COMMONWEALTH of VIRGINIA

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

Gregory A. Whirley
Commissioner

March 5, 2013

MEMORANDUM

To: All Holders of the Virginia Department of Transportation's 2008 Road and Bridge Standards

The following is a list of sheets contained in the 2008 Road and Bridge Standards that have been revised. Please add these pages to your copy of the standards. An interim standard sheet will not be required in plan assemblies for the following sheets only. Changes to these sheets will not affect the basis of payment or estimates.

PAGE	REVISION
104.26	Corrected label for DI-10 used in sags to DI-10I
~~108.03~~	~~Revised note 6 from "a PI of 13 or less" to "a PI of 13 or mo~~
203.02	Corrected Section C-C to show the curb.
203.03	Corrected Section C-C to show the curb.
803.06	Revised Plan view length of full superelevation to "Length= 1/3 Lr or Greater"
803.20	Corrected definitions for ed and eNC.
803.22	Corrected Lr Calculation for the 72 ft. Pavement example.
803.32-803.44	Tables were revised to reflect the minimum roadway width by speed in accordance with the AASHTO Green Book. Lr values for widening were revised to remove the 2 second rule and Lr values 48' and 72' pavement widths with pavement widening.

The following is a list of revised standards to the 2008 Road and Bridge Standards that ***require*** an interim standard sheet to be in included in your plan assembly until the next edition of the standards is published. Please add these pages to your copy of the standards. The respective interim standard sheet number has been placed with the revised standard. The interim standard sheets are available on VDOT's web site, on the FTP server, and in Falcon DMS for VDOT personnel. These interim standard sheets will be required in plan assemblies for Tier 1 projects advertised August 27, 2013 and later, along with Tier 2 projects advertised October 16, 2013 and later.

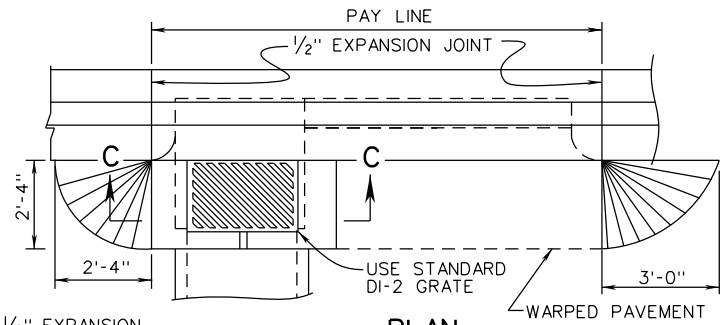
PAGE	INTERIM	STANDARD	REVISION
107.18	IIS01_05	PC-1	REVISED TABLE A TO (SEE NOTE 2)
107.20	IIS01_06	PC-1	REVISED PE PIPE CHART REMOVED VITRIFIED CLAY PIPE ADDED POLYPROPYLENE PIPE REVISED NOTES 3 AND 6 AND ADDED NOTE 7.
107.21	IIS01_07	PC-1	REVISED TABLE A TO INCLUDE POLYPROPYLENE PIPE
107.22	IIS01_08	PC-1	REVISED TABLE A1 TO INCLUDE POLYPROPYLENE PIPE
113.11	IIS01_09	EC-7	REVISED “EXISTING GROUND” NOTE TO “ EXISTING GROUND OR TOP OF EMBANKMENT” SECTION A-A “SLOPE” TO “SLOPE VARIES”
113.14	IIS01_10	EC-10	ADDED NOTE UNDER EARTHEN BERM SECTION
605.01	IIS06_02	NG-1	ADDED NOTE REQUIRING AN EYE BOLT TO BE INSTALLED INSIDE THE FACILITY FOR SECURING NUCLEAR GAUGE.

If you have any questions or comments regarding this revision, please contact Chuck Patterson P.E., at (804) 786-1805, of the Standards and Special Design Section.

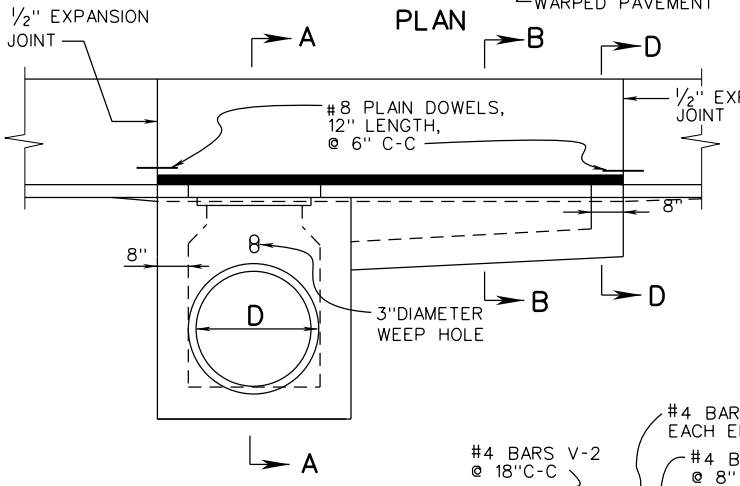
Sincerely,

Signature on file: March 5, 2013

Mohammad Mirshahi, P.E.
Deputy Chief Engineer



PLAN



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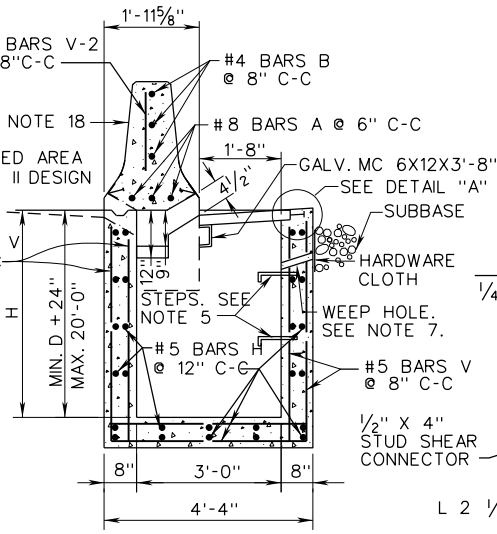
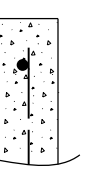
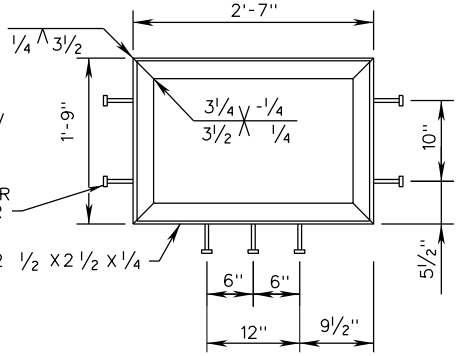


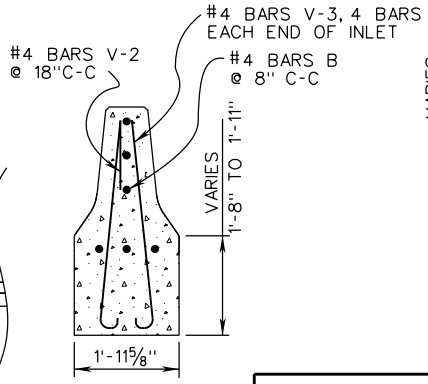
SECTION A-A



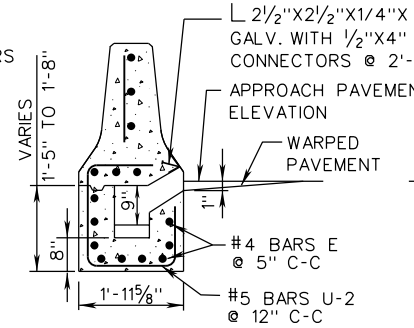
DETAIL "A"



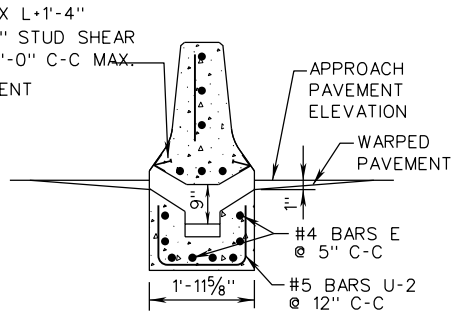
COLLAR
GALV. STEEL



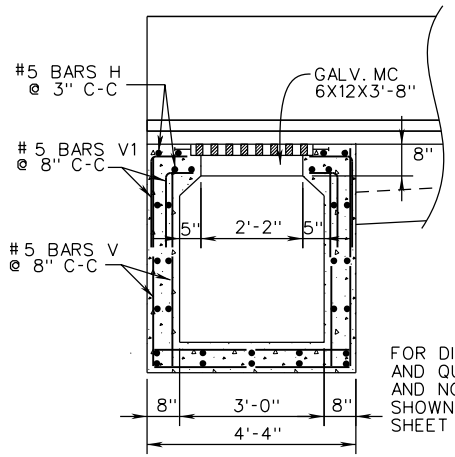
SECTION D-D



SECTION B-B
SINGLE SLOT
TYPE I



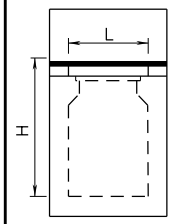
SECTION B-B
DOUBLE SLOT
TYPE II



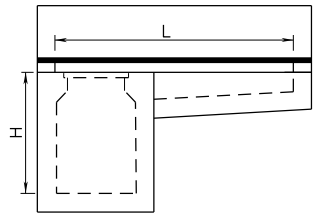
FOR DIMENSIONS AND QUANTITIES AND NOTES NOT SHOWN SEE SHEET 2 OF 2.

SECTION C-C

DI-10G

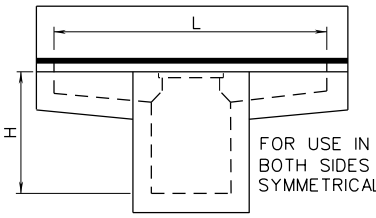


DI-10H



FOR USE ON GRADES

DI-10I



FOR USE IN SAGS. BOTH SIDES TO BE SYMMETRICAL.

SPECIFICATION REFERENCE	CONCRETE MEDIAN BARRIER DROP INLET (WITH MB-7D)	VDOT ROAD AND BRIDGE STANDARDS
233 302	12" - 36" PIPE: DEPTH (H)=20'-0" MAX. VIRGINIA DEPARTMENT OF TRANSPORTATION	REVISION DATE 01/13 · SHEET 1 OF 2 · 104.26

STEEL SPIRAL RIB PIPE 3/4" WIDE x 3/4" RIBS SPACED @ 7 1/2"

PIPE DIAMETER INCHES	AREA SQ. FT.	MAXIMUM HEIGHT OF COVER IN FEET — SHEET THICKNESS IN INCHES (GAUGE)			MINIMUM SHEET THICKNESS FOR ENTRANCE PIPES WITH LESS THAN 1 FT. COVER INCHES (GAUGE)
		0.064 (16)	0.079 (14)	0.109 (12)	
12	0.8	18			0.064 (16)
15	1.2	18			0.064 (16)
18	1.8	18	92	130	0.064 (16)
21	2.4	18	64	88	0.079 (14)
24	3.1	17	48	65	0.109 (12)
27	4.0	17	39	50	
30	4.9	17	33	41	
36	7.1	16	26	31	
42	9.6	16	23	26	
48	12.6	15	21	23	
54	16.0	15	19	21	
60	19.6	14	19	20	
66	23.8		18	19	
72	28.3		18	18	
78	33.2			18	
84	38.6			18	

NOTES:

1. COVER HEIGHTS INDICATED IN TABLES ARE FOR FINISHED CONSTRUCTION.
2. TO PROTECT PIPE DURING CONSTRUCTION, MINIMUM HEIGHT OF COVER TO BE IN ACCORDANCE WITH TABLE A PRIOR TO ALLOWING CONSTRUCTION TRAFFIC TO CROSS INSTALLATION. THE COVER SHALL EXTEND THE FULL LENGTH OF THE PIPE. THE APPROACH FILL IS TO EXTEND A MINIMUM OF 15 DIAMETERS ON EACH SIDE OF THE PIPE OR TO THE INTERSECTION WITH THE CUT.
3. MINIMUM FINISHED HEIGHT OF COVER FOR ALL PIPES, EXCEPT THOSE UNDER ENTRANCES, SHALL BE 2.0' OR 1/2 DIAMETER, WHICHEVER IS GREATER. IN CASES IN WHICH THESE COVER HEIGHTS CANNOT BE ACHIEVED, AN ABSOLUTE MINIMUM FINISHED COVER HEIGHT OF 1.0' OR 1/4 DIAMETER, WHICHEVER IS GREATER, WILL BE ALLOWED ONLY IF ALL POSSIBLE MEANS TO OBTAIN THE STANDARD VALUE HAVE BEEN EXHAUSTED. THE MINIMUM FINISHED HEIGHT OF COVER FOR PIPES UNDER ENTRANCES IS 9" FOR PIPE DIAMETERS LESS THAN OR EQUAL TO 24" AND 12" OR 1/4 DIAMETER, WHICHEVER IS GREATER, FOR PIPE DIAMETERS GREATER THAN 24". WHERE POLYMER COATED PIPE WILL BE USED AND THE SURFACE OVER THE TOP OF THE PIPE WILL BE ASPHALT, CLASS I BACKFILL MATERIAL IS TO BE PLACED UP TO A MINIMUM OF 6" ABOVE THE TOP OF THE PIPE.
4. SEE STANDARD PB-1 FOR PIPE BEDDING AND BACKFILL REQUIREMENTS.
5. 16 GAUGE PIPE LIMITED TO THOSE LOCATIONS WHERE PIPE DIAMETER PLUS COVER IS LESS THAN 20'.
6. THE MAXIMUM HEIGHT OF COVER SHOWN IN THE TABLES IS BASED ON A SOIL MODULUS OF 700 PSI. ALL OTHER DESIGN CRITERIA ARE IN ACCORDANCE WITH THE AASHTO SPECIFICATIONS AND VDOT MODIFICATIONS FOR SOIL CORRUGATED METAL STRUCTURE INTERACTION SYSTEMS.
7. A MAXIMUM HEIGHT OF COVER TABLE FOR STEEL SPRIAL RIB WITH 3/4" WIDE x 1" DEEP RIPS SPACED AT 11 1/2" IS AVAILIBLE UPON REQUEST.

TABLE A	
PIPE DIAMETER	MINIMUM COVER HEIGHT DURING CONSTRUCTION (SEE NOTE 2)
12" TO 30"	18"
36" AND ABOVE	1/2 DIAMETER

SPECIFICATION REFERENCE
232 302

A COPY OF THE ORIGINAL SEALED AND SIGNED STANDARD DRAWING IS ON FILE IN THE CENTRAL OFFICE

STEEL SPIRAL RIB PIPE
HEIGHT OF COVER TABLE FOR H-20 LIVE LOAD

VIRGINIA DEPARTMENT OF TRANSPORTATION

VDOT
ROAD AND BRIDGE STANDARDS

REVISION DATE	SHEET 14 OF 18
01/13	107.18

POLYETHYLENE CORRUGATED PIPE (PE) (SEE NOTE 6)		
DIAMETER INCHES	AREA SQ. FT.	MAXIMUM HEIGHT OF COVER FEET
12	0.8	21
15	1.2	21
18	1.8	20
24	3.1	20
30	4.9	19
36	7.1	18
42	9.6	18
48	12.6	17
54	15.9	16
60	19.6	16

POLYVINYLCHLORIDE RIBBED PIPE (PVC)		
DIAMETER INCHES	AREA SQ. FT.	MAXIMUM HEIGHT OF COVER FEET
18	1.7	20
21	2.3	19
24	3.0	19
30	4.7	18
36	6.9	18
48	12.3	18

POLYPROPYLENE PIPE (PP) (SEE NOTE 7)		
DIAMETER INCHES	AREA SQ. FT.	MAXIMUM HEIGHT OF COVER FEET
12	0.8	21
15	1.2	21
18	1.8	20
24	3.1	20
30	4.9	19
36	7.1	18
42	9.6	18
48	12.6	17

NOTES:

1. COVER HEIGHTS INDICATED IN TABLES ARE FOR FINISHED CONSTRUCTION.
2. TO PROTECT PIPE DURING CONSTRUCTION, MINIMUM HEIGHT OF COVER TO BE IN ACCORDANCE WITH TABLE A PRIOR TO ALLOWING CONSTRUCTION TRAFFIC TO CROSS INSTALLATION. THE COVER SHALL EXTEND THE FULL LENGTH OF THE PIPE. THE APPROACH FILL IS TO EXTEND A MINIMUM OF 10(DIAMETER + ½ DIAMETER) ON EACH SIDE OF THE PIPE OR TO THE INTERSECTION WITH A CUT.
3. STANDARD MINIMUM FINISHED HEIGHT OF COVER FOR ALL PIPES, EXCEPT THOSE UNDER ENTRANCES, SHALL BE 2.0' OR ½ DIAMETER WHICHEVER IS GREATER. FOR 12" THROUGH 48" DIAMETER PIPE INSTALLATIONS WHERE THE COVER HEIGHTS CANNOT BE ACHIEVED, AN ABSOLUTE MINIMUM FINISHED COVER HEIGHT OF 1.0' WILL BE ALLOWED ONLY IF ALL POSSIBLE MEANS TO OBTAIN THE STANDARD VALUE HAVE BEEN EXHAUSTED. THE MINIMUM FINISHED HEIGHT OF COVER FOR PIPES UNDER ENTRANCES IS 9" FOR PIPE DIAMETERS LESS THAN OR EQUAL TO 24", AND 12" FOR PIPE DIAMETERS GREATER THAN 24". WHERE THE SURFACE OVER THE TOP OF THE PIPE WILL BE ASPHALT, A MINIMUM OF 6" OF CLASS I BACKFILL MATERIAL IS TO BE PLACED BETWEEN THE TOP OF THE PIPE AND THE BOTTOM OF THE ASPHALT.
4. SEE STANDARD PB-1 FOR PIPE BEDDING AND BACKFILL REQUIREMENTS.
5. THE MAXIMUM HEIGHT OF COVER SHOWN IN THE TABLES IS BASED ON A SOIL MODULUS OF 700 PSI. ALL OTHER DESIGN CRITERIA ARE IN ACCORDANCE WITH THE AASHTO SPECIFICATIONS AND VDOT MODIFICATIONS FOR SOIL THERMOPLASTIC PIPE INTERACTION SYSTEMS.
6. HEIGHT OF COVER VALUES FOR 12" THROUGH 36" DIAMETER APPLY TO TYPE C OR S. HEIGHT OF COVER VALUES FOR 42" THROUGH 60" APPLY TO TYPE S ONLY.
7. HEIGHT OF COVER VALUES FOR 12" THROUGH 30" DIAMETER APPLY TO TYPE S. HEIGHT OF COVER VALUES FOR 36" THROUGH 48" APPLY TO TYPE D ONLY.

TABLE A	
PIPE DIAMETER	MINIMUM COVER HEIGHT DURING CONSTRUCTION (SEE NOTE 2)
12" TO 30"	18"
36" AND ABOVE	½ DIAMETER

SPECIFICATION REFERENCE
232 302

A COPY OF THE ORIGINAL SEALED AND SIGNED STANDARD DRAWING IS ON FILE IN THE CENTRAL OFFICE

PLASTIC PIPE
HEIGHT OF COVER TABLES FOR H-20 LIVE LOAD

VIRGINIA DEPARTMENT OF TRANSPORTATION

VDOT
ROAD AND BRIDGE STANDARDS

REVISION DATE	SHEET 16 OF 18
01/13	107.20

PC-1

TABLE A - ALLOWABLE TYPE OF PIPE CULVERT

FOR ROADWAYS THAT ARE CONSTRUCTED, FUNDED OR WILL ULTIMATELY BE MAINTAINED BY VDOT

FUNCTIONAL CLASSIFICATION OF ROADS SYSTEM UNDER WHICH PIPE IS TO BE INSTALLED					
	HIGHER FUNCTIONAL CLASS - HFC RURAL PRINCIPAL ARTERIAL, URBAN PRINCIPAL ARTERIAL, RURAL MINOR ARTERIAL, URBAN MINOR ARTERIAL, RURAL COLLECTOR ROADS, URBAN COLLECTOR STREETS, SUBDIVISION STREETS WITH AN ADT GREATER THAN 4000		LOWER FUNCTIONAL CLASS - LFC RURAL LOCAL ROADS, URBAN LOCAL STREETS, SUBDIVISION STREETS WITH AN ADT LESS THAN OR EQUAL TO 4000		ENTRANCE PIPE
ALLOWABLE PIPE CULVERTS NOTES 1 & 2	STATEWIDE EXCEPT LOCATIONS SHOWN IN TABLE B	LOCATION SHOWN IN TABLE B	STATEWIDE EXCEPT LOCATIONS SHOWN IN TABLE B	LOCATION SHOWN IN TABLE B	STATEWIDE
CONCRETE	✓	✓	✓	✓	✓
ALUMINUM COATED TYPE 2 CORRUGATED STEEL NOTE 3	✓		✓		✓
POLYMER COATED (10/10) CORRUGATED STEEL NOTE 3	✓	✓	✓	✓	✓
UNCOATED GALVANIZED CORRUGATED STEEL NOTES 3 & 4					✓
GALVANIZED STEEL STRUCTURAL PLATE NOTE 3			✓		✓
GALVANIZED STEEL STRUCTURAL PLATE WITH CONCRETE INVERT NOTE 3	✓		✓	✓	✓
CORRUGATED ALUMINUM ALLOY NOTE 3	✓	✓	✓	✓	✓
CORRUGATED ALUMINUM ALLOY STRUCTUAL PLATE NOTE 3	✓	✓	✓	✓	✓
POLYVINYLCHLORIDE (PVC) RIBBED PIPE (SMOOTH INTERIOR)	✓	✓	✓	✓	✓
POLYETHYLENE (PE) CORRUGATED TYPE C	✓	✓	✓	✓	
POLYETHYLENE (PE) CORRUGATED TYPE S	✓	✓	✓	✓	✓
POLYPROPYLENE (PP) TYPE D OR S	✓	✓	✓	✓	✓

NOTES:

1. ALLOWABLE TYPES OF PIPES FOR A SPECIFIC AREA ARE TO CONFORM TO THE CRITERIA SHOWN IN TABLES A, A1, B, AND C. ANY DEVIATION MUST BE APPROVED BY THE STATE LOCATION AND DESIGN ENGINEER AND THE DISTRICT MATERIALS ENGINEER.
2. SEE HEIGHT OF COVER TABLES FOR MINIMUM AND MAXIMUM COVER LIMITATIONS FOR EACH TYPE OF PIPE.
3. SEE TABLE C FOR MINIMUM AND MAXIMUM pH, RESISTIVITY, AND VELOCITY LIMITATIONS FOR METAL PIPES.
4. USE ONLY UNDER ENTRANCES WHERE THE PIPE SIZE IS LESS THAN OR EQUAL TO 30" DIAMETER (OR EQUIVALENT) AND THE HEIGHT OF COVER IS LESS THAN OR EQUAL TO 15' AND AS AN OUTLET PIPE FOR STANDARD DI-13 SHOULDER SLOT INLETS.

