



# COMMONWEALTH of VIRGINIA

DEPARTMENT OF TRANSPORTATION  
1401 EAST BROAD STREET  
RICHMOND, VIRGINIA 23219-2000

David S. Ekern, P.E.  
COMMISSIONER

August 30, 2007

## MEMORANDUM

To: All Holders of the Virginia Department of Transportation's 2001 Road and Bridge Standards

The following sheets of the 2001 Road and Bridge Standards listed below have been revised. Projects advertised for construction starting in March 2008 will require that an insertable sheet of the revised standards be included in the plan assembly until the next edition of the imperial standards is published. A copy of each revised sheet will be available electronically in PDF format on the VDOT website. The insertable sheets for the revised standards will be available in Falcon DMS for VDOT personnel and on the VDOT FTP server for consultants working on VDOT projects.

<b>PAGE</b>	<b>INSERT</b>	<b>STANDARD</b>	<b>REVISION</b>
101.26	A-194	EW-11	Revised notes to allow the use of crushed glass in place of aggregate.
104.01	A-190	DI-1	Dump No Waste Drains to Waterway lettering added to grate.
104.02	A-190	DI-1A	Revised notes to allow the use of crushed glass in place of aggregate.
104.04	A-191	DI-2	Dump No Waste Drains to Waterways lettering added to grate.
104.31	A-163	DI-12	Dump No Waste Drains to Waterways lettering added to grate and revised notes to allow the use of crushed glass in place of aggregate.

<b>PAGE</b>	<b>INSERT</b>	<b>STANDARD</b>	<b>REVISION</b>
104.33	A-164	DI-12	Revised notes to allow the use of crushed glass in place of aggregate.
104.34	A-164	DI-12	Dump No Waste Drains to Waterways lettering added to grate.
104.35	A-165	DI-13	Modified distance between inlet and bridge terminal wall and require CG-3 between inlet and bridge terminal wall.
104.36	A-165	DI-13	Modified distance between inlet and bridge terminal wall and require CG-3 between inlet and bridge terminal wall.
105.01	A-192_1	IC-2	Dump No Waste Drains to Waterways lettering added to cover.
105.02	A-192_1	IC-2	Dump No Waste Drains to Waterways lettering added to cover.
105.03	A-192_2	IC-2	Dump No Waste Drains to Waterways lettering added to cover.
107.01	A-86	PB-1	Revised notes to allow the use of crushed glass in place of aggregate.
107.02	A-86	PB-1	Revised notes to allow the use of crushed glass in place of aggregate.
107.03	A-120	PB-1	Revised notes to allow the use of crushed glass in place of aggregate.
108.01	A-80	UD-1	Revised notes to allow the use of crushed glass in place of aggregate.
108.02	A-80	UD-2	Revised notes to allow the use of crushed glass in place of aggregate.
108.03	A-55	UD-3	Revised notes to allow the use of crushed glass in place of aggregate.
108.04	A-84	CD-1	Revised notes to allow the use of crushed glass in place of aggregate.

<b>PAGE</b>	<b>INSERT</b>	<b>STANDARD</b>	<b>REVISION</b>
108.05	A-84	CD-2	Revised notes to allow the use of crushed glass in place of aggregate.
108.06	A-81	UD-4	Revised notes to allow the use of crushed glass in place of aggregate.
108.07	A-81	UD-4	Revised notes to allow the use of crushed glass in place of aggregate.
108.08	A-82	UD-5	Revised notes to allow the use of crushed glass in place of aggregate.
108.09	A-83	UD-7	Revised notes to allow the use of crushed glass in place of aggregate.
114.01	A-69	EC-1	Revised description of EC-1 classification to match old pay item codes.
114.03	A-70_1	EC-3	Revised to be EC-3 Sheet 1 of 3.
114.03A	A-70_1	EC-3	Added new EC-3 sheet to match old pay item codes.
114.04	A-70_2	EC-3	Revised to be EC-3 Sheet 3 of 3.
203.04	A-195	CG-11	Revised sheet to clarify differences between street connections and commercial entrances.
301.08	A-193	PR-3	Revised Anchor Slab Type I, Section A-A to include missing rebar across construction joint.
301.11	A-193	PR-4	Revised Anchor Slab Type I, Section A-A to include missing rebar across construction joint.
304.01	ISD-1772A	RS-1	Clarified title of standard and revised radius of rumble strip to 12.5”
304.03	A-188	RS-3	Revised radius of rumble strip to 12.5”

<b>PAGE</b>	<b>INSERT</b>	<b>STANDARD</b>	<b>REVISION</b>
401.01	A-161	RW-2	Revised notes to allow the use of crushed glass in place of aggregate
401.02	A-161	RW-3	Revised notes to allow the use of crushed glass in place of aggregate.
501.44	A-98	MB-7D,E,F	Revised notes to allow the use of crushed glass in place of aggregate.
501.56	A-96	MB-12A,B,C	Revised notes to allow the use of crushed glass in place of aggregate.
1201.11	A-196	RW-1A	Revised notes to allow the use of crushed glass in place of aggregate.
1201.12	A-196	RW-1B	Revised notes to allow the use of crushed glass in place of aggregate.
1301.48	A-127	JB-1A,2A,3A,4A,5A	Revised notes to allow the use of crushed glass in place of aggregate.
1301.50	A-140	JB-1B,2B,3B,4B,5B	Revised notes to allow the use of crushed glass in place of aggregate.
1301.51	A-141	JB-1C,2C,3C,4C,5C	Revised notes to allow the use of crushed glass in place of aggregate.
1301.52	A-197	JB-1D	Revised notes to allow the use of crushed glass in place of aggregate.
1301.74	A-155	OSS-1	Deleted note for alternate sign structure.
1301.75	A-155	OSS-1	Deleted note for alternate sign structure.
1401.01	A-198	UB-1	Revised notes to allow the use of crushed glass in place of aggregate.
1405.01	A-199	LD-1	Revised notes to allow the use of crushed glass in place of aggregate.
1409.01	A-200	BOV-1	Revised notes to allow the use of crushed glass in place of aggregate.

In addition to these revisions, insertable sheet A-166\_9 (VDOT standard PC-1, sheets 107.20A and 107.21) has been eliminated. VDOT standard PC-1 sheets 107.20A and 107.21 are still valid standards, but since they do not deal with information pertinent to construction, they no longer need to be included in plan assemblies.

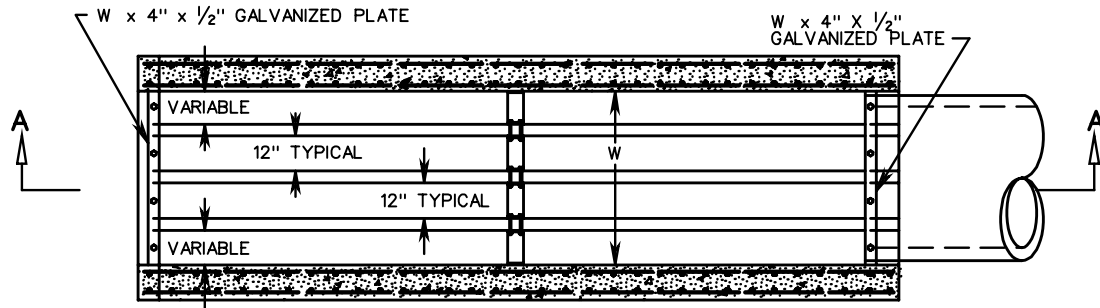
If you have any questions or comments regarding the listed revisions to this publication, please contact Steve Van Cleef of the Standards and Special Design Section at (804) 786-2532.

Sincerely,

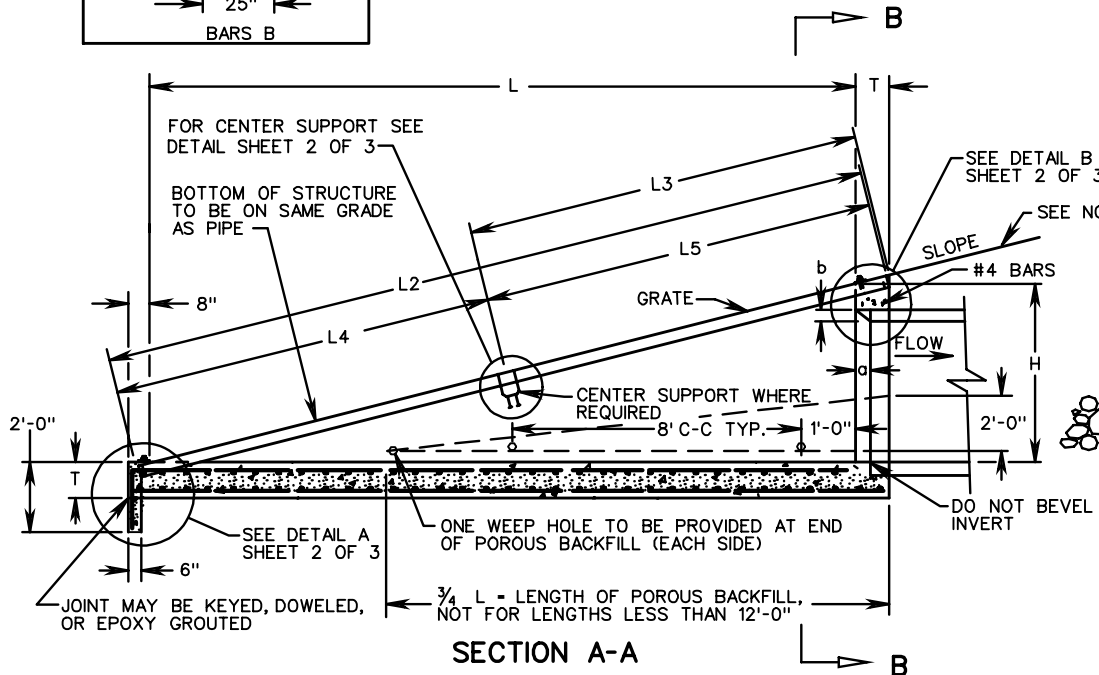
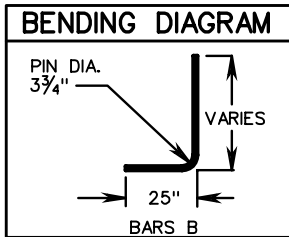
Mohammad Mirshahi, P.E.  
State Location and Design Engineer

**NOTES:**

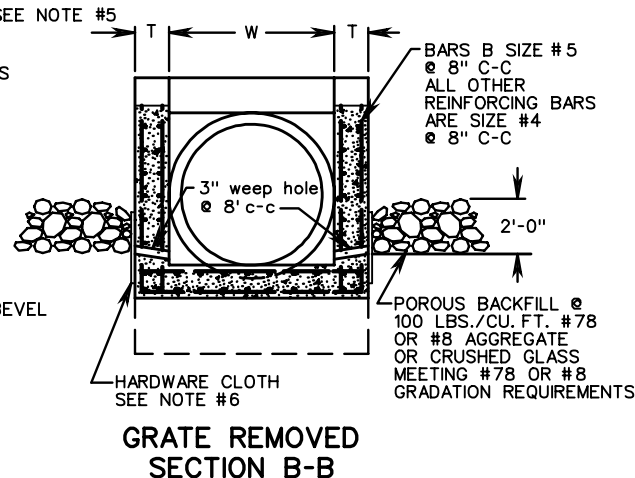
1. THIS ITEM MAY BE PRECAST OR CAST IN PLACE. ALL CAST CONCRETE TO BE CLASS A3, FOR PRECAST USE 4000 PSI MINIMUM. REINFORCING STEEL TO HAVE A MINIMUM 1/2" COVER.
2. FOR TABULATION OF DIMENSIONS AND QUANTITIES SEE SHEET 3 OF 3.
3. ALL PIPE FOR GRATE, STRUCTURAL TUBING, AND RELATED HARDWARE TO BE GALVANIZED.
4. STANDARD EW-11 TO BE INSTALLED SO THE GRATE CONFIGURATION IS ALWAYS PERPENDICULAR TO THE EDGE OF THE SHOULDER.
5. SLOPE AS SPECIFIED ON TYPICAL SECTION.
6. WEEP HOLE WITH 12" X 12" PLASTIC HARDWARE CLOTH 1/4" MESH OR GALVANIZED STEEL WIRE, MINIMUM WIRE DIAMETER 0.03" NUMBER 4 MESH HARDWARE CLOTH ANCHORED FIRMLY OUTSIDE OF STRUCTURE.
7. HEADWALL TO BE BEVELED IN ALL AREAS EXCEPT WHERE A CONFLICT WITH INVERT OR WINGWALLS OCCUR.
8. BEVEL EDGE IS REQUIRED ON THE HEADWALL OF THE INLET END OF THE CULVERT (WHERE THE FLOW ENTERS THE CULVERT).
9. HEADWALL AT THE OUTLET END OF THE CULVERT MAY BE EITHER SQUARE EDGE OR BEVEL EDGE.
10. 3/4" CHAMFER MAY BE PROVIDED ON ALL EDGES AT MANUFACTURER'S OPTION.



PLAN VIEW



SECTION A-A



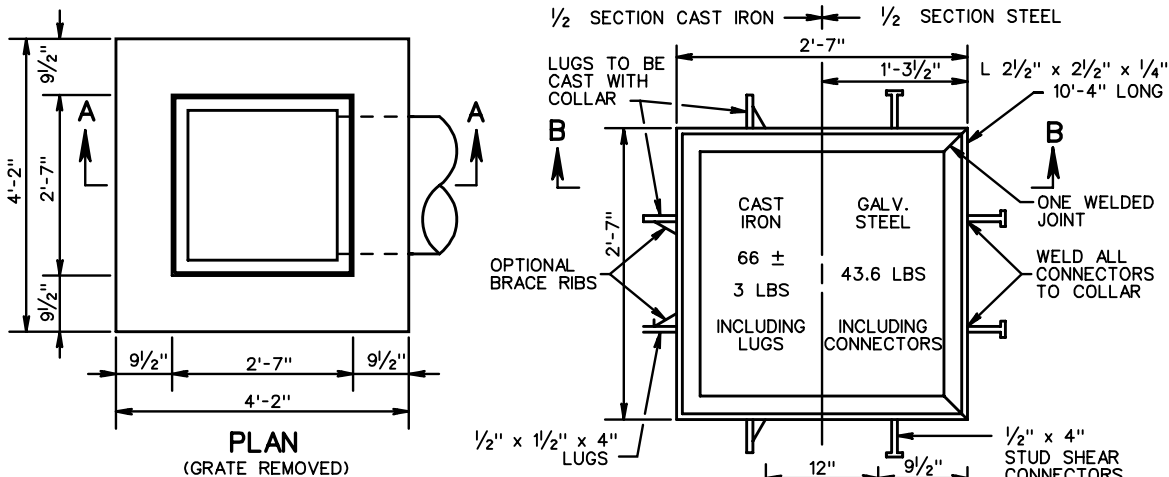
GRATE REMOVED SECTION B-B

SHEET 1 OF 3

**PIPE ENDWALL WITH LOAD-CARRYING GRATE  
FOR 12"-60" PIPES**  
VIRGINIA DEPARTMENT OF TRANSPORTATION

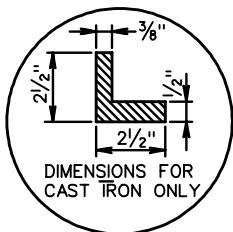
SPECIFICATION REFERENCE
105
233
302

REV 8/07  
101.26

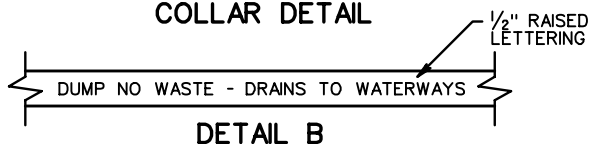


**PLAN**  
(GRATE REMOVED)

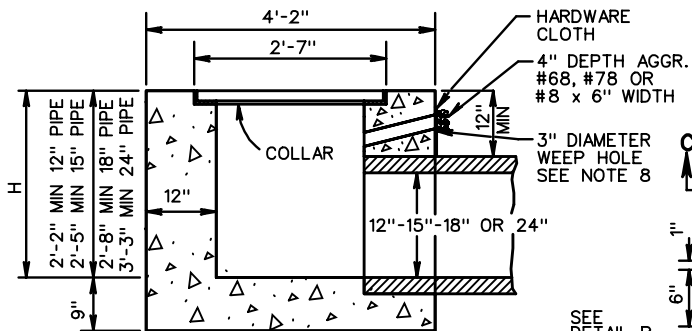
**SECTION B-B**  
**COLLAR DETAIL**



**DETAIL A**



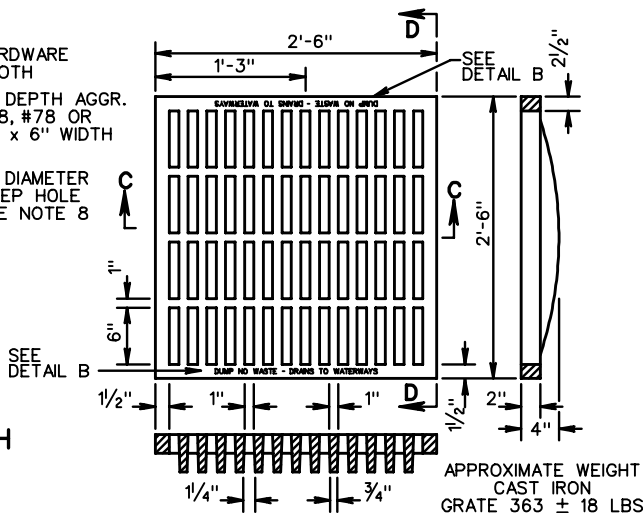
**DETAIL B**



**SECTION A-A**  
**CONCRETE QUANTITIES FOR MIN. DEPTH**

12" CONCRETE PIPE - 1.440 CU. YD. CONCRETE  
 15" CONCRETE PIPE - 1.528 CU. YD. CONCRETE  
 18" CONCRETE PIPE - 1.620 CU. YD. CONCRETE  
 24" CONCRETE PIPE - 1.817 CU. YD. CONCRETE

ADD 0.469 CU. YD. PER  
 ADDITIONAL FOOT OF DEPTH.



**SECTION C-C** **SECTION D-D**  
**GRATE DETAIL**

**NOTES**

1. DEPTH OF INLET (H) TO BE SHOWN ON PLANS. FOR DEPTH GREATER THAN 10' USE STANDARD DI-1A
2. THE "H" DIMENSION SHOWN ON THE STANDARDS AND SPECIFIED ON THE PLANS WILL BE MEASURED FROM THE INVERT OF THE OUTFALL PIPE TO THE TOP OF THE STRUCTURE. PLAN "H" DIMENSIONS ARE APPROXIMATE ONLY FOR ESTIMATING PURPOSES AND THE ACTUAL DIMENSIONS SHALL BE DETERMINED BY THE CONTRACTOR FROM FIELD CONDITIONS.
3. WHEN SPECIFIED ON THE PLANS THE INVERT IS TO BE SHAPED IN ACCORDANCE WITH STANDARD IS-1. THE COST OF FURNISHING AND PLACING ALL MATERIALS INCIDENTAL TO THE SHAPING IS TO BE INCLUDED IN THE BID PRICE FOR THE STRUCTURE.
4. IN THE EVENT THE INVERT OF THE OUTFALL PIPE IS HIGHER THAN THE BOTTOM OF THE STRUCTURE, THE INVERT OF THE STRUCTURE SHALL BE SHAPED WITH CEMENT MORTAR TO PREVENT STANDING OR PONDING OF WATER IN THE STRUCTURE. THE COST OF FURNISHING AND PLACING ALL MATERIALS INCIDENTAL TO INLET SHAPING IS TO BE INCLUDED IN THE BID PRICE FOR THE STRUCTURE.
5. STEPS ARE TO BE PROVIDED WHEN H IS 4'-0" OR GREATER. FOR DETAILS SEE STANDARD ST-1.
6. THIS ITEM MAY BE PRECAST OR CAST-IN-PLACE.
7. #4 X 8" SMOOTH DOWELS AT APPROXIMATELY 12" C-C TO BE PLACED IN ALL AREAS ADJACENT TO ABUTTING CONCRETE TO PREVENT SETTLEMENT. IN LIEU OF DOWELS A 2"X4" NOTCH MAY BE PROVIDED. SEE STANDARD T-DI-3, 4 FOR ALTERNATE DESIGN.
8. 3" DIAMETER WEEP HOLE WITH 12"X12" PLASTIC HARDWARE CLOTH 1/4" MESH OR GALVANIZED STEEL WIRE, MINIMUM WIRE DIAMETER 0.03", NUMBER 4 MESH HARDWARE CLOTH ANCHORED FIRMLY TO THE OUTSIDE OF THE STRUCTURE.
9. CAST IN PLACE CONCRETE IS TO BE CLASS A3 (3000 PSI). PRECAST CONCRETE IS TO BE 4000 PSI.
10. ANY ALTERNATE METHODS OF ANCHORAGE MEETING THE APPROVAL OF THE ENGINEER MAY BE SUBSTITUTED FOR THE CAST IRON LUGS AS SHOWN HEREON.
11. DUMP NO WASTE - DRAINS TO WATERWAY LETTERING ON GRATE MAY VARY BY MANUFACTURER BASED ON AN APPROVED DESIGN.

**STANDARD DROP INLET**

**12" - 24" PIPE: MAXIMUM DEPTH (H) = 10'**

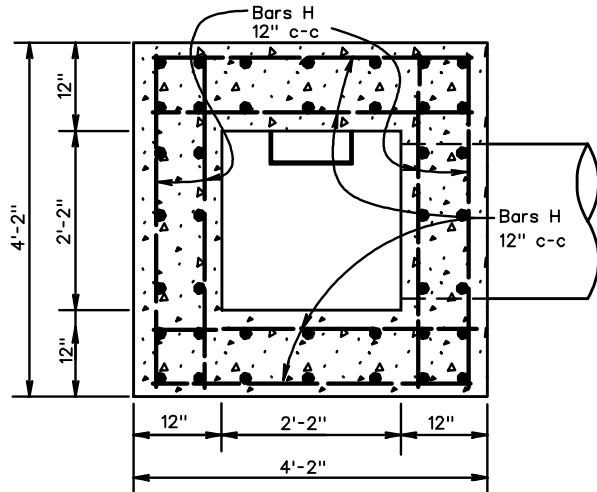
VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION  
REFERENCE

233  
302

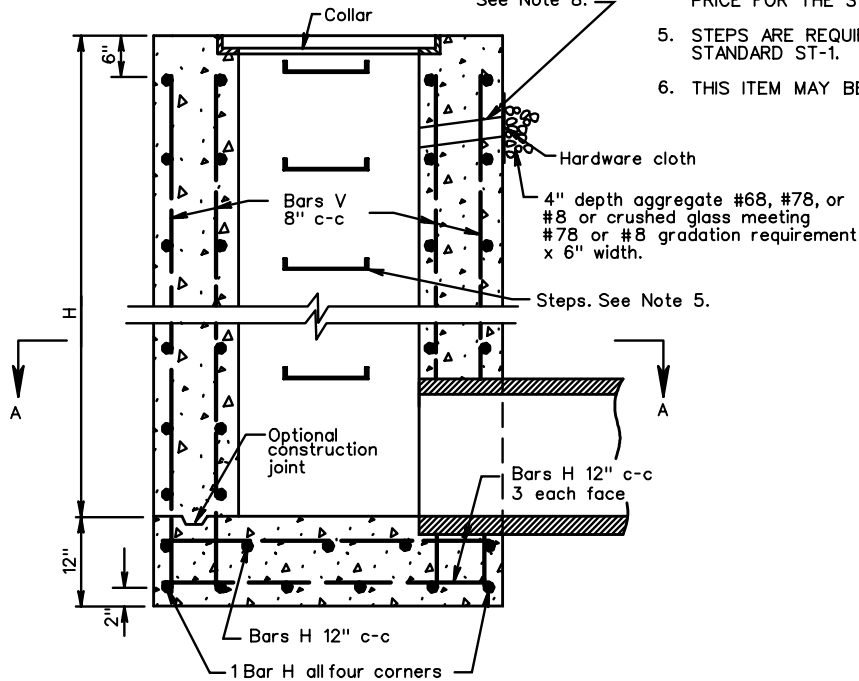
**NOTES**

1. DEPTH OF INLET (H) TO BE SHOWN ON PLANS. MAXIMUM DEPTH (H) TO BE 20'. FOR DEPTHS LESS THAN 10' USE STANDARD DI-1.
2. THE "H" DIMENSION SHOWN ON THE STANDARDS AND SPECIFIED ON THE PLANS WILL BE MEASURED FROM THE INVERT OF THE OUTFALL PIPE TO THE TOP OF THE STRUCTURE. PLAN "H" DIMENSIONS ARE APPROXIMATE ONLY FOR ESTIMATING PURPOSES AND THE ACTUAL DIMENSIONS SHALL BE DETERMINED BY THE CONTRACTOR FROM FIELD CONDITIONS.
3. WHEN SPECIFIED ON THE PLANS THE INVERT IS TO BE SHAPED IN ACCORDANCE WITH STANDARD IS-1. THE COST OF FURNISHING AND PLACING ALL MATERIALS INCIDENTAL TO THE SHAPING IS TO BE INCLUDED IN THE BID PRICE FOR THE STRUCTURE.
4. IN THE EVENT THE INVERT OF THE OUTFALL PIPE IS HIGHER THAN THE BOTTOM OF THE STRUCTURE, THE INVERT OF THE STRUCTURE SHALL BE SHAPED WITH CEMENT MORTAR TO PREVENT STANDING OR PONDING OF WATER IN THE STRUCTURE. THE COST OF FURNISHING AND PLACING ALL MATERIALS INCIDENTAL TO THE SHAPING IS TO BE INCLUDED IN THE BID PRICE FOR THE STRUCTURE.
5. STEPS ARE REQUIRED. FOR DETAILS SEE STANDARD ST-1.
6. THIS ITEM MAY BE PRECAST OR CAST-IN-PLACE.
7. # 4 X 8" SMOOTH DOWELS AT APPROXIMATELY 12" C-C TO BE PLACED IN ALL AREAS ADJACENT TO ABUTTING CONCRETE TO PREVENT SETTLEMENT. IN LIEU OF DOWELS A 2" X 4" NOTCH MAY BE PROVIDED. SEE STANDARD T-DI-3, 4 FOR ALTERNATE DESIGN.
8. 3" DIAMETER WEEP HOLE WITH 12"X12" PLASTIC HARDWARE CLOTH 1/4" MESH OR GALVANIZED STEEL WIRE, MINIMUM WIRE DIAMETER 0.03", NUMBER 4 MESH HARDWARE CLOTH ANCHORED FIRMLY TO THE OUTSIDE OF THE STRUCTURE.
9. ALL REINFORCING STEEL SHALL HAVE A MIN. COVER OF 2".
10. ALL REINFORCING STEEL TO BE CUT CLEAR OF ALL OPENINGS BY 2".
11. CAST-IN PLACE CONCRETE IS TO BE CLASS A3 (3000 PSI). PRECAST CONCRETE IS TO BE 4000 PSI.
12. ALL SPLICES IN BARS V TO BE A MINIMUM OF 40 DIAMETERS (20").
13. IF OPTIONAL CONSTRUCTION JOINT IS USED, IT IS TO BE KEYED.
14. FOR DETAILS AND DIMENSIONS, ETC. OF GRATE AND STEEL OR CAST IRON COLLAR SEE STANDARD DI-1.



**SECTION A-A**

3" Diameter weep hole. See Note 8.



**SECTION THROUGH ELEVATION**

REINFORCING STEEL SCHEDULE			
MARK	SIZE	NO REQ'D	LENGTH
Bars H	#5	8x(H + 2)	3'-10"
Bars V	#4	40	H + 4"

APPROXIMATE QUANTITIES FOR MINIMUM (10') DEPTH		
CONCRETE PIPE DIAMETER	CONCRETE	REINF. STEEL
	Cu. Yds.	Lbs.
12"	5.218	655
15"	5.193	651
18"	5.163	647
24"	5.089	639

Increments to be added for each additional foot of depth (H):  
 0.465 Cu. Yds. of concrete  
 58.7 Lbs. of reinforcing steel

SPECIFICATION REFERENCE

233  
302

**STANDARD DROP INLET**  
**12" - 24" PIPE: DEPTH (H) 10' TO 20'**

VIRGINIA DEPARTMENT OF TRANSPORTATION

REV 8/07

104.02



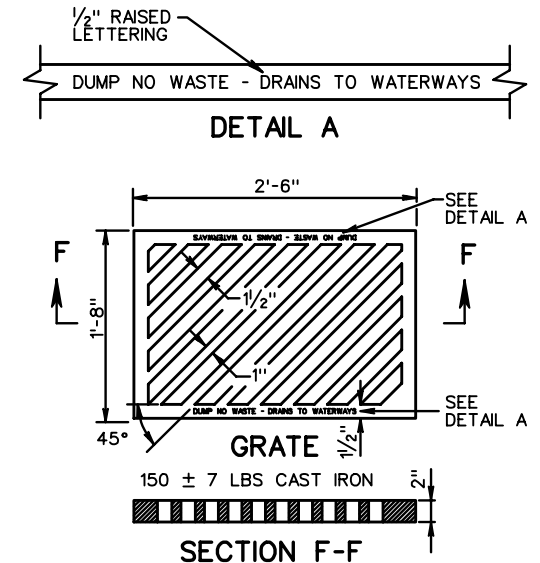
**TABLE OF QUANTITIES**

DI-2A,2B,2C

TYPE	L	REINFORCING STEEL														WEIGHT Lbs.	
		CONCRETE	BARS A		BARS A-1		BARS B		BARS B-1		BARS C		BARS E		BARS F		
		Cu. Yds.	No.	Lin. Ft.*	No.	Lin. Ft.*	No.	Lin. Ft.*	No.	Lin. Ft.*	No.	Lin. Ft.*	No.	Lin. Ft.*	No.		Lin. Ft.*
DI-2A	2'-2"	1.71	4	3'-2"	5	3'-2"	4	3'-6"	-	-	5	2'-0"	-	-	-	1'-6"	55
DI-2B	4'	1.95	4	3'-2"	5	5'-0"	4	3'-6"	3	4'-3" to 4'-6"	5	2'-0"	3	2'-0"	3	1'-6"	84
	6'	2.23	4	3'-2"	5	7'-0"	4	3'-6"	7	4'-3" to 4'-6"	5	2'-0"	3	4'-0"	3	1'-6"	119
	8'	2.51	4	3'-2"	5	9'-0"	4	3'-6"	11	4'-3" to 4'-6"	5	2'-0"	3	6'-0"	3	1'-6"	154
	10'	2.79	4	3'-2"	5	11'-0"	4	3'-6"	15	4'-3" to 4'-6"	5	2'-0"	3	8'-0"	3	1'-6"	189
	12'	3.05	4	3'-2"	5	13'-0"	4	3'-6"	19	4'-3" to 4'-6"	5	2'-0"	3	10'-0"	3	1'-6"	224
	14'	3.34	4	3'-2"	5	15'-0"	4	3'-6"	23	4'-3" to 4'-6"	5	2'-0"	3	12'-0"	3	1'-6"	259
	16'	3.61	4	3'-2"	5	17'-0"	4	3'-6"	27	4'-3" to 4'-6"	5	2'-0"	3	14'-0"	3	1'-6"	294
	18'	3.89	4	3'-2"	5	19'-0"	4	3'-6"	31	4'-3" to 4'-6"	5	2'-0"	3	16'-0"	3	1'-6"	329
DI-2C	20'	4.17	4	3'-2"	5	21'-0"	4	3'-6"	35	4'-3" to 4'-6"	5	2'-0"	3	18'-0"	3	1'-6"	364
	6'	2.24	4	3'-2"	5	7'-0"	4	3'-6"	6	4'-3" to 4'-6"	5	2'-0"	6	2'-1"	6	1'-6"	115
	8'	2.55	4	3'-2"	5	9'-0"	4	3'-6"	10	4'-3" to 4'-6"	5	2'-0"	6	3'-1"	6	1'-6"	150
	10'	2.82	4	3'-2"	5	11'-0"	4	3'-6"	14	4'-3" to 4'-6"	5	2'-0"	6	4'-1"	6	1'-6"	185
	12'	3.09	4	3'-2"	5	13'-0"	4	3'-6"	18	4'-3" to 4'-6"	5	2'-0"	6	5'-1"	6	1'-6"	220
	14'	3.37	4	3'-2"	5	15'-0"	4	3'-6"	22	4'-3" to 4'-6"	5	2'-0"	6	6'-1"	6	1'-6"	255
	16'	3.65	4	3'-2"	5	17'-0"	4	3'-6"	26	4'-3" to 4'-6"	5	2'-0"	6	7'-1"	6	1'-6"	290
	18'	3.93	4	3'-2"	5	19'-0"	4	3'-6"	30	4'-3" to 4'-6"	5	2'-0"	6	8'-1"	6	1'-6"	325
20'	4.20	4	3'-2"	5	21'-0"	4	3'-6"	34	4'-3" to 4'-6"	5	2'-0"	6	9'-1"	6	1'-6"	360	

**NOTES**

- DEPTH OF INLET (H) TO BE SHOWN ON PLANS.
- THE "H" DIMENSION SHOWN ON THE STANDARDS AND SPECIFIED ON THE PLANS WILL BE MEASURED FROM THE INVERT OF THE OUTFALL PIPE TO THE TOP OF THE STRUCTURE. PLAN "H" DIMENSIONS ARE APPROXIMATE ONLY FOR ESTIMATING PURPOSES AND THE ACTUAL DIMENSIONS SHALL BE DETERMINED BY THE CONTRACTOR FROM FIELD CONDITIONS.
- WHEN SPECIFIED ON THE PLANS THE INVERT IS TO BE SHAPED IN ACCORDANCE WITH STANDARD IS-1. THE COST OF FURNISHING AND PLACING ALL MATERIALS INCIDENTAL TO THE SHAPING IS TO BE INCLUDED IN THE BID PRICE FOR THE STRUCTURE.
- IN THE EVENT THE INVERT OF THE OUTFALL PIPE IS HIGHER THAN THE BOTTOM OF THE STRUCTURE, THE INVERT OF THE STRUCTURE SHALL BE SHAPED WITH CEMENT MORTAR TO PREVENT STANDING OR PONDING OF WATER IN THE STRUCTURE. THE COST OF FURNISHING AND PLACING ALL MATERIALS INCIDENTAL TO THE SHAPING IS TO BE INCLUDED IN THE BID PRICE FOR THE STRUCTURE.
- STEPS ARE TO BE PROVIDED WHEN H IS 4'-0" OR GREATER. FOR DETAILS SEE STANDARD ST-1.
- THIS ITEM MAY BE PRECAST OR CAST-IN-PLACE.
- # 4 X 8" SMOOTH DOWELS AT APPROXIMATELY 12" C-C TO BE PLACED IN ALL AREAS ADJACENT TO ABUTTING CONCRETE TO PREVENT SETTLEMENT.
- 3" DIAMETER WEEP HOLE TO BE LOCATED TO DRAIN SUBBASE MATERIAL. WEEP HOLE WITH 12"X12" PLASTIC HARDWARE CLOTH 1/4" MESH OR GALVANIZED STEEL WIRE, MINIMUM WIRE DIAMETER 0.03", NUMBER 4 MESH HARDWARE CLOTH ANCHORED FIRMLY TO THE OUTSIDE OF THE STRUCTURE.
- ALL REINFORCING STEEL SHALL HAVE A MINIMUM COVER OF 2".
- ALL REINFORCING STEEL TO BE CUT CLEAR OF ALL OPENINGS BY 2".
- CAST-IN PLACE CONCRETE IS TO BE CLASS A3 (3000 PSI). PRECAST CONCRETE IS TO BE 4000 PSI.
- LENGTH OF SLOT (L) WILL, IN EVERY CASE, BE SHOWN ON PLANS.
- THIS STANDARD IS INTENDED FOR USE IN CURB AND GUTTER SITUATIONS ONLY.
- STANDARD INLETS MAY BE CONSTRUCTED WITH CONCRETE BLOCKS IN ACCORDANCE WITH THE DETAILS SHOWN ON STANDARD DRAWING DI-MB.
- THIS AREA MAY BE EARTHEN, IN WHICH CASE THE EXPANSION JOINTS WILL APPLY ONLY TO CURB AND GUTTER.
- CONCRETE QUANTITIES SHOWN ARE FOR DEPTH (H) OF 5'-2" WITHOUT PIPES. THE AMOUNT DISPLACED BY PIPES MUST BE DEDUCTED TO OBTAIN TRU QUANTITIES, FOR INLETS OF DIFFERENT DEPTHS ADD OR SUBTRACT 0.28 CUBIC YARDS OF CONCRETE FOR EACH FOOT.
- LENGTH OF ANGLE IRON AS SHOWN ON SHEET 1 OF 2 IS TO BE L 16" AT 4.10 LBS./FT.
- \* DENOTES LENGTH OF ONE (1) BAR.
- ALL REINFORCING BARS TO BE #5.
- GRATE TO BE INSTALLED SO SLOTS WILL DIRECT WATER TOWARD THE INLET THROAT.
- MINIMUM HEIGHT = PIPE DIA. + 2'-6" WHEN PIPES ARE LOCATED UNDER EXTENDED SLOT OF INLET.
- DUMP NO WASTE - DRAINS TO WATERWAYS LETTERING ON GRATE MAY VARY BY MANUFACTURER BASED ON AN APPROVED DESIGN.



