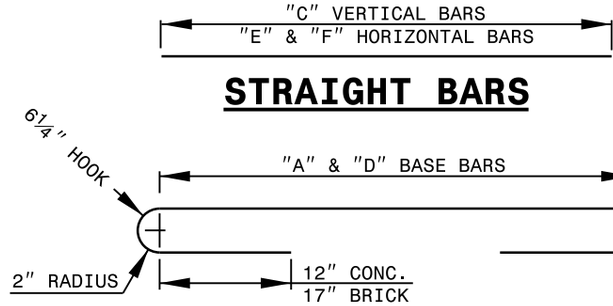
PLAN



PLAN OF BASE

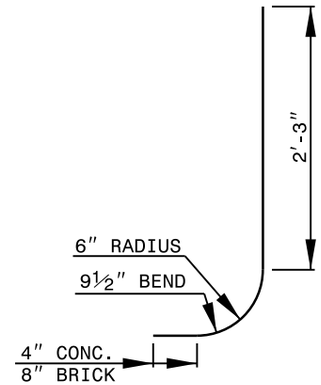
BILL OF MATERIALS

COMMON		CONCRETE ALT.			BRICK ALT.		
BAR	SIZE	LENGTH	QUANTITY	WEIGHT	LENGTH	QUANTITY	WEIGHT
A	#5	6'-4½"	6	39.9	7'-7½"	6	47.7
B	#5	3'-4½"	16	56.3	3'-4½"	16	56.3
C	#5	2'-8"	14	38.9	-0-	-0-	-0-
D	#5	8'-0½"	4	33.6	9'-3½"	4	38.8
E	#5	3'-0"	20	62.6	3'-0"	10	31.3
F	#5	4'-8"	20	97.3	4'-8"	10	48.7
REINF. STEEL (TOTAL WEIGHT LBS.)				328.6			222.8
CONCRETE IN BASE CLASS 'AA' (CUBIC YARDS)				0.56			0.66
CONCRETE IN WALLS CLASS 'AA' (CUBIC YARDS)				0.92			-0-
CONCRETE IN WALLS CLASS 'B' (CUBIC YARDS)				-0-			0.36
BRICK IN WALLS (CUBIC YARDS)				-0-			0.91
CONCRETE TOTAL (CUBIC YARDS)				1.48			1.02
BRICK & CONCRETE TOTAL (CUBIC YARDS)				1.48			1.93
CONC. CUBIC YARDS IN WALL/FOOT OF HEIGHT				0.35			0.14
BRICK CUBIC YARDS IN WALL/FOOT OF HEIGHT				-0-			0.34
LBS. OF REINF. STEEL IN WALL/FOOT OF HEIGHT				94.9			47.6



STRAIGHT BARS

BASE BARS



CORNER BARS

GENERAL NOTES:
-USE CLASS 'AA' CONCRETE FOR CAST IN PLACE CONCRETE BOX.
-USE CLASS 'B' CONCRETE IN THE WALL CAVITY FOR REINFORCED BRICK CONSTRUCTION AND CLASS 'AA' FOR THE FOOTING BASE.
-CHAMFER ALL EXPOSED CONCRETE CORNERS 1".
-USE FORMS TO CONSTRUCT THE BOTTOM SLAB.
-IF PIPES ARE SET IN THE BASE FOLLOW CONSTRUCTION PROCEDURES SHOWN BY STD. DWG. 840.00.
-PRECAST UNITS MADE OF CLASS 'AA' CONCRETE MAY BE USED IN LIEU OF BRICK MASONRY CONSTRUCTION.
-INCLUDE REINFORCING STEEL COST IN THE UNIT OR LINEAR FOOT BID PRICE FOR "MASONRY DRAINAGE STRUCTURE".
-REFERENCE STD. DWG. 840.25 FOR FRAME ANCHORAGE.
-CONCRETE BRICK, JUMBO BRICK AND 4" SOLID CONCRETE BLOCK WILL BE PERMITTED.
-CONCRETE FOR BRICK BOX REFER TO SECTION 832 OF THE STANDARD SPECIFICATIONS.
-PROVIDE GRATED DROP INLETS OVER 3'-6" DEEP WITH STEPS SPACED 12" ON CENTER AS DIRECTED BY STD. DWG. 840.66.
-FRAME AND GRATES ARE SEPARATE CONTRACT ITEMS.

STATE OF NORTH CAROLINA
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RALEIGH, N.C.

1-24

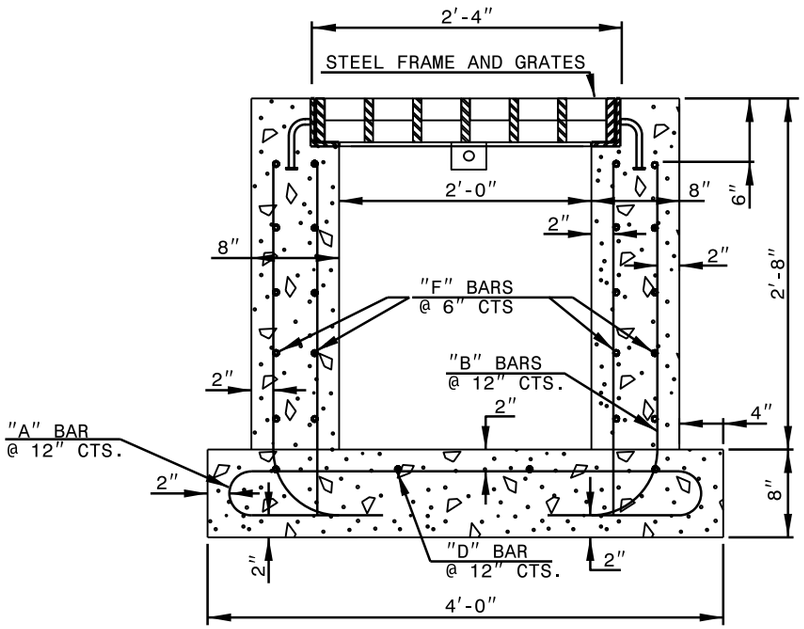
ROADWAY STANDARD DRAWING FOR

TRAFFIC BEARING GRATED DROP INLET

FOR DOUBLE FRAME AND GRATES

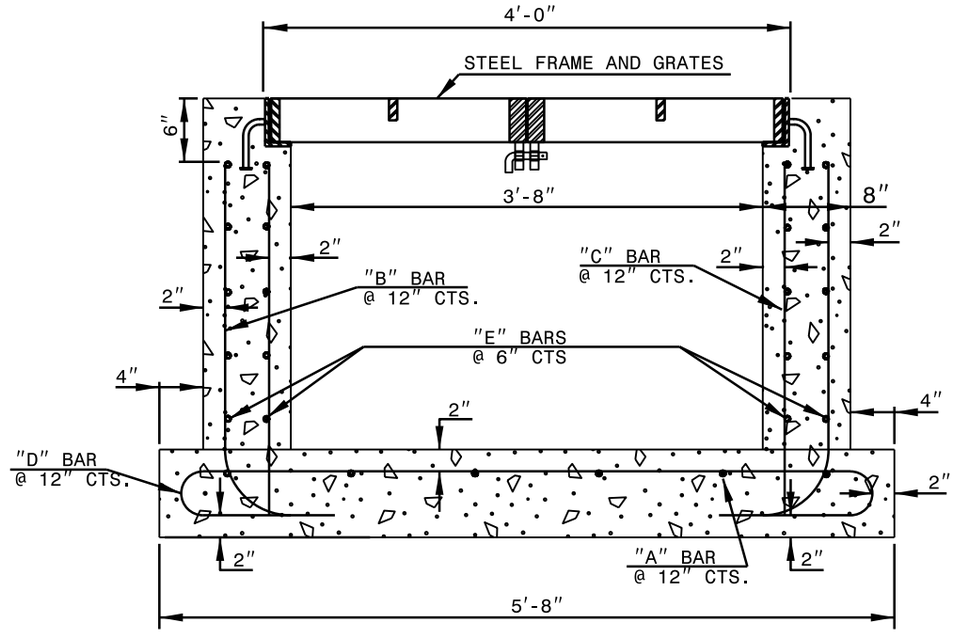
840.35

NOTES:
-HORIZONTAL AND VERTICAL DIMENSIONS MAY BE ADJUSTED AS THE FIELD CONDITIONS AND/OR ALTERNATE DESIGN REQUIRE.
-MAXIMUM HEIGHT FOR THIS STRUCTURE IS 14′-0″.
-STD. DWG. 840.46 CONTROLS MAXIMUN DEPTH IF PRECAST BOX IS USED.
-MAKE ALL ADJUSTMENTS AS DIRECTED BY THE ENGINEER.
-ANCHOR STEEL FRAME AND GRATES IN ACCORDANCE WITH DETAILS SHOWN.
-NO BRICK RISERS ARE PERMITTED ON ANY PART OF THIS DRAINAGE STRUCTURE.



MAX. PIPE DIAMETER IS 18″ R.C.P.

SECTION X-X



MAX. PIPE DIAMETER IS 36″ R.C.P.

SECTION Y-Y

TRAFFIC BEARING DROP INLET

STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

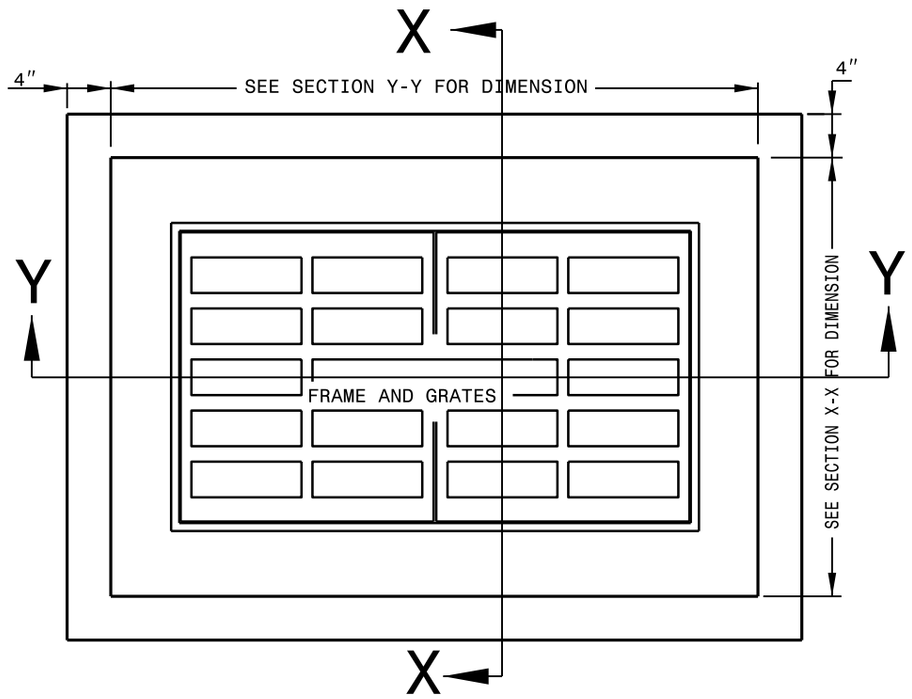
1-24

ROADWAY STANDARD DRAWING FOR

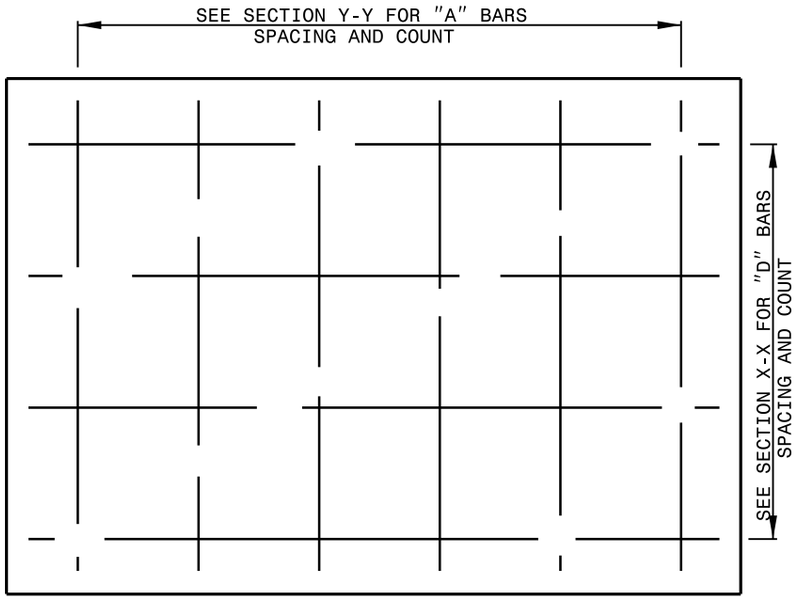
TRAFFIC BEARING GRATED DROP INLET

FOR STEEL (840.37) DOUBLE FRAME AND GRATES

840.36



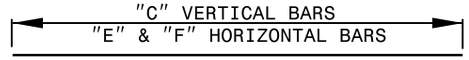
PLAN



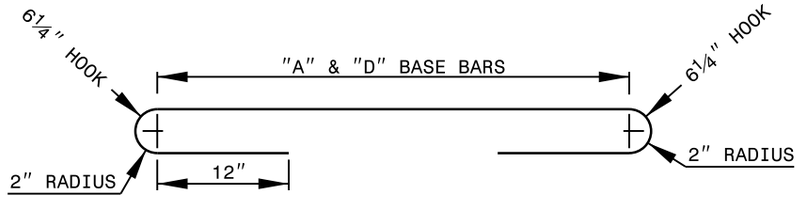
PLAN OF BASE

BILL OF MATERIALS

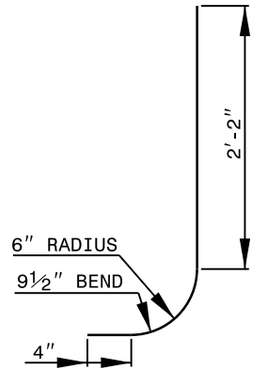
COMMON		CONCRETE		
BAR	SIZE	LENGTH	QUANTITY	WEIGHT
A	#5	6′-4½″	6	39.9
B	#5	3′-3½″	16	54.9
C	#5	2′-8″	14	38.9
D	#5	8′-0½″	4	33.6
E	#5	3′-0″	20	62.6
F	#5	4′-8″	20	97.3
REINF. STEEL (TOTAL WEIGHT LBS.)				327.2
CONCRETE IN BASE (CUBIC YARDS)				0.56
CONCRETE IN WALLS (CUBIC YARDS)				0.92
CONCRETE TOTAL (CUBIC YARDS)				1.48
CONC. CUBIC YARDS IN WALL/FOOT OF HEIGHT				0.35
LBS. OF REINF. STEEL IN WALL/FOOT OF HEIGHT				94.9



STRAIGHT BARS



BASE BARS



CORNER BARS

GENERAL NOTES:
-USE CLASS 'AA' CONCRETE FOR CAST IN PLACE BOX.
-CHAMFER ALL EXPOSED CONCRETE CORNERS 1".
-USE FORMS TO CONSTRUCT THE BOTTOM SLAB.
-IF PIPES ARE SET IN THE BASE FOLLOW CONSTRUCTION PROCEDURES SHOWN BY STD. DWG. 840.00.
-INCLUDE REINFORCING STEEL COST IN THE BID PRICE FOR "MASONRY DRAINAGE STRUCTURE".
-PROVIDE GRATED DROP INLETS OVER 3′-6" DEEP WITH STEPS SPACED 12" ON CENTER AS DIRECTED BY STD. DWG. 840.66.
-FRAME AND GRATES ARE SEPARATE CONTRACT ITEMS.

