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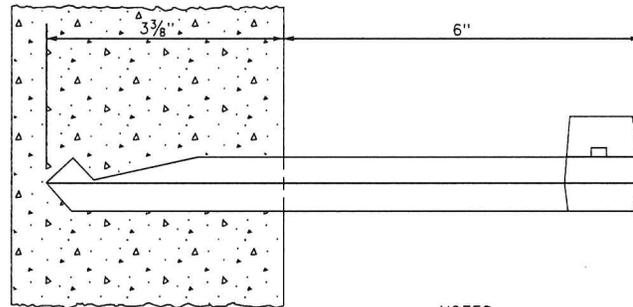
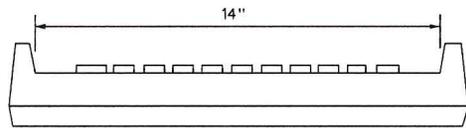
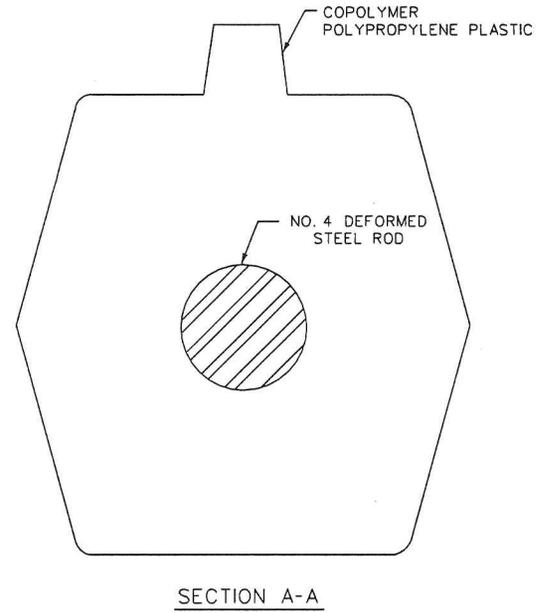
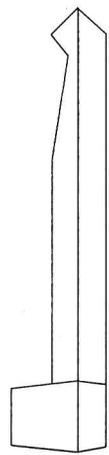
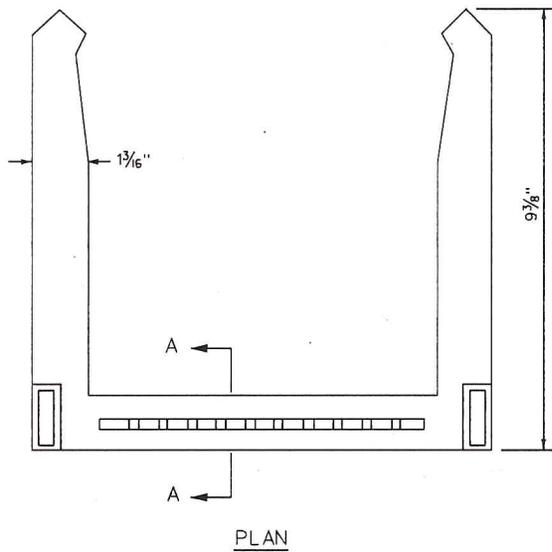
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320.05: ENDWALLS FOR MULTIPLE PIPE CULVERTS (12"-36" PIPES – 45 SKEW)

320.06: REINFORCEMENT IN PCC ENDWALLS



NOTES:

1. REFER TO DDOT STD. SPECIFICATIONS 309.01 FOR ADDITIONAL MANHOLE STEP DETAILS.
2. STEPS SHALL BE PLACED INTO WET CONCRETE WALL DURING MANUFACTURE OR MORTARED INTO HOLES AFTER CONCRETE HAS SET.

ISSUED:	8/2015
REVISION	APPROVAL

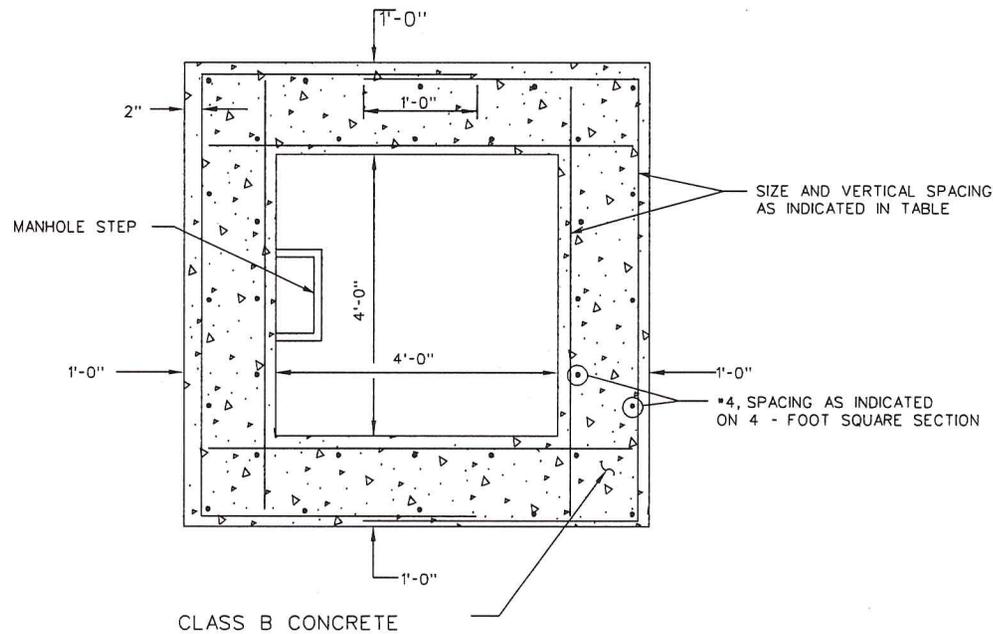
RECOMMENDED: *Adil Raza*
PROJECT MANAGER

APPROVED: *Muhammad Kholid*
CHIEF ENGINEER

MANHOLE STEPS

d. DISTRICT OF COLUMBIA
DEPARTMENT OF TRANSPORTATION

DWG. NO. 309.01



PLAN

DEPTH (FT.)	SIZE AND SPACING OF HORIZ. BARS
35	*5 @ 7 1/2"
30	*5 @ 12"
25	*5 @ 12"
20	*5 @ 12"
15	*5 @ 12"
10	*5 @ 12"

NOTES:

1. FOR DEPTHS GREATER THAN 20 FEET, SPECIAL FEATURES MAY BE REQUIRED SUCH AS PLATFORMS, INTERIOR MANHOLE COVERS, ENLARGED SECTION, ETC.
2. ALL VERTICAL BARS ARE *4, SPACED AS SHOWN ON SECTION.
3. ALL STEEL SHALL HAVE 2" COVER UNLESS OTHERWISE SPECIFIED.
4. ALL CONCRETE TO BE CLASS B, AIR ENTRAINED, TYPE II CEMENT.
5. REINFORCING STEEL SHALL CONFORM TO AASHTO M 31, GRADE 60.