TABLE A1 - ALLOWABLE TYPE OF STORM SEWER PIPE

FOR ROADWAYS THAT ARE CONSTRUCTED, FUNDED OR WILL ULTIMATELY BE MAINTAINED BY VDOT

FUNCTIONAL CLASSIFICATION OF ROADS SYSTEM UNDER WHICH PIPE IS TO BE INSTALLED

	HIGHER FUNCTIONAL CLASS - HFC RURAL PRINCIPAL ARTERIAL, URBAN PRINCIPAL ARTERIAL, RURAL MINOR ARTERIAL, URBAN MINOR ARTERIAL, RURAL COLLECTOR ROADS, URBAN COLLECTOR STREETS, SUBDIVISION STREETS WITH AN ADT GREATER THAN 4000	LOWER FUNCTIONAL CLASS - LFC RURAL LOCAL ROADS, URBAN LOCAL STREETS, SUBDIVISION STREETS WITH AN ADT LESS THAN OR EQUAL TO 4000	
ALLOWABLE PIPE CULVERTS NOTES 1 & 2	STATEWIDE	STATEWIDE EXCEPT LOCATIONS SHOWN IN TABLE B	LOCATION SHOWN IN TABLE B
CONCRETE	✓	✓	✓
CORRUGATED STEEL ALUMINUM COATED TYPE 2 FULLY CONCRETE LINED NOTE 3		✓	
ALUMINUM COATED TYPE 2 STEEL SPIRAL RIB NOTE 3		✓	
POLYMER COATED (10/10) CORRUGATED STEEL SPIRAL RIB NOTE 3		✓	✓
POLYMER COATED (10/10) CORRUGATED STEEL DOUBLE WALL (SMOOTH INTERIOR) NOTE 3	✓	✓	✓
ALUMINUM SPIRAL RIB NOTE 3		✓	✓
POLYVINYLCHLORIDE (PVC) RIBBED PIPE (SMOOTH INTERIOR)	✓	✓	✓
POLYETHYLENE (PE) CORRUGATED TYPE S	✓	✓	✓
POLYPROPYLENE (PP) TYPE D OR S	✓	✓	✓

TABLE B

EXCEPTIONS TO STATEWIDE APPLICATIONS

COUNTIES (INCLUDING TOWNS)				CITIES	
ARLINGTON - EAST OF AND INCLUDING RTES. 95 & 395		SURRY - EAST OF AND INCLUDING RTE. 10		SUFFOLK - EAST OF AND INCLUDING RTE. 32	
FAIRFAX - EAST OF AND INCLUDING RTES. 95 & 395		ISLE OF WIGHT - EAST OF AND INCLUDING RTE. 10		CHESAPEAKE	WILLIAMSBURG
PRINCE WILLIAM - EAST OF AND INCLUDING RTES. 95 & 395				VIRGINIA BEACH	POQUOSON
WESTMORELAND	JAMES CITY	ESSEX	NORTHAMPTON	HAMPTON	PORTSMOUTH
LANCASTER	ACCOMACK	MIDDLESEX	STAFFORD	NEWPORT NEWS	
MATTHEWS	SPOTSYLVANIA	YORK	KING GEORGE	NORFOLK	
GLOUCESTER	NORTHUMBERLAND	RICHMOND		ALEXANDRIA	
				FREDERICKSBURG	

TABLE C

PIPE TYPE	ALLOWABLE pH RANGE (SEE NOTE 6)		ALLOWABLE RESISTIVITY RANGE (Ohms-cm)		ALLOWABLE VELOCITY (FPS) (SEE NOTE 5)
	MIN.	MAX.	MIN.	MAX.	MAXIMUM
ALUMINUM COATED TYPE 2 CORRUGATED STEEL	5.0	9.0	1500	-	5
GALVANIZED STEEL STRUCTURAL PLATE WITH CONCRETE INVERT	6.0	9.0	2000	10000	15
GALVANIZED STEEL STRUCTURAL PLATE	6.0	9.0	2000	10000	5
POLYMER COATED (10/10) CORRUGATED STEEL	4.0	9.0	750	-	15
UNCOATED GALVANIZED CORRUGATED STEEL	6.0	10.0	2000	10000	5
CORRUGATED ALUMINUM ALLOY	4.0	9.0	500	-	5
CORRUGATED ALUMINUM ALLOY STRUCTURAL PLATE	4.0	9.0	500	-	5
ALUMINUM SPIRAL RIB	4.0	9.0	500	-	5
ALUMINUM COATED TYPE 2 SPIRAL RIB	5.0	9.0	1500	-	5
CORRUGATED STEEL ALUMINUM COATED TYPE 2 FULLY CONCRETE LINED	5.0	9.0	1500	-	15
POLYMER COATED CORRUGATED STEEL SPIRAL RIB	4.0	9.0	750	-	15
POLYMER COATED CORRUGATED STEEL DOUBLE WALL	4.0	9.0	750	-	15

NOTES:

1. ALLOWABLE TYPES OF PIPES FOR A SPECIFIC AREA ARE TO CONFORM TO THE CRITERIA SHOWN IN TABLES A, A1, B, AND C. ANY DEVIATION MUST BE APPROVED BY THE STATE LOCATION AND DESIGN ENGINEER AND THE DISTRICT MATERIALS ENGINEER.
2. SEE HEIGHT OF COVER TABLES FOR MINIMUM AND MAXIMUM COVER LIMITATIONS FOR EACH TYPE OF PIPE.
3. SEE TABLE C FOR MINIMUM AND MAXIMUM pH, RESISTIVITY, AND VELOCITY LIMITATIONS FOR METAL PIPES.
4. USE ONLY UNDER ENTRANCES WHERE THE PIPE SIZE IS LESS THAN OR EQUAL TO 30" DIAMETER (OR EQUIVALENT) AND THE HEIGHT OF COVER IS LESS THAN OR EQUAL TO 15' AND AS AN OUTLET PIPE FOR STANDARD DI-13 SHOULDER SLOT INLETS.
5. ALLOWABLE VELOCITY WHERE ABRASIVE BEDLOAD IS PRESENT OR ANTICIPATED. MAXIMUM VELOCITY BASED ON 10 YEAR DESIGN DISCHARGE (Q).
6. pH VALUES APPLY TO BOTH THE SOIL AND WATER.

SPECIFICATION REFERENCE

232
302

A COPY OF THE ORIGINAL SEALED AND SIGNED STANDARD DRAWING IS ON FILE IN THE CENTRAL OFFICE

ALLOWABLE PIPE CRITERIA FOR CULVERT AND STORM SEWERS

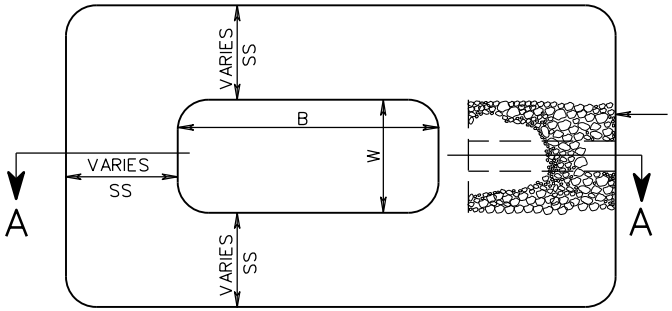
VIRGINIA DEPARTMENT OF TRANSPORTATION

VDOT
ROAD AND BRIDGE STANDARDS

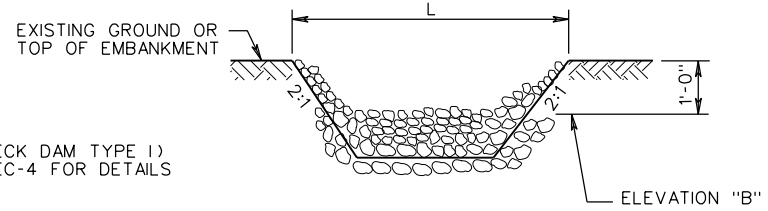
REVISION DATE
01/13

SHEET 18 OF 18

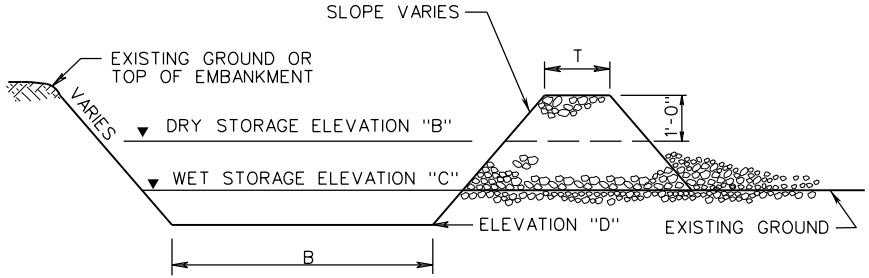
107.22



PLAN VIEW OF TEMPORARY SEDIMENT TRAP



TYPICAL SECTION THRU WEIR
(ROCK CHECK DAM TYPE 1)



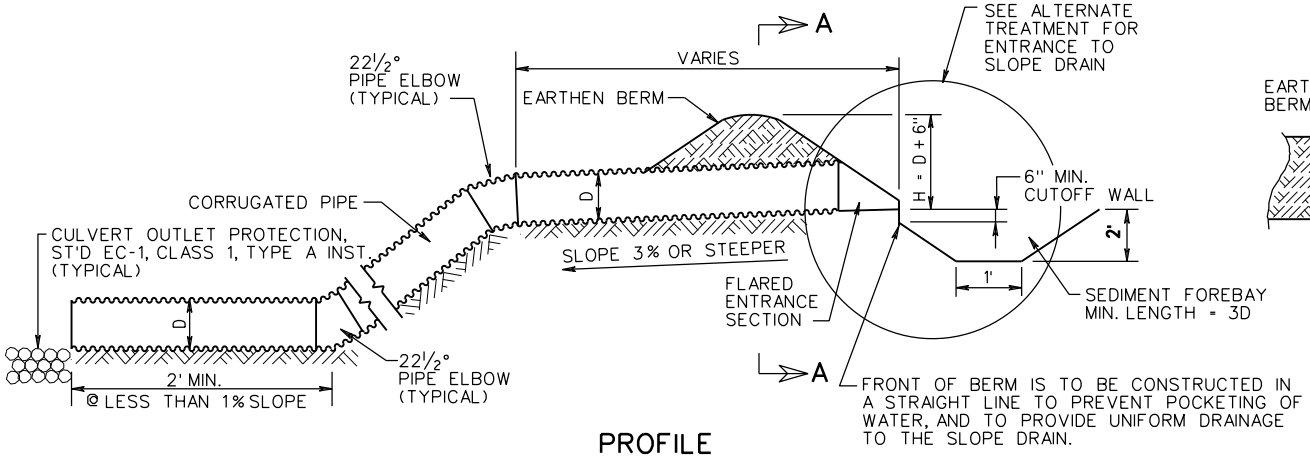
TYPICAL SECTION (A-A) THRU
TEMPORARY SEDIMENT TRAP

NOTES:

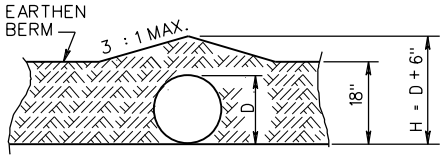
1. CHECK DAM IS SHOWN FOR ILLUSTRATION ONLY AND IS NOT INCLUDED IN PAYMENT FOR SEDIMENT TRAP.
2. THE SEDIMENT STORAGE VOLUME SHALL BE 134 CUBIC YARDS/ACRE OF TOTAL CONTRIBUTING DRAINAGE AREA AND SHALL CONSIST OF HALF IN THE FORM OF WET STORAGE AND HALF IN THE FORM OF DRY STORAGE.
3. SEE PLANS FOR DIMENSIONS AND ELEVATIONS.

SPECIFICATION REFERENCE	TYPICAL SEDIMENT TRAP	VDOT ROAD AND BRIDGE STANDARDS
107 303	VIRGINIA DEPARTMENT OF TRANSPORTATION	REVISION DATE 01/13 · SHEET 1 OF 1 · 113.11

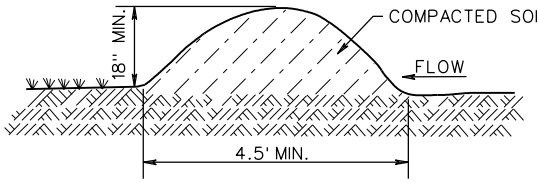
TEMPORARY BERM & SLOPE DRAIN



PROFILE



SECTION A-A



EARTHEN BERM

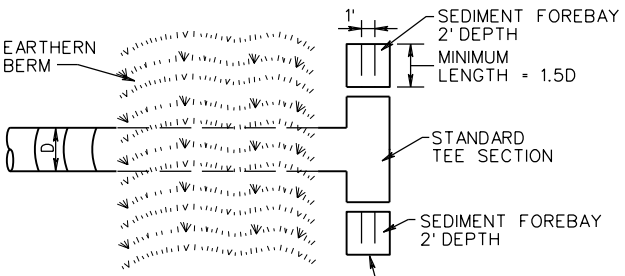
EARTHEN BERM SHALL BE INSTALLED IN ACCORDANCE WITH THE PLANS AND SPECIFICATIONS OR AS DIRECTED BY THE ENGINEER.

SIZE OF SLOPE DRAIN	
MAXIMUM DRAINAGE AREA (ACRES)	MINIMUM PIPE DIAMETER, D (IN.)
0.5	12
1.5	18
2.5	21
3.0	24

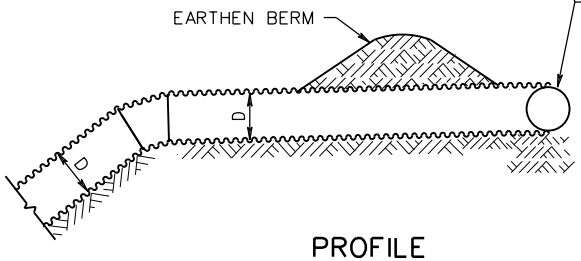
NOTES

1. SLOPE DRAIN SHALL BE SECURELY STAKED TO THE SLOPE, AT 10' (OR LESS) INTERVALS.
2. THE SLOPE DRAIN SECTIONS SHALL BE SECURELY FASTENED TOGETHER AND HAVE WATER TIGHT FITTINGS.

ALTERNATE ENTRANCE TREATMENT

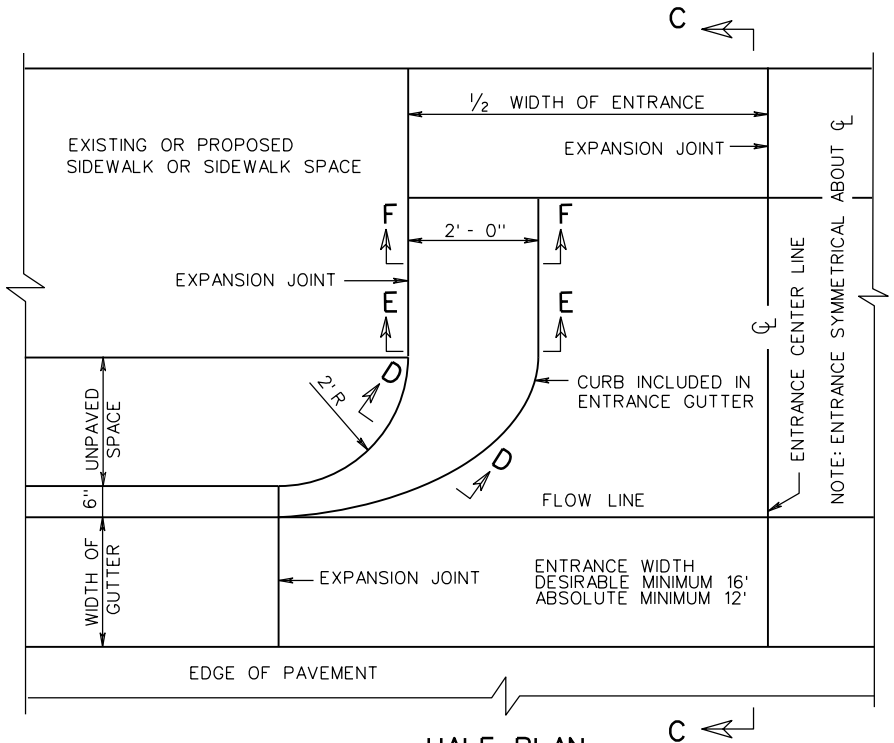


PLAN VIEW

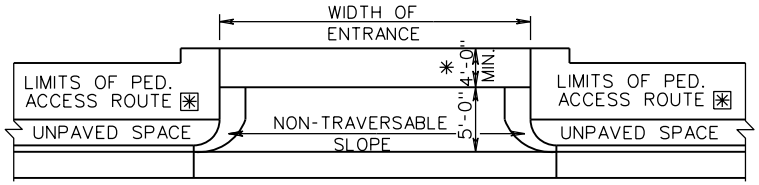


PROFILE

VDOT ROAD AND BRIDGE STANDARDS		TEMPORARY BERM & SLOPE DRAIN	SPECIFICATION REFERENCE
SHEET 1 OF 1	REVISION DATE 01/13	VIRGINIA DEPARTMENT OF TRANSPORTATION	107 303
113.14			

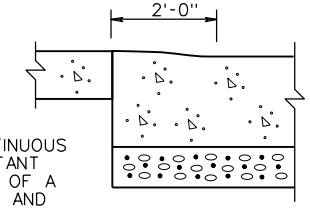


HALF PLAN



PEDESTRIAN ACCESS ROUTE DETAIL

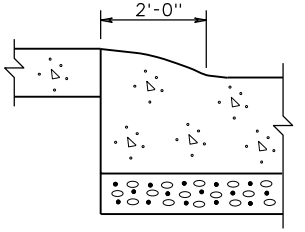
ADDITIONAL RIGHT-OF-WAY IS REQUIRED IF THE LIMITS OF PEDESTRIAN ACCESS ROUTE ✳ EXTEND BEYOND EXISTING OR PROPOSED VDOT RIGHT-OF WAY.



SECTION F-F

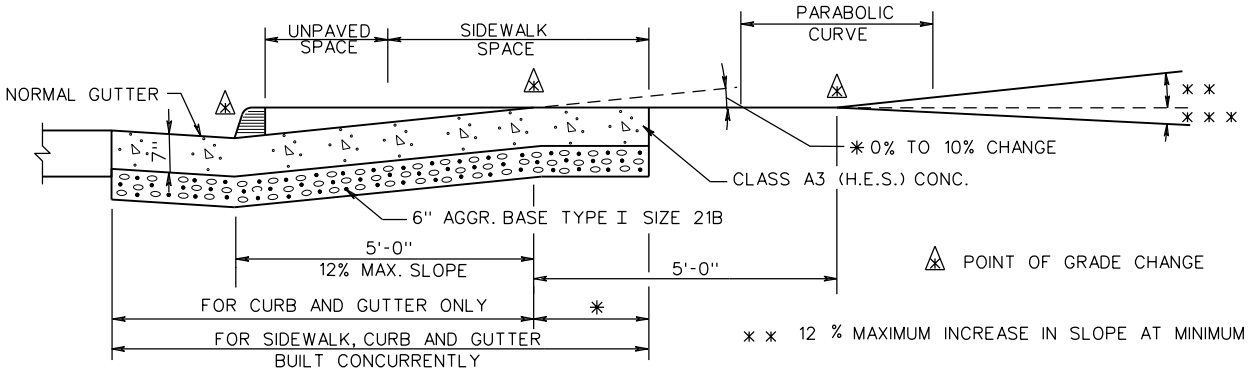
✳ PEDESTRIAN ACCESS ROUTES PROVIDE A CONTINUOUS UNOBSTRUCTED, STABLE, FIRM AND SLIP RESISTANT PATH CONNECTING ALL ACCESSIBLE ELEMENTS OF A FACILITY THAT CAN BE APPROACHED, ENTERED AND USED BY PEDESTRIANS. IF ACCESS ROUTE IS ADJACENT TO BACK OF CURB, MINIMUM WIDTH SHOULD BE 6'.

✳ IF PEDESTRIAN ACCESS ROUTES ✳ ARE BEING PROVIDED, A MINIMUM 4' TRAVERSABLE WIDTH IS REQUIRED WITH A MAX. 2% CROSS SLOPE.



SECTION E-E

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.