SPECIFICATION REFERENCE
233 302

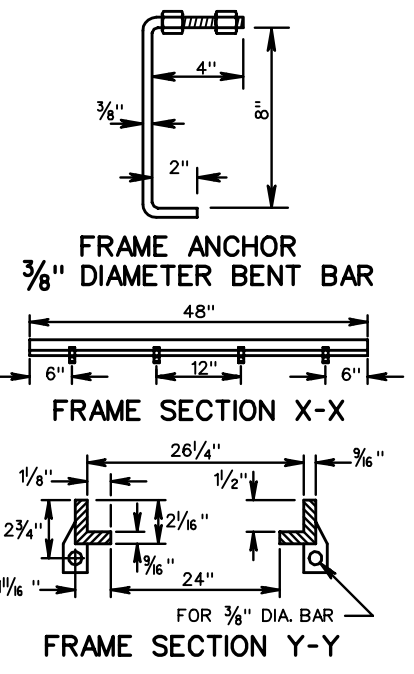
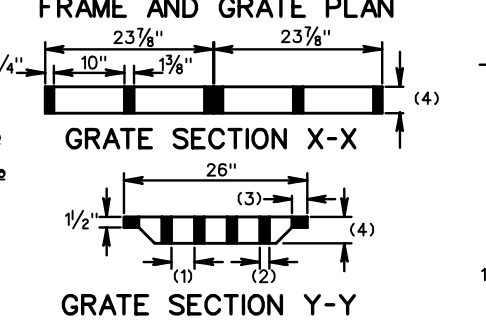
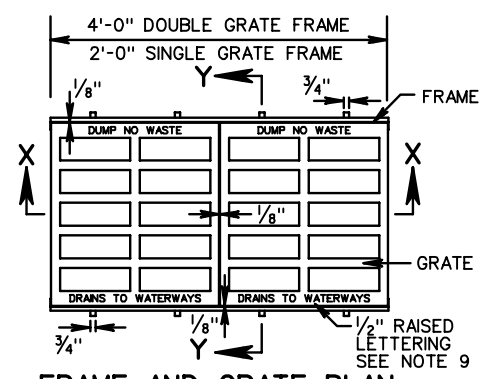
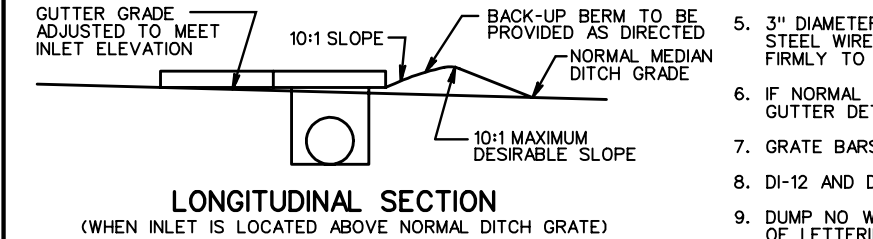
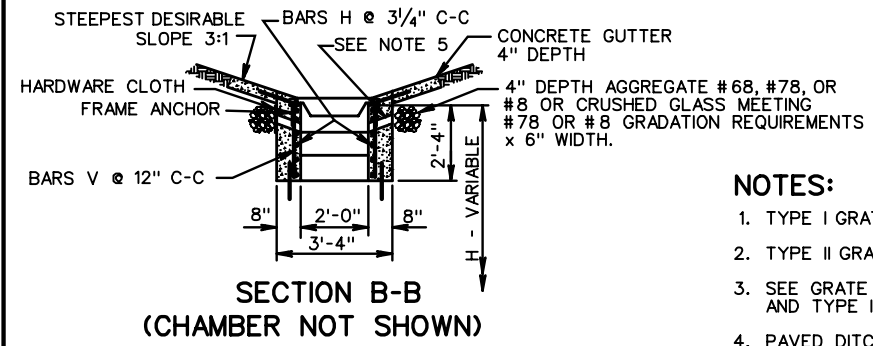
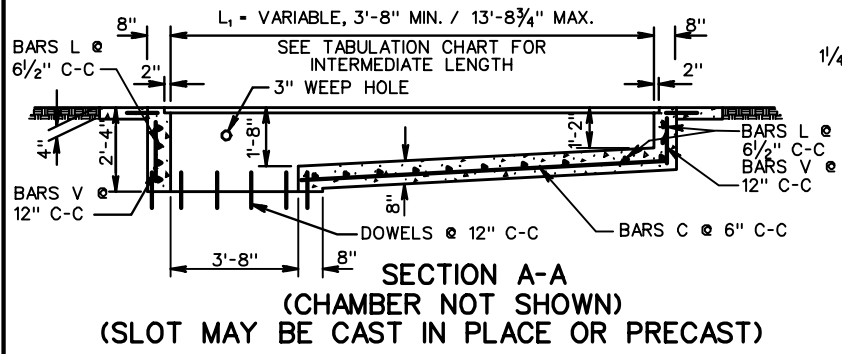
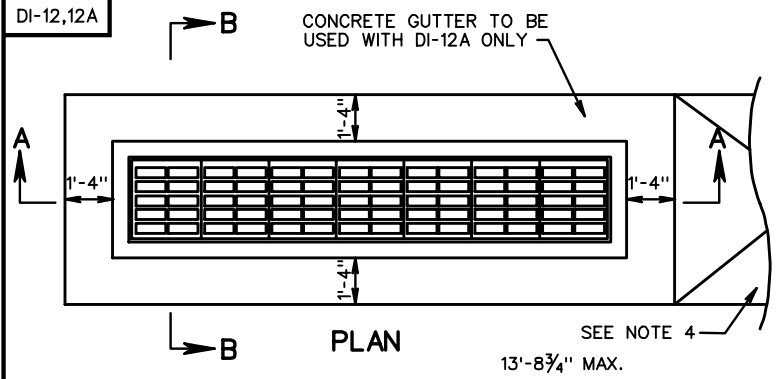
**STANDARD CURB DROP INLET  
12"-24" PIPE: MAXIMUM DEPTH (H)-9'**

VIRGINIA DEPARTMENT OF TRANSPORTATION

Sheet 2 of 2

REV 8/07  
104.04

DI-12,12A



NOTE: SEE GRATE DIMENSION TABLE FOR GRATE TYPE I & II DIMENSIONS

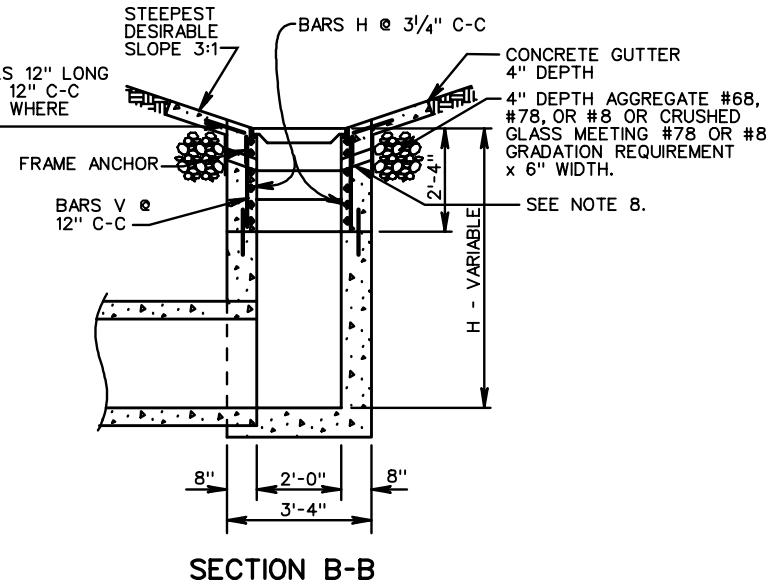
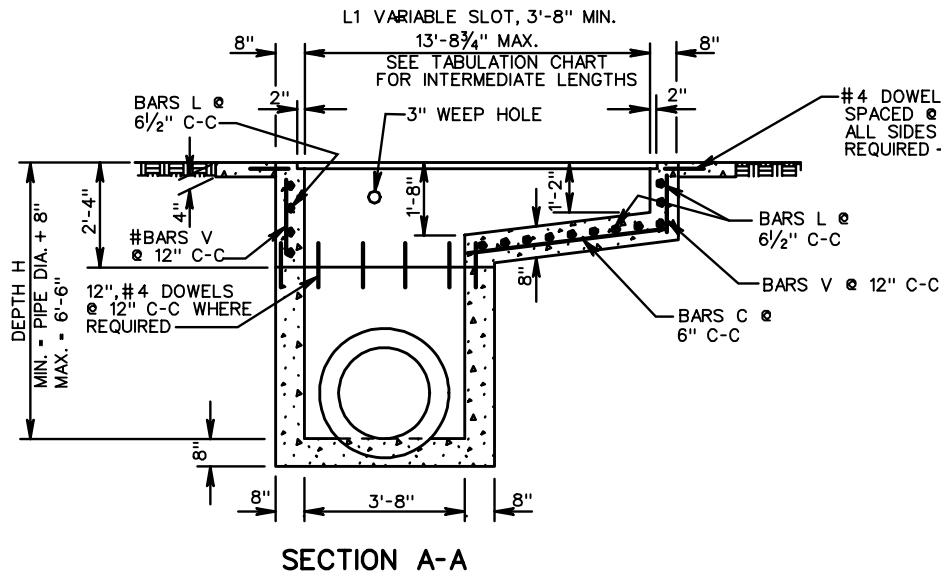
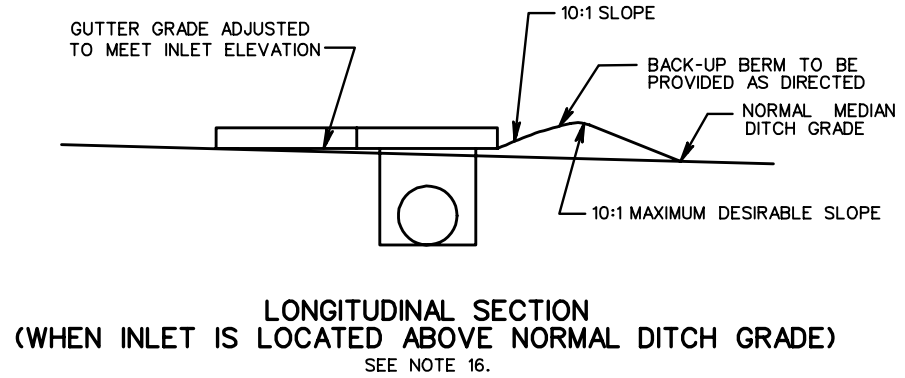
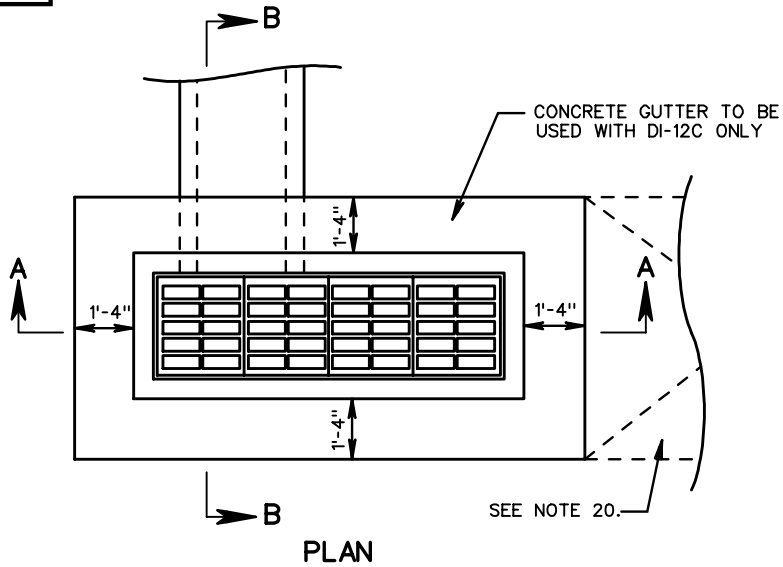
GRATE DIMENSIONS				
GRATE TYPE	OPENING WIDTH (1)	BAR THICKNESS (2)	END SECTION WIDTH (3)	GRATE THICKNESS (4)
TYPE I	3 1/4"	1 3/8"	2 1/8"	3 3/4"
	5 OPENINGS	4 BARS		
TYPE II	1 1/2"	1 3/8"	2 3/16"	3 3/4"
	8 OPENINGS	7 BARS		

- NOTES:
- TYPE I GRATE: LIMITED ACCESS AND RURAL UNLIMITED ACCESS: PEDESTRIAN ACCESS UNLIKELY
  - TYPE II GRATE: URBAN AREAS: PEDESTRIAN ACCESSIBLE AREAS.
  - SEE GRATE DIMENSION TABLE FOR SIZE AND NUMBER OF GRATE OPENINGS REQUIRED FOR TYPE I AND TYPE II GRATE.
  - PAVED DITCHES ARE TO BE TRANSITIONED TO MEET INLET GUTTER AS SHOWN IN STANDARD PG-2A.
  - 3" DIAMETER WEEP HOLE WITH 12" X 12" PLASTIC HARDWARE CLOTH 1/4" MESH OR GALVANIZED STEEL WIRE, MINIMUM WIRE DIAMETER 0.03", NUMBER 4 MESH HARDWARE CLOTH ANCHORED FIRMLY TO OUTSIDE OF STRUCTURE.
  - IF NORMAL DITCH GRADE IS TOO FLAT TO ALLOW FOR ADJUSTED GRADE TO INLET, A SPECIAL GUTTER DETAIL WILL BE REQUIRED ON PLANS.
  - GRATE BARS TO BE PARALLEL TO DITCH FLOW.
  - DI-12 AND DI-12A ARE NOT TO BE UTILIZED IN LOCATIONS NORMALLY SUBJECT TO TRAFFIC.
  - DUMP NO WASTE DRAINS TO WATERWAYS LETTERING IS REQUIRED ON ALL DI-12 GRATES. LOCATION OF LETTERING MAY VARY BY MANUFACTURER.

REV 8/07  
104.31

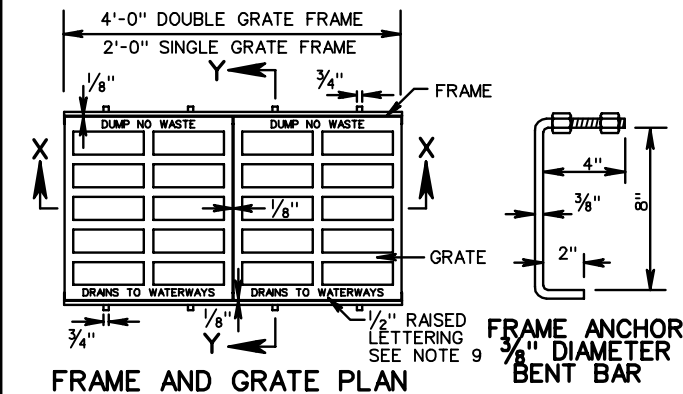
MULTIGRATE DROP INLET  
FOR PIPE SIZES 12" TO 72"  
VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE  
233  
302

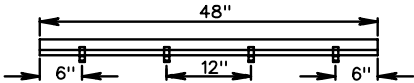


**MULTIGRATE DROP INLET  
FOR PIPE SIZES 12" TO 36"**  
VIRGINIA DEPARTMENT OF TRANSPORTATION

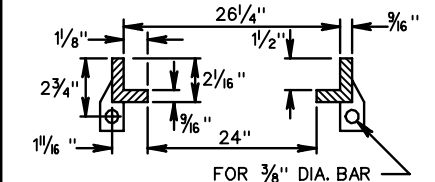
SPECIFICATION REFERENCE
241
503



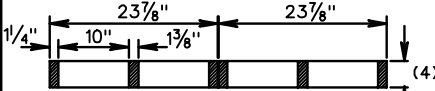
FRAME AND GRATE PLAN



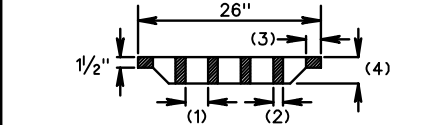
FRAME SECTION X-X



FRAME SECTION Y-Y



GRATE SECTION X-X



GRATE SECTION Y-Y

NOTE: SEE GRATE DIMENSION TABLE FOR GRATE TYPE I & II DIMENSIONS

GRATE DIMENSIONS				
GRATE TYPE	OPENING WIDTH (1)	BAR THICKNESS (2)	END SECTION WIDTH (3)	GRATE THICKNESS (4)
TYPE I	3 1/4" 5 OPENINGS	1 3/8" 4 BARS	2 1/8"	3 3/4"
TYPE II	1 1/2" 8 OPENINGS	1 3/8" 7 BARS	2 3/16"	3 3/4"

**NOTES**

- DEPTH OF INLET (H) TO BE SHOWN ON PLANS. FOR DEPTH GREATER THAN 6'-6", USE ST'D. DI-12, DI-12A.
- THE "H" DIMENSION SHOWN ON THE STANDARDS AND SPECIFIED ON THE PLANS WILL BE MEASURED FROM THE INVERT OF THE OUTFALL PIPE TO THE TOP OF THE STRUCTURE. PLAN "H" DIMENSIONS ARE APPROXIMATE ONLY FOR ESTIMATING PURPOSES AND THE ACTUAL DIMENSIONS SHALL BE DETERMINED BY THE CONTRACTOR FROM FIELD CONDITIONS.
- WHEN SPECIFIED ON THE PLANS THE INVERT IS TO BE SHAPED IN ACCORDANCE WITH STANDARD IS-1. THE COST OF FURNISHING AND PLACING ALL MATERIALS INCIDENTAL TO THE SHAPING IS TO BE INCLUDED IN THE BID PRICE FOR THE STRUCTURE.
- IN THE EVENT THE INVERT OF THE OUTFALL PIPE IS HIGHER THAN THE BOTTOM OF THE STRUCTURE, THE INVERT OF THE STRUCTURE SHALL BE SHAPED WITH CEMENT MORTAR TO PREVENT STANDING OR PONDING OF WATER IN THE STRUCTURE. THE COST OF FURNISHING AND PLACING ALL MATERIALS INCIDENTAL TO THE SHAPING IS TO BE INCLUDED IN THE BID PRICE FOR THE STRUCTURE.
- STEPS ARE TO BE PROVIDED WHEN H IS 4'-0" OR GREATER. FOR DETAILS SEE STANDARD ST-1.
- THIS ITEM MAY BE PRECAST OR CAST-IN-PLACE.
- # 4 DOWELS 12" LONG, 12" C-C TO BE PLACED IN ALL AREAS ADJACENT TO ABUTTING CONCRETE TO PREVENT SETTLEMENT.
- 3" DIAMETER WEEP HOLE 12"x12" PLASTIC HARDWARE CLOTH 1/4" MESH OR GALVANIZED STEEL WIRE, MINIMUM WIRE DIAMETER 0.03". NUMBER 4 MESH HARDWARE CLOTH ANCHORED FIRMLY TO THE OUTSIDE OF THE STRUCTURE.
- ALL REINFORCING STEEL SHALL HAVE A MIN. COVER OF 2".
- ALL REINFORCING STEEL TO BE CUT CLEAR OF ALL OPENINGS BY 2".
- CAST-IN PLACE CONCRETE IS TO BE CLASS A3 (3000 PSI). PRECAST CONCRETE IS TO BE 4000 PSI.
- LENGTH OF SLOT (L) WILL IN EVERY CASE, BE SHOWN ON PLANS.
- ALL REINFORCING BARS TO BE #4
- DI-12C CONCRETE GUTTER INCREMENT: ADD 0.07 CU. YDS CLASS A3 CONCRETE FOR EACH ADDITIONAL FOOT OF SLOT LENGTH GREATER THAN MINIMUM 3'-8".
- GRATE BARS TO BE INSTALLED SO THEY WILL BE ALIGNED PARALLEL TO THE DITCH FLOW.
- IF NORMAL DITCH GRADE IS TOO FLAT TO ALLOW FOR ADJUSTED GRADE TO INLET A SPECIAL GUTTER DETAIL WILL BE REQUIRED ON PLANS.
- DI-12B----NO GUTTER  
DI-12C----PERIPHERAL GUTTER
- PAVED DITCHES ARE TO BE TRANSITIONED TO MEET INLET GUTTER AS SHOWN IN STANDARD PG-2A.
- QUANTITIES SHOWN ARE FOR INLETS WITHOUT PIPES. PIPE DISPLACEMENTS MUST BE DEDUCTED TO OBTAIN TRUE QUANTITIES.
- PAVED TRANSITION WHERE REQUIRED ON PLANS. TRANSITION IS TO BE SHAPED TO CONFORM TO ROUNDED CONCRETE GUTTER OF DI-12C.
- TYPE I GRATE: LIMITED ACCESS AND RURAL UNLIMITED ACCESS PEDESTRIAN ACCESS UNLIKELY
- TYPE II GRATE: URBAN AREAS: PEDESTRIAN ACCESSIBLE AREAS
- L = LENGTH ROUNDED FOR PLAN USE.
- DI-12C: FOR APPROX. QUANTITIES FOR DI-12C, ADD 0.36 CU. YDS. OF CLASS A3 CONCRETE TO DI-12B QUANTITIES FOR CONCRETE GUTTER. QUANTITY SHOWN IS FOR A MINIMUM SLOT LENGTH OF 3'-8". FOR OTHER LENGTHS SEE CONCRETE GUTTER INCREMENT BELOW.
- DI-12B AND DI-12C ARE NOT TO BE UTILIZED IN LOCATIONS NORMALLY SUBJECT TO TRAFFIC.
- DUMP NO WASTE DRAINS TO WATERWAYS LETTERING IS REQUIRED ON ALL DI-12 GRATES. LOCATION OF LETTERING ON GRATE MAY VARY BY MANUFACTURER.

**TABULATION CHARTS**

APPROXIMATE QUANTITIES DI-12B ONLY (SEE NOTES 19 & 24)					
(MINIMUM HEIGHT) SLOT 4' TO 14' (SEE NOTE 23)					
L (SEE NOTE 23)	L1	CONCRETE CU. YDS.	REINFORCING STEEL LBS.	NUMBER GRATES	CONCRETE CHAMBER INCREMENTS PER FOOT CU. YDS.
4	3'-8"	0.99	81.27	2	.35
6	5'-8 3/4"	1.28	122.81	3	
8	7'-8"	1.48	161.90	4	
10	9'-8 3/4"	1.79	203.37	5	
12	11'-8"	2.09	242.45	6	
14	13'-8 3/4"	2.40	283.93	7	

SHEET 2 OF 2

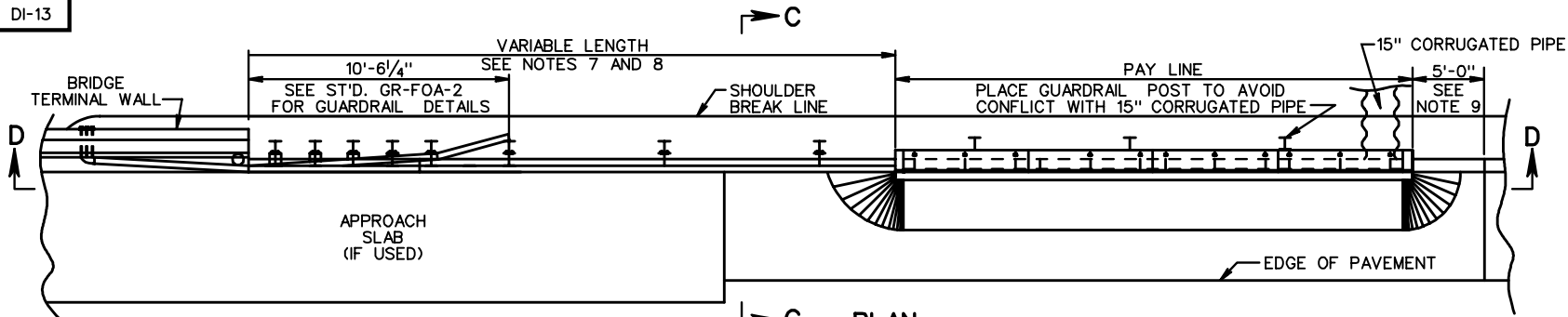
SPECIFICATION REFERENCE
241
503

**MULTIGRATE DROP INLET FOR PIPE SIZES 12" TO 36"**

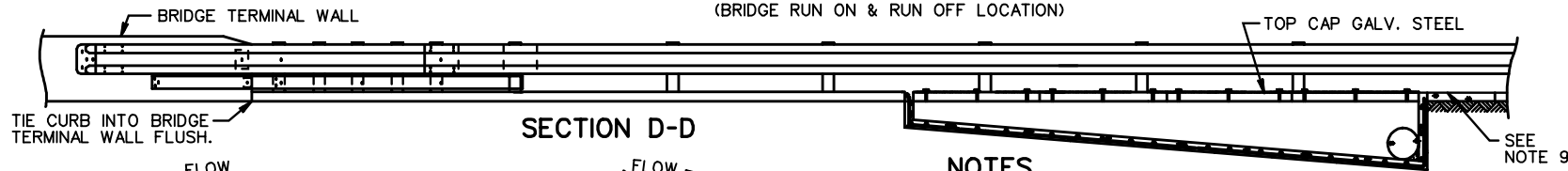
VIRGINIA DEPARTMENT OF TRANSPORTATION

REV 8/07

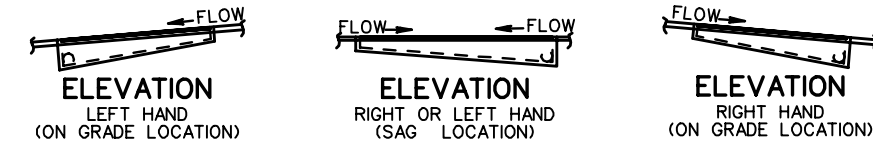
104.34



PLAN  
(BRIDGE RUN ON & RUN OFF LOCATION)



SECTION D-D



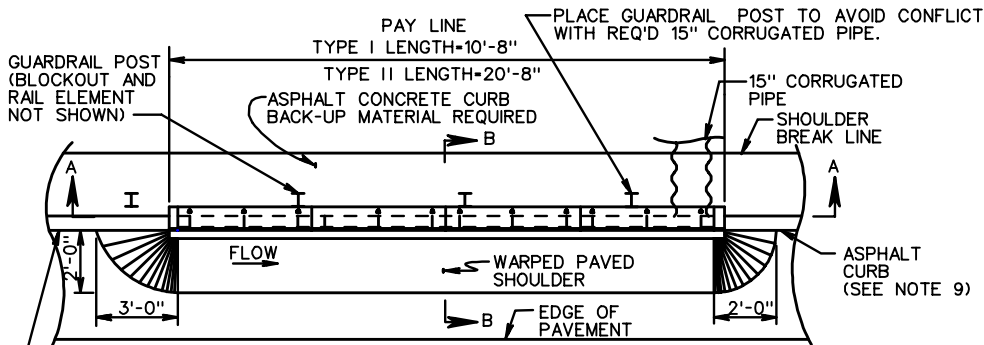
ELEVATION

ELEVATION

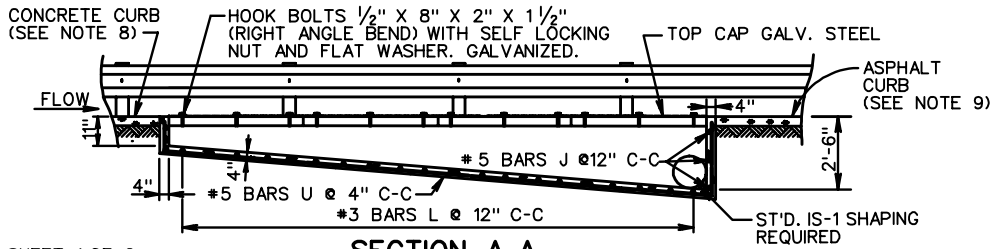
ELEVATION

**NOTES**

1. THIS UNIT MAY BE PRECAST OR CAST IN PLACE. CAST IN PLACE CONCRETE IS TO BE CLASS A3 (3000 PSI). PRECAST CONCRETE IS TO BE 4000 PSI.
2. ALL REINFORCING STEEL IS TO BE GRADE 60.
3. PIPES ARE TO BE PLACED ON THE DOWN GRADE OR LOWER END OF INLET.
4. PRECAST UNITS MUST BE FURNISHED WITH PIPES PLACED TO THE RIGHT OR LEFT ACCORDING TO THE FLOW DOWN GRADE, WHEN FACING THE INLET FROM THE CENTER OF THE ROAD.
5. WHEN THIS INLET IS USED IN A SAG LOCATION EITHER A RIGHT HAND OR A LEFT HAND UNIT MAY BE USED.
6. BACKFILL TO BE PLACED AND COMPACTED IN ACCORDANCE WITH SECTION 303.09 OF THE ROAD AND BRIDGE SPECIFICATIONS.
7. DI-13 STRUCTURE SHALL BE LOCATED A MINIMUM OF 11 FEET FROM THE END OF THE BRIDGE TERMINAL WALL. IN LOCATIONS THAT INCLUDE AN APPROACH SLAB EXTENDING BEYOND THE END OF THE BRIDGE TERMINAL WALL, THE DI13 STRUCTURE SHALL BE PLACED A MINIMUM OF 5 FEET BEYOND THE END OF THE APPROACH SLAB.
8. STANDARD CG-3 CONCRETE CURB SHALL BE PLACED FROM THE END OF THE INLET TO THE BEGINNING OF THE BRIDGE TERMINAL WALL. ASPHALT CONCRETE CURB BACK UP MATERIAL SHALL BE PLACED BEHIND CG-3 AS SHOWN IN SECTION C-C. THE COST OF CG-3 CURB AND ASPHALT CONCRETE CURB BACK UP MATERIAL SHALL BE PAID FOR SEPERATELY FROM THE DI-13 STRUCTURE.
9. STANDARD MC-3B ASPHALT CURB SHALL BE EXTENDED 5 FEET PAST THE END OF THE INLET AND TRANSITION DOWN TO GRADE LEVEL. LONGER LENGTHS OF CURB MAY BE NEEDED BEYOND THIS LIMIT AND THEN TRANSITIONED DOWN IN 5 FEET. SEE THE ROADWAY PLANS FOR THE REQUIRED LENGTH OF CURB. THE COST OF MC-3B CURB AND ASPHALT CONCRETE CURB BACKUP MATERIAL SHALL BE PAID FOR SEPERATELY FROM THE DI-13 STRUCTURE.
10. FOR DETAILS OF SLOT INLET AND PIPE INSTALLATION, SEE SECTION B-B OF SHEET 2 OR 2.



PLAN  
(ROADWAY LOCATION)



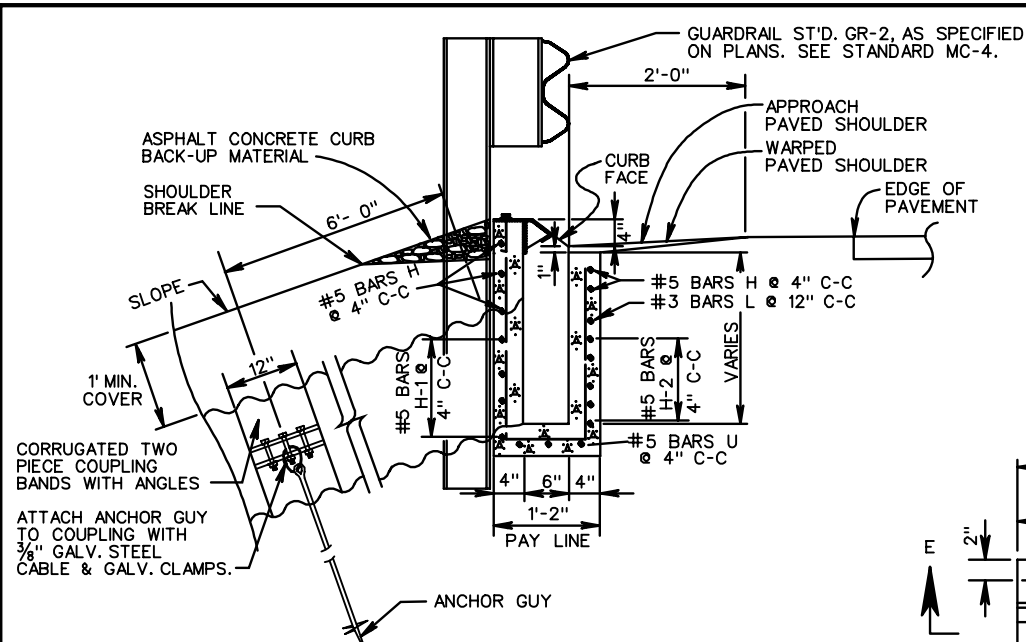
SECTION A-A

**SHOULDER SLOT INLET**

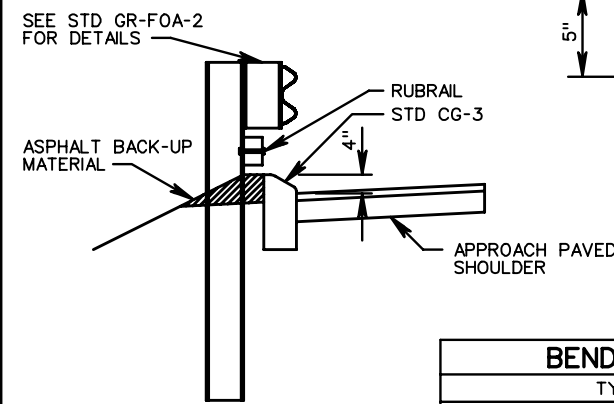
VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION  
REFERENCE

233  
302

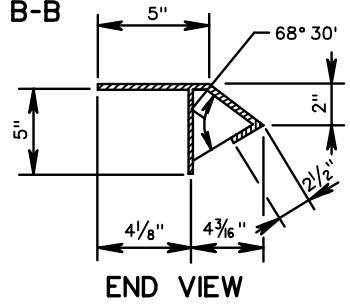


**SECTION B-B**

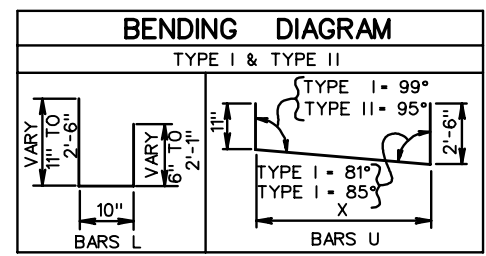


**SECTION C-C**

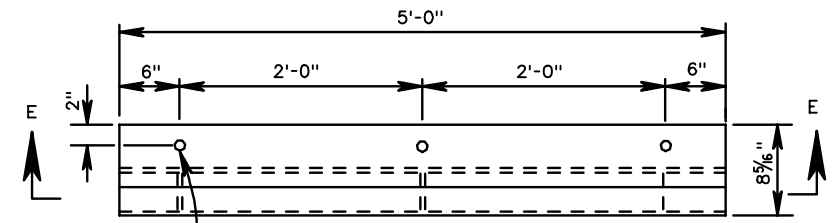
TYPE I		TYPE II	
MARK	X	MARK	X
U	10'-5 1/2"	U	20'-4 3/4"



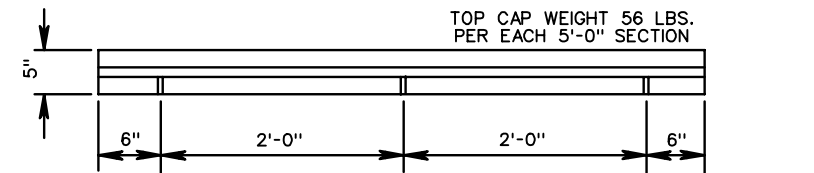
**END VIEW**



**BENDING DIAGRAM**



**PLAN**



**SECTION E-E  
TOP CAP DETAIL**

**TYPICAL METHOD OF INSTALLATION  
FOR PIPE ON FILL SLOPE**

**NOTES**

- SEE SHEET 1 OF 2 (104.35) OF ROAD AND BRIDGE STANDARDS FOR ADDITIONAL DESIGN AND PLACING INFORMATION.
- TOP CAP IS TO BE FABRICATED FROM A-36 STEEL PLATE 1/4" THICK. ALL JOINTS ARE TO BE WELDED USING 1/4" FILLET WELDS AND THE COMPLETE UNIT IS TO BE GALVANIZED.
- GUARDRAIL MUST BE FLUSH WITH THE FACE OF CURB.

