COMMONWEALTH of VIRGINIA

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

Gregory A. Whirley
Commissioner

July 10, 2012

MEMORANDUM

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

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

PAGE	REVISION
103.02	Revised the Specification reference in the first sentence to 302.
303.01	Clarified X1 dimension
502.23	Removed sand bags from notes
700.01	Revised table of contents to remove the GS-10 through GS-13 standards (The GS standards are now in appendix A of the Road Design Manual)
800.01-800.04	Revised table of contents to include the TC-5.11 Standards
803.01-803.44	New TC Standards (TC-5.11) based on the 2011 AASHTO Green Book.

Note: The TC-5.11 standards will be required for all projects with an advertisement date of August 13, 2013 and later. Any project in which the designer feels they cannot meet this date shall get approval from the State Location & Design Engineer or his designee.

The following is a list of revised standards to the 2008 Road and Bridge Standards that ***require*** an interim standard sheet to be in included in your plan assembly until the next edition of the imperial standards is published. Please add these pages to your copy of the standards. The respective interim standard sheet number has been placed with the revised standard. The interim standard sheets are available on VDOT's web site, on the FTP server, and in Falcon DMS for VDOT personnel. These interim standard sheets will be required in plan assemblies for Tier 1 projects advertised December 28, 2012 and later along with Tier 2 projects advertised April 9, 2013 and later.

PAGE	INTERIM	STANDARD	REVISION
107.01	IIS01_04	PB-1	CLARIFIED AREA FOR BACKFILL FOR PLASTIC PIPE
203.08A	IIS02_05	CG-12	ADDED NOTE CLARIFYING THE USE OF DETECTABLE WARNINGS ON CUT THROUGH 'S LESS THAN 6'
301.07	IIS03_01	PR-3	TRANSVERSE STEEL SPACING CHANGED TO 36" C-C. SECTION B-B CHANGED 10' TO 8' SECTION B-B CHANGED 32" TO 38"
301.09	IIS03_02	PR-3	ADJUSTED NOTE LOCATIONS
301.10	IIS03_08	PR-4	TRANSVERSE STEEL SPACING CHANGED TO 48" C-C. SECTION B-B CHANGED 10' TO 8' SECTION B-B CHANGED 38" TO 46"
301.12	IIS03_09	PR-4	ADJUSTED NOTE LOCATIONS
305.01	IIS03_07	ACOT-1	REVISED NOTES 1-5 ADDED NOTE FOR BRIDGE TERMINI
501.09	IIS05_05	GR-6	SECTION A-A CHANGED TO 6:1 SLOPE ADDED "BACK SLOPE HGT 4'-0" MIN. PLAN VIEW CLARIFIED 12.5:1 FLARE, ADDED 2:1 OR STEEPER BACK SLOPE, AND CLARIFIED FRONT SLOPE.
501.10	IIS05_07	GR-6	DETAIL F TAPER REMOVED SECTION D-D REVISED TO 2:1 SLOPE SECTION E-E REVISED TO 2:1 SLOPE
501.11	IIS05_21	GR-7	NOTE 2 ADDED "D" FOR HEIGHT TOLERANCE OF 27 ¾" – 28 ¾"
501.16	IIS05_22	GR-9	NOTE 2 ADDED "D" FOR HEIGHT TOLERANCE OF 27 ¾" – 28 ¾"

The Wing Walls for the Box Culvert Standards Section 1000 have been replaced in their entirety to comply with the LRFD criteria. The interim standard sheets will be listed by the corresponding page number. Every box culvert will require interim standard sheets when used.

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

Sincerely,

Signature on file: July 10, 2012

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

LEGEND — PAGE

GENERAL NOTES - PRECAST

PRECAST STRUCTURES WILL CONFORM TO SECTION 302 OF THE SPECIFICATIONS. THE MANUFACTURER WILL HAVE THE OPTION OF SELECTING THE COMBINATION OF PRECAST UNITS TO COMPLETE A STRUCTURE UNLESS OTHERWISE NOTED ON THE PLANS.

THE "H" (LINEAR FEET FOR MANHOLES) DIMENSION SHOWN ON THE STANDARDS AND SPECIFIED ON THE PLANS WILL BE MEASURED FROM THE INVERT OF THE OUTFALL PIPE TO THE TOP OF THE MASONARY STRUCTURE. PLAN "H" DIMENSIONS ARE APPROXIMATE ONLY FOR ESTIMATING PURPOSES AND THE ACTUAL DIMENSIONS SHALL BE DETERMINED BY THE CONTRACTOR FROM FIELD CONDITIONS.

IN THE EVENT THE INVERT OF THE OUTFALL PIPE IS HIGHER THAN THE BOTTOM OF THE STRUCTURE, THE INVERT OF THE STRUCTURE SHALL BE SHAPED WITH CEMENT MORTAR TO PREVENT STANDING OR PONDING OF WATER IN THE STRUCTURE. THIS WILL APPLY TO ALL STRUCTURES MEETING THIS CONDITION AND IS NOT TO BE CONFUSED WITH STANDARD IS-1 THE COST FOR INVERT SHAPING SHALL BE INCLUDED IN THE PRICE BID FOR THE STRUCTURE.

WHEN SPECIFIED ON THE PLANS THE INVERT IS TO BE SHAPED IN ACCORDANCE WITH STANDARD IS-1. THE COST OF FURNISHING AND PLACING ALL MATERIALS INCIDENTAL TO THE SHAPING IS TO BE INCLUDED IN THE PRICE BID FOR THE STRUCTURE.

ALL PRECAST STRUCTURES TO BE CONSTRUCTED WITH 4000 PSI MINIMUM CONCRETE.

STEPS IN ACCORDANCE WITH STANDARD ST-1 ARE TO BE PROVIDED IN ALL MANHOLES AND IN ALL DROP INLETS WITH AN "H" DIMENSION OF 4'-0" OR GREATER.

3" DIAMETER WEEP HOLES WILL BE REQUIRED IN PRECAST STRUCTURE'S LOCATED ADJACENT TO THE PAVEMENT TO DRAIN THE SUBBASE. PLACEMENT OF WEEP HOLES IN THE PRECAST UNIT WILL BE DETERMINED BY THE PROXIMITY OF THE STRUCTURE TO THE SUBBASE. WEEP HOLES MAY ALSO BE REQUIRED IN OTHER STRUCTURES WHEN CALLED FOR ON THE PLANS OR DIRECTED BY THE ENGINEER.

WEEP HOLES WILL HAVE 12" X 12" PLASTIC HARDWARE CLOTH, 1/4" MESH OR GALVANIZED STEEL WIRE, MINIMUM WIRE DIAMETER 0.03", NUMBER 4 MESH HARDWARE CLOTH ANCHORED FIRMLY TO OUTSIDE OF STRUCTURE.

PRECAST UNITS LOCATED ADJACENT TO CAST-IN-PLACE CONCRETE ITEMS, SUCH AS FLUMES, DITCHES, GUTTERS, AND SIDEWALKS SHALL BE CONNECTED TO THE ADJACENT UNIT BY MEANS OF NO. 4 SMOOTH STEEL DOWELS SPACED ON APPROXIMATELY 12" CENTERS THROUGHOUT THE CONTACT LENGTH AND EXTENDING AT LEAST 4" INTO BOTH THE PRECAST UNIT TO RECEIVE THE DOWELS, THEY SHALL NOT EXCEED 5/8" DIAMETER.

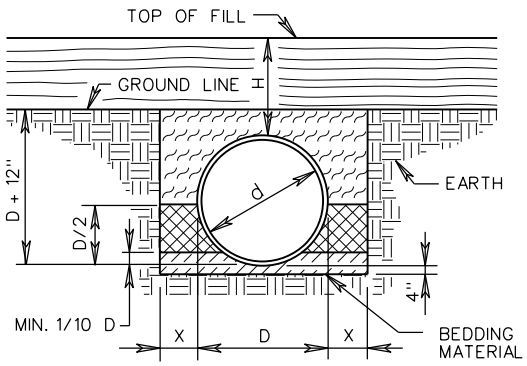
THE STANDARD SAFETY SLAB (SL-1) IS TO BE USED ONLY WHEN SPECIFIED IN THE PLANS ON THE DRAINAGE SUMMARY SHEET AND/OR THE DRAINAGE DESCRIPTION. REFER TO STANDARD SL-1 FOR SAFETY SLAB INFORMATION.

3/4" CHAMFER MAY BE PROVIDED ON ALL EDGES AT MANUFACTURER'S OPTION.

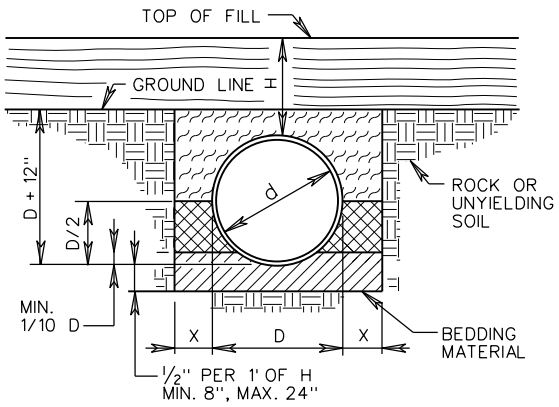
SPECIFICATION REFERENCE	GENERAL NOTES - PRECAST VIRGINIA DEPARTMENT OF TRANSPORTATION	VDOT ROAD AND BRIDGE STANDARDS REVISION DATE 07/12 — SHEET 1 OF 1 103.02

PB-1

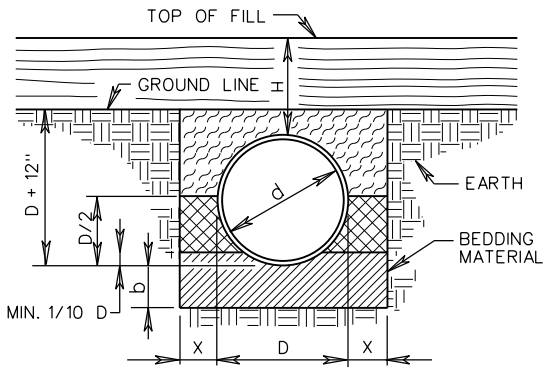
NO PROJECTION OF PIPE ABOVE GROUND LINE



NORMAL EARTH FOUNDATION

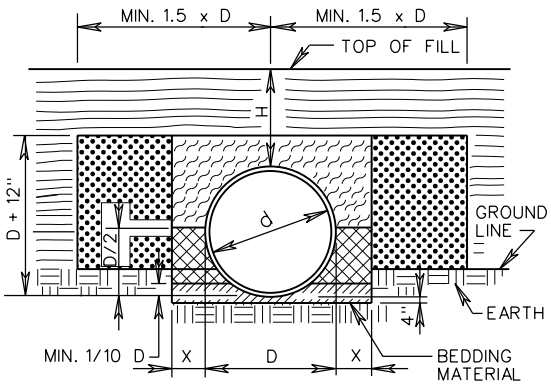


ROCK FOUNDATION

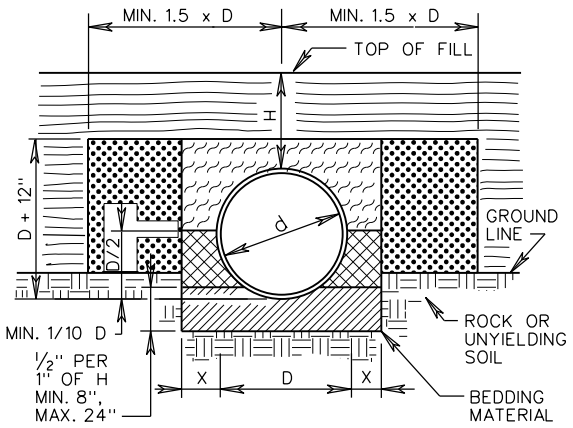


FOUNDATION SOFT, YIELDING, OR OTHERWISE UNSUITABLE MATERIAL

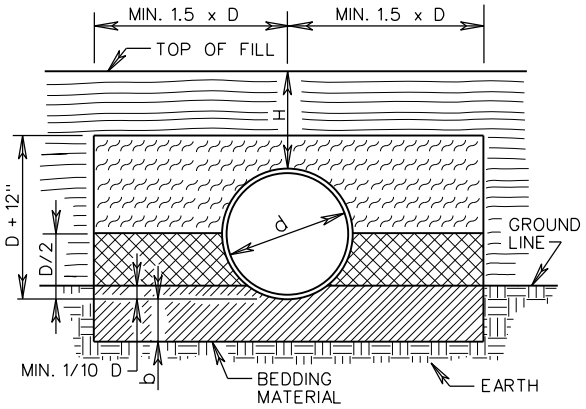
PIPE PROJECTION ABOVE GROUND LINE



NORMAL EARTH FOUNDATION



ROCK FOUNDATION



FOUNDATION SOFT, YIELDING, OR OTHERWISE UNSUITABLE MATERIAL

BEDDING MATERIAL IN ACCORDANCE WITH SECTION 302 OF THE ROAD AND BRIDGE SPECIFICATIONS.

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

FOR PLASTIC PIPE CLASS I BACKFILL MATERIAL IN ACCORDANCE WITH SECTION 302 OF THE ROAD AND BRIDGE SPECIFICATIONS.

FOR ALL OTHER PIPE REGULAR BACKFILL MATERIAL IN ACCORDANCE WITH SECTION 302 OF THE ROAD AND BRIDGE SPECIFICATIONS.

EMBANKMENT

REGULAR BACKFILL MATERIAL IN ACCORDANCE WITH SECTION 302 OF THE ROAD AND BRIDGE SPECIFICATIONS.

NOTES:

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

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

VDOT
ROAD AND BRIDGE STANDARDS

INSTALL. OF PIPE CULVERTS AND STORM SEWERS CIRC. PIPE BEDDING AND BACKFILL - METHOD "A"

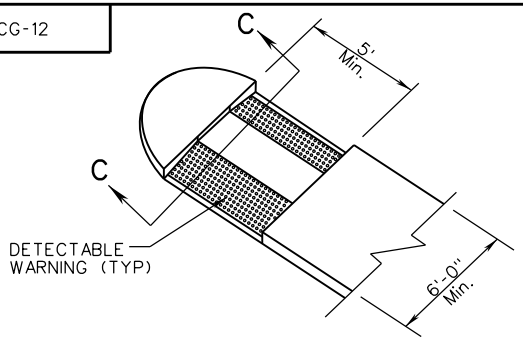
VIRGINIA DEPARTMENT OF TRANSPORTATION

SHEET 1 OF 4	REVISION DATE
107.01	07/12

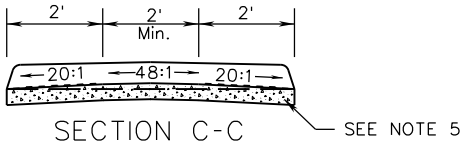
SPECIFICATION REFERENCE

302
303

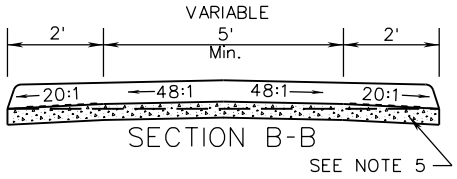
CG-12



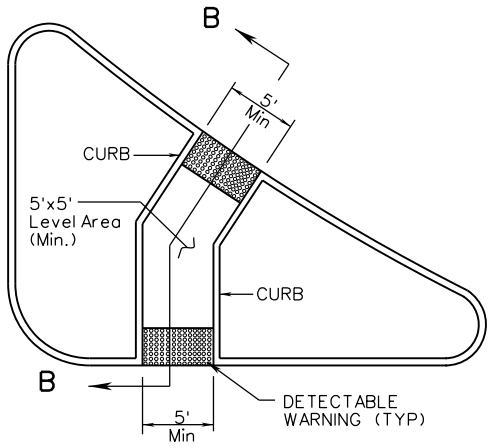
MEDIAN WITH CUT-THROUGH
TYPE M2



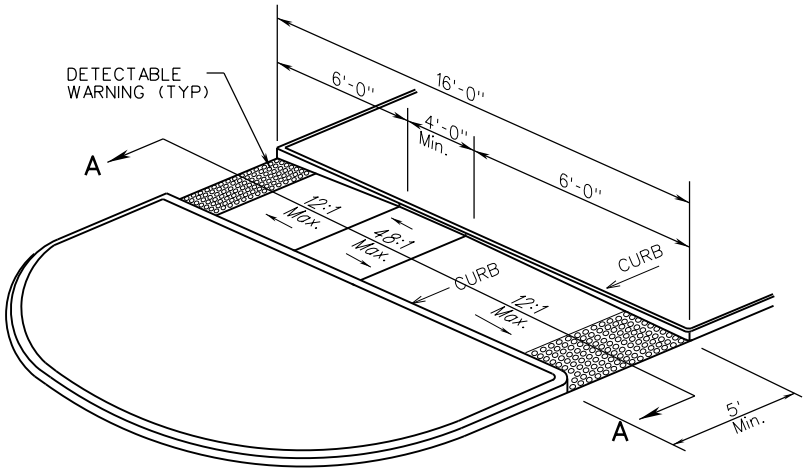
SECTION C-C



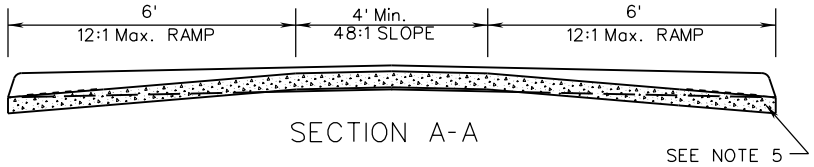
SECTION B-B



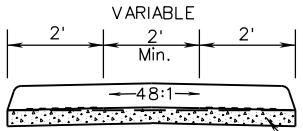
REFUGE ISLAND WITH RAMPS
TYPE RI1



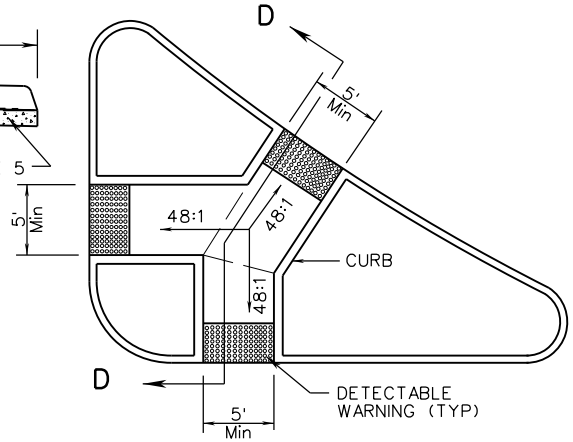
MEDIAN WITH RAMP
TYPE M1



SECTION A-A



SECTION D-D



REFUGE ISLAND CUT - THROUGH
TYPE RI2

NOTES:

1. FOR GENERAL NOTES ON THE DETECTABLE WARNING SURFACE, SEE SHEET 1 OF 5.
2. CURB SHALL BE SHAPED TO MATCH THE FACE OF ROADWAY CURB.
3. SEE ROADWAY PLANS FOR MEDIAN AND REFUGE ISLAND DIMENSIONS
4. RAMPS AND CUT THROUGH'S SHALL BE ALIGNED WITH CROSSWALKS.
5. THE RAMPS AND CUT THROUGH'S SHALL BE INSTALLED AND PAID FOR AS 4" HYDRAULIC CEMENT CONCRETE SIDEWALK IN ACCORDANCE WITH SECTION 504 OF THE ROAD & BRIDGE SPECIFICATIONS. EXCAVATION OF MATERIAL FOR THE INSTALLATION OF THE SIDEWALK SHALL BE INCLUDED IN THE PRICE BID FOR 4" HYDRAULIC CEMENT CONCRETE SIDEWALK.
6. CUT THROUGH'S LESS THAN 6' IN WIDTH SHALL NOT HAVE DETECTABLE WARNINGS INSTALLED.

VDOT
ROAD AND BRIDGE STANDARDS

CG-12 DETECTABLE WARNING SURFACE

MEDIAN AND REFUGE ISLAND APPLICATIONS

VIRGINIA DEPARTMENT OF TRANSPORTATION

SHEET 5 OF 5	REVISION DATE
203.08A	7/12

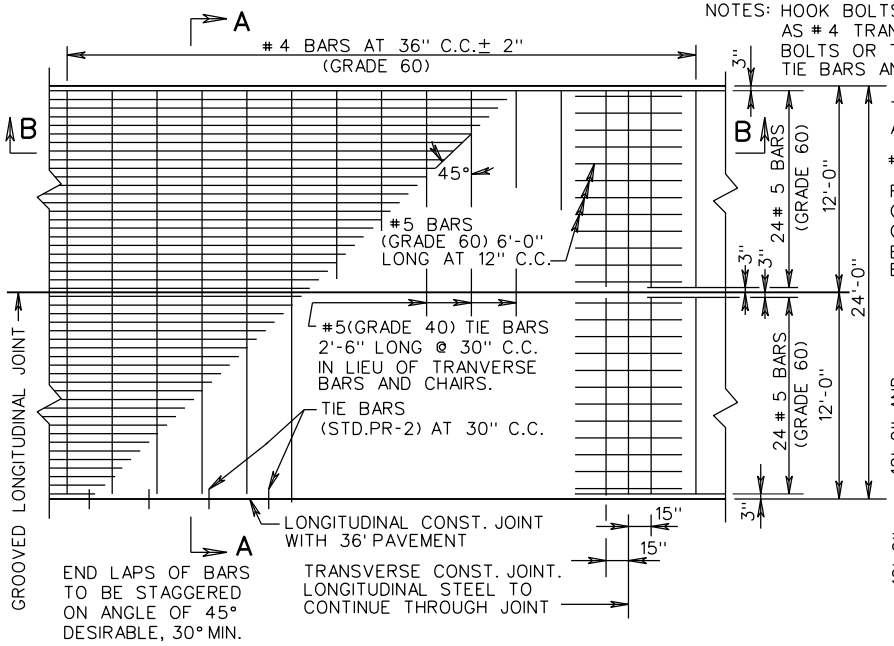
SPECIFICATION REFERENCE
105
502

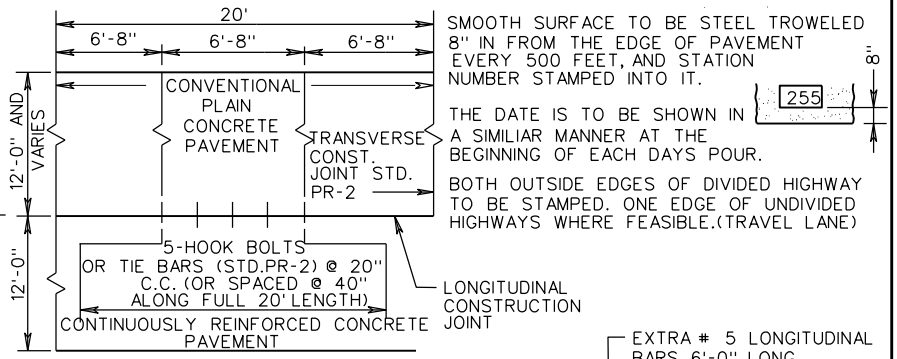
NOTES: HOOK BOLTS OR TIE BARS ARE TO BE PLACED IN THE SAME HORIZONTAL PLANE AS # 4 TRANSVERSE BARS. WHERE NECESSARY ADJUST THE LOCATION OF HOOK BOLTS OR TIE BARS TO A 2½" MINIMUM CLEARANCE BETWEEN HOOK BOLTS OR TIE BARS AND TRANSVERSE BARS.

TRANSVERSE CONSTRUCTION JOINT BARS ARE TO BE PLACED IN THE SAME HORIZONTAL AS # 5 LONGITUDINAL BARS.

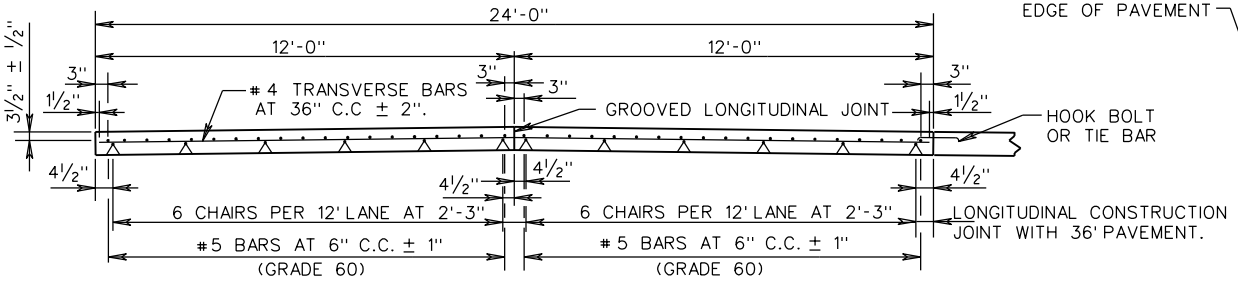
#5 LONGITUDINAL BARS ARE TO BE LAPPED AND TIED IN THE SAME HORIZONTAL PLANE.

FOR 36' WIDTH PAVEMENT USE SINGLE 12' LANES WITH 2 LONGITUDINAL CONSTRUCTION JOINTS OR 12' AND 24' LANES WITH ONE LONGITUDINAL CONSTRUCTION JOINT AND ONE GROVED LONGITUDINAL JOINT. TRANSVERSE BARS SHALL NOT EXTEND THROUGH LONGITUDINAL CONSTRUCTION JOINTS, BUT SHALL EXTEND FULL LENGTH (23'-9") FOR GROOVED LONGITUDINAL JOINTS.

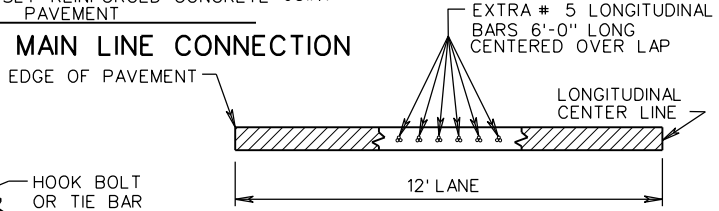




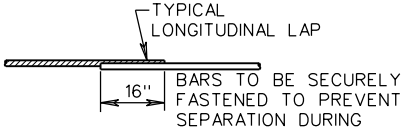
PLAN-RAMP & MAIN LINE CONNECTION

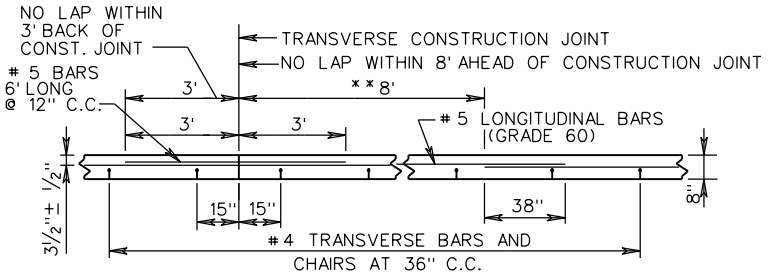


SECTION A-A

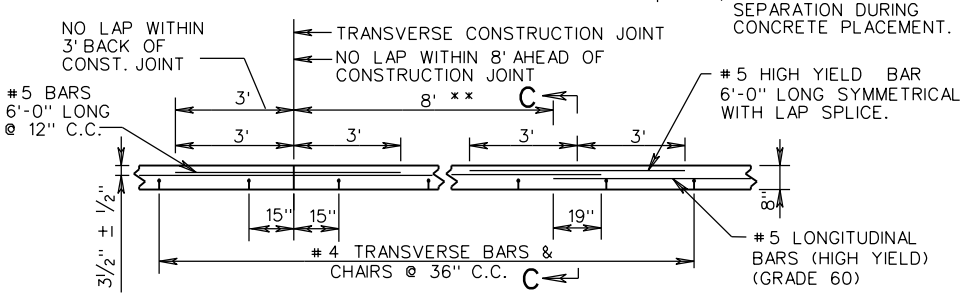


SECTION C-C





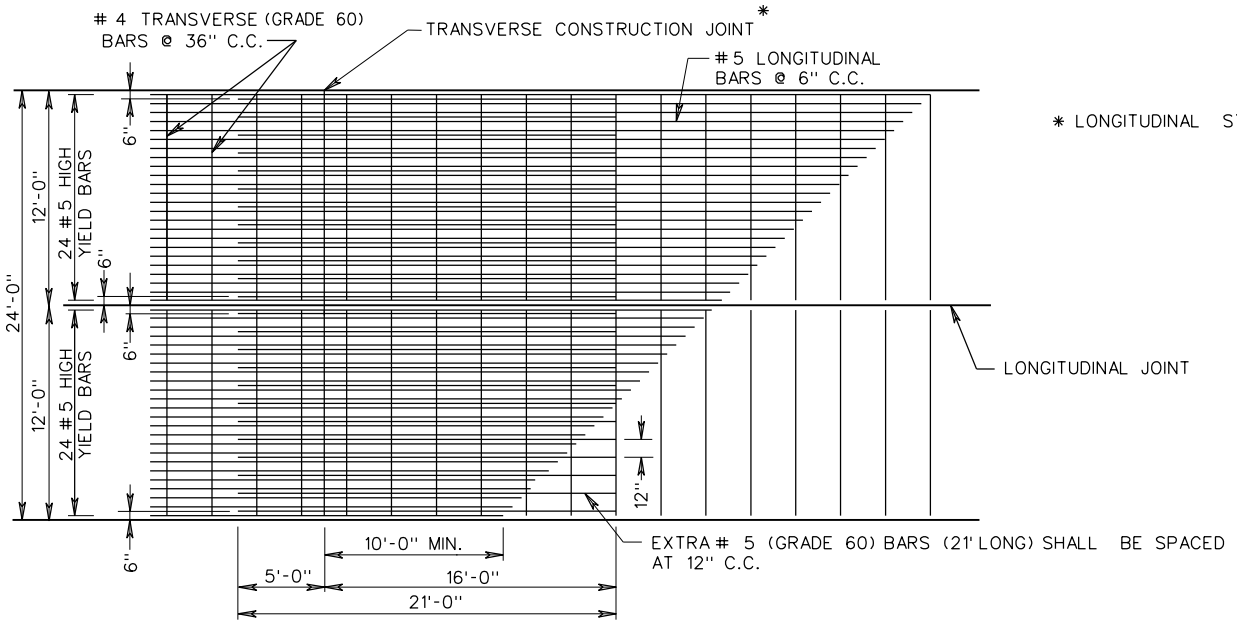
SECTION B-B
DOUBLE LAP METHOD



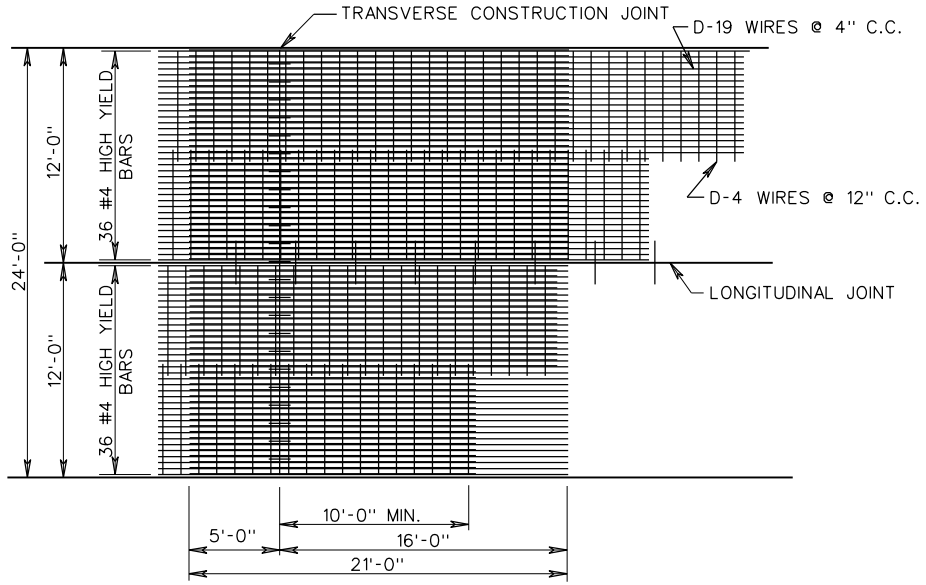
SECTION B-B
EXTRA BAR METHOD

** DOUBLE LAP REQUIREMENT (38") AND THE EXTRA BAR METHOD APPLY ONLY TO LAPS FALLING WITHIN AN AREA OF 8' BEYOND THE CONSTRUCTION JOINT.

SPECIFICATION REFERENCE	A COPY OF THE ORIGINAL SEALED AND SIGNED DRAWING IS ON FILE IN THE CENTRAL OFFICE.	VDOT ROAD AND BRIDGE STANDARDS
316	# 8" THICK CONTINUOUSLY REINFORCED CONC. PAVE. (STEEL BAR REINFORCEMENT) VIRGINIA DEPARTMENT OF TRANSPORTATION	REVISION DATE 7/12 · SHEET 2 OF 4 · 301.07



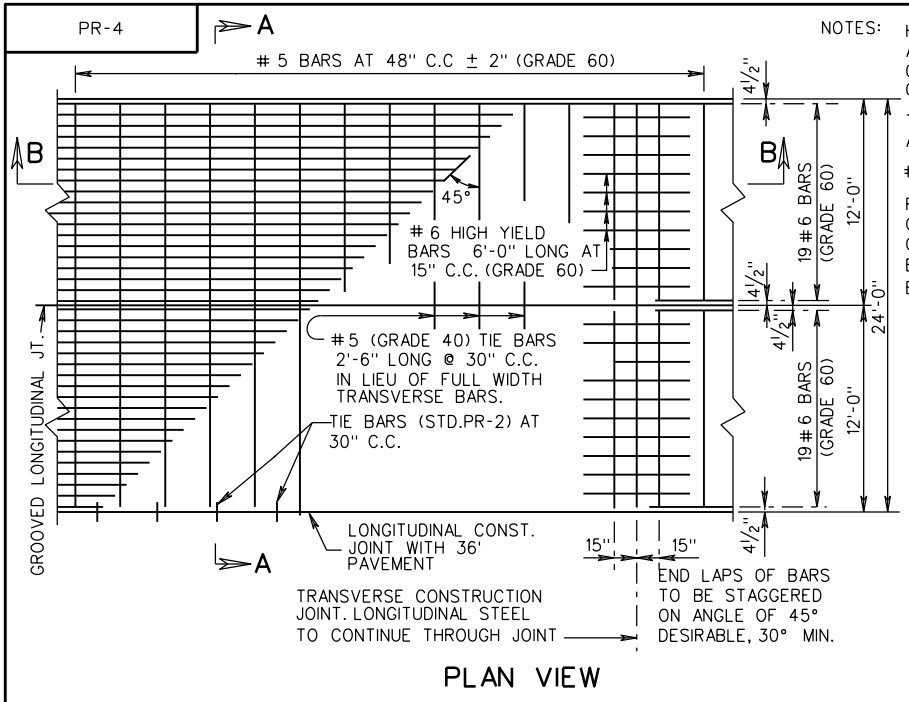
LEAVE OUT JOINT
FOR USE WITH STEEL BAR REINFORCEMENT



LEAVE OUT JOINT
FOR USE WITH WIRE MESH REINFORCEMENT

SPECIFICATION REFERENCE	A COPY OF THE ORIGINAL SEALED AND SIGNED DRAWING IS ON FILE IN THE CENTRAL OFFICE.	VDOT ROAD AND BRIDGE STANDARDS
316	**8" THICK CONTINUOUSLY REINFORCED CONC. PAVE.** (LEAVE OUT JOINT DETAIL) VIRGINIA DEPARTMENT OF TRANSPORTATION	REVISION DATE 7/12 · SHEET 4 OF 4 · 301.09

PR-4



PLAN VIEW

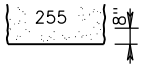
NOTES:

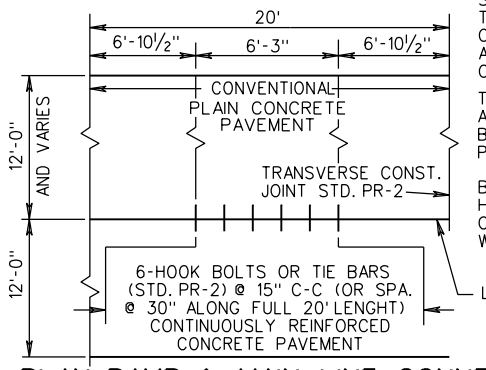
HOOK BOLTS OR TIE BARS ARE TO BE PLACED IN THE SAME HORIZONTAL PLANE AS #5 TRANSVERSE BARS. WHERE NECESSARY ADJUST THE LOCATION OF HOOK BOLTS OR TIE BARS TO A 2½" MINIMUM CLEARANCE BETWEEN HOOK BOLTS OR TIE BARS AND TRANSVERSE BARS.

TRANSVERSE CONSTRUCTION JOINT BARS ARE TO BE PLACED IN THE SAME HORIZONTAL PLANE AS #6 LONGITUDINAL BARS.

#6 LONGITUDINAL BARS ARE TO BE LAPPED AND TIED IN THE SAME HORIZONTAL PLANE.

FOR 36' WIDTH PAVEMENT USE SINGLE 12' LANES WITH 2 LONGITUDINAL CONSTRUCTION JOINTS OR 12' AND 24' LANES WITH ONE LONGITUDINAL CONSTRUCTION JOINT AND ONE GROOVED LONGITUDINAL JOINT. TRANSVERSE BARS SHALL NOT EXTEND THROUGH LONGITUDINAL CONSTRUCTION JOINTS, BUT SHALL EXTEND FULL LENGTH (23'-9") FOR GROOVED LONGITUDINAL JOINTS.



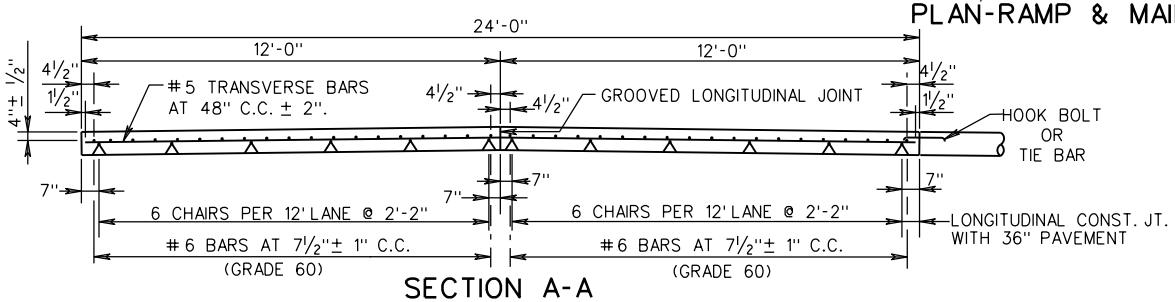


PLAN-RAMP & MAIN LINE CONNECTION

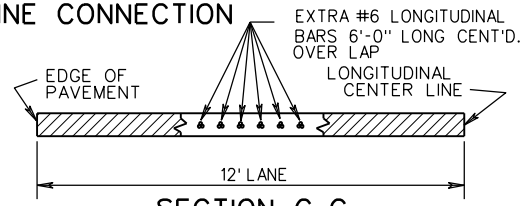
SMOOTH SURFACE TO BE STEEL TROWELED 8" IN FROM THE EDGE OF PAVEMENT EVERY 500 FEET, AND STATION NUMBER STAMPED ON IT.

THE DATE IS TO BE SHOWN IN A SIMILAR MANNER AT THE BEGINNING OF EACH DAYS POUR.

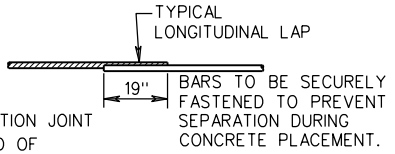
BOTH OUTSIDE EDGES OF DIVIDED HIGHWAY TO BE STAMPED. ONE EDGE OF UNDIVIDED HIGHWAY WHERE FEASIBLE. (TRAVEL LANE)

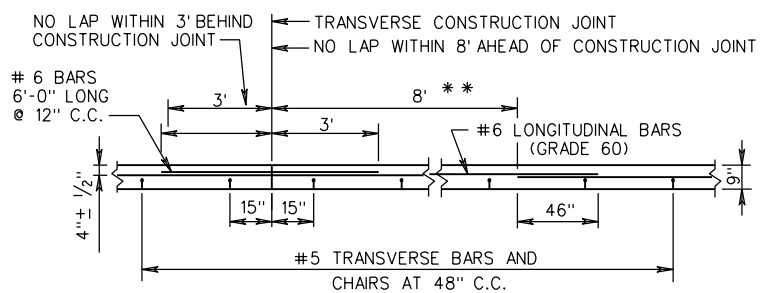


SECTION A-A



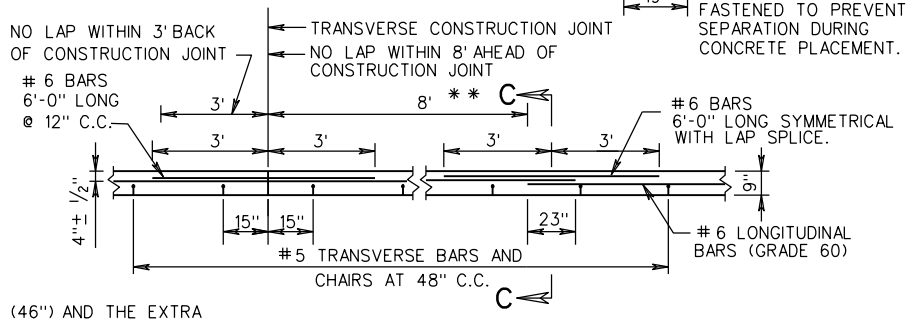
SECTION C-C





SECTION B-B
DOUBLE LAP METHOD

** DOUBLE LAP REQUIREMENT (46") AND THE EXTRA BAR METHOD APPLY ONLY TO LAPS FALLING WITHIN AN AREA OF 8' BEYOND THE CONSTRUCTION JOINT.



SECTION B-B
EXTRA BAR METHOD

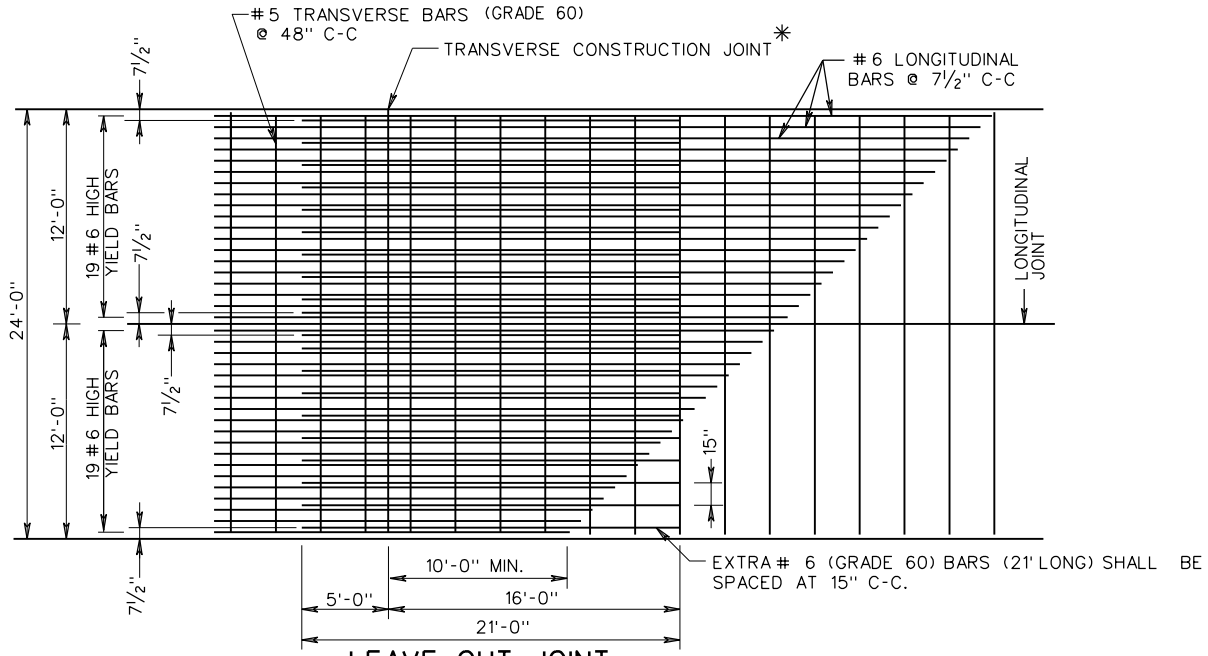
VDOT
ROAD AND BRIDGE STANDARDS

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

9" THICK CONTINUOUSLY REINFORCED CONC. PAVE.
(STEEL BAR REINFORCEMENT)
VIRGINIA DEPARTMENT OF TRANSPORTATION

SHEET 1 OF 3	REVISION DATE
301.10	7/12

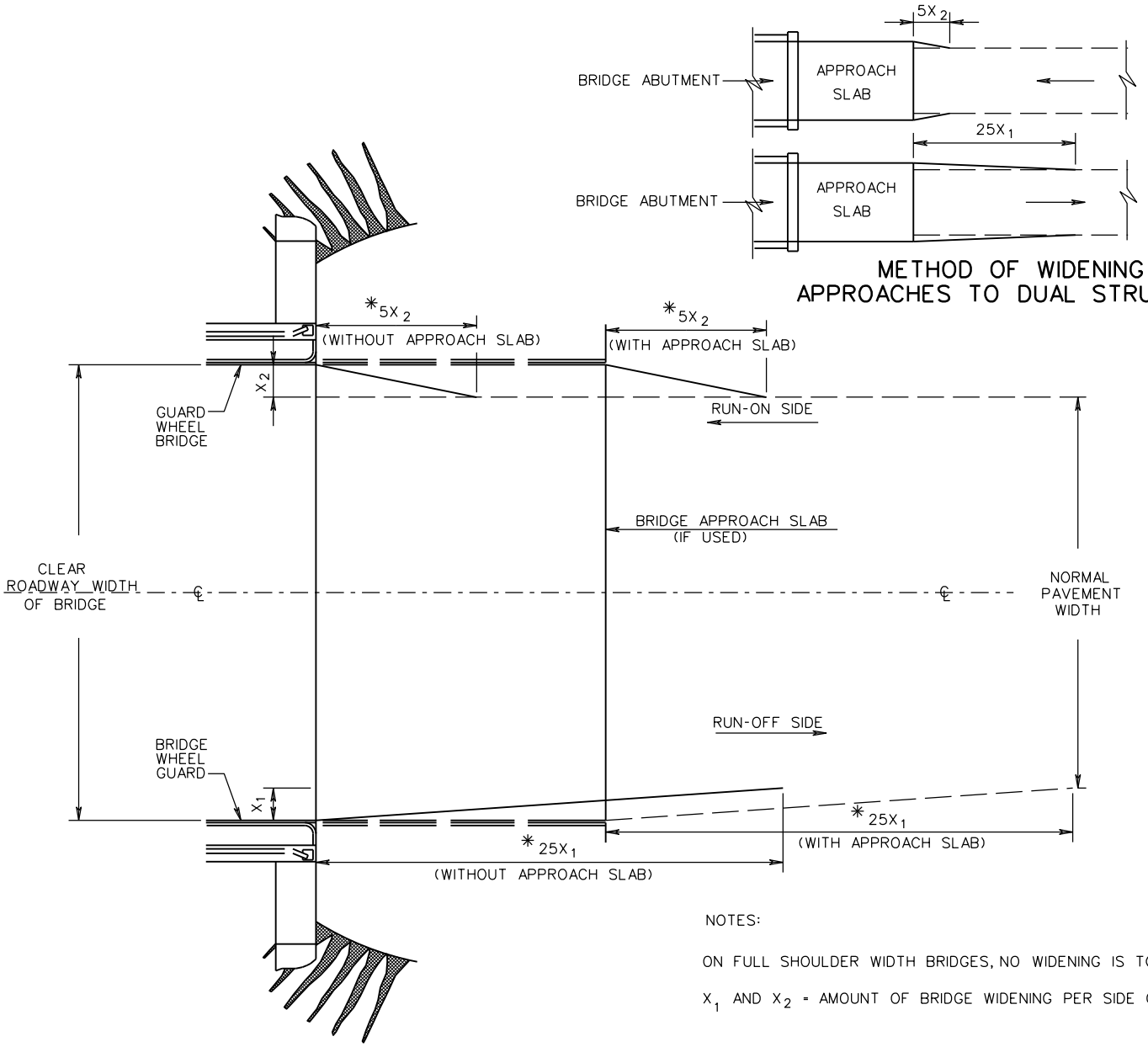
SPECIFICATION REFERENCE
316



LEAVE OUT JOINT
STEEL BAR REINFORCEMENT ONLY

* LONGITUDINAL STEEL TO CONTINUE THROUGH JOINT.