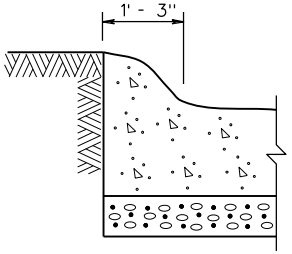


SECTION C-C

⚠ POINT OF GRADE CHANGE

✳ ✳ 12 % MAXIMUM INCREASE IN SLOPE AT MINIMUM 10' INTERVALS

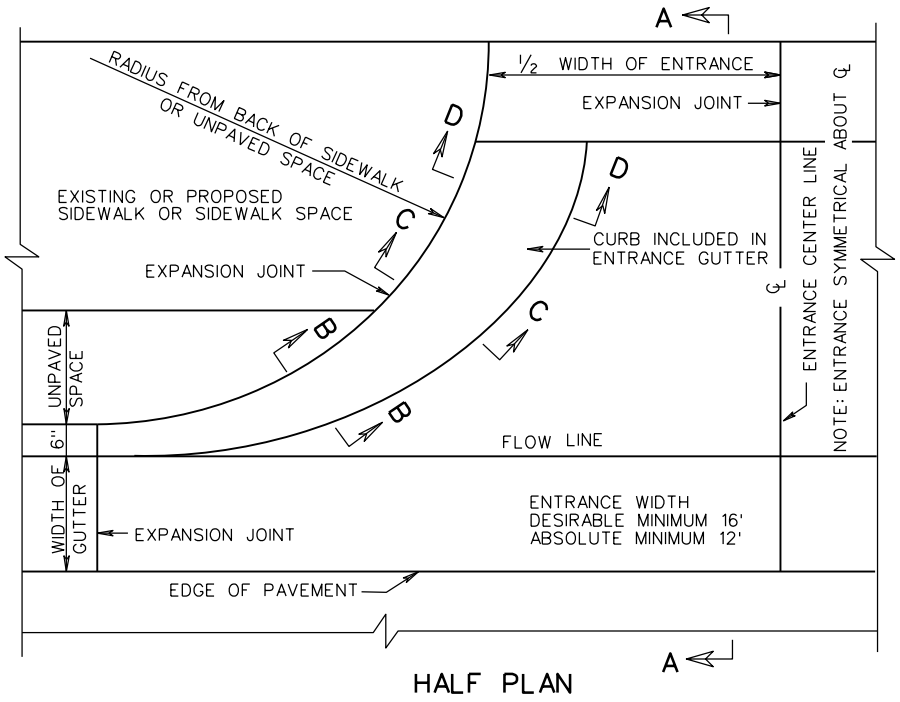
✳ ✳ ✳ 3 % MAXIMUM DECREASE IN SLOPE FOR FIRST 10' INTERVAL AND
8 % MAXIMUM DECREASE FOR SUCCEEDING MINIMUM 10' INTERVALS



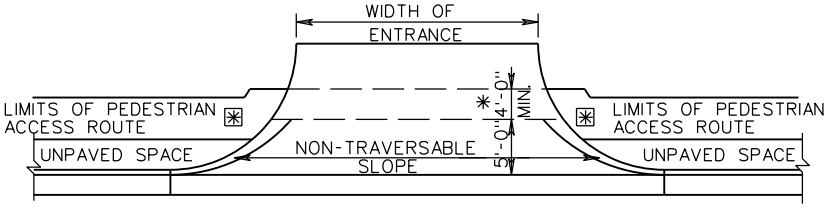
SECTION D-D

SPECIFICATION REFERENCE	STANDARD ENTRANCE GUTTER (FOR USE WITH UNPAVED SPACE BETWEEN CURB & SIDEWALK) VIRGINIA DEPARTMENT OF TRANSPORTATION	VDOT ROAD AND BRIDGE STANDARDS
502		REVISION DATE 01/13 · SHEET 1 OF 1 · 203.02

CG-9D



HALF PLAN

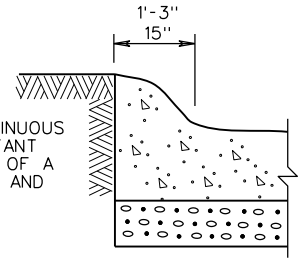


PEDESTRIAN ACCESS ROUTE DETAIL

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

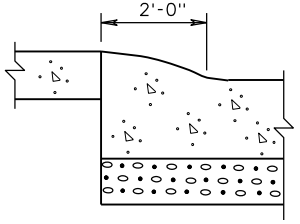
⊛ PEDESTRIAN ACCESS ROUTES PROVIDE A CONTINUOUS UNOBSTRUCTED, STABLE, FIRM AND SLIP RESISTANT PATH CONNECTING ALL ACCESSIBLE ELEMENTS OF A FACILITY THAT CAN BE APPROACHED, ENTERED AND USED BY PEDESTRIANS.

* IF PEDESTRIAN ACCESS ROUTES ⊛ ARE BEING PROVIDED, A MINIMUM 4' TRAVERSABLE WIDTH IS REQUIRED WITH A MAX. 2% CROSS SLOPE.

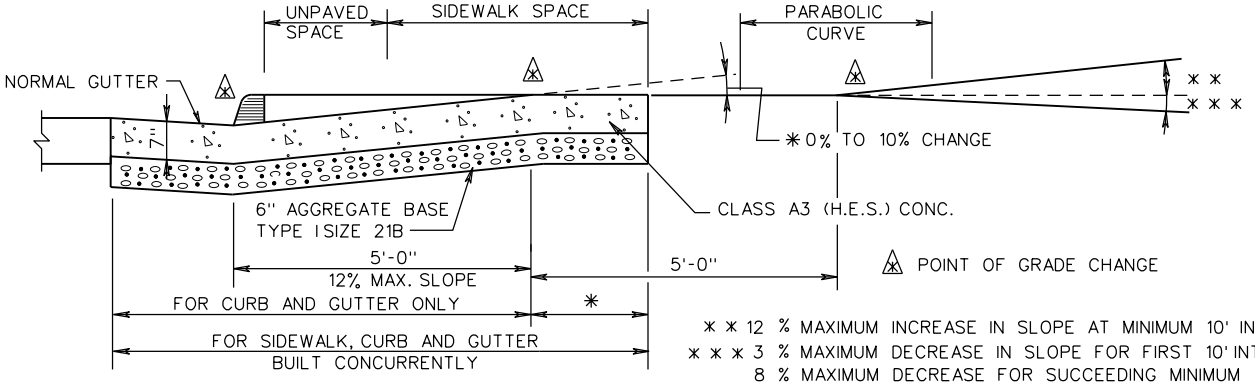


SECTION B-B

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.

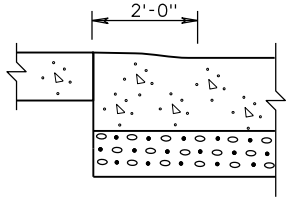


SECTION C-C



SECTION A-A

** 12 % MAXIMUM INCREASE IN SLOPE AT MINIMUM 10' INTERVALS
*** 3 % MAXIMUM DECREASE IN SLOPE FOR FIRST 10' INTERVAL AND 8 % MAXIMUM DECREASE FOR SUCCEEDING MINIMUM 10' INTERVALS



SECTION D-D

VDOT
ROAD AND BRIDGE STANDARDS

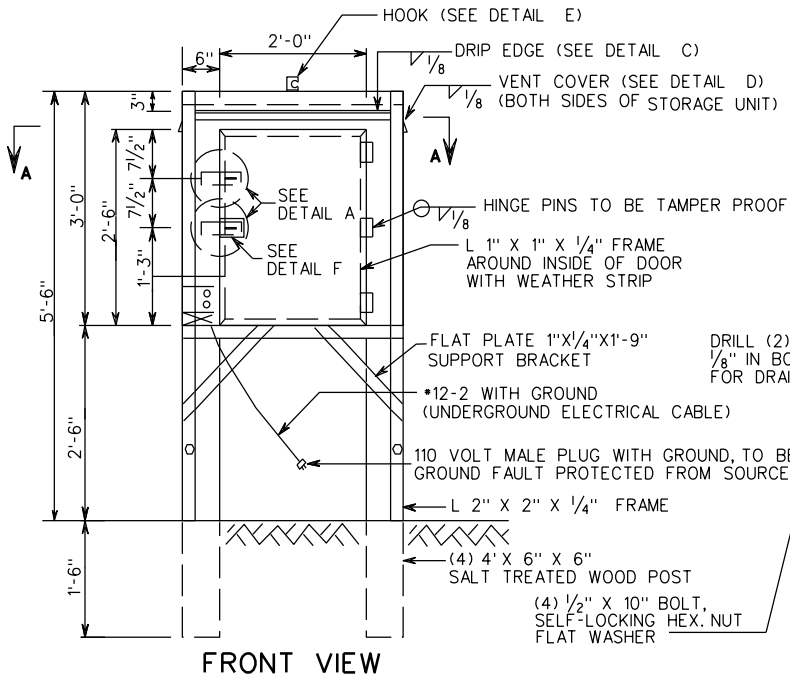
STANDARD ENTRANCE GUTTER

VIRGINIA DEPARTMENT OF TRANSPORTATION

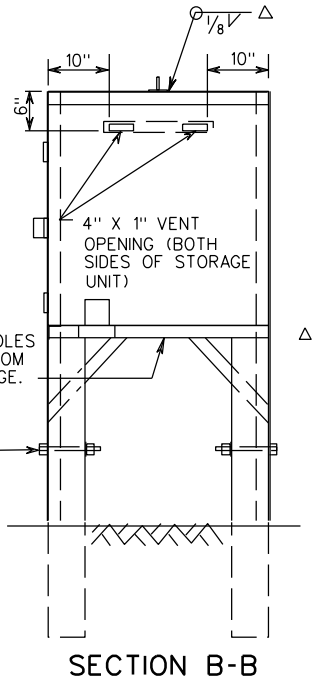
SHEET 1 OF 1	REVISION DATE
203.03	01/13

SPECIFICATION REFERENCE

502



FRONT VIEW



SECTION B-B

NOTES:

NO SEPARATE PAYMENT WILL BE MADE FOR FURNISHING, INSTALLING AND PROVIDING MAINTENANCE OF THE STORAGE FACILITY FOR NUCLEAR GAUGE AND THE PRICE THEREOF SHALL BE INCLUDED IN THE PRICE BID FOR FIELD OFFICE (TYPE) SPECIFIED, IN ACCORDANCE WITH SECTION 514 OF THE CURRENT ROAD AND BRIDGE SPECIFICATIONS.

BOX TO BE CONSTRUCTED OF A-36 SHEET STEEL 1/8" MIN. THICKNESS. WHEN WELDING TO FRAME USE 1/8" FILLET WELDS.

ALL FRAME WORK IS TO BE A-36 STEEL ANGLE L 2" X 2" X 1/4".

ALL FRAME WELDS ARE TO BE 1/4" FILLET OR BUTT WELDED ACCORDINGLY.

METAL SCREEN SHALL HAVE A MAXIMUM OF 50 SQUARES PER INCH TO A MINIMUM OF 25 SQUARES PER INCH AND BE SPOT WELDED TO INSIDE OF THE BOX OVER VENT OPENINGS.

△ THE HOOK SHALL BE WELDED TO THE CENTER OF THE TOP.

VENT OPENINGS SHALL BE PARTIALLY COVERED EXTERNALLY BY METAL VENT COVERS.

STORAGE UNIT SHALL BE PAINTED INTERNALLY AND EXTERNALLY WITH A ONE COAT ACRYLIC DIRECT TO METAL (DTM) COATING, WITH A THICKNESS OF 4-6 MILS (WET MIL THICKNESS). COLOR SHALL BE EQUAL TO FEDERAL STANDARD COLOR NO. 595-17886 (WHITE).

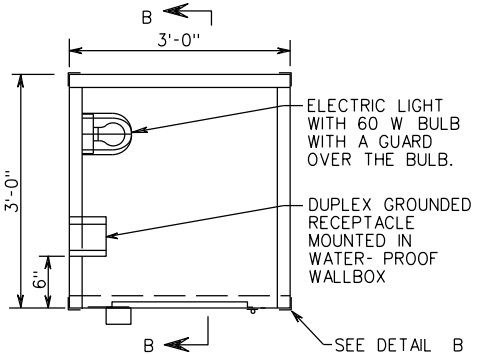
THE DESIGN IS TO BE 4" ID AND MOUNTED AT A 45° ANGLE OVER THE HASP OPENING IN THE DOOR.

OPTIONAL SHROUD DESIGN IS TO BE SUBMITTED FOR THE ENGINEERS REVIEW AND APPROVAL.

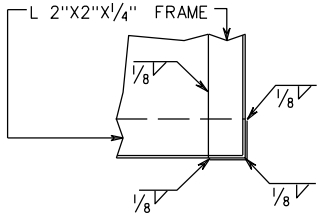
CONTRASTING PAINT IS REQUIRED TO DEPICT STORAGE AREA.

STORAGE UNIT TO HAVE TWO (2) TAMPER-RESISTANT HASPS WITH A LOCK BOX EACH, OPEN ON THE BOTTOM AND TOP.

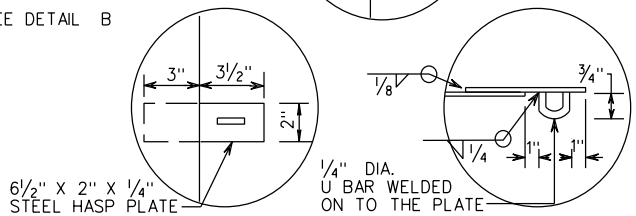
A STEEL EYEBOLT SHALL BE INSTALLED IN THE FLOOR INSIDE THE CONTAINER TO ACCOMMODATE A LINKED SECURITY CHAIN. THE EYEBOLT MAY BE THROUGH BOLTED OR WELDED TO THE FLOOR AND SHALL HAVE A MINIMUM 1/2" DIAMETER EYE TO ALLOW THE GAUGE TO BE CHAINED AND LOCKED TO THE FLOOR OF THE FACILITY.



SECTION A-A

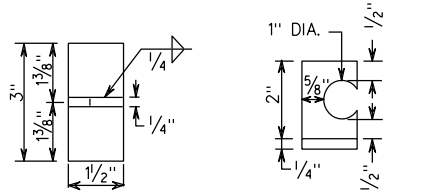


DETAIL B



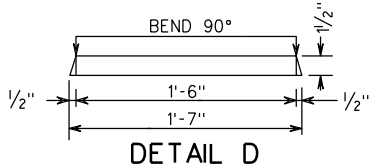
FRONT VIEW TOP VIEW

DETAIL A

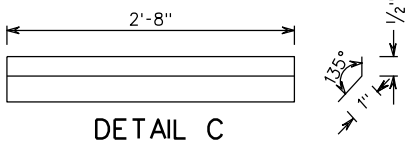


TOP VIEW FRONT VIEW

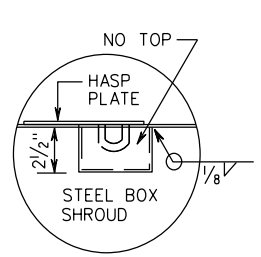
DETAIL E



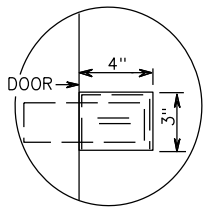
DETAIL D



DETAIL C



TOP VIEW

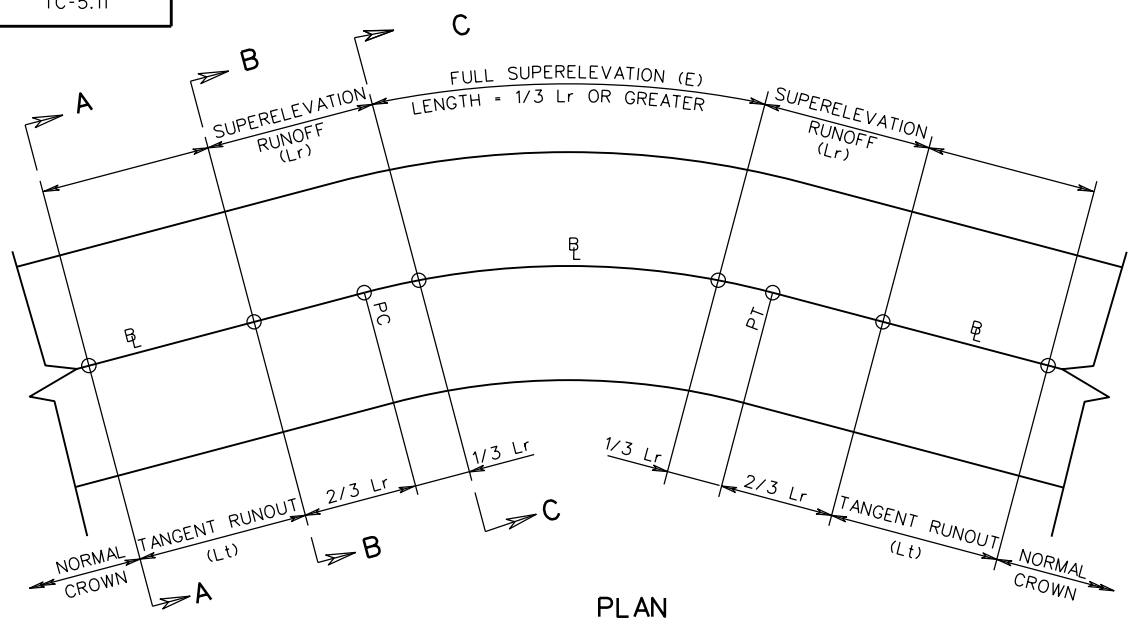


FRONT VIEW

DETAIL F

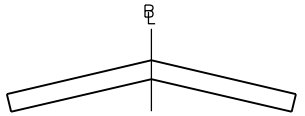
SPECIFICATION REFERENCE	STORAGE FACILITY FOR NUCLEAR GAUGE	VDOT ROAD AND BRIDGE STANDARDS
	VIRGINIA DEPARTMENT OF TRANSPORTATION	REVISION DATE 01/13 · SHEET 1 OF 1 · 605.01

TC-5.11

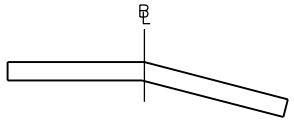


PLAN

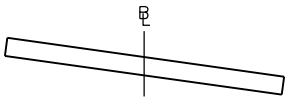
Lt = Lr(2/E)



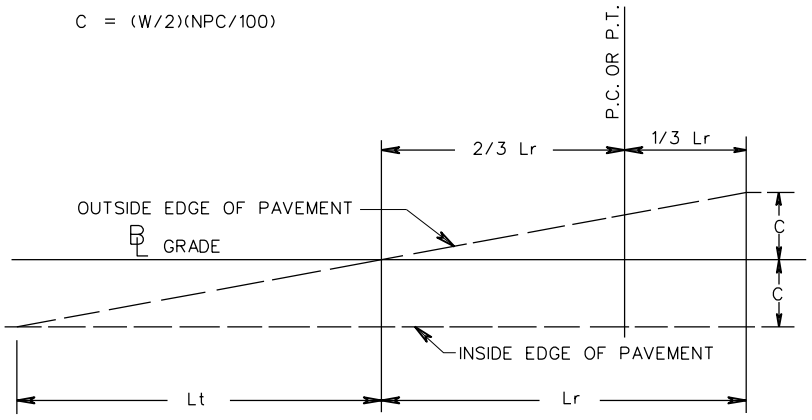
SECTION A-A
NORMAL CROWN



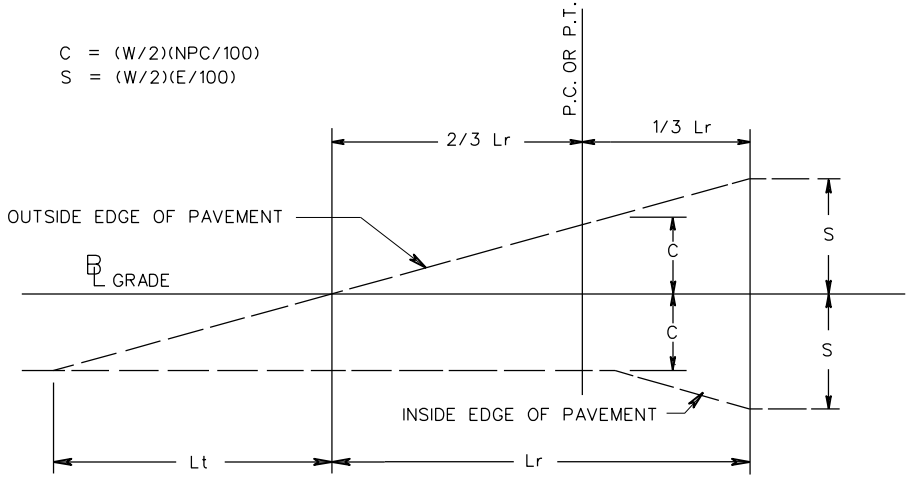
SECTION B-B
NORMAL CROWN
REMOVED (FLAT)



SECTION C-C
FULL SUPERELEVATION



SUPERELEVATED BY AN AMOUNT EQUAL TO THE STANDARD PAVEMENT CROWN



NOTE : ON THE INSIDE OF CURVE THE STANDARD PAVEMENT CROWN (C) SHALL BE HELD UNTIL IT IS EXCEEDED BY THE TABULATED RATE OF SUPERELEVATION (E).

SUPERELEVATED BY AN AMOUNT EXCEEDING THE STANDARD PAVEMENT CROWN

VDOT
ROAD AND BRIDGE STANDARDS

SHEET 1 OF 1
803.06

REVISION DATE
01/13

DETAIL FOR NON-TRANSITION ℄ URBAN & RURAL CONDITIONS W/OUT PAVEMENT WIDENING

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE

TC-5.11

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) 12' LANE	MIN. TRANSITION LENGTH IN FEET RURAL CONDITIONS WITH PAVEMENT WIDENING AND REVERSE CURVES FOR ALL CONDITIONS (2 SECOND RULE)	MAXIMUM RELATIVE GRADIENT (rg) RAMPS AND LOOPS 16' LANE	18' LANE	24' LANE
20	0.74	59	0.84	0.89	0.99
25	0.70	74	0.80	0.84	0.93
30	0.66	88	0.75	0.80	0.88
35	0.62	103	0.71	0.75	0.83
40	0.58	117	0.66	0.70	0.77
45	0.54	132	0.61	0.65	0.72
50	0.50	147	0.57	0.60	0.67
55	0.47	161	0.54	0.57	0.63
60	0.45	176	0.51	0.54	0.60
65	0.43	191	0.49	0.52	0.57
70	0.40	205	0.45	0.48	0.53
75	0.38	220	0.43	0.46	0.51
80	0.35	235	0.39	0.42	0.47

DEFINITIONS

A - FRONT OVERHANG OF DESIGN VEHICLE FROM APPROPRIATE TABLE.

bw - ADJUSTMENT FACTOR FROM TABLE.