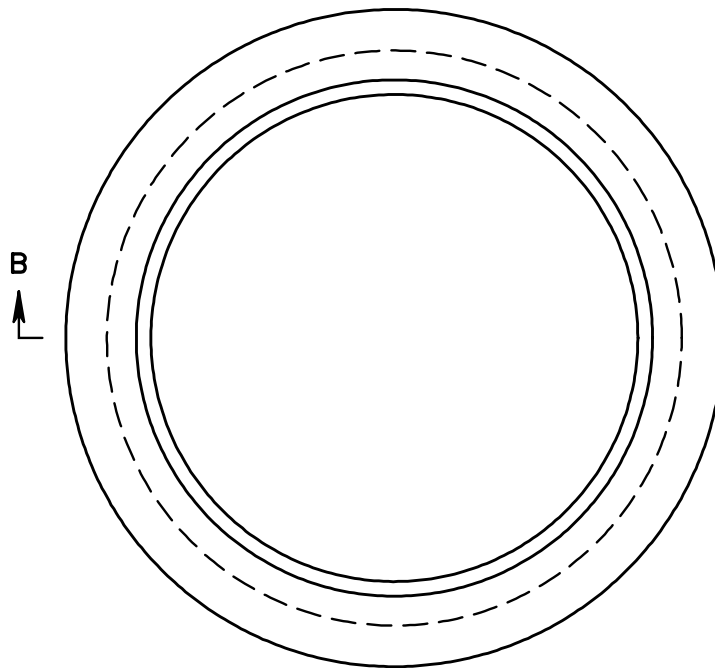
TYPE I					TYPE II				
MARK	SIZE	NO.	SPA.	LENGTH	MARK	SIZE	NO.	SPA.	LENGTH
H	#5	6	4"	10'-4"	H	#5	6	4"	20'-4"
H-1	#5	4	4"	8'-11" TO 2'-8"	H-1	#5	4	4"	12'-8" TO 2'-8"
H-2	#5	4	4"	8'-11" TO 2'-8"	H-2	#5	4	4"	12'-8" TO 2'-8"
J	#5	5	12"	0'-10"	J	#5	5	12"	0'-10"
L	#5	11	12"	5'-5" TO 2'-3"	L	#5	21	12"	5'-5" TO 2'-3"
U	#5	3	4"	13'-10"	U	#5	3	4"	23'-10"

**REINFORCING STEEL SCHEDULE**

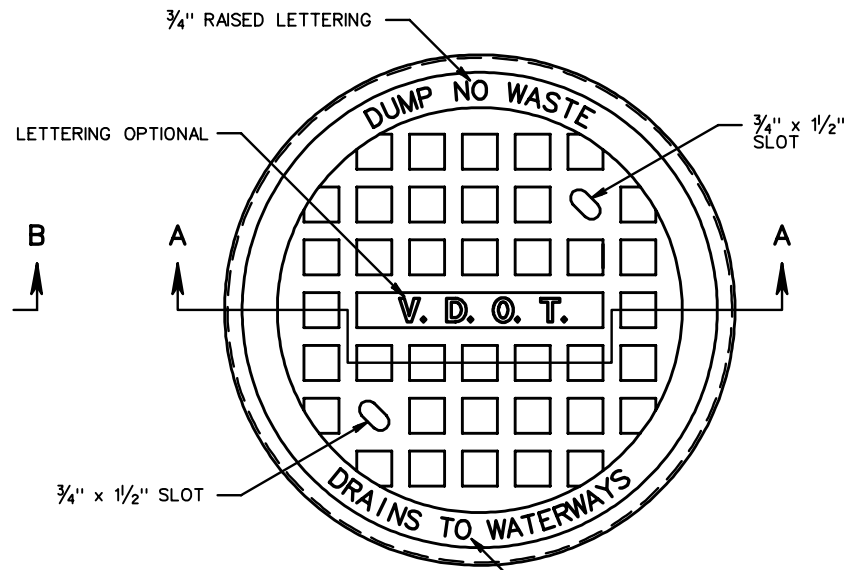
SPECIFICATION REFERENCE

**SHOULDER SLOT INLET**

VIRGINIA DEPARTMENT OF TRANSPORTATION

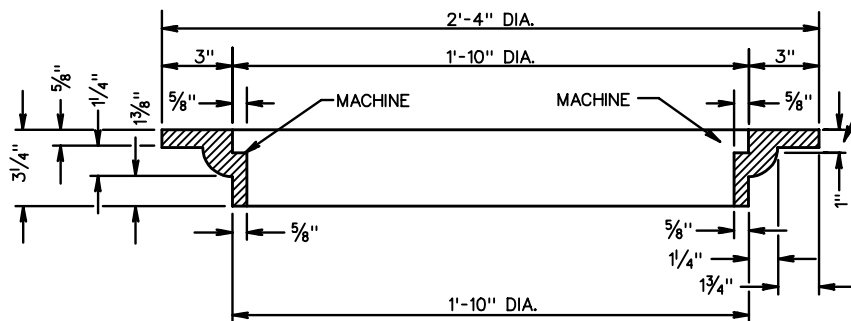


FRAME

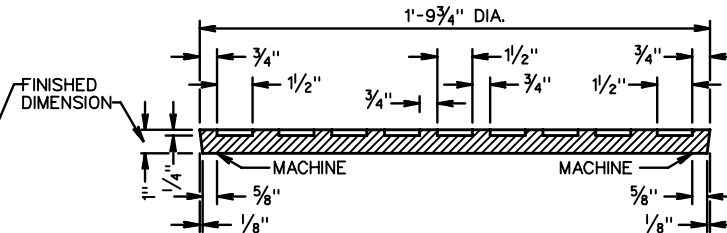


COVER

APPROXIMATE WEIGHT  
CAST IRON  
FRAME 86 ± 4 LBS.  
COVER 83 ± 4 LBS.



SECTION B-B



SECTION A-A

NOTES

1. THE LETTERS V.D.O.T. ARE OPTIONAL, IF USED THE LETTERS ARE TO BE CAST IN THE DEPRESSION IN TOP OF THE COVER 1" WIDE AND RAISED 1/4" HIGH AS SHOWN.
2. THE DUMP NO WASTE DRAINS TO WATERWAYS LETTERING IS REQUIRED ON ALL IC-2 COVERS. LOCATION OF LETTERING ON IC-2 COVER MAY VARY BY MANUFACTURER.

SPECIFICATION  
REFERENCE

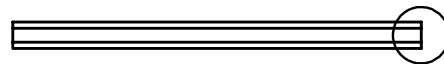
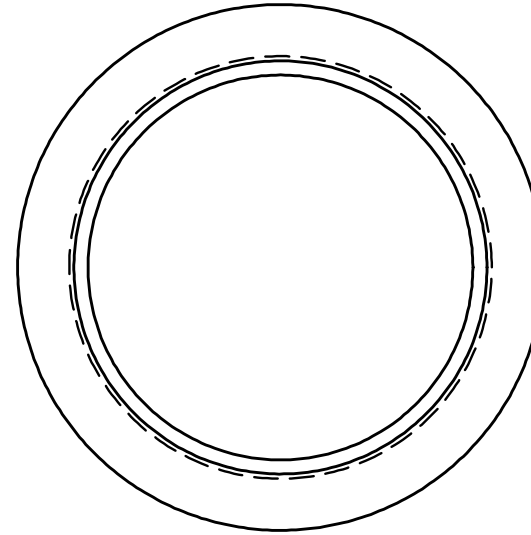
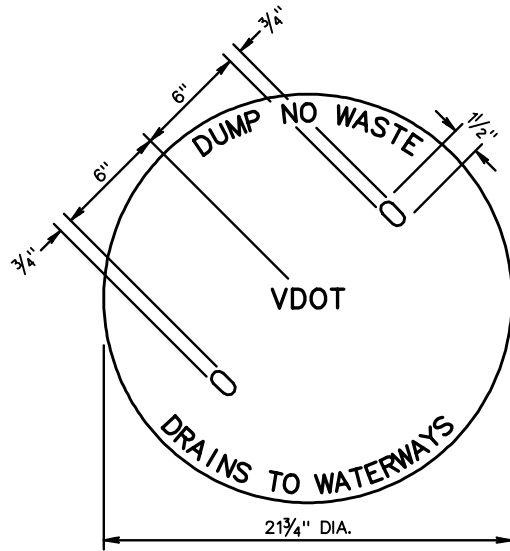
224  
302

STANDARD INLET AND FRAME COVER

VIRGINIA DEPARTMENT OF TRANSPORTATION

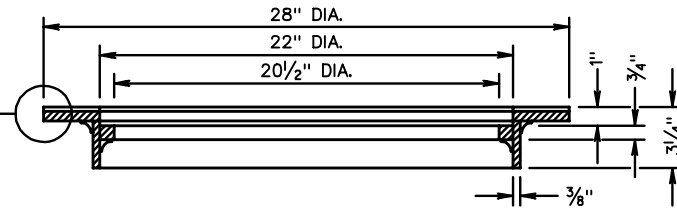
REV 8/07

105.01

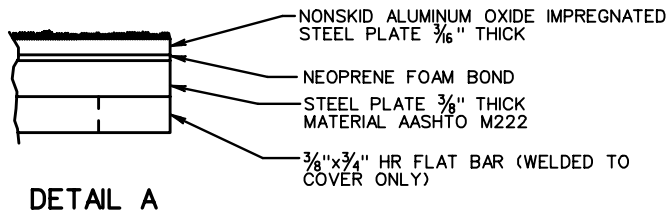


INLET COVER

SEE  
DETAIL A



SECTION C-C  
INLET FRAME



DETAIL A

**NOTES**

1. STRUCTURAL COMPONENTS SHALL CONFORM TO AASHTO M222.
2. FRAME AND COVER SHALL HAVE A CONTINUOUS FLASH FIT.
3. DUMP NO WASTE DRAINS TO WATERWAYS LETTERING IS REQUIRED ON ALL IC-2 COVERS.

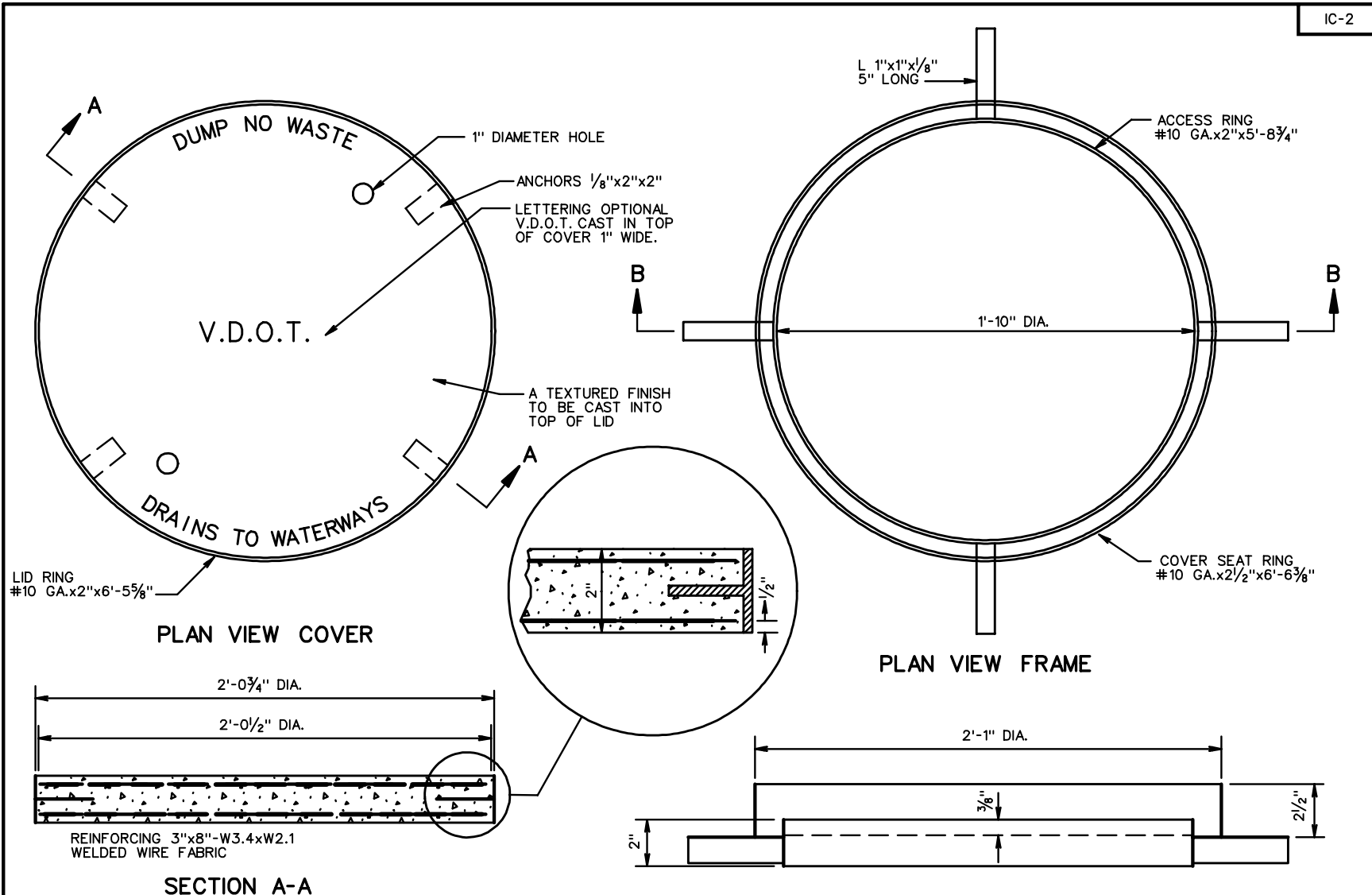
**STANDARD INLET AND FRAME COVER**

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION  
REFERENCE

302





**NOTES**

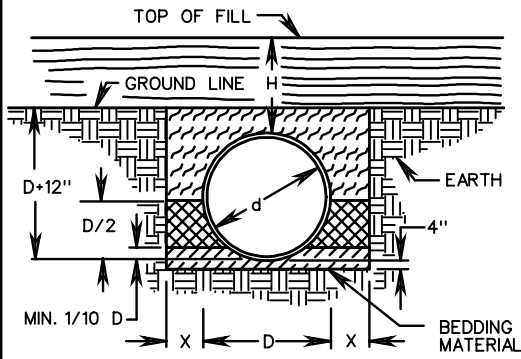
1. CONCRETE 4000 PSI
2. SUPPLIER MAY FURNISH 1/8" STEEL FOR 10 GA.
3. ALL METAL GALVANIZED TO V.D.O.T. STANDARD AND ASTM A 123-73.
4. DUMP NO WASTE DRAINS TO WATERWAYS LETTERING IS REQUIRED ON ALL IC-2 COVERS.

SPECIFICATION REFERENCE
105 302

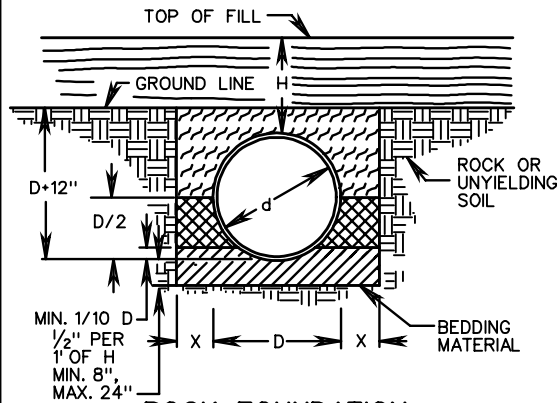
**PRECAST INLET AND FRAME COVER**

VIRGINIA DEPARTMENT OF TRANSPORTATION

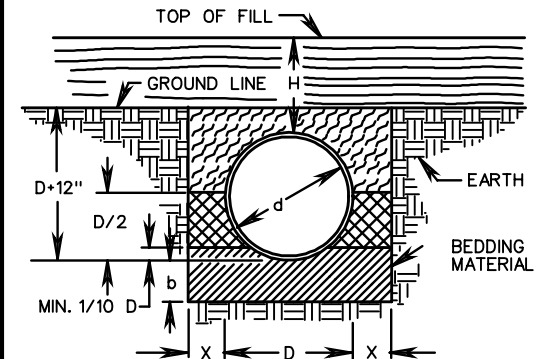
NO PROJECTION OF PIPE ABOVE GROUND LINE



NORMAL EARTH FOUNDATION

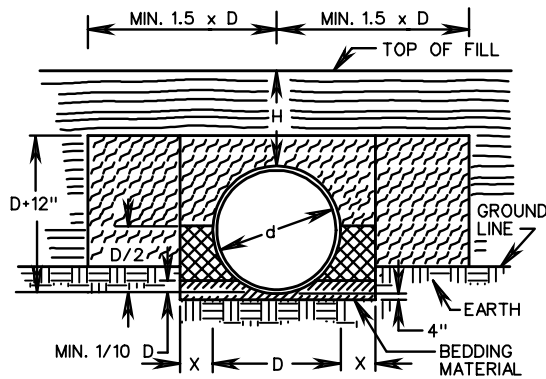


ROCK FOUNDATION

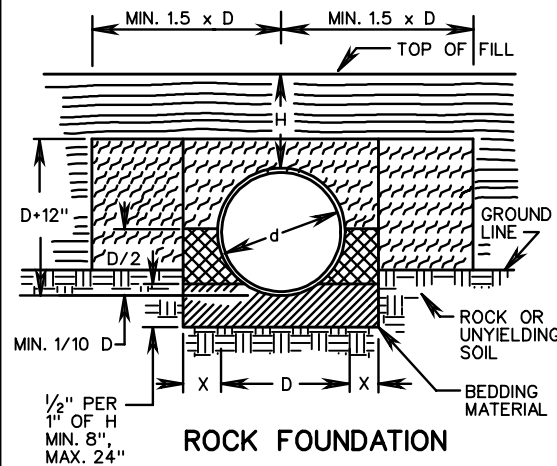


FOUNDATION SOFT, YIELDING, OR OTHERWISE UNSUITABLE MATERIAL

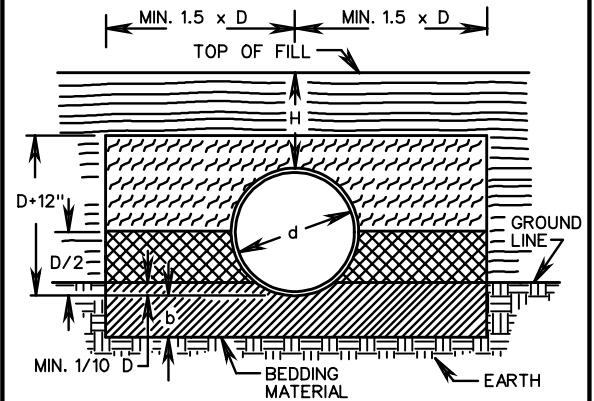
PIPE PROJECTION ABOVE GROUND LINE







NORMAL EARTH FOUNDATION



ROCK FOUNDATION



FOUNDATION SOFT, YIELDING, OR OTHERWISE UNSUITABLE MATERIAL

-  BEDDING MATERIAL IN ACCORDANCE WITH SECTION 302 OF THE ROAD AND BRIDGE SPECIFICATIONS.
-  CLASS I BACKFILL MATERIAL IN ACCORDANCE WITH SECTION 302 OF THE ROAD AND BRIDGE SPECIFICATIONS.
-  REGULAR BACKFILL MATERIAL IN ACCORDANCE WITH SECTION 302 OF THE ROAD AND BRIDGE SPECIFICATIONS.
-  EMBANKMENT

NOTES:

FOR PLASTIC PIPE, THE LIMITS OF THE CLASS I BACKFILL MATERIAL SHALL BE EXTENDED TO 12" ABOVE THE TOP OF THE PIPE.

FOR GENERAL NOTES ON PIPE BEDDING, SEE INSTALLATION OF PIPE CULVERTS AND STORM SEWERS GENERAL NOTES ON SHEET 107.00.

CRUSHED GLASS CONFORMING TO THE SIZE REQUIREMENTS FOR CRUSHER RUN AGGREGATE SIZE 25 AND 26 MAY BE USED IN PLACE OF CLASS I BACKFILL.

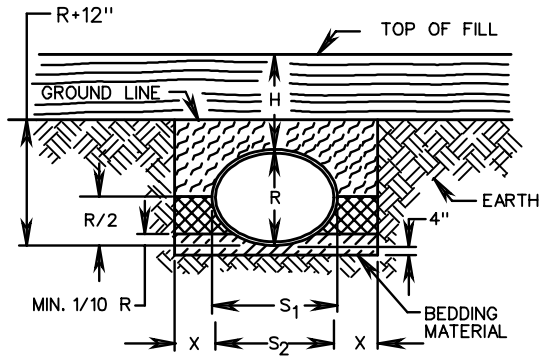
SPECIFICATION REFERENCE

302  
303

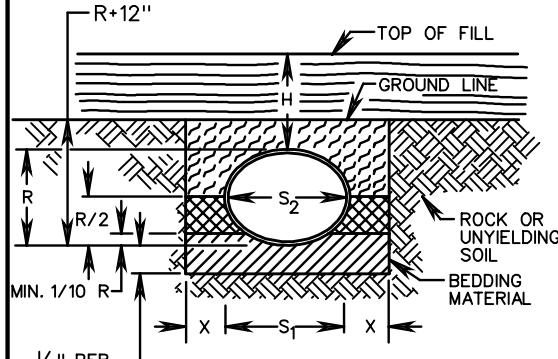
INSTALLATION OF PIPE CULVERTS AND STORM SEWERS  
CIRCULAR PIPE BEDDING AND BACKFILL - METHOD "A"

VIRGINIA DEPARTMENT OF TRANSPORTATION

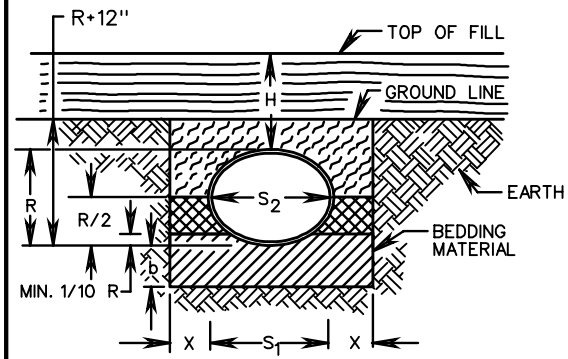
NO PROJECTION OF PIPE ABOVE GROUND LINE



NORMAL EARTH FOUNDATION

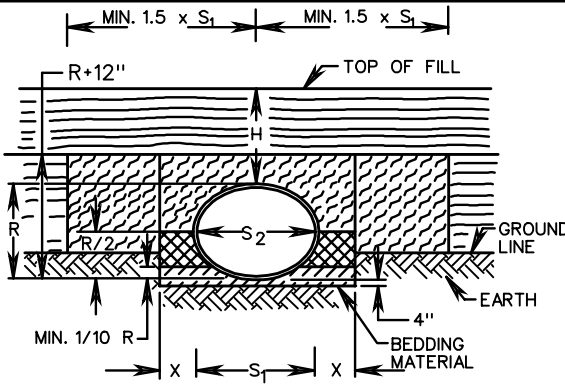


ROCK FOUNDATION  
 $\frac{1}{2}$ " PER  
 1" OF H  
 MIN. 8"  
 MAX. 24"

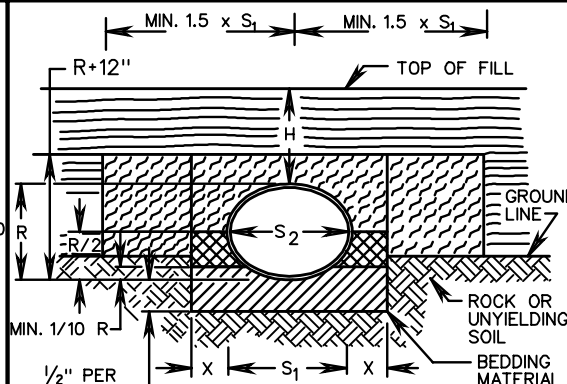


FOUNDATION SOFT, YIELDING, OR OTHERWISE UNSUITABLE MATERIAL

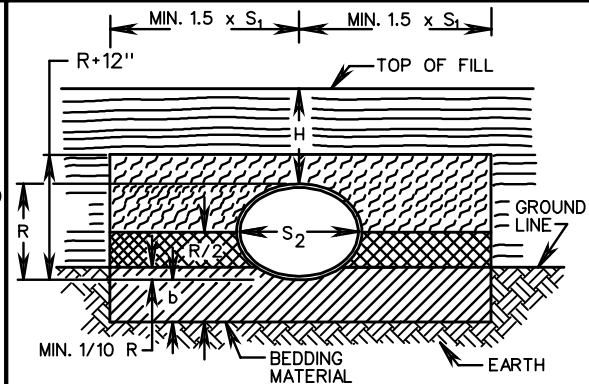
PIPE PROJECTION ABOVE GROUND LINE







NORMAL EARTH FOUNDATION



ROCK FOUNDATION  
 $\frac{1}{2}$ " PER  
 1" OF H  
 MIN. 8"  
 MAX. 24"



FOUNDATION SOFT, YIELDING, OR OTHERWISE UNSUITABLE MATERIAL

-  BEDDING MATERIAL IN ACCORDANCE WITH SECTION 302 OF THE ROAD AND BRIDGE SPECIFICATIONS.
-  CLASS I BACKFILL MATERIAL IN ACCORDANCE WITH SECTION 302 OF THE ROAD AND BRIDGE SPECIFICATIONS.
-  REGULAR BACKFILL MATERIAL IN ACCORDANCE WITH SECTION 302 OF THE ROAD AND BRIDGE SPECIFICATIONS.
-  EMBANKMENT

NOTES:

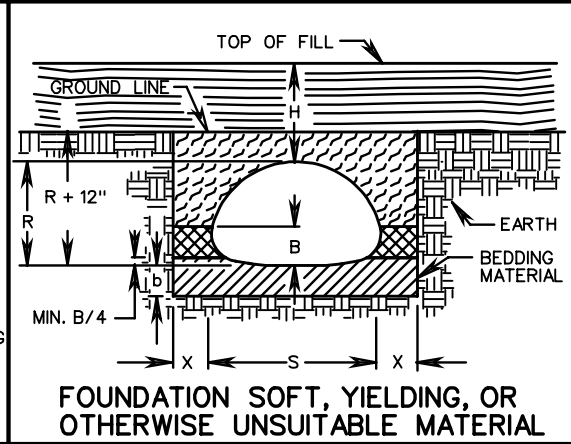
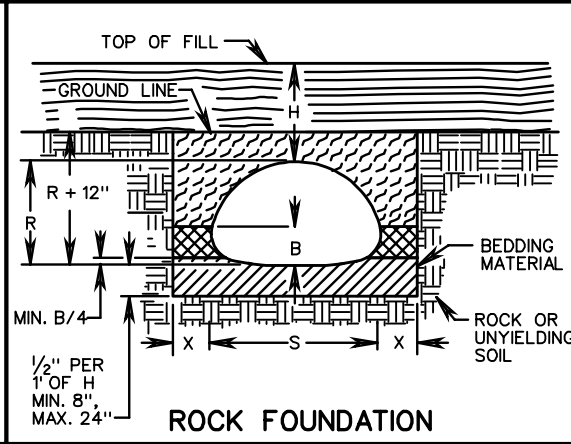
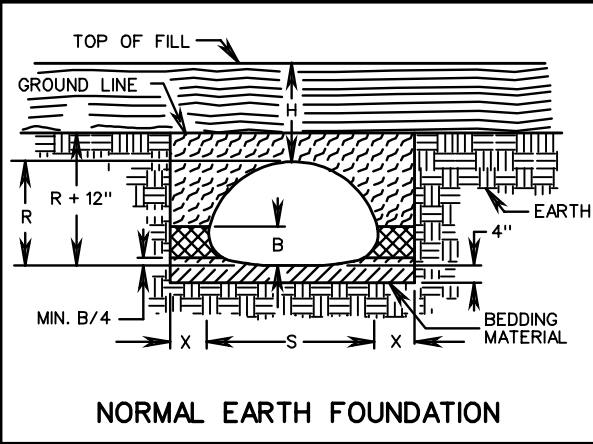
FOR GENERAL NOTES ON PIPE BEDDING, SEE INSTALLATION OF PIPE CULVERTS AND STORM SEWERS GENERAL NOTES ON SHEET 107.00.

CRUSHED GLASS CONFORMING TO THE SIZE REQUIREMENTS FOR CRUSHER RUN AGGREGATE SIZE 25 AND 26 MAY BE USED IN PLACE OF CLASS I BACKFILL.

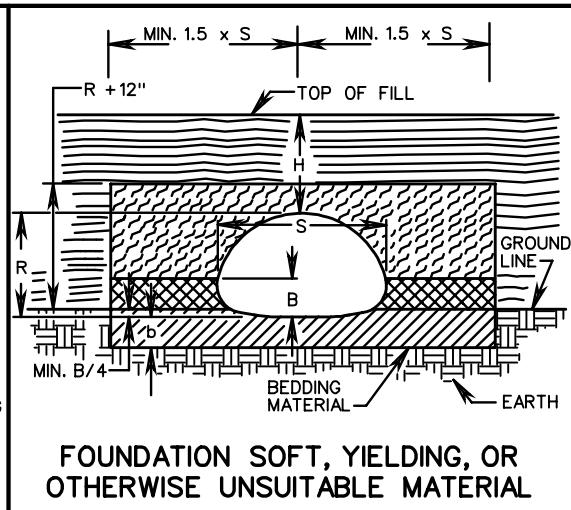
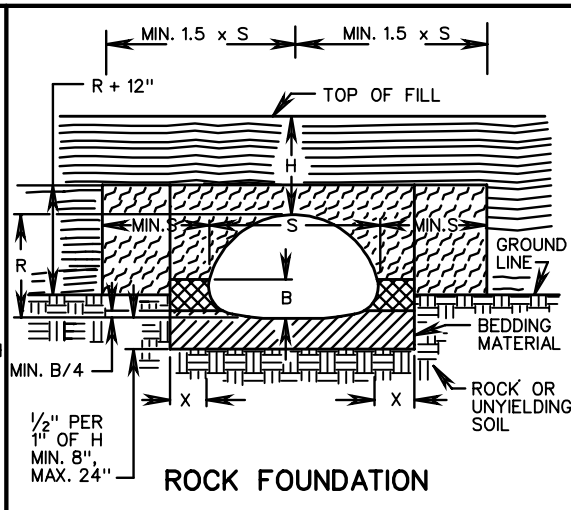
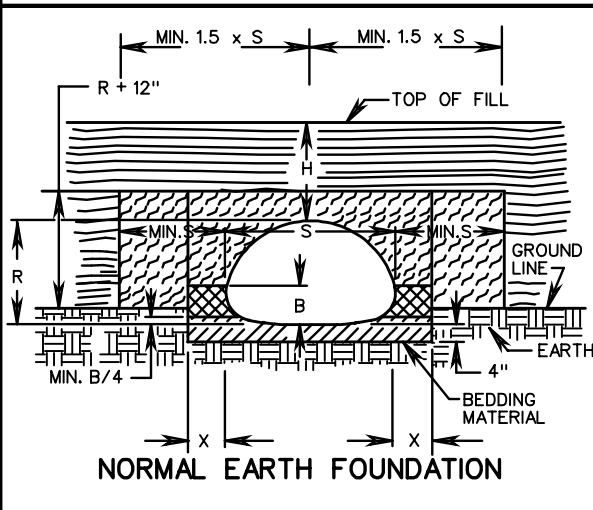
INSTALLATION OF PIPE CULVERTS AND STORM SEWERS  
 ELLIPTICAL PIPE BEDDING AND BACKFILL - METHOD "A"





NO PROJECTION OF PIPE ARCH ABOVE GROUND LINE

PB-1



PIPE ARCH PROJECTION ABOVE GROUND LINE



-  BEDDING MATERIAL IN ACCORDANCE WITH SECTION 302 OF THE ROAD AND BRIDGE SPECIFICATIONS.
-  CLASS I BACKFILL MATERIAL IN ACCORDANCE WITH SECTION 302 OF THE ROAD AND BRIDGE SPECIFICATIONS.
-  REGULAR BACKFILL MATERIAL IN ACCORDANCE WITH SECTION 302 OF THE ROAD AND BRIDGE SPECIFICATIONS.
-  EMBANKMENT

**NOTE:**

FOR GENERAL NOTES ON PIPE BEDDING, SEE INSTALLATION OF PIPE CULVERTS AND STORM SEWERS GENERAL NOTES ON SHEET 107.00.  
 CRUSHED GLASS CONFORMING TO THE SIZE REQUIREMENTS FOR CRUSHER RUN AGGREGATE SIZE 25 AND 26 MAY BE USED IN PLACE OF CLASS I BACKFILL.

SHEET 3 of 4

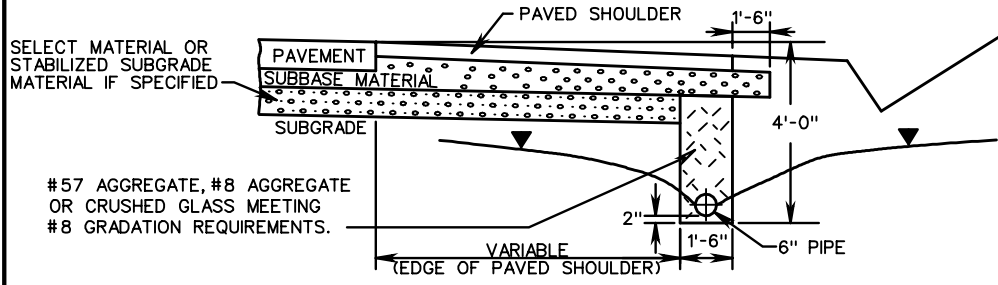
SPECIFICATION REFERENCE
302
303

**INSTALLATION OF PIPE CULVERTS AND STORM SEWERS  
 PIPE ARCH BEDDING AND BACKFILL**

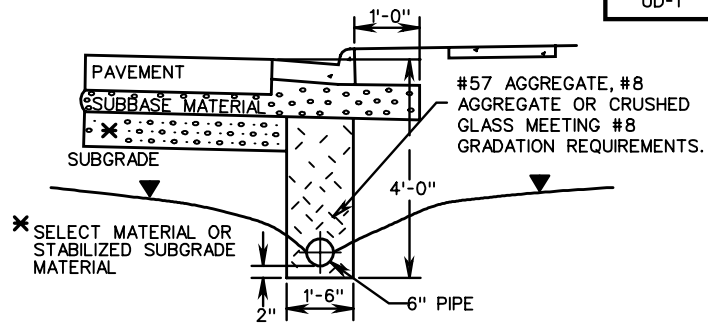
VIRGINIA DEPARTMENT OF TRANSPORTATION

REV 8/07

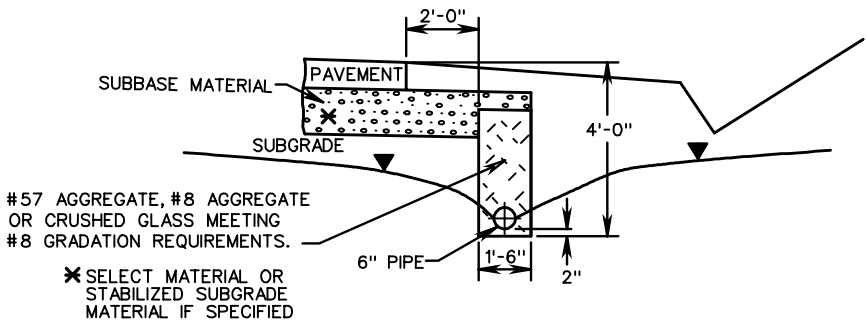
107.03



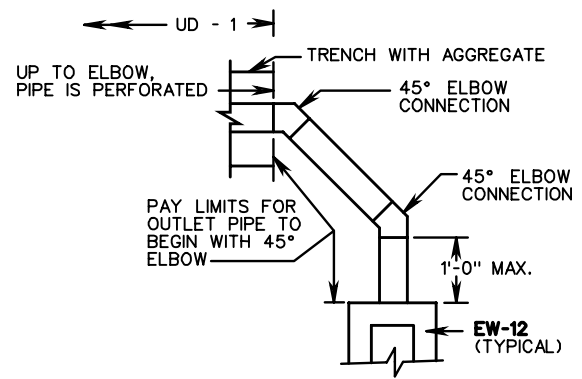
PAVED SHOULDER SECTION



CURB AND GUTTER SECTION



WITHOUT PAVED SHOULDER



PLAN VIEW OF OUTLET PIPE AT FILL

NOTES:

1. WHEN THE LONGITUDINAL PIPE CONNECTS DIRECTLY INTO A DRAINAGE STRUCTURE (DROP INLET, MANHOLE, ECT.), NON-PERFORATED OUTLET PIPES ARE NOT REQUIRED.
2. INVERT ELEVATION AT OUTLET END OF OUTLET PIPE TO BE A MINIMUM OF 1'-0" ABOVE INVERT ELEVATION OF RECEIVING DRAINAGE DITCH OR STRUCTURE.
3. ALL CONNECTIONS (ELBOWS, WYES, ETC.) WITHIN PAY LIMITS FOR OUTLET PIPE ARE TO BE OF THE SAME CRUSHING STRENGTH AS THE OUTLET PIPE.
4. OUTLET PIPE ARE TO BE INSTALLED ON 2% MIN. (3% DESIRABLE) GRADE.
5. THE NORMAL DEPTH OF UNDERDRAIN IS TO BE 4'-0" BELOW THE NEAR EDGE OF PAVEMENT AS SHOWN. THE LONGITUDINAL GRADE OF THE UNDERDRAIN SHALL FOLLOW THAT OF THE ROADWAY WITH A MINIMUM GRADE OF 0.2 %
6. WHERE THE BOTTOM OF SELECT MATERIAL IS GREATER THAN 4'-0" BELOW THE PAVEMENT, THE BOTTOM OF THE UNDERDRAIN IS TO BE COINCIDENT WITH THE BOTTOM OF SELECT MATERIAL AND THE TRENCH DEPTH AND BACKFILL QUANTITY INCREASED ACCORDINGLY.
7. WHEN USED WITH STABILIZED OPEN-GRADED DRAINAGE LAYER, THE BOTTOM OF THE CURB AND GUTTER SHALL BE CONSTRUCTED PARALLEL TO THE SLOPE OF SUBBASE COURSES OUT TO THE DEPTH OF THE PAVEMENT.
8. OUTLET PIPE TO BE SECURELY CONNECTED TO EW-12OR OTHER DRAINAGE STRUCTURE.
9. ▼ DENOTES WATER TABLE.
10. OUTLET PIPE CONFIGURATION TO PROVIDE FOR PASSAGE OF INSPECTION CAMERA WITH 2½" I. D. HEAD.