ISSUED:	8/2015
REVISION	APPROVAL

RECOMMENDED: *Adil Rijaz*
PROJECT MANAGER

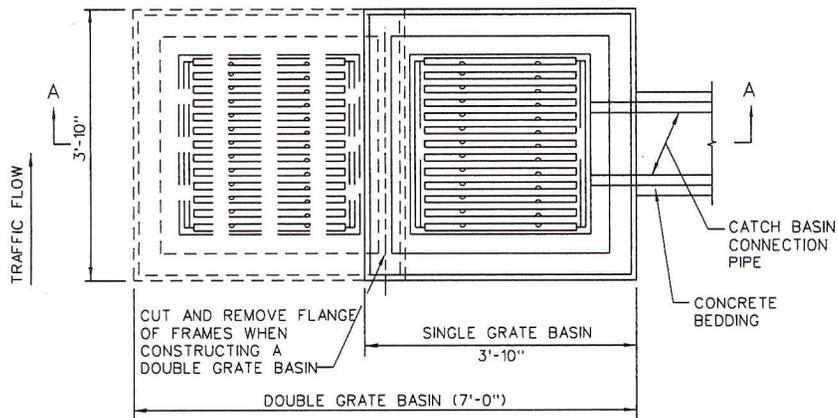
APPROVED: *Muhammed Khalid*
CHIEF ENGINEER

REINFORCED CONCRETE RISER SECTION FOR MANHOLES

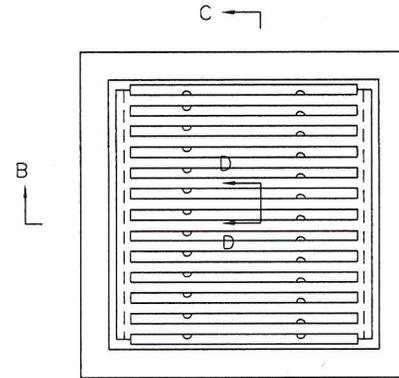
d.

DISTRICT OF COLUMBIA
DEPARTMENT OF TRANSPORTATION

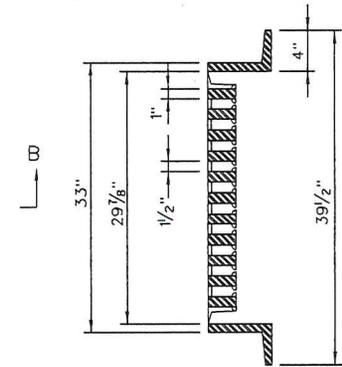
DWG. NO. 309.02



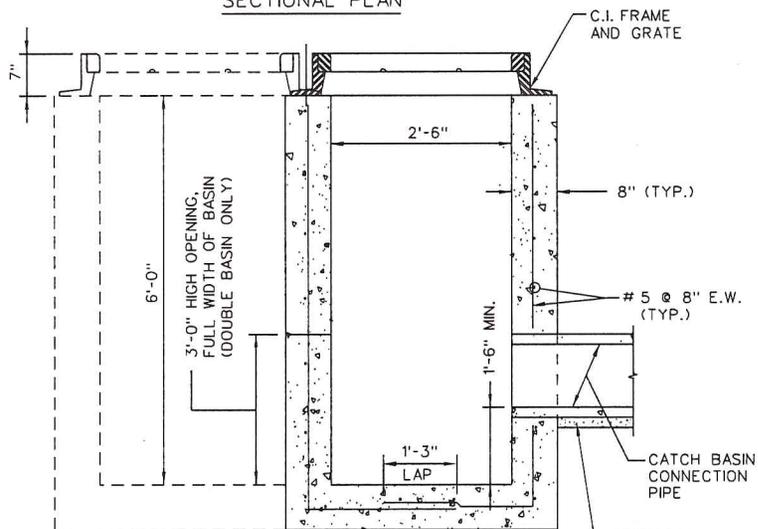
SECTIONAL PLAN



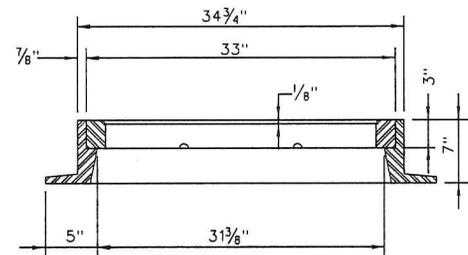
PLAN



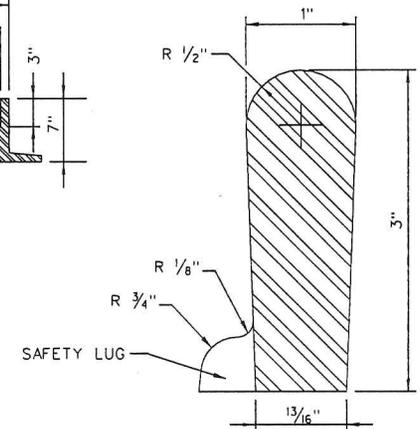
SECTION C - C



SECTION A - A



SECTION B - B



SECTION D - D

NOTES:

1. GRAY IRON CASTINGS PER AASHTO M105, CLASS 30A.
2. ALL MACHINE FINISH TO BE A.S.A. SPECIFICATION, ROUGHNESS SYMBOL 250, TOLERANCE - 0 + 1/16".
3. ALL CONCRETE TO BE CLASS B, AIR ENTRAINED, TYPE II CEMENT.
4. REINFORCING SHALL BE CENTERED IN WALL AND BASE AND SHALL CONFORM TO AASHTO M31 GRADE 60.
5. FOR INSTALLATION OR MAINTENANCE, CONTRACTOR SHALL REFER TO LATEST DC WATER SPECIFICATIONS AND DETAILS.
6. INSTALLATION SHALL BE PER APPROVAL OF DDOT CHIEF ENGINEER.

ISSUED:	8/2015
REVISION	APPROVAL

RECOMMENDED: *Adil Raj*
PROJECT MANAGER

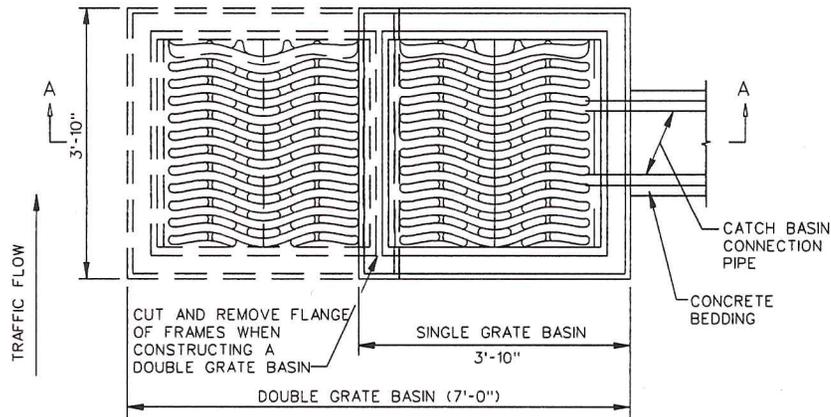
APPROVED: *Muhammed Khalid*
CHIEF ENGINEER

GRATE TYPE CATCH BASIN
WITH SAFETY GRATE

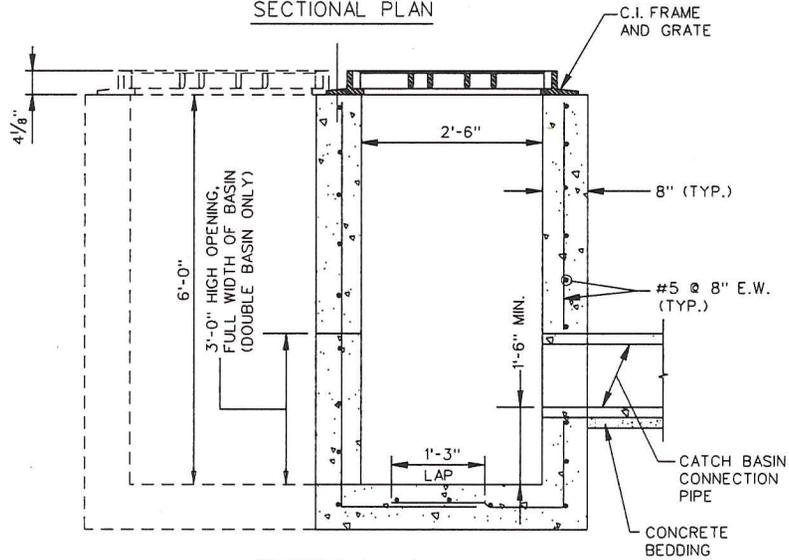
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DISTRICT OF COLUMBIA
DEPARTMENT OF TRANSPORTATION