STATE OF NORTH CAROLINA
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RALEIGH, N.C.

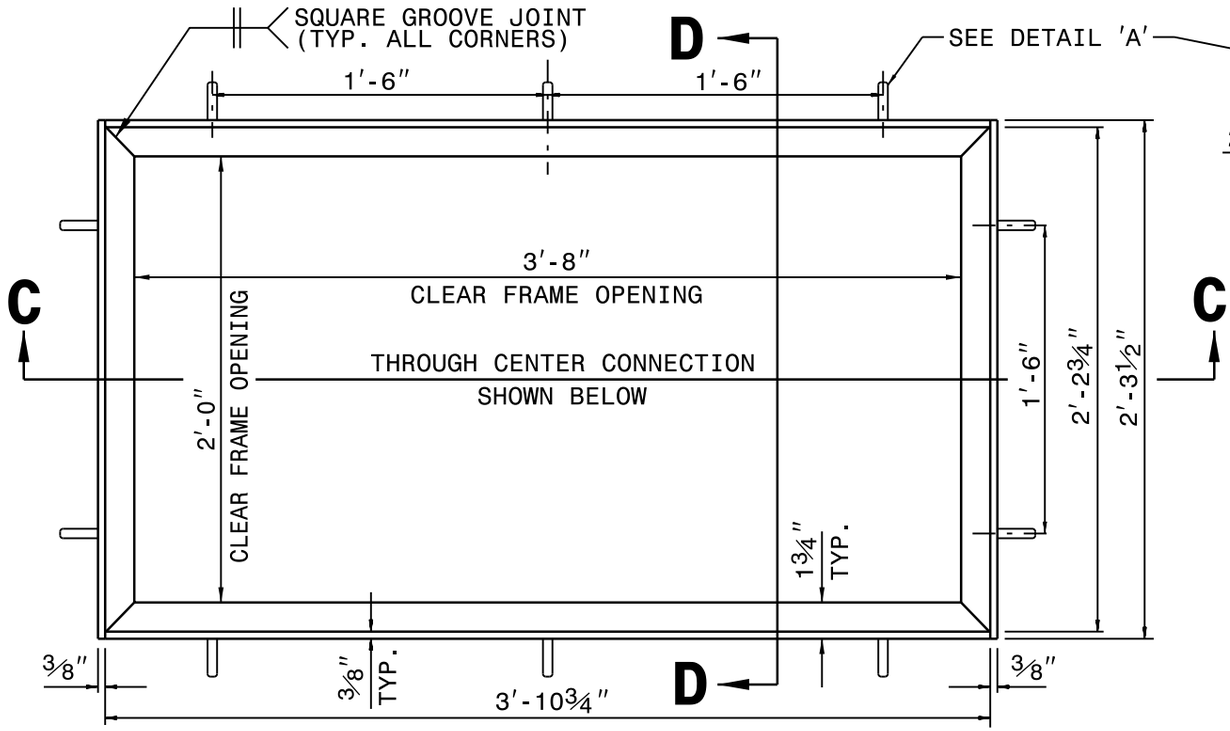
1-24

ROADWAY STANDARD DRAWING FOR

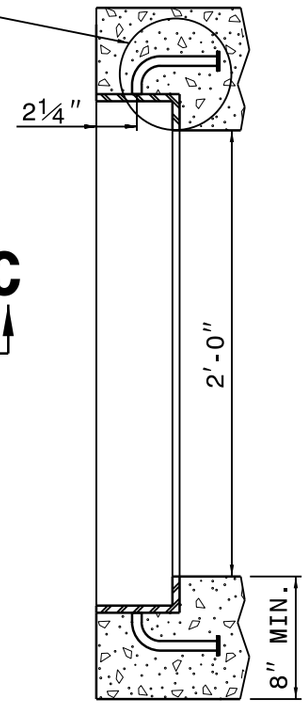
TRAFFIC BEARING GRATED DROP INLET

FOR STEEL (840.37) DOUBLE FRAME AND GRATES

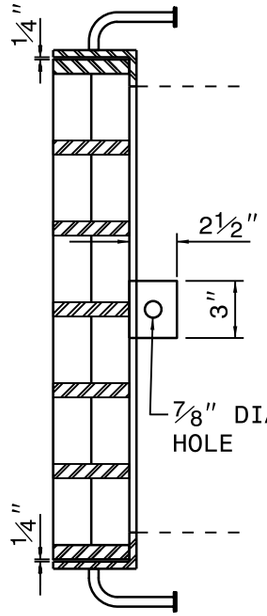
840.36



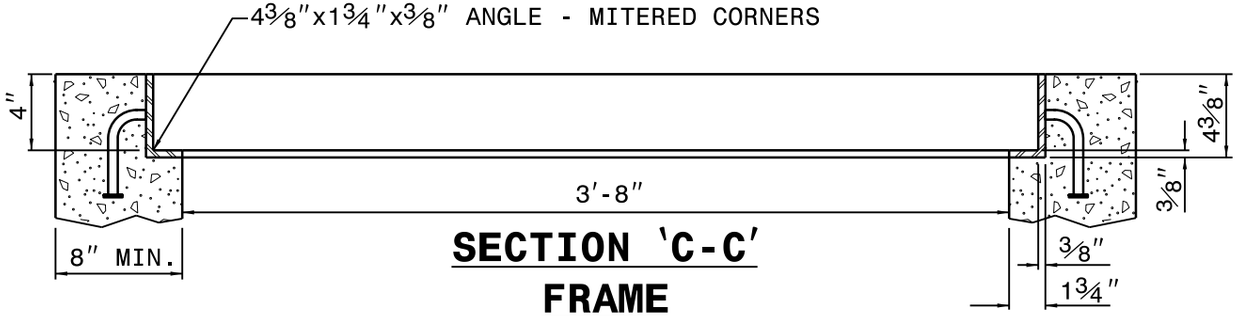
PLAN VIEW



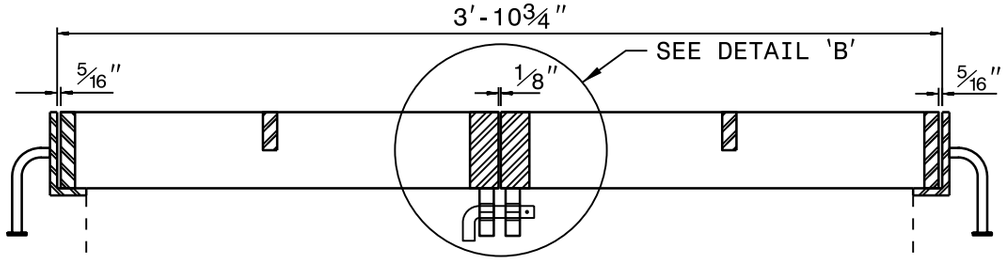
SECTION 'D-D'



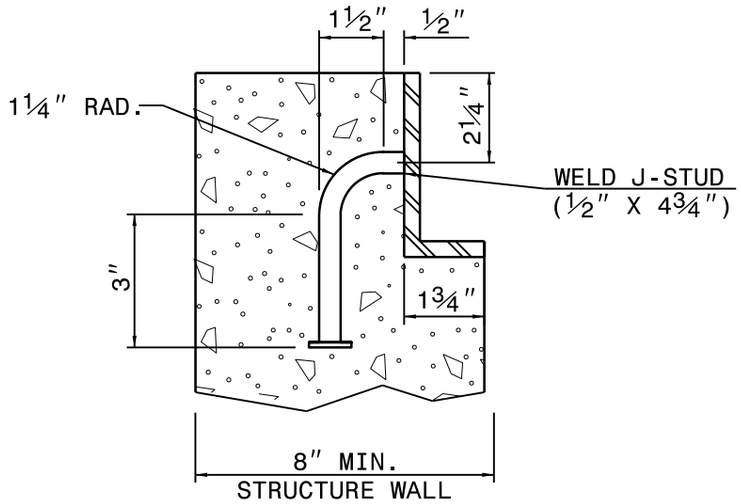
ELEVATION OF GRATE IN FRAME SYSTEM SHOWN THROUGH SECTION 'D-D'



SECTION 'C-C'
FRAME



ELEVATION OF GRATES IN FRAME SYSTEM SECTION 'C-C'



DETAIL 'A' STUD ANCHOR

STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

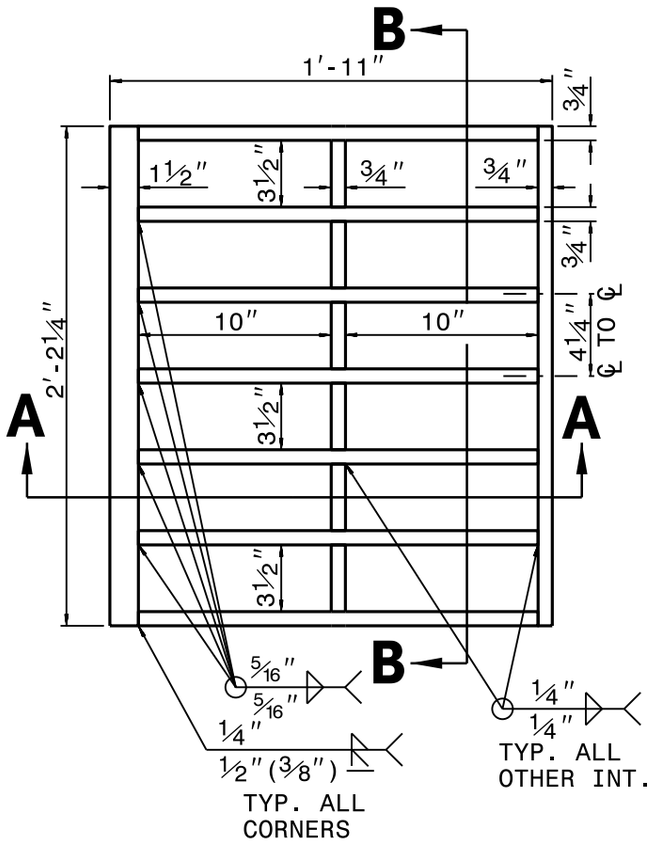
1-24

ROADWAY STANDARD DRAWING FOR

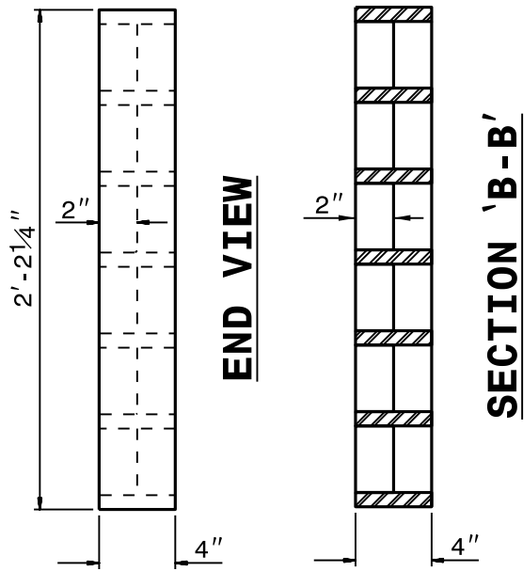
STEEL GRATE AND FRAME

SHEET 1 OF 2

840.37



PLAN VIEW

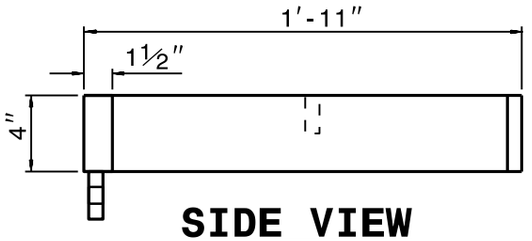


END VIEW

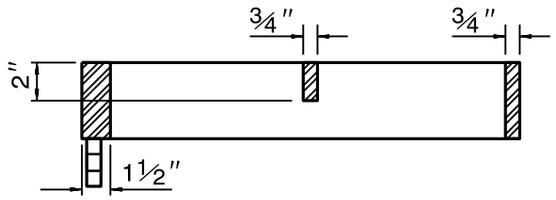
SECTION 'B-B'

NOTES:

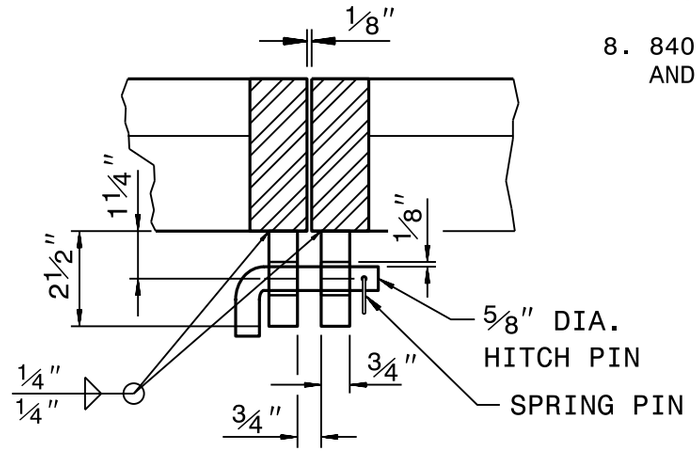
1. HOT DIP GALVANIZE FRAME AND GRATE IN ACCORDANCE WITH ASTM DESIGNATION A-123 AND AASHTO M-111.
2. GRATE IS DESIGNED TO WITHSTAND HS25-44 LOADING.
3. TWO (2) GRATES REQUIRED PER FRAME. ONE (1) GRATE DEPICTED FOR CLARITY.
4. PROVIDE STEEL CONFORMING TO THE LATEST REQUIRMENTS OF AASHTO M270 (ASTM A709) GRADE 36.
5. WELD IN ACCORDANCE WITH THE AASHTO/AWS D1.5 BRIDGE WELDING CODE. SEAL WELD ALL CONNECTIONS ALONG TOP AND BOTTOM HORIZONTAL SEAMS OF CONNECTIONS IN ADDITION TO ANY REQUIRED STRUCTURAL WELDS.
6. USE 5/16" DOUBLE FILLET WELDS FOR CONNECTING MAIN BARS TO EDGE BARS AND 1/4" FILLETS AT ALL OTHER LOCATIONS.
7. NOTCHING OF BEARING BARS TO ACCEPT CROSS BAR IS PROHIBITED.
8. 840.37 FRAMES AND GRATES ARE SUBJECT TO LIVE LOADS AND ARE NOT CONSIDERED TO BE ANCILLARY PRODUCTS.



