COMMONWEALTH of VIRGINIA

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

PHILIP A. SHUCET
COMMISSIONER

MOHAMMAD MIRSHAHI, P.E.
STATE LOCATION AND DESIGN ENGINEER

March 17, 2003

MEMORANDUM

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

The following is a list of standards contained in the 2001 Road and Bridge Standards that have been revised. Please add these pages to your copy of the standards. An insertable sheet will not be required in plan assemblies.

STANDARD	PAGE	REVISION
GS-10 GS-11 GS-12	702.00 702.01 702.02	Revised tables. Changed nomenclature of slopes from rational to percentage.
TC-5.01	802.13 802.14 802.22 802.34 to 802.44	Revised Relative Gradient Table and references to the table for application of the "two second rule" resulting in CR and LS Computations for 9' and 10' roadway widths.

The following is a list of revised standards to the 2001 Road and Bridge Standards that do require an insertable sheet to be in included in your plan assembly until the next edition of the imperial standards is published. Please add these pages to your copy of the standards. The respective insertable sheet number has been placed with the revised standard in parenthesis. An insertable sheet is available for each of these revised standards. The insertable sheets are available on VDOT's web site on the FTP server and in Falcon DMS for VDOT personnel. These insertable sheets will be required in plan assemblies for projects utilizing the standard items listed below that have not been turned in for first submission.

STANDARD	PAGE	REVISION
T-DI-2 (A148)	103.04	Modify min. height chart to include additional pipe sizes.
T-D-I-3, 4 (A148)	103.05	

STANDARD	PAGE	REVISION
SB-1 (A143)	110.01	Revise dimension tables.
SB-1PC (A143)	110.02	Revise interior height of Circular structure.
EC-5 (ISD414-1)	114.06	Revised notes, dimensions,
EC-6 (ISD414-2)	114.07	and references to Geotextile
EC-INS (ISD414-4)	115.01	fabrics.
SWM-1 (ISD2209)	116.01	Replaced DI-7 cover with
	116.02	trash rack and riprap with Conc. Class A3 for invert fill.
	116.03	Void and removed From Standards
SWM-DR (ISD2216, ISD2216A)	116.04	Revise quantities for
	116.05	Concrete Cradle and added
	116.06	quantity table. Added HDPE
	116.07	Debris Rack. Added Trash
	116.08	Rack Details.
CG-12 (A59)	203.05	Revise typical application
	203.06	details and redefined as detectable warning surface.
	203.07	
CG-13 (A108)	203.08	Incorporates detectable warning surface.
RS-1 (ISD1722)	304.01	Removed notes referring to shoulder material.
RS-2	304.02	Void and removed from standards.
GR-6 (A132)	501.10	Added detail for occurrence of paved ditch.
GR-11 (A145)	501.21	Revised Pay Limits
GR-INS (A146)	501.33	Added detail for Terminal
	501.34	end occurrence beyond clear zone

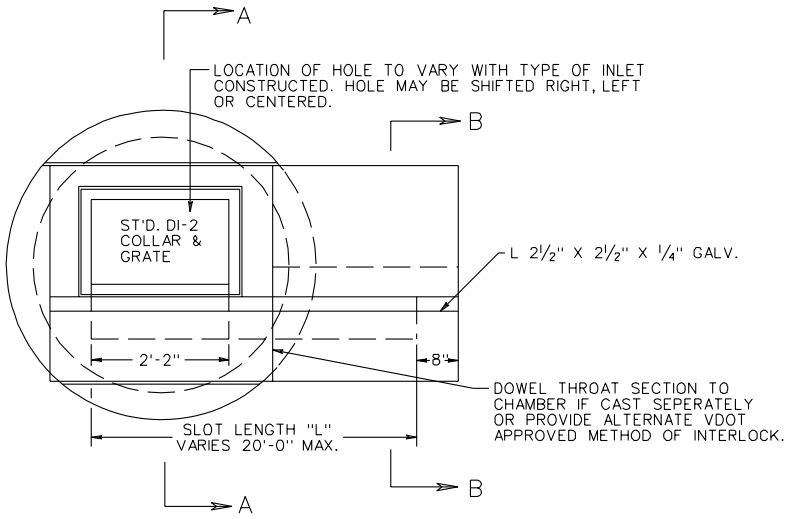
If you have any questions or comments regarding the listed revisions to this publication, please contact Mrs. N. E. Berry of the Engineering Services Section at (804) 786-2543.

Sincerely,

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

INSERTABLE SHEET A148

T-DI-2



PLAN

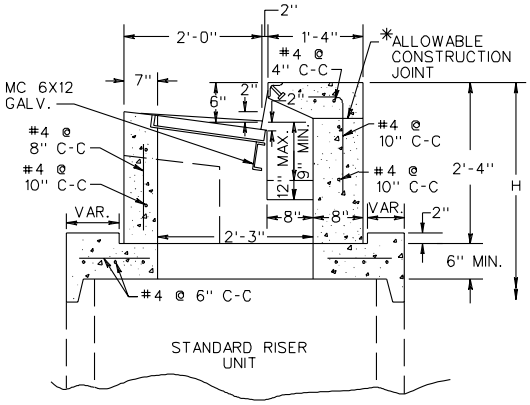
RECOMMENDED MINIMUM HEIGHT CHART	
PIPE SIZE	"H" DIMENSION (CONCRETE PIPE)
12"	4'-8"
15"	4'-11¼"
18"	5'-2½"
21"	5'-5¾"
24"	5'-9"
27"	6'-0¼"
30"	6'-6½"
33"	6'-9¾"
36"	7'-1"
42"	7'-7½"
48"	8'-2"

NOTES

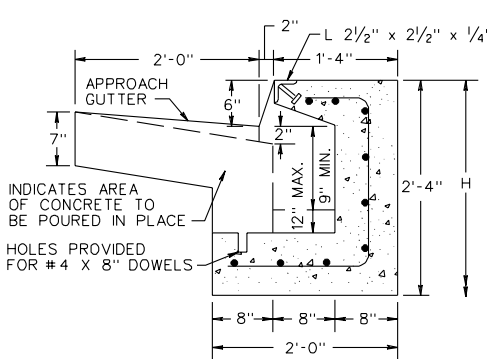
1. SEE GENERAL NOTES - PRECAST FOR ADDITIONAL DETAILS.
2. CONCRETE TO BE 4000 PSI MINIMUM.
3. REINFORCING STEEL IN ACCORDANCE WITH ASTM-615.
4. DIMENSIONS SHOWN ARE MINIMUM. ACTUAL DIMENSIONS MAY VARY WITH MANUFACTURER.
5. FOR DETAILS OF FRAME AND GRATE SEE STANDARD DI-2A, B, C.

* 6. VERTICAL REINFORCING BARS TO BE CONTINUOUS THROUGH JOINT.

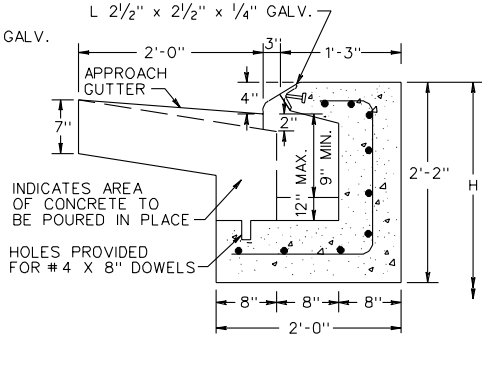
7. STANDARD ST-1 STEPS NOT REQUIRED IN THIS TOP UNIT.



SECTION A-A



SECTION B-B
(CG-6 CURB AND GUTTER)



ALTERNATE SECTION B-B
(FOR USE WITH CG-7 CURB AND GUTTER)

SPECIFICATION REFERENCE
105 233 302

STANDARD PRECAST TOP UNITS

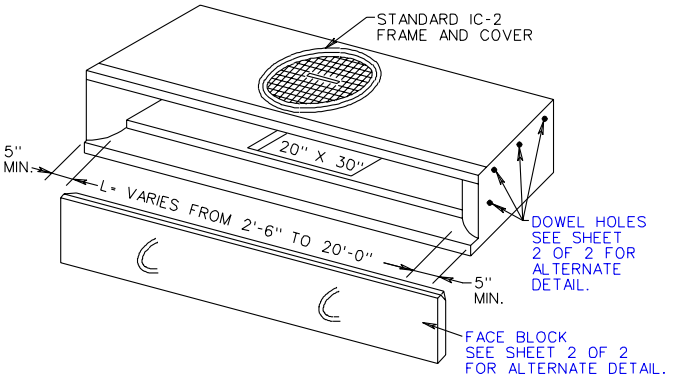
VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 3/03

103.04

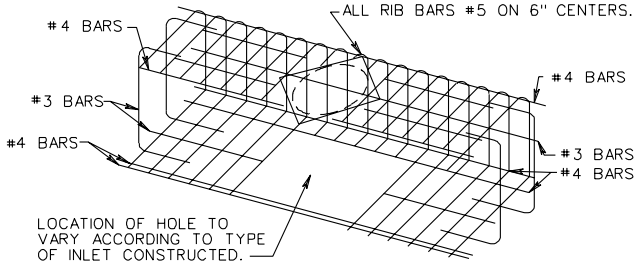
T-DI-3,4

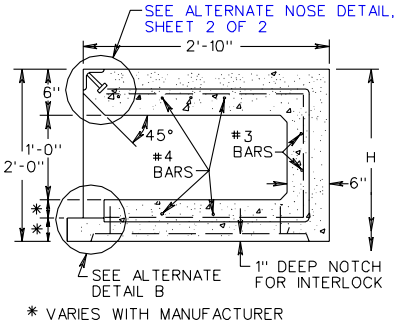
CURB DROP INLET THROAT SECTION



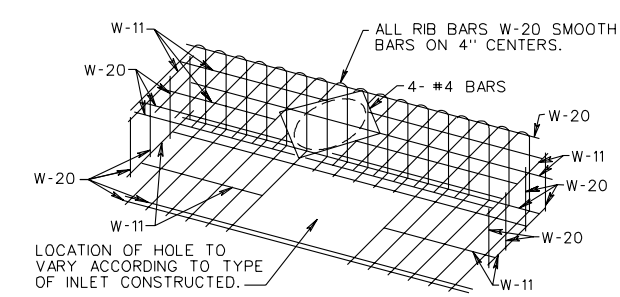
NOTES:

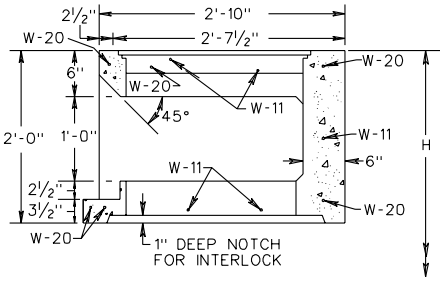
1. SEE GENRERAL NOTES - PRECAST FOR ADDITIONAL DETAILS.
2. CONCRETE TO BE 4000 PSI MINIMUM COMPRESSIVE STRENGTH.
3. REINFORCING STEEL IN ACCORDANCE WITH ASTM A-615 FOR REINFORCING BARS.
4. REINFORCING IN ACCORDANCE WITH ASTM A-185 FOR WELDED WIRE MESH.
5. DIMENSIONS SHOWN ARE MINIMUM. ACTUAL DIMENSIONS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





TYPICAL MINIMUM BAR REINFORCEMENT





TYPICAL MINIMUM WELDED WIRE REINFORCEMENT

RECOMMENDED MINIMUM HEIGHT CHART

	PIPE SIZE	H DIMENSION CONCRETE PIPE
DI-3A,B,C, FOR 36" I.D. BASE UNIT	6"	2'-11"
	8"	3'-1¼"
	10"	3'-3¼"
	12"	3'-6"
	15"	3'-9¼"
	18"	4'-0½"
	21"	4'-3¾"
DI-3A,B,C, D, E, & F FOR 48" I.D. BASE UNIT	6"	3'-9"
	8"	3'-11¼"
	10"	4'-1¼"
	12"	4'-4"
	15"	4'-7¼"
	18"	4'-10½"
	21"	5'-1¾"
	24"	5'-5"
	27"	5'-8¼"
DI-3A,B,C,D,E, & F FOR 60" OR 72" I.D. BASE UNITS & DI-4A, B, C, D, E, & F	12"	4'-4"
	15"	4'-7¼"
	18"	4'-10½"
	21"	5'-1¾"
	24"	5'-5"
	27"	5'-8¼"
	30"	6'-2¾"
	33"	6'-5¾"
	36"	6'-9"
	42"	7'-3½"
	48"	7'-10"

SHEET 1 OF 2

STANDARD PRECAST TOP UNITS

VIRGINIA DEPARTMENT OF TRANSPORTATION

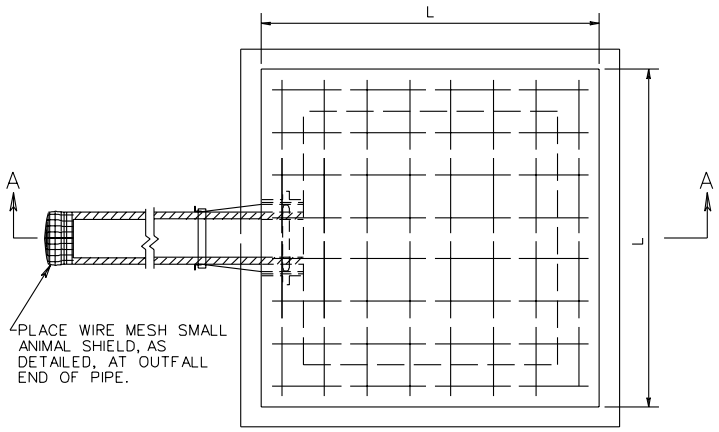
REV. 3/03

103.05

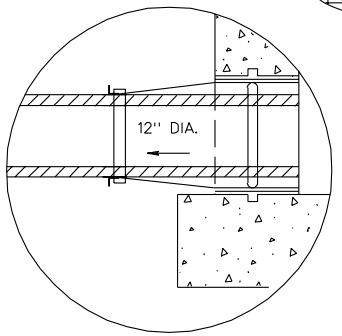
SPECIFICATION REFERENCE

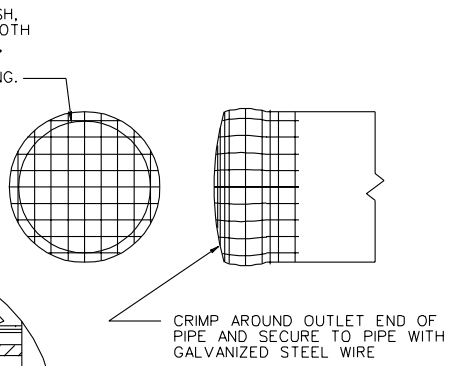
105
233
302

SB-1

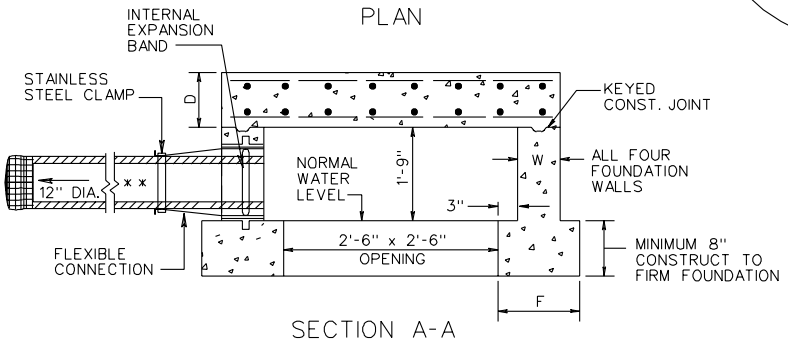


PLAN





ANIMAL SHIELD DETAIL



SECTION A-A

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

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

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

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

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

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

THIS ITEM MAY BE PRECAST OR CAST IN PLACE.

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

PIPE(S) SHALL BE CONNECTED TO SPRING BOX WITH A FLEXIBLE BOOT MEETING ASTM SPECIFICATION C-923. COST OF FLEXIBLE CONNECTION TO BE INCLUDED IN BID PRICE FOR SPRING BOX. BOOT SHALL BE MADE FROM NEOPRENE RUBBER AND HAVE A ⅜" MINIMUM WALL THICKNESS THROUGHOUT. THE INTERNAL EXPANSION BAND TO SECURE THE BOOT IN PLACE SHALL CONFORM TO ALUMINUM MATERIAL SPECIFICATION 6061-T6. THE EXTERNAL BAND TO CLAMP AND SEAL THE BOOT TO THE PIPE SHALL BE STAINLESS STEEL-CORROSION RESISTANT CONFORMING TO ASTM SPECIFICATION A-167. THE OPENING TO RECEIVE THE FLEXIBLE CONNECTION SHALL BE CORE DRILLED AND IS TO BE CONSTRUCTED TO ALLOW FOR LATERAL AND VERTICAL MOVEMENT, AS WELL AS ANGULAR ADJUSTMENT THRU 20 DEGREES. ALL FIELD INSTALLATION OF PIPE TO SPRING BOX USING FLEXIBLE BOOT SHALL BE COMPLETED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS AND SPECIFICATIONS.

STANDARD SPRING BOX

VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 3/03

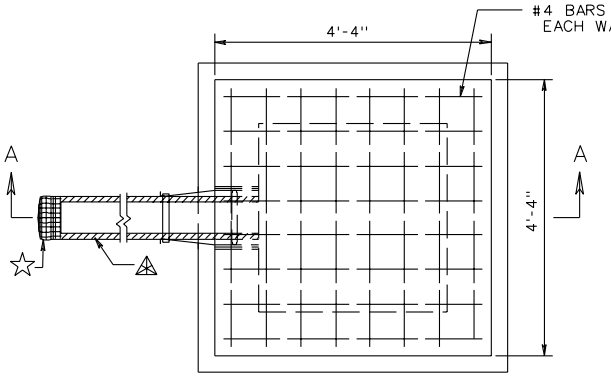
110.01

SPECIFICATION REFERENCE

105
232
302

INSERTABLE SHEET A143

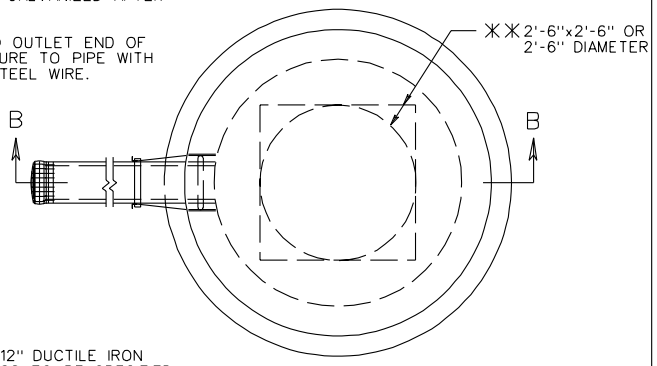
SB-1 PC



PLAN
(SQUARE)

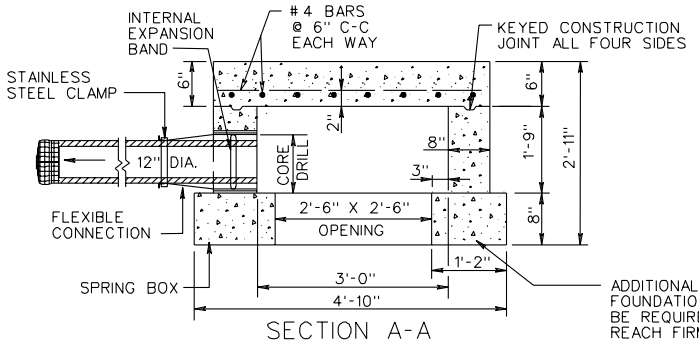
☆ 3/4"x3/4" MESH HARDWARE CLOTH, MIN. 17 GAUGE GALVANIZED AFTER WEAVING.

⚠ CRIMP AROUND OUTLET END OF PIPE AND SECURE TO PIPE WITH GALVANIZED STEEL WIRE.

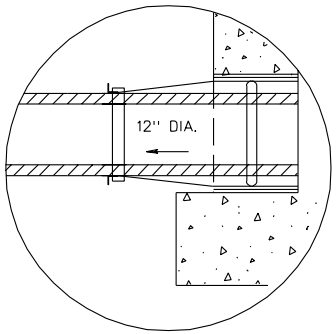


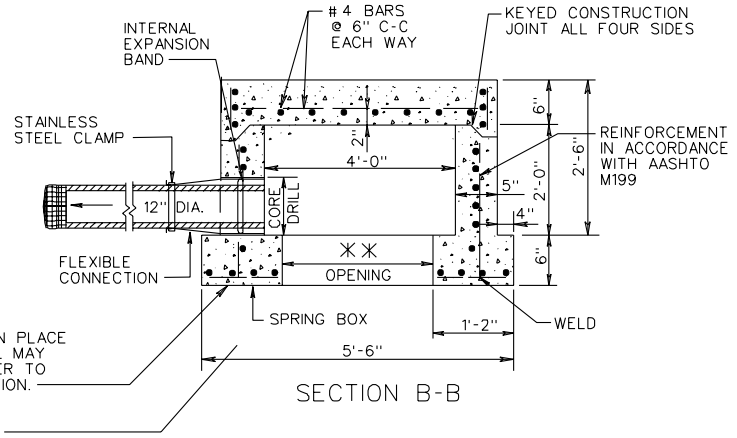
PLAN
(CIRCULAR)

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



SECTION A-A





SECTION B-B

ADDITIONAL POURED IN PLACE FOUNDATION MATERIAL MAY BE REQUIRED IN ORDER TO REACH FIRM FOUNDATION.

NOTES:

CONCRETE TO BE 4000 PSI MINIMUM COMPRESSIVE STRENGTH.

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

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

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

SPECIFICATION REFERENCE
105

PRECAST SPRING BOX

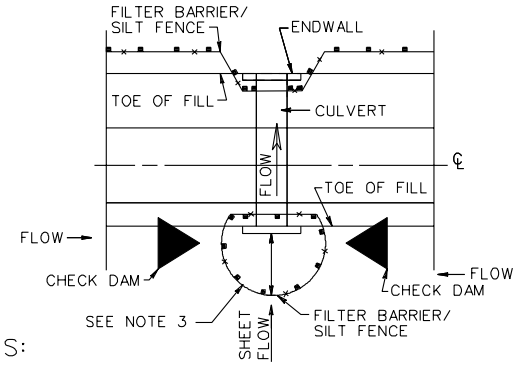
VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 3/03

110.02

EC-5

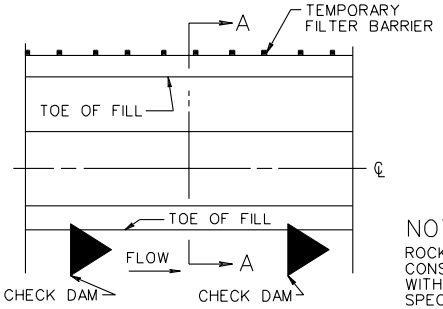
TYPICAL DETAIL FOR TEMPORARY FILTER BARRIER/SILT FENCE/CHECK DAM AT CULVERT



NOTES:

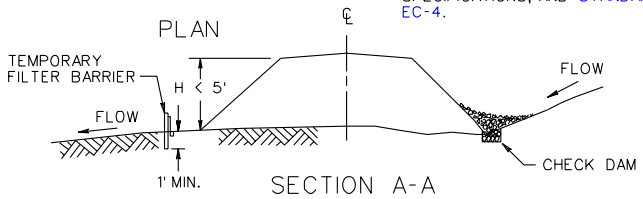
1. IF ANY PORTION OF FILL IS GREATER THAN 5', SILT FENCE IS REQUIRED. IF FILL HEIGHT IS LESS THAN 5', FILTER BARRIER IS REQUIRED.
2. ROCK CHECK DAM IS TO BE CONSTRUCTRD IN ACCORDANCE WITH THE ROAD AND BRIDGE SPECIFICATIONS, AND STANDARD EC-4.
3. DISTANCE IS 6' MINIMUM AND IS TO BE CONTAINED WITHIN RIGHT OF WAY OR EASEMENT.

TYPICAL DETAIL FOR TEMPORARY FILTER BARRIER/CHECK DAM AT TOE OF FILL



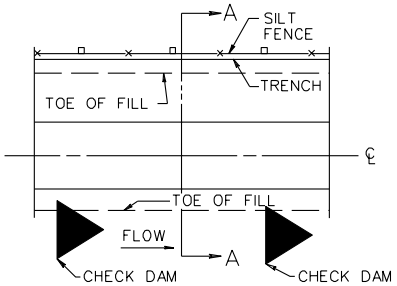
PLAN

NOTE:
ROCK CHECK DAM IS TO BE CONSTRUCTED IN ACCORDANCE WITH THE ROAD AND BRIDGE SPECIFICATIONS, AND STANDARD EC-4.

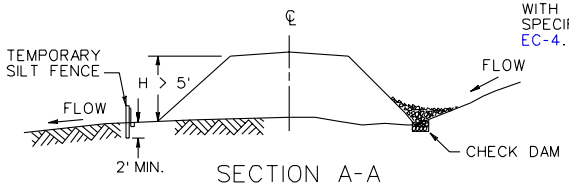


SECTION A-A

TYPICAL DETAIL FOR TEMPORARY SILT FENCE/CHECK DAM AT TOE OF FILL

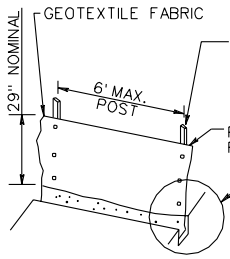


NOTE:
ROCK CHECK DAM IS TO BE CONSTRUCTED IN ACCORDANCE WITH THE ROAD AND BRIDGE SPECIFICATIONS, AND STANDARD EC-4.

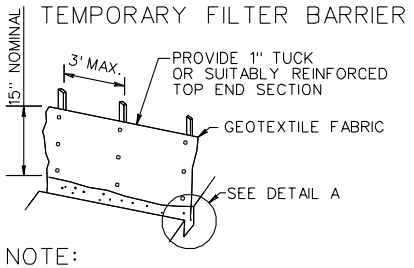


SECTION A-A

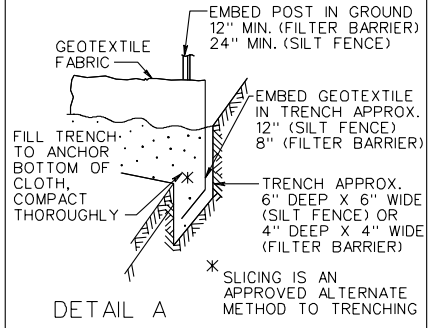
TEMPORARY SILT FENCE



TEMPORARY FILTER BARRIER



NOTE:
SUPPORTS FOR TEMPORARY FILTER BARRIERS SHALL BE A NOMINAL 1" X 2" OR A 1½" DIA. NO. 2 SOUTHERN PINE OR OAK, OR STEEL HAVING A MIN. WEIGHT OF 1.00 LBS. PER LINEAR FOOT.



DETAIL A

TEMPORARY SILT FENCE AND FILTER BARRIER

VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 3/03

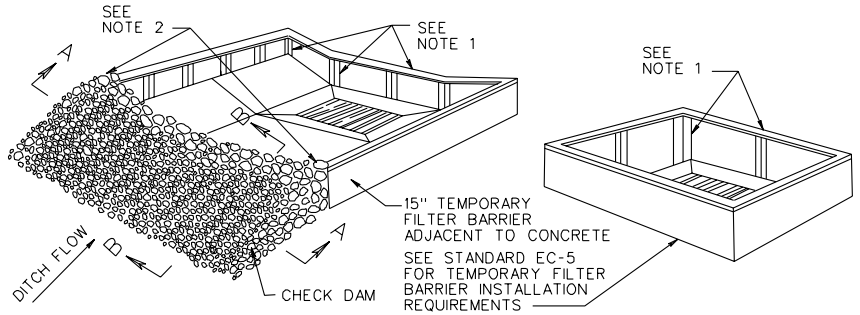
114.06

SPECIFICATION REFERENCE

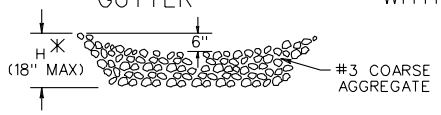
107
242
303

EC-6

DROP INLET SILT TRAP (TYPE A)



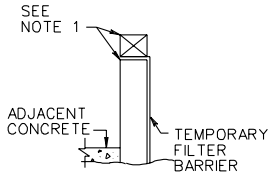
TYPICAL TREATMENT FOR DROP INLET WITH CONCRETE GUTTER

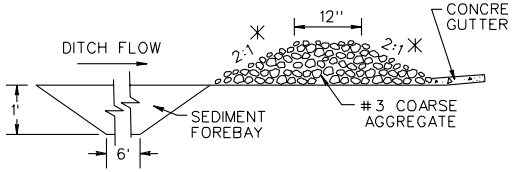


SECTION A-A

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

TYPICAL TREATMENT FOR DROP INLET WITHOUT CONCRETE GUTTER





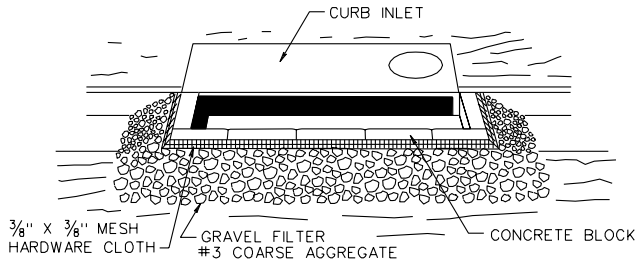
SECTION B-B

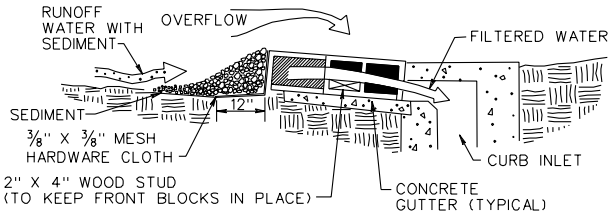
GEOTEXTILE PRODUCTS DESIGNED TO BE INSERTED INTO GRATED DROP INLETS OR DESIGNED TO COVER THE SLOTS OF SLOT DROP INLETS, THAT HAVE BEEN APPROVED FOR USE ON VDOT PROJECTS AND ARE FOUND ON VDOT'S SPEL LIST, MAY BE SUBSTITUTED FOR THE DROP INLET PROTECTION DEVICES DETAILED HEREON.