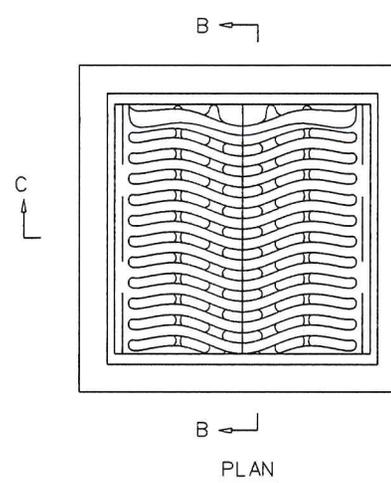
DWG. NO. 310.01



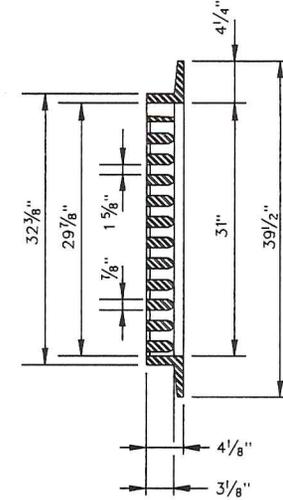
SECTIONAL PLAN



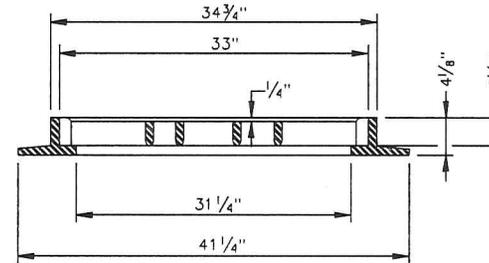
SECTION A - A



PLAN



SECTION B - B



SECTION C - C

NOTES:

1. GRAY IRON CASTINGS PER AASHTO M105, CLASS 30A.
2. ALL MACHINE FINISH TO BE A.S.A. SPECIFICATION, ROUGHNESS SYMBOL 250, TOLERANCE - 0 + 1/16".
3. ALL CONCRETE TO BE CLASS B, AIR ENTRAINED, TYPE II CEMENT.
4. REINFORCING SHALL BE CENTERED IN WALL AND BASE AND SHALL CONFORM TO AASHTO M31 GRADE 60.
5. FOR INSTALLATION OR MAINTENANCE, CONTRACTOR SHALL REFER TO LATEST DC WATER SPECIFICATIONS AND DETAILS.
6. INSTALLATION SHALL BE PER APPROVAL OF DDOT CHIEF ENGINEER.

ISSUED:	8/2015
REVISION	APPROVAL

RECOMMENDED: *Adil Rijj*
PROJECT MANAGER

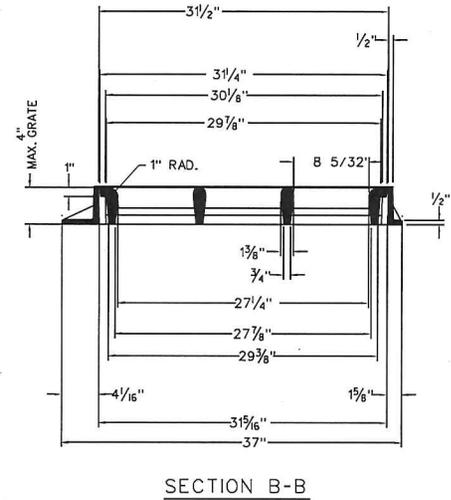
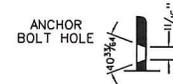
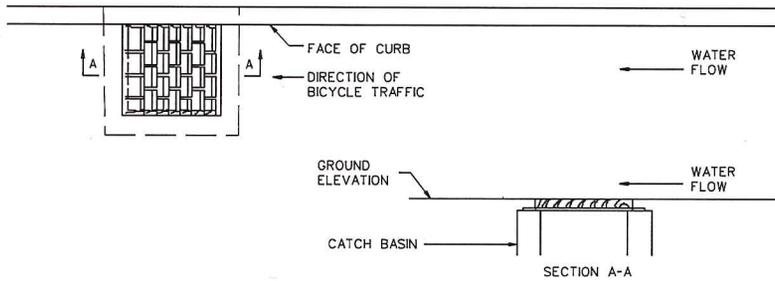
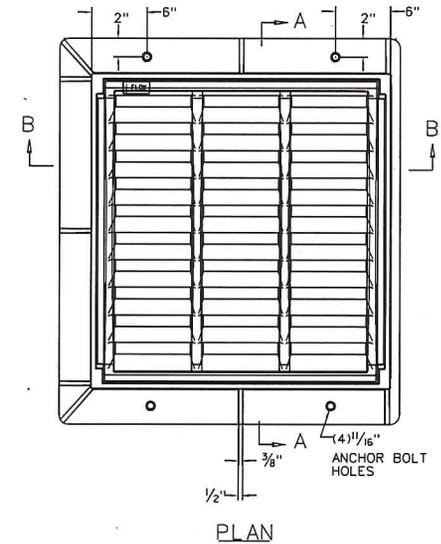
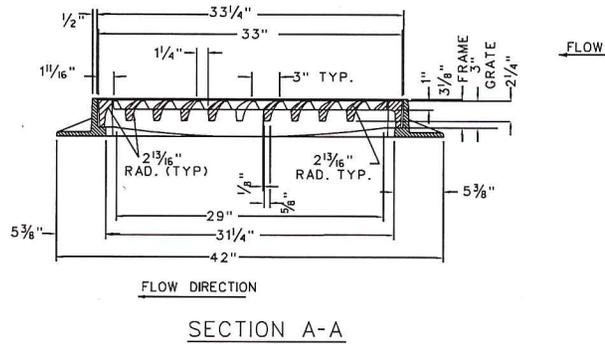
APPROVED: *Muhammed Kholid*
CHIEF ENGINEER

GRATE TYPE CATCH BASIN
WITH SERPENTINE GRATE

d.

DISTRICT OF COLUMBIA
DEPARTMENT OF TRANSPORTATION

DWG. NO. 310.02



NOTES:

1. GRAY IRON CASTINGS PER AASHTO M105, CLASS 30A.
2. ALL MACHINE FINISH TO BE A.S.A. SPECIFICATION, ROUGHNESS SYMBOL 250, TOLERANCE - 0 + 1/16".
3. ALL CONCRETE TO BE CLASS B, AIR ENTRAINED, TYPE II CEMENT.
4. REINFORCING SHALL BE CENTERED IN WALL AND BASE AND SHALL CONFORM TO AASHTO M31 GRADE 60.
5. FOR INSTALLATION OR MAINTENANCE, CONTRACTOR SHALL REFER TO LATEST DC WATER SPECIFICATIONS AND DETAILS.