C - LATERAL CLEARANCE OF DESIGN VEHICLE FROM APPROPRIATE TABLE.

E - SUPERELEVATION RATE FROM APPROPRIATE TABLE.

e_d - DESIGN SUPERELEVATION RATE, PERCENT

e_{NC} - NORMAL CROSS SLOPE RATE, PERCENT

F_A - CALCULATED WIDTH OF OVERHANG FOR DESIGN VEHICLE.

L - WHEELBASE OF DESIGN VEHICLE FROM APPROPRIATE TABLE.

Lr - LENGTH OF SUPERELEVATION RUNOFF SECTION.

Lt - LENGTH OF TANGENT RUNOUT SECTION

M - MULTIPLE LANE FACTOR.

N - NUMBER OF LANES.

n_1 - NUMBER OF LANES ROTATED (FROM TABLES).

Pw - 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.

FORMULAS USED TO CALCULATE SUPERELEVATION RUNOFF (Lr) AND CROWN RUNOUT (Lt)

NO WIDENING REQUIRED

$Lr = b_w(W_n\ n_1\ E/rg)$

$Lr = M(WE/rg)$ (ALT. MULTI-LANE)

WIDENING REQUIRED

$Lr = b_w[E\ n_1\ (W_n + w/N)/rg]$

$Lr = m[E(W + w/N)/rg]$ (ALT. MULTI-LANE)

$$L_t = \left(\frac{e_{NC}}{e_d}\right) Lr$$

FOR SOLVED PROBLEMS USING THIS METHODOLOGY FOR Lr, SEE THE EXAMPLES ON PAGE 803.22

NOTE: AN ALTERNATE METHOD FOR MULTI-LANE UNDIVIDED PAVEMENTS (48'). THE Lr IS 1.5 TIMES (M=1.5) THE CORRESPONDING LENGTH FOR TWO LANE HIGHWAYS; AND FOR SIX LANE UNDIVIDED PAVEMENTS (72'), THE Lr IS TWO TIMES (M=2) THE CORRESPONDING LENGTH FOR TWO LANE HIGHWAYS.

VDOT
ROAD AND BRIDGE STANDARDS

METHODOLOGIES FOR CALCULATING TC-5.11 VALUES

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE

RURAL EXAMPLE

20 FT PAVEMENT WIDTH
(DESIGN SOFTWARE - 1 LANE AT 10 FT)

$V_D = 50$ MPH $R = 1000$ FT
$W_n = 10$ FT $rg = 0.50$
$E = 7.6$ (7.6% PER 803.38)

$$U = u + R - \sqrt{R^2 - L^2}$$
$$U = 8.5 + 1000 - \sqrt{(1000)^2 - (43)^2}$$
$$U = 9.42492$$

$$F_A = \sqrt{R^2 + A\,(2L + A)} - R$$
$$F_A = \sqrt{(1000)^2 + 4[\,2(19.5) + 4\,]} - 1000$$
$$F_A = .085996$$

$$Z = (V_D / \sqrt{R})$$
$$Z = (50 / \sqrt{1000})$$
$$Z = 1.58$$

$$W_C = N\,(U + C) + F_A + Z$$
$$W_C = 2(9.42492 + 2) + 0.085996 + 1.58$$
$$W_C = 24.5158$$

$$w = W_C - 2W_n = 24.5158 - 2(10) = 4.5158 \text{ or } 4.5$$

(w>2 THEREFORE WIDENING IS REQUIRED)
$$Lr = [E\,n_1(W_n + w/2)/\,rg\,]\,b_w$$
$$Lr = [7.6(1)(10 + 4.5/2)\,/\,0.50]\,1$$
$$Lr = 7.6\,(12.25)/0.50$$
$$Lr = 186.20$$

RURAL EXAMPLE

72 FT PAVEMENT WIDTH
(DESIGN SOFTWARE - 3 LANES AT 12 FT)

$V_D = 40$ MPH $R = 500$ FT
$W_n = 12$ FT $rg = 0.58$
$E = 8.0$ (8% PER PAGE 803.36)

$$U = u + R - \sqrt{R^2 - L^2}$$
$$U = 8.5 + 500 - \sqrt{(500)^2 - (43)^2}$$
$$U = 10.35243$$

$$F_A = \sqrt{R^2 + A\,(2L + A)} - R$$
$$F_A = \sqrt{(500)^2 + 4[\,2(19.5) + 4\,]} - 500$$
$$F_A = .1719$$

$$Z = (V_D / \sqrt{R})$$
$$Z = (40 / \sqrt{500})$$
$$Z = 1.7885$$

$$W_C = 2\,(U + C) + F_A + Z$$
$$W_C = 2(10.35243 + 3) + 0.1719 + 1.7885$$
$$W_C = 28.6652$$

$$w = W_C - 2W_n = 28.6652 - 2(12) = 4.6652$$

FOR 72' PAVEMENT WIDTH
$w = 3(4.6652) = 13.9956$

(w>2 THEREFORE WIDENING IS REQUIRED)
$$Lr = [E\,n_1(W_n + w/6)/\,rg]\,b_w$$
$$Lr = [8\,(3)\,(12 + 13.9956/6)/\,0.58]\,0.6667$$
$$Lr = (343.9824/0.58)\,0.6667$$
$$Lr = 395.4018$$

OR

$$Lr = M[E(W_n + w/N)/rg]$$
$$Lr = 2\,[8(12 + 13.9956/6)\,/\,0.58]$$
$$Lr = 2\,(114.6608/0.58)$$
$$Lr = 395.3820$$

URBAN EXAMPLES

24 FT PAVEMENT WIDTH
(DESIGN SOFTWARE - 1 LANE AT 12 FT)

$V_D = 40$ MPH $R = 600$ FT
$W_n = 12$ FT $rg = 0.58$
$E = 4.0$ (4% PER PAGE 803.28)

$$Lr = (W_n\,n_1\,E/rg)\,b_w$$
$$Lr = [12(1)(4)/0.58]\,1.00$$
$$Lr = (48/.058)$$
$$Lr = 82.7586$$

66 FT PAVEMENT WIDTH
(DESIGN SOFTWARE - 3 LANES AT 11 FT)

$V_D = 40$ MPH $R = 600$ FT
$W_n = 11$ FT $rg = 0.58$
$E = 4.0$ (4% PER PAGE 803.28)

$$Lr = b_w\,(W_n\,n_1\,E/rg)$$
$$Lr = 0.6667\,[11(3)(4)/\,0.58]$$
$$Lr = 0.6667\,(132/0.58)$$
$$Lr = 151.7317$$

OR

$$Lr = M\,(E\,W_n/rg)$$
$$Lr = 2\,[4(11)/\,0.58]$$
$$Lr = 2\,(44/0.58)$$
$$Lr = 151.7241$$

VDOT
ROAD AND BRIDGE STANDARDS

CALCULATED TC-5.11 EXAMPLES

VIRGINIA DEPARTMENT OF TRANSPORTATION

SHEET 1 OF 1
803.22

REVISION DATE
01/13

SPECIFICATION REFERENCE

TRANSITION CURVES - RURAL
20 MPH DESIGN SPEED

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE

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

DESIGN VELOCITY =20		WIDTH= 18 FT			WIDTH=20 FT			WIDTH=22 FT			WIDTH=24 FT			WIDTH=48 FT			INTERCHANGE RAMPS			
		DESIGN SOFTWARE EQUIVALENTS (NUMBER OF LANES AT LANE WIDTH)															WIDTH			
		1 @ 9'			1 @ 10'			1 @ 11'			1 @ 12'			2 @ 12'			16 FT		18 FT	
RADIUS(FT)	E(%)	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	Lt	Lr
1640	NC	0	0	2.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1210	2	28	28	2.2	28	28	0	30	30	0	33	33	0	49	49	0	39	39	41	41
1180	2.1	28	29	2.3	28	29	0	30	32	0	33	35	0	49	52	0	39	40	41	43
1100	2.2	29	31	2.3	28	30	0	30	33	0	33	36	0	49	54	0	39	42	41	45
1020	2.3	28	32	2.4	28	32	0	30	35	0	33	38	0	49	56	0	39	44	41	47
1008	2.4	29	34	2.4	28	33	0	30	36	0	33	39	0	49	59	0	39	46	41	49
960	2.5	28	35	2.5	28	34	0	30	38	0	33	41	0	49	61	0	39	48	41	51
880	2.6	29	37	2.6	28	36	0	30	39	0	33	43	0	49	64	0	39	50	41	53
840	2.7	29	38	2.6	28	37	0	30	41	0	33	44	0	49	66	0	39	52	41	55
810	2.8	29	40	2.7	28	38	0	30	42	0	33	46	0	49	69	0	39	54	41	57
774	2.9	29	41	2.7	28	40	0	30	44	0	33	48	0	49	71	0	39	56	41	59
760	3	28	42	2.7	28	41	0	30	45	0	33	49	0	49	73	0	39	58	41	61
720	3.1	29	44	2.8	28	42	0	30	47	0	33	51	0	49	76	0	39	60	41	63
680	3.2	29	46	2.9	28	44	0	30	48	0	33	52	0	49	78	0	39	61	41	65
658	3.3	29	47	2.9	28	45	0	30	50	0	33	54	0	49	81	0	39	63	41	67
641	3.4	29	49	3	30	51	2	30	51	0	33	56	0	49	83	0	39	65	41	69
617	3.5	29	50	3	30	53	2	30	53	0	33	57	0	49	86	0	39	67	41	71
595	3.6	29	52	3.1	30	54	2.1	30	54	0	33	59	0	49	88	0	39	69	41	73
574	3.7	29	53	3.2	30	56	2.2	30	55	0	33	60	0	49	90	0	39	71	41	75
548	3.8	29	55	3.2	30	57	2.2	30	57	0	33	62	0	49	93	0	39	73	41	77
528	3.9	30	57	3.3	31	59	2.3	30	58	0	33	64	0	49	95	0	39	75	41	79
499	4	29	58	3.4	31	61	2.4	30	60	0	33	65	0	49	98	0	39	77	41	81
484	4.1	30	60	3.5	31	63	2.5	30	61	0	33	67	0	49	100	0	39	79	41	83
468	4.2	30	62	3.5	31	64	2.5	30	63	0	33	69	0	49	103	0	39	80	41	85
451	4.3	30	63	3.6	31	66	2.6	30	64	0	33	70	0	49	105	0	39	82	41	87
435	4.4	30	65	3.7	31	68	2.7	30	66	0	33	72	0	49	108	0	39	84	41	89
418	4.5	30	67	3.8	32	70	2.8	30	67	0	33	73	0	49	110	0	39	86	41	92
402	4.6	30	69	3.9	31	71	2.9	30	69	0	33	75	0	49	112	0	39	88	41	94
373	4.7	31	71	4.1	32	74	3.1	33	77	2.1	33	77	0	49	115	0	39	90	41	96
366	4.8	30	72	4.1	32	75	3.1	33	79	2.1	33	78	0	49	117	0	39	92	41	98
342	4.9	31	74	4.3	32	78	3.3	33	81	2.3	33	80	0	49	120	0	39	94	41	100
330	5	31	76	4.4	32	80	3.4	33	83	2.4	33	82	0	49	122	0	39	96	41	102
309	5.1	31	78	4.6	33	82	3.6	34	85	2.6	33	83	0	49	125	0	39	98	41	104
298	5.2	31	80	4.7	33	84	3.7	34	87	2.7	33	85	0	49	127	0	39	100	41	106
276	5.3	32	83	4.9	33	86	3.9	34	90	2.9	33	86	0	49	129	0	39	101	41	108
268	5.4	32	84	5	33	88	4	34	92	3	36	95	2	53	143	4	39	103	41	110
252	5.5	32	87	5.2	33	90	4.2	35	94	3.2	36	98	2.2	54	147	4.4	39	105	41	112
244	5.6	32	89	5.4	34	93	4.4	35	97	3.4	36	100	2.4	54	150	4.8	39	107	41	114
235	5.7	32	91	5.5	34	95	4.5	35	99	3.5	36	103	2.5	55	154	5	39	109	41	116
226	5.8	33	93	5.6	34	97	4.6	35	101	3.6	36	105	2.6	55	157	5.2	39	111	41	118
214	5.9	33	96	5.9	34	100	4.9	36	104	3.9	37	108	2.9	55	161	5.8	39	113	41	120
204	6	33	98	6.1	34	102	5.1	36	106	4.1	37	110	3.1	55	165	6.2	39	115	41	122
199	6.1	33	100	6.2	35	104	5.2	36	108	4.2	37	113	3.2	56	169	6.4	39	117	41	124
192	6.2	33	102	6.3	35	106	5.3	36	111	4.3	37	115	3.3	56	172	6.6	39	119	41	126
181	6.3	34	105	6.6	35	109	5.6	37	114	4.6	38	118	3.6	57	177	7.2	39	120	41	128
174	6.4	34	108	6.8	35	112	5.8	37	116	4.8	38	121	3.8	57	181	7.6	39	122	41	130
167	6.5	34	110	7	36	115	6	37	119	5	38	123	4	57	185	8	39	124	41	132
160	6.6	35	113	7.2	36	117	6.2	37	122	5.2	39	126	4.2	58	189	8.4	39	126	41	134
156	6.7	35	115	7.4	36	120	6.4	38	125	5.4	39	129	4.4	58	193	8.8	39	128	41	136
149	6.8	35	118	7.6	37	123	6.6	38	127	5.6	39	132	4.6	59	198	9.2	39	130	41	138
145	6.9	36	121	7.8	37	125	6.8	38	130	5.8	40	135	4.8	59	202	9.6	39	132	41	140
140	7	36	123	8	37	128	7	38	133	6	40	138	5	59	206	10	39	134	41	142
134	7.1	36	127	8.3	37	131	7.3	39	136	6.3	40	141	5.3	60	211	10.6	39	136	41	144
128	7.2	37	130	8.6	38	135	7.6	39	140	6.6	40	144	5.6	60	216	11.2	39	138	41	146
124	7.3	37	133	8.8	38	138	7.8	40	143	6.8	41	147	5.8	61	221	11.6	39	140	41	148
120	7.4	37	135	9	38	140	8	40	145	7	41	150	6	61	225	12	39	141	41	150
114	7.5	38	140	9.5	39	145	8.5	40	150	7.5	42	155	6.5	62	232	13	39	143	41	152
107	7.6	38	144	9.9	40	149	8.9	41	154	7.9	42	159	6.9	63	239	13.8	39	145	41	154
102	7.7	39	148	10.4	40	153	9.4	42	159	8.4	43	164	7.4	64	246	14.8	39	147	41	156
96	7.8	39	152	10.8	41	158	9.8	42	163	8.8	44	168	7.8	65	252	15.6	39	149	41	158
90	7.9	40	158	11.5	42	163	10.5	43	169	9.5	45	174	8.5	67	261	17	39	151	41	160
77	8	43	169	13.1	44	174	12.1	45	179	11.1	47	185	10.1	70	277	20.2	39	153	41	162

NOTE:
Lt, Lr & w VALUES IN FEET. LISTED RADIUS IS THE MINIMUM ALLOWABLE RADIUS FOR THE CORRESPONDING E, Lt, Lr, AND w VALUES. WIDENING SHOWN IS BASED ON A SU-40 DESIGN VEHICLE.

SPECIFICATION REFERENCE

TRANSITION CURVES - RURAL
25 MPH DESIGN SPEED

VIRGINIA DEPARTMENT OF TRANSPORTATION

DESIGN FACTORS FOR A DESIGN SPEED OF 25 MPH (RURAL) USING E= 8% MAX.

DESIGN VELOCITY =25		WIDTH= 18 FT			WIDTH=20 FT			WIDTH=22 FT			WIDTH=24 FT			WIDTH=48 FT			INTERCHANGE RAMPS WIDTH			
		DESIGN SOFTWARE EQUIVALENTS (NUMBER OF LANES AT LANE WIDTH)																		
		1 @ 9'			1 @ 10'			1 @ 11'			1 @ 12'			2 @ 12'			16 FT		18 FT	
RADIUS(FT)	E(%)	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	Lt	Lr
2370	NC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1745	2	29	29	2.1	29	29	0	32	32	0	35	35	0	52	52	0	40	40	43	43
1698	2.1	30	31	2.1	29	30	0	32	33	0	35	36	0	52	54	0	40	42	43	45
1580	2.2	30	32	2.1	29	32	0	32	35	0	35	38	0	52	57	0	40	44	43	48
1520	2.3	30	34	2.2	29	33	0	32	37	0	35	40	0	52	60	0	40	46	43	50
1432	2.4	30	35	2.2	29	35	0	32	38	0	35	42	0	52	62	0	40	48	43	52
1400	2.5	30	37	2.2	29	36	0	32	40	0	35	43	0	52	65	0	40	50	43	54
1290	2.6	30	38	2.3	29	38	0	32	41	0	35	45	0	52	67	0	40	52	43	56
1254	2.7	30	40	2.3	29	39	0	32	43	0	35	47	0	52	70	0	40	54	43	58
1220	2.8	30	41	2.4	29	40	0	32	44	0	35	48	0	52	72	0	40	56	43	60
1160	2.9	30	43	2.4	29	42	0	32	46	0	35	50	0	52	75	0	40	58	43	63
1080	3	30	44	2.5	29	43	0	32	48	0	35	52	0	52	78	0	40	60	43	65
1056	3.1	30	46	2.5	29	45	0	32	49	0	35	54	0	52	80	0	40	62	43	67
1008	3.2	30	48	2.6	29	46	0	32	51	0	35	55	0	52	83	0	40	64	43	69
990	3.3	30	49	2.6	29	48	0	32	52	0	35	57	0	52	85	0	40	66	43	71
950	3.4	30	51	2.6	29	49	0	32	54	0	35	59	0	52	88	0	40	68	43	73
910	3.5	30	52	2.7	29	50	0	32	55	0	35	60	0	52	90	0	40	70	43	75
870	3.6	30	54	2.7	29	52	0	32	57	0	35	62	0	52	93	0	40	72	43	78
830	3.7	30	55	2.8	29	53	0	32	59	0	35	64	0	52	96	0	40	74	43	80
807	3.8	30	57	2.8	29	55	0	32	60	0	35	66	0	52	98	0	40	76	43	82
781	3.9	31	59	2.9	29	56	0	32	62	0	35	67	0	52	101	0	40	78	43	84
752	4	30	60	2.9	29	58	0	32	63	0	35	69	0	52	103	0	40	80	43	86
718	4.1	31	62	3	32	65	2	32	65	0	35	71	0	52	106	0	40	82	43	88
690	4.2	31	64	3.1	32	67	2.1	32	66	0	35	72	0	52	108	0	40	84	43	90
662	4.3	31	65	3.1	32	68	2.1	32	68	0	35	74	0	52	111	0	40	86	43	93
652	4.4	31	67	3.2	32	70	2.2	32	70	0	35	76	0	52	114	0	40	88	43	95
626	4.5	31	69	3.2	32	72	2.2	32	71	0	35	78	0	52	116	0	40	90	43	97
599	4.6	31	70	3.3	32	74	2.3	32	73	0	35	79	0	52	119	0	40	92	43	99
588	4.7	31	72	3.3	32	75	2.3	32	74	0	35	81	0	52	121	0	40	94	43	101
562	4.8	31	74	3.4	32	77	2.4	32	76	0	35	83	0	52	124	0	40	96	43	103
535	4.9	32	76	3.5	33	79	2.5	32	77	0	35	84	0	52	126	0	40	98	43	105
524	5	31	77	3.5	33	81	2.5	32	79	0	35	86	0	52	129	0	40	100	43	108
498	5.1	31	79	3.6	33	83	2.6	32	81	0	35	88	0	52	132	0	40	102	43	110
470	5.2	32	81	3.8	33	85	2.8	32	82	0	35	90	0	52	134	0	40	104	43	112
458	5.3	32	83	3.8	33	87	2.8	32	84	0	35	91	0	52	137	0	40	106	43	114
446	5.4	32	85	3.9	33	89	2.9	32	85	0	35	93	0	52	139	0	40	108	43	116
420	5.5	32	87	4	34	91	3	35	95	2	35	95	0	52	142	0	40	110	43	118
408	5.6	32	89	4.1	34	93	3.1	35	97	2.1	35	96	0	52	144	0	40	112	43	120
392	5.7	32	91	4.2	34	95	3.2	35	99	2.2	35	98	0	52	147	0	40	114	43	123
376	5.8	33	93	4.3	34	97	3.3	35	101	2.3	35	100	0	52	150	0	40	116	43	125
360	5.9	33	95	4.4	34	99	3.4	35	103	2.4	35	102	0	52	152	0	40	118	43	127
340	6	33	97	4.6	34	102	3.6	36	106	2.6	35	103	0	52	155	0	40	120	43	129
337	6.1	33	99	4.6	34	103	3.6	36	108	2.6	35	105	0	52	157	0	40	122	43	131
322	6.2	33	101	4.7	34	105	3.7	36	110	2.7	35	107	0	52	160	0	40	124	43	133
308	6.3	34	104	4.9	35	108	3.9	36	113	2.9	35	108	0	52	162	0	40	126	43	135
299	6.4	34	106	5	35	110	4	36	115	3	38	119	2	56	179	4	40	128	43	138
290	6.5	33	107	5	35	112	4	36	117	3	38	121	2	56	182	4	40	130	43	140
273	6.6	34	110	5.3	35	115	4.3	37	120	3.3	38	124	2.3	57	186	4.6	40	132	43	142
267	6.7	34	112	5.3	35	117	4.3	37	122	3.3	38	126	2.3	57	189	4.6	40	134	43	144
259	6.8	34	114	5.4	35	119	4.4	37	124	3.4	38	129	2.4	57	193	4.8	40	136	43	146
251	6.9	34	117	5.6	36	122	4.6	37	127	3.6	38	132	2.6	58	197	5.2	40	138	43	148
242	7	34	119	5.7	36	124	4.7	37	129	3.7	39	134	2.7	58	201	5.4	40	140	43	150
234	7.1	35	121	5.8	36	126	4.8	37	131	3.8	39	136	2.8	58	204	5.6	40	142	43	153
225	7.2	35	124	6	36	129	5	38	134	4	39	139	3	59	209	6	40	144	43	155
216	7.3	35	127	6.2	37	132	5.2	38	137	4.2	39	142	3.2	59	213	6.4	40	146	43	157
209	7.4	35	129	6.3	37	134	5.3	38	140	4.3	39	145	3.3	59	217	6.6	40	148	43	159
199	7.5	36	132	6.5	37	137	5.5	38	142	4.5	40	148	3.5	59	221	7	40	150	43	161
191	7.6	36	135	6.7	37	140	5.7	39	145	4.7	40	151	3.7	60	226	7.4	40	152	43	163
177	7.7	37	139	7.1	38	144	6.1	39	150	5.1	41	155	4.1	61	232	8.2	40	154	43	165
168	7.8	37	142	7.4	38	148	6.4	40	153	5.4	41	159	4.4	62	238	8.8	40	156	43	168
159	7.9	37	146	7.7	39	151	6.7	40	157	5.7	42	162	4.7	62	243	9.4	40	158	43	170
135	8	39	153	8.7	40	159	7.7	41	164	6.7	43	170	5.7	64	255	11.4	40	160	43	172

NOTE:
Lt, Lr & w VALUES IN FEET. LISTED RADIUS IS THE MINIMUM ALLOWABLE RADIUS FOR THE CORRESPONDING E, Lt, Lr, AND w VALUES. WIDENING SHOWN IS BASED ON A SU-40 DESIGN VEHICLE.