LONGITUDINAL PERFORATED PIPE

TYPE OF PIPE	CRUSHING STRENGTH	
	*W.T.	6" NOMINAL DIAMETER
SMOOTH WALL PVC	.153	
CORRUGATED PE		AASHTO M-252

NON-PERFORATED OUTLET PIPE

TYPE OF PIPE	CRUSHING STRENGTH	
	*W.T.	6" NOMINAL DIAMETER
SMOOTH WALL PVC	.153	
SMOOTH WALL PE		70 PSI ***

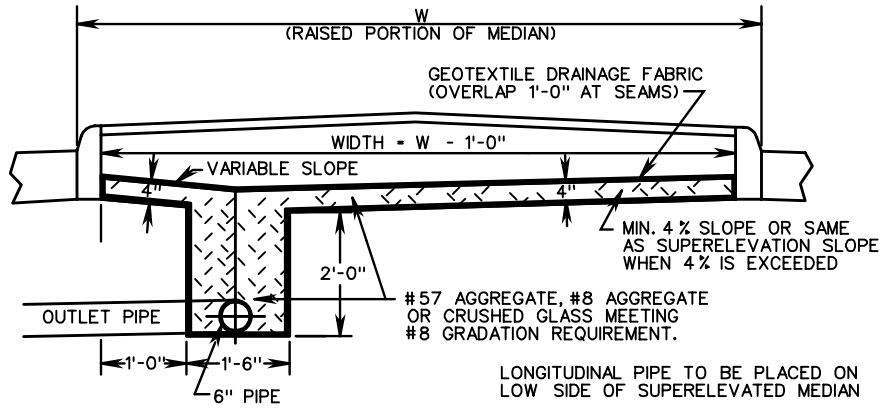
\* WALL THICKNESS (MIN) - INCHES  
 \*\*\* TESTED ACCORDING TO ASTM D-2412 AT 5% DEFLECTION.

SPECIFICATION REFERENCE
240
501
701

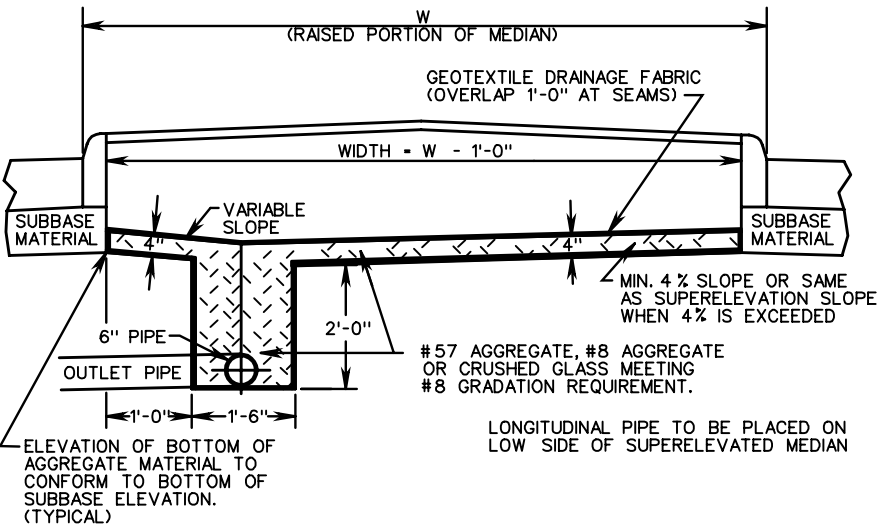
STANDARD GROUNDWATER UNDERDRAIN

VIRGINIA DEPARTMENT OF TRANSPORTATION

#57 AGGREGATE,  
#8 AGGREGATE OR  
CRUSHED GLASS  
MEETING #8  
GRADATION.



WITHOUT SUBBASE MATERIAL



WITH SUBBASE MATERIAL

LONGITUDINAL PERFORATED PIPE

TYPE OF PIPE	CRUSHING STRENGTH	
	W.T.	6" NOMINAL DIAMETER
SMOOTH WALL PVC	0.153	
CORRUGATED PE		AASHTO M-252

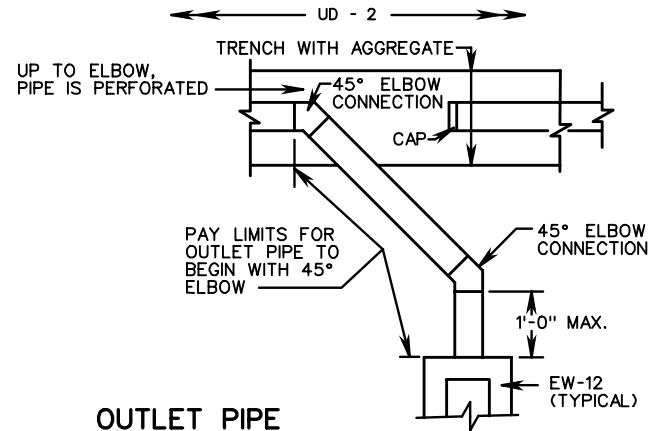
NON-PERFORATED OUTLET PIPE

TYPE OF PIPE	CRUSHING STRENGTH	
	W.T.	6" NOMINAL DIAMETER
SMOOTH WALL PVC	0.153	
SMOOTH WALL PE		70 PSI ***

\* WALL THICKNESS (MIN) - INCHES  
\*\*\* TESTED ACCORDING TO ASTM D-2412 AT 5% DEFLECTION.

NOTES:

1. WHEN THE LONGITUDINAL PIPE CONNECTS DIRECTLY INTO A DRAINAGE STRUCTURE (DROP INLET, MANHOLE, ECT.), NON-PERFORATED OUTLET PIPES ARE NOT REQUIRED.
2. INVERT ELEVATION AT OUTLET END OF OUTLET PIPE TO BE A MINIMUM OF 1'-0" ABOVE INVERT ELEVATION OF RECEIVING DRAINAGE DITCH OR STRUCTURE.
3. ALL CONNECTIONS (ELBOWS, WYES, ETC.) WITHIN PAY LIMITS FOR OUTLET PIPE ARE TO BE OF THE SAME CRUSHING STRENGTH AS THE OUTLET PIPE.
4. OUTLET PIPE ARE TO BE INSTALLED ON 2% MIN. (3% DESIRABLE) GRADE AND LOCATED AT A MAXIMUM OF 500' APART.
5. OUTLET PIPE TO BE SECURELY CONNECTED TO EW-12OR OTHER DRAINAGE STRUCTURE.
6. WHEN UNDERDRAIN MUST TRAVERSE UNDER CROSSOVER LOCATIONS, NON-PERFORATED OUTLET PIPE ONLY IS TO BE USED UNDER CROSSOVER PAVEMENT.

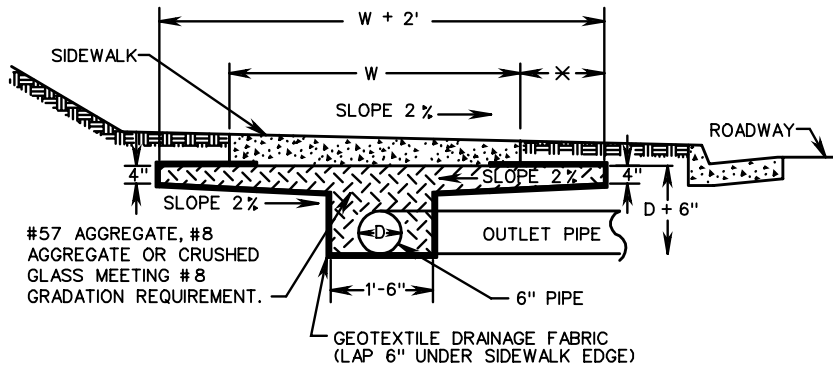


STANDARD UNDERDRAIN FOR USE  
WITH RAISED GRASS MEDIAN STRIPS

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION  
REFERENCE

240  
501  
701



※ THIS PORTION TO BE DELETED WHEN SIDEWALK IS ADJACENT TO CURB OR CURB AND GUTTER WITH NO BUFFER STRIP.

**NOTES:**

1. WHEN THE LONGITUDINAL PIPE CONNECTS DIRECTLY INTO A DRAINAGE STRUCTURE (DROP INLET, MANHOLE, ECT.), NON-PERFORATED OUTLET PIPES ARE NOT REQUIRED.
2. INVERT ELEVATION AT OUTLET END OF OUTLET PIPE TO BE A MINIMUM OF 1'-0" ABOVE INVERT ELEVATION OF RECEIVING DRAINAGE DITCH OR STRUCTURE.
3. ALL CONNECTIONS (ELBOWS, WYES, ETC.) WITHIN PAY LIMITS FOR OUTLET PIPE ARE TO BE OF THE SAME CRUSHING STRENGTH AS THE OUTLET PIPE.
4. OUTLET PIPE ARE TO BE INSTALLED ON 2% MIN. (3% DESIRABLE) GRADE.
5. OUTLET PIPE TO BE SECURELY CONNECTED TO EW-12OR OTHER DRAINAGE STRUCTURE.
6. SIDEWALK UNDERDRAIN IS TO BE USED WHEN THE SIDEWALK LONGITUDINAL GRADIENT IS 3% OR MORE AND WHEN THE UNDERLYING SOIL HAS 34% OR MORE PASSING THE NO. 200 SIEVE, AND HAS A PLOF 13 OR LESS, AND THE AREA HAS A HISTORY OF SIDEWALK UNDERMINING.
7. SIDEWALK UNDERDRAINS SHOULD BE TIED INTO THE STORM SEWER SYSTEM AT POINTS APPROXIMATELY A CITY BLOCK APART. UNDERDRAIN RUNS MUST NOT EXCEED 1,000 FEET IN LENGTH WITHOUT DISCHARGING INTO THE STORM DRAIN SYSTEM OR INTO AN OPEN DRAIN.
8. WITHIN THE LIMITS OF A COMMERCIAL ENTRANCE, NON-PERFORATED PIPE SHALL BE UTILIZED IN LIEU OF PERFORATED PIPE.

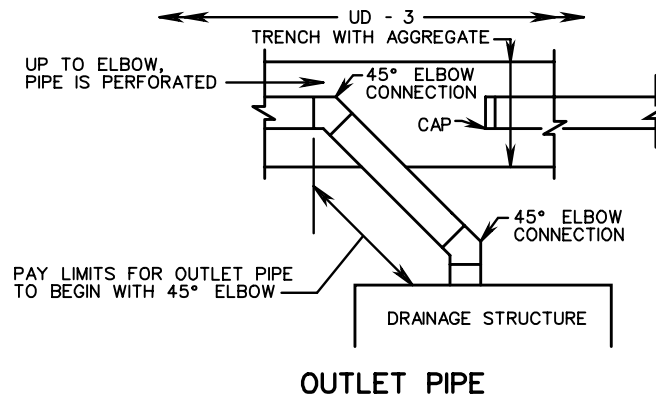
**LONGITUDINAL PERFORATED PIPE**

TYPE OF PIPE	CRUSHING STRENGTH	
	※ W.T.	6" NOMINAL DIAMETER
SMOOTH WALL PVC	0.153	
CORRUGATED PE		AASHTO M-252

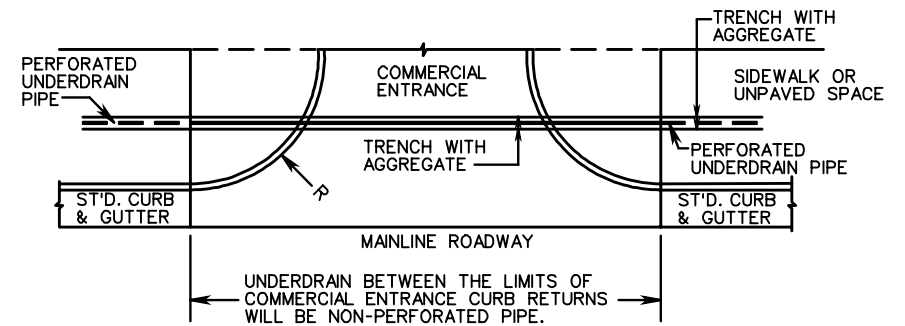
**NON-PERFORATED PIPE FOR USE UNDER COMMERCIAL ENTRANCES AND FOR OUTLETS**

TYPE OF PIPE	CRUSHING STRENGTH	
	※ W.T.	6" NOMINAL DIAMETER
SMOOTH WALL PVC	0.153	
SMOOTH WALL PE		70 PSI ※※※

※ WALL THICKNESS (MIN) - INCHES  
 ※※※ TESTED ACCORDING TO ASTM D-2412 AT 5% DEFLECTION.



**OUTLET PIPE**



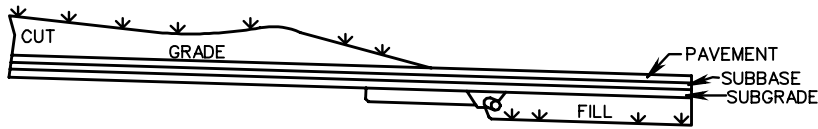
SPECIFICATION REFERENCE

232  
501  
701

**STANDARD SIDEWALK UNDERDRAIN**

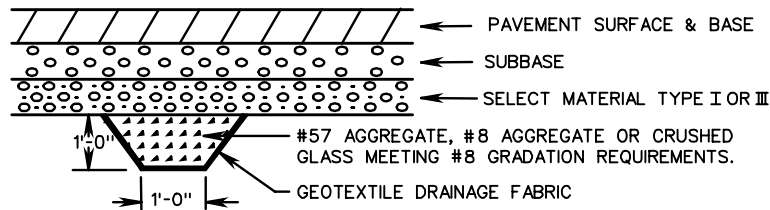
VIRGINIA DEPARTMENT OF TRANSPORTATION

REV 8/07  
108.03

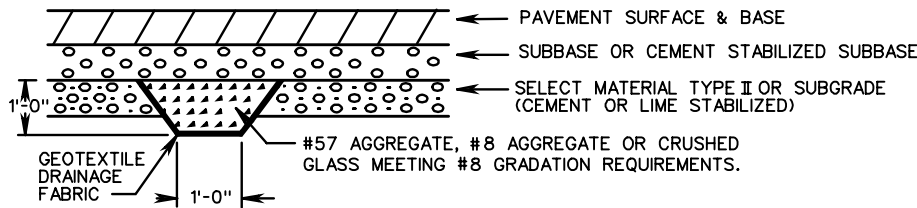


**COMBINATION UNDERDRAIN CD-1 AT LOWER END OF CUTS  
CENTER LINE SECTION  
(WITH TYPE I SELECT MATERIAL)**

**TRENCH PLACEMENT**



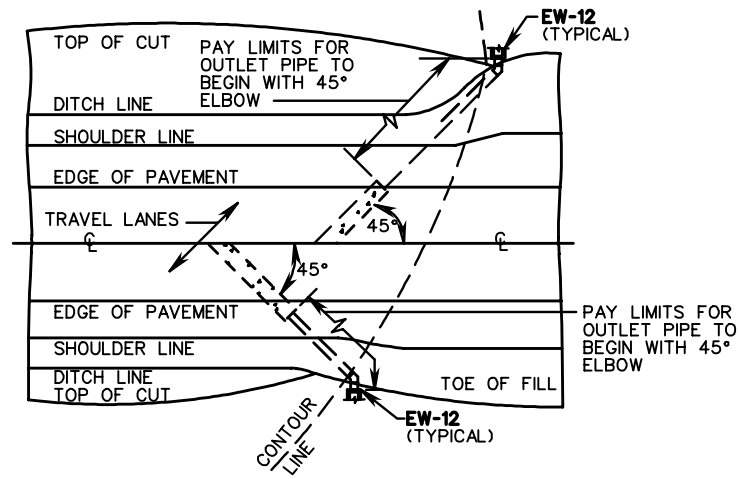
OR



**NON-PERFORATED OUTLET PIPE**

TYPE OF PIPE	CRUSHING STRENGTH	
	W.T. 4" NOM. DIAMETER	W.T. 6" NOM. DIAMETER
SMOOTH WALL PVC	.103	0.153
SMOOTH WALL PE	70 PSI ***	70 PSI ***

※ WALL THICKNESS (MIN) - INCHES  
 ※※※ TESTED ACCORDING TO ASTM D-2412 AT 5% DEFLECTION.



**PLAN VIEW  
(PLACEMENT OF CD-1 COMBINATION UNDERDRAIN)**

**GENERAL NOTES**

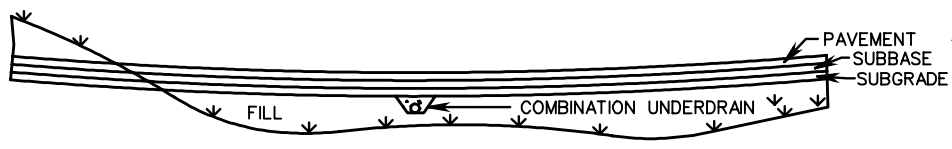
- UNLESS SPECIFICALLY INDICATED, COMBINATION UNDERDRAIN WILL NOT BE LOCATED AT THIS POINT WHEN BOTH SUBBASE AND SUBGRADE ARE STABILIZED.
- TRENCH SHALL BE FILLED WITH AGGREGATE AND THOROUGHLY HAND TAMPED TO INSURE COMPACTNESS.
- OUTLET PIPE SHALL BEGIN AT THE EDGE OF THE TRAVEL LANE PAVEMENT AND SHALL BE PLACED ON A GRADE PARALLEL TO THE SHOULDER SLOPE 2% MIN. (3% DESIRABLE) GRADE.
- ON CURB AND GUTTER SECTIONS, WHERE IT IS IMPOSSIBLE TO OTHERWISE PROVIDE OUTLETS FOR UNDERDRAINS, THEY ARE TO BE LOCATED SO AS TO DRAIN INTO DROP INLETS OR MANHOLES.
- ON SUPERELEVATED SECTIONS, TRENCH IS TO BE UNDER ENTIRE PAVEMENT AREA WITH OUTLET PIPE ON LOW SIDE ONLY.
- INVERT ELEVATION AT OUTLET END OF OUTLET PIPE TO BE A MINIMUM OF 1'-0" ABOVE INVERT ELEVATION OF RECEIVING DRAINAGE DITCH OR STRUCTURE.
- ALL CONNECTIONS (ELBOWS, WYES, ETC.) WITHIN PAY LIMITS FOR OUTLET PIPE ARE TO BE OF THE SAME CRUSHING STRENGTH AS THE OUTLET PIPE.
- OUTLET PIPE TO BE SECURELY CONNECTED TO EW-12 OR OTHER DRAINAGE STRUCTURE.

**STANDARD COMBINATION UNDERDRAIN  
(AT LOWER END OF CUTS)**

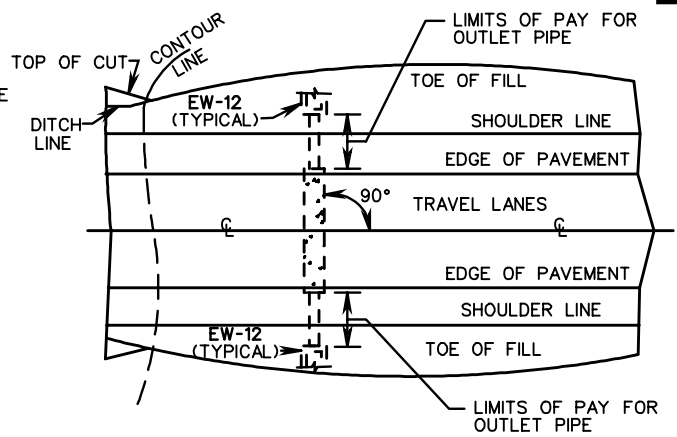
SPECIFICATION  
REFERENCE

232  
501  
701



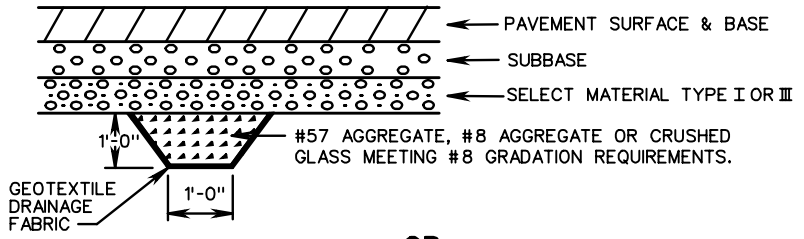


**COMBINATION UNDERDRAIN CD-2 ON FILLS  
CENTER LINE SECTION  
(WITH TYPE 1 SELECT MATERIAL)**

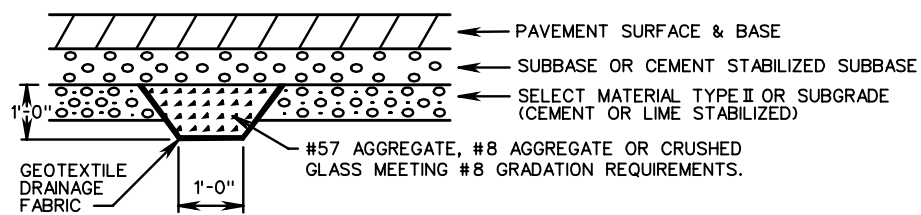


**PLAN VIEW SHOWING PLACEMENT OF  
CD-2 UNDERDRAIN**

**TRENCH PLACEMENT**



OR



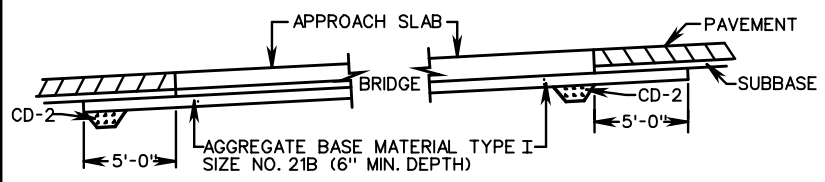
**NON-PERFORATED OUTLET PIPE**

TYPE OF PIPE	CRUSHING STRENGTH	
	W.T. 4" NOM. DIAMETER	W.T. 6" NOM. DIAMETER
SMOOTH WALL PVC	.103	0.153
SMOOTH WALL PE	70 PSI ***	70 PSI ***

\* WALL THICKNESS (MIN) - INCHES  
 \*\*\* TESTED ACCORDING TO ASTM D-2412 AT 5% DEFLECTION.

**GENERAL NOTES**

1. TRENCH SHALL BE FILLED WITH AGGREGATE AND THOROUGHLY HAND TAMPED TO INSURE COMPACTNESS.
2. OUTLET PIPE SHALL BEGIN AT THE EDGE OF THE TRAVEL LANE PAVEMENT AND SHALL BE PLACED ON A GRADE PARALLEL TO THE SHOULDER SLOPE 2 1/2% MIN. (3% DESIRABLE) GRADE.
3. ON CURB AND GUTTER SECTIONS, WHERE IT IS IMPOSSIBLE TO OTHERWISE PROVIDE OUTLETS FOR UNDERDRAINS, THEY ARE TO BE LOCATED SO AS TO DRAIN INTO DROP INLETS OR MANHOLES.
4. ON SUPERELEVATED SECTIONS, TRENCH IS TO BE UNDER ENTIRE PAVEMENT AREA WITH OUTLET PIPE ON LOW SIDE ONLY.
5. INVERT ELEVATION AT OUTLET END OF OUTLET PIPE TO BE A MINIMUM OF 1'-0" ABOVE INVERT ELEVATION OF RECEIVING DRAINAGE DITCH OR STRUCTURE.
6. ALL CONNECTIONS (ELBOWS, WYES, ETC.) WITHIN PAY LIMITS FOR OUTLET PIPE ARE TO BE OF THE SAME CRUSHING STRENGTH AS THE OUTLET PIPE.
7. OUTLET PIPE TO BE SECURELY CONNECTED TO EW-12 OR OTHER DRAINAGE STRUCTURE.

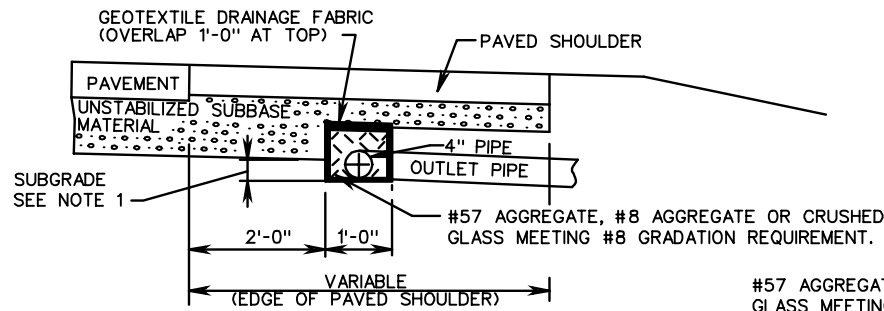


**PLACEMENT OF CD-2 UNDERDRAIN AT  
BRIDGE APPROACH SLABS**

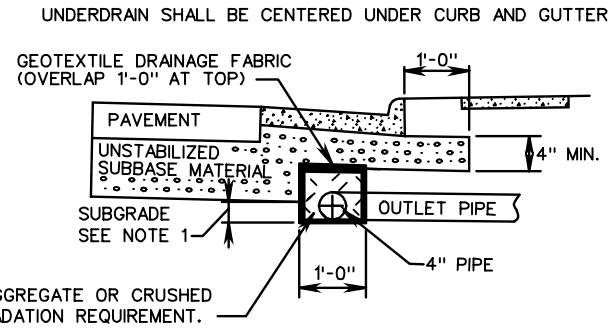
SPECIFICATION REFERENCE
232
501
701

**STANDARD COMBINATION UNDERDRAIN  
(AT GRADE SAGS AND BRIDGE APPROACHES)**

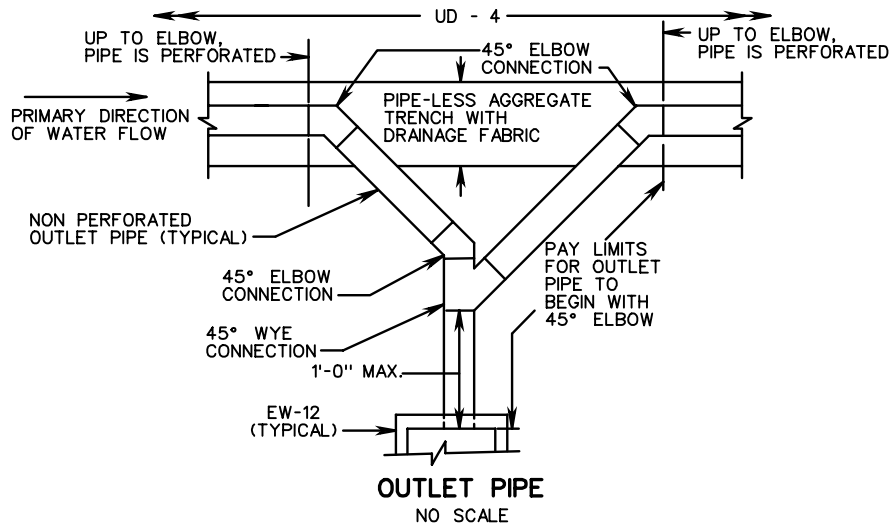
VIRGINIA DEPARTMENT OF TRANSPORTATION



PAVED SHOULDER SECTION



CURB AND GUTTER SECTION



SHEET 1 OF 2

# STANDARD PAVEMENT EDGEDRAIN

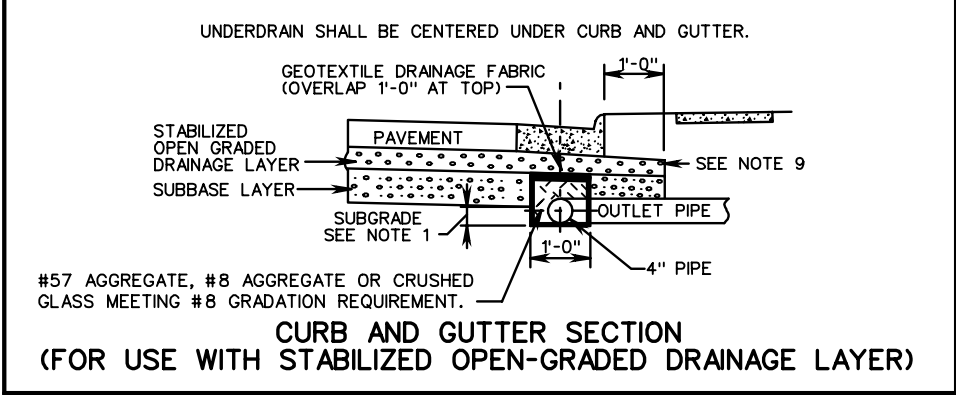
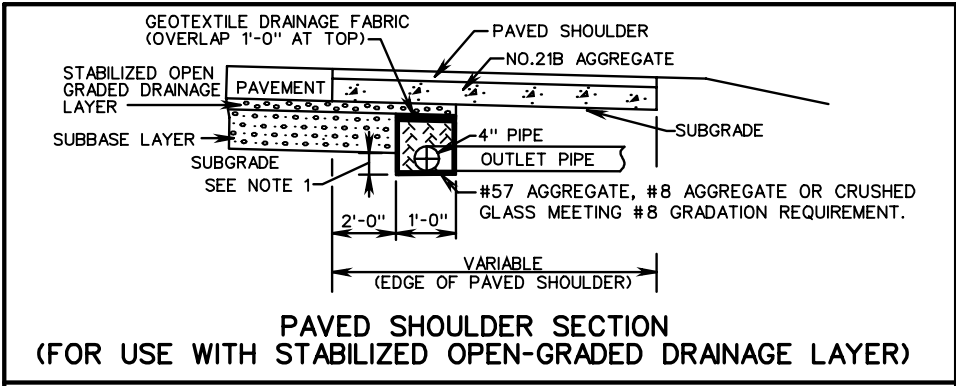
VIRGINIA DEPARTMENT OF TRANSPORTATION

REV 8/07

108.06

SPECIFICATION REFERENCE

240  
258  
501  
701



- NOTES:**
- 4" MINIMUM, PROVIDED ATTAINING MINIMUM 4" OF AGGREGATE ON TOP OF PIPE.
  - WHEN THE LONGITUDINAL PIPE CONNECTS DIRECTLY INTO A DRAINAGE STRUCTURE (DROP INLET, MANHOLE, ECT.), NON-PERFORATED OUTLET PIPES ARE NOT REQUIRED.
  - INVERT ELEVATION AT OUTLET END OF OUTLET PIPE TO BE A MINIMUM OF 1'-0" ABOVE INVERT ELEVATION OF RECEIVING DRAINAGE DITCH OR STRUCTURE.
  - ALL CONNECTIONS (ELBOWS, WYES, ETC.) WITHIN PAY LIMITS FOR OUTLET PIPE ARE TO BE OF THE SAME CRUSHING STRENGTH AS THE OUTLET PIPE.
  - OUTLET PIPES ARE TO BE INSTALLED ON 2% MIN. (3% DESIRABLE) GRADE AND LOCATED EVERY 350' MAXIMUM OR AS NOTED ON PLANS.
  - OUTLET PIPE TO BE SECURELY CONNECTED TO EW-12 OR OTHER DRAINAGE STRUCTURE.
  - WITHIN THE LIMITS OF A COMMERCIAL ENTRANCE, NON-PERFORATED PIPE SHALL BE UTILIZED IN LIEU OF PERFORATED PIPE.
  - THE LENGTH OF PIPE BETWEEN THE WYE CONNECTION AND THE EW-12 SHALL BE LIMITED TO NO MORE THAN 1'-0" TO PERMIT CAMERA INSPECTION OF THE MAIN LINE IN EITHER DIRECTION.
  - IN SITUATIONS WHEN FULL DEPTH OF STABILIZED OPEN-GRADED MATERIAL CANNOT BE MAINTAINED UNDER CURB AND GUTTER, NO. 21B AGGREGATE SHALL BE USED UNDER CURB AND GUTTER. NO. 21B AGGREGATE MAY ALSO BE USED FROM TOP OF STABILIZED OPEN-GRADED MATERIAL LAYER AND CURB AND GUTTER.

SPECIFICATION REFERENCE
240
258
501
701

**LONGITUDINAL PERFORATED PIPE**

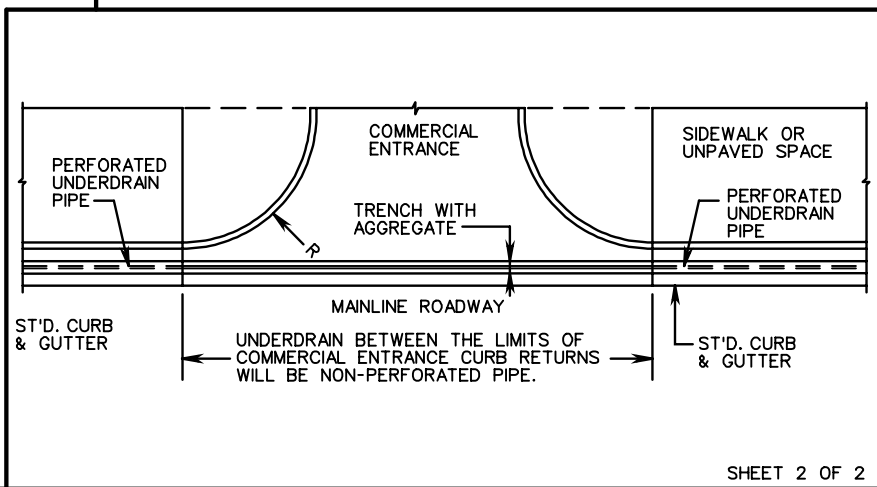
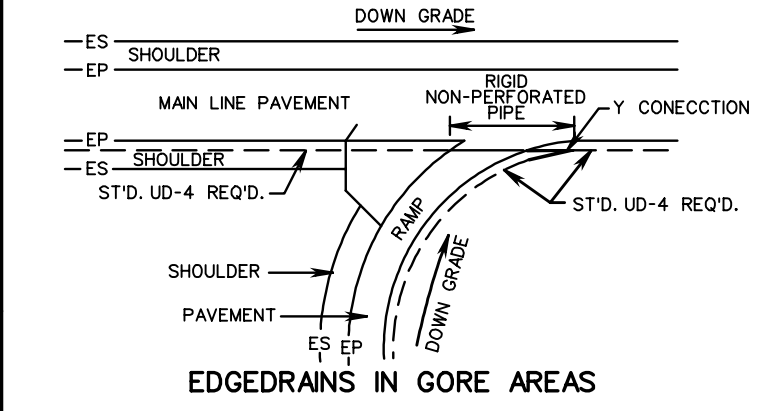
UD-4

TYPE OF PIPE	CRUSHING STRENGTH	
	W.T.	4" NOM. DIAMETER
SMOOTH WALL PVC	.103	
CORRUGATED PE		AASHTO M-252

**NON-PERFORATED OUTLET PIPE FOR USE UNDER COMMERCIAL ENTRANCES AND FOR OUTLETS**

TYPE OF PIPE	CRUSHING STRENGTH	
	W.T.	4" NOM. DIAMETER
SMOOTH WALL PVC	.103	
SMOOTH WALL PE		70 PSI ***

× WALL THICKNESS (MIN) - INCHES  
 \*\*\* TESTED ACCORDING TO ASTM D-2412 AT 5% DEFLECTION.