ISSUED:	8/2015
REVISION	APPROVAL

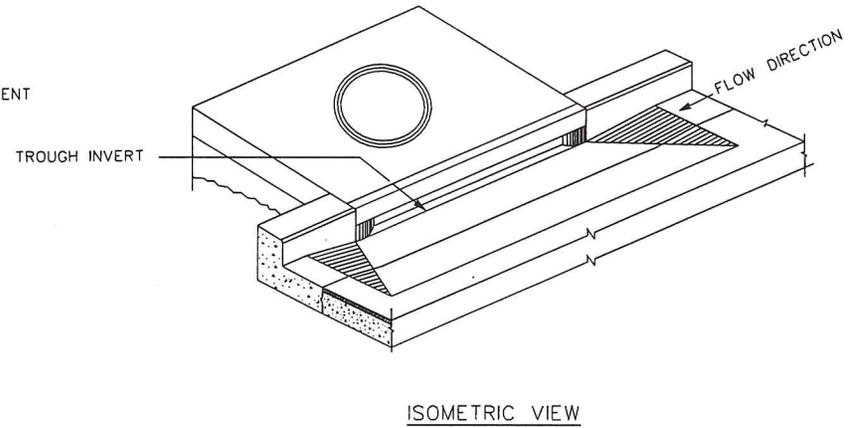
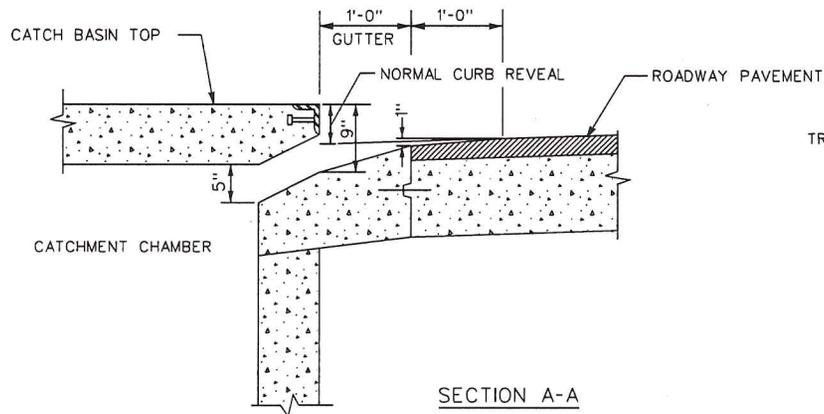
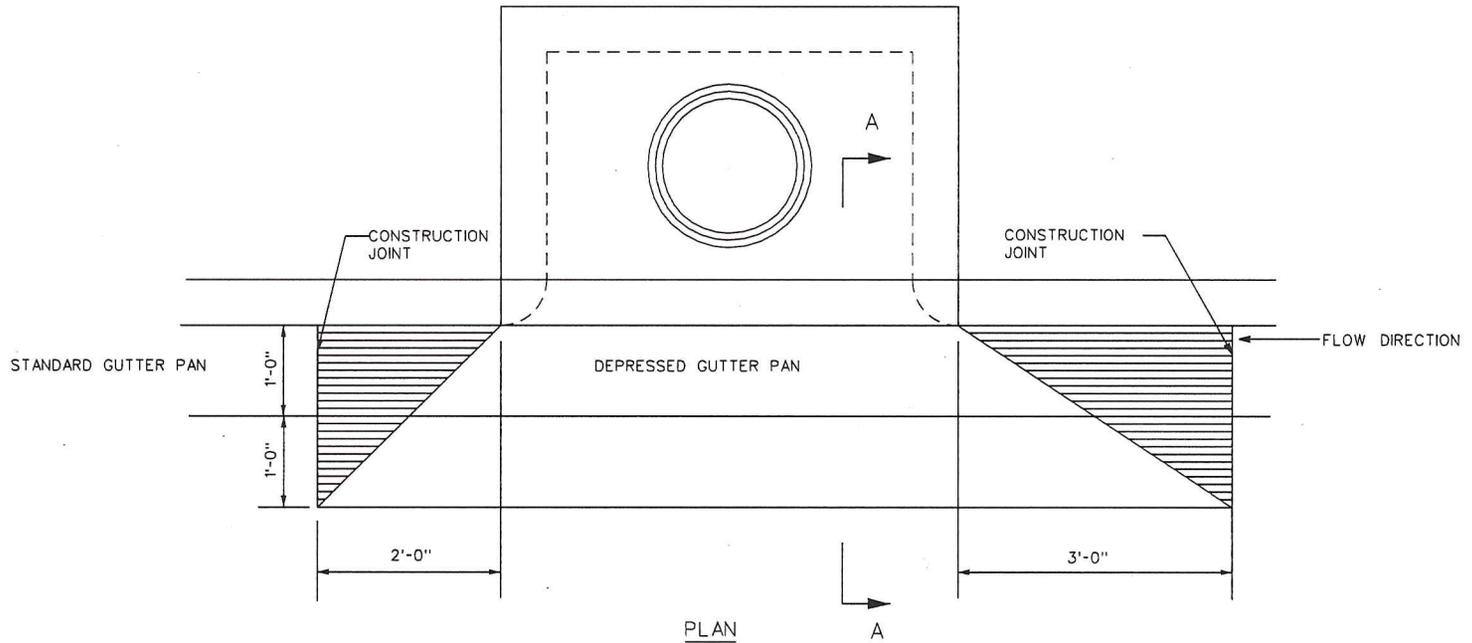
RECOMMENDED: *Attilio Ruj*
PROJECT MANAGER

APPROVED: *Muhammed Khalid*
CHIEF ENGINEER

CURVE VANE GRATE WITH FRAME
FOR SINGLE TYPE S INLET
(FOR BICYCLE LANES)

d. DISTRICT OF COLUMBIA
DEPARTMENT OF TRANSPORTATION

DWG. NO. 310.03



ISSUED: 8/2015

REVISION	APPROVAL

RECOMMENDED: *Adil Raj*

PROJECT MANAGER

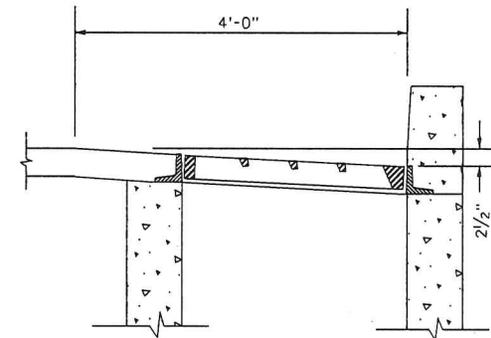
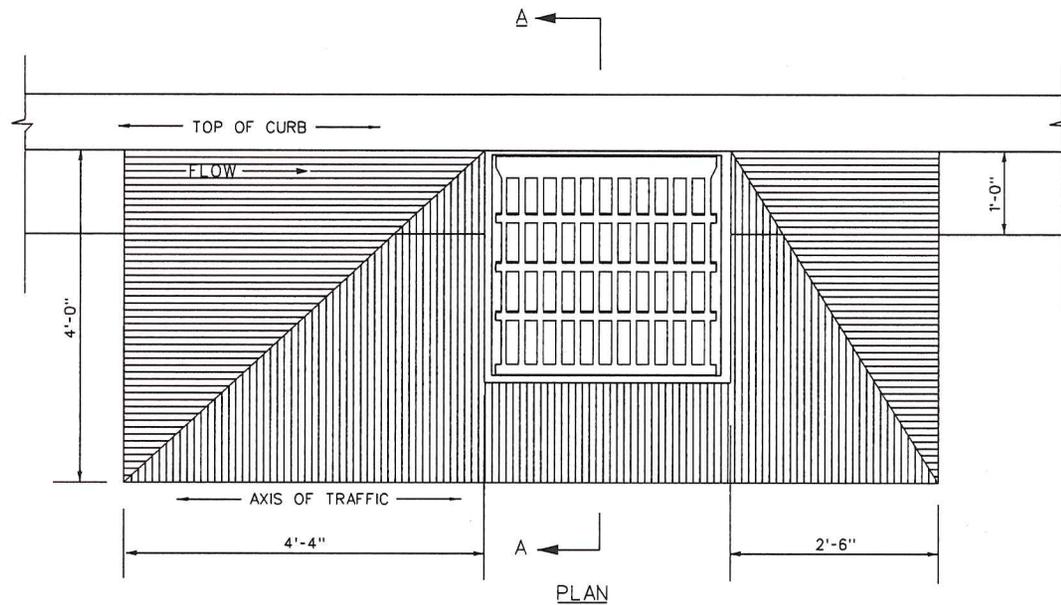
APPROVED: *Muhammed Khelid*