VDOT ROAD AND BRIDGE STANDARDS	A COPY OF THE ORIGINAL SEALED AND SIGNED DRAWING IS ON FILE IN THE CENTRAL OFFICE. 9" THICK CONTINUOUSLY REINFORCED CONC. PAVE. (LEAVE OUT JOINT DETAIL) VIRGINIA DEPARTMENT OF TRANSPORTATION	SPECIFICATION REFERENCE
SHEET 3 OF 3 301.12	REVISION DATE 7/12	316



NOTES:

ON FULL SHOULDER WIDTH BRIDGES, NO WIDENING IS TO BE PROVIDED.

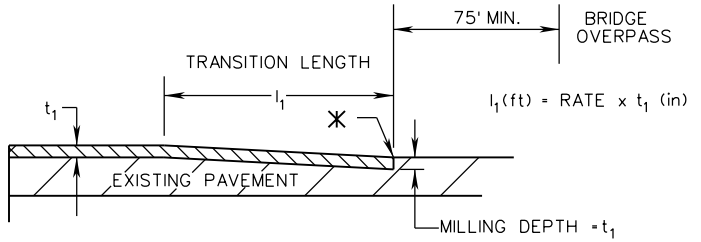
X_1 AND X_2 = AMOUNT OF BRIDGE WIDENING PER SIDE (10' MAXIMUM).

* IF BRIDGE DRAINAGE APRONS ARE REQUIRED THE PAVEMENT WIDENING IS TO BE APPLIED AT THE END OF THE DRAINAGE APRON FARTHEST FROM THE ABUTMENT BACKWALL.

SPECIFICATION REFERENCE	METHOD OF WIDENING BRIDGE APPROACH PAVEMENT	VDOT ROAD AND BRIDGE STANDARDS
NONE	VIRGINIA DEPARTMENT OF TRANSPORTATION	REVISION DATE 7/12 · SHEET 1 OF 1 · 303.01

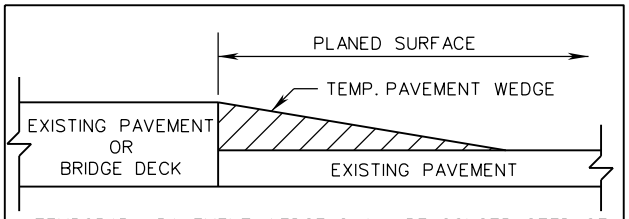
NOTES

1. TIE-IN REQUIREMENTS TO INTERSECTING ROADS OR STREETS SHALL BE IN ACCORDANCE WITH THE CONTRACT DOCUMENTS OR AT THE DIRECTION OF THE ENGINEER.
2. EXISTING PAVEMENT SURFACE SHALL BE PLANED TO TRANSITION THE TOP COURSE OF THE ASPHALT CONCRETE OVERLAY. ANY SUB-COURSE TERMINATION MAY BE NOTCHED INTO THE EXISTING PAVEMENT OR BLENDED WITH THE NEXT COURSE OF PAVEMENT.
3. WHEN THERE IS A SPECIAL PROVISION FOR RIDEABILITY INCLUDED IN THE CONTRACT, A DISTANCE OF 105 FEET (0.02 OF A MILE), MEASURED FROM THE LINE OF THE TIE-IN WILL BE EXEMPTED FROM PAY ADJUSTMENT.
4. TRANSITION SHALL BEGIN/END AT THE PROJECT LIMITS, AT BRIDGE APPROACH SLAB/ABUTMENT (OR AN INTERMEDIATE POINT DETERMINED BY THE ENGINEER), AND A MINIMUM OF 75 FEET FROM A VERTICAL PLANE OF THE NEAREST OUTER FACE OF THE BRIDGE OVERPASS.
5. NO OVERLAY OR MILLING SHALL BE PERMITTED ON THE BRIDGE DECK WITHOUT THE PRIOR WRITTEN APPROVAL OF THE DISTRICT BRIDGE ENGINEER.



SINGLE COURSE OVERLAY TRANSITION GEOMETRY
(NOT TO SCALE)

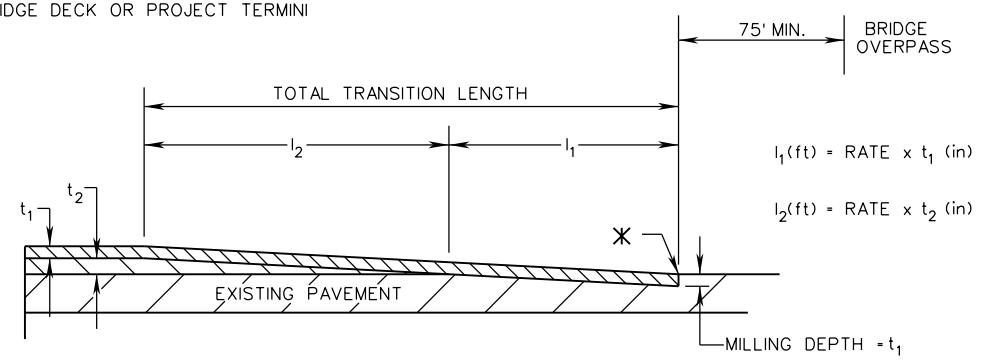
TRANSITION RATE						
	POSTED SPEED MPH					
	25	35	45	55	65	70
RATE (FT/INCH)	20	25	35	40	45	50



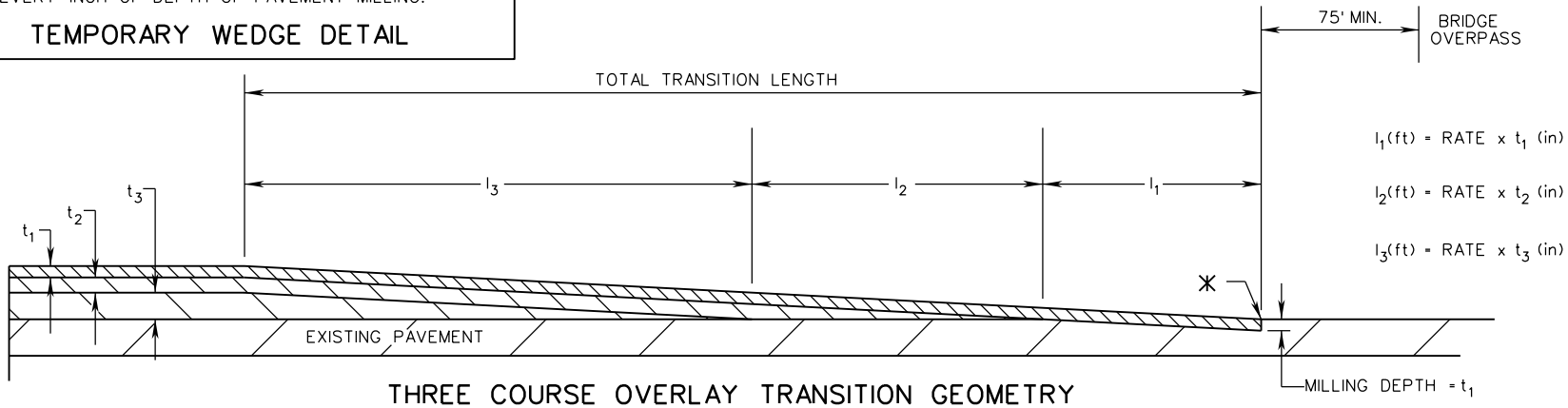
TEMPORARY PAVEMENT WEDGE SHALL BE CONSTRUCTED OF SURFACE MIX ASPHALT A MINIMUM OF 3 FEET IN LENGTH FOR EVERY INCH OF DEPTH OF PAVEMENT MILLING.

TEMPORARY WEDGE DETAIL

✳ BRIDGE DECK OR PROJECT TERMINI



TWO COURSE OVERLAY TRANSITION GEOMETRY
(NOT TO SCALE)



THREE COURSE OVERLAY TRANSITION GEOMETRY
(NOT TO SCALE)

SPECIFICATION REFERENCE
210
315
515

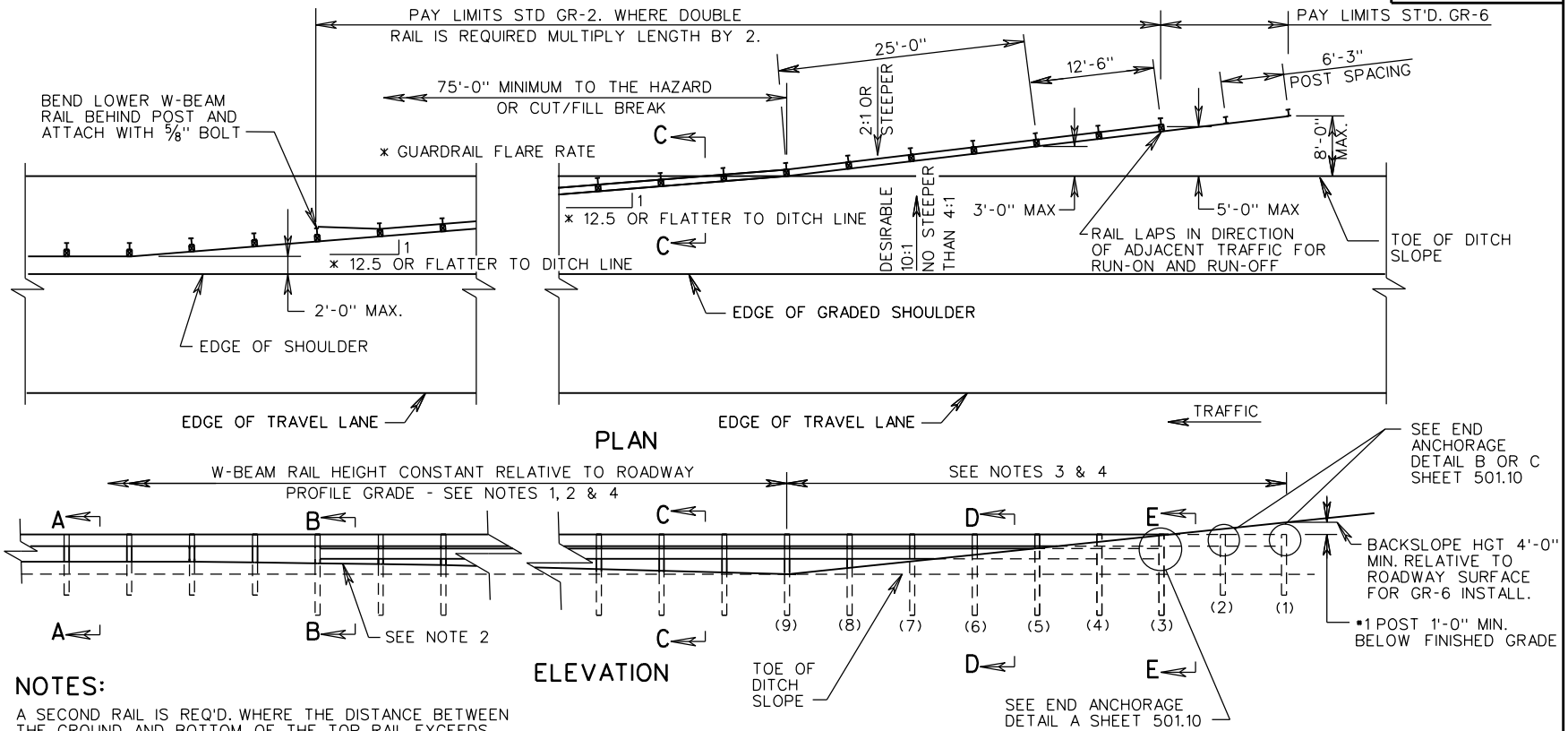
A COPY OF THE ORIGINAL SEALED AND SIGNED DRAWING IS ON FILE IN THE CENTRAL OFFICE.

ASPHALT CONCRETE OVERLAY TRANSITIONS

VIRGINIA DEPARTMENT OF TRANSPORTATION

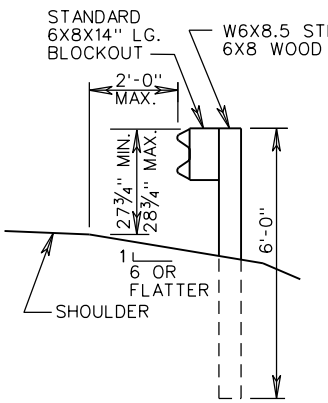
VDOT
ROAD AND BRIDGE STANDARDS

REVISION DATE	SHEET 1 OF 1
7/12	305.01

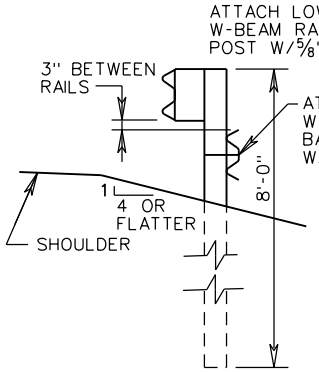


NOTES:

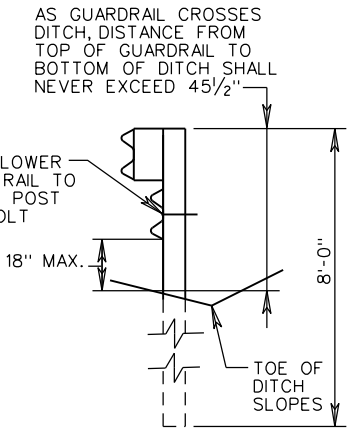
1. A SECOND RAIL IS REQ'D. WHERE THE DISTANCE BETWEEN THE GROUND AND BOTTOM OF THE TOP RAIL EXCEEDS 18" (UP TO THE POINT WHERE THE RAIL CROSSES THE DITCH LINE). THE DOUBLE RAIL WILL EXTEND TO POST #3.
2. MAXIMUM DISTANCE BETWEEN BOTTOM OF THE LOWER W-BEAM RAIL AND GROUND LINE IS 18". WHEN DOUBLE RAIL IS REQ'D., TAPER BOTH W-BEAM RAILS TO MAINTAIN THE 18" DISTANCE FROM THE GROUND.
3. BOTH W-BEAM RAILS TO BE 1'-0" BELOW FINISHED GRADE AT POST #1 (8'-0" OFFSET).
4. A 8'-0" LONG POST MUST BE USED WHEN UPPER AND LOWER W-BEAM RAILS ARE REQUIRED. FROM THE BEGINNING OF THE LOWER RAIL THROUGH POST #3.
5. STANDARD GR-6 TERMINAL TREATMENT MAY BE USED AT THE RUN-ON END OF DIVIDED HIGHWAYS (LEFT AND RIGHT OF TRAFFIC) AND AT THE RUN-ON AND RUN-OFF ENDS ON UNDIVIDED HIGHWAYS.
6. ALL POST SPACING 6'-3" C-C UNLESS OTHERWISE NOTED. THE POST MAY BE W6 X 8.5 STEEL OR 6 X 8 WOOD EXCEPT THE LAST 3 TERMINAL POSTS MUST BE W6 X 8.5 STEEL.
7. FOR SECTIONS D-D & E-E, AND END ANCHORAGE DETAILS SEE SHEET 501.10.
8. ALL TERMINAL RUN-ON OR RUN-OFF INSTALLATIONS SHALL BE INSTALLED WITH RAILS LAPPED IN THE DIRECTION OF ADJACENT TRAFFIC.
9. IF THE BACKSLOPE IS ROCK AND 1:1 OR STEEPER, THE W-BEAM MAY BE ANCHORED PER SOLID ROCK CUT INSTALLATION (DETAIL F).



SECTION A-A



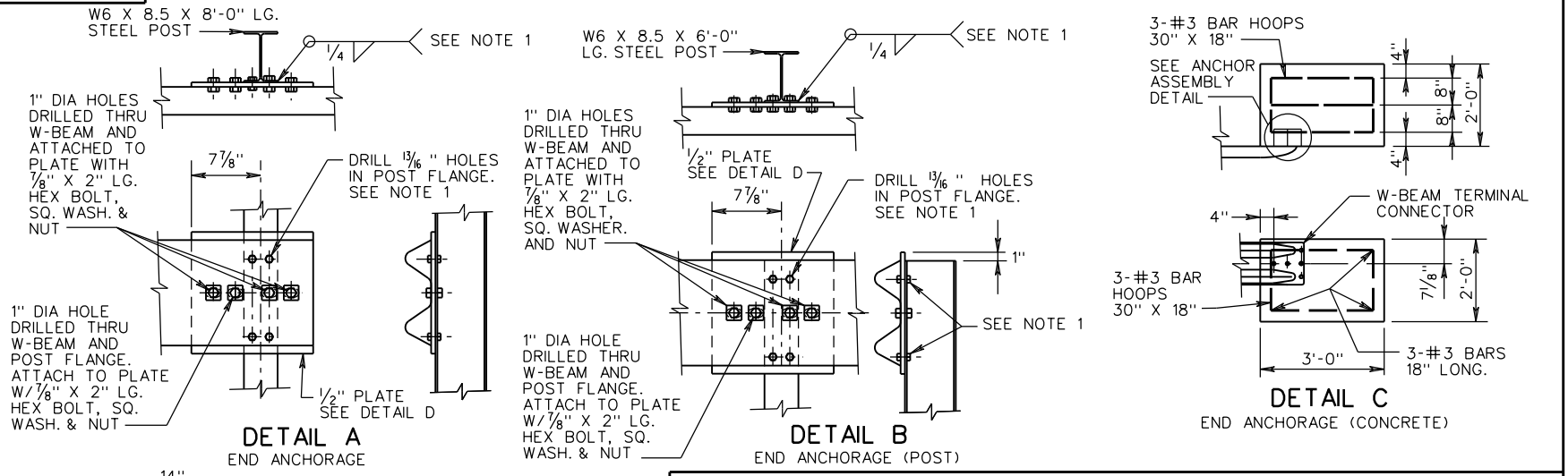
SECTION B-B

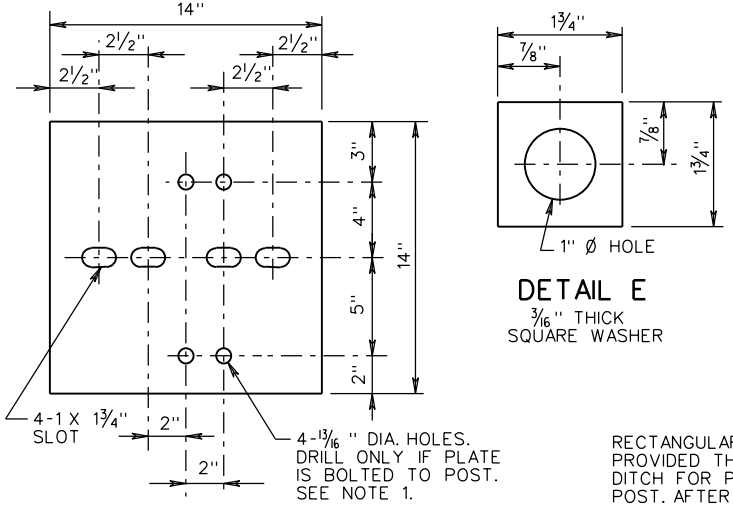


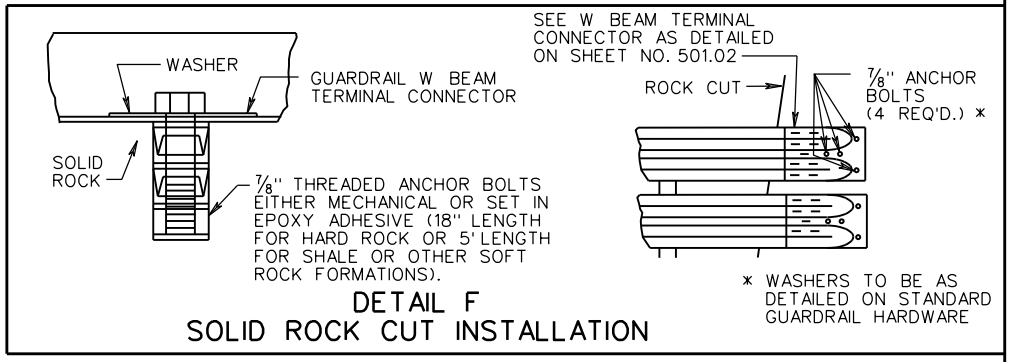
SECTION C-C

SPECIFICATION REFERENCE	A COPY OF THE ORIGINAL SEALED AND SIGNED DRAWING IS ON FILE IN THE CENTRAL OFFICE.	VDOT ROAD AND BRIDGE STANDARDS
221 505	# TERMINAL TREATMENT FOR W-BEAM GUARDRAIL VIRGINIA DEPARTMENT OF TRANSPORTATION	REVISION DATE 7/12
		SHEET 1 OF 2 501.09

GR-6

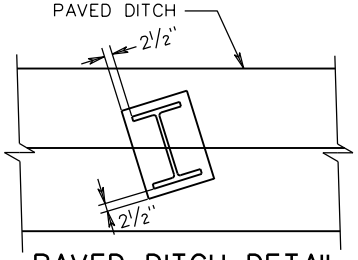


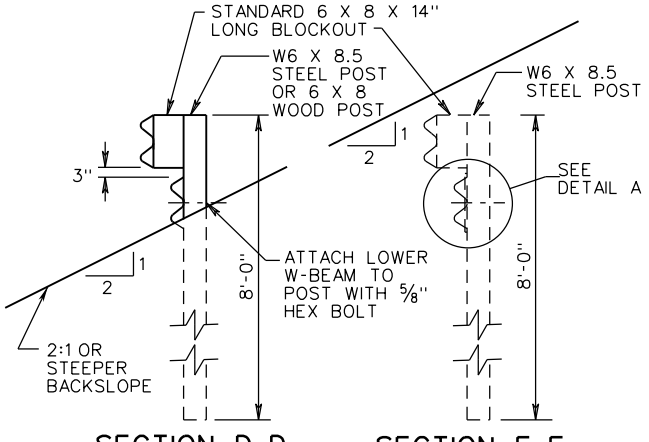




NOTE:

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.





VDOT ROAD AND BRIDGE STANDARDS	A COPY OF THE ORIGINAL SEALED AND SIGNED DRAWING IS ON FILE IN THE CENTRAL OFFICE.		SPECIFICATION REFERENCE
SHEET 2 OF 2	# TERMINAL TREATMENT FOR W-BEAM GUARDRAIL	REVISION DATE	221
501.10	VIRGINIA DEPARTMENT OF TRANSPORTATION	7/12	505

NOTES:

1. GUARDRAIL TERMINAL, STD. GR-7 IS TO BE SRT 350 (SIMILAR TO AS SHOWN) MANUFACTURED BY TRINITY INDUSTRIES, THE FLEAT 350 MANUFACTURED BY ROAD SYSTEMS, INC., OR OTHER VDOT APPROVED EQUAL MEETING NCHRP 350 TESTING CRITERIA.
2. ALL TERMINALS SHALL BE INSTALLED ACCORDING TO THE MANUFACTURER'S INSTALLATION INSTRUCTIONS AND THE FOLLOWING VDOT REQUIREMENTS:

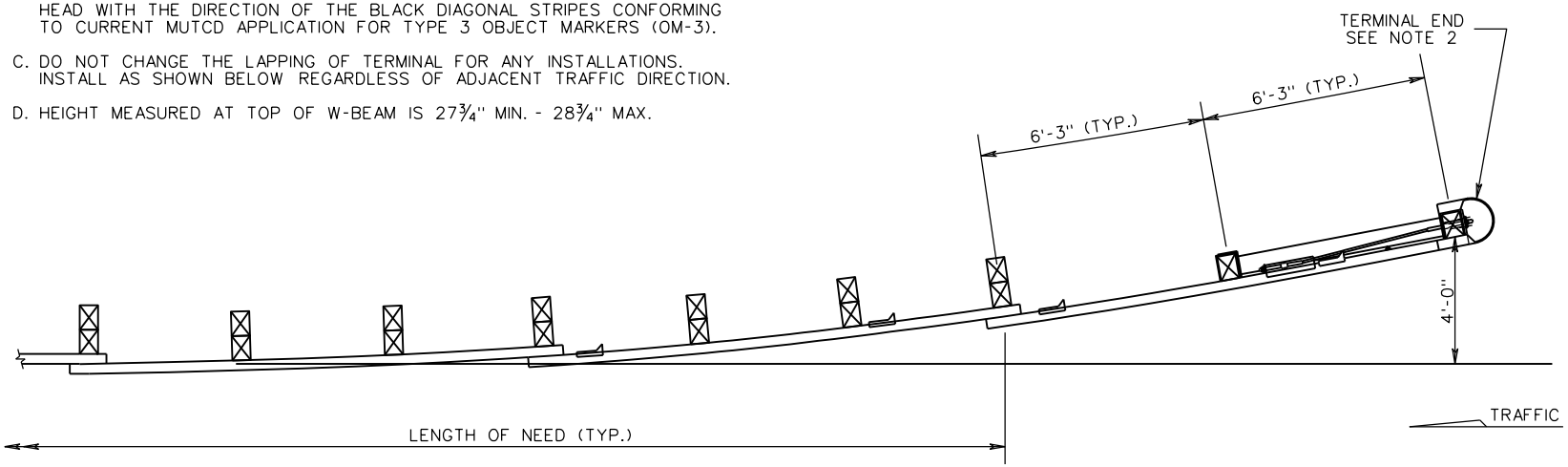
   A. ALL STANDARD GR-7 TERMINALS SHALL BE INSTALLED WITH A 4 FT. OFFSET.

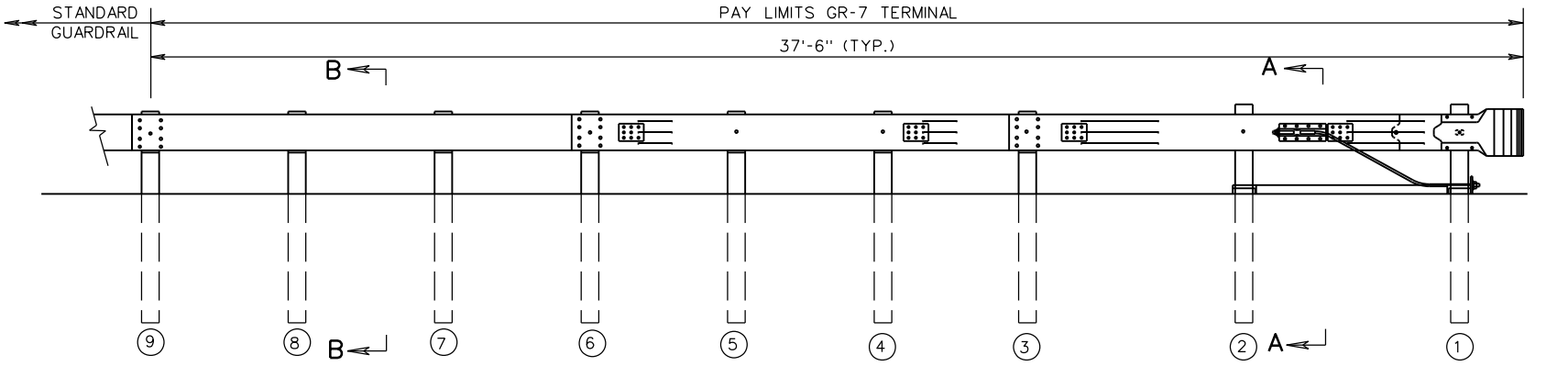
   B. YELLOW 8" X 36" REFLECTIVE SHEETING, IN ACCORDANCE WITH VDOT SPECIFICATIONS, SHOULD BE APPLIED IN TERMINALS EMPLOYING W-BEAM END SECTIONS. FOR TERMINALS EMPLOYING IMPACT (EXTRUDER) HEADS, AMBER (YELLOW) REFLECTIVE SHEETING WITH BLACK DIAGONAL STRIPES SHOULD BE APPLIED TO THE FULL AREA INSIDE THE IMPACT HEAD WITH THE DIRECTION OF THE BLACK DIAGONAL STRIPES CONFORMING TO CURRENT MUTCD APPLICATION FOR TYPE 3 OBJECT MARKERS (OM-3).

   C. DO NOT CHANGE THE LAPPING OF TERMINAL FOR ANY INSTALLATIONS. INSTALL AS SHOWN BELOW REGARDLESS OF ADJACENT TRAFFIC DIRECTION.

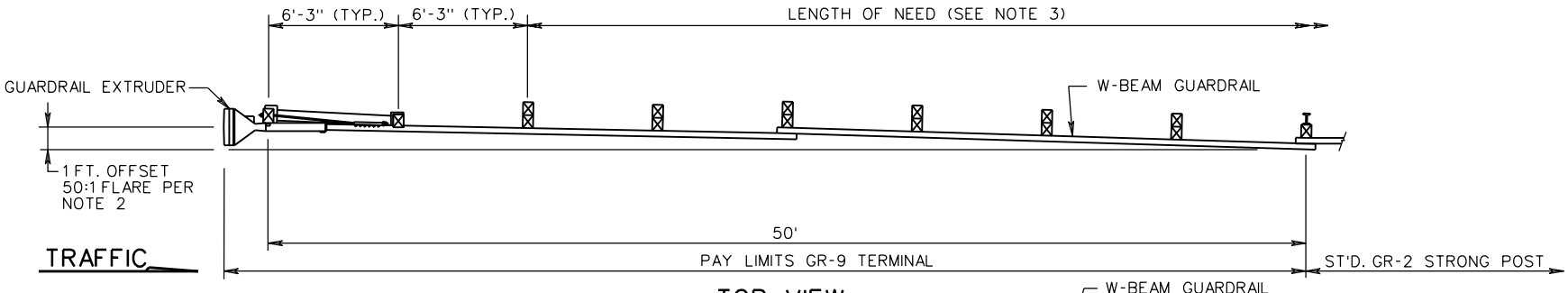
   D. HEIGHT MEASURED AT TOP OF W-BEAM IS 27¾" MIN. - 28¾" MAX.

3. IF YOU CANNOT GET THE NECESSARY CLEAR RUNOUT AREA FOR THE GR-7 TERMINAL, CONSIDER ALTERNATIVE TERMINAL OPTIONS.
4. THIS DRAWING IS REPRESENTATIONAL ONLY. DETAILS, DIMENSIONS, QUANTITIES, AND OTHER INFORMATION NOT SHOWN WILL VARY FOR EACH MANUFACTURER. SEE INDIVIDUAL MANUFACTURER'S PLANS FOR THIS INFORMATION.

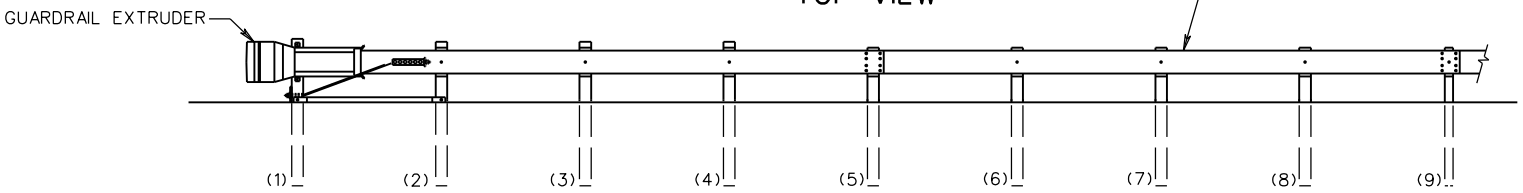




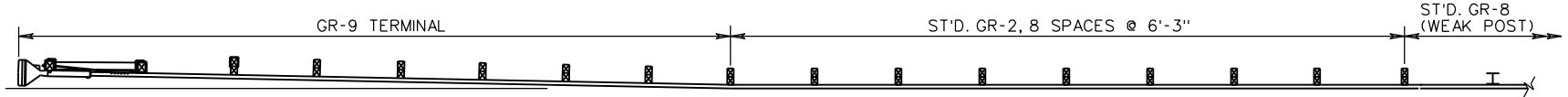
SPECIFICATION REFERENCE	A COPY OF THE ORIGINAL SEALED AND SIGNED DRAWING IS ON FILE IN THE CENTRAL OFFICE.	VDOT ROAD AND BRIDGE STANDARDS
221 505	# BREAKAWAY CABLE TERMINAL (4' FLARE) VIRGINIA DEPARTMENT OF TRANSPORTATION	REVISION DATE 07/12 · SHEET 1 OF 3 · 501.11



TOP VIEW



ELEVATION



TRANSITION FROM GR-9 TERMINAL TO WEAK POST (STANDARD GR-8) GUARDRAIL

NOTES:

1. ALTERNATE BREAKAWAY CABLE TERMINAL (GR-9) IS TO BE ET-PLUS (SIMILAR TO AS SHOWN), OR CAT (ST'D. MB-3 TERMINAL OPTION) AS MANUFACTURED BY TRINITY HIGHWAY PRODUCTS, LLC., BRAKEMASTER (ST'D. MB-3 TERMINAL OPTION) AS MANUFACTURED BY ENERGY ABSORPTION SYSTEMS, INC., THE SKT-350 AS MANUFACTURED BY ROAD SYSTEMS, INC., OR OTHER VDOT APPROVED EQUAL MEETING NCHRP 350 TESTING CRITERIA.

2. ALL TERMINALS SHALL BE INSTALLED ACCORDING TO THE MANUFACTURER'S INSTALLATION INSTRUCTIONS AND THE FOLLOWING VDOT REQUIREMENTS:

   A. ALL STANDARD GR-9 TERMINALS (SIMILAR TO AS SHOWN ABOVE) SHALL BE INSTALLED WITH A 1 FT. OFFSET ACCOMPLISHED WITH A 50:1 FLARE TO PREVENT THE GUARDRAIL EXTRUDER FROM ENCROACHING ON THE SHOULDER FOR 3R WORK WHERE RIGHT OF WAY IS LIMITED, THE OFFSET CAN BE DECREASED AS DIRECTED BY THE ENGINEER.

   B. DIRECTION OF THE REFLECTIVE TAPE ON THE EXTRUDER SHALL CONFORM TO MUTCD APPLICATION FOR DIAGONAL STRIPES ON OBJECT MARKERS AND BRIDGE END PANELS. COLOR OF TAPE SHALL BE AMBER (YELLOW).

   C. DO NOT CHANGE THE LAPPING OF TERMINAL FOR ANY INSTALLATIONS. INSTALL AS SHOWN ABOVE REGARDLESS OF ADJACENT TRAFFIC DIRECTION.

   D. HEIGHT MEASURED AT TOP OF W-BEAM IS 27¾" MIN. - 28¾" MAX.

3. IF THE CALCULATED LENGTH OF NEED CANNOT BE MET FOR THE SITES OF RETROFIT, MAINTENANCE, OR UPGRADE OF TERMINALS, PROVIDE AS MUCH DISTANCE AS POSSIBLE TO THE HAZARD.

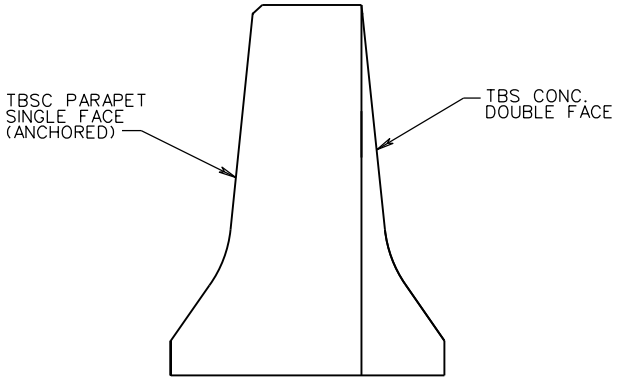
4. THIS DRAWING IS REPRESENTATIONAL ONLY. DETAILS, DIMENSIONS, QUANTITIES, AND OTHER INFORMATION NOT SHOWN WILL VARY FOR EACH MANUFACTURER. SEE INDIVIDUAL MANUFACTURER'S PLANS FOR THIS INFORMATION.

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

ALTERNATE BREAKAWAY CABLE TERMINAL
NO FLARE

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE
505



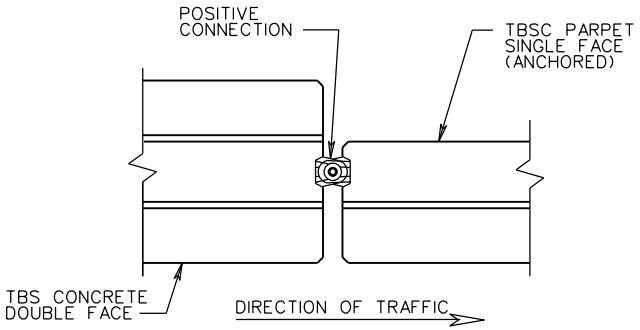
SECTION B-B

NOTES:

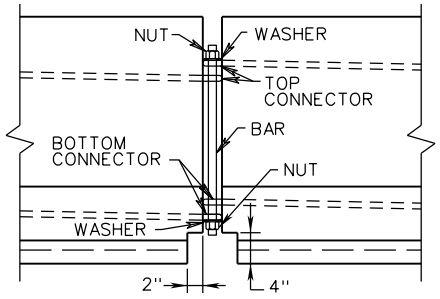
1. BASIS OF PAYMENT:
   TRAFFIC BARRIER SERVICE LATERAL SUPPORT WILL BE MEASURED AND PAID FOR IN UNITS OF EACH COMPLETE IN PLACE AND SHALL INCLUDE FURNISHING AND PLACING PRECAST CONCRETE BARRIERS (TBS CONCRETE) AND MAINTENANCE, REMOVAL WHEN NO LONGER NECESSARY, AND ALL MATERIALS, LABOR, TOOLS, EQUIPMENT, AND INCIDENTALS NECESSARY TO COMPLETE THE WORK.

2. FOR POSITIVE CONNECTION DETAILS AND DIMENSIONS SEE STANDARD MB-INS, SHEETS 502.20 - 502.22

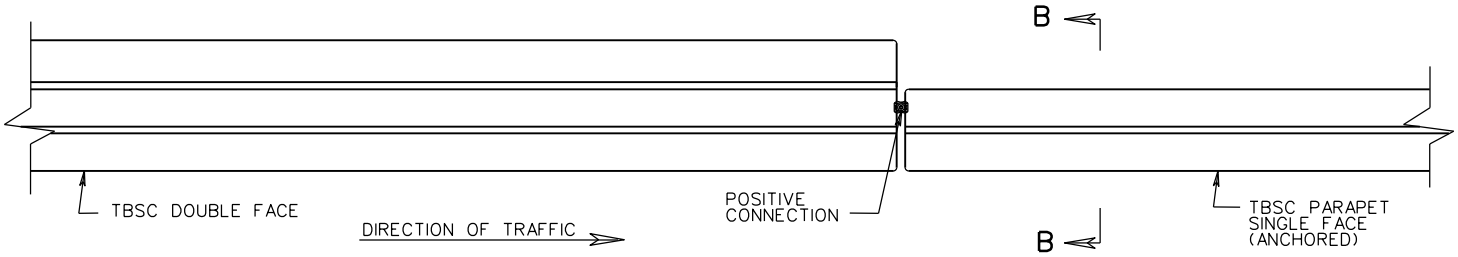
3. FOR DIMENSIONS NOT SHOWN, REFER TO ST'D. MB-7D AND MB-10A.



PLAN OF POSITIVE CONNECTION



ELEVATION OF POSITIVE CONNECTION



PLAN VIEW
METHOD A

VDOT
ROAD AND BRIDGE STANDARDS

SHEET 4 OF 5 | REVISION DATE 7/12

502.23

BUTTING TRAFFIC BARRIER SERVICE TO SINGLE FACE PARAPET SERVICE

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE

STANDARD	TITLE		PAGE
CS-1, 1A	TYPICAL METHODS OF GRADING SIDE SLOPES		701.01
CS-2	SUGGESTED DRAINAGE TREATMENT AT BEGINNING OF FILLS		701.02
CS-2A	TYPICAL METHODS OF GRADING SIDE SLOPES		701.03
CS-3	TYPICAL METHODS OF GRADING SIDE SLOPES		701.04
CS-3A	TYPICAL METHODS OF GRADING SIDE SLOPES		701.05
CS-3B	TYPICAL METHODS OF GRADING SIDE SLOPES		701.06
CS-4	TYPICAL METHODS OF GRADING SIDE SLOPES		701.07
CS-4A	TYPICAL METHODS OF GRADING SIDE SLOPES		701.08
CS-4B	TYPICAL METHODS OF GRADING SIDE SLOPES		701.09
CS-4C	TYPICAL METHODS OF GRADING SIDE SLOPES		701.10
CS-4E	TYPICAL METHODS OF GRADING SIDE SLOPES		701.11
GS-10	MINIMUM DESIGN CRITERIA FOR TEMPORARY DETOURS (MOT)	SEE VDOT'S ROAD DESIGN MANUAL FOR GS STANDARDS	VOID
GS-11	STANDARD SHOULDER DESIGN FOR ALL SYSTEMS EXCEPT LOCAL ROADS AND STREETS	SEE VDOT'S ROAD DESIGN MANUAL FOR GS STANDARDS	VOID
GS-12	STANDARD SHOULDER DESIGN FOR LOCAL ROADS AND STREETS	SEE VDOT'S ROAD DESIGN MANUAL FOR GS STANDARDS	VOID
GS-13	STANDARD GRADED MEDIAN DESIGNS	SEE VDOT'S ROAD DESIGN MANUAL FOR GS STANDARDS	VOID

INDEX OF SHEETS
SECTION 700-GEOMETRIC DESIGN

VIRGINIA DEPARTMENT OF TRANSPORTATION

VDOT
ROAD AND BRIDGE STANDARDS

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7/12	700.01

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SECTION 800-TRANSITION CURVES

VIRGINIA DEPARTMENT OF TRANSPORTATION

VDOT
ROAD AND BRIDGE STANDARDS

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7/12	800.01

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SECTION 800-TRANSITION CURVES

VIRGINIA DEPARTMENT OF TRANSPORTATION

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SECTION 800-TRANSITION CURVES

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VDOT
ROAD AND BRIDGE STANDARDS

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SECTION 800-TRANSITION CURVES

VIRGINIA DEPARTMENT OF TRANSPORTATION

GENERAL CONDITION

ALL ORIGINAL CROSS SECTIONS SHALL BE TAKEN FROM THE BASELINE AT STATIONS, PLUS FIFTIES, AND UNUSUAL BREAKS IN THE GROUND AS ON TANGENT ALIGNMENT.

WHERE A PART OR ALL OF A SUPERELEVATION TRANSITION CURVE FALLS ON A VERTICAL CURVE, ELEVATIONS ON THE VERTICAL CURVE SHOULD BE COMPUTED FOR THE POSITIONS GIVEN ON SHEET 803.15 FOR CROWN TRANSITIONS, SHEET 803.16 FOR URBAN PROJECTS AND SHEET 803.17 FOR RURAL PROJECTS. THESE ELEVATIONS AND PLUSES SHOULD BE SHOWN ON THE PLANS FOR THE CONVENIENCE OF THE SURVEY PARTY IN STAKING OUT THE PROJECT. THROUGHOUT THESE SECTIONS OF THE GRADE, ELEVATIONS AT EVEN STATIONS AND PLUS FIFTIES SHOULD BE OMITTED.

SLOPE STAKES SHOULD BE SET AT THE POSITIONS ON THE TRANSITION GIVEN ON SHEETS 803.15, 803.16 AND 803.17 AND GROUND CROSS SECTIONS TAKEN AT THESE POSITIONS OMITTING THE STATIONS AND PLUS FIFTIES THROUGHOUT THE TRANSITION. IF UNUSUAL BREAKS IN THE GROUND OCCUR, ADDITIONAL SECTIONS SHOULD, OF COURSE, BE TAKEN. ADDITIONAL SECTIONS SHOULD ALSO BE TAKEN WHERE LOCATION IS THROUGH ROCK CUT IN ANTICIPATION OF UNUSUAL BREAKAGE WHICH MAY OCCUR DURING CONSTRUCTION.

AFTER ROUGH GRADING HAS BEEN DONE, FINE GRADING (BLUE TOP) AND FORM STAKES SHOULD BE SET AT THE POSITIONS GIVEN ON SHEET 803.15 FOR CROWN TRANSITIONS, SHEET 803.16 FOR URBAN PROJECTS OR AS GIVEN ON SHEET 803.17 FOR RURAL PROJECTS.

FINAL CROSS SECTIONS SHOULD, OF COURSE, BE TAKEN AT THOSE POSITIONS AT WHICH THE SLOPE STAKE SECTIONS WERE TAKEN. WHERE UNUSUAL BREAKAGE IN ROCK OCCURS, AND THIS WAS NOT ANTICIPATED, ADDITIONAL FINAL SECTIONS SHOULD BE TAKEN AND ORIGINAL GROUND SECTIONS INTERPOLATED.

BASELINE STAKES SHOULD BE SET AT ALL P.C.'S, P.T.'S, T.S.'S, S.T.'S, S.C.'S, AND C.S.'S IN STAKING OUT ALIGNMENT BUT SLOPE STAKES NEED NOT BE SET NOR CROSS SECTIONS TAKEN AT P.C.'S OR P.T.'S EXCEPT WHERE CALLED FOR IN THE ACCOMPANYING TABLES. THE TRANSITION WILL TAKE ITS FORM FROM THE POSITIONS GIVEN ON SHEETS 803.16 AND 803.17.

THE RIGHT OF WAY SHALL, IN ALL CASES, BE REFERENCED FROM THE BASELINE.

THE DESIGNER SHOULD EXERCISE CAUTION IN THE USE OF COMPOUND AND REVERSE CURVES UNLESS TOPOGRAPHICAL OR RIGHT OF WAY RESTRICTIONS MAKE THEIR USE APPROPIATE. THE USE OF BROKEN-BACK CURVES SHOULD BE AVOIDED EXCEPT WHERE VERY UNUSUAL TOPOGRAPHICAL OR RIGHT OF WAY CONDITIONS MAKE OTHER ALTERNATIVES IMPRACTICAL. THE USE OF BROKEN-BACK CURVES MAY REQUIRE A DESIGN EXCEPTION FROM THE STATE LOCATION AND DESIGN ENGINEER. SEE SHEETS 803.11 THRU 803.14 FOR GENERAL INFORMATION ON COMPOUND, REVERSE AND BROKEN-BACK CURVE INFORMATION.

A DESIGN EXCEPTION IS NOT REQUIRED WHEN USING VALUES FROM SHEETS 803.23 THRU 803.44 SINCE THESE TABLES WERE DERIVED WITHIN AASHTO GUIDELINES.