VDOT
ROAD AND BRIDGE STANDARDS

REVISION DATE 01/13

SHEET 1 OF 1

803.33

TC-5.11

VDOT ROAD AND BRIDGE STANDARDS

REVISION DATE 01/13

TRANSITION CURVES - RURAL 30 MPH DESIGN SPEED

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE

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

DESIGN VELOCITY =30		WIDTH= 18 FT			WIDTH=20 FT			WIDTH=22 FT			WIDTH=24 FT			WIDTH=48 FT			INTERCHANGE RAMPS			
		DESIGN SOFTWARE EQUIVALENTS (NUMBER OF LANES AT LANE WIDTH)															WIDTH			
		1 @ 9'			1 @ 10'			1 @ 11'			1 @ 12'			2 @ 12'			16 FT		18 FT	
RADIUS(FT)	E(%)	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	Lt	Lr
3240	NC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2400	2	31	31	2	31	31	0	34	34	0	37	37	0	55	55	0	43	43	45	45
2360	2.1	31	32	2	31	32	0	34	35	0	37	39	0	55	58	0	43	45	45	48
2200	2.2	31	34	2	31	34	0	34	37	0	37	40	0	55	60	0	43	47	45	50
2040	2.3	31	36	2.1	31	35	0	34	39	0	37	42	0	55	63	0	43	50	45	52
2000	2.4	31	37	2.1	31	37	0	34	40	0	37	44	0	55	66	0	43	52	45	54
1920	2.5	32	39	2.1	31	38	0	34	42	0	37	46	0	55	69	0	43	54	45	57
1840	2.6	31	40	2.1	31	40	0	34	44	0	37	48	0	55	71	0	43	56	45	59
1760	2.7	32	42	2.2	31	41	0	34	45	0	37	50	0	55	74	0	43	58	45	61
1680	2.8	31	43	2.2	31	43	0	34	47	0	37	51	0	55	77	0	43	60	45	63
1600	2.9	32	45	2.3	31	44	0	34	49	0	37	53	0	55	80	0	43	62	45	66
1520	3	32	47	2.3	31	46	0	34	50	0	37	55	0	55	82	0	43	64	45	68
1440	3.1	31	48	2.3	31	47	0	34	52	0	37	57	0	55	85	0	43	67	45	70
1430	3.2	32	50	2.4	31	49	0	34	54	0	37	59	0	55	88	0	43	69	45	72
1352	3.3	31	51	2.4	31	50	0	34	55	0	37	60	0	55	90	0	43	71	45	75
1288	3.4	32	53	2.5	31	52	0	34	57	0	37	62	0	55	93	0	43	73	45	77
1259	3.5	32	55	2.5	31	54	0	34	59	0	37	64	0	55	96	0	43	75	45	79
1203	3.6	32	56	2.5	31	55	0	34	60	0	37	66	0	55	99	0	43	77	45	81
1182	3.7	32	58	2.5	31	57	0	34	62	0	37	68	0	55	101	0	43	79	45	84
1120	3.8	32	60	2.6	31	58	0	34	64	0	37	70	0	55	104	0	43	82	45	86
1090	3.9	32	61	2.6	31	60	0	34	65	0	37	71	0	55	107	0	43	84	45	88
1038	4	32	63	2.7	31	61	0	34	67	0	37	73	0	55	110	0	43	86	45	90
1010	4.1	32	65	2.7	31	63	0	34	69	0	37	75	0	55	112	0	43	88	45	93
980	4.2	32	67	2.8	31	64	0	34	70	0	37	77	0	55	115	0	43	90	45	95
941	4.3	32	68	2.8	31	66	0	34	72	0	37	79	0	55	118	0	43	92	45	97
910	4.4	32	70	2.9	31	67	0	34	74	0	37	80	0	55	120	0	43	94	45	99
878	4.5	32	72	2.9	31	69	0	34	75	0	37	82	0	55	123	0	43	96	45	102
863	4.6	32	73	2.9	31	70	0	34	77	0	37	84	0	55	126	0	43	99	45	104
824	4.7	32	75	3	34	79	2	34	79	0	37	86	0	55	129	0	43	101	45	106
807	4.8	33	77	3	34	80	2	34	80	0	37	88	0	55	131	0	43	103	45	108
781	4.9	33	79	3.1	34	83	2.1	34	82	0	37	90	0	55	134	0	43	105	45	111
742	5	32	80	3.1	34	84	2.1	34	84	0	37	91	0	55	137	0	43	107	45	113
731	5.1	33	82	3.2	34	86	2.2	34	85	0	37	93	0	55	140	0	43	109	45	115
698	5.2	33	84	3.2	34	88	2.2	34	87	0	37	95	0	55	142	0	43	111	45	117
675	5.3	33	86	3.3	34	90	2.3	34	89	0	37	97	0	55	145	0	43	114	45	120
647	5.4	33	88	3.4	34	92	2.4	34	90	0	37	99	0	55	148	0	43	116	45	122
626	5.5	33	90	3.4	35	94	2.4	34	92	0	37	100	0	55	150	0	43	118	45	124
604	5.6	33	92	3.5	35	96	2.5	34	94	0	37	102	0	55	153	0	43	120	45	126
573	5.7	33	94	3.6	35	98	2.6	34	95	0	37	104	0	55	156	0	43	122	45	129
565	5.8	33	95	3.6	35	100	2.6	34	97	0	37	106	0	55	159	0	43	124	45	131
543	5.9	33	97	3.7	35	102	2.7	34	99	0	37	108	0	55	161	0	43	126	45	133
522	6	34	100	3.8	35	104	2.8	34	100	0	37	110	0	55	164	0	43	128	45	135
510	6.1	34	101	3.8	35	106	2.8	34	102	0	37	111	0	55	167	0	43	131	45	138
486	6.2	34	103	3.9	35	108	2.9	34	104	0	37	113	0	55	170	0	43	133	45	140
464	6.3	34	105	4	35	110	3	37	115	2	37	115	0	55	172	0	43	135	45	142
450	6.4	34	108	4.1	35	112	3.1	37	117	2.1	37	117	0	55	175	0	43	137	45	144
440	6.5	34	109	4.1	36	114	3.1	37	119	2.1	37	119	0	55	178	0	43	139	45	147
430	6.6	34	111	4.2	36	116	3.2	37	121	2.2	37	120	0	55	180	0	43	141	45	149
410	6.7	35	114	4.3	36	119	3.3	37	124	2.3	37	122	0	55	183	0	43	143	45	151
400	6.8	35	116	4.4	36	121	3.4	37	126	2.4	37	124	0	55	186	0	43	146	45	153
390	6.9	35	118	4.5	36	123	3.5	38	129	2.5	37	126	0	55	189	0	43	148	45	156
371	7	35	120	4.6	36	126	3.6	38	131	2.6	37	128	0	55	191	0	43	150	45	158
360	7.1	35	123	4.7	37	128	3.7	38	133	2.7	37	130	0	55	194	0	43	152	45	160
343	7.2	35	125	4.8	37	130	3.8	38	136	2.8	37	131	0	55	197	0	43	154	45	162
332	7.3	35	127	4.9	37	133	3.9	38	138	2.9	37	133	0	55	200	0	43	156	45	165
320	7.4	35	129	5	37	135	4	39	141	3	40	146	2	60	219	4	43	158	45	167
309	7.5	36	132	5.1	37	137	4.1	39	143	3.1	40	149	2.1	60	223	4.2	43	160	45	169
298	7.6	36	135	5.3	37	140	4.3	39	146	3.3	40	152	2.3	60	228	4.6	43	163	45	171
280	7.7	36	138	5.5	38	143	4.5	39	149	3.5	41	155	2.5	61	232	5	43	165	45	174
271	7.8	36	140	5.6	38	146	4.6	39	152	3.6	41	158	2.6	61	236	5.2	43	167	45	176
259	7.9	37	143	5.8	38	149	4.8	40	155	3.8	41	161	2.8	62	241	5.6	43	169	45	178
215	8	38	149	6.5	39	155	5.5	41	161	4.5	42	167	3.5	63	250	7	43	171	45	180

NOTE:
Lt, Lr & w VALUES IN FEET. LISTED RADIUS IS THE MINIMUM ALLOWABLE RADIUS FOR THE CORRESPONDING E, Lt, Lr, AND w VALUES. WIDENING SHOWN IS BASED ON A SU-40 DESIGN VEHICLE.

TRANSITION CURVES - RURAL
35 MPH DESIGN SPEED

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE

DESIGN FACTORS FOR A DESIGN SPEED OF 35 MPH (RURAL) USING E= 8% MAX.

DESIGN VELOCITY =35		WIDTH= 18 FT			WIDTH=20 FT			WIDTH=22 FT			WIDTH=24 FT			WIDTH=48 FT			WIDTH=72 FT			INTERCHANGE RAMPS WIDTH			
		DESIGN SOFTWARE EQUIVALENTS (NUMBER OF LANES AT LANE WIDTH)																					
		1 @ 9'			1 @ 10'			1 @ 11'			1 @ 12'			2 @ 12'			3 @ 12'			16 FT		18 FT	
RADIUS(FT)	E(%)	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	Lt	Lr
4260	NC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3160	2	30	30	0	33	33	0	36	36	0	39	39	0	59	59	0	78	78	0	46	46	48	48
3040	2.1	30	31	0	33	34	0	36	38	0	39	41	0	59	61	0	78	82	0	46	48	48	51
2940	2.2	30	32	0	33	36	0	36	40	0	39	43	0	59	64	0	78	86	0	46	50	48	53
2700	2.3	33	38	2	33	38	0	36	41	0	39	45	0	59	67	0	78	90	0	46	52	48	56
2580	2.4	33	39	2	33	39	0	36	43	0	39	47	0	59	70	0	78	93	0	46	55	48	58
2520	2.5	33	41	2	33	41	0	36	45	0	39	49	0	59	73	0	78	97	0	46	57	48	60
2412	2.6	34	43	2.1	33	42	0	36	47	0	39	51	0	59	76	0	78	101	0	46	59	48	63
2303	2.7	33	44	2.1	33	44	0	36	48	0	39	53	0	59	79	0	78	105	0	46	61	48	65
2220	2.8	33	46	2.1	33	46	0	36	50	0	39	55	0	59	82	0	78	109	0	46	64	48	68
2085	2.9	34	48	2.2	33	47	0	36	52	0	39	57	0	59	85	0	78	113	0	46	66	48	70
1994	3	33	49	2.2	33	49	0	36	54	0	39	59	0	59	88	0	78	117	0	46	68	48	72
1915	3.1	33	51	2.2	33	50	0	36	55	0	39	60	0	59	90	0	78	120	0	46	70	48	75
1865	3.2	34	53	2.3	33	52	0	36	57	0	39	62	0	59	93	0	78	124	0	46	73	48	77
1822	3.3	34	55	2.3	33	54	0	36	59	0	39	64	0	59	96	0	78	128	0	46	75	48	80
1706	3.4	33	56	2.3	33	55	0	36	61	0	39	66	0	59	99	0	78	132	0	46	77	48	82
1648	3.5	34	58	2.4	33	57	0	36	63	0	39	68	0	59	102	0	78	136	0	46	79	48	84
1590	3.6	34	60	2.4	33	59	0	36	64	0	39	70	0	59	105	0	78	140	0	46	82	48	87
1533	3.7	33	61	2.4	33	60	0	36	66	0	39	72	0	59	108	0	78	144	0	46	84	48	89
1476	3.8	34	63	2.5	33	62	0	36	68	0	39	74	0	59	111	0	78	148	0	46	86	48	92
1467	3.9	34	65	2.5	33	63	0	36	70	0	39	76	0	59	114	0	78	151	0	46	88	48	94
1410	4	34	67	2.5	33	65	0	36	71	0	39	78	0	59	117	0	78	155	0	46	91	48	96
1355	4.1	34	68	2.5	33	67	0	36	73	0	39	80	0	59	120	0	78	159	0	46	93	48	99
1300	4.2	34	70	2.6	33	68	0	36	75	0	39	82	0	59	122	0	78	163	0	46	95	48	101
1275	4.3	34	72	2.6	33	70	0	36	77	0	39	84	0	59	125	0	78	167	0	46	97	48	104
1220	4.4	34	74	2.7	33	71	0	36	79	0	39	86	0	59	128	0	78	171	0	46	100	48	106
1200	4.5	34	76	2.7	33	73	0	36	80	0	39	88	0	59	131	0	78	175	0	46	102	48	108
1140	4.6	34	77	2.7	33	75	0	36	82	0	39	90	0	59	134	0	78	179	0	46	104	48	111
1110	4.7	34	79	2.8	33	76	0	36	84	0	39	91	0	59	137	0	78	182	0	46	106	48	113
1080	4.8	34	81	2.8	33	78	0	36	86	0	39	93	0	59	140	0	78	186	0	46	109	48	116
1050	4.9	34	83	2.8	33	80	0	36	87	0	39	95	0	59	143	0	78	190	0	46	111	48	118
1020	5	34	85	2.9	33	81	0	36	89	0	39	97	0	59	146	0	78	194	0	46	113	48	120
990	5.1	34	86	2.9	33	83	0	36	91	0	39	99	0	59	149	0	78	198	0	46	115	48	123
960	5.2	34	88	2.9	33	84	0	36	93	0	39	101	0	59	151	0	78	202	0	46	118	48	125
930	5.3	34	90	3	36	95	2	36	95	0	39	103	0	59	154	0	78	206	0	46	120	48	128
889	5.4	35	92	3	36	96	2	36	96	0	39	105	0	59	157	0	78	210	0	46	122	48	130
873	5.5	35	94	3.1	36	99	2.1	36	98	0	39	107	0	59	160	0	78	213	0	46	124	48	132
847	5.6	35	96	3.1	36	100	2.1	36	100	0	39	109	0	59	163	0	78	217	0	46	127	48	135
806	5.7	35	98	3.2	36	103	2.2	36	102	0	39	111	0	59	166	0	78	221	0	46	129	48	137
790	5.8	35	100	3.2	36	104	2.2	36	103	0	39	113	0	59	169	0	78	225	0	46	131	48	140
752	5.9	35	102	3.3	36	107	2.3	36	105	0	39	115	0	59	172	0	78	229	0	46	133	48	142
730	6	35	104	3.4	37	109	2.4	36	107	0	39	117	0	59	175	0	78	233	0	46	136	48	144
709	6.1	35	106	3.4	37	111	2.4	36	109	0	39	119	0	59	178	0	78	237	0	46	138	48	147
689	6.2	35	107	3.4	37	112	2.4	36	110	0	39	120	0	59	180	0	78	240	0	46	140	48	149
666	6.3	35	110	3.5	37	115	2.5	36	112	0	39	122	0	59	183	0	78	244	0	46	142	48	152
654	6.4	35	111	3.5	37	117	2.5	36	114	0	39	124	0	59	186	0	78	248	0	46	145	48	154
629	6.5	36	114	3.6	37	119	2.6	36	116	0	39	126	0	59	189	0	78	252	0	46	147	48	156
607	6.6	36	116	3.7	37	121	2.7	36	118	0	39	128	0	59	192	0	78	256	0	46	149	48	159
591	6.7	36	118	3.7	37	123	2.7	36	119	0	39	130	0	59	195	0	78	260	0	46	151	48	161
568	6.8	36	120	3.8	38	126	2.8	36	121	0	39	132	0	59	198	0	78	264	0	46	154	48	164
558	6.9	36	122	3.8	37	127	2.8	36	123	0	39	134	0	59	201	0	78	268	0	46	156	48	166
534	7	36	124	3.9	38	130	2.9	36	125	0	39	136	0	59	204	0	78	271	0	46	158	48	168
518	7.1	36	126	4	38	132	3	39	138	2	39	138	0	59	207	0	78	275	0	46	160	48	171
494	7.2	36	129	4.1	38	135	3.1	39	140	2.1	39	140	0	59	210	0	78	279	0	46	163	48	173
476	7.3	36	131	4.2	38	137	3.2	40	143	2.2	39	142	0	59	212	0	78	283	0	46	165	48	176
464	7.4	37	134	4.3	38	140	3.3	40	146	2.3	39	144	0	59	215	0	78	287	0	46	167	48	178
446	7.5	37	136	4.4	38	142	3.4	40	148	2.4	39	146	0	59	218	0	78	291	0	46	170	48	180
437	7.6	37	138	4.4	38	144	3.4	40	150	2.4	39	148	0	59	221	0	78	295	0	46	172	48	183
420	7.7	37	140	4.5	38	146	3.5	40	153	2.5	39	150	0	59	224	0	78	299	0	46	174	48	185
402	7.8	37	143	4.6	39	149	3.6	40	155	2.6	39	151	0	59	227	0	78	302	0	46	176	48	188
367	7.9	37	146	4.9	39	153	3.9	41	159	2.9	39	153	0	59	230	0	78	306	0	46	179	48	190
316	8	38	151	5.4	40	158	4.4	41	164	3.4	43	171	2.4	64	256	4.8	86	341	7.2	46	181	48	192

NOTE:
Lt, Lr & w VALUES IN FEET. LISTED RADIUS IS THE MINIMUM ALLOWABLE RADIUS FOR THE CORRESPONDING E, Lt, Lr, AND w VALUES. WIDENING SHOWN IS BASED ON A SU-40 DESIGN VEHICLE.

VDOT ROAD AND BRIDGE STANDARDS

REVISION DATE 01/13

SHEET 1 OF 1

803.35

TC-5.11

NOTE:
Lt, Lr & w VALUES IN FEET. LISTED RADIUS IS THE MINIMUM ALLOWABLE RADIUS FOR THE CORRESPONDING E, Lt, Lr, AND w VALUES.
WIDENING SHOWN IS BASED ON A WB-62 DESIGN VEHICLE.