CHIEF ENGINEER

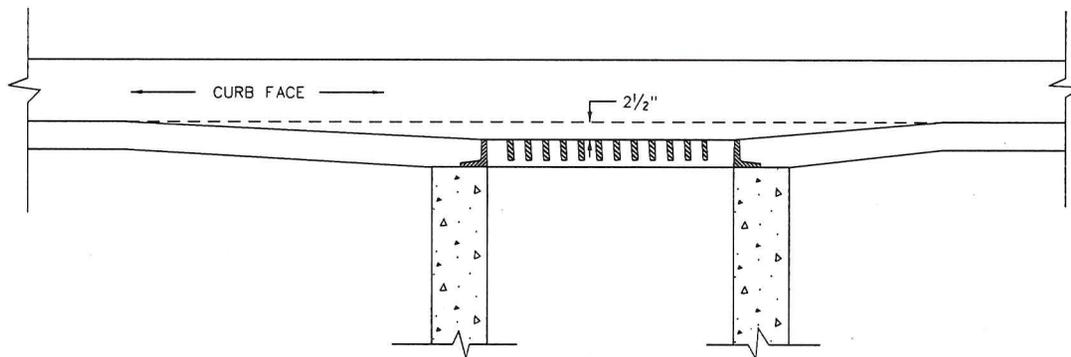
METHOD OF DEPRESSING GUTTER

d. DISTRICT OF COLUMBIA
DEPARTMENT OF TRANSPORTATION

DWG. NO. 310.04



SECTION A-A



SECTION AT FLOW LINE

ISSUED:	8/2015
REVISION	APPROVAL

RECOMMENDED: *Adil Raza*
PROJECT MANAGER

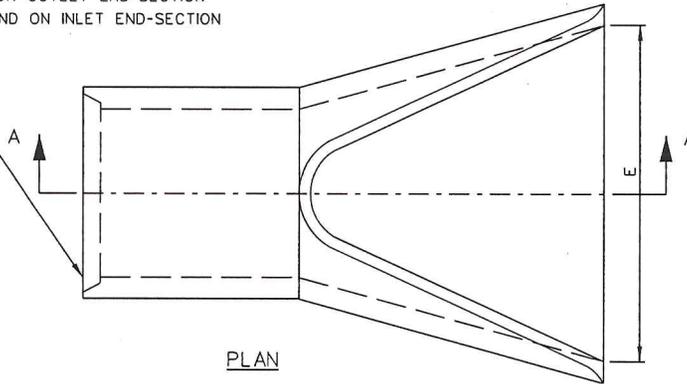
APPROVED: *Muhammed Khalid*
CHIEF ENGINEER

METHOD OF DEPRESSING PAVEMENT
(FOR GUTTER OPENING INLET)

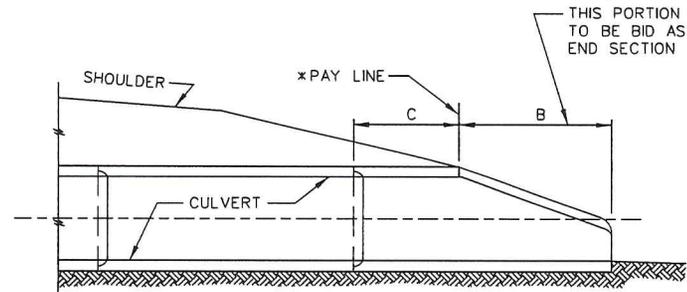
d. DISTRICT OF COLUMBIA
DEPARTMENT OF TRANSPORTATION

DWG. NO. 310.05

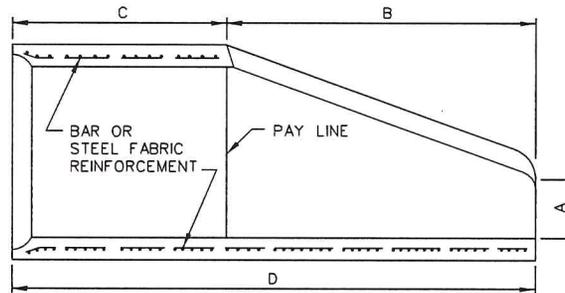
HUB END ON OUTLET END-SECTION
 SPIGOT END ON INLET END-SECTION



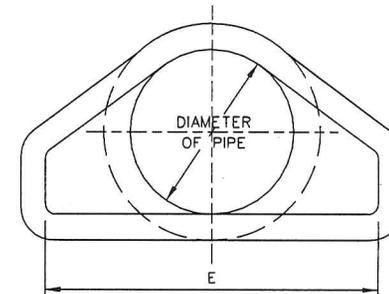
PLAN



SLOPE DETAIL



SECTION A-A



END VIEW

END SECTION DIMENSIONS					
DIAM.	A	B	C	D	E
12"	4"	2'-0"	4'-0 ⁷ / ₈ "	6'-0 ⁷ / ₈ "	2'-0"
15"	6"	2'-3"	3'-10"	6'-1"	2'-6"
18"	9"	2'-3"	3'-10"	6'-1"	3'-0"
24"	9 ¹ / ₂ "	3'-7"	2'-6"	6'-1"	4'-0"
30"	1'-0"	4'-6"	1'-7 ³ / ₄ "	6'-1 ³ / ₄ "	5'-0"
36"	1'-3"	5'-3"	2'-10 ³ / ₄ "	8'-1 ³ / ₄ "	6'-0"
42"		5'-3"	2'-11"	8'-2"	6'-6"
48"	2'-0"	6'-0"	2'-2"	8'-2"	7'-0"

NOTE:

1. THE PORTION OF THE END SECTION DIMENSIONED "C" SHALL BE PAID FOR AT THE UNIT PRICE BID FOR THE EQUIVALENT DIAMETER CULVERT PIPE, MEASURED TO THE NEAREST FOOT FOR EACH PIPE INSTALLATION. THE PORTION DIMENSIONED "B" SHALL BE PAID FOR AS "FLARED END SECTION".

ISSUED: 8/2015
 REVISION APPROVAL

RECOMMENDED: *Adil Raza*
 PROJECT MANAGER

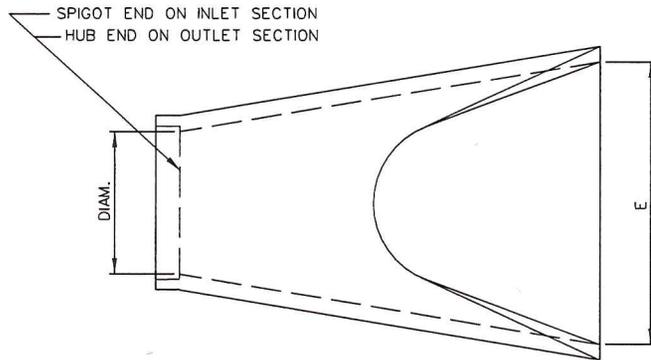
APPROVED: *Muhammed Khalid*
 CHIEF ENGINEER

FLARED END-SECTION
 (FOR 12" - 48" CONCRETE PIPE CULVERTS)

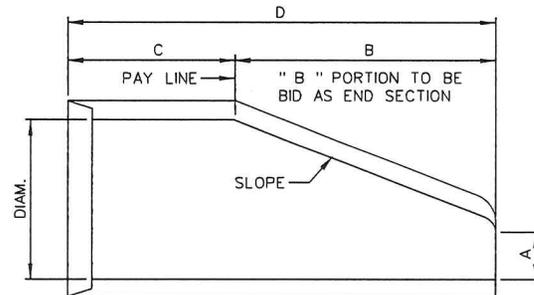


DISTRICT OF COLUMBIA
 DEPARTMENT OF TRANSPORTATION

DWG. NO. 314.01



PLAN



LONGITUDINAL SECTION

TABLE OF DIMENSIONS						
CONCRETE END SECTION						
DIAM.	SLOPE	A	B	C	D	E
15"	3:1	6½"	2'-4"	3'-10"	6'-2"	2'-6"
18"	3:1	10¼"	2'-2"	4'-0"	6'-2"	3'-0"
24"	3:1	11"	3'-7"	2'-8"	6'-3"	4'-0"
30"	3:1	1'-1"	4'-5"	1'-10"	6'-3"	5'-0"
36"	3:1	1'-3½"	5'-3"	2'-11"	8'-2"	6'-0"
42"	3:1	1'-9¼"	5'-5"	2'-10"	8'-3"	6'-6"
48"	3:1	2'-1"	6'-0"	2'-2"	8'-2"	7'-0"
54"	2.4:1	2'-5"	5'-2"	2'-10"	8'-0"	7'-6"
60"	2:1	2'-7"	4'-11"	3'-8½"	8'-7½"	8'-0"
66"	2:1	2'-4"	6'-6"	1'-9"	8'-3"	8'-6"
72"	2:1	2'-10"	6'-6"	1'-9"	8'-3"	9'-0"

NOTES:

1. END SECTIONS MUST BE REINFORCED TO CONFORM WITH CLASS IV PIPE.
2. CONTRACTOR HAS OPTION OF FURNISHING END SECTIONS CONFORMING TO DETAILS ON THIS SHEET OR END SECTIONS CONFORMING TO DETAILS ON DWG. NO. 314.02.