SIDE VIEW



SECTION 'A-A'



DETAIL 'B' CENTER LOCK

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DIVISION OF HIGHWAYS
RALEIGH, N.C.

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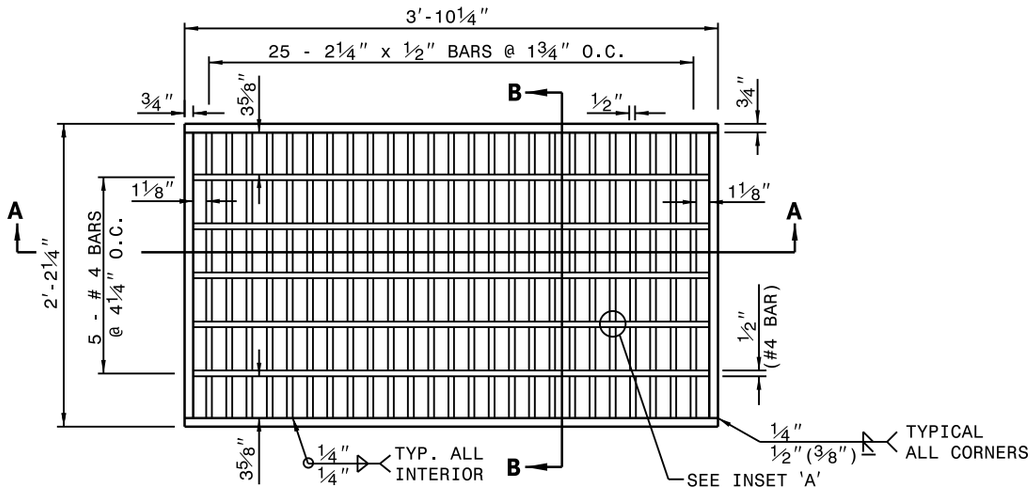
ROADWAY STANDARD DRAWING FOR

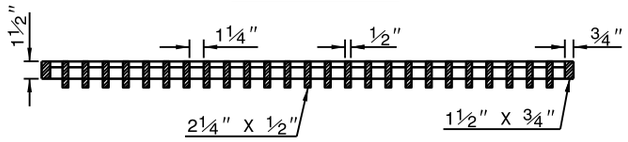
STEEL GRATE AND FRAME

SHEET 2 OF 2

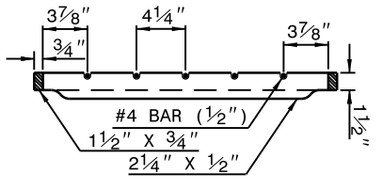
840.37



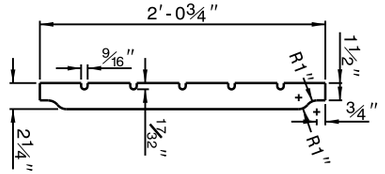
PLAN VIEW



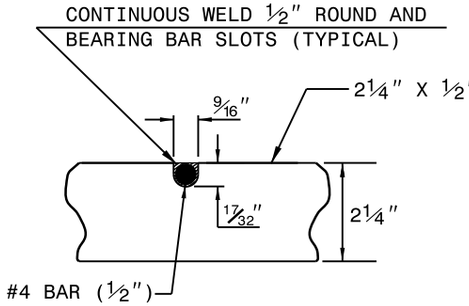
SECTION A-A GRATE



SECTION B-B

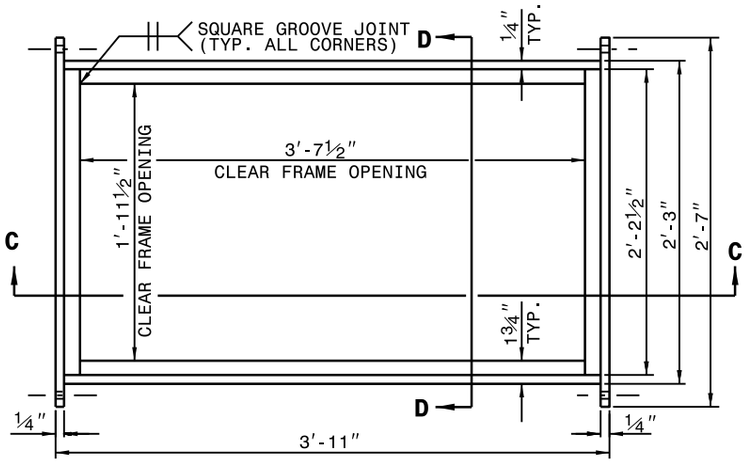


DETAIL OF BEARING BAR

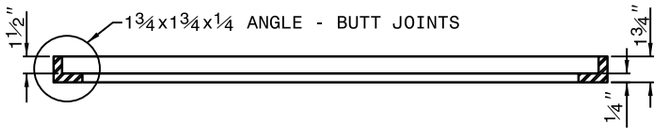


INSET 'A'

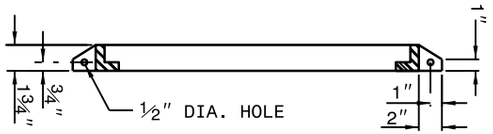
(1⁷⁄32" X 9⁄16" NOTCH IN 2¼" X ½" BAR)



PLAN VIEW



SECTION C-C FRAME



SECTION 'D-D'

NOTES:

1. HOT DIP GALVANIZE FRAME AND GRATE IN ACCORDANCE WITH ASTM DESIGNATION A-123 AND AASHTO M-111.
2. GRATE SHOULD MEET HS-20 LOADING.
3. PROVIDE STEEL CONFORMING TO THE LATEST REQUIRMENTS OF AASHTO M270 (ASTM A709) GRADE 36.
4. WELD IN ACCORDANCE WITH THE AASHTO/AWS D1.5 BRIDGE WELDING CODE. SEAL WELD ALL CONNECTIONS ALONG TOP AND BOTTOM HORIZONTAL SEAMS OF CONNECTIONS IN ADDITION TO ANY REQUIRED STRUCTURAL WELDS.
5. 840.39 FRAMES AND GRATES ARE SUBJECT TO LIVE LOADS AND ARE NOT CONSIDERED TO BE ANCILLARY PRODUCTS.
6. SEE STANDARD DRAWING 840.25 FOR FRAME ANCHORAGE.

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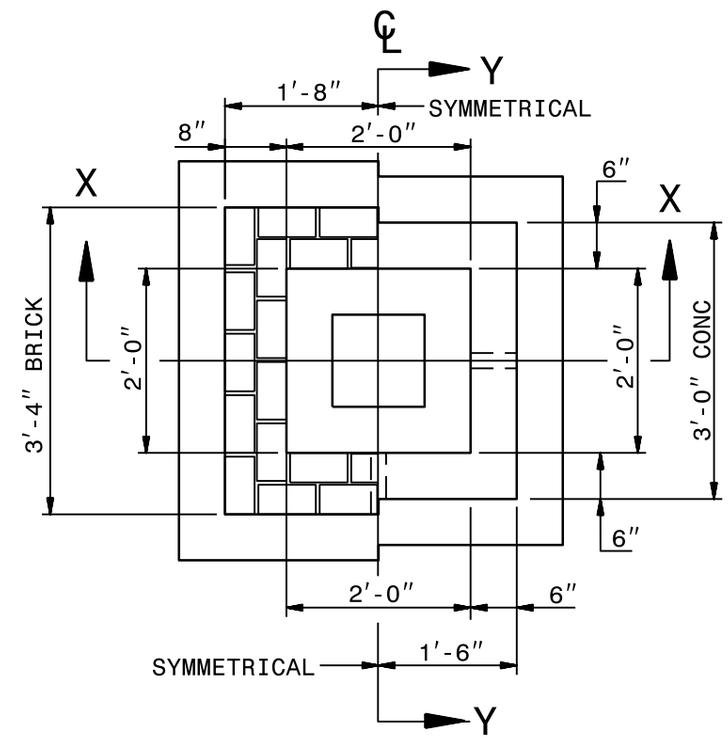
ROADWAY STANDARD DRAWING FOR

STEEL GRATE AND FRAME

BICYCLE SAFE

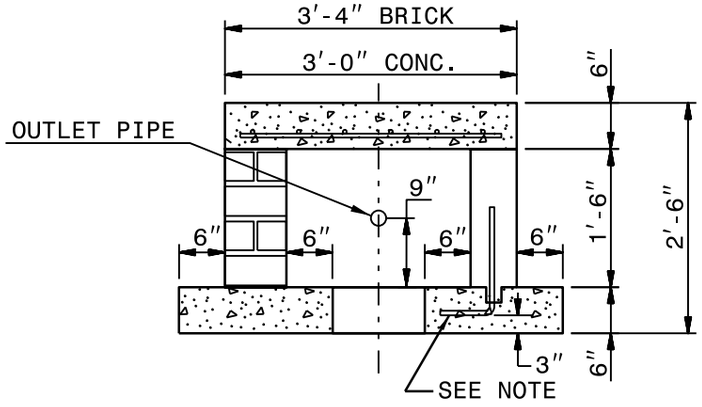
SHEET 1 OF 1

840.39



PLAN

COVER REMOVED



SECTION X-X OR Y-Y

GENERAL NOTES:

USE CLASS "B" CONCRETE THROUGHOUT.

OPTIONAL CONSTRUCTION OF CONCRETE BOX - MONOLITHIC POUR, 2" KEYWAY, OR #4 BAR DOWELS AT 12" CENTERS AS DIRECTED BY THE ENGINEER.

REINFORCING STEEL (A-BARS) TO BE #3 STRAIGHT BARS, 12 BARS REQUIRED 2′-9" LONG FOR CONCRETE BOX AND 3′-1" LONG FOR BRICK BOX.

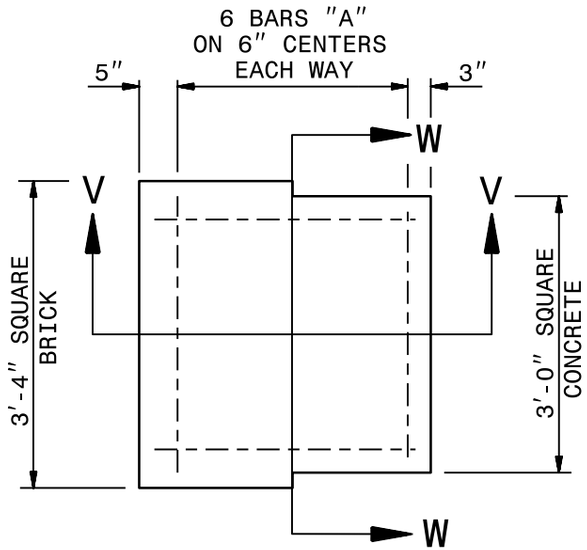
DIMENSIONS OF BOX MAY BE CHANGED BY THE ENGINEER.

MORTAR JOINTS ½" ± ⅛" THICK.

CONCAVE TOOL ALL EXPOSED JOINTS.

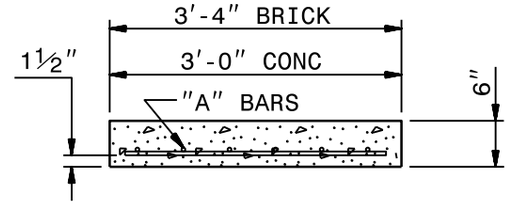
USE FORMS TO CONSTRUCT THE BOTTOM SLAB.

JUMBO BRICK WILL BE PERMITTED. CONCRETE BRICK OR 4" SOLID CONCRETE BLOCKS MAY BE USED IN LIEU OF CLAY BRICK.



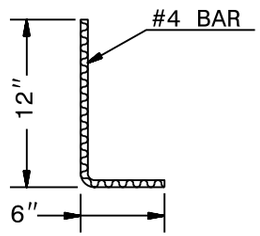
PLAN OF COVER

FOR BRICK BOX | FOR CONCRETE BOX



SECTION V-V OR W-W

TABLE OF QTY.'S FOR CONC. SPRING BOX			
FILL HEIGHT	TOP SLAB THICKNESS	CONC. CU. YD.	REINF. LBS.
25′ OR LESS	6″	0.722	12
26′ THRU 50′	6½″*	0.737	22
51′ THRU 75′	7½″	0.742	34
76′ THRU 100′	8½″	0.792	34



DOWEL

TABLE OF QUANTITIES FOR BRICK SPRING BOX					
FILL HEIGHT	TOP SLAB THICKNESS	CONC. CU. YD.	BRICK CU. YD.	TOTAL CU. YD.	REINF. LBS.
25′ OR LESS	6″	0.535	0.395	0.930	14
26′ THRU 50′	6½″*	0.552	0.395	0.947	25
51′ THRU 75′	7½″	0.586	0.395	0.981	39
76′ THRU 100′	8½″	0.620	0.395	1.015	39

* USE THIS TOP SLAB FOR LIVE LOAD UP TO 2′ OF FILL.