TRANSITION CURVES - RURAL
40 MPH DESIGN SPEED

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

DESIGN VELOCITY =40		WIDTH= 18 FT			WIDTH=20 FT			WIDTH=22 FT			WIDTH=24 FT			WIDTH=48 FT			WIDTH=72 FT			INTERCHANGE RAMPS			
		DESIGN SOFTWARE EQUIVALENTS (NUMBER OF LANES AT LANE WIDTH)																		WIDTH			
		1 @ 9'			1 @ 10'			1 @ 11'			1 @ 12'			2 @ 12'			3 @ 12'			16 FT		18 FT	
RADIUS(FT)	E(%)	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	Lt	Lr
5410	NC	0	0	3	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4120	2	37	37	3.1	39	39	2.1	38	38	0	42	42	0	63	63	0	83	83	0	49	49	52	52
3920	2.1	37	39	3.2	39	41	2.2	38	40	0	42	44	0	63	66	0	83	87	0	49	51	52	54
3640	2.2	37	41	3.2	39	43	2.2	38	42	0	42	46	0	63	69	0	83	92	0	49	54	52	57
3480	2.3	37	43	3.3	39	45	2.3	38	44	0	42	48	0	63	72	0	83	96	0	49	56	52	60
3400	2.4	37	45	3.3	39	47	2.3	38	46	0	42	50	0	63	75	0	83	100	0	49	59	52	62
3160	2.5	37	47	3.4	39	49	2.4	38	48	0	42	52	0	63	78	0	83	104	0	49	61	52	65
3094	2.6	37	48	3.4	39	51	2.4	38	50	0	42	54	0	63	81	0	83	108	0	49	64	52	67
2970	2.7	37	50	3.4	39	53	2.4	38	52	0	42	56	0	63	84	0	83	112	0	49	66	52	70
2784	2.8	84	52	3.5	39	55	2.5	38	54	0	42	58	0	63	87	0	83	116	0	49	68	52	72
2712	2.9	81	54	3.5	39	57	2.5	38	55	0	42	60	0	63	90	0	83	120	0	49	71	52	75
2556	3	78	56	3.6	39	59	2.6	38	57	0	42	63	0	63	94	0	83	125	0	49	73	52	78
2472	3.1	76	58	3.6	39	61	2.6	38	59	0	42	65	0	63	97	0	83	129	0	49	76	52	80
2395	3.2	74	60	3.7	40	63	2.7	38	61	0	42	67	0	63	100	0	83	133	0	49	78	52	83
2294	3.3	71	62	3.7	40	65	2.7	38	63	0	42	69	0	63	103	0	83	137	0	49	80	52	85
2212	3.4	69	64	3.8	40	67	2.8	38	65	0	42	71	0	63	106	0	83	141	0	49	83	52	88
2171	3.5	67	66	3.8	40	69	2.8	38	67	0	42	73	0	63	109	0	83	145	0	49	85	52	90
2073	3.6	65	68	3.9	40	72	2.9	38	69	0	42	75	0	63	112	0	83	149	0	49	88	52	93
2001	3.7	64	70	3.9	40	74	2.9	38	71	0	42	77	0	63	115	0	83	154	0	49	90	52	96
1941	3.8	62	73	4	40	76	3	42	79	2	42	79	0	63	118	0	83	158	0	49	93	52	98
1856	3.9	60	74	4	40	78	3	42	81	2	42	81	0	63	122	0	83	162	0	49	95	52	101
1800	4	59	77	4.1	40	80	3.1	42	84	2.1	42	83	0	63	125	0	83	166	0	49	97	52	103
1744	4.1	58	79	4.1	40	82	3.1	42	86	2.1	42	85	0	63	128	0	83	170	0	49	100	52	106
1689	4.2	56	81	4.2	40	84	3.2	42	88	2.2	42	87	0	63	131	0	83	174	0	49	102	52	108
1635	4.3	55	83	4.2	40	86	3.2	42	90	2.2	42	89	0	63	134	0	83	178	0	49	105	52	111
1581	4.4	54	85	4.3	41	89	3.3	42	93	2.3	42	92	0	63	137	0	83	183	0	49	107	52	114
1527	4.5	52	87	4.3	41	91	3.3	42	95	2.3	42	94	0	63	140	0	83	187	0	49	110	52	116
1502	4.6	51	89	4.4	41	93	3.4	43	97	2.4	42	96	0	63	143	0	83	191	0	49	112	52	119
1477	4.7	50	91	4.4	41	95	3.4	43	99	2.4	42	98	0	63	146	0	83	195	0	49	114	52	121
1424	4.8	49	94	4.5	41	98	3.5	43	102	2.5	42	100	0	63	149	0	83	199	0	49	117	52	124
1368	4.9	48	96	4.5	41	100	3.5	43	104	2.5	42	102	0	63	153	0	83	203	0	49	119	52	126
1346	5	47	98	4.6	41	102	3.6	43	107	2.6	42	104	0	63	156	0	83	207	0	49	122	52	129
1296	5.1	46	100	4.7	41	105	3.7	43	109	2.7	42	106	0	63	159	0	83	212	0	49	124	52	132
1267	5.2	45	102	4.7	41	107	3.7	43	111	2.7	42	108	0	63	162	0	83	216	0	49	127	52	134
1220	5.3	45	105	4.8	42	109	3.8	43	114	2.8	42	110	0	63	165	0	83	220	0	49	129	52	137
1190	5.4	44	107	4.8	42	111	3.8	43	116	2.8	42	112	0	63	168	0	83	224	0	49	131	52	139
1160	5.5	43	109	4.9	42	114	3.9	43	119	2.9	42	114	0	63	171	0	83	228	0	49	134	52	142
1101	5.6	42	112	5	42	116	4	44	121	3	45	126	2	68	189	4	90	252	6	49	136	52	144
1081	5.7	42	114	5.1	42	119	4.1	44	124	3.1	45	129	2.1	68	193	4.2	90	257	6.3	49	139	52	147
1054	5.8	41	116	5.1	42	121	4.1	44	126	3.1	45	131	2.1	68	196	4.2	90	261	6.3	49	141	52	150
1025	5.9	40	118	5.2	42	124	4.2	44	129	3.2	46	134	2.2	68	200	4.4	91	267	6.6	49	144	52	152
988	6	41	121	5.3	42	126	4.3	44	131	3.3	46	137	2.3	69	205	4.6	91	273	6.9	49	146	52	155
957	6.1	41	124	5.4	43	129	4.4	44	134	3.4	46	139	2.4	69	209	4.8	92	278	7.2	49	148	52	157
942	6.2	41	126	5.4	43	131	4.4	44	136	3.4	46	142	2.4	69	212	4.8	92	283	7.2	49	151	52	160
912	6.3	41	128	5.5	43	134	4.5	44	139	3.5	46	144	2.5	69	216	5	92	288	7.5	49	153	52	162
875	6.4	41	131	5.6	43	136	4.6	45	142	3.6	46	147	2.6	69	221	5.2	92	294	7.8	49	156	52	165
866	6.5	41	133	5.6	43	138	4.6	45	144	3.6	46	150	2.6	69	224	5.2	92	299	7.8	49	158	52	168
837	6.6	41	135	5.7	43	141	4.7	45	147	3.7	47	152	2.7	70	228	5.4	93	304	8.1	49	160	52	170
806	6.7	42	139	5.9	43	144	4.9	45	150	3.9	47	156	2.9	70	234	5.8	93	311	8.7	49	163	52	173
782	6.8	42	141	6	44	147	5	45	153	4	47	159	3	70	238	6	94	317	9	49	165	52	175
754	6.9	42	144	6.1	44	150	5.1	45	156	4.1	47	162	3.1	71	242	6.2	94	323	9.3	49	168	52	178
744	7	42	146	6.1	44	152	5.1	45	158	4.1	47	164	3.1	71	246	6.2	94	328	9.3	49	170	52	180
714	7.1	42	149	6.3	44	155	5.3	46	161	4.3	48	168	3.3	71	251	6.6	95	335	9.9	49	173	52	183
692	7.2	43	152	6.4	44	158	5.4	46	164	4.4	48	171	3.4	71	256	6.8	95	341	10.2	49	175	52	186
663	7.3	43	155	6.5	45	161	5.5	46	167	4.5	48	174	3.5	72	260	7	95	347	10.5	49	177	52	188
651	7.4	43	157	6.6	45	164	5.6	46	170	4.6	48	177	3.6	72	265	7.2	96	353	10.8	49	180	52	191
622	7.5	43	161	6.8	45	167	5.8	47	174	4.8	48	180	3.8	72	270	7.6	96	360	11.4	49	182	52	193
597	7.6	44	164	6.9	45	170	5.9	47	177	4.9	49	183	3.9	73	275	7.8	97	366	11.7	49	185	52	196
581	7.7	44	166	7	45	173	6	47	180	5	49	186	4	73	279	8	97	372	12	49	187	52	198
561	7.8	44	170	7.2	46	177	6.2	47	183	5.2	49	190	4.2	73	285	8.4	98	380	12.6	49	190	52	201
535	7.9	44	173	7.4	46	180	6.4	48	187	5.4	49	194	4.4	74	291	8.8	98	387	13.2	49	192	52	204
446	8	46	182	8.3	48	189	7.3	49	196	6.3	51	203	5.3	76	304	10.6	102	405	15.9	49	194	52	206

DESIGN FACTORS FOR A DESIGN SPEED OF 45 MPH (RURAL) USING E= 8% MAX.

DESIGN VELOCITY =45		WIDTH=20 FT			WIDTH=22 FT			WIDTH=24 FT			WIDTH=48 FT			WIDTH=72 FT			INTERCHANGE RAMPS WIDTH			
		DESIGN SOFTWARE EQUIVALENTS (NUMBER OF LANES AT LANE WIDTH)															16 FT		18 FT	
		1 @ 10'			1 @ 11'			1 @ 12'			2 @ 12'			3 @ 12'						
RADIUS(FT)	E(%)	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	Lt	Lr
6710	NC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5180	2	41	41	2	41	41	0	45	45	0	67	67	0	89	89	0	53	53	56	56
4730	2.1	41	43	2.1	41	43	0	45	47	0	67	70	0	89	94	0	53	56	56	59
4560	2.2	41	46	2.1	41	45	0	45	49	0	67	74	0	89	98	0	53	58	56	61
4350	2.3	42	48	2.2	41	47	0	45	52	0	67	77	0	89	103	0	53	61	56	64
4080	2.4	42	50	2.2	41	49	0	45	54	0	67	80	0	89	107	0	53	63	56	67
3930	2.5	42	52	2.3	41	51	0	45	56	0	67	84	0	89	112	0	53	66	56	70
3780	2.6	42	54	2.3	41	53	0	45	58	0	67	87	0	89	116	0	53	69	56	72
3630	2.7	42	56	2.3	41	55	0	45	60	0	67	90	0	89	120	0	53	71	56	75
3450	2.8	42	59	2.4	41	58	0	45	63	0	67	94	0	89	125	0	53	74	56	78
3270	2.9	42	61	2.4	41	60	0	45	65	0	67	97	0	89	129	0	53	77	56	81
3150	3	42	63	2.5	41	62	0	45	67	0	67	100	0	89	134	0	53	79	56	84
3030	3.1	42	65	2.5	41	64	0	45	69	0	67	104	0	89	138	0	53	82	56	86
2920	3.2	42	67	2.5	41	66	0	45	72	0	67	107	0	89	143	0	53	84	56	89
2840	3.3	42	70	2.6	41	68	0	45	74	0	67	110	0	89	147	0	53	87	56	92
2784	3.4	42	72	2.6	41	70	0	45	76	0	67	114	0	89	152	0	53	90	56	95
2670	3.5	42	74	2.6	41	72	0	45	78	0	67	117	0	89	156	0	53	92	56	97
2606	3.6	43	76	2.7	41	74	0	45	80	0	67	120	0	89	160	0	53	95	56	100
2498	3.7	43	78	2.7	41	76	0	45	83	0	67	124	0	89	165	0	53	98	56	103
2393	3.8	43	81	2.8	41	78	0	45	85	0	67	127	0	89	169	0	53	100	56	106
2355	3.9	43	83	2.8	41	80	0	45	87	0	67	130	0	89	174	0	53	103	56	108
2261	4	43	85	2.9	41	82	0	45	89	0	67	134	0	89	178	0	53	105	56	111
2183	4.1	43	87	2.9	41	84	0	45	92	0	67	137	0	89	183	0	53	108	56	114
2126	4.2	43	90	2.9	41	86	0	45	94	0	67	140	0	89	187	0	53	111	56	117
2069	4.3	43	92	3	45	96	2	45	96	0	67	144	0	89	192	0	53	113	56	120
2012	4.4	43	94	3	45	98	2	45	98	0	67	147	0	89	196	0	53	116	56	122
1955	4.5	43	97	3.1	45	101	2.1	45	100	0	67	150	0	89	200	0	53	119	56	125
1878	4.6	43	99	3.1	45	103	2.1	45	103	0	67	154	0	89	205	0	53	121	56	128
1820	4.7	43	101	3.2	45	106	2.2	45	105	0	67	157	0	89	209	0	53	124	56	131
1788	4.8	43	104	3.2	45	108	2.2	45	107	0	67	160	0	89	214	0	53	126	56	133
1739	4.9	43	106	3.2	45	110	2.2	45	109	0	67	164	0	89	218	0	53	129	56	136
1703	5	44	108	3.3	45	113	2.3	45	112	0	67	167	0	89	223	0	53	132	56	139
1652	5.1	44	111	3.3	45	115	2.3	45	114	0	67	170	0	89	227	0	53	134	56	142
1578	5.2	44	113	3.4	46	118	2.4	45	116	0	67	174	0	89	232	0	53	137	56	144
1535	5.3	44	116	3.5	46	121	2.5	45	118	0	67	177	0	89	236	0	53	140	56	147
1496	5.4	44	118	3.5	46	123	2.5	45	120	0	67	180	0	89	240	0	53	142	56	150
1464	5.5	44	120	3.5	46	125	2.5	45	123	0	67	184	0	89	245	0	53	145	56	153
1419	5.6	44	123	3.6	46	128	2.6	45	125	0	67	187	0	89	249	0	53	147	56	156
1378	5.7	44	126	3.7	46	131	2.7	45	127	0	67	190	0	89	254	0	53	150	56	158
1324	5.8	44	128	3.7	46	133	2.7	45	129	0	67	194	0	89	258	0	53	153	56	161
1306	5.9	45	131	3.8	46	136	2.8	45	132	0	67	197	0	89	263	0	53	155	56	164
1261	6	45	133	3.9	47	139	2.9	45	134	0	67	200	0	89	267	0	53	158	56	167
1240	6.1	45	135	3.9	47	141	2.9	45	136	0	67	204	0	89	272	0	53	160	56	169
1196	6.2	45	138	4	47	144	3	49	150	2	73	224	4	97	299	6	53	163	56	172
1173	6.3	45	140	4	47	146	3	49	152	2	73	228	4	97	304	6	53	166	56	175
1150	6.4	45	143	4.1	47	149	3.1	49	155	2.1	73	232	4.2	97	310	6.3	53	168	56	178
1103	6.5	45	146	4.2	47	152	3.2	49	158	2.2	73	237	4.4	98	316	6.6	53	171	56	180
1079	6.6	45	148	4.2	47	154	3.2	49	161	2.2	73	241	4.4	98	321	6.6	53	174	56	183
1054	6.7	45	151	4.3	47	157	3.3	49	164	2.3	74	245	4.6	98	327	6.9	53	176	56	186
1000	6.8	46	154	4.4	48	160	3.4	49	167	2.4	74	250	4.8	98	333	7.2	53	179	56	189
986	6.9	46	156	4.4	48	163	3.4	49	169	2.4	74	253	4.8	98	338	7.2	53	181	56	192
948	7	46	160	4.6	48	166	3.6	50	173	2.6	74	259	5.2	99	345	7.8	53	184	56	194
933	7.1	46	162	4.6	48	169	3.6	50	175	2.6	74	263	5.2	99	350	7.8	53	187	56	197
896	7.2	46	165	4.7	48	172	3.7	50	178	2.7	75	267	5.4	99	356	8.1	53	189	56	200
858	7.3	47	168	4.8	48	175	3.8	50	182	2.8	75	272	5.6	100	363	8.4	53	192	56	203
846	7.4	47	171	4.9	48	178	3.9	50	185	2.9	75	277	5.8	100	369	8.7	53	195	56	205
807	7.5	47	174	5	49	181	4	50	188	3	75	282	6	100	375	9	53	197	56	208
800	7.6	47	177	5.1	49	184	4.1	51	191	3.1	76	287	6.2	101	382	9.3	53	200	56	211
760	7.7	47	180	5.2	49	187	4.2	51	194	3.2	76	291	6.4	101	388	9.6	53	202	56	214
720	7.8	48	184	5.4	49	191	4.4	51	198	3.4	77	297	6.8	102	396	10.2	53	205	56	216
680	7.9	48	188	5.6	50	195	4.6	52	202	3.6	77	303	7.2	103	404	10.8	53	208	56	219
589	8	49	195	6.2	51	202	5.2	53	209	4.2	79	314	8.4	105	418	12.6	53	210	56	222

NOTE:
Lt, Lr & w VALUES IN FEET. LISTED RADIUS IS THE MINIMUM ALLOWABLE RADIUS FOR THE CORRESPONDING E, Lt, Lr, AND w VALUES.
WIDENING SHOWN IS BASED ON A WB-62 DESIGN VEHICLE.

SPECIFICATION REFERENCE

TRANSITION CURVES - RURAL
45 MPH DESIGN SPEED

VIRGINIA DEPARTMENT OF TRANSPORTATION

VDOT ROAD AND BRIDGE STANDARDS

REVISION DATE 01/13

SHEET 1 OF 1

803.37

TC-5.11

NOTE:
Lt, Lr & w VALUES IN FEET. LISTED RADIUS IS THE MINIMUM ALLOWABLE RADIUS FOR THE CORRESPONDING E, Lt, Lr, AND w VALUES. WIDENING SHOWN IS BASED ON A WB-62 DESIGN VEHICLE.

TRANSITION CURVES - RURAL
50 MPH DESIGN SPEED

VIRGINIA DEPARTMENT OF TRANSPORTATION

DESIGN FACTORS FOR A DESIGN SPEED OF 50 MPH (RURAL) USING E= 8% MAX.

DESIGN VELOCITY =50		WIDTH=20 FT			WIDTH=22 FT			WIDTH=24 FT			WIDTH=48 FT			WIDTH=72 FT			INTERCHANGE RAMPS WIDTH			
		DESIGN SOFTWARE EQUIVALENTS (NUMBER OF LANES AT LANE WIDTH)																		
		1 @ 10'			1 @ 11'			1 @ 12'			2 @ 12'			3 @ 12'			16 FT		18 FT	
RADIUS(FT)	E(%)	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	Lt	Lr
8150	NC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6013	2	44	44	2	44	44	0	48	48	0	72	72	0	96	96	0	57	57	60	60
5703	2.1	45	47	2.1	44	47	0	48	51	0	72	76	0	96	101	0	57	59	60	63
5420	2.2	45	49	2.1	44	49	0	48	53	0	72	80	0	96	106	0	57	62	60	66
5162	2.3	45	51	2.1	44	51	0	48	56	0	72	83	0	96	111	0	57	65	60	69
4926	2.4	45	54	2.2	44	53	0	48	58	0	72	87	0	96	116	0	57	68	60	72
4708	2.5	45	56	2.2	44	55	0	48	60	0	72	90	0	96	120	0	57	71	60	75
4507	2.6	45	58	2.2	44	58	0	48	63	0	72	94	0	96	125	0	57	73	60	78
4320	2.7	45	61	2.3	44	60	0	48	65	0	72	98	0	96	130	0	57	76	60	81
4146	2.8	45	63	2.3	44	62	0	48	68	0	72	101	0	96	135	0	57	79	60	84
3985	2.9	45	65	2.3	44	64	0	48	70	0	72	105	0	96	140	0	57	82	60	87
3834	3	45	68	2.4	44	66	0	48	72	0	72	108	0	96	144	0	57	85	60	90
3692	3.1	45	70	2.4	44	69	0	48	75	0	72	112	0	96	149	0	57	88	60	93
3560	3.2	45	72	2.4	44	71	0	48	77	0	72	116	0	96	154	0	57	90	60	96
3434	3.3	45	75	2.5	44	73	0	48	80	0	72	119	0	96	159	0	57	93	60	99
3316	3.4	45	77	2.5	44	75	0	48	82	0	72	123	0	96	164	0	57	96	60	102
3205	3.5	45	79	2.5	44	77	0	48	84	0	72	126	0	96	168	0	57	99	60	105
3099	3.6	46	82	2.6	44	80	0	48	87	0	72	130	0	96	173	0	57	102	60	108
2999	3.7	46	84	2.6	44	82	0	48	89	0	72	134	0	96	178	0	57	104	60	111
2904	3.8	46	86	2.6	44	84	0	48	92	0	72	137	0	96	183	0	57	107	60	114
2814	3.9	46	89	2.7	44	86	0	48	94	0	72	141	0	96	188	0	57	110	60	117
2728	4	46	91	2.7	44	88	0	48	96	0	72	144	0	96	192	0	57	113	60	120
2646	4.1	46	94	2.8	44	91	0	48	99	0	72	148	0	96	197	0	57	116	60	123
2568	4.2	46	96	2.8	44	93	0	48	101	0	72	152	0	96	202	0	57	118	60	126
2493	4.3	46	99	2.8	44	95	0	48	104	0	72	155	0	96	207	0	57	121	60	129
2422	4.4	46	101	2.9	44	97	0	48	106	0	72	159	0	96	212	0	57	124	60	132
2353	4.5	46	104	2.9	44	99	0	48	108	0	72	162	0	96	216	0	57	127	60	135
2287	4.6	46	106	2.9	44	102	0	48	111	0	72	166	0	96	221	0	57	130	60	138
2224	4.7	46	109	3	48	113	2	48	113	0	72	170	0	96	226	0	57	132	60	141
2163	4.8	46	111	3	48	116	2	48	116	0	72	173	0	96	231	0	57	135	60	144
2104	4.9	47	114	3.1	49	119	2.1	48	118	0	72	177	0	96	236	0	57	138	60	147
2047	5	47	116	3.1	49	121	2.1	48	120	0	72	180	0	96	240	0	57	141	60	150
1992	5.1	47	118	3.1	49	123	2.1	48	123	0	72	184	0	96	245	0	57	144	60	153
1939	5.2	47	121	3.2	49	126	2.2	48	125	0	72	188	0	96	250	0	57	146	60	156
1888	5.3	47	123	3.2	49	129	2.2	48	128	0	72	191	0	96	255	0	57	149	60	159
1838	5.4	47	126	3.3	49	132	2.3	48	130	0	72	195	0	96	260	0	57	152	60	162
1790	5.5	47	129	3.3	49	134	2.3	48	132	0	72	198	0	96	264	0	57	155	60	165
1743	5.6	47	132	3.4	49	137	2.4	48	135	0	72	202	0	96	269	0	57	158	60	168
1698	5.7	47	134	3.4	49	140	2.4	48	137	0	72	206	0	96	274	0	57	160	60	171
1653	5.8	47	137	3.5	49	143	2.5	48	140	0	72	209	0	96	279	0	57	163	60	174
1610	5.9	47	139	3.5	49	145	2.5	48	142	0	72	213	0	96	284	0	57	166	60	177
1568	6	47	141	3.5	49	147	2.5	48	144	0	72	216	0	96	288	0	57	169	60	180
1527	6.1	48	144	3.6	50	151	2.6	48	147	0	72	220	0	96	293	0	57	172	60	183
1487	6.2	48	147	3.6	50	153	2.6	48	149	0	72	224	0	96	298	0	57	175	60	186
1448	6.3	48	150	3.7	50	156	2.7	48	152	0	72	227	0	96	303	0	57	177	60	189
1410	6.4	48	153	3.8	50	159	2.8	48	154	0	72	231	0	96	308	0	57	180	60	192
1372	6.5	48	155	3.8	50	162	2.8	48	156	0	72	234	0	96	312	0	57	183	60	195
1336	6.6	48	158	3.9	50	165	2.9	48	159	0	72	238	0	96	317	0	57	186	60	198
1300	6.7	48	161	3.9	50	167	2.9	48	161	0	72	242	0	96	322	0	57	189	60	201
1265	6.8	48	164	4	50	170	3	52	177	2	78	266	4	104	354	6	57	191	60	204
1230	6.9	48	166	4	50	173	3	52	180	2	78	270	4	104	359	6	57	194	60	207
1196	7	49	169	4.1	51	176	3.1	53	183	2.1	79	275	4.2	105	366	6.3	57	197	60	210
1162	7.1	49	172	4.2	51	179	3.2	53	187	2.2	79	280	4.4	105	373	6.6	57	200	60	213
1128	7.2	49	175	4.3	51	183	3.3	53	190	2.3	79	285	4.6	106	379	6.9	57	203	60	216
1094	7.3	49	178	4.3	51	185	3.3	53	192	2.3	79	288	4.6	106	384	6.9	57	205	60	219
1059	7.4	49	181	4.4	51	188	3.4	53	196	2.4	80	294	4.8	106	391	7.2	57	208	60	222
1024	7.5	50	184	4.5	51	192	3.5	53	199	2.5	80	299	5	106	398	7.5	57	211	60	225
988	7.6	50	187	4.6	52	195	3.6	54	203	2.6	80	304	5.2	107	405	7.8	57	214	60	228
950	7.7	50	191	4.7	52	198	3.7	54	206	2.7	81	309	5.4	107	412	8.1	57	217	60	231
908	7.8	50	194	4.8	52	202	3.8	54	210	2.8	81	314	5.6	108	419	8.4	57	219	60	234
860	7.9	51	198	5	52	206	4	54	214	3	81	320	6	108	427	9	57	222	60	237
760	8	51	204	5.4	53	212	4.4	55	220	3.4	83	329	6.8	110	439	10.2	57	225	60	240

SPECIFICATION REFERENCE

SPECIFICATION REFERENCE

DESIGN FACTORS FOR A DESIGN SPEED OF 55 MPH (RURAL) USING E= 8% MAX.