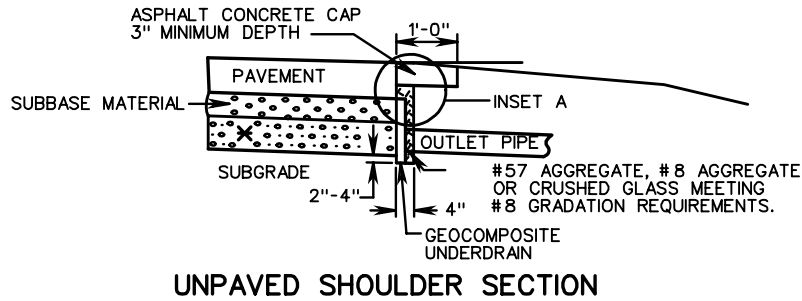
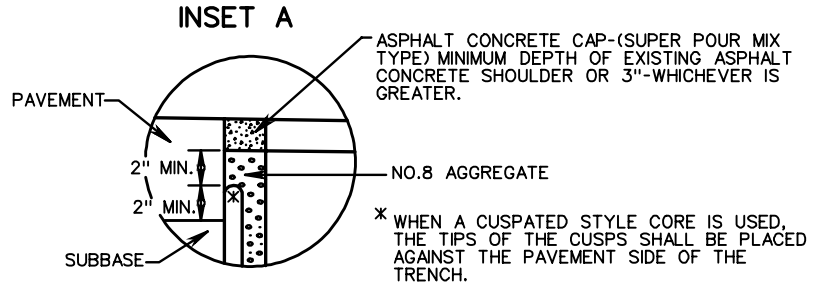
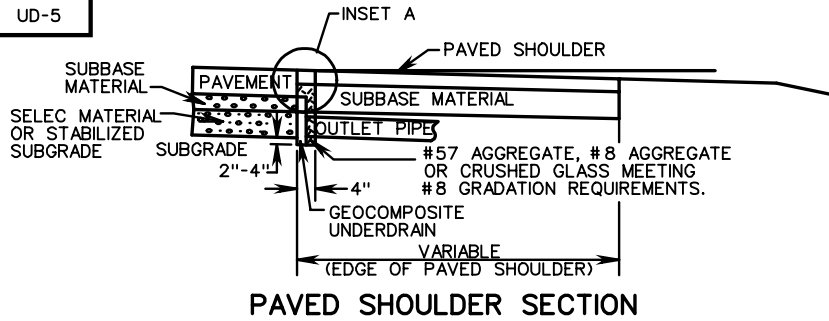


**STANDARD PAVEMENT EDGEDRAIN**

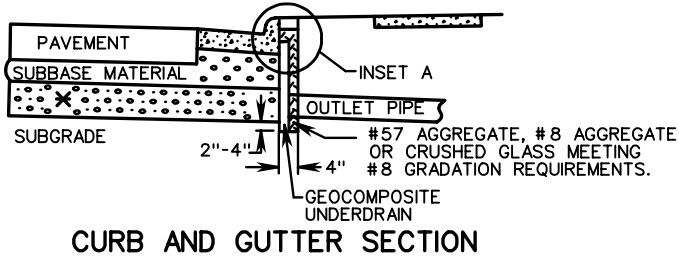
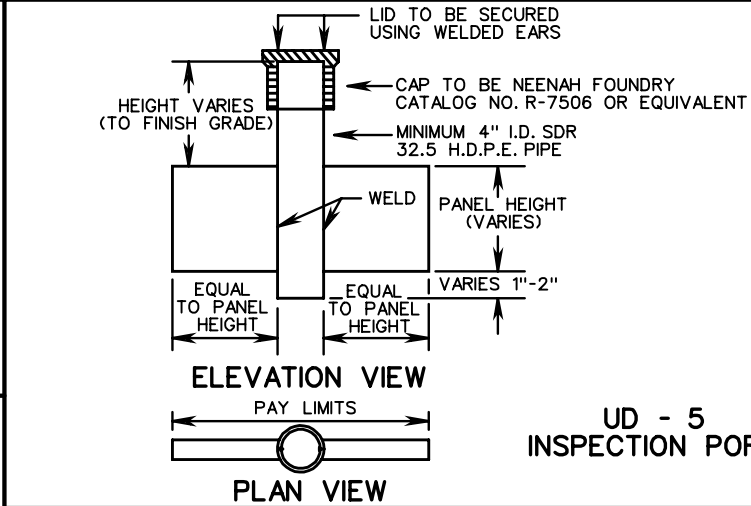
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108.07

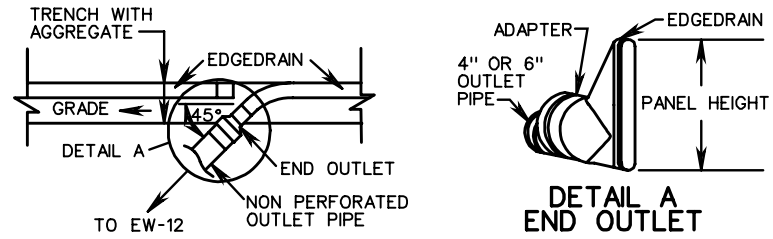
UD-5



\* SELECT MATERIAL OR STABILIZED SUBGRADE MATERIAL



\* SELECT MATERIAL OR STABILIZED SUBGRADE MATERIAL



**EDGEDRAIN CONNECTION TO OUTLET PIPE  
NON-PERFORATED OUTLET PIPE**

TYPE OF PIPE	CRUSHING STRENGTH			
	* W.T.	4" NOM. DIAMETER	* W.T.	6" NOM. DIAMETER
CORRUGATED ALUMINUM			0.048	
SMOOTH WALL PVC	.103		0.153	
SMOOTH WALL PE		70 PSI ***		70 PSI ***

\* WALL THICKNESS (MIN) - INCHES  
\*\*\* TESTED ACCORDING TO ASTM D-2412 AT 5% DEFLECTION.

**NOTES:**

1. INVERT ELEVATION AT OUTLET END OF OUTLET PIPE TO BE A MINIMUM OF 1'-0" ABOVE INVERT ELEVATION OF RECEIVING DRAINAGE DITCH OR STRUCTURE.
2. ALL CONNECTIONS (ELBOWS, WYES, ETC.) WITHIN PAY LIMITS FOR OUTLET PIPE ARE TO BE OF THE SAME CRUSHING STRENGTH AS THE OUTLET PIPE.
3. OUTLET PIPES ARE TO BE INSTALLED ON 2% MIN. (3% DESIRABLE) GRADE AND LOCATED EVERY 350' MAXIMUM OR AS NOTED ON PLANS.
4. OUTLET PIPE TO BE SECURELY CONNECTED TO EW-12 OR OTHER DRAINAGE STRUCTURE.
5. UD-5 INSPECTION PORTS ARE TO BE LOCATED WHERE SPECIFIED ON THE PLANS.

**PREFABRICATED GEOCOMPOSITE RETROFIT  
PAVEMENT EDGEDRAIN**

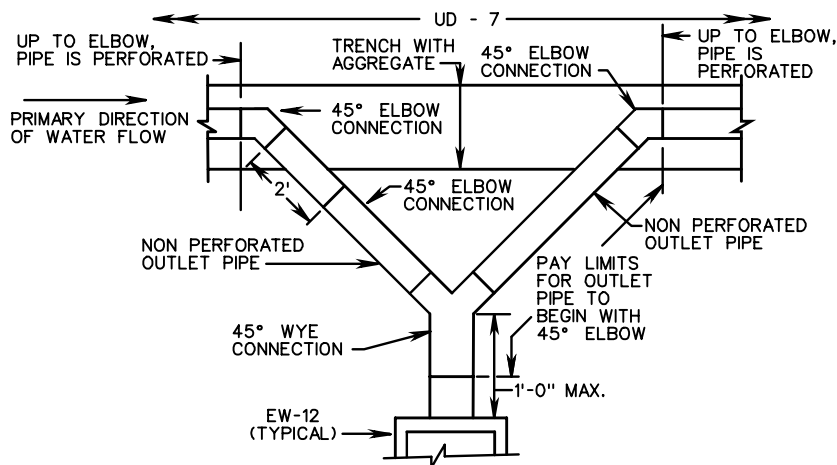
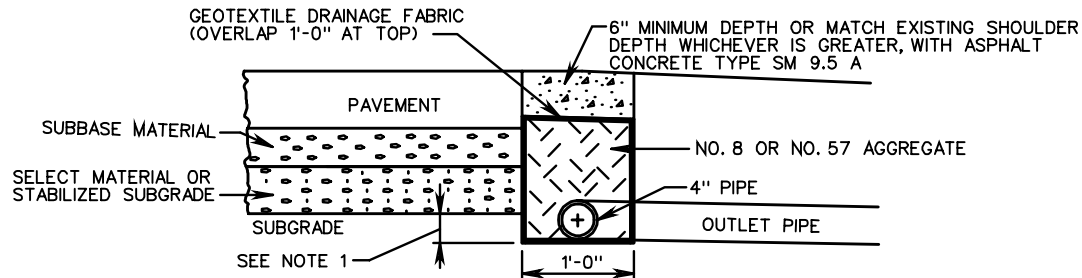
SPECIFICATION REFERENCE

240  
501  
701

REV 8/07

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VIRGINIA DEPARTMENT OF TRANSPORTATION



OUTLET PIPE

**NOTES:**

1. 4" MINIMUM, PROVIDED ATTAINING MINIMUM 4" OF AGGREGATE ON TOP OF PIPE.
2. WHERE THE LONGITUDINAL PERFORATED PIPE ALIGNS WITH A DRAINAGE STRUCTURE (DROP INLET, MANHOLE, ETC.), A NON-PERFORATED OUTLET PIPE IS NOT REQUIRED. INSTEAD, THE PERFORATED PIPE IS TO BE CONNECTED DIRECTLY TO THE DRAINAGE STRUCTURE. WHERE THE LONGITUDINAL PERFORATED PIPE IS CONTINUOUS, IT SHALL BE CONNECTED TO EACH SIDE OF THE DRAINAGE STRUCTURE.
3. INVERT ELEVATION AT OUTLET END OF OUTLET PIPE TO BE A MINIMUM OF 1'-0" ABOVE INVERT ELEVATION OF RECEIVING DRAINAGE DITCH OR STRUCTURE.
4. ALL CONNECTIONS (ELBOWS, WYES, ETC.) WITHIN PAY LIMITS FOR OUTLET PIPE ARE TO BE OF THE SAME CRUSHING STRENGTH AS THE OUTLET PIPE.
5. OUTLET PIPES ARE TO BE INSTALLED ON 2% MIN. (3% DESIRABLE) GRADE AND LOCATED EVERY 350' MAXIMUM OR AS NOTED ON PLANS.
6. OUTLET PIPE TO BE SECURELY CONNECTED TO EW-12 OR OTHER DRAINAGE STRUCTURE.
7. WITHIN THE LIMITS OF A COMMERCIAL ENTRANCE, NON-PERFORATED PIPE SHALL BE UTILIZED IN LIEU OF PERFORATED PIPE.
8. THE LENGTH OF PIPE BETWEEN THE WYE CONNECTION AND THE EW-12 SHALL BE LIMITED TO NO MORE THAN 1'-0" TO PERMIT CAMERA INSPECTION OF THE MAIN LINE IN EITHER DIRECTION.
9. EXISTING ASPHALT SHOULDER TO BE SAWED TO ACHIEVE A SMOOTH JOINT.

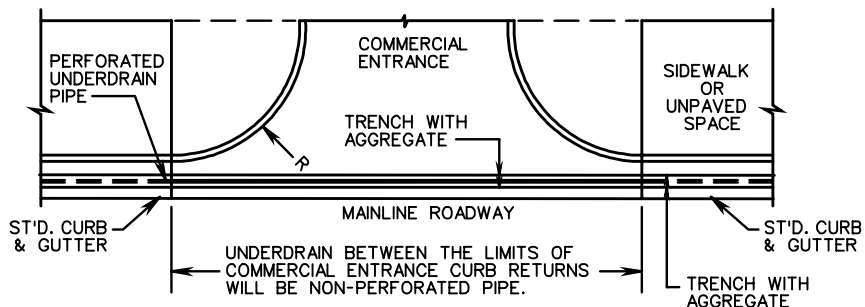
**LONGITUDINAL PERFORATED PIPE**

TYPE OF PIPE	CRUSHING STRENGTH	
	W.T.	4" NOM. DIAMETER
SMOOTH WALL PVC	.103	
CORRUGATED PE		AASHTO M-252

**NON-PERFORATED OUTLET PIPE FOR USE UNDER COMMERCIAL ENTRANCES AND FOR OUTLETS**

TYPE OF PIPE	CRUSHING STRENGTH	
	W.T.	4" NOM. DIAMETER
SMOOTH WALL PVC	.103	
SMOOTH WALL PE		70 PSI ***

\* WALL THICKNESS (MIN) - INCHES  
 \*\*\* TESTED ACCORDING TO ASTM D-2412 AT 5% DEFLECTION.



SPECIFICATION REFERENCE

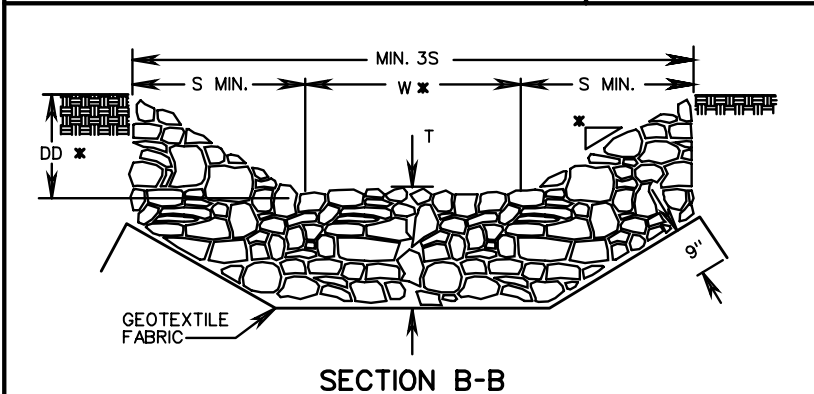
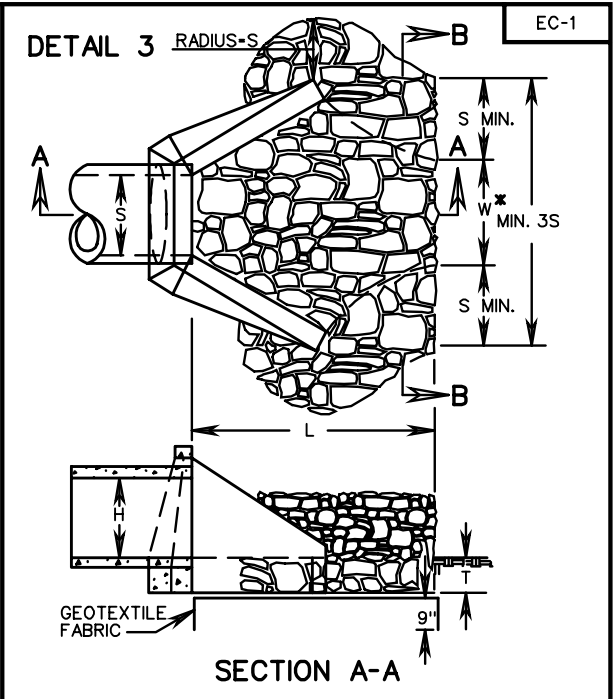
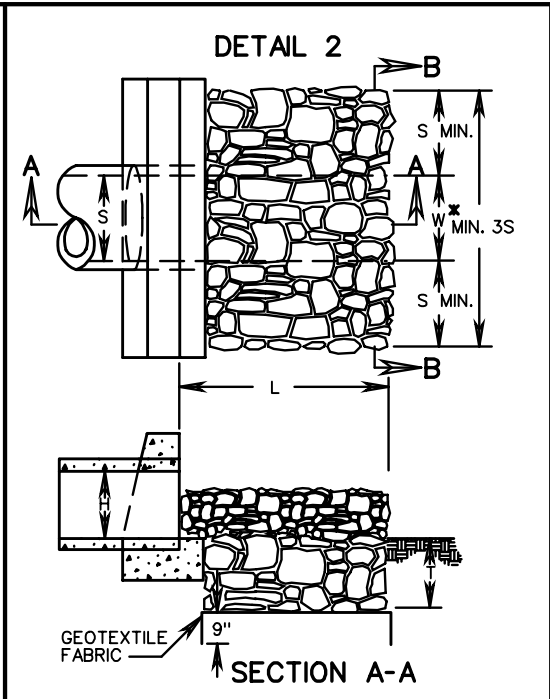
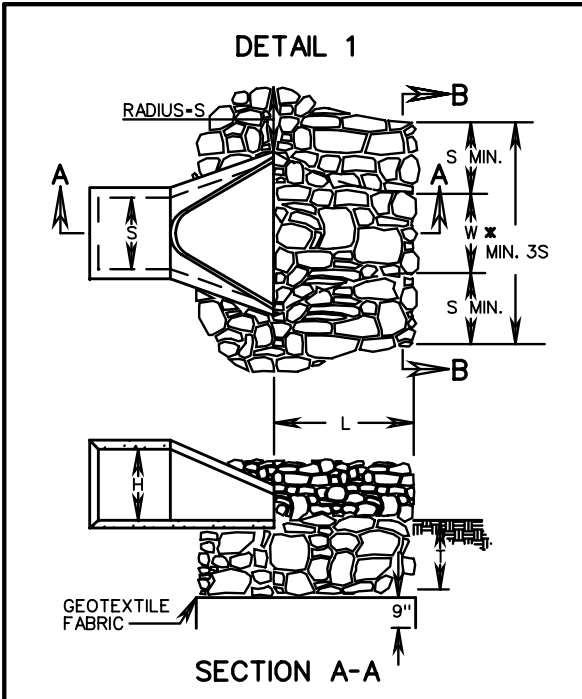
- 240
- 501
- 701

**STANDARD RETROFIT EDGEDRAIN**

VIRGINIA DEPARTMENT OF TRANSPORTATION

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**NOTES:**

1. FOR MULTIPLE LINE INSTALLATIONS, DIMENSION S IS TO GOVERN THE PROTECTION OUTSIDE THE CHANNEL WIDTH (W).
2. ON ANY INSTALLATION REQUIRING CULVERT OUTLET PROTECTION WHERE NO ENDWALL OR ENDSECTION IS SPECIFIED ON THE PLANS, CONSTRUCTION IS TO BE IN ACCORDANCE WITH DETAIL 2 SHOWN ABOVE.
3. GEOTEXTILE FABRIC TO BE INSTALLED UNDER CLASS A1, I, AND II MATERIALS IN ACCORDANCE WITH THE SPECIFICATIONS.
4. S - DIAMETER OF CIRCULAR CULVERT OR SPAN FOR BOX, ELLIPTICAL OR ARCH CULVERT. H - DIAMETER OF CIRCULAR CULVERT OR RISE/HEIGHT FOR BOX, ELLIPTICAL OR ARCH CULVERT.

\* USE TYPICAL SECTION SHOWN ON PLANS FOR SIDE SLOPE, BOTTOM WIDTH AND DEPTH OF CHANNEL OR MATCH EXISTING DITCH OR NATURAL GROUND.

TYPE OF OUTLET PROTECTION MATERIAL		MAXIMUM OUTLET VELOCITY (FOR DESIGN STORM)	MINIMUM "T" (INCHES)
CLASS A1	CLASS A1 DRY RIPRAP	8 fps	18
CLASS I	CLASS I DRY RIPRAP	14 fps	24
CLASS II	CLASS II DRY RIPRAP	19 fps	36

OUTLET PROTECTION MINIMUM LENGTH (L)	
TYPE A INSTALLATION	3H
TYPE B INSTALLATION	5H

SPECIFICATION REFERENCE
204
245
303
414

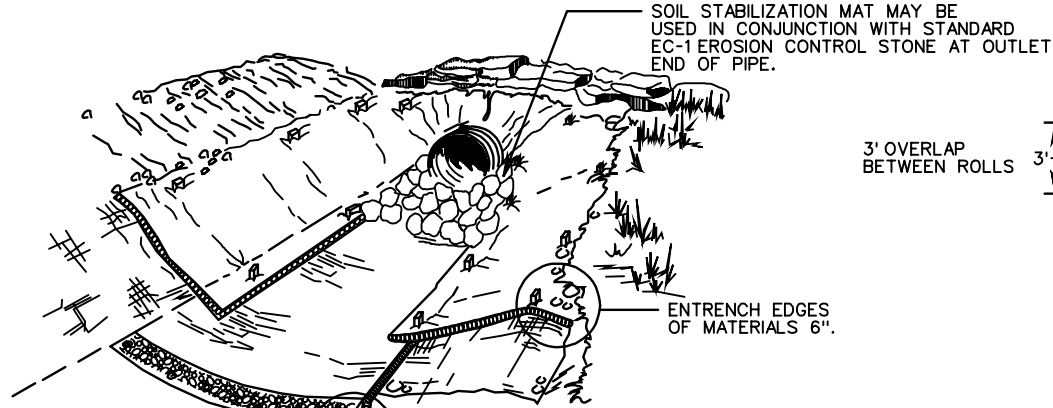
# CULVERT OUTLET PROTECTION

VIRGINIA DEPARTMENT OF TRANSPORTATION

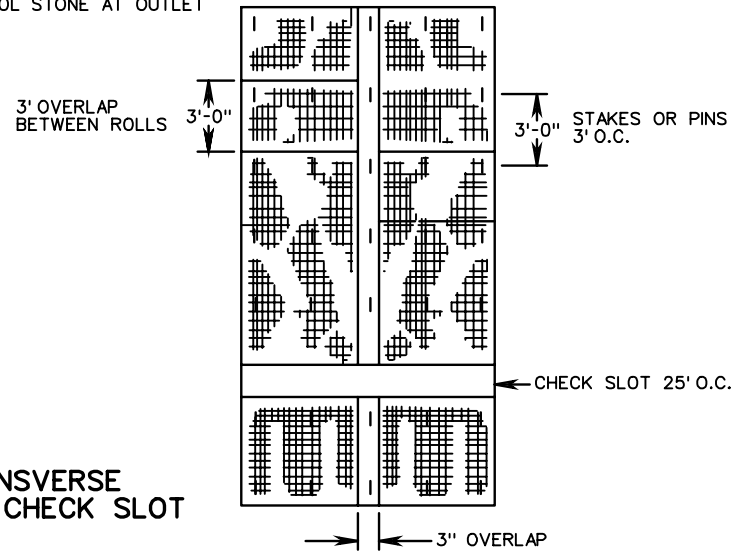
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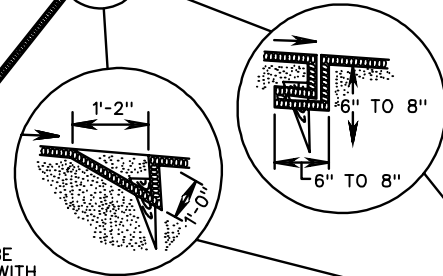
TYPICAL INSTALLATION AT END OF PIPE



STAKING DETAIL

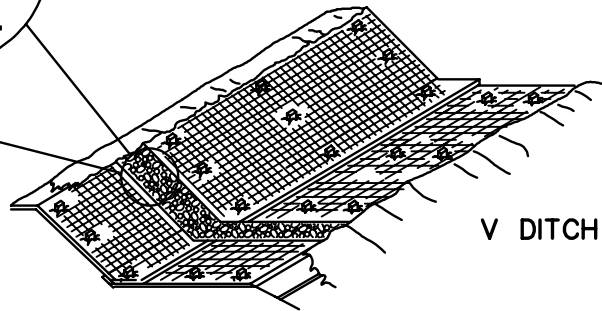


\* TRANSVERSE CLOSED CHECK SLOT



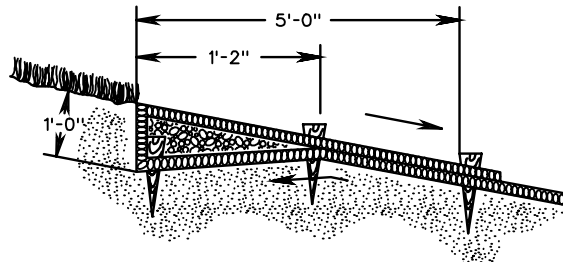
\* TRANSVERSE CHECK SLOT TO BE CONSTRUCTED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATION FOR PREFERRED INSTALLATION.

\* TRANSVERSE OPEN CHECK SLOT



NOTES:

1. STAKES SHALL BE WOOD OR METAL AS RECOMMENDED BY THE MANUFACTURER AND SHALL BE A MINIMUM OF 12" IN LENGTH. IN SANDY SOILS METAL STAKES A MINIMUM OF 18" IN LENGTH SHALL BE USED.
2. SOIL STABILIZATION MAT TYPE A AND B ARE TO BE IN ACCORDANCE WITH THE APPROVED PRODUCTS LIST.
3. SOIL STABILIZATION MAT SHOULD BE INSTALLED TO THE SHOULDER BREAK POINT OR EXISTING GROUND THEN EMBEDDED 6". MATERIAL ON BOTH SIDES OF THE DITCH SHALL BE INSTALLED TO THE SAME ELEVATIONS.
4. IF MORE THAN 3 LINES OF MATERIAL ARE REQUIRED PARALLEL TO THE  $\text{C}$  OF THE DITCH, MATERIAL SHALL BE INSTALLED PERPENDICULAR TO THE CENTER LINE OF THE DITCH, STARTING AT THE LOWEST  $\text{C}$  ELEVATION OF THE DITCH.
5. FOR SOURCES OF APPROVED MATERIALS SEE VDOT'S APPROVED PRODUCTS LIST FOR ST'D. EC-3, TYPE A OR B.



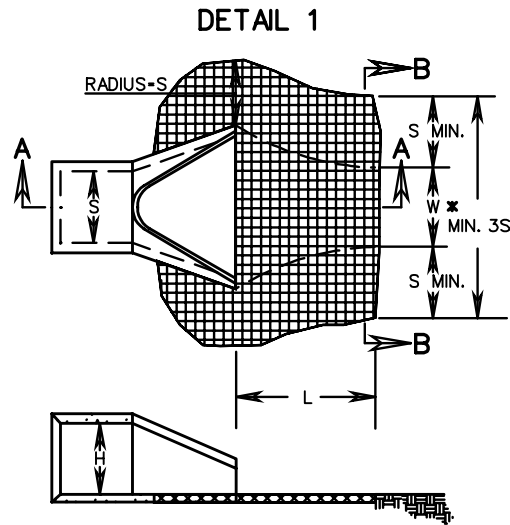
UPSTREAM AND DOWNSTREAM TERMINAL

SPECIFICATION REFERENCE

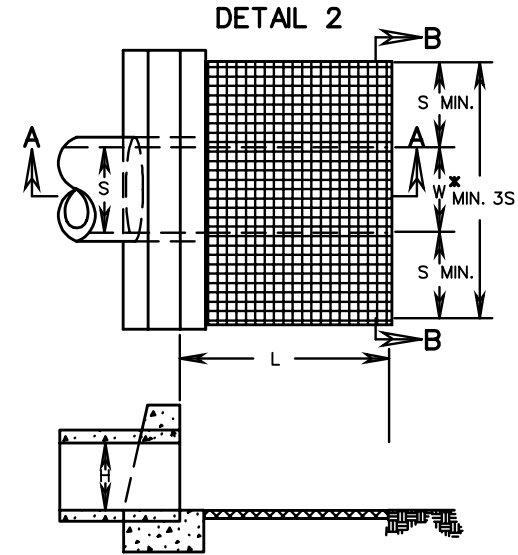
606  
244

SOIL STABILIZATION MAT  
DITCH INSTALLATION TYPE A OR B

VIRGINIA DEPARTMENT OF TRANSPORTATION



SECTION A-A



SECTION A-A

**NOTES:**

1. FOR MULTIPLE LINE INSTALLATIONS, DIMENSION S IS TO GOVERN THE PROTECTION OUTSIDE THE CHANNEL WIDTH (W).
  2. ON ANY INSTALLATION REQUIRING CULVERT OUTLET PROTECTION WHERE NO ENDWALL OR ENDSECTION IS SPECIFIED ON THE PLANS, CONSTRUCTION IS TO BE IN ACCORDANCE WITH DETAIL 2 SHOWN ABOVE.
  3. SOIL STABILIZATION MAT TYPE B SHALL BE USED FOR CULVERT OUTLET PROTECTION WHERE THE OUTLET VELOCITY IS 6 FPS OR LESS AND THE TOTAL HYDRAULIC OPENING IS LESS THAN 7 SQUARE FEET. IF THE TOTAL HYDRAULIC OPENING IS 7 SQUARE FEET OR GREATER, OR THE OUTLET VELOCITY IS GREATER THAN 6 FPS, USE STANDARD EC-1.
  4. S = DIAMETER OF CIRCULAR CULVERT OR SPAN FOR BOX, ELLIPTICAL OR ARCH CULVERT.  
H = DIAMETER OF CIRCULAR CULVERT OR RISE/HEIGHT FOR BOX, ELLIPTICAL OR ARCH CULVERT.
- \* USE TYPICAL SECTION SHOWN ON PLANS FOR SIDE SLOPE, BOTTOM WIDTH AND DEPTH OF CHANNEL OR MATCH EXISTING DITCH OR NATURAL GROUND.

SPECIFICATION REFERENCE
204
245
303
414

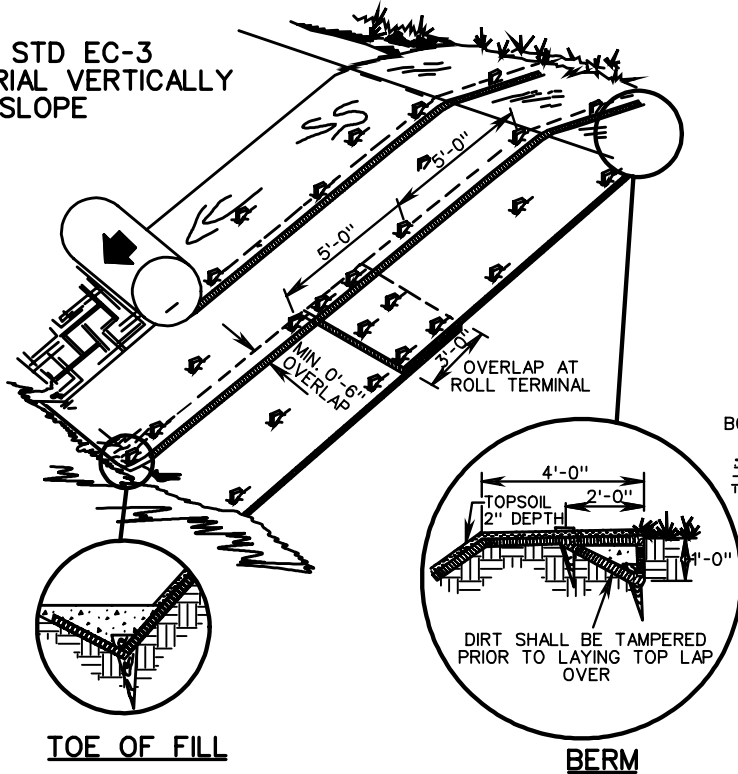
## SOIL STABILIZATION MAT CULVERT OUTLET PROTECTION INSTALLATION

VIRGINIA DEPARTMENT OF TRANSPORTATION



**FILL SLOPE SECTION**

**DROP STD EC-3 MATERIAL VERTICALLY DOWNSLOPE**



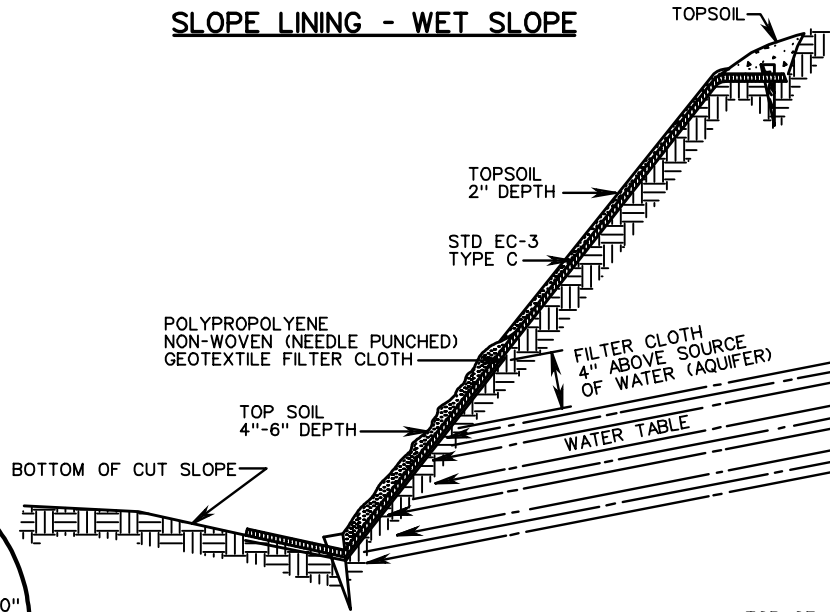
**TOE OF FILL**  
MAINTAIN SLOPE ANGLE

**BERM**  
TRENCH INTO BERM AND PROGRESS DOWNSLOPE

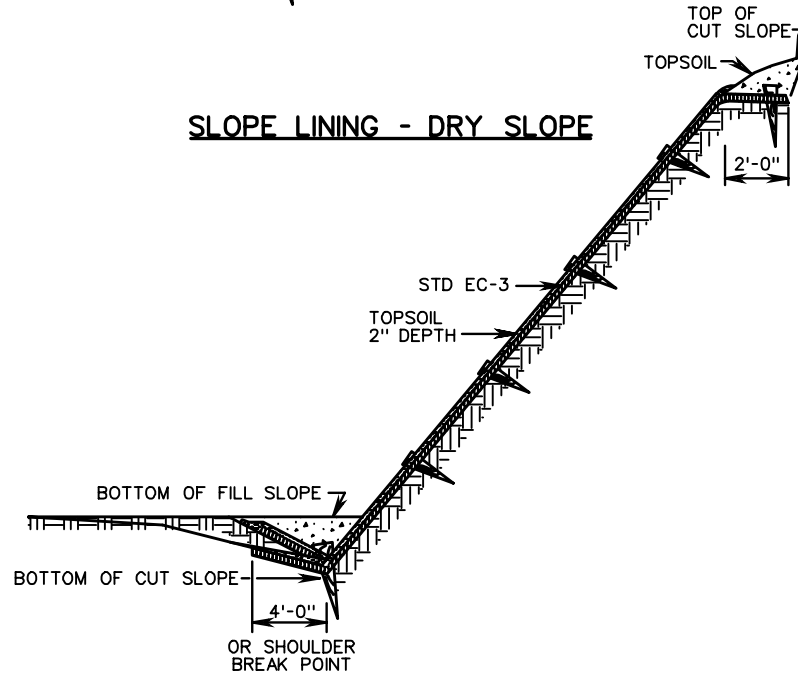
**NOTE:**

1. SLOPE SURFACE SHALL BE SMOOTH AND FREE OF ROCKS, LUMPS OF DIRT, GRASS, AND STICKS. MAT SHALL BE PLACED FLAT ON SURFACE FOR PROPER SOIL CONTACT.
2. STAKES SHALL BE WOOD OR METAL AS RECOMMENDED BY THE MANUFACTURER AND SHALL BE A MINIMUM OF 18 INCHES IN LENGTH.
3. BASIS OF PAYMENT SHALL BE SQUARE YARDS OF STANDARD EC-3 (TYPE C) IN PLACE.
4. SOIL STABILIZATION MAT TYPE C SHALL BE IN ACCORDANCE WITH THE APPROVED PRODUCT LIST.
5. TOPSOIL SHALL BE SPREAD TO A UNIFORM THICKNESS PRIOR TO APPLICATION OF SEED AND MULCH.
6. FOR SOURCES OF APPROVED MATERIALS SEE VDOT'S APPROVED PRODUCTS LIST FOR ST'D. EC-3, TYPE C MATERIALS.
7. SLOPES 1/2:1 AND FLATTER SHALL BE BACKFILLED WITH TOPSOIL AT 2 INCH DEPTH. SEED SHALL BE APPLIED TO THE TOPSOIL AND MULCHED WITH TYPE IMULCH.
8. SLOPES STEEPER THAN 1/2:1 SHALL BE SEEDED IMMEDIATELY PRIOR TO INSTALLATION OF ST'D. EC-3 TYPE C MATERIAL.