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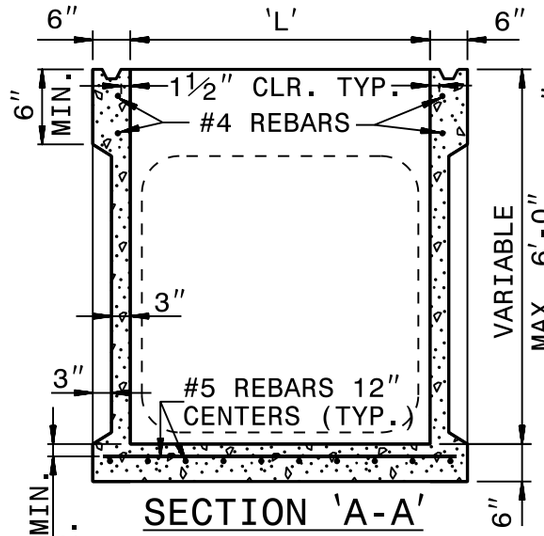
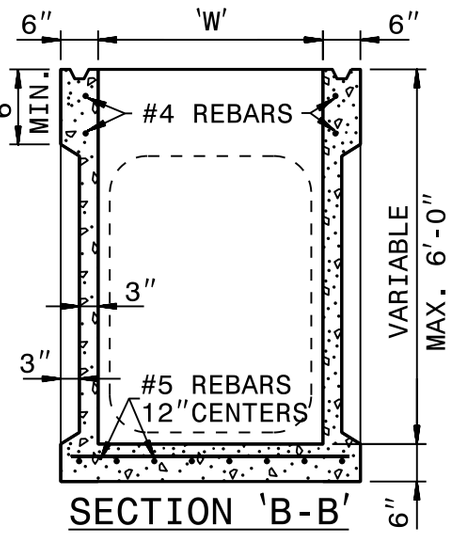
ROADWAY STANDARD DRAWING FOR

SPRING BOX

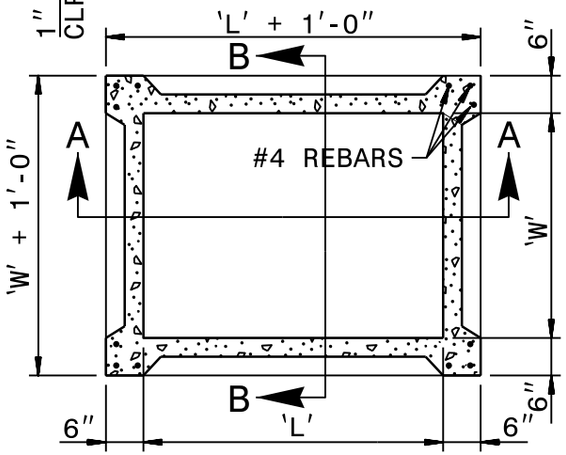
CONCRETE OR BRICK



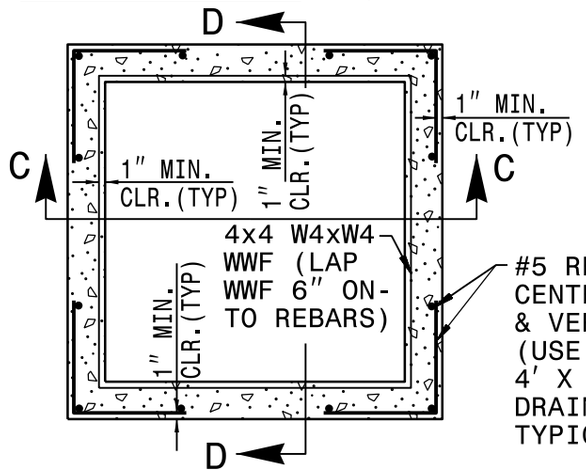
SECTION 'A-A'



SECTION 'B-B'



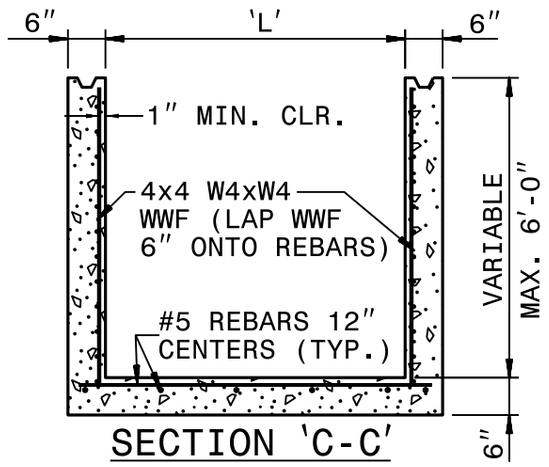
WAFFLE WALL PLAN VIEW



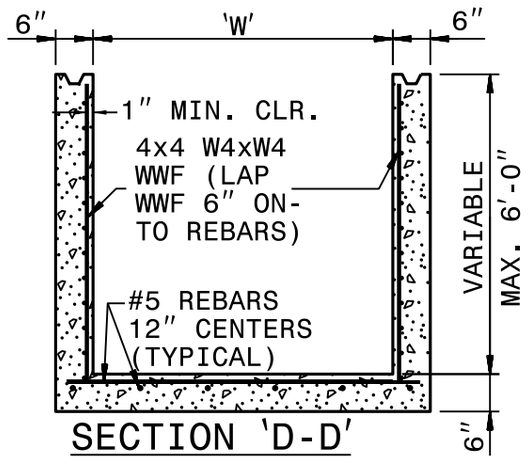
SOLID WALL PLAN VIEW

#5 REBARS @ 12″ CENTERS (HORIZ. & VERT.) (USE WITH 4′ X 4′ & LARGER DRAINAGE STRUCTURES TYPICAL)

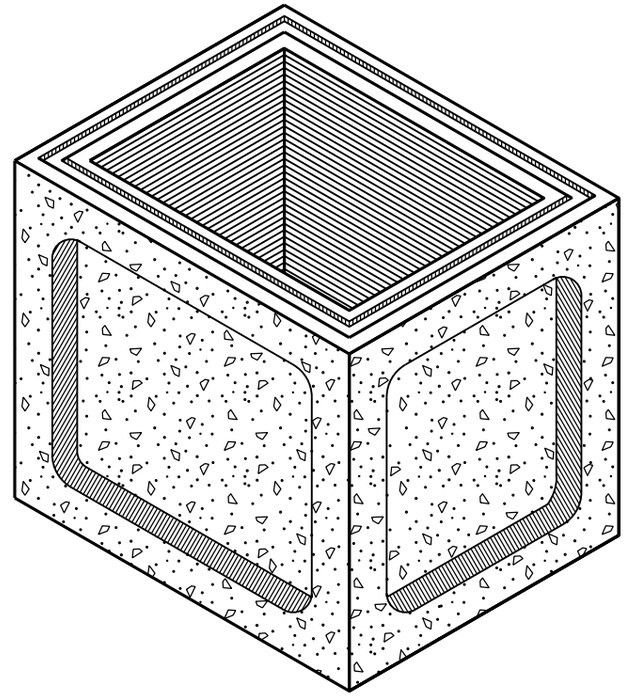
THE PATTERN OF THE KNOCK-OUT PANELS ARE SHOWN FOR ILLUSTRATIVE PURPOSES ONLY.



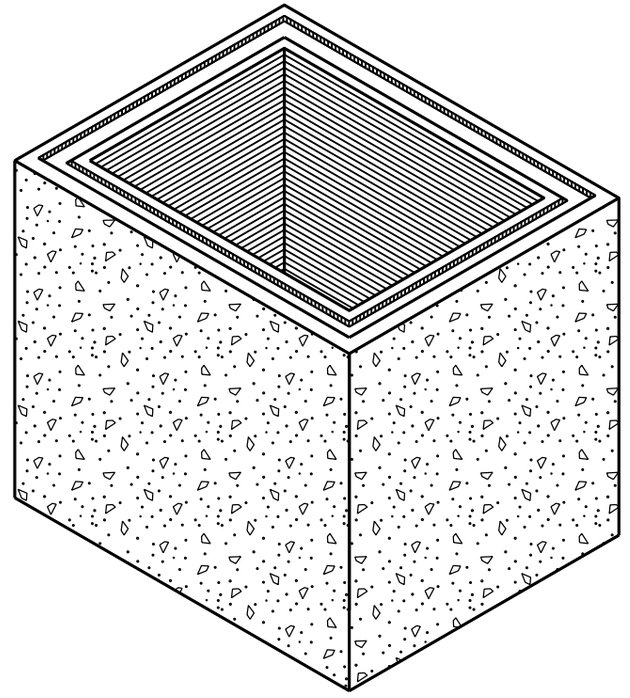
SECTION 'C-C'



SECTION 'D-D'



WAFFLE WALL ISOMETRIC VIEW



SOLID WALL ISOMETRIC VIEW

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ROADWAY STANDARD DRAWING FOR

PRECAST DRAINAGE STRUCTURE

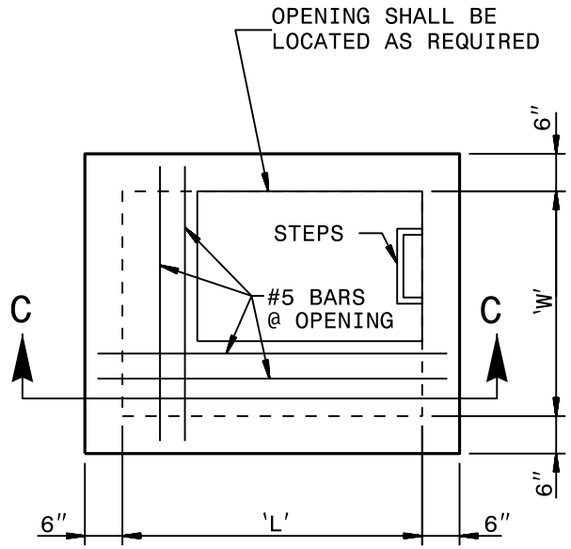
(SOLID AND WAFFLE WALL)

SHEET 1 OF 2

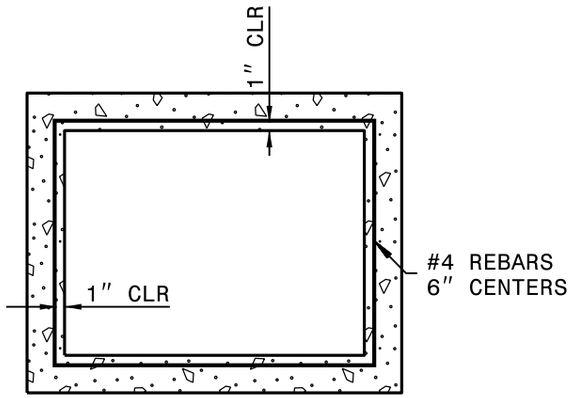
840.45

GENERAL NOTES:

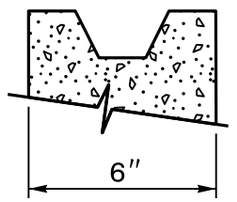
* THIS PRECAST BOX MAY BE USED FOR THE FOLLOWING STANDARDS: 840.01, 840.02, 840.04, 840.05, 840.13, 840.14, 840.15, 840.17, 840.18, 840.19, 840.26, 840.27, 840.28, 840.31, 840.32 AND 840.41.
* INSTALL PRECAST DRAINAGE STRUCTURES AND PAY FOR IN ACCORDANCE WITH SPECIFICATION SECTION 840.
* DO NOT PLACE PRECAST DRAINAGE STRUCTURES UNDER TRAFFIC OR WHERE TRAFFIC WILL BE DETOURED.
* USE 4000 PSI CONCRETE.
* PROVIDE ALL REINFORCING STEEL WHICH MEETS ASTM A615 FOR GRADE 60 AND WELDED WIRE FABRIC CONFORMING TO ASTM A1064.
* LIMIT MAXIMUM DEPTH TO TOP OF BOTTOM SLAB FOR WAFFLE WALL STRUCTURE TO 10′-0″; LIMIT SOLID WALL STRUCTURE TO 15′-0″.
* PLACE LIFT HOLES OR PINS IN ACCORDANCE WITH OSHA STANDARD 1926.704.
* CUT OR FORM OPENINGS FOR PIPE TO PROVIDE REQUIRED SIZE AND LOCATION. ORIENT WAFFLE WALL STRUCTURES SO THAT PIPES ENTER THROUGH THE KNOCKOUT/WAFFLE PANELS ONLY. PIPES MAY ENTER THROUGH THE CORNERS OF SOLID WALL BOXES IF A MINIMUM OF 6″ OF WALL IS PROVIDED ABOVE THE HOLE.
* ALL ELEMENTS PRECAST TO MEET ASTM C913.
* FRAME AND GRATE HEIGHT MAY BE ADJUSTED WITH CONCRETE OR BRICK IN ACCORDANCE WITH STANDARD 840.25.
* PROVIDE PRECAST STRUCTURES OVER 3′-6″ IN DEPTH WITH STEPS AS DIRECTED BY THE ENGINEER.
* WELDED WIRE FABRIC MAY BE SUBSTITUTED FOR REBAR AS LONG AS THE SAME AREA OF STEEL IS PROVIDED.
* SEAL JOINTS WITH A FLEXIBLE BUTYL RUBBER BASE CONFORMING TO FEDERAL SPECIFICATION SS-S-21A, AASHTO M-198, TYPE B - BUTYL RUBBER.
* LIMIT MAXIMUM STRUCTURE SIZE TO INSIDE CLEAR DIMENSIONS OF 5′-0″ X 5′-0″.
* THE OUTSIDE PIPE DIAMETER PLUS 2″ OR THE OPENING REQUIRED FOR FRAME AND GRATE IS THE MINIMUM STRUCTURE SIZE WHICHEVER IS GREATER.
* USE MANHOLE FRAME AND COVER AS INDICATED ON THE PLANS. REINFORCE OPENING AS SHOWN ON THIS SHEET.