ISSUED:	8/2015
REVISION	APPROVAL

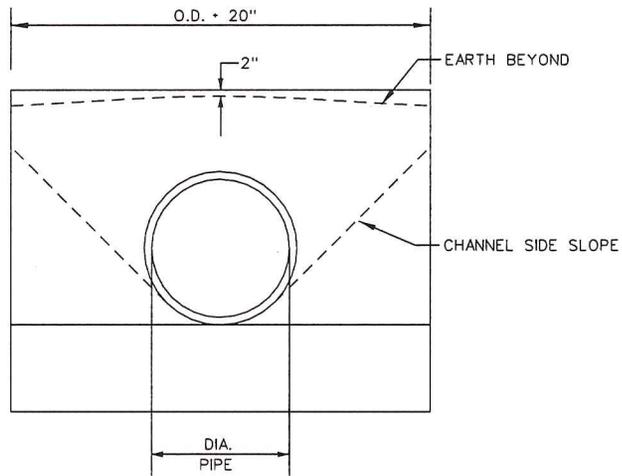
RECOMMENDED: *Adil Riaz*
PROJECT MANAGER

APPROVED: *Muhammed Khalid*
CHIEF ENGINEER

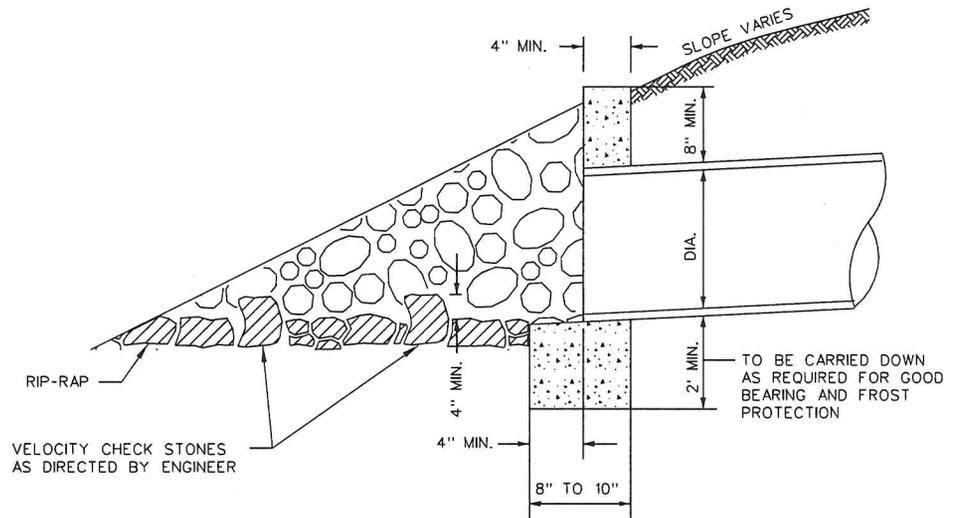
FLARED END-SECTION
(FOR 15" - 72" CONCRETE PIPE CULVERTS)

d. DISTRICT OF COLUMBIA
DEPARTMENT OF TRANSPORTATION

DWG. NO. 314.02



ELEVATION



NOTE:

1. ALL CONCRETE SHALL BE CLASS B, AIR ENTRAINED, TYPE II CEMENT.

ISSUED:	8/2015
REVISION	APPROVAL

RECOMMENDED: *Adil Raj*
PROJECT MANAGER

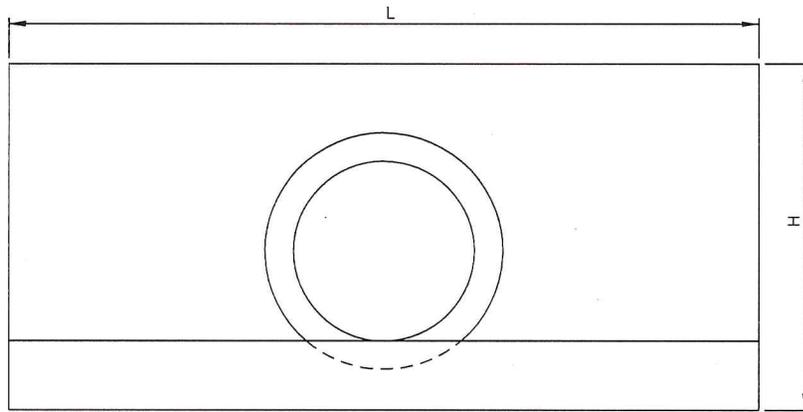
APPROVED: *Muhammed Kholid*
CHIEF ENGINEER

STANDARD HEADWALL FOR 24 INCH AND SMALLER DIAMETER OUTLET

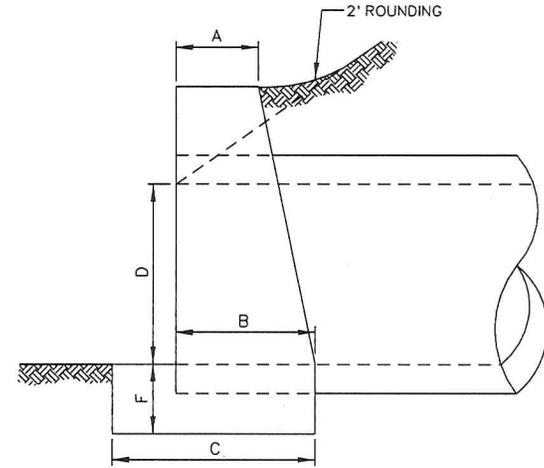
d.

DISTRICT OF COLUMBIA
DEPARTMENT OF TRANSPORTATION

DWG. NO. 320.01



FRONT ELEVATION



END ELEVATION

DIAMETER OF PIPE CULVERT (D)						
	12"	15"	18"	24"	30"	36"
A	0'-6"	0'-8"	0'-9"	0'-11"	1'-0"	1'-0"
B	0'-11"	1'-1/2"	1'-3"	1'-6"	1'-9"	2'-0"
C	1'-4"	1'-7"	1'-9"	2'-2"	2'-6"	2'-9"
F	0'-6"	0'-8"	0'-8"	0'-9"	0'-9"	0'-9"
H	2'-3"	2'-11"	3'-2"	3'-9"	4'-3"	4'-9"
L	4'-0"	5'-0"	6'-0"	8'-0"	10'-0"	12'-0"

SEE DWG. NO. 320.06
FOR STEEL REINFORCING

CUBIC YARDS CONCRETE						
CONC. PIPE	0.241	0.492	0.697	1.319	2.067	2.947
C. M. PIPE	0.257	0.521	0.739	1.398	2.198	3.146

ISSUED: 8/2015
REVISION APPROVAL

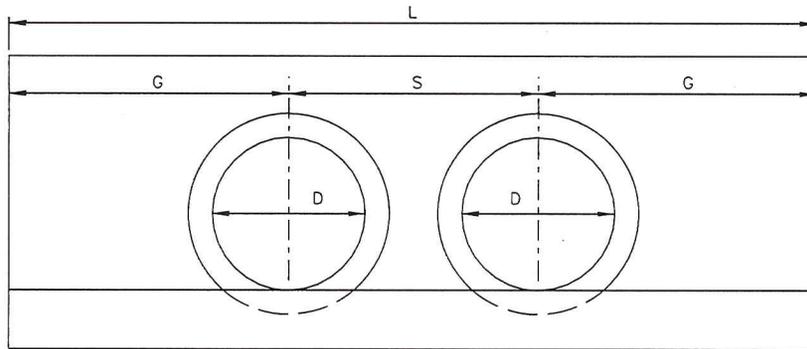
RECOMMENDED: *Adil Riaz*
PROJECT MANAGER