REFER TO CHAPTER 4 OF AASHTO'S A POLICY ON GEOMETRIC DESIGN OF HIGHWAYS AND STREETS FOR INFORMATION ON THE USE OF 18' PAVEMENT WIDTHS (9' LANE WIDTHS).

ALL TANGENT RUNOUT SECTION (Lt) VALUES AND SUPERELEVATION RUNOFF LENGTHS (Lr) LISTED IN THE TABLES HAVE BEEN ROUNDED UP TO THE NEAREST FOOT. ALL Lt VALUES ARE BASED ON A 2% CROWN.

STANDARD SYMBOLS

LOCATION ℄.....ALIGNMENT ON WHICH THE PROPOSED RIGHT-OF-WAY AND CONSTRUCTION IS BASED.
STANDARD PAVEMENT.....THE TYPICAL PAVEMENT SECTION TO BE SHOWN ON THE ROAD PLANS.
P.C. .....POINT OF BEGINNING OF BASELINE CIRCULAR CURVE.
P.T. .....POINT OF ENDING OF BASELINE CIRCULAR CURVE.
P.C.C. .....POINT OF BASELINE COMPOUND CURVATURE.
P.R.C.....POINT OF BASELINE REVERSE CURVE.
T.S. .....POINT OF CHANGE FROM TANGENT TO TRANSITION CURVE. (TANGENT TO SPIRAL)
S.C. .....POINT OF CHANGE FROM TRANSITION CURVE TO CIRCULAR CURVE. (SPIRAL TO CIRCULAR)
C.S. .....POINT OF CHANGE FROM CIRCULAR CURVE TO TRANSITION CURVE. (CIRCULAR TO SPIRAL)
S.T. .....POINT OF CHANGE FROM TRANSITION CURVE TO TANGENT. (SPIRAL TO TANGENT)
RADIUS .....RADIUS OF BASELINE CIRCULAR CURVE.
DV .....APPROXIMATE MAXIMUM SAFE SPEED IN MILES PER HOUR USING STANDARD RATE OF SUPER-ELEVATION.
NC .....APPROXIMATE MAXIMUM SAFE SPEED IN MILES PER HOUR WITH NO SUPERELEVATION. FACTORS APPLY ONLY TO URBAN LOW SPEED CONDITIONS.
Lr .....LENGTH OF TRANSITION CURVE MEASURED ALONG BASELINE. WHERE NO TRANSITION CURVE IS APPLIED Lr IS LENGTH OF SUPERELEVATION RUNOFF SECTION.
W OR PW .....WIDTH OF STANDARD PAVEMENT.
ZT .....DISTANCE FROM TRANSITIONED BASELINE TO EDGES OF TRANSITIONED PAVEMENT
w .....MAXIMUM TOTAL PAVEMENT WIDENING.
E .....RATE OF SUPERELEVATION.
F .....SAFE SIDE FRICTION FACTOR.
S .....AMOUNT OF SUPERELEVATION TO BE APPLIED TO THE BASELINE GRADE TO OBTAIN THE ELEVATIONS OF THE EDGES OF TRANSITIONED PAVEMENT.
C .....DIFFERENCE IN ELEVATION BETWEEN BASELINE (CENTER) AND EDGE OF PAVEMENT FOR STANDARD PAVEMENT CROWN.
Lt .....STANDARD PAVEMENT CROWN TRANSITION OR TANGENT RUNOUT SECTION.
CP .....CHORD POINT (1/10 INCREMENTS OF TRANSITION CURVE).
NPC.....NORMAL PAVEMENT CROWN.

ALL DISTANCES (HORIZONTAL AND VERTICAL) ARE MEASURED IN FEET.

VDOT
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803.02

TRANSITION CURVES FOR RURAL AND URBAN HIGHWAYS AND STREET CONDITIONS

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE

RURAL CONDITION

RURAL CONDITIONS APPLY TO INTERSTATE, ARTERIAL, PRIMARY AND SECONDARY SYSTEMS OR TO ANY OTHER ROAD WITH RURAL TYPE DESIGN AND OPERATING CONDITIONS.

THESE TABLES CONTAIN THE MINIMUM ALLOWABLE SUPERELEVATION, TRANSITION LENGTHS, AND WIDENING CORRECTIONS FOR STANDARD RURAL PAVEMENT WIDTHS THROUGH A RANGE OF DESIGN VELOCITIES CONSIDERED MOST LIKELY TO BE USED IN RURAL HIGHWAY DESIGN.

DEFINITIONS FOR THE STANDARD SYMBOLS USED THROUGHOUT THESE TABLES ARE FOUND ON SHEET 803.02.

FOR MINIMUM DESIGN FACTORS FOR VARIOUS DESIGN SPEEDS FOR RURAL CONDITIONS SEE SHEETS 803.32 THRU 803.44.

ON CURVES WITH NO PAVEMENT WIDENING. PAVEMENT WILL BE SUPERELEVATED BY AN AMOUNT EQUAL TO THE RATE SHOWN IN THE TABLES. SEE SHEET 803.06 FOR A GRAPHICAL ILLUSTRATION OF THE APPLICATION OF THIS CORRECTION.

ON CURVES WITH PAVEMENT WIDENING, WIDENING WILL BE ACHEIVED BY EQUAL WIDENING OF BOTH EDGES OF PAVEMENT OVER THE SUPERELEVATION RUNOFF LENGTH. SEE PAGE 803.05 FOR DETAILS.

WHEN USING COMPOUND OR REVERSE CURVES WITH RURAL CONDITIONS, SEE SHEETS 803.11, 803.12, 803.13, AND 803.14 FOR DETAILS OF TRANSITIONS.

FOR CURVE RADII NOT LISTED IN TABLES, REFER TO SHEET 803.20 TO CALCULATE SUPERELEVATION RUNOFF LENGTH (Lr) AND PAVEMENT WIDENING (w).

Lr AND E SHALL BE SHOWN ON THE PLANS FOR ALL CURVES.

FOR ADDITIONAL GENERAL INSTRUCTIONS (BOTH URBAN AND RURAL) SEE SHEET 803.01.

TC-5.11

URBAN CONDITION

URBAN CONDITIONS APPLY TO URBAN STREET SYSTEMS AND ANY OTHER ROAD WITH PRESENT OR FUTURE URBAN STREET OPERATING CONDITIONS.

THESE TABLES CONTAIN THE MINIMUM SUPERELEVATION RATES AND TRANSITION LENGTHS FOR STANDARD URBAN PAVEMENT WIDTHS THROUGH A RANGE OF DESIGN VELOCITIES CONSIDERED MOST LIKELY TO BE USED IN URBAN ROAD DESIGN.

DEFINITIONS FOR THE STANDARD SYMBOLS USED THROUGHOUT THESE TABLES ARE FOUND ON SHEET 803.02.

A TABLE FOR "LOW SPEED URBAN" DESIGNS IS ON SHEET 803.23 WITH A RANGE OF STANDARD PAVEMENT WIDTHS (W), TRANSITION LENGTHS (Lr), AND RADII OF CURVE WHEN SUPERELEVATED BY AN AMOUNT EQUAL TO THE NORMAL CROWN AND THE APPROXIMATE MAXIMUM SAFE SPEEDS (DV) AFFORDED THEREBY. VALUES IN THIS TABLE CAN BE USED ON STREETS WITH OPERATING SPEEDS LESS THAN OR EQUAL TO 45 MPH. ALSO SHOWN ARE THE APPROXIMATE MAXIMUM SAFE SPEEDS (NC) WITH NO SUPERELEVATION. VALUES FOR (NC) CAN BE USED ON URBAN ARTERIAL, COLLECTOR, AND LOCAL STREETS.

FOR MINIMUM DESIGN FACTORS FOR VARIOUS DESIGN SPEEDS FOR URBAN CONDITIONS SEE SHEETS 803.24 THRU 803.31

THE USE OF SPIRAL TRANSITIONS FOR COMPOUND AND REVERSE CURVES ON URBAN ROADWAYS SHOULD BE AVOIDED. HOWEVER, THE ENGINEER DOES HAVE LATITUDE IN THE USE OF SPIRAL TRANSITIONS IF THE GEOMETRICS ARE WARRANTED. SHOULD SPIRAL TRANSITIONS BE UTILIZED, SEE PAGE 803.13 AND 803.14 FOR DETAILS. WHEN URBAN CONDITIONS APPLY THERE WILL BE NO PAVEMENT WIDENING. THE LENGTH OF TRANSITION (Lr) DETERMINES THE LENGTH OF SUPERELEVATION TRANSITION THROUGH WHICH THE OUTER EDGE OF PAVEMENT IS RAISED ABOVE THE BASELINE GRADE TO A MAXIMUM OF $E(\frac{W}{2})$. SEE SHEET 803.07 FOR A GRAPHICAL ILLUSTRATION OF THE APPLICATION OF THIS CORRECTION.

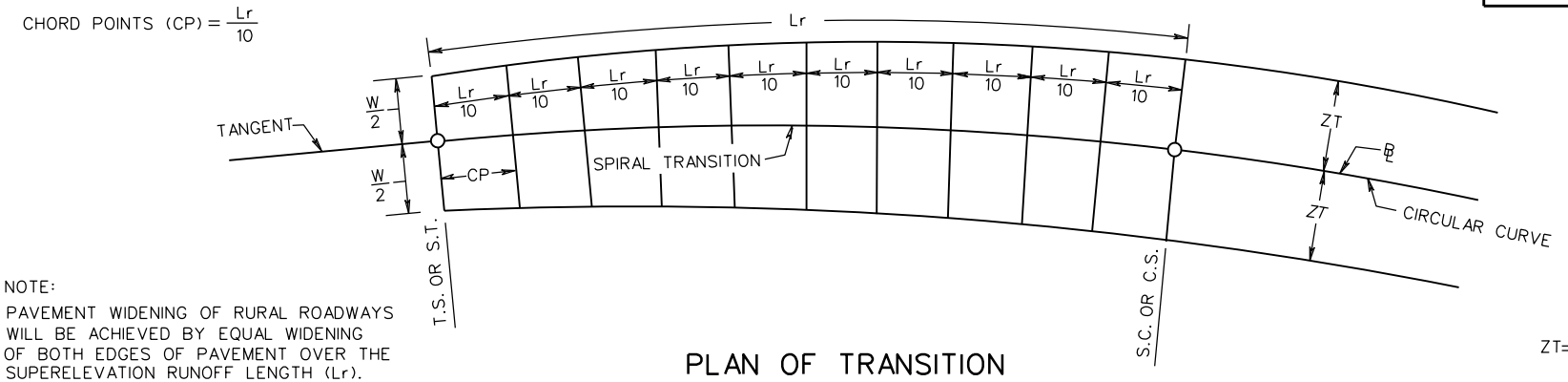
FOR CURVE RADII NOT LISTED IN TABLES REFER TO SHEET 803.20 TO CALCULATE TRANSITION LENGTHS (Lr).

Lr SHALL BE SHOWN ON THE PLANS FOR ALL CURVES.

E SHALL BE SHOWN ON THE PLANS FOR ALL CURVES WITH URBAN STREET CONDITIONS.

FOR ADDITIONAL GENERAL INSTRUCTIONS (BOTH URBAN AND RURAL) SEE SHEET 803.01.

TC-5.11

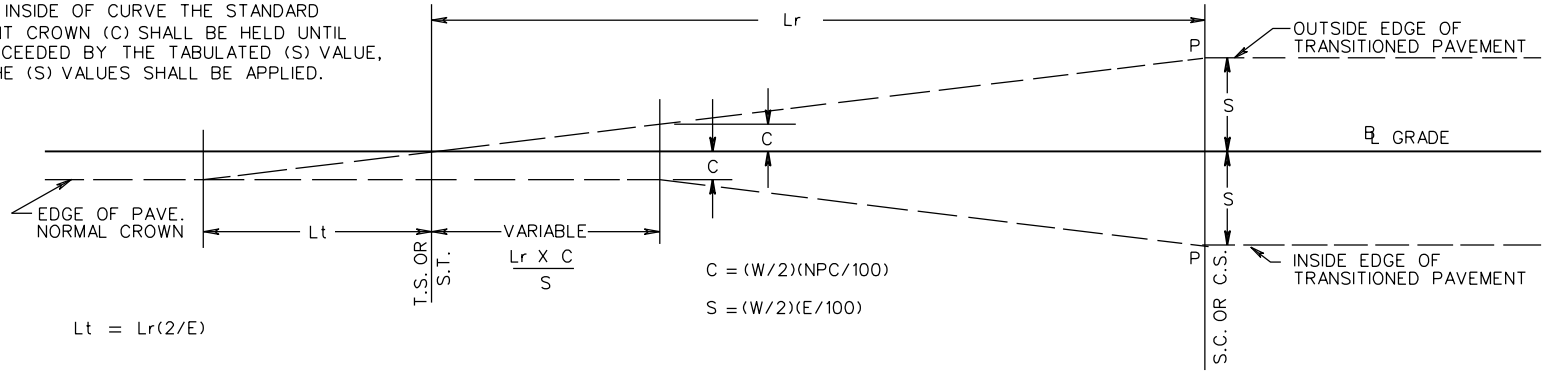


NOTE:
PAVEMENT WIDENING OF RURAL ROADWAYS WILL BE ACHIEVED BY EQUAL WIDENING OF BOTH EDGES OF PAVEMENT OVER THE SUPERELEVATION RUNOFF LENGTH (Lr).

PLAN OF TRANSITION

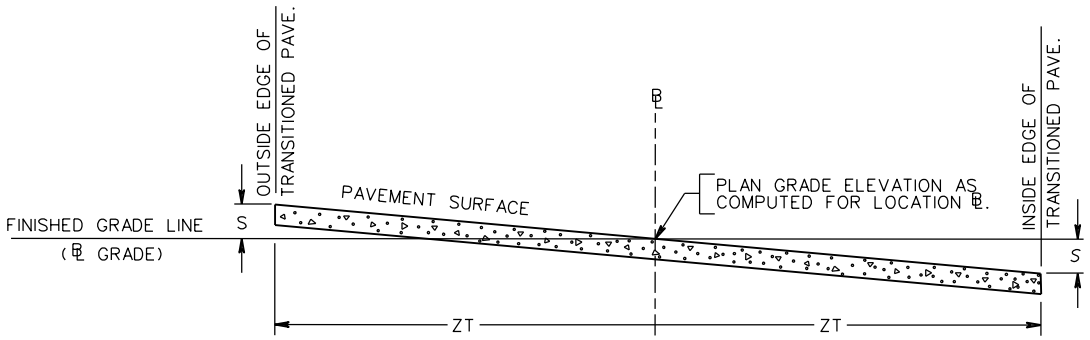
$ZT = \frac{W + w}{2}$

NOTE:
ON THE INSIDE OF CURVE THE STANDARD PAVEMENT CROWN (C) SHALL BE HELD UNTIL IT IS EXCEEDED BY THE TABULATED (S) VALUE, THEN THE (S) VALUES SHALL BE APPLIED.



PROFILE OF TRANSITION

NOTE: SHORT VERTICAL CURVES SHOULD BE INSERTED BY EYE AT POINTS (P) IF CONSIDERED NECESSARY.



CROSS SECTION THRU TRANSITION

SPECIFICATION REFERENCE

DETAIL FOR TRANSITIONED ℄ RURAL CONDITION WITH PAVEMENT WIDENING

VIRGINIA DEPARTMENT OF TRANSPORTATION

VDOT
ROAD AND BRIDGE STANDARDS

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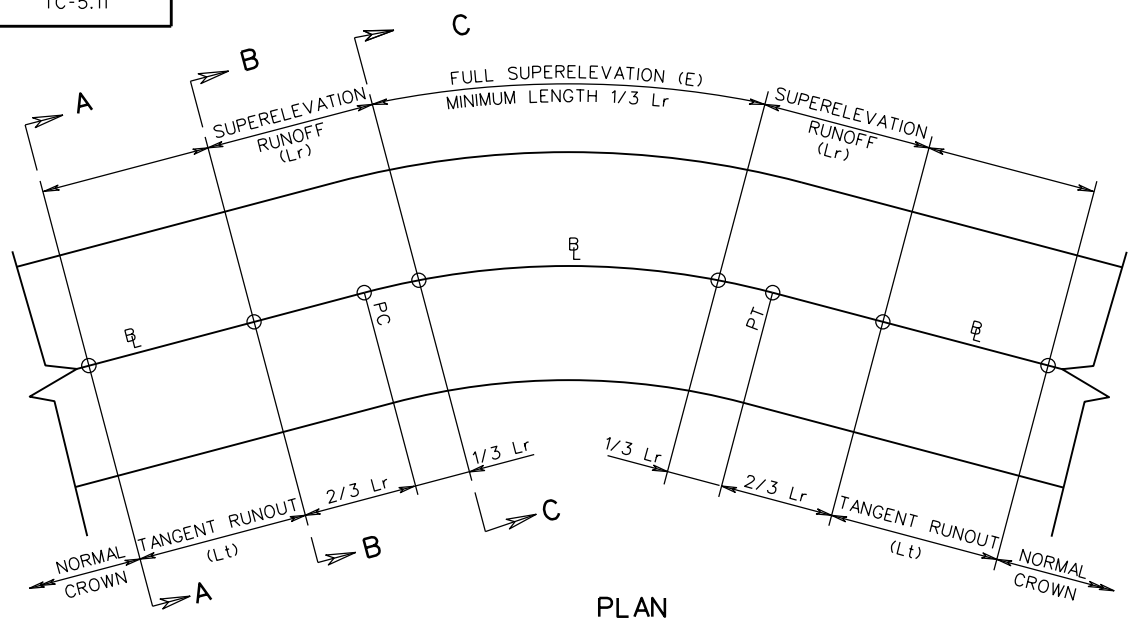
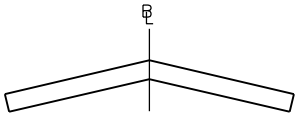
TC-5.11

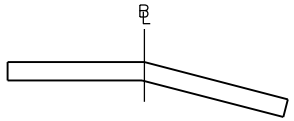


PLAN

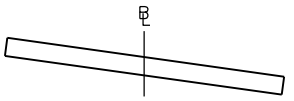
Lt = Lr(2/E)



SECTION A-A
NORMAL CROWN

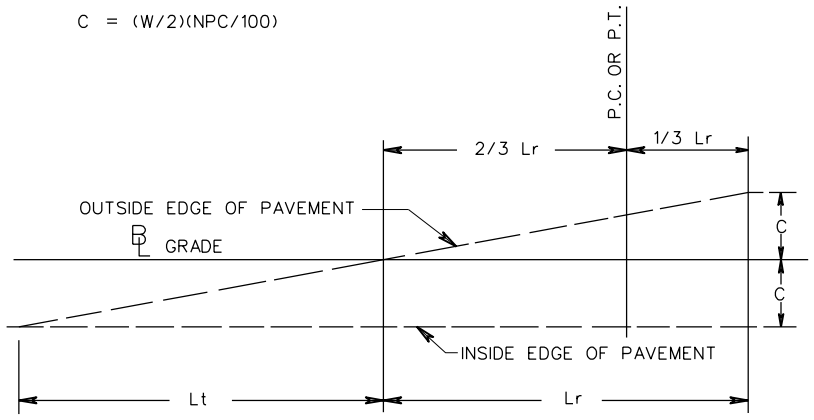


SECTION B-B
NORMAL CROWN
REMOVED (FLAT)



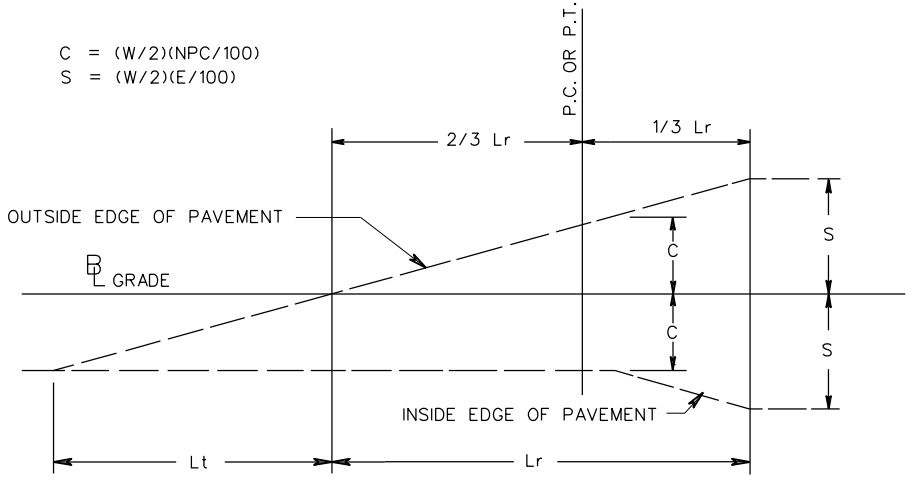
SECTION C-C
FULL SUPERELEVATION

C = (W/2)(NPC/100)



SUPERELEVATED BY AN AMOUNT EQUAL TO THE STANDARD PAVEMENT CROWN

C = (W/2)(NPC/100)
S = (W/2)(E/100)



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

SUPERELEVATED BY AN AMOUNT EXCEEDING THE STANDARD PAVEMENT CROWN

VDOT
ROAD AND BRIDGE STANDARDS

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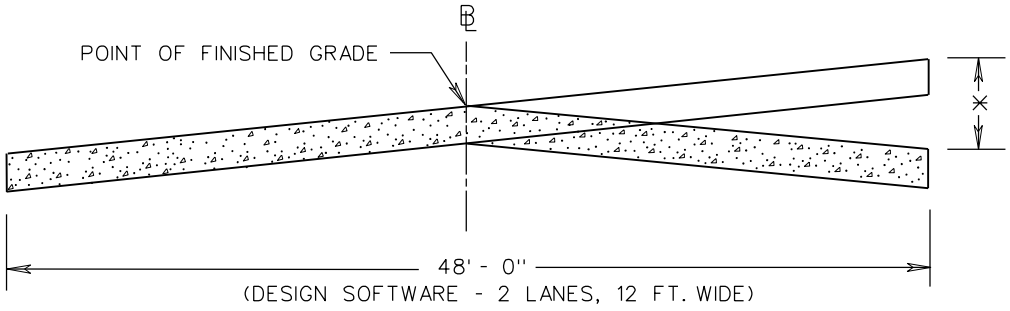
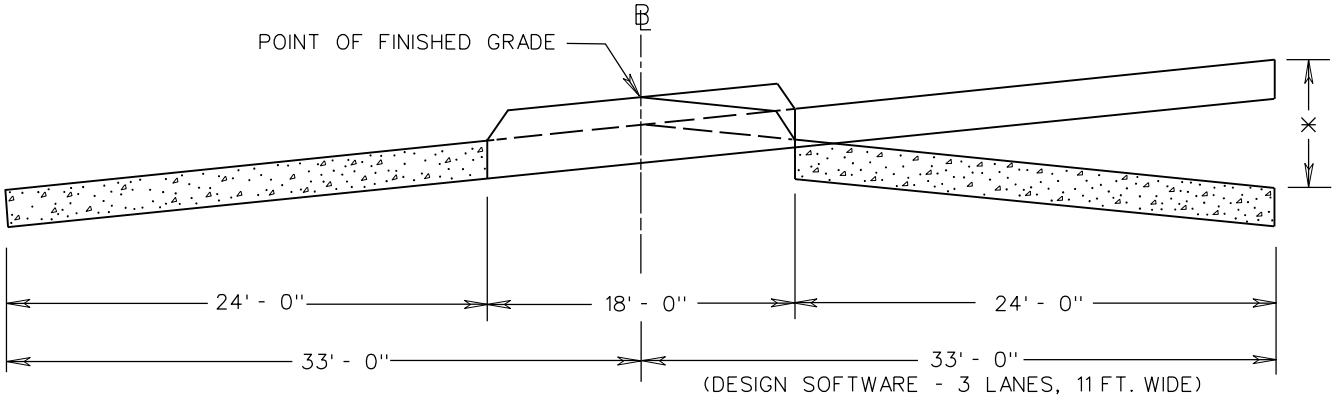
803.06

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

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE



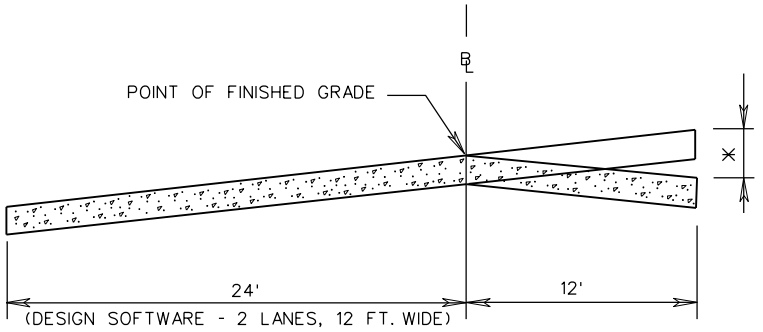


* THE ELEVATION DIFFERENTIAL BETWEEN NORMAL CROWN AND MAXIMUM SUPERELEVATION, RELATIVE TO THE BASELINE PROFILE.

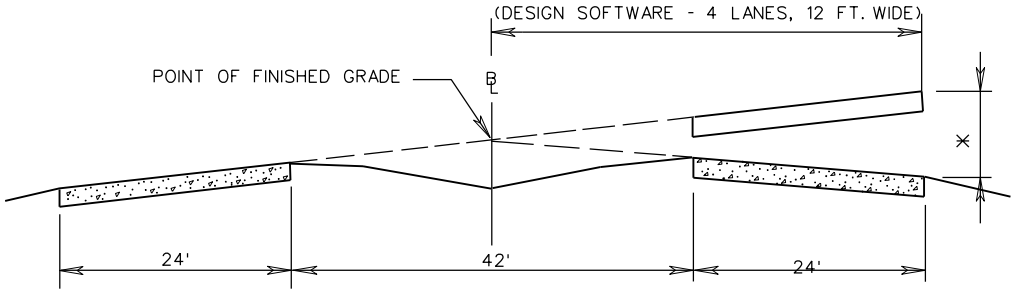
ADDITIONAL INFORMATION MAY BE OBTAINED FROM A POLICY ON GEOMETRIC DESIGN OF HIGHWAYS AND STREETS (AASHTO) BOOK, CHAPTER III - ELEMENTS OF DESIGN (SUPERELEVATION RUNOFF).

ON STANDARD TC-5.11ULS, TC-5.11U , AND TC-5.11R (WITHOUT PAVEMENT WIDENING) SUPERELEVATED CURVES, POSITION THE SUPERELEVATION RUNOFF SECTION (Lr) TWO THIRDS (2/3) ON THE TANGENT AND ONE THIRD (1/3) INTO THE CURVE. STATIONS AND ELEVATIONS FOR THESE TRANSITIONS WILL NEED TO BE COMPUTED FOR TS, SC, CS, ST AND EVERY 25' INCREMENT (i.e., 10+00, 10+25, 10+50, 10+75, etc...)

SPECIFICATION REFERENCE	DETAILS OF SUPERELEVATION ABOUT BASELINE	VDOT ROAD AND BRIDGE STANDARDS
	VIRGINIA DEPARTMENT OF TRANSPORTATION	REVISION DATE / SHEET 1 OF 1 / 803.07



THE PAVEMENT WIDTHS SHOWN IN THE STANDARD TC-5.11 TABLES ON SHEET 803.24 THROUGH 803.44 REPRESENT TWICE THE DISTANCE FROM THE CROWNLINE TO THE EDGE OF PAVEMENT ON THE HIGH SIDE.



* THE ELEVATION DIFFERENTIAL BETWEEN NORMAL CROWN AND MAXIMUM SUPERELEVATION, RELATIVE TO THE BASELINE PROFILE.

ADDITIONAL INFORMATION MAY BE OBTAINED FROM A POLICY ON GEOMETRIC DESIGN OF HIGHWAYS AND STREETS (AASHTO) BOOK, CHAPTER III - ELEMENTS OF DESIGN (SUPERELEVATION RUNOFF).

PROJECTS IN WHICH LANES MAY BE ADDED IN THE FUTURE IN THE MEDIAN AREA SHOULD BE DESIGNED WITH THE CONSTRUCTION BASELINE AND POINT OF FINISHED GRADE LOCATED IN THE MIDDLE OF THE MEDIAN. SUPERELEVATION IS TO BE ROTATED FROM THIS BASELINE POINT. THIS WILL PREVENT UNEVEN PAVEMENT PROBLEMS (WHEN ADDITIONAL LANES ARE ADDED IN THE MEDIAN AREA) SUCH AS CROSSOVER GRADES AS WELL AS THE NEED FOR RETAINING WALLS, MEDIAN BARRIERS AND SPECIAL DESIGN DRAINAGE STRUCTURES. ADDITIONAL RIGHT OF WAY OR EASEMENTS, IN MOST SITUATIONS, WILL NOT BE REQUIRED.

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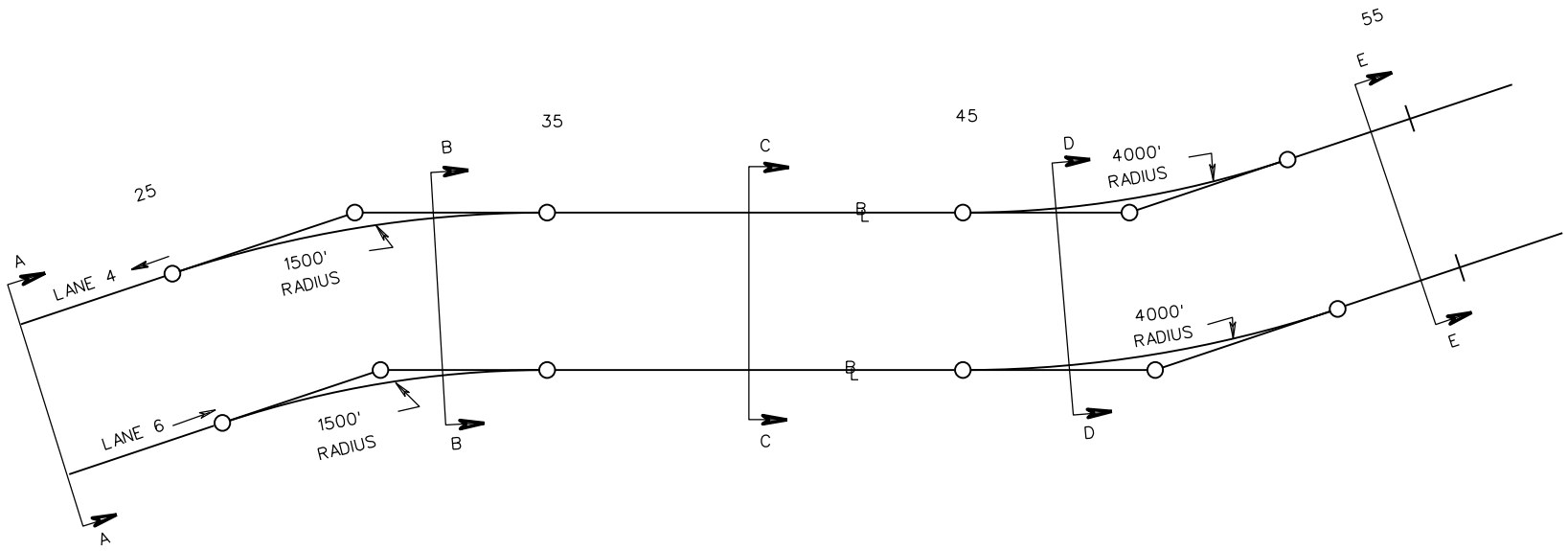
DETAILS OF SUPERELEVATION ABOUT BASELINE

VIRGINIA DEPARTMENT OF TRANSPORTATION



EXAMPLE FOR FOUR LANE ROADWAYS

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE

VDOT
ROAD AND BRIDGE STANDARDS

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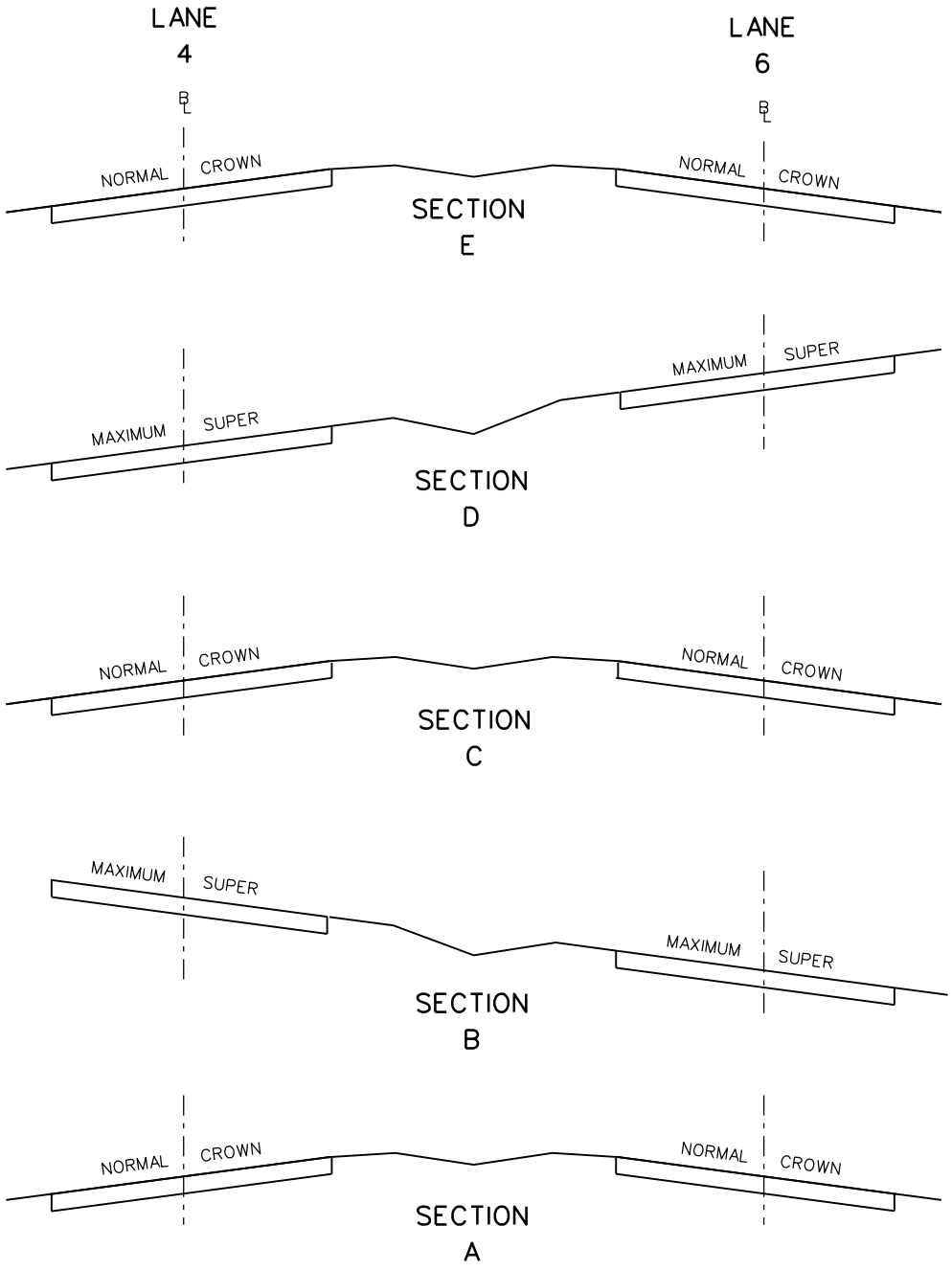
TC-5.11



VDOT
ROAD AND BRIDGE STANDARDS

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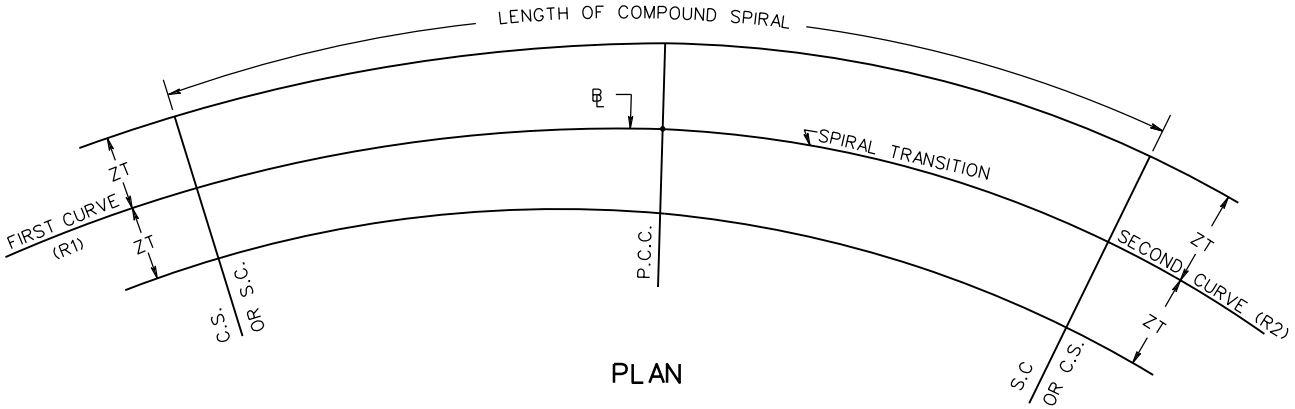
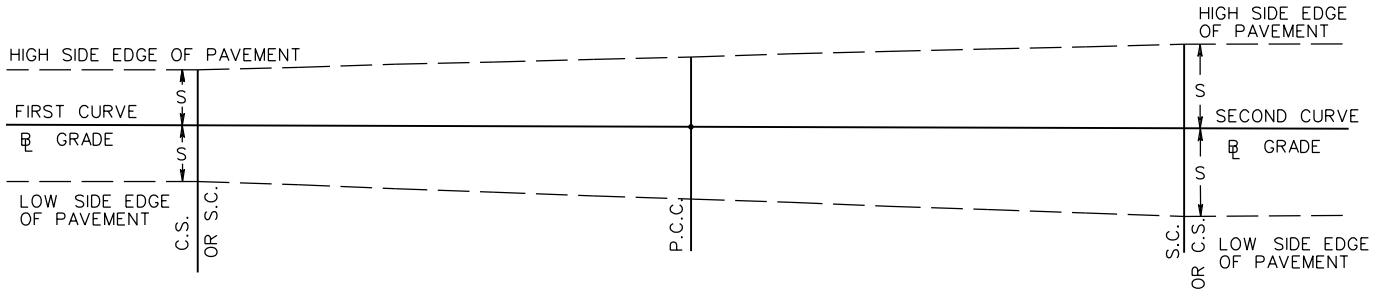
CROSS SECTION - FOUR LANE ROADWAY

VIRGINIA DEPARTMENT OF TRANSPORTATION



PLAN

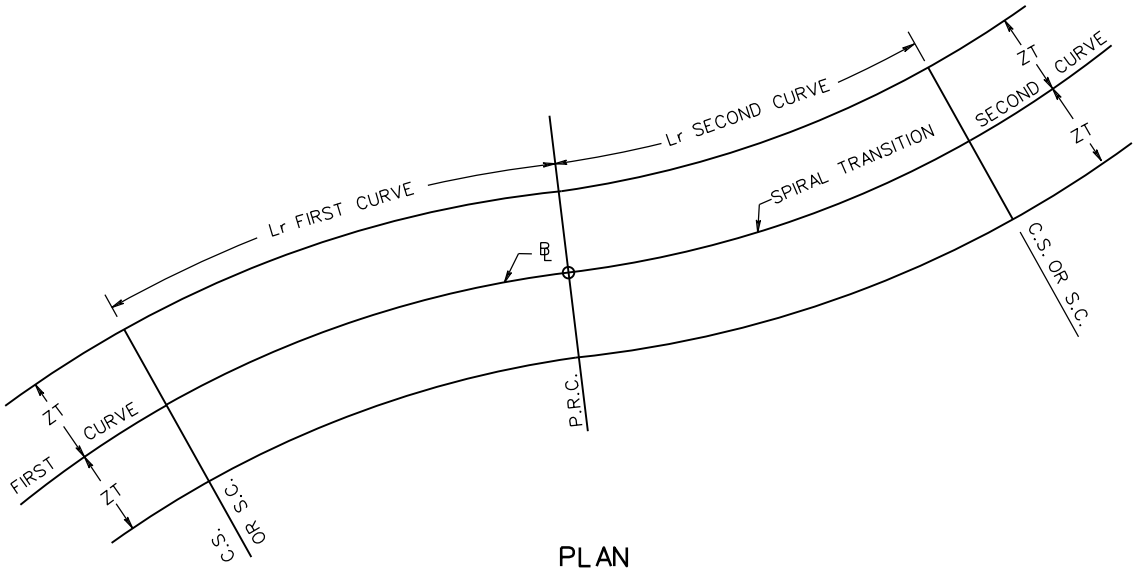


PROFILE

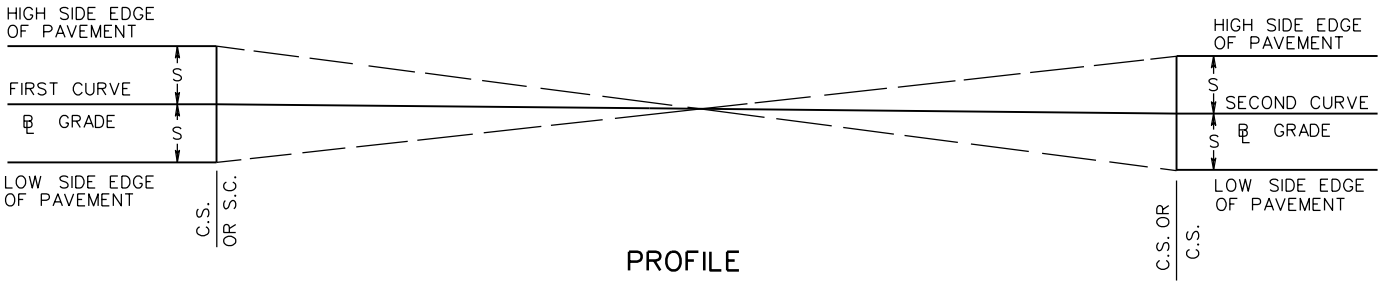
NOTE:

1. FOR COMPOUND CURVES ON OPEN ROADWAYS, THE RATIO OF FLATTER RADIUS (R1) TO THE SHARPER RADIUS (R2) SHALL NOT EXCEED 1.5:1.
2. FOR COMPOUND CURVES ON RAMPS AND AT INTERSECTIONS, THE RATIO OF THE FLATTER RADIUS (R1) TO THE SHARPER RADIUS (R2) SHALL NOT EXCEED 2:1. WHERE PRACTICAL, A DESIRABLE MAXIMUM RATIO OF 1.75:1 SHOULD BE USED.
3. COMPUTE STRAIGHT LINE WIDENING AND SUPERELEVATION TRANSITION FROM MAXIMUM OF FIRST CURVE TO MAXIMUM OF SECOND CURVE.
4. REFER TO CHAPTER 3 OF THE AASHTO GREEN BOOK FOR ADDITIONAL COMPOUND CURVE DESIGN INFORMATION.
5. THE SEPARATE CURVES THAT ARE COMBINED TO CREATE THE COMPOUND CURVE, SHOULD BE OF SUFFICIENT LENGTH TO ALLOW ADEQUATE DEVELOPMENT OF THE FULL SUPERELEVATION ON EACH CURVE.

SPECIFICATION REFERENCE	METHOD OF APPLYING TC-5.11 ON COMPOUND CURVES RURAL CONDITIONS WITH PAVEMENT WIDENING VIRGINIA DEPARTMENT OF TRANSPORTATION	VDOT ROAD AND BRIDGE STANDARDS
		REVISION DATE / SHEET 1 OF 1
		803.11



PLAN



PROFILE

NOTE:

1. COMPUTE STRAIGHT LINE WIDENING AND SUPERELEVATION TRANSITION FROM MAXIMUM OF FIRST CURVE TO MAXIMUM OF SECOND CURVE.
2. REFER TO CHAPTER 3 OF THE AASHTO'S A POLICY ON THE GEOMETRIC DESIGN OF HIGHWAYS AND STREETS FOR ADDITIONAL REVERSE CURVE DESIGN INFORMATION.
3. REVERSE CURVES SHOULD HAVE A CURVE LENGTH THAT ALLOWS ADEQUATE DEVELOPMENT OF THE FULL SUPERELEVATED SECTION OF PAVEMENT FOR EACH CURVE.