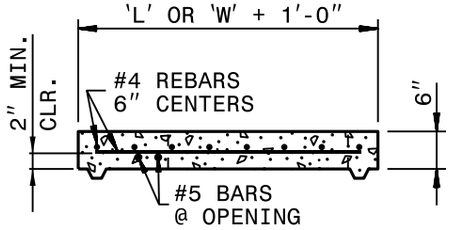
PLAN TOP SLAB



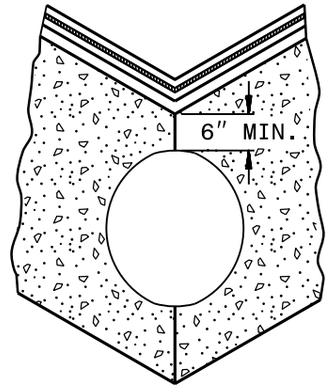
PRECAST RISER PLAN



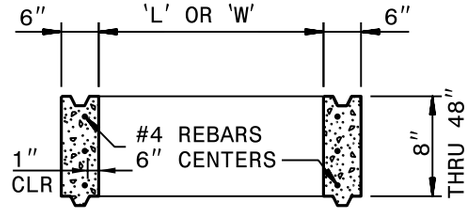
SECTION VIEW



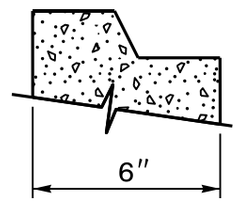
SECTION 'C-C'



CORNER CUT DETAIL (SOLID WALL BOX)



PRECAST RISER DETAIL



SECTION VIEW

OPTIONAL JOINT DETAILS

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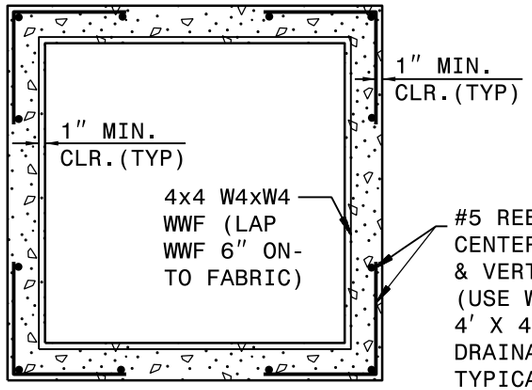
ROADWAY STANDARD DRAWING FOR

PRECAST DRAINAGE STRUCTURE

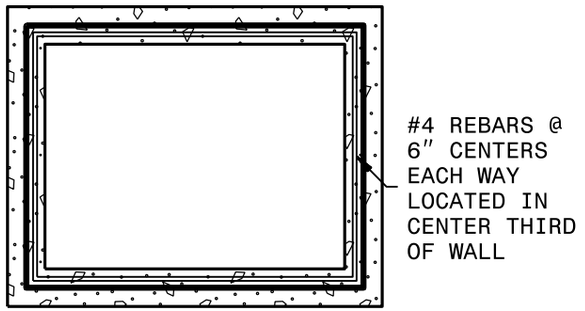
(GENERAL NOTES AND DETAILS)

SHEET 2 OF 2

840.45



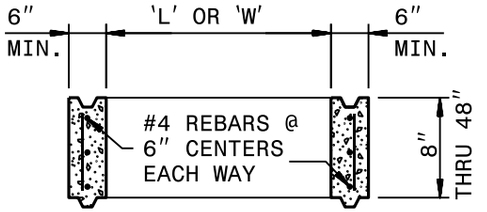
PLAN VIEW OF BASE UNIT



PRECAST RISER PLAN

SECTION VIEWS

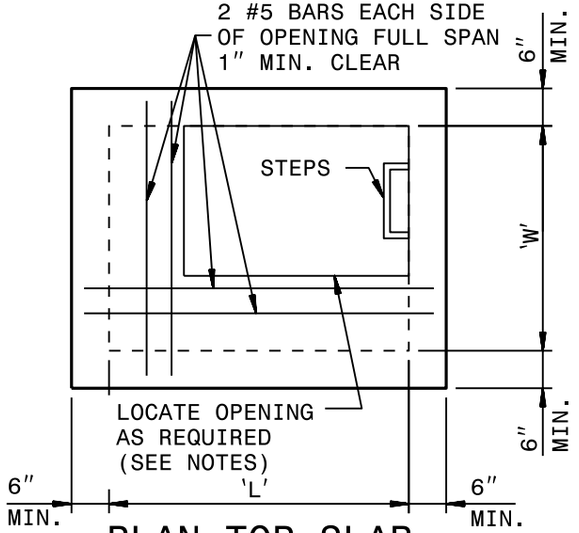
OPTIONAL JOINT DETAILS



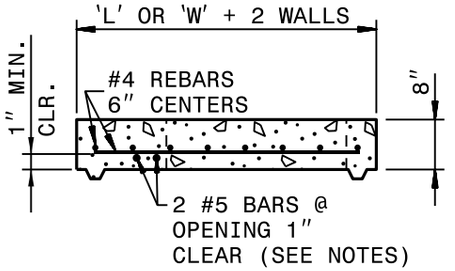
TYPICAL PRECAST
RISER SECTION

GENERAL NOTES:

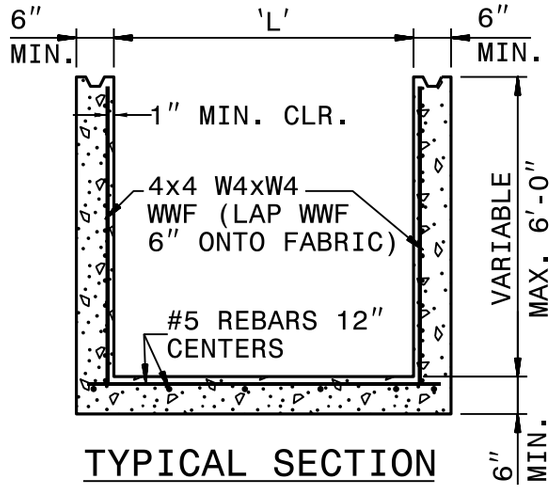
* THIS PRECAST BOX MAY BE USED FOR THE FOLLOWING STANDARDS: 840.01, 840.02, 840.04, 840.05, 840.14, 840.15, 840.31, 840.32, 840.34, 840.35, 840.36 AND 840.41.
* INSTALL AND PAY FOR PRECAST DRAINAGE STRUCTURES IN ACCORDANCE WITH NCDOT STANDARD SPECIFICATION SECTION 840.
* USE 4000 PSI MINIMUM COMPRESSIVE STRENGTH CONCRETE.
* USE ASTM A615 GRADE 60 REINFORCING STEEL. USE ASTM A1064 WELDED WIRE FABRIC (WWF).
* LIMIT MAXIMUM DEPTH TO TOP OF BOTTOM SLAB TO 15′-0″.
* PLACE LIFT HOLES OR PINS IN ACCORDANCE WITH OSHA STANDARD 1926.704.
* ORIENT STRUCTURES SO THAT CORNERS WILL NOT BE CUT OR MODIFIED UNLESS ALLOWED BY DETAIL IN PLANS.
* PRECAST ALL ELEMENTS TO MEET ASTM C913.
* FRAME AND GRATE HEIGHT MAY BE ADJUSTED WITH CONCRETE OR BRICK IN ACCORDANCE WITH STANDARD 840.25.
* PROVIDE PRECAST STRUCTURES OVER 3′-6″ IN DEPTH WITH STEPS 12″ ON CENTERS IN ACCORDANCE WITH STD. NO. 840.66.
* WELDED WIRE FABRIC MAY BE SUBSTITUTED FOR REBAR IF THE SAME MIN. AREA OF STEEL IS PROVIDED.
* SEAL JOINTS WITH A FLEXIBLE BUTYL RUBBER BASE CONFORMING TO FEDERAL SPECIFICATIONS SS-S-21A, AASHTO M-198, TYPE B - BUTYL RUBBER.
* LIMIT MAXIMUM STRUCTURE SIZE INSIDE CLEAR DIMENSIONS TO 6′-0″ X 6′-0″.
* THE OUTSIDE PIPE DIAMETER PLUS 2″ IS THE MINIMUM STRUCTURE SIZE OR THE OPENING REQUIRED FOR GRATE AND FRAME WHICHEVER IS GREATER.
* ROUND MANHOLE MAY BE USED IN LIEU OF SQUARE PROVIDED 2 EXTRA #5′S ARE PLACED ON EVERY SIDE NOT ADJACENT TO A WALL. SEE STD. DWG. 840.34 FOR MANHOLE INSTALLATION.



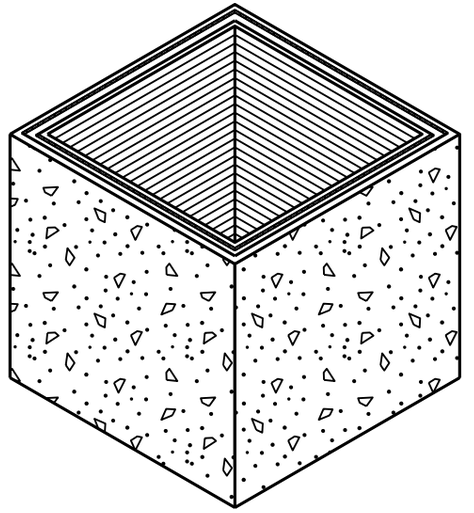
PLAN TOP SLAB



TYPICAL SECTION
TOP SLAB



TYPICAL SECTION
OF BASE UNIT



ISOMETRIC VIEW

STATE OF
NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

1-24

ROADWAY STANDARD DRAWING FOR

TRAFFIC BEARING PRECAST DRAINAGE STRUCTURE

SHEET 1 OF 1

840.46

GENERAL NOTES:

MORTAR JOINTS ½″ ± ⅛″ THICK.

CONCAVE TOOL ALL EXPOSED JOINTS.

USE CLASS "B" CONCRETE THROUGHOUT.

USE FORMS TO CONSTRUCT THE BASE SLAB.

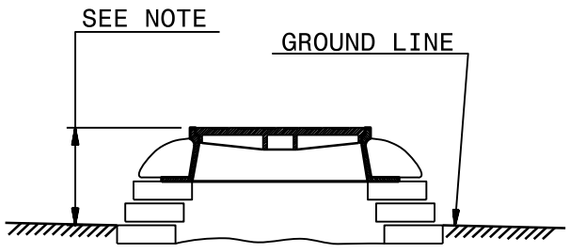
JUMBO BRICK WILL BE PERMITTED. CONCRETE BRICK OR 4″ SOLID CONCRETE BLOCKS MAY BE USED IN LIEU OF CLAY BRICK.

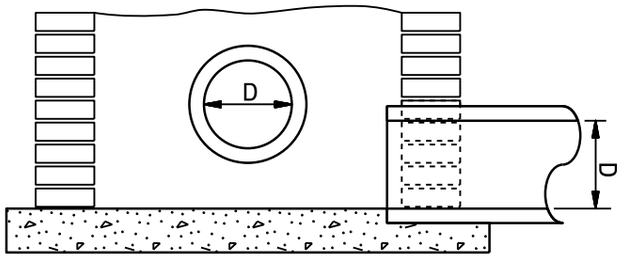
IF REINFORCED CONCRETE PIPE IS SET IN BASE SLAB OF BOX, ADD TO BASE AS SHOWN IN STD. NO. 840.00.

WHERE THE MANHOLE IS EXPOSED TO ROAD TRAFFIC, CONSTRUCT THE TOP OF THE MANHOLE FLUSH WITH THE GROUND. AT OTHER LOCATIONS CONSTRUCT A MINIMUM OF 9″ ABOVE THE GROUND.

THE HEIGHT OF GRADE ADJUSTMENT RINGS OR BRICK PLUS FRAME AND COVER SHALL NOT EXCEED 24″.

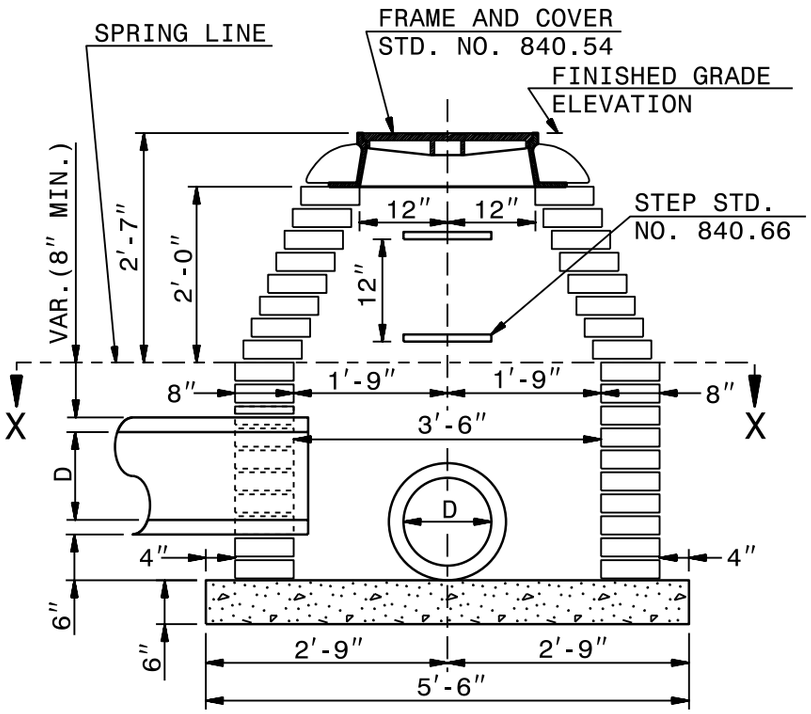
PROVIDE MANHOLES OVER 3′-6″ IN DEPTH WTH STEPS 12″ ON CENTERS IN ACCORDANCE WITH STD. NO. 840.66.