APPROVED: *Muhammed Khalid*
CHIEF ENGINEER

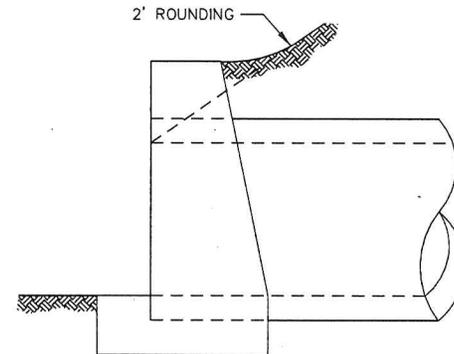
ENDWALLS
FOR 12" - 36" PIPE CULVERTS

d. DISTRICT OF COLUMBIA
DEPARTMENT OF TRANSPORTATION

DWG. NO. 320.02



FRONT ELEVATION



END ELEVATION

FOR CONCRETE PIPE					
DIA. (D) OF PIPE	S	G	L	CU. YDS. CONC. ONE DOUBLE ENDWALL	INCREASE CU. YDS. EACH ADD. PIPE
12"	1'-10"	2'-0"	5'-10"	0.329	0.088
15"	2'-3"	2'-6"	7'-3"	0.671	0.179
18"	2'-8"	3'-0"	8'-8"	0.941	0.244
24"	3'-6"	4'-0"	11'-6"	1.763	0.444
30"	4'-4"	5'-0"	14'-4"	2.730	0.663
36"	5'-2"	6'-0"	17'-2"	3.854	0.907

FOR CORRUGATED METAL PIPE					
DIA. (D) OF PIPE	S	G	L	CU. YDS. CONC. ONE DOUBLE ENDWALL	INCREASE CU. YDS. EACH ADD. PIPE
12"	1'-7"	2'-0"	5'-7"	0.344	0.087
15"	1'-11/2"	2'-6"	6'-11/2"	0.696	0.175
18"	2'-4"	3'-0"	8'-4"	0.980	0.241
24"	3'-1"	4'-0"	11'-1"	1.840	0.442
30"	3'-10"	5'-0"	13'-10"	2.868	0.670
36"	4'-7"	6'-0"	16'-7"	4.076	0.931

NOTE:

1. QUANTITIES GIVEN ARE FOR ONE ENDWALL. ALL DIMENSIONS NOT GIVEN IN TABLE ARE THE SAME AS THOSE FOR SINGLE ENDWALLS FOR THE SAME SIZE OF PIPE. (SEE DWG. NO. 320.02).

ISSUED:	8/2015
REVISION	APPROVAL

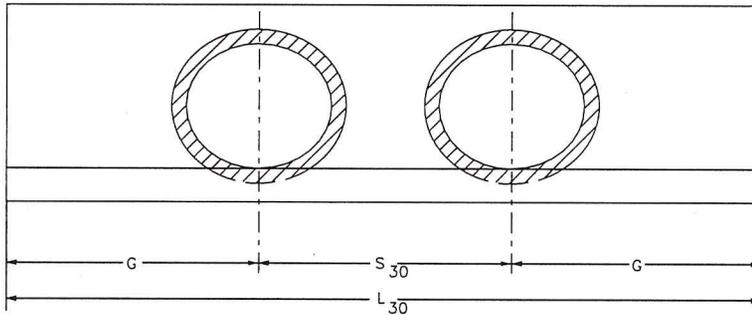
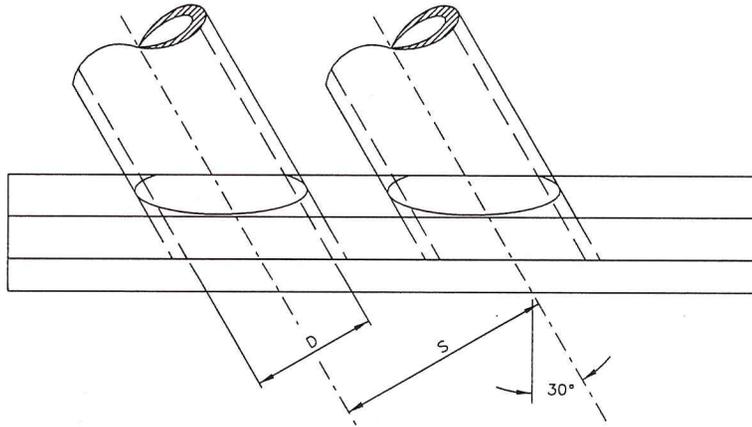
RECOMMENDED: *Adil Riaz*
PROJECT MANAGER

APPROVED: *Muhammed Kholid*
CHIEF ENGINEER

ENDWALLS
FOR MULTIPLE PIPE CULVERTS
12" - 36" PIPES

d. DISTRICT OF COLUMBIA
DEPARTMENT OF TRANSPORTATION

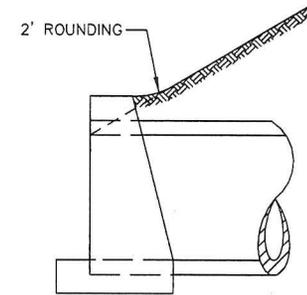
DWG. NO. 320.03



FRONT ELEVATION

NOTE:

1. QUANTITIES GIVEN ARE FOR ONE ENDWALL. ALL DIMENSIONS NOT GIVEN IN TABLE ARE THE SAME AS THOSE FOR SINGLE ENDWALLS FOR THE SAME SIZE OF PIPE. (SEE DWG. NO. 320.02).



END ELEVATION

FOR CONCRETE PIPE						
DIA. (D) OF PIPE	G	S	S ₃₀	L ₃₀	CU.YDS. CONC. ONE DOUBLE ENDWALL	INCREASE CU.YDS. EACH ADD. PIPE
12"	2'-0"	1'-10"	2'-1 ³ / ₈ "	6'-1 ³ / ₈ "	0.336	0.101
15"	2'-6"	2'-3"	2'-7 ¹ / ₈ "	7'-7 ¹ / ₈ "	0.688	0.207
18"	3'-0"	2'-8"	3'-1"	9'-1"	0.962	0.283
24"	4'-0"	3'-6"	4'-0 ¹ / ₂ "	12'-0 ¹ / ₂ "	1.794	0.512
30"	5'-0"	4'-4"	5'-0"	15'-0"	2.769	0.765
36"	6'-0"	5'-2"	5'-11 ⁵ / ₈ "	17'-11 ⁵ / ₈ "	3.895	1.048

FOR CORRUGATED METAL PIPE						
DIA. (D) OF PIPE	G	S	S ₃₀	L ₃₀	CU.YDS. CONC. ONE DOUBLE ENDWALL	INCREASE CU.YDS. EACH ADD. PIPE
12"	2'-0"	1'-7"	1'-10"	5'-10"	0.354	0.100
15"	2'-6"	1'-11 ¹ / ₂ "	2'-3 ¹ / ₈ "	7'-3 ¹ / ₈ "	0.714	0.201
18"	3'-0"	2'-4"	2'-8 ³ / ₈ "	8'-8 ³ / ₈ "	1.005	0.278
24"	4'-0"	3'-1"	3'-6 ³ / ₄ "	11'-6 ³ / ₄ "	1.882	0.510
30"	5'-0"	3'-10"	4'-5 ¹ / ₈ "	14'-5 ¹ / ₈ "	2.929	0.775
36"	6'-0"	4'-7"	5'-3 ¹ / ₂ "	17'-3 ¹ / ₂ "	4.153	1.075