**SLOPE LINING - WET SLOPE**



**SLOPE LINING - DRY SLOPE**

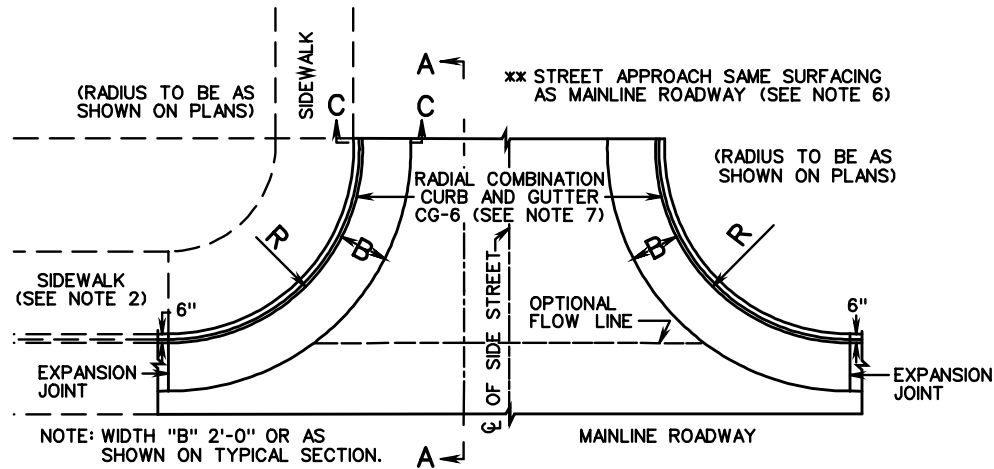


SHEET 3 OF 3

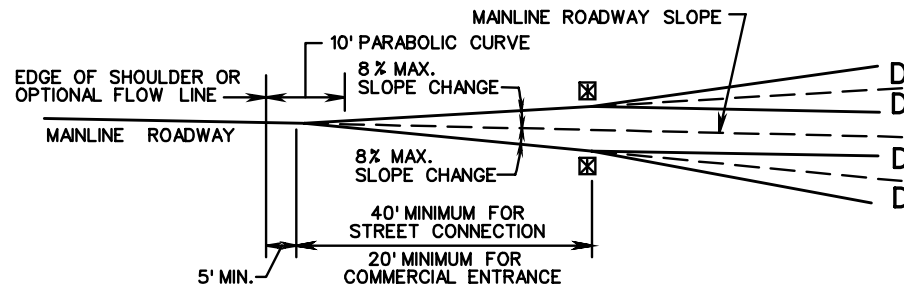
**SOIL STABILIZATION MAT - SLOPE INSTALLATION TYPE C**

SPECIFICATION REFERENCE

244  
606

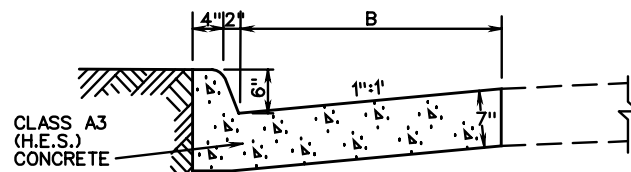


PLAN VIEW



☒ CONSTRUCT GRADE CHANGES WITH A PARABOLIC CURVE.

SECTION A - A



SECTION C-C

**GENERAL NOTES**

1. WHEN CG-11 IS USED FOR STREET CONNECTIONS, THE CONNECTION MUST BE DESIGNED IN ACCORDANCE WITH AASHTO POLICY AND THE APPLICABLE REQUIREMENTS OF THE VDOT ROAD DESIGN MANUAL.
2. WHEN THE ENTRANCE RADII CANNOT ACCOMMODATE THE TURNING REQUIREMENTS OF ANTICIPATED HEAVY TRUCK TRAFFIC, THE DEPTH FOR SIDEWALK & CURB RAMPS WITHIN THE LIMITS OF THE RADII SHOULD BE INCREASED TO 7".
3. WHEN USED IN CONJUNCTION WITH STANDARD CG-3 OR CG-7, THE CURB FACE ON THIS STANDARD IS TO BE ADJUSTED TO MATCH THE MOUNTABLE CURB CONFIGURATION.
4. SEE STANDARD CG-12 FOR CURB RAMP DESIGN TO BE USED WITH THIS STANDARD.
5. OPTIONAL FLOWLINE MAY REQUIRE WARPING OF A PORTION OF GUTTER TO PRECLUDE PONDING OF WATER.

**ENTRANCE NOTES**

6. PLANS ARE TO INDICATE WHEN CONSTRUCTION OF A FLOW LINE IS REQUIRED TO PROVIDE POSITIVE DRAINAGE ACROSS THE ENTRANCE.
7. MAINLINE PAVEMENT SHALL BE CONSTRUCTED TO THE R/W LINE (EXCEPT ANY SUBGRADE STABILIZATION REQUIRED FOR MAINLINE PAVEMENT WHICH CAN BE OMITTED IN THE ENTRANCE.)
8. RADIAL CURB OR COMBINATION CURB AND GUTTER SHALL NOT BE CONSTRUCTED BEYOND THE R/W LINE EXCEPT FOR REPLACEMENT PURPOSES.
9. THE DESIRABLE AND MAXIMUM ENTRANCE GRADE CHANGES "D" ARE LISTED IN THE ALLOWABLE ENTRANCE GRADE TABLE. THESE VALUES ARE NOT APPLICABLE TO STREET CONNECTIONS.

**ALLOWABLE ENTRANCE GRADE CHANGES**

ENTRANCE VOLUME		GRADE CHANGE "D"	
		DESIRABLE	MAXIMUM
HIGH	MORE THAN 1500 VPD	0 %	3 %
MEDIUM	500-1500 VPD	≤ 3 %	6 %
LOW	LESS THAN 500 VPD	≤ 6 %	8 %

NOTE: ALLOWABLE ENTRANCE GRADE TABLE IS NOT APPLICABLE TO STREET CONNECTIONS

SPECIFICATION REFERENCE

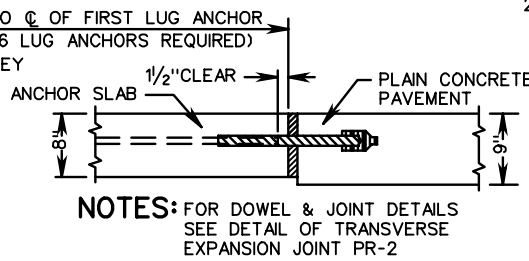
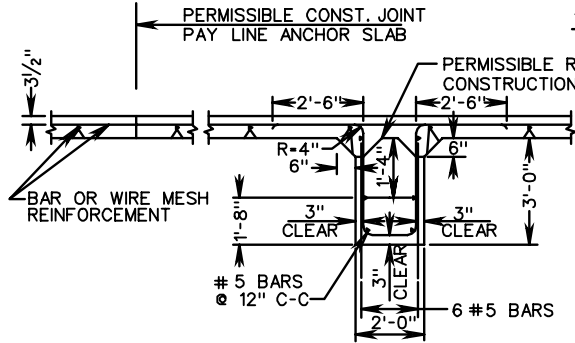
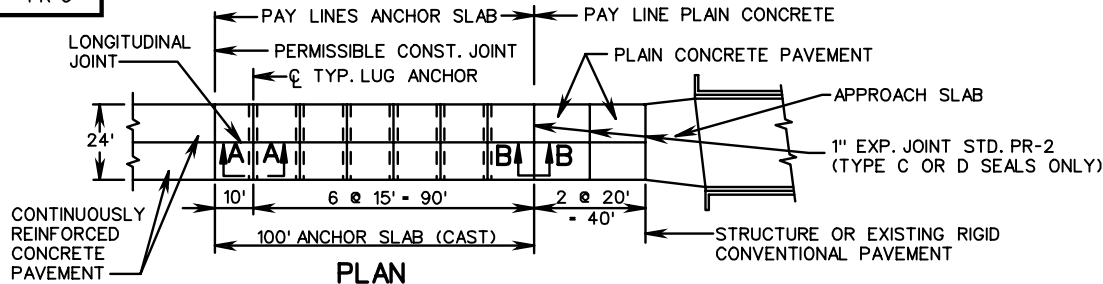
502

**METHOD OF TREATMENT-  
CONNECTION FOR STREET INTERSECTIONS  
AND COMMERCIAL ENTRANCES**

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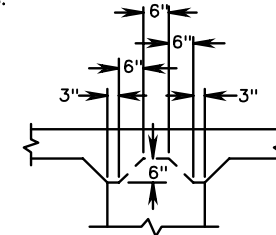
**SECTION B-B  
ANCHOR SLAB TYPE I**  
(FOR USE ADJACENT TO PLAIN CONCRETE PAVEMENT)

**NOTES:**

CONCRETE FOR LUG ANCHORS SHALL BE POURED AGAINST COMPACTED SUBGRADE. CONCRETE FOR LUGS AND ANCHOR SLAB MAY BE POURED MONOLITHICALLY OR POURED USING RAISED KEY CONSTRUCTION JOINT METHOD.

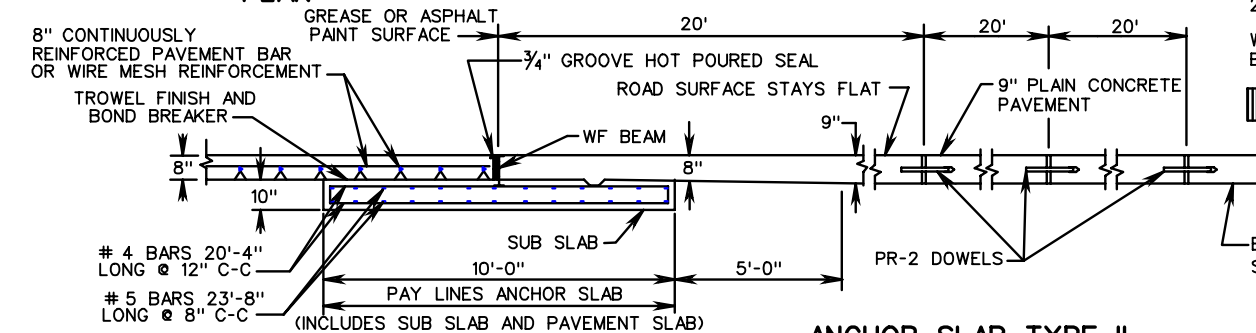
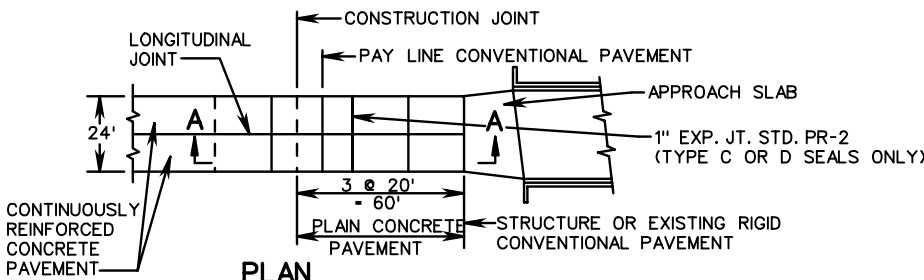
ADEQUATE CONSOLIDATION OF CONCRETE IN LUGS WILL BE OBTAINED WITHOUT DISPLACING LONGITUDINAL CONTINUOUS STEEL, BY THE USE OF INTERNAL VIBRATION.

WHEN LESS THAN FULL WIDTH LUG AND PAVEMENT SLAB IS PLACED, THE # 5 TRANSVERSE STEEL IN THE LUGS SHALL BE EXTENDED, LAPPED AND SPLICED AT LEAST 25 DIAMETERS.



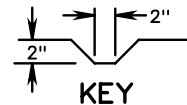
**DETAIL-RAISED KEY  
CONSTRUCTION JOINT**

**SECTION A-A**



**ANCHOR SLAB TYPE II**  
(FOR USE ADJACENT TO PLAIN CONCRETE PAVEMENT)

WF BEAM (WEIGHT AND DIMENSIONS)					
CRCP THICKNESS	EMBEDMENT IN "SUB SLAB"	WF BEAM SIZE	FLANGE		WEB THICKNESS
			WIDTH	THICKNESS	
8"	6"	14 X 61	10"	5/8"	3/8"



**NOTES:**

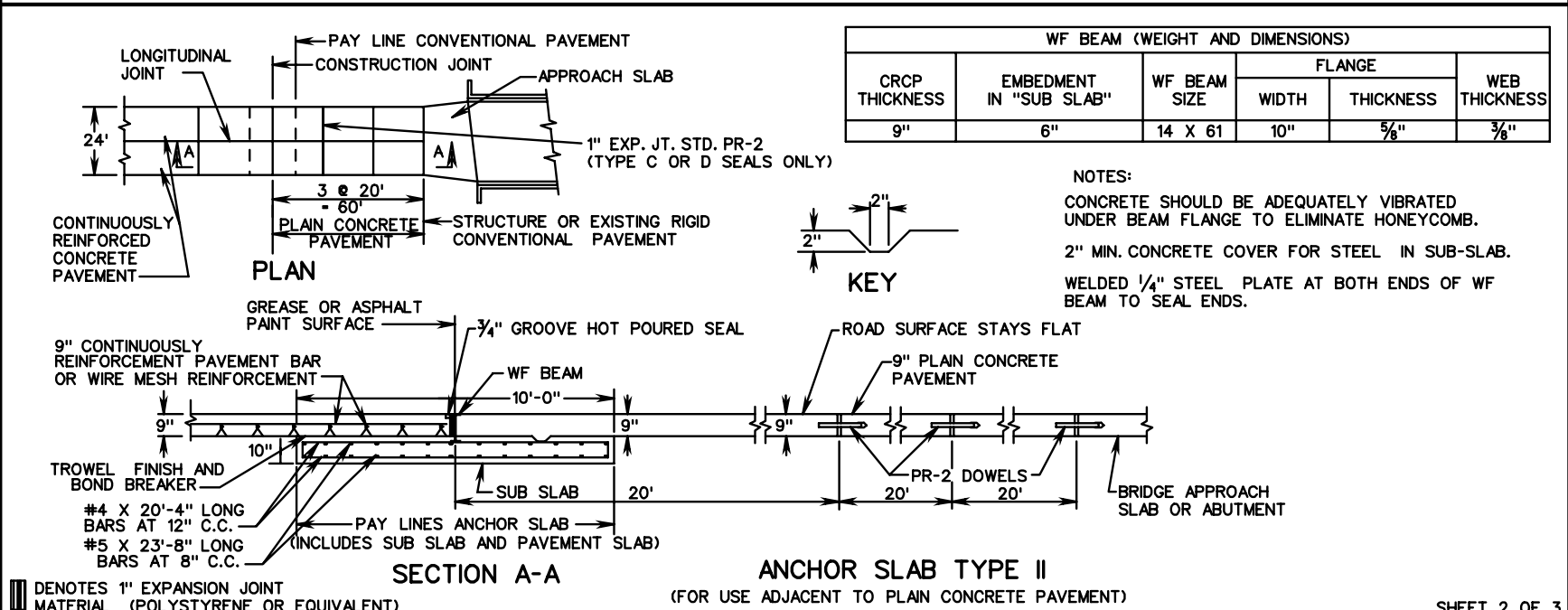
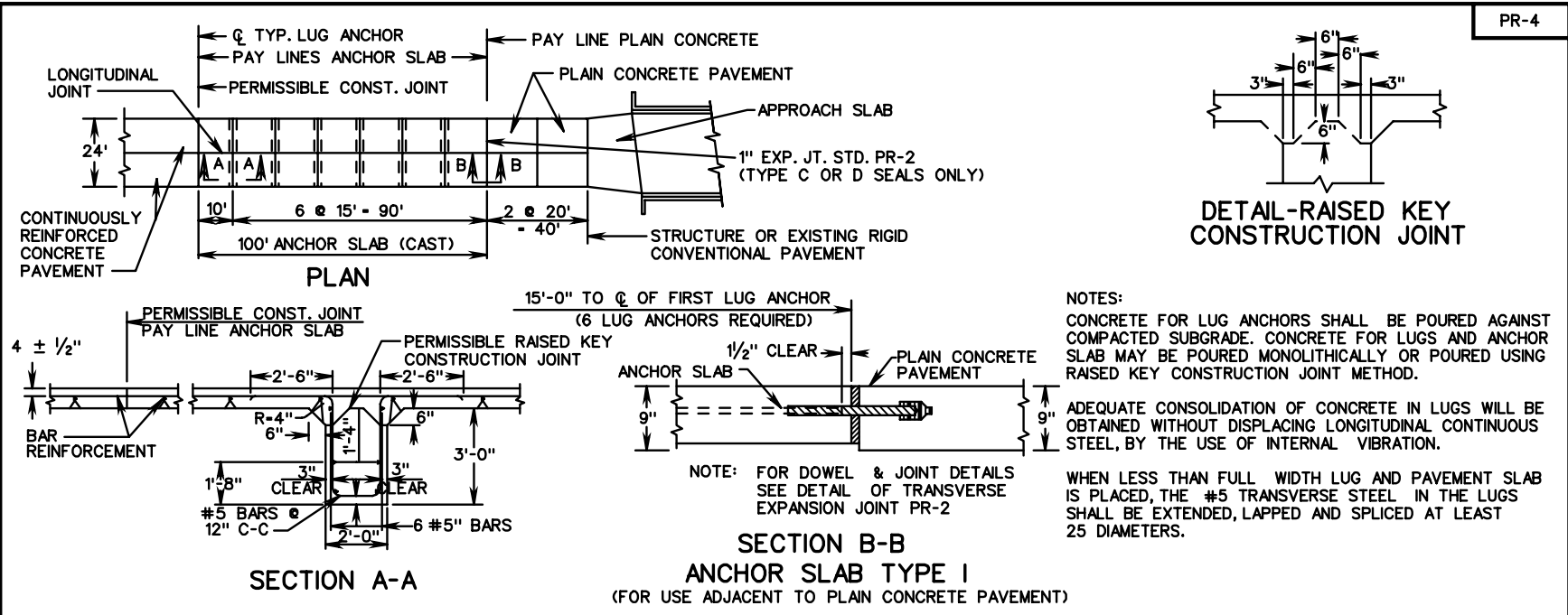
CONCRETE SHOULD BE ADEQUATELY VIBRATED UNDER BEAM FLANGE TO ELIMINATE HONEYCOMB.

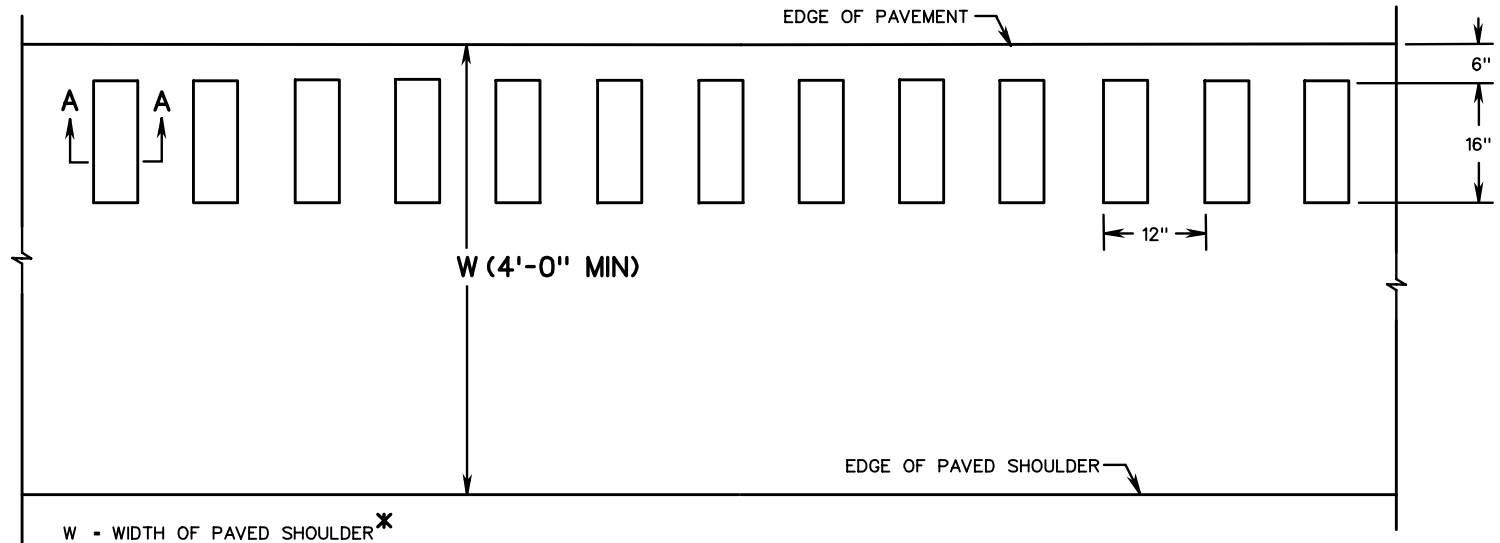
2" MIN. CONCRETE COVER FOR STEEL IN SUB-SLAB.

WELDED 1/4" STEEL PLATE AT BOTH ENDS OF WF BEAM TO SEAL ENDS.

▨ DENOTES 1" EXPANSION JOINT MATERIAL POLYSTYRENE OR EQUIVALENT)

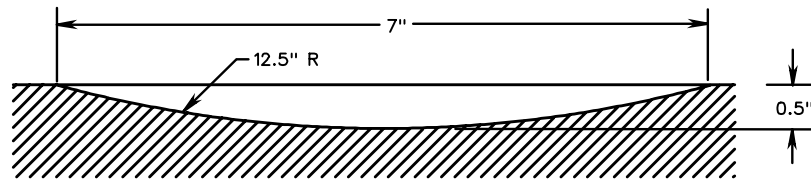
**8" THICK CONTINUOUSLY REINFORCED CONCRETE PAVEMENT  
(FOR USE WITH BAR OR WIRE MESH REINFORCEMENT)**





W - WIDTH OF PAVED SHOULDER \*

PLAN VIEW



SECTION A-A

**NOTES**

RUMBLE STRIPS SHALL BE PLACED CONTINUOUSLY AS DIRECTED BY THE ENGINEER.

RUMBLE STRIPS SHALL NOT BE PLACED WITHIN LIMITS OF BRIDGE DRAINAGE APRONS OR SPECIAL DESIGN SHOULDER SLOT INLETS.

RUMBLE STRIPS SHALL BE PLACED ON MAINLINE SHOULDERS ONLY.

\* WHERE BICYCLES ARE NOT PROHIBITED, THE MINIMUM WIDTH OF THE OUTSIDE PAVED SHOULDER SHALL BE 8 FT.

REVISED 11/02

SPECIFICATION REFERENCE

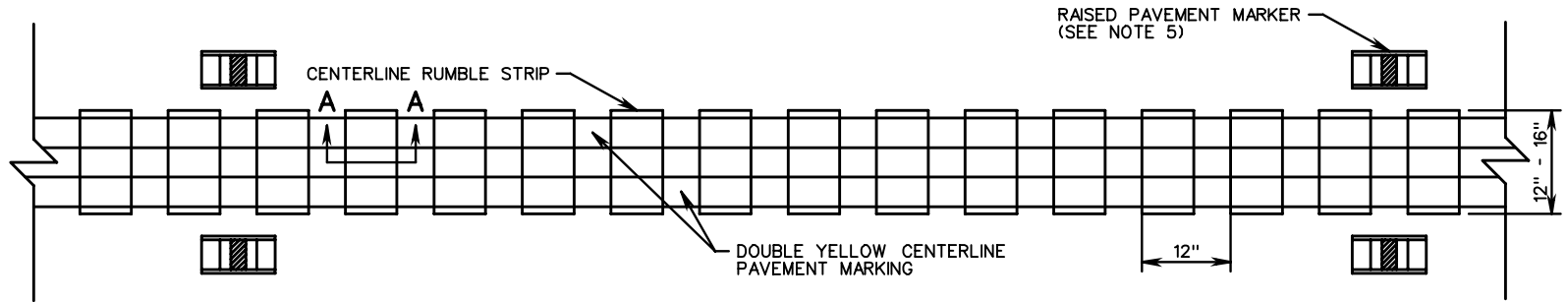
310  
315

**CONTINUOUS SHOULDER RUMBLE STRIPS**

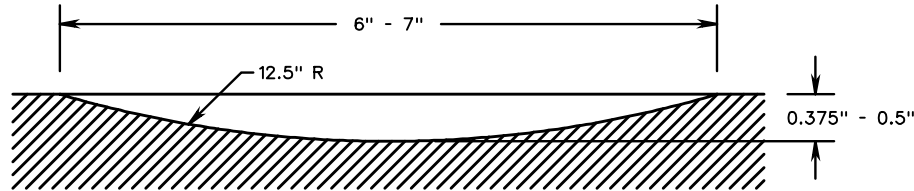
VIRGINIA DEPARTMENT OF TRANSPORTATION

REV 8/07

304.01



PLAN VIEW



SECTION A-A

**NOTES**

1. CENTERLINE RUMBLE STRIPS SHALL NOT BE INSTALLED WITHIN THE LIMITS OF BRIDGES.
2. CENTERLINE RUMBLE STRIPS SHALL NOT BE INSTALLED ON SUBDIVISION STREETS OR IN NARROW UNMARKED ROAD SECTIONS WITHOUT PAVEMENT MARKINGS.
3. CENTERLINE RUMBLE STRIPS SHALL NOT BE INSTALLED WITHIN THE LIMITS OF CENTER TWO-WAY TURN LANES.
4. CENTERLINE RUMBLE STRIPS SHALL NOT BE INSTALLED IN PASSING ZONES EXCEPT AS DIRECTED BY THE TRAFFIC ENGINEER. THE DEPTH OF CENTERLINE RUMBLE STRIPS IN PASSING ZONES SHALL BE  $\frac{3}{8}$ ".
5. USE OF RAISED PAVEMENT MARKERS IS OPTIONAL. SEE STANDARD PM-9 FOR DETAILS ON RAISED PAVEMENT MARKER PLACEMENT.

SPECIFICATION  
REFERENCE

310  
315

**CENTERLINE RUMBLE STRIPS**

VIRGINIA DEPARTMENT OF TRANSPORTATION

REV 8/07

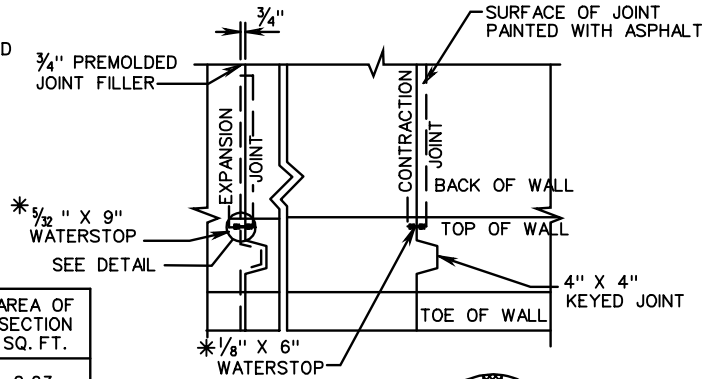
304.03

\* WATER STOPS TO BE ELASTOMERIC OR OTHER APPROVED MATERIAL. DIMENSIONS SHOWN ARE ABSOLUTE MINIMUM.

EXPANSION JOINTS AT INTERVALS NOT EXCEEDING 90'.

HEIGHT OF WALL "H" IN FEET	THICKNESS AT TOP "A" IN FEET	THICKNESS AT BASE B=4H	COMPRESSION AT TOE LBS. PER SQ. FT.	AREA OF SECTION SQ. FT.
2	1'-0"	1'-0"	627	2.63
3	"	1'-2 <sup>3</sup> / <sub>8</sub> "	1009	3.93
4	"	1'-7 <sup>1</sup> / <sub>4</sub> "	1369	5.83
5	"	2'-0"	1709	8.13
6	"	2'-4 <sup>3</sup> / <sub>4</sub> "	2049	10.83
7	"	2'-9 <sup>5</sup> / <sub>8</sub> "	2385	13.93
8	"	3'-2 <sup>3</sup> / <sub>8</sub> "	2720	17.43
9	"	3'-7 <sup>1</sup> / <sub>4</sub> "	3054	21.33
10	"	4'-0"	3386	25.63
11	"	4'-4 <sup>3</sup> / <sub>4</sub> "	3718	30.33
12	"	4'-9 <sup>5</sup> / <sub>8</sub> "	4050	35.43
13	"	5'-2 <sup>3</sup> / <sub>8</sub> "	4381	40.93
14	"	5'-7 <sup>1</sup> / <sub>4</sub> "	4712	46.83
15	"	6'-0"	5043	53.13

SAFE BEARING CAPACITY OF SOIL	
ROCK MINIMUM.....	10,000 - 20,000 LBS. PER SQ. FT.
GRAVEL AND COARSE SAND, WELL CEMENTED.....	16,000 - 20,000 LBS. PER SQ. FT.
CLAY IN THICK BEDS, ALWAYS DRY.....	12,000 - 16,000 LBS. PER SQ. FT.
CLAY IN THICK BEDS, MODERATELY DRY.....	8,000 - 12,000 LBS. PER SQ. FT.
CLAY, SOFT.....	2,000 - 4,000 LBS. PER SQ. FT.
SAND, DRY, COMPACT, AND WELL CEMENTED.....	8,000 - 12,000 LBS. PER SQ. FT.
SAND, CLEAN, DRY.....	4,000 - 8,000 LBS. PER SQ. FT.
ALLUVIAL SOILS, ETC.....	1,000 - 2,000 LBS. PER SQ. FT.



H = HEIGHT IN FT.

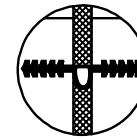
A = 1'

BASE = 4/10 H

EARTH = 100 LBS.

CONCRETE = 150 LBS.

ANGLE OF REPOSE = 1 1/2: 1

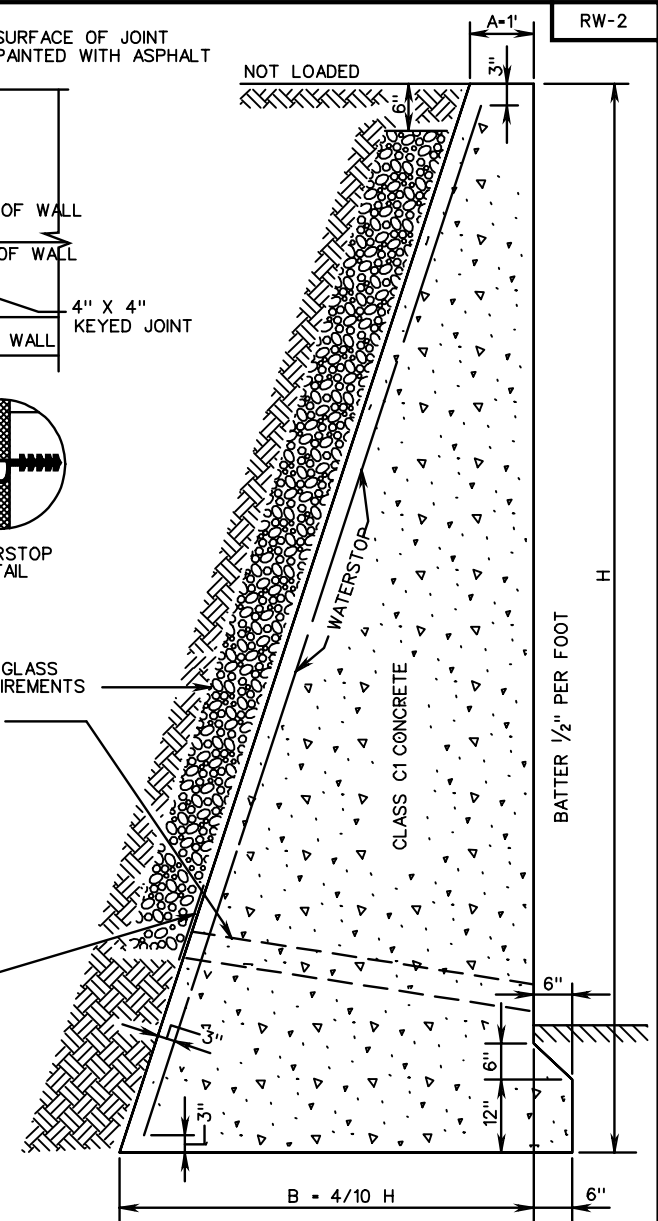


WATERSTOP DETAIL

POROUS BACKFILL @ 100 LBS./CU. FT.  
#78 OR #8 AGGREGATE OR CRUSHED GLASS  
MEETING #78 OR #8 GRADATION REQUIREMENTS

3" DRAIN PIPE 8' APART

WEEP HOLE WITH 12"X12" PLASTIC HARDWARE CLOTH 1/4" MESH OR GALVANIZED STEEL WIRE, MINIMUM WIRE DIAMETER 0.03", #4 MESH HARDWARE CLOTH ANCHORED FIRMLY TO OUTSIDE OF STRUCTURE.



NOTE:  
IF COMPRESSION AT TOE EXCEEDS SAFE BEARING CAPACITY OF SOIL, A SPECIAL FOOTING IS TO BE USED.  
DEPTH OF WALL IN GROUND DETERMINED BY CONDITIONS. TO BE NOT LESS THAN 1'-6".

SPECIFICATION REFERENCE

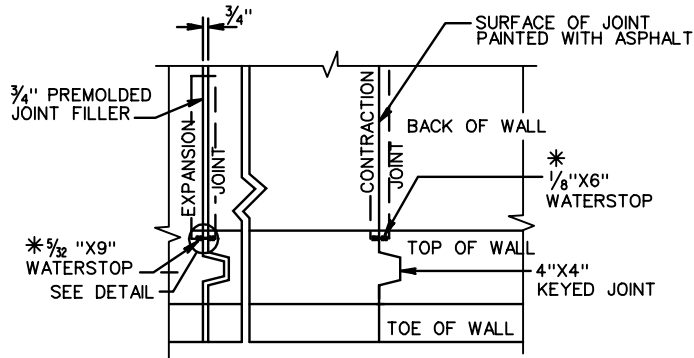
506

## CONCRETE GRAVITY RETAINING WALL - LEVEL BACKFILL

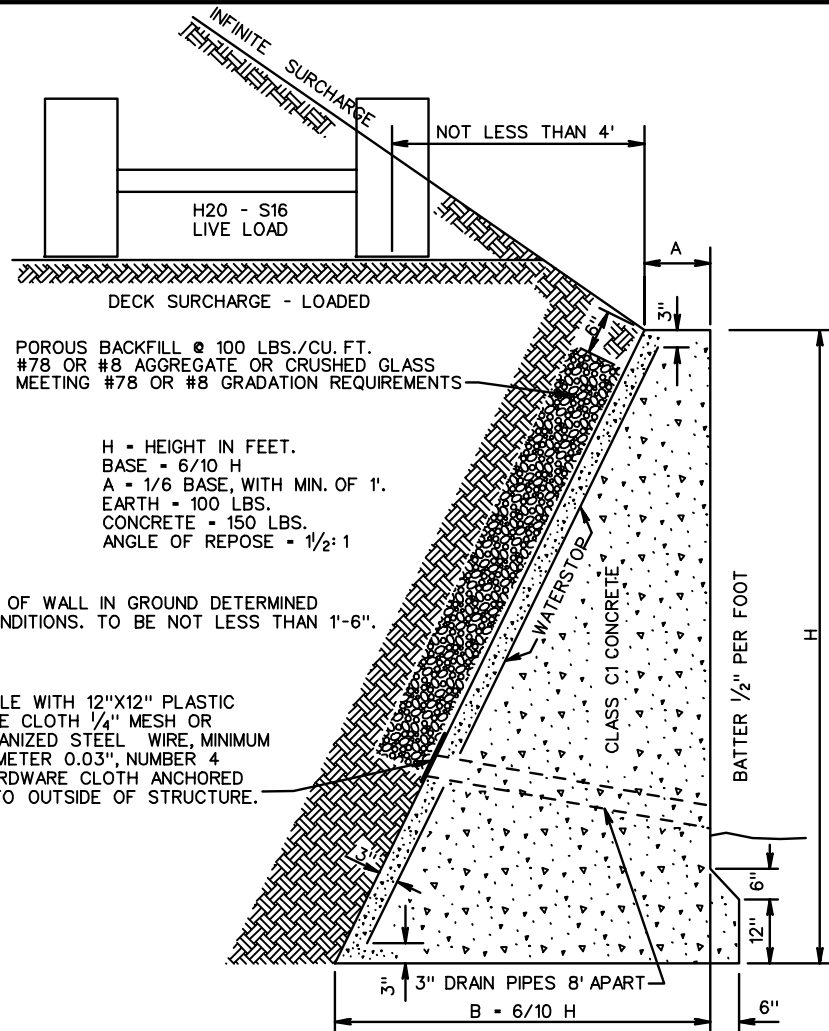
VIRGINIA DEPARTMENT OF TRANSPORTATION

REV 8/07

401.01



CONTRACTION JOINTS AT INTERVALS NOT EXCEEDING 30'.  
 EXPANSION JOINTS AT INTERVALS NOT EXCEEDING 90'.  
 \* WATER STOPS TO BE ELASTOMERIC OR OTHER APPROVED MATERIAL. DIMENSIONS SHOWN ARE ABSOLUTE MINIMUM.