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ROAD AND BRIDGE STANDARDS

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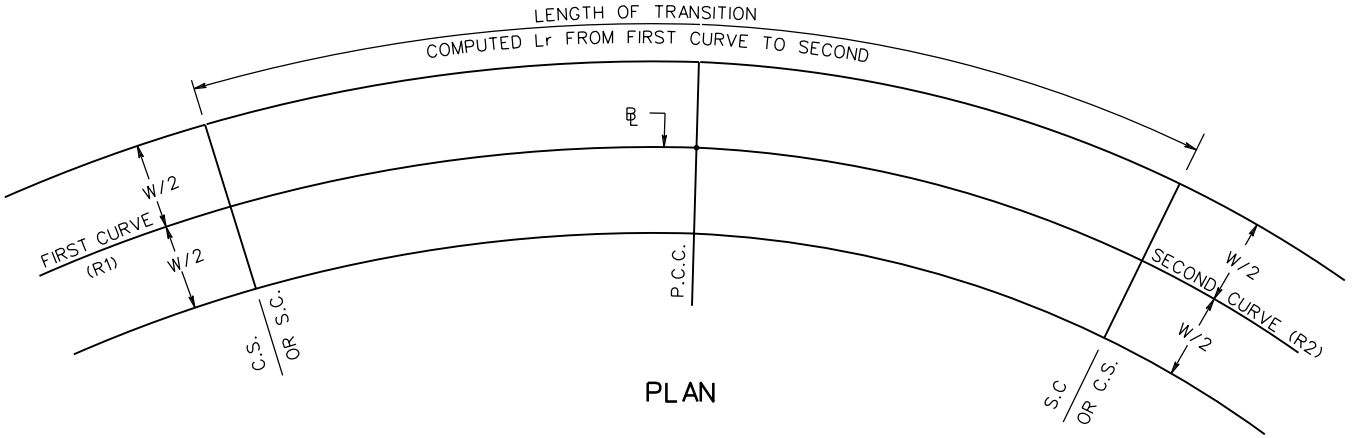
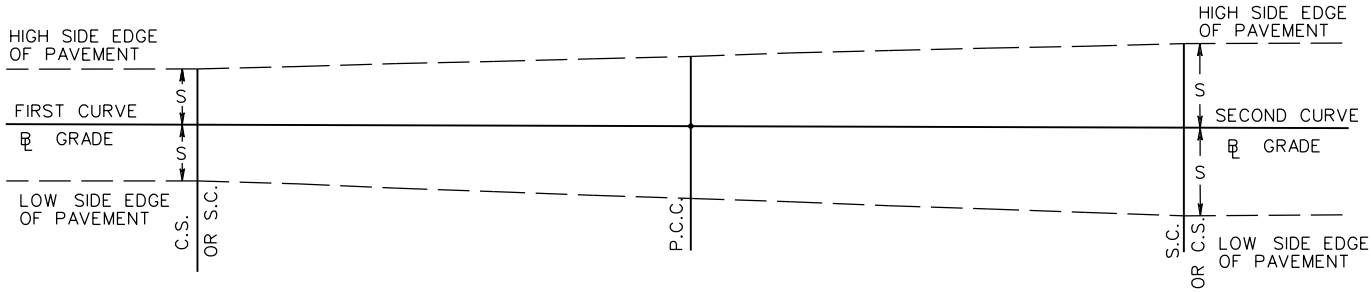
METHOD OF APPLYING TC-5.11 ON REVERSE CURVES RURAL CONDITION WITH PAVEMENT WIDENING

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE



PLAN



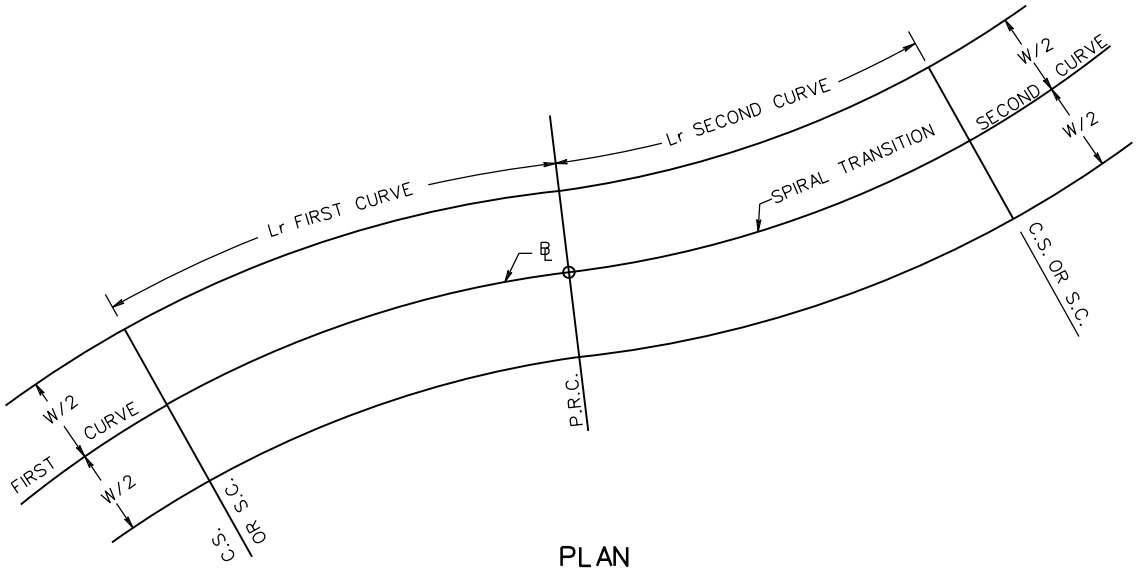
PROFILE

NOTE:

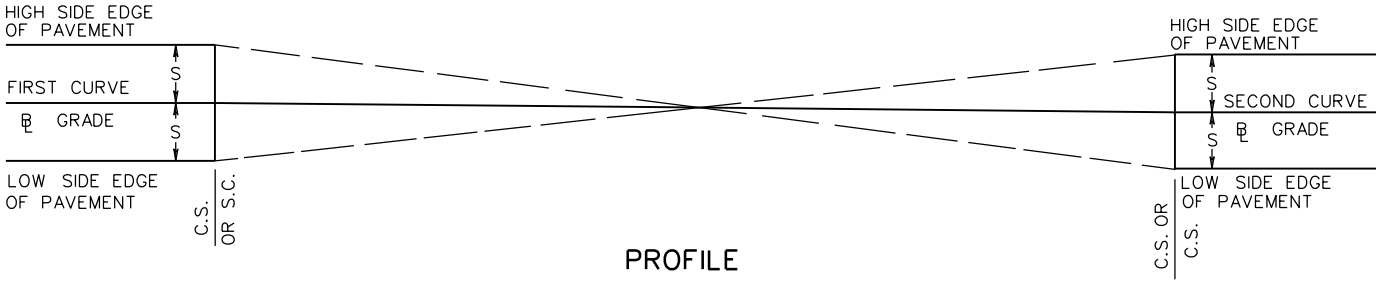
1. FOR COMPOUND CURVES ON OPEN ROADWAYS, THE RATIO OF FLATTER RADIUS (R1) TO THE SHARPER RADIUS (R2) SHALL NOT EXCEED 1.5:1.
2. FOR COMPOUND CURVES ON RAMPS AND AT INTERSECTIONS, THE RATIO OF THE FLATTER RADIUS (R1) TO THE SHARPER RADIUS (R2) SHALL NOT EXCEED 2:1. WHERE PRACTICAL, A DESIRABLE MAXIMUM RATIO OF 1.75:1 SHOULD BE USED.
3. COMPUTE SUPERELEVATION TRANSITION FROM MAXIMUM OF FIRST CURVE TO MAXIMUM OF SECOND CURVE. LENGTH OF COMPOUND SPIRAL COMPUTED PER PAGE 803.20.
4. REFER TO CHAPTER 3 OF THE AASHTO GREEN BOOK FOR ADDITIONAL COMPOUND CURVE DESIGN INFORMATION.
5. THE SEPARATE CURVES THAT ARE COMBINED TO CREATE THE COMPOUND CURVE, SHOULD BE OF SUFFICIENT LENGTH TO ALLOW ADEQUATE DEVELOPMENT OF THE FULL SUPERELEVATION ON EACH CURVE.

SPECIFICATION REFERENCE	METHOD OF APPLYING TC-5.11 ON COMPOUND CURVES URBAN & RURAL CONDITIONS W/OUT PAVEMENT WIDENING VIRGINIA DEPARTMENT OF TRANSPORTATION	VDOT ROAD AND BRIDGE STANDARDS REVISION DATE / SHEET 1 OF 1 803.13

TC-5.11



PLAN



PROFILE

NOTES:

1. COMPUTE SUPERELEVATION TRANSITION FROM MAXIMUM OF FIRST CURVE TO MAXIMUM OF SECOND CURVE. LENGTH OF SUPERELEVATION RUNOFF (Lr) COMPUTED PER PAGE 803.20.
2. REFER TO CHAPTER 3 OF THE AASHTO'S A POLICY ON THE GEOMETRIC DESIGN OF HIGHWAYS AND STREETS FOR ADDITIONAL REVERSE CURVE DESIGN INFORMATION.
3. THE USE OF SPIRAL TRANSITIONS FOR COMPOUND AND REVERSE CURVES ON URBAN ROADWAYS SHOULD BE AVOIDED. HOWEVER, THE ENGINEER DOES HAVE LATITUDE IN THE USE OF SPIRAL TRANSITIONS IF THE GEOMETRICS ARE WARRANTED.
4. REVERSE CURVES SHOULD HAVE A CURVE LENGTH THAT ALLOWS ADEQUATE DEVELOPMENT OF THE FULL SUPERELEVATED SECTION OF PAVEMENT FOR EACH CURVE.

VDOT
ROAD AND BRIDGE STANDARDS

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METHOD OF APPLYING TC-5.11 ON REVERSE CURVES URBAN & RURAL CONDITIONS W/OUT PAVEMENT WIDENING

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE

TRANSITION TABLE

LENGTH OF TANGENT RUNOUT (Lt)	START/END OF SUPERELEVATION RUNOFF (Lr)	DISTANCE IN FEET FROM START/END OF SUPERELEVATION RUNOFF SECTION (Lr)				NORMAL CROWN
		1	2	3	4	
220	0	44	88	132	176	220
200	0	40	80	120	140	200
180	0	36	72	108	144	180
160	0	32	64	96	128	160
140	0	28	56	84	112	140
120	0	24	48	72	96	120
100	0	20	40	60	80	100
90	0	18	36	54	72	90
80	0	16	32	48	64	80
60	0	15	30	45	———	60
40	0	20	———	———	———	40

NOTE:

TABLE LISTS POSTIONS ON TRANSITIONS AT WHICH SLOPE STAKES SHOULD BE SET, CONSTRUCTION AND FINAL CROSS-SECTIONS TAKEN, FINE GRADING STAKES (BLUE TOP) SET, AND FORM STAKES SET (CONCRETE PAVEMENT ONLY).

SPECIFICATION REFERENCE

CROWN TRANSITION / TANGENT RUNOUT (Lt) TABLE

VIRGINIA DEPARTMENT OF TRANSPORTATION

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URBAN CONDITIONS
RURAL CONDITIONS WITHOUT PAVEMENT WIDENING

FOR USE WITH FLEXIBLE AND CONCRETE PAVEMENT

(Lr POSITIONED 2/3 ±ON TANGENT, 1/3 ±ON CURVE)

LENGTH OF SUPERELEVATION RUNOFF (Lr)	END/ BEGIN TANGENT RUNOUT (Lt)	DISTANCE IN FEET FROM P.C. OR P.T. ON TANGENT						P.C. OR P.T.	DISTANCE IN FEET FROM P.C. OR P.T. ON CURVE			FULL SUPER ELEVATION (E)
		1	2	3	4	5	6		7	8	9	
480	320	272	224	176	128	80	32	STAKE	16	64	112	160
460	307	261	215	169	123	77	31	STAKE	15	61	107	153
440	293	249	205	161	117	73	29	STAKE	15	59	103	147
420	280	238	196	154	112	70	28	STAKE	14	56	98	140
400	267	227	187	147	107	67	27	STAKE	13	53	93	133
380	253	215	177	139	101	63	25	STAKE	13	51	89	127
360	240	204	168	132	96	60	24	STAKE	12	48	84	120
340	227	193	159	125	91	57	23	STAKE	11	45	79	113
320	213	181	149	117	85	53	21	STAKE	11	43	75	107
300	200	170	140	110	80	50	20	STAKE	10	40	70	100
280	187	159	131	103	75	47	19	STAKE	9	37	65	93
260	173	147 *	121	95 *	69	43 *	17	STAKE *	9	35 *	61	87
240	160	136 *	112	88 *	64	40 *	16	STAKE *	8	32 *	56	80
220	147	125 *	103	81 *	59	37 *	15	STAKE *	7	29 *	51	73
200	133	113 *	93	73 *	53	33 *	13	STAKE *	7	27 *	47	67
180	120	102 *	84	66 *	48	30 *	12	STAKE *	6	24 *	42	60
160	107	91 *	75	59 *	43	27 *	11	STAKE *	5	21 *	37	53

NOTE :

TABLE GIVING POSITIONS ON CURVES AT WHICH SLOPE STAKES SHOULD BE SET, CONSTRUCTION AND FINAL CROSS-SECTIONS TAKEN, FINE GRADING STAKES (BLUE TOP) SET, AND FORM STAKES SET (CONCRETE PAVEMENT ONLY).

* DENOTES ADDITIONAL STAKING POSITIONS FOR USE WITH CONCRETE PAVEMENT ONLY.

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TABLE I

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE

RURAL CONDITIONS WITH PAVEMENT WIDENING

FOR USE WITH FLEXIBLE AND CONCRETE PAVEMENT

LENGTH OF SUPERELEVATION RUNOFF (Lr)	T.S. OR S.T.	DISTANCE IN FEET FROM T.S. OR S.T. ALONG SPIRAL TRANSITION									S.C. OR C.S.
		1	2	3	4	5	6	7	8	9	
480	0	48	96	144	192	240	288	336	384	432	480
460	0	46	92	138	184	230	276	322	368	414	460
440	0	44	88	132	176	220	264	308	352	396	440
420	0	42	84	126	168	210	252	294	336	378	420
400	0	40	80	120	160	200	240	280	320	360	400
380	0	38	76	114	152	190	228	266	304	342	380
360	0	36	72	108	144	180	216	252	288	324	360
340	0	34	68	102	136	170	204	238	272	306	340
320	0	32	64	96	128	160	192	224	256	288	320
300	0	30	60	90	120	150	180	210	240	270	300
280	0	28	56	84	112	140	168	196	224	252	280
260	0	26 *	52	78 *	104	130 *	156	182 *	208	234 *	260
240	0	24 *	48	72 *	96	120 *	144	168 *	192	216 *	240
220	0	22 *	44	66 *	88	110 *	132	154 *	176	198 *	220
200	0	20 *	40	60 *	80	100 *	120	140 *	160	180 *	200
180	0	18 *	36	54 *	72	90 *	108	126 *	144	162 *	180
160	0	16 *	32	48 *	64	80 *	96	112 *	128	144 *	160

NOTE :

TABLE GIVING POSITIONS ON TRANSITION CURVES AT WHICH SLOPE STAKES SHOULD BE SET, CONSTRUCTION AND FINAL CROSS-SECTIONS TAKEN, FINE GRADING STAKES (BLUE TOP) SET, AND FORM STAKES SET (CONCRETE PAVEMENT ONLY).

* DENOTES ADDITIONAL STAKING POSITIONS FOR USE WITH CONCRETE PAVEMENT ONLY.

SPECIFICATION REFERENCE

TABLE 2

VIRGINIA DEPARTMENT OF TRANSPORTATION

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GENERAL DESIGN CONSIDERATIONS

1. WHERE PAVEMENT WIDENING IS REQUIRED, THE APPROPRIATE WIDENING IS ADDED TO THE LANE WIDTH WHEN CALCULATING THE SUPERELEVATION RUNOFF LENGTH (Lr).
2. THE COMPUTED SUPERELEVATION RUNOFF LENGTH (Lr) IS ROUNDED UP TO THE NEAREST FOOT.
3. WHEN THE SUPERELEVATION RUNOFF LENGTH (Lr) IS CALCULATED, IT MUST BE COMPARED WITH THE MINIMUM VALUE LISTED IN THE APPROPRIATE COLUMN ON THE RELATIVE GRADIENT TABLE.
4. TANGENT RUNOUT (Lt) IS ALWAYS ACHIEVED OUTSIDE OF THE SUPERELEVATION RUNOFF SECTION (Lr).
5. NO PAVEMENT WIDENING IS REQUIRED FOR URBAN ROADWAYS.
6. PAVEMENT WIDENING IS APPLIED ONLY WHEN CALCULATED WIDENING (w) IS EQUAL TO OR GREATER THAN 2 FEET. SEE PAGE 803.05 FOR DETAIL.
7. WHEN CALCULATING WIDENING (w) FOR MULTI-LANE RURAL ROADWAYS, WIDENING IS FIRST CALCULATED USING THE SINGLE LANE WIDTH FOR "W".
9. CALCULATED WIDENING IS ROUNDED UP TO THE NEAREST 0.1 FOOT.
10. CURVES WITH SPIRAL CURVE TRANSITIONS MUST HAVE A MINIMUM SUPERELEVATION RUNOFF LENGTH (Lr) EQUAL TO 2 SECONDS OF TRAVEL TIME AT THE ROADWAY'S DESIGN SPEED AS NOTED IN THE RELATIVE GRADIENT TABLE.
11. THE MINIMUM LENGTH OF CURVE SHOULD EQUAL THE LENGTH OF SUPERELEVATION TRANSITION OR Lr. THIS IS TO ALLOW SUFFICIENT DEVELOPMENT OF THE FULL SUPERELEVATED SECTION OF PAVEMENT WHICH SHOULD BE A MINIMUM LENGTH OF ⅓ THE TRANSITION Lr.
12. REVERSE CURVES SHOULD BE SEPARATED BY A TANGENT OF SUFFICENT LENGTH TO ALLOW THE FULL Lr AND Lt FOR EACH CURVE. IF THIS IS NOT POSSIBLE A MINIMUM LENGTH OF TANGENT SHOULD ALLOW FOR THE FULL Lr FOR EACH CURVE.
13. REVERSE CURVES THAT MEET AT A PRC SHOULD HAVE A CURVE LENGTH THAT ALLOWS ADEQUATE DEVELOPMENT OF THE FULL SUPERELEVATED SECTION OF PAVEMENT FOR EACH CURVE.
14. THE SEPARATE CURVES THAT ARE COMBINED TO CREATE THE COMPOUND CURVE, SHOULD BE OF SUFFICIENT LENGTH TO ALLOW ADEQUATE DEVELOPMENT OF THE FULL SUPERELEVATION ON EACH CURVE.

MAXIMUM RADIUS FOR USE OF A SPIRAL CURVE TRANSITION

DESIGN SPEED (mph)	MAXIMUM RADIUS (ft)
20	203
25	317
30	456
35	620
40	810
45	1025
50	1265
55	1531
60	1822
65	2138
70	2479
75	2846
80	3238

MAXIMUM LENGTH OF SPIRAL

$$L_{s,max} = \sqrt{24\,(p_{max})\,R}$$

$L_{s,max}$ = MAXIMUM LENGTH OF SPIRAL, ft

p_{max} = MAXIMUM LATERAL OFFSET BETWEEN THE TANGENT AND CIRCULAR CURVE (3.3 ft)

R = RADIUS OF CIRCULAR CURVE, ft

SPECIFICATION REFERENCE

METHODOLOGIES FOR CALCULATING TC-5.11 VALUES

VIRGINIA DEPARTMENT OF TRANSPORTATION

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TC-5.11

ADJUSTMENT FACTORS

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

RELATIVE GRADIENTS

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

DEFINITIONS

A - FRONT OVERHANG OF DESIGN VEHICLE FROM APPROPRIATE TABLE.

bw - ADJUSTMENT FACTOR FROM TABLE.

C - LATERAL CLEARANCE OF DESIGN VEHICLE FROM APPROPRIATE TABLE.

E - SUPERELEVATION RATE FROM APPROPRIATE TABLE.

e_d - NORMAL CROSS SLOPE RATE, PERCENT

e_{NC} - DESIGN SUPERELEVATION RATE, PERCENT

F_A - CALCULATED WIDTH OF OVERHANG FOR DESIGN VEHICLE.

L - WHEELBASE OF DESIGN VEHICLE FROM APPROPRIATE TABLE.

Lr - LENGTH OF SUPERELEVATION RUNOFF SECTION.

Lt - LENGTH OF TANGENT RUNOUT SECTION

M - MULTIPLE LANE FACTOR.

N - NUMBER OF LANES.

n_1 - NUMBER OF LANES ROTATED (FROM TABLES).

Pw - PAVEMENT WIDTH.

R - RADIUS OF CURVE.

rg - RELATIVE GRADIENT FROM APPROPRIATE TABLE.

U - CALCULATED TRACK WIDTH OF DESIGN VEHICLE.

u - TRACK WIDTH OF DESIGN VEHICLE FROM APPROPRIATE TABLE.

V_D - DESIGN VELOCITY.

w - CALCULATED WIDENING.

W - PAVEMENT WIDTH

W_C - CALCULATED TOTAL CURVE WIDTH.

W_n - WIDTH OF LANE.

Z - CALCULATED EXTRA WIDTH ALLOWANCE.

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

NO WIDENING REQUIRED

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

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

WIDENING REQUIRED

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

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

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

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

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

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ROAD AND BRIDGE STANDARDS

METHODOLOGIES FOR CALCULATING TC-5.11 VALUES

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE

DESIGN VEHICLE DIMENSIONS

DESIGN VEHICLE TYPE	u WIDTH	A FRONT OVERHANG	L	
			WB *1	WB *2
P	7	3	11	0
SU-30	8	4	20	0
SU-40	8	4	25	0
S-BUS-36	8	2.5	21.3	0
WB-40	8	3	12.5	27.5
WB-62	8.5	4	19.5	43

NOTE: THE "L" VALUE USED IN CALCULATING "U" WILL BE THE GREATER OF THE VALUES LISTED UNDER WB*1 OR WB*2 IN THE TABLE. THE "L" VALUE USED IN CALCULATING F_A WILL ALWAYS BE THE VALUE FROM THE WB*1 COLUMN UNDER "L".

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

FOR OTHER DESIGN VEHICLE DIMENSIONS REFER TO THE AASHTO GREEN BOOK.

FORMULAS USED TO CALCULATE WIDENING (w)

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

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

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

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

$$w = W_C - 2W_n$$

DESIGN VEHICLE SU-40

24 FT PAVEMENT WIDTH

$V_D = 20$ MPH R = 200 FT
$W_n = 12$ FT rg = 0.74
E = 6.1 (6.1% PER 803.32)

$U = u + R - \sqrt{R^2 - L^2}$
$U = 8.0 + 200 - \sqrt{(200)^2 - (25)^2}$
$U = 9.56865$

$F_A = \sqrt{R^2 + A(2L + A)} - R$
$F_A = \sqrt{(200)^2 + 4[2(25) + 4]} - 200$
$F_A = .53927$

$Z = (V_D / \sqrt{R})$
$Z = (20 / \sqrt{200})$
$Z = 1.41$

$W_C = N(U + C) + F_A + Z$
$W_C = 2(9.56865 + 3) + 0.53927 + 1.41$
$W_C = 27.08657$

$w = W_C - 2W_n = 27.08657 - 2(12) = 3.0865$ or 3.1

DESIGN VEHICLE SU-40

20 FT PAVEMENT WIDTH

$V_D = 35$ MPH R = 500 FT
$W_n = 10$ FT rg = 0.62
E = 3.1 (3.1% PER 803.38)

$U = u + R - \sqrt{R^2 - L^2}$
$U = 8.0 + 500 - \sqrt{(500)^2 - (25)^2}$
$U = 8.62539$

$F_A = \sqrt{R^2 + A(2L + A)} - R$
$F_A = \sqrt{(500)^2 + 4[2(25) + 4]} - 500$
$F_A = .21595$

$Z = (V_D / \sqrt{R})$
$Z = (35 / \sqrt{500})$
$Z = 1.57$

$W_C = N(U + C) + F_A + Z$
$W_C = 2(8.62539 + 2) + 0.21595 + 1.57$
$W_C = 23.0367$

$w = W_C - 2W_n = 23.0367 - 2(10) = 3.0367$ or 3.0

DESIGN VEHICLE WB-62

20 FT PAVEMENT WIDTH

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

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

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

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

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

$w = W_C - 2W_n = 24.5158 - 2(10) = 4.5158$ or 4.5

SPECIFICATION REFERENCE

METHODOLOGIES FOR CALCULATING TC-5.11 VALUES

VIRGINIA DEPARTMENT OF TRANSPORTATION

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RURAL EXAMPLE

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

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

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

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

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

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

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

(w>2 THEREFORE WIDENING IS REQUIRED)

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

RURAL EXAMPLE

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

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

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

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

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

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

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

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

(w>2 THEREFORE WIDENING IS REQUIRED)

$$Lr = [E\, n_1 (W_n + w/3)/ rg]\, b_w$$
$$Lr = [8\ (3)\ (12 + 13.9956/3)/ 0.58]\ 0.6667$$
$$Lr = (399.9648/0.58)\ 0.6667$$
$$Lr = 459.7526$$

OR

$$Lr = M[E(W_n + w/N)/rg]$$
$$Lr = 2\ [8(12 + 13.9956/3) / 0.58]$$
$$Lr = 2\ (133.3216/0.58)$$
$$Lr = 459.7296$$

URBAN EXAMPLES

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

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

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

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

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

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

OR

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

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CALCULATED TC-5.11 EXAMPLES

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE

MINIMUM RADII AND SUPERELEVATION RUNOFF SECTION LENGTHS (Lr) FOR +2% SUPERELEVATION

RADIUS (FEET)	E (%)	f	DV (MPH)	LENGTH OF SUPERELEVATION RUNOFF (Lr) IN FEET						
				PAVEMENT WIDTH (W)						
				24' (1@12')	36' (1.5@12')	48' (2@12')	60' (3@10')	66' (3@11')	72' (3@12')	W > 72'
> 795	2.0	0.150	45	45	56	67	75	82	90	*
593	2.0	0.160	40	42	52	63	70	77	84	*
408	2.0	0.180	35	39	49	59	65	72	78	*
273	2.0	0.200	30	37	46	55	61	67	74	*
167	2.0	0.230	25	35	43	52	58	64	69	*
92	2.0	0.270	20	33	41	49	55	60	66	*

* FOR PAVEMENT WIDTHS GREATER THAN 72 FEET USE Lr VALUES DEVELOPED BY THE DESIGN SOFTWARE.

MINIMUM RADII FOR DESIGNS UTILIZING -2% SUPERELEVATION NORMAL PAVEMENT CROWN

RADIUS (FEET)	f	NC (MPH)
> 1039	.150	45
762	.160	40
510	.180	35
333	.200	30
198	.230	25
107	.270	20

SPECIFICATION REFERENCE

SUMMARY OF STD. TC-5.11 ULS

URBAN-LOW SPEED DESIGN FACTORS

VIRGINIA DEPARTMENT OF TRANSPORTATION

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DESIGN FACTORS FOR A DESIGN SPEED OF 20 MPH (URBAN) USING E= 4% MAX.

RADIUS (FEET)	E (%)	PAVEMENT WIDTH											
		24 FT		36 FT		48 FT		60 FT		66 FT		72 FT	
		DESIGN SOFTWARE EQUIVALENTS (NUMBER OF LANES AT LANE WIDTH)											
		1 @ 12'		1.5 @ 12'		2 @ 12'		3 @ 10'		3 @ 11'		3 @ 12'	
		Lt	Lr	Lt	Lr	Lt	Lr	Lt	Lr	Lt	Lr	Lt	Lr
1410	NC	0	0	0	0	0	0	0	0	0	0	0	0
960	2	33	33	41	41	49	49	55	55	60	60	65	65
868	2.1	33	35	41	43	49	52	55	57	60	63	65	69
756	2.2	33	36	41	45	49	54	55	60	60	66	65	72
684	2.3	33	38	41	47	49	56	55	63	60	69	65	75
565	2.4	33	39	41	49	49	59	55	65	60	72	65	78
504	2.5	33	41	41	51	49	61	55	68	60	75	65	82
408	2.6	33	43	41	53	49	64	55	71	60	78	65	85
376	2.7	33	44	41	55	49	66	55	73	60	81	65	88
348	2.8	33	46	41	57	49	69	55	76	60	84	65	91
300	2.9	33	48	41	59	49	71	55	79	60	87	65	95
264	3	33	49	41	61	49	73	55	82	60	90	65	98
254	3.1	33	51	41	63	49	76	55	84	60	93	65	101
229	3.2	33	52	41	65	49	78	55	87	60	96	65	104
197	3.3	33	54	41	67	49	81	55	90	60	99	65	108
188	3.4	33	56	41	69	49	83	55	92	60	102	65	111
167	3.5	33	57	41	71	49	86	55	95	60	105	65	114
156	3.6	33	59	41	73	49	88	55	98	60	108	65	117
147	3.7	33	60	41	75	49	90	55	100	60	110	65	120
124	3.8	33	62	41	77	49	93	55	103	60	113	65	124
116	3.9	33	64	41	79	49	95	55	106	60	116	65	127
87	4	33	65	41	81	49	98	55	109	60	119	65	130

NOTE:

Lt AND Lr VALUES IN FEET.

FOR PAVEMENT WIDTHS GREATER THAN 72 FEET USE Lr VALUES DEVELOPED BY THE DESIGN SOFTWARE.

LISTED RADIUS IS THE MINIMUM ALLOWABLE RADIUS FOR THE CORRESPONDING E, Lt, AND Lr VALUES.

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ROAD AND BRIDGE STANDARDS

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803.24

TRANSITION CURVES - URBAN
20 MPH DESIGN SPEED

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE

DESIGN FACTORS FOR A DESIGN SPEED OF 25 MPH (URBAN) USING E= 4% MAX.

RADIUS (FEET)	E (%)	PAVEMENT WIDTH											
		24 FT		36 FT		48 FT		60 FT		66 FT		72 FT	
		DESIGN SOFTWARE EQUIVALENTS (NUMBER OF LANES AT LANE WIDTH)											
		1 @ 12'		1.5 @ 12'		2 @ 12'		3 @ 10'		3 @ 11'		3 @ 12'	
		Lt	Lr	Lt	Lr	Lt	Lr	Lt	Lr	Lt	Lr	Lt	Lr
2050	NC	0	0	0	0	0	0	0	0	0	0	0	0
1350	2	35	35	43	43	52	52	58	58	63	63	69	69
1234	2.1	35	36	43	45	52	54	58	60	63	66	69	72
1119	2.2	35	38	43	48	52	57	58	63	63	70	69	76
994	2.3	35	40	43	50	52	60	58	66	63	73	69	79
858	2.4	35	42	43	52	52	62	58	69	63	76	69	83
750	2.5	35	43	43	54	52	65	58	72	63	79	69	86
664	2.6	35	45	43	56	52	67	58	75	63	82	69	90
593	2.7	35	47	43	58	52	70	58	78	63	85	69	93
534	2.8	35	48	43	60	52	72	58	80	63	88	69	96
483	2.9	35	50	43	63	52	75	58	83	63	92	69	100
440	3	35	52	43	65	52	78	58	86	63	95	69	103
402	3.1	35	54	43	67	52	80	58	89	63	98	69	107
369	3.2	35	55	43	69	52	83	58	92	63	101	69	110
339	3.3	35	57	43	71	52	85	58	95	63	104	69	114
311	3.4	35	59	43	73	52	88	58	98	63	107	69	117
286	3.5	35	60	43	75	52	90	58	100	63	110	69	120
263	3.6	35	62	43	78	52	93	58	103	63	114	69	124
241	3.7	35	64	43	80	52	96	58	106	63	117	69	127
218	3.8	35	66	43	82	52	98	58	109	63	120	69	131
195	3.9	35	67	43	84	52	101	58	112	63	123	69	134
155	4	35	69	43	86	52	103	58	115	63	126	69	138

NOTE:

Lt AND Lr VALUES IN FEET.

FOR PAVEMENT WIDTHS GREATER THAN 72 FEET USE Lr VALUES DEVELOPED BY THE DESIGN SOFTWARE.

LISTED RADIUS IS THE MINIMUM ALLOWABLE RADIUS FOR THE CORRESPONDING E, Lt, AND Lr VALUES.

SPECIFICATION REFERENCE

TRANSITION CURVES - URBAN 25 MPH DESIGN SPEED

VIRGINIA DEPARTMENT OF TRANSPORTATION

VDOT ROAD AND BRIDGE STANDARDS

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DESIGN FACTORS FOR A DESIGN SPEED OF 30 MPH (URBAN) USING E= 4% MAX.

RADIUS (FEET)	E (%)	PAVEMENT WIDTH											
		24 FT		36 FT		48 FT		60 FT		66 FT		72 FT	
		DESIGN SOFTWARE EQUIVALENTS (NUMBER OF LANES AT LANE WIDTH)											
		1 @ 12'		1.5 @ 12'		2 @ 12'		3 @ 10'		3 @ 11'		3 @ 12'	
		Lt	Lr	Lt	Lr	Lt	Lr	Lt	Lr	Lt	Lr	Lt	Lr
2830	NC	0	0	0	0	0	0	0	0	0	0	0	0
1885	2.0	37	37	46	46	55	55	61	61	67	67	73	73
1734	2.1	37	39	46	48	55	58	61	64	67	70	73	77
1588	2.2	37	40	46	50	55	60	61	67	67	74	73	80
1442	2.3	37	42	46	53	55	63	61	70	67	77	73	84
1282	2.4	37	44	46	55	55	66	61	73	67	80	73	88
1134	2.5	37	46	46	57	55	69	61	76	67	84	73	91
1013	2.6	37	48	46	60	55	71	61	79	67	87	73	95
913	2.7	37	50	46	62	55	74	61	82	67	90	73	99
827	2.8	37	51	46	64	55	77	61	85	67	94	73	102
754	2.9	37	53	46	66	55	80	61	88	67	97	73	106
689	3.0	37	55	46	69	55	82	61	91	67	100	73	110
633	3.1	37	57	46	71	55	85	61	94	67	104	73	113
582	3.2	37	59	46	73	55	88	61	97	67	107	73	117
536	3.3	37	60	46	75	55	90	61	100	67	110	73	120
495	3.4	37	62	46	78	55	93	61	104	67	114	73	124
456	3.5	37	64	46	80	55	96	61	107	67	117	73	128
420	3.6	37	66	46	82	55	99	61	110	67	120	73	131
385	3.7	37	68	46	85	55	101	61	113	67	124	73	135
351	3.8	37	70	46	87	55	104	61	116	67	127	73	139
314	3.9	37	71	46	89	55	107	61	119	67	130	73	142
251	4.0	37	73	46	91	55	110	61	122	67	134	73	146

NOTE:

Lt AND Lr VALUES IN FEET.

FOR PAVEMENT WIDTHS GREATER THAN 72 FEET USE Lr VALUES DEVELOPED BY THE DESIGN SOFTWARE.

LISTED RADIUS IS THE MINIMUM ALLOWABLE RADIUS FOR THE CORRESPONDING E, Lt, AND Lr VALUES.

VDOT
ROAD AND BRIDGE STANDARDS

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803.26

TRANSITION CURVES - URBAN
30 MPH DESIGN SPEED

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE

DESIGN FACTORS FOR A DESIGN SPEED OF 35 MPH (URBAN) USING E- 4% MAX.

RADIUS (FEET)	E (%)	PAVEMENT WIDTH											
		24 FT		36 FT		48 FT		60 FT		66 FT		72 FT	
		DESIGN SOFTWARE EQUIVALENTS (NUMBER OF LANES AT LANE WIDTH)											
		1 @ 12'		1.5 @ 12'		2 @ 12'		3 @ 10'		3 @ 11'		3 @ 12'	
		Lt	Lr	Lt	Lr	Lt	Lr	Lt	Lr	Lt	Lr	CR	Lr
3730	NC	0	0	0	0	0	0	0	0	0	0	0	0
2511	2.0	39	39	49	49	59	59	65	65	71	71	78	78
2320	2.1	39	41	49	51	59	61	65	68	71	75	78	82
2138	2.2	39	43	49	54	59	64	65	71	71	79	78	86
1961	2.3	39	45	49	56	59	67	65	75	71	82	78	90
1781	2.4	39	47	49	59	59	70	65	78	71	86	78	93
1593	2.5	39	49	49	61	59	73	65	81	71	89	78	97
1434	2.6	39	51	49	63	59	76	65	84	71	93	78	101
1299	2.7	39	53	49	66	59	79	65	88	71	96	78	105
1184	2.8	39	55	49	68	59	82	65	91	71	100	78	109
1084	2.9	39	57	49	71	59	85	65	94	71	103	78	113
995	3.0	39	59	49	73	59	88	65	97	71	107	78	117
916	3.1	39	60	49	75	59	90	65	100	71	110	78	120
846	3.2	39	62	49	78	59	93	65	104	71	114	78	124
782	3.3	39	64	49	80	59	96	65	107	71	118	78	128
723	3.4	39	66	49	83	59	99	65	110	71	121	78	132
668	3.5	39	68	49	85	59	102	65	113	71	125	78	136
617	3.6	39	70	49	88	59	105	65	117	71	128	78	140
567	3.7	39	72	49	90	59	108	65	120	71	132	78	144
518	3.8	39	74	49	92	59	111	65	123	71	135	78	148
465	3.9	39	76	49	95	59	114	65	126	71	139	78	151
373	4.0	39	78	49	97	59	117	65	130	71	142	78	155

NOTE:

Lt AND Lr VALUES IN FEET.

FOR PAVEMENT WIDTHS GREATER THAN 72 FEET USE Lr VALUES DEVELOPED BY THE DESIGN SOFTWARE.

LISTED RADIUS IS THE MINIMUM ALLOWABLE RADIUS FOR THE CORRESPONDING E, Lt, AND Lr VALUES.

SPECIFICATION REFERENCE

TRANSITION CURVES - URBAN
35 MPH DESIGN SPEED

VIRGINIA DEPARTMENT OF TRANSPORTATION

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DESIGN FACTORS FOR A DESIGN SPEED OF 40 MPH (URBAN) USING E= 4% MAX.

RADIUS (FEET)	E (%)	PAVEMENT WIDTH											
		24 FT		36 FT		48 FT		60 FT		66 FT		72 FT	
		DESIGN SOFTWARE EQUIVALENTS (NUMBER OF LANES AT LANE WIDTH)											
		1 @ 12'		1.5 @ 12'		2 @ 12'		3 @ 10'		3 @ 11'		3 @ 12'	
		Lt	Lr	Lt	Lr	Lt	Lr	Lt	Lr	Lt	Lr	Lt	Lr
4770	NC	0	0	0	0	0	0	0	0	0	0	0	0
3245	2.0	42	42	52	52	63	63	69	69	76	76	83	83
3009	2.1	42	44	52	55	63	66	69	73	76	80	83	87
2787	2.2	42	46	52	57	63	69	69	76	76	84	83	92
2575	2.3	42	48	52	60	63	72	69	80	76	88	83	96
2367	2.4	42	50	52	63	63	75	69	83	76	92	83	100
2155	2.5	42	52	52	65	63	78	69	87	76	95	83	104
1954	2.6	42	54	52	68	63	81	69	90	76	99	83	108
1782	2.7	42	56	52	70	63	84	69	94	76	103	83	112
1633	2.8	42	58	52	73	63	87	69	97	76	107	83	116
1502	2.9	42	60	52	75	63	90	69	100	76	110	83	120
1385	3.0	42	63	52	78	63	94	69	104	76	114	83	125
1281	3.1	42	65	52	81	63	97	69	107	76	118	83	129
1187	3.2	42	67	52	83	63	100	69	111	76	122	83	133
1100	3.3	42	69	52	86	63	103	69	114	76	126	83	137
1020	3.4	42	71	52	88	63	106	69	118	76	129	83	141
946	3.5	42	73	52	91	63	109	69	121	76	133	83	145
875	3.6	42	75	52	94	63	112	69	125	76	137	83	149
806	3.7	42	77	52	96	63	115	69	128	76	141	83	154
738	3.8	42	79	52	99	63	118	69	132	76	145	83	158
664	3.9	42	81	52	101	63	122	69	135	76	148	83	162
536	4.0	42	83	52	104	63	125	69	138	76	152	83	166

NOTE:

Lt AND Lr VALUES IN FEET.

FOR PAVEMENT WIDTHS GREATER THAN 72 FEET USE Lr VALUES DEVELOPED BY THE DESIGN SOFTWARE.

LISTED RADIUS IS THE MINIMUM ALLOWABLE RADIUS FOR THE CORRESPONDING E, Lt, AND Lr VALUES.

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ROAD AND BRIDGE STANDARDS

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TRANSITION CURVES - URBAN
40 MPH DESIGN SPEED

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE

DESIGN FACTORS FOR A DESIGN SPEED OF 45 MPH (URBAN) USING E= 4% MAX.

RADIUS (FEET)	E (%)	PAVEMENT WIDTH											
		24 FT		36 FT		48 FT		60 FT		66 FT		72 FT	
		DESIGN SOFTWARE EQUIVALENTS (NUMBER OF LANES AT LANE WIDTH)											
		1 @ 12'		1.5 @ 12'		2 @ 12'		3 @ 10'		3 @ 11'		3 @ 12'	
		Lt	Lr	Lt	Lr	Lt	Lr	Lt	Lr	Lt	Lr	Lt	Lr
5930	NC	0	0	0	0	0	0	0	0	0	0	0	0
4058	2.0	45	45	56	56	67	67	75	75	82	82	89	89
3771	2.1	45	47	56	59	67	70	75	78	82	86	89	94
3502	2.2	45	49	56	62	67	74	75	82	82	90	89	98
3248	2.3	45	52	56	64	67	77	75	86	82	94	89	103
3002	2.4	45	54	56	67	67	80	75	89	82	98	89	107
2758	2.5	45	56	56	70	67	84	75	93	82	102	89	112
2516	2.6	45	58	56	73	67	87	75	97	82	106	89	116
2304	2.7	45	60	56	75	67	90	75	100	82	110	89	120
2119	2.8	45	63	56	78	67	94	75	104	82	115	89	125
1955	2.9	45	65	56	81	67	97	75	108	82	119	89	129
1808	3.0	45	67	56	84	67	100	75	112	82	123	89	134
1676	3.1	45	69	56	87	67	104	75	115	82	127	89	138
1556	3.2	45	72	56	89	67	107	75	119	82	131	89	143
1446	3.3	45	74	56	92	67	110	75	123	82	135	89	147
1343	3.4	45	76	56	95	67	114	75	126	82	139	89	152
1247	3.5	45	78	56	98	67	117	75	130	82	143	89	156
1156	3.6	45	80	56	100	67	120	75	134	82	147	89	160
1067	3.7	45	83	56	103	67	124	75	138	82	151	89	165
978	3.8	45	85	56	106	67	127	75	141	82	155	89	169
883	3.9	45	87	56	109	67	130	75	145	82	159	89	174
713	4.0	45	89	56	112	67	134	75	149	82	163	89	178

NOTE:

Lt AND Lr VALUES IN FEET.

FOR PAVEMENT WIDTHS GREATER THAN 72 FEET USE Lr VALUES DEVELOPED BY THE DESIGN SOFTWARE.

LISTED RADIUS IS THE MINIMUM ALLOWABLE RADIUS FOR THE CORRESPONDING E, Lt, AND Lr VALUES.

SPECIFICATION REFERENCE

TRANSITION CURVES - URBAN
45 MPH DESIGN SPEED

VIRGINIA DEPARTMENT OF TRANSPORTATION

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ROAD AND BRIDGE STANDARDS

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DESIGN FACTORS FOR A DESIGN SPEED OF 50 MPH (URBAN) USING E= 4 % MAX.

RADIUS (FEET)	E (%)	PAVEMENT WIDTH											
		24 FT		36 FT		48 FT		60 FT		66 FT		72 FT	
		DESIGN SOFTWARE EQUIVALENTS (NUMBER OF LANES AT LANE WIDTH)											
		1 @ 12'		1.5 @ 12'		2 @ 12'		3 @ 10'		3 @ 11'		3 @ 12'	
		Lt	Lr	Lt	Lr	Lt	Lr	Lt	Lr	Lt	Lr	Lt	Lr
7220	NC	0	0	0	0	0	0	0	0	0	0	0	0
4972	2.0	48	48	60	60	72	72	80	80	88	88	96	96
4629	2.1	48	51	60	63	72	76	80	84	88	93	96	101
4310	2.2	48	53	60	66	72	80	80	88	88	97	96	106
4010	2.3	48	56	60	69	72	83	80	92	88	102	96	111
3723	2.4	48	58	60	72	72	87	80	96	88	106	96	116
3444	2.5	48	60	60	75	72	90	80	100	88	110	96	120
3166	2.6	48	63	60	78	72	94	80	104	88	115	96	125
2911	2.7	48	65	60	81	72	98	80	108	88	119	96	130
2686	2.8	48	68	60	84	72	101	80	112	88	124	96	135
2486	2.9	48	70	60	87	72	105	80	116	88	128	96	140
2306	3.0	48	72	60	90	72	108	80	120	88	132	96	144
2143	3.1	48	75	60	93	72	112	80	124	88	137	96	149
1994	3.2	48	77	60	96	72	116	80	128	88	141	96	154
1857	3.3	48	80	60	99	72	119	80	132	88	146	96	159
1729	3.4	48	82	60	102	72	123	80	136	88	150	96	164
1608	3.5	48	84	60	105	72	126	80	140	88	154	96	168
1493	3.6	48	87	60	108	72	130	80	144	88	159	96	173
1381	3.7	48	89	60	111	72	134	80	148	88	163	96	178
1268	3.8	48	92	60	114	72	137	80	152	88	168	96	183
1146	3.9	48	94	60	117	72	141	80	156	88	172	96	188
929	4.0	48	96	60	120	72	144	80	160	88	176	96	192

NOTE:

Lt AND Lr VALUES IN FEET.

FOR PAVEMENT WIDTHS GREATER THAN 72 FEET USE Lr VALUES DEVELOPED BY THE DESIGN SOFTWARE.

LISTED RADIUS IS THE MINIMUM ALLOWABLE RADIUS FOR THE CORRESPONDING E, Lt AND Lr VALUES.

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TRANSITION CURVES - URBAN
50 MPH DESIGN SPEED

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE

DESIGN FACTORS FOR A DESIGN SPEED OF 55 MPH (URBAN) USING E= 4% MAX.

RADIUS (FEET)	E (%)	PAVEMENT WIDTH											
		24 FT		36 FT		48 FT		60 FT		66 FT		72 FT	
		DESIGN SOFTWARE EQUIVALENTS (NUMBER OF LANES AT LANE WIDTH)											
		1 @ 12'		1.5 @ 12'		2 @ 12'		3 @ 10'		3 @ 11'		3 @ 12'	
		Lt	Lr	Lt	Lr	Lt	Lr	Lt	Lr	Lt	Lr	Lt	Lr
8650	NC	0	0	0	0	0	0	0	0	0	0	0	0
5995	2.0	52	52	64	64	77	77	86	86	94	94	103	103
5592	2.1	52	54	64	68	77	81	86	90	94	99	103	108
5218	2.2	52	57	64	71	77	85	86	94	94	103	103	113
4869	2.3	52	59	64	74	77	89	86	98	94	108	103	118
4538	2.4	52	62	64	77	77	92	86	103	94	113	103	123
4220	2.5	52	64	64	80	77	96	86	107	94	118	103	128
3909	2.6	52	67	64	83	77	100	86	111	94	122	103	133
3610	2.7	52	69	64	87	77	104	86	115	94	127	103	138
3343	2.8	52	72	64	90	77	108	86	120	94	132	103	143
3104	2.9	52	75	64	93	77	112	86	124	94	136	103	149
2888	3.0	52	77	64	96	77	115	86	128	94	141	103	154
2691	3.1	52	80	64	99	77	119	86	132	94	146	103	159
2510	3.2	52	82	64	103	77	123	86	137	94	150	103	164
2343	3.3	52	85	64	106	77	127	86	141	94	155	103	169
2186	3.4	52	87	64	109	77	131	86	145	94	160	103	174
2037	3.5	52	90	64	112	77	135	86	149	94	164	103	179
1895	3.6	52	92	64	115	77	138	86	154	94	169	103	184
1756	3.7	52	95	64	119	77	142	86	158	94	174	103	189
1615	3.8	52	98	64	122	77	146	86	162	94	178	103	195
1462	3.9	52	100	64	125	77	150	86	166	94	183	103	200
1191	4.0	52	103	64	128	77	154	86	171	94	188	103	205

NOTE:

Lt AND Lr VALUES IN FEET.

FOR PAVEMENT WIDTHS GREATER THAN 72 FEET USE Lr VALUES DEVELOPED BY THE DESIGN SOFTWARE.

LISTED RADIUS IS THE MINIMUM ALLOWABLE RADIUS FOR THE CORRESPONDING E, Lt, AND Lr VALUES.

SPECIFICATION REFERENCE

TRANSITION CURVES - URBAN
55 MPH DESIGN SPEED

VIRGINIA DEPARTMENT OF TRANSPORTATION

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TRANSITION CURVES - RURAL
20 MPH DESIGN SPEED

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE

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

DESIGN VELOCITY =20		WIDTH= 18 FT			WIDTH=20 FT			WIDTH=22 FT			WIDTH=24 FT			WIDTH=48 FT			INTERCHANGE RAMPS			
		DESIGN SOFTWARE EQUIVALENTS (NUMBER OF LANES AT LANE WIDTH)															WIDTH			
		1 @ 9'			1 @ 10'			1 @ 11'			1 @ 12'			2 @ 12'			16 FT		18 FT	
RADIUS(FT)	E(%)	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	Lt	Lr
1640	NC	0	0	2.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1210	2	59	59	2.2	28	28	0	30	30	0	33	33	0	49	49	0	39	39	41	41
1180	2.1	57	59	2.3	28	29	0	30	32	0	33	35	0	49	52	0	39	40	41	43
1100	2.2	54	59	2.3	28	30	0	30	33	0	33	36	0	49	54	0	39	42	41	45
1020	2.3	52	59	2.4	28	32	0	30	35	0	33	38	0	49	56	0	39	44	41	47
1008	2.4	50	59	2.4	28	33	0	30	36	0	33	39	0	49	59	0	39	46	41	49
960	2.5	48	59	2.5	28	34	0	30	38	0	33	41	0	49	61	0	39	48	41	51
880	2.6	46	59	2.6	28	36	0	30	39	0	33	43	0	49	64	0	39	50	41	53
840	2.7	44	59	2.6	28	37	0	30	41	0	33	44	0	49	66	0	39	52	41	55
810	2.8	43	59	2.7	28	38	0	30	42	0	33	46	0	49	69	0	39	54	41	57
774	2.9	41	59	2.7	28	40	0	30	44	0	33	48	0	49	71	0	39	56	41	59
760	3	40	59	2.7	28	41	0	30	45	0	33	49	0	49	73	0	39	58	41	61
720	3.1	39	59	2.8	28	42	0	30	47	0	33	51	0	49	76	0	39	60	41	63
680	3.2	37	59	2.9	28	44	0	30	48	0	33	52	0	49	78	0	39	61	41	65
658	3.3	36	59	2.9	28	45	0	30	50	0	33	54	0	49	81	0	39	63	41	67
641	3.4	35	59	3	30	51	2	30	51	0	33	56	0	49	83	0	39	65	41	69
617	3.5	34	59	3	30	53	2	30	53	0	33	57	0	49	86	0	39	67	41	71
595	3.6	33	59	3.1	30	54	2.1	30	54	0	33	59	0	49	88	0	39	69	41	73
574	3.7	32	59	3.2	30	56	2.2	30	55	0	33	60	0	49	90	0	39	71	41	75
548	3.8	32	59	3.2	30	57	2.2	30	57	0	33	62	0	49	93	0	39	73	41	77
528	3.9	31	59	3.3	31	59	2.3	30	58	0	33	64	0	49	95	0	39	75	41	79
499	4	30	59	3.4	31	61	2.4	30	60	0	33	65	0	49	98	0	39	77	41	81
484	4.1	30	60	3.5	31	63	2.5	30	61	0	33	67	0	49	100	0	39	79	41	83
468	4.2	30	62	3.5	31	64	2.5	30	63	0	33	69	0	49	103	0	39	80	41	85
451	4.3	30	63	3.6	31	66	2.6	30	64	0	33	70	0	49	105	0	39	82	41	87
435	4.4	30	65	3.7	31	68	2.7	30	66	0	33	72	0	49	108	0	39	84	41	89
418	4.5	30	67	3.8	32	70	2.8	30	67	0	33	73	0	49	110	0	39	86	41	92
402	4.6	30	69	3.9	31	71	2.9	30	69	0	33	75	0	49	112	0	39	88	41	94
373	4.7	31	71	4.1	32	74	3.1	33	77	2.1	33	77	0	49	115	0	39	90	41	96
366	4.8	30	72	4.1	32	75	3.1	33	79	2.1	33	78	0	49	117	0	39	92	41	98
342	4.9	31	74	4.3	32	78	3.3	33	81	2.3	33	80	0	49	120	0	39	94	41	100
330	5	31	76	4.4	32	80	3.4	33	83	2.4	33	82	0	49	122	0	39	96	41	102
309	5.1	31	78	4.6	33	82	3.6	34	85	2.6	33	83	0	49	125	0	39	98	41	104
298	5.2	31	80	4.7	33	84	3.7	34	87	2.7	33	85	0	49	127	0	39	100	41	106
276	5.3	32	83	4.9	33	86	3.9	34	90	2.9	33	86	0	49	129	0	39	101	41	108
268	5.4	32	84	5	33	88	4	34	92	3	36	95	2	57	154	4	39	103	41	110
252	5.5	32	87	5.2	33	90	4.2	35	94	3.2	36	98	2.2	58	159	4.4	39	105	41	112
244	5.6	32	89	5.4	34	93	4.4	35	97	3.4	36	100	2.4	59	164	4.8	39	107	41	114
235	5.7	32	91	5.5	34	95	4.5	35	99	3.5	36	103	2.5	59	168	5	39	109	41	116
226	5.8	33	93	5.6	34	97	4.6	35	101	3.6	36	105	2.6	60	172	5.2	39	111	41	118
214	5.9	33	96	5.9	34	100	4.9	36	104	3.9	37	108	2.9	61	179	5.8	39	113	41	120
204	6	33	98	6.1	34	102	5.1	36	106	4.1	37	110	3.1	62	184	6.2	39	115	41	122
199	6.1	33	100	6.2	35	104	5.2	36	108	4.2	37	113	3.2	62	188	6.4	39	117	41	124
192	6.2	33	102	6.3	35	106	5.3	36	111	4.3	37	115	3.3	63	193	6.6	39	119	41	126
181	6.3	34	105	6.6	35	109	5.6	37	114	4.6	38	118	3.6	64	200	7.2	39	120	41	128
174	6.4	34	108	6.8	35	112	5.8	37	116	4.8	38	121	3.8	65	205	7.6	39	122	41	130
167	6.5	34	110	7	36	115	6	37	119	5	38	123	4	65	211	8	39	124	41	132
160	6.6	35	113	7.2	36	117	6.2	37	122	5.2	39	126	4.2	66	217	8.4	39	126	41	134
156	6.7	35	115	7.4	36	120	6.4	38	125	5.4	39	129	4.4	67	223	8.8	39	128	41	136
149	6.8	35	118	7.6	37	123	6.6	38	127	5.6	39	132	4.6	68	229	9.2	39	130	41	138
145	6.9	36	121	7.8	37	125	6.8	38	130	5.8	40	135	4.8	69	235	9.6	39	132	41	140
140	7	36	123	8	37	128	7	38	133	6	40	138	5	70	242	10	39	134	41	142
134	7.1	36	127	8.3	37	131	7.3	39	136	6.3	40	141	5.3	71	249	10.6	39	136	41	144
128	7.2	37	130	8.6	38	135	7.6	39	140	6.6	40	144	5.6	72	257	11.2	39	138	41	146
124	7.3	37	133	8.8	38	138	7.8	40	143	6.8	41	147	5.8	73	264	11.6	39	140	41	148
120	7.4	37	135	9	38	140	8	40	145	7	41	150	6	73	270	12	39	141	41	150
114	7.5	38	140	9.5	39	145	8.5	40	150	7.5	42	155	6.5	76	282	13	39	143	41	152
107	7.6	38	144	9.9	40	149	8.9	41	154	7.9	42	159	6.9	77	292	13.8	39	145	41	154
102	7.7	39	148	10.4	40	153	9.4	42	159	8.4	43	164	7.4	79	303	14.8	39	147	41	156
96	7.8	39	152	10.8	41	158	9.8	42	163	8.8	44	168	7.8	81	314	15.6	39	149	41	158
90	7.9	40	158	11.5	42	163	10.5	43	169	9.5	45	174	8.5	84	329	17	39	151	41	160
77	8	43	169	13.1	44	174	12.1	45	179	11.1	47	185	10.1	90	359	20.2	39	153	41	162

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

SPECIFICATION REFERENCE

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

DESIGN VELOCITY =25		WIDTH= 18 FT			WIDTH=20 FT			WIDTH=22 FT			WIDTH=24 FT			WIDTH=48 FT			INTERCHANGE RAMPS WIDTH			
		DESIGN SOFTWARE EQUIVALENTS (NUMBER OF LANES AT LANE WIDTH)																		
		1 @ 9'			1 @ 10'			1 @ 11'			1 @ 12'			2 @ 12'			16 FT		18 FT	
RADIUS(FT)	E(%)	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	Lt	Lr
2370	NC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1745	2	29	29	2.1	29	29	0	32	32	0	35	35	0	52	52	0	40	40	43	43
1698	2.1	71	74	2.1	29	30	0	32	33	0	35	36	0	52	54	0	40	42	43	45
1580	2.2	68	74	2.1	29	32	0	32	35	0	35	38	0	52	57	0	40	44	43	48
1520	2.3	65	74	2.2	29	33	0	32	37	0	35	40	0	52	60	0	40	46	43	50
1432	2.4	62	74	2.2	29	35	0	32	38	0	35	42	0	52	62	0	40	48	43	52
1400	2.5	60	74	2.2	29	36	0	32	40	0	35	43	0	52	65	0	40	50	43	54
1290	2.6	57	74	2.3	29	38	0	32	41	0	35	45	0	52	67	0	40	52	43	56
1254	2.7	55	74	2.3	29	39	0	32	43	0	35	47	0	52	70	0	40	54	43	58
1220	2.8	53	74	2.4	29	40	0	32	44	0	35	48	0	52	72	0	40	56	43	60
1160	2.9	52	74	2.4	29	42	0	32	46	0	35	50	0	52	75	0	40	58	43	63
1080	3	50	74	2.5	29	43	0	32	48	0	35	52	0	52	78	0	40	60	43	65
1056	3.1	48	74	2.5	29	45	0	32	49	0	35	54	0	52	80	0	40	62	43	67
1008	3.2	47	74	2.6	29	46	0	32	51	0	35	55	0	52	83	0	40	64	43	69
990	3.3	45	74	2.6	29	48	0	32	52	0	35	57	0	52	85	0	40	66	43	71
950	3.4	44	74	2.6	29	49	0	32	54	0	35	59	0	52	88	0	40	68	43	73
910	3.5	43	74	2.7	29	50	0	32	55	0	35	60	0	52	90	0	40	70	43	75
870	3.6	42	74	2.7	29	52	0	32	57	0	35	62	0	52	93	0	40	72	43	78
830	3.7	40	74	2.8	29	53	0	32	59	0	35	64	0	52	96	0	40	74	43	80
807	3.8	39	74	2.8	29	55	0	32	60	0	35	66	0	52	98	0	40	76	43	82
781	3.9	38	74	2.9	29	56	0	32	62	0	35	67	0	52	101	0	40	78	43	84
752	4	37	74	2.9	29	58	0	32	63	0	35	69	0	52	103	0	40	80	43	86
718	4.1	37	74	3	32	65	2	32	65	0	35	71	0	52	106	0	40	82	43	88
690	4.2	36	74	3.1	32	67	2.1	32	66	0	35	72	0	52	108	0	40	84	43	90
662	4.3	35	74	3.1	32	68	2.1	32	68	0	35	74	0	52	111	0	40	86	43	93
652	4.4	34	74	3.2	32	70	2.2	32	70	0	35	76	0	52	114	0	40	88	43	95
626	4.5	33	74	3.2	32	72	2.2	32	71	0	35	78	0	52	116	0	40	90	43	97
599	4.6	33	74	3.3	32	74	2.3	32	73	0	35	79	0	52	119	0	40	92	43	99
588	4.7	32	74	3.3	32	75	2.3	32	74	0	35	81	0	52	121	0	40	94	43	101
562	4.8	31	74	3.4	32	77	2.4	32	76	0	35	83	0	52	124	0	40	96	43	103
535	4.9	32	76	3.5	33	79	2.5	32	77	0	35	84	0	52	126	0	40	98	43	105
524	5	31	77	3.5	33	81	2.5	32	79	0	35	86	0	52	129	0	40	100	43	108
498	5.1	31	79	3.6	33	83	2.6	32	81	0	35	88	0	52	132	0	40	102	43	110
470	5.2	32	81	3.8	33	85	2.8	32	82	0	35	90	0	52	134	0	40	104	43	112
458	5.3	32	83	3.8	33	87	2.8	32	84	0	35	91	0	52	137	0	40	106	43	114
446	5.4	32	85	3.9	33	89	2.9	32	85	0	35	93	0	52	139	0	40	108	43	116
420	5.5	32	87	4	34	91	3	35	95	2	35	95	0	52	142	0	40	110	43	118
408	5.6	32	89	4.1	34	93	3.1	35	97	2.1	35	96	0	52	144	0	40	112	43	120
392	5.7	32	91	4.2	34	95	3.2	35	99	2.2	35	98	0	52	147	0	40	114	43	123
376	5.8	33	93	4.3	34	97	3.3	35	101	2.3	35	100	0	52	150	0	40	116	43	125
360	5.9	33	95	4.4	34	99	3.4	35	103	2.4	35	102	0	52	152	0	40	118	43	127
340	6	33	97	4.6	34	102	3.6	36	106	2.6	35	103	0	52	155	0	40	120	43	129
337	6.1	33	99	4.6	34	103	3.6	36	108	2.6	35	105	0	52	157	0	40	122	43	131
322	6.2	33	101	4.7	34	105	3.7	36	110	2.7	35	107	0	52	160	0	40	124	43	133
308	6.3	34	104	4.9	35	108	3.9	36	113	2.9	35	108	0	52	162	0	40	126	43	135
299	6.4	34	106	5	35	110	4	36	115	3	38	119	2	60	192	4	40	128	43	138
290	6.5	33	107	5	35	112	4	36	117	3	38	121	2	60	195	4	40	130	43	140
273	6.6	34	110	5.3	35	115	4.3	37	120	3.3	38	124	2.3	62	203	4.6	40	132	43	142
267	6.7	34	112	5.3	35	117	4.3	37	122	3.3	38	126	2.3	62	206	4.6	40	134	43	144
259	6.8	34	114	5.4	35	119	4.4	37	124	3.4	38	129	2.4	62	210	4.8	40	136	43	146
251	6.9	34	117	5.6	36	122	4.6	37	127	3.6	38	132	2.6	63	216	5.2	40	138	43	148
242	7	34	119	5.7	36	124	4.7	37	129	3.7	39	134	2.7	64	221	5.4	40	140	43	150
234	7.1	35	121	5.8	36	126	4.8	37	131	3.8	39	136	2.8	64	226	5.6	40	142	43	153
225	7.2	35	124	6	36	129	5	38	134	4	39	139	3	65	232	6	40	144	43	155
216	7.3	35	127	6.2	37	132	5.2	38	137	4.2	39	142	3.2	66	238	6.4	40	146	43	157
209	7.4	35	129	6.3	37	134	5.3	38	140	4.3	39	145	3.3	66	243	6.6	40	148	43	159
199	7.5	36	132	6.5	37	137	5.5	38	142	4.5	40	148	3.5	67	250	7	40	150	43	161
191	7.6	36	135	6.7	37	140	5.7	39	145	4.7	40	151	3.7	68	256	7.4	40	152	43	163
177	7.7	37	139	7.1	38	144	6.1	39	150	5.1	41	155	4.1	70	266	8.2	40	154	43	165
168	7.8	37	142	7.4	38	148	6.4	40	153	5.4	41	159	4.4	71	275	8.8	40	156	43	168
159	7.9	37	146	7.7	39	151	6.7	40	157	5.7	42	162	4.7	72	283	9.4	40	158	43	170
135	8	39	153	8.7	40	159	7.7	41	164	6.7	43	170	5.7	76	304	11.4	40	160	43	172

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

TRANSITION CURVES - RURAL
25 MPH DESIGN SPEED

VIRGINIA DEPARTMENT OF TRANSPORTATION

VDOT ROAD AND BRIDGE STANDARDS

REVISION DATE

803.33

SHEET 1 OF 1

TC-5.11

TRANSITION CURVES - RURAL
30 MPH DESIGN SPEED

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE

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

DESIGN VELOCITY =30		WIDTH= 18 FT			WIDTH=20 FT			WIDTH=22 FT			WIDTH=24 FT			WIDTH=48 FT			INTERCHANGE RAMPS			
		DESIGN SOFTWARE EQUIVALENTS (NUMBER OF LANES AT LANE WIDTH)															WIDTH			
		1 @ 9'			1 @ 10'			1 @ 11'			1 @ 12'			2 @ 12'			16 FT		18 FT	
RADIUS(FT)	E(%)	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	Lt	Lr
3240	NC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2400	2	31	31	2	31	31	0	34	34	0	37	37	0	55	55	0	43	43	45	45
2360	2.1	31	32	2	31	32	0	34	35	0	37	39	0	55	58	0	43	45	45	48
2200	2.2	31	34	2	31	34	0	34	37	0	37	40	0	55	60	0	43	47	45	50
2040	2.3	31	36	2.1	31	35	0	34	39	0	37	42	0	55	63	0	43	50	45	52
2000	2.4	74	88	2.1	31	37	0	34	40	0	37	44	0	55	66	0	43	52	45	54
1920	2.5	71	88	2.1	31	38	0	34	42	0	37	46	0	55	69	0	43	54	45	57
1840	2.6	68	88	2.1	31	40	0	34	44	0	37	48	0	55	71	0	43	56	45	59
1760	2.7	66	88	2.2	31	41	0	34	45	0	37	50	0	55	74	0	43	58	45	61
1680	2.8	63	88	2.2	31	43	0	34	47	0	37	51	0	55	77	0	43	60	45	63
1600	2.9	61	88	2.3	31	44	0	34	49	0	37	53	0	55	80	0	43	62	45	66
1520	3	59	88	2.3	31	46	0	34	50	0	37	55	0	55	82	0	43	64	45	68
1440	3.1	57	88	2.3	31	47	0	34	52	0	37	57	0	55	85	0	43	67	45	70
1430	3.2	55	88	2.4	31	49	0	34	54	0	37	59	0	55	88	0	43	69	45	72
1352	3.3	54	88	2.4	31	50	0	34	55	0	37	60	0	55	90	0	43	71	45	75
1288	3.4	52	88	2.5	31	52	0	34	57	0	37	62	0	55	93	0	43	73	45	77
1259	3.5	51	88	2.5	31	54	0	34	59	0	37	64	0	55	96	0	43	75	45	79
1203	3.6	49	88	2.5	31	55	0	34	60	0	37	66	0	55	99	0	43	77	45	81
1182	3.7	48	88	2.5	31	57	0	34	62	0	37	68	0	55	101	0	43	79	45	84
1120	3.8	47	88	2.6	31	58	0	34	64	0	37	70	0	55	104	0	43	82	45	86
1090	3.9	46	88	2.6	31	60	0	34	65	0	37	71	0	55	107	0	43	84	45	88
1038	4	44	88	2.7	31	61	0	34	67	0	37	73	0	55	110	0	43	86	45	90
1010	4.1	43	88	2.7	31	63	0	34	69	0	37	75	0	55	112	0	43	88	45	93
980	4.2	42	88	2.8	31	64	0	34	70	0	37	77	0	55	115	0	43	90	45	95
941	4.3	41	88	2.8	31	66	0	34	72	0	37	79	0	55	118	0	43	92	45	97
910	4.4	40	88	2.9	31	67	0	34	74	0	37	80	0	55	120	0	43	94	45	99
878	4.5	40	88	2.9	31	69	0	34	75	0	37	82	0	55	123	0	43	96	45	102
863	4.6	39	88	2.9	31	70	0	34	77	0	37	84	0	55	126	0	43	99	45	104
824	4.7	38	88	3	34	79	2	34	79	0	37	86	0	55	129	0	43	101	45	106
807	4.8	37	88	3	34	80	2	34	80	0	37	88	0	55	131	0	43	103	45	108
781	4.9	36	88	3.1	34	83	2.1	34	82	0	37	90	0	55	134	0	43	105	45	111
742	5	36	88	3.1	34	84	2.1	34	84	0	37	91	0	55	137	0	43	107	45	113
731	5.1	35	88	3.2	34	86	2.2	34	85	0	37	93	0	55	140	0	43	109	45	115
698	5.2	34	88	3.2	34	88	2.2	34	87	0	37	95	0	55	142	0	43	111	45	117
675	5.3	34	88	3.3	34	90	2.3	34	89	0	37	97	0	55	145	0	43	114	45	120
647	5.4	33	88	3.4	34	92	2.4	34	90	0	37	99	0	55	148	0	43	116	45	122
626	5.5	33	90	3.4	35	94	2.4	34	92	0	37	100	0	55	150	0	43	118	45	124
604	5.6	33	92	3.5	35	96	2.5	34	94	0	37	102	0	55	153	0	43	120	45	126
573	5.7	33	94	3.6	35	98	2.6	34	95	0	37	104	0	55	156	0	43	122	45	129
565	5.8	33	95	3.6	35	100	2.6	34	97	0	37	106	0	55	159	0	43	124	45	131
543	5.9	33	97	3.7	35	102	2.7	34	99	0	37	108	0	55	161	0	43	126	45	133
522	6	34	100	3.8	35	104	2.8	34	100	0	37	110	0	55	164	0	43	128	45	135
510	6.1	34	101	3.8	35	106	2.8	34	102	0	37	111	0	55	167	0	43	131	45	138
486	6.2	34	103	3.9	35	108	2.9	34	104	0	37	113	0	55	170	0	43	133	45	140
464	6.3	34	105	4	35	110	3	37	115	2	37	115	0	55	172	0	43	135	45	142
450	6.4	34	108	4.1	35	112	3.1	37	117	2.1	37	117	0	55	175	0	43	137	45	144
440	6.5	34	109	4.1	36	114	3.1	37	119	2.1	37	119	0	55	178	0	43	139	45	147
430	6.6	34	111	4.2	36	116	3.2	37	121	2.2	37	120	0	55	180	0	43	141	45	149
410	6.7	35	114	4.3	36	119	3.3	37	124	2.3	37	122	0	55	183	0	43	143	45	151
400	6.8	35	116	4.4	36	121	3.4	37	126	2.4	37	124	0	55	186	0	43	146	45	153
390	6.9	35	118	4.5	36	123	3.5	38	129	2.5	37	126	0	55	189	0	43	148	45	156
371	7	35	120	4.6	36	126	3.6	38	131	2.6	37	128	0	55	191	0	43	150	45	158
360	7.1	35	123	4.7	37	128	3.7	38	133	2.7	37	130	0	55	194	0	43	152	45	160
343	7.2	35	125	4.8	37	130	3.8	38	136	2.8	37	131	0	55	197	0	43	154	45	162
332	7.3	35	127	4.9	37	133	3.9	38	138	2.9	37	133	0	55	200	0	43	156	45	165
320	7.4	35	129	5	37	135	4	39	141	3	40	146	2	64	236	4	43	158	45	167
309	7.5	36	132	5.1	37	137	4.1	39	143	3.1	40	149	2.1	65	241	4.2	43	160	45	169
298	7.6	36	135	5.3	37	140	4.3	39	146	3.3	40	152	2.3	65	247	4.6	43	163	45	171
280	7.7	36	138	5.5	38	143	4.5	39	149	3.5	41	155	2.5	66	254	5	43	165	45	174
271	7.8	36	140	5.6	38	146	4.6	39	152	3.6	41	158	2.6	67	259	5.2	43	167	45	176
259	7.9	37	143	5.8	38	149	4.8	40	155	3.8	41	161	2.8	68	266	5.6	43	169	45	178
215	8	38	149	6.5	39	155	5.5	41	161	4.5	42	167	3.5	71	282	7	43	171	45	180

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

SPECIFICATION REFERENCE

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

DESIGN VELOCITY =35		WIDTH= 18 FT			WIDTH=20 FT			WIDTH=22 FT			WIDTH=24 FT			WIDTH=48 FT			WIDTH=72 FT			INTERCHANGE RAMPS WIDTH			
		DESIGN SOFTWARE EQUIVALENTS (NUMBER OF LANES AT LANE WIDTH)																					
		1 @ 9'			1 @ 10'			1 @ 11'			1 @ 12'			2 @ 12'			3 @ 12'			16 FT		18 FT	
RADIUS(FT)	E(%)	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	Lt	Lr
4260	NC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3160	2	30	30	0	33	33	0	36	36	0	39	39	0	59	59	0	78	78	0	46	46	48	48
3040	2.1	30	31	0	33	34	0	36	38	0	39	41	0	59	61	0	78	82	0	46	48	48	51
2940	2.2	30	32	0	33	36	0	36	40	0	39	43	0	59	64	0	78	86	0	46	50	48	53
2700	2.3	33	38	2	33	38	0	36	41	0	39	45	0	59	67	0	78	90	0	46	52	48	56
2580	2.4	33	39	2	33	39	0	36	43	0	39	47	0	59	70	0	78	93	0	46	55	48	58
2520	2.5	33	41	2	33	41	0	36	45	0	39	49	0	59	73	0	78	97	0	46	57	48	60
2412	2.6	80	103	2.1	33	42	0	36	47	0	39	51	0	59	76	0	78	101	0	46	59	48	63
2303	2.7	77	103	2.1	33	44	0	36	48	0	39	53	0	59	79	0	78	105	0	46	61	48	65
2220	2.8	74	103	2.1	33	46	0	36	50	0	39	55	0	59	82	0	78	109	0	46	64	48	68
2085	2.9	72	103	2.2	33	47	0	36	52	0	39	57	0	59	85	0	78	113	0	46	66	48	70
1994	3	69	103	2.2	33	49	0	36	54	0	39	59	0	59	88	0	78	117	0	46	68	48	72
1915	3.1	67	103	2.2	33	50	0	36	55	0	39	60	0	59	90	0	78	120	0	46	70	48	75
1865	3.2	65	103	2.3	33	52	0	36	57	0	39	62	0	59	93	0	78	124	0	46	73	48	77
1822	3.3	63	103	2.3	33	54	0	36	59	0	39	64	0	59	96	0	78	128	0	46	75	48	80
1706	3.4	61	103	2.3	33	55	0	36	61	0	39	66	0	59	99	0	78	132	0	46	77	48	82
1648	3.5	59	103	2.4	33	57	0	36	63	0	39	68	0	59	102	0	78	136	0	46	79	48	84
1590	3.6	58	103	2.4	33	59	0	36	64	0	39	70	0	59	105	0	78	140	0	46	82	48	87
1533	3.7	56	103	2.4	33	60	0	36	66	0	39	72	0	59	108	0	78	144	0	46	84	48	89
1476	3.8	55	103	2.5	33	62	0	36	68	0	39	74	0	59	111	0	78	148	0	46	86	48	92
1467	3.9	53	103	2.5	33	63	0	36	70	0	39	76	0	59	114	0	78	151	0	46	88	48	94
1410	4	52	103	2.5	33	65	0	36	71	0	39	78	0	59	117	0	78	155	0	46	91	48	96
1355	4.1	51	103	2.5	33	67	0	36	73	0	39	80	0	59	120	0	78	159	0	46	93	48	99
1300	4.2	50	103	2.6	33	68	0	36	75	0	39	82	0	59	122	0	78	163	0	46	95	48	101
1275	4.3	48	103	2.6	33	70	0	36	77	0	39	84	0	59	125	0	78	167	0	46	97	48	104
1220	4.4	47	103	2.7	33	71	0	36	79	0	39	86	0	59	128	0	78	171	0	46	100	48	106
1200	4.5	46	103	2.7	33	73	0	36	80	0	39	88	0	59	131	0	78	175	0	46	102	48	108
1140	4.6	45	103	2.7	33	75	0	36	82	0	39	90	0	59	134	0	78	179	0	46	104	48	111
1110	4.7	44	103	2.8	33	76	0	36	84	0	39	91	0	59	137	0	78	182	0	46	106	48	113
1080	4.8	43	103	2.8	33	78	0	36	86	0	39	93	0	59	140	0	78	186	0	46	109	48	116
1050	4.9	43	103	2.8	33	80	0	36	87	0	39	95	0	59	143	0	78	190	0	46	111	48	118
1020	5	42	103	2.9	33	81	0	36	89	0	39	97	0	59	146	0	78	194	0	46	113	48	120
990	5.1	41	103	2.9	33	83	0	36	91	0	39	99	0	59	149	0	78	198	0	46	115	48	123
960	5.2	40	103	2.9	33	84	0	36	93	0	39	101	0	59	151	0	78	202	0	46	118	48	125
930	5.3	39	103	3	36	95	2	36	95	0	39	103	0	59	154	0	78	206	0	46	120	48	128
889	5.4	39	103	3	36	96	2	36	96	0	39	105	0	59	157	0	78	210	0	46	122	48	130
873	5.5	38	103	3.1	36	99	2.1	36	98	0	39	107	0	59	160	0	78	213	0	46	124	48	132
847	5.6	37	103	3.1	36	100	2.1	36	100	0	39	109	0	59	163	0	78	217	0	46	127	48	135
806	5.7	37	103	3.2	36	103	2.2	36	102	0	39	111	0	59	166	0	78	221	0	46	129	48	137
790	5.8	36	103	3.2	36	104	2.2	36	103	0	39	113	0	59	169	0	78	225	0	46	131	48	140
752	5.9	35	103	3.3	36	107	2.3	36	105	0	39	115	0	59	172	0	78	229	0	46	133	48	142
730	6	35	104	3.4	37	109	2.4	36	107	0	39	117	0	59	175	0	78	233	0	46	136	48	144
709	6.1	35	106	3.4	37	111	2.4	36	109	0	39	119	0	59	178	0	78	237	0	46	138	48	147
689	6.2	35	107	3.4	37	112	2.4	36	110	0	39	120	0	59	180	0	78	240	0	46	140	48	149
666	6.3	35	110	3.5	37	115	2.5	36	112	0	39	122	0	59	183	0	78	244	0	46	142	48	152
654	6.4	35	111	3.5	37	117	2.5	36	114	0	39	124	0	59	186	0	78	248	0	46	145	48	154
629	6.5	36	114	3.6	37	119	2.6	36	116	0	39	126	0	59	189	0	78	252	0	46	147	48	156
607	6.6	36	116	3.7	37	121	2.7	36	118	0	39	128	0	59	192	0	78	256	0	46	149	48	159
591	6.7	36	118	3.7	37	123	2.7	36	119	0	39	130	0	59	195	0	78	260	0	46	151	48	161
568	6.8	36	120	3.8	38	126	2.8	36	121	0	39	132	0	59	198	0	78	264	0	46	154	48	164
558	6.9	36	122	3.8	37	127	2.8	36	123	0	39	134	0	59	201	0	78	268	0	46	156	48	166
534	7	36	124	3.9	38	130	2.9	36	125	0	39	136	0	59	204	0	78	271	0	46	158	48	168
518	7.1	36	126	4	38	132	3	39	138	2	39	138	0	59	207	0	78	275	0	46	160	48	171
494	7.2	36	129	4.1	38	135	3.1	39	140	2.1	39	140	0	59	210	0	78	279	0	46	163	48	173
476	7.3	36	131	4.2	38	137	3.2	40	143	2.2	39	142	0	59	212	0	78	283	0	46	165	48	176
464	7.4	37	134	4.3	38	140	3.3	40	146	2.3	39	144	0	59	215	0	78	287	0	46	167	48	178
446	7.5	37	136	4.4	38	142	3.4	40	148	2.4	39	146	0	59	218	0	78	291	0	46	170	48	180
437	7.6	37	138	4.4	38	144	3.4	40	150	2.4	39	148	0	59	221	0	78	295	0	46	172	48	183
420	7.7	37	140	4.5	38	146	3.5	40	153	2.5	39	150	0	59	224	0	78	299	0	46	174	48	185
402	7.8	37	143	4.6	39	149	3.6	40	155	2.6	39	151	0	59	227	0	78	302	0	46	176	48	188
367	7.9	37	146	4.9	39	153	3.9	41	159	2.9	39	153	0	59	230	0	78	306	0	46	179	48	190
316	8	38	151	5.4	40	158	4.4	41	164	3.4	43	171	2.4	70	279	4.8	93	372	7.2	46	181	48	192

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

TC-5.11

TRANSITION CURVES - RURAL
35 MPH DESIGN SPEED

VIRGINIA DEPARTMENT OF TRANSPORTATION

VDOT ROAD AND BRIDGE STANDARDS

REVISION DATE

803.35

SHEET 1 OF 1

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

TRANSITION CURVES - RURAL
40 MPH DESIGN SPEED

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

DESIGN VELOCITY =40		WIDTH= 18 FT			WIDTH=20 FT			WIDTH=22 FT			WIDTH=24 FT			WIDTH=48 FT			WIDTH=72 FT			INTERCHANGE RAMPS			
		DESIGN SOFTWARE EQUIVALENTS (NUMBER OF LANES AT LANE WIDTH)																		WIDTH			
		1 @ 9'			1 @ 10'			1 @ 11'			1 @ 12'			2 @ 12'			3 @ 12'			16 FT		18 FT	
RADIUS(FT)	E(%)	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	Lt	Lr
5410	NC	0	0	3	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4120	2	37	37	3.1	39	39	2.1	38	38	0	42	42	0	63	63	0	83	83	0	49	49	52	52
3920	2.1	37	39	3.2	39	41	2.2	38	40	0	42	44	0	63	66	0	83	87	0	49	51	52	54
3640	2.2	37	41	3.2	39	43	2.2	38	42	0	42	46	0	63	69	0	83	92	0	49	54	52	57
3480	2.3	37	43	3.3	39	45	2.3	38	44	0	42	48	0	63	72	0	83	96	0	49	56	52	60
3400	2.4	37	45	3.3	39	47	2.3	38	46	0	42	50	0	63	75	0	83	100	0	49	59	52	62
3160	2.5	37	47	3.4	39	49	2.4	38	48	0	42	52	0	63	78	0	83	104	0	49	61	52	65
3094	2.6	37	48	3.4	39	51	2.4	38	50	0	42	54	0	63	81	0	83	108	0	49	64	52	67
2970	2.7	37	50	3.4	39	53	2.4	38	52	0	42	56	0	63	84	0	83	112	0	49	66	52	70
2784	2.8	84	52	3.5	39	55	2.5	38	54	0	42	58	0	63	87	0	83	116	0	49	68	52	72
2712	2.9	81	54	3.5	39	57	2.5	38	55	0	42	60	0	63	90	0	83	120	0	49	71	52	75
2556	3	78	56	3.6	39	59	2.6	38	57	0	42	63	0	63	94	0	83	125	0	49	73	52	78
2472	3.1	76	58	3.6	39	61	2.6	38	59	0	42	65	0	63	97	0	83	129	0	49	76	52	80
2395	3.2	74	60	3.7	40	63	2.7	38	61	0	42	67	0	63	100	0	83	133	0	49	78	52	83
2294	3.3	71	62	3.7	40	65	2.7	38	63	0	42	69	0	63	103	0	83	137	0	49	80	52	85
2212	3.4	69	64	3.8	40	67	2.8	38	65	0	42	71	0	63	106	0	83	141	0	49	83	52	88
2171	3.5	67	66	3.8	40	69	2.8	38	67	0	42	73	0	63	109	0	83	145	0	49	85	52	90
2073	3.6	65	68	3.9	40	72	2.9	38	69	0	42	75	0	63	112	0	83	149	0	49	88	52	93
2001	3.7	64	70	3.9	40	74	2.9	38	71	0	42	77	0	63	115	0	83	154	0	49	90	52	96
1941	3.8	62	73	4	40	76	3	42	79	2	42	79	0	63	118	0	83	158	0	49	93	52	98
1856	3.9	60	74	4	40	78	3	42	81	2	42	81	0	63	122	0	83	162	0	49	95	52	101
1800	4	59	77	4.1	40	80	3.1	42	84	2.1	42	83	0	63	125	0	83	166	0	49	97	52	103
1744	4.1	58	79	4.1	40	82	3.1	42	86	2.1	42	85	0	63	128	0	83	170	0	49	100	52	106
1689	4.2	56	81	4.2	40	84	3.2	42	88	2.2	42	87	0	63	131	0	83	174	0	49	102	52	108
1635	4.3	55	83	4.2	40	86	3.2	42	90	2.2	42	89	0	63	134	0	83	178	0	49	105	52	111
1581	4.4	54	85	4.3	41	89	3.3	42	93	2.3	42	92	0	63	137	0	83	183	0	49	107	52	114
1527	4.5	52	87	4.3	41	91	3.3	42	95	2.3	42	94	0	63	140	0	83	187	0	49	110	52	116
1502	4.6	51	89	4.4	41	93	3.4	43	97	2.4	42	96	0	63	143	0	83	191	0	49	112	52	119
1477	4.7	50	91	4.4	41	95	3.4	43	99	2.4	42	98	0	63	146	0	83	195	0	49	114	52	121
1424	4.8	49	94	4.5	41	98	3.5	43	102	2.5	42	100	0	63	149	0	83	199	0	49	117	52	124
1368	4.9	48	96	4.5	41	100	3.5	43	104	2.5	42	102	0	63	153	0	83	203	0	49	119	52	126
1346	5	47	98	4.6	41	102	3.6	43	107	2.6	42	104	0	63	156	0	83	207	0	49	122	52	129
1296	5.1	46	100	4.7	41	105	3.7	43	109	2.7	42	106	0	63	159	0	83	212	0	49	124	52	132
1267	5.2	45	102	4.7	41	107	3.7	43	111	2.7	42	108	0	63	162	0	83	216	0	49	127	52	134
1220	5.3	45	105	4.8	42	109	3.8	43	114	2.8	42	110	0	63	165	0	83	220	0	49	129	52	137
1190	5.4	44	107	4.8	42	111	3.8	43	116	2.8	42	112	0	63	168	0	83	224	0	49	131	52	139
1160	5.5	43	109	4.9	42	114	3.9	43	119	2.9	42	114	0	63	171	0	83	228	0	49	134	52	142
1101	5.6	42	112	5	42	116	4	44	121	3	45	126	2	73	203	4	97	271	6	49	136	52	144
1081	5.7	42	114	5.1	42	119	4.1	44	124	3.1	45	129	2.1	73	208	4.2	98	278	6.3	49	139	52	147
1054	5.8	41	116	5.1	42	121	4.1	44	126	3.1	45	131	2.1	73	212	4.2	98	282	6.3	49	141	52	150
1025	5.9	40	118	5.2	42	124	4.2	44	129	3.2	46	134	2.2	74	217	4.4	98	289	6.6	49	144	52	152
988	6	41	121	5.3	42	126	4.3	44	131	3.3	46	137	2.3	74	222	4.6	99	296	6.9	49	146	52	155
957	6.1	41	124	5.4	43	129	4.4	44	134	3.4	46	139	2.4	75	228	4.8	100	303	7.2	49	148	52	157
942	6.2	41	126	5.4	43	131	4.4	44	136	3.4	46	142	2.4	75	231	4.8	100	308	7.2	49	151	52	160
912	6.3	41	128	5.5	43	134	4.5	44	139	3.5	46	144	2.5	75	237	5	100	315	7.5	49	153	52	162
875	6.4	41	131	5.6	43	136	4.6	45	142	3.6	46	147	2.6	76	242	5.2	101	323	7.8	49	156	52	165
866	6.5	41	133	5.6	43	138	4.6	45	144	3.6	46	150	2.6	76	246	5.2	101	328	7.8	49	158	52	168
837	6.6	41	135	5.7	43	141	4.7	45	147	3.7	47	152	2.7	77	251	5.4	102	335	8.1	49	160	52	170
806	6.7	42	139	5.9	43	144	4.9	45	150	3.9	47	156	2.9	78	259	5.8	103	345	8.7	49	163	52	173
782	6.8	42	141	6	44	147	5	45	153	4	47	159	3	78	264	6	104	352	9	49	165	52	175
754	6.9	42	144	6.1	44	150	5.1	45	156	4.1	47	162	3.1	79	270	6.2	105	360	9.3	49	168	52	178
744	7	42	146	6.1	44	152	5.1	45	158	4.1	47	164	3.1	79	274	6.2	105	365	9.3	49	170	52	180
714	7.1	42	149	6.3	44	155	5.3	46	161	4.3	48	168	3.3	80	281	6.6	106	375	9.9	49	173	52	183
692	7.2	43	152	6.4	44	158	5.4	46	164	4.4	48	171	3.4	80	287	6.8	107	383	10.2	49	175	52	186
663	7.3	43	155	6.5	45	161	5.5	46	167	4.5	48	174	3.5	81	293	7	107	391	10.5	49	177	52	188
651	7.4	43	157	6.6	45	164	5.6	46	170	4.6	48	177	3.6	81	299	7.2	108	399	10.8	49	180	52	191
622	7.5	43	161	6.8	45	167	5.8	47	174	4.8	48	180	3.8	82	307	7.6	109	409	11.4	49	182	52	193
597	7.6	44	164	6.9	45	170	5.9	47	177	4.9	49	183	3.9	83	313	7.8	110	417	11.7	49	185	52	196
581	7.7	44	166	7	45	173	6	47	180	5	49	186	4	83	319	8	111	425	12	49	187	52	198
561	7.8	44	170	7.2	46	177	6.2	47	183	5.2	49	190	4.2	84	327	8.4	112	436	12.6	49	190	52	201
535	7.9	44	173	7.4	46	180	6.4	48	187	5.4	49	194	4.4	85	336	8.8	114	447	13.2	49	192	52	204
446	8	46	182	8.3	48	189	7.3	49	196	6.3	51	203	5.3	90	358	10.6	120	478	15.9	49	194	52	206

SPECIFICATION REFERENCE

TRANSITION CURVES - RURAL
45 MPH DESIGN SPEED

VIRGINIA DEPARTMENT OF TRANSPORTATION

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)																		16 FT		18 FT	
		1 @ 9'			1 @ 10'			1 @ 11'			1 @ 12'			2 @ 12'			3 @ 12'						
RADIUS(FT)	E(%)	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	Lt	Lr
6710	NC	0	0	2.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5180	2	39	39	3	41	41	2	41	41	0	45	45	0	67	67	0	89	89	0	53	53	56	56
4730	2.1	40	42	3.1	41	43	2.1	41	43	0	45	47	0	67	70	0	89	94	0	53	56	56	59
4560	2.2	40	43	3.1	41	46	2.1	41	45	0	45	49	0	67	74	0	89	98	0	53	58	56	61
4350	2.3	40	46	3.2	42	48	2.2	41	47	0	45	52	0	67	77	0	89	103	0	53	61	56	64
4080	2.4	40	48	3.2	42	50	2.2	41	49	0	45	54	0	67	80	0	89	107	0	53	63	56	67
3930	2.5	40	50	3.3	42	52	2.3	41	51	0	45	56	0	67	84	0	89	112	0	53	66	56	70
3780	2.6	40	52	3.3	42	54	2.3	41	53	0	45	58	0	67	87	0	89	116	0	53	69	56	72
3630	2.7	40	54	3.3	42	56	2.3	41	55	0	45	60	0	67	90	0	89	120	0	53	71	56	75
3450	2.8	40	56	3.4	42	59	2.4	41	58	0	45	63	0	67	94	0	89	125	0	53	74	56	78
3270	2.9	40	58	3.4	42	61	2.4	41	60	0	45	65	0	67	97	0	89	129	0	53	77	56	81
3150	3	40	60	3.5	42	63	2.5	41	62	0	45	67	0	67	100	0	89	134	0	53	79	56	84
3030	3.1	40	62	3.5	42	65	2.5	41	64	0	45	69	0	67	104	0	89	138	0	53	82	56	86
2920	3.2	40	64	3.5	42	67	2.5	41	66	0	45	72	0	67	107	0	89	143	0	53	84	56	89
2840	3.3	80	132	3.6	42	70	2.6	41	68	0	45	74	0	67	110	0	89	147	0	53	87	56	92
2784	3.4	78	132	3.6	42	72	2.6	41	70	0	45	76	0	67	114	0	89	152	0	53	90	56	95
2670	3.5	76	132	3.6	42	74	2.6	41	72	0	45	78	0	67	117	0	89	156	0	53	92	56	97
2606	3.6	74	132	3.7	43	76	2.7	41	74	0	45	80	0	67	120	0	89	160	0	53	95	56	100
2498	3.7	72	132	3.7	43	78	2.7	41	76	0	45	83	0	67	124	0	89	165	0	53	98	56	103
2393	3.8	70	132	3.8	43	81	2.8	41	78	0	45	85	0	67	127	0	89	169	0	53	100	56	106
2355	3.9	68	132	3.8	43	83	2.8	41	80	0	45	87	0	67	130	0	89	174	0	53	103	56	108
2261	4	66	132	3.9	43	85	2.9	41	82	0	45	89	0	67	134	0	89	178	0	53	105	56	111
2183	4.1	65	132	3.9	43	87	2.9	41	84	0	45	92	0	67	137	0	89	183	0	53	108	56	114
2126	4.2	63	132	3.9	43	90	2.9	41	86	0	45	94	0	67	140	0	89	187	0	53	111	56	117
2069	4.3	62	132	4	43	92	3	45	96	2	45	96	0	67	144	0	89	192	0	53	113	56	120
2012	4.4	60	132	4	43	94	3	45	98	2	45	98	0	67	147	0	89	196	0	53	116	56	122
1955	4.5	59	132	4.1	43	97	3.1	45	101	2.1	45	100	0	67	150	0	89	200	0	53	119	56	125
1878	4.6	58	132	4.1	43	99	3.1	45	103	2.1	45	103	0	67	154	0	89	205	0	53	121	56	128
1820	4.7	57	132	4.2	43	101	3.2	45	106	2.2	45	105	0	67	157	0	89	209	0	53	124	56	131
1788	4.8	55	132	4.2	43	104	3.2	45	108	2.2	45	107	0	67	160	0	89	214	0	53	126	56	133
1739	4.9	54	132	4.2	43	106	3.2	45	110	2.2	45	109	0	67	164	0	89	218	0	53	129	56	136
1703	5	53	132	4.3	44	108	3.3	45	113	2.3	45	112	0	67	167	0	89	223	0	53	132	56	139
1652	5.1	52	132	4.3	44	111	3.3	45	115	2.3	45	114	0	67	170	0	89	227	0	53	134	56	142
1578	5.2	51	132	4.4	44	113	3.4	46	118	2.4	45	116	0	67	174	0	89	232	0	53	137	56	144
1535	5.3	50	132	4.5	44	116	3.5	46	121	2.5	45	118	0	67	177	0	89	236	0	53	140	56	147
1496	5.4	49	132	4.5	44	118	3.5	46	123	2.5	45	120	0	67	180	0	89	240	0	53	142	56	150
1464	5.5	48	132	4.5	44	120	3.5	46	125	2.5	45	123	0	67	184	0	89	245	0	53	145	56	153
1419	5.6	48	132	4.6	44	123	3.6	46	128	2.6	45	125	0	67	187	0	89	249	0	53	147	56	156
1378	5.7	47	132	4.7	44	126	3.7	46	131	2.7	45	127	0	67	190	0	89	254	0	53	150	56	158
1324	5.8	46	132	4.7	44	128	3.7	46	133	2.7	45	129	0	67	194	0	89	258	0	53	153	56	161
1306	5.9	45	132	4.8	45	131	3.8	46	136	2.8	45	132	0	67	197	0	89	263	0	53	155	56	164
1261	6	44	132	4.9	45	133	3.9	47	139	2.9	45	134	0	67	200	0	89	267	0	53	158	56	167
1240	6.1	44	132	4.9	45	135	3.9	47	141	2.9	45	136	0	67	204	0	89	272	0	53	160	56	169
1196	6.2	43	133	5	45	138	4	47	144	3	49	150	2	78	242	4	104	322	6	53	163	56	172
1173	6.3	43	135	5	45	140	4	47	146	3	49	152	2	78	245	4	104	327	6	53	166	56	175
1150	6.4	43	137	5.1	45	143	4.1	47	149	3.1	49	155	2.1	79	251	4.2	105	335	6.3	53	168	56	178
1103	6.5	44	140	5.2	45	146	4.2	47	152	3.2	49	158	2.2	79	257	4.4	106	342	6.6	53	171	56	180
1079	6.6	44	142	5.2	45	148	4.2	47	154	3.2	49	161	2.2	79	261	4.4	106	348	6.6	53	174	56	183
1054	6.7	44	145	5.3	45	151	4.3	47	157	3.3	49	164	2.3	80	267	4.6	106	355	6.9	53	176	56	186
1000	6.8	44	148	5.4	46	154	4.4	48	160	3.4	49	167	2.4	80	272	4.8	107	363	7.2	53	179	56	189
986	6.9	44	150	5.4	46	156	4.4	48	163	3.4	49	169	2.4	80	276	4.8	107	368	7.2	53	181	56	192
948	7	44	153	5.6	46	160	4.6	48	166	3.6	50	173	2.6	82	284	5.2	109	379	7.8	53	184	56	194
933	7.1	44	156	5.6	46	162	4.6	48	169	3.6	50	175	2.6	82	288	5.2	109	384	7.8	53	187	56	197
896	7.2	44	158	5.7	46	165	4.7	48	172	3.7	50	178	2.7	82	294	5.4	109	392	8.1	53	189	56	200
858	7.3	45	161	5.8	47	168	4.8	48	175	3.8	50	182	2.8	83	301	5.6	110	401	8.4	53	192	56	203
846	7.4	45	164	5.9	47	171	4.9	48	178	3.9	50	185	2.9	83	307	5.8	111	409	8.7	53	195	56	205
807	7.5	45	167	6	47	174	5	49	181	4	50	188	3	84	313	6	112	417	9	53	197	56	208
800	7.6	45	170	6.1	47	177	5.1	49	184	4.1	51	191	3.1	84	319	6.2	112	426	9.3	53	200	56	211
760	7.7	45	173	6.2	47	180	5.2	49	187	4.2	51	194	3.2	85	326	6.4	113	434	9.6	53	202	56	214
720	7.8	46	177	6.4	48	184	5.4	49	191	4.4	51	198	3.4	86	334	6.8	115	445	10.2	53	205	56	216
680	7.9	46	180	6.6	48	188	5.6	50	195	4.6	52	202	3.6	87	343	7.2	116	457	10.8	53	208	56	219
589	8	47	187	7.2	49	195	6.2	51	202	5.2	53	209	4.2	90	360	8.4	120	480	12.6	53	210	56	222

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

TC-5.11

VDOT
ROAD AND BRIDGE STANDARDS

REVISION DATE

803.37

SHEET 1 OF 1

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

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			
		DESIGN SOFTWARE EQUIVALENTS (NUMBER OF LANES AT LANE WIDTH)																		WIDTH			
		1 @ 9'			1 @ 10'			1 @ 11'			1 @ 12'			2 @ 12'			3 @ 12'			16 FT		18 FT	
RADIUS(FT)	E(%)	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	Lt	Lr
8150	NC	0	0	2.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6013	2	42	42	3	44	44	2	44	44	0	48	48	0	72	72	0	96	96	0	57	57	60	60
5703	2.1	43	45	3.1	45	47	2.1	44	47	0	48	51	0	72	76	0	96	101	0	57	59	60	63
5420	2.2	43	47	3.1	45	49	2.1	44	49	0	48	53	0	72	80	0	96	106	0	57	62	60	66
5162	2.3	43	49	3.1	45	51	2.1	44	51	0	48	56	0	72	83	0	96	111	0	57	65	60	69
4926	2.4	43	51	3.2	45	54	2.2	44	53	0	48	58	0	72	87	0	96	116	0	57	68	60	72
4708	2.5	43	53	3.2	45	56	2.2	44	55	0	48	60	0	72	90	0	96	120	0	57	71	60	75
4507	2.6	43	56	3.2	45	58	2.2	44	58	0	48	63	0	72	94	0	96	125	0	57	73	60	78
4320	2.7	43	58	3.3	45	61	2.3	44	60	0	48	65	0	72	98	0	96	130	0	57	76	60	81
4146	2.8	43	60	3.3	45	63	2.3	44	62	0	48	68	0	72	101	0	96	135	0	57	79	60	84
3985	2.9	43	62	3.3	45	65	2.3	44	64	0	48	70	0	72	105	0	96	140	0	57	82	60	87
3834	3	43	65	3.4	45	68	2.4	44	66	0	48	72	0	72	108	0	96	144	0	57	85	60	90
3692	3.1	43	67	3.4	45	70	2.4	44	69	0	48	75	0	72	112	0	96	149	0	57	88	60	93
3560	3.2	43	69	3.4	45	72	2.4	44	71	0	48	77	0	72	116	0	96	154	0	57	90	60	96
3434	3.3	43	71	3.5	45	75	2.5	44	73	0	48	80	0	72	119	0	96	159	0	57	93	60	99
3316	3.4	43	74	3.5	45	77	2.5	44	75	0	48	82	0	72	123	0	96	164	0	57	96	60	102
3205	3.5	43	76	3.5	45	79	2.5	44	77	0	48	84	0	72	126	0	96	168	0	57	99	60	105
3099	3.6	44	78	3.6	46	82	2.6	44	80	0	48	87	0	72	130	0	96	173	0	57	102	60	108
2999	3.7	44	80	3.6	46	84	2.6	44	82	0	48	89	0	72	134	0	96	178	0	57	104	60	111
2904	3.8	44	83	3.6	46	86	2.6	44	84	0	48	92	0	72	137	0	96	183	0	57	107	60	114
2814	3.9	76	147	3.7	46	89	2.7	44	86	0	48	94	0	72	141	0	96	188	0	57	110	60	117
2728	4	74	147	3.7	46	91	2.7	44	88	0	48	96	0	72	144	0	96	192	0	57	113	60	120
2646	4.1	72	147	3.8	46	94	2.8	44	91	0	48	99	0	72	148	0	96	197	0	57	116	60	123
2568	4.2	70	147	3.8	46	96	2.8	44	93	0	48	101	0	72	152	0	96	202	0	57	118	60	126
2493	4.3	69	147	3.8	46	99	2.8	44	95	0	48	104	0	72	155	0	96	207	0	57	121	60	129
2422	4.4	67	147	3.9	46	101	2.9	44	97	0	48	106	0	72	159	0	96	212	0	57	124	60	132
2353	4.5	66	147	3.9	46	104	2.9	44	99	0	48	108	0	72	162	0	96	216	0	57	127	60	135
2287	4.6	64	147	3.9	46	106	2.9	44	102	0	48	111	0	72	166	0	96	221	0	57	130	60	138
2224	4.7	63	147	4	46	109	3	48	113	2	48	113	0	72	170	0	96	226	0	57	132	60	141
2163	4.8	62	147	4	46	111	3	48	116	2	48	116	0	72	173	0	96	231	0	57	135	60	144
2104	4.9	60	147	4.1	47	114	3.1	49	119	2.1	48	118	0	72	177	0	96	236	0	57	138	60	147
2047	5	59	147	4.1	47	116	3.1	49	121	2.1	48	120	0	72	180	0	96	240	0	57	141	60	150
1992	5.1	58	147	4.1	47	118	3.1	49	123	2.1	48	123	0	72	184	0	96	245	0	57	144	60	153
1939	5.2	57	147	4.2	47	121	3.2	49	126	2.2	48	125	0	72	188	0	96	250	0	57	146	60	156
1888	5.3	56	147	4.2	47	123	3.2	49	129	2.2	48	128	0	72	191	0	96	255	0	57	149	60	159
1838	5.4	55	147	4.3	47	126	3.3	49	132	2.3	48	130	0	72	195	0	96	260	0	57	152	60	162
1790	5.5	54	147	4.3	47	129	3.3	49	134	2.3	48	132	0	72	198	0	96	264	0	57	155	60	165
1743	5.6	53	147	4.4	47	132	3.4	49	137	2.4	48	135	0	72	202	0	96	269	0	57	158	60	168
1698	5.7	52	147	4.4	47	134	3.4	49	140	2.4	48	137	0	72	206	0	96	274	0	57	160	60	171
1653	5.8	51	147	4.5	47	137	3.5	49	143	2.5	48	140	0	72	209	0	96	279	0	57	163	60	174
1610	5.9	50	147	4.5	47	139	3.5	49	145	2.5	48	142	0	72	213	0	96	284	0	57	166	60	177
1568	6	49	147	4.5	47	141	3.5	49	147	2.5	48	144	0	72	216	0	96	288	0	57	169	60	180
1527	6.1	49	147	4.6	48	144	3.6	50	151	2.6	48	147	0	72	220	0	96	293	0	57	172	60	183
1487	6.2	48	147	4.6	48	147	3.6	50	153	2.6	48	149	0	72	224	0	96	298	0	57	175	60	186
1448	6.3	47	147	4.7	48	150	3.7	50	156	2.7	48	152	0	72	227	0	96	303	0	57	177	60	189
1410	6.4	46	147	4.8	48	153	3.8	50	159	2.8	48	154	0	72	231	0	96	308	0	57	180	60	192
1372	6.5	46	149	4.8	48	155	3.8	50	162	2.8	48	156	0	72	234	0	96	312	0	57	183	60	195
1336	6.6	47	152	4.9	48	158	3.9	50	165	2.9	48	159	0	72	238	0	96	317	0	57	186	60	198
1300	6.7	46	154	4.9	48	161	3.9	50	167	2.9	48	161	0	72	242	0	96	322	0	57	189	60	201
1265	6.8	47	157	5	48	164	4	50	170	3	52	177	2	84	286	4	112	381	6	57	191	60	204
1230	6.9	47	159	5	48	166	4	50	173	3	52	180	2	84	290	4	112	387	6	57	194	60	207
1196	7	47	162	5.1	49	169	4.1	51	176	3.1	53	183	2.1	85	297	4.2	113	395	6.3	57	197	60	210
1162	7.1	47	165	5.2	49	172	4.2	51	179	3.2	53	187	2.2	86	303	4.4	114	404	6.6	57	200	60	213
1128	7.2	47	168	5.3	49	175	4.3	51	183	3.3	53	190	2.3	86	309	4.6	115	412	6.9	57	203	60	216
1094	7.3	47	171	5.3	49	178	4.3	51	185	3.3	53	192	2.3	86	314	4.6	115	418	6.9	57	205	60	219
1059	7.4	48	174	5.4	49	181	4.4	51	188	3.4	53	196	2.4	87	320	4.8	116	427	7.2	57	208	60	222
1024	7.5	48	177	5.5	50	184	4.5	51	192	3.5	53	199	2.5	87	327	5	116	435	7.5	57	211	60	225
988	7.6	48	180	5.6	50	187	4.6	52	195	3.6	54	203	2.6	88	333	5.2	117	444	7.8	57	214	60	228
950	7.7	48	183	5.7	50	191	4.7	52	198	3.7	54	206	2.7	89	340	5.4	118	453	8.1	57	217	60	231
908	7.8	48	186	5.8	50	194	4.8	52	202	3.8	54	210	2.8	89	347	5.6	119	462	8.4	57	219	60	234
860	7.9	49	190	6	51	198	5	52	206	4	54	214	3	90	356	6	120	474	9	57	222	60	237
760	8	49	196	6.4	51	204	5.4	53	212	4.4	55	220	3.4	93	370	6.8	124	493	10.2	57	225	60	240

TRANSITION CURVES - RURAL
50 MPH DESIGN SPEED

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE

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)																		16 FT		18 FT	
		1 @ 9'			1 @ 10'			1 @ 11'			1 @ 12'			2 @ 12'			3 @ 12'						
RADIUS(FT)	E(%)	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	Lt	Lr
9720	NC	0	0	2.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7190	2	45	45	3	43	43	0	47	47	0	52	52	0	77	77	0	103	103	0	60	60	64	64
6821	2.1	45	47	3	43	45	0	47	50	0	52	54	0	77	81	0	103	108	0	60	63	64	67
6485	2.2	45	50	3	43	47	0	47	52	0	52	57	0	77	85	0	103	113	0	60	66	64	70
6179	2.3	45	52	3.1	43	49	0	47	54	0	52	59	0	77	89	0	103	118	0	60	69	64	73
5897	2.4	45	54	3.1	43	52	0	47	57	0	52	62	0	77	92	0	103	123	0	60	72	64	76
5638	2.5	45	57	3.1	43	54	0	47	59	0	52	64	0	77	96	0	103	128	0	60	75	64	79
5399	2.6	46	59	3.2	43	56	0	47	61	0	52	67	0	77	100	0	103	133	0	60	78	64	83
5177	2.7	46	61	3.2	43	58	0	47	64	0	52	69	0	77	104	0	103	138	0	60	80	64	86
4972	2.8	46	64	3.2	43	60	0	47	66	0	52	72	0	77	108	0	103	143	0	60	83	64	89
4779	2.9	46	66	3.3	43	62	0	47	68	0	52	75	0	77	112	0	103	149	0	60	86	64	92
4600	3	46	68	3.3	43	64	0	47	71	0	52	77	0	77	115	0	103	154	0	60	89	64	95
4432	3.1	46	71	3.3	43	66	0	47	73	0	52	80	0	77	119	0	103	159	0	60	92	64	98
4274	3.2	46	73	3.3	43	69	0	47	75	0	52	82	0	77	123	0	103	164	0	60	95	64	102
4125	3.3	46	76	3.4	43	71	0	47	78	0	52	85	0	77	127	0	103	169	0	60	98	64	105
3986	3.4	46	78	3.4	43	73	0	47	80	0	52	87	0	77	131	0	103	174	0	60	101	64	108
3853	3.5	46	80	3.4	43	75	0	47	82	0	52	90	0	77	135	0	103	179	0	60	104	64	111
3728	3.6	46	83	3.5	43	77	0	47	85	0	52	92	0	77	138	0	103	184	0	60	107	64	114
3610	3.7	46	85	3.5	43	79	0	47	87	0	52	95	0	77	142	0	103	189	0	60	110	64	117
3498	3.8	46	87	3.5	43	81	0	47	89	0	52	98	0	77	146	0	103	195	0	60	113	64	120
3391	3.9	46	90	3.6	43	83	0	47	92	0	52	100	0	77	150	0	103	200	0	60	116	64	124
3289	4	46	92	3.6	43	86	0	47	94	0	52	103	0	77	154	0	103	205	0	60	119	64	127
3192	4.1	46	95	3.6	43	88	0	47	96	0	52	105	0	77	158	0	103	210	0	60	122	64	130
3100	4.2	47	97	3.7	43	90	0	47	99	0	52	108	0	77	161	0	103	215	0	60	125	64	133
3011	4.3	47	100	3.7	43	92	0	47	101	0	52	110	0	77	165	0	103	220	0	60	128	64	136
2927	4.4	47	102	3.7	43	94	0	47	103	0	52	113	0	77	169	0	103	225	0	60	131	64	139
2846	4.5	72	161	3.8	49	110	2.8	47	106	0	52	115	0	77	173	0	103	230	0	60	134	64	143
2768	4.6	70	161	3.8	49	112	2.8	47	108	0	52	118	0	77	177	0	103	235	0	60	137	64	146
2693	4.7	69	161	3.8	49	114	2.8	47	110	0	52	120	0	77	180	0	103	240	0	60	140	64	149
2621	4.8	68	161	3.9	49	117	2.9	47	113	0	52	123	0	77	184	0	103	246	0	60	143	64	152
2552	4.9	66	161	3.9	49	120	2.9	47	115	0	52	126	0	77	188	0	103	251	0	60	146	64	155
2486	5	65	161	3.9	49	122	2.9	47	118	0	52	128	0	77	192	0	103	256	0	60	149	64	158
2421	5.1	64	161	4	49	125	3	52	131	2	52	131	0	77	196	0	103	261	0	60	152	64	162
2359	5.2	62	161	4	49	128	3	52	133	2	52	133	0	77	200	0	103	266	0	60	155	64	165
2299	5.3	61	161	4	49	130	3	52	136	2	52	136	0	77	203	0	103	271	0	60	158	64	168
2241	5.4	60	161	4.1	50	133	3.1	52	139	2.1	52	138	0	77	207	0	103	276	0	60	160	64	171
2185	5.5	59	161	4.1	50	136	3.1	52	142	2.1	52	141	0	77	211	0	103	281	0	60	163	64	174
2130	5.6	58	161	4.2	50	139	3.2	52	145	2.2	52	143	0	77	215	0	103	286	0	60	166	64	177
2077	5.7	57	161	4.2	50	141	3.2	52	147	2.2	52	146	0	77	219	0	103	292	0	60	169	64	180
2026	5.8	56	161	4.2	50	144	3.2	52	150	2.2	52	149	0	77	223	0	103	297	0	60	172	64	184
1976	5.9	55	161	4.3	50	147	3.3	52	153	2.3	52	151	0	77	226	0	103	302	0	60	175	64	187
1927	6	54	161	4.3	50	149	3.3	52	156	2.3	52	154	0	77	230	0	103	307	0	60	178	64	190
1880	6.1	53	161	4.3	50	152	3.3	52	158	2.3	52	156	0	77	234	0	103	312	0	60	181	64	193
1833	6.2	52	161	4.4	50	155	3.4	52	161	2.4	52	159	0	77	238	0	103	317	0	60	184	64	196
1788	6.3	52	161	4.4	50	157	3.4	52	164	2.4	52	161	0	77	242	0	103	322	0	60	187	64	199
1743	6.4	51	161	4.5	50	160	3.5	53	167	2.5	52	164	0	77	246	0	103	327	0	60	190	64	203
1700	6.5	50	161	4.5	50	163	3.5	53	170	2.5	52	166	0	77	249	0	103	332	0	60	193	64	206
1657	6.6	49	161	4.6	51	166	3.6	53	173	2.6	52	169	0	77	253	0	103	338	0	60	196	64	209
1615	6.7	49	162	4.6	51	169	3.6	53	176	2.6	52	172	0	77	257	0	103	343	0	60	199	64	212
1573	6.8	49	165	4.7	51	172	3.7	53	179	2.7	52	174	0	77	261	0	103	348	0	60	202	64	215
1532	6.9	49	167	4.7	51	174	3.7	53	182	2.7	52	177	0	77	265	0	103	353	0	60	205	64	218
1491	7	49	170	4.8	51	178	3.8	53	185	2.8	52	179	0	77	269	0	103	358	0	60	208	64	222
1450	7.1	49	173	4.8	51	180	3.8	53	188	2.8	52	182	0	77	272	0	103	363	0	60	211	64	225
1409	7.2	49	176	4.9	51	184	3.9	53	191	2.9	52	184	0	77	276	0	103	368	0	60	214	64	228
1369	7.3	50	179	5	52	187	4	54	195	3	56	202	2	90	327	4	120	435	6	60	217	64	231
1327	7.4	50	182	5	52	189	4	54	197	3	56	205	2	90	331	4	120	441	6	60	220	64	234
1285	7.5	50	185	5.1	52	193	4.1	54	201	3.1	56	209	2.1	90	338	4.2	120	450	6.3	60	223	64	237
1241	7.6	50	188	5.2	52	196	4.2	54	204	3.2	56	212	2.2	91	345	4.4	121	460	6.6	60	226	64	240
1195	7.7	50	191	5.3	52	200	4.3	54	208	3.3	56	216	2.3	92	352	4.6	122	469	6.9	60	229	64	244
1145	7.8	50	195	5.4	53	203	4.4	55	211	3.4	57	220	2.4	92	359	4.8	123	478	7.2	60	232	64	247
1085	7.9	51	198	5.5	53	206	4.5	55	215	3.5	57	223	2.5	93	366	5	124	488	7.5	60	235	64	250
964	8	51	203	5.8	53	212	4.8	55	220	3.8	58	229	2.8	95	378	5.6	126	504	8.4	60	238	64	253

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

TC-5.11

TRANSITION CURVES - RURAL
55 MPH DESIGN SPEED

VIRGINIA DEPARTMENT OF TRANSPORTATION

VDOT ROAD AND BRIDGE STANDARDS

REVISION DATE

803.39

SHEET 1 OF 1

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

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			
		DESIGN SOFTWARE EQUIVALENTS (NUMBER OF LANES AT LANE WIDTH)																		WIDTH			
		1 @ 9'			1 @ 10'			1 @ 11'			1 @ 12'			2 @ 12'			3 @ 12'			16 FT		18 FT	
RADIUS(FT)	E(%)	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	Lt	Lr
11500	NC	0	0	2.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8480	2	47	47	2.9	45	45	0	49	49	0	54	54	0	80	80	0	107	107	0	63	63	67	67
8048	2.1	47	49	3	49	52	2	49	52	0	54	56	0	80	84	0	107	112	0	63	66	67	70
7654	2.2	47	52	3	49	54	2	49	54	0	54	59	0	80	88	0	107	118	0	63	70	67	74
7294	2.3	47	54	3	49	57	2	49	57	0	54	62	0	80	92	0	107	123	0	63	73	67	77
6965	2.4	47	56	3	49	59	2	49	59	0	54	64	0	80	96	0	107	128	0	63	76	67	80
6661	2.5	47	59	3.1	50	62	2.1	49	62	0	54	67	0	80	100	0	107	134	0	63	79	67	84
6381	2.6	47	61	3.1	50	64	2.1	49	64	0	54	70	0	80	104	0	107	139	0	63	82	67	87
6121	2.7	47	64	3.1	50	67	2.1	49	66	0	54	72	0	80	108	0	107	144	0	63	85	67	90
5879	2.8	48	66	3.2	50	70	2.2	49	69	0	54	75	0	80	112	0	107	150	0	63	88	67	94
5654	2.9	48	69	3.2	50	72	2.2	49	71	0	54	78	0	80	116	0	107	155	0	63	91	67	97
5444	3	48	71	3.2	50	74	2.2	49	74	0	54	80	0	80	120	0	107	160	0	63	95	67	100
5247	3.1	48	74	3.2	50	77	2.2	49	76	0	54	83	0	80	124	0	107	166	0	63	98	67	104
5063	3.2	48	76	3.3	50	80	2.3	49	79	0	54	86	0	80	128	0	107	171	0	63	101	67	107
4889	3.3	48	79	3.3	50	82	2.3	49	81	0	54	88	0	80	132	0	107	176	0	63	104	67	110
4725	3.4	48	81	3.3	50	85	2.3	49	84	0	54	91	0	80	136	0	107	182	0	63	107	67	114
4571	3.5	48	84	3.4	50	88	2.4	49	86	0	54	94	0	80	140	0	107	187	0	63	110	67	117
4424	3.6	48	86	3.4	50	90	2.4	49	88	0	54	96	0	80	144	0	107	192	0	63	113	67	120
4286	3.7	48	88	3.4	50	93	2.4	49	91	0	54	99	0	80	148	0	107	198	0	63	117	67	124
4155	3.8	48	91	3.4	50	95	2.4	49	93	0	54	102	0	80	152	0	107	203	0	63	120	67	127
4030	3.9	48	94	3.5	50	98	2.5	49	96	0	54	104	0	80	156	0	107	208	0	63	123	67	130
3911	4	48	96	3.5	50	100	2.5	49	98	0	54	107	0	80	160	0	107	214	0	63	126	67	134
3798	4.1	48	98	3.5	50	103	2.5	49	101	0	54	110	0	80	164	0	107	219	0	63	129	67	137
3690	4.2	48	101	3.6	51	106	2.6	49	103	0	54	112	0	80	168	0	107	224	0	63	132	67	140
3587	4.3	48	104	3.6	51	108	2.6	49	106	0	54	115	0	80	172	0	107	230	0	63	135	67	144
3488	4.4	48	106	3.6	51	111	2.6	49	108	0	54	118	0	80	176	0	107	235	0	63	139	67	147
3394	4.5	49	109	3.7	51	114	2.7	49	110	0	54	120	0	80	180	0	107	240	0	63	142	67	150
3303	4.6	49	111	3.7	51	117	2.7	49	113	0	54	123	0	80	184	0	107	246	0	63	145	67	154
3216	4.7	49	114	3.7	51	119	2.7	49	115	0	54	126	0	80	188	0	107	251	0	63	148	67	157
3133	4.8	49	116	3.7	51	122	2.7	49	118	0	54	128	0	80	192	0	107	256	0	63	151	67	160
3053	4.9	49	119	3.8	51	125	2.8	49	120	0	54	131	0	80	196	0	107	262	0	63	154	67	164
2975	5	49	122	3.8	51	127	2.8	49	123	0	54	134	0	80	200	0	107	267	0	63	157	67	167
2901	5.1	49	124	3.8	51	130	2.8	49	125	0	54	136	0	80	204	0	107	272	0	63	160	67	170
2829	5.2	68	176	3.9	51	133	2.9	49	128	0	54	139	0	80	208	0	107	278	0	63	164	67	174
2759	5.3	67	176	3.9	51	135	2.9	49	130	0	54	142	0	80	212	0	107	283	0	63	167	67	177
2692	5.4	66	176	3.9	51	138	2.9	49	132	0	54	144	0	80	216	0	107	288	0	63	170	67	180
2627	5.5	64	176	4	52	141	3	54	147	2	54	147	0	80	220	0	107	294	0	63	173	67	184
2565	5.6	63	176	4	52	144	3	54	150	2	54	150	0	80	224	0	107	299	0	63	176	67	187
2504	5.7	62	176	4	52	146	3	54	152	2	54	152	0	80	228	0	107	304	0	63	179	67	190
2445	5.8	61	176	4.1	52	149	3.1	54	156	2.1	54	155	0	80	232	0	107	310	0	63	182	67	194
2387	5.9	60	176	4.1	52	152	3.1	54	158	2.1	54	158	0	80	236	0	107	315	0	63	186	67	197
2332	6	59	176	4.1	52	154	3.1	54	161	2.1	54	160	0	80	240	0	107	320	0	63	189	67	200
2277	6.1	58	176	4.2	52	158	3.2	54	165	2.2	54	163	0	80	244	0	107	326	0	63	192	67	204
2225	6.2	57	176	4.2	52	160	3.2	54	167	2.2	54	166	0	80	248	0	107	331	0	63	195	67	207
2173	6.3	56	176	4.2	52	163	3.2	54	170	2.2	54	168	0	80	252	0	107	336	0	63	198	67	210
2122	6.4	55	176	4.3	52	166	3.3	54	173	2.3	54	171	0	80	256	0	107	342	0	63	201	67	214
2072	6.5	55	176	4.3	52	169	3.3	54	176	2.3	54	174	0	80	260	0	107	347	0	63	204	67	217
2022	6.6	54	176	4.3	52	171	3.3	54	179	2.3	54	176	0	80	264	0	107	352	0	63	208	67	220
1974	6.7	53	176	4.4	52	175	3.4	55	182	2.4	54	179	0	80	268	0	107	358	0	63	211	67	224
1925	6.8	52	176	4.4	52	177	3.4	55	185	2.4	54	182	0	80	272	0	107	363	0	63	214	67	227
1877	6.9	52	176	4.5	53	181	3.5	55	188	2.5	54	184	0	80	276	0	107	368	0	63	217	67	230
1830	7	51	176	4.5	53	183	3.5	55	191	2.5	54	187	0	80	280	0	107	374	0	63	220	67	234
1782	7.1	51	179	4.6	53	187	3.6	55	195	2.6	54	190	0	80	284	0	107	379	0	63	223	67	237
1735	7.2	51	181	4.6	53	189	3.6	55	197	2.6	54	192	0	80	288	0	107	384	0	63	226	67	240
1687	7.3	51	185	4.7	53	193	3.7	55	201	2.7	54	195	0	80	292	0	107	390	0	63	230	67	244
1638	7.4	51	187	4.7	53	195	3.7	55	204	2.7	54	198	0	80	296	0	107	395	0	63	233	67	247
1588	7.5	51	190	4.8	53	199	3.8	56	207	2.8	54	200	0	80	300	0	107	400	0	63	236	67	250
1537	7.6	51	193	4.8	53	201	3.8	56	210	2.8	54	203	0	80	304	0	107	406	0	63	239	67	254
1482	7.7	51	196	4.9	54	205	3.9	56	214	2.9	54	206	0	80	308	0	107	411	0	63	242	67	257
1422	7.8	52	200	5	54	208	4	56	217	3	58	226	2	94	364	4	134	520	6	63	245	67	260
1350	7.9	52	203	5.1	54	212	4.1	56	221	3.1	58	230	2.1	94	372	4.2	135	532	6.3	63	248	67	264
1204	8	52	208	5.4	55	217	4.4	57	226	3.4	59	235	2.4	96	384	4.8	139	555	7.2	63	251	67	267

TRANSITION CURVES - RURAL
60 MPH DESIGN SPEED

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE

SPECIFICATION REFERENCE

TRANSITION CURVES - RURAL
65 MPH DESIGN SPEED

VIRGINIA DEPARTMENT OF TRANSPORTATION

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

DESIGN VELOCITY =65		WIDTH= 18 FT			WIDTH=20 FT			WIDTH=22 FT			WIDTH=24 FT			WIDTH=48 FT			WIDTH=72 FT			INTERCHANGE RAMPS WIDTH			
		DESIGN SOFTWARE EQUIVALENTS (NUMBER OF LANES AT LANE WIDTH)																					
		1 @ 9'			1 @ 10'			1 @ 11'			1 @ 12'			2 @ 12'			3 @ 12'			16 FT		18 FT	
RADIUS(FT)	E(%)	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	Lt	Lr
12900	NC	0	0	2.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9566	2	49	49	2.9	47	47	0	52	52	0	56	56	0	84	84	0	112	112	0	66	66	70	70
9083	2.1	49	52	2.9	47	49	0	52	54	0	56	59	0	84	88	0	112	118	0	66	69	70	73
8643	2.2	49	54	3	52	57	2	52	57	0	56	62	0	84	93	0	112	123	0	66	72	70	77
8242	2.3	49	57	3	52	59	2	52	59	0	56	65	0	84	97	0	112	129	0	66	76	70	80
7873	2.4	49	59	3	52	62	2	52	62	0	56	67	0	84	101	0	112	134	0	66	79	70	84
7534	2.5	50	62	3.1	52	65	2.1	52	64	0	56	70	0	84	105	0	112	140	0	66	82	70	87
7221	2.6	50	64	3.1	52	67	2.1	52	67	0	56	73	0	84	109	0	112	146	0	66	85	70	90
6931	2.7	50	67	3.1	52	70	2.1	52	70	0	56	76	0	84	114	0	112	151	0	66	89	70	94
6662	2.8	50	69	3.1	52	72	2.1	52	72	0	56	79	0	84	118	0	112	157	0	66	92	70	97
6411	2.9	50	72	3.2	52	75	2.2	52	75	0	56	81	0	84	122	0	112	162	0	66	95	70	101
6176	3	50	74	3.2	52	78	2.2	52	77	0	56	84	0	84	126	0	112	168	0	66	98	70	104
5957	3.1	50	77	3.2	52	81	2.2	52	80	0	56	87	0	84	130	0	112	174	0	66	102	70	108
5751	3.2	50	79	3.2	52	83	2.2	52	82	0	56	90	0	84	134	0	112	179	0	66	105	70	111
5557	3.3	50	82	3.3	52	86	2.3	52	85	0	56	93	0	84	139	0	112	185	0	66	108	70	115
5375	3.4	50	85	3.3	52	89	2.3	52	87	0	56	95	0	84	143	0	112	190	0	66	112	70	118
5203	3.5	50	87	3.3	52	91	2.3	52	90	0	56	98	0	84	147	0	112	196	0	66	115	70	122
5040	3.6	50	90	3.3	52	94	2.3	52	93	0	56	101	0	84	151	0	112	201	0	66	118	70	125
4886	3.7	50	93	3.4	53	97	2.4	52	95	0	56	104	0	84	155	0	112	207	0	66	121	70	129
4740	3.8	50	95	3.4	53	99	2.4	52	98	0	56	107	0	84	160	0	112	213	0	66	125	70	132
4601	3.9	50	98	3.4	53	102	2.4	52	100	0	56	109	0	84	164	0	112	218	0	66	128	70	135
4469	4	50	100	3.5	53	105	2.5	52	103	0	56	112	0	84	168	0	112	224	0	66	131	70	139
4344	4.1	50	103	3.5	53	108	2.5	52	105	0	56	115	0	84	172	0	112	229	0	66	134	70	142
4224	4.2	50	105	3.5	53	110	2.5	52	108	0	56	118	0	84	176	0	112	235	0	66	138	70	146
4109	4.3	50	108	3.5	53	113	2.5	52	110	0	56	120	0	84	180	0	112	240	0	66	141	70	149
4000	4.4	51	111	3.6	53	116	2.6	52	113	0	56	123	0	84	185	0	112	246	0	66	144	70	153
3896	4.5	51	114	3.6	53	119	2.6	52	116	0	56	126	0	84	189	0	112	252	0	66	147	70	156
3795	4.6	51	116	3.6	53	121	2.6	52	118	0	56	129	0	84	193	0	112	257	0	66	151	70	160
3699	4.7	51	119	3.6	53	124	2.6	52	121	0	56	132	0	84	197	0	112	263	0	66	154	70	163
3607	4.8	51	122	3.7	53	127	2.7	52	123	0	56	134	0	84	201	0	112	268	0	66	157	70	167
3518	4.9	51	124	3.7	53	130	2.7	52	126	0	56	137	0	84	206	0	112	274	0	66	160	70	170
3433	5	51	127	3.7	53	132	2.7	52	128	0	56	140	0	84	210	0	112	280	0	66	164	70	174
3351	5.1	51	130	3.8	54	136	2.8	52	131	0	56	143	0	84	214	0	112	285	0	66	167	70	177
3272	5.2	51	132	3.8	54	138	2.8	52	134	0	56	146	0	84	218	0	112	291	0	66	170	70	180
3196	5.3	51	135	3.8	54	141	2.8	52	136	0	56	148	0	84	222	0	112	296	0	66	174	70	184
3122	5.4	51	137	3.8	54	144	2.8	52	139	0	56	151	0	84	227	0	112	302	0	66	177	70	187
3051	5.5	51	141	3.9	54	147	2.9	52	141	0	56	154	0	84	231	0	112	307	0	66	180	70	191
2982	5.6	51	143	3.9	54	150	2.9	52	144	0	56	157	0	84	235	0	112	313	0	66	183	70	194
2916	5.7	51	146	3.9	54	152	2.9	52	146	0	56	160	0	84	239	0	112	319	0	66	187	70	198
2852	5.8	66	191	3.9	54	155	2.9	52	149	0	56	162	0	84	243	0	112	324	0	66	190	70	201
2789	5.9	65	191	4	54	158	3	56	165	2	56	165	0	84	247	0	112	330	0	66	193	70	205
2729	6	64	191	4	54	161	3	56	168	2	56	168	0	84	252	0	112	335	0	66	196	70	208
2670	6.1	63	191	4	54	164	3	56	171	2	56	171	0	84	256	0	112	341	0	66	200	70	212
2613	6.2	62	191	4.1	54	167	3.1	57	174	2.1	56	174	0	84	260	0	112	347	0	66	203	70	215
2558	6.3	61	191	4.1	54	170	3.1	57	177	2.1	56	176	0	84	264	0	112	352	0	66	206	70	219
2504	6.4	60	191	4.1	54	172	3.1	57	180	2.1	56	179	0	84	268	0	112	358	0	66	209	70	222
2451	6.5	59	191	4.2	54	176	3.2	57	183	2.2	56	182	0	84	273	0	112	363	0	66	213	70	225
2398	6.6	58	191	4.2	54	179	3.2	57	186	2.2	56	185	0	84	277	0	112	369	0	66	216	70	229
2346	6.7	58	191	4.2	54	181	3.2	57	189	2.2	56	187	0	84	281	0	112	374	0	66	219	70	232
2294	6.8	57	191	4.3	55	185	3.3	57	193	2.3	56	190	0	84	285	0	112	380	0	66	223	70	236
2242	6.9	56	191	4.3	55	187	3.3	57	195	2.3	56	193	0	84	289	0	112	386	0	66	226	70	239
2191	7	55	191	4.3	55	190	3.3	57	198	2.3	56	196	0	84	294	0	112	391	0	66	229	70	243
2139	7.1	54	191	4.4	55	194	3.4	57	202	2.4	56	199	0	84	298	0	112	397	0	66	232	70	246
2087	7.2	54	191	4.4	55	196	3.4	57	205	2.4	56	201	0	84	302	0	112	402	0	66	236	70	250
2034	7.3	53	191	4.4	55	199	3.4	57	208	2.4	56	204	0	84	306	0	112	408	0	66	239	70	253
1980	7.4	53	194	4.5	55	203	3.5	57	211	2.5	56	207	0	84	310	0	112	414	0	66	242	70	257
1924	7.5	53	197	4.5	55	205	3.5	57	214	2.5	56	210	0	84	314	0	112	419	0	66	245	70	260
1867	7.6	53	200	4.6	55	209	3.6	58	218	2.6	56	213	0	84	319	0	112	425	0	66	249	70	264
1805	7.7	53	204	4.7	56	213	3.7	58	222	2.7	56	215	0	84	323	0	112	430	0	66	252	70	267
1737	7.8	53	206	4.7	56	215	3.7	58	225	2.7	56	218	0	84	327	0	112	436	0	66	255	70	270
1656	7.9	54	210	4.8	56	219	3.8	58	228	2.8	56	221	0	84	331	0	112	441	0	66	258	70	274
1488	8	54	214	5	56	224	4	59	233	3	61	242	2	98	391	4	140	559	6	66	262	70	277

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

TC-5.11

VDOT ROAD AND BRIDGE STANDARDS

REVISION DATE

SHEET 1 OF 1

803.41

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

TRANSITION CURVES - RURAL
70 MPH DESIGN SPEED

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			
		DESIGN SOFTWARE EQUIVALENTS (NUMBER OF LANES AT LANE WIDTH)																		WIDTH			
		1 @ 9'			1 @ 10'			1 @ 11'			1 @ 12'			2 @ 12'			3 @ 12'			16 FT		18 FT	
RADIUS(FT)	E(%)	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	Lt	Lr
14500	NC	0	0	2.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10731	2	53	53	2.9	50	50	0	55	55	0	60	60	0	90	90	0	120	120	0	72	72	75	75
10194	2.1	53	55	2.9	50	53	0	55	58	0	60	63	0	90	95	0	120	126	0	72	75	75	79
9706	2.2	53	58	3	55	61	2	55	61	0	60	66	0	90	99	0	120	132	0	72	79	75	83
9260	2.3	53	61	3	55	64	2	55	64	0	60	69	0	90	104	0	120	138	0	72	82	75	87
8851	2.4	53	63	3	55	66	2	55	66	0	60	72	0	90	108	0	120	144	0	72	86	75	90
8474	2.5	53	66	3	55	69	2	55	69	0	60	75	0	90	113	0	120	150	0	72	89	75	94
8127	2.6	53	69	3.1	56	72	2.1	55	72	0	60	78	0	90	117	0	120	156	0	72	93	75	98
7805	2.7	53	72	3.1	56	75	2.1	55	75	0	60	81	0	90	122	0	120	162	0	72	96	75	102
7506	2.8	53	74	3.1	56	78	2.1	55	77	0	60	84	0	90	126	0	120	168	0	72	100	75	105
7227	2.9	53	77	3.1	56	81	2.1	55	80	0	60	87	0	90	131	0	120	174	0	72	104	75	109
6967	3	53	80	3.2	56	84	2.2	55	83	0	60	90	0	90	135	0	120	180	0	72	107	75	113
6724	3.1	53	83	3.2	56	87	2.2	55	86	0	60	93	0	90	140	0	120	186	0	72	111	75	117
6495	3.2	53	85	3.2	56	89	2.2	55	88	0	60	96	0	90	144	0	120	192	0	72	114	75	120
6281	3.3	53	88	3.2	56	92	2.2	55	91	0	60	99	0	90	149	0	120	198	0	72	118	75	124
6079	3.4	54	91	3.3	56	95	2.3	55	94	0	60	102	0	90	153	0	120	204	0	72	121	75	128
5888	3.5	54	94	3.3	56	98	2.3	55	97	0	60	105	0	90	158	0	120	210	0	72	125	75	132
5708	3.6	54	96	3.3	56	101	2.3	55	99	0	60	108	0	90	162	0	120	216	0	72	128	75	135
5537	3.7	54	99	3.3	56	104	2.3	55	102	0	60	111	0	90	167	0	120	222	0	72	132	75	139
5376	3.8	54	102	3.4	56	107	2.4	55	105	0	60	114	0	90	171	0	120	228	0	72	136	75	143
5222	3.9	54	105	3.4	56	110	2.4	55	108	0	60	117	0	90	176	0	120	234	0	72	139	75	147
5076	4	54	107	3.4	56	112	2.4	55	110	0	60	120	0	90	180	0	120	240	0	72	143	75	150
4937	4.1	54	110	3.4	56	115	2.4	55	113	0	60	123	0	90	185	0	120	246	0	72	146	75	154
4805	4.2	54	113	3.5	57	119	2.5	55	116	0	60	126	0	90	189	0	120	252	0	72	150	75	158
4679	4.3	54	116	3.5	57	121	2.5	55	119	0	60	129	0	90	194	0	120	258	0	72	153	75	162
4558	4.4	54	119	3.5	57	124	2.5	55	121	0	60	132	0	90	198	0	120	264	0	72	157	75	165
4443	4.5	54	121	3.5	57	127	2.5	55	124	0	60	135	0	90	203	0	120	270	0	72	160	75	169
4332	4.6	54	125	3.6	57	130	2.6	55	127	0	60	138	0	90	207	0	120	276	0	72	164	75	173
4226	4.7	54	127	3.6	57	133	2.6	55	130	0	60	141	0	90	212	0	120	282	0	72	168	75	177
4125	4.8	54	130	3.6	57	136	2.6	55	132	0	60	144	0	90	216	0	120	288	0	72	171	75	180
4027	4.9	54	133	3.6	57	139	2.6	55	135	0	60	147	0	90	221	0	120	294	0	72	175	75	184
3933	5	55	136	3.7	57	142	2.7	55	138	0	60	150	0	90	225	0	120	300	0	72	178	75	188
3843	5.1	55	139	3.7	57	145	2.7	55	141	0	60	153	0	90	230	0	120	306	0	72	182	75	192
3756	5.2	55	142	3.7	57	148	2.7	55	143	0	60	156	0	90	234	0	120	312	0	72	185	75	195
3673	5.3	55	144	3.7	57	151	2.7	55	146	0	60	159	0	90	239	0	120	318	0	72	189	75	199
3592	5.4	55	148	3.8	57	154	2.8	55	149	0	60	162	0	90	243	0	120	324	0	72	192	75	203
3514	5.5	55	150	3.8	57	157	2.8	55	152	0	60	165	0	90	248	0	120	330	0	72	196	75	207
3439	5.6	55	153	3.8	57	160	2.8	55	154	0	60	168	0	90	252	0	120	336	0	72	200	75	210
3366	5.7	55	156	3.8	57	163	2.8	55	157	0	60	171	0	90	257	0	120	342	0	72	203	75	214
3296	5.8	55	159	3.9	58	167	2.9	55	160	0	60	174	0	90	261	0	120	348	0	72	207	75	218
3228	5.9	55	162	3.9	58	169	2.9	55	163	0	60	177	0	90	266	0	120	354	0	72	210	75	222
3163	6	55	165	3.9	58	172	2.9	55	165	0	60	180	0	90	270	0	120	360	0	72	214	75	225
3099	6.1	55	167	3.9	58	175	2.9	55	168	0	60	183	0	90	275	0	120	366	0	72	217	75	229
3037	6.2	55	171	4	58	179	3	55	171	0	60	186	0	90	279	0	120	372	0	72	221	75	233
2977	6.3	55	174	4	58	182	3	55	174	0	60	189	0	90	284	0	120	378	0	72	224	75	237
2919	6.4	55	176	4	58	184	3	55	176	0	60	192	0	90	288	0	120	384	0	72	228	75	240
2862	6.5	64	205	4	58	187	3	60	195	2	60	195	0	90	293	0	120	390	0	72	232	75	244
2807	6.6	63	205	4.1	58	191	3.1	61	199	2.1	60	198	0	90	297	0	120	396	0	72	235	75	248
2753	6.7	62	205	4.1	58	194	3.1	61	202	2.1	60	201	0	90	302	0	120	402	0	72	239	75	252
2699	6.8	61	205	4.1	58	197	3.1	61	205	2.1	60	204	0	90	306	0	120	408	0	72	242	75	255
2645	6.9	60	205	4.1	58	200	3.1	61	208	2.1	60	207	0	90	311	0	120	414	0	72	246	75	259
2590	7	59	205	4.2	58	203	3.2	61	212	2.2	60	210	0	90	315	0	120	420	0	72	249	75	263
2535	7.1	58	205	4.2	58	206	3.2	61	215	2.2	60	213	0	90	320	0	120	426	0	72	253	75	267
2480	7.2	57	205	4.2	58	209	3.2	61	218	2.2	60	216	0	90	324	0	120	432	0	72	256	75	270
2423	7.3	57	205	4.3	59	213	3.3	61	222	2.3	60	219	0	90	329	0	120	438	0	72	260	75	274
2365	7.4	56	207	4.3	59	216	3.3	61	225	2.3	60	222	0	90	333	0	120	444	0	72	264	75	278
2305	7.5	56	210	4.3	59	219	3.3	61	228	2.3	60	225	0	90	338	0	120	450	0	72	267	75	282
2242	7.6	57	213	4.4	59	223	3.4	61	232	2.4	60	228	0	90	342	0	120	456	0	72	271	75	285
2175	7.7	57	216	4.4	59	226	3.4	61	235	2.4	60	231	0	90	347	0	120	462	0	72	274	75	289
2100	7.8	57	220	4.5	59	230	3.5	62	239	2.5	60	234	0	90	351	0	120	468	0	72	278	75	293
2010	7.9	57	224	4.6	59	234	3.6	62	243	2.6	60	237	0	90	356	0	120	474	0	72	281	75	297
1821	8	57	228	4.8	60	238	3.8	62	248	2.8	60	240	0	90	360	0	120	480	0	72	285	75	300

SPECIFICATION REFERENCE

SPECIFICATION REFERENCE

TRANSITION CURVES - RURAL
75 MPH DESIGN SPEED

VIRGINIA DEPARTMENT OF TRANSPORTATION

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

DESIGN VELOCITY =75		WIDTH= 18 FT			WIDTH=20 FT			WIDTH=22 FT			WIDTH=24 FT			WIDTH=48 FT			WIDTH=72 FT			INTERCHANGE RAMPS WIDTH			
		DESIGN SOFTWARE EQUIVALENTS (NUMBER OF LANES AT LANE WIDTH)																					
		1 @ 9'			1 @ 10'			1 @ 11'			1 @ 12'			2 @ 12'			3 @ 12'			16 FT		18 FT	
RADIUS(FT)	E(%)	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	Lt	Lr
16100	NC	0	0	2.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12200	2	55	55	2.9	53	53	0	58	58	0	64	64	0	95	95	0	127	127	0	75	75	79	79
11805	2.1	55	58	2.9	53	56	0	58	61	0	64	67	0	95	100	0	127	134	0	75	79	79	83
10920	2.2	55	61	2.9	53	58	0	58	64	0	64	70	0	95	105	0	127	140	0	75	82	79	87
10483	2.3	56	64	3	58	67	2	58	67	0	64	73	0	95	109	0	127	146	0	75	86	79	90
10001	2.4	56	67	3	58	70	2	58	70	0	64	76	0	95	114	0	127	153	0	75	90	79	94
9559	2.5	56	70	3	58	73	2	58	73	0	64	79	0	95	119	0	127	159	0	75	94	79	98
9152	2.6	56	72	3	58	76	2	58	76	0	64	83	0	95	124	0	127	166	0	75	97	79	102
8777	2.7	56	75	3.1	59	79	2.1	58	79	0	64	86	0	95	128	0	127	172	0	75	101	79	106
8507	2.8	56	78	3.1	59	82	2.1	58	82	0	64	89	0	95	133	0	127	178	0	75	105	79	110
8181	2.9	56	81	3.1	59	85	2.1	58	84	0	64	92	0	95	138	0	127	185	0	75	108	79	114
7950	3	56	84	3.1	59	88	2.1	58	87	0	64	95	0	95	143	0	127	191	0	75	112	79	118
7664	3.1	56	87	3.2	59	91	2.2	58	90	0	64	98	0	95	147	0	127	197	0	75	116	79	122
7397	3.2	56	90	3.2	59	94	2.2	58	93	0	64	102	0	95	152	0	127	204	0	75	120	79	126
7275	3.3	56	93	3.2	59	97	2.2	58	96	0	64	105	0	95	157	0	127	210	0	75	123	79	130
7034	3.4	56	95	3.2	59	100	2.2	58	99	0	64	108	0	95	162	0	127	216	0	75	127	79	134
6809	3.5	56	98	3.2	59	103	2.2	58	102	0	64	111	0	95	166	0	127	223	0	75	131	79	137
6477	3.6	57	101	3.3	59	106	2.3	58	105	0	64	114	0	95	171	0	127	229	0	75	134	79	141
6279	3.7	57	104	3.3	59	109	2.3	58	108	0	64	117	0	95	176	0	127	235	0	75	138	79	145
6091	3.8	57	107	3.3	59	112	2.3	58	110	0	64	120	0	95	180	0	127	242	0	75	142	79	149
5967	3.9	57	110	3.3	59	115	2.3	58	113	0	64	124	0	95	185	0	127	248	0	75	146	79	153
5797	4	57	113	3.4	59	118	2.4	58	116	0	64	127	0	95	190	0	127	254	0	75	149	79	157
5635	4.1	57	116	3.4	59	121	2.4	58	119	0	64	130	0	95	195	0	127	261	0	75	153	79	161
5579	4.2	57	119	3.4	59	124	2.4	58	122	0	64	133	0	95	199	0	127	267	0	75	157	79	165
5430	4.3	57	122	3.4	59	127	2.4	58	125	0	64	136	0	95	204	0	127	273	0	75	160	79	169
5287	4.4	57	124	3.4	59	130	2.4	58	128	0	64	139	0	95	209	0	127	280	0	75	164	79	173
5151	4.5	57	128	3.5	60	134	2.5	58	131	0	64	143	0	95	214	0	127	286	0	75	168	79	177
5020	4.6	57	131	3.5	60	137	2.5	58	134	0	64	146	0	95	218	0	127	292	0	75	172	79	180
4881	4.7	57	133	3.5	60	140	2.5	58	137	0	64	149	0	95	223	0	127	299	0	75	175	79	184
4762	4.8	57	136	3.5	60	143	2.5	58	139	0	64	152	0	95	228	0	127	305	0	75	179	79	188
4647	4.9	57	140	3.6	60	146	2.6	58	142	0	64	155	0	95	233	0	127	312	0	75	183	79	192
4537	5	57	143	3.6	60	149	2.6	58	145	0	64	158	0	95	237	0	127	318	0	75	187	79	196
4464	5.1	57	145	3.6	60	152	2.6	58	148	0	64	162	0	95	242	0	127	324	0	75	190	79	200
4362	5.2	57	148	3.6	60	155	2.6	58	151	0	64	165	0	95	247	0	127	331	0	75	194	79	204
4263	5.3	58	152	3.7	60	159	2.7	58	154	0	64	168	0	95	252	0	127	337	0	75	198	79	208
4169	5.4	58	155	3.7	60	162	2.7	58	157	0	64	171	0	95	256	0	127	343	0	75	201	79	212
4023	5.5	58	158	3.7	60	165	2.7	58	160	0	64	174	0	95	261	0	127	350	0	75	205	79	216
3980	5.6	58	160	3.7	60	168	2.7	58	163	0	64	177	0	95	266	0	127	356	0	75	209	79	220
3938	5.7	58	163	3.7	60	171	2.7	58	165	0	64	180	0	95	270	0	127	362	0	75	213	79	224
3804	5.8	58	167	3.8	60	174	2.8	58	168	0	64	184	0	95	275	0	127	369	0	75	216	79	227
3725	5.9	58	170	3.8	60	177	2.8	58	171	0	64	187	0	95	280	0	127	375	0	75	220	79	231
3648	6	58	173	3.8	60	180	2.8	58	174	0	64	190	0	95	285	0	127	381	0	75	224	79	235
3574	6.1	58	175	3.8	60	183	2.8	58	177	0	64	193	0	95	289	0	127	388	0	75	227	79	239
3533	6.2	58	179	3.9	61	187	2.9	58	180	0	64	196	0	95	294	0	127	394	0	75	231	79	243
3462	6.3	58	182	3.9	61	190	2.9	58	183	0	64	199	0	95	299	0	127	400	0	75	235	79	247
3394	6.4	58	185	3.9	61	193	2.9	58	186	0	64	203	0	95	304	0	127	407	0	75	239	79	251
3328	6.5	58	188	3.9	61	196	2.9	58	189	0	64	206	0	95	308	0	127	413	0	75	242	79	255
3268	6.6	59	192	4	61	200	3	64	209	2	64	209	0	95	313	0	127	419	0	75	246	79	259
3209	6.7	58	194	4	61	203	3	64	212	2	64	212	0	95	318	0	127	426	0	75	250	79	263
3149	6.8	58	197	4	61	206	3	64	215	2	64	215	0	95	323	0	127	432	0	75	254	79	267
3088	6.9	58	200	4	61	209	3	64	218	2	64	218	0	95	327	0	127	438	0	75	257	79	270
3029	7	59	204	4.1	61	213	3.1	64	222	2.1	64	222	0	95	332	0	127	445	0	75	261	79	274
3010	7.1	59	207	4.1	61	216	3.1	64	226	2.1	64	225	0	95	337	0	127	451	0	75	265	79	278
2942	7.2	59	210	4.1	61	219	3.1	64	229	2.1	64	228	0	95	342	0	127	458	0	75	268	79	282
2856	7.3	61	220	4.1	61	222	3.1	64	232	2.1	64	231	0	95	346	0	127	464	0	75	272	79	286
2796	7.4	60	220	4.2	62	226	3.2	64	236	2.2	64	234	0	95	351	0	127	470	0	75	276	79	290
2781	7.5	59	220	4.2	62	229	3.2	64	239	2.2	64	237	0	95	356	0	127	477	0	75	280	79	294
2704	7.6	59	222	4.2	62	232	3.2	64	242	2.2	64	240	0	95	360	0	127	483	0	75	283	79	298
2615	7.7	59	226	4.3	62	237	3.3	64	247	2.3	64	244	0	95	365	0	127	489	0	75	287	79	302
2520	7.8	59	229	4.3	62	240	3.3	64	250	2.3	64	247	0	95	370	0	127	496	0	75	291	79	306
2480	7.9	59	232	4.3	62	243	3.3	64	253	2.3	64	250	0	95	375	0	127	502	0	75	294	79	310
2215	8	60	237	4.5	62	248	3.5	65	258	2.5	64	253	0	95	379	0	127	508	0	75	298	79	314

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

TC-5.11

VDOT
ROAD AND BRIDGE STANDARDS

REVISION DATE

SHEET 1 OF 1

803.43

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

TRANSITION CURVES - RURAL
80 MPH DESIGN SPEED

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

DESIGN VELOCITY =80		WIDTH= 18 FT			WIDTH=20 FT			WIDTH=22 FT			WIDTH=24 FT			WIDTH=48 FT			WIDTH=72 FT			INTERCHANGE RAMPS			
		DESIGN SOFTWARE EQUIVALENTS (NUMBER OF LANES AT LANE WIDTH)																		WIDTH			
		1 @ 9'			1 @ 10'			1 @ 11'			1 @ 12'			2 @ 12'			3 @ 12'			16 FT		18 FT	
RADIUS(FT)	E(%)	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	w	Lt	Lr	Lt	Lr
17800	NC	0	0	2.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13704	2	60	60	2.9	58	58	0	63	63	0	69	69	0	103	103	0	138	138	0	83	83	86	86
12749	2.1	60	63	2.9	58	60	0	63	66	0	69	72	0	103	108	0	138	145	0	83	87	86	90
12340	2.2	60	66	2.9	58	63	0	63	70	0	69	76	0	103	114	0	138	152	0	83	91	86	95
11845	2.3	60	69	2.9	58	66	0	63	73	0	69	79	0	103	119	0	138	159	0	83	95	86	99
11401	2.4	60	72	3	63	76	2	63	76	0	69	83	0	103	124	0	138	166	0	83	99	86	103
10706	2.5	60	75	3	63	79	2	63	79	0	69	86	0	103	129	0	138	173	0	83	103	86	108
10251	2.6	60	78	3	63	82	2	63	82	0	69	90	0	103	134	0	138	180	0	83	107	86	112
9831	2.7	61	82	3.1	64	86	2.1	63	85	0	69	93	0	103	139	0	138	187	0	83	111	86	116
9528	2.8	61	85	3.1	64	89	2.1	63	88	0	69	96	0	103	144	0	138	193	0	83	115	86	120
9163	2.9	61	88	3.1	64	92	2.1	63	92	0	69	100	0	103	150	0	138	200	0	83	119	86	125
8904	3	61	91	3.1	64	95	2.1	63	95	0	69	103	0	103	155	0	138	207	0	83	124	86	129
8584	3.1	61	94	3.1	64	98	2.1	63	98	0	69	107	0	103	160	0	138	214	0	83	128	86	133
8358	3.2	61	97	3.2	64	102	2.2	63	101	0	69	110	0	103	165	0	138	221	0	83	132	86	138
8148	3.3	61	100	3.2	64	105	2.2	63	104	0	69	114	0	103	170	0	138	228	0	83	136	86	142
7881	3.4	61	103	3.2	64	108	2.2	63	107	0	69	117	0	103	175	0	138	235	0	83	140	86	146
7490	3.5	61	106	3.2	64	111	2.2	63	110	0	69	120	0	103	180	0	138	242	0	83	144	86	150
7319	3.6	61	110	3.2	64	115	2.2	63	114	0	69	124	0	103	186	0	138	249	0	83	148	86	155
7096	3.7	61	113	3.3	64	118	2.3	63	117	0	69	127	0	103	191	0	138	255	0	83	152	86	159
6883	3.8	61	116	3.3	64	122	2.3	63	120	0	69	131	0	103	196	0	138	262	0	83	156	86	163
6743	3.9	61	119	3.3	64	125	2.3	63	123	0	69	134	0	103	201	0	138	269	0	83	160	86	168
6550	4	61	122	3.3	64	128	2.3	63	126	0	69	138	0	103	206	0	138	276	0	83	165	86	172
6367	4.1	62	126	3.4	64	132	2.4	63	129	0	69	141	0	103	211	0	138	283	0	83	169	86	176
6193	4.2	62	129	3.4	64	135	2.4	63	132	0	69	144	0	103	216	0	138	290	0	83	173	86	180
6038	4.3	62	132	3.4	64	138	2.4	63	136	0	69	148	0	103	222	0	138	297	0	83	177	86	185
5868	4.4	62	135	3.4	64	141	2.4	63	139	0	69	151	0	103	227	0	138	304	0	83	181	86	189
5820	4.5	62	138	3.4	64	144	2.4	63	142	0	69	155	0	103	232	0	138	311	0	83	185	86	193
5656	4.6	62	142	3.5	65	148	2.5	63	145	0	69	158	0	103	237	0	138	318	0	83	189	86	198
5499	4.7	62	145	3.5	65	152	2.5	63	148	0	69	162	0	103	242	0	138	324	0	83	193	86	202
5405	4.8	62	148	3.5	65	155	2.5	63	151	0	69	165	0	103	247	0	138	331	0	83	197	86	206
5274	4.9	62	151	3.5	65	158	2.5	63	154	0	69	168	0	103	252	0	138	338	0	83	202	86	210
5150	5	62	154	3.5	65	161	2.5	63	158	0	69	172	0	103	258	0	138	345	0	83	206	86	215
5067	5.1	62	158	3.6	65	165	2.6	63	161	0	69	175	0	103	263	0	138	352	0	83	210	86	219
4951	5.2	62	161	3.6	65	168	2.6	63	164	0	69	179	0	103	268	0	138	359	0	83	214	86	223
4775	5.3	62	164	3.6	65	172	2.6	63	167	0	69	182	0	103	273	0	138	366	0	83	218	86	228
4669	5.4	62	167	3.6	65	175	2.6	63	170	0	69	186	0	103	278	0	138	373	0	83	222	86	232
4586	5.5	62	171	3.7	65	179	2.7	63	173	0	69	189	0	103	283	0	138	380	0	83	226	86	236
4497	5.6	62	174	3.7	65	182	2.7	63	176	0	69	192	0	103	288	0	138	386	0	83	230	86	240
4410	5.7	62	177	3.7	65	185	2.7	63	180	0	69	196	0	103	294	0	138	393	0	83	234	86	245
4337	5.8	62	180	3.7	65	189	2.7	63	183	0	69	199	0	103	299	0	138	400	0	83	238	86	249
4267	5.9	62	183	3.7	65	192	2.7	63	186	0	69	203	0	103	304	0	138	407	0	83	243	86	253
4227	6	62	186	3.7	65	195	2.7	63	189	0	69	206	0	103	309	0	138	414	0	83	247	86	258
4146	6.1	63	190	3.8	66	199	2.8	63	192	0	69	210	0	103	314	0	138	421	0	83	251	86	262
4047	6.2	63	194	3.8	66	202	2.8	63	195	0	69	213	0	103	319	0	138	428	0	83	255	86	266
3966	6.3	63	197	3.8	66	206	2.8	63	198	0	69	216	0	103	324	0	138	435	0	83	259	86	270
3877	6.4	63	200	3.8	66	209	2.8	63	202	0	69	220	0	103	330	0	138	442	0	83	263	86	275
3860	6.5	63	203	3.8	66	212	2.8	63	205	0	69	223	0	103	335	0	138	448	0	83	267	86	279
3790	6.6	63	207	3.9	66	216	2.9	63	208	0	69	227	0	103	340	0	138	455	0	83	271	86	283
3723	6.7	63	210	3.9	66	220	2.9	63	211	0	69	230	0	103	345	0	138	462	0	83	275	86	288
3652	6.8	63	213	3.9	66	223	2.9	63	214	0	69	234	0	103	350	0	138	469	0	83	279	86	292
3582	6.9	63	216	3.9	66	226	2.9	63	217	0	69	237	0	103	355	0	138	476	0	83	284	86	296
3513	7	63	220	4	66	230	3	69	240	2	69	240	0	103	360	0	138	483	0	83	288	86	300
3467	7.1	64	224	4	66	234	3	69	244	2	69	244	0	103	366	0	138	490	0	83	292	86	305
3425	7.2	64	227	4	66	237	3	69	247	2	69	247	0	103	371	0	138	497	0	83	296	86	309
3354	7.3	64	230	4	66	240	3	69	251	2	69	251	0	103	376	0	138	504	0	83	300	86	313
3324	7.4	63	233	4	66	244	3	69	254	2	69	254	0	103	381	0	138	510	0	83	304	86	318
3218	7.5	64	237	4.1	66	248	3.1	69	259	2.1	69	258	0	103	386	0	138	517	0	83	308	86	322
3159	7.6	64	240	4.1	66	251	3.1	69	262	2.1	69	261	0	103	391	0	138	524	0	83	312	86	326
3115	7.7	64	244	4.1	66	255	3.1	69	266	2.1	69	264	0	103	396	0	138	531	0	83	316	86	330
3029	7.8	64	247	4.1	66	258	3.1	69	269	2.1	69	268	0	103	402	0	138	538	0	83	320	86	335
2895	7.9	64	251	4.2	67	262	3.2	70	274	2.2	69	271	0	103	407	0	138	545	0	83	325	86	339
2675	8	64	255	4.3	67	267	3.3	70	278	2.3	69	275	0	103	412	0	138	552	0	83	329	86	343

INDEX OF SHEETS
SECTION 1000-BOX CULVERTS

VIRGINIA DEPARTMENT OF TRANSPORTATION

VDOT
ROAD AND BRIDGE STANDARDS

NOTES TO DESIGNER:

The designer shall ensure that the following checks are undertaken to ensure the suitability of the standard box culvert and wingwall designs to a particular site.

General:

The designer shall review the site investigation results and material testing to confirm the site exposure and environment is within the scope of these standards. This includes highly saline environments, maritime environments including splash zones and other aggressive chemicals.

Box Culverts:

The designer shall review the geometry and applied loading of the proposed site to ensure that the design is within the scope of these standards.

AASHTO Crack Control Criteria, Article 5.7.3.4, is ignored.

Wingwalls:

The standard wingwall designs do not allow for increased earth pressure loads due to seismic effects.

The designer shall ensure that the overall slip circle stability and wall deflections are checked in accordance with Section 11.6.2 of AASHTO LRFD.

The designer shall ensure the friction angle for founding stratum, ffound', is a minimum of 32 degrees for 2:1 Slope Wingwalls and 34 degrees for 1.5:1 Slope Wingwalls.
Where the founding stratum is a cohesive soil, the designer shall ensure that the sliding stability of the wall is verified.

Where the designer proposes to improve the foundation strata to allow the use of the standard wingwall designs, the designer shall ensure that additional sliding and bearing pressure checks are carried out at the base of the improved soil layer.

In locations where it is not practical to provide the back of wall drainage system as indicated on the drawings, the designer shall re-check the wingwall designs taking into account the site groundwater conditions. Special consideration of groundwater conditions may also be required in locations where the watercourse is prone to rapid and significant changes in water level, including seepage effects where appropriate.

The designer shall calculate the nominal bearing resistance of the foundation material using the semi-empirical approach given in AASHTO LRFD Section 10.6.3.1.3 using the width of footing at the low and high ends of the wingwall, dimensions N1 and N2, for the footing width B. The designer shall check that the factored bearing resistance at each end of the wall, qR, is greater than the minimum values given in the table below. Where the factored bearing resistance is below the minimum values given in the table the designer shall re-design the wall based on an increased footing width or provide improvement to the foundation bearing resistance such that its bearing resistance exceeds the minimum values.

2:1 Slope Wingwalls Type I

N1 OR N2 (FT.)	$q_{r,min.}$ (ksf)	N1 OR N2 (FT.)	$q_{r,min.}$ (ksf)
3'-0"	0.85	9'-0"	3.92
3'-6"	1.11	9'-6"	3.99
4'-0"	1.27	10'-0"	4.07
4'-6"	1.71	11'-0"	4.28
5'-0"	2.03	12'-0"	4.36
5'-6"	2.36	12'-6"	4.46
6'-0"	2.70	13'-0"	4.56
6'-6"	3.05	14'-0"	4.56
7'-0"	3.10	14'-6"	4.66
7'-6"	3.45	15'-0"	4.99
8'-0"	3.51	15'-6"	5.10
8'-6"	3.86		

2:1 Slope Wingwalls Type II

N1 OR N2 (FT.)	$q_{r,min.}$ (ksf)	N1 OR N2 (FT.)	$q_{r,min.}$ (ksf)
3'-0"	0.48	8'-0"	4.13
4'-0"	1.40	8'-6"	4.16
4'-6"	1.71	9'-0"	4.21
5'-0"	2.03	9'-6"	4.43
5'-6"	2.36	10'-0"	5.19
6'-0"	2.70	10'-6"	5.23
6'-6"	3.05	11'-0"	5.61
7'-0"	3.10	12'-0"	5.40
7'-6"	3.76	13'-0"	5.55

1.5:1 Slope Wingwalls Type I

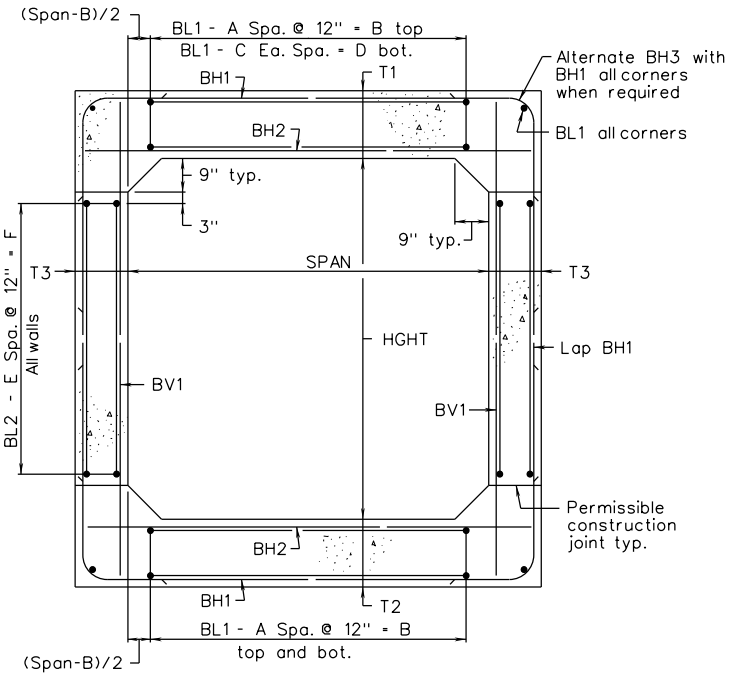
N1 OR N2 (FT.)	$q_{r,min.}$ (ksf)	N1 OR N2 (FT.)	$q_{r,min.}$ (ksf)
3'-0"	1.02	8'-6"	3.44
3'-6"	1.15	9'-0"	3.57
4'-0"	1.50	9'-6"	3.71
4'-3"	1.68	10'-0"	4.10
4'-6"	1.88	11'-6"	4.28
4'-9"	2.08	12'-0"	4.42
5'-0"	1.98	12'-6"	4.55
5'-6"	2.40	13'-6"	4.60
6'-0"	2.53	15'-0"	4.95
6'-6"	2.65	15'-6"	5.32
7'-0"	2.78	16'-0"	5.70
7'-6"	3.18	16'-6"	6.11
		17'-6"	6.15

1.5:1 Slope Wingwalls Type II

N1 OR N2 (FT.)	$q_{r,min.}$ (ksf)	N1 OR N2 (FT.)	$q_{r,min.}$ (ksf)
3'-0"	0.55	8'-0"	4.26
4'-0"	1.50	8'-6"	4.35
4'-3"	1.68	9'-0"	4.64
4'-6"	1.88	9'-6"	4.93
4'-9"	2.08	10'-0"	5.04
5'-0"	2.28	10'-6"	5.49
5'-3"	2.49	11'-0"	5.83
5'-6"	2.71	11'-6"	5.93
5'-9"	2.93	12'-0"	6.04
6'-0"	3.15	12'-6"	6.16
6'-6"	3.61	13'-0"	6.28
7'-0"	3.70	13'-3"	6.51
7'-6"	4.17	14'-0"	6.53
		15'-0"	6.48

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

SPECIFICATION REFERENCE	NOTES TO DESIGNER BOX CULVERTS AND WINGS VIRGINIA DEPARTMENT OF TRANSPORTATION	VDOT ROAD AND BRIDGE STANDARDS
		REVISION DATE: 07/12 — SHEET 1 OF 1 — 1000.05



TYPICAL SECTION

GENERAL NOTES:

Capacity: AASHTO HL-93 Loading

Specifications:

Construction: Virginia Department of Transportation Road and Bridge Specifications, 2007.

Design: AASHTO LRFD Bridge Design Specifications, 5th Edition 2010; 2011 Interim Specifications; and VDOT Modifications.

All concrete shall be Class A4.

Deformed reinforcing bars shall conform to ASTM A615, Grade 60. All reinforcing bar dimensions on the detailed drawings are to centers of bars except where otherwise noted and are subject to fabrication and construction tolerances.

Construction joints shall be constructed and bonded in accordance with the current VDOT Road and Bridge Specifications.

Barrels more than 35' in length shall be poured in sections by providing vertical construction joints, not exceeding 25' between joints nor more than 30' from ends of barrels.

** Bars BH1 and BH3 shall have a pin diameter of 24 bar diameters.

Dimensions on bar diagrams are out-to-out of bars. Bars are straight unless otherwise shown.

The number of BL1 and BL2 bars shown in the table is the number of longitudinal bars shown in the typical section and may not equal the total number of bars required. BL1 and BL2 bars shall have a lap of 30 bar diameters at splices. At construction joints, first placed bars shall project 30 bar diameters beyond the joint. Estimated QUAN./LF shown for reinforcing steel does not include the quantity for laps of BL1 and BL2 bars. The additional weight per longitudinal lap is shown in the table.

The minimum cover of main reinforcing bars shall be $2\frac{1}{2}$" from the face of the concrete for culverts under 0 to 2 foot fills and shall be 2" from the face of the concrete for all other culverts.

All reinforcing steel for culverts under 0 to 2 foot fills shall be low carbon/chromium reinforcing steel conforming to ASTM A1035.

At the Contractor's option, BV1 bars may be spliced at the permissible construction joint in order to facilitate construction. No additional compensation shall be provided for the increase in reinforcing steel quantity due to the splices.

Headwall quantities shown assume wingwalls are to be built at a 45° angle to the headwall.

The designs are applicable to the fill height and other conditions indicated. Any change in the conditions invalidates these designs.

Wingwalls referenced by letter apply when the acceptable foundation level is the same for both box and wings. If foundation levels are different, the height of the wingwall shall be adjusted by selection of another lettered wingwall of the appropriate height. For wingwall details, refer to standard series BCW for the appropriate fill slope.

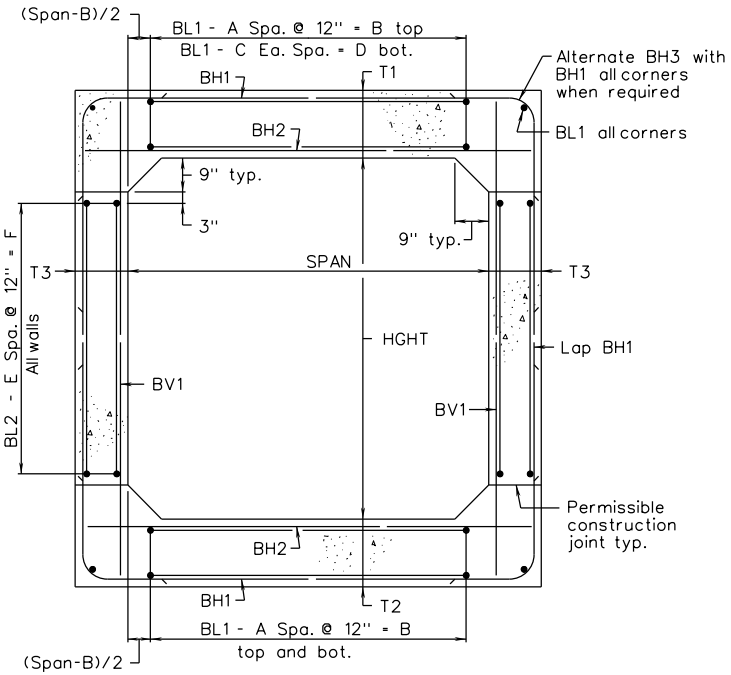
For details of extending existing boxes, refer to standard BCE-01.

For modification of details for skewed culverts, see the skewed box details included in the road plans.

This standard shall be used with the BCB standard series.

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

SPECIFICATION REFERENCE	OVERSIZE BOX CULVERTS STANDARD DETAILS VIRGINIA DEPARTMENT OF TRANSPORTATION	VDOT ROAD AND BRIDGE STANDARDS
		REVISION DATE 07/12
		SHEET 1 OF 2
		1001.01



TYPICAL SECTION

GENERAL NOTES:

Capacity: AASHTO HL-93 Loading

Specifications:

Construction: Virginia Department of Transportation Road and Bridge Specifications, 2007.

Design: AASHTO LRFD Bridge Design Specifications, 5th Edition 2010; 2011 Interim Specifications; and VDOT Modifications.

All concrete shall be Class A4.

Deformed reinforcing bars shall conform to ASTM A615, Grade 60. All reinforcing bar dimensions on the detailed drawings are to centers of bars except where otherwise noted and are subject to fabrication and construction tolerances.

Construction joints shall be constructed and bonded in accordance with the current VDOT Road and Bridge Specifications.

Barrels more than 35' in length shall be poured in sections by providing vertical construction joints, not exceeding 25' between joints nor more than 30' from ends of barrels.

** Bars BH1 and BH3 shall have a pin diameter of 24 bar diameters.

Dimensions on bar diagrams are out-to-out of bars. Bars are straight unless otherwise shown.

The number of BL1 and BL2 bars shown in the table is the number of longitudinal bars shown in the typical section and may not equal the total number of bars required. BL1 and BL2 bars shall have a lap of 30 bar diameters at splices. At construction joints, first placed bars shall project 30 bar diameters beyond the joint. Estimated QUAN./LF shown for reinforcing steel does not include the quantity for laps of BL1 and BL2 bars. The additional weight per longitudinal lap is shown in the table.

The minimum cover of main reinforcing bars shall be $2\frac{1}{2}$" from the face of the concrete for culverts under 0 to 2 foot fills and shall be 2" from the face of the concrete for all other culverts.

All reinforcing steel for culverts under 0 to 2 foot fills shall be low carbon/chromium reinforcing steel conforming to ASTM A1035.

At the Contractor's option, BV1 bars may be spliced at the permissible construction joint in order to facilitate construction. No additional compensation shall be provided for the increase in reinforcing steel quantity due to the splices.

Headwall quantities shown assume wingwalls are to be built at a 45° angle to the headwall.

The designs are applicable to the fill height and other conditions indicated. Any change in the conditions invalidates these designs.

Wingwalls referenced by letter apply when the acceptable foundation level is the same for both box and wings. If foundation levels are different, the height of the wingwall shall be adjusted by selection of another lettered wingwall of the appropriate height. For wingwall details, refer to standard series BCW for the appropriate fill slope.

For details of extending existing boxes, refer to standard BCE-01.

For modification of details for skewed culverts, see the skewed box details included in the road plans.

This standard shall be used with the BCS standard series.

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

VDOT ROAD AND BRIDGE STANDARDS		SINGLE BOX CULVERTS STANDARD DETAILS VIRGINIA DEPARTMENT OF TRANSPORTATION	SPECIFICATION REFERENCE
SHEET 1 OF 2	REVISION DATE		
1002.01	07/12		

GENERAL NOTE

Capacity: AASHTO HI-93 Loading.

Specifications:

Construction - Va. Department of Transportation Road and Bridge Specifications 2007.

Design - AASHTO LRFD Bridge Design Specifications, 5th Edition 2010; 2011 Interim Specifications; and VDOT Modifications.

All concrete shall be Class A4.

Deformed reinforcing bars shall conform to ASTM A615, Grade 60. All reinforcing bar dimensions on the detailed drawings are to centers of bars except where otherwise noted and are subject to fabrication and construction tolerances.

Construction joints shall be constructed and bonded in accordance with the current Road and Bridge Specifications.

Barrels more than 35' in length shall be poured in sections by providing vertical construction joints, not exceeding 25' between joints nor more than 30' from ends of barrels.

** All bends shall be made with a pin diameter as listed in TABLE A except for Bars BH3 and BH4 which shall have a pin diameter of 24 bar diameters.

Dimensions on bar diagrams are out-to-out of bars. Bars are straight and #4 size unless otherwise shown. BL2 shall be #3 size.

The number of BL1 and BL2 bars shown in the table is the number of longitudinal bars shown in the Typical Section and may not equal the total number of bars required. BL1 and BL2 shall have a lap of 30 bar diameters at splices. At construction joints, first placed bars shall project 30 bar diameters beyond the joint. Estimated QUAN./LF shown for reinforcing steel does not include quantity for laps of BL1 and BL2 bars. The additional weight per longitudinal lap is shown in the table.

The minimum cover of main reinforcing bars shall be $2\frac{1}{2}$" from the face of the concrete for culverts under 0 to 2 foot fills and shall be 2" from the face of cencrete for all other culverts.

All reinforcing steel for culverts under 0 to 2 foot fills shall be Low Carbon/Chromium Reinforcing Steel conforming to ASTM A1035.

At the Contractor's option, BV1 and BV2 bars may be spliced at the permissible construction joint in order to facilitate construction. No additional compensation shall be provided for the increase in reinforcing steel quantity due to the splices.

Bar HW2 shall be 4" less than culvert height in length.

Headwall quantities shown assume wingwalls are to be built at a 45° angle to the headwall.

The designs are applicable to the fill height and other conditions indicated. Any change in the conditions invalidates these designs.

Wingwalls referenced by letter apply when the acceptable foundation level is the same for both box and wings. If foundation levels are different, the height of the wingwall shall be adjusted by selection of another lettered wingwall of appropriate height. For wingwall details, refer to standard series BCW for the appropriate fill slope.

For details of extending existing boxes, refer to Standard BCE-01.

For modification of details for skewed culverts, see the skewed box details included in the road plans.

This standard shall be used with the BCD standard series.

GENERAL NOTE

Capacity: AASHTO HI-93 Loading.

Specifications:

Construction - Virginia Department of Transportation Road and Bridge Specifications 2007.

Design - AASHTO LRFD Bridge Design Specifications, 5th Edition 2010; 2011 Interim Specifications; and VDOT Modifications.

All concrete shall be Class A4.

Deformed reinforcing bars shall conform to ASTM A615, Grade 60. All reinforcing bar dimensions on the detailed drawings are to centers of bars except where otherwise noted and are subject to fabrication and construction tolerances.

Construction joints shall be constructed and bonded in accordance with the current Road and Bridge Specifications.

Barrels more than 35' in length shall be poured in sections by providing vertical construction joints, not exceeding 25' between joints nor more than 30' from ends of barrels.

** All bends shall be made with a pin diameter as listed in TABLE A except for Bars BH3 and BH4 which shall have a pin diameter of 24 bar diameters.

Dimensions on bar diagrams are out-to-out of bars. Bars are straight and #4 size unless otherwise shown. BL2 shall be #3 size.

The number of BL1 and BL2 bars shown in the table is the number of longitudinal bars shown in the Typical Section and may not equal the total number of bars required. BL1 and BL2 shall have a lap of 30 bar diameters at splices. At construction joints, first placed bars shall project 30 bar diameters beyond the joint. Estimated QUAN./LF shown for reinforcing steel does not include quantity for laps of BL1 and BL2 bars. The additional weight per longitudinal lap is shown in the table.

The minimum cover of main reinforcing bars shall be 2½" from the face of the concrete for culverts under 0 to 2 foot fills and shall be 2" from the face of cencrete for all other culverts.

All reinforcing steel for culverts under 0 to 2 foot fills shall be Low Carbon/Chromium Reinforcing Steel conforming to ASTM A1035.

At the Contractor's option, BV1 and BV2 bars may be spliced at the permissible construction joint in order to facilitate construction. No additional compensation shall be provided for the increase in reinforcing steel quantity due to the splices.

Bar HW2 shall be 4" less than culvert height in length.

Headwall quantities shown assume wingwalls are to be built at a 45° angle to the headwall.

The designs are applicable to the fill height and other conditions indicated. Any change in the conditions invalidates these designs.

Wingwalls referenced by letter apply when the acceptable foundation level is the same for both box and wings. If foundation levels are different, the height of the wingwall shall be adjusted by selection of another lettered wingwall of appropriate height. For wingwall details, refer to standard series BCW for the appropriate fill slope.

For details of extending existing boxes, refer to Standard BCE-01.

For modification of details for skewed culverts, see the skewed box details included in the road plans.

This standard shall be used with the BCT standard series.

GENERAL NOTE

Capacity: AASHTO HI-93 Loading.

Specifications:

Construction - Virginia Department of Transportation Road and Bridge Specifications 2007.

Design - AASHTO LRFD Bridge Design Specifications, 5th Edition 2010; 2011 Interim Specifications; and VDOT Modifications.

All concrete shall be Class A4.

Deformed reinforcing bars shall conform to ASTM A615, Grade 60. All reinforcing bar dimensions on the detailed drawings are to centers of bars except where otherwise noted and are subject to fabrication and construction tolerances.

Construction joints shall be constructed and bonded in accordance with the current Road and Bridge Specifications.

Barrels more than 35' in length shall be poured in sections by providing vertical construction joints, not exceeding 25' between joints nor more than 30' from ends of barrels.

** All bends shall be made with a pin diameter as listed in TABLE A except for Bars BH3 and BH4 which shall have a pin diameter of 24 bar diameters.

Dimensions on bar diagrams are out-to-out of bars. Bars are straight and #4 size unless otherwise shown. BL2 shall be #3 size.

The number of BL1 and BL2 bars shown in the table is the number of longitudinal bars shown in the Typical Section and may not equal the total number of bars required. BL1 and BL2 shall have a lap of 30 bar diameters at splices. At construction joints, first placed bars shall project 30 bar diameters beyond the joint. Estimated QUAN./LF shown for reinforcing steel does not include quantity for laps of BL1 and BL2 bars. The additional weight per longitudinal lap is shown in the table.

The minimum cover of main reinforcing bars shall be $2\frac{1}{2}$" from the face of the concrete for culverts under 0 to 2 foot fills and shall be 2" from the face of cencrete for all other culverts.

All reinforcing steel for culverts under 0 to 2 foot fills shall be Low Carbon/Chromium Reinforcing Steel conforming to ASTM A1035.

At the Contractor's option, BV1 and BV2 bars may be spliced at the permissible construction joint in order to facilitate construction. No additional compensation shall be provided for the increase in reinforcing steel quantity due to the splices.

Bar HW2 shall be 4" less than culvert height in length.

Headwall quantities shown assume wingwalls are to be built at a 45° angle to the headwall.

The designs are applicable to the fill height and other conditions indicated. Any change in the conditions invalidates these designs.

Wingwalls referenced by letter apply when the acceptable foundation level is the same for both box and wings. If foundation levels are different, the height of the wingwall shall be adjusted by selection of another lettered wingwall of appropriate height. For wingwall details, refer to standard series BCW for the appropriate fill slope.

For details of extending existing boxes, refer to Standard BCE-01.

For modification of details for skewed culverts, see the skewed box details included in the road plans.

This standard shall be used with the BCQ standard series.

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

SPECIFICATION REFERENCE	QUADRUPLE BOX CULVERTS STANDARD DETAILS VIRGINIA DEPARTMENT OF TRANSPORTATION	VDOT ROAD AND BRIDGE STANDARDS
		REVISION DATE: 07/12
		SHEET 2 OF 3 1005.02

GENERAL NOTES

Specifications:

AASHTO LRFD Bridge Design Specifications 5th Edition 2010; 2011 Interim Revisions; and VDOT Modifications

Limits of validity for Standard Wingwall design

The standard wingwall designs are based on the following assumptions:

there is no structural connection between the wall and the box culvert
traffic surcharge loading is neglected.

Backfill

Backfill shall comprise granular material with an internal friction angle Φ' of at least 34 °. Cohesive backfill shall not be permitted. Compaction of the backfill material within a distance of one-half the height of the wall shall be by hand compactors only.

Drainage

The Contractor shall provide the drainage system indicated on Sheet 1.

The cost for the drainage system (including porous backfill, 6" diameter non-rigid tubing and other items required) shall be incidental to the cost bid for Concrete.

Concrete

All concrete shall be Class A4.

Reinforcement

Deformed reinforcing bars shall conform to ASTM A615, Grade 60. All reinforcing bar dimensions on the detailed drawings are to centers of bars except where otherwise noted and are subject to fabrication and construction tolerances.

Dimensions on bar diagrams are out-to-out of bars. Bars are straight unless otherwise shown.

The concrete cover to the outermost reinforcement bars shall be as follows:

Wall footing (all faces) 3" minimum cover
Wall stem (all faces) 2½" minimum cover

At the Contractor's option WV Series bars may be spliced at top of the footing in order to facilitate construction. Splice lengths shall be in accordance with Table C on Sheet 1. No additional compensation shall be provided for the increase in reinforcing steel quantity due to the splices.

Miscellaneous

Weepholes shall be placed at the lowest point feasible for free drainage away from the wing.

Four Type I Wings are to be used for straight crossings and skews up to 20°. Two Type I and two Type II Wings are to be used for skews from 25° to 45°. For skews above 45°, special design wings are required. The wingwall to be used for each culvert is shown on the BC series sheets.

The designs shown are applicable for a 45° skew with the roadway and other conditions indicated. Any change in these conditions invalidates these designs.

Quantities shown are for one wing.

WING	Wall Quantities		q_{r_min} ksf High End	q_{r_min} ksf Low End
	Concrete CY	Reinforcement LB		
A	1.7	162	1.10	0.57
B	2.1	193	1.28	0.57
C	2.5	221	1.50	0.57
D	2.7	236	1.68	0.63
E	3.2	265	1.88	0.63
F	3.7	299	2.08	0.63
G	4.1	353	2.13	0.76
H	4.6	382	2.40	0.76
I	5.4	460	2.52	0.84
J	6.2	509	2.65	0.84
K	7.1	619	2.78	1.02
L	7.4	653	2.92	1.02
M	8.1	718	3.18	1.02
N	8.9	922	3.19	1.15
O	9.7	968	3.44	1.15
P	10.7	1117	3.57	1.15
Q	11.5	1240	3.71	1.28
R	12.6	1379	3.84	1.28
S	13.5	1478	4.10	1.28
T	18.0	1815	4.28	1.56
U	18.7	2063	4.42	1.79
V	20.3	2318	4.55	1.79
W	22.3	2619	4.60	1.79
X	25.1	2822	4.74	1.98
Y	26.6	3173	4.95	1.98
Z	28.5	3423	5.10	1.98
AA	30.0	3765	5.32	1.98
BB	31.4	4553	5.47	2.11
CC	33.0	4977	5.70	2.11
DD	40.5	5679	6.11	2.28
EE	42.4	6262	6.15	2.53

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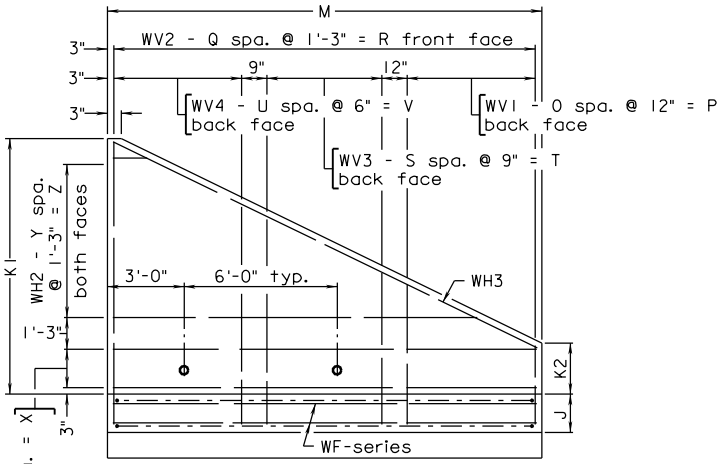
1006.01 | 07/12

WING DETAIL

1½: 1 FILL SLOPE - TYPE I

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE



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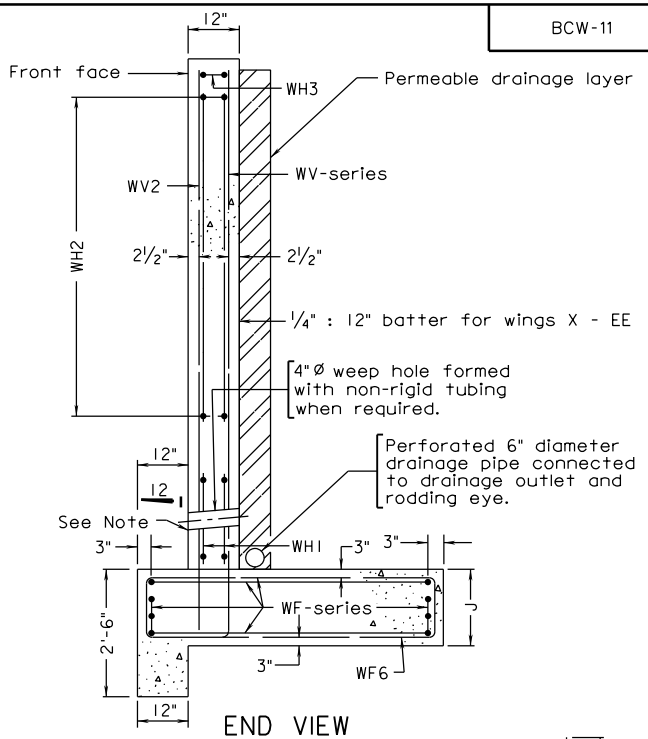
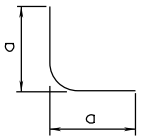
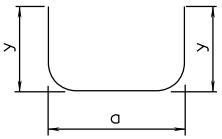


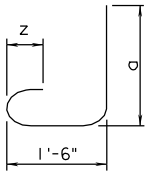
END VIEW



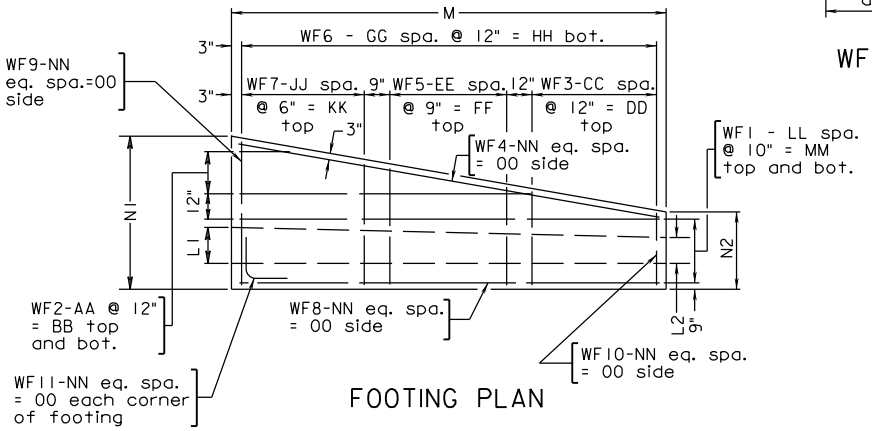
WF11



WF1 TO WF3, WF5 TO WF7



WV1, WV3, WV4



FOOTING PLAN

TABLE A	
Wall	y
A-W	9½"
X	1'-0½"
Y-CC	1'-3½"
DD-EE	1'-9½"

TABLE B		
Bar Size	Pin Dia.	Z
#3	2¼"	4"
#4	3"	4½"
#5	3¾"	5"
#6	4½"	6"
#7	5¼"	7"
#8	6"	8"
#9	9"	10⅛"

TABLE C	
Bar Size	Splice Length
#4	1'- 9"
#5	2'- 4"
#6	2'- 7"
#7	3'- 3"
#8	4'- 2"
#9	5'- 4"

A COPY OF THE ORIGINAL SEALED AND SIGNED DRAWING AND DESIGN STATEMENT IS ON FILE IN THE CENTRAL OFFICE.