DESIGN VELOCITY =55		WIDTH=22 FT			WIDTH=24 FT			WIDTH=48 FT			WIDTH=72 FT			INTERCHANGE RAMPS WIDTH			
		DESIGN SOFTWARE EQUIVALENTS (NUMBER OF LANES AT LANE WIDTH)												16 FT		18 FT	
		1 @ 11'			1 @ 12'			2 @ 12'			3 @ 12'						
RADIUS(FT)	E(%)	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	Lt	Lr
9720	NC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7190	2	47	47	0	52	52	0	77	77	0	103	103	0	60	60	64	64
6821	2.1	47	50	0	52	54	0	77	81	0	103	108	0	60	63	64	67
6485	2.2	47	52	0	52	57	0	77	85	0	103	113	0	60	66	64	70
6179	2.3	47	54	0	52	59	0	77	89	0	103	118	0	60	69	64	73
5897	2.4	47	57	0	52	62	0	77	92	0	103	123	0	60	72	64	76
5638	2.5	47	59	0	52	64	0	77	96	0	103	128	0	60	75	64	79
5399	2.6	47	61	0	52	67	0	77	100	0	103	133	0	60	78	64	83
5177	2.7	47	64	0	52	69	0	77	104	0	103	138	0	60	80	64	86
4972	2.8	47	66	0	52	72	0	77	108	0	103	143	0	60	83	64	89
4779	2.9	47	68	0	52	75	0	77	112	0	103	149	0	60	86	64	92
4600	3	47	71	0	52	77	0	77	115	0	103	154	0	60	89	64	95
4432	3.1	47	73	0	52	80	0	77	119	0	103	159	0	60	92	64	98
4274	3.2	47	75	0	52	82	0	77	123	0	103	164	0	60	95	64	102
4125	3.3	47	78	0	52	85	0	77	127	0	103	169	0	60	98	64	105
3986	3.4	47	80	0	52	87	0	77	131	0	103	174	0	60	101	64	108
3853	3.5	47	82	0	52	90	0	77	135	0	103	179	0	60	104	64	111
3728	3.6	47	85	0	52	92	0	77	138	0	103	184	0	60	107	64	114
3610	3.7	47	87	0	52	95	0	77	142	0	103	189	0	60	110	64	117
3498	3.8	47	89	0	52	98	0	77	146	0	103	195	0	60	113	64	120
3391	3.9	47	92	0	52	100	0	77	150	0	103	200	0	60	116	64	124
3289	4	47	94	0	52	103	0	77	154	0	103	205	0	60	119	64	127
3192	4.1	47	96	0	52	105	0	77	158	0	103	210	0	60	122	64	130
3100	4.2	47	99	0	52	108	0	77	161	0	103	215	0	60	125	64	133
3011	4.3	47	101	0	52	110	0	77	165	0	103	220	0	60	128	64	136
2927	4.4	47	103	0	52	113	0	77	169	0	103	225	0	60	131	64	139
2846	4.5	47	106	0	52	115	0	77	173	0	103	230	0	60	134	64	143
2768	4.6	47	108	0	52	118	0	77	177	0	103	235	0	60	137	64	146
2693	4.7	47	110	0	52	120	0	77	180	0	103	240	0	60	140	64	149
2621	4.8	47	113	0	52	123	0	77	184	0	103	246	0	60	143	64	152
2552	4.9	47	115	0	52	126	0	77	188	0	103	251	0	60	146	64	155
2486	5	47	118	0	52	128	0	77	192	0	103	256	0	60	149	64	158
2421	5.1	52	131	2	52	131	0	77	196	0	103	261	0	60	152	64	162
2359	5.2	52	133	2	52	133	0	77	200	0	103	266	0	60	155	64	165
2299	5.3	52	136	2	52	136	0	77	203	0	103	271	0	60	158	64	168
2241	5.4	52	139	2.1	52	138	0	77	207	0	103	276	0	60	160	64	171
2185	5.5	52	142	2.1	52	141	0	77	211	0	103	281	0	60	163	64	174
2130	5.6	52	145	2.2	52	143	0	77	215	0	103	286	0	60	166	64	177
2077	5.7	52	147	2.2	52	146	0	77	219	0	103	292	0	60	169	64	180
2026	5.8	52	150	2.2	52	149	0	77	223	0	103	297	0	60	172	64	184
1976	5.9	52	153	2.3	52	151	0	77	226	0	103	302	0	60	175	64	187
1927	6	52	156	2.3	52	154	0	77	230	0	103	307	0	60	178	64	190
1880	6.1	52	158	2.3	52	156	0	77	234	0	103	312	0	60	181	64	193
1833	6.2	52	161	2.4	52	159	0	77	238	0	103	317	0	60	184	64	196
1788	6.3	52	164	2.4	52	161	0	77	242	0	103	322	0	60	187	64	199
1743	6.4	53	167	2.5	52	164	0	77	246	0	103	327	0	60	190	64	203
1700	6.5	53	170	2.5	52	166	0	77	249	0	103	332	0	60	193	64	206
1657	6.6	53	173	2.6	52	169	0	77	253	0	103	338	0	60	196	64	209
1615	6.7	53	176	2.6	52	172	0	77	257	0	103	343	0	60	199	64	212
1573	6.8	53	179	2.7	52	174	0	77	261	0	103	348	0	60	202	64	215
1532	6.9	53	182	2.7	52	177	0	77	265	0	103	353	0	60	205	64	218
1491	7	53	185	2.8	52	179	0	77	269	0	103	358	0	60	208	64	222
1450	7.1	53	188	2.8	52	182	0	77	272	0	103	363	0	60	211	64	225
1409	7.2	53	191	2.9	52	184	0	77	276	0	103	368	0	60	214	64	228
1369	7.3	54	195	3	56	202	2	83	303	4	111	404	6	60	217	64	231
1327	7.4	54	197	3	56	205	2	83	308	4	111	410	6	60	220	64	234
1285	7.5	54	201	3.1	56	209	2.1	84	313	4.2	112	417	6.3	60	223	64	237
1241	7.6	54	204	3.2	56	212	2.2	84	318	4.4	112	424	6.6	60	226	64	240
1195	7.7	54	208	3.3	56	216	2.3	84	324	4.6	112	431	6.9	60	229	64	244
1145	7.8	55	211	3.4	57	220	2.4	85	329	4.8	113	439	7.2	60	232	64	247
1085	7.9	55	215	3.5	57	223	2.5	85	335	5	113	446	7.5	60	235	64	250
964	8	55	220	3.8	58	229	2.8	86	343	5.6	115	457	8.4	60	238	64	253

NOTE:
Lt, Lr & w VALUES IN FEET. LISTED RADIUS IS THE MINIMUM ALLOWABLE RADIUS FOR THE CORRESPONDING E, Lt, Lr, AND w VALUES. WIDENING SHOWN IS BASED ON A WB-62 DESIGN VEHICLE.

TC-5.11

TRANSITION CURVES - RURAL
55 MPH DESIGN SPEED

VIRGINIA DEPARTMENT OF TRANSPORTATION

VDOT ROAD AND BRIDGE STANDARDS

REVISION DATE 01/13

SHEET 1 OF 1

803.39

NOTE:
Lt, Lr & w VALUES IN FEET. LISTED RADIUS IS THE MINIMUM ALLOWABLE RADIUS FOR THE CORRESPONDING E, Lt, Lr, AND w VALUES.
WIDENING SHOWN IS BASED ON A WB-62 DESIGN VEHICLE.

TRANSITION CURVES - RURAL
60 MPH DESIGN SPEED

VIRGINIA DEPARTMENT OF TRANSPORTATION

DESIGN FACTORS FOR A DESIGN SPEED OF 60 MPH (RURAL) USING E= 8% MAX.

DESIGN VELOCITY =60		WIDTH=22 FT			WIDTH=24 FT			WIDTH=48 FT			WIDTH=72 FT			INTERCHANGE RAMPS			
		DESIGN SOFTWARE EQUIVALENTS (NUMBER OF LANES AT LANE WIDTH)												WIDTH			
		1 @ 11'			1 @ 12'			2 @ 12'			3 @ 12'			16 FT		18 FT	
RADIUS(FT)	E(%)	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	Lt	Lr
11500	NC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8480	2	49	49	0	54	54	0	80	80	0	107	107	0	63	63	67	67
8048	2.1	49	52	0	54	56	0	80	84	0	107	112	0	63	66	67	70
7654	2.2	49	54	0	54	59	0	80	88	0	107	118	0	63	70	67	74
7294	2.3	49	57	0	54	62	0	80	92	0	107	123	0	63	73	67	77
6965	2.4	49	59	0	54	64	0	80	96	0	107	128	0	63	76	67	80
6661	2.5	49	62	0	54	67	0	80	100	0	107	134	0	63	79	67	84
6381	2.6	49	64	0	54	70	0	80	104	0	107	139	0	63	82	67	87
6121	2.7	49	66	0	54	72	0	80	108	0	107	144	0	63	85	67	90
5879	2.8	49	69	0	54	75	0	80	112	0	107	150	0	63	88	67	94
5654	2.9	49	71	0	54	78	0	80	116	0	107	155	0	63	91	67	97
5444	3	49	74	0	54	80	0	80	120	0	107	160	0	63	95	67	100
5247	3.1	49	76	0	54	83	0	80	124	0	107	166	0	63	98	67	104
5063	3.2	49	79	0	54	86	0	80	128	0	107	171	0	63	101	67	107
4889	3.3	49	81	0	54	88	0	80	132	0	107	176	0	63	104	67	110
4725	3.4	49	84	0	54	91	0	80	136	0	107	182	0	63	107	67	114
4571	3.5	49	86	0	54	94	0	80	140	0	107	187	0	63	110	67	117
4424	3.6	49	88	0	54	96	0	80	144	0	107	192	0	63	113	67	120
4286	3.7	49	91	0	54	99	0	80	148	0	107	198	0	63	117	67	124
4155	3.8	49	93	0	54	102	0	80	152	0	107	203	0	63	120	67	127
4030	3.9	49	96	0	54	104	0	80	156	0	107	208	0	63	123	67	130
3911	4	49	98	0	54	107	0	80	160	0	107	214	0	63	126	67	134
3798	4.1	49	101	0	54	110	0	80	164	0	107	219	0	63	129	67	137
3690	4.2	49	103	0	54	112	0	80	168	0	107	224	0	63	132	67	140
3587	4.3	49	106	0	54	115	0	80	172	0	107	230	0	63	135	67	144
3488	4.4	49	108	0	54	118	0	80	176	0	107	235	0	63	139	67	147
3394	4.5	49	110	0	54	120	0	80	180	0	107	240	0	63	142	67	150
3303	4.6	49	113	0	54	123	0	80	184	0	107	246	0	63	145	67	154
3216	4.7	49	115	0	54	126	0	80	188	0	107	251	0	63	148	67	157
3133	4.8	49	118	0	54	128	0	80	192	0	107	256	0	63	151	67	160
3053	4.9	49	120	0	54	131	0	80	196	0	107	262	0	63	154	67	164
2975	5	49	123	0	54	134	0	80	200	0	107	267	0	63	157	67	167
2901	5.1	49	125	0	54	136	0	80	204	0	107	272	0	63	160	67	170
2829	5.2	49	128	0	54	139	0	80	208	0	107	278	0	63	164	67	174
2759	5.3	49	130	0	54	142	0	80	212	0	107	283	0	63	167	67	177
2692	5.4	49	132	0	54	144	0	80	216	0	107	288	0	63	170	67	180
2627	5.5	54	147	2	54	147	0	80	220	0	107	294	0	63	173	67	184
2565	5.6	54	150	2	54	150	0	80	224	0	107	299	0	63	176	67	187
2504	5.7	54	152	2	54	152	0	80	228	0	107	304	0	63	179	67	190
2445	5.8	54	156	2.1	54	155	0	80	232	0	107	310	0	63	182	67	194
2387	5.9	54	158	2.1	54	158	0	80	236	0	107	315	0	63	186	67	197
2332	6	54	161	2.1	54	160	0	80	240	0	107	320	0	63	189	67	200
2277	6.1	54	165	2.2	54	163	0	80	244	0	107	326	0	63	192	67	204
2225	6.2	54	167	2.2	54	166	0	80	248	0	107	331	0	63	195	67	207
2173	6.3	54	170	2.2	54	168	0	80	252	0	107	336	0	63	198	67	210
2122	6.4	54	173	2.3	54	171	0	80	256	0	107	342	0	63	201	67	214
2072	6.5	54	176	2.3	54	174	0	80	260	0	107	347	0	63	204	67	217
2022	6.6	54	179	2.3	54	176	0	80	264	0	107	352	0	63	208	67	220
1974	6.7	55	182	2.4	54	179	0	80	268	0	107	358	0	63	211	67	224
1925	6.8	55	185	2.4	54	182	0	80	272	0	107	363	0	63	214	67	227
1877	6.9	55	188	2.5	54	184	0	80	276	0	107	368	0	63	217	67	230
1830	7	55	191	2.5	54	187	0	80	280	0	107	374	0	63	220	67	234
1782	7.1	55	195	2.6	54	190	0	80	284	0	107	379	0	63	223	67	237
1735	7.2	55	197	2.6	54	192	0	80	288	0	107	384	0	63	226	67	240
1687	7.3	55	201	2.7	54	195	0	80	292	0	107	390	0	63	230	67	244
1638	7.4	55	204	2.7	54	198	0	80	296	0	107	395	0	63	233	67	247
1588	7.5	56	207	2.8	54	200	0	80	300	0	107	400	0	63	236	67	250
1537	7.6	56	210	2.8	54	203	0	80	304	0	107	406	0	63	239	67	254
1482	7.7	56	214	2.9	54	206	0	80	308	0	107	411	0	63	242	67	257
1422	7.8	56	217	3	58	226	2	87	338	4	116	451	6	63	245	67	260
1350	7.9	56	221	3.1	58	230	2.1	87	344	4.2	116	459	6.3	63	248	67	264
1204	8	57	226	3.4	59	235	2.4	88	352	4.8	118	470	7.2	63	251	67	267

SPECIFICATION REFERENCE

SPECIFICATION REFERENCE

TRANSITION CURVES - RURAL
65 MPH DESIGN SPEED

VIRGINIA DEPARTMENT OF TRANSPORTATION

DESIGN FACTORS FOR A DESIGN SPEED OF 65 MPH (RURAL) USING E= 8% MAX.

DESIGN VELOCITY =65										WIDTH=22 FT			WIDTH=24 FT			WIDTH=48 FT			WIDTH=72 FT			INTERCHANGE RAMPS WIDTH			
										DESIGN SOFTWARE EQUIVALENTS (NUMBER OF LANES AT LANE WIDTH)												16 FT		18 FT	
										1 @ 11'			1 @ 12'			2 @ 12'			3 @ 12'						
RADIUS(FT)	E(%)									Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	Lt	Lr
12900	NC									0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9566	2									52	52	0	56	56	0	84	84	0	112	112	0	66	66	70	70
9083	2.1									52	54	0	56	59	0	84	88	0	112	118	0	66	69	70	73
8643	2.2									52	57	0	56	62	0	84	93	0	112	123	0	66	72	70	77
8242	2.3									52	59	0	56	65	0	84	97	0	112	129	0	66	76	70	80
7873	2.4									52	62	0	56	67	0	84	101	0	112	134	0	66	79	70	84
7534	2.5									52	64	0	56	70	0	84	105	0	112	140	0	66	82	70	87
7221	2.6									52	67	0	56	73	0	84	109	0	112	146	0	66	85	70	90
6931	2.7									52	70	0	56	76	0	84	114	0	112	151	0	66	89	70	94
6662	2.8									52	72	0	56	79	0	84	118	0	112	157	0	66	92	70	97
6411	2.9									52	75	0	56	81	0	84	122	0	112	162	0	66	95	70	101
6176	3									52	77	0	56	84	0	84	126	0	112	168	0	66	98	70	104
5957	3.1									52	80	0	56	87	0	84	130	0	112	174	0	66	102	70	108
5751	3.2									52	82	0	56	90	0	84	134	0	112	179	0	66	105	70	111
5557	3.3									52	85	0	56	93	0	84	139	0	112	185	0	66	108	70	115
5375	3.4									52	87	0	56	95	0	84	143	0	112	190	0	66	112	70	118
5203	3.5									52	90	0	56	98	0	84	147	0	112	196	0	66	115	70	122
5040	3.6									52	93	0	56	101	0	84	151	0	112	201	0	66	118	70	125
4886	3.7									52	95	0	56	104	0	84	155	0	112	207	0	66	121	70	129
4740	3.8									52	98	0	56	107	0	84	160	0	112	213	0	66	125	70	132
4601	3.9									52	100	0	56	109	0	84	164	0	112	218	0	66	128	70	135
4469	4									52	103	0	56	112	0	84	168	0	112	224	0	66	131	70	139
4344	4.1									52	105	0	56	115	0	84	172	0	112	229	0	66	134	70	142
4224	4.2									52	108	0	56	118	0	84	176	0	112	235	0	66	138	70	146
4109	4.3									52	110	0	56	120	0	84	180	0	112	240	0	66	141	70	149
4000	4.4									52	113	0	56	123	0	84	185	0	112	246	0	66	144	70	153
3896	4.5									52	116	0	56	126	0	84	189	0	112	252	0	66	147	70	156
3795	4.6									52	118	0	56	129	0	84	193	0	112	257	0	66	151	70	160
3699	4.7									52	121	0	56	132	0	84	197	0	112	263	0	66	154	70	163
3607	4.8									52	123	0	56	134	0	84	201	0	112	268	0	66	157	70	167
3518	4.9									52	126	0	56	137	0	84	206	0	112	274	0	66	160	70	170
3433	5									52	128	0	56	140	0	84	210	0	112	280	0	66	164	70	174
3351	5.1									52	131	0	56	143	0	84	214	0	112	285	0	66	167	70	177
3272	5.2									52	134	0	56	146	0	84	218	0	112	291	0	66	170	70	180
3196	5.3									52	136	0	56	148	0	84	222	0	112	296	0	66	174	70	184
3122	5.4									52	139	0	56	151	0	84	227	0	112	302	0	66	177	70	187
3051	5.5									52	141	0	56	154	0	84	231	0	112	307	0	66	180	70	191
2982	5.6									52	144	0	56	157	0	84	235	0	112	313	0	66	183	70	194
2916	5.7									52	146	0	56	160	0	84	239	0	112	319	0	66	187	70	198
2852	5.8									52	149	0	56	162	0	84	243	0	112	324	0	66	190	70	201
2789	5.9									56	165	2	56	165	0	84	247	0	112	330	0	66	193	70	205
2729	6									56	168	2	56	168	0	84	252	0	112	335	0	66	196	70	208
2670	6.1									56	171	2	56	171	0	84	256	0	112	341	0	66	200	70	212
2613	6.2									57	174	2.1	56	174	0	84	260	0	112	347	0	66	203	70	215
2558	6.3									57	177	2.1	56	176	0	84	264	0	112	352	0	66	206	70	219
2504	6.4									57	180	2.1	56	179	0	84	268	0	112	358	0	66	209	70	222
2451	6.5									57	183	2.2	56	182	0	84	273	0	112	363	0	66	213	70	225
2398	6.6									57	186	2.2	56	185	0	84	277	0	112	369	0	66	216	70	229
2346	6.7									57	189	2.2	56	187	0	84	281	0	112	374	0	66	219	70	232
2294	6.8									57	193	2.3	56	190	0	84	285	0	112	380	0	66	223	70	236
2242	6.9									57	195	2.3	56	193	0	84	289	0	112	386	0	66	226	70	239
2191	7									57	198	2.3	56	196	0	84	294	0	112	391	0	66	229	70	243
2139	7.1									57	202	2.4	56	199	0	84	298	0	112	397	0	66	232	70	246
2087	7.2									57	205	2.4	56	201	0	84	302	0	112	402	0	66	236	70	250
2034	7.3									57	208	2.4	56	204	0	84	306	0	112	408	0	66	239	70	253
1980	7.4									57	211	2.5	56	207	0	84	310	0	112	414	0	66	242	70	257
1924	7.5									57	214	2.5	56	210	0	84	314	0	112	419	0	66	245	70	260
1867	7.6									58	218	2.6	56	213	0	84	319	0	112	425	0	66	249	70	264
1805	7.7									58	222	2.7	56	215	0	84	323	0	112	430	0	66	252	70	267
1737	7.8									58	225	2.7	56	218	0	84	327	0	112	436	0	66	255	70	270
1656	7.9									58	228	2.8	56	221	0	84	331	0	112	441	0	66	258	70	274
1488	8									59	233	3	61	242	2	91	363	4	121	484	6	66	262	70	277

NOTE:
Lt, Lr & w VALUES IN FEET. LISTED RADIUS IS THE MINIMUM ALLOWABLE RADIUS FOR THE CORRESPONDING E, Lt, Lr, AND w VALUES.
WIDENING SHOWN IS BASED ON A WB-62 DESIGN VEHICLE.