ISSUED: 8/2015

REVISION APPROVAL

RECOMMENDED:

APPROVED:

Adil Rijaz
PROJECT MANAGER

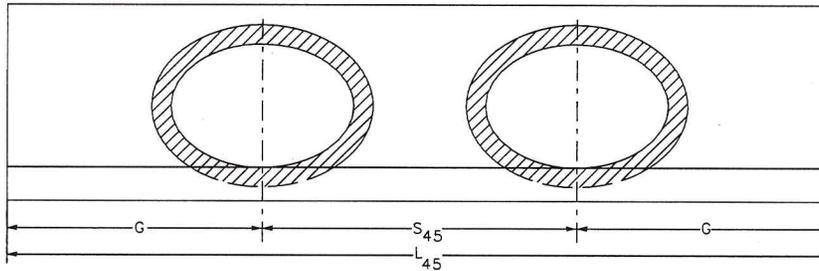
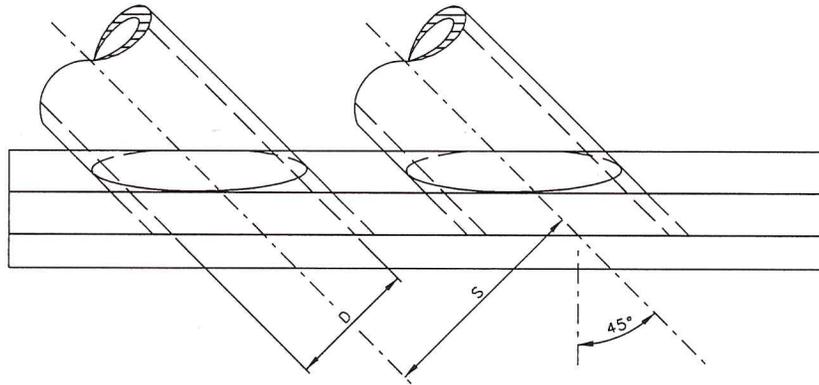
Muhammed Kholid
CHIEF ENGINEER

ENDWALLS
FOR MULTIPLE PIPE CULVERTS
12"-36" PIPES - 30° SKEW

d.

DISTRICT OF COLUMBIA
DEPARTMENT OF TRANSPORTATION

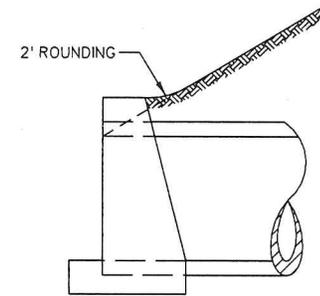
DWG. NO. 320.04



FRONT ELEVATION

NOTE:

1. QUANTITIES GIVEN ARE FOR ONE ENDWALL. ALL DIMENSIONS NOT GIVEN IN TABLE ARE THE SAME AS THOSE FOR SINGLE ENDWALLS FOR THE SAME SIZE OF PIPE. (SEE DWG. NO. 320.02).



END ELEVATION

FOR CONCRETE PIPE						
DIA. (D) OF PIPE	G	S	S ₄₅	L ₄₅	CU. YDS. CONC. ONE DOUBLE ENDWALL	INCREASE CU. YDS. EACH ADD. PIPE
12"	2'-0"	1'-10"	2'-7 ¹ / ₈ "	6'-7 ¹ / ₈ "	0.350	0.125
15"	2'-6"	2'-3"	3'-2 ¹ / ₈ "	8'-2 ¹ / ₈ "	0.714	0.253
18"	3'-0"	2'-8"	3'-9 ¹ / ₄ "	9'-9 ¹ / ₄ "	0.995	0.346
24"	4'-0"	3'-6"	4'-11 ³ / ₈ "	12'-11 ³ / ₈ "	1.846	0.626
30"	5'-0"	4'-4"	6'-1 ¹ / ₂ "	16'-1 ¹ / ₂ "	2.834	0.937
36"	6'-0"	5'-2"	7'-3 ⁵ / ₈ "	19'-3 ⁵ / ₈ "	3.966	1.281

FOR CORRUGATED METAL PIPE						
DIA. (D) OF PIPE	G	S	S ₄₅	L ₄₅	CU. YDS. CONC. ONE DOUBLE ENDWALL	INCREASE CU. YDS. EACH ADD. PIPE
12"	2'-0"	1'-7"	2'-2 ¹ / ₈ "	6'-2 ¹ / ₈ "	0.369	0.122
15"	2'-6"	1'-11 ¹ / ₂ "	2'-9 ¹ / ₄ "	7'-9 ¹ / ₄ "	0.746	0.246
18"	3'-0"	2'-4"	3'-3 ⁵ / ₈ "	9'-3 ⁵ / ₈ "	1.047	0.340
24"	4'-0"	3'-1"	4'-4 ³ / ₈ "	12'-4 ³ / ₈ "	1.956	0.625
30"	5'-0"	3'-10"	5'-5"	15'-5"	3.030	0.948
36"	6'-0"	4'-7"	6'-5 ³ / ₄ "	18'-5 ³ / ₄ "	4.280	1.316

ISSUED: 8/2015

RECOMMENDED:

Adil Raza
PROJECT MANAGER

REVISION APPROVAL

APPROVED:

Muhammed Kholid
CHIEF ENGINEER

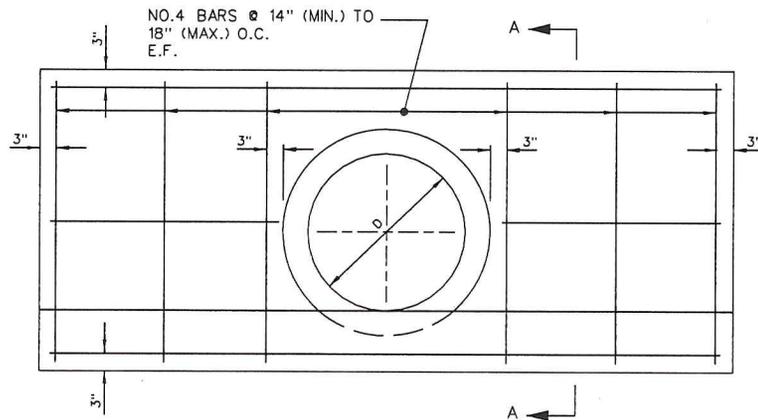
ENDWALLS

FOR MULTIPLE PIPE CULVERTS
12"-36" PIPES - 45° SKEW

d.

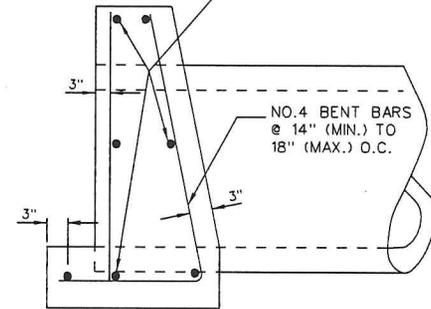
DISTRICT OF COLUMBIA
DEPARTMENT OF TRANSPORTATION

DWG. NO. 320.05



ELEVATION

NO.4 BARS @ 22" (MAX.) O.C. BOTH FACES. - TOP & BOTTOM BARS TO BE FULL LENGTH



SECTION A-A

REINFORCEMENT IN PCC ENDWALLS

ISSUED:	8/2015
REVISION	APPROVAL

RECOMMENDED: *Adil Raza*
PROJECT MANAGER

APPROVED: *Muhammed Khalid*
CHIEF ENGINEER

REINFORCEMENT IN PCC ENDWALLS

d.

DISTRICT OF COLUMBIA
DEPARTMENT OF TRANSPORTATION

DWG. NO. 320.06