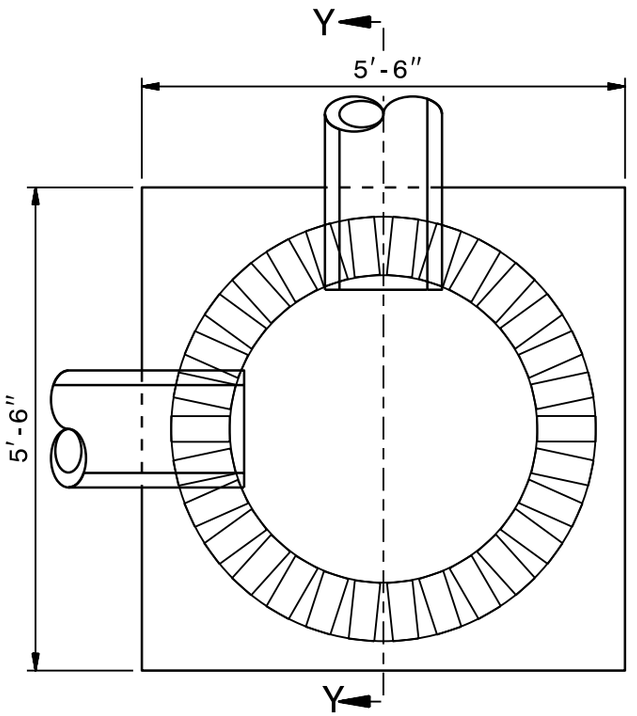


PART SECTION Y-Y

MINIMUM DIMENSIONS AND QUANTITIES FOR MANHOLE					
PIPE DIM.	CU. YDS. CONCRETE	TOTAL BRICK MASONRY CU. YDS.	CU. YDS. BRICK MASONRY PER FT. HT.	DEDUCTIONS FOR ONE PIPE (CU.YD.)	
D	BASE	ABOVE S-L	BELOW S-L	C.M.	R.C.
12″	0.560	0.530	0.323	0.020	0.032
15″	0.560	0.530	0.323	0.031	0.047
18″	0.560	0.530	0.323	0.044	0.065
24″	0.560	0.530	0.323	0.078	0.113
30″	0.560	0.530	0.323	0.122	0.170
36″	0.560	0.530	0.323	0.176	0.238



SECTION ON ℄



SECTION X-X

STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

1-24

ROADWAY STANDARD DRAWING FOR

BRICK MANHOLE

12″ THRU 36″ PIPE

SHEET 1 OF 1

840.51

GENERAL NOTES

USE 4000 PSI MINIMUM COMPRESSIVE STRENGTH CONCRETE.

USE ASTM A615 GRADE 60 REINFORCING STEEL. USE ASTM A1064 WELDED WIRE FABRIC (WWF).

FABRICATE, ASSEMBLE AND DESIGN PRECAST MANHOLE COMPONENTS ACCORDANCE WITH AASHTO M199.

ASSEMBLE RISER AND GRADE RINGS WITH THE STEPS SPACED 12″ FROM THE TOP TO THE BOTTOM OF THE MANHOLE.

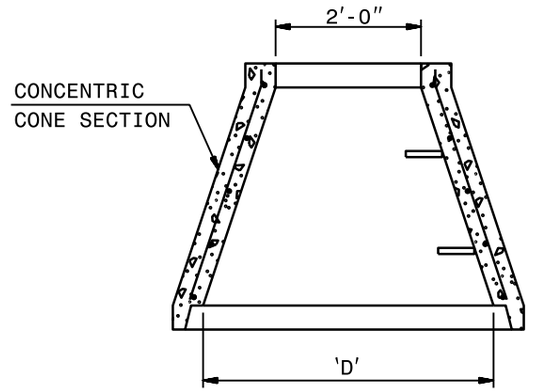
THE HEIGHT OF GRADE ADJUSTMENT RINGS PLUS FRAME AND COVER SHALL NOT EXCEED 24″.

WHERE THE MANHOLE IS EXPOSED TO ROAD TRAFFIC, CONSTRUCT THE TOP OF THE MANHOLE FLUSH WITH THE GROUND AND A MINIMUM OF 9″ ABOVE THE GROUND AT OTHER LOCATIONS.

LIMIT DEPTH OF FILL TO 30′-0″ FROM FINISH GRADE TO TOP OF BOTTOM SLAB.

THE MIN. SLAB THICKNESS 'T' IS THE DIMENSION OF THE THINNEST PORTION OF THE TOP/BOTTOM SLAB.

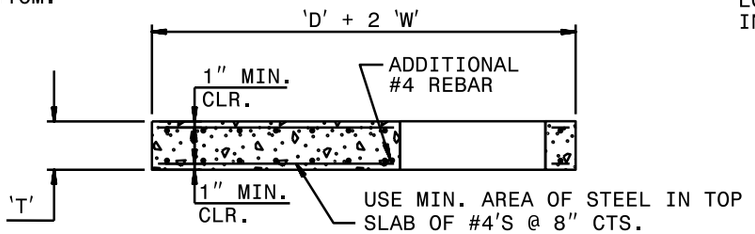
* TOP MAT OF REINFORCEMENT MAY BE NEGLECTED IF TOP SLAB HAS A DISTINGUISHABLE TOP AND BOTTOM.



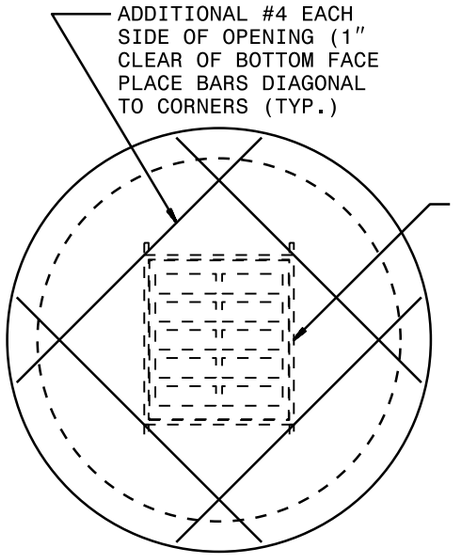
ALTERNATE CONE SECTION

D	W	T	As
INTERNAL DIAMETER (FT.)	MIN. WALL THICKNESS (IN.)	MIN. TOP/BOTTOM SLAB THICKNESS (IN.)	MIN. CIRCUMFERENTIAL AREA OF STEEL PER VERTICAL FT. (SQ. IN.)
4	4	6	0.12
5	5	8	0.15
6	6	8	0.18

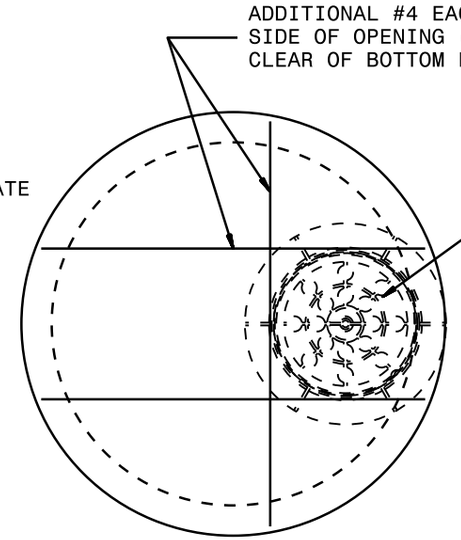
FRAME AND GRATES	STD. NO.
TRAFFIC BEARING	840.37
	840.39
NONTRAFFIC BEARING:	840.22
	840.24
	840.20
	840.29
	840.33



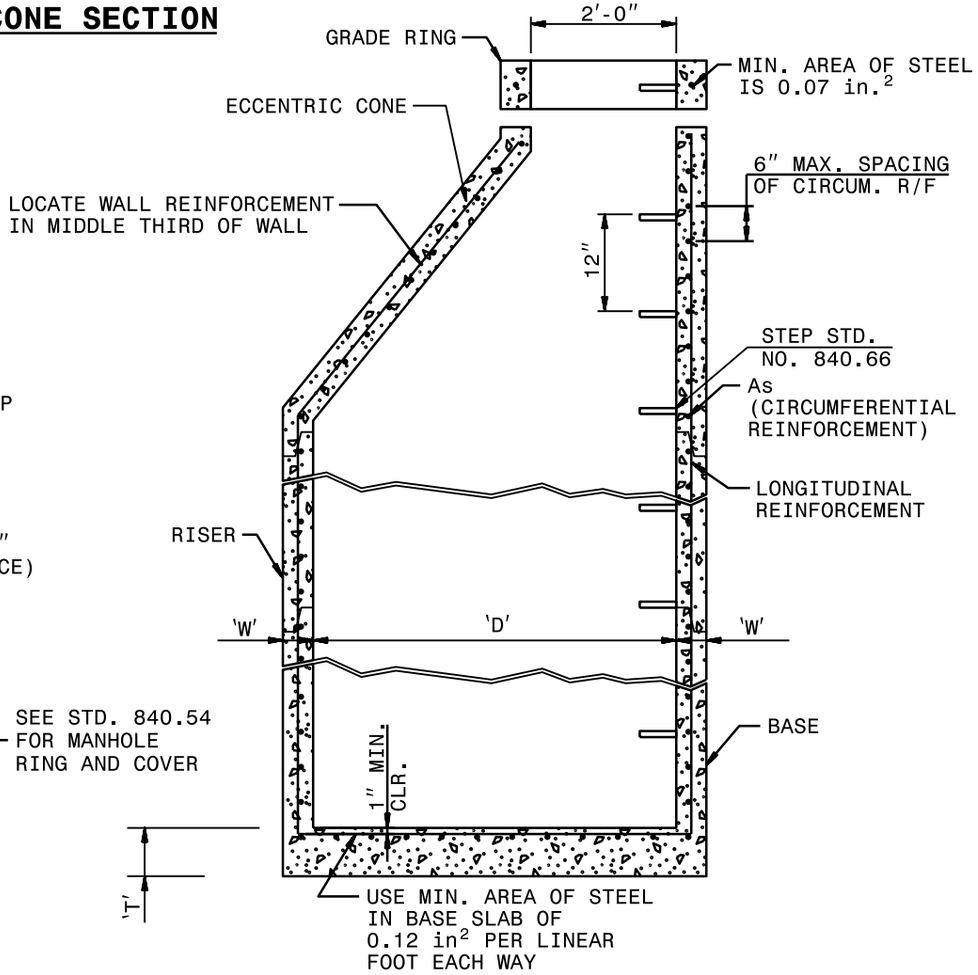
FLAT TOP SLAB



GRATED INLET OPTION



MANHOLE OPTION



TYPICAL MANHOLE SECTION

STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

1-24

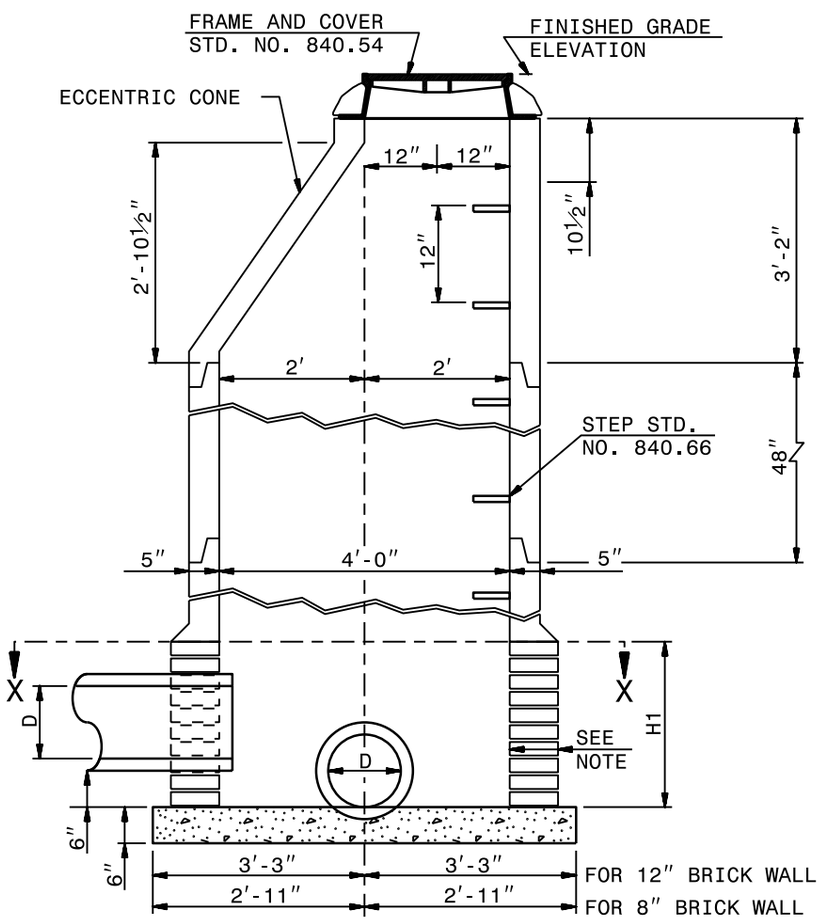
ROADWAY STANDARD DRAWING FOR

PRECAST MANHOLE 4′,5′ AND 6′ DIAMETER

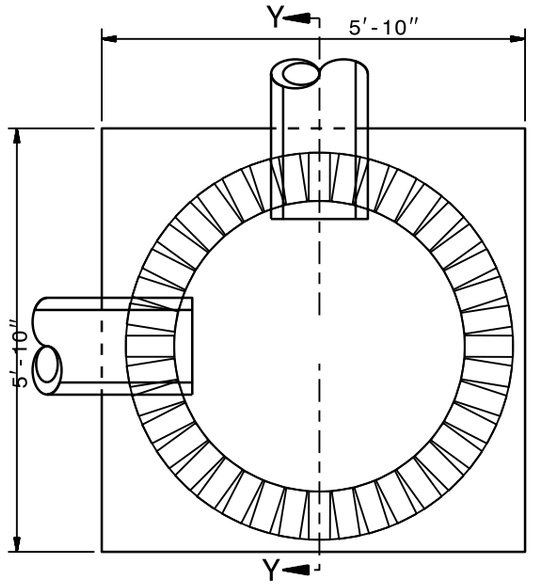
12″ THRU 48″ PIPE

SHEET 1 OF 1

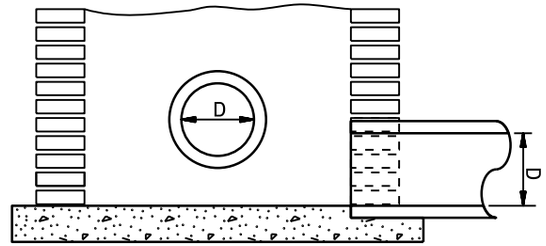
840.52



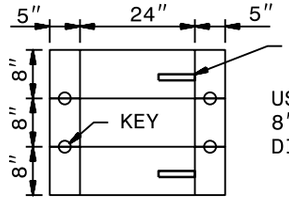
SECTION ON ℄



SECTION X-X



PART SECTION Y-Y



STEP STD. NO. 840.66

USE 24" GRADE RINGS IN 8" HIGH SECTIONS AS DIRECTED BY THE ENGINEER.