NOTES

1. POSTS AND TOP RAIL SHALL BE A NOMINAL 2½" X 2½" OR A 3" DIA. NO. 2 SOUTHERN PINE, A NOMINAL 2" X 2" OAK, OR STEEL HAVING A MIN. WEIGHT OF 1.25 LBS. PER LINEAR FOOT AND A MIN. LENGTH OF 5' FOR TEMPORARY SILT FENCES.
2. END OF FILTER BARRIER TO BE EMBEDDED INTO AGGREGATE.
3. IF A DROP INLET IS LOCATED IN A SAG IN THE DITCH GRADE, A CHECK DAM IS REQUIRED FOR EACH SIDE OF THE INLET THAT RECEIVES DITCH FLOW.
4. WHERE DRAINAGE AREAS EXCEED ONE ACRE OR DITCH GRADE EXCEEDS 3%, A TEMPORARY SEDIMENT FOREBAY SHALL BE INSTALLED WITH MINIMUM DIMENSIONS OF 12" DEPTH, 2' WIDTH AND 6' LENGTH.

DROP INLET SILT TRAP TYPE B (BLOCK AND GRAVEL)



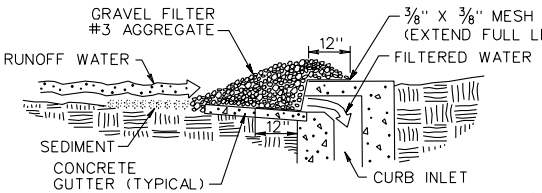


SECTION VIEW

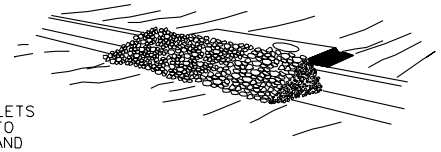
SPECIFIC APPLICATION

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

ALTERNATE DROP INLET SILT TRAP TYPE B (GRAVEL)



SECTION VIEW



SPECIFIC APPLICATION

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

SPECIFICATION REFERENCE
107 242 303

DROP INLET SILT TRAP (TYPE A AND B)

VIRGINIA DEPARTMENT OF TRANSPORTATION

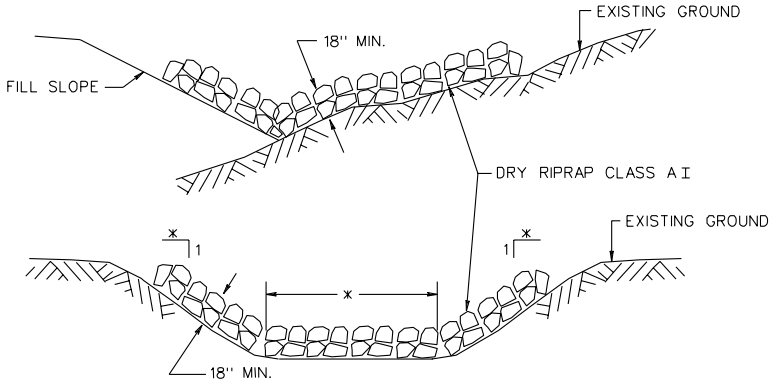
REV. 3/03

114.07

INSERTABLE SHEET isd 414 4

ESC-INS

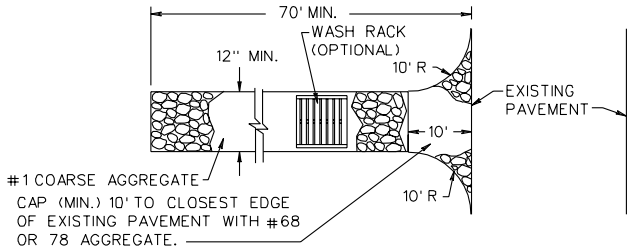
SUGGESTED METHOD OF TEMPORARILY PLACING RIPRAP FOR EROSION CONTROL IN CHANNELS, DITCHES, & AT TOE OF FILL SLOPES



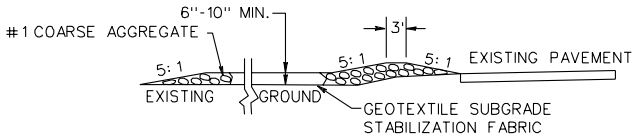
NOTES:

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

MINIMUM REQUIREMENTS FOR STABILIZED CONSTRUCTION ENTRANCE



PLAN



PROFILE

1. SURFACE WATER SHALL BE PIPED UNDER THE CONSTRUCTION ENTRANCE. IF PIPING IS IMPRACTICAL, A MOUNTABLE BERM WITH 5:1 SLOPES WILL BE PERMITTED.

2. THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHT OF WAY. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL STONE AS CONDITIONS DEMAND AND REPAIR AND/OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT. ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACKED ONTO PUBLIC RIGHT OF WAY SHALL BE REMOVED IMMEDIATELY.

3. WHEELS SHALL BE CLEANED TO REMOVE SEDIMENT PRIOR TO ENTRANCE ONTO PUBLIC RIGHT OF WAY. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AN AREA STABILIZED WITH STONE AND WHICH DRAINS INTO AN APPROVED SEDIMENT TRAPPING DEVICE.

4. PERIODIC INSPECTION AND NEEDED MAINTENANCE SHALL BE PROVIDED AFTER HEAVY USE AND EACH RAIN.

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

SPECIFICATION REFERENCE
107 303

TEMPORARY EROSION & SILTATION CONTROL

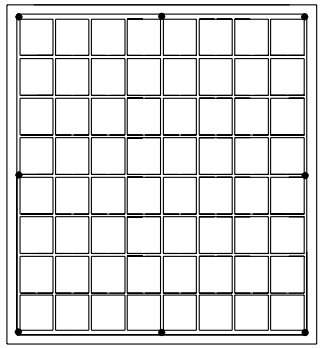
VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 3/03

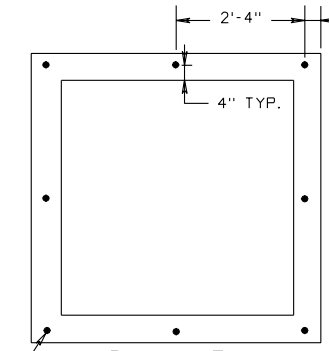
115.01

INSERTABLE SHEET isd 2216

SWM-1



PLAN VIEW

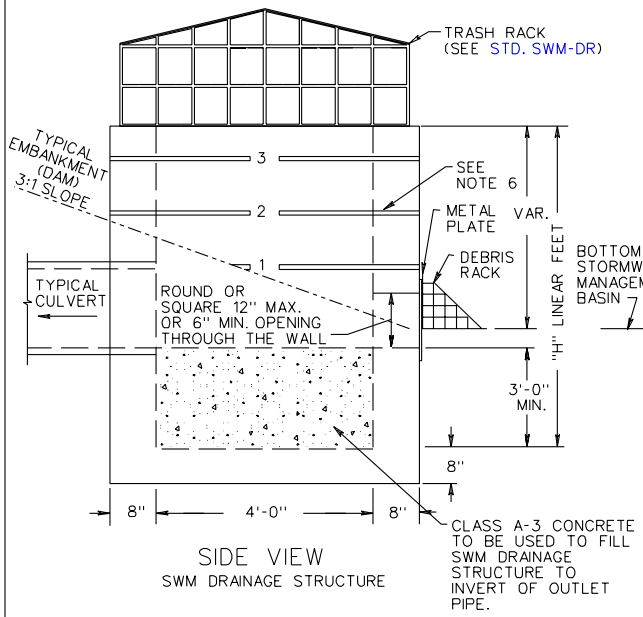


PLAN VIEW
(TRASH RACK NOT SHOWN)

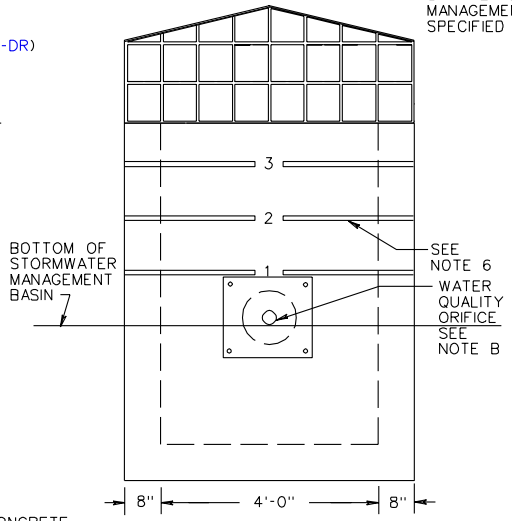
3/8" DIA. X 6" LG. ADHESIVE BOLTS W/FLAT WASHERS AND SELF LOCKING NUTS TYPICAL 8 PLACES.

NOTES:

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



SIDE VIEW
SWM DRAINAGE STRUCTURE



FRONT VIEW
(DEBRIS RACK NOT SHOWN)

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

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

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

SHEET 1 OF 2

SPECIFICATION REFERENCE

302

CAST IN PLACE STORMWATER MANAGEMENT DRAINAGE STRUCTURE

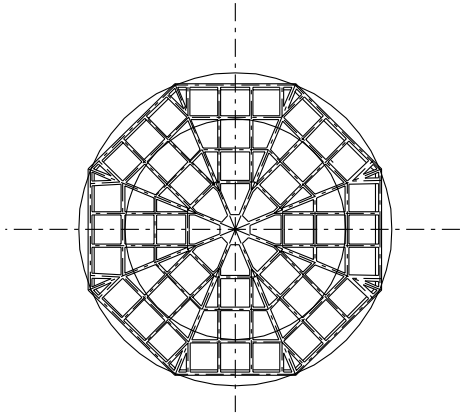
VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 3/03

116.01

INSERTABLE SHEET isd 2216

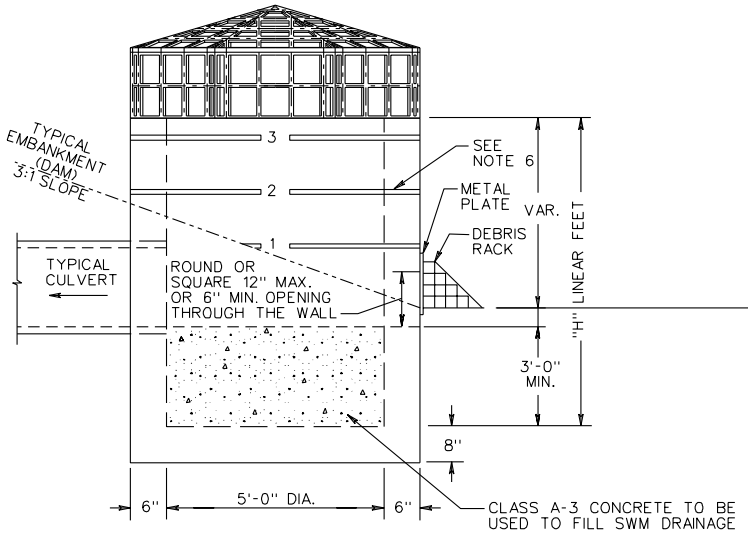
SWM-1



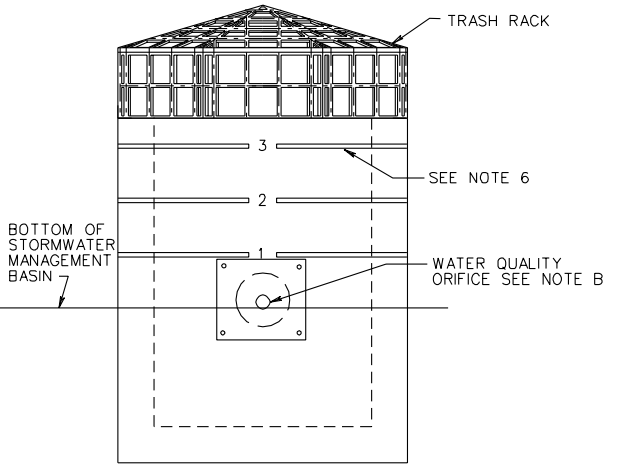
PLAN VIEW

NOTES:

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



SIDE VIEW
SWM DRAINAGE STRUCTURE



FRONT VIEW
(DEBRIS RACK NOT SHOWN)

SHEET 2 OF 2

PRECAST STORMWATER MANAGEMENT DRAINAGE STRUCTURE

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE

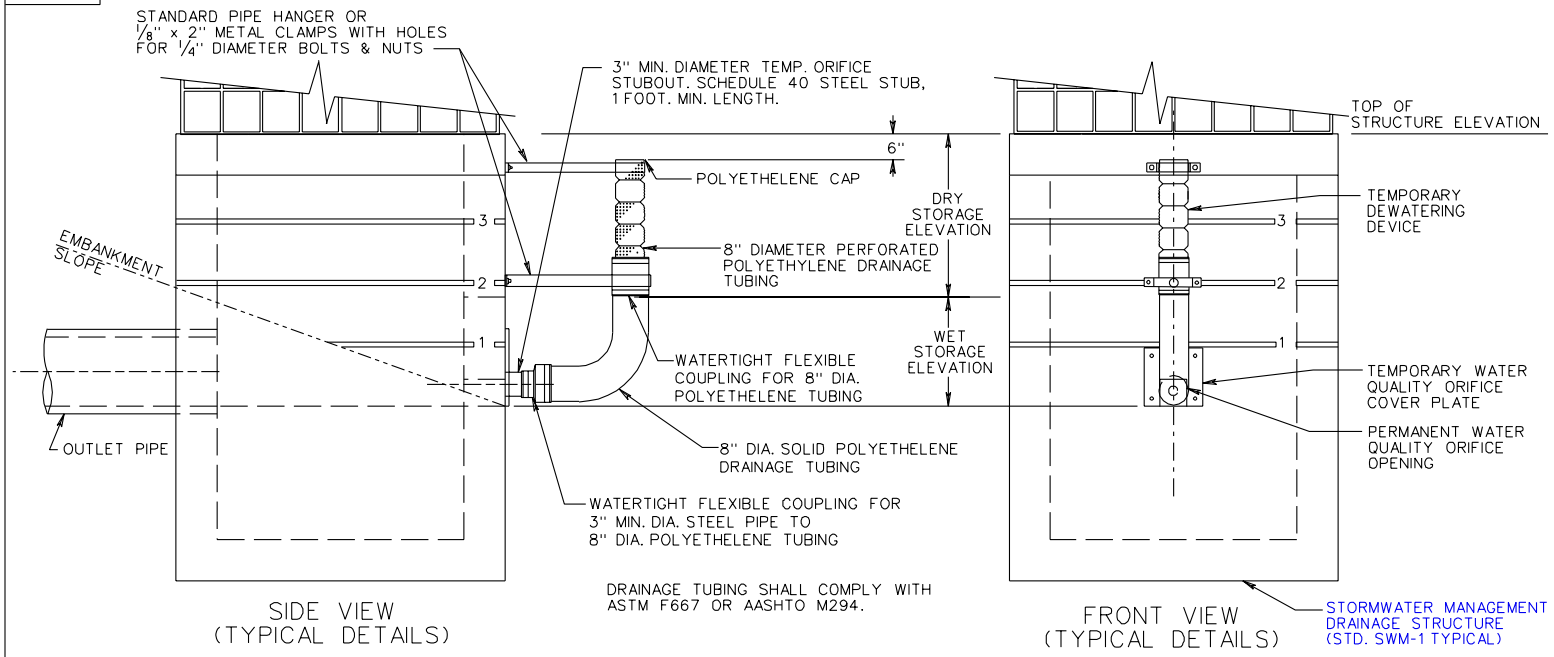
105
302

REV. 3/03

116.02

INSERTABLE SHEET isd 2216A

SWM-DR



NOTES:

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

STORMWATER MANAGEMENT (SWM) DETAILS

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE

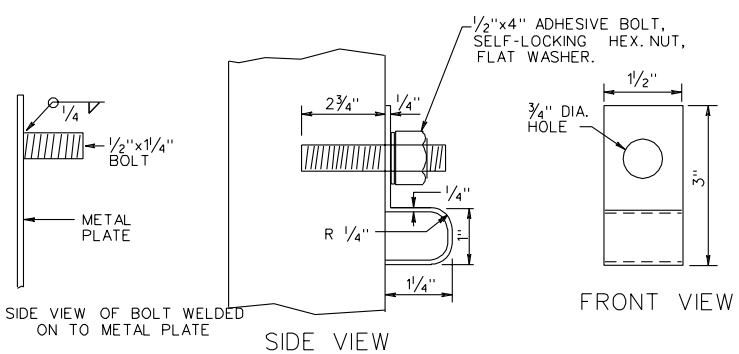
302

REV. 3/03

116.04

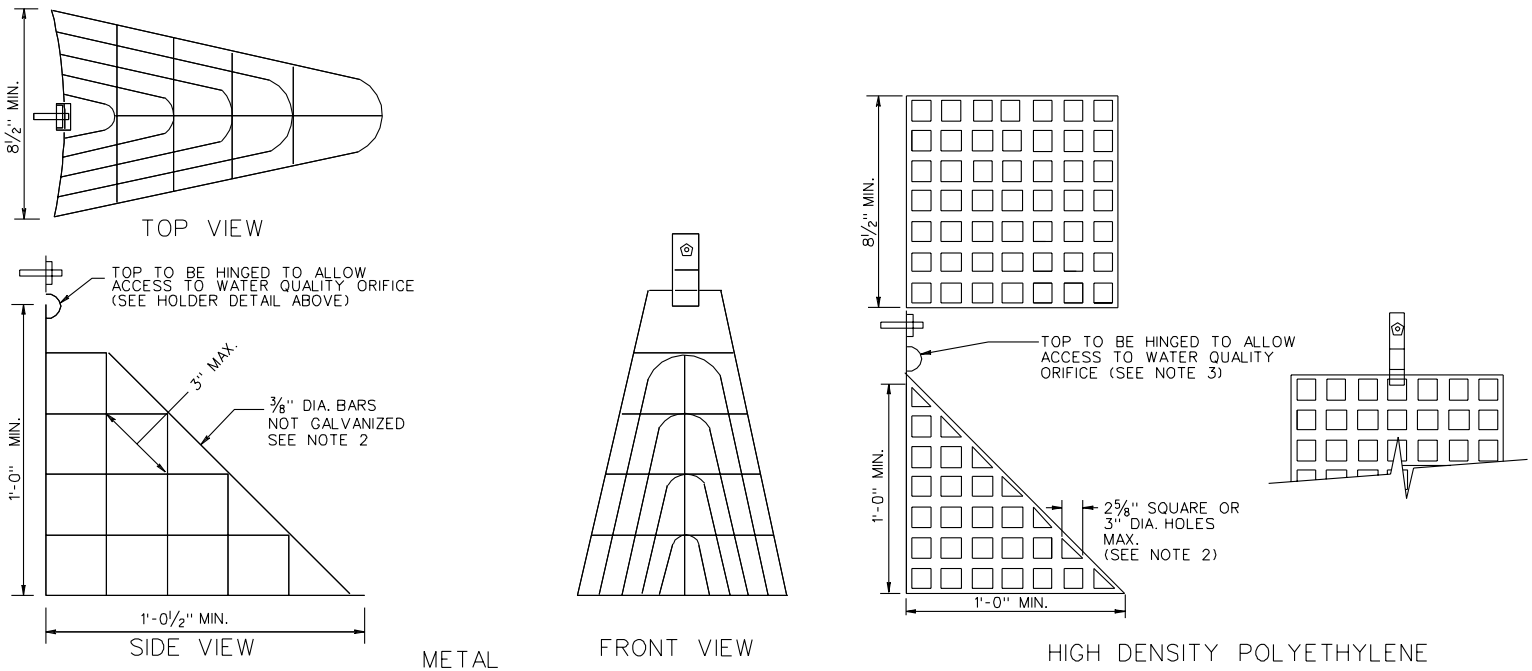
INSERTABLE SHEET isd 2209

SWM-DR



DETAIL FOR DEBRIS RACK HOLDER

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



DETAIL FOR DEBRIS RACK
(FOR WATER QUALITY ORIFICE)

SHEET 2 OF 5

SPECIFICATION REFERENCE
302

STORMWATER MANAGEMENT (SWM) DETAILS

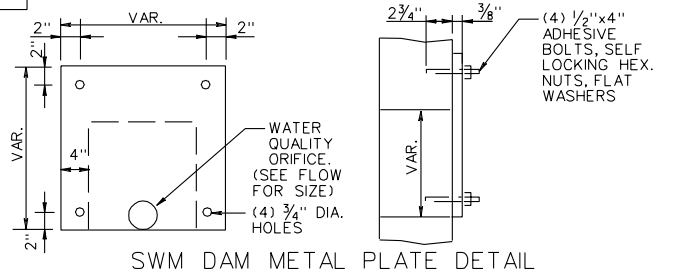
DEBRIS RACK, METAL PLATE, WATER QUALITY ORIFICE, CONCRETE CRADLE
(FOR SWM DRAINAGE STRUCTURES, SWM RISER PIPES AND SWM DAMS)
VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 3/03

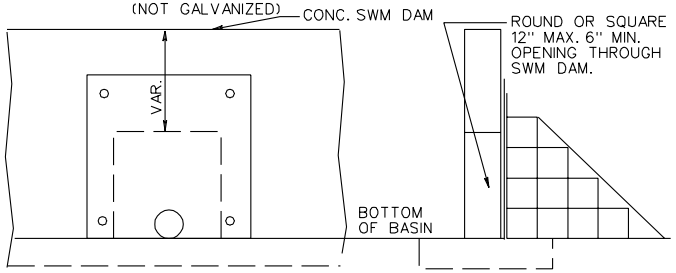
116.05

INSERTABLE SHEET isd 2209

SWM-DR



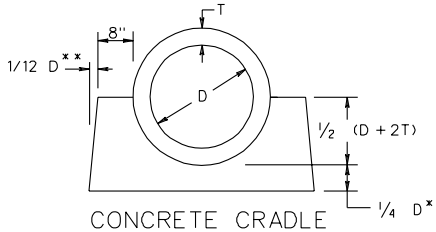
SWM DAM METAL PLATE DETAIL



DETAIL FOR METAL PLATE AND WATER QUALITY ORIFICE

SIDE VIEW OF SWM DAM WITH DEBRIS

TYPICAL SWM DAM



CONCRETE CRADLE

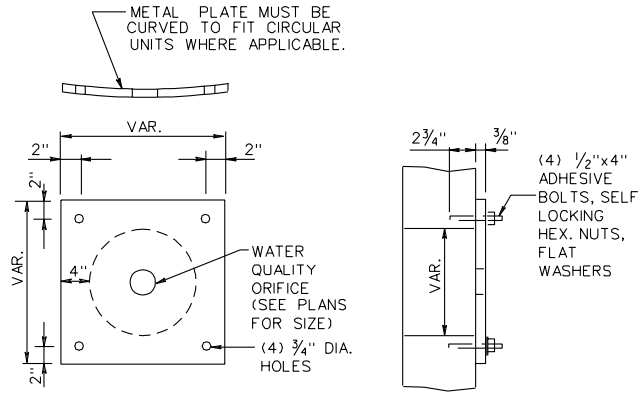
PIPE SIZE INCHES	CRADLE BOTTOM WIDTH (INCHES)	CRADLE HEIGHT (INCHES)	CRADLE TOP WIDTH (INCHES)	INCREMENT, IN CUBIC YARDS, PER LINEAR FOOT OF PIPE
12	34	14	32	0.093
15	38	15.75	35.5	0.110
18	42	17.5	39	0.129
24	50	21	46	0.168
30	58	26	53	0.233
36	66	31	60	0.307
42	74	36	67	0.390

* CONCRETE SHALL BE CLASS A3 BUT NOT LESS THAN 6"

** IF THE PIPE IS LAID IN AN EXCAVATED TRENCH, THEN THE SIDE WALLS MAY CONFORM TO THE TRENCH SHAPE (IE THE TRENCH MAY BECOME THE CRADLE FORM).

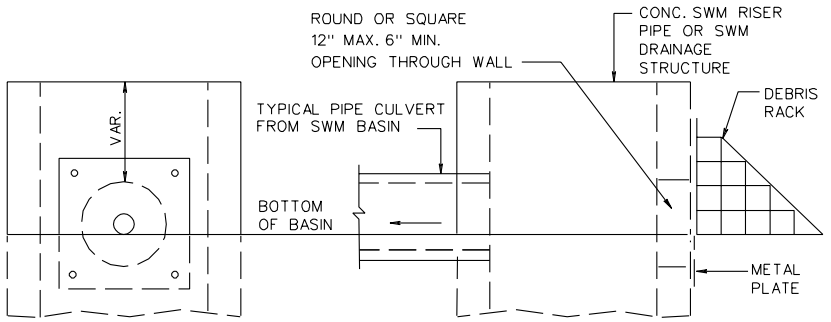
CONCRETE CRADLE IS TO BE INSTALLED UNDER THE ENTIRE LENGTH OF CULVERT AT EACH STORMWATER MANAGEMENT BASIN.

CONCRETE CRADLE IS TO BE PAID FOR AS MISCELLANEOUS CONCRETE AND SUMMARIZED IN CUBIC YARDS FOR EACH PIPE LOCATION



METAL PLATE DETAIL

(NOT GALVANIZED)



DETAIL FOR METAL PLATE AND WATER QUALITY ORIFICE

SIDE VIEW WITH DEBRIS RACK

TYPICAL SWM DRAINAGE STRUCTURE

SHEET 3 OF 5

STORMWATER MANAGEMENT (SWM) DETAILS

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

VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 3/03

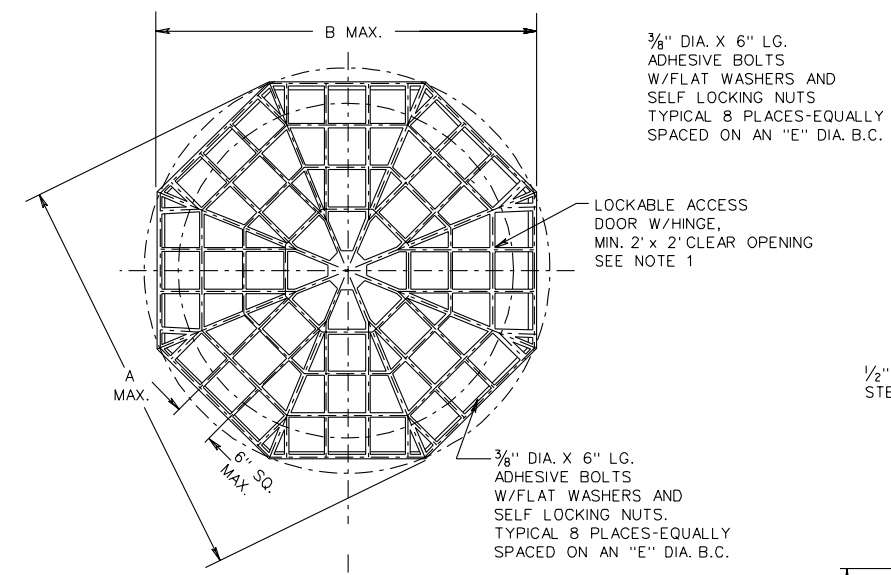
116.06

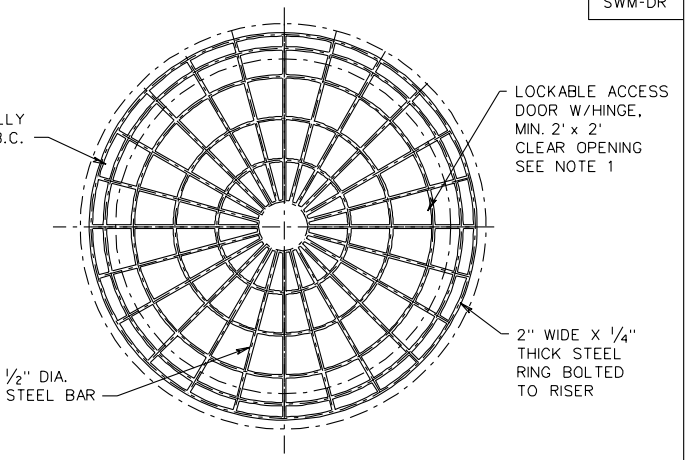
SPECIFICATION REFERENCE

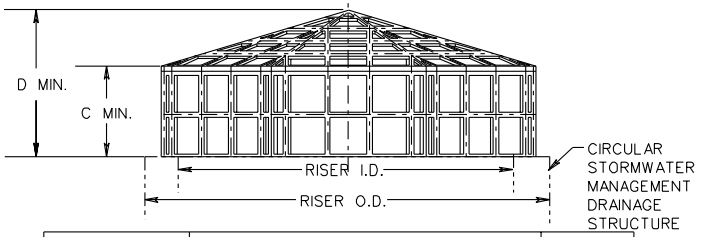
302

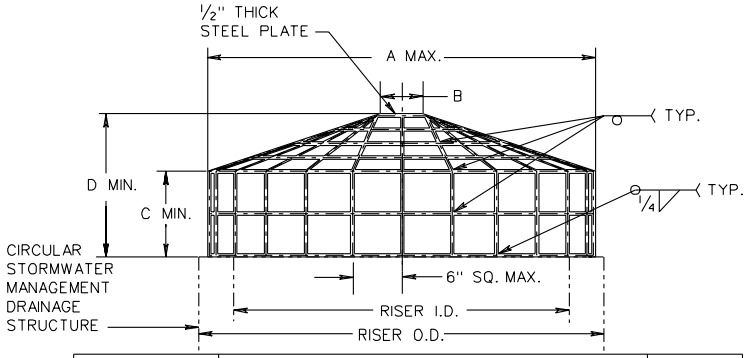
INSERTABLE SHEET isd 2216A

SWM-DR









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

HIGH DENSITY POLYETHYLENE

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

METAL

NOTES:
1. A HINGED, LOCKABLE ACCESS DOOR SHALL BE PROVIDED ON ALL TRASH RACKS IF THE TOTAL WEIGHT OF THE TRASH RACK IS GREATER THAN 75 LBS OR IF THE TRASH RACK IS TO BE PLACED ON A SWM-1 WITH AN "H" DIMENSION GREATER THAN 7'-2".
2. ANTI-VORTEX PLATE IS TO BE USED WHEN SPECIFIED ON THE PLANS. COST OF FURNISHING AND PLACING THE ANTI-VORTEX PLATE IS TO BE INCLUDED IN THE BID PRICE FOR THE STRUCTURE.

SHEET 4 OF 5

SPECIFICATION REFERENCE

302

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

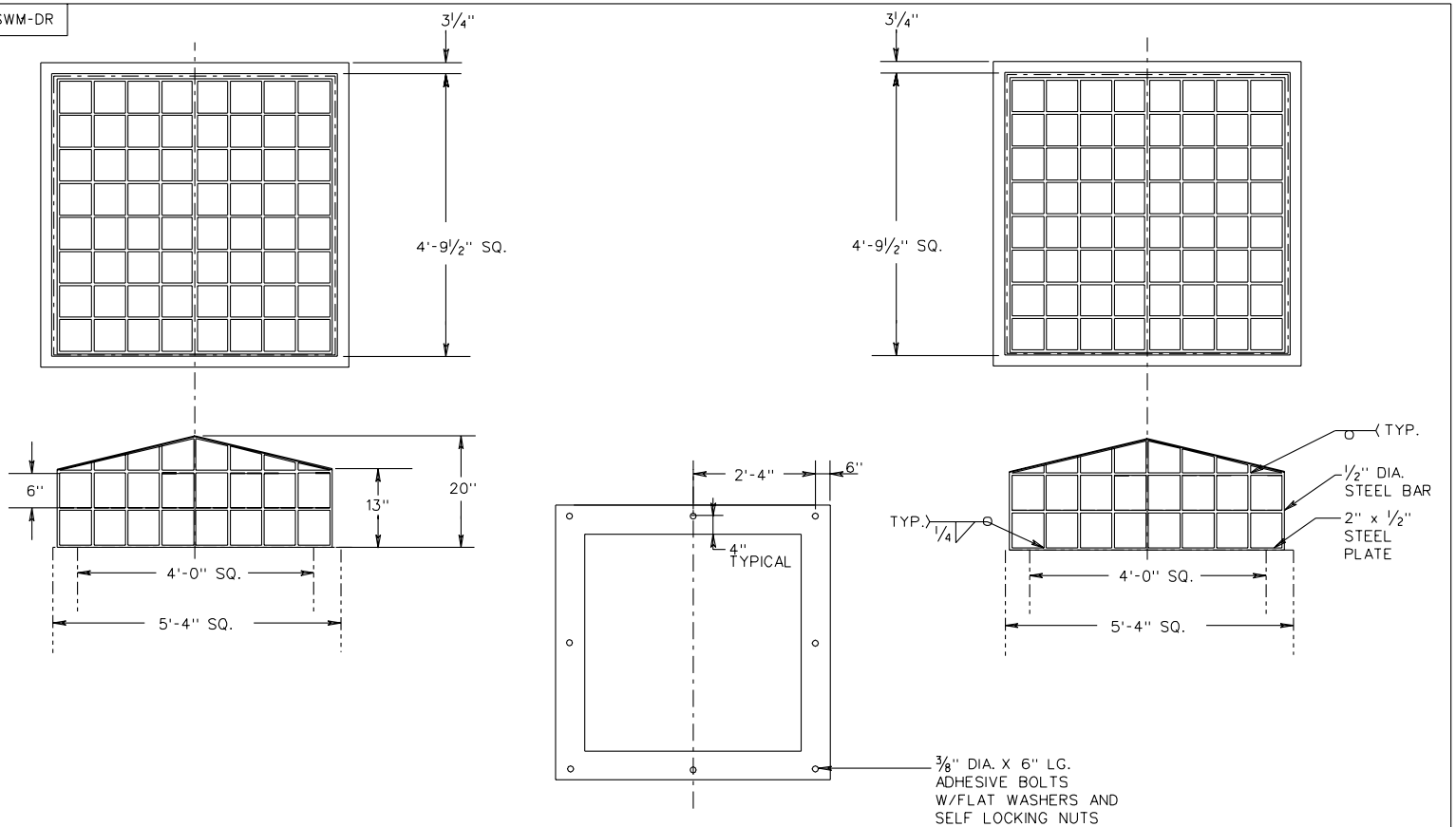
VIRGINIA DEPARTMENT OF TRANSPORTATION

NEW 3/03

116.07

INSERTABLE SHEET isd 2216A

SWM-DR



NOTES:
1. A HINGED, LOCKABLE ACCESS DOOR WITH A MINIMUM 2' x 2' CLEAR OPENING, SHALL BE PROVIDED ON ALL TRASH RACKS.

HIGH DENSITY POLYETHYLENE

APPROX. WT. (LBS.)
95

METAL (STEEL)

APPROX. WT. (LBS.)
188

SHEET 5 OF 5

NEW 3/03

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

VIRGINIA DEPARTMENT OF TRANSPORTATION

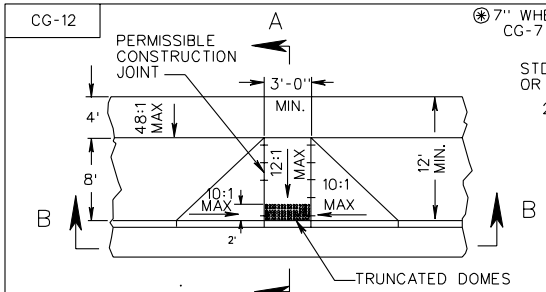
SPECIFICATION REFERENCE

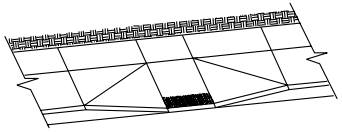
302

116.08

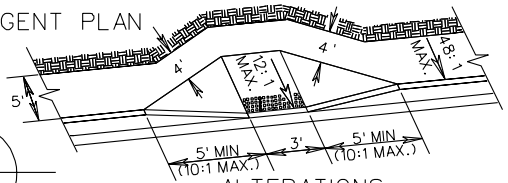
INSERTABLE SHEET A59

CG-12

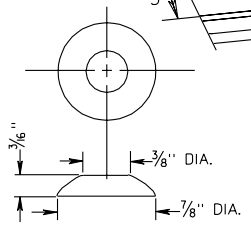




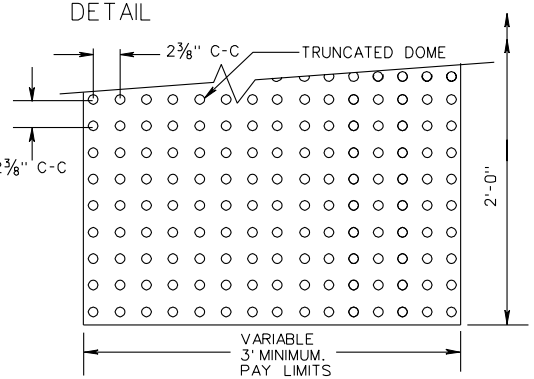
TANGENT PLAN



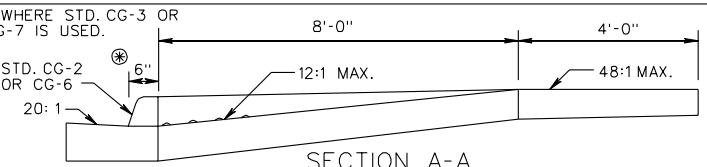
ALTERATIONS



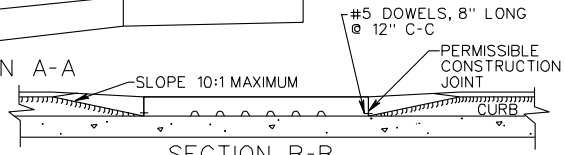
TRUNCATED DOME DETAIL



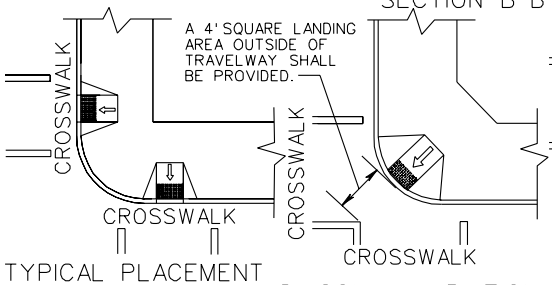
DETECTABLE WARNING DETAIL



SECTION A-A

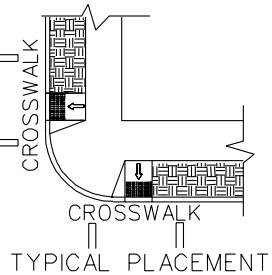


SECTION B-B



TYPICAL PLACEMENT AT INTERSECTION WITHIN CROSSWALK

DIAGONAL VARIATION



TYPICAL PLACEMENT AT INTERSECTION WITHIN CROSSWALK (WITH BUFFER STRIP)

TYPE A (PERPENDICULAR) APPLICATION

THIS DESIGN TO BE USED FOR CONSTRUCTION THAT INCORPORATES WIDER SIDEWALK. LANDING (48" WIDE) REQUIRED AT TOP OF CURB RAMP. MINIMUM CURB RAMP LENGTH 8 FEET FOR NEW CONSTRUCTION, 6 FEET FOR ALTERATIONS.

NOTES:

1. DETECTABLE WARNING TO BE CLASS A-3 CONCRETE (CLASS A-4 IF PRECAST) WITH SLIP RESISTANT INTEGRAL SURFACE COVERING THE FULL WIDTH OF THE RAMP FLOOR BY 2 FOOT IN LENGTH IN THE DIRECTION OF TRAVEL. OTHER TYPES OF MATERIAL WITH THE TRUNCATED DOME DETECTABLE WARNING MAY BE USED WITH THE APPROVAL OF THE ENGINEER.
2. THE DETECTABLE WARNING SHALL BE PROVIDED BY TRUNCATED DOMES. TRUNCATED DOMES TO BE STAMPED IF CAST-IN-PLACE OR PRECAST IN TOP SURFACE. THE COLOR OF THE DETECTABLE WARNING SECTION SHALL BE A CONTRASTING COLOR WITH THE ADJACENT SURFACES (ADJACENT SURFACES INCLUDES FLARED SIDES).
3. SLOPING SIDES OF CURB RAMP MAY BE POURED MONOLITHICALLY WITH RAMP FLOOR OR BY USING PERMISSIBLE CONSTRUCTION JOINT WITH REQUIRED BARS.
4. IF RAMP FLOOR IS PRECAST, HOLES MUST BE PROVIDED FOR DOWEL BARS SO THAT ADJOINING FLARED SIDES CAN BE CAST IN PLACE AFTER PLACEMENT OF PRECAST RAMP FLOOR. PRECAST CONCRETE SHALL BE CLASS A-4.
5. REQUIRED BARS ARE TO BE NO. 5 X 8" PLACED 1' CENTER TO CENTER ALONG BOTH SIDES OF THE RAMP FLOOR, MID-DEPTH OF RAMP FLOOR. MINIMUM CONCRETE COVER 1½".
6. CURB/CURB AND GUTTER SLOPE TRANSITIONS ADJACENT TO CURB RAMPS ARE INCLUDED IN PAYMENT FOR CURB/CURB AND GUTTER.
7. WHEN USED IN CONJUNCTION WITH STANDARD CG-3 OR CG-7, THE CURB FACE ON THIS STANDARD IS TO BE ADJUSTED TO MATCH THE MOUNTABLE CURB AND CONFIGURATION.
8. CURB RAMPS ARE TO BE LOCATED AS SHOWN ON THE PLANS OR AS DIRECTED BY THE ENGINEER. THEY ARE TO BE PROVIDED AT INTERSECTIONS WHEREVER AN ACCESSIBLE ROUTE WITHIN THE RIGHT OF WAY OF A HIGHWAY FACILITY CROSSES A CURB REGARDLESS OF WHETHER SIDEWALK IS EXISTING, PROPOSED, OR NONEXISTENT. THEY MUST BE LOCATED WITHIN PEDESTRIAN CROSSWALKS AS SHOWN ON PLANS OR AS DIRECTED BY THE ENGINEER, AND SHOULD NOT BE LOCATED BEHIND VEHICLE STOP LINES. EXISTING LIGHT POLES, FIRE HYDRANTS, DROP INLETS, ETC. WILL AFFECT PLACEMENT. ACCESSIBLE ROUTE IS DEFINED AS A CONTINUOUS UNOBSTRUCTED, STABLE, FIRM AND SLIP RESISTANT PATH CONNECTING ALL ACCESSIBLE ELEMENTS OF A FACILITY THAT CAN BE APPROACHED, ENTERED AND USED BY PERSONS WITH MOBILITY IMPAIRMENTS.
9. RAMPS MAY BE PLACED ON RADIAL OR TANGENTIAL SECTIONS PROVIDED THAT THE CURB OPENING IS PLACED WITHIN THE LIMITS OF THE CROSSWALK.
10. TYPICAL CONCRETE SIDEWALK IS 4" THICK. WHEN THE ENTRANCE RADII CANNOT ACCOMMODATE THE TURNING REQUIREMENTS OF ANTICIPATED HEAVY TRUCK TRAFFIC THE CONCRETE SIDEWALK DEPTH SHOULD BE INCREASED TO 7".

SHEET 1 OF 3

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

VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 3/03

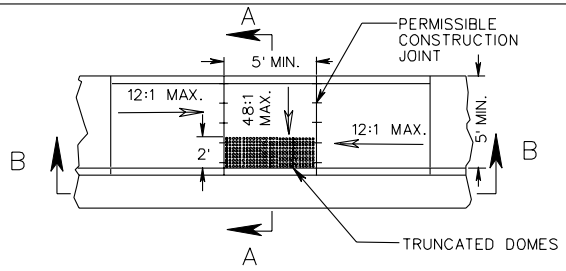
203.05

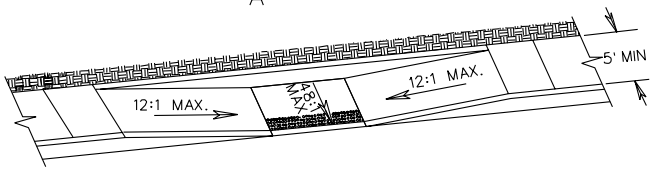
SPECIFICATION REFERENCE

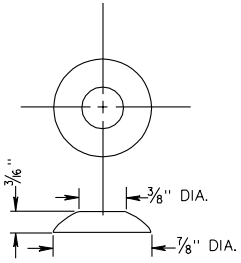
105
502

INSERTABLE SHEET A59

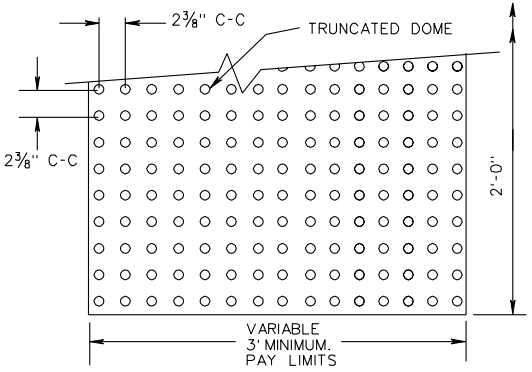
CG-12



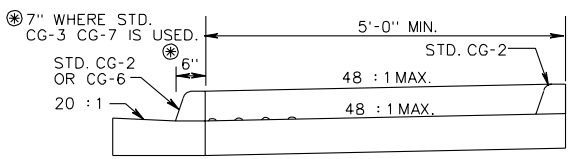




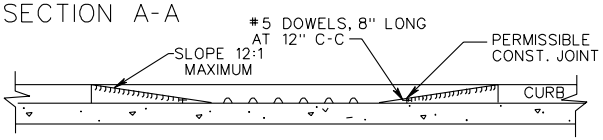
TRUNCATED DOME DETAIL



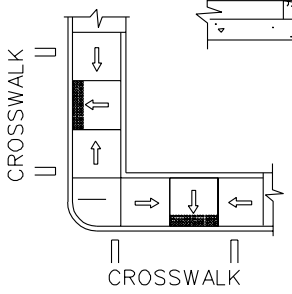
DETECTABLE WARNING DETAIL



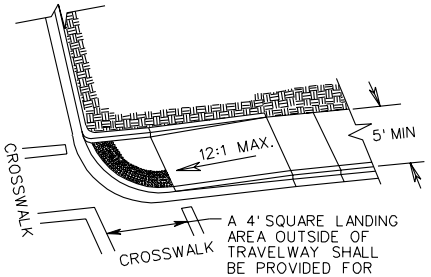
SECTION A-A



SECTION B-B



TYPICAL PLACEMENT AT INTERSECTION WITHIN CROSSWALK



TYPE B (PARALLEL) APPLICATION

NOTES:

1. DETECTABLE WARNING TO BE CLASS A-3 CONCRETE (CLASS A-4 IF PRECAST) WITH SLIP RESISTANT INTEGRAL SURFACE COVERING THE FULL WIDTH OF THE RAMP FLOOR BY 2 FOOT IN LENGTH IN THE DIRECTION OF TRAVEL. OTHER TYPES OF MATERIAL WITH THE TRUNCATED DOME DETECTABLE WARNING MAY BE USED WITH THE APPROVAL OF THE ENGINEER.
2. THE DETECTABLE WARNING SHALL BE PROVIDED BY TRUNCATED DOMES. TRUNCATED DOMES TO BE STAMPED IF CAST-IN-PLACE OR PRECAST IN TOP SURFACE. THE COLOR OF THE DETECTABLE WARNING SECTION SHALL BE A CONTRASTING COLOR WITH THE ADJACENT SURFACES (ADJACENT SURFACES INCLUDES FLARED SIDES).
3. SLOPING SIDES OF CURB RAMP MAY BE POURED MONOLITHICALLY WITH RAMP FLOOR OR BY USING PERMISSIBLE CONSTRUCTION JOINT WITH REQUIRED BARS.
4. IF RAMP FLOOR IS PRECAST, HOLES MUST BE PROVIDED FOR DOWEL BARS SO THAT ADJOINING FLARED SIDES CAN BE CAST IN PLACE AFTER PLACEMENT OF PRECAST RAMP FLOOR. PRECAST CONCRETE SHALL BE CLASS A-4.
5. REQUIRED BARS ARE TO BE NO. 5 X 8" PLACED 1' CENTER TO CENTER ALONG BOTH SIDES OF THE RAMP FLOOR, MID-DEPTH OF RAMP FLOOR. MINIMUM CONCRETE COVER 1½".
6. CURB/CURB AND GUTTER SLOPE TRANSITIONS ADJACENT TO CURB RAMPS ARE INCLUDED IN PAYMENT FOR CURB/CURB AND GUTTER.
7. WHEN USED IN CONJUNCTION WITH STANDARD CG-3 OR CG-7, THE CURB FACE ON THIS STANDARD IS TO BE ADJUSTED TO MATCH THE MOUNTABLE CURB AND CONFIGURATION.
8. CURB RAMPS ARE TO BE LOCATED AS SHOWN ON THE PLANS OR AS DIRECTED BY THE ENGINEER. THEY ARE TO BE PROVIDED AT INTERSECTIONS WHEREVER AN ACCESSIBLE ROUTE WITHIN THE RIGHT OF WAY OF A HIGHWAY FACILITY CROSSES A CURB REGARDLESS OF WHETHER SIDEWALK IS EXISTING, PROPOSED, OR NONEXISTENT. THEY MUST BE LOCATED WITHIN PEDESTRIAN CROSSWALKS AS SHOWN ON PLANS OR AS DIRECTED BY THE ENGINEER, AND SHOULD NOT BE LOCATED BEHIND VEHICLE STOP LINES. EXISTING LIGHT POLES, FIRE HYDRANTS, DROP INLETS, ETC. WILL AFFECT PLACEMENT. ACCESSIBLE ROUTE IS DEFINED AS A CONTINUOUS UNOBSTRUCTED, STABLE, FIRM AND SLIP RESISTANT PATH CONNECTING ALL ACCESSIBLE ELEMENTS OF A FACILITY THAT CAN BE APPROACHED, ENTERED AND USED BY PERSONS WITH MOBILITY IMPAIRMENTS.
9. RAMPS MAY BE PLACED ON RADIAL OR TANGENTIAL SECTIONS PROVIDED THAT THE CURB OPENING IS PLACED WITHIN THE LIMITS OF THE CROSSWALK.
10. TYPICAL CONCRETE SIDEWALK IS 4" THICK. WHEN THE ENTRANCE RADII CANNOT ACCOMMODATE THE TURNING REQUIREMENTS OF ANTICIPATED HEAVY TRUCK TRAFFIC THE CONCRETE SIDEWALK DEPTH SHOULD BE INCREASED TO 7".

SPECIFICATION REFERENCE
105 502

CG-12 DETECTABLE WARNING SURFACE TYPE B (PARALLEL) APPLICATION

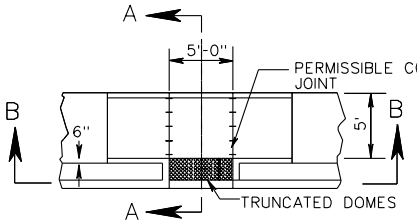
VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 3/03

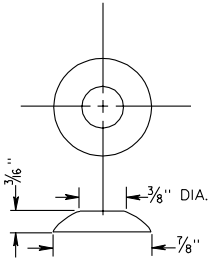
203.06

INSERTABLE SHEET A59

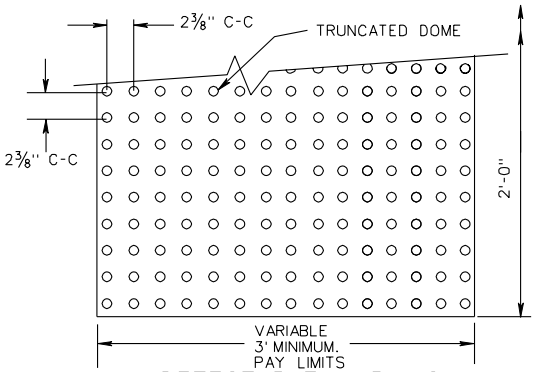
CG-12



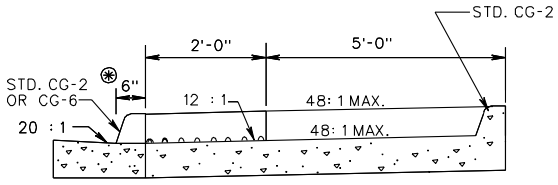
TANGENT PLAN



TRUNCATED DOME DETAIL

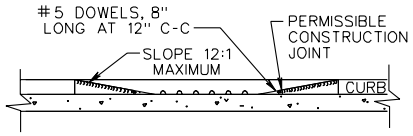


DETECTABLE WARNING DETAIL

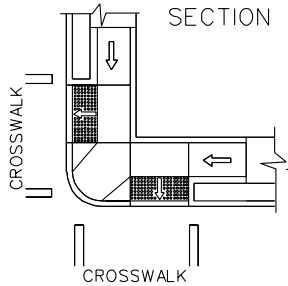


⊛ 7" WHERE STD. CG-3 CG-7 IS USED.

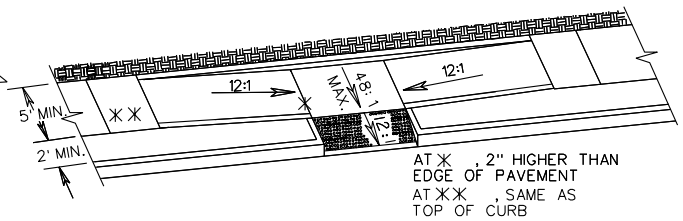
SECTION A-A



SECTION B-B



TYPICAL PLACEMENT AT INTERSECTION WITH BUFFER STRIP



TYPE C (PARALLEL & PERPENDICULAR) APPLICATION

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

NOTES:

1. DETECTABLE WARNING TO BE CLASS A-3 CONCRETE (CLASS A-4 IF PRECAST) WITH SLIP RESISTANT INTEGRAL SURFACE COVERING THE FULL WIDTH OF THE RAMP FLOOR BY 2 FOOT IN LENGTH IN THE DIRECTION OF TRAVEL. OTHER TYPES OF MATERIAL WITH THE TRUNCATED DOME DETECTABLE WARNING MAY BE USED WITH THE APPROVAL OF THE ENGINEER.
2. THE DETECTABLE WARNING SHALL BE PROVIDED BY TRUNCATED DOMES. TRUNCATED DOMES TO BE STAMPED IF CAST-IN-PLACE OR PRECAST IN TOP SURFACE. THE COLOR OF THE DETECTABLE WARNING SECTION SHALL BE A CONTRASTING COLOR WITH THE ADJACENT SURFACES (ADJACENT SURFACES INCLUDES FLARED SIDES).
3. SLOPING SIDES OF CURB RAMP MAY BE POURED MONOLITHICALLY WITH RAMP FLOOR OR BY USING PERMISSIBLE CONSTRUCTION JOINT WITH REQUIRED BARS.
4. IF RAMP FLOOR IS PRECAST, HOLES MUST BE PROVIDED FOR DOWEL BARS SO THAT ADJOINING FLARED SIDES CAN BE CAST IN PLACE AFTER PLACEMENT OF PRECAST RAMP FLOOR. PRECAST CONCRETE SHALL BE CLASS A-4.
5. REQUIRED BARS ARE TO BE NO. 5 X 8" PLACED 1' CENTER TO CENTER ALONG BOTH SIDES OF THE RAMP FLOOR, MID-DEPTH OF RAMP FLOOR. MINIMUM CONCRETE COVER 1½".
6. CURB/CURB AND GUTTER SLOPE TRANSITIONS ADJACENT TO CURB RAMPS ARE INCLUDED IN PAYMENT FOR CURB/CURB AND GUTTER.
7. WHEN USED IN CONJUNCTION WITH STANDARD CG-3 OR CG-7, THE CURB FACE ON THIS STANDARD IS TO BE ADJUSTED TO MATCH THE MOUNTABLE CURB AND CONFIGURATION.
8. CURB RAMPS ARE TO BE LOCATED AS SHOWN ON THE PLANS OR AS DIRECTED BY THE ENGINEER. THEY ARE TO BE PROVIDED AT INTERSECTIONS WHEREVER AN ACCESSIBLE ROUTE WITHIN THE RIGHT OF WAY OF A HIGHWAY FACILITY CROSSES A CURB REGARDLESS OF WHETHER SIDEWALK IS EXISTING, PROPOSED, OR NONEXISTENT. THEY MUST BE LOCATED WITHIN PEDESTRIAN CROSSWALKS AS SHOWN ON PLANS OR AS DIRECTED BY THE ENGINEER, AND SHOULD NOT BE LOCATED BEHIND VEHICLE STOP LINES. EXISTING LIGHT POLES, FIRE HYDRANTS, DROP INLETS, ETC. WILL AFFECT PLACEMENT. ACCESSIBLE ROUTE IS DEFINED AS A CONTINUOUS UNOBSTRUCTED, STABLE, FIRM AND SLIP RESISTANT PATH CONNECTING ALL ACCESSIBLE ELEMENTS OF A FACILITY THAT CAN BE APPROACHED, ENTERED AND USED BY PERSONS WITH MOBILITY IMPAIRMENTS.
9. RAMPS MAY BE PLACED ON RADIAL OR TANGENTIAL SECTIONS PROVIDED THAT THE CURB OPENING IS PLACED WITHIN THE LIMITS OF THE CROSSWALK.
10. TYPICAL CONCRETE SIDEWALK IS 4" THICK. WHEN THE ENTRANCE RADII CANNOT ACCOMMODATE THE TURNING REQUIREMENTS OF ANTICIPATED HEAVY TRUCK TRAFFIC THE CONCRETE SIDEWALK DEPTH SHOULD BE INCREASED TO 7".

SHEET 3 OF 3

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

VIRGINIA DEPARTMENT OF TRANSPORTATION

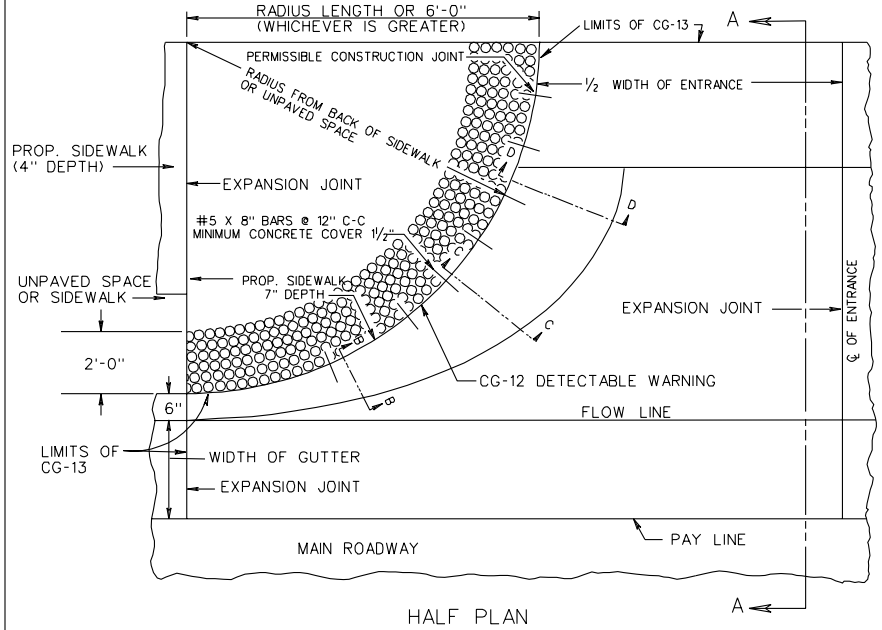
REV. 3/03

203.07

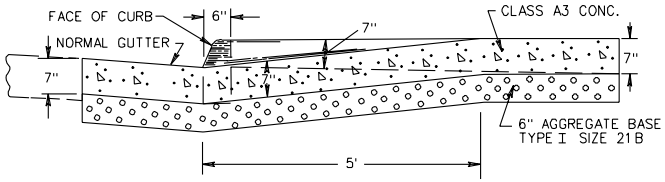
SPECIFICATION REFERENCE

105
502

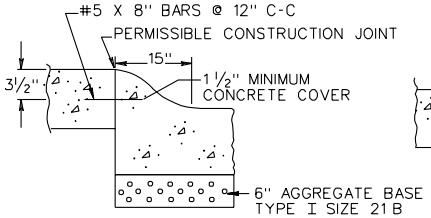
CG-13



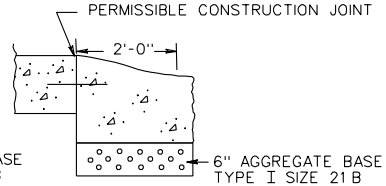
HALF PLAN



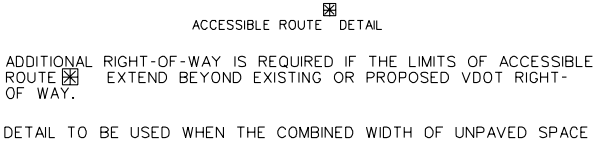
SECTION A-A



SECTION B-B



SECTION C-C



ACCESSIBLE ROUTE DETAIL

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

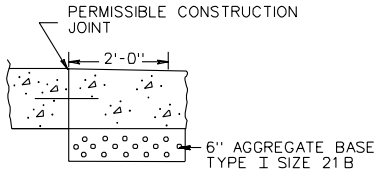
DETAIL TO BE USED WHEN THE COMBINED WIDTH OF UNPAVED SPACE AND SIDEWALK SPACE IS LESS THAN 7'.

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

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

NOTES:

1. PROP. 7" SIDEWALK IS TO BE POURED MONOLITHICALLY WITH ENTRANCE OR BY USING PERMISSIBLE CONSTRUCTION JOINT WITH REQUIRED BARS.
2. PROPOSED 7" SIDEWALK TO BE CLASS A-3 CONCRETE.
3. REQUIRED BARS ARE TO BE NO. 5X8" PLACED 1' CENTER TO CENTER ALONG BACK OF CURB, MID-DEPTH OF SIDEWALK. MINIMUM CONCRETE COVER 1½".
4. ALL DETAILS AND DIMENSIONS NOT SHOWN ARE THE SAME AS STANDARD CG-9D.
5. THIS DESIGN MAY ALSO BE APPLIED TO OTHER ENTRANCE STANDARDS AS THE NEED ARISES.
6. WHEN USED IN CONJUNCTION WITH STANDARD CG-3 OR CG-7, THE CURB FACE ON. THIS STANDARD IS TO BE ADJUSTED TO MATCH THE MOUNTABLE CURB CONFIGURATION.
7. SEE INSERTABLE SHEET A59 FOR STANDARD CG-12 DETECTABLE WARNING DETAILS.



SECTION D-D

SPECIFICATION REFERENCE
502

COMMERCIAL ENTRANCE
(HEAVY TRUCK TRAFFIC ANTICIPATED)

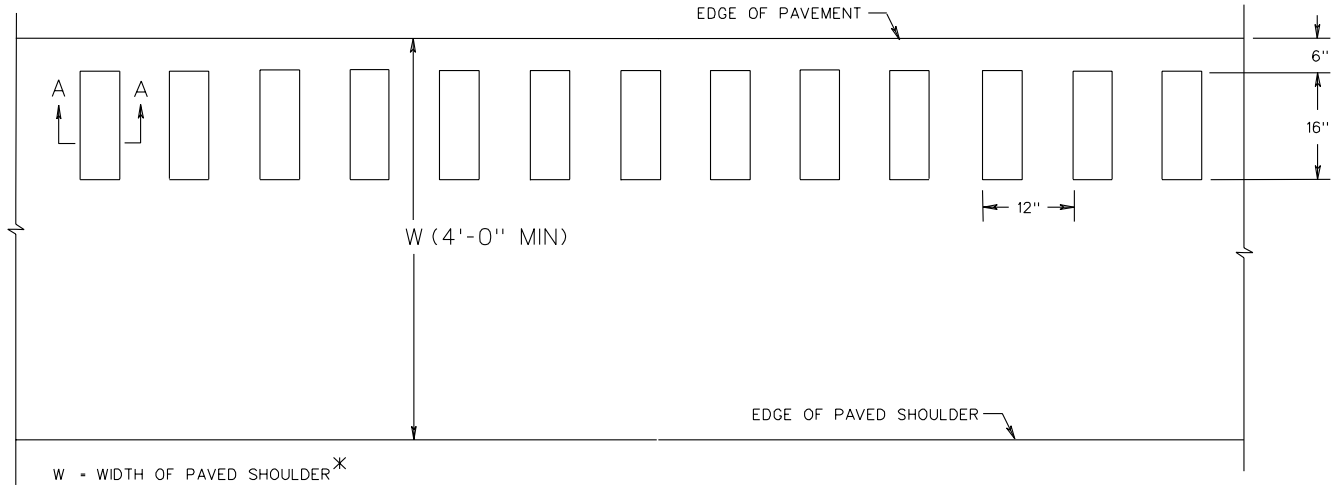
VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 3/03

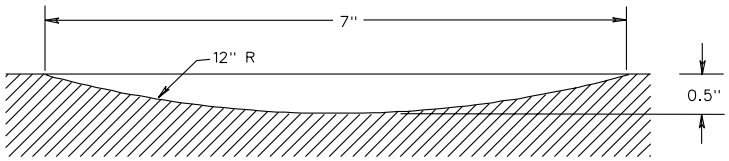
203.08

INSERTABLE SHEET isd1722a

RS-1



PLAN VIEW



SECTION A-A

NOTES

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

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

RUMBLE STRIPS SHALL BE PLACED ON MAINLINE SHOULDERS ONLY.

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

REVISED 11/02

SPECIFICATION REFERENCE
310 315

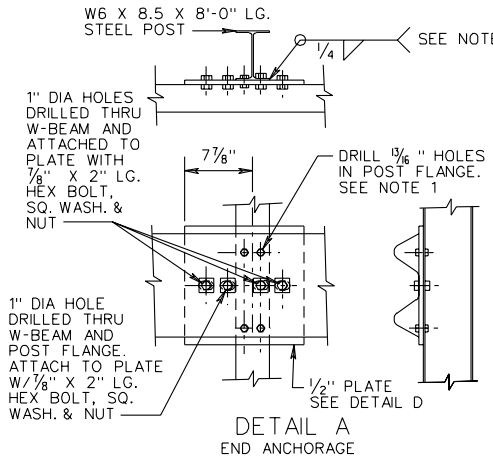
RUMBLE STRIPS

VIRGINIA DEPARTMENT OF TRANSPORTATION

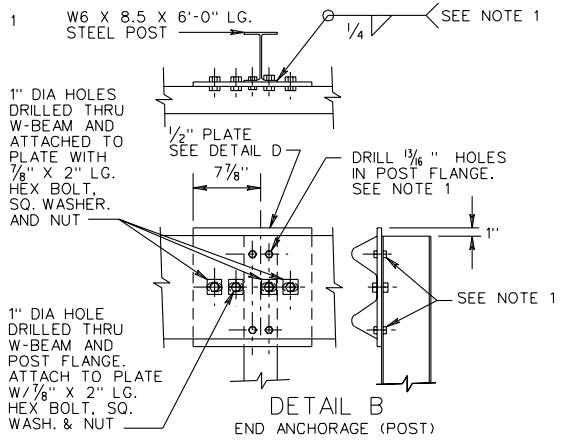
304.01

INSERTABLE SHEET A132

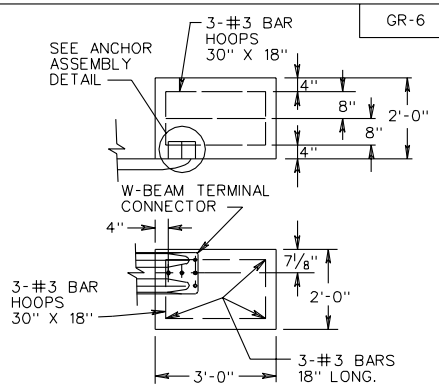
GR-6



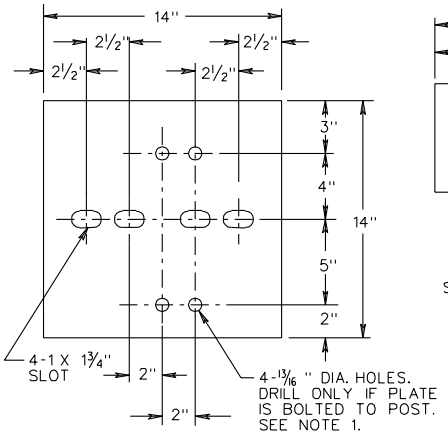
DETAIL A
END ANCHORAGE



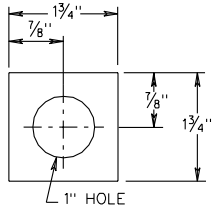
DETAIL B
END ANCHORAGE (POST)



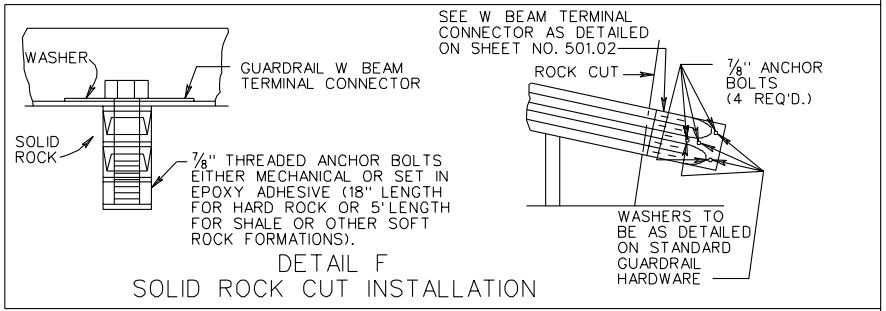
DETAIL C
END ANCHORAGE (CONCRETE)



DETAIL D
1/2" THICK STEEL PLATE



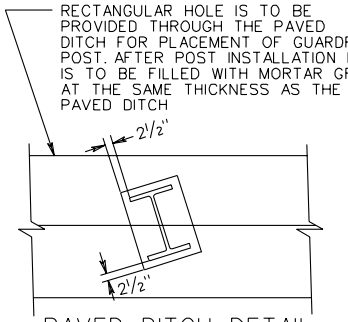
DETAIL E
3/16" THICK SQUARE WASHER



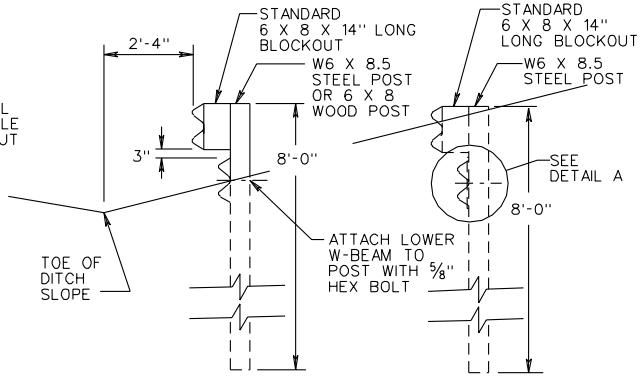
DETAIL F
SOLID ROCK CUT INSTALLATION

NOTE:

1. 1/2" STEEL PLATE MAY BE WELDED OR BOLTED TO POST. IF PLATE IS BOLTED TO POST USE 4 - 5/8" X 1 1/2" LG. HEX HEAD BOLTS W/ HEX NUTS. IF PLATE IS WELDED TO POST DO NOT DRILL 13/16 " HOLES IN PLATE OR IN POST FLANGES.
2. CONCRETE END ANCHORAGE MAY BE USED IN PLACE OF STEEL POST AT 8'-0" OFFSET.



PAVED DITCH DETAIL



SECTION D-D

SECTION E-E

SHEET 2 OF 2

SPECIFICATION REFERENCE
505 221

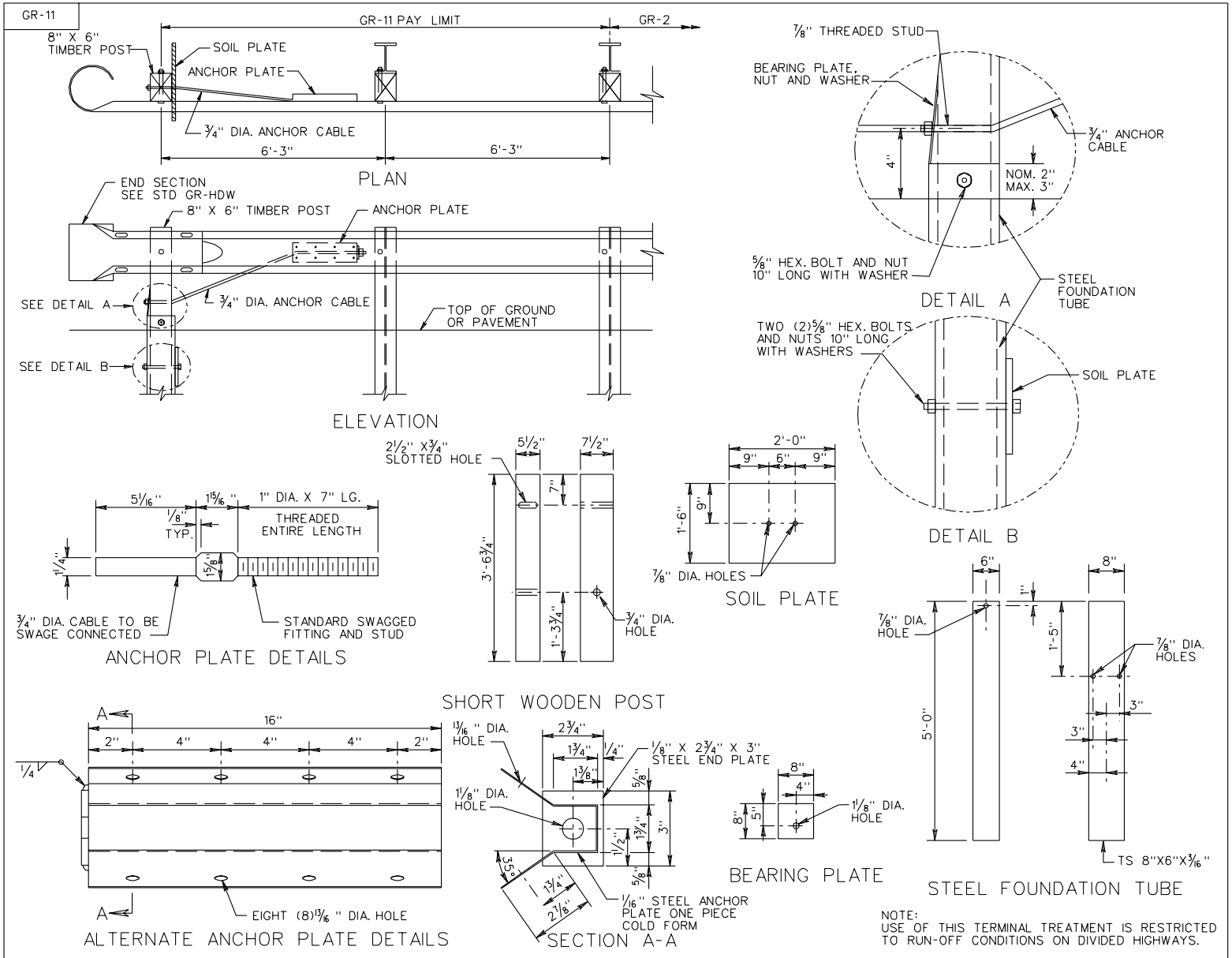
TERMINAL TREATMENT FOR W BEAM GUARDRAIL

VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 11/02

501.10

INSERTABLE SHEET A145



NOTE:
USE OF THIS TERMINAL TREATMENT IS RESTRICTED TO RUN-OFF CONDITIONS ON DIVIDED HIGHWAYS.

TRAILING END TERMINAL TREATMENT

VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 3/03

501.21

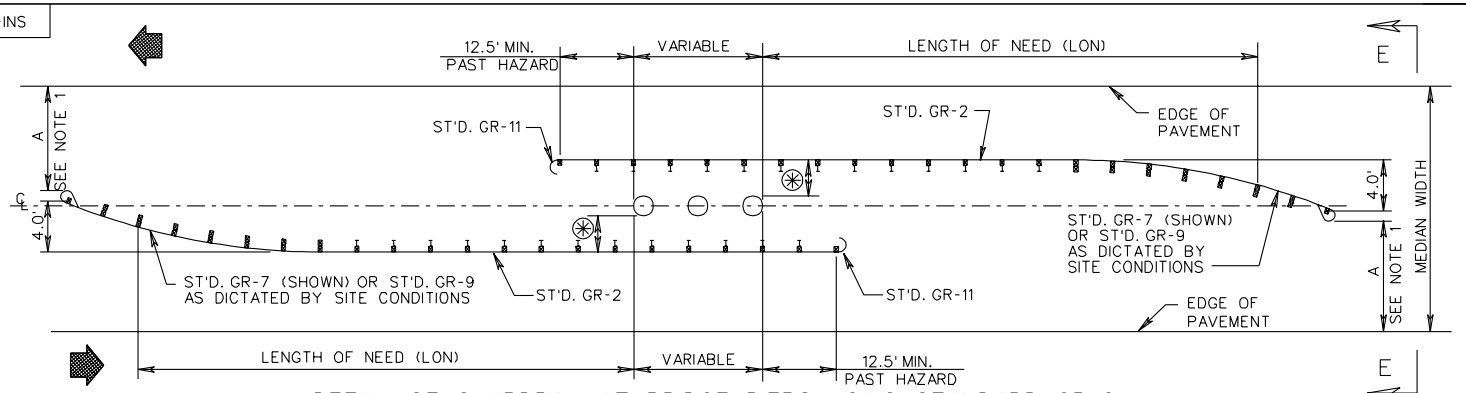
SPECIFICATION REFERENCE

505

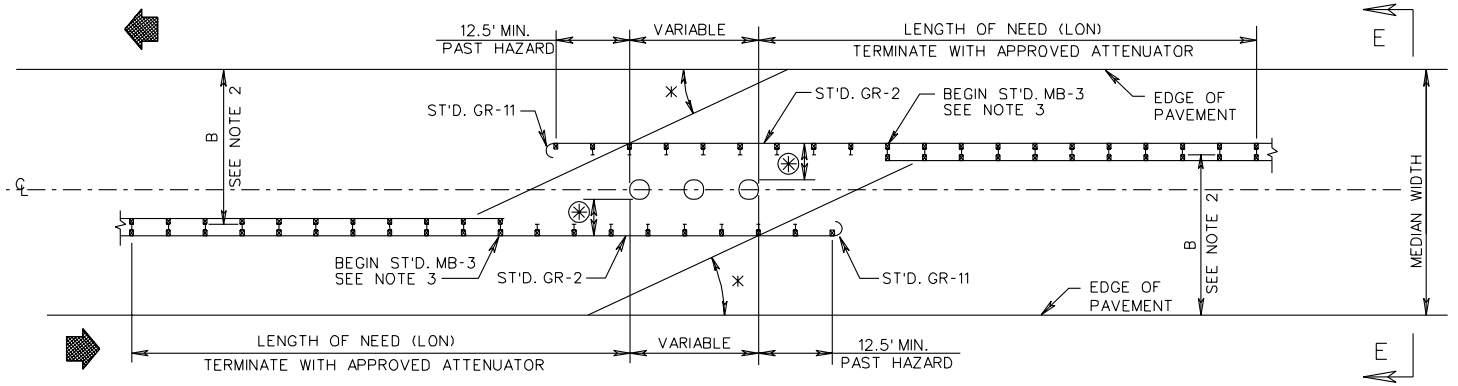
221

INSERTABLE SHEET A146

GR-INS

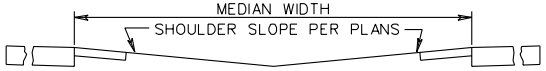


DETAIL OF GUARDRAIL AT BRIDGE PIERS USING STANDARD GR-2



DETAIL OF GUARDRAIL AT BRIDGE PIERS USING STANDARD GR-2 & MB-3
WHEN BACK OF GUARDRAIL IS WITHIN REQUIRED CLEAR ZONE

TYPICAL SECTION



SECTION E-E

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

⁎ 25° ANGLE OF VEHICLE DEPARTURE.

NOTES:

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

SHEET 1 OF 8

SHEET 1 OF 8

W BEAM GUARDRAIL INSTALLATION CRITERIA

VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 3/03

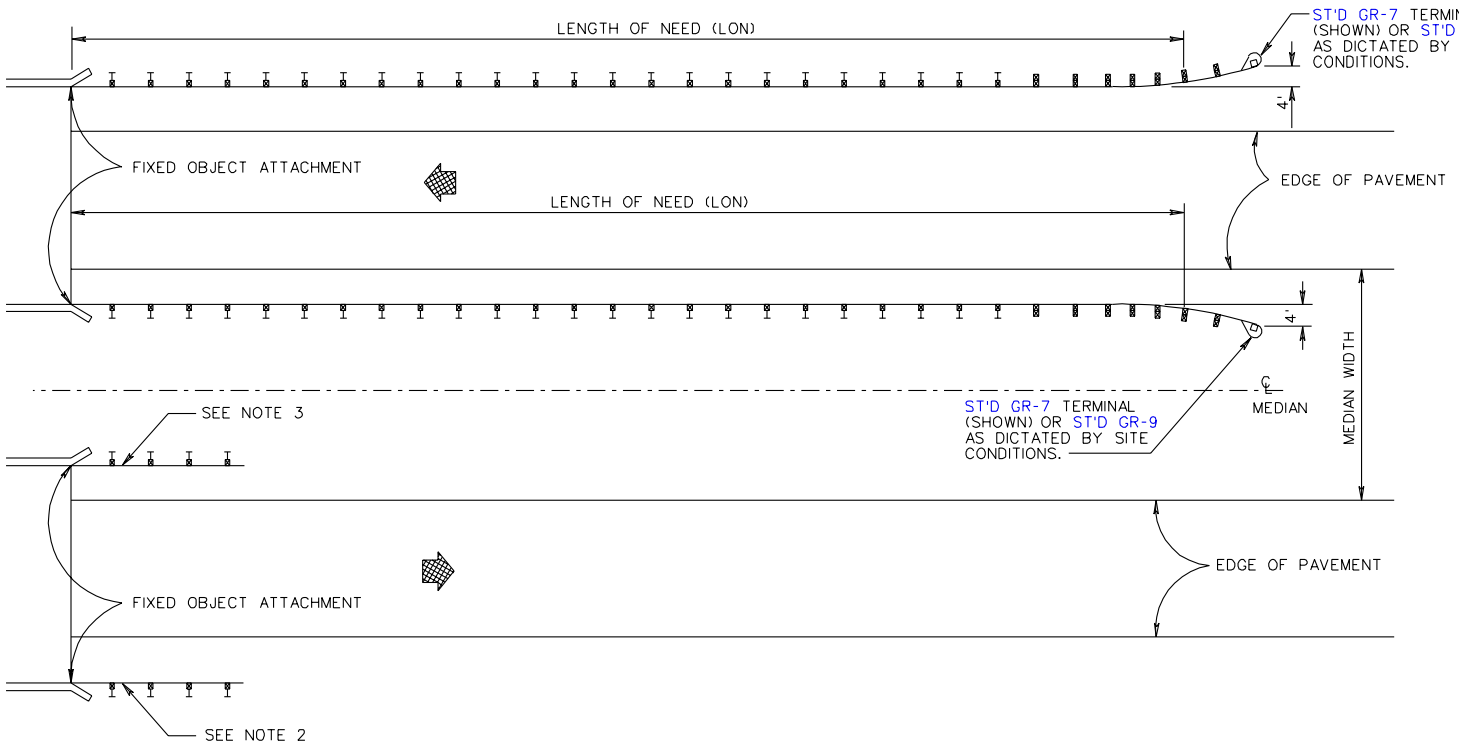
501.33

SPECIFICATION REFERENCE

221
505

INSERTABLE SHEET A146

GR-INS



NOTES:

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

DETAIL OF GUARDRAIL AT DUAL BRIDGES

SPECIFICATION REFERENCE

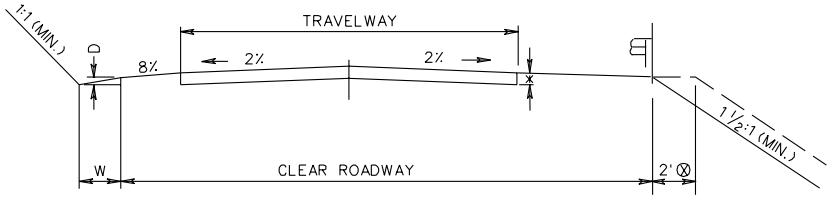
221
505

W BEAM GUARDRAIL INSTALLATION CRITERIA

VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 3/03

501.34



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

TYPICAL SECTION

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

BRIDGE WIDTH = APPROACH ROADWAY WIDTH (CLEAR ROADWAY).

WIDTHS FOR TWO WAY TRAFFIC (LESSER WIDTH MAY BE USED FOR ONE-WAY)

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

✳ CURVES TO BE WIDENED IN ACCORDANCE WITH ST'D. TC-5.01R.

✳✳ PAID FOR BY INDIVIDUAL QUANTITIES.

GEOMETRICS

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

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

SPECIFICATION REFERENCE

510

MINIMUM DESIGN CRITERIA FOR TEMPORARY DETOURS (MAINTENANCE OF TRAFFIC)

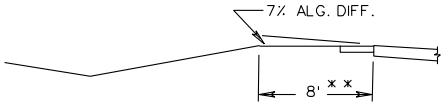
VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 3/03

702.00

GS-11

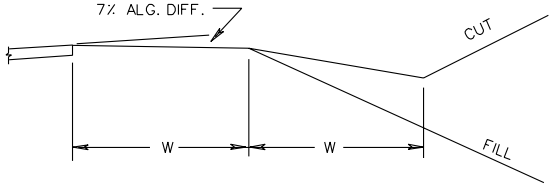
GRADED MEDIAN SHOULDERS



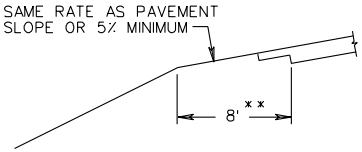
* * WHERE MAINLINE IS 6 OR MORE LANES GRADED SHOULDER WIDTH IS TO BE THE SAME AS THAT SHOWN FOR FILL SHOULDER FOR INDEPENDENT GRADING.

HIGH SIDE - SUPERELEVATED

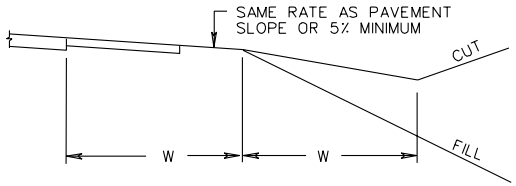
OUTSIDE SHOULDERS



HIGH SIDE - SUPERELEVATED



LOW SIDE - SUPERELEVATED



LOW SIDE - SUPERELEVATED

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

STANDARD SHOULDER DESIGN FOR ALL SYSTEMS EXCEPT LOCAL ROADS AND STREETS

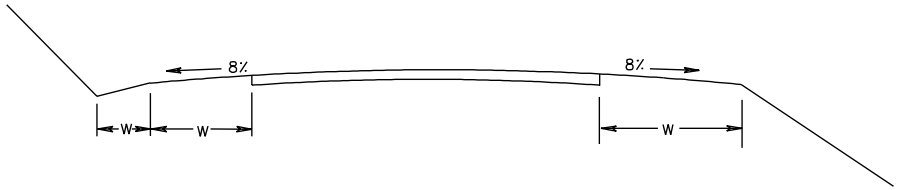
VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 3/03

702.01

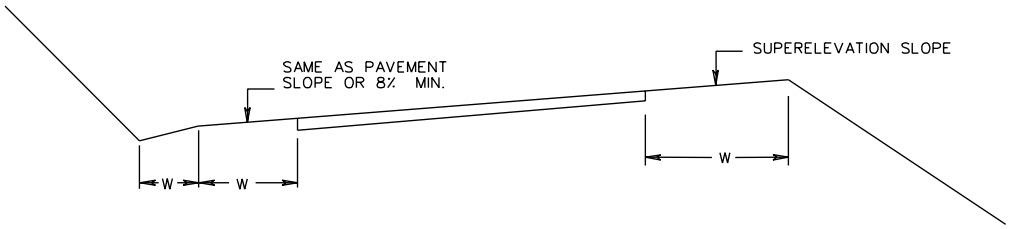
GS-12

TANGENT SECTION



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

SUPERELEVATED SECTION



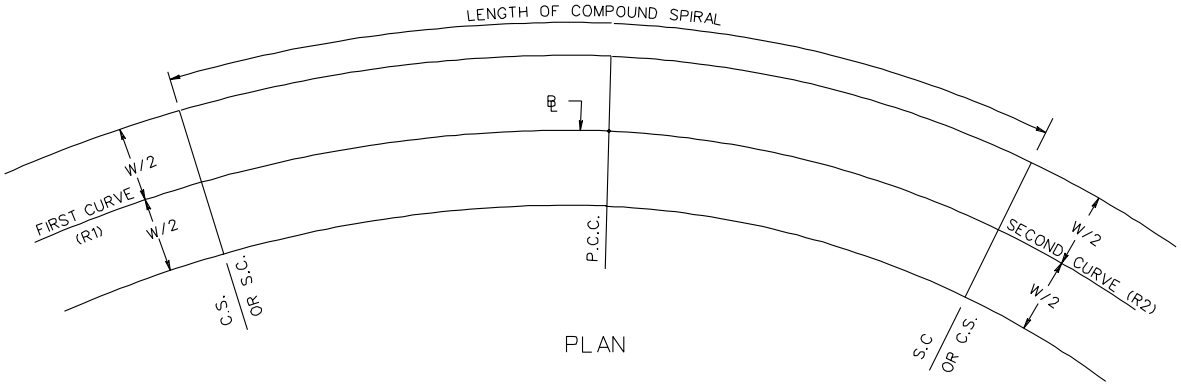
FOR WIDTHS OF SHOULDERS AND DITCHES (W)
SEE STANDARDS.

STANDARD SHOULDER DESIGNS FOR LOCAL ROADS & STREETS

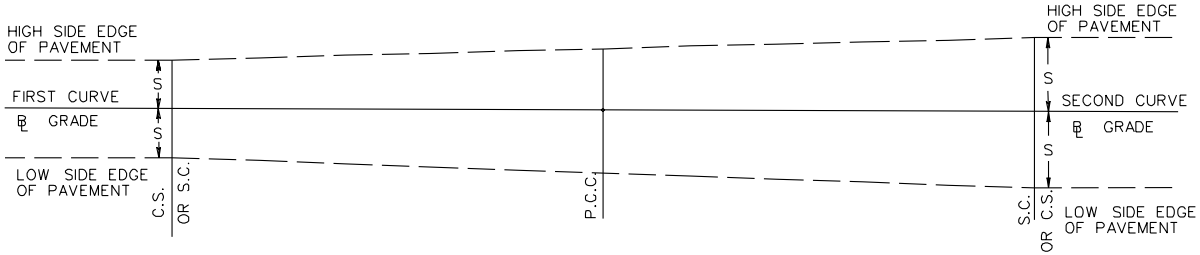
VIRGINIA DEPARTMENT OF TRANSPORTATION

REV 3/03

702.02



PLAN



PROFILE

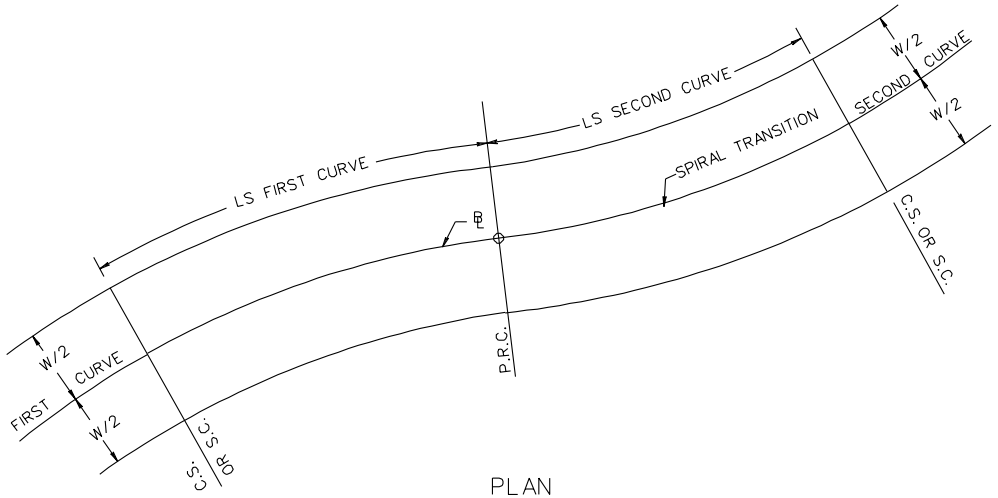
NOTE:

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

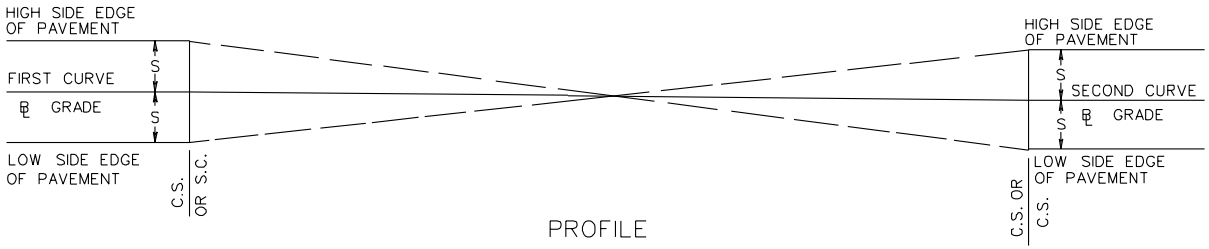
REV. 3/03

SPECIFICATION REFERENCE	METHOD OF APPLYING TC-5.01 ON COMPOUND CURVES URBAN CONDITIONS & RURAL CONDITIONS WITHOUT PAVEMENT WIDENING
	VIRGINIA DEPARTMENT OF TRANSPORTATION

TC-5.01



PLAN



PROFILE

NOTE:

1. COMPUTE SUPERELEVATION TRANSITION FROM MAXIMUM OF FIRST CURVE TO MAXIMUM OF SECOND CURVE. LENGTH OF LS (SPIRAL TRANSITIONS) COMPUTED PER PAGE 802.22.

2. REFER TO OF THE ROAD DESIGN MANUAL FOR ADDITIONAL REVERSE CURVE DESIGN INFORMATION.

REV. 3/03

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

SPECIFICATION REFERENCE

802.14

VIRGINIA DEPARTMENT OF TRANSPORTATION

TC-5.01

CURVE WIDENING TABLES

SU DESIGN VEHICLE

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

LATERAL CLEARANCE

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

ADJUSTMENT FACTORS

NUMBER OF LANES ROTATED n_1	ADJUSTMENT FACTOR (b_w)
1	1.00
1.5	0.8333
2	0.75
2.5	0.70
3	0.6667
3.5	0.6425

RELATIVE GRADIENTS

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

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.

F_A - CALCULATED WIDTH OF OVERHANG FOR DESIGN VEHICLE.

L - WHEELBASE OF DESIGN VEHICLE FROM APPROPRIATE TABLE.

LS - LENGTH OF SPIRAL OR SUPERELEVATION TRANSITION LENGTH.

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.

GENERAL DESIGN CONSIDERATIONS

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

FORMULAS USED TO CALCULATE TRANSITION LENGTH (LS) AND WIDENING (w)

NO WIDENING REQUIRED

$LS = b_w(W_n E/rg)$

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

WIDENING REQUIRED

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

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

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

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

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

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

$w = W_C - 2W_n$

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

METHODOLOGIES FOR CALCULATING TC-5.01 VALUES

REV. 3/03

REV. 3/03

802.34

TC-5.01

TRANSITION CURVES - RURAL

20 MPH DESIGN SPEED

VIRGINIA DEPARTMENT OF TRANSPORTATION

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 WIDTH			
		DESIGN SOFTWARE EQUIVALENTS (NUMBER OF LANES AT LANE WIDTH)															16 FT		18 FT	
		1 @ 9'			1 @ 10'			1 @ 11'			1 @ 12'			2 @ 12'						
RADIUS(FT)	E(%)	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	CR	LS
1800	NC	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0	0
1213	2.0	59	59	2.0	28	28	0.0	30	30	0.0	33	33	0.0	49	49	0.0	39	39	41	41
1148	2.1	57	59	2.1	28	29	0.0	30	32	0.0	33	35	0.0	49	52	0.0	39	40	41	43
1090	2.2	54	59	2.1	28	30	0.0	30	33	0.0	33	36	0.0	49	54	0.0	39	42	41	45
1036	2.3	52	59	2.1	28	32	0.0	30	35	0.0	33	38	0.0	49	56	0.0	39	44	41	47
987	2.4	50	59	2.2	28	33	0.0	30	36	0.0	33	39	0.0	49	59	0.0	39	46	41	49
941	2.5	48	59	2.2	28	34	0.0	30	38	0.0	33	41	0.0	49	61	0.0	39	48	41	51
899	2.6	46	59	2.3	28	36	0.0	30	39	0.0	33	43	0.0	49	64	0.0	39	50	41	53
860	2.7	44	59	2.3	28	37	0.0	30	41	0.0	33	44	0.0	49	66	0.0	39	52	41	55
824	2.8	43	59	2.3	28	38	0.0	30	42	0.0	33	46	0.0	49	69	0.0	39	54	41	57
790	2.9	41	59	2.4	28	40	0.0	30	44	0.0	33	48	0.0	49	71	0.0	39	56	41	59
759	3.0	40	59	2.4	28	41	0.0	30	45	0.0	33	49	0.0	49	73	0.0	39	58	41	61
729	3.1	39	59	2.5	28	42	0.0	30	47	0.0	33	51	0.0	49	76	0.0	39	60	41	63
701	3.2	37	59	2.5	28	44	0.0	30	48	0.0	33	52	0.0	49	78	0.0	39	61	41	65
674	3.3	36	59	2.5	28	45	0.0	30	50	0.0	33	54	0.0	49	81	0.0	39	63	41	67
650	3.4	35	59	2.6	28	46	0.0	30	51	0.0	33	56	0.0	49	83	0.0	39	65	41	69
626	3.5	34	59	2.6	28	48	0.0	30	53	0.0	33	57	0.0	49	86	0.0	39	67	41	71
604	3.6	33	59	2.7	28	49	0.0	30	54	0.0	33	59	0.0	49	88	0.0	39	69	41	73
582	3.7	32	59	2.7	28	50	0.0	30	55	0.0	33	60	0.0	49	90	0.0	39	71	41	75
562	3.8	32	59	2.8	28	52	0.0	30	57	0.0	33	62	0.0	49	93	0.0	39	73	41	77
543	3.9	31	59	2.8	28	53	0.0	30	58	0.0	33	62	0.0	49	95	0.0	39	75	41	79
524	4.0	30	59	2.9	28	55	0.0	30	60	0.0	33	65	0.0	49	98	0.0	39	77	41	81
506	4.1	29	59	2.9	28	56	0.0	30	61	0.0	33	67	0.0	49	100	0.0	39	79	41	83
489	4.2	29	60	3.0	30	63	2.0	30	63	0.0	33	69	0.0	49	103	0.0	39	80	41	85
473	4.3	29	62	3.0	30	64	2.0	30	64	0.0	33	70	0.0	49	105	0.0	39	82	41	87
457	4.4	29	63	3.0	30	66	2.0	30	66	0.0	33	72	0.0	49	108	0.0	39	84	41	89
442	4.5	29	65	3.1	31	68	2.1	30	67	0.0	33	73	0.0	49	110	0.0	39	86	41	92
427	4.6	29	66	3.2	30	69	2.2	30	69	0.0	33	75	0.0	49	112	0.0	39	88	41	94
413	4.7	29	68	3.2	31	71	2.2	30	70	0.0	33	77	0.0	49	115	0.0	39	90	41	96
399	4.8	30	70	3.3	31	73	2.3	30	72	0.0	33	78	0.0	49	117	0.0	39	92	41	98
385	4.9	29	71	3.3	31	74	2.3	30	73	0.0	33	80	0.0	49	120	0.0	39	94	41	100
372	5.0	30	73	3.4	31	76	2.4	30	75	0.0	33	82	0.0	49	122	0.0	39	96	41	102
358	5.1	30	75	3.5	31	78	2.5	30	76	0.0	33	83	0.0	49	125	0.0	39	98	41	104
345	5.2	30	76	3.5	31	80	2.5	30	78	0.0	33	85	0.0	49	127	0.0	39	100	41	106
332	5.3	30	78	3.6	31	81	2.6	30	79	0.0	33	86	0.0	49	129	0.0	39	101	41	108
320	5.4	30	80	3.7	31	83	2.7	30	81	0.0	33	88	0.0	49	132	0.0	39	103	41	110
308	5.5	30	82	3.8	31	85	2.8	30	82	0.0	33	90	0.0	49	134	0.0	39	105	41	112
297	5.6	30	83	3.9	32	87	2.9	30	84	0.0	33	91	0.0	49	137	0.0	39	107	41	114
286	5.7	30	85	3.9	32	89	2.9	30	85	0.0	33	93	0.0	49	139	0.0	39	109	41	116
276	5.8	30	87	4.0	32	91	3.0	33	95	2.0	33	95	0.0	53	153	2.0	39	111	41	118
266	5.9	31	89	4.1	32	93	3.1	33	97	2.1	33	96	0.0	54	157	2.2	39	113	41	120
258	6.0	30	90	4.2	32	95	3.2	33	99	2.2	33	98	0.0	54	161	2.4	39	115	41	122
248	6.1	31	92	4.3	32	97	3.3	34	101	2.3	33	99	0.0	55	165	2.6	39	117	41	124
240	6.2	31	94	4.4	32	99	3.4	34	103	2.4	33	101	0.0	55	169	2.8	39	119	41	126
232	6.3	31	96	4.5	33	101	3.5	34	105	2.5	33	103	0.0	55	173	3.0	39	120	41	128
225	6.4	31	98	4.6	33	103	3.6	34	107	2.6	33	104	0.0	56	177	3.2	39	122	41	130
217	6.5	31	100	4.7	33	105	3.7	34	109	2.7	33	106	0.0	56	181	3.4	39	124	41	132
209	6.6	31	102	4.8	33	107	3.8	34	111	2.8	33	108	0.0	57	185	3.6	39	126	41	134
202	6.7	32	104	4.9	33	109	3.9	34	113	2.9	33	109	0.0	57	189	3.8	39	128	41	136
196	6.8	32	106	5.0	33	111	4.0	34	115	3.0	36	120	2.0	57	193	4.0	39	130	41	138
189	6.9	32	108	5.1	33	113	4.1	35	118	3.1	36	122	2.1	58	198	4.2	39	132	41	140
183	7.0	32	110	5.2	33	115	4.2	35	120	3.2	36	124	2.2	58	202	4.4	39	134	41	142
176	7.1	32	112	5.3	33	117	4.3	35	122	3.3	36	127	2.3	59	206	4.6	39	136	41	144
170	7.2	32	115	5.5	34	120	4.5	35	125	3.5	36	129	2.5	59	212	5.0	39	138	41	146
164	7.3	33	117	5.6	34	122	4.6	35	127	3.6	37	132	2.6	60	217	5.2	39	140	41	148
158	7.4	33	119	5.8	34	124	4.8	35	129	3.8	37	134	2.8	60	222	5.6	39	141	41	150
152	7.5	33	122	5.9	34	127	4.9	36	132	3.9	37	137	2.9	61	227	5.8	39	143	41	152
146	7.6	33	124	6.1	34	129	5.1	36	135	4.1	37	140	3.1	62	233	6.2	39	145	41	154
139	7.7	33	127	6.3	35	132	5.3	36	137	4.3	38	143	3.3	63	239	6.6	39	147	41	156
132	7.8	34	130	6.5	35	135	5.5	36	140	4.5	38	145	3.5	64	246	7.0	39	149	41	158
124	7.9	34	133	6.8	35	138	5.8	37	144	4.8	38	149	3.8	65	254	7.6	39	151	41	160
108	8.0	35	139	7.6	36	144	6.6	38	150	5.6	39	155	4.6	68	270	9.2	39	153	41	162

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

SPECIFICATION REFERENCE

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(%)	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	CR	LS
2500	NC	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0	0
1756	2.0	26	26	0.0	29	29	0.0	32	32	0.0	35	35	0.0	52	52	0.0	40	40	43	43
1664	2.1	71	74	2.0	29	30	0.0	32	33	0.0	35	36	0.0	52	54	0.0	40	42	43	45
1579	2.2	68	74	2.0	29	32	0.0	32	35	0.0	35	38	0.0	52	57	0.0	40	44	43	48
1502	2.3	65	74	2.0	29	33	0.0	33	37	0.0	35	40	0.0	52	60	0.0	40	46	43	50
1431	2.4	62	74	2.1	29	35	0.0	32	38	0.0	35	42	0.0	52	62	0.0	40	48	43	52
1366	2.5	60	74	2.1	29	36	0.0	32	40	0.0	35	43	0.0	52	65	0.0	40	50	43	54
1306	2.6	57	74	2.1	29	38	0.0	32	41	0.0	35	45	0.0	52	67	0.0	40	52	43	56
1250	2.7	55	74	2.1	29	39	0.0	32	43	0.0	35	47	0.0	52	70	0.0	40	54	43	58
1198	2.8	53	74	2.2	29	40	0.0	32	44	0.0	35	48	0.0	52	72	0.0	40	56	43	60
1149	2.9	52	74	2.2	29	42	0.0	32	46	0.0	35	50	0.0	52	75	0.0	40	58	43	63
1104	3.0	50	74	2.2	29	43	0.0	32	48	0.0	35	52	0.0	52	78	0.0	40	60	43	65
1061	3.1	48	74	2.3	29	45	0.0	32	49	0.0	35	54	0.0	52	80	0.0	40	62	43	67
1021	3.2	47	74	2.3	29	46	0.0	32	51	0.0	35	55	0.0	52	83	0.0	40	64	43	69
983	3.3	45	74	2.3	29	48	0.0	32	52	0.0	35	57	0.0	52	85	0.0	40	66	43	71
948	3.4	44	74	2.4	29	49	0.0	32	54	0.0	35	59	0.0	52	88	0.0	40	68	43	73
914	3.5	43	74	2.4	29	50	0.0	32	55	0.0	35	60	0.0	52	90	0.0	40	70	43	75
882	3.6	42	74	2.4	29	52	0.0	32	57	0.0	35	62	0.0	52	93	0.0	40	72	43	78
852	3.7	40	74	2.5	29	53	0.0	32	59	0.0	35	64	0.0	52	96	0.0	40	74	43	80
823	3.8	39	74	2.5	29	55	0.0	32	60	0.0	35	66	0.0	52	98	0.0	40	76	43	82
795	3.9	38	74	2.6	29	56	0.0	32	62	0.0	35	67	0.0	52	101	0.0	40	78	43	84
769	4.0	37	74	2.6	29	58	0.0	32	63	0.0	35	69	0.0	52	103	0.0	40	80	43	86
744	4.1	37	74	2.6	29	59	0.0	32	65	0.0	35	71	0.0	52	106	0.0	40	82	43	88
720	4.2	36	74	2.7	29	60	0.0	32	66	0.0	35	72	0.0	52	108	0.0	40	84	43	90
696	4.3	35	74	2.7	29	62	0.0	32	68	0.0	35	74	0.0	52	111	0.0	40	86	43	93
674	4.4	34	74	2.7	29	63	0.0	32	70	0.0	35	76	0.0	52	114	0.0	40	88	43	95
652	4.5	33	74	2.8	29	65	0.0	32	71	0.0	35	78	0.0	52	116	0.0	40	90	43	97
632	4.6	33	74	2.8	29	66	0.0	32	73	0.0	35	79	0.0	52	119	0.0	40	92	43	99
612	4.7	32	74	2.9	29	68	0.0	32	74	0.0	35	81	0.0	52	121	0.0	40	94	43	101
592	4.8	31	74	2.9	29	69	0.0	32	76	0.0	35	83	0.0	52	124	0.0	40	96	43	103
573	4.9	31	75	2.9	29	70	0.0	32	77	0.0	35	84	0.0	52	126	0.0	40	98	43	105
555	5.0	30	75	3.0	32	79	2.0	32	79	0.0	35	86	0.0	52	129	0.0	40	100	43	108
537	5.1	31	77	3.0	32	81	2.0	32	81	0.0	35	88	0.0	52	132	0.0	40	102	43	110
519	5.2	31	79	3.1	32	83	2.1	32	82	0.0	35	90	0.0	52	134	0.0	40	104	43	112
502	5.3	31	80	3.1	32	84	2.1	32	84	0.0	35	91	0.0	52	137	0.0	40	106	43	114
485	5.4	31	82	3.2	32	86	2.2	32	85	0.0	35	93	0.0	52	139	0.0	40	108	43	116
468	5.5	31	84	3.2	32	88	2.2	32	87	0.0	35	95	0.0	52	142	0.0	40	110	43	118
452	5.6	31	86	3.3	33	90	2.3	32	88	0.0	35	96	0.0	52	144	0.0	40	112	43	120
437	5.7	31	88	3.4	33	92	2.4	32	90	0.0	35	98	0.0	52	147	0.0	40	114	43	123
423	5.8	31	89	3.4	33	93	2.4	32	92	0.0	35	100	0.0	52	150	0.0	40	116	43	125
409	5.9	31	91	3.5	33	95	2.5	32	93	0.0	35	102	0.0	52	152	0.0	40	118	43	127
396	6.0	31	93	3.5	33	97	2.5	32	95	0.0	35	103	0.0	52	155	0.0	40	120	43	129
383	6.1	32	95	3.6	33	99	2.6	32	96	0.0	35	105	0.0	52	157	0.0	40	122	43	131
371	6.2	32	97	3.7	33	101	2.7	32	98	0.0	35	107	0.0	52	160	0.0	40	124	43	133
359	6.3	32	98	3.7	33	103	2.7	32	99	0.0	35	108	0.0	52	162	0.0	40	126	43	135
347	6.4	32	100	3.8	33	105	2.8	32	101	0.0	35	110	0.0	52	165	0.0	40	128	43	138
336	6.5	32	102	3.9	33	103	2.9	32	103	0.0	35	112	0.0	52	168	0.0	40	130	43	140
326	6.6	32	104	3.9	33	108	2.9	32	104	0.0	35	114	0.0	52	170	0.0	40	132	43	142
315	6.7	32	106	4.0	34	111	3.0	35	115	2.0	35	115	0.0	56	187	2.0	40	134	43	144
305	6.8	32	108	4.1	34	113	3.1	35	118	2.1	35	117	0.0	57	191	2.2	40	136	43	146
295	6.9	32	110	4.2	34	115	3.2	35	120	2.2	35	119	0.0	57	196	2.4	40	138	43	148
286	7.0	32	111	4.2	34	116	3.2	35	121	2.2	35	120	0.0	57	198	2.4	40	140	43	150
276	7.1	33	114	4.3	34	119	3.3	35	124	2.3	35	122	0.0	58	203	2.6	40	142	43	153
267	7.2	33	116	4.4	34	121	3.4	35	126	2.4	35	124	0.0	58	207	2.8	40	144	43	155
258	7.3	33	118	4.5	34	123	3.5	36	128	2.5	35	126	0.0	59	212	3.0	40	146	43	157
248	7.4	33	120	4.6	34	125	3.6	36	131	2.6	35	127	0.0	59	216	3.2	40	148	43	159
239	7.5	33	122	4.7	34	127	3.7	36	133	2.7	35	129	0.0	59	221	3.4	40	150	43	161
229	7.6	33	124	4.8	35	130	3.8	36	135	2.8	35	131	0.0	60	225	3.6	40	152	43	163
219	7.7	33	127	5.0	35	132	4.0	36	138	3.0	38	143	2.0	60	231	4.0	40	154	43	165
209	7.8	34	129	5.1	35	135	4.1	36	140	3.1	38	146	2.1	61	236	4.2	40	156	43	168
196	7.9	34	132	5.3	35	138	4.3	37	143	3.3	38	149	2.3	62	243	4.6	40	158	43	170
172	8.0	34	136	5.8	36	142	4.8	37	148	3.8	39	154	2.8	64	254	5.6	40	160	43	172

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

TC-5.01

REV. 3/03

802.35

802.36

REV. 3/03

TRANSITION CURVES - RURAL
30 MPH DESIGN SPEED

VIRGINIA DEPARTMENT OF TRANSPORTATION

TC-5.01

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 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(%)	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	CR	LS
3500	NC	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0	0
2402	2.0	28	28	0.0	31	31	0.0	34	34	0.0	37	37	0.0	55	55	0.0	43	43	45	45
2276	2.1	28	29	0.0	31	32	0.0	34	35	0.0	37	39	0.0	55	58	0.0	43	45	45	48
2161	2.2	28	30	0.0	31	34	0.0	34	37	0.0	37	40	0.0	55	60	0.0	43	47	45	50
2056	2.3	28	32	0.0	31	35	0.0	34	39	0.0	37	42	0.0	55	63	0.0	43	50	45	52
1960	2.4	74	88	2.0	31	37	0.0	34	40	0.0	37	44	0.0	55	66	0.0	43	52	45	54
1871	2.5	71	88	2.0	31	38	0.0	34	42	0.0	37	46	0.0	55	69	0.0	43	54	45	57
1789	2.6	68	88	2.0	31	40	0.0	34	44	0.0	37	48	0.0	55	71	0.0	43	56	45	59
1713	2.7	66	88	2.1	31	41	0.0	34	45	0.0	37	50	0.0	55	74	0.0	43	58	45	61
1643	2.8	63	88	2.1	31	43	0.0	34	47	0.0	37	51	0.0	55	77	0.0	43	60	45	63
1577	2.9	61	88	2.1	31	44	0.0	34	49	0.0	37	53	0.0	55	80	0.0	43	62	45	66
1515	3.0	59	88	2.1	31	46	0.0	34	50	0.0	37	55	0.0	55	82	0.0	43	64	45	68
1457	3.1	57	88	2.2	31	47	0.0	34	52	0.0	37	57	0.0	55	85	0.0	43	67	45	70
1403	3.2	55	88	2.2	31	49	0.0	34	54	0.0	37	59	0.0	55	88	0.0	43	69	45	72
1352	3.3	54	88	2.2	31	50	0.0	34	55	0.0	37	60	0.0	55	90	0.0	43	71	45	75
1303	3.4	52	88	2.3	31	52	0.0	34	57	0.0	37	62	0.0	55	93	0.0	43	73	45	77
1258	3.5	51	88	2.3	31	54	0.0	34	59	0.0	37	64	0.0	55	96	0.0	43	75	45	79
1214	3.6	49	88	2.3	31	55	0.0	34	60	0.0	37	66	0.0	55	99	0.0	43	77	45	81
1173	3.7	48	88	2.3	31	57	0.0	34	62	0.0	37	68	0.0	55	101	0.0	43	79	45	84
1134	3.8	47	88	2.4	31	58	0.0	34	64	0.0	37	70	0.0	55	104	0.0	43	82	45	86
1097	3.9	46	88	2.4	31	60	0.0	34	65	0.0	37	71	0.0	55	107	0.0	43	84	45	88
1061	4.0	44	88	2.4	31	61	0.0	34	67	0.0	37	73	0.0	55	110	0.0	43	86	45	90
1028	4.1	43	88	2.5	31	63	0.0	34	69	0.0	37	75	0.0	55	112	0.0	43	88	45	93
995	4.2	42	88	2.5	31	64	0.0	34	70	0.0	37	77	0.0	55	115	0.0	43	90	45	95
964	4.3	41	88	2.5	31	66	0.0	34	72	0.0	37	79	0.0	55	118	0.0	43	92	45	97
934	4.4	40	88	2.6	31	67	0.0	34	74	0.0	37	80	0.0	55	120	0.0	43	94	45	99
905	4.5	40	88	2.6	31	69	0.0	34	75	0.0	37	82	0.0	55	123	0.0	43	96	45	102
877	4.6	39	88	2.6	31	70	0.0	34	77	0.0	37	84	0.0	55	126	0.0	43	99	45	104
851	4.7	38	88	2.7	31	72	0.0	34	79	0.0	37	86	0.0	55	129	0.0	43	101	45	106
825	4.8	37	88	2.7	31	73	0.0	34	80	0.0	37	88	0.0	55	131	0.0	43	103	45	108
800	4.9	36	88	2.7	31	75	0.0	34	82	0.0	37	90	0.0	55	134	0.0	43	105	45	111
775	5.0	36	88	2.8	31	76	0.0	34	84	0.0	37	91	0.0	55	137	0.0	43	107	45	113
752	5.1	35	88	2.8	31	78	0.0	34	85	0.0	37	93	0.0	55	140	0.0	43	109	45	115
729	5.2	34	88	2.8	31	79	0.0	34	87	0.0	37	95	0.0	55	142	0.0	43	111	45	117
706	5.3	34	88	2.9	31	81	0.0	34	89	0.0	37	97	0.0	55	145	0.0	43	114	45	120
684	5.4	33	88	2.9	31	82	0.0	34	90	0.0	37	99	0.0	55	148	0.0	43	116	45	122
663	5.5	32	88	3.0	34	92	2.0	34	92	0.0	37	100	0.0	55	150	0.0	43	118	45	124
641	5.6	33	90	3.0	34	94	2.0	34	94	0.0	37	102	0.0	55	153	0.0	43	120	45	126
621	5.7	32	91	3.0	34	95	2.0	34	95	0.0	37	104	0.0	55	156	0.0	43	122	45	129
602	5.8	33	93	3.1	34	98	2.1	34	97	0.0	37	106	0.0	55	159	0.0	43	124	45	131
583	5.9	33	95	3.1	34	99	2.1	34	99	0.0	37	108	0.0	55	161	0.0	43	126	45	133
565	6.0	33	97	3.2	34	101	2.2	34	100	0.0	37	110	0.0	55	164	0.0	43	128	45	135
548	6.1	33	98	3.2	34	103	2.2	34	102	0.0	37	111	0.0	55	167	0.0	43	131	45	138
531	6.2	33	101	3.3	34	105	2.3	34	104	0.0	37	113	0.0	55	170	0.0	43	133	45	140
515	6.3	33	102	3.3	34	107	2.3	34	105	0.0	37	115	0.0	55	172	0.0	43	135	45	142
499	6.4	33	104	3.4	35	109	2.4	34	107	0.0	37	117	0.0	55	175	0.0	43	137	45	144
484	6.5	33	106	3.4	35	111	2.4	34	109	0.0	37	119	0.0	55	178	0.0	43	139	45	147
469	6.6	33	108	3.5	35	113	2.5	34	110	0.0	37	120	0.0	55	180	0.0	43	141	45	149
455	6.7	33	110	3.5	35	115	2.5	34	112	0.0	37	122	0.0	55	183	0.0	43	143	45	151
441	6.8	33	112	3.6	35	117	2.6	34	114	0.0	37	124	0.0	55	186	0.0	43	146	45	153
427	6.9	33	113	3.6	35	119	2.6	34	115	0.0	37	126	0.0	55	189	0.0	43	148	45	156
414	7.0	34	116	3.7	35	121	2.7	34	117	0.0	37	128	0.0	55	191	0.0	43	150	45	158
400	7.1	34	118	3.8	35	123	2.8	34	119	0.0	37	130	0.0	55	194	0.0	43	152	45	160
387	7.2	34	119	3.8	35	125	2.8	34	120	0.0	37	131	0.0	55	197	0.0	43	154	45	162
374	7.3	34	122	3.9	35	127	2.9	34	122	0.0	37	133	0.0	55	200	0.0	43	156	45	165
361	7.4	34	124	4.0	35	129	3.0	37	135	2.0	37	135	0.0	60	219	2.0	43	158	45	167
348	7.5	34	126	4.1	36	132	3.1	37	137	2.1	37	137	0.0	60	224	2.2	43	160	45	169
334	7.6	34	128	4.2	36	134	3.2	37	140	2.2	37	139	0.0	60	228	2.4	43	163	45	171
320	7.7	35	131	4.3	36	136	3.3	37	142	2.3	37	140	0.0	61	233	2.6	43	165	45	174
305	7.8	35	133	4.4	36	139	3.4	38	145	2.4	37	142	0.0	62	238	2.8	43	167	45	176
287	7.9	35	135	4.5	36	141	3.5	38	147	2.5	37	144	0.0	62	243	3.0	43	169	45	178
251	8.0	35	139	4.9	37	145	3.9	38	151	2.9	37	146	0.0	64	253	3.8	43	171	45	180

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

SPECIFICATION REFERENCE

SPECIFICATION REFERENCE

TRANSITION CURVES - RURAL
35 MPH DESIGN SPEED

VIRGINIA DEPARTMENT OF TRANSPORTATION

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(%)	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	CR	LS
5000	NC	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0	0
3149	2.0	30	30	0.0	33	33	0.0	36	36	0.0	39	39	0.0	59	59	0.0	78	78	0.0	46	46	48	48
2866	2.1	30	31	0.0	33	34	0.0	36	38	0.0	39	41	0.0	59	61	0.0	78	82	0.0	46	48	48	51
2865	2.2	30	32	0.0	33	36	0.0	36	40	0.0	39	43	0.0	59	64	0.0	78	86	0.0	46	50	48	53
2835	2.2	30	32	0.0	33	36	0.0	36	40	0.0	39	43	0.0	59	64	0.0	78	86	0.0	46	50	48	53
2698	2.3	30	34	0.0	33	38	0.0	36	41	0.0	39	45	0.0	59	67	0.0	78	90	0.0	46	52	48	56
2573	2.4	30	35	0.0	33	39	0.0	36	43	0.0	33	47	0.0	59	70	0.0	78	93	0.0	46	55	48	58
2457	2.5	83	103	2.0	33	41	0.0	36	45	0.0	39	49	0.0	59	73	0.0	78	97	0.0	46	57	48	60
2350	2.6	80	103	2.0	33	42	0.0	36	47	0.0	39	51	0.0	59	76	0.0	78	101	0.0	46	59	48	63
2251	2.7	77	103	2.0	33	44	0.0	36	48	0.0	39	53	0.0	59	79	0.0	78	105	0.0	46	61	48	65
2159	2.8	74	103	2.0	33	46	0.0	36	50	0.0	39	55	0.0	59	82	0.0	78	109	0.0	46	64	48	68
2073	2.9	72	103	2.1	33	47	0.0	36	52	0.0	39	57	0.0	59	85	0.0	78	113	0.0	46	66	48	70
1993	3.0	69	103	2.1	33	49	0.0	36	54	0.0	39	59	0.0	59	88	0.0	78	117	0.0	46	68	48	72
1917	3.1	67	103	2.1	33	50	0.0	36	55	0.0	39	60	0.0	59	90	0.0	78	120	0.0	46	70	48	75
1847	3.2	65	103	2.1	33	52	0.0	36	57	0.0	39	62	0.0	59	93	0.0	78	124	0.0	46	73	48	77
1780	3.3	68	103	2.2	33	54	0.0	36	59	0.0	39	64	0.0	59	96	0.0	78	128	0.0	46	75	48	80
1717	3.4	61	103	2.2	33	55	0.0	36	61	0.0	39	66	0.0	59	99	0.0	78	132	0.0	46	77	48	82
1658	3.5	59	103	2.2	33	57	0.0	36	63	0.0	39	68	0.0	59	102	0.0	78	136	0.0	46	79	48	84
1602	3.6	58	103	2.2	33	59	0.0	36	64	0.0	39	70	0.0	59	105	0.0	78	140	0.0	46	82	48	87
1548	3.7	56	103	2.3	33	60	0.0	36	66	0.0	39	72	0.0	59	108	0.0	78	144	0.0	46	84	48	89
1497	3.8	55	103	2.3	33	62	0.0	36	68	0.0	39	74	0.0	59	111	0.0	78	148	0.0	46	86	48	92
1449	3.9	53	103	2.3	33	63	0.0	36	70	0.0	39	76	0.0	59	114	0.0	78	151	0.0	46	88	48	94
1403	4.0	52	103	2.3	33	65	0.0	36	71	0.0	39	78	0.0	59	117	0.0	78	155	0.0	46	91	48	96
1359	4.1	51	103	2.4	33	67	0.0	36	73	0.0	39	80	0.0	59	120	0.0	78	159	0.0	46	93	48	99
1317	4.2	50	103	2.4	33	68	0.0	36	75	0.0	39	82	0.0	59	122	0.0	78	163	0.0	46	95	48	101
1277	4.3	48	103	2.4	33	70	0.0	36	77	0.0	39	84	0.0	59	125	0.0	78	167	0.0	46	97	48	104
1238	4.4	47	103	2.4	33	71	0.0	36	79	0.0	39	86	0.0	59	128	0.0	78	171	0.0	46	100	48	106
1201	4.5	46	103	2.5	33	73	0.0	36	80	0.0	39	88	0.0	59	131	0.0	78	175	0.0	46	102	48	108
1165	4.6	45	103	2.5	33	75	0.0	36	82	0.0	39	90	0.0	59	134	0.0	78	179	0.0	46	104	48	111
1131	4.7	44	103	2.5	33	76	0.0	36	84	0.0	39	91	0.0	59	137	0.0	78	182	0.0	46	106	48	113
1097	4.8	43	103	2.6	33	78	0.0	36	86	0.0	39	93	0.0	59	140	0.0	78	186	0.0	46	109	48	116
1065	4.9	43	103	2.6	33	80	0.0	36	87	0.0	39	95	0.0	59	143	0.0	78	190	0.0	46	111	48	118
1034	5.0	42	103	2.6	33	81	0.0	36	89	0.0	39	97	0.0	59	146	0.0	78	194	0.0	46	113	48	120
1004	5.1	41	103	2.6	33	83	0.0	36	91	0.0	39	99	0.0	59	149	0.0	78	198	0.0	46	115	48	123
975	5.2	40	103	2.7	33	84	0.0	36	93	0.0	39	101	0.0	59	151	0.0	78	202	0.0	46	118	48	125
946	5.3	39	103	2.7	33	86	0.0	36	95	0.0	39	103	0.0	59	154	0.0	78	206	0.0	46	120	48	128
918	5.4	39	103	2.7	33	88	0.0	36	96	0.0	39	105	0.0	59	157	0.0	78	210	0.0	46	122	48	130
891	5.5	38	103	2.8	33	89	0.0	36	98	0.0	39	107	0.0	59	160	0.0	78	213	0.0	46	124	48	132
864	5.6	37	103	2.8	33	91	0.0	36	100	0.0	39	109	0.0	59	163	0.0	78	217	0.0	46	127	48	135
838	5.7	37	103	2.8	33	92	0.0	36	102	0.0	39	111	0.0	59	166	0.0	78	221	0.0	46	129	48	137
813	5.8	36	103	2.9	33	94	0.0	36	103	0.0	39	113	0.0	59	169	0.0	78	225	0.0	46	131	48	140
789	5.9	35	103	2.9	33	96	0.0	36	105	0.0	39	115	0.0	59	172	0.0	78	229	0.0	46	133	48	142
766	6.0	35	103	3.0	36	107	2.0	36	107	0.0	39	117	0.0	59	175	0.0	78	233	0.0	46	136	48	144
743	6.1	35	104	3.0	36	109	2.0	36	109	0.0	39	119	0.0	59	178	0.0	78	237	0.0	46	138	48	147
722	6.2	34	105	3.0	36	110	2.0	36	110	0.0	39	120	0.0	59	180	0.0	78	240	0.0	46	140	48	149
701	6.3	35	108	3.1	36	113	2.1	36	112	0.0	39	122	0.0	59	183	0.0	78	244	0.0	46	142	48	152
680	6.4	35	109	3.1	36	115	2.1	36	114	0.0	39	124	0.0	59	186	0.0	78	248	0.0	46	145	48	154
660	6.5	35	112	3.2	36	117	2.2	36	116	0.0	39	126	0.0	59	189	0.0	78	252	0.0	46	147	48	156
641	6.6	35	113	3.2	37	119	2.2	36	118	0.0	39	128	0.0	59	192	0.0	78	256	0.0	46	149	48	159
622	6.7	35	115	3.2	36	120	2.2	36	119	0.0	39	130	0.0	59	195	0.0	78	260	0.0	46	151	48	161
603	6.8	35	117	3.3	37	123	2.3	36	121	0.0	39	132	0.0	59	198	0.0	78	264	0.0	46	154	48	164
585	6.9	35	119	3.3	37	125	2.3	36	123	0.0	39	134	0.0	59	201	0.0	78	268	0.0	46	156	48	166
567	7.0	35	121	3.4	37	127	2.4	36	125	0.0	39	136	0.0	59	204	0.0	78	271	0.0	46	158	48	168
550	7.1	35	123	3.4	37	129	2.4	36	126	0.0	39	138	0.0	59	207	0.0	78	275	0.0	46	160	48	171
532	7.2	35	125	3.5	37	131	2.5	36	128	0.0	39	140	0.0	59	210	0.0	78	279	0.0	46	163	48	173
515	7.3	35	127	3.5	37	133	2.5	36	130	0.0	39	142	0.0	59	212	0.0	78	283	0.0	46	165	48	176
497	7.4	35	129	3.6	37	135	2.6	36	132	0.0	39	144	0.0	59	215	0.0	78	287	0.0	46	167	48	178
480	7.5	35	132	3.7	37	138	2.7	36	134	0.0	39	146	0.0	59	218	0.0	83	308	2.1	46	170	48	180
461	7.6	35	133	3.7	37	140	2.7	36	135	0.0	39	148	0.0	59	221	0.0	83	312	2.1	46	172	48	183
442	7.7	36	136	3.8	37	142	2.8	36	137	0.0	39	150	0.0	59	224	0.0	83	318	2.4	46	174	48	185
422	7.8	36	138	3.9	38	145	2.9	36	139	0.0	39	151	0.0	59	227	0.0	84	325	2.7	46	176	48	188
397	7.9	36	141	4.0	38	147	3.0	39	153	2.0	39	153	0.0	64	249	2.0	85	332	3.0	46	179	48	190
350	8.0	36	144	4.3	38	151	3.3	40	157	2.3	39	155	0.0	65	258	2.6	86	344	3.9	46	181	48	192

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

TRANSITION CURVES - RURAL
40 MPH DESIGN SPEED

VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 3/03
802.38

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 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(%)	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	CR	LS
6000	NC	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0	0
4000	2.0	32	32	0.0	35	35	0.0	38	38	0.0	42	42	0.0	63	63	0.0	83	83	0.0	49	49	52	52
3792	2.1	32	33	0.0	35	37	0.0	38	40	0.0	42	44	0.0	63	66	0.0	83	87	0.0	49	51	52	54
3603	2.2	32	35	0.0	35	38	0.0	38	42	0.0	42	46	0.0	63	69	0.0	83	92	0.0	49	54	52	57
3430	2.3	32	36	0.0	35	40	0.0	38	44	0.0	42	48	0.0	63	72	0.0	83	96	0.0	49	56	52	60
3271	2.4	32	38	0.0	35	42	0.0	38	46	0.0	42	50	0.0	63	75	0.0	83	100	0.0	49	59	52	62
3125	2.5	32	39	0.0	35	44	0.0	38	48	0.0	42	52	0.0	63	78	0.0	83	104	0.0	49	61	52	65
2990	2.6	32	41	0.0	35	45	0.0	38	50	0.0	42	54	0.0	63	81	0.0	83	108	0.0	49	64	52	67
2866	2.7	32	42	0.0	35	47	0.0	38	52	0.0	42	56	0.0	63	84	0.0	83	112	0.0	49	66	52	70
2865	2.7	87	117	2.0	35	47	0.0	38	52	0.0	42	56	0.0	63	84	0.0	83	112	0.0	49	66	52	70
2748	2.8	84	117	2.0	35	49	0.0	38	54	0.0	42	58	0.0	63	87	0.0	83	116	0.0	49	68	52	72
2640	2.9	81	117	2.0	35	50	0.0	38	55	0.0	42	60	0.0	63	90	0.0	83	120	0.0	49	71	52	75
2538	3.0	78	117	2.0	35	52	0.0	38	57	0.0	42	63	0.0	63	94	0.0	83	125	0.0	49	73	52	78
2443	3.1	76	117	2.1	35	54	0.0	38	59	0.0	42	65	0.0	63	97	0.0	83	129	0.0	49	76	52	80
2354	3.2	74	117	2.1	35	56	0.0	38	61	0.0	42	67	0.0	63	100	0.0	83	133	0.0	49	78	52	83
2269	3.3	71	117	2.1	35	57	0.0	38	63	0.0	42	69	0.0	63	103	0.0	83	137	0.0	49	80	52	85
2190	3.4	69	117	2.1	35	59	0.0	38	65	0.0	42	71	0.0	63	106	0.0	83	141	0.0	49	83	52	88
2115	3.5	67	117	2.2	35	61	0.0	38	67	0.0	42	73	0.0	63	109	0.0	83	145	0.0	49	85	52	90
2044	3.6	65	117	2.2	35	63	0.0	38	69	0.0	42	75	0.0	63	112	0.0	83	149	0.0	49	88	52	93
1977	3.7	64	117	2.2	35	64	0.0	38	71	0.0	42	77	0.0	63	115	0.0	83	154	0.0	49	90	52	96
1913	3.8	62	117	2.2	35	66	0.0	38	73	0.0	42	79	0.0	63	118	0.0	83	158	0.0	49	93	52	98
1852	3.9	60	117	2.2	35	68	0.0	38	74	0.0	42	81	0.0	63	122	0.0	83	162	0.0	49	95	52	101
1794	4.0	59	117	2.3	35	69	0.0	38	76	0.0	42	83	0.0	63	125	0.0	83	166	0.0	49	97	52	103
1739	4.1	58	117	2.3	35	71	0.0	38	78	0.0	42	85	0.0	63	128	0.0	83	170	0.0	49	100	52	106
1686	4.2	56	117	2.3	35	73	0.0	38	80	0.0	42	87	0.0	63	131	0.0	83	174	0.0	49	102	52	108
1635	4.3	55	117	2.3	35	75	0.0	38	82	0.0	42	89	0.0	63	134	0.0	83	178	0.0	49	105	52	111
1587	4.4	54	117	2.4	35	76	0.0	38	84	0.0	42	92	0.0	63	137	0.0	83	183	0.0	49	107	52	114
1540	4.5	52	117	2.4	35	78	0.0	38	86	0.0	42	94	0.0	63	140	0.0	83	187	0.0	49	110	52	116
1495	4.6	51	117	2.4	35	80	0.0	38	88	0.0	42	96	0.0	63	143	0.0	83	191	0.0	49	112	52	119
1452	4.7	50	117	2.4	35	82	0.0	38	90	0.0	42	98	0.0	63	146	0.0	83	195	0.0	49	114	52	121
1411	4.8	49	117	2.5	35	83	0.0	38	92	0.0	42	100	0.0	63	149	0.0	83	199	0.0	49	117	52	124
1370	4.9	48	117	2.5	35	85	0.0	38	93	0.0	42	102	0.0	63	153	0.0	83	203	0.0	49	119	52	126
1332	5.0	47	117	2.5	35	87	0.0	38	95	0.0	42	104	0.0	63	156	0.0	83	207	0.0	49	122	52	129
1294	5.1	46	117	2.5	35	88	0.0	38	97	0.0	42	106	0.0	63	159	0.0	83	212	0.0	49	124	52	132
1258	5.2	45	117	2.6	35	90	0.0	38	99	0.0	42	108	0.0	63	162	0.0	83	216	0.0	49	127	52	134
1222	5.3	45	117	2.6	35	92	0.0	38	101	0.0	42	110	0.0	63	165	0.0	83	220	0.0	49	129	52	137
1188	5.4	44	117	2.6	35	94	0.0	38	103	0.0	42	112	0.0	63	168	0.0	83	224	0.0	49	131	52	139
1154	5.5	43	117	2.7	35	95	0.0	38	105	0.0	42	114	0.0	63	171	0.0	83	228	0.0	49	134	52	142
1122	5.6	42	117	2.7	35	97	0.0	38	107	0.0	42	116	0.0	63	174	0.0	83	232	0.0	49	136	52	144
1090	5.7	42	117	2.7	35	99	0.0	38	109	0.0	42	118	0.0	63	177	0.0	83	236	0.0	49	139	52	147
1058	5.8	41	117	2.7	35	100	0.0	38	110	0.0	42	120	0.0	63	180	0.0	83	240	0.0	49	141	52	150
1028	5.9	40	117	2.8	35	102	0.0	38	112	0.0	42	123	0.0	63	184	0.0	83	245	0.0	49	144	52	152
999	6.0	39	117	2.8	35	104	0.0	38	114	0.0	42	125	0.0	63	187	0.0	83	249	0.0	49	146	52	155
971	6.1	39	117	2.8	35	106	0.0	38	116	0.0	42	127	0.0	63	190	0.0	83	253	0.0	49	148	52	157
944	6.2	38	117	2.9	35	107	0.0	38	118	0.0	42	129	0.0	63	193	0.0	83	257	0.0	49	151	52	160
917	6.3	38	117	2.9	35	109	0.0	38	120	0.0	42	131	0.0	63	196	0.0	83	261	0.0	49	153	52	162
891	6.4	37	117	2.9	35	111	0.0	38	122	0.0	42	133	0.0	63	199	0.0	83	265	0.0	49	156	52	165
866	6.5	37	118	3.0	39	124	2.0	38	124	0.0	42	135	0.0	63	202	0.0	83	269	0.0	49	158	52	168
842	6.6	37	120	3.0	39	126	2.0	38	126	0.0	42	137	0.0	63	205	0.0	83	274	0.0	49	160	52	170
818	6.7	37	122	3.0	39	128	2.0	38	128	0.0	42	139	0.0	63	208	0.0	83	278	0.0	49	163	52	173
794	6.8	37	124	3.1	39	130	2.1	38	129	0.0	42	141	0.0	63	212	0.0	83	282	0.0	49	165	52	175
771	6.9	37	126	3.1	39	132	2.1	38	131	0.0	42	143	0.0	63	215	0.0	83	286	0.0	49	168	52	178
748	7.0	37	128	3.2	39	134	2.2	38	133	0.0	42	145	0.0	63	218	0.0	83	290	0.0	49	170	52	180
726	7.1	37	130	3.2	39	136	2.2	38	135	0.0	42	147	0.0	63	221	0.0	83	294	0.0	49	173	52	183
703	7.2	37	133	3.3	39	139	2.3	38	137	0.0	42	149	0.0	63	224	0.0	83	298	0.0	49	175	52	186
681	7.3	37	135	3.3	39	141	2.3	38	139	0.0	42	152	0.0	63	227	0.0	83	303	0.0	49	177	52	188
658	7.4	38	137	3.4	39	143	2.4	38	141	0.0	42	154	0.0	63	230	0.0	83	307	0.0	49	180	52	191
635	7.5	38	139	3.4	39	145	2.4	38	143	0.0	42	156	0.0	63	233	0.0	83	311	0.0	49	182	52	193
612	7.6	38	141	3.5	39	148	2.5	38	145	0.0	42	158	0.0	63	236	0.0	83	315	0.0	49	185	52	196
587	7.7	38	143	3.5	39	150	2.5	38	147	0.0	42	160	0.0	63	239	0.0	83	319	0.0	49	187	52	198
560	7.8	38	146	3.6	39	152	2.6	38	148	0.0	42	162	0.0	63	243	0.0	83	323	0.0	49	190	52	201
529	7.9	38	148	3.7	40	155	2.7	38	150	0.0	42	164	0.0	63	246	0.0	88	346	2.1	49	192	52	204
465	8.0	38	152	4.0	40	159	3.0	42	166	2.0	42	166	0.0	63	269	0.0	90	359	3.0	49	194	52	206

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

SPECIFICATION REFERENCE

SPECIFICATION REFERENCE

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

DESIGN VELOCITY =45		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(%)	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	CR	LS
8000	NC	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0	0
4957	2.0	34	34	0.0	38	38	0.0	41	41	0.0	45	45	0.0	67	67	0.0	89	89	0.0	53	53	56	56
4702	2.1	34	35	0.0	38	39	0.0	41	43	0.0	45	47	0.0	67	70	0.0	89	94	0.0	53	56	56	59
4467	2.2	34	37	0.0	38	41	0.0	41	45	0.0	45	49	0.0	67	74	0.0	89	98	0.0	53	58	56	61
4254	2.3	34	39	0.0	38	43	0.0	41	47	0.0	45	52	0.0	67	77	0.0	89	103	0.0	53	61	56	64
4057	2.4	34	40	0.0	38	45	0.0	41	49	0.0	45	54	0.0	67	80	0.0	89	107	0.0	53	63	56	67
3876	2.5	34	42	0.0	38	47	0.0	41	51	0.0	45	56	0.0	67	84	0.0	89	112	0.0	53	66	56	70
3710	2.6	34	44	0.0	38	49	0.0	41	53	0.0	45	58	0.0	67	87	0.0	89	116	0.0	53	69	56	72
3554	2.7	34	45	0.0	38	50	0.0	41	55	0.0	45	60	0.0	67	90	0.0	89	120	0.0	53	71	56	75
3412	2.8	34	47	0.0	38	52	0.0	41	58	0.0	45	63	0.0	67	94	0.0	89	125	0.0	53	74	56	78
3278	2.9	34	49	0.0	38	54	0.0	41	60	0.0	45	65	0.0	67	97	0.0	89	129	0.0	53	77	56	81
3152	3.0	34	50	0.0	38	56	0.0	41	62	0.0	45	67	0.0	67	100	0.0	89	134	0.0	53	79	56	84
3035	3.1	34	52	0.0	38	58	0.0	41	64	0.0	45	69	0.0	67	104	0.0	89	138	0.0	53	82	56	86
2925	3.2	34	54	0.0	38	60	0.0	41	66	0.0	45	72	0.0	67	107	0.0	89	143	0.0	53	84	56	89
2866	3.3	34	55	0.0	38	62	0.0	41	68	0.0	45	74	0.0	67	110	0.0	89	147	0.0	53	87	56	92
2865	3.3	80	132	2.1	38	62	0.0	41	68	0.0	45	74	0.0	67	110	0.0	89	147	0.0	53	87	56	92
2822	3.3	80	132	2.1	38	62	0.0	41	68	0.0	45	74	0.0	67	110	0.0	89	147	0.0	53	87	56	92
2724	3.4	78	132	2.1	38	63	0.0	41	70	0.0	45	76	0.0	67	114	0.0	89	152	0.0	53	90	56	95
2631	3.5	76	132	2.1	38	65	0.0	41	72	0.0	45	78	0.0	67	117	0.0	89	156	0.0	53	92	56	97
2544	3.6	74	132	2.1	38	67	0.0	41	74	0.0	45	80	0.0	67	120	0.0	89	160	0.0	53	95	56	100
2461	3.7	72	132	2.2	38	69	0.0	41	76	0.0	45	83	0.0	67	124	0.0	89	165	0.0	53	98	56	103
2383	3.8	70	132	2.2	38	71	0.0	41	78	0.0	45	85	0.0	67	127	0.0	89	169	0.0	53	100	56	106
2308	3.9	68	132	2.2	38	73	0.0	41	80	0.0	45	87	0.0	67	130	0.0	89	174	0.0	53	103	56	108
2237	4.0	66	132	2.2	38	75	0.0	41	82	0.0	45	89	0.0	67	134	0.0	89	178	0.0	53	105	56	111
2169	4.1	65	132	2.2	38	76	0.0	41	84	0.0	45	92	0.0	67	137	0.0	89	183	0.0	53	108	56	114
2104	4.2	63	132	2.3	38	78	0.0	41	86	0.0	45	94	0.0	67	140	0.0	89	187	0.0	53	111	56	117
2041	4.3	62	132	2.3	38	80	0.0	41	88	0.0	45	96	0.0	67	144	0.0	89	192	0.0	53	113	56	120
1982	4.4	60	132	2.3	38	82	0.0	41	90	0.0	45	98	0.0	67	147	0.0	89	196	0.0	53	116	56	122
1924	4.5	59	132	2.3	38	84	0.0	41	92	0.0	45	100	0.0	67	150	0.0	89	200	0.0	53	119	56	125
1870	4.6	58	132	2.4	38	86	0.0	41	94	0.0	45	103	0.0	67	154	0.0	89	205	0.0	53	121	56	128
1817	4.7	57	132	2.4	38	88	0.0	41	96	0.0	45	105	0.0	67	157	0.0	89	209	0.0	53	124	56	131
1766	4.8	55	132	2.4	38	89	0.0	41	98	0.0	45	107	0.0	67	160	0.0	89	214	0.0	53	126	56	133
1717	4.9	54	132	2.4	38	91	0.0	41	100	0.0	45	109	0.0	67	164	0.0	89	218	0.0	53	129	56	136
1669	5.0	53	132	2.4	38	93	0.0	41	102	0.0	45	112	0.0	67	167	0.0	89	223	0.0	53	132	56	139
1624	5.1	52	132	2.5	38	95	0.0	41	104	0.0	45	114	0.0	67	170	0.0	89	227	0.0	53	134	56	142
1579	5.2	51	132	2.5	38	97	0.0	41	106	0.0	45	116	0.0	67	174	0.0	89	232	0.0	53	137	56	144
1536	5.3	50	132	2.5	38	99	0.0	41	108	0.0	45	118	0.0	67	177	0.0	89	236	0.0	53	140	56	147
1495	5.4	49	132	2.5	38	100	0.0	41	110	0.0	45	120	0.0	67	180	0.0	89	240	0.0	53	142	56	150
1454	5.5	48	132	2.6	38	102	0.0	41	113	0.0	45	123	0.0	67	184	0.0	89	245	0.0	53	145	56	153
1415	5.6	48	132	2.6	38	104	0.0	41	115	0.0	45	125	0.0	67	187	0.0	89	249	0.0	53	147	56	156
1376	5.7	47	132	2.6	38	106	0.0	41	117	0.0	45	127	0.0	67	190	0.0	89	254	0.0	53	150	56	158
1339	5.8	46	132	2.6	38	108	0.0	41	119	0.0	45	129	0.0	67	194	0.0	89	258	0.0	53	153	56	161
1302	5.9	45	132	2.7	38	110	0.0	41	121	0.0	45	132	0.0	67	197	0.0	89	263	0.0	53	155	56	164
1266	6.0	44	132	2.7	38	112	0.0	41	123	0.0	45	134	0.0	67	200	0.0	89	267	0.0	53	158	56	167
1232	6.1	44	132	2.7	38	113	0.0	41	125	0.0	45	136	0.0	67	204	0.0	89	272	0.0	53	160	56	169
1199	6.2	43	132	2.8	38	115	0.0	41	127	0.0	45	138	0.0	67	207	0.0	89	276	0.0	53	163	56	172
1166	6.3	42	132	2.8	38	117	0.0	41	129	0.0	45	140	0.0	67	210	0.0	89	280	0.0	53	166	56	175
1135	6.4	42	132	2.8	38	119	0.0	41	131	0.0	45	143	0.0	67	214	0.0	89	285	0.0	53	168	56	178
1104	6.5	41	132	2.8	38	121	0.0	41	133	0.0	45	145	0.0	67	217	0.0	89	289	0.0	53	171	56	180
1073	6.6	40	132	2.9	38	123	0.0	41	135	0.0	45	147	0.0	67	220	0.0	89	294	0.0	53	174	56	183
1044	6.7	40	132	2.9	38	125	0.0	41	137	0.0	45	149	0.0	67	224	0.0	89	298	0.0	53	176	56	186
1015	6.8	39	132	2.9	38	126	0.0	41	139	0.0	45	152	0.0	67	227	0.0	89	303	0.0	53	179	56	189
986	6.9	40	135	3.0	41	141	2.0	41	141	0.0	45	154	0.0	67	230	0.0	89	307	0.0	53	181	56	192
957	7.0	40	137	3.0	41	143	2.0	41	143	0.0	45	156	0.0	67	234	0.0	89	312	0.0	53	184	56	194
929	7.1	40	139	3.1	42	146	2.1	41	145	0.0	45	158	0.0	67	237	0.0	89	316	0.0	53	187	56	197
902	7.2	40	141	3.1	42	148	2.1	41	147	0.0	45	160	0.0	67	240	0.0	89	320	0.0	53	189	56	200
874	7.3	40	143	3.1	42	150	2.1	41	149	0.0	45	163	0.0	67	244	0.0	89	325	0.0	53	192	56	203
845	7.4	40	146	3.2	42	153	2.2	41	151	0.0	45	165	0.0	67	247	0.0	89	329	0.0	53	195	56	205
817	7.5	40	148	3.2	42	155	2.2	41	153	0.0	45	167	0.0	67	250	0.0	89	334	0.0	53	197	56	208
787	7.6	40	150	3.3	42	157	2.3	41	155	0.0	45	169	0.0	67	254	0.0	89	338	0.0	53	200	56	211
756	7.7	40	152	3.3	42	159	2.3	41	157	0.0	45	172	0.0	67	257	0.0	89	343	0.0	53	202	56	214
723	7.8	40	155	3.4	42	162	2.4	41	159	0.0	45	174	0.0	67	260	0.0	89	347	0.0	53	205	56	216
683	7.9	40	158	3.5	42	165	2.5	41	161	0.0	45	176	0.0	67	264	0.0	89	352	0.0	53	208	56	219
602	8.0	41	161	3.7	43	169	2.7	41	163	0.0	45	178	0.0	67	267	0.0	95	377	2.1	53	210	56	222

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

TC-5.01

TRANSITION CURVES - RURAL
45 MPH DESIGN SPEED

VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 3/03

802.39

TRANSITION CURVES - RURAL
50 MPH DESIGN SPEED

VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 3/03
802.40

SPECIFICATION REFERENCE

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

DESIGN VELOCITY -50		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(%)	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	CR	LS
8000	NC	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0	0
6013	2.0	36	36	0.0	40	40	0.0	44	44	0.0	48	48	0.0	72	72	0.0	96	96	0.0	57	57	60	60
5703	2.1	36	38	0.0	40	42	0.0	44	47	0.0	48	51	0.0	72	76	0.0	96	101	0.0	57	59	60	63
5420	2.2	36	40	0.0	40	44	0.0	44	49	0.0	48	53	0.0	72	80	0.0	96	106	0.0	57	62	60	66
5162	2.3	36	42	0.0	40	46	0.0	44	51	0.0	48	56	0.0	72	83	0.0	96	111	0.0	57	65	60	69
4926	2.4	36	44	0.0	40	48	0.0	44	53	0.0	48	58	0.0	72	87	0.0	96	116	0.0	57	68	60	72
4708	2.5	36	45	0.0	40	50	0.0	44	55	0.0	48	60	0.0	72	90	0.0	96	120	0.0	57	71	60	75
4507	2.6	36	47	0.0	40	52	0.0	44	58	0.0	48	63	0.0	72	94	0.0	96	125	0.0	57	73	60	78
4320	2.7	36	49	0.0	40	54	0.0	44	60	0.0	48	65	0.0	72	98	0.0	96	130	0.0	57	76	60	81
4146	2.8	36	51	0.0	40	56	0.0	44	62	0.0	48	68	0.0	72	101	0.0	96	135	0.0	57	79	60	84
3985	2.9	36	53	0.0	40	58	0.0	44	64	0.0	48	70	0.0	72	105	0.0	96	140	0.0	57	82	60	87
3834	3.0	36	54	0.0	40	60	0.0	44	66	0.0	48	72	0.0	72	108	0.0	96	144	0.0	57	85	60	90
3692	3.1	36	56	0.0	40	62	0.0	44	69	0.0	48	75	0.0	72	112	0.0	96	149	0.0	57	88	60	93
3560	3.2	36	58	0.0	40	64	0.0	44	71	0.0	48	77	0.0	72	116	0.0	96	154	0.0	57	90	60	96
3434	3.3	36	60	0.0	40	66	0.0	44	73	0.0	48	80	0.0	72	119	0.0	96	159	0.0	57	93	60	99
3316	3.4	36	62	0.0	40	68	0.0	44	75	0.0	48	82	0.0	72	123	0.0	96	164	0.0	57	96	60	102
3205	3.5	36	63	0.0	40	70	0.0	44	77	0.0	48	84	0.0	72	126	0.0	96	168	0.0	57	99	60	105
3099	3.6	36	65	0.0	40	72	0.0	44	80	0.0	48	87	0.0	72	130	0.0	96	173	0.0	57	102	60	108
2999	3.7	36	67	0.0	40	74	0.0	44	82	0.0	48	89	0.0	72	134	0.0	96	178	0.0	57	104	60	111
2904	3.8	36	69	0.0	40	76	0.0	44	84	0.0	48	92	0.0	72	137	0.0	96	183	0.0	57	107	60	114
2866	3.9	36	71	0.0	40	78	0.0	44	86	0.0	48	94	0.0	72	141	0.0	96	188	0.0	57	110	60	117
2865	3.9	76	147	2.2	40	78	0.0	44	86	0.0	48	94	0.0	72	141	0.0	96	188	0.0	57	110	60	117
2814	3.9	76	147	2.2	40	78	0.0	44	86	0.0	48	94	0.0	72	141	0.0	96	188	0.0	57	110	60	117
2728	4.0	74	147	2.2	40	80	0.0	44	88	0.0	48	96	0.0	72	144	0.0	96	192	0.0	57	113	60	120
2646	4.1	72	147	2.2	40	82	0.0	44	91	0.0	48	99	0.0	72	148	0.0	96	197	0.0	57	116	60	123
2568	4.2	70	147	2.2	40	84	0.0	44	93	0.0	48	101	0.0	72	152	0.0	96	202	0.0	57	118	60	126
2493	4.3	69	147	2.2	40	86	0.0	44	95	0.0	48	104	0.0	72	155	0.0	96	207	0.0	57	121	60	129
2422	4.4	67	147	2.3	40	88	0.0	44	97	0.0	48	106	0.0	72	159	0.0	96	212	0.0	57	124	60	132
2353	4.5	66	147	2.3	40	90	0.0	44	99	0.0	48	108	0.0	72	162	0.0	96	216	0.0	57	127	60	135
2287	4.6	64	147	2.3	40	92	0.0	44	102	0.0	48	111	0.0	72	166	0.0	96	221	0.0	57	130	60	138
2224	4.7	63	147	2.3	40	94	0.0	44	104	0.0	48	113	0.0	72	170	0.0	96	226	0.0	57	132	60	141
2163	4.8	62	147	2.4	40	96	0.0	44	106	0.0	48	116	0.0	72	173	0.0	96	231	0.0	57	135	60	144
2104	4.9	60	147	2.4	40	98	0.0	44	108	0.0	48	118	0.0	72	177	0.0	96	236	0.0	57	138	60	147
2047	5.0	59	147	2.4	40	100	0.0	44	110	0.0	48	120	0.0	72	180	0.0	96	240	0.0	57	141	60	150
1992	5.1	58	147	2.4	40	102	0.0	44	113	0.0	48	123	0.0	72	184	0.0	96	245	0.0	57	144	60	153
1939	5.2	57	147	2.4	40	104	0.0	44	115	0.0	48	125	0.0	72	188	0.0	96	250	0.0	57	146	60	156
1888	5.3	56	147	2.5	40	106	0.0	44	117	0.0	48	128	0.0	72	191	0.0	96	255	0.0	57	149	60	159
1838	5.4	55	147	2.5	40	108	0.0	44	119	0.0	48	130	0.0	72	195	0.0	96	260	0.0	57	152	60	162
1790	5.5	54	147	2.5	40	110	0.0	44	121	0.0	48	132	0.0	72	198	0.0	96	264	0.0	57	155	60	165
1743	5.6	53	147	2.5	40	112	0.0	44	124	0.0	48	135	0.0	72	202	0.0	96	269	0.0	57	158	60	168
1698	5.7	52	147	2.6	40	114	0.0	44	126	0.0	48	137	0.0	72	206	0.0	96	274	0.0	57	160	60	171
1653	5.8	51	147	2.6	40	116	0.0	44	128	0.0	48	140	0.0	72	209	0.0	96	279	0.0	57	163	60	174
1610	5.9	50	147	2.6	40	118	0.0	44	130	0.0	48	142	0.0	72	213	0.0	96	284	0.0	57	166	60	177
1568	6.0	49	147	2.6	40	120	0.0	44	132	0.0	48	144	0.0	72	216	0.0	96	288	0.0	57	169	60	180
1527	6.1	49	147	2.6	40	122	0.0	44	135	0.0	48	147	0.0	72	220	0.0	96	293	0.0	57	172	60	183
1487	6.2	48	147	2.7	40	124	0.0	44	137	0.0	48	149	0.0	72	224	0.0	96	298	0.0	57	175	60	186
1448	6.3	47	147	2.7	40	126	0.0	44	139	0.0	48	152	0.0	72	227	0.0	96	303	0.0	57	177	60	189
1410	6.4	46	147	2.7	40	128	0.0	44	141	0.0	48	154	0.0	72	231	0.0	96	308	0.0	57	180	60	192
1372	6.5	46	147	2.8	40	130	0.0	44	143	0.0	48	156	0.0	72	234	0.0	96	312	0.0	57	183	60	195
1336	6.6	45	147	2.8	40	132	0.0	44	146	0.0	48	159	0.0	72	238	0.0	96	317	0.0	57	186	60	198
1300	6.7	44	147	2.8	40	134	0.0	44	148	0.0	48	161	0.0	72	242	0.0	96	322	0.0	57	189	60	201
1265	6.8	44	147	2.8	40	136	0.0	44	150	0.0	48	164	0.0	72	245	0.0	96	327	0.0	57	191	60	204
1230	6.9	43	147	2.9	40	138	0.0	44	152	0.0	48	166	0.0	72	249	0.0	96	332	0.0	57	194	60	207
1196	7.0	42	147	2.9	40	140	0.0	44	154	0.0	48	168	0.0	72	252	0.0	96	336	0.0	57	197	60	210
1162	7.1	42	149	2.9	40	142	0.0	44	157	0.0	48	171	0.0	72	256	0.0	96	341	0.0	57	200	60	213
1128	7.2	43	152	3.0	45	159	2.0	44	159	0.0	48	173	0.0	72	260	0.0	96	346	0.0	57	203	60	216
1094	7.3	43	154	3.0	45	161	2.0	44	161	0.0	48	176	0.0	72	263	0.0	96	351	0.0	57	205	60	219
1059	7.4	43	156	3.0	45	163	2.0	44	163	0.0	48	178	0.0	72	267	0.0	96	356	0.0	57	208	60	222
1024	7.5	43	159	3.1	45	166	2.1	44	165	0.0	48	180	0.0	72	270	0.0	96	360	0.0	57	211	60	225
988	7.6	43	161	3.1	45	168	2.1	44	168	0.0	48	183	0.0	72	274	0.0	96	365	0.0	57	214	60	228
950	7.7	43	164	3.2	45	171	2.2	44	170	0.0	48	185	0.0	72	278	0.0	96	370	0.0	57	217	60	231
908	7.8	43	166	3.2	45	174	2.2	44	172	0.0	48	188	0.0	72	281	0.0	96	375	0.0	57	219	60	234
860	7.9	43	169	3.3	45	177	2.3	44	174	0.0	48	190	0.0	72	285	0.0	96	380	0.0	57	222	60	237
760	8.0	43	172	3.5	45	180	2.5	44	176	0.0	48	192	0.0	72	288	0.0	96	384	0.0	57	225	60	240

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

SPECIFICATION REFERENCE

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

DESIGN VELOCITY =55		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(%)	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	CR	LS
10000	NC	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0	0
7190	2.0	39	39	0.0	43	43	0.0	47	47	0.0	52	52	0.0	77	77	0.0	103	103	0.0	60	60	64	64
6821	2.1	39	41	0.0	43	45	0.0	47	50	0.0	52	54	0.0	77	81	0.0	103	108	0.0	60	63	64	67
6485	2.2	39	43	0.0	43	47	0.0	47	52	0.0	52	57	0.0	77	85	0.0	103	113	0.0	60	66	64	70
6179	2.3	39	45	0.0	43	49	0.0	47	54	0.0	52	59	0.0	77	89	0.0	103	118	0.0	60	69	64	73
5897	2.4	39	46	0.0	43	52	0.0	47	57	0.0	52	62	0.0	77	92	0.0	103	123	0.0	60	72	64	76
5638	2.5	39	48	0.0	43	54	0.0	47	59	0.0	52	64	0.0	77	96	0.0	103	128	0.0	60	75	64	79
5399	2.6	39	50	0.0	43	56	0.0	47	61	0.0	52	67	0.0	77	100	0.0	103	133	0.0	60	78	64	83
5177	2.7	39	52	0.0	43	58	0.0	47	64	0.0	52	69	0.0	77	104	0.0	103	138	0.0	60	80	64	86
4972	2.8	39	54	0.0	43	60	0.0	47	66	0.0	52	72	0.0	77	108	0.0	103	143	0.0	60	83	64	89
4779	2.9	39	56	0.0	43	62	0.0	47	68	0.0	52	75	0.0	77	112	0.0	103	149	0.0	60	86	64	92
4600	3.0	39	58	0.0	43	64	0.0	47	71	0.0	52	77	0.0	77	115	0.0	103	154	0.0	60	89	64	95
4432	3.1	39	60	0.0	43	66	0.0	47	73	0.0	52	80	0.0	77	119	0.0	103	159	0.0	60	92	64	98
4274	3.2	39	62	0.0	43	69	0.0	47	75	0.0	52	82	0.0	77	123	0.0	103	164	0.0	60	95	64	102
4125	3.3	39	64	0.0	43	71	0.0	47	78	0.0	52	85	0.0	77	127	0.0	103	169	0.0	60	98	64	105
3986	3.4	39	66	0.0	43	73	0.0	47	80	0.0	52	87	0.0	77	131	0.0	103	174	0.0	60	101	64	108
3853	3.5	39	68	0.0	43	75	0.0	47	82	0.0	52	90	0.0	77	135	0.0	103	179	0.0	60	104	64	111
3728	3.6	39	69	0.0	43	77	0.0	47	85	0.0	52	92	0.0	77	138	0.0	103	184	0.0	60	107	64	114
3610	3.7	39	71	0.0	43	79	0.0	47	87	0.0	52	95	0.0	77	142	0.0	103	189	0.0	60	110	64	117
3498	3.8	39	73	0.0	43	81	0.0	47	89	0.0	52	98	0.0	77	146	0.0	103	195	0.0	60	113	64	120
3391	3.9	39	75	0.0	43	83	0.0	47	92	0.0	52	100	0.0	77	150	0.0	103	200	0.0	60	116	64	124
3289	4.0	39	77	0.0	43	86	0.0	47	94	0.0	52	103	0.0	77	154	0.0	103	205	0.0	60	119	64	127
3192	4.1	39	79	0.0	43	88	0.0	47	96	0.0	52	105	0.0	77	158	0.0	103	210	0.0	60	122	64	130
3100	4.2	39	81	0.0	43	90	0.0	47	99	0.0	52	108	0.0	77	161	0.0	103	215	0.0	60	125	64	133
3011	4.3	39	83	0.0	43	92	0.0	47	101	0.0	52	110	0.0	77	165	0.0	103	220	0.0	60	128	64	136
2927	4.4	39	85	0.0	43	94	0.0	47	103	0.0	52	113	0.0	77	169	0.0	103	225	0.0	60	131	64	139
2866	4.5	39	87	0.0	43	96	0.0	47	106	0.0	52	115	0.0	77	173	0.0	103	230	0.0	60	134	64	143
2865	4.5	72	161	2.2	43	96	0.0	47	106	0.0	52	115	0.0	77	173	0.0	103	230	0.0	60	134	64	143
2846	4.5	72	161	2.3	43	96	0.0	47	106	0.0	52	115	0.0	77	173	0.0	103	230	0.0	60	134	64	143
2768	4.6	70	161	2.3	43	98	0.0	47	108	0.0	52	118	0.0	77	177	0.0	103	235	0.0	60	137	64	146
2693	4.7	69	161	2.3	43	100	0.0	47	110	0.0	52	120	0.0	77	180	0.0	103	240	0.0	60	140	64	149
2621	4.8	68	161	2.3	43	103	0.0	47	113	0.0	52	123	0.0	77	184	0.0	103	246	0.0	60	143	64	152
2552	4.9	66	161	2.3	43	105	0.0	47	115	0.0	52	126	0.0	77	188	0.0	103	251	0.0	60	146	64	155
2486	5.0	65	161	2.3	43	107	0.0	47	118	0.0	52	128	0.0	77	192	0.0	103	256	0.0	60	149	64	158
2421	5.1	64	161	2.4	43	109	0.0	47	120	0.0	52	131	0.0	77	196	0.0	103	261	0.0	60	152	64	162
2359	5.2	62	161	2.4	43	111	0.0	47	122	0.0	52	133	0.0	77	200	0.0	103	266	0.0	60	155	64	165
2299	5.3	61	161	2.4	43	113	0.0	47	125	0.0	52	136	0.0	77	203	0.0	103	271	0.0	60	158	64	168
2241	5.4	60	161	2.4	43	115	0.0	47	127	0.0	52	138	0.0	77	207	0.0	103	276	0.0	60	160	64	171
2185	5.5	59	161	2.5	43	118	0.0	47	129	0.0	52	141	0.0	77	211	0.0	103	281	0.0	60	163	64	174
2130	5.6	58	161	2.5	43	120	0.0	47	132	0.0	52	143	0.0	77	215	0.0	103	286	0.0	60	166	64	177
2077	5.7	57	161	2.5	43	122	0.0	47	134	0.0	52	146	0.0	77	219	0.0	103	292	0.0	60	169	64	180
2026	5.8	56	161	2.5	43	124	0.0	47	136	0.0	52	149	0.0	77	223	0.0	103	297	0.0	60	172	64	184
1976	5.9	55	161	2.5	43	126	0.0	47	139	0.0	52	151	0.0	77	226	0.0	103	302	0.0	60	175	64	187
1927	6.0	54	161	2.6	43	128	0.0	47	141	0.0	52	154	0.0	77	230	0.0	103	307	0.0	60	178	64	190
1880	6.1	53	161	2.6	43	130	0.0	47	143	0.0	52	156	0.0	77	234	0.0	103	312	0.0	60	181	64	193
1833	6.2	52	161	2.6	43	132	0.0	47	146	0.0	52	159	0.0	77	238	0.0	103	317	0.0	60	184	64	196
1788	6.3	52	161	2.6	43	135	0.0	47	148	0.0	52	161	0.0	77	242	0.0	103	322	0.0	60	187	64	199
1743	6.4	51	161	2.6	43	137	0.0	47	150	0.0	52	164	0.0	77	246	0.0	103	327	0.0	60	190	64	203
1700	6.5	50	161	2.7	43	139	0.0	47	153	0.0	52	166	0.0	77	249	0.0	103	332	0.0	60	193	64	206
1657	6.6	49	161	2.7	43	141	0.0	47	155	0.0	52	169	0.0	77	253	0.0	103	338	0.0	60	196	64	209
1615	6.7	49	161	2.7	43	143	0.0	47	157	0.0	52	172	0.0	77	257	0.0	103	343	0.0	60	199	64	212
1573	6.8	48	161	2.7	43	145	0.0	47	160	0.0	52	174	0.0	77	261	0.0	103	348	0.0	60	202	64	215
1532	6.9	47	161	2.8	43	147	0.0	47	162	0.0	52	177	0.0	77	265	0.0	103	353	0.0	60	205	64	218
1491	7.0	46	161	2.8	43	149	0.0	47	164	0.0	52	179	0.0	77	269	0.0	103	358	0.0	60	208	64	222
1450	7.1	46	161	2.8	43	152	0.0	47	167	0.0	52	182	0.0	77	272	0.0	103	363	0.0	60	211	64	225
1409	7.2	45	161	2.9	43	154	0.0	47	169	0.0	52	184	0.0	77	276	0.0	103	368	0.0	60	214	64	228
1369	7.3	45	163	2.9	43	156	0.0	47	171	0.0	52	187	0.0	77	280	0.0	103	373	0.0	60	217	64	231
1327	7.4	45	165	2.9	43	158	0.0	47	174	0.0	52	189	0.0	77	284	0.0	103	378	0.0	60	220	64	234
1285	7.5	45	168	3.0	47	176	2.0	47	176	0.0	52	192	0.0	77	288	0.0	103	383	0.0	60	223	64	237
1241	7.6	45	170	3.0	47	178	2.0	47	178	0.0	52	195	0.0	77	292	0.0	103	389	0.0	60	226	64	240
1195	7.7	45	173	3.0	48	181	2.0	47	181	0.0	52	197	0.0	77	295	0.0	103	394	0.0	60	229	64	244
1145	7.8	46	176	3.1	48	184	2.1	47	183	0.0	52	200	0.0	77	299	0.0	103	399	0.0	60	232	64	247
1085	7.9	46	179	3.2	48	187	2.2	47	185	0.0	52	202	0.0	77	303	0.0	103	404	0.0	60	235	64	250
964	8.0	46	182	3.3	48	190	2.3	47	188	0.0	52	205	0.0	77	307	0.0	103	409	0.0	60	238	64	253

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

TC-5.01

TRANSITION CURVES - RURAL
55 MPH DESIGN SPEED

VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 3/03

B02.41

REV. 3/03
802.42

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- 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)																		16 FT		18 FT	
		1 @ 9'			1 @ 10'			1 @ 11'			1 @ 12'			2 @ 12'			3 @ 12'						
RADIUS(FT)	E(%)	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	CR	LS
12000	NC	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0	0
8480	2.0	40	40	0.0	45	45	0.0	49	49	0.0	54	54	0.0	80	80	0.0	107	107	0.0	63	63	67	67
8048	2.1	40	42	0.0	45	47	0.0	49	52	0.0	54	56	0.0	80	84	0.0	107	112	0.0	63	66	67	70
7654	2.2	40	44	0.0	45	49	0.0	49	54	0.0	54	59	0.0	80	88	0.0	107	118	0.0	63	70	67	74
7294	2.3	40	46	0.0	45	52	0.0	49	57	0.0	54	62	0.0	80	92	0.0	107	123	0.0	63	73	67	77
6965	2.4	40	48	0.0	45	54	0.0	49	59	0.0	54	64	0.0	80	96	0.0	107	128	0.0	63	76	67	80
6661	2.5	40	50	0.0	45	56	0.0	49	62	0.0	54	67	0.0	80	100	0.0	107	134	0.0	63	79	67	84
6381	2.6	40	52	0.0	45	58	0.0	49	64	0.0	54	70	0.0	80	104	0.0	107	139	0.0	63	82	67	87
6121	2.7	40	54	0.0	45	60	0.0	49	66	0.0	54	72	0.0	80	108	0.0	107	144	0.0	63	85	67	90
5879	2.8	40	56	0.0	45	63	0.0	49	69	0.0	54	75	0.0	80	112	0.0	107	150	0.0	63	88	67	94
5654	2.9	40	58	0.0	45	65	0.0	49	71	0.0	54	78	0.0	80	116	0.0	107	155	0.0	63	91	67	97
5444	3.0	40	60	0.0	45	67	0.0	49	74	0.0	54	80	0.0	80	120	0.0	107	160	0.0	63	95	67	100
5247	3.1	40	62	0.0	45	69	0.0	49	76	0.0	54	83	0.0	80	124	0.0	107	166	0.0	63	98	67	104
5063	3.2	40	64	0.0	45	72	0.0	49	79	0.0	54	86	0.0	80	128	0.0	107	171	0.0	63	101	67	107
4889	3.3	40	66	0.0	45	74	0.0	49	81	0.0	54	88	0.0	80	132	0.0	107	176	0.0	63	104	67	110
4725	3.4	40	68	0.0	45	76	0.0	49	84	0.0	54	91	0.0	80	136	0.0	107	182	0.0	63	107	67	114
4571	3.5	40	70	0.0	45	78	0.0	49	86	0.0	54	94	0.0	80	140	0.0	107	187	0.0	63	110	67	117
4424	3.6	40	72	0.0	45	80	0.0	49	88	0.0	54	96	0.0	80	144	0.0	107	192	0.0	63	113	67	120
4286	3.7	40	74	0.0	45	83	0.0	49	91	0.0	54	99	0.0	80	148	0.0	107	198	0.0	63	117	67	124
4155	3.8	40	76	0.0	45	85	0.0	49	93	0.0	54	102	0.0	80	152	0.0	107	203	0.0	63	120	67	127
4030	3.9	40	78	0.0	45	87	0.0	49	96	0.0	54	104	0.0	80	156	0.0	107	208	0.0	63	123	67	130
3911	4.0	40	80	0.0	45	89	0.0	49	98	0.0	54	107	0.0	80	160	0.0	107	214	0.0	63	126	67	134
3798	4.1	40	82	0.0	45	92	0.0	49	101	0.0	54	110	0.0	80	164	0.0	107	219	0.0	63	129	67	137
3690	4.2	40	84	0.0	45	94	0.0	49	103	0.0	54	112	0.0	80	168	0.0	107	224	0.0	63	132	67	140
3587	4.3	40	86	0.0	45	96	0.0	49	106	0.0	54	115	0.0	80	172	0.0	107	230	0.0	63	135	67	144
3488	4.4	40	88	0.0	45	98	0.0	49	108	0.0	54	118	0.0	80	176	0.0	107	235	0.0	63	139	67	147
3394	4.5	40	90	0.0	45	100	0.0	49	110	0.0	54	120	0.0	80	176	0.0	107	240	0.0	63	142	67	150
3303	4.6	40	92	0.0	45	103	0.0	49	113	0.0	54	123	0.0	80	184	0.0	107	246	0.0	63	145	67	154
3216	4.7	40	94	0.0	45	105	0.0	49	115	0.0	54	126	0.0	80	188	0.0	107	251	0.0	63	148	67	157
3133	4.8	40	96	0.0	45	107	0.0	49	118	0.0	54	128	0.0	80	192	0.0	107	256	0.0	63	151	67	160
3053	4.9	40	98	0.0	45	109	0.0	49	120	0.0	54	131	0.0	80	196	0.0	107	262	0.0	63	154	67	164
2975	5.0	40	100	0.0	45	112	0.0	49	123	0.0	54	134	0.0	80	200	0.0	107	267	0.0	63	157	67	167
2901	5.1	40	102	0.0	45	114	0.0	49	125	0.0	54	136	0.0	80	204	0.0	107	272	0.0	63	160	67	170
2866	5.2	40	104	0.0	45	116	0.0	49	128	0.0	54	139	0.0	80	208	0.0	107	278	0.0	63	164	67	174
2865	5.2	68	176	2.3	45	116	0.0	49	128	0.0	54	139	0.0	80	208	0.0	107	278	0.0	63	164	67	174
2829	5.2	68	176	2.4	45	116	0.0	49	128	0.0	54	139	0.0	80	208	0.0	107	278	0.0	63	164	67	174
2759	5.3	67	176	2.4	45	118	0.0	49	130	0.0	54	142	0.0	80	212	0.0	107	283	0.0	63	167	67	177
2692	5.4	66	176	2.4	45	120	0.0	49	132	0.0	54	144	0.0	80	216	0.0	107	288	0.0	63	170	67	180
2627	5.5	64	176	2.4	45	123	0.0	49	135	0.0	54	147	0.0	80	220	0.0	107	294	0.0	63	173	67	184
2565	5.6	63	176	2.4	45	125	0.0	49	137	0.0	54	150	0.0	80	224	0.0	107	299	0.0	63	176	67	187
2504	5.7	62	176	2.4	45	127	0.0	49	140	0.0	54	152	0.0	80	228	0.0	107	304	0.0	63	179	67	190
2445	5.8	61	176	2.5	45	129	0.0	49	142	0.0	54	155	0.0	80	232	0.0	107	310	0.0	63	182	67	194
2387	5.9	60	176	2.5	45	132	0.0	49	145	0.0	54	158	0.0	80	236	0.0	107	315	0.0	63	186	67	197
2332	6.0	59	176	2.5	45	134	0.0	49	147	0.0	54	160	0.0	80	240	0.0	107	320	0.0	63	189	67	200
2277	6.1	58	176	2.5	45	136	0.0	49	150	0.0	54	163	0.0	80	244	0.0	107	326	0.0	63	192	67	204
2225	6.2	57	176	2.5	45	138	0.0	49	152	0.0	54	166	0.0	80	248	0.0	107	331	0.0	63	195	67	207
2173	6.3	56	176	2.6	45	140	0.0	49	154	0.0	54	168	0.0	80	252	0.0	107	336	0.0	63	198	67	210
2122	6.4	55	176	2.6	45	143	0.0	49	157	0.0	54	171	0.0	80	256	0.0	107	342	0.0	63	201	67	214
2072	6.5	55	176	2.6	45	145	0.0	49	159	0.0	54	174	0.0	80	260	0.0	107	347	0.0	63	204	67	217
2022	6.6	54	176	2.6	45	147	0.0	49	162	0.0	54	176	0.0	80	264	0.0	107	352	0.0	63	208	67	220
1974	6.7	53	176	2.6	45	149	0.0	49	164	0.0	54	179	0.0	80	268	0.0	107	358	0.0	63	211	67	224
1925	6.8	52	176	2.7	45	152	0.0	49	167	0.0	54	182	0.0	80	272	0.0	107	363	0.0	63	214	67	227
1877	6.9	52	176	2.7	45	154	0.0	49	169	0.0	54	184	0.0	80	276	0.0	107	368	0.0	63	217	67	230
1830	7.0	51	176	2.7	45	156	0.0	49	172	0.0	54	187	0.0	80	280	0.0	107	374	0.0	63	220	67	234
1782	7.1	50	176	2.7	45	158	0.0	49	174	0.0	54	190	0.0	80	284	0.0	107	379	0.0	63	223	67	237
1735	7.2	49	176	2.8	45	160	0.0	49	176	0.0	54	192	0.0	80	288	0.0	107	384	0.0	63	226	67	240
1687	7.3	49	176	2.8	45	163	0.0	49	179	0.0	54	195	0.0	80	292	0.0	107	390	0.0	63	230	67	244
1638	7.4	48	176	2.8	45	165	0.0	49	181	0.0	54	198	0.0	80	296	0.0	107	395	0.0	63	233	67	247
1588	7.5	47	176	2.9	45	167	0.0	49	184	0.0	54	200	0.0	80	300	0.0	107	400	0.0	63	236	67	250
1537	7.6	47	177	2.9	45	169	0.0	49	186	0.0	54	203	0.0	80	304	0.0	107	406	0.0	63	239	67	254
1482	7.7	47	179	2.9	45	172	0.0	49	189	0.0	54	206	0.0	80	308	0.0	107	411	0.0	63	242	67	257
1422	7.8	47	182	3.0	49	191	2.0	49	191	0.0	54	208	0.0	80	312	0.0	107	416	0.0	63	245	67	260
1350	7.9	47	185	3.0	49	194	2.0	49	194	0.0	54	211	0.0	80	316	0.0	107	422	0.0	63	248	67	264
1204	8.0	48	189	3.2	50	198	2.2	49	196	0.0	54	214	0.0	80	320	0.0	107	427	0.0	63	251	67	267

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

SPECIFICATION REFERENCE

SPECIFICATION REFERENCE

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

DESIGN VELOCITY =65		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	
	E(%)	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	CR	LS
14000	NC	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0	0
9566	2.0	42	42	0.0	47	47	0.0	52	52	0.0	56	56	0.0	84	84	0.0	112	112	0.0	66	66	70	70
9083	2.1	42	44	0.0	47	49	0.0	52	54	0.0	56	59	0.0	84	88	0.0	112	118	0.0	66	69	70	73
8643	2.2	42	47	0.0	47	52	0.0	52	57	0.0	56	62	0.0	84	93	0.0	112	123	0.0	66	72	70	77
8242	2.3	42	49	0.0	47	54	0.0	52	59	0.0	56	65	0.0	84	97	0.0	112	129	0.0	66	76	70	80
7873	2.4	42	51	0.0	47	56	0.0	52	62	0.0	56	67	0.0	84	101	0.0	112	134	0.0	66	79	70	84
7534	2.5	42	53	0.0	47	59	0.0	52	64	0.0	56	70	0.0	84	105	0.0	112	140	0.0	66	82	70	87
7221	2.6	42	55	0.0	47	61	0.0	52	67	0.0	56	73	0.0	84	109	0.0	112	146	0.0	66	85	70	90
6931	2.7	42	57	0.0	47	63	0.0	52	70	0.0	56	76	0.0	84	114	0.0	112	151	0.0	66	89	70	94
6662	2.8	42	59	0.0	47	66	0.0	52	72	0.0	56	79	0.0	84	118	0.0	112	157	0.0	66	92	70	97
6411	2.9	42	61	0.0	47	68	0.0	52	75	0.0	56	81	0.0	84	122	0.0	112	162	0.0	66	95	70	101
6176	3.0	42	63	0.0	47	70	0.0	52	77	0.0	56	84	0.0	84	126	0.0	112	168	0.0	66	98	70	104
5957	3.1	42	65	0.0	47	73	0.0	52	80	0.0	56	87	0.0	84	130	0.0	112	174	0.0	66	102	70	108
5751	3.2	42	67	0.0	47	75	0.0	52	82	0.0	56	90	0.0	84	134	0.0	112	179	0.0	66	105	70	111
5557	3.3	42	70	0.0	47	77	0.0	52	85	0.0	56	93	0.0	84	139	0.0	112	185	0.0	66	108	70	115
5375	3.4	42	72	0.0	47	80	0.0	52	87	0.0	56	95	0.0	84	143	0.0	112	190	0.0	66	112	70	118
5203	3.5	42	74	0.0	47	82	0.0	52	90	0.0	56	98	0.0	84	147	0.0	112	196	0.0	66	115	70	122
5040	3.6	42	76	0.0	47	84	0.0	52	93	0.0	56	101	0.0	84	151	0.0	112	201	0.0	66	118	70	125
4886	3.7	42	78	0.0	47	87	0.0	52	95	0.0	56	104	0.0	84	155	0.0	112	207	0.0	66	121	70	129
4740	3.8	42	80	0.0	47	89	0.0	52	98	0.0	56	107	0.0	84	160	0.0	112	213	0.0	66	125	70	132
4601	3.9	42	82	0.0	47	91	0.0	52	100	0.0	56	109	0.0	84	164	0.0	112	218	0.0	66	128	70	135
4469	4.0	42	84	0.0	47	94	0.0	52	103	0.0	56	112	0.0	84	168	0.0	112	224	0.0	66	131	70	139
4344	4.1	42	86	0.0	47	96	0.0	52	105	0.0	56	115	0.0	84	172	0.0	112	229	0.0	66	134	70	142
4224	4.2	42	88	0.0	47	98	0.0	52	108	0.0	56	118	0.0	84	176	0.0	112	235	0.0	66	138	70	146
4109	4.3	42	90	0.0	47	100	0.0	52	110	0.0	56	120	0.0	84	180	0.0	112	240	0.0	66	141	70	149
4000	4.4	42	93	0.0	47	103	0.0	52	113	0.0	56	123	0.0	84	185	0.0	112	246	0.0	66	144	70	153
3896	4.5	42	95	0.0	47	105	0.0	52	116	0.0	56	126	0.0	84	189	0.0	112	252	0.0	66	147	70	156
3795	4.6	42	97	0.0	47	107	0.0	52	118	0.0	56	129	0.0	84	193	0.0	112	257	0.0	66	151	70	160
3699	4.7	42	99	0.0	47	110	0.0	52	121	0.0	56	132	0.0	84	197	0.0	112	263	0.0	66	154	70	163
3607	4.8	42	101	0.0	47	112	0.0	52	123	0.0	56	134	0.0	84	201	0.0	112	268	0.0	66	157	70	167
3518	4.9	42	103	0.0	47	114	0.0	52	126	0.0	56	137	0.0	84	206	0.0	112	274	0.0	66	160	70	170
3433	5.0	42	105	0.0	47	117	0.0	52	128	0.0	56	140	0.0	84	210	0.0	112	280	0.0	66	164	70	174
3351	5.1	42	107	0.0	47	119	0.0	52	131	0.0	56	143	0.0	84	214	0.0	112	285	0.0	66	167	70	177
3272	5.2	42	109	0.0	47	121	0.0	52	134	0.0	56	146	0.0	84	218	0.0	112	291	0.0	66	170	70	180
3196	5.3	42	111	0.0	47	124	0.0	52	136	0.0	56	148	0.0	84	222	0.0	112	296	0.0	66	174	70	184
3122	5.4	42	114	0.0	47	126	0.0	52	139	0.0	56	151	0.0	84	227	0.0	112	302	0.0	66	177	70	187
3051	5.5	42	116	0.0	47	128	0.0	52	141	0.0	56	154	0.0	84	231	0.0	112	307	0.0	66	180	70	191
2982	5.6	42	118	0.0	47	131	0.0	52	144	0.0	56	157	0.0	84	235	0.0	112	313	0.0	66	183	70	194
2916	5.7	42	120	0.0	47	133	0.0	52	146	0.0	56	160	0.0	84	239	0.0	112	319	0.0	66	187	70	198
2866	5.8	42	122	0.0	47	135	0.0	52	149	0.0	56	162	0.0	84	243	0.0	112	324	0.0	66	190	70	201
2865	5.8	66	191	2.4	47	135	0.0	52	149	0.0	56	162	0.0	84	243	0.0	112	324	0.0	66	190	70	201
2852	5.8	66	191	2.4	47	135	0.0	52	149	0.0	56	162	0.0	84	243	0.0	112	324	0.0	66	190	70	201
2789	5.9	65	191	2.5	47	138	0.0	52	151	0.0	56	165	0.0	84	247	0.0	112	330	0.0	66	193	70	205
2729	6.0	64	191	2.5	47	140	0.0	52	154	0.0	56	168	0.0	84	252	0.0	112	335	0.0	66	196	70	208
2670	6.1	63	191	2.5	47	142	0.0	52	157	0.0	56	171	0.0	84	256	0.0	112	341	0.0	66	200	70	212
2613	6.2	62	191	2.5	47	145	0.0	52	159	0.0	56	174	0.0	84	260	0.0	112	347	0.0	66	203	70	215
2558	6.3	61	191	2.5	47	147	0.0	52	162	0.0	56	176	0.0	84	264	0.0	112	352	0.0	66	206	70	219
2504	6.4	60	191	2.5	47	149	0.0	52	164	0.0	56	179	0.0	84	268	0.0	112	358	0.0	66	209	70	222
2451	6.5	59	191	2.6	47	152	0.0	52	167	0.0	56	182	0.0	84	273	0.0	112	363	0.0	66	213	70	225
2398	6.6	58	191	2.6	47	154	0.0	52	169	0.0	56	185	0.0	84	277	0.0	112	369	0.0	66	216	70	229
2346	6.7	58	191	2.6	47	156	0.0	52	172	0.0	56	187	0.0	84	281	0.0	112	374	0.0	66	219	70	232
2294	6.8	57	191	2.6	47	159	0.0	52	174	0.0	56	190	0.0	84	285	0.0	112	380	0.0	66	223	70	236
2242	6.9	56	191	2.6	47	161	0.0	52	177	0.0	56	193	0.0	84	289	0.0	112	386	0.0	66	226	70	239
2191	7.0	55	191	2.7	47	163	0.0	52	180	0.0	56	196	0.0	84	294	0.0	112	391	0.0	66	229	70	243
2139	7.1	54	191	2.7	47	166	0.0	52	182	0.0	56	199	0.0	84	298	0.0	112	397	0.0	66	232	70	246
2087	7.2	54	191	2.7	47	168	0.0	52	185	0.0	56	201	0.0	84	302	0.0	112	402	0.0	66	236	70	250
2034	7.3	53	191	2.7	47	170	0.0	52	187	0.0	56	204	0.0	84	306	0.0	112	408	0.0	66	239	70	253
1980	7.4	52	191	2.8	47	173	0.0	52	190	0.0	56	207	0.0	84	310	0.0	112	414	0.0	66	242	70	257
1924	7.5	51	191	2.8	47	175	0.0	52	192	0.0	56	210	0.0	84	314	0.0	112	419	0.0	66	245	70	260
1867	7.6	51	191	2.8	47	177	0.0	52	195	0.0	56	213	0.0	84	319	0.0	112	425	0.0	66	249	70	264
1805	7.7	50	191	2.9	47	180	0.0	52	197	0.0	56	215	0.0	84	323	0.0	112	430	0.0	66	252	70	267
1737	7.8	49	191	2.9	47	182	0.0	52	200	0.0	56	218	0.0	84	327	0.0	112	436	0.0	66	255	70	270
1656	7.9	49	192	2.9	47	184	0.0	52	203	0.0	56	221	0.0	84	331	0.0	112	441	0.0	66	258	70	274
1488	8.0	50	197	3.1	52	206	2.1	52	205	0.0	56	224	0.0	84	335	0.0	112	447	0.0	66	262	70	277

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

TC-5.01

TRANSITION CURVES - RURAL
65 MPH DESIGN SPEED

VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 3/03

802.43

REV. 3/03

802.44

TRANSITION CURVES - RURAL
70 MPH DESIGN SPEED

VIRGINIA DEPARTMENT OF TRANSPORTATION

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

DESIGN VELOCITY =70		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(%)	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	w	CR	LS	CR	LS
17000	NC	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0	0
10731	2.0	45	45	0.0	50	50	0.0	55	55	0.0	60	60	0.0	90	90	0.0	120	120	0.0	72	72	75	75
10194	2.1	45	48	0.0	50	53	0.0	55	58	0.0	60	63	0.0	90	95	0.0	120	126	0.0	72	75	75	79
9706	2.2	45	50	0.0	50	55	0.0	55	61	0.0	60	66	0.0	90	99	0.0	120	132	0.0	72	79	75	83
9260	2.3	45	52	0.0	50	58	0.0	55	64	0.0	60	69	0.0	90	104	0.0	120	138	0.0	72	82	75	87
8851	2.4	45	54	0.0	50	60	0.0	55	66	0.0	60	72	0.0	90	108	0.0	120	144	0.0	72	86	75	90
8474	2.5	45	57	0.0	50	63	0.0	55	69	0.0	60	75	0.0	90	113	0.0	120	150	0.0	72	89	75	94
8127	2.6	45	59	0.0	50	65	0.0	55	72	0.0	60	78	0.0	90	117	0.0	120	156	0.0	72	93	75	98
7805	2.7	45	61	0.0	50	68	0.0	55	75	0.0	60	81	0.0	90	122	0.0	120	162	0.0	72	96	75	102
7506	2.8	45	63	0.0	50	70	0.0	55	77	0.0	60	84	0.0	90	126	0.0	120	168	0.0	72	100	75	105
7227	2.9	45	66	0.0	50	73	0.0	55	80	0.0	60	87	0.0	90	131	0.0	120	174	0.0	72	104	75	109
6967	3.0	45	68	0.0	50	75	0.0	55	83	0.0	60	90	0.0	90	135	0.0	120	180	0.0	72	107	75	113
6724	3.1	45	70	0.0	50	78	0.0	55	86	0.0	60	93	0.0	90	140	0.0	120	186	0.0	72	111	75	117
6495	3.2	45	72	0.0	50	80	0.0	55	88	0.0	60	96	0.0	90	144	0.0	120	192	0.0	72	114	75	120
6281	3.3	45	75	0.0	50	83	0.0	55	91	0.0	60	99	0.0	90	149	0.0	120	198	0.0	72	118	75	124
6079	3.4	45	77	0.0	50	85	0.0	55	94	0.0	60	102	0.0	90	153	0.0	120	204	0.0	72	121	75	128
5888	3.5	45	79	0.0	50	88	0.0	55	97	0.0	60	105	0.0	90	158	0.0	120	210	0.0	72	125	75	132
5708	3.6	45	81	0.0	50	90	0.0	55	99	0.0	60	108	0.0	90	162	0.0	120	216	0.0	72	128	75	135
5537	3.7	45	84	0.0	50	93	0.0	55	102	0.0	60	111	0.0	90	167	0.0	120	222	0.0	72	132	75	139
5376	3.8	45	86	0.0	50	95	0.0	55	105	0.0	60	114	0.0	90	171	0.0	120	228	0.0	72	136	75	143
5222	3.9	45	88	0.0	50	98	0.0	55	108	0.0	60	117	0.0	90	176	0.0	120	234	0.0	72	139	75	147
5076	4.0	45	90	0.0	50	100	0.0	55	110	0.0	60	120	0.0	90	180	0.0	120	240	0.0	72	143	75	150
4937	4.1	45	93	0.0	50	103	0.0	55	113	0.0	60	123	0.0	90	185	0.0	120	246	0.0	72	146	75	154
4805	4.2	45	95	0.0	50	105	0.0	55	116	0.0	60	126	0.0	90	189	0.0	120	252	0.0	72	150	75	158
4679	4.3	45	97	0.0	50	108	0.0	55	119	0.0	60	129	0.0	90	194	0.0	120	258	0.0	72	153	75	162
4558	4.4	45	99	0.0	50	110	0.0	55	121	0.0	60	132	0.0	90	198	0.0	120	264	0.0	72	157	75	165
4443	4.5	45	102	0.0	50	113	0.0	55	124	0.0	60	135	0.0	90	203	0.0	120	270	0.0	72	160	75	169
4332	4.6	45	104	0.0	50	115	0.0	55	127	0.0	60	138	0.0	90	207	0.0	120	276	0.0	72	164	75	173
4226	4.7	45	106	0.0	50	118	0.0	55	130	0.0	60	141	0.0	90	212	0.0	120	282	0.0	72	168	75	177
4125	4.8	45	108	0.0	50	120	0.0	55	132	0.0	60	144	0.0	90	216	0.0	120	288	0.0	72	171	75	180
4027	4.9	45	111	0.0	50	123	0.0	55	135	0.0	60	147	0.0	90	221	0.0	120	294	0.0	72	175	75	184
3933	5.0	45	113	0.0	50	125	0.0	55	138	0.0	60	150	0.0	90	225	0.0	120	300	0.0	72	178	75	188
3843	5.1	45	115	0.0	50	128	0.0	55	141	0.0	60	153	0.0	90	230	0.0	120	306	0.0	72	182	75	192
3756	5.2	45	117	0.0	50	130	0.0	55	143	0.0	60	156	0.0	90	234	0.0	120	312	0.0	72	185	75	195
3673	5.3	45	120	0.0	50	133	0.0	55	146	0.0	60	159	0.0	90	239	0.0	120	318	0.0	72	189	75	199
3592	5.4	45	122	0.0	50	135	0.0	55	149	0.0	60	162	0.0	90	243	0.0	120	324	0.0	72	192	75	203
3514	5.5	45	124	0.0	50	138	0.0	55	152	0.0	60	165	0.0	90	248	0.0	120	330	0.0	72	196	75	207
3439	5.6	45	126	0.0	50	140	0.0	55	154	0.0	60	168	0.0	90	252	0.0	120	336	0.0	72	200	75	210
3366	5.7	45	129	0.0	50	143	0.0	55	157	0.0	60	171	0.0	90	257	0.0	120	342	0.0	72	203	75	214
3296	5.8	45	131	0.0	50	145	0.0	55	160	0.0	60	174	0.0	90	261	0.0	120	348	0.0	72	207	75	218
3228	5.9	45	133	0.0	50	148	0.0	55	163	0.0	60	177	0.0	90	266	0.0	120	354	0.0	72	210	75	222
3163	6.0	45	135	0.0	50	150	0.0	55	165	0.0	60	180	0.0	90	270	0.0	120	360	0.0	72	214	75	225
3099	6.1	45	138	0.0	50	153	0.0	55	168	0.0	60	183	0.0	90	275	0.0	120	366	0.0	72	217	75	229
3037	6.2	45	140	0.0	50	155	0.0	55	171	0.0	60	186	0.0	90	279	0.0	120	372	0.0	72	221	75	233
2977	6.3	45	142	0.0	50	158	0.0	55	174	0.0	60	189	0.0	90	284	0.0	120	378	0.0	72	224	75	237
2919	6.4	45	144	0.0	50	160	0.0	55	176	0.0	60	192	0.0	90	288	0.0	120	384	0.0	72	228	75	240
2866	6.5	45	147	0.0	50	163	0.0	55	179	0.0	60	195	0.0	90	293	0.0	120	390	0.0	72	232	75	244
2865	6.5	64	205	2.5	50	163	0.0	55	179	0.0	60	195	0.0	90	293	0.0	120	390	0.0	72	232	75	244
2862	6.5	64	205	2.5	50	163	0.0	55	179	0.0	60	195	0.0	90	293	0.0	120	390	0.0	72	232	75	244
2807	6.6	63	205	2.5	50	165	0.0	55	182	0.0	60	198	0.0	90	297	0.0	120	396	0.0	72	235	75	248
2753	6.7	62	205	2.6	50	168	0.0	55	185	0.0	60	201	0.0	90	302	0.0	120	402	0.0	72	239	75	252
2699	6.8	61	205	2.6	50	170	0.0	55	187	0.0	60	204	0.0	90	306	0.0	120	408	0.0	72	242	75	255
2645	6.9	60	205	2.6	50	173	0.0	55	190	0.0	60	207	0.0	90	311	0.0	120	414	0.0	72	246	75	259
2590	7.0	59	205	2.6	50	175	0.0	55	193	0.0	60	210	0.0	90	315	0.0	120	420	0.0	72	249	75	263
2535	7.1	58	205	2.6	50	178	0.0	55	196	0.0	60	213	0.0	90	320	0.0	120	426	0.0	72	253	75	267
2480	7.2	57	205	2.7	50	180	0.0	55	198	0.0	60	216	0.0	90	324	0.0	120	432	0.0	72	256	75	270
2423	7.3	57	205	2.7	50	183	0.0	55	201	0.0	60	219	0.0	90	329	0.0	120	438	0.0	72	260	75	274
2365	7.4	56	205	2.7	50	185	0.0	55	204	0.0	60	222	0.0	90	333	0.0	120	444	0.0	72	264	75	278
2305	7.5	55	205	2.7	50	188	0.0	55	207	0.0	60	225	0.0	90	338	0.0	120	450	0.0	72	267	75	282
2242	7.6	54	205	2.7	50	190	0.0	55	209	0.0	60	228	0.0	90	342	0.0	120	456	0.0	72	271	75	285
2175	7.7	54	205	2.8	50	193	0.0	55	212	0.0	60	231	0.0	90	347	0.0	120	462	0.0	72	274	75	289
2100	7.8	53	205	2.8	50	195	0.0	55	215	0.0	60	234	0.0	90	351	0.0	120	468	0.0	72	278	75	293
2010	7.9	53	207	2.9	50	198	0.0	55	218	0.0	60	237	0.0	90	356	0.0	120	474	0.0	72	281	75	297
1821	8.0	53	210	3.0	55	220	2.0	55	220	0.0	60	240	0.0	90	360	0.0	120	480	0.0	72	285	75	300

NOTE:
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SPECIFICATION REFERENCE