H = HEIGHT IN FEET.  
 BASE = 6/10 H  
 A = 1/6 BASE, WITH MIN. OF 1'.  
 EARTH = 100 LBS.  
 CONCRETE = 150 LBS.  
 ANGLE OF REPOSE = 1/2: 1

NOTE:  
 DEPTH OF WALL IN GROUND DETERMINED BY CONDITIONS. TO BE NOT LESS THAN 1'-6".

WEEP HOLE WITH 12"X12" PLASTIC HARDWARE CLOTH 1/4" MESH OR OR GALVANIZED STEEL WIRE, MINIMUM WIRE DIAMETER 0.03", NUMBER 4 MESH HARDWARE CLOTH ANCHORED FIRMLY TO OUTSIDE OF STRUCTURE.

HEIGHT OF WALL "H" IN FEET	THICKNESS AT TOP "A" IN FEET	THICKNESS AT BASE B=.6H	COMPRESSION AT TOE LBS. PER SQ. FT.	AREA OF SECTION SQ. FT.
3	1'-0"	1'-9 5/8"	856	4.83
4	1'-0"	2'-4 3/4"	1141	7.43
5	1'-0"	3'-0"	1427	10.63
6	1'-0"	3'-7 1/4"	1712	14.43
7	1'-0"	4'-2 3/8"	1997	18.83
8	1'-0"	4'-9 5/8"	2283	23.83
9	1'-0"	5'-4 3/4"	2568	29.43
10	1'-0"	6'-0"	2853	35.63
11	1'-1 1/4 "	6'-7 1/4"	3139	42.98
12	1'-2 3/8 "	7'-2 3/8"	3424	51.03
13	1'-3 5/8 "	7'-9 5/8"	3709	59.78
14	1'-4 3/4 "	8'-4 3/4"	3995	69.23
15	1'-6"	9'-0"	4280	79.38

SAFE BEARING CAPACITY OF SOIL	
ROCK MINIMUM.....	10,000 - 20,000 LBS. PER SQ. FT.
GRAVEL AND COARSE SAND, WELL CEMENTED .....	16,000 - 20,000 LBS. PER SQ. FT.
CLAY IN THICK BEDS, ALWAYS DRY.....	12,000 - 16,000 LBS. PER SQ. FT.
CLAY IN THICK BEDS, MODERATELY DRY.....	8,000 - 12,000 LBS. PER SQ. FT.
CLAY, SOFT.....	2,000 - 4,000 LBS. PER SQ. FT.
SAND, DRY, COMPACT, AND WELL CEMENTED .....	8,000 - 12,000 LBS. PER SQ. FT.
SAND, CLEAN, DRY .....	4,000 - 8,000 LBS. PER SQ. FT.
ALLUVIAL SOILS, ETC .....	1,000 - 2,000 LBS. PER SQ. FT.

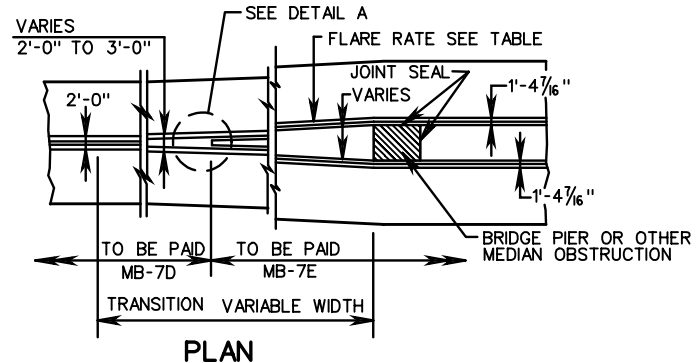
NOTE: IF COMPRESSION AT TOE EXCEEDS SAFE BEARING CAPACITY OF SOIL, A SPECIAL FOOTING IS TO BE USED.

# CONCRETE GRAVITY RETAINING WALLS INFINITE SURCHARGE AND DECK SURCHARGE - LOADED

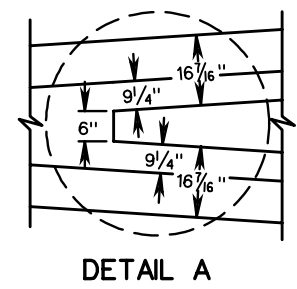
SPECIFICATION REFERENCE

506

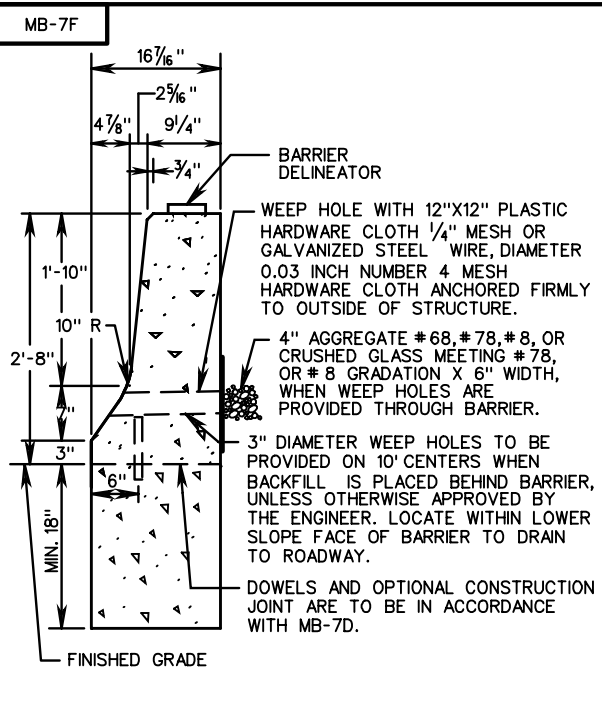
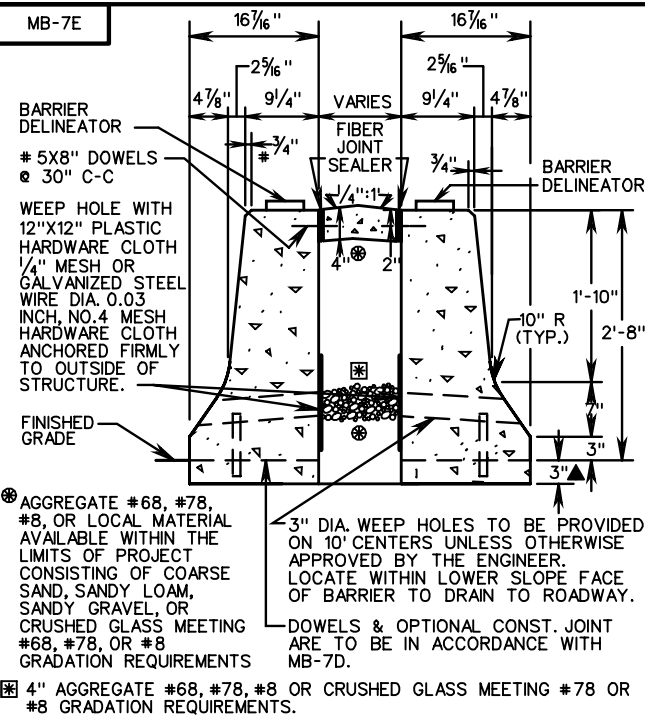
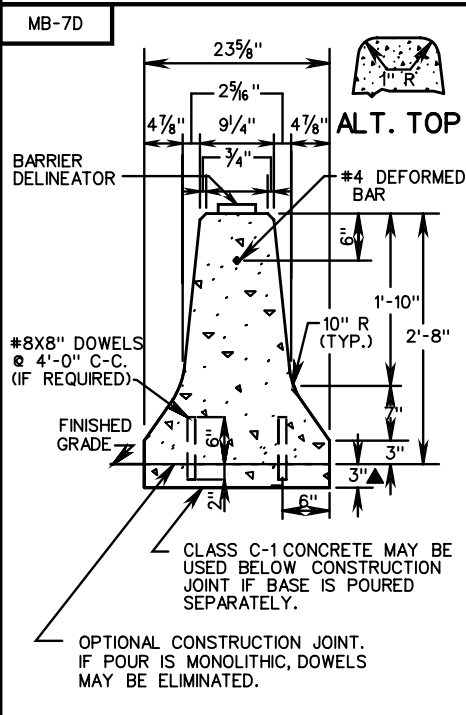




\* SUGGESTED MAXIMUM FLARE RATE FOR RIGID BARRIER SYSTEMS.



DESIGN SPEED	FLARE RATES		
	INSIDE SHY LINE	BEYOND SHY LINE	
MPH	SHY LINE LS	FLARE RATE	FLARE RATE
70	10'	30:1	20:1 *
60	8'	26:1	18:1 *
50	6.5'	21:1	14:1 *
40	5'	16:1	10:1 *
30	3.5'	13:1	8:1 *



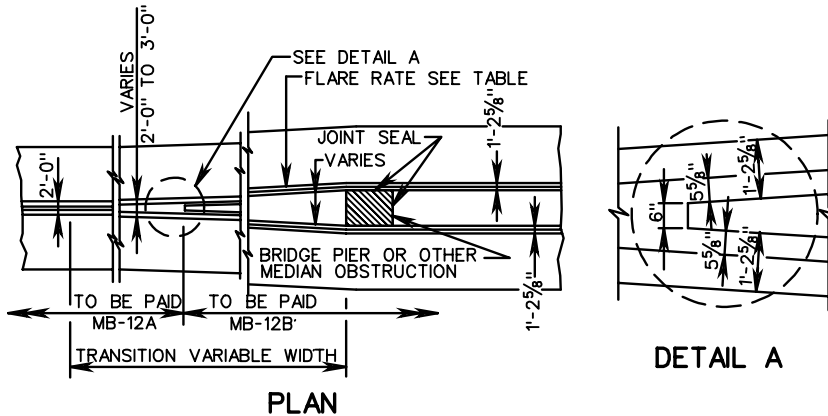
**NOTES:**  
 IF THE CONTRACTOR ELECTS TO USE THE OPTIONAL CONSTRUCTION JOINT, TRANSVERSE JOINTS FOR CRACK CONTROL AND EXPANSION JOINTS ARE TO BE PROVIDED IN BOTH FOOTING AND BARRIER AT THE SAME LOCATION.  
 TRANSVERSE JOINTS ARE TO COINCIDE WITH JOINTS IN ADJACENT PAVEMENT WITH A MAXIMUM SPACING OF 20 FEET C-C.  
 CONCRETE MEDIAN BARRIER MAY BE PRECAST, CAST IN PLACE OR SLIP-FORMED. FOR PRECAST DESIGN SEE STANDARD MB-7D PC.  
 HORIZONTAL REINFORCING STEEL BARS ARE TO BE SEPARATED AT ALL EXPANSION AND CONTRACTION JOINTS. A 2" CONCRETE COVER IS REQUIRED OVER THE ENDS OF THE REINFORCING STEEL.

BARRIER DELINEATOR SIZE, COLOR, AND SPACING TO BE IN ACCORDANCE WITH THE SPECIFICATIONS.  
 COST OF DELINEATOR TO BE INCLUDED IN THE PRICE BID FOR MEDIAN BARRIER.  
 REFLECTIVE SURFACE OF BARRIER DELINEATOR IN ALL INSTANCES, TO BE FACING ONCOMING TRAFFIC.  
 ALTERNATE TOP DESIGN SHOWN ON MB-7D. MAY ALSO BE APPLIED TO MB-7E AND MB-7F.  
 CONCRETE TO BE CLASS A3 IF CAST IN PLACE, 4000 PSI IF PRECAST.  
 ▲ DEPTH OF CONCRETE BASE MAY BE EXTENDED AT THE CONTRACTOR'S OPTION TO COINCIDE WITH BOTTOM OF PAVEMENT COURSE IN WHICH BASE TERMINATES; HOWEVER, THE COST OF ADDITIONAL CONCRETE SHALL BE INCLUDED IN UNIT PRICE BID PER LINEAR FOOT OF BARRIER.

SPECIFICATION REFERENCE
105 502

# CONCRETE MEDIAN BARRIER

VIRGINIA DEPARTMENT OF TRANSPORTATION



**NOTES:**

IF THE CONTRACTOR ELECTS TO USE THE OPTIONAL CONSTRUCTION JOINTS, TRANSVERSE JOINTS FOR CRACK CONTROL AND EXPANSION JOINTS ARE TO BE PROVIDED IN BOTH FOOTING AND BARRIER AT THE SAME LOCATION.

TRANSVERSE JOINTS ARE TO COINCIDE WITH JOINTS IN ADJACENT PAVEMENT WITH A MAXIMUM SPACING OF 20 FT. C-C.

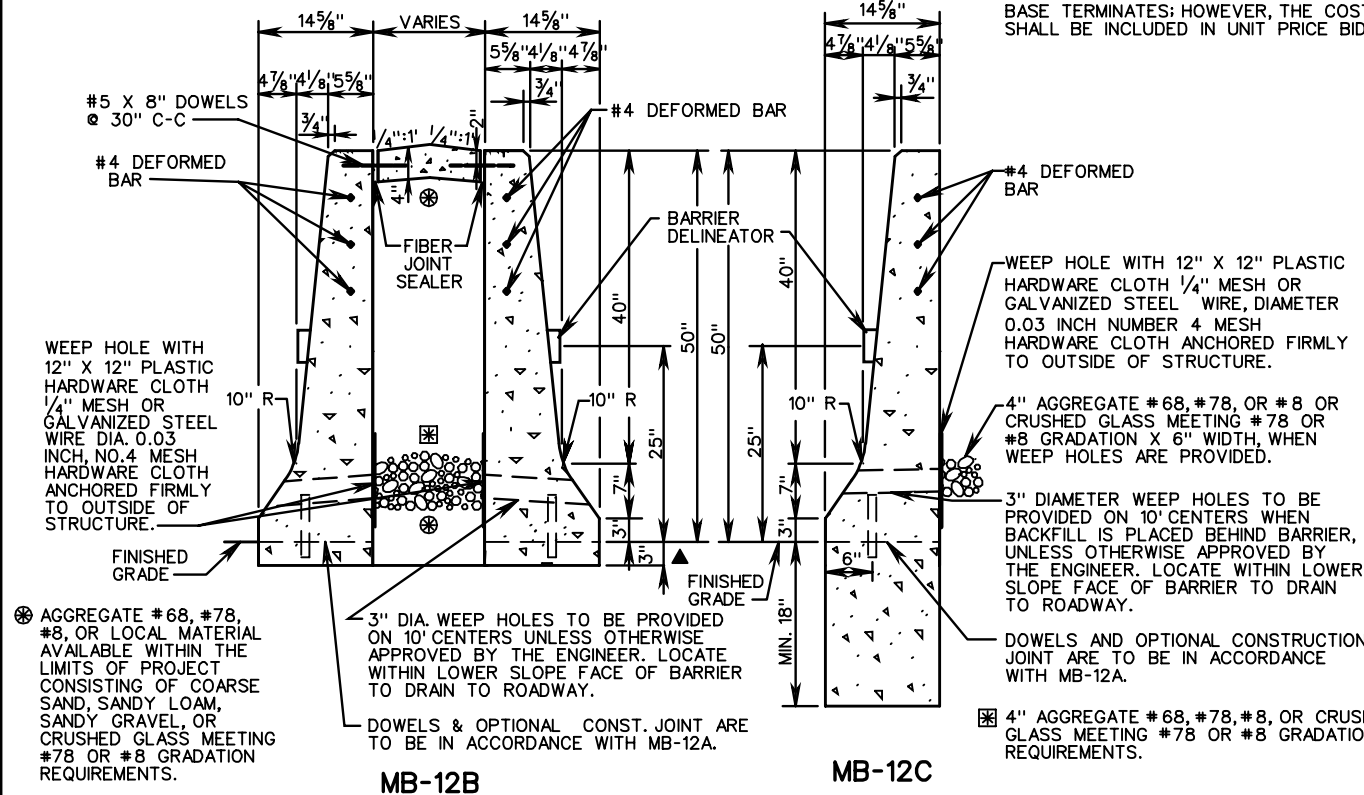
CONCRETE MEDIAN BARRIER MAY BE CAST IN PLACE OR SLIP-FORMED.

HORIZONTAL REINFORCING STEEL BARS ARE TO BE SEPARATE AT ALL EXPANSION AND CONTRACTION JOINTS. A 2" CONCRETE COVER IS REQUIRED OVER THE ENDS OF THE REINFORCING STEEL.

BARRIER DELINEATOR SIZE, COLOR AND SPACING SHALL BE IN ACCORDANCE WITH THE SPECIFICATIONS. COST OF DELINEATOR SHALL BE INCLUDED IN THE PRICE BID FOR MEDIAN BARRIER. REFLECTIVE SURFACE OF BARRIER DELINEATOR, IN ALL INSTANCES, SHALL BE FACING THE ONCOMING TRAFFIC.

CONCRETE SHALL BE CLASS A3 IF CAST IN PLACE, 4000 PSI IF PRECAST.

▲ DEPTH OF CONCRETE BASE MAY BE EXTENDED AT THE CONTRACTOR'S OPTION TO COINCIDE WITH BOTTOM OF PAVEMENT COURSE IN WHICH BASE TERMINATES; HOWEVER, THE COST OF ADDITIONAL CONCRETE SHALL BE INCLUDED IN UNIT PRICE BID PER LINEAR FT. OF BARRIER.



FLARE RATES			
DESIGN SPEED	INSIDE SHY LINE	BEYOND SHY LINE	
MPH	SHY LINE LS	FLARE RATE	FLARE RATE
70	10'	30:1	20:1 *
60	8'	26:1	18:1 *
50	6.5'	21:1	14:1 *
40	5'	16:1	10:1 *
30	3.5'	13:1	8:1 *

\* SUGGESTED MAXIMUM FLARE RATE FOR RIGID BARRIER SYSTEMS.

SHEET 2 OF 2

SPECIFICATION REFERENCE
105 502

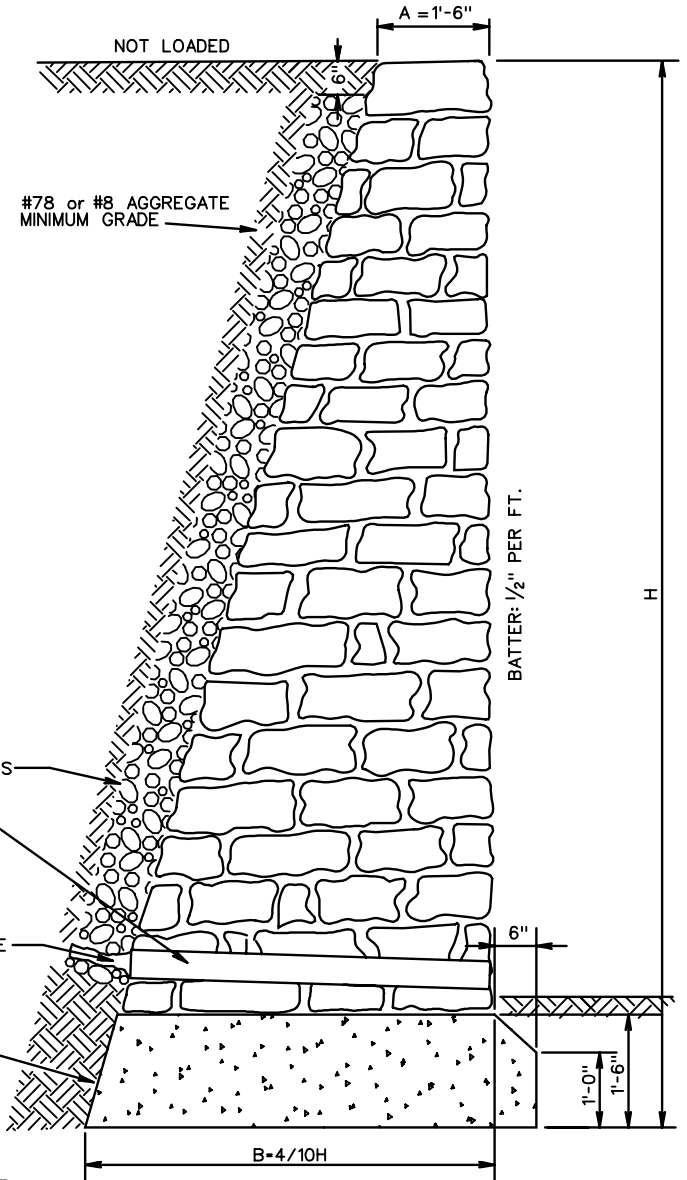
**CONCRETE MEDIAN BARRIER (TALL WALL)**

VIRGINIA DEPARTMENT OF TRANSPORTATION

REV 8/07

501.56

HEIGHT OF WALL "H" IN FEET	THICKNESS AT TOP "A" IN FEET	THICKNESS AT BASE IN FEET	AREA OF WALL SQ. FEET	AREA OF FOOTING SQ. FEET
2	1'-6"	1'-6"	0.750	2.875
3	1'-6"	1'-6"	2.250	2.875
4	1'-6"	1'-7/4"	3.828	2.997
5	1'-6"	2'-0"	5.862	3.513
6	1'-6"	2'-4 3/4"	8.212	4.113
7	1'-6"	2'-9 1/2"	12.060	4.615
8	1'-6"	3'-2 1/2"	14.240	5.186
9	1'-6"	3'-7 1/4"	17.813	5.762
10	1'-6"	4'-0"	21.781	6.344
11	1'-6"	4'-4 3/4"	26.148	6.927
12	1'-6"	4'-9 1/2"	30.909	7.516
13	1'-6"	5'-2 1/2"	36.070	8.105
14	1'-6"	5'-7 1/4"	41.629	8.696
15	1'-6"	6'-0"	47.587	9.288



H = HEIGHT IN FEET  
 A = 1'-6"  
 BASE = 4/10 H  
 EARTH = 100 Lbs.  
 RUBBLE = 150 LBS.  
 ANGLE OF REPOSE = 1 1/2: 1

POROUS BACKFILL @ 100 LBS./CU. FT.  
 #78 OR #8 AGGREGATE OR CRUSHED GLASS  
 MEETING #78 OR #8 GRADATION REQUIREMENTS

3" DRAIN PIPES 8' C-C

WEEP HOLE WITH 12"x12" PLASTIC HARDWARE CLOTH  
 1/4" MESH OR GALVANIZED STEEL WIRE, MINIMUM  
 WIRE DIAMETER 0.03", NUMBER 4 MESH HARDWARE  
 CLOTH ANCHORED FIRMLY TO OUTSIDE OF STRUCTURE

DRAIN PIPES ARE TO BE ONE CONTINUOUS LENGTH  
 OR BELL AND SPIGOT WITH MORTARED JOINTS.

CLASS A3 OR C1 CONCRETE

**NOTE:**

DEPTH OF WALL IN GROUND DETERMINED BY  
 CONDITIONS. SHALL BE NOT LESS THAN 1'-6".  
 IF COMPRESSION AT TOE EXCEEDS SAFE BEARING  
 CAPACITY OF SOIL, A SPECIAL FOOTING IS TO BE USED.

SPECIFICATION  
 REFERENCE

506

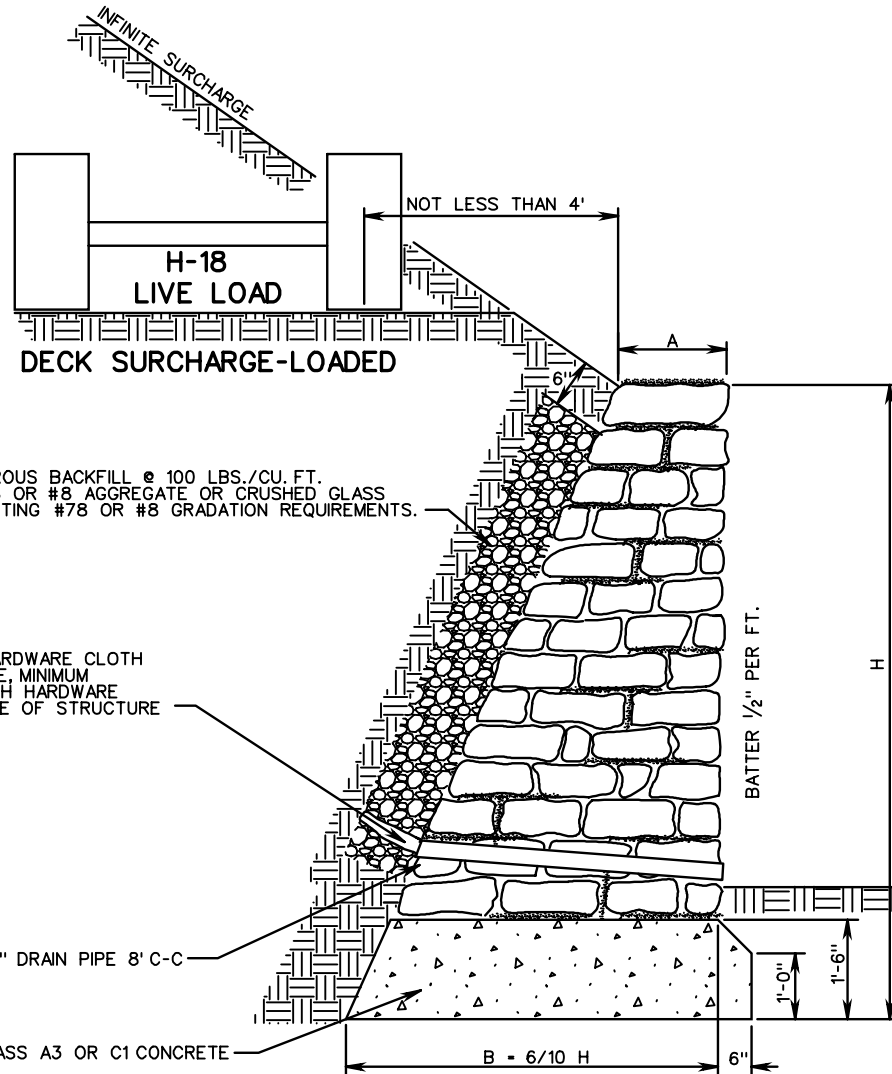
**MORTAR RUBBLE RETAINING WALL-LEVEL BACKFILL**

VIRGINIA DEPARTMENT OF TRANSPORTATION

REV 8/07

1201.11

HEIGHT OF WALL "H" IN FEET	THICKNESS AT TOP "A" IN FEET	THICKNESS AT BASE IN FEET	AREA OF WALL SQ. FEET	AREA OF FOOTING SQ. FEET
3	1'-6"	1'-9 <sup>5</sup> / <sub>8</sub> "	2.362	3.213
4	1'-6"	2'-4 <sup>7</sup> / <sub>8</sub> "	4.453	3.972
5	1'-6"	3'-0"	7.087	4.788
6	1'-8"	3'-7 <sup>1</sup> / <sub>4</sub> "	10.763	5.663
7	1'-8"	4'-2 <sup>3</sup> / <sub>8</sub> "	14.642	6.518
8	1'-9"	4'-9 <sup>5</sup> / <sub>8</sub> "	19.429	7.396
9	1'-9"	5'-4 <sup>7</sup> / <sub>8</sub> "	24.531	8.269
10	1'-10"	6'-0"	30.634	9.157
11	1'-10"	6'-7 <sup>1</sup> / <sub>4</sub> "	35.970	10.038
12	1'-11"	7'-2 <sup>3</sup> / <sub>4</sub> "	44.395	10.930
13	1'-11"	7'-9 <sup>5</sup> / <sub>8</sub> "	51.968	11.816
14	2'-0"	8'-4 <sup>7</sup> / <sub>8</sub> "	60.714	12.711
15	2'-0"	9'-0"	69.530	13.595



POROUS BACKFILL @ 100 LBS./CU. FT.  
#78 OR #8 AGGREGATE OR CRUSHED GLASS  
MEETING #78 OR #8 GRADATION REQUIREMENTS.

WEEP HOLE WITH 12"x12" PLASTIC HARDWARE CLOTH  
1/4" MESH OR GALVANIZED STEEL WIRE, MINIMUM  
WIRE DIAMETER 0.03", NUMBER 4 MESH HARDWARE  
CLOTH ANCHORED FIRMLY TO OUTSIDE OF STRUCTURE

DRAIN PIPES ARE TO BE ONE CONTINUOUS LENGTH  
OR BELL AND SPIGOT WITH MORTARED JOINTS.

H = HEIGHT IN FEET

BASE = 6/10 H

WT. EARTH = 100 LBS./CU. FT.

WT. RUBBLE = 150 LBS./CU. FT.

ANGLE OF REPOSE = 1 1/2: 1

**NOTE:**

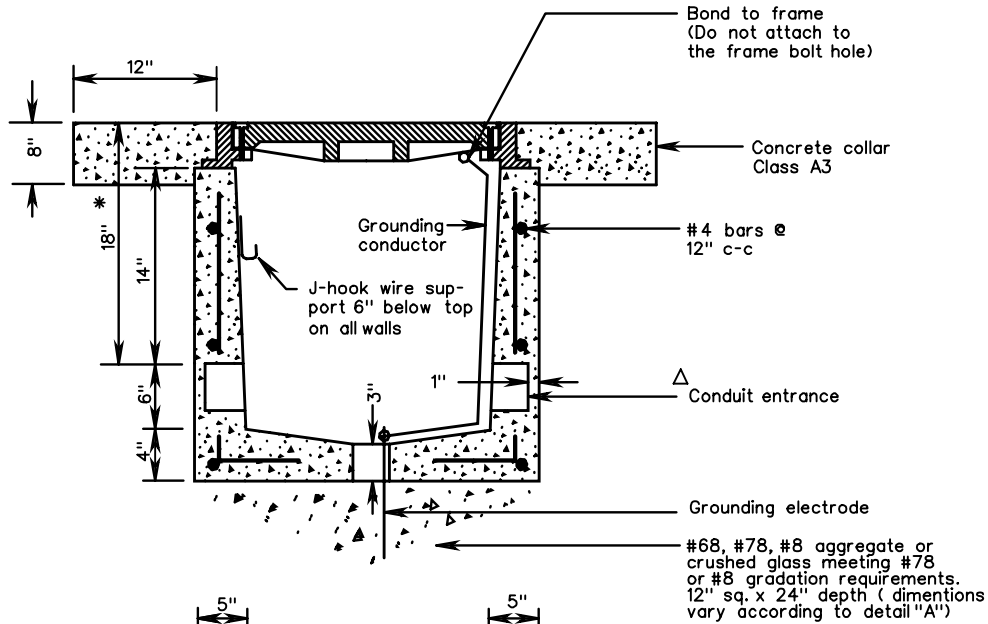
IF COMPRESSION AT TOE EXCEEDS SAFE BEARING CAPACITY OF SOIL,  
A SPECIAL FOOTING IS TO BE USED.

DEPTH OF WALL IN GROUND SHALL BE DETERMINED BY CONDITIONS.  
SHALL BE NOT LESS THAN 1'-6".

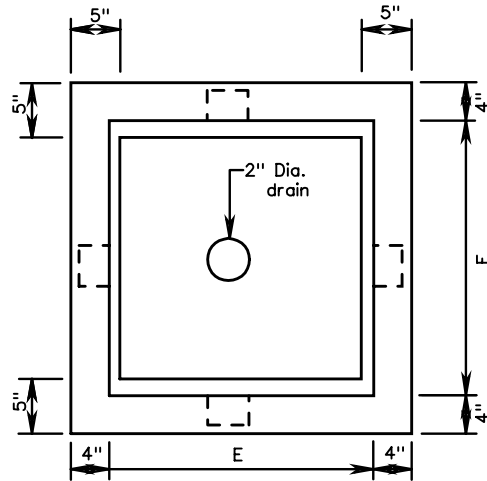
# MORTAR RUBBLE RETAINING WALL INFINITE SURCHARGE AND DECK SURCHARGE - LOADED

SPECIFICATION  
REFERENCE

506



STANDARD	DIMENSIONS	
	E	F
JB-1A	14"	14"
JB-2A	14"	20"
JB-3A	20"	20"
JB-4A	20"	27"
JB-5A	27"	27"



**PLAN VIEW**  
(FRAME AND COVER REMOVED)

**Notes:**

J-Hook wire supports shall be securely attached to the junction box with a bolt and nut with a neoprene washer or an expansion fitting.

Conduit entrances shall be located as shown on the plans. Conduits shall extend 2" min. to 3" max. beyond the inside wall of the junction box.

Bell ends shall be installed on the ends of PVC conduits. Grounding bushings shall be installed on the ends of metal conduits. Bell ends & bushings shall be plugged to prevent moisture & rodent entry.

\* Depth of conduit entrances for magnetic detectors shall be in accordance with St'd TD-2.

All reinforcing steel shall have a minimum 1 1/2" concrete cover. Any reinforcing steel in conflict with conduit shall be cut a minimum of 1 1/2" from conduit.

The junction box may be precast or cast in place concrete.

△ A minimum 2" diameter conduit entrance is required unless otherwise specified on plans.

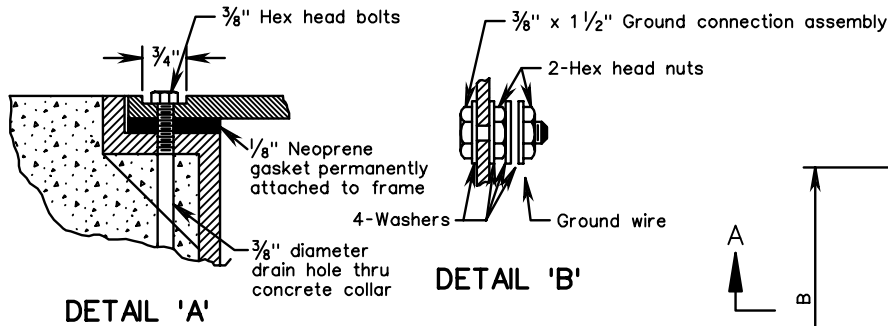
A concrete collar is required only when junction box is installed in earth areas.

High strength grout conforming to the Road & Bridge Specifications shall be used to secure the frame to the junction box.

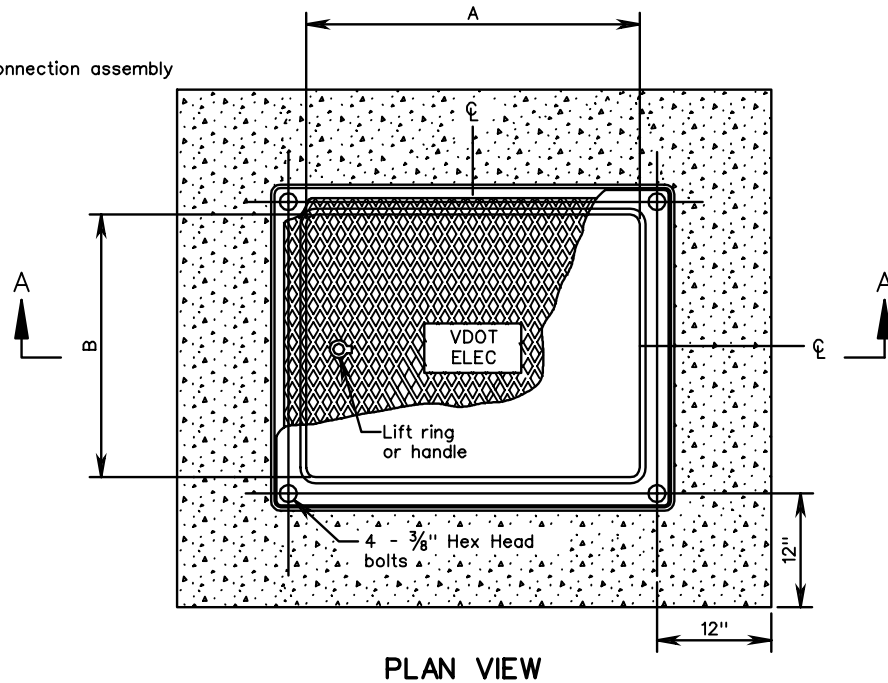
All junction boxes shall be installed with a grounding electrode unless box houses only communication/interconnect cable.

Voids resulting from entrance of conduits into junction box shall be completely filled with hydraulic cement grout conforming to the Road & Bridge Specifications.

**JUNCTION BOX**



STANDARD	DIMENSIONS	
	A	B
JB-1B	12"	12"
JB-2B	12"	18"
JB-3B	18"	18"
JB-4B	18"	24"
JB-5B	24"	24"



**Notes:**

Conduit entrances shall be located as shown on the plans. Conduits shall extend 2" min. to 3" max. beyond the inside wall of the junction box.

Bellends shall be installed on the ends of PVC conduits. Grounding bushings shall be installed on the ends of metal conduits. Bell ends & bushings shall be plugged to prevent moisture & rodent entry.

\* Depth of conduit entrances for magnetic detectors shall be in accordance with Standard TD-2.

The cover shall have a non-skid surface with letters cast in the depression on top. The letters "VDOT ELEC", "VDOT TRAF", "VDOT COMM" or "UTILITY" as applicable are to be 1" wide and raised 1/4" high. Covers used for junction boxes installed within municipalities shall not require the VDOT reference.

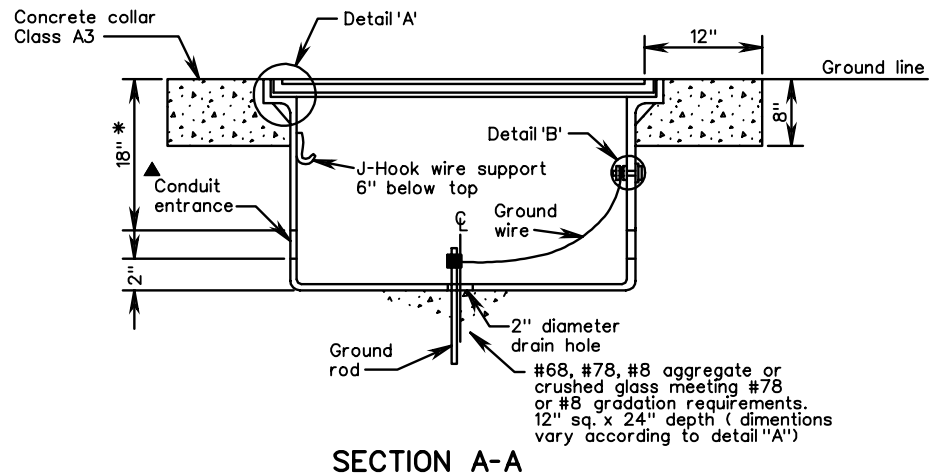
▲ A minimum 2" diameter conduit entrance is required, unless otherwise specified on plans.

A concrete collar is required only when junction box is installed in earth areas.

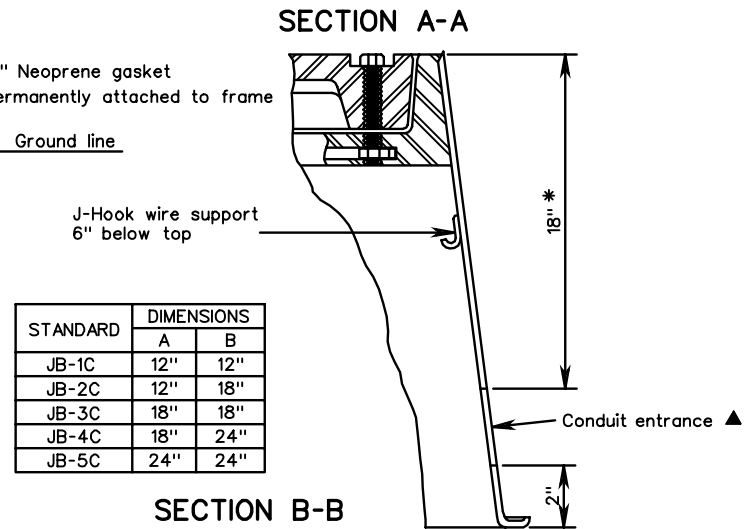
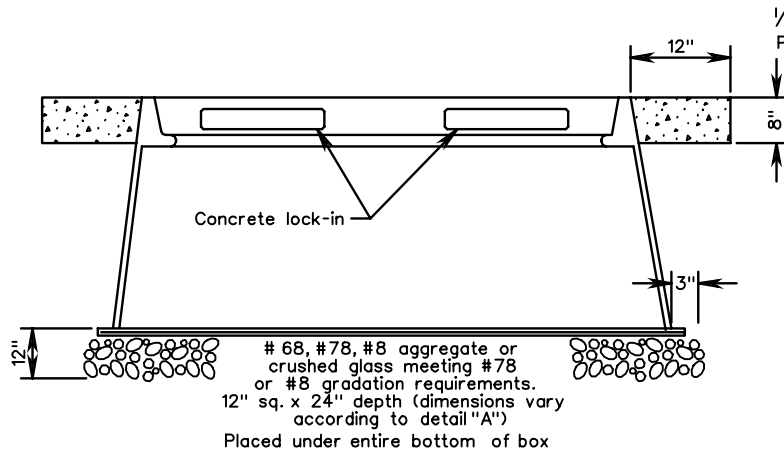
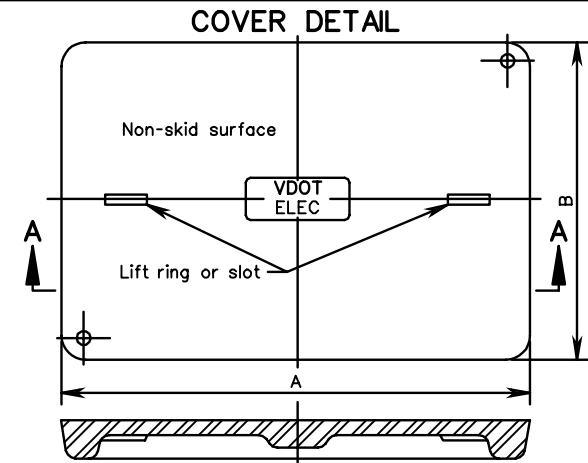
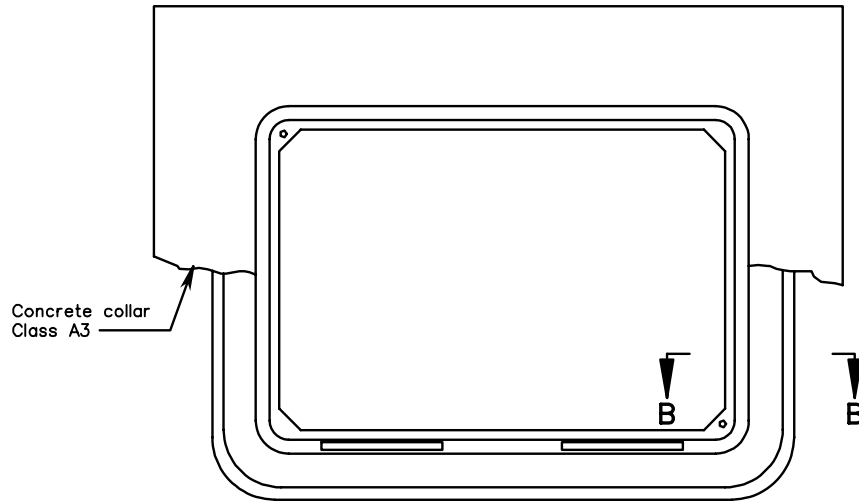
All junction boxes shall be installed with a ground rod unless box houses only communication/interconnect cable.

Voids resulting from entrance of conduits into junction boxes shall be completely filled with an appropriate material.

Junction box shall be a gray-iron casting with an asphalt coating on exterior surface except cover.



**JUNCTION BOX**



STANDARD	DIMENSIONS	
	A	B
JB-1C	12"	12"
JB-2C	12"	18"
JB-3C	18"	18"
JB-4C	18"	24"
JB-5C	24"	24"

**Notes:**

Conduit entrances shall be located as shown on the plans.  
Bellends shall be installed on the ends of PVC conduits.  
Grounding bushings shall be installed on the ends of metal conduits.  
Bellends and bushings shall be plugged to prevent moisture and rodent entry.

Depth of conduit entrance for use of magnetic detectors shall be in accordance with Standard TD-2.

The junction box shall be of a polymer concrete with fiberglass sides.

The cover shall have a non-skid surface with letters cast in the depression on top. The letters "VDOT ELEC", "VDOT TRAF", "VDOT COMM" or "UTILITY" as applicable are to be 1" wide and raised 1/4" high. Covers used for junction boxes installed within municipalities shall not require the VDOT reference.

All junction boxes shall be installed with a ground rod unless box houses only communication/interconnect cable.

Two recessed 3/8" Hex head bolts are required for each cover.

▲ A minimum 2" diameter conduit entrance is required, unless otherwise specified on the plans.

A concrete collar is required only when junction box is installed in earth areas.

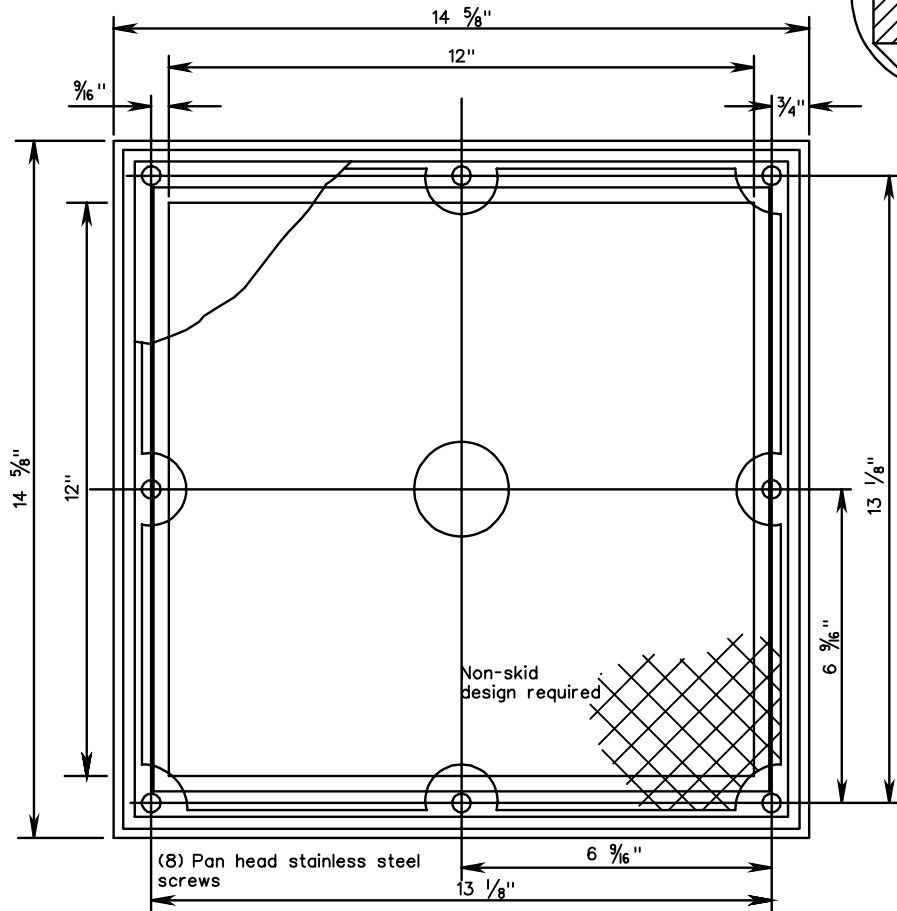
Conduits shall extend 2" to 3" max. beyond the inside wall of the junction box.

The junction box may be a two piece design with the top section no less than 17" in depth.

Voids resulting from entrance of conduits into junction boxes shall be completely filled with an appropriate material.

# JUNCTION BOX

TOP VIEW



**Notes:**

Finish: Galvanized in accordance with Section 233 and coated (outside) except the cover with an approved mastic.  
 Material: Box 1/4" steelplate & cover 1" steelplate ASTM-A36M.

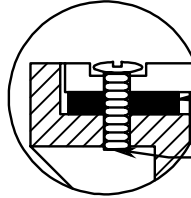
All junction boxes shall be installed with a ground rod unless box houses only communication/interconnect cable.

PVC conduits shall have bell ends and metal conduits shall have grounding bushings on all ends.

Bellends and bushings shall be plugged to prevent moisture and rodent entry.

Voids resulting from entrance of conduits into junction boxes shall be completely filled with an appropriate material.

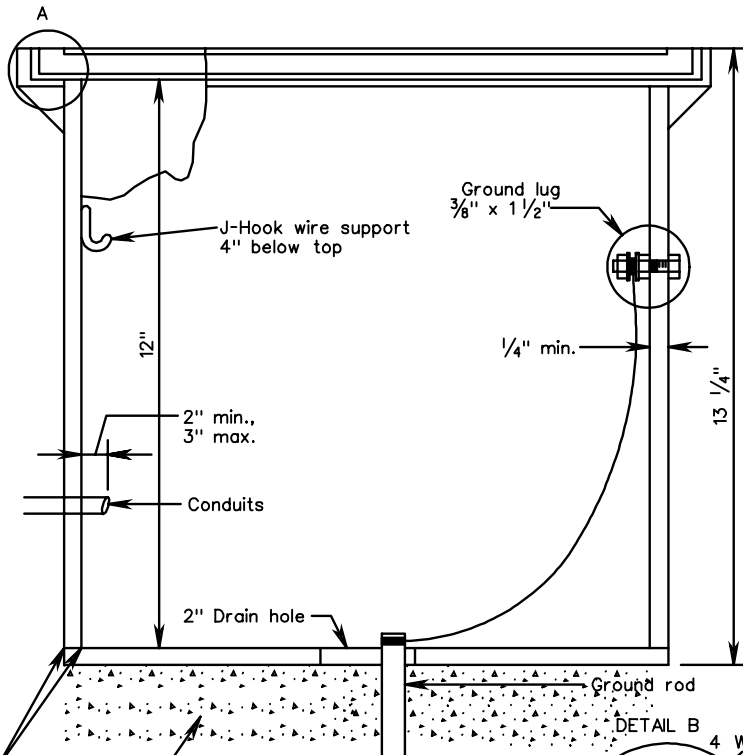
DETAIL A



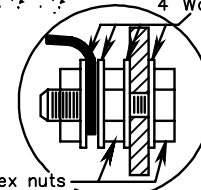
1/8" Neoprene gasket  
 Permanently attached to frame

When setting box in concrete, cover with set screws shall be in place.

SIDE VIEW



DETAIL B



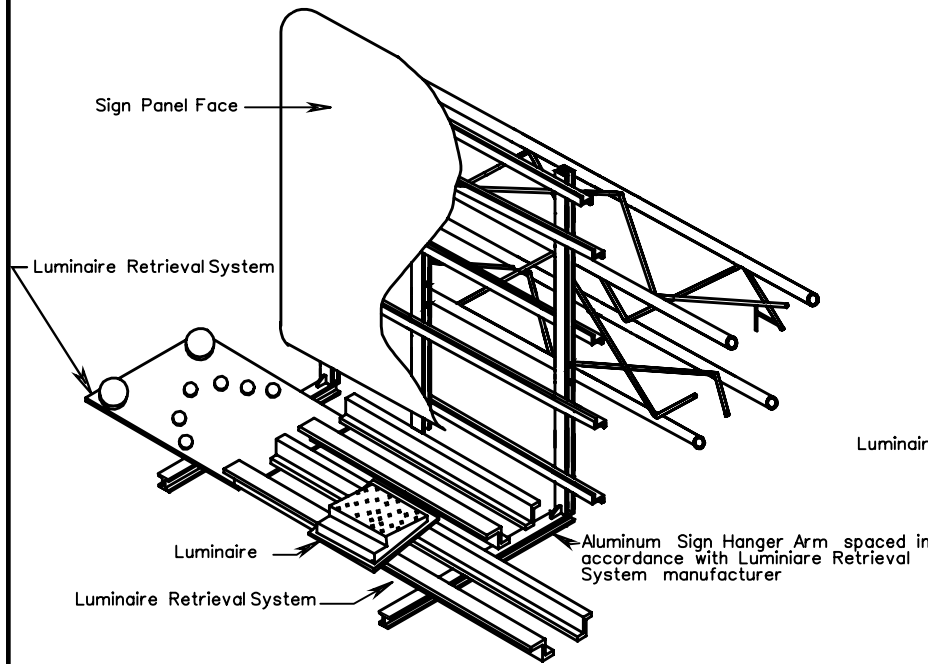
2 Hex nuts

Grounding lug  
 galvanized bolt  
 ASTM-A307

**JUNCTION BOX**

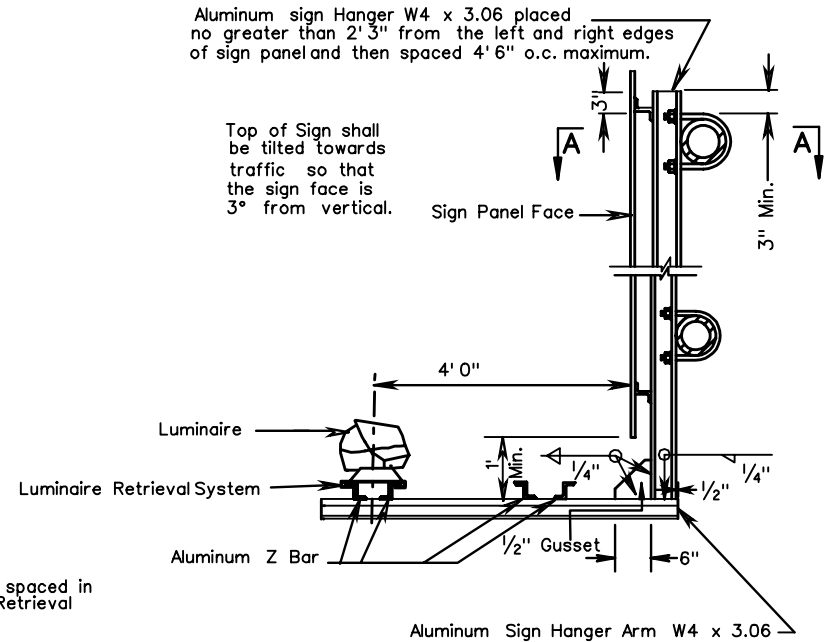


SIGN HANGER ERECTION DETAIL WITH LUMINAIRE RETRIEVAL SYSTEM



Aluminum sign Hanger W4 x 3.06 placed no greater than 2'3" from the left and right edges of sign panel and then spaced 4'6" o.c. maximum.

Top of Sign shall be tilted towards traffic so that the sign face is 3° from vertical.

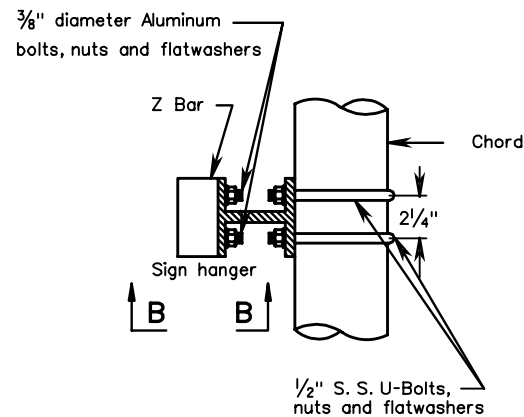


**Note:**

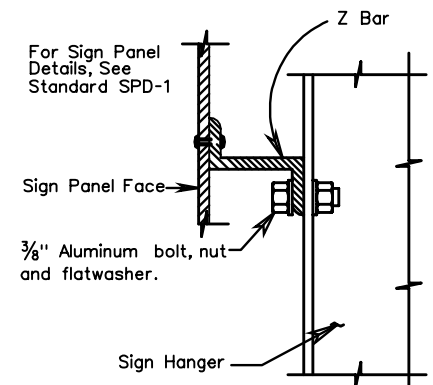
Luminaire Retrieval System including electrical system shall be equal to "LUMI-TRAK" and designed for the number of luminaires indicated on the plans. Spacing of hangers used to support the retrieval system shall be in accordance with manufacturer's recommendations. Turntable end shall be of sufficient length to align with the vertical edge of the outside paved shoulder ( $\pm 6"$ ) or shall be extended 5 feet beyond the vertical edge ( $\pm 6"$ ) of the outermost sign luminaire whichever is greater. The opposite end of retrieval system shall extend a minimum of 6 inches past the outermost vertical edge of the sign hanger arm.

Luminaires and Luminaire Retrieval System required only where indicated on the plans.

**SECTION A-A**

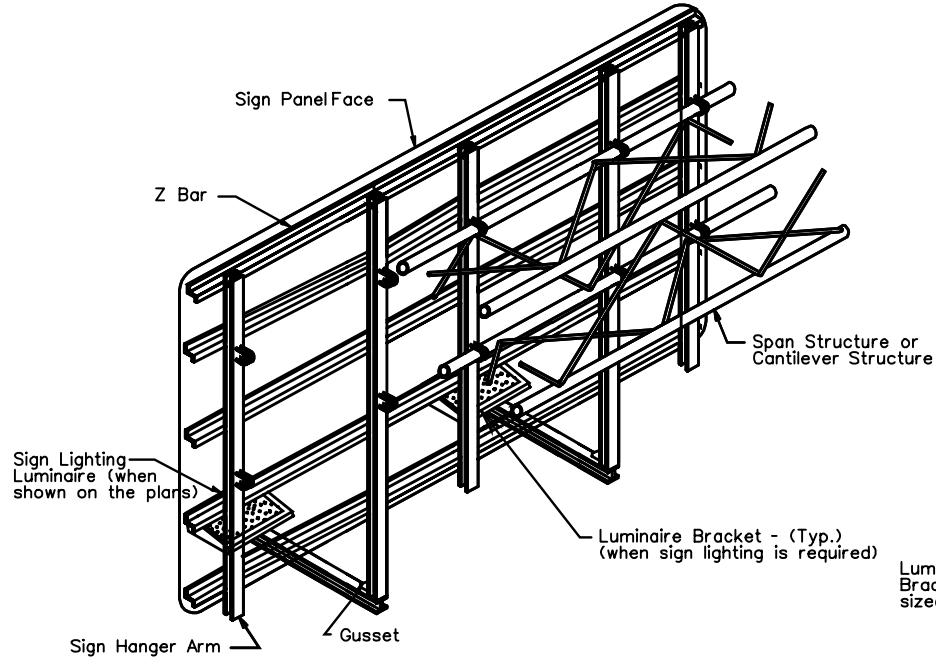


**SECTION B-B**



**TYPICAL DETAILS FOR OVERHEAD SIGN STRUCTURES**

VIRGINIA DEPARTMENT OF TRANSPORTATION



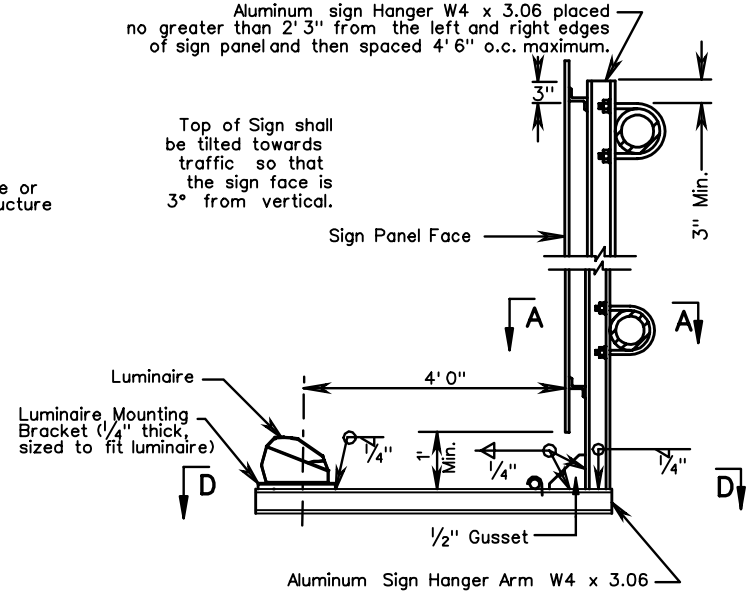
**SIGN ATTACHMENT TO TRUSS-TYPE STRUCTURES**

**SIGN HANGER ERECTION DETAIL WITH LUMINAIRE**

(WHEN NO LUMINAIRE RETRIEVAL SYSTEM IS REQUIRED)

Aluminum sign Hanger W4 x 3.06 placed no greater than 2' 3" from the left and right edges of sign panel and then spaced 4' 6" o.c. maximum.

Top of Sign shall be tilted towards traffic so that the sign face is 3° from vertical.

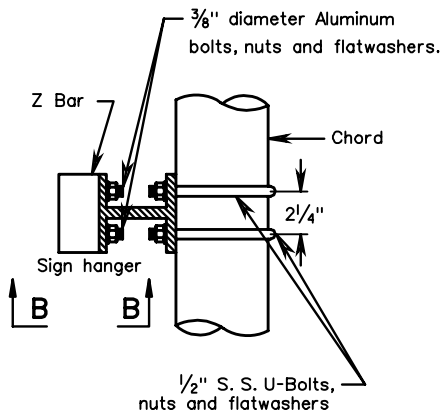


**Note**

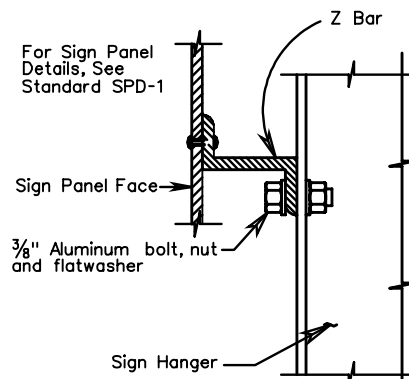
Luminaires required only where indicated on the plans.

Luminaire to be attached to mounting bracket with 4, 3/8" Dia. galvanized cap screws, lockwashers and nuts.

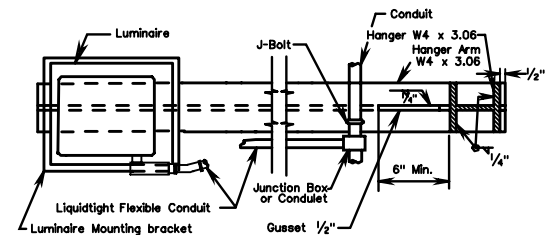
**SECTION A-A**



**SECTION B-B**

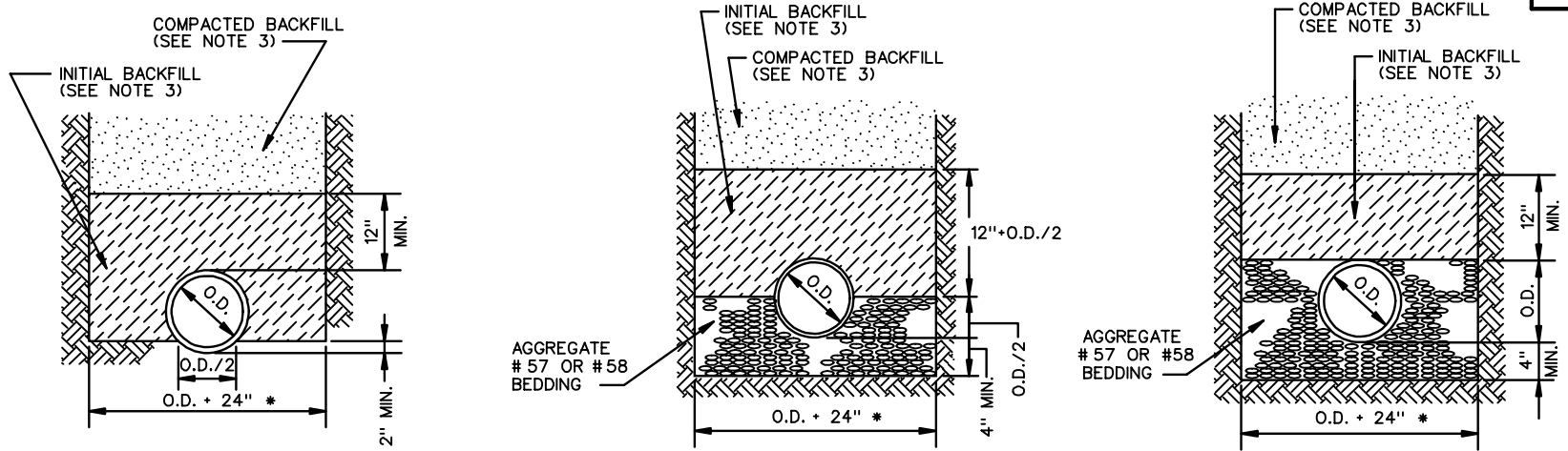


**SECTION D-D**



**TYPICAL DETAILS FOR OVERHEAD SIGN STRUCTURES**

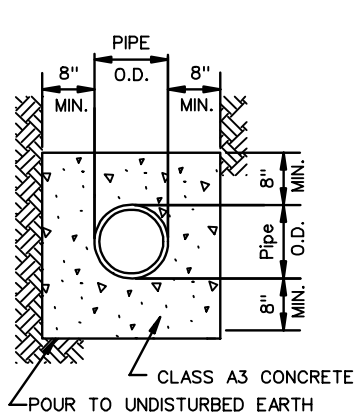
VIRGINIA DEPARTMENT OF TRANSPORTATION



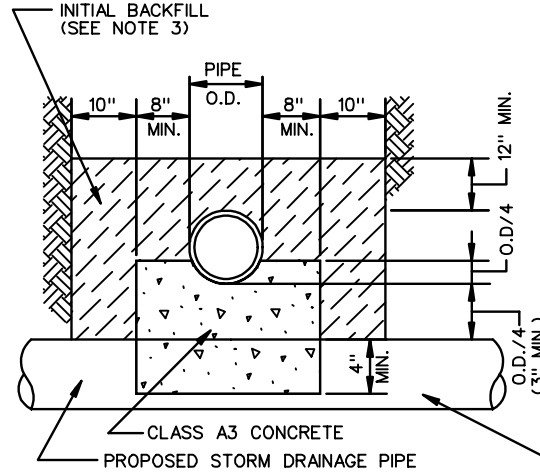
TYPE 1

TYPE 2

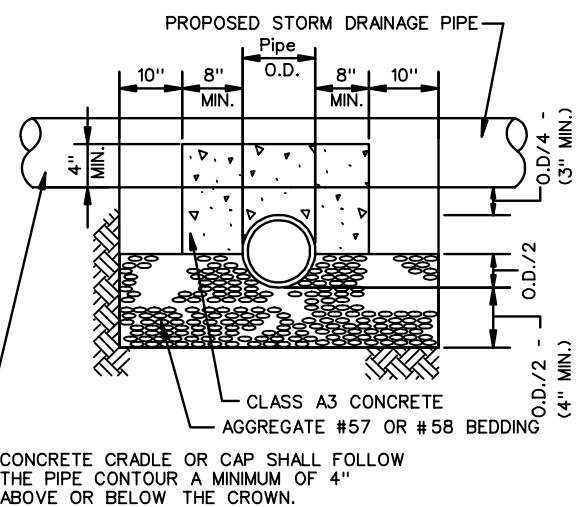
TYPE 3



CONCRETE ENCASMENT



CONCRETE CRADLE



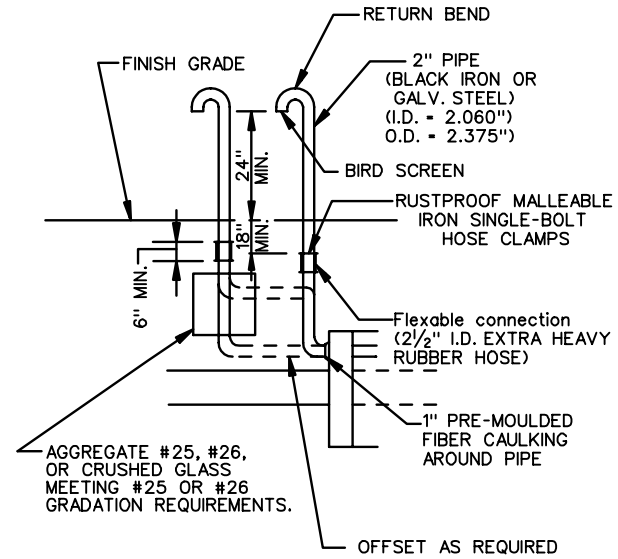
CONCRETE CAP

NOTES:

1. WHERE THE TRENCH BOTTOM IS IN ROCK, IT SHALL BE EXCAVATED TO A MINIMUM OF 8" BELOW THE BOTTOM OF THE PIPE BACKFILLED WITH BEDDING MATERIAL.
  2. WHERE PIPE FOUNDATIONS ARE YIELDING, PIPE SHALL BE BEDDED ON A MINIMUM OF 8" BEDDING MATERIAL.
  3. INITIAL AND COMPACTED BACKFILL SHALL MEET THE REQUIREMENTS OF SECTION 520.03 OF THE VDOT SPECIFICATIONS. CRUSHED GLASS CONFORMING TO THE SIZE REQUIREMENTS FOR CRUSHER RUN AGGREGATE SIZE 25 OR 26 AND MEETING THE REQUIREMENTS OF SECTION 520.03 OF THE VDOT SPECIFICATION MAY BE USED AS BACKFILL MATERIAL.
- \* FOR PIPE LESS THAN 12" THE TRENCH WIDTH MAY BE 36" MAXIMUM.

UTILITY BEDDING AND PROTECTION  
WATER AND SANITARY SEWER FACILITIES

VIRGINIA DEPARTMENT OF TRANSPORTATION



### Notes:

WRAP CONNECTION IN POLYETHELENE  
AND PLASTER WITH ROOFING CEMENT  
OR ASPHALTIC MATERIAL.

STANDARD LEAK DETECTOR

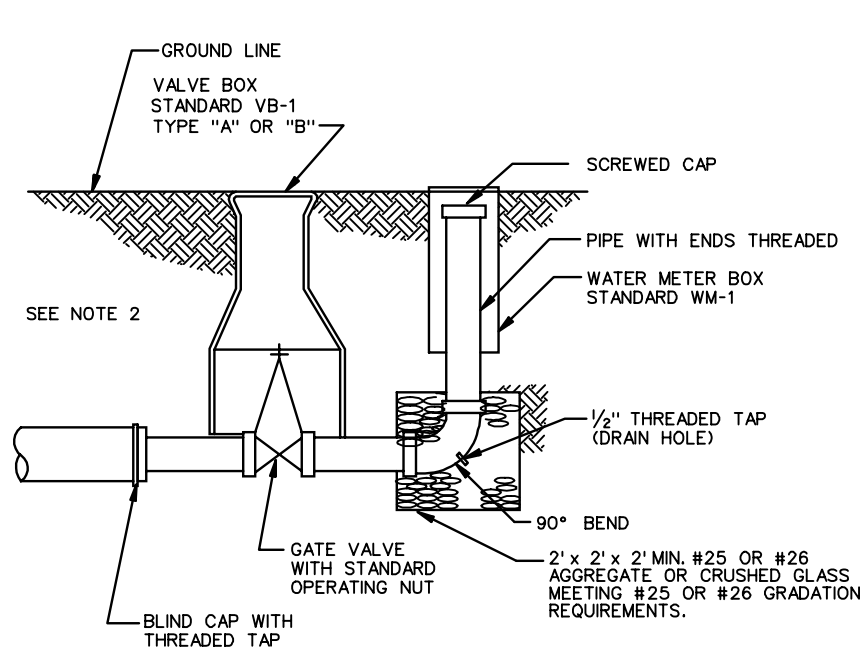
LD-1

**LEAK DETECTOR**

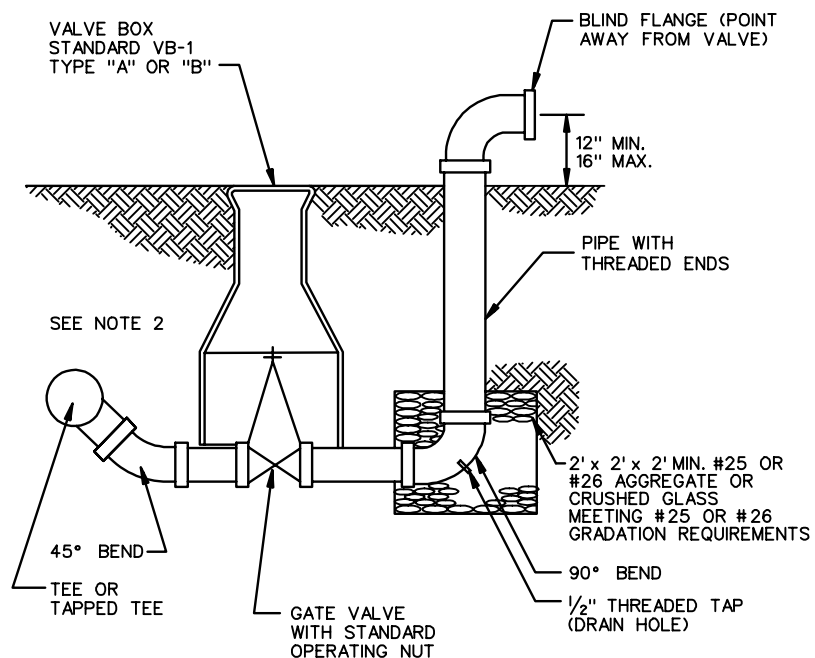
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TYPE "A"



TYPE "B"

## NOTES:

1. ALL BLOW-OFFS SHOULD BE PLACED IN A POSITION TO ASSURE NATURAL DRAINAGE.
2. EITHER TYPE "A" OR TYPE "B" BLOW-OFF MAY BE USED AT DEAD OR SAG SITUATION.
3. BLOW-OFF PIPE SHALL BE THREADED BLACK IRON OR GALVANIZED STEEL PIPE.
4. SIZE OF BLOW-OFF SHALL BE SPECIFIED ON THE PLANS.

## BLOW-OFF VALVE AND BOX WATER AND SANITARY SEWER FACILITIES

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