DIMENSIONS	
PIPE DIM.	BRICK HEIGHT
D	H1 (MIN)
12"	1'-5"
15"	1'-8"
18"	1'-11"
24"	2'-6"
30"	3'-0"
36"	3'-7"
42"	4'-2"

GENERAL NOTES:

MORTAR JOINTS ½" ± ⅛" THICK.

USE CLASS "B" CONCRETE THROUGHOUT.

USE FORMS TO CONSTRUCT THE BASE SLAB.

JUMBO BRICK WILL BE PERMITTED. CONCRETE BRICK OR 4" SOLID CONCRETE BLOCK WILL BE USED IN LIEU OF CLAY BRICK.

USE PRECAST MANHOLE COMPONENTS MEETING REQUIREMENTS OF STD.NO.840.52 AND AASHTO M199.

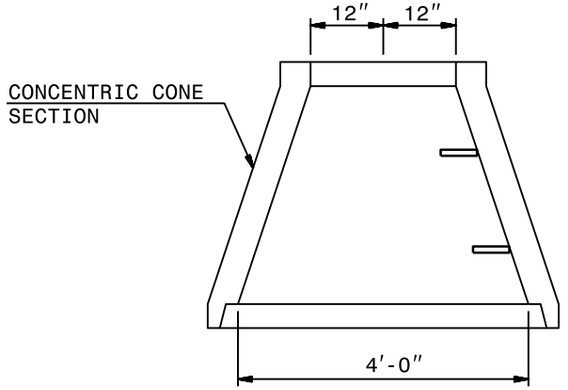
FOR MANHOLE OVER 12' VERTICAL WALL DEPTH, CONSTRUCT BRICK MASONRY WALL 12" THICK. FOR MANHOLES WITH A VERTICAL WALL DEPTH LESS THAN 12', CONSTRUCT BRICK MASONRY WALL 8" THICK.

ASSEMBLE RISERS AND GRADE RINGS WITH THE STEPS SPACED 12" FROM THE TOP TO THE BOTTOM OF THE MANHOLE.

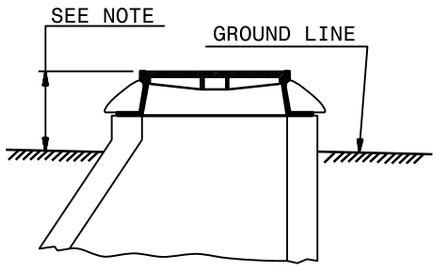
THE HEIGHT OF GRADE ADJUSTMENT RINGS PLUS FRAME AND COVER SHALL NOT EXCEED 24".

WHERE THE MANHOLE IS EXPOSED TO ROAD TRAFFIC, CONSTRUCT THE TOP OF THE MANHOLE FLUSH WITH THE GROUND AND A MINIMUM OF 9" ABOVE THE GROUND AT OTHER LOCATIONS.

IF REINFORCED CONCRETE PIPE IS SET IN BASE SLAB OF BOX, ADD TO BASE AS SHOWN IN STD. NO. 840.00.



ALTERNATE CONE SECTION



STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

1-24

ROADWAY STANDARD DRAWING FOR

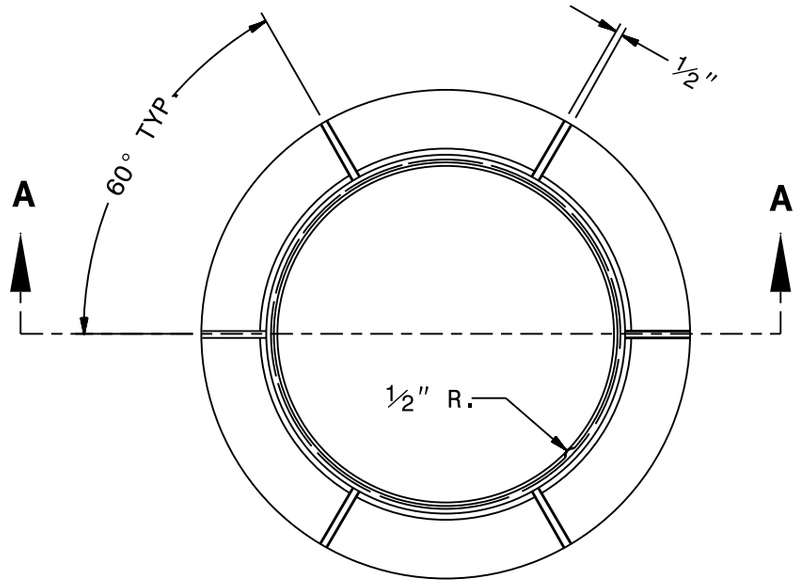
PRECAST MANHOLE WITH MASONRY BASE

12" THRU 42" PIPE

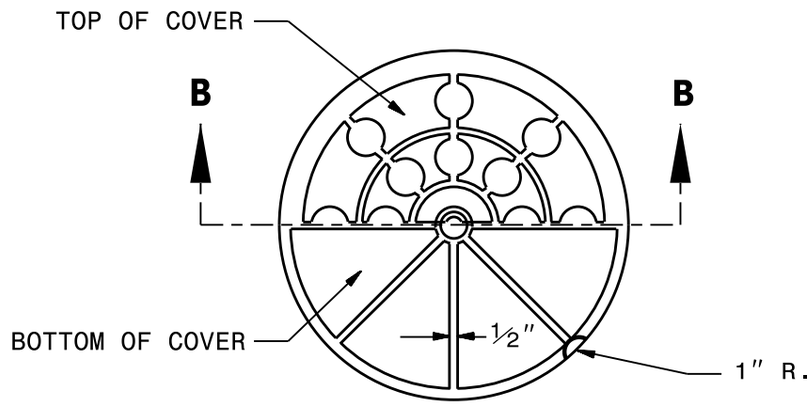
SHEET 1 OF 1

840.53

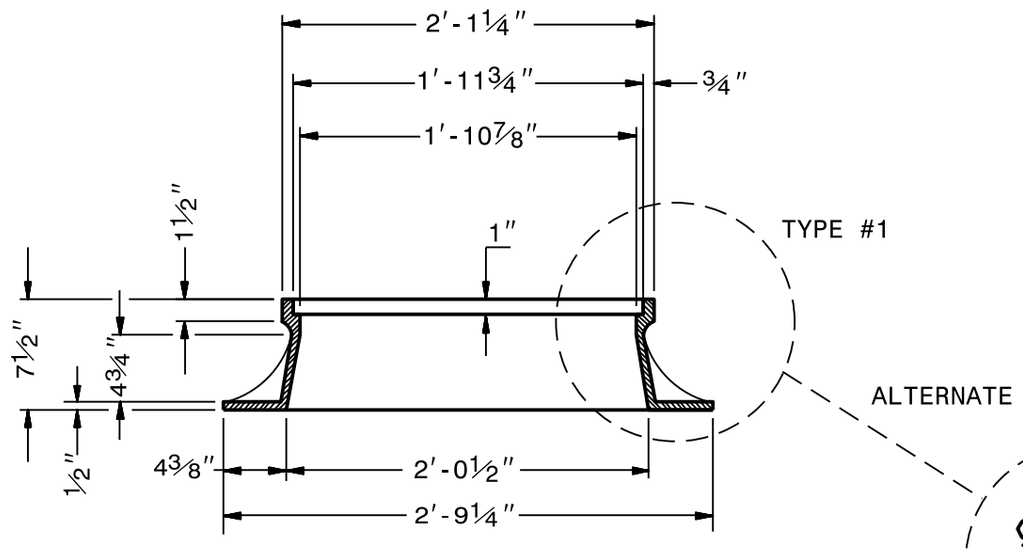
SOLID COVER SHOWN PERFORATED. PERFORATED AVAILABLE IF SPECIFIED.
STATE USE OF SYSTEM ON COVER
(I.E.: SEWER, STORM DRAIN, ELECTRICAL)



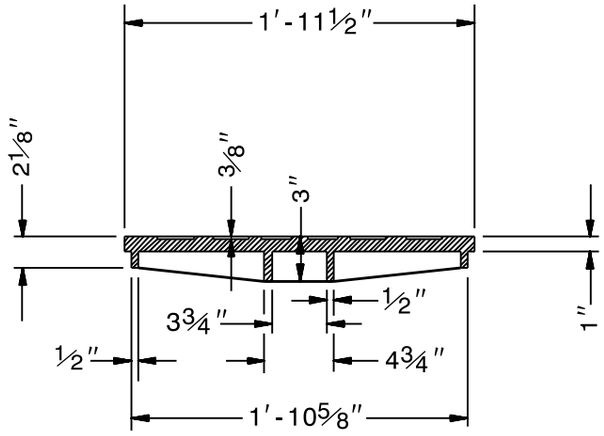
PLAN OF FRAME



PLAN OF COVER



SECTION A-A



SECTION B-B

MINIMUM WEIGHTS - LBS.
FRAME - 180
COVER - 120
TOTAL - 300

STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

1-24

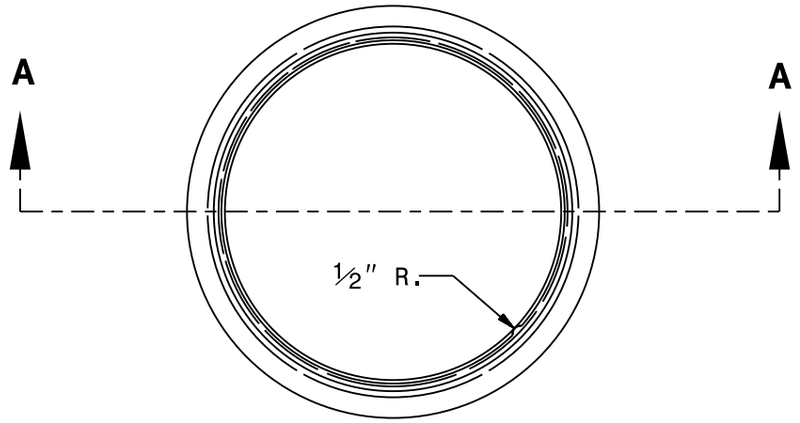
ROADWAY STANDARD DRAWING FOR

MANHOLE FRAME AND COVER

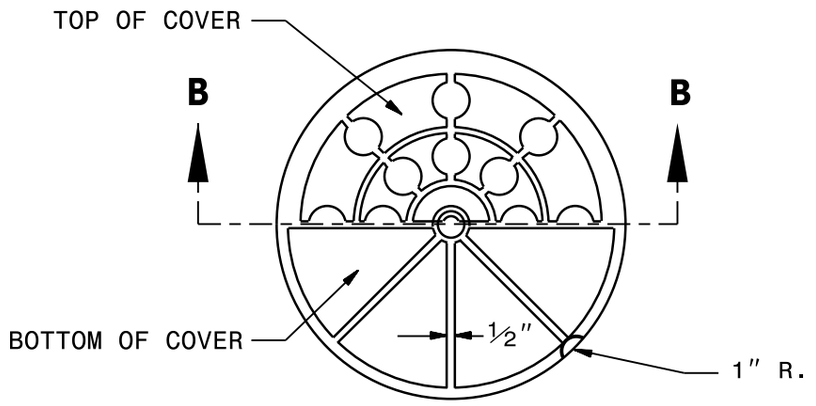
SHEET 1 OF 1

840.54

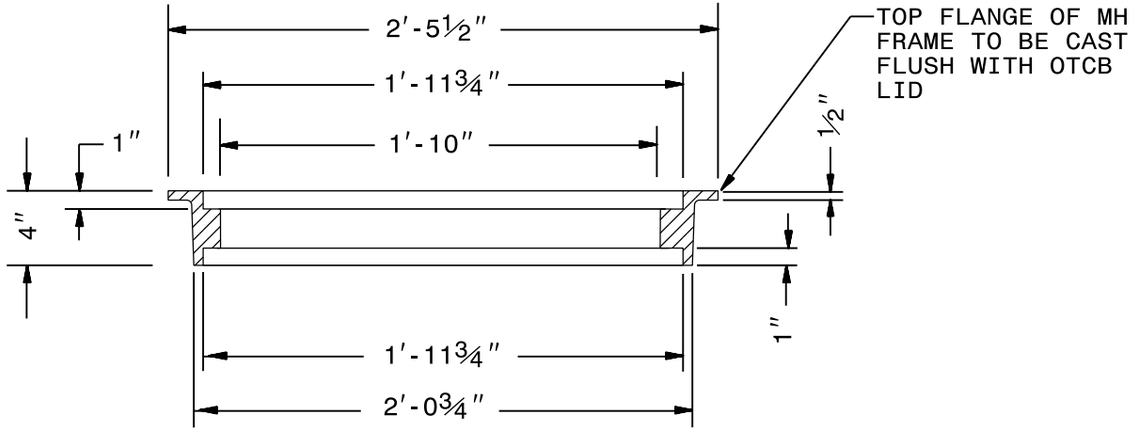
SOLID COVER SHOWN PERFORATED. PERFORATED AVAILABLE IF SPECIFIED.
STATE USE OF SYSTEM ON COVER
(I.E.: SEWER, STORM DRAIN, ELECTRICAL)