VDOT ROAD AND BRIDGE STANDARDS

REVISION DATE 01/13

SHEET 1 OF 1

803.41

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VDOT
ROAD AND BRIDGE STANDARDS

803.42 SHEET 1 OF 1

REVISION DATE 01/13

TC-5.11

NOTE:
Lt, Lr & w VALUES IN FEET. LISTED RADIUS IS THE MINIMUM ALLOWABLE RADIUS FOR THE CORRESPONDING E, Lt, Lr, AND w VALUES.
WIDENING SHOWN IS BASED ON A WB-62 DESIGN VEHICLE.

TRANSITION CURVES - RURAL
70 MPH DESIGN SPEED

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

DESIGN VELOCITY =70		WIDTH=22 FT			WIDTH=24 FT			WIDTH=48 FT			WIDTH=72 FT			INTERCHANGE RAMPS			
		DESIGN SOFTWARE EQUIVALENTS (NUMBER OF LANES AT LANE WIDTH)												WIDTH			
		1 @ 11'			1 @ 12'			2 @ 12'			3 @ 12'			16 FT		18 FT	
RADIUS(FT)	E(%)	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	Lt	Lr
14500	NC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10731	2	55	55	0	60	60	0	90	90	0	120	120	0	72	72	75	75
10194	2.1	55	58	0	60	63	0	90	95	0	120	126	0	72	75	75	79
9706	2.2	55	61	0	60	66	0	90	99	0	120	132	0	72	79	75	83
9260	2.3	55	64	0	60	69	0	90	104	0	120	138	0	72	82	75	87
8851	2.4	55	66	0	60	72	0	90	108	0	120	144	0	72	86	75	90
8474	2.5	55	69	0	60	75	0	90	113	0	120	150	0	72	89	75	94
8127	2.6	55	72	0	60	78	0	90	117	0	120	156	0	72	93	75	98
7805	2.7	55	75	0	60	81	0	90	122	0	120	162	0	72	96	75	102
7506	2.8	55	77	0	60	84	0	90	126	0	120	168	0	72	100	75	105
7227	2.9	55	80	0	60	87	0	90	131	0	120	174	0	72	104	75	109
6967	3	55	83	0	60	90	0	90	135	0	120	180	0	72	107	75	113
6724	3.1	55	86	0	60	93	0	90	140	0	120	186	0	72	111	75	117
6495	3.2	55	88	0	60	96	0	90	144	0	120	192	0	72	114	75	120
6281	3.3	55	91	0	60	99	0	90	149	0	120	198	0	72	118	75	124
6079	3.4	55	94	0	60	102	0	90	153	0	120	204	0	72	121	75	128
5888	3.5	55	97	0	60	105	0	90	158	0	120	210	0	72	125	75	132
5708	3.6	55	99	0	60	108	0	90	162	0	120	216	0	72	128	75	135
5537	3.7	55	102	0	60	111	0	90	167	0	120	222	0	72	132	75	139
5376	3.8	55	105	0	60	114	0	90	171	0	120	228	0	72	136	75	143
5222	3.9	55	108	0	60	117	0	90	176	0	120	234	0	72	139	75	147
5076	4	55	110	0	60	120	0	90	180	0	120	240	0	72	143	75	150
4937	4.1	55	113	0	60	123	0	90	185	0	120	246	0	72	146	75	154
4805	4.2	55	116	0	60	126	0	90	189	0	120	252	0	72	150	75	158
4679	4.3	55	119	0	60	129	0	90	194	0	120	258	0	72	153	75	162
4558	4.4	55	121	0	60	132	0	90	198	0	120	264	0	72	157	75	165
4443	4.5	55	124	0	60	135	0	90	203	0	120	270	0	72	160	75	169
4332	4.6	55	127	0	60	138	0	90	207	0	120	276	0	72	164	75	173
4226	4.7	55	130	0	60	141	0	90	212	0	120	282	0	72	168	75	177
4125	4.8	55	132	0	60	144	0	90	216	0	120	288	0	72	171	75	180
4027	4.9	55	135	0	60	147	0	90	221	0	120	294	0	72	175	75	184
3933	5	55	138	0	60	150	0	90	225	0	120	300	0	72	178	75	188
3843	5.1	55	141	0	60	153	0	90	230	0	120	306	0	72	182	75	192
3756	5.2	55	143	0	60	156	0	90	234	0	120	312	0	72	185	75	195
3673	5.3	55	146	0	60	159	0	90	239	0	120	318	0	72	189	75	199
3592	5.4	55	149	0	60	162	0	90	243	0	120	324	0	72	192	75	203
3514	5.5	55	152	0	60	165	0	90	248	0	120	330	0	72	196	75	207
3439	5.6	55	154	0	60	168	0	90	252	0	120	336	0	72	200	75	210
3366	5.7	55	157	0	60	171	0	90	257	0	120	342	0	72	203	75	214
3296	5.8	55	160	0	60	174	0	90	261	0	120	348	0	72	207	75	218
3228	5.9	55	163	0	60	177	0	90	266	0	120	354	0	72	210	75	222
3163	6	55	165	0	60	180	0	90	270	0	120	360	0	72	214	75	225
3099	6.1	55	168	0	60	183	0	90	275	0	120	366	0	72	217	75	229
3037	6.2	55	171	0	60	186	0	90	279	0	120	372	0	72	221	75	233
2977	6.3	55	174	0	60	189	0	90	284	0	120	378	0	72	224	75	237
2919	6.4	55	176	0	60	192	0	90	288	0	120	384	0	72	228	75	240
2862	6.5	60	195	2	60	195	0	90	293	0	120	390	0	72	232	75	244
2807	6.6	61	199	2.1	60	198	0	90	297	0	120	396	0	72	235	75	248
2753	6.7	61	202	2.1	60	201	0	90	302	0	120	402	0	72	239	75	252
2699	6.8	61	205	2.1	60	204	0	90	306	0	120	408	0	72	242	75	255
2645	6.9	61	208	2.1	60	207	0	90	311	0	120	414	0	72	246	75	259
2590	7	61	212	2.2	60	210	0	90	315	0	120	420	0	72	249	75	263
2535	7.1	61	215	2.2	60	213	0	90	320	0	120	426	0	72	253	75	267
2480	7.2	61	218	2.2	60	216	0	90	324	0	120	432	0	72	256	75	270
2423	7.3	61	222	2.3	60	219	0	90	329	0	120	438	0	72	260	75	274
2365	7.4	61	225	2.3	60	222	0	90	333	0	120	444	0	72	264	75	278
2305	7.5	61	228	2.3	60	225	0	90	338	0	120	450	0	72	267	75	282
2242	7.6	61	232	2.4	60	228	0	90	342	0	120	456	0	72	271	75	285
2175	7.7	61	235	2.4	60	231	0	90	347	0	120	462	0	72	274	75	289
2100	7.8	62	239	2.5	60	234	0	90	351	0	120	468	0	72	278	75	293
2010	7.9	62	243	2.6	60	237	0	90	356	0	120	474	0	72	281	75	297
1821	8	62	248	2.8	60	240	0	90	360	0	120	480	0	72	285	75	300

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE

SPECIFICATION REFERENCE

TRANSITION CURVES - RURAL
75 MPH DESIGN SPEED

VIRGINIA DEPARTMENT OF TRANSPORTATION

DESIGN FACTORS FOR A DESIGN SPEED OF 75 MPH (RURAL) USING E= 8% MAX.

DESIGN VELOCITY =75		WIDTH=22 FT			WIDTH=24 FT			WIDTH=48 FT			WIDTH=72 FT			INTERCHANGE RAMPS WIDTH			
		DESIGN SOFTWARE EQUIVALENTS (NUMBER OF LANES AT LANE WIDTH)												16 FT		18 FT	
		1 @ 11'			1 @ 12'			2 @ 12'			3 @ 12'						
RADIUS(FT)	E(%)	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	Lt	Lr
16100	NC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12200	2	58	58	0	64	64	0	95	95	0	127	127	0	75	75	79	79
11805	2.1	58	61	0	64	67	0	95	100	0	127	134	0	75	79	79	83
10920	2.2	58	64	0	64	70	0	95	105	0	127	140	0	75	82	79	87
10483	2.3	58	67	0	64	73	0	95	109	0	127	146	0	75	86	79	90
10001	2.4	58	70	0	64	76	0	95	114	0	127	153	0	75	90	79	94
9559	2.5	58	73	0	64	79	0	95	119	0	127	159	0	75	94	79	98
9152	2.6	58	76	0	64	83	0	95	124	0	127	166	0	75	97	79	102
8777	2.7	58	79	0	64	86	0	95	128	0	127	172	0	75	101	79	106
8507	2.8	58	82	0	64	89	0	95	133	0	127	178	0	75	105	79	110
8181	2.9	58	84	0	64	92	0	95	138	0	127	185	0	75	108	79	114
7950	3	58	87	0	64	95	0	95	143	0	127	191	0	75	112	79	118
7664	3.1	58	90	0	64	98	0	95	147	0	127	197	0	75	116	79	122
7397	3.2	58	93	0	64	102	0	95	152	0	127	204	0	75	120	79	126
7275	3.3	58	96	0	64	105	0	95	157	0	127	210	0	75	123	79	130
7034	3.4	58	99	0	64	108	0	95	162	0	127	216	0	75	127	79	134
6809	3.5	58	102	0	64	111	0	95	166	0	127	223	0	75	131	79	137
6477	3.6	58	105	0	64	114	0	95	171	0	127	229	0	75	134	79	141
6279	3.7	58	108	0	64	117	0	95	176	0	127	235	0	75	138	79	145
6091	3.8	58	110	0	64	120	0	95	180	0	127	242	0	75	142	79	149
5967	3.9	58	113	0	64	124	0	95	185	0	127	248	0	75	146	79	153
5797	4	58	116	0	64	127	0	95	190	0	127	254	0	75	149	79	157
5635	4.1	58	119	0	64	130	0	95	195	0	127	261	0	75	153	79	161
5579	4.2	58	122	0	64	133	0	95	199	0	127	267	0	75	157	79	165
5430	4.3	58	125	0	64	136	0	95	204	0	127	273	0	75	160	79	169
5287	4.4	58	128	0	64	139	0	95	209	0	127	280	0	75	164	79	173
5151	4.5	58	131	0	64	143	0	95	214	0	127	286	0	75	168	79	177
5020	4.6	58	134	0	64	146	0	95	218	0	127	292	0	75	172	79	180
4881	4.7	58	137	0	64	149	0	95	223	0	127	299	0	75	175	79	184
4762	4.8	58	139	0	64	152	0	95	228	0	127	305	0	75	179	79	188
4647	4.9	58	142	0	64	155	0	95	233	0	127	312	0	75	183	79	192
4537	5	58	145	0	64	158	0	95	237	0	127	318	0	75	187	79	196
4464	5.1	58	148	0	64	162	0	95	242	0	127	324	0	75	190	79	200
4362	5.2	58	151	0	64	165	0	95	247	0	127	331	0	75	194	79	204
4263	5.3	58	154	0	64	168	0	95	252	0	127	337	0	75	198	79	208
4169	5.4	58	157	0	64	171	0	95	256	0	127	343	0	75	201	79	212
4023	5.5	58	160	0	64	174	0	95	261	0	127	350	0	75	205	79	216
3980	5.6	58	163	0	64	177	0	95	266	0	127	356	0	75	209	79	220
3938	5.7	58	165	0	64	180	0	95	270	0	127	362	0	75	213	79	224
3804	5.8	58	168	0	64	184	0	95	275	0	127	369	0	75	216	79	227
3725	5.9	58	171	0	64	187	0	95	280	0	127	375	0	75	220	79	231
3648	6	58	174	0	64	190	0	95	285	0	127	381	0	75	224	79	235
3574	6.1	58	177	0	64	193	0	95	289	0	127	388	0	75	227	79	239
3533	6.2	58	180	0	64	196	0	95	294	0	127	394	0	75	231	79	243
3462	6.3	58	183	0	64	199	0	95	299	0	127	400	0	75	235	79	247
3394	6.4	58	186	0	64	203	0	95	304	0	127	407	0	75	239	79	251
3328	6.5	58	189	0	64	206	0	95	308	0	127	413	0	75	242	79	255
3268	6.6	64	209	2	64	209	0	95	313	0	127	419	0	75	246	79	259
3209	6.7	64	212	2	64	212	0	95	318	0	127	426	0	75	250	79	263
3149	6.8	64	215	2	64	215	0	95	323	0	127	432	0	75	254	79	267
3088	6.9	64	218	2	64	218	0	95	327	0	127	438	0	75	257	79	270
3029	7	64	222	2.1	64	222	0	95	332	0	127	445	0	75	261	79	274
3010	7.1	64	226	2.1	64	225	0	95	337	0	127	451	0	75	265	79	278
2942	7.2	64	229	2.1	64	228	0	95	342	0	127	458	0	75	268	79	282
2856	7.3	64	232	2.1	64	231	0	95	346	0	127	464	0	75	272	79	286
2796	7.4	64	236	2.2	64	234	0	95	351	0	127	470	0	75	276	79	290
2781	7.5	64	239	2.2	64	237	0	95	356	0	127	477	0	75	280	79	294
2704	7.6	64	242	2.2	64	240	0	95	360	0	127	483	0	75	283	79	298
2615	7.7	64	247	2.3	64	244	0	95	365	0	127	489	0	75	287	79	302
2520	7.8	64	250	2.3	64	247	0	95	370	0	127	496	0	75	291	79	306
2480	7.9	64	253	2.3	64	250	0	95	375	0	127	502	0	75	294	79	310
2215	8	65	258	2.5	64	253	0	95	379	0	127	508	0	75	298	79	314

NOTE:
Lt, Lr & w VALUES IN FEET. LISTED RADIUS IS THE MINIMUM ALLOWABLE RADIUS FOR THE CORRESPONDING E, Lt, Lr, AND w VALUES.
WIDENING SHOWN IS BASED ON A WB-62 DESIGN VEHICLE.

VDOT
ROAD AND BRIDGE STANDARDS

REVISION DATE 01/13

SHEET 1 OF 1

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VDOT ROAD AND BRIDGE STANDARDS

SHEET 1 OF 1

803.44

REVISION DATE 01/13

TC-5.11

NOTE:
Lt, Lr & w VALUES IN FEET. LISTED RADIUS IS THE MINIMUM ALLOWABLE RADIUS FOR THE CORRESPONDING E, Lt, Lr, AND w VALUES.
WIDENING SHOWN IS BASED ON A WB-62 DESIGN VEHICLE.

TRANSITION CURVES - RURAL
80 MPH DESIGN SPEED

DESIGN FACTORS FOR A DESIGN SPEED OF 80 MPH (RURAL) USING E= 8% MAX.

DESIGN VELOCITY =80		WIDTH=22 FT			WIDTH=24 FT			WIDTH=48 FT			WIDTH=72 FT			INTERCHANGE RAMPS			
		DESIGN SOFTWARE EQUIVALENTS (NUMBER OF LANES AT LANE WIDTH)												WIDTH			
		1 @ 11'			1 @ 12'			2 @ 12'			3 @ 12'			16 FT		18 FT	
RADIUS(FT)	E(%)	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	Lt	Lr
17800	NC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13704	2	63	63	0	69	69	0	103	103	0	138	138	0	83	83	86	86
12749	2.1	63	66	0	69	72	0	103	108	0	138	145	0	83	87	86	90
12340	2.2	63	70	0	69	76	0	103	114	0	138	152	0	83	91	86	95
11845	2.3	63	73	0	69	79	0	103	119	0	138	159	0	83	95	86	99
11401	2.4	63	76	0	69	83	0	103	124	0	138	166	0	83	99	86	103
10706	2.5	63	79	0	69	86	0	103	129	0	138	173	0	83	103	86	108
10251	2.6	63	82	0	69	90	0	103	134	0	138	180	0	83	107	86	112
9831	2.7	63	85	0	69	93	0	103	139	0	138	187	0	83	111	86	116
9528	2.8	63	88	0	69	96	0	103	144	0	138	193	0	83	115	86	120
9163	2.9	63	92	0	69	100	0	103	150	0	138	200	0	83	119	86	125
8904	3	63	95	0	69	103	0	103	155	0	138	207	0	83	124	86	129
8584	3.1	63	98	0	69	107	0	103	160	0	138	214	0	83	128	86	133
8358	3.2	63	101	0	69	110	0	103	165	0	138	221	0	83	132	86	138
8148	3.3	63	104	0	69	114	0	103	170	0	138	228	0	83	136	86	142
7881	3.4	63	107	0	69	117	0	103	175	0	138	235	0	83	140	86	146
7490	3.5	63	110	0	69	120	0	103	180	0	138	242	0	83	144	86	150
7319	3.6	63	114	0	69	124	0	103	186	0	138	249	0	83	148	86	155
7096	3.7	63	117	0	69	127	0	103	191	0	138	255	0	83	152	86	159
6883	3.8	63	120	0	69	131	0	103	196	0	138	262	0	83	156	86	163
6743	3.9	63	123	0	69	134	0	103	201	0	138	269	0	83	160	86	168
6550	4	63	126	0	69	138	0	103	206	0	138	276	0	83	165	86	172
6367	4.1	63	129	0	69	141	0	103	211	0	138	283	0	83	169	86	176
6193	4.2	63	132	0	69	144	0	103	216	0	138	290	0	83	173	86	180
6038	4.3	63	136	0	69	148	0	103	222	0	138	297	0	83	177	86	185
5868	4.4	63	139	0	69	151	0	103	227	0	138	304	0	83	181	86	189
5820	4.5	63	142	0	69	155	0	103	232	0	138	311	0	83	185	86	193
5656	4.6	63	145	0	69	158	0	103	237	0	138	318	0	83	189	86	198
5499	4.7	63	148	0	69	162	0	103	242	0	138	324	0	83	193	86	202
5405	4.8	63	151	0	69	165	0	103	247	0	138	331	0	83	197	86	206
5274	4.9	63	154	0	69	168	0	103	252	0	138	338	0	83	202	86	210
5150	5	63	158	0	69	172	0	103	258	0	138	345	0	83	206	86	215
5067	5.1	63	161	0	69	175	0	103	263	0	138	352	0	83	210	86	219
4951	5.2	63	164	0	69	179	0	103	268	0	138	359	0	83	214	86	223
4775	5.3	63	167	0	69	182	0	103	273	0	138	366	0	83	218	86	228
4669	5.4	63	170	0	69	186	0	103	278	0	138	373	0	83	222	86	232
4586	5.5	63	173	0	69	189	0	103	283	0	138	380	0	83	226	86	236
4497	5.6	63	176	0	69	192	0	103	288	0	138	386	0	83	230	86	240
4410	5.7	63	180	0	69	196	0	103	294	0	138	393	0	83	234	86	245
4337	5.8	63	183	0	69	199	0	103	299	0	138	400	0	83	238	86	249
4267	5.9	63	186	0	69	203	0	103	304	0	138	407	0	83	243	86	253
4227	6	63	189	0	69	206	0	103	309	0	138	414	0	83	247	86	258
4146	6.1	63	192	0	69	210	0	103	314	0	138	421	0	83	251	86	262
4047	6.2	63	195	0	69	213	0	103	319	0	138	428	0	83	255	86	266
3966	6.3	63	198	0	69	216	0	103	324	0	138	435	0	83	259	86	270
3877	6.4	63	202	0	69	220	0	103	330	0	138	442	0	83	263	86	275
3860	6.5	63	205	0	69	223	0	103	335	0	138	448	0	83	267	86	279
3790	6.6	63	208	0	69	227	0	103	340	0	138	455	0	83	271	86	283
3723	6.7	63	211	0	69	230	0	103	345	0	138	462	0	83	275	86	288
3652	6.8	63	214	0	69	234	0	103	350	0	138	469	0	83	279	86	292
3582	6.9	63	217	0	69	237	0	103	355	0	138	476	0	83	284	86	296
3513	7	69	240	2	69	240	0	103	360	0	138	483	0	83	288	86	300
3467	7.1	69	244	2	69	244	0	103	366	0	138	490	0	83	292	86	305
3425	7.2	69	247	2	69	247	0	103	371	0	138	497	0	83	296	86	309
3354	7.3	69	251	2	69	251	0	103	376	0	138	504	0	83	300	86	313
3324	7.4	69	254	2	69	254	0	103	381	0	138	510	0	83	304	86	318
3218	7.5	69	259	2.1	69	258	0	103	386	0	138	517	0	83	308	86	322
3159	7.6	69	262	2.1	69	261	0	103	391	0	138	524	0	83	312	86	326
3115	7.7	69	266	2.1	69	264	0	103	396	0	138	531	0	83	316	86	330
3029	7.8	69	269	2.1	69	268	0	103	402	0	138	538	0	83	320	86	335
2895	7.9	70	274	2.2	69	271	0	103	407	0	138	545	0	83	325	86	339
2675	8	70	278	2.3	69	275	0	103	412	0	138	552	0	83	329	86	343

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE