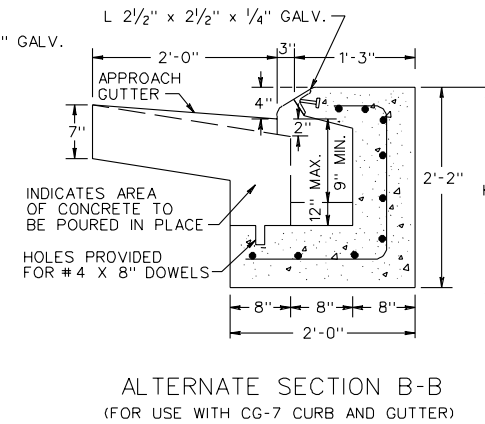
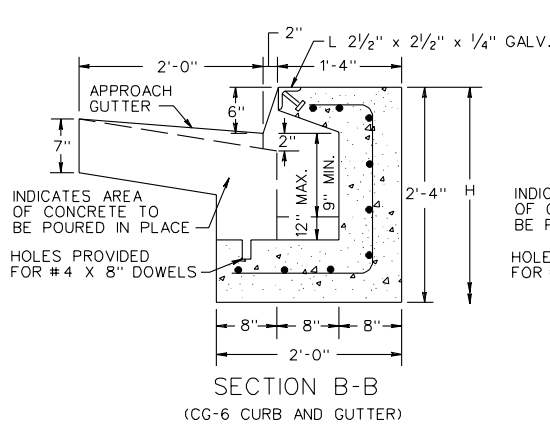
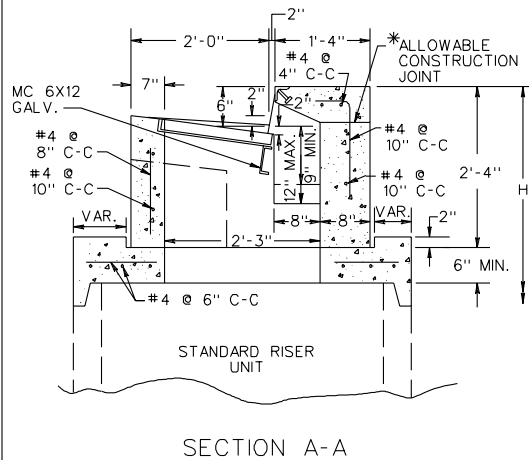


PIPE SIZE	"H" DIMENSION (CONCRETE PIPE)
12"	4'-8"
15"	4'-11 1/4"
18"	5'-2 1/2"
21"	5'-5 3/4"
24"	5'-9"
27"	6'-0 1/4"
30"	6'-6 1/2"
33"	6'-9 3/4"
36"	7'-1"
42"	7'-7 1/2"
48"	8'-2"

NOTES

1. SEE GENERAL NOTES - PRECAST FOR ADDITIONAL DETAILS.
2. CONCRETE TO BE 4000 PSIMUMUM.
3. REINFORCING STEEL IN ACCORDANCE WITH ASTM-615.
4. DIMENSIONS SHOWN ARE MINIMUM. ACTUAL DIMENSIONS MAY VARY WITH MANUFACTURER.
5. FOR DETAILS OF FRAME AND GRATE SEE STANDARD DI-2A, B, C.
- * 6. VERTICAL REINFORCING BARS TO BE CONTINUOUS THROUGH JOINT.
7. STANDARD ST-1 STEPS NOT REQUIRED IN THIS TOP UNIT.



SPECIFICATION REFERENCE
105 233 302

STANDARD PRECAST TOP UNITS

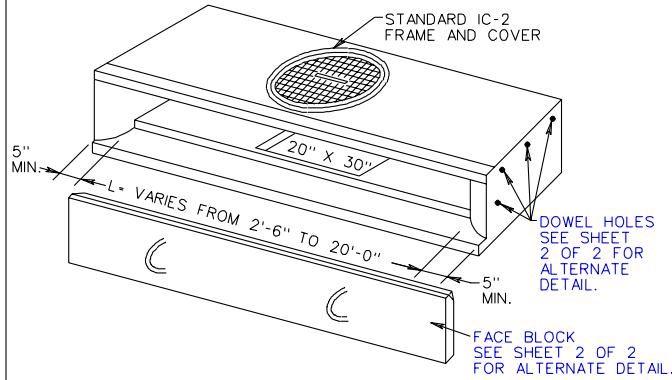
VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 3/03

103.04

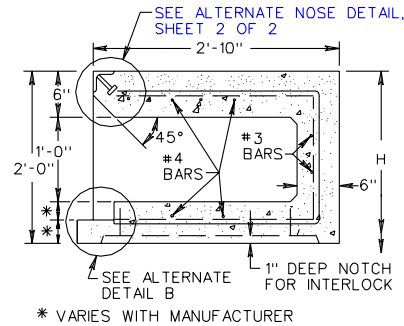
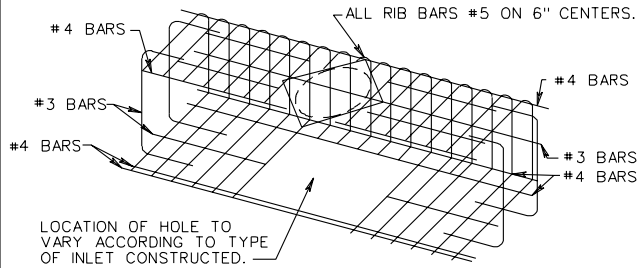
T-DI-3,4

CURB DROP INLET THROAT SECTION

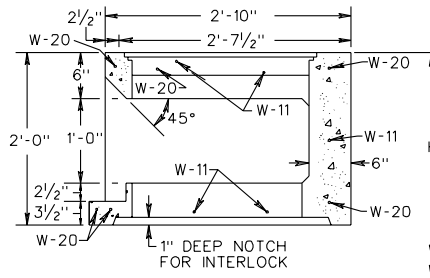
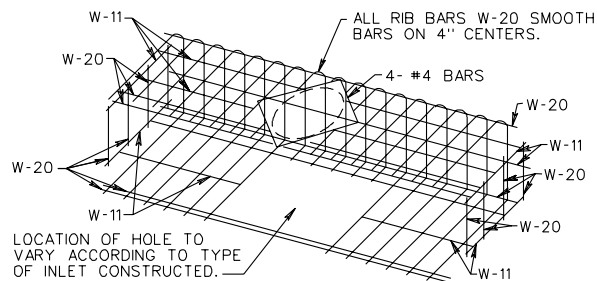


NOTES:

1. SEE GENERAL NOTES - PRECAST FOR ADDITIONAL DETAILS.
2. CONCRETE TO BE 4000 PSI MINIMUM COMPRESSIVE STRENGTH.
3. REINFORCING STEEL IN ACCORDANCE WITH ASTM A-615 FOR REINFORCING BARS.
4. REINFORCING IN ACCORDANCE WITH ASTM A-185 FOR WELDED WIRE MESH.
5. DIMENSIONS SHOWN ARE MINIMUM. ACTUAL DIMENSIONS MAY VARY WITH MANUFACTURER.
6. THIS UNIT MAY BE USED WITH ALL STANDARD DI-3 & DI-4 CURB DROP INLETS.
7. EACH FACE BLOCK SHALL HAVE 2 OR MORE LOOPS (#3 BARS) CAST IN FACE AS SHOWN. THESE LOOPS MAY BE USED FOR LIFT, AND FOR TIEING IN THE POURED IN PLACE GUTTER SECTION. FACE BLOCKS ARE TO BE SEALED WITH GROUT OR POLYSULFIDE SEALER.
8. STANDARD ST-1 STEPS NOT REQUIRED IN THIS TOP UNIT.



TYPICAL MINIMUM BAR REINFORCEMENT



TYPICAL MINIMUM WELDED WIRE REINFORCEMENT

RECOMMENDED MINIMUM HEIGHT CHART

DI-3A,B,C, FOR 36" I.D. BASE UNIT	PIPE SIZE	H DIMENSION CONCRETE PIPE
	6"	2'-11"
8"	3'-1 ¹ / ₄ "	
10"	3'-3 ³ / ₄ "	
12"	3'-6"	
15"	3'-9 ¹ / ₄ "	
18"	4'-0 ¹ / ₂ "	
21"	4'-3 ³ / ₄ "	
DI-3A,B,C,D,E,& F FOR 48" I.D. BASE UNIT	6"	3'-9"
	8"	3'-11 ¹ / ₄ "
	10"	4'-1 ¹ / ₄ "
	12"	4'-4"
	15"	4'-7 ¹ / ₄ "
	18"	4'-10 ¹ / ₂ "
21"	5'-1 ³ / ₄ "	
24"	5'-5"	
27"	5'-8 ¹ / ₄ "	
DI-3A,B,C,D,E,& F FOR 60" OR 72" I.D. BASE UNITS & DI-4A, B, C, D, E, & F	12"	4'-4"
	15"	4'-7 ¹ / ₄ "
	18"	4'-10 ¹ / ₂ "
	21"	5'-1 ³ / ₄ "
	24"	5'-5"
	27"	5'-8 ¹ / ₄ "
	30"	6'-2 ³ / ₄ "
	33"	6'-5 ³ / ₄ "
	36"	6'-9"
	42"	7'-3 ¹ / ₂ "
48"	7'-10"	

SHEET 1 OF 2

STANDARD PRECAST TOP UNITS

REV. 3/03

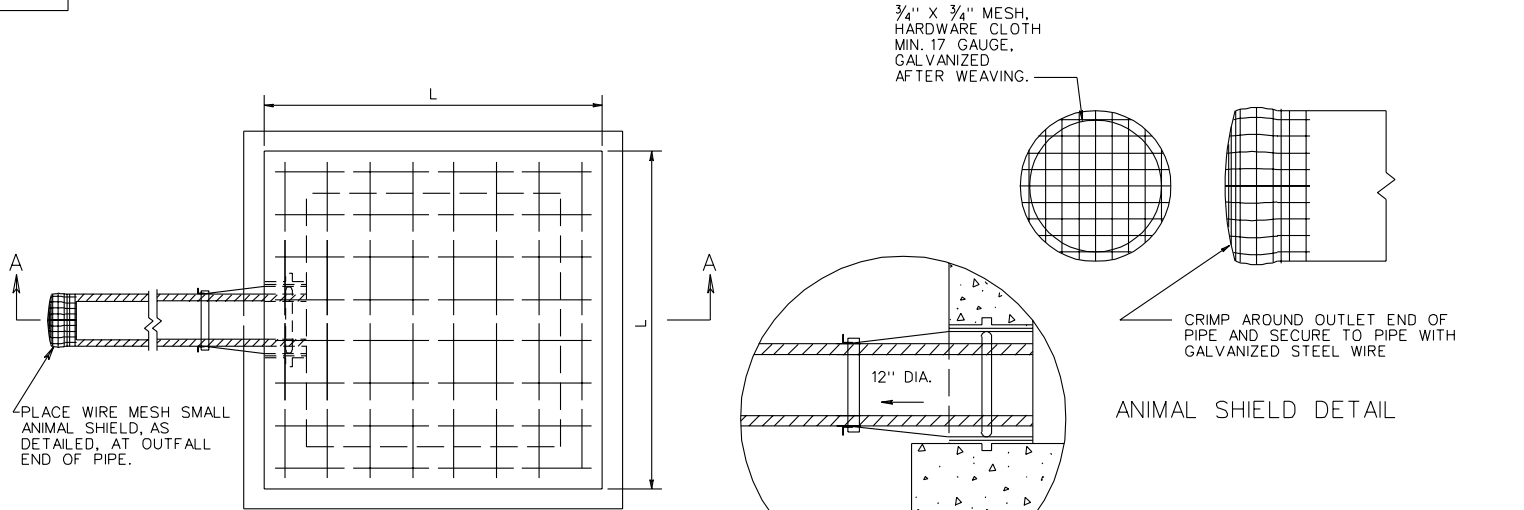
103.05

VIRGINIA DEPARTMENT OF TRANSPORTATION

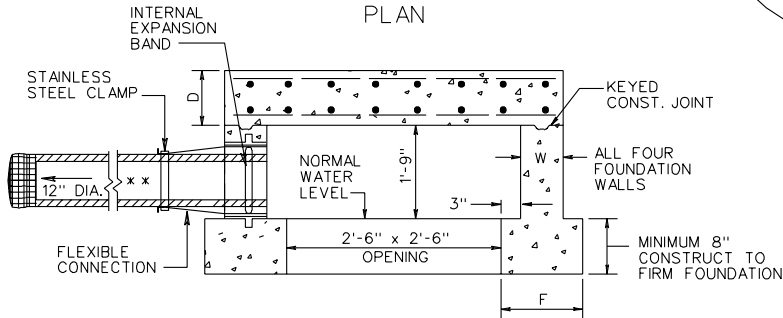
SPECIFICATION
REFERENCE

105
233
302

SB-1



PLAN



NOTES:
ALL CONCRETE TO BE CLASS A3 IF CAST IN PLACE. FOR PRECAST SEE SHEET 110.02.

CONCRETE QUANTITIES SHOWN ARE BASED ON A 12" DUCTILE IRON WATER LINE. IF OTHER SIZE OR TYPE OF PIPE IS USED QUANTITIES ARE TO BE ADJUSTED ACCORDINGLY.

COST OF WIRE MESH SHIELD AT OUTFALL END OF PIPE IS TO BE INCLUDED IN PRICE BID FOR PIPE.

THIS ITEM MAY BE PRECAST OR CAST IN PLACE.

CONTRACTOR IS TO PROVIDE OPENING FOR PIPE AND FLEXIBLE CONNECTOR BY CORING OR CAST-IN-PLACE SLEEVE WITH WATER STOP COLLAR.

PIPE(S) SHALL BE CONNECTED TO SPRING BOX WITH A FLEXIBLE BOOT MEETING ASTM SPECIFICATION C-923. COST OF FLEXIBLE CONNECTION TO BE INCLUDED IN BID PRICE FOR SPRING BOX. BOOT SHALL BE MADE FROM NEOPRENE RUBBER AND HAVE A 3/8" MINIMUM WALL THICKNESS THROUGHOUT. THE INTERNAL EXPANSION BAND TO SECURE THE BOOT IN PLACE SHALL CONFORM TO ALUMINUM MATERIAL SPECIFICATION 6061-T6. THE EXTERNAL BAND TO CLAMP AND SEAL THE BOOT TO THE PIPE SHALL BE STAINLESS STEEL-CORROSION RESISTANT CONFORMING TO ASTM SPECIFICATION A-167. THE OPENING TO RECEIVE THE FLEXIBLE CONNECTION SHALL BE CORE DRILLED AND IS TO BE CONSTRUCTED TO ALLOW FOR LATERAL AND VERTICAL MOVEMENT, AS WELL AS ANGULAR ADJUSTMENT THRU 20 DEGREES. ALL FIELD INSTALLATION OF PIPE TO SPRING BOX USING FLEXIBLE BOOT SHALL BE COMPLETED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS AND SPECIFICATIONS.

** STANDARD RECOMMENDED PIPE IS 12" DUCTILE IRON WATER LINE. PUSH ON JOINTS, CLASS TO BE SPECIFIED BASED UPON HEIGHT OF COVER.

HEIGHT OF FILL	SIZE (L)	TOP SLAB (D)	SIDEWALLS (W)	FOOTING WIDTH (F)	REINFORCING STEEL				QUANTITIES		
					NO. REQ'D.	LENGTH	SIZE	SPACING C-C	CU. YDS. CONC.	REINF. STEEL LBS.	INCREMENT * CU. YDS.
BELOW 25'	4'	8"	6"	12"	32	3'-9"	#4	6"	1.189	80	0.043
25' - 50'	4'-4"	8"	8"	14"	32	4'-1"	#5	6"	1.512	136	0.053

* QUANTITIES SHOWN ARE BASED ON A 8" DEPTH OF FOOTING, ADD INCREMENTAL QUANTITY FOR EACH ADDITIONAL 1" OF DEPTH.

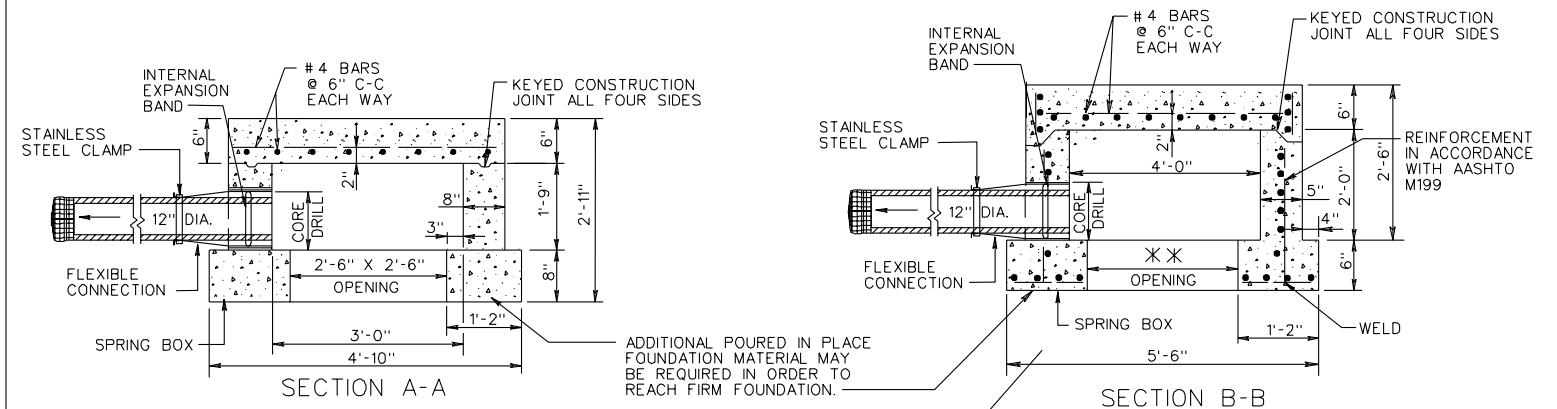
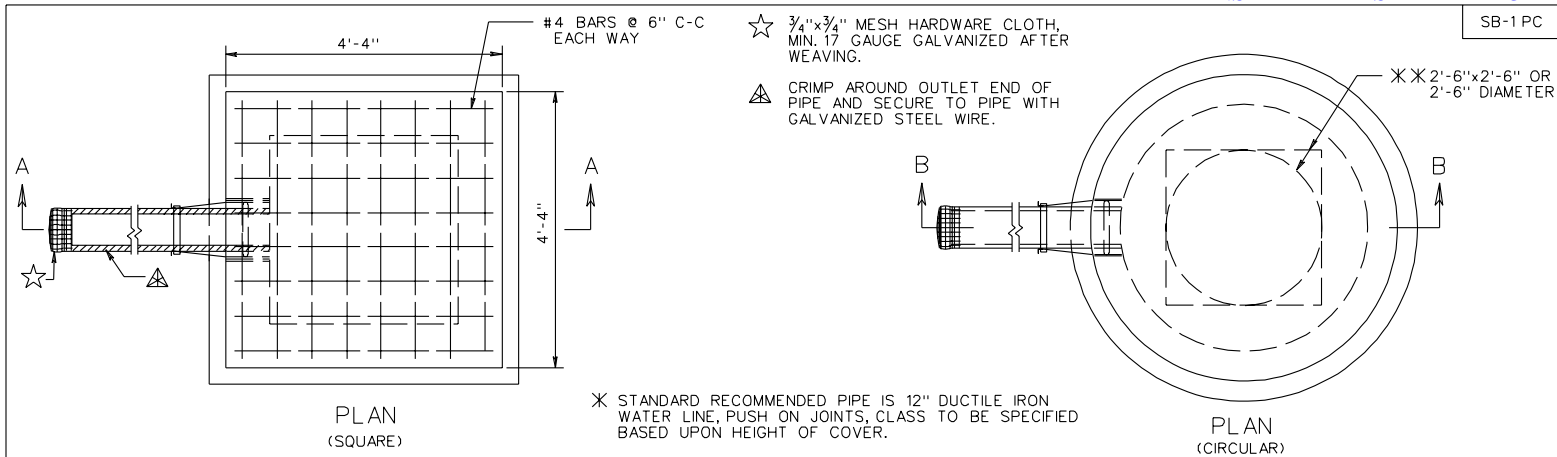
STANDARD SPRING BOX

REV. 3/03
110.01

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE

105
232
302



NOTES:

CONCRETE TO BE 4000 PSI MINIMUM COMPRESSIVE STRENGTH.

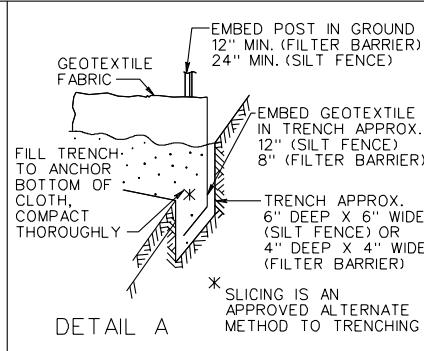
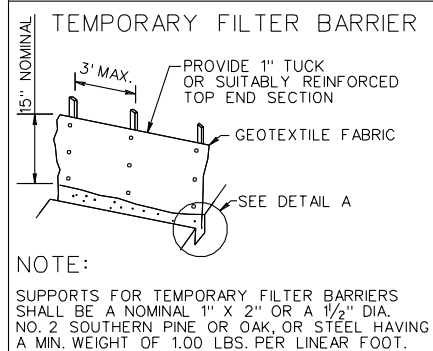
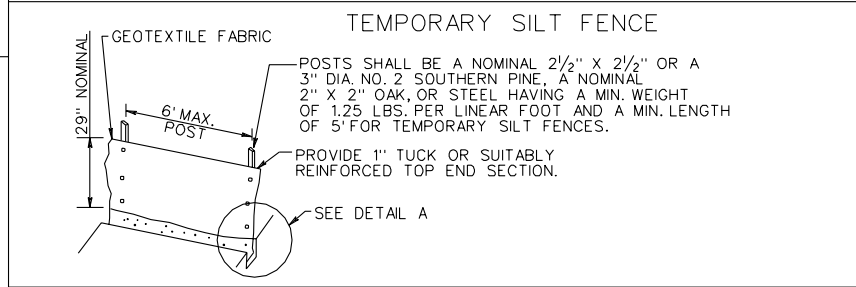
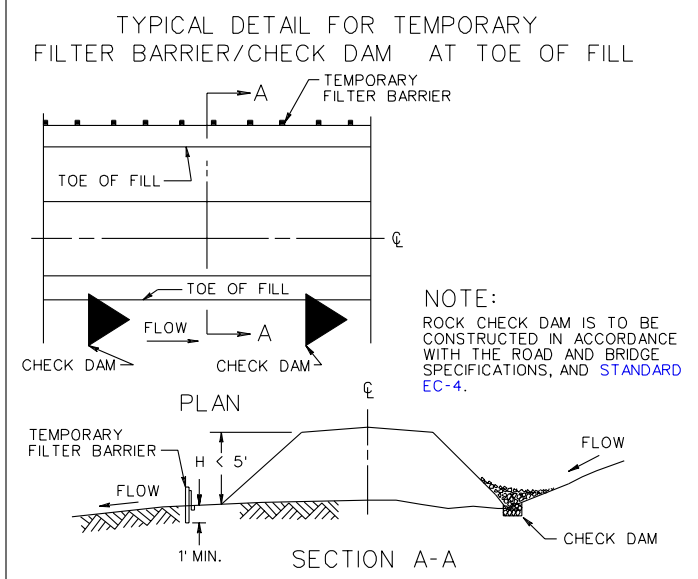
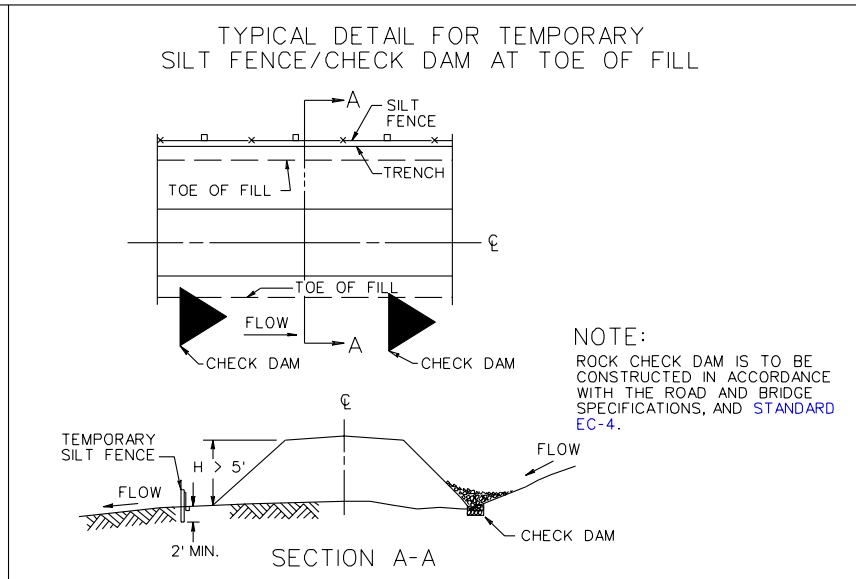
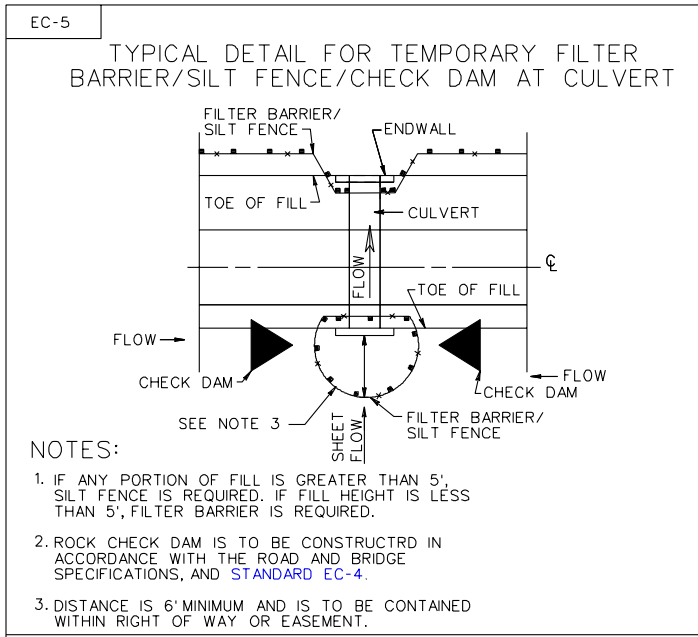
REINFORCING STEEL IN ACCORDANCE WITH A.S.T.M. A-615 (REINFORCING BARS).

PIPE(S) SHALL BE CONNECTED TO SPRING BOX WITH A FLEXIBLE BOOT MEETING ASTM SPECIFICATION C-923. COST OF FLEXIBLE CONNECTION TO BE INCLUDED IN BID PRICE FOR SPRING BOX. BOOT SHALL BE MADE FROM NEOPRENE RUBBER AND HAVE A 3/8" MINIMUM WALL THICKNESS THROUGHOUT. THE INTERNAL EXPANSION BAND TO SECURE THE BOOT IN PLACE SHALL CONFORM TO ALUMINUM MATERIAL SPECIFICATION 6061-T6. THE EXTERNAL BAND TO CLAMP AND SEAL THE BOOT TO THE PIPE SHALL BE STAINLESS STEEL-CORROSION RESISTANT CONFORMING TO ASTM SPECIFICATION A-167. THE OPENING TO RECEIVE THE FLEXIBLE CONNECTION SHALL BE CORE DRILLED AND IS TO BE CONSTRUCTED TO ALLOW FOR LATERAL AND VERTICAL MOVEMENT, AS WELL AS ANGULAR ADJUSTMENT THRU 20 DEGREES. ALL FIELD INSTALLATION OF PIPE TO SPRING BOX USING FLEXIBLE BOOT SHALL BE COMPLETED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS AND SPECIFICATIONS.

DIMENSIONS SHOWN ARE MINIMUM. ACTUAL MEASUREMENTS MAY VARY WITH MANUFACTURER'S TOLERANCES.

SPECIFICATION REFERENCE
105

PRECAST SPRING BOX
VIRGINIA DEPARTMENT OF TRANSPORTATION

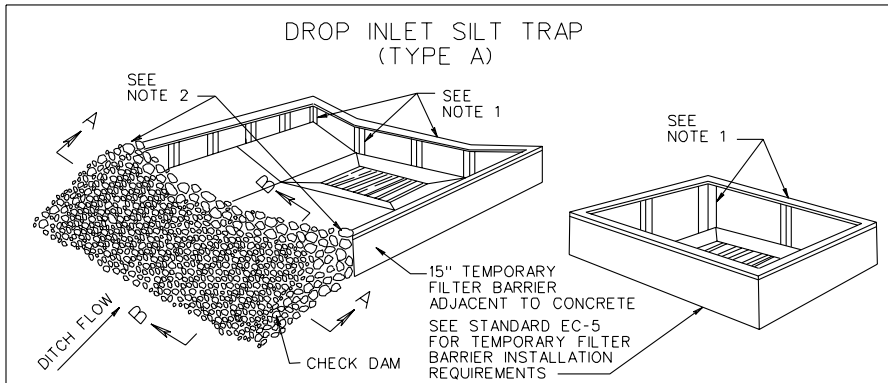


TEMPORARY SILT FENCE AND FILTER BARRIER

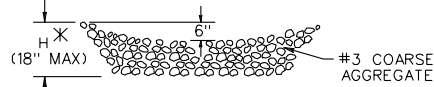
REV. 3/03
114.06

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE
107 242 303

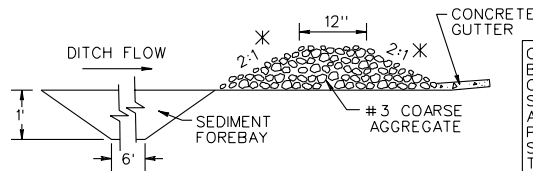


TYPICAL TREATMENT FOR DROP INLET WITH CONCRETE GUTTER



SECTION A-A

* IF CHECK DAM IS LOCATED INSIDE CLEAR ZONE AND ADJACENT TO A TRAVELWAY, SLOPE FACING ON COMING TRAFFIC IS TO BE 6:1 AND MAXIMUM H IS TO BE 12".

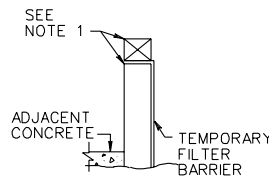


SECTION B-B

NOTES

1. POSTS AND TOP RAIL SHALL BE A NOMINAL 2 1/2" X 2 1/2" OR A 3" DIA. NO. 2 SOUTHERN PINE, A NOMINAL 2" X 2" OAK, OR STEEL HAVING A MIN. WEIGHT OF 1.25 LBS. PER LINEAR FOOT AND A MIN. LENGTH OF 5' FOR TEMPORARY SILT FENCES.
2. END OF FILTER BARRIER TO BE EMBEDDED INTO AGGREGATE.
3. IF A DROP INLET IS LOCATED IN A SAG IN THE DITCH GRADE, A CHECK DAM IS REQUIRED FOR EACH SIDE OF THE INLET THAT RECEIVES DITCH FLOW.
4. WHERE DRAINAGE AREAS EXCEED ONE ACRE OR DITCH GRADE EXCEEDS 3%, A TEMPORARY SEDIMENT FOREBAY SHALL BE INSTALLED WITH MINIMUM DIMENSIONS OF 12" DEPTH, 2' WIDTH AND 6' LENGTH.

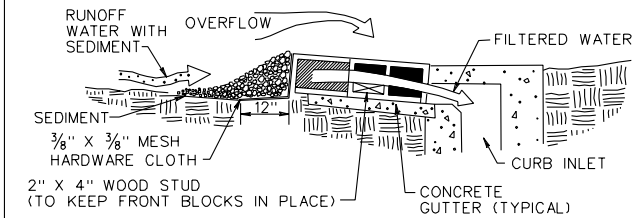
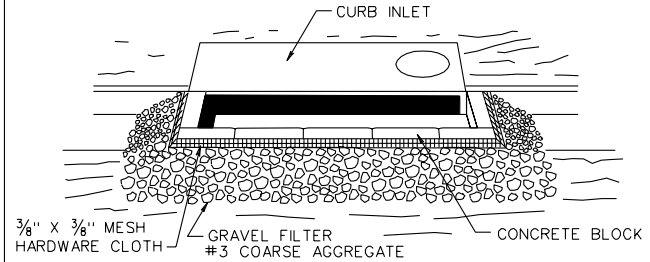
TYPICAL TREATMENT FOR DROP INLET WITHOUT CONCRETE GUTTER



GEOTEXTILE PRODUCTS DESIGNED TO BE INSERTED INTO GRATED DROP INLETS OR DESIGNED TO COVER THE SLOTS OF SLOT DROP INLETS, THAT HAVE BEEN APPROVED FOR USE ON VDOT PROJECTS AND ARE FOUND ON VDOT'S SPEL LIST, MAY BE SUBSTITUTED FOR THE DROP INLET PROTECTION DEVICES DETAILED HEREON.

DROP INLET SILT TRAP TYPE B (BLOCK AND GRAVEL)

EC-6

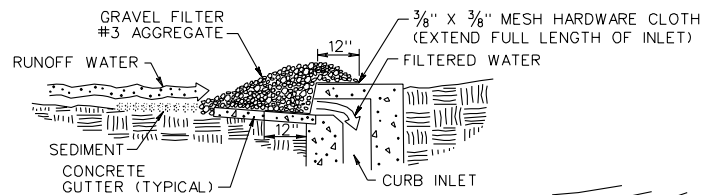


SECTION VIEW

SPECIFIC APPLICATION

THIS METHOD OF INLET PROTECTION IS APPLICABLE AT CURB INLETS WHERE AN OVERFLOW CAPABILITY IS NECESSARY TO PREVENT EXCESSIVE PONDING IN FRONT OF THE STRUCTURE.

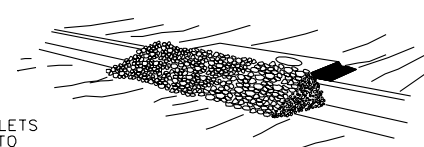
ALTERNATE DROP INLET SILT TRAP TYPE B (GRAVEL)



SECTION VIEW

SPECIFIC APPLICATION

THIS METHOD OF INLET PROTECTION IS APPLICABLE AT CURB INLETS WHERE PONDING IN FRONT OF THE STRUCTURE IS NOT LIKELY TO CAUSE INCONVENIENCE OR DAMAGE TO ADJACENT STRUCTURES AND UNPROTECTED AREAS.



SPECIFICATION REFERENCE

- 107
- 242
- 303

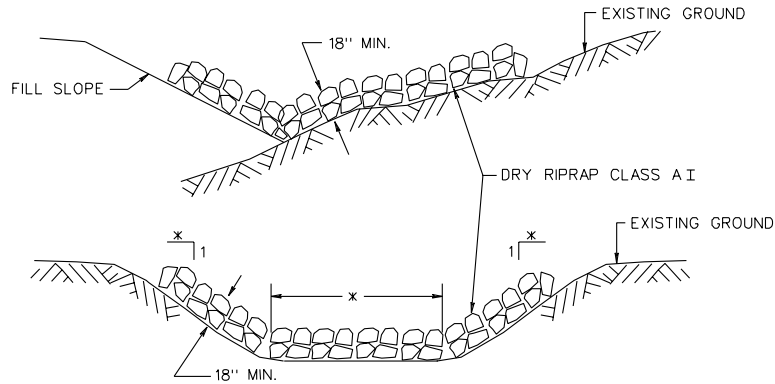
DROP INLET SILT TRAP (TYPE A AND B)

VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 3/03

114.07

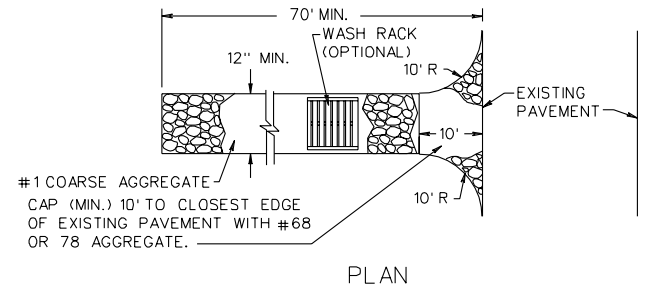
SUGGESTED METHOD OF TEMPORARILY PLACING RIPRAP FOR EROSION CONTROL IN CHANNELS, DITCHES, & AT TOE OF FILL SLOPES



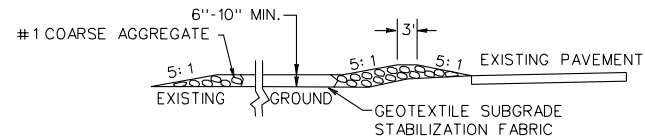
NOTES:

1. THE DEPTH OF PROTECTION WILL DEPEND ON WHATEVER DEPTH IS ATTAINABLE, WITH THE RIPRAP BEING EVENLY SPREAD WITH THE QUANTITY SHOWN ON THESE PLANS. RIPRAP MAY BE ADDED OR DELETED AS FOUND NECESSARY BY THE ENGINEER.

MINIMUM REQUIREMENTS FOR STABILIZED CONSTRUCTION ENTRANCE



PLAN



PROFILE

1. SURFACE WATER SHALL BE PIPED UNDER THE CONSTRUCTION ENTRANCE. IF PIPING IS IMPRACTICAL, A MOUNTABLE BERM WITH 5:1 SLOPES WILL BE PERMITTED.
2. THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHT OF WAY. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL STONE AS CONDITIONS DEMAND AND REPAIR AND/OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT. ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACKED ONTO PUBLIC RIGHT OF WAY SHALL BE REMOVED IMMEDIATELY.
3. WHEELS SHALL BE CLEANED TO REMOVE SEDIMENT PRIOR TO ENTRANCE ONTO PUBLIC RIGHT OF WAY. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AN AREA STABILIZED WITH STONE AND WHICH DRAINS INTO AN APPROVED SEDIMENT TRAPPING DEVICE.
4. PERIODIC INSPECTION AND NEEDED MAINTENANCE SHALL BE PROVIDED AFTER HEAVY USE AND EACH RAIN.

* SIDE SLOPES AND BOTTOM WIDTH (IF TRAPEZOIDAL) SHOWN IN TYPICAL SECTION OF PROPOSED DITCH OR CHANNEL.

SPECIFICATION REFERENCE

107
303

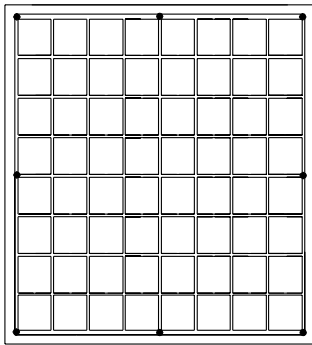
TEMPORARY EROSION & SILTATION CONTROL

VIRGINIA DEPARTMENT OF TRANSPORTATION

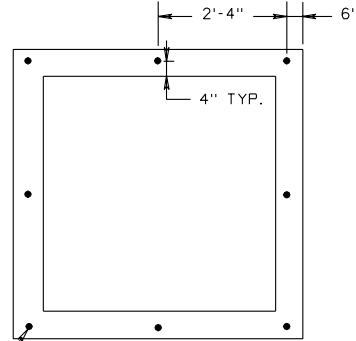
REV. 3/03

115.01

SWM-1



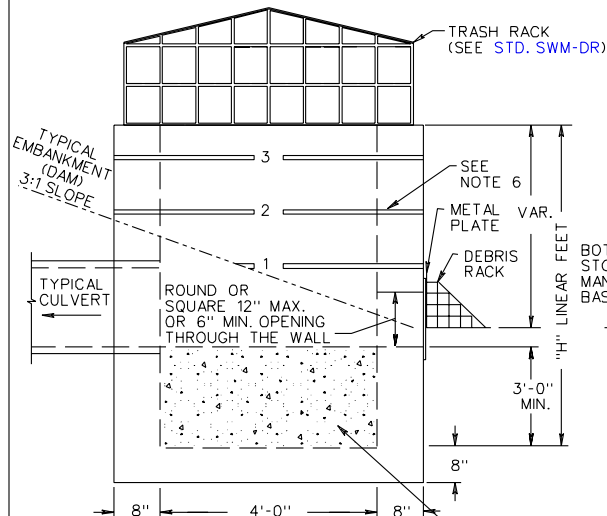
PLAN VIEW



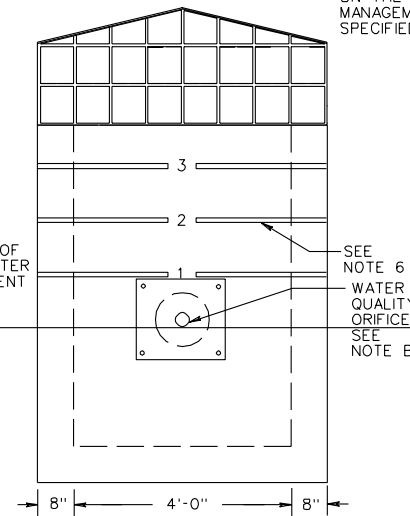
PLAN VIEW
(TRASH RACK NOT SHOWN)
3/8" DIA. X 6" LG. ADHESIVE BOLTS
W/FLAT WASHERS AND SELF
LOCKING NUTS TYPICAL 8 PLACES.

NOTES:

1. COST OF TRASH RACK AND DEBRIS RACK ARE TO BE INCLUDED IN THE BID PRICE FOR THE STORMWATER MANAGEMENT DRAINAGE STRUCTURE.
2. STRUCTURE MAY BE PRECAST OR CAST IN PLACE. SEE SHEET 2 OF 2 FOR DETAILS ON PRECAST STRUCTURE.
3. WEEP HOLES SHALL NOT BE PROVIDED.
4. STEPS ARE TO BE PROVIDED WHEN HEIGHT OF STRUCTURE IS 4'-0" OR GREATER ABOVE INVERT OF OUTLET PIPE. FOR STEP DETAILS SEE STANDARD ST-1.
5. FOR DETAILS ON METAL PLATE, DEBRIS RACK AND TRASH RACK SEE STANDARD SWM-DR.
6. MARK HEIGHT OF STRUCTURE, IN BLACK, WITH 4" HIGH NUMERALS AND 1" WIDE HORIZONTAL STRIPES AT 1' INTERVALS FROM INVERT OF WATER QUALITY ORIFICE (ALL VISIBLE SIDES).
7. THE PERMANENT STORMWATER MANAGEMENT DRAINAGE STRUCTURE, STANDARD SWM-1 MAY BE MODIFIED WHERE THE STORMWATER MANAGEMENT BASIN IS TO BE USED AS A TEMPORARY SEDIMENT BASIN DURING PROJECT CONSTRUCTION. SEE STANDARD SWM-DR, SHEET 1 OF 5, FOR TEMPORARY MODIFICATION DETAILS.
8. THE SIZE OF THE WATER QUALITY ORIFICE SHALL BE SPECIFIED ON THE PLANS. ADDITIONAL OPENINGS IN THE STORMWATER MANAGEMENT DRAINAGE STRUCTURE TO BE PROVIDED WHEN SPECIFIED ON THE PLANS.



SIDE VIEW
SWM DRAINAGE STRUCTURE



FRONT VIEW
(DEBRIS RACK NOT SHOWN)

CLASS A-3 CONCRETE TO BE USED TO FILL SWM DRAINAGE STRUCTURE TO INVERT OF OUTLET PIPE.

APPROXIMATE QUANTITIES
CAST-IN-PLACE CLASS A-3 CONCRETE TO BE USED.
MAXIMUM DEPTH (H) TO BE 12'-8".

PIPE SIZE	12"	15"	18"	24"	30"	36"	42"
MINIMUM DEPTH H	5'-0"	5'-3/4"	5'-6 1/2"	6'-1"	6'-7 1/2"	7'-2"	7'-8 1/2"
CU. YDS. CONCRETE	2.665	2.773	2.878	3.078	3.624	3.437	3.598

INCREMENT PER FOOT OF ADDITIONAL DEPTH "H" = 0.461 CU. YDS.

SHEET 1 OF 2

SPECIFICATION REFERENCE

302

CAST IN PLACE STORMWATER MANAGEMENT
DRAINAGE STRUCTURE

VIRGINIA DEPARTMENT OF TRANSPORTATION

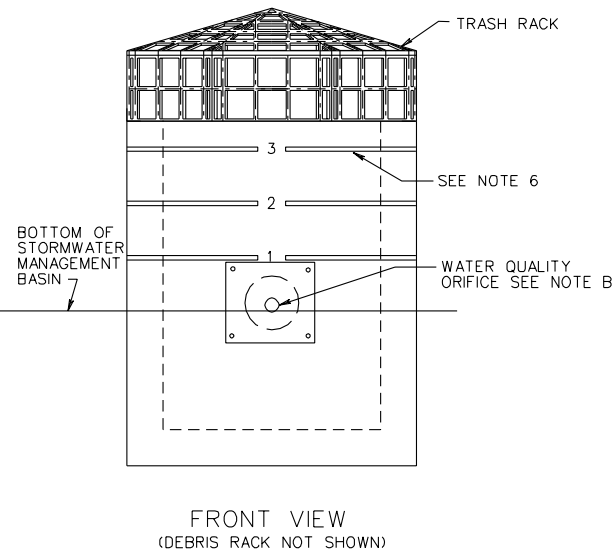
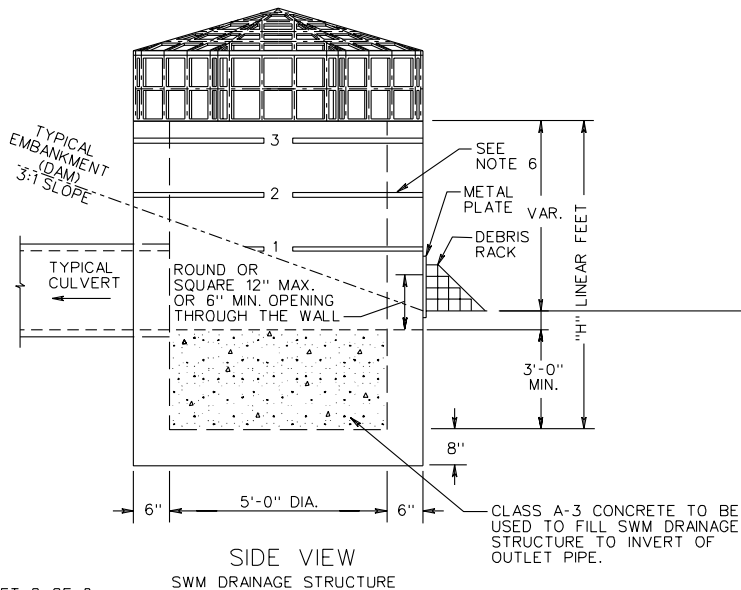
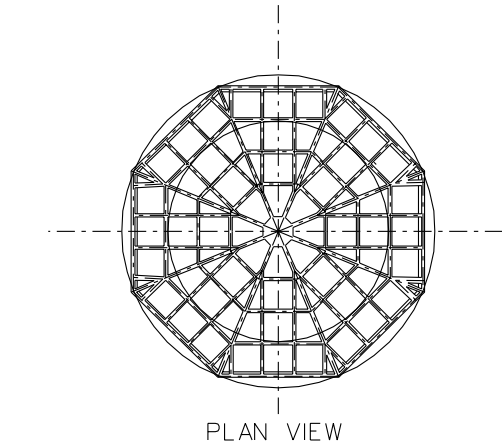
REV. 3/03

116.01

SWM-1

NOTES:

1. COST OF TRASH RACK AND DEBRIS RACK ARE TO BE INCLUDED IN THE PRICE BID FOR THE STORMWATER MANAGEMENT DRAINAGE STRUCTURE.
2. STRUCTURE MAY BE PRECAST OR CAST IN PLACE. SEE SHEET 1 OF 2 FOR DETAILS ON CAST IN PLACE STRUCTURE.
3. WEEP HOLES SHALL NOT BE PROVIDED. ANY LIFT HOLES SHALL BE PLUGGED.
4. STEPS ARE TO BE PROVIDED WHEN HEIGHT OF STRUCTURE IS 4'-0" OR GREATER ABOVE INVERT OF OUTLET PIPE. FOR STEP DETAILS SEE STANDARD ST-1.
5. SEE STANDARD SWM-DR FOR DETAILS ON PLATE, DEBRIS RACK AND TRASH RACK.
6. MARK HEIGHT OF STRUCTURE, IN BLACK, WITH 4" HIGH NUMERALS AND 1" WIDE HORIZONTAL STRIPES AT 1' INTERVALS FROM INVERT OF WATER QUALITY ORIFICE (ALL VISIBLE SIDES).
7. THE PERMANENT STORMWATER MANAGEMENT DRAINAGE STRUCTURE, STANDARD SWM-1 MAY BE MODIFIED WHERE THE STORMWATER MANAGEMENT BASIN IS TO BE USED AS A TEMPORARY SEDIMENT BASIN DURING PROJECT CONSTRUCTION. SEE STANDARD SWM-DR, SHEET 1 OF 5 FOR TEMPORARY MODIFICATION DETAILS.
8. THE SIZE OF THE WATER QUALITY ORIFICE SHALL BE SPECIFIED ON THE PLANS. ADDITIONAL OPENINGS IN THE STORMWATER MANAGEMENT DRAINAGE STRUCTURE TO BE PROVIDED WHEN SPECIFIED ON THE PLANS.



SHEET 2 OF 2

PRECAST STORMWATER MANAGEMENT DRAINAGE STRUCTURE

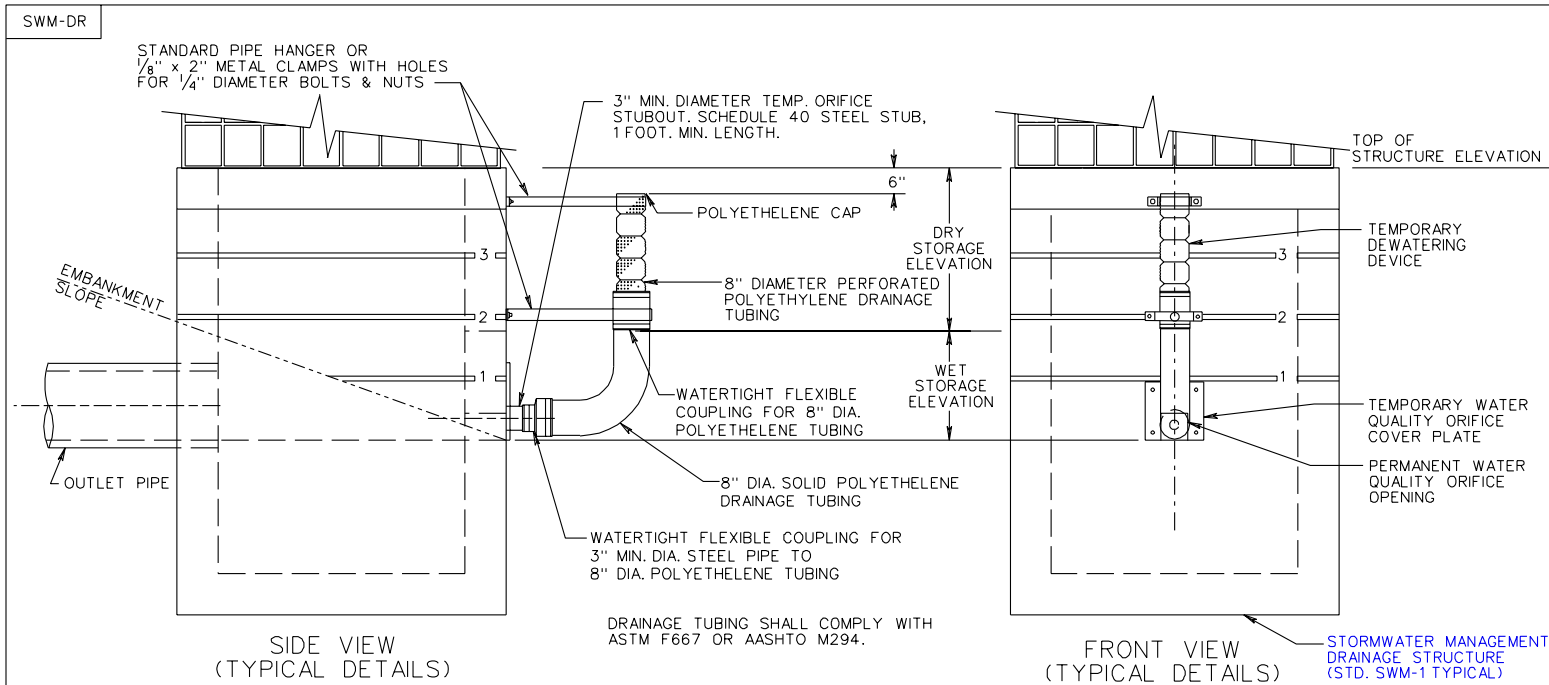
REV. 3/03

VIRGINIA DEPARTMENT OF TRANSPORTATION

116.02

SPECIFICATION
REFERENCE

105
302



NOTES:

1. THESE DETAILS ARE TO BE USED TO MODIFY THE PERMANENT STORMWATER MANAGEMENT DRAINAGE STRUCTURE WHERE THE STORMWATER MANAGEMENT BASIN IS TO BE USED FOR A TEMPORARY SEDIMENT BASIN DURING PROJECT CONSTRUCTION.
2. GRADE STORMWATER MANAGEMENT BASIN AS SHOWN IN PLANS.
3. ALL OPENINGS (IF ANY) IN SIDE OF STRUCTURE (OTHER THAN PERMANENT WATER QUALITY ORIFICE) ARE TO BE COVERED WITH SOLID METAL PLATES WHILE THE BASIN IS BEING USED FOR SEDIMENT CONTROL.
4. DEWATERING DEVICE AND COMPONENTS AND TEMPORARY METAL PLATES (IF ANY), AS SHOWN IN THE DETAIL, ARE TO BE REMOVED AND PERMANENT STEEL PLATE WITH WATER QUALITY ORIFICE IS TO BE INSTALLED WHEN BASIN IS NO LONGER NEEDED FOR SEDIMENT CONTROL.
5. SIMILAR DEVICE MAY ALSO BE USED ON OTHER STORMWATER MANAGEMENT DRAINAGE STRUCTURES.
6. COST OF TEMPORARY DEWATERING DEVICE AND TEMPORARY METAL PLATES (IF ANY) SHALL BE INCLUDED IN THE BID PRICE FOR STORMWATER MANAGEMENT DRAINAGE STRUCTURE.
7. THE TEMPORARY 8" DIA. POLYETHYLENE DRAINAGE TUBING IS TO BE SOLID FOR THE LENGTH BELOW WET STORAGE ELEVATION AND IS TO BE PERFORATED ABOVE THE WET STORAGE ELEVATION. THE COUPLING IS TO BE WATERTIGHT.

SHEET 1 OF 5

REV. 3/03

116.04

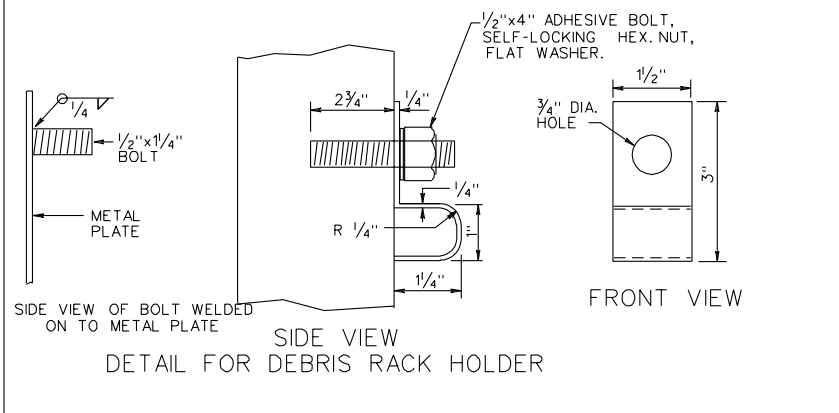
STORMWATER MANAGEMENT (SWM) DETAILS

VIRGINIA DEPARTMENT OF TRANSPORTATION

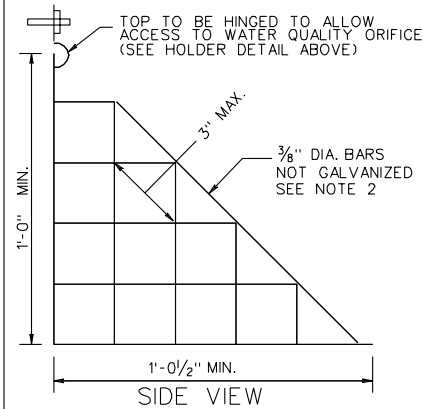
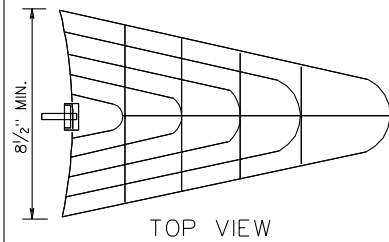
SPECIFICATION REFERENCE

302

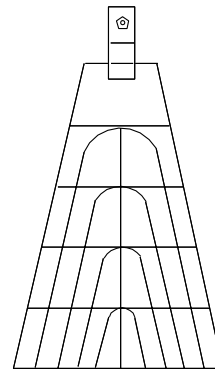
SWM-DR



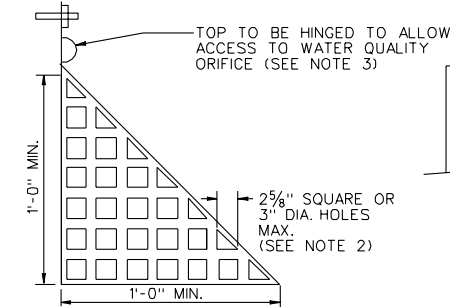
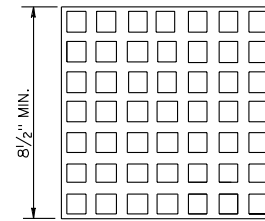
1. COST OF DEBRIS RACK, METAL PLATE, AND DEBRIS RACK HOLDER TO BE INCLUDED IN THE BID PRICE FOR THE SWM DRAINAGE STRUCTURE.
2. DEBRIS RACK MAY BE FABRICATED FROM WELDED 3/8" DIAMETER BARS OR 1/2" THICK HIGH DENSITY POLYETHYLENE. METAL COMPONENTS OF DEBRIS RACK MUST NOT BE GALVANIZED.
3. DEBRIS RACK TO BE HINGED AS SHOWN OR CONTRACTOR MAY SUBSTITUTE A COMPARABLE DESIGN AS APPROVED BY THE ENGINEER.
4. THE LOCATION OF THE DEBRIS RACK HOLDER MAY BE ADJUSTED FOR VARIABLE CONDITIONS. WHEN HOLDER BOLT IS LOCATED ON THE METAL PLATE THE 1/2" DIA. BOLT LENGTH IS TO BE REDUCED 1/4" LG. AND WELDED TO THE PLATE. DEBRIS RACK HOLDER AND ALL HARDWARE IS TO BE GALVANIZED.



METAL



DETAIL FOR DEBRIS RACK
(FOR WATER QUALITY ORIFICE)



HIGH DENSITY POLYETHYLENE

SHEET 2 OF 5

SPECIFICATION REFERENCE

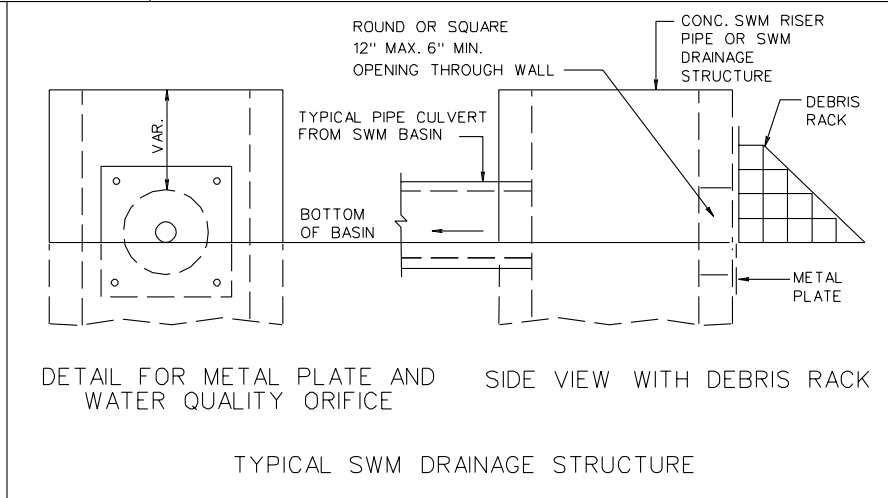
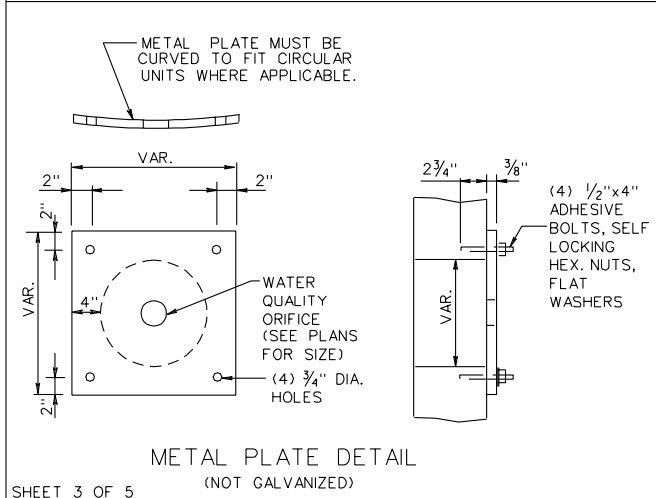
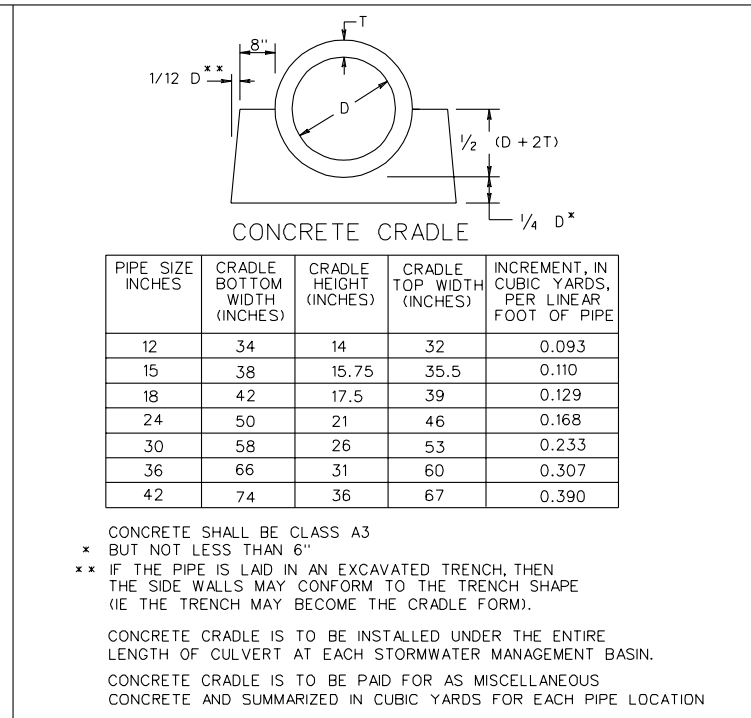
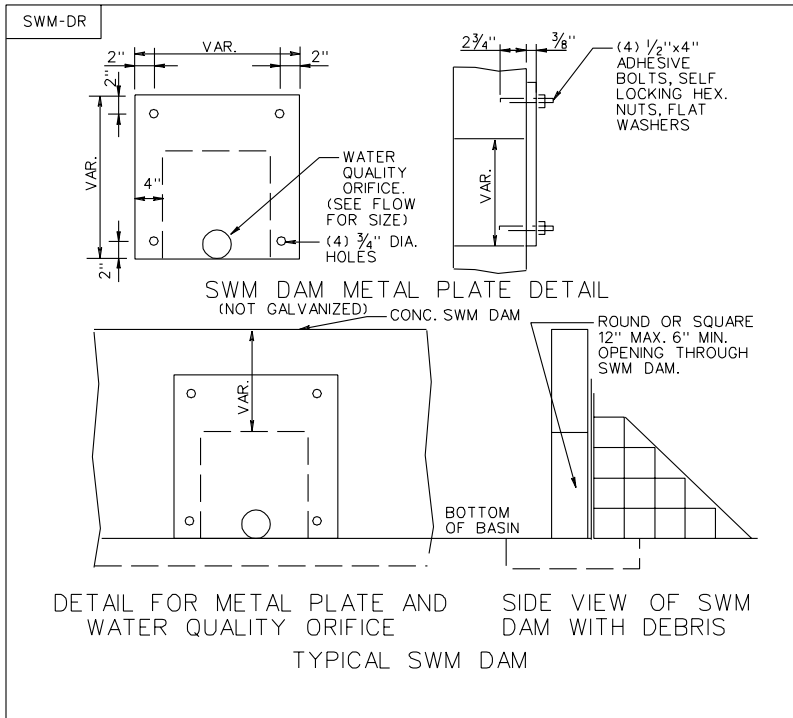
302

STORMWATER MANAGEMENT (SWM) DETAILS

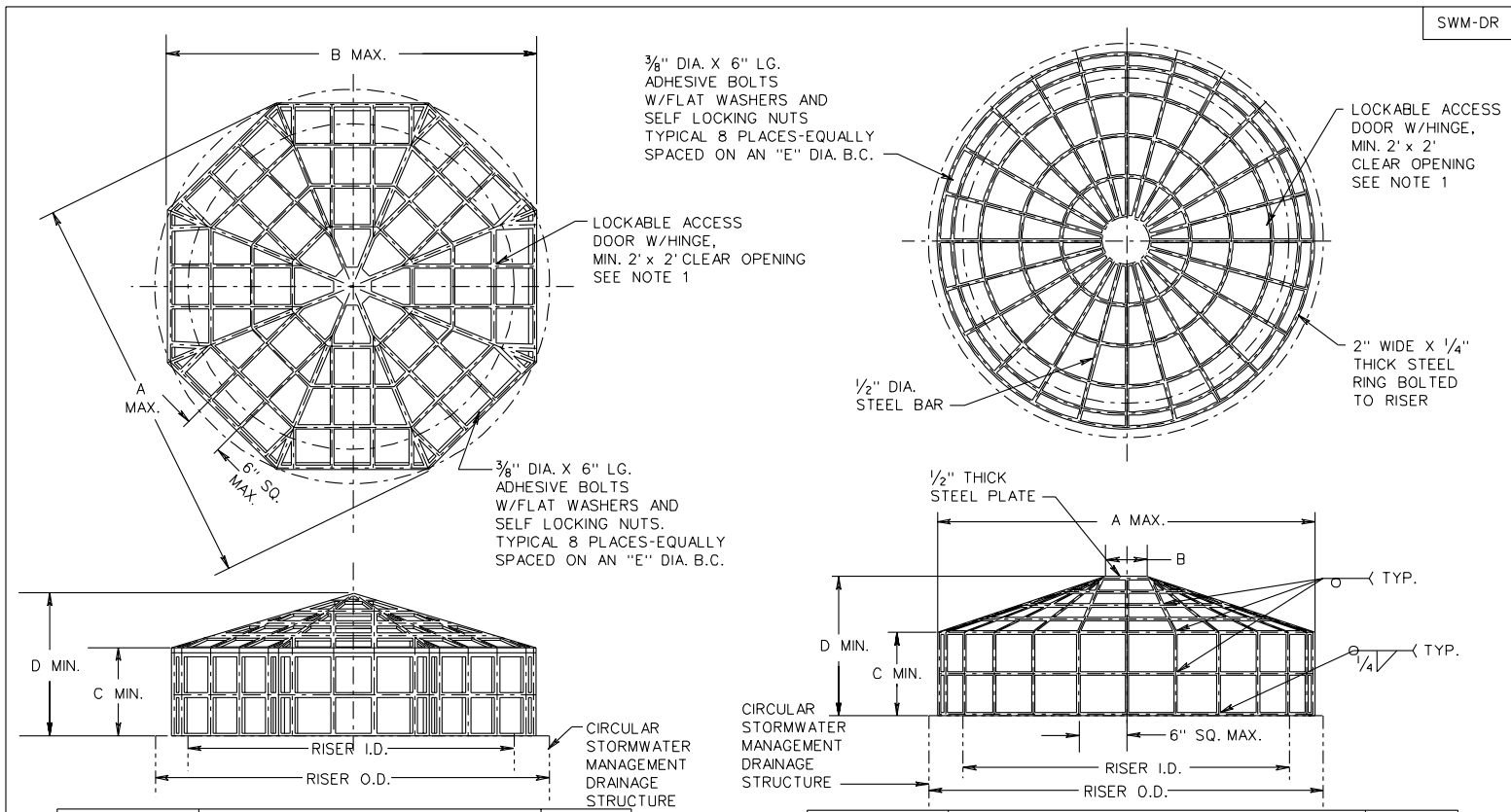
DEBRIS RACK, METAL PLATE, WATER QUALITY ORIFICE, CONCRETE CRADLE
(FOR SWM DRAINAGE STRUCTURES, SWM RISER PIPES AND SWM DAMS)
VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 3/03

116.05



SWM-DR



RISER		DIMENSION						APPROX.
I.D.	O.D.	A	B	C	D	E	WT. (LBS.)	
24	30	31	28 ⁵ / ₈	7	11	27	24	
36	44	45	41 ¹ / ₂	13	19	40	58	
48	58	59	54 ¹ / ₂	13	21	53	86	
60	72	73	67 ¹ / ₂	17	28	66	135	
72	86	87	80 ³ / ₈	23	35	79	204	
84	100	101	93 ³ / ₄	25	39	92	266	
96	114	115	106 ¹ / ₄	22	38	105	305	

HIGH DENSITY POLYETHYLENE

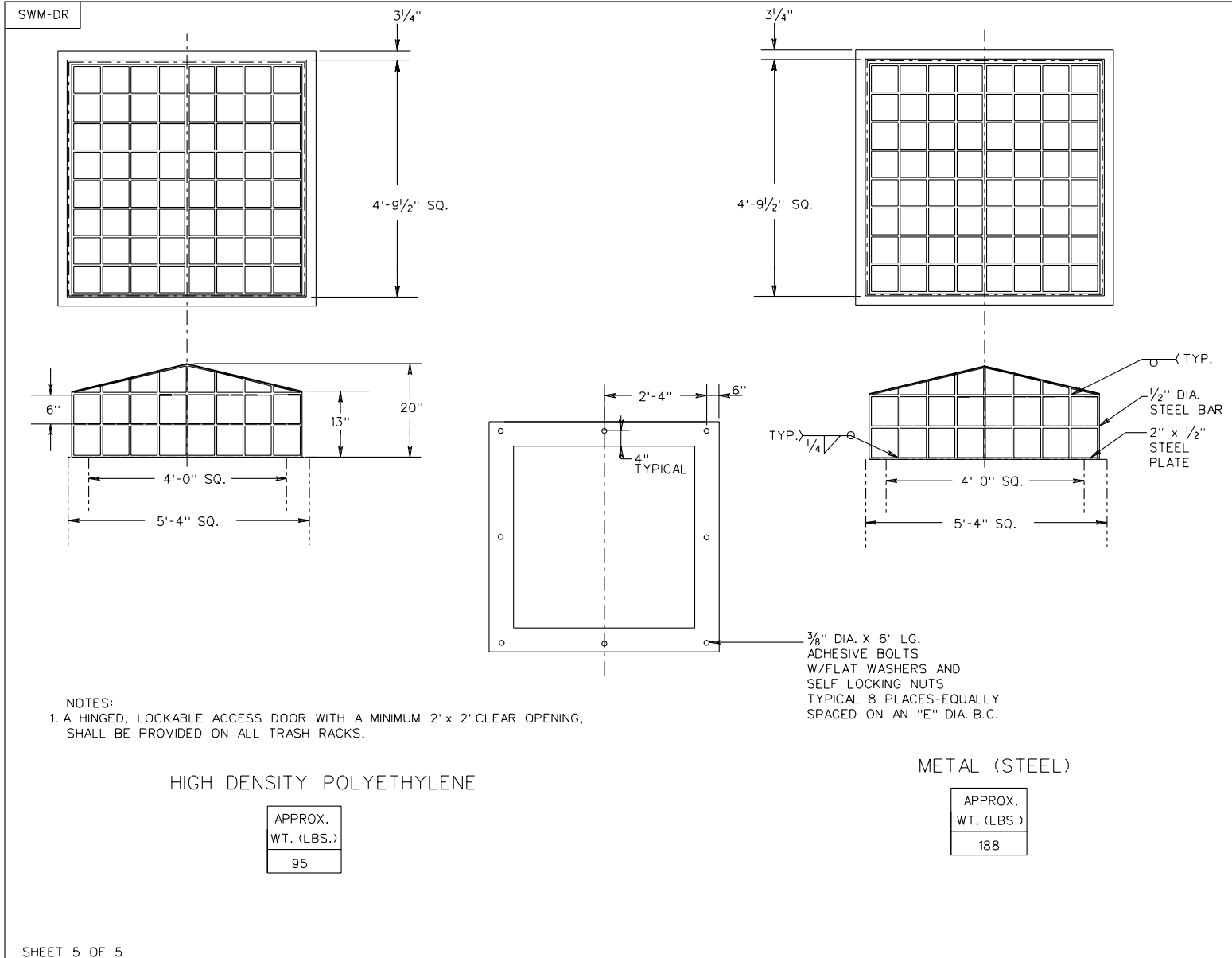
NOTES:
 1. A HINGED, LOCKABLE ACCESS DOOR SHALL BE PROVIDED ON ALL TRASH RACKS IF THE TOTAL WEIGHT OF THE TRASH RACK IS GREATER THAN 75 LBS OR IF THE TRASH RACK IS TO BE PLACED ON A SWM-1 WITH AN "H" DIMENSION GREATER THAN 7'-2".

RISER		DIMENSION							APPROX.
I.D.	O.D.	A	B	C	D	E	SEGMENT	WT. (LBS.)	
24	30	30	6	7	10	27	15	46	
36	44	42	6	13	18	40	22	82	
48	58	55	9	13	20	53	29	120	
60	72	68	9	17	26	66	36	169	
72	86	81	9	23	34	79	42	227	
84	100	94	12	25	37	92	49	290	
96	114	107	12	22	36	105	56	341	

METAL

2. ANTI-VORTEX PLATE IS TO BE USED WHEN SPECIFIED ON THE PLANS. COST OF FURNISHING AND PLACING THE ANTI-VORTEX PLATE IS TO BE INCLUDED IN THE BID PRICE FOR THE STRUCTURE.

SPECIFICATION REFERENCE	STORMWATER MANAGEMENT (SWM) DETAILS TRASH RACK FOR STORMWATER MANAGEMENT DRAINAGE STRUCTURES	NEW 3/03
302	VIRGINIA DEPARTMENT OF TRANSPORTATION	116.07



STORMWATER MANAGEMENT (SWM) DETAILS TRASH RACK FOR STORMWATER MANAGEMENT DRAINAGE STRUCTURES

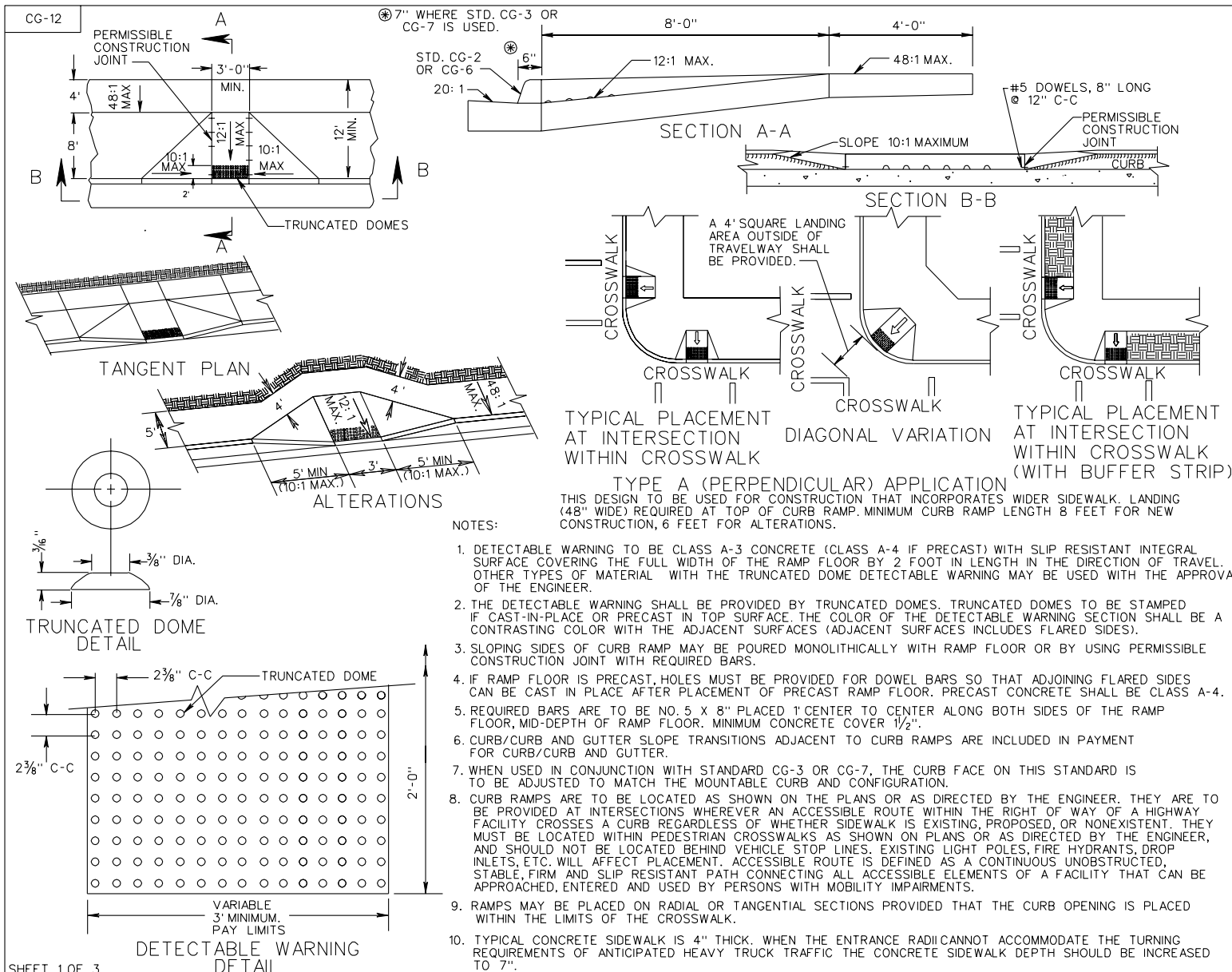
NEW 3/03

116.08

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE

302



SHEET 1 OF 3

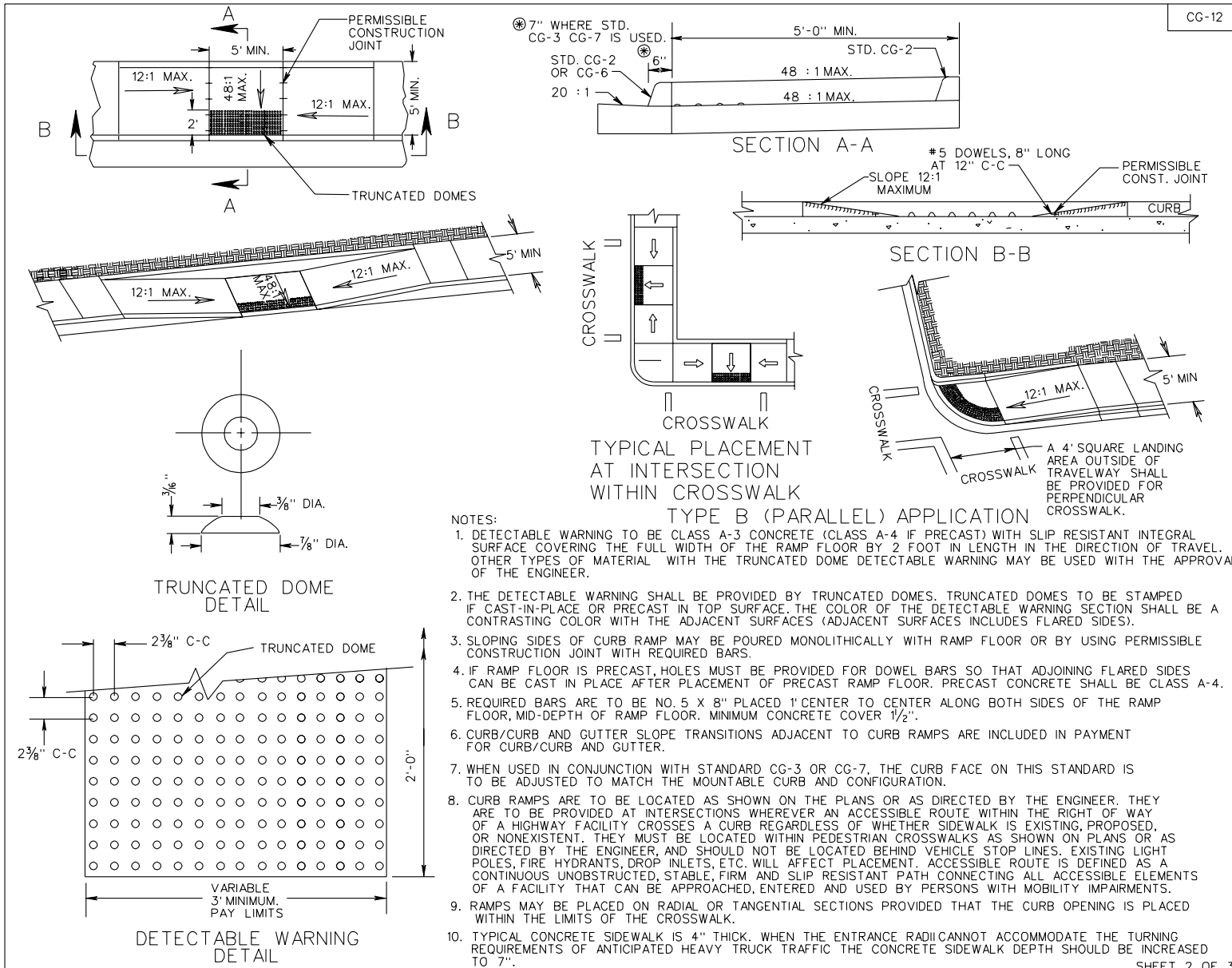
CG-12 DETECTABLE WARNING SURFACE
TYPE A (PERPENDICULAR) APPLICATION

VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 3/03
203.05

SPECIFICATION
REFERENCE

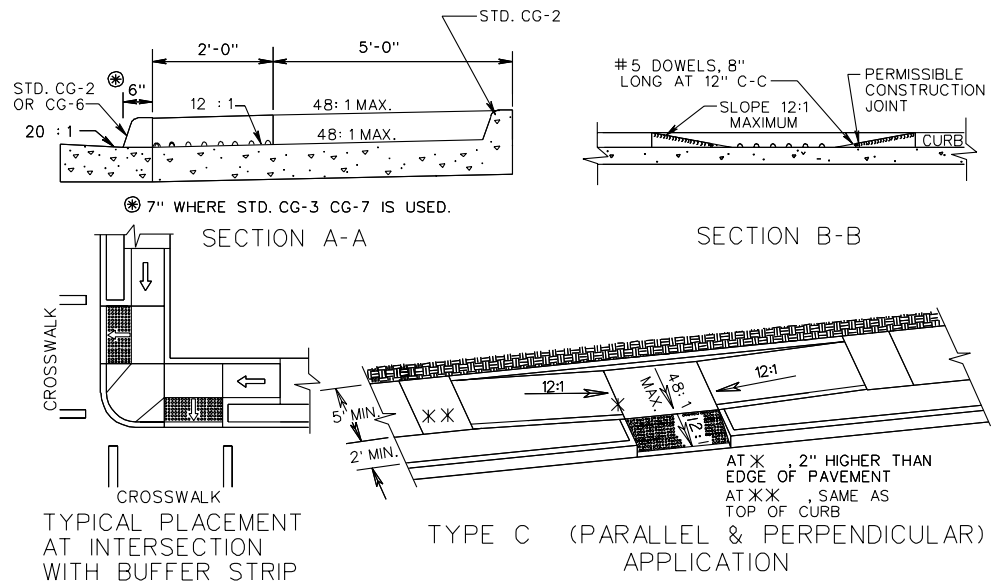
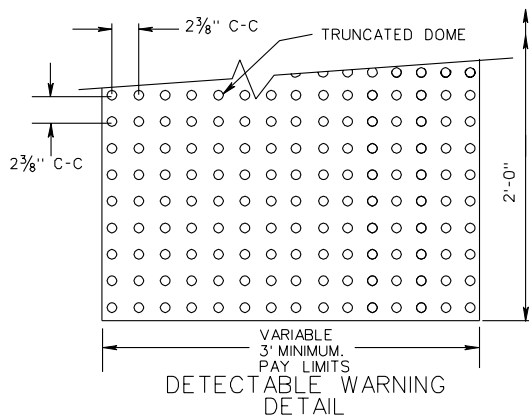
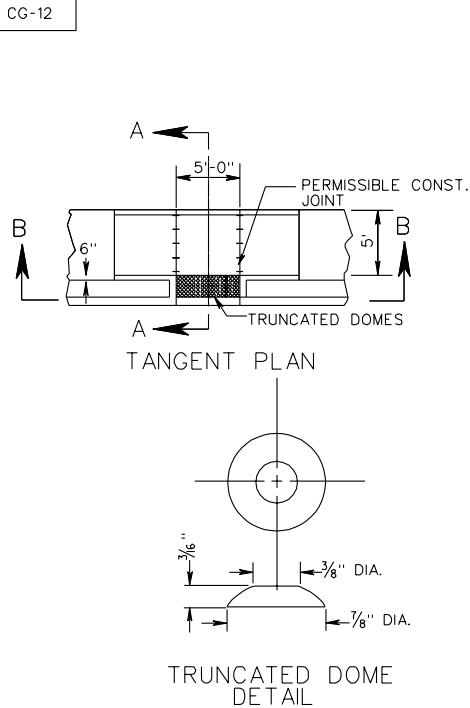
105
502



SPECIFICATION REFERENCE
105 502

CG-12 DETECTABLE WARNING SURFACE
 TYPE B (PARALLEL) APPLICATION
 VIRGINIA DEPARTMENT OF TRANSPORTATION

CG-12



THIS COMBINED (PARALLEL & PERPENDICULAR) DESIGN FOR ALTERATIONS CAN BE USED WITH ADJOINING BUFFER STRIP. LANDING AT BOTTOM OF TWO SLOPING SIDES WITH 60" X 60" MIN. DIMENSIONS. THE SHORT PERPENDICULAR RUN TO THE STREET CAN BE PROTECTED BY A LANDSCAPED SETBACK OR CONNECTED TO THE SIDEWALK WITH A WARPED SURFACE.

- NOTES:
1. DETECTABLE WARNING TO BE CLASS A-3 CONCRETE (CLASS A-4 IF PRECAST) WITH SLIP RESISTANT INTEGRAL SURFACE COVERING THE FULL WIDTH OF THE RAMP FLOOR BY 2 FOOT IN LENGTH IN THE DIRECTION OF TRAVEL. OTHER TYPES OF MATERIAL WITH THE TRUNCATED DOME DETECTABLE WARNING MAY BE USED WITH THE APPROVAL OF THE ENGINEER.
 2. THE DETECTABLE WARNING SHALL BE PROVIDED BY TRUNCATED DOMES. TRUNCATED DOMES TO BE STAMPED IF CAST-IN-PLACE OR PRECAST IN TOP SURFACE. THE COLOR OF THE DETECTABLE WARNING SECTION SHALL BE A CONTRASTING COLOR WITH THE ADJACENT SURFACES (ADJACENT SURFACES INCLUDES FLARED SIDES).
 3. SLOPING SIDES OF CURB RAMP MAY BE POURED MONOLITHICALLY WITH RAMP FLOOR OR BY USING PERMISSIBLE CONSTRUCTION JOINT WITH REQUIRED BARS.
 4. IF RAMP FLOOR IS PRECAST, HOLES MUST BE PROVIDED FOR DOWEL BARS SO THAT ADJOINING FLARED SIDES CAN BE CAST IN PLACE AFTER PLACEMENT OF PRECAST RAMP FLOOR. PRECAST CONCRETE SHALL BE CLASS A-4.
 5. REQUIRED BARS ARE TO BE NO. 5 X 8" PLACED 1' CENTER TO CENTER ALONG BOTH SIDES OF THE RAMP FLOOR, MID-DEPTH OF RAMP FLOOR. MINIMUM CONCRETE COVER 1/2".
 6. CURB/CURB AND GUTTER SLOPE TRANSITIONS ADJACENT TO CURB RAMPS ARE INCLUDED IN PAYMENT FOR CURB/CURB AND GUTTER.
 7. 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 AND CONFIGURATION.
 8. CURB RAMPS ARE TO BE LOCATED AS SHOWN ON THE PLANS OR AS DIRECTED BY THE ENGINEER. THEY ARE TO BE PROVIDED AT INTERSECTIONS WHEREVER AN ACCESSIBLE ROUTE WITHIN THE RIGHT OF WAY OF A HIGHWAY FACILITY CROSSES A CURB REGARDLESS OF WHETHER SIDEWALK IS EXISTING, PROPOSED, OR NONEXISTENT. THEY MUST BE LOCATED WITHIN PEDESTRIAN CROSSWALKS AS SHOWN ON PLANS OR AS DIRECTED BY THE ENGINEER, AND SHOULD NOT BE LOCATED BEHIND VEHICLE STOP LINES. EXISTING LIGHT POLES, FIRE HYDRANTS, DROP INLETS, ETC. WILL AFFECT PLACEMENT. ACCESSIBLE ROUTE IS DEFINED AS A CONTINUOUS UNOBSTRUCTED, STABLE, FIRM AND SLIP RESISTANT PATH CONNECTING ALL ACCESSIBLE ELEMENTS OF A FACILITY THAT CAN BE APPROACHED, ENTERED AND USED BY PERSONS WITH MOBILITY IMPAIRMENTS.
 9. RAMPS MAY BE PLACED ON RADIAL OR TANGENTIAL SECTIONS PROVIDED THAT THE CURB OPENING IS PLACED WITHIN THE LIMITS OF THE CROSSWALK.
 10. TYPICAL CONCRETE SIDEWALK IS 4" THICK. WHEN THE ENTRANCE RADIUS CANNOT ACCOMMODATE THE TURNING REQUIREMENTS OF ANTICIPATED HEAVY TRUCK TRAFFIC THE CONCRETE SIDEWALK DEPTH SHOULD BE INCREASED TO 7".

SHEET 3 OF 3

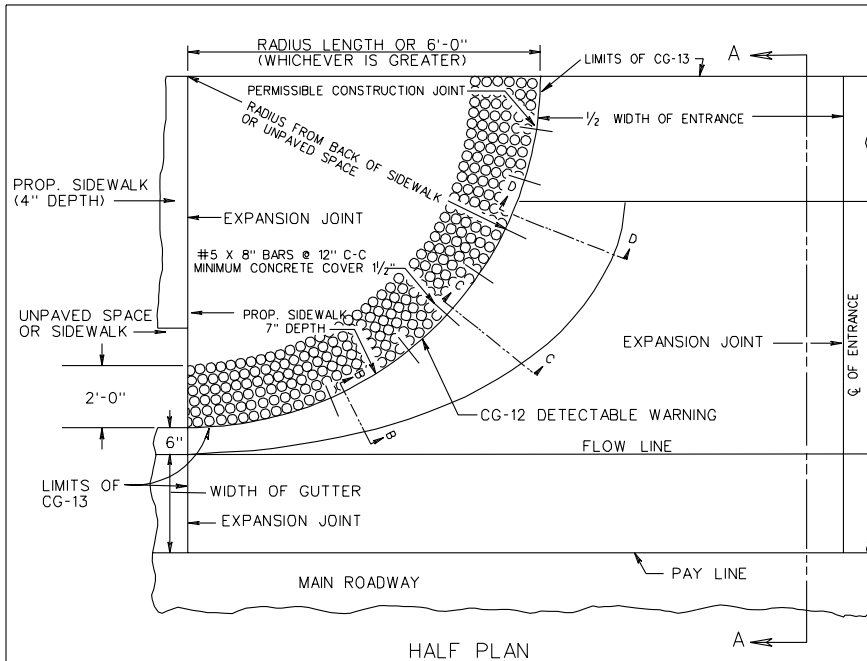
CG-12 DETECTABLE WARNING SURFACE
TYPE C (PARALLEL & PERPENDICULAR) APPLICATION

REV. 3/03
203.07

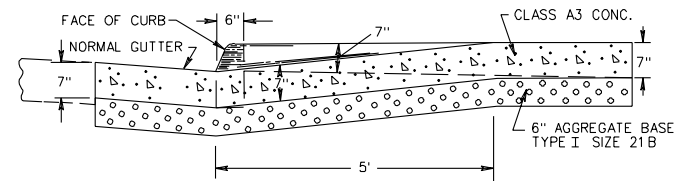
VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION
REFERENCE

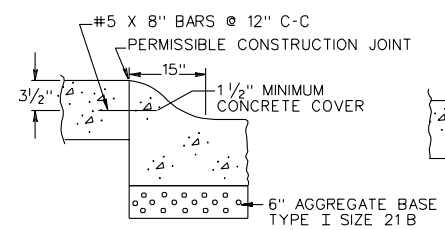
105
502



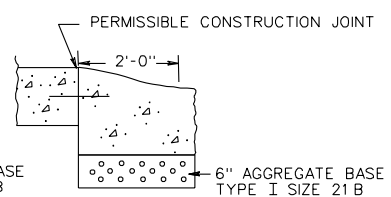
HALF PLAN



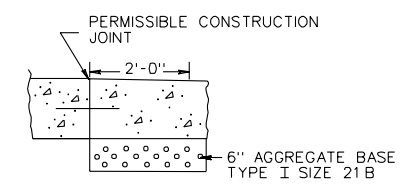
SECTION A-A



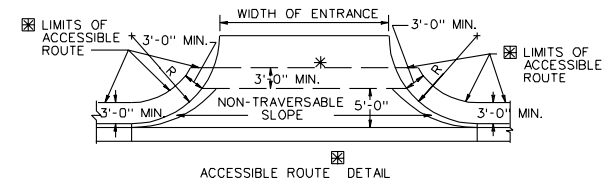
SECTION B-B



SECTION C-C



SECTION D-D



ADDITIONAL RIGHT-OF-WAY IS REQUIRED IF THE LIMITS OF ACCESSIBLE ROUTE EXTEND BEYOND EXISTING OR PROPOSED VDOT RIGHT-OF-WAY.

DETAIL TO BE USED WHEN THE COMBINED WIDTH OF UNPAVED SPACE AND SIDEWALK SPACE IS LESS THAN 7'.

ACCESSIBLE ROUTE IS DEFINED AS A CONTINUOUS UNOBSTRUCTED, STABLE, FIRM AND SLIP RESISTANT PATH CONNECTING ALL ACCESSIBLE ELEMENTS OF A FACILITY THAT CAN BE APPROACHED, ENTERED AND USED BY PERSONS WITH MOBILITY IMPAIRMENTS.

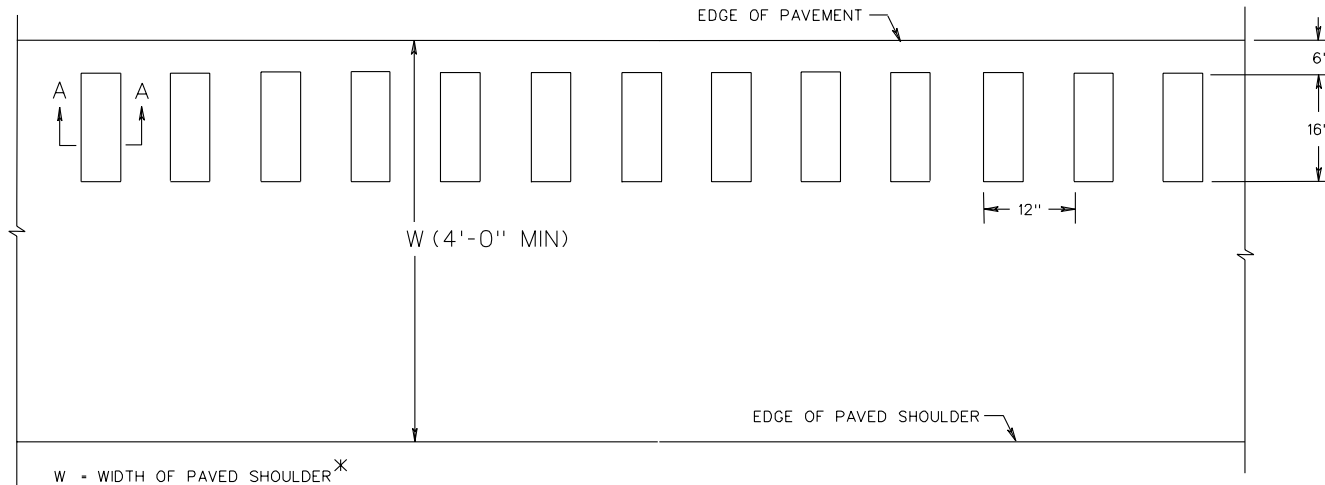
* IF ACCESSIBLE ROUTES ARE BEING PROVIDED, A MINIMUM 3' TRAVERSABLE WIDTH IS REQUIRED.

NOTES:

1. PROP. 7" SIDEWALK IS TO BE POURED MONOLITHICALLY WITH ENTRANCE OR BY USING PERMISSIBLE CONSTRUCTION JOINT WITH REQUIRED BARS.
2. PROPOSED 7" SIDEWALK TO BE CLASS A-3 CONCRETE.
3. REQUIRED BARS ARE TO BE NO. 5X8" PLACED 1' CENTER TO CENTER ALONG BACK OF CURB, MID-DEPTH OF SIDEWALK. MINIMUM CONCRETE COVER 1 1/2".
4. ALL DETAILS AND DIMENSIONS NOT SHOWN ARE THE SAME AS STANDARD CG-9D.
5. THIS DESIGN MAY ALSO BE APPLIED TO OTHER ENTRANCE STANDARDS AS THE NEED ARISES.
6. 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.
7. SEE INSERTABLE SHEET A59 FOR STANDARD CG-12 DETECTABLE WARNING DETAILS.

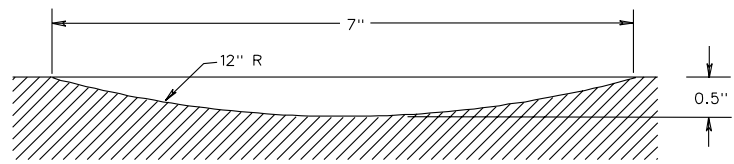
SPECIFICATION REFERENCE	<p>COMMERCIAL ENTRANCE (HEAVY TRUCK TRAFFIC ANTICIPATED)</p> <p>VIRGINIA DEPARTMENT OF TRANSPORTATION</p>	REV. 3/03
502		203.08

RS-1



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.

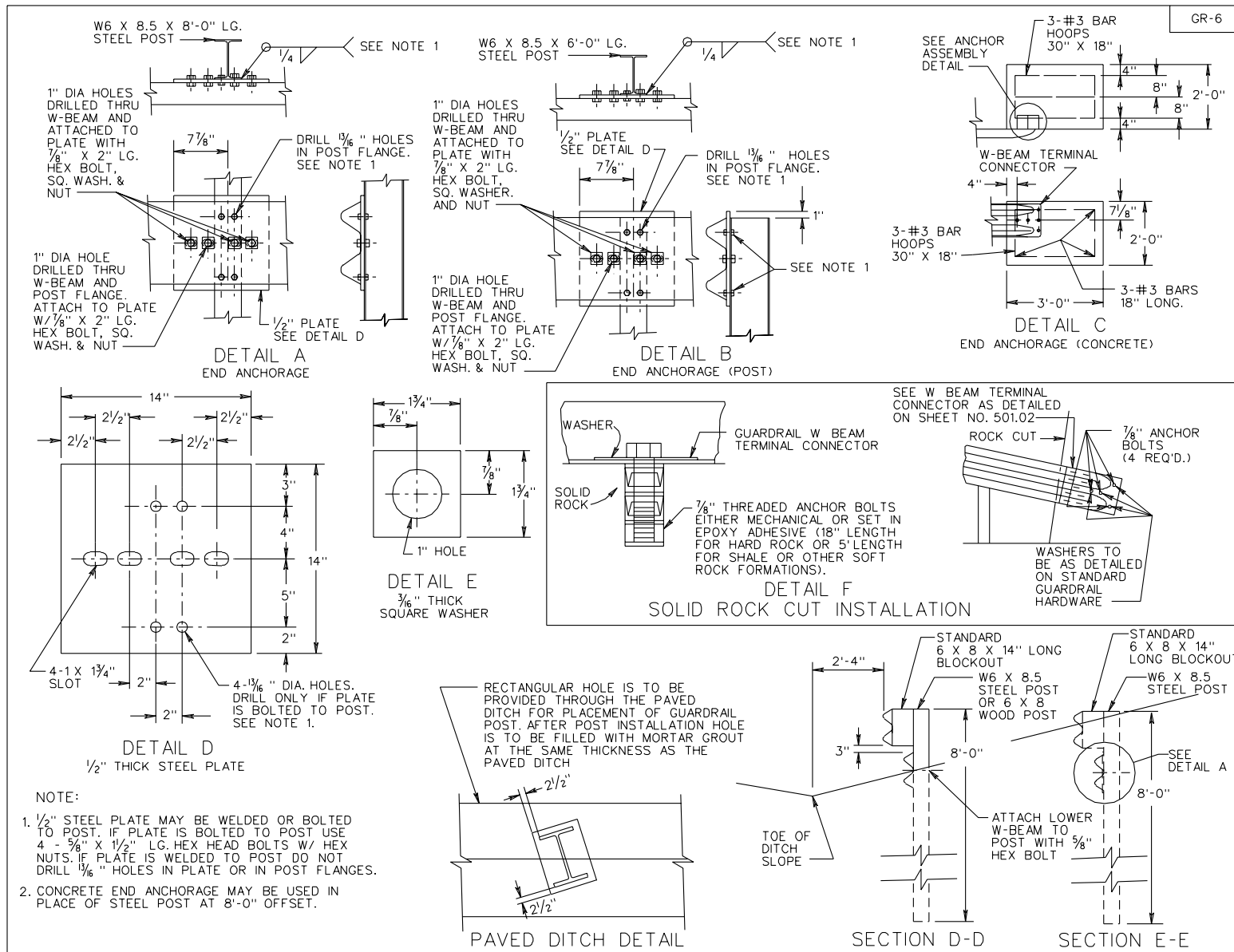
REVISED 11/02

SPECIFICATION REFERENCE
310 315

RUMBLE STRIPS

VIRGINIA DEPARTMENT OF TRANSPORTATION

304.01



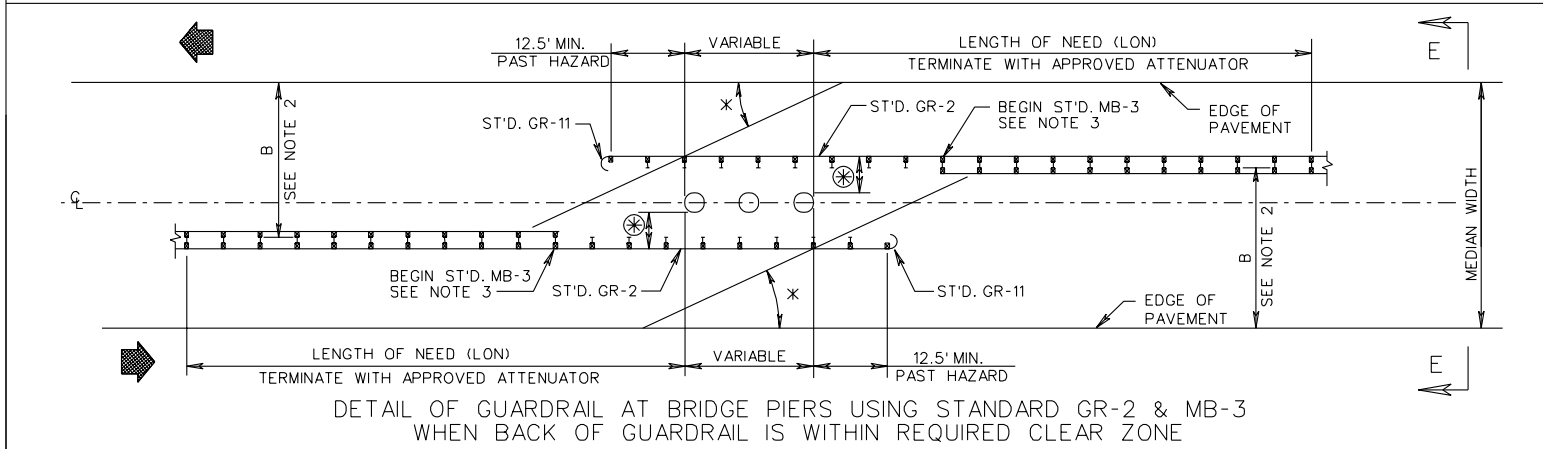
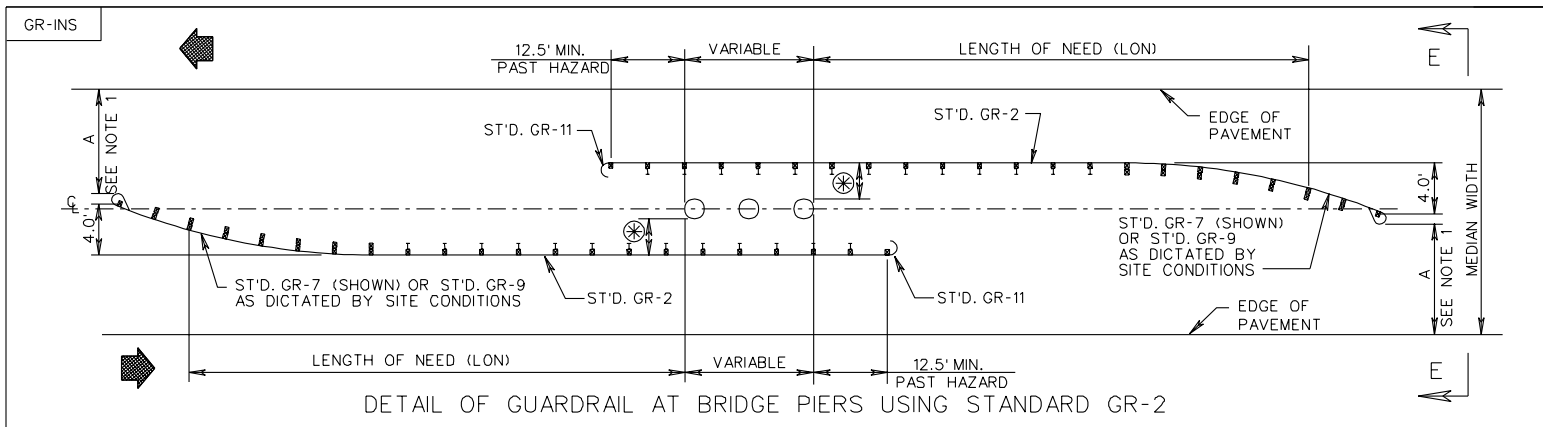
SPECIFICATION REFERENCE
505 221

TERMINAL TREATMENT FOR W BEAM GUARDRAIL

VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 11/02

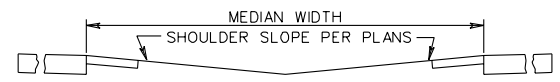
501.10



TYPICAL SECTION

⊗ GUARDRAIL SHALL BE PLACED SO THAT A HAZARD IS NOT WITHIN THE DEFLECTION LIMIT OF THE GUARDRAIL. THE GUARDRAIL DESIGN AND PLACEMENT SHOWN ABOVE MAY ALSO BE USED FOR SHIELDING AN OVERHEAD SIGN SUPPORT, FIXED OBJECTS OR OTHER TYPES OF ROAD SIDE OBSTRUCTIONS.

* 25° ANGLE OF VEHICLE DEPARTURE.

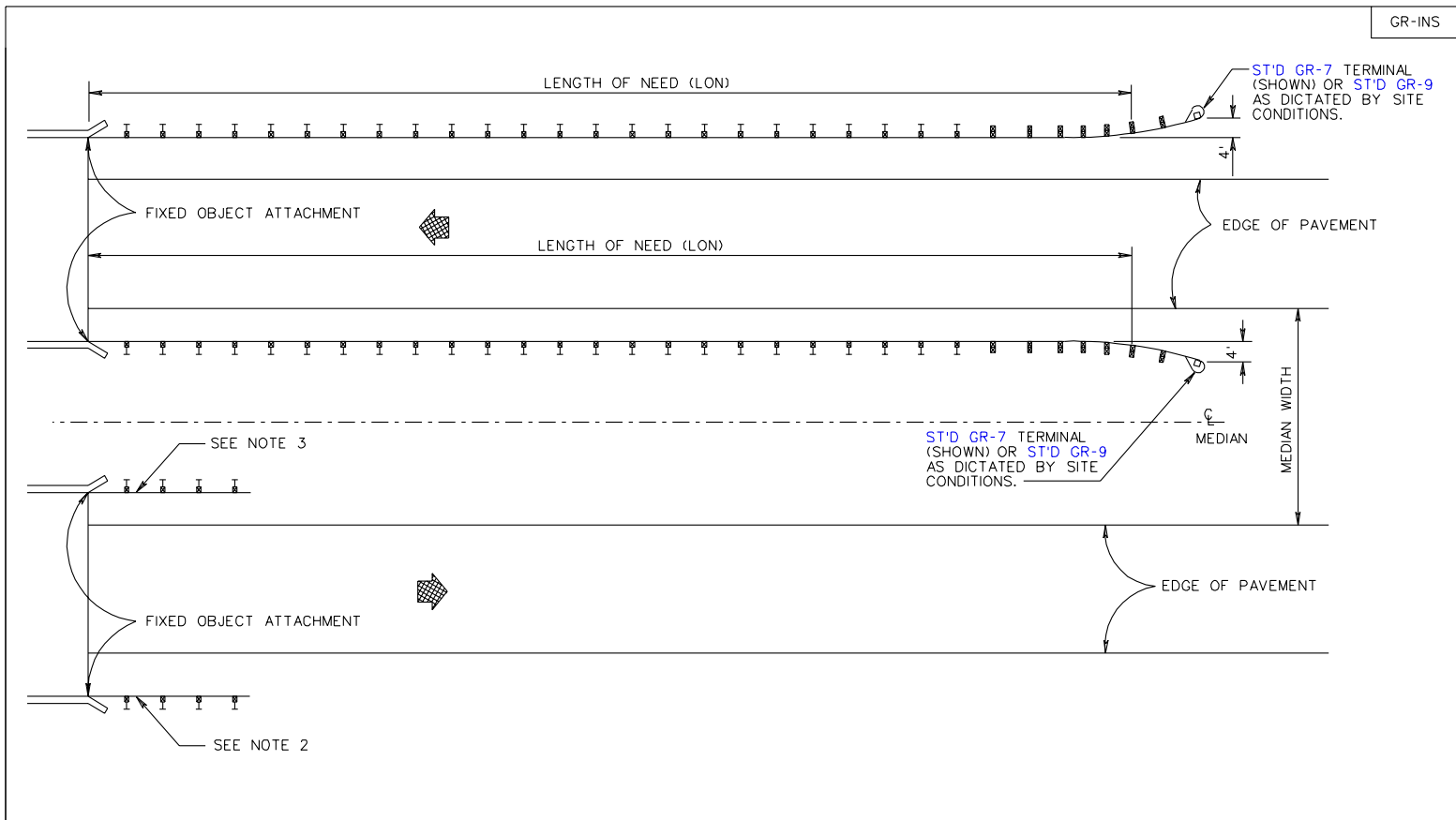


SECTION E-E

- NOTES:
1. DISTANCE "A" MUST BE GREATER THAN REQ'D. CLEAR ZONE.
 2. DISTANCE "B" IS LESS THAN REQ'D. CLEAR ZONE.
 3. BEGIN ST'D. MB-3 AT THE POST PRIOR TO THE POINT WHERE THE 25° ANGLE OF VEHICLE DEPARTURE WILL INTERSECT THE MB-3.