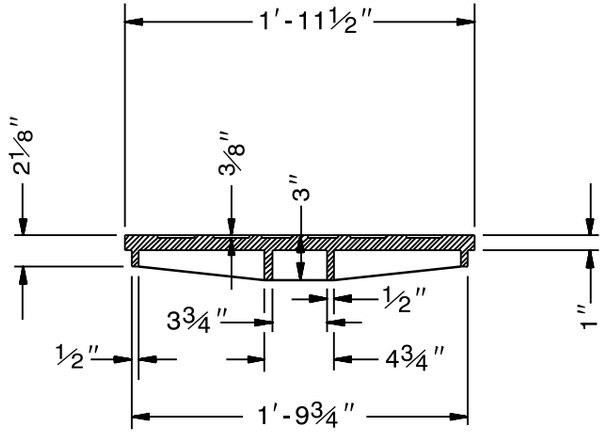
PLAN OF FRAME



PLAN OF COVER



SECTION A-A



SECTION B-B

MINIMUM WEIGHTS - LBS.
FRAME - 180
COVER - 120
TOTAL - 300

STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

1-24

ROADWAY STANDARD DRAWING FOR

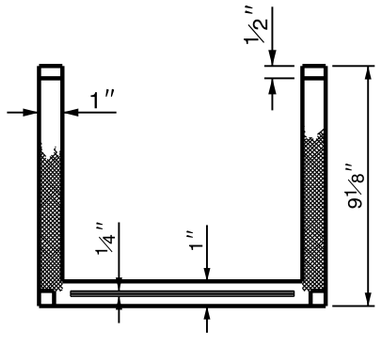
MANHOLE FRAME AND COVER

(FLUSH WITH SLAB FOR OPEN THROAT CATCH BASIN)

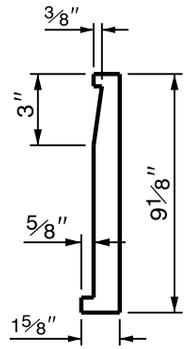
SHEET 1 OF 1

840.55

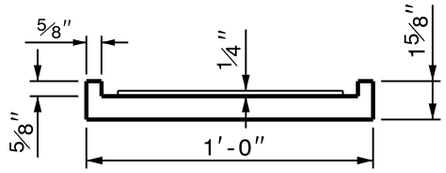
NOTES:
INSTALL ALL STEPS PROTRUDING 4″ FROM INSIDE FACE OF STRUCTURE WALL.
STEPS DIFFERING IN DIMENSIONS, CONFIGURATION, OR MATERIALS FROM THOSE SHOWN MAY ALSO BE USED PROVIDED THE CONTRACTOR HAS FURNISHED THE ENGINEER WITH DETAILS OF THE PROPOSED STEPS AND HAS RECEIVED WRITTEN APPROVAL FROM THE ENGINEER FOR THE USE OF SUCH STEPS.



PLAN

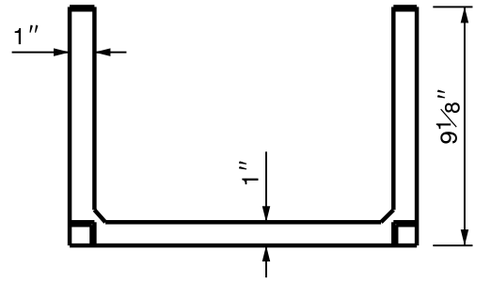


SIDE ELEVATION

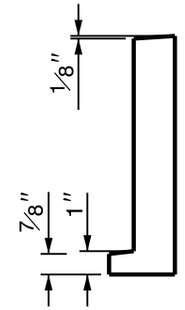


ELEVATION

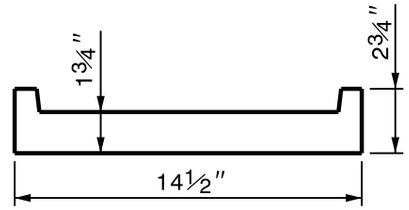
CAST IRON



PLAN

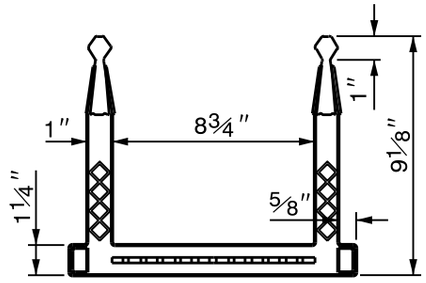


SIDE ELEVATION

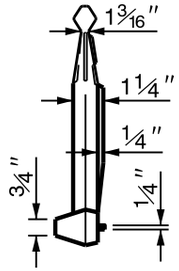


ELEVATION

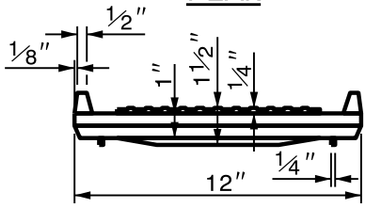
CAST IRON



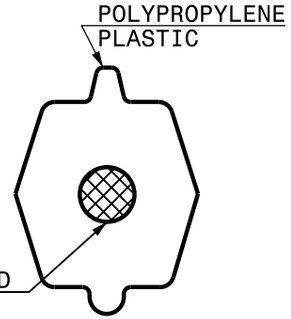
PLAN



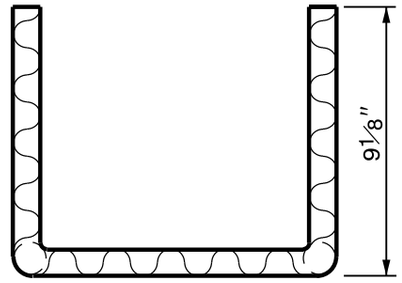
SIDE ELEVATION
COMPOSITE



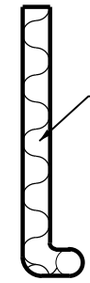
ELEVATION



SECTION A-A

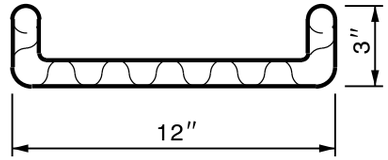


PLAN



SIDE ELEVATION

REINFORCING STEEL



ELEVATION

NOTE:
DO NOT USE IN
SANITARY SEWER MANHOLES.

STATE OF
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RALEIGH, N.C.

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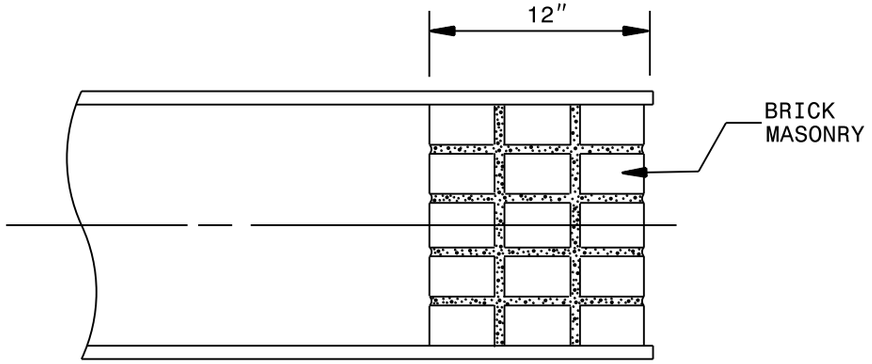
ROADWAY STANDARD DRAWING FOR

DRAINAGE STRUCTURE STEPS

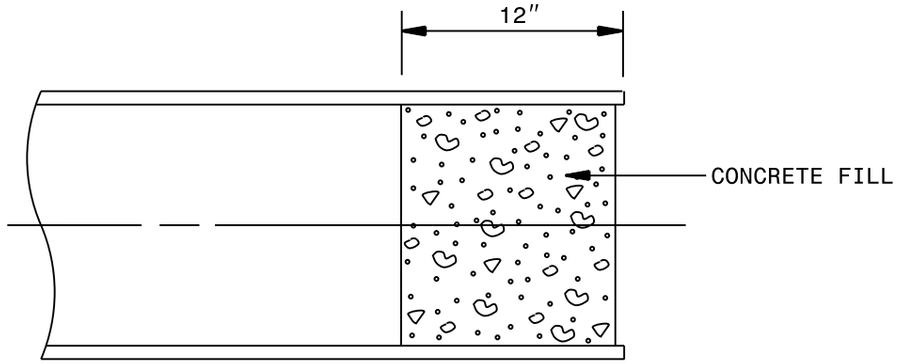
SHEET 1 OF 1

840.66



SECTION OF MASONRY

PIPE PLUG



SECTION OF CONCRETE

PIPE PLUG

QUANTITIES	
PIPE SIZE	CUBIC YARDS
12″	0.029
15″	0.045
18″	0.065
24″	0.116
30″	0.182
36″	0.262
42″	0.356
48″	0.465
54″	0.589
60″	0.727
66″	0.880

NOTE:

EITHER BRICK MASONRY OR CONCRETE MAY BE USED.

CONCRETE BRICK MAY BE USED IN LIEU OF CLAY BRICK. JUMBO BRICK WILL BE PERMITTED.

NOTE:

USE PAY LIMITS (C.Y.) FOR PIPE PLUGS 12″ IN THICKNESS ONLY.

STATE OF
NORTH CAROLINA
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RALEIGH, N.C.

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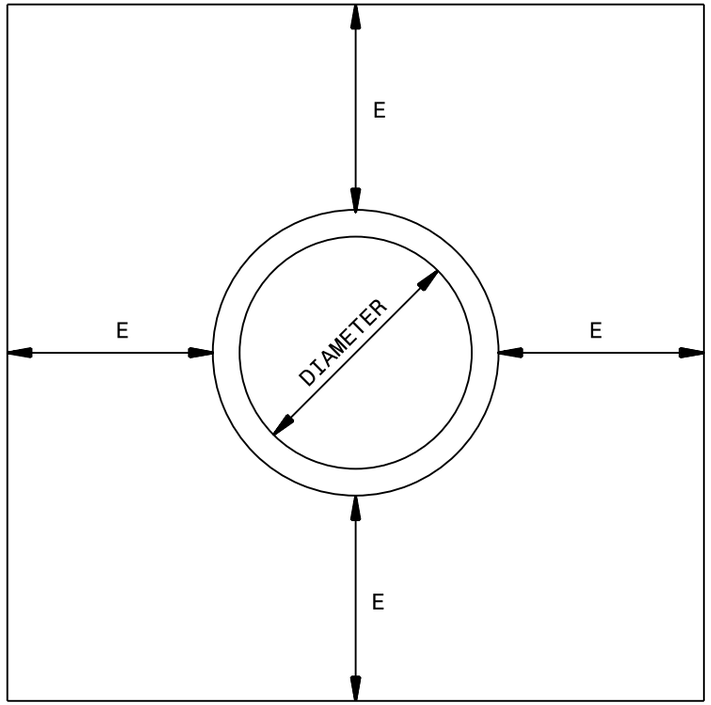
ROADWAY STANDARD DRAWING FOR

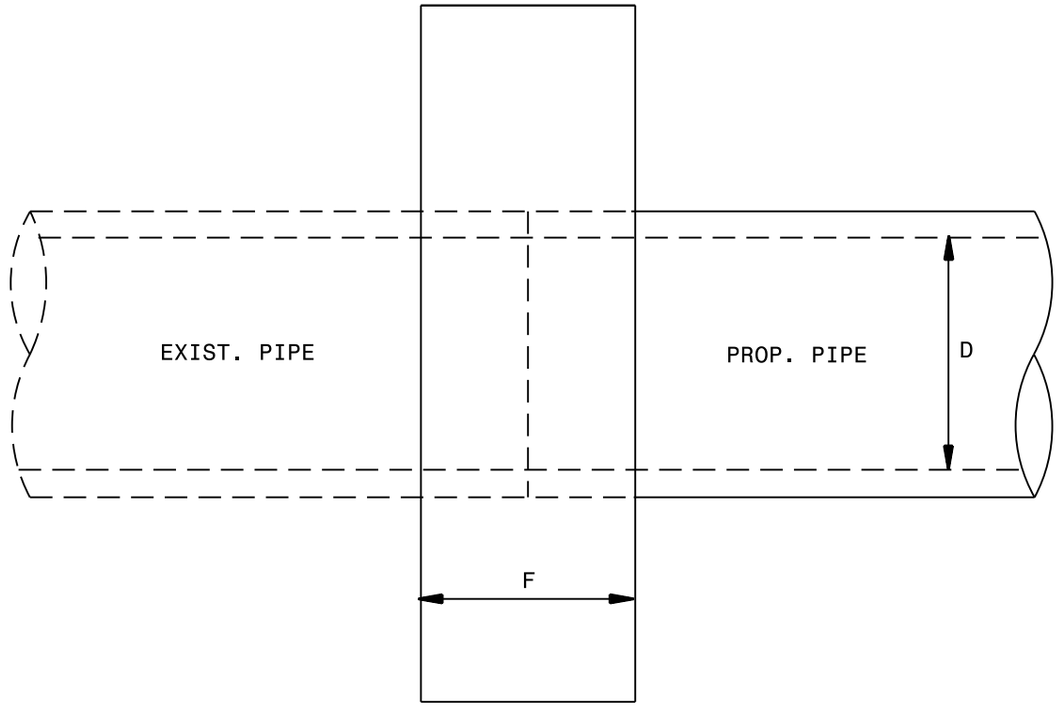
CONCRETE AND BRICK PIPE PLUG

SHEET 1 OF 1

840.71



ELEVATION



SIDE ELEVATION

GENERAL NOTES:

USE PIPE COLLAR FOR EXTENDING EXISTING CONCRETE PIPE CULVERTS AT LOCATIONS SHOWN ON PLANS OR AS DIRECTED BY THE ENGINEER. THIS INCLUDES EXTENDING EXISTING PIPES WITH PIPES OF DIFFERENT MATERIALS.

CONSTRUCT THE PIPE COLLAR WITH CLASS "B" OR BETTER CONCRETE.

OBSERVE ALL REQUIREMENTS OF SECTION 840 OF THE STANDARD SPECIFICATIONS.

* USE 12 INCH DIAMETER VALUES FOR PIPE DIAMETERS LESS THAN 12 INCH.

D	E	F	CU. YD.
12″	12″	12″	0.3528
15″	12″	12″	0.3990
18″	12″	12″	0.4465
24″	12″	12″	0.5526
30″	12″	12″	0.6560
36″	12″	12″	0.7640
42″	12″	12″	0.8856
48″	12″	12″	1.0126
54″	18″	18″	2.5793
60″	18″	18″	2.8506
66″	18″	18″	3.1307
72″	18″	18″	3.4176

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STATE OF
NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

ROADWAY STANDARD DRAWING FOR

PIPE COLLAR