W BEAM GUARDRAIL INSTALLATION CRITERIA

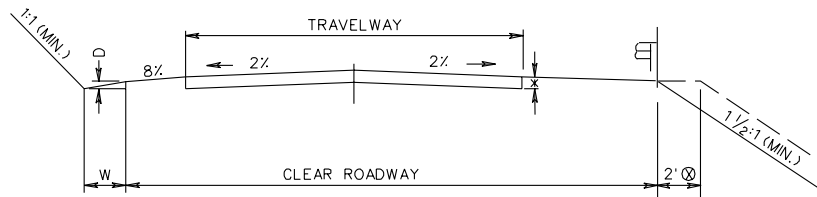
SPECIFICATION REFERENCE
221 505



- NOTES:
1. IF A CUT SECTION IS CLOSER THAN 200', A STANDARD GR-6 TERMINAL IS PREFERRED.
 2. NO GUARDRAIL IS REQUIRED ON RUN-OFF UNLESS NEEDED TO SHIELD A HAZARD WITHIN THE REQUIRED CLEAR ZONE.
 3. NO GUARDRAIL IS REQUIRED ON RUN-OFF UNLESS NEEDED TO SHIELD A HAZARD WITHIN THE REQUIRED CLEAR ZONE. REFER TO SHEET 501.33 IF BACK OF GUARDRAIL FROM THE OPPOSING LANES IS WITHIN THE REQUIRED CLEAR ZONE.

DETAIL OF GUARDRAIL AT DUAL BRIDGES

SPECIFICATION REFERENCE	<p>W BEAM GUARDRAIL INSTALLATION CRITERIA</p> <p>VIRGINIA DEPARTMENT OF TRANSPORTATION</p>	REV. 3/03
221 505		501.34



* SEE PLANS FOR BASE DEPTH AND TYPE AND PAVED SURFACE TREATMENT WHERE REQUIRED.

TYPICAL SECTION

⊗ FOR GUARDRAIL:
ADD 2' TO 4' SHOULDERS
ADD 3' TO ALL OTHER SHOULDERS

BRIDGE WIDTH = APPROACH ROADWAY WIDTH (CLEAR ROADWAY).

WIDTHS FOR TWO WAY TRAFFIC (LESSER WIDTH MAY BE USED FOR ONE-WAY)								
TYPE	CURRENT ADT	* TRAVELWAY WIDTH	SURFACE		MIN. ROADWAY SHOULDER TO SHOULDER ⊗	DITCH WIDTH (W)	DITCH DEPTH (D)	PAY ITEM
			UNPAVED	PAVED				
A	0-250	18'	✓		22'	4'	16"	LF.
B	251-750	20'	✓		24' ABS. 30' DES.	4'	16"	LF.
C	751-2000	22'		✓	30' ABS. 34' DES.	4'	16"	* *
D	2001-5500	24'		✓	40'	4'	16"	* *
E	5501-15,000	24'		✓	40'	4'	16"	* *
F	15,000-ABOVE	24'		✓	40'	6'	18"	* *

* CURVES TO BE WIDENED IN ACCORDANCE WITH ST'D. TC-5.01R.
** PAID FOR BY INDIVIDUAL QUANTITIES.

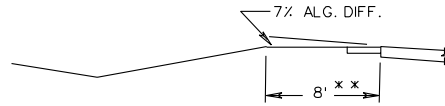
GEOMETRICS							
DESIGN SPEED M.P.H.		20	30	40	50	60	70
MIN. RADII		108' R	251' R	465' R	760' R	1204' R	1821' R
MAX. % GRADE	DES.	8%	7%	7%	6%	5%	5%
	ABS.	16%	14%	13%	10%	6%	6%
STOPPING SIGHT DISTANCE	DES.	125'	200'	325'	475'	650'	850'
	MIN.			305'	425'	570'	730'
MAXIMUM SUPERELEVATION		8%	8%	8%	8%	8%	8%

IF GEOMETRICS AND WIDTHS SHOWN IN THESE CHARTS ARE GREATER THAN THE FINISHED CONTRACT DESIGN, APPROVAL MAY BE GRANTED BY THE DEPARTMENT FOR LESSER VALUES.

GS-11

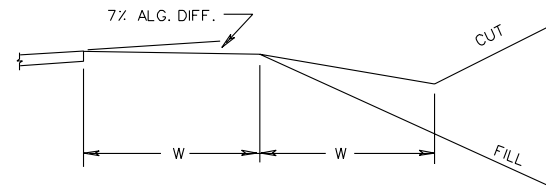
GRADED MEDIAN SHOULDERS

OUTSIDE SHOULDERS

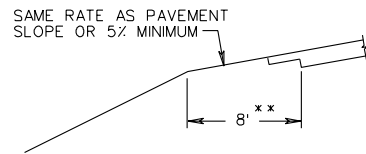


* * WHERE MAINLINE IS 6 OR MORE LANES GRADED SHOULDER WIDTH IS TO BE THE SAME AS THAT SHOWN FOR FILL SHOULDER FOR INDEPENDENT GRADING.

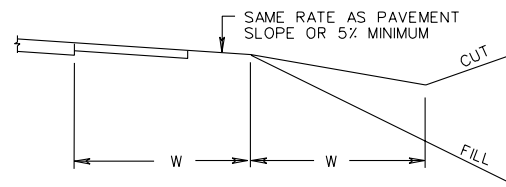
HIGH SIDE - SUPERELEVATED



HIGH SIDE - SUPERELEVATED



LOW SIDE - SUPERELEVATED



LOW SIDE - SUPERELEVATED

NOTE: FOR WIDTH OF SHOULDERS AND DITCHES (W) SEE GEOMETRIC DESIGN STANDARDS.

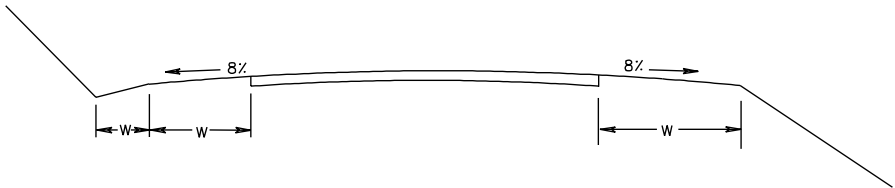
STANDARD SHOULDER DESIGN FOR ALL SYSTEMS
EXCEPT LOCAL ROADS AND STREETS

REV. 3/03

702.01

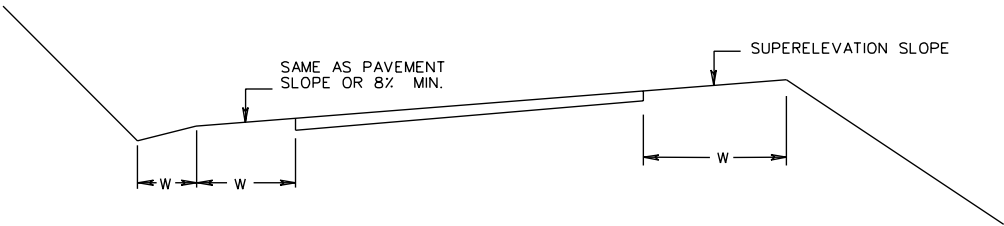
VIRGINIA DEPARTMENT OF TRANSPORTATION

TANGENT SECTION



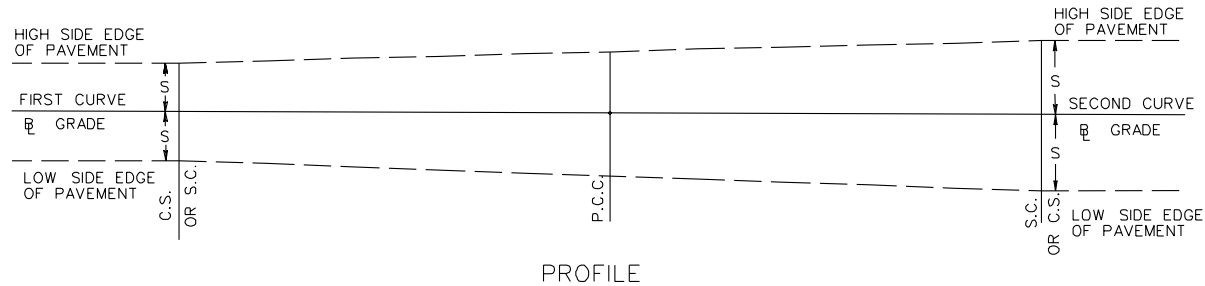
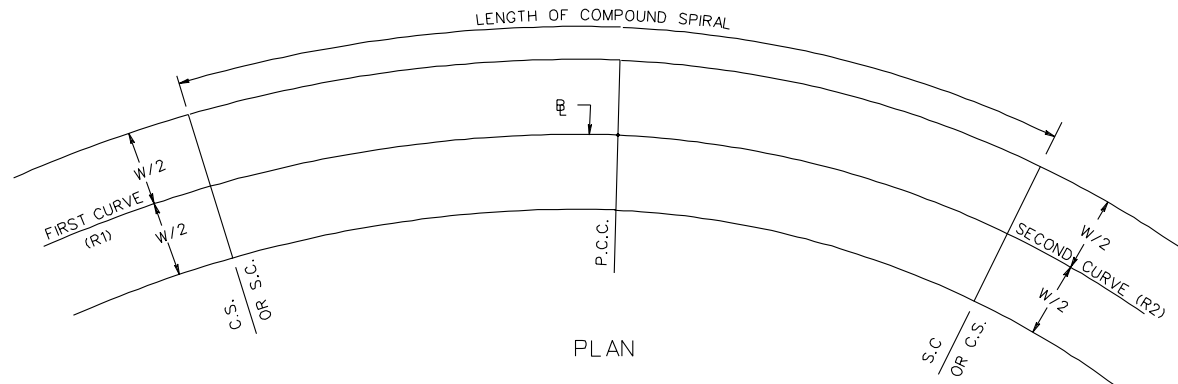
FOR WIDTHS OF SHOULDERS AND DITCHES (W)
SEE STANDARDS..

SUPERELEVATED SECTION



FOR WIDTHS OF SHOULDERS AND DITCHES (W)
SEE STANDARDS.

STANDARD SHOULDER DESIGNS FOR LOCAL ROADS & STREETS

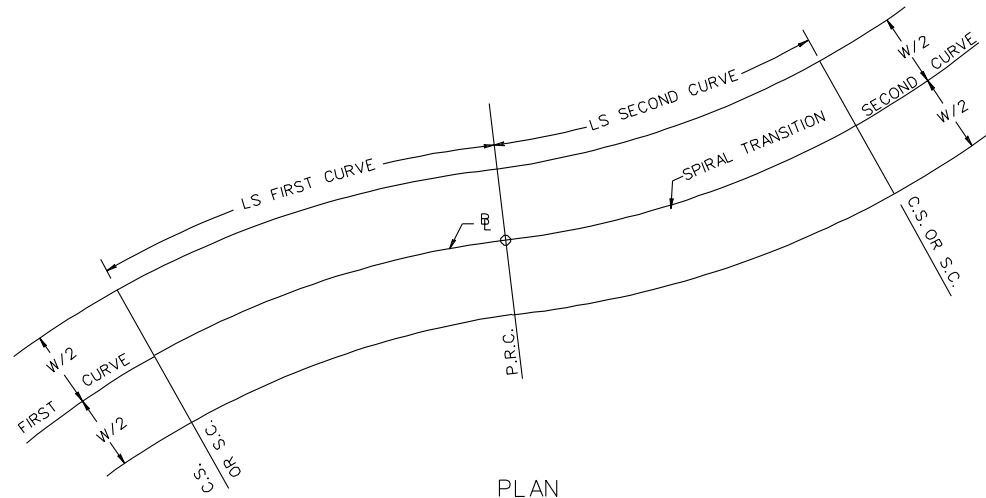


NOTE:

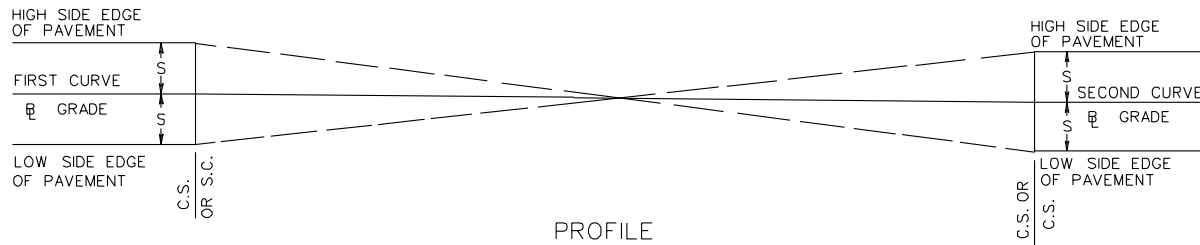
1. FOR COMPOUND CURVES ON ROADWAYS, THE RATIO OF FLATTER RADIUS (R1) TO THE SHARPER RADIUS (R2) SHALL NOT EXCEED 1.5:1 WHERE PRACTICAL, A DESIRABLE MAXIMUM RATIO OF 1.75:1 SHOULD BE USED. FOR COMPOUND CURVES ON RAMP, THE RATIO OF THE FLATTER RADIUS (R1) TO THE SHARPER RADIUS (R2) SHALL NOT EXCEED 2:1.
2. COMPUTE SUPERELEVATION TRANSITION FROM MAXIMUM OF FIRST CURVE TO MAXIMUM OF SECOND CURVE. LENGTH OF COMPOUND SPIRAL COMPUTED PER PAGE 802.22.
3. REFER TO THE ROAD DESIGN MANUAL FOR ADDITIONAL COMPOUND CURVE DESIGN INFORMATION.

SPECIFICATION REFERENCE

METHOD OF APPLYING TC-5.01 ON COMPOUND CURVES
URBAN CONDITIONS & RURAL CONDITIONS WITHOUT PAVEMENT WIDENING



PLAN



PROFILE

NOTE:

1. COMPUTE SUPERELEVATION TRANSITION FROM MAXIMUM OF FIRST CURVE TO MAXIMUM OF SECOND CURVE. LENGTH OF LS (SPIRAL TRANSITIONS) COMPUTED PER PAGE 802.22.
2. REFER TO OF THE ROAD DESIGN MANUAL FOR ADDITIONAL REVERSE CURVE DESIGN INFORMATION.

REV. 3/03

METHOD OF APPLYING TC-5.01 ON REVERSE CURVES
 URBAN CONDITIONS & RURAL CONDITIONS WITHOUT PAVEMENT WIDENING

SPECIFICATION
 REFERENCE

CURVE WIDENING TABLES

SU DESIGN VEHICLE

COMPONENT	SIZE
OVERALL WIDTH (u)	8.0 ft
WHEELBASE (L)	20 ft
FRONT OVERHANG (A)	4 ft

LATERAL CLEARANCE

LANE WIDTH	CLEARANCE (C)
9 ft	1.5 ft
10 ft	2 ft
11 ft	2.5 ft
12 ft	3 ft
16 ft	5 ft

ADJUSTMENT FACTORS

NUMBER OF LANES ROTATED (n ₁)	ADJUSTMENT FACTOR (b _w)
1	1.00
1.5	0.8333
2	0.75
2.5	0.70
3	0.6667
3.5	0.6425

RELATIVE GRADIENTS

DESIGN SPEED (V _D) MPH	MAXIMUM RELATIVE GRADIENT (rg)	MIN. TRANSITION LENGTH IN FEET RURAL CONDITIONS WITH PAVEMENT WIDENING AND REVERSE CURVES FOR ALL CONDITIONS (2 SECOND RULE)
20	0.74	59
25	0.70	74
30	0.66	88
35	0.62	103
40	0.58	117
45	0.54	132
50	0.50	147
55	0.47	161
60	0.45	176
65	0.43	191
70	0.40	205

- A - FRONT OVERHANG OF DESIGN VEHICLE FROM APPROPRIATE TABLE.
- b_w - ADJUSTMENT FACTOR FROM TABLE.
- C - LATERAL CLEARANCE OF DESIGN VEHICLE FROM APPROPRIATE TABLE.
- E - SUPERELEVATION RATE FROM APPROPRIATE TABLE.
- F_A - CALCULATED WIDTH OF OVERHANG FOR DESIGN VEHICLE.
- L - WHEELBASE OF DESIGN VEHICLE FROM APPROPRIATE TABLE.
- LS - LENGTH OF SPIRAL OR SUPERELEVATION TRANSITION LENGTH.

DEFINITIONS

- M - MULTIPLE LANE FACTOR.
- N - NUMBER OF LANES.
- n₁ - NUMBER OF LANES ROTATED (FROM TABLES).
- P_w - PAVEMENT WIDTH.
- R - RADIUS OF CURVE.
- rg - RELATIVE GRADIENT FROM APPROPRIATE TABLE.
- U - CALCULATED TRACK WIDTH OF DESIGN VEHICLE.

- u - TRACK WIDTH OF DESIGN VEHICLE FROM APPROPRIATE TABLE.
- V_D - DESIGN VELOCITY.
- w - CALCULATED WIDENING.
- W - PAVEMENT WIDTH
- W_C - CALCULATED TOTAL CURVE WIDTH.
- W_n - WIDTH OF LANE.
- Z - CALCULATED EXTRA WIDTH ALLOWANCE.

GENERAL DESIGN CONSIDERATIONS

1. WHERE PAVEMENT WIDENING IS REQUIRED, THE APPROPRIATE WIDENING IS ADDED TO THE LANE WIDTH WHEN CALCULATING THE TRANSITION LENGTH (LS).
2. THE COMPUTED TRANSITION LENGTH (LS) IS ROUNDED UP TO THE NEAREST FOOT.
3. WHEN THE TRANSITION LENGTH (LS) IS CALCULATED, IT MUST BE COMPARED WITH THE MINIMUM VALUE LISTED IN THE APPROPRIATE COLUMN ON THE RELATIVE GRADIENT TABLE.
4. CROWN RUNOFF IS ALWAYS ACHIEVED OUTSIDE OF THE TRANSITION.
5. NO PAVEMENT WIDENING IS REQUIRED FOR URBAN ROADWAYS.
6. NO PAVEMENT WIDENING IS REQUIRED FOR RURAL ROADWAYS WITH A CURVE RADIUS GREATER THAN 2865 FEET.
7. NO PAVEMENT WIDENING IS REQUIRED FOR RURAL ROADWAYS WITH 12 FOOT WIDE LANES AND A CURVE RADIUS GREATER THAN 881 FEET.
8. PAVEMENT WIDENING IS APPLIED ONLY WHEN CALCULATED WIDENING (w) IS EQUAL TO OR GREATER THAN 2 FEET.
9. WHEN CALCULATING WIDENING (w) FOR MULTI-LANE RURAL ROADWAYS, WIDENING IS FIRST CALCULATED USING THE SINGLE LANE WIDTH FOR "W".
10. AN ALTERNATE METHOD FOR MULTI-LANE UNDIVIDED PAVEMENTS (48'). THE LS IS 1.5 TIMES (M*1.5) THE CORRESPONDING LENGTH FOR TWO LANE HIGHWAYS; AND FOR SIX LANE UNDIVIDED PAVEMENTS (72'), THE LS IS TWO TIMES (M*2) THE CORRESPONDING LENGTH FOR TWO LANE HIGHWAYS.
11. CALCULATED WIDENING IS ROUNDED UP TO THE NEAREST 0.1 FOOT.
12. CURVES WITH SPIRAL CURVE TRANSITIONS MUST HAVE A MINIMUM TRANSITION LENGTH (LS) EQUAL TO 2 SECONDS OF TRAVEL TIME AT THE ROADWAY'S DESIGN SPEED AS NOTED IN THE RELATIVE GRADIENT TABLE.

NO WIDENING REQUIRED FORMULAS USED TO CALCULATE TRANSITION LENGTH (LS) AND WIDENING (w)

LS = b_w(W_n E/rg)
 LS = M(WE/rg) (ALT. MULTI-LANE)

WIDENING REQUIRED
 LS = b_w[E n₁ (W_n + w/N)/rg]
 LS = m[E(W + w/N)/rg] (ALT. MULTI-LANE)

$$U = u + R - \sqrt{R^2 - L^2}$$

$$F_A = \sqrt{R^2 + A(2L + A)} - R$$

$$Z = (V_D / \sqrt{R})$$

$$W_C = N(U + C) + F_A + Z$$

$$w = W_C - 2W_n$$

FOR SOLVED PROBLEMS USING THIS METHODOLOGY, SEE THE EXAMPLES ON PAGE 802.23

METHODOLOGIES FOR CALCULATING TC-5.01 VALUES

DESIGN FACTORS FOR A DESIGN SPEED OF 20 MPH (RURAL) USING E = 8% MAX.

DESIGN VELOCITY -20	DESIGN SOFTWARE EQUIVALENTS (NUMBER OF LANES AT LANE WIDTH)												INTERCHANGE RAMP WIDTH						
	WIDTH= 18 FT			WIDTH=20 FT			WIDTH=22 FT			WIDTH=24 FT			WIDTH=48 FT		18 FT				
	1 @ 9'			1 @ 10'			1 @ 11'			1 @ 12'			2 @ 12'		16 FT		18 FT		
	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	CR	LS
1800	NC	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0
1213	2.0	59	2.0	28	28	0.0	30	30	0.0	33	33	0.0	49	49	0.0	39	39	41	41
1148	2.1	57	59	2.1	28	29	0.0	30	32	0.0	33	35	0.0	49	52	0.0	39	40	41
1090	2.2	54	59	2.1	28	30	0.0	30	33	0.0	33	36	0.0	49	54	0.0	39	42	41
1036	2.3	52	59	2.1	28	32	0.0	30	35	0.0	33	38	0.0	49	56	0.0	39	44	41
987	2.4	50	59	2.2	28	33	0.0	30	36	0.0	33	39	0.0	49	59	0.0	39	46	41
941	2.5	48	59	2.2	28	34	0.0	30	38	0.0	33	41	0.0	49	61	0.0	39	48	41
899	2.6	46	59	2.3	28	36	0.0	30	39	0.0	33	43	0.0	49	64	0.0	39	50	41
860	2.7	44	59	2.3	28	37	0.0	30	41	0.0	33	44	0.0	49	66	0.0	39	52	41
824	2.8	43	59	2.3	28	38	0.0	30	42	0.0	33	46	0.0	49	69	0.0	39	54	41
790	2.9	41	59	2.4	28	40	0.0	30	44	0.0	33	48	0.0	49	71	0.0	39	56	41
759	3.0	40	59	2.4	28	41	0.0	30	45	0.0	33	49	0.0	49	73	0.0	39	58	41
729	3.1	39	59	2.5	28	42	0.0	30	47	0.0	33	51	0.0	49	76	0.0	39	60	41
701	3.2	37	59	2.5	28	44	0.0	30	48	0.0	33	52	0.0	49	78	0.0	39	61	41
674	3.3	36	59	2.5	28	45	0.0	30	50	0.0	33	54	0.0	49	81	0.0	39	63	41
650	3.4	35	59	2.6	28	46	0.0	30	51	0.0	33	56	0.0	49	83	0.0	39	65	41
626	3.5	34	59	2.6	28	48	0.0	30	53	0.0	33	57	0.0	49	86	0.0	39	67	41
604	3.6	33	59	2.7	28	49	0.0	30	54	0.0	33	59	0.0	49	88	0.0	39	69	41
582	3.7	32	59	2.7	28	50	0.0	30	55	0.0	33	60	0.0	49	90	0.0	39	71	41
562	3.8	32	59	2.8	28	52	0.0	30	57	0.0	33	62	0.0	49	93	0.0	39	73	41
543	3.9	31	59	2.8	28	53	0.0	30	58	0.0	33	62	0.0	49	95	0.0	39	75	41
524	4.0	30	59	2.9	28	55	0.0	30	60	0.0	33	65	0.0	49	98	0.0	39	77	41
506	4.1	29	59	2.9	28	56	0.0	30	61	0.0	33	67	0.0	49	100	0.0	39	79	41
489	4.2	29	60	3.0	30	63	2.0	30	63	0.0	33	69	0.0	49	103	0.0	39	80	41
473	4.3	29	63	3.0	30	64	2.0	30	64	0.0	33	70	0.0	49	105	0.0	39	82	41
457	4.4	29	63	3.0	30	66	2.0	30	66	0.0	33	72	0.0	49	108	0.0	39	84	41
442	4.5	29	65	3.1	31	68	2.1	30	67	0.0	33	73	0.0	49	110	0.0	39	86	41
427	4.6	29	66	3.2	31	71	2.2	30	70	0.0	33	75	0.0	49	112	0.0	39	88	41
413	4.7	29	68	3.2	31	71	2.2	30	70	0.0	33	77	0.0	49	115	0.0	39	90	41
399	4.8	30	70	3.3	31	73	2.3	30	72	0.0	33	78	0.0	49	117	0.0	39	92	41
385	4.9	29	71	3.3	31	74	2.3	30	73	0.0	33	80	0.0	49	120	0.0	39	94	41
372	5.0	30	73	3.4	31	76	2.4	30	75	0.0	33	82	0.0	49	122	0.0	39	96	41
358	5.1	30	75	3.5	31	78	2.5	30	76	0.0	33	83	0.0	49	125	0.0	39	98	41
345	5.2	30	76	3.5	31	80	2.5	30	78	0.0	33	85	0.0	49	127	0.0	39	100	41
332	5.3	30	78	3.6	31	81	2.6	30	79	0.0	33	86	0.0	49	129	0.0	39	101	41
320	5.4	30	80	3.7	31	83	2.7	30	81	0.0	33	88	0.0	49	132	0.0	39	103	41
308	5.5	30	82	3.8	31	85	2.8	30	82	0.0	33	90	0.0	49	134	0.0	39	105	41
297	5.6	30	83	3.9	32	87	2.9	30	84	0.0	33	91	0.0	49	137	0.0	39	107	41
286	5.7	30	85	3.9	32	89	2.9	30	85	0.0	33	93	0.0	49	139	0.0	39	109	41
276	5.8	30	87	4.0	32	91	3.0	33	95	2.0	33	95	0.0	53	153	2.0	39	111	41
266	5.9	31	89	4.1	32	93	3.1	33	97	2.1	33	96	0.0	54	157	2.2	39	113	41
258	6.0	30	90	4.2	32	95	3.2	33	99	2.2	33	98	0.0	54	161	2.4	39	115	41
248	6.1	31	92	4.3	32	97	3.3	34	101	2.3	33	99	0.0	55	165	2.6	39	117	41
240	6.2	31	94	4.4	32	99	3.4	34	103	2.4	33	101	0.0	55	169	2.8	39	119	41
232	6.3	31	96	4.5	33	101	3.5	34	105	2.5	33	103	0.0	55	173	3.0	39	120	41
225	6.4	31	98	4.6	33	103	3.6	34	107	2.6	33	104	0.0	56	177	3.2	39	122	41
217	6.5	31	100	4.7	33	105	3.7	34	109	2.7	33	106	0.0	56	181	3.4	39	124	41
209	6.6	31	102	4.8	33	107	3.8	34	111	2.8	33	108	0.0	57	185	3.6	39	126	41
202	6.7	32	104	4.9	33	109	3.9	34	113	2.9	33	109	0.0	57	189	3.8	39	128	41
196	6.8	32	106	5.0	33	111	4.0	34	115	3.0	36	120	2.0	57	193	4.0	39	130	41
189	6.9	32	108	5.1	33	113	4.1	35	118	3.1	36	122	2.1	58	198	4.2	39	132	41
183	7.0	32	110	5.2	33	115	4.2	35	120	3.2	36	124	2.2	58	202	4.4	39	134	41
176	7.1	32	112	5.3	33	117	4.3	35	122	3.3	36	127	2.3	59	206	4.6	39	136	41
170	7.2	32	115	5.5	34	120	4.5	35	125	3.5	36	129	2.5	59	212	5.0	39	138	41
164	7.3	33	117	5.6	34	122	4.6	35	127	3.6	37	132	2.6	60	217	5.2	39	140	41
158	7.4	33	119	5.8	34	124	4.8	35	129	3.8	37	134	2.8	60	222	5.6	39	141	41
152	7.5	33	122	5.9	34	127	4.9	36	132	3.9	37	137	2.9	61	227	5.8	39	143	41
146	7.6	33	124	6.1	34	129	5.1	36	135	4.1	37	140	3.1	62	233	6.2	39	145	41
139	7.7	33	127	6.3	35	132	5.3	36	137	4.3	38	143	3.3	63	239	6.6	39	147	41
132	7.8	34	130	6.5	35	135	5.5	36	140	4.5	38	145	3.5	64	246	7.0	39	149	41
124	7.9	34	133	6.8	35	138	5.8	37	144	4.8	38	149	3.8	65	254	7.6	39	151	41
108	8.0	35	139	7.6	36	144	6.6	38	150	5.6	39	155	4.6	68	270	9.2	39	153	41

NOTE: CR, LS & w VALUES IN FEET. LISTED RADIUS IS THE MINIMUM ALLOWABLE RADIUS FOR THE CORRESPONDING E, CR, LS, AND w VALUES.

SPECIFICATION REFERENCE	DESIGN FACTORS FOR A DESIGN SPEED OF 25 MPH (RURAL) USING E = 8% MAX.																								
	DESIGN VELOCITY -25 RADIUS(FT) E(Z)	WIDTH+ 18 FT			WIDTH+20 FT			WIDTH+22 FT			WIDTH+24 FT			WIDTH+48 FT			INTERCHANGE RAMP								
		DESIGN SOFTWARE EQUIVALENTS (NUMBER OF LANES AT LANE WIDTH)						DESIGN SOFTWARE EQUIVALENTS (NUMBER OF LANES AT LANE WIDTH)						DESIGN SOFTWARE EQUIVALENTS (NUMBER OF LANES AT LANE WIDTH)						DESIGN SOFTWARE EQUIVALENTS (NUMBER OF LANES AT LANE WIDTH)					
		1 @ 9'		1 @ 10'		1 @ 11'		1 @ 12'		1 @ 12'		2 @ 12'		16 FT		18 FT									
CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS						
2500	NC	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0	0					
1756	2.0	26	0.0	29	2.9	0.0	32	3.2	0.0	35	3.5	0.0	38	3.8	0.0	42	4.2	0.0	46	4.6					
1664	2.1	74	2.0	29	3.0	0.0	32	3.3	0.0	35	3.6	0.0	38	3.9	0.0	42	4.5	0.0	46	4.9					
1579	2.2	68	74	2.0	29	3.2	0.0	35	3.5	0.0	38	4.0	0.0	42	4.4	0.0	46	4.8	0.0	50					
1502	2.3	65	74	2.0	29	3.3	0.0	37	3.7	0.0	40	4.0	0.0	44	4.4	0.0	48	4.8	0.0	52					
1431	2.4	62	74	2.1	29	3.5	0.0	38	3.8	0.0	42	4.2	0.0	46	4.6	0.0	50	5.0	0.0	54					
1366	2.5	60	74	2.1	29	3.6	0.0	39	3.9	0.0	43	4.3	0.0	47	4.7	0.0	51	5.1	0.0	55					
1306	2.6	57	74	2.1	29	3.8	0.0	41	4.1	0.0	45	4.5	0.0	49	4.9	0.0	53	5.3	0.0	57					
1250	2.7	55	74	2.1	29	3.9	0.0	42	4.2	0.0	46	4.6	0.0	50	5.0	0.0	54	5.4	0.0	58					
1198	2.8	53	74	2.2	29	4.0	0.0	43	4.3	0.0	47	4.7	0.0	51	5.1	0.0	55	5.5	0.0	59					
1149	2.9	52	74	2.2	29	4.2	0.0	44	4.4	0.0	48	4.8	0.0	52	5.2	0.0	56	5.6	0.0	60					
1104	3.0	50	74	2.2	29	4.3	0.0	45	4.5	0.0	49	4.9	0.0	53	5.3	0.0	57	5.7	0.0	61					
1061	3.1	48	74	2.3	29	4.5	0.0	46	4.6	0.0	50	5.0	0.0	54	5.4	0.0	58	5.8	0.0	62					
1021	3.2	47	74	2.3	29	4.6	0.0	47	4.7	0.0	51	5.1	0.0	55	5.5	0.0	59	5.9	0.0	63					
983	3.3	45	74	2.3	29	4.8	0.0	48	4.8	0.0	52	5.2	0.0	56	5.6	0.0	60	6.0	0.0	64					
948	3.4	44	74	2.4	29	4.9	0.0	49	4.9	0.0	53	5.3	0.0	57	5.7	0.0	61	6.1	0.0	65					
914	3.5	43	74	2.4	29	5.0	0.0	50	5.0	0.0	54	5.4	0.0	58	5.8	0.0	62	6.2	0.0	66					
882	3.6	42	74	2.4	29	5.2	0.0	52	5.2	0.0	56	5.6	0.0	60	6.0	0.0	64	6.4	0.0	68					
852	3.7	40	74	2.5	29	5.3	0.0	53	5.3	0.0	57	5.7	0.0	61	6.1	0.0	65	6.5	0.0	69					
823	3.8	39	74	2.5	29	5.5	0.0	54	5.4	0.0	58	5.8	0.0	62	6.2	0.0	66	6.6	0.0	70					
795	3.9	38	74	2.6	29	5.6	0.0	55	5.5	0.0	59	5.9	0.0	63	6.3	0.0	67	6.7	0.0	71					
769	4.0	37	74	2.6	29	5.8	0.0	56	5.6	0.0	60	6.0	0.0	64	6.4	0.0	68	6.8	0.0	72					
744	4.1	37	74	2.6	29	5.9	0.0	57	5.7	0.0	61	6.1	0.0	65	6.5	0.0	69	6.9	0.0	73					
720	4.2	36	74	2.7	29	6.0	0.0	58	5.8	0.0	62	6.2	0.0	66	6.6	0.0	70	7.0	0.0	74					
696	4.3	35	74	2.7	29	6.2	0.0	60	6.0	0.0	64	6.4	0.0	68	6.8	0.0	72	7.2	0.0	76					
674	4.4	34	74	2.7	29	6.3	0.0	61	6.1	0.0	65	6.5	0.0	69	6.9	0.0	73	7.3	0.0	77					
652	4.5	33	74	2.8	29	6.5	0.0	62	6.2	0.0	66	6.6	0.0	70	7.0	0.0	74	7.4	0.0	78					
632	4.6	33	74	2.8	29	6.6	0.0	63	6.3	0.0	67	6.7	0.0	71	7.1	0.0	75	7.5	0.0	79					
612	4.7	32	74	2.8	29	6.8	0.0	64	6.4	0.0	68	6.8	0.0	72	7.2	0.0	76	7.6	0.0	80					
592	4.8	31	74	2.9	29	6.9	0.0	65	6.5	0.0	69	6.9	0.0	73	7.3	0.0	77	7.7	0.0	81					
573	4.9	31	75	2.9	29	7.0	0.0	66	6.6	0.0	70	7.0	0.0	74	7.4	0.0	78	7.8	0.0	82					
555	5.0	30	75	3.0	29	7.2	0.0	67	6.7	0.0	71	7.1	0.0	75	7.5	0.0	79	7.9	0.0	83					
537	5.1	31	77	3.0	32	8.1	2.0	32	8.1	2.0	32	8.1	2.0	32	8.1	2.0	32	8.1	2.0	32					
519	5.2	31	79	3.1	32	8.3	2.1	32	8.2	2.1	32	8.2	2.1	32	8.2	2.1	32	8.2	2.1	32					
502	5.3	31	80	3.1	32	8.4	2.1	32	8.4	2.1	32	8.4	2.1	32	8.4	2.1	32	8.4	2.1	32					
485	5.4	31	82	3.2	32	8.6	2.2	32	8.5	2.2	32	8.5	2.2	32	8.5	2.2	32	8.5	2.2	32					
468	5.5	31	84	3.2	32	8.8	2.2	32	8.7	2.2	32	8.7	2.2	32	8.7	2.2	32	8.7	2.2	32					
452	5.6	31	86	3.3	33	9.0	2.3	32	8.8	2.3	32	8.8	2.3	32	8.8	2.3	32	8.8	2.3	32					
437	5.7	31	88	3.4	33	9.2	2.4	32	9.0	2.4	32	9.0	2.4	32	9.0	2.4	32	9.0	2.4	32					
423	5.8	31	89	3.4	33	9.3	2.4	32	9.2	2.4	32	9.2	2.4	32	9.2	2.4	32	9.2	2.4	32					
409	5.9	31	91	3.5	33	9.5	2.5	32	9.3	2.5	32	9.3	2.5	32	9.3	2.5	32	9.3	2.5	32					
396	6.0	31	93	3.5	33	9.7	2.5	32	9.5	2.5	32	9.5	2.5	32	9.5	2.5	32	9.5	2.5	32					
383	6.1	32	95	3.6	33	9.9	2.6	32	9.6	2.6	32	9.6	2.6	32	9.6	2.6	32	9.6	2.6	32					
371	6.2	32	97	3.7	33	10.1	2.7	32	9.8	2.7	32	9.8	2.7	32	9.8	2.7	32	9.8	2.7	32					
359	6.3	32	98	3.7	33	10.3	2.7	32	9.9	2.7	32	9.9	2.7	32	9.9	2.7	32	9.9	2.7	32					
347	6.4	32	100	3.8	33	10.5	2.8	32	10.1	2.8	32	10.1	2.8	32	10.1	2.8	32	10.1	2.8	32					
336	6.5	32	102	3.9	33	10.3	2.9	32	10.3	2.9	32	10.3	2.9	32	10.3	2.9	32	10.3	2.9	32					
326	6.6	32	104	3.9	33	10.8	2.9	32	10.4	2.9	32	10.4	2.9	32	10.4	2.9	32	10.4	2.9	32					
315	6.7	32	106	4.0	34	11.1	3.0	35	11.5	3.0	35	11.5	3.0	35	11.5	3.0	35	11.5	3.0	35					
305	6.8	32	108	4.1	34	11.3	3.1	35	11.8	3.1	35	11.8	3.1	35	11.8	3.1	35	11.8	3.1	35					
295	6.9	32	110	4.2	34	11.5	3.2	35	12.0	3.2	35	12.0	3.2	35	12.0	3.2	35	12.0	3.2	35					
286	7.0	32	111	4.2	34	11.6	3.2	35	12.1	3.2	35	12.1	3.2	35	12.1	3.2	35	12.1	3.2	35					
276	7.1	33	114	4.3	34	11.9	3.3	35	12.4	3.3	35	12.4	3.3	35	12.4	3.3	35	12.4	3.3	35					
267	7.2	33	116	4.4	34	12.1	3.4	35	12.6	3.4	35	12.6	3.4	35	12.6	3.4	35	12.6	3.4	35					
258	7.3	33	118	4.5	34	12.3	3.5	36	12.8	3.5	36	12.8	3.5	36	12.8	3.5	36	12.8	3.5	36					
248	7.4	33	120	4.6	34	12.5	3.6	36	13.1	3.6	36	13.1	3.6	36	13.1	3.6	36	13.1	3.6	36					
239	7.5	33	122	4.7	34	12.7	3.7	36	13.3	3.7	36	13.3	3.7	36	13.3	3.7	36	13.3	3.7	36					
229	7.6	33	124	4.8	35	13.0	3.8	36	13.5	3.8	36	13.5	3.8	36	13.5	3.8	36	13.5	3.8	36					
219	7.7	33	127	5.0	35	13.2	4.0	36	13.8	4.0	36	13.8	4.0	36	13.8	4.0	36	13.8	4.0	36					
209	7.8	34	129	5.1	35	13.5	4.1	36	14.0	4.1	36	14.0	4.1	36	14.0	4.1	36	14.0	4.1	36					
196	7.9	34	132	5.3	35	13.8	4.3	37	14.3	4.3	37	14.3	4.3	37	14.3	4.3	37	14.3	4.3	37					
172	8.0	34	136	5.8	36	14.2	4.8	37	14.8	4.8	37	14.8	4.8	37	14.8	4.8	37	14.8	4.8	37					

TC-5.01

NOTE: CR, LS & w VALUES IN FEET. LISTED RADIUS IS THE MINIMUM ALLOWABLE RADIUS FOR THE CORRESPONDING E, CR, LS, AND w VALUES.

REV. 3/03

802.35

TRANSITION CURVES - RURAL
25 MPH DESIGN SPEED
VIRGINIA DEPARTMENT OF TRANSPORTATION

DESIGN FACTORS FOR A DESIGN SPEED OF 30 MPH (RURAL) USING E = 8% MAX.

DESIGN VELOCITY -30	DESIGN SOFTWARE EQUIVALENTS (NUMBER OF LANES AT LANE WIDTH)												INTERCHANGE RAMP														
	WIDTH= 18 FT				WIDTH=20 FT				WIDTH=22 FT				WIDTH=24 FT				WIDTH=48 FT										
	1 @ 9'			1 @ 10'			1 @ 11'			1 @ 12'			1 @ 12'			2 @ 12'			16 FT			18 FT					
	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	w
3500	NC	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0	0	0	0	0	
2402	2.0	28	0.0	31	31	0.0	34	34	0.0	37	37	0.0	37	37	0.0	55	55	0.0	43	43	0.0	43	43	0.0	45	45	
2276	2.1	28	29	0.0	31	32	0.0	34	35	0.0	37	39	0.0	37	39	0.0	55	58	0.0	43	45	0.0	43	45	0.0	48	48
2161	2.2	28	30	0.0	31	34	0.0	34	37	0.0	37	40	0.0	37	40	0.0	55	60	0.0	43	47	0.0	43	47	0.0	50	50
2056	2.3	28	32	0.0	31	35	0.0	34	39	0.0	37	42	0.0	37	42	0.0	55	63	0.0	43	50	0.0	43	50	0.0	52	52
1960	2.4	74	88	2.0	31	37	0.0	34	40	0.0	37	44	0.0	37	44	0.0	55	66	0.0	43	52	0.0	43	52	0.0	54	54
1871	2.5	71	88	2.0	31	38	0.0	34	42	0.0	37	46	0.0	37	46	0.0	55	69	0.0	43	54	0.0	43	54	0.0	57	57
1789	2.6	68	88	2.0	31	40	0.0	34	44	0.0	37	48	0.0	37	48	0.0	55	71	0.0	43	56	0.0	43	56	0.0	59	59
1713	2.7	66	88	2.1	31	41	0.0	34	45	0.0	37	50	0.0	37	50	0.0	55	74	0.0	43	58	0.0	43	58	0.0	61	61
1643	2.8	63	88	2.1	31	43	0.0	34	47	0.0	37	51	0.0	37	51	0.0	55	77	0.0	43	60	0.0	43	60	0.0	63	63
1577	2.9	61	88	2.1	31	44	0.0	34	49	0.0	37	53	0.0	37	53	0.0	55	80	0.0	43	62	0.0	43	62	0.0	66	66
1515	3.0	59	88	2.1	31	46	0.0	34	50	0.0	37	55	0.0	37	55	0.0	55	82	0.0	43	64	0.0	43	64	0.0	68	68
1457	3.1	57	88	2.2	31	47	0.0	34	52	0.0	37	57	0.0	37	57	0.0	55	85	0.0	43	67	0.0	43	67	0.0	70	70
1403	3.2	55	88	2.2	31	49	0.0	34	54	0.0	37	59	0.0	37	59	0.0	55	88	0.0	43	69	0.0	43	69	0.0	72	72
1352	3.3	54	88	2.2	31	50	0.0	34	55	0.0	37	60	0.0	37	60	0.0	55	90	0.0	43	71	0.0	43	71	0.0	75	75
1303	3.4	52	88	2.3	31	52	0.0	34	57	0.0	37	62	0.0	37	62	0.0	55	93	0.0	43	73	0.0	43	73	0.0	77	77
1258	3.5	51	88	2.3	31	54	0.0	34	59	0.0	37	64	0.0	37	64	0.0	55	96	0.0	43	75	0.0	43	75	0.0	79	79
1214	3.6	49	88	2.3	31	55	0.0	34	60	0.0	37	66	0.0	37	66	0.0	55	99	0.0	43	77	0.0	43	77	0.0	81	81
1173	3.7	48	88	2.3	31	57	0.0	34	62	0.0	37	68	0.0	37	68	0.0	55	101	0.0	43	79	0.0	43	79	0.0	84	84
1134	3.8	47	88	2.4	31	58	0.0	34	64	0.0	37	70	0.0	37	70	0.0	55	104	0.0	43	82	0.0	43	82	0.0	86	86
1097	3.9	46	88	2.4	31	60	0.0	34	65	0.0	37	71	0.0	37	71	0.0	55	107	0.0	43	84	0.0	43	84	0.0	88	88
1061	4.0	44	88	2.4	31	61	0.0	34	67	0.0	37	73	0.0	37	73	0.0	55	110	0.0	43	86	0.0	43	86	0.0	90	90
1028	4.1	43	88	2.5	31	63	0.0	34	69	0.0	37	75	0.0	37	75	0.0	55	112	0.0	43	88	0.0	43	88	0.0	93	93
995	4.2	42	88	2.5	31	64	0.0	34	70	0.0	37	77	0.0	37	77	0.0	55	115	0.0	43	90	0.0	43	90	0.0	95	95
964	4.3	41	88	2.5	31	66	0.0	34	72	0.0	37	79	0.0	37	79	0.0	55	118	0.0	43	92	0.0	43	92	0.0	97	97
934	4.4	40	88	2.6	31	67	0.0	34	74	0.0	37	80	0.0	37	80	0.0	55	120	0.0	43	94	0.0	43	94	0.0	99	99
905	4.5	40	88	2.6	31	69	0.0	34	75	0.0	37	82	0.0	37	82	0.0	55	123	0.0	43	96	0.0	43	96	0.0	102	102
877	4.6	39	88	2.6	31	70	0.0	34	77	0.0	37	84	0.0	37	84	0.0	55	126	0.0	43	99	0.0	43	99	0.0	104	104
851	4.7	38	88	2.7	31	72	0.0	34	79	0.0	37	86	0.0	37	86	0.0	55	129	0.0	43	101	0.0	43	101	0.0	106	106
825	4.8	37	88	2.7	31	73	0.0	34	80	0.0	37	88	0.0	37	88	0.0	55	131	0.0	43	103	0.0	43	103	0.0	108	108
800	4.9	36	88	2.7	31	75	0.0	34	82	0.0	37	90	0.0	37	90	0.0	55	134	0.0	43	105	0.0	43	105	0.0	111	111
775	5.0	36	88	2.8	31	76	0.0	34	84	0.0	37	91	0.0	37	91	0.0	55	137	0.0	43	107	0.0	43	107	0.0	113	113
752	5.1	35	88	2.8	31	78	0.0	34	85	0.0	37	93	0.0	37	93	0.0	55	140	0.0	43	109	0.0	43	109	0.0	115	115
729	5.2	34	88	2.8	31	79	0.0	34	87	0.0	37	95	0.0	37	95	0.0	55	142	0.0	43	111	0.0	43	111	0.0	117	117
706	5.3	34	88	2.9	31	81	0.0	34	89	0.0	37	97	0.0	37	97	0.0	55	145	0.0	43	114	0.0	43	114	0.0	120	120
684	5.4	33	88	2.9	31	82	0.0	34	90	0.0	37	99	0.0	37	99	0.0	55	148	0.0	43	116	0.0	43	116	0.0	122	122
663	5.5	32	88	3.0	34	92	2.0	34	92	0.0	37	100	0.0	37	100	0.0	55	150	0.0	43	118	0.0	43	118	0.0	124	124
641	5.6	33	80	3.0	34	94	2.0	34	94	0.0	37	102	0.0	37	102	0.0	55	153	0.0	43	120	0.0	43	120	0.0	126	126
621	5.7	32	91	3.0	34	95	2.0	34	95	0.0	37	104	0.0	37	104	0.0	55	156	0.0	43	122	0.0	43	122	0.0	129	129
602	5.8	33	93	3.1	34	98	2.1	34	97	0.0	37	106	0.0	37	106	0.0	55	159	0.0	43	124	0.0	43	124	0.0	131	131
583	5.9	33	95	3.1	34	99	2.1	34	99	0.0	37	108	0.0	37	108	0.0	55	161	0.0	43	126	0.0	43	126	0.0	133	133
565	6.0	33	97	3.2	34	101	2.2	34	100	0.0	37	110	0.0	37	110	0.0	55	164	0.0	43	128	0.0	43	128	0.0	135	135
548	6.1	33	98	3.2	34	103	2.2	34	102	0.0	37	111	0.0	37	111	0.0	55	167	0.0	43	131	0.0	43	131	0.0	138	138
531	6.2	33	101	3.3	34	105	2.3	34	104	0.0	37	113	0.0	37	113	0.0	55	170	0.0	43	133	0.0	43	133	0.0	140	140
515	6.3	33	102	3.3	34	107	2.3	34	105	0.0	37	115	0.0	37	115	0.0	55	172	0.0	43	135	0.0	43	135	0.0	142	142
499	6.4	33	104	3.4	35	109	2.4	34	107	0.0	37	117	0.0	37	117	0.0	55	175	0.0	43	137	0.0	43	137	0.0	144	144
484	6.5	33	106	3.4	35	111	2.4	34	109	0.0	37	119	0.0	37	119	0.0	55	178	0.0	43	139	0.0	43	139	0.0	147	147
469	6.6	33	108	3.5	35	113	2.5	34	110	0.0	37	120	0.0	37	120	0.0	55	180	0.0	43	141	0.0	43	141	0.0	149	149
455	6.7	33	110	3.5	35	115	2.5	34	112	0.0	37	122	0.0	37	122	0.0	55	183	0.0	43	143	0.0	43	143	0.0	151	151
441	6.8	33	112	3.6	35	117	2.6	34	114	0.0	37	124	0.0	37	124	0.0	55	186	0.0	43	146	0.0	43	146	0.0	153	153
427	6.9	33	113	3.6	35	119	2.6	34	115	0.0	37	126	0.0	37	126	0.0	55	189	0.0	43	148	0.0	43	148	0.0	156	156
414	7.0	34	116	3.7	35	121	2.7	34	117	0.0	37	128	0.0	37	128	0.0	55	191	0.0	43	150	0.0	43	150	0.0	158	158
400	7.1	34	118	3.8	35	123	2.8	34	119	0.0	37	130	0.0	37	130	0.0	55	194	0.0	43	152	0.0	43	152	0.0	160	160
387	7.2	34	119	3.8	35	125	2.8	34	120	0.0	37	131	0.0	37	131	0.0	55	197	0.0	43	154	0.0	43	154	0.0	162	162
374	7.3	34	122	3.9	35	127	2.9	34	122	0.0	37	133	0.0	37	133	0.0	55	200	0.0	43	156	0.0	43	156	0.0	165	16

SPECIFICATION REFERENCE		DESIGN FACTORS FOR A DESIGN SPEED OF 35 MPH (RURAL) USING E = 8% MAX.																																									
		DESIGN VELOCITY -35														INTERCHANGE RAMPS																											
		WIDTH= 18 FT							WIDTH=20 FT							WIDTH=22 FT							WIDTH=24 FT							WIDTH=48 FT							WIDTH=72 FT						
		1 @ 9'		1 @ 10'		1 @ 11'			1 @ 12'		2 @ 12'		3 @ 12'			16 FT		18 FT																									
RADIUS(FT)	E(%)	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	w									
5000	NC	0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0									
3149	2.0	30	30	0.0	33	3.3	0.0	36	3.6	0.0	39	3.9	0.0	59	5.9	0.0	78	7.8	0.0	78	7.8	0.0	78	7.8	0.0	46	4.6	48	4.8	48	4.8	48	4.8	48	4.8	48	4.8						
2866	2.1	30	31	0.0	33	3.4	0.0	36	3.8	0.0	39	4.1	0.0	59	6.1	0.0	78	8.2	0.0	78	8.2	0.0	78	8.6	0.0	46	5.0	48	5.3	48	5.3	48	5.3	48	5.3	48	5.3						
2865	2.2	30	32	0.0	33	3.6	0.0	36	4.0	0.0	39	4.3	0.0	59	6.4	0.0	78	8.6	0.0	78	8.6	0.0	78	8.6	0.0	46	5.0	48	5.3	48	5.3	48	5.3	48	5.3	48	5.3						
2698	2.3	30	34	0.0	33	3.8	0.0	36	4.4	0.0	39	4.7	0.0	59	6.7	0.0	78	9.0	0.0	78	9.0	0.0	78	9.0	0.0	46	5.2	48	5.6	48	5.6	48	5.6	48	5.6	48	5.6						
2573	2.4	30	35	0.0	33	3.9	0.0	36	4.5	0.0	39	4.8	0.0	59	7.0	0.0	78	9.3	0.0	78	9.3	0.0	78	9.3	0.0	46	5.5	48	5.8	48	5.8	48	5.8	48	5.8	48	5.8						
2457	2.5	83	103	2.0	33	4.1	0.0	36	4.5	0.0	39	4.9	0.0	59	7.3	0.0	78	9.7	0.0	78	9.7	0.0	78	9.7	0.0	46	5.7	48	6.0	48	6.0	48	6.0	48	6.0	48	6.0						
2350	2.6	80	103	2.0	33	4.2	0.0	36	4.7	0.0	39	5.1	0.0	59	7.6	0.0	78	10.1	0.0	78	10.1	0.0	78	10.1	0.0	46	5.9	48	6.3	48	6.3	48	6.3	48	6.3	48	6.3						
2251	2.7	77	103	2.0	33	4.4	0.0	36	4.8	0.0	39	5.3	0.0	59	7.9	0.0	78	10.5	0.0	78	10.5	0.0	78	10.5	0.0	46	6.1	48	6.5	48	6.5	48	6.5	48	6.5	48	6.5						
2159	2.8	74	103	2.0	33	4.6	0.0	36	5.0	0.0	39	5.5	0.0	59	8.2	0.0	78	10.9	0.0	78	10.9	0.0	78	10.9	0.0	46	6.4	48	6.8	48	6.8	48	6.8	48	6.8	48	6.8	48	6.8				
2073	2.9	72	103	2.1	33	4.7	0.0	36	5.2	0.0	39	5.7	0.0	59	8.5	0.0	78	11.3	0.0	78	11.3	0.0	78	11.3	0.0	46	6.6	48	7.0	48	7.0	48	7.0	48	7.0	48	7.0	48	7.0				
1993	3.0	69	103	2.1	33	4.9	0.0	36	5.4	0.0	39	5.9	0.0	59	8.8	0.0	78	11.7	0.0	78	11.7	0.0	78	11.7	0.0	46	6.8	48	7.2	48	7.2	48	7.2	48	7.2	48	7.2	48	7.2				
1917	3.1	67	103	2.1	33	5.0	0.0	36	5.5	0.0	39	6.0	0.0	59	9.0	0.0	78	12.0	0.0	78	12.0	0.0	78	12.0	0.0	46	7.0	48	7.4	48	7.4	48	7.4	48	7.4	48	7.4	48	7.4				
1847	3.2	65	103	2.1	33	5.2	0.0	36	5.7	0.0	39	6.2	0.0	59	9.3	0.0	78	12.4	0.0	78	12.4	0.0	78	12.4	0.0	46	7.3	48	7.7	48	7.7	48	7.7	48	7.7	48	7.7	48	7.7				
1780	3.3	68	103	2.2	33	5.4	0.0	36	5.9	0.0	39	6.4	0.0	59	9.6	0.0	78	12.8	0.0	78	12.8	0.0	78	12.8	0.0	46	7.5	48	8.0	48	8.0	48	8.0	48	8.0	48	8.0	48	8.0				
1717	3.4	61	103	2.2	33	5.5	0.0	36	6.1	0.0	39	6.6	0.0	59	9.9	0.0	78	13.2	0.0	78	13.2	0.0	78	13.2	0.0	46	7.7	48	8.2	48	8.2	48	8.2	48	8.2	48	8.2	48	8.2				
1658	3.5	59	103	2.2	33	5.7	0.0	36	6.3	0.0	39	6.8	0.0	59	10.2	0.0	78	13.6	0.0	78	13.6	0.0	78	13.6	0.0	46	7.9	48	8.4	48	8.4	48	8.4	48	8.4	48	8.4	48	8.4				
1602	3.6	58	103	2.2	33	5.9	0.0	36	6.4	0.0	39	7.0	0.0	59	10.5	0.0	78	14.0	0.0	78	14.0	0.0	78	14.0	0.0	46	8.2	48	8.7	48	8.7	48	8.7	48	8.7	48	8.7	48	8.7				
1548	3.7	56	103	2.3	33	6.0	0.0	36	6.6	0.0	39	7.2	0.0	59	10.8	0.0	78	14.4	0.0	78	14.4	0.0	78	14.4	0.0	46	8.4	48	8.9	48	8.9	48	8.9	48	8.9	48	8.9	48	8.9				
1497	3.8	55	103	2.3	33	6.2	0.0	36	6.8	0.0	39	7.4	0.0	59	11.1	0.0	78	14.8	0.0	78	14.8	0.0	78	14.8	0.0	46	8.6	48	9.2	48	9.2	48	9.2	48	9.2	48	9.2	48	9.2				
1449	3.9	53	103	2.3	33	6.3	0.0	36	7.0	0.0	39	7.6	0.0	59	11.4	0.0	78	15.1	0.0	78	15.1	0.0	78	15.1	0.0	46	8.8	48	9.4	48	9.4	48	9.4	48	9.4	48	9.4	48	9.4				
1403	4.0	52	103	2.3	33	6.5	0.0	36	7.1	0.0	39	7.8	0.0	59	11.7	0.0	78	15.5	0.0	78	15.5	0.0	78	15.5	0.0	46	9.1	48	9.6	48	9.6	48	9.6	48	9.6	48	9.6	48	9.6				
1359	4.1	51	103	2.4	33	6.7	0.0	36	7.3	0.0	39	8.0	0.0	59	12.0	0.0	78	15.9	0.0	78	15.9	0.0	78	15.9	0.0	46	9.3	48	9.9	48	9.9	48	9.9	48	9.9	48	9.9	48	9.9				
1317	4.2	50	103	2.4	33	6.8	0.0	36	7.5	0.0	39	8.2	0.0	59	12.2	0.0	78	16.3	0.0	78	16.3	0.0	78	16.3	0.0	46	9.5	48	10.1	48	10.1	48	10.1	48	10.1	48	10.1	48	10.1				
1277	4.3	48	103	2.4	33	7.0	0.0	36	7.7	0.0	39	8.4	0.0	59	12.5	0.0	78	16.7	0.0	78	16.7	0.0	78	16.7	0.0	46	9.7	48	10.4	48	10.4	48	10.4	48	10.4	48	10.4	48	10.4				
1238	4.4	47	103	2.4	33	7.1	0.0	36	7.9	0.0	39	8.6	0.0	59	12.8	0.0	78	17.1	0.0	78	17.1	0.0	78	17.1	0.0	46	10.0	48	10.6	48	10.6	48	10.6	48	10.6	48	10.6	48	10.6				
1201	4.5	46	103	2.5	33	7.3	0.0	36	8.0	0.0	39	8.8	0.0	59	13.1	0.0	78	17.5	0.0	78	17.5	0.0	78	17.5	0.0	46	10.2	48	10.8	48	10.8	48	10.8	48	10.8	48	10.8	48	10.8				
1165	4.6	45	103	2.5	33	7.5	0.0	36	8.2	0.0	39	9.0	0.0	59	13.4	0.0	78	17.9	0.0	78	17.9	0.0	78	17.9	0.0	46	10.4	48	11.1	48	11.1	48	11.1	48	11.1	48	11.1	48	11.1				
1131	4.7	44	103	2.5	33	7.6	0.0	36	8.4	0.0	39	9.1	0.0	59	13.7	0.0	78	18.2	0.0	78	18.2	0.0	78	18.2	0.0	46	10.6	48	11.3	48	11.3	48	11.3	48	11.3	48	11.3	48	11.3				
1097	4.8	43	103	2.6	33	7.8	0.0	36	8.6	0.0	39	9.3	0.0	59	14.0	0.0	78	18.6	0.0	78	18.6	0.0	78	18.6	0.0	46	10.9	48	11.6	48	11.6	48	11.6	48	11.6	48	11.6	48	11.6				
1065	4.9	43	103	2.6	33	8.0	0.0	36	8.7	0.0	39	9.5	0.0	59	14.3	0.0	78	19.0	0.0	78	19.0	0.0	78	19.0	0.0	46	11.1	48	11.8	48	11.8	48	11.8	48	11.8	48	11.8	48	11.8				
1034	5.0	42	103	2.6	33	8.1	0.0	36	8.9	0.0	39	9.7	0.0	59	14.6	0.0	78	19.4	0.0	78	19.4	0.0	78	19.4	0.0	46	11.3	48	12.0	48	12.0	48	12.0	48	12.0	48	12.0	48	12.0				
1004	5.1	41	103	2.6	33	8.3	0.0	36	9.1	0.0	39	9.9	0.0	59	14.9	0.0	78	19.8	0.0	78	19.8	0.0	78	19.8	0.0	46	11.5	48	12.3	48	12.3	48	12.3	48	12.3	48	12.3	48	12.3				
975	5.2	40	103	2.7	33	8.4	0.0	36	9.3	0.0	39	10.1	0.0	59	15.1	0.0	78	20.2	0.0	78	20.2	0.0	78	20.2	0.0	46	11.8	48	12.5	48	12.5	48	12.5	48	12.5	48	12.5	48	12.5				
946	5.3	39	103	2.7	33	8.6	0.0	36	9.5	0.0	39	10.3	0.0	59	15.4	0.0	78	20.6	0.0	78	20.6	0.0	78	20.6	0.0	46	12.0	48	12.8	48	12.8	48	12.8	48	12.8	48	12.8	48	12.8				
918	5.4	39	103	2.7	33	8.8	0.0	36	9.6	0.0	39	10.5	0.0	59	15.7	0.0	78	21.0	0.0	78	21.0	0.0	78	21.0	0.0	46	12.2	48	13.0	48	13.0	48	13.0	48	13.0	48	13.0	48	13.0				
891	5.5	38	103	2.8	33	8.9	0.0	36	9.8	0.0	39	10.7	0.0	59	16.0	0.0	78	21.3	0.0	78	21.3	0.0	78	21.3	0.0	46	12.4	48	13.2	48	13.2	48	13.2	48	13.2	48	13.2	48	13.2				
864	5.6	37	103	2.8	33	9.1	0.0	36	10.0	0.0	39	10.9	0.0	59	16.3	0.0	78	21.7	0.0	78	21.7	0.0	78	21.7	0.0	46	12.7	48	13.5	48	13.5	48											

DESIGN FACTORS FOR A DESIGN SPEED OF 40 MPH (RURAL) USING E = 8% MAX.

DESIGN VELOCITY -40	DESIGN SOFTWARE EQUIVALENTS (NUMBER OF LANES AT LANE WIDTH)										INTERCHANGE RAMPS							
	1 @ 9'		1 @ 10'		1 @ 11'		1 @ 12'		2 @ 12'		3 @ 12'		16 FT		18 FT			
	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	
6000	NC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4000	2.0	32	32	0.0	35	35	0.0	38	38	0.0	42	42	0.0	63	63	0.0	83	83
3792	2.1	32	33	0.0	35	37	0.0	38	40	0.0	42	44	0.0	63	66	0.0	83	87
3603	2.2	32	35	0.0	35	38	0.0	38	42	0.0	42	46	0.0	63	69	0.0	83	92
3430	2.3	32	36	0.0	35	40	0.0	38	44	0.0	42	48	0.0	63	72	0.0	83	96
3271	2.4	32	38	0.0	35	42	0.0	38	46	0.0	42	50	0.0	63	75	0.0	83	100
3125	2.5	32	39	0.0	35	44	0.0	38	48	0.0	42	52	0.0	63	78	0.0	83	104
2990	2.6	32	41	0.0	35	45	0.0	38	50	0.0	42	54	0.0	63	81	0.0	83	108
2866	2.7	32	42	0.0	35	47	0.0	38	52	0.0	42	56	0.0	63	84	0.0	83	112
2748	2.8	84	117	2.0	35	49	0.0	38	54	0.0	42	58	0.0	63	87	0.0	83	116
2640	2.9	81	117	2.0	35	50	0.0	38	55	0.0	42	60	0.0	63	90	0.0	83	120
2538	3.0	78	117	2.0	35	52	0.0	38	57	0.0	42	63	0.0	63	94	0.0	83	125
2443	3.1	76	117	2.1	35	54	0.0	38	59	0.0	42	65	0.0	63	97	0.0	83	129
2354	3.2	74	117	2.1	35	56	0.0	38	61	0.0	42	67	0.0	63	100	0.0	83	133
2269	3.3	71	117	2.1	35	57	0.0	38	63	0.0	42	69	0.0	63	103	0.0	83	137
2190	3.4	69	117	2.1	35	59	0.0	38	65	0.0	42	71	0.0	63	106	0.0	83	141
2115	3.5	67	117	2.2	35	61	0.0	38	67	0.0	42	73	0.0	63	109	0.0	83	145
2044	3.6	65	117	2.2	35	63	0.0	38	69	0.0	42	75	0.0	63	112	0.0	83	149
1977	3.7	64	117	2.2	35	64	0.0	38	71	0.0	42	77	0.0	63	115	0.0	83	154
1913	3.8	62	117	2.2	35	66	0.0	38	73	0.0	42	79	0.0	63	118	0.0	83	158
1852	3.9	60	117	2.2	35	68	0.0	38	74	0.0	42	81	0.0	63	122	0.0	83	162
1794	4.0	59	117	2.3	35	69	0.0	38	76	0.0	42	83	0.0	63	125	0.0	83	166
1739	4.1	58	117	2.3	35	71	0.0	38	78	0.0	42	85	0.0	63	128	0.0	83	170
1686	4.2	56	117	2.3	35	73	0.0	38	80	0.0	42	87	0.0	63	131	0.0	83	174
1635	4.3	55	117	2.3	35	75	0.0	38	82	0.0	42	89	0.0	63	134	0.0	83	178
1587	4.4	54	117	2.4	35	76	0.0	38	84	0.0	42	92	0.0	63	137	0.0	83	183
1540	4.5	52	117	2.4	35	78	0.0	38	86	0.0	42	94	0.0	63	140	0.0	83	187
1495	4.6	51	117	2.4	35	80	0.0	38	88	0.0	42	96	0.0	63	143	0.0	83	191
1452	4.7	50	117	2.4	35	82	0.0	38	90	0.0	42	98	0.0	63	146	0.0	83	195
1411	4.8	49	117	2.5	35	83	0.0	38	92	0.0	42	100	0.0	63	149	0.0	83	199
1370	4.9	48	117	2.5	35	85	0.0	38	93	0.0	42	102	0.0	63	153	0.0	83	203
1332	5.0	47	117	2.5	35	87	0.0	38	95	0.0	42	104	0.0	63	156	0.0	83	207
1294	5.1	46	117	2.5	35	88	0.0	38	97	0.0	42	106	0.0	63	159	0.0	83	212
1258	5.2	45	117	2.6	35	90	0.0	38	99	0.0	42	108	0.0	63	162	0.0	83	216
1222	5.3	45	117	2.6	35	92	0.0	38	101	0.0	42	110	0.0	63	165	0.0	83	220
1188	5.4	44	117	2.6	35	94	0.0	38	103	0.0	42	112	0.0	63	168	0.0	83	224
1154	5.5	43	117	2.7	35	95	0.0	38	105	0.0	42	114	0.0	63	171	0.0	83	228
1122	5.6	42	117	2.7	35	97	0.0	38	107	0.0	42	116	0.0	63	174	0.0	83	232
1090	5.7	42	117	2.7	35	99	0.0	38	109	0.0	42	118	0.0	63	177	0.0	83	236
1058	5.8	41	117	2.7	35	100	0.0	38	110	0.0	42	120	0.0	63	180	0.0	83	240
1028	5.9	40	117	2.8	35	102	0.0	38	112	0.0	42	123	0.0	63	184	0.0	83	245
999	6.0	39	117	2.8	35	104	0.0	38	114	0.0	42	125	0.0	63	187	0.0	83	249
971	6.1	39	117	2.8	35	106	0.0	38	116	0.0	42	127	0.0	63	190	0.0	83	253
944	6.2	38	117	2.9	35	107	0.0	38	118	0.0	42	129	0.0	63	193	0.0	83	257
917	6.3	38	117	2.9	35	109	0.0	38	120	0.0	42	131	0.0	63	196	0.0	83	261
891	6.4	37	117	2.9	35	111	0.0	38	122	0.0	42	133	0.0	63	199	0.0	83	265
866	6.5	37	118	3.0	39	124	2.0	38	124	0.0	42	135	0.0	63	202	0.0	83	269
842	6.6	37	120	3.0	39	126	2.0	38	126	0.0	42	137	0.0	63	205	0.0	83	274
818	6.7	37	122	3.0	39	128	2.0	38	128	0.0	42	139	0.0	63	208	0.0	83	278
794	6.8	37	124	3.1	39	130	2.1	38	129	0.0	42	141	0.0	63	212	0.0	83	282
771	6.9	37	126	3.1	39	132	2.1	38	131	0.0	42	143	0.0	63	215	0.0	83	286
748	7.0	37	128	3.2	39	134	2.2	38	133	0.0	42	145	0.0	63	218	0.0	83	290
726	7.1	37	130	3.2	39	136	2.2	38	135	0.0	42	147	0.0	63	221	0.0	83	294
703	7.2	37	133	3.3	39	139	2.3	38	137	0.0	42	149	0.0	63	224	0.0	83	298
681	7.3	37	135	3.3	39	141	2.3	38	139	0.0	42	152	0.0	63	227	0.0	83	303
658	7.4	38	137	3.4	39	143	2.4	38	141	0.0	42	154	0.0	63	230	0.0	83	307
635	7.5	38	139	3.4	39	145	2.4	38	143	0.0	42	156	0.0	63	233	0.0	83	311
612	7.6	38	141	3.5	39	148	2.5	38	145	0.0	42	158	0.0	63	236	0.0	83	315
587	7.7	38	143	3.5	39	150	2.5	38	147	0.0	42	160	0.0	63	239	0.0	83	319
560	7.8	38	146	3.6	39	152	2.6	38	148	0.0	42	162	0.0	63	243	0.0	83	323
529	7.9	38	148	3.7	40	155	2.7	38	150	0.0	42	164	0.0	63	246	0.0	88	346
465	8.0	38	152	4.0	40	159	3.0	42	166	2.0	42	166	0.0	63	269	0.0	90	359

NOTE: CR, LS & w VALUES IN FEET. LISTED RADIUS IS THE MINIMUM ALLOWABLE RADIUS FOR THE CORRESPONDING E, CR, LS, AND w VALUES.

SPECIFICATION REFERENCE

TRANSITION CURVES - RURAL
40 MPH DESIGN SPEED
VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE		DESIGN FACTORS FOR A DESIGN SPEED OF 45 MPH (RURAL) USING E = 8% MAX.																													
		DESIGN SOFTWARE EQUIVALENTS (NUMBER OF LANES AT LANE WIDTH)														INTERCHANGE RAMPS															
		WIDTH+ 18 FT				WIDTH+20 FT				WIDTH+22 FT				WIDTH+24 FT				WIDTH+48 FT				WIDTH+72 FT				WIDTH					
		1 @ 9'		1 @ 10'		1 @ 11'		1 @ 12'		2 @ 12'		3 @ 12'		16 FT		18 FT															
		CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	w
8000	NC	0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
4957	2.0	34	34	0.0	38	38	0.0	41	41	0.0	45	45	0.0	67	67	0.0	67	67	0.0	89	89	0.0	89	89	0.0	53	53	56	56	56	
4702	2.1	34	35	0.0	38	39	0.0	41	43	0.0	45	47	0.0	67	70	0.0	67	74	0.0	89	94	0.0	89	98	0.0	53	56	56	59	59	
4467	2.2	34	37	0.0	38	41	0.0	41	45	0.0	45	49	0.0	67	74	0.0	67	74	0.0	89	98	0.0	89	98	0.0	53	58	56	61	61	
4254	2.3	34	39	0.0	38	43	0.0	41	47	0.0	45	52	0.0	67	77	0.0	67	77	0.0	89	103	0.0	89	103	0.0	53	61	56	64	64	
4057	2.4	34	40	0.0	38	45	0.0	41	49	0.0	45	54	0.0	67	80	0.0	67	80	0.0	89	107	0.0	89	107	0.0	53	63	56	67	67	
3876	2.5	34	42	0.0	38	47	0.0	41	51	0.0	45	56	0.0	67	84	0.0	67	84	0.0	89	112	0.0	89	112	0.0	53	66	56	70	70	
3710	2.6	34	44	0.0	38	49	0.0	41	53	0.0	45	58	0.0	67	87	0.0	67	87	0.0	89	116	0.0	89	116	0.0	53	69	56	72	72	
3554	2.7	34	45	0.0	38	50	0.0	41	55	0.0	45	60	0.0	67	90	0.0	67	90	0.0	89	120	0.0	89	120	0.0	53	71	56	75	75	
3412	2.8	34	47	0.0	38	52	0.0	41	58	0.0	45	63	0.0	67	94	0.0	67	94	0.0	89	125	0.0	89	125	0.0	53	74	56	78	78	
3278	2.9	34	49	0.0	38	54	0.0	41	60	0.0	45	65	0.0	67	97	0.0	67	97	0.0	89	129	0.0	89	129	0.0	53	77	56	81	81	
3152	3.0	34	50	0.0	38	56	0.0	41	62	0.0	45	67	0.0	67	100	0.0	67	100	0.0	89	134	0.0	89	134	0.0	53	79	56	84	84	
3035	3.1	34	52	0.0	38	58	0.0	41	64	0.0	45	69	0.0	67	104	0.0	67	104	0.0	89	138	0.0	89	138	0.0	53	82	56	86	86	
2925	3.2	34	54	0.0	38	60	0.0	41	66	0.0	45	72	0.0	67	107	0.0	67	107	0.0	89	143	0.0	89	143	0.0	53	84	56	89	89	
2866	3.3	34	55	0.0	38	62	0.0	41	68	0.0	45	74	0.0	67	110	0.0	67	110	0.0	89	147	0.0	89	147	0.0	53	87	56	92	92	
2865	3.3	80	132	2.1	38	62	0.0	41	68	0.0	45	74	0.0	67	110	0.0	67	110	0.0	89	147	0.0	89	147	0.0	53	87	56	92	92	
2822	3.3	80	132	2.1	38	62	0.0	41	68	0.0	45	74	0.0	67	110	0.0	67	110	0.0	89	147	0.0	89	147	0.0	53	87	56	92	92	
2724	3.4	78	132	2.1	38	63	0.0	41	70	0.0	45	76	0.0	67	114	0.0	67	114	0.0	89	152	0.0	89	152	0.0	53	90	56	95	95	
2631	3.5	76	132	2.1	38	65	0.0	41	72	0.0	45	78	0.0	67	117	0.0	67	117	0.0	89	156	0.0	89	156	0.0	53	92	56	97	97	
2544	3.6	74	132	2.1	38	67	0.0	41	74	0.0	45	80	0.0	67	120	0.0	67	120	0.0	89	160	0.0	89	160	0.0	53	95	56	100	100	
2461	3.7	72	132	2.2	38	69	0.0	41	76	0.0	45	83	0.0	67	124	0.0	67	124	0.0	89	165	0.0	89	165	0.0	53	98	56	103	103	
2383	3.8	70	132	2.2	38	71	0.0	41	78	0.0	45	85	0.0	67	127	0.0	67	127	0.0	89	169	0.0	89	169	0.0	53	100	56	106	106	
2308	3.9	68	132	2.2	38	73	0.0	41	80	0.0	45	87	0.0	67	130	0.0	67	130	0.0	89	174	0.0	89	174	0.0	53	103	56	108	108	
2237	4.0	66	132	2.2	38	75	0.0	41	82	0.0	45	89	0.0	67	134	0.0	67	134	0.0	89	178	0.0	89	178	0.0	53	105	56	111	111	
2169	4.1	65	132	2.2	38	76	0.0	41	84	0.0	45	92	0.0	67	137	0.0	67	137	0.0	89	183	0.0	89	183	0.0	53	108	56	114	114	
2104	4.2	63	132	2.3	38	78	0.0	41	86	0.0	45	94	0.0	67	140	0.0	67	140	0.0	89	187	0.0	89	187	0.0	53	111	56	117	117	
2041	4.3	62	132	2.3	38	80	0.0	41	88	0.0	45	96	0.0	67	144	0.0	67	144	0.0	89	192	0.0	89	192	0.0	53	113	56	120	120	
1982	4.4	60	132	2.3	38	82	0.0	41	90	0.0	45	98	0.0	67	147	0.0	67	147	0.0	89	196	0.0	89	196	0.0	53	116	56	122	122	
1924	4.5	59	132	2.3	38	84	0.0	41	92	0.0	45	100	0.0	67	150	0.0	67	150	0.0	89	200	0.0	89	200	0.0	53	119	56	125	125	
1870	4.6	58	132	2.4	38	86	0.0	41	94	0.0	45	103	0.0	67	154	0.0	67	154	0.0	89	205	0.0	89	205	0.0	53	121	56	128	128	
1817	4.7	57	132	2.4	38	88	0.0	41	96	0.0	45	105	0.0	67	157	0.0	67	157	0.0	89	209	0.0	89	209	0.0	53	124	56	131	131	
1766	4.8	55	132	2.4	38	89	0.0	41	98	0.0	45	107	0.0	67	160	0.0	67	160	0.0	89	214	0.0	89	214	0.0	53	126	56	133	133	
1717	4.9	54	132	2.4	38	91	0.0	41	100	0.0	45	109	0.0	67	164	0.0	67	164	0.0	89	218	0.0	89	218	0.0	53	129	56	136	136	
1669	5.0	53	132	2.4	38	93	0.0	41	102	0.0	45	112	0.0	67	167	0.0	67	167	0.0	89	223	0.0	89	223	0.0	53	132	56	139	139	
1624	5.1	52	132	2.5	38	95	0.0	41	104	0.0	45	114	0.0	67	170	0.0	67	170	0.0	89	227	0.0	89	227	0.0	53	134	56	142	142	
1579	5.2	51	132	2.5	38	97	0.0	41	106	0.0	45	116	0.0	67	174	0.0	67	174	0.0	89	232	0.0	89	232	0.0	53	137	56	144	144	
1536	5.3	50	132	2.5	38	99	0.0	41	108	0.0	45	118	0.0	67	177	0.0	67	177	0.0	89	236	0.0	89	236	0.0	53	140	56	147	147	
1495	5.4	49	132	2.5	38	100	0.0	41	110	0.0	45	120	0.0	67	180	0.0	67	180	0.0	89	240	0.0	89	240	0.0	53	142	56	150	150	
1454	5.5	48	132	2.6	38	102	0.0	41	113	0.0	45	123	0.0	67	184	0.0	67	184	0.0	89	245	0.0	89	245	0.0	53	145	56	153	153	
1415	5.6	48	132	2.6	38	104	0.0	41	115	0.0	45	125	0.0	67	187	0.0	67	187	0.0	89	249	0.0	89	249	0.0	53	147	56	156	156	
1376	5.7	47	132	2.6	38	106	0.0	41	117	0.0	45	127	0.0	67	190	0.0	67	190	0.0	89	254	0.0	89	254	0.0	53	150	56	158	158	
1339	5.8	46	132	2.6	38	108	0.0	41	119	0.0	45	129	0.0	67	194	0.0	67	194	0.0	89	258	0.0	89	258	0.0	53	153	56	161	161	
1302	5.9	45	132	2.7	38	110	0.0	41	121	0.0	45	132	0.0	67	197	0.0	67	197	0.0	89	263	0.0	89	263	0.0	53	155	56	164	164	
1266	6.0	44	132	2.7	38	112	0.0	41	123	0.0	45	134	0.0	67	200	0.0	67	200	0.0	89	267	0.0	89	267	0.0	53	158	56	167	167	
1232	6.1	44	132	2.7	38	113	0.0	41	125	0.0	45	136	0.0	67	204	0.0	67	204	0.0	89	272	0.0	89	272	0.0	53	160	56	169	169	
1199	6.2	43	132	2.8	38	115	0.0	41	127	0.0	45	138	0.0	67	207	0.0	67	207	0.0	89	276	0.0	89	276	0.0	53	163	56	172	172	
1166	6.3	42	132	2.8	38	117	0.0	41	129	0.0	45	140	0.0	67	210	0.0	67	210	0.0	89	280	0.0	89	280	0.0	53	166	56	175	175	
1135	6.4	42	132	2.8	38	119	0.0	41	131	0.0	45	143	0.0	67	214	0.0	67	214	0.0	89	285	0.0	89	285	0.0	53	168	56	178	178	
1104	6.5	41	132	2.8	38	121	0.0	41	133</																						

SPECIFICATION REFERENCE		DESIGN FACTORS FOR A DESIGN SPEED OF 55 MPH (RURAL) USING E = 8% MAX.																															
		DESIGN SOFTWARE EQUIVALENTS (NUMBER OF LANES AT LANE WIDTH)														INTERCHANGE RAMPS																	
		WIDTH+18 FT				WIDTH+20 FT				WIDTH+22 FT				WIDTH+24 FT				WIDTH+48 FT				WIDTH+72 FT				16 FT				18 FT			
		DESIGN VELOCITY -55		1 @ 9'		1 @ 10'		1 @ 11'		1 @ 12'		2 @ 12'		3 @ 12'		CR		LS		CR		LS		CR		LS		CR		LS			
10000	NC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
7190	2.0	39	39	0.0	43	43	0.0	47	47	0.0	52	52	0.0	57	57	0.0	62	62	0.0	67	67	0.0	72	72	0.0	77	77	0.0	82	82			
6821	2.1	39	41	0.0	43	45	0.0	47	50	0.0	52	54	0.0	57	61	0.0	62	65	0.0	67	71	0.0	72	76	0.0	77	81	0.0	82	86			
6485	2.2	39	43	0.0	43	47	0.0	47	52	0.0	52	57	0.0	57	63	0.0	62	68	0.0	67	74	0.0	72	79	0.0	77	85	0.0	82	90			
6179	2.3	39	45	0.0	43	49	0.0	47	54	0.0	52	59	0.0	57	65	0.0	62	70	0.0	67	77	0.0	72	83	0.0	77	89	0.0	82	94			
5897	2.4	39	46	0.0	43	52	0.0	47	57	0.0	52	62	0.0	57	70	0.0	62	75	0.0	67	82	0.0	72	88	0.0	77	96	0.0	82	100			
5638	2.5	39	48	0.0	43	54	0.0	47	59	0.0	52	64	0.0	57	73	0.0	62	77	0.0	67	85	0.0	72	91	0.0	77	99	0.0	82	104			
5399	2.6	39	50	0.0	43	56	0.0	47	61	0.0	52	67	0.0	57	76	0.0	62	79	0.0	67	88	0.0	72	94	0.0	77	100	0.0	82	108			
5177	2.7	39	52	0.0	43	58	0.0	47	64	0.0	52	69	0.0	57	79	0.0	62	81	0.0	67	91	0.0	72	96	0.0	77	104	0.0	82	112			
4972	2.8	39	54	0.0	43	60	0.0	47	66	0.0	52	72	0.0	57	82	0.0	62	83	0.0	67	94	0.0	72	100	0.0	77	108	0.0	82	118			
4779	2.9	39	56	0.0	43	62	0.0	47	68	0.0	52	75	0.0	57	85	0.0	62	86	0.0	67	95	0.0	72	102	0.0	77	112	0.0	82	122			
4600	3.0	39	58	0.0	43	64	0.0	47	71	0.0	52	77	0.0	57	88	0.0	62	90	0.0	67	99	0.0	72	104	0.0	77	115	0.0	82	128			
4432	3.1	39	60	0.0	43	66	0.0	47	73	0.0	52	80	0.0	57	91	0.0	62	93	0.0	67	102	0.0	72	106	0.0	77	119	0.0	82	132			
4274	3.2	39	62	0.0	43	69	0.0	47	75	0.0	52	82	0.0	57	94	0.0	62	96	0.0	67	105	0.0	72	108	0.0	77	123	0.0	82	138			
4125	3.3	39	64	0.0	43	71	0.0	47	78	0.0	52	85	0.0	57	97	0.0	62	99	0.0	67	108	0.0	72	110	0.0	77	127	0.0	82	142			
3986	3.4	39	66	0.0	43	73	0.0	47	80	0.0	52	87	0.0	57	100	0.0	62	101	0.0	67	110	0.0	72	112	0.0	77	131	0.0	82	146			
3853	3.5	39	68	0.0	43	75	0.0	47	82	0.0	52	90	0.0	57	103	0.0	62	103	0.0	67	112	0.0	72	114	0.0	77	135	0.0	82	150			
3728	3.6	39	69	0.0	43	77	0.0	47	85	0.0	52	92	0.0	57	106	0.0	62	105	0.0	67	114	0.0	72	116	0.0	77	138	0.0	82	154			
3610	3.7	39	71	0.0	43	79	0.0	47	87	0.0	52	95	0.0	57	109	0.0	62	107	0.0	67	116	0.0	72	118	0.0	77	142	0.0	82	158			
3498	3.8	39	73	0.0	43	81	0.0	47	89	0.0	52	98	0.0	57	111	0.0	62	109	0.0	67	118	0.0	72	120	0.0	77	146	0.0	82	162			
3391	3.9	39	75	0.0	43	83	0.0	47	92	0.0	52	100	0.0	57	114	0.0	62	111	0.0	67	120	0.0	72	122	0.0	77	149	0.0	82	166			
3289	4.0	39	77	0.0	43	86	0.0	47	94	0.0	52	103	0.0	57	117	0.0	62	113	0.0	67	122	0.0	72	124	0.0	77	154	0.0	82	170			
3192	4.1	39	79	0.0	43	88	0.0	47	96	0.0	52	105	0.0	57	119	0.0	62	115	0.0	67	124	0.0	72	126	0.0	77	158	0.0	82	174			
3100	4.2	39	81	0.0	43	90	0.0	47	99	0.0	52	108	0.0	57	121	0.0	62	117	0.0	67	126	0.0	72	128	0.0	77	161	0.0	82	178			
3011	4.3	39	83	0.0	43	92	0.0	47	101	0.0	52	110	0.0	57	123	0.0	62	119	0.0	67	128	0.0	72	130	0.0	77	165	0.0	82	182			
2927	4.4	39	85	0.0	43	94	0.0	47	103	0.0	52	113	0.0	57	125	0.0	62	121	0.0	67	130	0.0	72	132	0.0	77	169	0.0	82	186			
2866	4.5	39	87	0.0	43	96	0.0	47	106	0.0	52	115	0.0	57	127	0.0	62	123	0.0	67	132	0.0	72	134	0.0	77	173	0.0	82	190			
2865	4.5	72	161	2.2	43	96	0.0	47	106	0.0	52	115	0.0	57	127	0.0	62	123	0.0	67	132	0.0	72	134	0.0	77	173	0.0	82	190			
2846	4.5	72	161	2.3	43	96	0.0	47	106	0.0	52	115	0.0	57	127	0.0	62	123	0.0	67	132	0.0	72	134	0.0	77	173	0.0	82	190			
2768	4.6	70	161	2.3	43	98	0.0	47	108	0.0	52	118	0.0	57	129	0.0	62	126	0.0	67	134	0.0	72	136	0.0	77	177	0.0	82	194			
2693	4.7	69	161	2.3	43	100	0.0	47	110	0.0	52	120	0.0	57	131	0.0	62	128	0.0	67	136	0.0	72	138	0.0	77	180	0.0	82	198			
2621	4.8	68	161	2.3	43	103	0.0	47	113	0.0	52	123	0.0	57	134	0.0	62	131	0.0	67	139	0.0	72	141	0.0	77	184	0.0	82	202			
2552	4.9	66	161	2.3	43	105	0.0	47	115	0.0	52	126	0.0	57	136	0.0	62	133	0.0	67	141	0.0	72	143	0.0	77	188	0.0	82	206			
2486	5.0	65	161	2.3	43	107	0.0	47	118	0.0	52	128	0.0	57	139	0.0	62	135	0.0	67	143	0.0	72	145	0.0	77	192	0.0	82	210			
2421	5.1	64	161	2.4	43	109	0.0	47	120	0.0	52	131	0.0	57	141	0.0	62	137	0.0	67	145	0.0	72	147	0.0	77	196	0.0	82	214			
2359	5.2	62	161	2.4	43	111	0.0	47	122	0.0	52	133	0.0	57	143	0.0	62	139	0.0	67	147	0.0	72	149	0.0	77	200	0.0	82	218			
2299	5.3	61	161	2.4	43	113	0.0	47	125	0.0	52	136	0.0	57	145	0.0	62	141	0.0	67	149	0.0	72	151	0.0	77	203	0.0	82	222			
2241	5.4	60	161	2.4	43	115	0.0	47	127	0.0	52	138	0.0	57	147	0.0	62	143	0.0	67	151	0.0	72	153	0.0	77	207	0.0	82	226			
2185	5.5	59	161	2.5	43	118	0.0	47	129	0.0	52	141	0.0	57	149	0.0	62	145	0.0	67	153	0.0	72	155	0.0	77	211	0.0	82	230			
2130	5.6	58	161	2.5	43	120	0.0	47	132	0.0	52	143	0.0	57	151	0.0	62	147	0.0	67	155	0.0	72	157	0.0	77	215	0.0	82	234			
2077	5.7	57	161	2.5	43	122	0.0	47	134	0.0	52	146	0.0	57	153	0.0	62	149	0.0	67	157	0.0	72	159	0.0	77	219	0.0	82	238			
2026	5.8	56	161	2.5	43	124	0.0	47	136	0.0	52	149	0.0	57	155	0.0	62	151	0.0	67	159	0.0	72	161	0.0	77	223	0.0	82	242			
1976	5.9	55	161	2.5	43	126	0.0	47	139	0.0	52	151	0.0	57	157	0.0	62	153	0.0	67	161	0.0	72	163	0.0	77	227	0.0	82	246			
1927	6.0	54	161	2.6	43	128	0.0	47	141	0.0	52	154	0.0	57	159	0.0	62	155	0.0	67	163	0.0	72	165	0.0	77	231	0.0	82	250			
1880	6.1	53	161	2.6	43	130	0.0	47	143	0.0	52	156	0.0	57	161	0.0	62	157	0.0	67	165	0.0	72	167	0.0	77	235	0.0	82	254			
1833	6.2	52	161	2.6	43	132	0.0	47	146	0.0	52	159	0.0	57	163	0.0	62	159	0.0	67	167	0.0	72	169	0.0	77	239	0.0	82	258			
1788	6.3	52	161	2.6	43	135	0.0	47	148	0.0	52	161	0.0	57	165	0.0	62	161	0.0	67	169	0.0	72	171	0.0	77	243	0.0	82	262			
1743	6.4	51	161	2.6	43	137	0.0	47	150	0.0	52	164	0.0	57	167	0.0	62	163	0.0	67	171	0.0	72	173	0.0	77	247	0.0	82	266			
1700	6.5	50	161	2.7	43	139	0.0	47	153	0.0	52	166	0.0	57	169	0.0	62	165	0.0	67	173	0.0	72	175	0.0	77	251	0.0	82	270			
1657	6.6	49	161	2.7	43	141	0.0	47	155	0.0	52	169	0.0	57	171	0.0	62	167	0.0	67	175	0.0	7										

SPECIFICATION REFERENCE		DESIGN FACTORS FOR A DESIGN SPEED OF 65 MPH (RURAL) USING E = 8% MAX.																											
		DESIGN SOFTWARE EQUIVALENTS (NUMBER OF LANES AT LANE WIDTH)														INTERCHANGE RAMPS													
		WIDTH+18 FT				WIDTH+20 FT				WIDTH+22 FT				WIDTH+24 FT				WIDTH+48 FT				WIDTH+72 FT				WIDTH			
		1 @ 9'		1 @ 10'		1 @ 11'		1 @ 12'		2 @ 12'		3 @ 12'		16 FT		18 FT													
E(%)	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	w		
14000	NC	0	0	0.0	0	0.0	0	0	0.0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	
9566	2.0	42	42	0.0	47	47	0.0	52	52	0.0	56	56	0.0	84	84	0.0	112	112	0.0	128	128	0.0	166	166	0.0	198	198	0.0	
9083	2.1	42	44	0.0	47	49	0.0	52	54	0.0	56	59	0.0	84	88	0.0	112	118	0.0	128	133	0.0	166	172	0.0	198	204	0.0	
8643	2.2	42	47	0.0	47	52	0.0	52	57	0.0	56	62	0.0	84	93	0.0	112	123	0.0	128	139	0.0	166	177	0.0	198	210	0.0	
8242	2.3	42	49	0.0	47	54	0.0	52	59	0.0	56	65	0.0	84	97	0.0	112	129	0.0	128	143	0.0	166	179	0.0	198	213	0.0	
7873	2.4	42	51	0.0	47	56	0.0	52	62	0.0	56	70	0.0	84	101	0.0	112	134	0.0	128	150	0.0	166	181	0.0	198	220	0.0	
7534	2.5	42	53	0.0	47	59	0.0	52	64	0.0	56	77	0.0	84	105	0.0	112	140	0.0	128	157	0.0	166	187	0.0	198	225	0.0	
7221	2.6	42	55	0.0	47	61	0.0	52	67	0.0	56	83	0.0	84	109	0.0	112	146	0.0	128	163	0.0	166	190	0.0	198	230	0.0	
6931	2.7	42	57	0.0	47	63	0.0	52	70	0.0	56	87	0.0	84	114	0.0	112	151	0.0	128	170	0.0	166	197	0.0	198	235	0.0	
6662	2.8	42	59	0.0	47	66	0.0	52	72	0.0	56	91	0.0	84	118	0.0	112	157	0.0	128	177	0.0	166	202	0.0	198	240	0.0	
6411	2.9	42	61	0.0	47	68	0.0	52	75	0.0	56	95	0.0	84	122	0.0	112	162	0.0	128	184	0.0	166	207	0.0	198	245	0.0	
6176	3.0	42	63	0.0	47	70	0.0	52	77	0.0	56	99	0.0	84	126	0.0	112	168	0.0	128	191	0.0	166	212	0.0	198	250	0.0	
5957	3.1	42	65	0.0	47	73	0.0	52	80	0.0	56	103	0.0	84	130	0.0	112	174	0.0	128	198	0.0	166	217	0.0	198	255	0.0	
5751	3.2	42	67	0.0	47	75	0.0	52	82	0.0	56	107	0.0	84	134	0.0	112	179	0.0	128	205	0.0	166	222	0.0	198	260	0.0	
5557	3.3	42	70	0.0	47	77	0.0	52	85	0.0	56	111	0.0	84	139	0.0	112	185	0.0	128	212	0.0	166	227	0.0	198	265	0.0	
5375	3.4	42	72	0.0	47	80	0.0	52	87	0.0	56	115	0.0	84	143	0.0	112	190	0.0	128	219	0.0	166	232	0.0	198	270	0.0	
5203	3.5	42	74	0.0	47	82	0.0	52	90	0.0	56	119	0.0	84	147	0.0	112	196	0.0	128	226	0.0	166	237	0.0	198	275	0.0	
5040	3.6	42	76	0.0	47	84	0.0	52	93	0.0	56	123	0.0	84	151	0.0	112	201	0.0	128	233	0.0	166	242	0.0	198	280	0.0	
4886	3.7	42	78	0.0	47	87	0.0	52	95	0.0	56	127	0.0	84	155	0.0	112	207	0.0	128	240	0.0	166	247	0.0	198	285	0.0	
4740	3.8	42	80	0.0	47	89	0.0	52	98	0.0	56	131	0.0	84	160	0.0	112	213	0.0	128	247	0.0	166	252	0.0	198	290	0.0	
4601	3.9	42	82	0.0	47	91	0.0	52	100	0.0	56	135	0.0	84	164	0.0	112	218	0.0	128	254	0.0	166	257	0.0	198	295	0.0	
4469	4.0	42	84	0.0	47	94	0.0	52	103	0.0	56	139	0.0	84	168	0.0	112	224	0.0	128	261	0.0	166	262	0.0	198	300	0.0	
4344	4.1	42	86	0.0	47	96	0.0	52	105	0.0	56	143	0.0	84	172	0.0	112	229	0.0	128	268	0.0	166	267	0.0	198	305	0.0	
4224	4.2	42	88	0.0	47	98	0.0	52	108	0.0	56	147	0.0	84	176	0.0	112	235	0.0	128	275	0.0	166	272	0.0	198	310	0.0	
4109	4.3	42	90	0.0	47	100	0.0	52	110	0.0	56	151	0.0	84	180	0.0	112	240	0.0	128	282	0.0	166	277	0.0	198	315	0.0	
4000	4.4	42	93	0.0	47	103	0.0	52	113	0.0	56	155	0.0	84	185	0.0	112	246	0.0	128	289	0.0	166	282	0.0	198	320	0.0	
3896	4.5	42	95	0.0	47	105	0.0	52	116	0.0	56	159	0.0	84	189	0.0	112	252	0.0	128	296	0.0	166	287	0.0	198	325	0.0	
3795	4.6	42	97	0.0	47	107	0.0	52	118	0.0	56	163	0.0	84	193	0.0	112	257	0.0	128	303	0.0	166	292	0.0	198	330	0.0	
3699	4.7	42	99	0.0	47	110	0.0	52	121	0.0	56	167	0.0	84	197	0.0	112	263	0.0	128	310	0.0	166	297	0.0	198	335	0.0	
3607	4.8	42	101	0.0	47	112	0.0	52	123	0.0	56	171	0.0	84	201	0.0	112	268	0.0	128	317	0.0	166	302	0.0	198	340	0.0	
3518	4.9	42	103	0.0	47	114	0.0	52	126	0.0	56	175	0.0	84	206	0.0	112	274	0.0	128	324	0.0	166	307	0.0	198	345	0.0	
3433	5.0	42	105	0.0	47	117	0.0	52	128	0.0	56	179	0.0	84	210	0.0	112	280	0.0	128	331	0.0	166	312	0.0	198	350	0.0	
3351	5.1	42	107	0.0	47	119	0.0	52	131	0.0	56	183	0.0	84	214	0.0	112	285	0.0	128	338	0.0	166	317	0.0	198	355	0.0	
3272	5.2	42	109	0.0	47	121	0.0	52	134	0.0	56	187	0.0	84	218	0.0	112	291	0.0	128	345	0.0	166	322	0.0	198	360	0.0	
3196	5.3	42	111	0.0	47	124	0.0	52	136	0.0	56	191	0.0	84	222	0.0	112	296	0.0	128	352	0.0	166	327	0.0	198	365	0.0	
3122	5.4	42	114	0.0	47	126	0.0	52	139	0.0	56	195	0.0	84	227	0.0	112	302	0.0	128	359	0.0	166	332	0.0	198	370	0.0	
3051	5.5	42	116	0.0	47	128	0.0	52	141	0.0	56	199	0.0	84	231	0.0	112	307	0.0	128	366	0.0	166	337	0.0	198	375	0.0	
2982	5.6	42	118	0.0	47	131	0.0	52	144	0.0	56	203	0.0	84	235	0.0	112	313	0.0	128	373	0.0	166	342	0.0	198	380	0.0	
2916	5.7	42	120	0.0	47	133	0.0	52	146	0.0	56	207	0.0	84	239	0.0	112	319	0.0	128	380	0.0	166	347	0.0	198	385	0.0	
2866	5.8	42	122	0.0	47	135	0.0	52	149	0.0	56	211	0.0	84	243	0.0	112	324	0.0	128	387	0.0	166	352	0.0	198	390	0.0	
2865	5.8	66	191	2.4	47	135	0.0	52	149	0.0	56	211	0.0	84	243	0.0	112	324	0.0	128	387	0.0	166	352	0.0	198	390	0.0	
2852	5.8	66	191	2.4	47	135	0.0	52	149	0.0	56	211	0.0	84	243	0.0	112	324	0.0	128	387	0.0	166	352	0.0	198	390	0.0	
2789	5.9	66	191	2.5	47	138	0.0	52	151	0.0	56	215	0.0	84	247	0.0	112	330	0.0	128	394	0.0	166	357	0.0	198	395	0.0	
2729	6.0	64	191	2.5	47	140	0.0	52	154	0.0	56	219	0.0	84	252	0.0	112	335	0.0	128	401	0.0	166	362	0.0	198	400	0.0	
2670	6.1	63	191	2.5	47	142	0.0	52	157	0.0	56	223	0.0	84	256	0.0	112	341	0.0	128	408	0.0	166	367	0.0	198	405	0.0	
2613	6.2	62	191	2.5	47	145	0.0	52	159	0.0	56	227	0.0	84	260	0.0	112	347	0.0	128	415	0.0	166	372	0.0	198	410	0.0	
2558	6.3	61	191	2.5	47	147	0.0	52	162	0.0	56	231	0.0	84	264	0.0	112	352	0.0	128	422	0.0	166	377	0.0	198	415	0.0	
2504	6.4	60	191	2.5	47	149	0.0	52	164	0.0	56	235	0.0	84	268	0.0	112	358	0.0	128	429	0.0	166	382	0.0	198	420	0.0	
2451	6.5	59	191	2.6	47	152	0.0	52	167	0.0	56	239	0.0	84	273	0.0	112	363	0.0	128	436	0.0	166	387	0.0	198	425	0.0	
2398	6.6	58	191	2.6	47	154	0.0	52	169	0.0	56	243	0.0	84	277	0.0	112	369	0.0	128	443	0.0	166	392	0.0	198	430	0.0	
2346	6.7	58	191	2.6	47	156	0.0	52	172	0.0	56	247	0.0	84	281	0.0	112	374	0.0	128	450	0.0	166	397	0.0	198	435	0.0	
2294	6.8	57	191	2.6	47	159</																							

DESIGN FACTORS FOR A DESIGN SPEED OF 70 MPH (RURAL) USING E = 8% MAX.

DESIGN VELOCITY -70	DESIGN SOFTWARE EQUIVALENTS (NUMBER OF LANES AT LANE WIDTH)										INTERCHANGE RAMPS							
	1 @ 9'		1 @ 10'		1 @ 11'		1 @ 12'		2 @ 12'		3 @ 12'		16 FT		18 FT			
	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	
17000	NC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10731	2.0	45	45	0.0	50	50	0.0	55	55	0.0	60	60	0.0	90	90	0.0	120	120
10194	2.1	45	48	0.0	50	53	0.0	55	58	0.0	60	63	0.0	90	95	0.0	120	126
9706	2.2	45	50	0.0	50	55	0.0	55	61	0.0	60	66	0.0	90	99	0.0	120	132
9260	2.3	45	52	0.0	50	58	0.0	55	64	0.0	60	69	0.0	90	104	0.0	120	138
8851	2.4	45	54	0.0	50	60	0.0	55	66	0.0	60	72	0.0	90	108	0.0	120	144
8474	2.5	45	57	0.0	50	63	0.0	55	69	0.0	60	75	0.0	90	113	0.0	120	150
8127	2.6	45	59	0.0	50	65	0.0	55	72	0.0	60	78	0.0	90	117	0.0	120	156
7805	2.7	45	61	0.0	50	68	0.0	55	75	0.0	60	81	0.0	90	122	0.0	120	162
7506	2.8	45	63	0.0	50	70	0.0	55	77	0.0	60	84	0.0	90	126	0.0	120	168
7227	2.9	45	66	0.0	50	73	0.0	55	80	0.0	60	87	0.0	90	131	0.0	120	174
6967	3.0	45	68	0.0	50	75	0.0	55	83	0.0	60	90	0.0	90	135	0.0	120	180
6724	3.1	45	70	0.0	50	78	0.0	55	86	0.0	60	93	0.0	90	140	0.0	120	186
6495	3.2	45	72	0.0	50	80	0.0	55	88	0.0	60	96	0.0	90	144	0.0	120	192
6281	3.3	45	75	0.0	50	83	0.0	55	91	0.0	60	99	0.0	90	149	0.0	120	198
6079	3.4	45	77	0.0	50	85	0.0	55	94	0.0	60	102	0.0	90	153	0.0	120	204
5888	3.5	45	79	0.0	50	88	0.0	55	97	0.0	60	105	0.0	90	158	0.0	120	210
5708	3.6	45	81	0.0	50	90	0.0	55	99	0.0	60	108	0.0	90	162	0.0	120	216
5537	3.7	45	84	0.0	50	93	0.0	55	102	0.0	60	111	0.0	90	167	0.0	120	222
5376	3.8	45	86	0.0	50	95	0.0	55	105	0.0	60	114	0.0	90	171	0.0	120	228
5222	3.9	45	88	0.0	50	98	0.0	55	108	0.0	60	117	0.0	90	176	0.0	120	234
5076	4.0	45	90	0.0	50	100	0.0	55	110	0.0	60	120	0.0	90	180	0.0	120	240
4937	4.1	45	93	0.0	50	103	0.0	55	113	0.0	60	123	0.0	90	185	0.0	120	246
4805	4.2	45	95	0.0	50	105	0.0	55	116	0.0	60	126	0.0	90	189	0.0	120	252
4679	4.3	45	97	0.0	50	108	0.0	55	119	0.0	60	129	0.0	90	194	0.0	120	258
4558	4.4	45	99	0.0	50	110	0.0	55	121	0.0	60	132	0.0	90	198	0.0	120	264
4443	4.5	45	102	0.0	50	113	0.0	55	124	0.0	60	135	0.0	90	203	0.0	120	270
4332	4.6	45	104	0.0	50	115	0.0	55	127	0.0	60	138	0.0	90	207	0.0	120	276
4226	4.7	45	106	0.0	50	118	0.0	55	130	0.0	60	141	0.0	90	212	0.0	120	282
4125	4.8	45	108	0.0	50	120	0.0	55	132	0.0	60	144	0.0	90	216	0.0	120	288
4027	4.9	45	111	0.0	50	123	0.0	55	135	0.0	60	147	0.0	90	221	0.0	120	294
3933	5.0	45	113	0.0	50	125	0.0	55	138	0.0	60	150	0.0	90	225	0.0	120	300
3843	5.1	45	115	0.0	50	128	0.0	55	141	0.0	60	153	0.0	90	230	0.0	120	306
3756	5.2	45	117	0.0	50	130	0.0	55	143	0.0	60	156	0.0	90	234	0.0	120	312
3673	5.3	45	120	0.0	50	133	0.0	55	146	0.0	60	159	0.0	90	239	0.0	120	318
3592	5.4	45	122	0.0	50	135	0.0	55	149	0.0	60	162	0.0	90	243	0.0	120	324
3514	5.5	45	124	0.0	50	138	0.0	55	152	0.0	60	165	0.0	90	248	0.0	120	330
3439	5.6	45	126	0.0	50	140	0.0	55	154	0.0	60	168	0.0	90	252	0.0	120	336
3366	5.7	45	129	0.0	50	143	0.0	55	157	0.0	60	171	0.0	90	257	0.0	120	342
3296	5.8	45	131	0.0	50	145	0.0	55	160	0.0	60	174	0.0	90	261	0.0	120	348
3228	5.9	45	133	0.0	50	148	0.0	55	163	0.0	60	177	0.0	90	266	0.0	120	354
3163	6.0	45	135	0.0	50	150	0.0	55	165	0.0	60	180	0.0	90	270	0.0	120	360
3099	6.1	45	138	0.0	50	153	0.0	55	168	0.0	60	183	0.0	90	275	0.0	120	366
3037	6.2	45	140	0.0	50	155	0.0	55	171	0.0	60	186	0.0	90	279	0.0	120	372
2977	6.3	45	142	0.0	50	158	0.0	55	174	0.0	60	189	0.0	90	284	0.0	120	378
2919	6.4	45	144	0.0	50	160	0.0	55	176	0.0	60	192	0.0	90	288	0.0	120	384
2866	6.5	45	147	0.0	50	163	0.0	55	179	0.0	60	195	0.0	90	293	0.0	120	390
2865	6.5	64	205	2.5	50	163	0.0	55	179	0.0	60	195	0.0	90	293	0.0	120	390
2862	6.5	64	205	2.5	50	163	0.0	55	179	0.0	60	195	0.0	90	293	0.0	120	390
2807	6.6	63	205	2.5	50	165	0.0	55	182	0.0	60	198	0.0	90	297	0.0	120	396
2753	6.7	62	205	2.6	50	168	0.0	55	185	0.0	60	201	0.0	90	302	0.0	120	402
2699	6.8	61	205	2.6	50	170	0.0	55	187	0.0	60	204	0.0	90	306	0.0	120	408
2645	6.9	60	205	2.6	50	173	0.0	55	190	0.0	60	207	0.0	90	311	0.0	120	414
2590	7.0	59	205	2.6	50	175	0.0	55	193	0.0	60	210	0.0	90	315	0.0	120	420
2535	7.1	58	205	2.6	50	178	0.0	55	196	0.0	60	213	0.0	90	320	0.0	120	426
2480	7.2	57	205	2.7	50	180	0.0	55	198	0.0	60	216	0.0	90	324	0.0	120	432
2423	7.3	57	205	2.7	50	183	0.0	55	201	0.0	60	219	0.0	90	329	0.0	120	438
2365	7.4	56	205	2.7	50	185	0.0	55	204	0.0	60	222	0.0	90	333	0.0	120	444
2305	7.5	55	205	2.7	50	188	0.0	55	207	0.0	60	225	0.0	90	338	0.0	120	450
2242	7.6	54	205	2.7	50	190	0.0	55	209	0.0	60	228	0.0	90	342	0.0	120	456
2175	7.7	54	205	2.8	50	193	0.0	55	212	0.0	60	231	0.0	90	347	0.0	120	462
2100	7.8	53	205	2.8	50	195	0.0	55	215	0.0	60	234	0.0	90	351	0.0	120	468
2010	7.9	53	207	2.9	50	198	0.0	55	218	0.0	60	237	0.0	90	356	0.0	120	474
1821	8.0	53	210	3.0	55	220	2.0	55	220	0.0	60	240	0.0	90	360	0.0	120	480

NOTE: CR, LS & w VALUES IN FEET. LISTED RADIUS IS THE MINIMUM ALLOWABLE RADIUS FOR THE CORRESPONDING E, CR, LS, AND w VALUES.

TRANSITION CURVES - RURAL
70 MPH DESIGN SPEED

SPECIFICATION
REFERENCE