SPECIFICATION REFERENCE

WING DETAIL

1½: 1 FILL SLOPE - TYPE I

VIRGINIA DEPARTMENT OF TRANSPORTATION

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ROAD AND BRIDGE STANDARDS

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BCW-11

WING	WALL DIMENSIONS								No. WEEP HOLES	FOOTING BAR SPACINGS													
	J	K1	K2	L1	L2	M	N1	N2		WF1		WF2		WF3		WF4, WF8 to WF10		WF5		WF6		WF7	
										LL	MM	AA	BB	CC	DD	NN	OO	EE	FF	GG	HH	JJ	KK
A	1'-6"	4'-0"	1'-9"	1'-0"	1'-0"	5'-0"	4'-0"	3'-0"	-	3	2'-6"	-	-	4	4'-0"	1	0'-8"	-	-	4	4'-0"	-	-
B	1'-6"	4'-6"	1'-9"	1'-0"	1'-0"	6'-0"	4'-0"	3'-0"	-	3	2'-6"	-	-	5	5'-0"	1	0'-8"	-	-	5	5'-0"	-	-
C	1'-6"	5'-0"	1'-9"	1'-0"	1'-0"	7'-0"	4'-0"	3'-0"	-	3	2'-6"	-	-	6	6'-0"	1	0'-8"	-	-	6	6'-0"	-	-
D	1'-6"	5'-6"	2'-3"	1'-0"	1'-0"	7'-0"	4'-3"	3'-0"	-	3	2'-6"	-	-	6	6'-0"	1	0'-8"	-	-	6	6'-0"	-	-
E	1'-6"	6'-0"	2'-3"	1'-0"	1'-0"	8'-0"	4'-6"	3'-0"	-	3	2'-6"	-	-	7	7'-0"	1	0'-8"	-	-	7	7'-0"	-	-
F	1'-6"	6'-6"	2'-3"	1'-0"	1'-0"	9'-0"	4'-9"	3'-0"	-	3	2'-6"	-	-	8	8'-0"	1	0'-8"	-	-	8	8'-0"	-	-
G	1'-6"	7'-0"	2'-9"	1'-0"	1'-0"	9'-0"	5'-6"	3'-0"	-	3	2'-6"	1	1'-0"	4	4'-0"	1	0'-8"	6	4'-6"	8	8'-0"	-	-
H	1'-6"	7'-6"	2'-9"	1'-0"	1'-0"	10'-0"	5'-6"	3'-0"	-	3	2'-6"	1	1'-0"	5	5'-0"	1	0'-8"	6	4'-6"	9	9'-0"	-	-
I	1'-6"	8'-0"	3'-0"	1'-0"	1'-0"	11'-0"	6'-0"	3'-0"	-	3	2'-6"	1	1'-0"	5	5'-0"	1	0'-8"	6	4'-6"	10	10'-0"	-	-
J	1'-6"	8'-6"	3'-0"	1'-0"	1'-0"	12'-0"	6'-6"	3'-0"	-	3	2'-6"	2	2'-0"	6	6'-0"	1	0'-8"	6	4'-6"	11	11'-0"	-	-
K	1'-6"	9'-0"	3'-6"	1'-0"	1'-0"	13'-0"	7'-0"	3'-0"	-	3	2'-6"	2	2'-0"	7	7'-0"	1	0'-8"	6	4'-6"	12	12'-0"	-	-
L	1'-6"	9'-6"	3'-6"	1'-0"	1'-0"	13'-0"	7'-6"	3'-0"	-	3	2'-6"	3	3'-0"	7	7'-0"	1	0'-8"	6	4'-6"	12	12'-0"	-	-
M	1'-6"	10'-0"	3'-6"	1'-0"	1'-0"	14'-0"	7'-6"	3'-0"	-	3	2'-6"	3	3'-0"	6	6'-0"	1	0'-8"	8	6'-0"	13	13'-0"	-	-
N	1'-6"	10'-6"	4'-0"	1'-0"	1'-0"	14'-0"	8'-6"	3'-6"	-	3	2'-6"	4	4'-0"	4	4'-0"	1	0'-8"	5	3'-9"	13	13'-0"	8	4'-0"
O	1'-6"	11'-0"	4'-0"	1'-0"	1'-0"	15'-0"	8'-6"	3'-6"	-	3	2'-6"	4	4'-0"	4	4'-0"	1	0'-8"	5	3'-9"	14	14'-0"	8	4'-0"
P	1'-6"	11'-6"	4'-0"	1'-0"	1'-0"	16'-0"	9'-0"	3'-6"	-	3	2'-6"	4	4'-0"	5	5'-0"	1	0'-8"	7	5'-3"	15	15'-0"	10	5'-0"
Q	1'-6"	12'-0"	4'-6"	1'-0"	1'-0"	16'-0"	9'-6"	4'-0"	-	4	3'-4"	4	4'-0"	5	5'-0"	1	0'-8"	7	5'-3"	15	15'-0"	10	5'-0"
R	1'-6"	12'-6"	4'-6"	1'-0"	1'-0"	17'-0"	10'-0"	4'-0"	-	4	3'-4"	4	4'-0"	5	5'-0"	1	0'-8"	7	5'-3"	16	16'-0"	10	5'-0"
S	1'-6"	13'-0"	4'-6"	1'-0"	1'-0"	18'-0"	10'-0"	4'-0"	-	4	3'-4"	4	4'-0"	5	5'-0"	1	0'-8"	7	5'-3"	17	17'-0"	10	5'-0"
T	2'-0"	13'-6"	4'-9"	1'-0"	1'-0"	19'-0"	11'-6"	4'-6"	-	4	3'-4"	6	6'-0"	6	6'-0"	1	1'-2"	8	6'-0"	18	18'-0"	12	6'-0"
U	2'-0"	14'-0"	5'-3"	1'-0"	1'-0"	19'-0"	12'-0"	4'-6"	-	4	3'-4"	6	6'-0"	6	6'-0"	1	1'-2"	8	6'-0"	18	18'-0"	12	6'-0"
V	2'-0"	14'-6"	5'-3"	1'-0"	1'-0"	20'-0"	12'-6"	4'-6"	1	4	3'-4"	7	7'-0"	6	6'-0"	1	1'-2"	8	6'-0"	19	19'-0"	12	6'-0"
W	2'-0"	15'-0"	5'-3"	1'-0"	1'-0"	21'-0"	13'-6"	4'-6"	1	4	3'-4"	8	8'-0"	6	6'-0"	1	1'-2"	8	6'-0"	20	20'-0"	12	6'-0"
X	2'-0"	15'-6"	5'-9"	1'-3¾"	1'-1⅛"	21'-0"	15'-0"	5'-0"	1	5	4'-2"	8	8'-0"	6	6'-0"	1	1'-2"	8	6'-0"	20	20'-0"	12	6'-0"
Y	2'-0"	16'-0"	5'-9"	1'-4"	1'-1⅛"	22'-0"	15'-0"	5'-0"	1	5	4'-2"	8	8'-0"	7	7'-0"	2	0'-7"	10	7'-6"	21	21'-0"	14	7'-0"
Z	2'-0"	16'-6"	5'-9"	1'-4⅛"	1'-1¼"	23'-0"	15'-6"	5'-0"	1	5	4'-2"	9	9'-0"	7	7'-0"	2	0'-7"	10	7'-6"	22	22'-0"	14	7'-0"
AA	2'-0"	17'-0"	5'-9"	1'-4¼"	1'-1¼"	24'-0"	15'-6"	5'-0"	1	5	4'-2"	9	9'-0"	7	7'-0"	2	0'-7"	10	7'-6"	23	23'-0"	14	7'-0"
BB	2'-0"	17'-6"	6'-3"	1'-4⅜"	1'-1¼"	24'-0"	16'-0"	5'-6"	1	6	5'-0"	9	9'-0"	7	7'-0"	2	0'-7"	10	7'-6"	23	23'-0"	14	7'-0"
CC	2'-0"	18'-0"	6'-3"	1'-4½"	1'-1¼"	25'-0"	16'-0"	5'-6"	2	6	5'-0"	9	9'-0"	8	8'-0"	2	0'-7"	11	8'-3"	24	24'-0"	16	8'-0"
DD	2'-6"	18'-6"	6'-3"	1'-4⅝"	1'-1⅜"	26'-0"	16'-6"	6'-0"	2	6	5'-0"	9	9'-0"	8	8'-0"	2	0'-10"	11	8'-3"	25	25'-0"	16	8'-0"
EE	2'-6"	19'-0"	6'-9"	1'-4¾"	1'-1⅜"	26'-0"	17'-6"	6'-0"	2	6	5'-0"	10	10'-0"	8	8'-0"	2	0'-10"	11	8'-3"	25	25'-0"	16	8'-0"

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

VDOT
ROAD AND BRIDGE STANDARDS

SHEET 3 OF 8 | REVISION DATE
1006.03 | 07/12

WING DETAILS

1½: 1 FILL SLOPE - TYPE I

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE

WING	WF1				WF2								WF3						
	SIZE	a	LENGTH	* Ea	SIZE	a			LENGTH			* Ea	SIZE	a			LENGTH		
						FROM	TO	VARY BY	FROM	TO	VARY BY			FROM	TO	VARY BY	FROM	TO	VARY BY
A	4	4′-5"	5′-9"	2	4	0′-8"	5′-8"	-	2′-0"	7′-0"	-	2	4	3′-4"	2′-7"	0′-2 3/8"	4′-9"	3′-11"	0′-2 3/8"
B	4	5′-5"	6′-9"	2	4	0′-11"	6′-11"	-	2′-3"	8′-3"	-	2	4	3′-5"	2′-7"	0′-2"	4′-9"	3′-11"	0′-2"
C	4	6′-5"	7′-9"	2	4	1′-2"	8′-2"	-	2′-6"	9′-6"	-	2	4	3′-5"	2′-6"	0′-1 5/8"	4′-9"	3′-11"	0′-1 5/8"
D	4	6′-5"	7′-9"	2	4	2′-2"	7′-9"	-	3′-7"	9′-2"	-	2	4	3′-7"	2′-7"	0′-2 1/8"	5′-0"	3′-11"	0′-2 1/8"
E	4	7′-5"	8′-9"	2	4	3′-5"	3′-5"	-	4′-9"	4′-9"	-	2	4	3′-10"	2′-7"	0′-2 1/4"	5′-3"	3′-11"	0′-2 1/4"
F	4	8′-5"	9′-9"	2	4	4′-6"	4′-6"	-	5′-11"	5′-11"	-	2	4	4′-1"	2′-7"	0′-2 1/4"	5′-6"	3′-11"	0′-2 1/4"
G	4	8′-5"	9′-9"	2	4	5′-8"	2′-1"	3′-7 1/8"	7′-1"	3′-5"	3′-7 1/8"	2	4	3′-4"	2′-3"	0′-3 1/4"	4′-8"	3′-7"	0′-3 1/4"
H	4	9′-5"	10′-9"	2	4	6′-5"	2′-5"	4′-0"	7′-9"	3′-9"	4′-0"	2	4	3′-6"	2′-3"	0′-3"	4′-10"	3′-7"	0′-3"
I	4	10′-5"	11′-9"	2	4	7′-8"	4′-0"	3′-8"	9′-0"	5′-4"	3′-8"	2	4	3′-10"	2′-6"	0′-3 1/4"	5′-3"	3′-10"	0′-3 1/4"
J	4	11′-5"	12′-9"	2	4	8′-10"	1′-11"	3′-5 1/8"	10′-2"	3′-4"	3′-5 1/8"	2	4	4′-3"	2′-6"	0′-3 1/2"	5′-7"	3′-10"	0′-3 1/2"
K	4	12′-5"	13′-9"	2	4	9′-11"	3′-5"	3′-3"	11′-4"	4′-10"	3′-3"	2	4	4′-8"	2′-6"	0′-3 5/8"	6′-0"	3′-10"	0′-3 5/8"
L	4	12′-5"	13′-9"	2	4	10′-3"	1′-7"	2′-10 5/8"	11′-7"	2′-11"	2′-10 5/8"	2	4	4′-11"	2′-6"	0′-4 1/8"	6′-4"	3′-11"	0′-4 1/8"
M	4	13′-5"	14′-9"	2	4	11′-1"	1′-9"	3′-1 1/4"	12′-5"	3′-1"	3′-1 1/4"	2	4	4′-7"	2′-8"	0′-3 3/4"	6′-0"	4′-0"	0′-3 3/4"
N	4	13′-5"	14′-9"	2	4	12′-8"	1′-6"	2′-9 1/2"	14′-1"	2′-10"	2′-9 1/2"	2	4	4′-5"	3′-0"	0′-4 1/4"	5′-10"	4′-5"	0′-4 1/4"
O	4	14′-5"	15′-9"	2	4	13′-8"	1′-8"	3′-0"	15′-0"	3′-0"	3′-0"	2	4	4′-8"	3′-4"	0′-4"	6′-1"	4′-9"	0′-4"
P	4	15′-5"	16′-9"	2	4	14′-8"	3′-0"	2′-10 3/4"	16′-0"	4′-4"	2′-10 3/4"	2	4	4′-3"	2′-6"	0′-4 1/8"	5′-7"	3′-10"	0′-4 1/8"
Q	4	15′-5"	16′-9"	2	4	13′-8"	2′-1"	2′-10 3/4"	15′-1"	3′-4"	2′-10 3/4"	2	4	4′-8"	3′-0"	0′-4 1/8"	6′-1"	4′-3"	0′-4 1/8"
R	4	16′-5"	17′-9"	2	4	14′-9"	3′-5"	2′-10"	16′-1"	4′-9"	2′-10"	2	4	5′-1"	3′-4"	0′-4 1/8"	6′-6"	4′-8"	0′-4 1/8"
S	4	17′-5"	18′-9"	2	4	15′-8"	3′-8"	3′-0"	17′-0"	5′-0"	3′-0"	2	4	5′-4"	3′-8"	0′-4"	6′-9"	5′-1"	0′-4"
T	4	18′-5"	20′-9"	2	4	18′-2"	1′-10"	2′-8 1/2"	20′-6"	4′-3"	2′-8 1/2"	2	4	5′-9"	3′-7"	0′-4 3/8"	8′-2"	5′-11"	0′-4 3/8"
U	4	18′-5"	20′-9"	2	4	18′-2"	3′-0"	2′-6 3/8"	20′-6"	5′-3"	2′-6 3/8"	2	4	5′-11"	3′-6"	0′-4 5/8"	8′-3"	5′-11"	0′-4 5/8"
V	4	19′-5"	21′-9"	2	4	19′-2"	1′-8"	2′-6"	21′-7"	4′-1"	2′-6"	2	4	6′-4"	3′-11"	0′-4 3/4"	8′-8"	6′-4"	0′-4 3/4"
W	4	20′-5"	22′-9"	2	4	20′-2"	1′-6"	2′-4"	22′-7"	3′-11"	2′-4"	2	4	6′-11"	4′-4"	0′-5 1/8"	9′-4"	6′-9"	0′-5 1/8"
X	4	20′-5"	22′-9"	2	5	19′-6"	2′-8"	2′-1 1/8"	21′-10"	5′-0"	2′-1 1/8"	2	5	7′-9"	4′-11"	0′-5 5/8"	10′-1"	7′-3"	0′-5 5/8"
Y	4	21′-5"	23′-9"	2	5	20′-6"	2′-10"	2′-2 3/8"	22′-9"	5′-2"	2′-2 3/8"	2	5	6′-11"	3′-9"	0′-5 3/8"	9′-3"	6′-1"	0′-5 3/8"
Z	4	22′-5"	24′-9"	2	5	21′-6"	1′-9"	2′-2 1/4"	23′-9"	4′-1"	2′-2 1/4"	2	5	7′-5"	4′-2"	0′-5 3/8"	9′-8"	6′-6"	0′-5 3/8"
AA	4	23′-5"	25′-9"	2	5	22′-5"	1′-10"	2′-3 3/8"	24′-9"	4′-2"	2′-3 3/8"	2	5	7′-8"	4′-8"	0′-5 1/4"	10′-0"	7′-0"	0′-5 1/4"
BB	4	23′-5"	25′-9"	2	5	21′-8"	1′-1"	2′-3 3/8"	24′-0"	3′-5"	2′-3 3/8"	2	6	8′-2"	5′-2"	0′-5 1/4"	10′-6"	7′-5"	0′-5 1/4"
CC	4	24′-5"	26′-9"	2	5	22′-7"	1′-2"	2′-4 1/2"	24′-11"	3′-6"	2′-4 1/2"	2	6	7′-9"	4′-5"	0′-5"	10′-0"	6′-8"	0′-5"
DD	5	25′-5"	28′-8"	2	5	24′-9"	2′-6"	2′-5 5/8"	28′-1"	5′-10"	2′-5 5/8"	2	6	8′-7"	5′-4"	0′-4 3/4"	11′-10"	8′-7"	0′-4 3/4"
EE	5	25′-5"	28′-8"	2	5	24′-10"	2′-2"	2′-3 1/8"	28′-2"	5′-6"	2′-3 1/8"	2	6	8′-10"	5′-4"	0′-5 1/4"	12′-1"	8′-7"	0′-5 1/4"

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SPECIFICATION REFERENCE

WING DETAILS

1 1/2 : 1 FILL SLOPE - TYPE I

VIRGINIA DEPARTMENT OF TRANSPORTATION

VDOT
ROAD AND BRIDGE STANDARDS

REVISION DATE 07/12

SHEET 4 OF 8

1006.04

WING	WF4		WF5							WF6						
	SIZE	LENGTH	SIZE	a			LENGTH			SIZE	a			LENGTH		
				FROM	TO	VARY BY	FROM	TO	VARY BY		FROM	TO	VARY BY	FROM	TO	VARY BY
A	4	4'-3"	-	-	-	-	-	-	-	4	3'-4"	2'-6"	0'-2 3/8"	4'-8"	3'-11"	0'-2 3/8"
B	4	5'-3"	-	-	-	-	-	-	-	4	3'-4"	2'-6"	0'-2"	4'-9"	3'-11"	0'-2"
C	4	6'-2"	-	-	-	-	-	-	-	4	3'-4"	2'-6"	0'-1 5/8"	4'-9"	3'-10"	0'-1 5/8"
D	4	6'-3"	-	-	-	-	-	-	-	4	3'-7"	2'-6"	0'-2 1/8"	4'-11"	3'-11"	0'-2 1/8"
E	4	7'-3"	-	-	-	-	-	-	-	4	3'-10"	2'-6"	0'-2 1/4"	5'-2"	3'-11"	0'-2 1/4"
F	4	8'-3"	-	-	-	-	-	-	-	4	4'-1"	2'-6"	0'-2 1/4"	5'-5"	3'-11"	0'-2 1/4"
G	4	8'-6"	4	4'-10"	3'-7"	0'-2 3/8"	6'-3"	5'-0"	0'-2 3/8"	4	4'-10"	2'-7"	0'-3 1/4"	6'-2"	4'-0"	0'-3 1/4"
H	4	9'-4"	4	4'-10"	3'-9"	0'-2 1/4"	6'-3"	5'-1"	0'-2 1/4"	4	4'-10"	2'-7"	0'-3"	6'-2"	3'-11"	0'-3"
I	4	10'-7"	4	5'-4"	4'-1"	0'-2 3/8"	6'-9"	5'-6"	0'-2 3/8"	4	5'-4"	2'-7"	0'-3 1/4"	6'-8"	3'-11"	0'-3 1/4"
J	4	11'-8"	4	5'-10"	4'-6"	0'-2 5/8"	7'-3"	5'-11"	0'-2 5/8"	4	5'-10"	2'-7"	0'-3 1/2"	7'-2"	4'-0"	0'-3 1/2"
K	4	12'-9"	5	6'-4"	4'-11"	0'-2 3/4"	7'-8"	6'-3"	0'-2 3/4"	4	6'-4"	2'-7"	0'-3 5/8"	7'-8"	4'-0"	0'-3 5/8"
L	4	12'-11"	5	6'-10"	5'-3"	0'-3"	8'-2"	6'-7"	0'-3"	4	6'-9"	2'-8"	0'-4 1/8"	8'-2"	4'-0"	0'-4 1/8"
M	4	13'-10"	5	6'-10"	4'-11"	0'-2 3/4"	8'-2"	6'-3"	0'-2 3/4"	4	6'-10"	2'-7"	0'-3 3/4"	8'-2"	4'-0"	0'-3 3/4"
N	4	14'-0"	5	6'-2"	4'-10"	0'-3 1/8"	7'-5"	6'-1"	0'-3 1/8"	4	7'-9"	3'-2"	0'-4 1/4"	9'-2"	4'-6"	0'-4 1/4"
O	4	15'-0"	5	6'-3"	5'-0"	0'-3"	7'-7"	6'-4"	0'-3"	4	7'-10"	3'-1"	0'-4"	9'-2"	4'-6"	0'-4"
P	4	16'-1"	5	6'-4"	4'-7"	0'-3"	7'-8"	5'-10"	0'-3"	4	8'-3"	3'-2"	0'-4 1/8"	9'-8"	4'-6"	0'-4 1/8"
Q	4	16'-1"	5	6'-10"	5'-1"	0'-3"	8'-2"	6'-4"	0'-3"	4	8'-9"	3'-8"	0'-4 1/8"	10'-2"	5'-0"	0'-4 1/8"
R	4	17'-2"	5	7'-4"	5'-5"	0'-3 1/8"	8'-7"	6'-9"	0'-3 1/8"	4	9'-3"	3'-8"	0'-4 1/8"	10'-8"	5'-0"	0'-4 1/8"
S	4	18'-2"	5	7'-5"	5'-8"	0'-3"	8'-9"	7'-0"	0'-3"	4	9'-4"	3'-7"	0'-4"	10'-8"	5'-0"	0'-4"
T	4	19'-5"	5	8'-4"	6'-1"	0'-3 1/4"	10'-8"	8'-5"	0'-3 1/4"	4	10'-9"	4'-2"	0'-4 3/8"	13'-2"	6'-6"	0'-4 3/8"
U	4	19'-7"	5	8'-8"	6'-3"	0'-3 1/2"	11'-0"	8'-7"	0'-3 1/2"	4	11'-3"	4'-2"	0'-4 5/8"	13'-8"	6'-7"	0'-4 5/8"
V	4	20'-8"	6	9'-1"	6'-9"	0'-3 1/2"	11'-5"	9'-0"	0'-3 1/2"	4	11'-9"	4'-2"	0'-4 3/4"	14'-2"	6'-7"	0'-4 3/4"
W	4	22'-0"	6	9'-11"	7'-4"	0'-3 3/4"	12'-2"	9'-7"	0'-3 3/4"	4	12'-9"	4'-2"	0'-5 1/8"	15'-2"	6'-7"	0'-5 1/8"
X	4	22'-5"	6	11'-1"	8'-3"	0'-4 1/4"	13'-4"	10'-6"	0'-4 1/4"	5	14'-3"	4'-9"	0'-5 5/8"	16'-7"	7'-1"	0'-5 5/8"
Y	4	23'-4"	6	10'-9"	7'-4"	0'-4"	13'-1"	9'-8"	0'-4"	5	14'-3"	4'-9"	0'-5 3/8"	16'-7"	7'-0"	0'-5 3/8"
Z	4	24'-5"	7	11'-3"	7'-10"	0'-4"	13'-6"	10'-1"	0'-4"	5	14'-9"	4'-9"	0'-5 3/8"	17'-1"	7'-0"	0'-5 3/8"
AA	4	25'-4"	7	11'-5"	8'-2"	0'-3 3/4"	13'-8"	10'-4"	0'-3 3/4"	5	14'-9"	4'-9"	0'-5 1/4"	17'-1"	7'-0"	0'-5 1/4"
BB	4	25'-4"	7	11'-11"	8'-8"	0'-3 3/4"	14'-2"	10'-10"	0'-3 3/4"	5	15'-3"	5'-2"	0'-5 1/4"	17'-7"	7'-6"	0'-5 1/4"
CC	4	26'-3"	7	11'-8"	8'-2"	0'-3 3/4"	13'-10"	10'-5"	0'-3 3/4"	5	15'-3"	5'-2"	0'-5"	17'-7"	7'-6"	0'-5"
DD	5	27'-2"	7	12'-3"	8'-11"	0'-3 5/8"	15'-6"	12'-2"	0'-3 5/8"	5	15'-9"	5'-8"	0'-4 3/4"	19'-1"	9'-0"	0'-4 3/4"
EE	5	27'-7"	7	12'-11"	9'-3"	0'-3 3/4"	16'-2"	12'-6"	0'-3 3/4"	5	16'-9"	5'-8"	0'-5 1/4"	20'-1"	9'-0"	0'-5 1/4"

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

VDOT
ROAD AND BRIDGE STANDARDS

WING DETAILS

1 1/2 : 1 FILL SLOPE - TYPE I

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE

SHEET 5 OF 8	REVISION DATE
1006.05	07/12

WING	WF7							WF8		WF9		WF10		WF11			
	SIZE	a			LENGTH			SIZE	LENGTH	SIZE	LENGTH	SIZE	LENGTH	SIZE	a	LENGTH	* Ea
		FROM	TO	VARY BY	FROM	TO	VARY BY										
A	-	-	-	-	-	-	-	4	4'-2"	4	3'-2"	4	2'-2"	4	2'-2"	4'-2"	4
B	-	-	-	-	-	-	-	4	5'-2"	4	3'-2"	4	2'-2"	4	2'-2"	4'-2"	4
C	-	-	-	-	-	-	-	4	6'-2"	4	3'-2"	4	2'-2"	4	2'-2"	4'-2"	4
D	-	-	-	-	-	-	-	4	6'-2"	4	3'-5"	4	2'-2"	4	2'-2"	4'-2"	4
E	-	-	-	-	-	-	-	4	7'-2"	4	3'-8"	4	2'-2"	4	2'-2"	4'-2"	4
F	-	-	-	-	-	-	-	4	8'-2"	4	3'-11"	4	2'-2"	4	2'-2"	4'-2"	4
G	-	-	-	-	-	-	-	4	8'-2"	4	4'-8"	4	2'-2"	4	2'-2"	4'-2"	4
H	-	-	-	-	-	-	-	4	9'-2"	4	4'-8"	4	2'-2"	4	2'-2"	4'-2"	4
I	-	-	-	-	-	-	-	4	10'-2"	4	5'-2"	4	2'-2"	4	2'-2"	4'-2"	4
J	-	-	-	-	-	-	-	4	11'-2"	4	5'-8"	4	2'-2"	4	2'-2"	4'-2"	4
K	-	-	-	-	-	-	-	4	12'-2"	4	6'-2"	4	2'-2"	4	2'-2"	4'-2"	4
L	-	-	-	-	-	-	-	4	12'-2"	4	6'-8"	4	2'-2"	4	2'-2"	4'-2"	4
M	-	-	-	-	-	-	-	4	13'-2"	4	6'-8"	4	2'-2"	4	2'-2"	4'-2"	4
N	5	7'-10"	6'-5"	0'-2⅛"	9'-2"	7'-9"	0'-2⅛"	4	13'-2"	4	7'-8"	4	2'-8"	4	2'-2"	4'-2"	4
O	5	7'-10"	6'-6"	0'-2"	9'-2"	7'-10"	0'-2"	4	14'-2"	4	7'-8"	4	2'-8"	4	2'-2"	4'-2"	4
P	5	8'-4"	6'-7"	0'-2"	9'-8"	7'-11"	0'-2"	4	15'-2"	4	8'-2"	4	2'-8"	4	2'-2"	4'-2"	4
Q	6	8'-10"	7'-1"	0'-2"	10'-2"	8'-5"	0'-2"	4	15'-2"	4	8'-8"	4	3'-2"	4	2'-2"	4'-2"	4
R	6	9'-4"	7'-7"	0'-2"	10'-7"	8'-10"	0'-2"	4	16'-2"	4	9'-2"	4	3'-2"	4	2'-2"	4'-2"	4
S	6	9'-4"	7'-8"	0'-2"	10'-7"	8'-11"	0'-2"	4	17'-2"	4	9'-2"	4	3'-2"	4	2'-2"	4'-2"	4
T	6	10'-10"	8'-7"	0'-2⅛"	13'-1"	10'-11"	0'-2⅛"	4	18'-2"	4	10'-8"	4	3'-8"	4	2'-2"	4'-2"	4
U	6	11'-4"	8'-11"	0'-2⅜"	13'-7"	11'-3"	0'-2⅜"	4	18'-2"	4	11'-2"	4	3'-8"	4	2'-2"	4'-2"	4
V	7	11'-10"	9'-5"	0'-2⅜"	14'-0"	11'-8"	0'-2⅜"	4	19'-2"	4	11'-8"	4	3'-8"	4	2'-2"	4'-2"	4
W	7	12'-10"	10'-3"	0'-2½"	15'-0"	12'-5"	0'-2½"	4	20'-2"	4	12'-8"	4	3'-8"	4	2'-2"	4'-2"	4
X	7	14'-4"	11'-5"	0'-2¾"	16'-6"	13'-8"	0'-2¾"	4	20'-2"	4	14'-2"	4	4'-2"	4	2'-2"	4'-2"	4
Y	7	14'-4"	11'-1"	0'-2⅝"	16'-6"	13'-4"	0'-2⅝"	4	21'-2"	4	14'-2"	4	4'-2"	4	2'-2"	4'-2"	4
Z	7	14'-10"	11'-7"	0'-2⅝"	17'-0"	13'-10"	0'-2⅝"	4	22'-2"	4	14'-8"	4	4'-2"	4	2'-2"	4'-2"	4
AA	7	14'-10"	11'-9"	0'-2⅝"	17'-0"	14'-0"	0'-2⅝"	4	23'-2"	4	14'-8"	4	4'-2"	4	2'-2"	4'-2"	4
BB	8	15'-4"	12'-3"	0'-2⅝"	17'-6"	14'-5"	0'-2⅝"	4	23'-2"	4	15'-2"	4	4'-8"	4	2'-2"	4'-2"	4
CC	8	15'-4"	11'-11"	0'-2½"	17'-6"	14'-1"	0'-2½"	4	24'-2"	4	15'-2"	4	4'-8"	4	2'-2"	4'-2"	4
DD	8	15'-10"	12'-7"	0'-2⅜"	19'-0"	15'-9"	0'-2⅜"	5	25'-2"	5	15'-8"	5	5'-2"	5	2'-9"	5'-4"	4
EE	8	16'-10"	13'-3"	0'-2⅝"	20'-0"	16'-5"	0'-2⅝"	5	25'-2"	5	16'-8"	5	5'-2"	5	2'-9"	5'-4"	4

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

SPECIFICATION REFERENCE

WING DETAILS

1½: 1 FILL SLOPE - TYPE I

VIRGINIA DEPARTMENT OF TRANSPORTATION

VDOT
ROAD AND BRIDGE STANDARDS

REVISION DATE 07/12

WING	STEM BAR SPACINGS												WV1							WV2			
	WV1		WV2		WV3		WV4		WH1		WH2		SIZE	a			LENGTH			SIZE	LENGTH		
	O	P	Q	R	S	T	U	V	W	X	Y	Z		FROM	TO	VARY BY	FROM	TO	VARY BY		FROM	TO	VARY BY
A	4	4'-0"	3	3'-9"	-	-	-	-	1	1'-3"	1	1'-3"	4	4'-11"	3'-1"	0'-5⅜"	6'-10"	5'-0"	0'-5⅜"	4	4'-11"	3'-2"	0'-6¾"
B	5	5'-0"	4	5'-0"	-	-	-	-	1	0'-6"	1	1'-3"	4	5'-5"	3'-1"	0'-5½"	7'-4"	5'-0"	0'-5½"	4	5'-5"	3'-1"	0'-6¾"
C	6	6'-0"	5	6'-3"	-	-	-	-	1	1'-0"	1	1'-3"	4	5'-11"	3'-1"	0'-5⅜"	7'-10"	5'-0"	0'-5⅜"	4	5'-11"	3'-0"	0'-7"
D	6	6'-0"	5	6'-3"	-	-	-	-	2	1'-6"	1	1'-3"	4	6'-5"	3'-7"	0'-5⅜"	8'-4"	5'-6"	0'-5⅜"	4	6'-5"	3'-6"	0'-7"
E	7	7'-0"	6	7'-6"	-	-	-	-	1	0'-9"	2	2'-6"	4	6'-11"	3'-7"	0'-5⅝"	8'-10"	5'-6"	0'-5⅝"	4	6'-11"	3'-4"	0'-7"
F	8	8'-0"	6	7'-6"	-	-	-	-	1	1'-3"	2	2'-6"	4	7'-5"	3'-7"	0'-5⅝"	9'-4"	5'-6"	0'-5⅝"	4	7'-5"	3'-10"	0'-7⅛"
G	4	4'-0"	6	7'-6"	6	4'-6"	-	-	2	1'-9"	2	2'-6"	4	5'-4"	3'-5"	0'-5⅝"	7'-2"	5'-3"	0'-5⅝"	4	7'-11"	4'-4"	0'-7⅛"
H	5	5'-0"	7	8'-9"	6	4'-6"	-	-	2	2'-3"	2	2'-6"	4	5'-9"	3'-5"	0'-5⅝"	7'-8"	5'-3"	0'-5⅝"	4	8'-5"	4'-3"	0'-7⅛"
I	5	5'-0"	8	10'-0"	6	4'-6"	-	-	2	1'-6"	3	3'-9"	4	6'-5"	4'-1"	0'-5⅜"	8'-4"	6'-0"	0'-5⅜"	4	8'-11"	4'-4"	0'-6¾"
J	6	6'-0"	9	11'-3"	6	4'-6"	-	-	2	2'-0"	3	3'-9"	4	6'-11"	4'-1"	0'-5½"	8'-9"	6'-0"	0'-5½"	4	9'-5"	4'-3"	0'-6¾"
K	7	7'-0"	10	12'-6"	6	4'-6"	-	-	2	2'-6"	3	3'-9"	4	7'-7"	4'-7"	0'-5"	9'-6"	6'-6"	0'-5"	4	9'-11"	4'-7"	0'-6⅜"
L	7	7'-0"	10	12'-6"	6	4'-6"	-	-	3	3'-0"	3	3'-9"	4	7'-10"	4'-7"	0'-5½"	9'-9"	6'-6"	0'-5½"	4	10'-5"	4'-7"	0'-6¾"
M	6	6'-0"	10	12'-6"	8	6'-0"	-	-	2	2'-3"	4	5'-0"	4	7'-8"	4'-10"	0'-5½"	9'-7"	6'-9"	0'-5½"	4	10'-11"	5'-1"	0'-7"
N	4	4'-0"	10	12'-6"	5	3'-9"	8	4'-0"	3	2'-9"	4	5'-0"	5	7'-0"	5'-1"	0'-5½"	8'-11"	7'-1"	0'-5½"	4	11'-5"	5'-7"	0'-7"
O	4	4'-0"	11	13'-9"	5	3'-9"	8	4'-0"	3	3'-3"	4	5'-0"	5	7'-6"	5'-7"	0'-5⅝"	9'-5"	7'-6"	0'-5⅝"	4	11'-11"	5'-6"	0'-7"
P	5	5'-0"	12	15'-0"	7	5'-3"	10	5'-0"	2	2'-6"	5	6'-3"	5	6'-9"	4'-5"	0'-5⅝"	8'-8"	6'-4"	0'-5⅝"	4	12'-5"	5'-4"	0'-7"
Q	5	5'-0"	12	15'-0"	7	5'-3"	10	5'-0"	3	3'-0"	5	6'-3"	5	7'-3"	4'-11"	0'-5⅝"	9'-2"	6'-10"	0'-5⅝"	4	12'-11"	5'-10"	0'-7"
R	5	5'-0"	13	16'-3"	7	5'-3"	10	5'-0"	3	3'-6"	5	6'-3"	4	7'-9"	5'-5"	0'-5⅝"	9'-8"	7'-3"	0'-5⅝"	4	13'-5"	5'-9"	0'-7"
S	5	5'-0"	14	17'-6"	7	5'-3"	10	5'-0"	4	4'-0"	5	6'-3"	5	8'-3"	5'-10"	0'-5⅝"	10'-2"	7'-10"	0'-5⅝"	4	13'-11"	5'-7"	0'-7"
T	6	6'-0"	14	17'-6"	8	6'-0"	12	6'-0"	3	3'-3"	6	7'-6"	5	8'-7"	5'-9"	0'-5½"	10'-6"	7'-9"	0'-5½"	4	14'-11"	6'-10"	0'-6¾"
U	6	6'-0"	14	17'-6"	8	6'-0"	12	6'-0"	3	3'-9"	6	7'-6"	5	9'-1"	6'-3"	0'-5½"	11'-0"	8'-3"	0'-5½"	4	15'-5"	7'-4"	0'-6¾"
V	6	6'-0"	15	18'-9"	8	6'-0"	12	6'-0"	4	4'-3"	6	7'-6"	5	9'-6"	6'-9"	0'-5½"	11'-6"	8'-8"	0'-5½"	4	15'-11"	7'-3"	0'-6¾"
W	6	6'-0"	16	20'-0"	8	6'-0"	12	6'-0"	4	4'-9"	6	7'-6"	5	10'-0"	7'-3"	0'-5½"	11'-11"	9'-2"	0'-5½"	4	16'-5"	7'-1"	0'-6¾"
X	6	6'-0"	16	20'-0"	8	6'-0"	12	6'-0"	5	5'-3"	6	7'-6"	5	10'-6"	7'-9"	0'-5½"	12'-5"	9'-8"	0'-5½"	4	16'-11"	7'-7"	0'-6¾"
Y	7	7'-0"	17	21'-3"	10	7'-6"	14	7'-0"	4	4'-6"	7	8'-9"	5	9'-10"	6'-7"	0'-5½"	11'-9"	8'-6"	0'-5½"	4	17'-5"	7'-6"	0'-7"
Z	7	7'-0"	18	22'-6"	10	7'-6"	14	7'-0"	4	5'-0"	7	8'-9"	6	10'-4"	7'-0"	0'-5⅝"	12'-4"	9'-1"	0'-5⅝"	4	17'-11"	7'-4"	0'-7"
AA	7	7'-0"	18	22'-6"	10	7'-6"	14	7'-0"	4	4'-3"	8	10'-0"	6	10'-9"	7'-6"	0'-5⅝"	12'-10"	9'-6"	0'-5⅝"	4	18'-5"	7'-10"	0'-7"
BB	7	7'-0"	18	22'-6"	10	7'-6"	21	10'-6"	4	4'-9"	8	10'-0"	7	9'-8"	6'-4"	0'-5⅝"	11'-9"	8'-5"	0'-5⅝"	4	18'-11"	8'-4"	0'-7"
CC	8	8'-0"	19	23'-9"	11	8'-3"	24	12'-0"	5	5'-3"	8	10'-0"	7	9'-1"	5'-3"	0'-5⅝"	11'-2"	7'-5"	0'-5⅝"	4	19'-5"	8'-3"	0'-7"
DD	8	8'-0"	20	25'-0"	11	8'-3"	24	12'-0"	5	5'-9"	8	10'-0"	7	10'-0"	6'-3"	0'-5⅝"	12'-2"	8'-4"	0'-5⅝"	4	20'-5"	8'-7"	0'-7"
EE	8	8'-0"	20	25'-0"	11	8'-3"	24	12'-0"	5	6'-3"	8	10'-0"	7	10'-6"	6'-9"	0'-5⅝"	12'-8"	8'-10"	0'-5⅝"	4	20'-11"	9'-1"	0'-7"

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VDOT
ROAD AND BRIDGE STANDARDS

SHEET 7 OF 8 | REVISION DATE
1006.07 | 07/12

WING DETAILS

1½: 1 FILL SLOPE - TYPE I

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE

WING	WV3							WV4							WH1			WH2					WH3	
	SIZE	a			LENGTH			SIZE	a			LENGTH			SIZE	LENGTH	* Ea	SIZE	LENGTH			* EA	SIZE	LENGTH
		FROM	TO	VARY BY	FROM	TO	VARY BY		FROM	TO	VARY BY	FROM	TO	VARY BY					FROM	TO	VARY BY			
A	-	-	-	-	-	-	-	-	-	-	-	-	-	_	4	4'-6"	2	4	2'-1"	-	-	2	4	5'-0"
B	-	-	-	-	-	-	-	-	-	-	-	-	-	_	4	5'-6"	2	4	4'-8"	2'-0"	2'-7½"	2	4	6'-1"
C	-	-	-	-	-	-	-	-	-	-	-	-	-	_	4	6'-6"	2	4	4'-7"	2'-0"	2'-6¾"	2	4	7'-3"
D	-	-	-	-	-	-	-	-	-	-	-	-	-	_	4	6'-6"	2	4	4'-7"	2'-0"	2'-6¾"	2	4	7'-3"
E	-	-	-	-	-	-	-	-	-	-	-	-	-	_	4	7'-6"	2	4	7'-2"	2'-0"	2'-7"	2	4	8'-4"
F	-	-	-	-	-	-	-	-	-	-	-	-	-	_	4	8'-6"	2	4	7'-2"	2'-0"	2'-7"	2	4	12'-5"
G	4	7'-11"	5'-9"	0'-4¼"	9'-10"	7'-8"	0'-4¼"	-	-	-	-	-	-	_	4	8'-6"	2	4	7'-2"	2'-0"	2'-7"	2	4	13'-5"
H	4	8'-5"	6'-3"	0'-4¼"	10'-4"	8'-2"	0'-4¼"	-	-	-	-	-	-	_	4	9'-6"	2	4	7'-2"	2'-0"	2'-7"	2	4	10'-7"
I	5	8'-11"	6'-10"	0'-4⅛"	10'-10"	8'-10"	0'-4⅛"	-	-	-	-	-	-	_	4	10'-6"	2	4	10'-2"	2'-1"	2'-8¼""	2	4	11'-7"
J	5	9'-5"	7'-4"	0'-4⅛"	11'-4"	9'-3"	0'-4⅛"	-	-	-	-	-	-	_	4	11'-6"	2	4	10'-1"	2'-1"	2'-8"	2	4	12'-8"
K	6	9'-11"	8'-0"	0'-3¾"	11'-11"	10'-0"	0'-3¾"	-	-	-	-	-	-	_	4	12'-6"	2	4	11'-0"	2'-3"	2'-10¾"	2	4	13'-7"
L	6	10'-5"	8'-4"	0'-4⅛"	12'-5"	10'-4"	0'-4⅛"	-	-	-	-	-	-	_	4	12'-6"	2	4	10'-0"	2'-0"	2'-7¾"	2	4	13'-10"
M	6	10'-11"	8'-1"	0'-4⅛"	12'-11"	10'-2"	0'-4⅛"	-	-	-	-	-	-	_	4	13'-6"	2	4	12'-8"	2'-0"	2'-7¾"	2	4	14'-11"
N	6	9'-3"	7'-5"	0'-4⅛"	11'-3"	9'-6"	0'-4⅛"	6	11'-5"	9'-7"	0'-2¾"	13'-5"	11'-7"	0'-2¾"	4	13'-6"	2	4	12'-8"	2'-0"	2'-7¾"	2	4	14'-11"
O	6	9'-8"	7'-11"	0'-4⅛"	11'-9"	10'-0"	0'-4⅛"	6	11'-11"	10'-0"	0'-2¾"	13'-11"	12'-1"	0'-2¾"	4	14'-6"	2	4	12'-7"	2'-0"	2'-7½"	2	4	16'-1"
P	6	9'-9"	7'-3"	0'-4⅛"	11'-9"	9'-3"	0'-4⅛"	6	12'-5"	10'-1"	0'-2¾"	14'-5"	12'-1"	0'-2¾"	4	15'-6"	2	4	15'-2"	2'-0"	2'-7½"	2	4	17'-2"
Q	6	10'-3"	7'-9"	0'-4⅛"	12'-3"	9'-9"	0'-4⅛"	6	12'-11"	10'-7"	0'-2¾"	14'-11"	12'-7"	0'-2¾"	4	15'-6"	2	4	15'-2"	2'-0"	2'-7½"	2	4	17'-2"
R	6	10'-8"	8'-3"	0'-4¼"	12'-9"	10'-3"	0'-4¼"	7	13'-5"	11'-1"	0'-2¾"	15'-6"	13'-2"	0'-2¾"	4	16'-6"	2	4	15'-1"	2'-0"	2'-7¼"	2	4	18'-3"
S	6	11'-2"	8'-8"	0'-4¼"	13'-3"	10'-9"	0'-4¼"	7	13'-11"	11'-7"	0'-2¾"	16'-0"	13'-8"	0'-2¾"	4	17'-6"	2	4	15'-1"	2'-0"	2'-7⅜"	2	4	19'-5"
T	6	11'-10"	9'-0"	0'-4⅛"	13'-10"	11'-1"	0'-4⅛"	7	14'-11"	12'-2"	0'-2¾"	17'-0"	14'-3"	0'-2¾"	4	18'-6"	2	4	18'-2"	2'-1"	2'-8"	2	4	20'-5"
U	7	12'-4"	9'-6"	0'-4⅛"	14'-5"	11'-8"	0'-4⅛"	8	15'-5"	12'-8"	0'-2¾"	17'-7"	14'-10"	0'-2¾"	4	18'-6"	2	4	18'-2"	2'-1"	2'-8"	2	4	20'-5"
V	7	12'-9"	10'-0"	0'-4⅛"	14'-11"	12'-1"	0'-4⅛"	8	15'-11"	13'-2"	0'-2¾"	18'-1"	15'-4"	0'-2¾"	4	19'-6"	2	4	18'-1"	2'-0"	2'-8"	2	4	21'-6"
W	7	13'-3"	10'-6"	0'-4⅛"	15'-5"	12'-7"	0'-4⅛"	9	16'-5"	13'-7"	0'-2¾"	18'-10"	16'-1"	0'-2¾"	4	20'-6"	2	4	18'-0"	2'-0"	2'-7¾"	2	4	22'-8"
X	7	13'-9"	11'-0"	0'-4⅛"	15'-11"	13'-1"	0'-4⅛"	8	16'-11"	14'-1"	0'-2¾"	19'-1"	16'-4"	0'-2¾"	4	20'-6"	2	4	18'-0"	2'-0"	2'-7¾"	2	4	22'-8"
Y	7	13'-10"	10'-3"	0'-4⅛"	15'-11"	12'-5"	0'-4⅛"	8	17'-5"	14'-2"	0'-2¾"	19'-7"	16'-4"	0'-2¾"	4	21'-6"	2	4	20'-8"	2'-0"	2'-7¾"	2	4	23'-9"
Z	7	14'-3"	10'-9"	0'-4⅛"	16'-5"	12'-11"	0'-4⅛"	8	17'-11"	14'-8"	0'-2¾"	20'-1"	16'-10"	0'-2¾"	4	22'-6"	2	4	20'-7"	2'-1"	2'-7¾"	2	4	24'-11"
AA	7	14'-9"	11'-3"	0'-4⅛"	16'-11"	13'-4"	0'-4⅛"	9	18'-5"	15'-2"	0'-2¾"	20'-10"	17'-7"	0'-2¾"	4	23'-6"	2	4	23'-2"	2'-1"	2'-7½"	2	4	26'-0"
BB	8	13'-8"	10'-1"	0'-4⅛"	15'-10"	12'-4"	0'-4⅛"	9	18'-11"	14'-0"	0'-2¾"	21'-4"	16'-5"	0'-2¾"	4	23'-6"	2	4	23'-2"	2'-1"	2'-7½"	2	4	26'-0"
CC	8	13'-5"	9'-6"	0'-4⅛"	15'-7"	11'-9"	0'-4⅛"	9	19'-5"	13'-9"	0'-2¾"	21'-10"	16'-3"	0'-2¾"	4	24'-6"	2	4	23'-1"	2'-0"	2'-7½"	2	4	27'-1"
DD	8	14'-5"	10'-6"	0'-4⅛"	16'-7"	12'-8"	0'-4⅛"	9	20'-5"	14'-9"	0'-2¾"	22'-10"	17'-2"	0'-2¾"	4	25'-6"	2	4	23'-1"	2'-0"	2'-7½"	2	4	28'-3"
EE	8	14'-11"	11'-0"	0'-4⅛"	17'-1"	13'-2"	0'-4⅛"	10	20'-11"	15'-3"	0'-2¾"	23'-4"	17'-8"	0'-2¾"	4	25'-6"	2	4	23'-1"	2'-0"	2'-7½"	2	4	28'-3"

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SPECIFICATION REFERENCE

WING DETAILS

1½: 1 FILL SLOPE - TYPE I

VIRGINIA DEPARTMENT OF TRANSPORTATION

VDOT

ROAD AND BRIDGE STANDARDS

REVISION DATE	SHEET 8 OF 8
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GENERAL NOTES

Specifications:

AASHTO LRFD Bridge Design Specifications 5th Edition 2010; 2011 Interim Revisions; and VDOT Modifications

Limits of validity for Standard Wingwall design

The standard wingwall designs are based on the following assumptions:

there is no structural connection between the wall and the box culvert
traffic surcharge loading is neglected.

Backfill

Backfill shall comprise granular material with an internal friction angle Φ' of at least 34 °. Cohesive backfill shall not be permitted. Compaction of the backfill material within a distance of one-half the height of the wall shall be by hand compactors only.

Drainage

The Contractor shall provide the drainage system indicated on Sheet 1.

The cost for the drainage system (including porous backfill, 6" diameter non-rigid tubing and other items required) shall be incidental to the cost bid for Concrete.

Concrete

All concrete shall be Class A4.

Reinforcement

Deformed reinforcing bars shall conform to ASTM A615, Grade 60. All reinforcing bar dimensions on the detailed drawings are to centers of bars except where otherwise noted and are subject to fabrication and construction tolerances.

Dimensions on bar diagrams are out-to-out of bars. Bars are straight unless otherwise shown.

The concrete cover to the outermost reinforcement bars shall be as follows:

Wall footing (all faces) 3" minimum cover
Wall stem (all faces) 2½" minimum cover

At the Contractor's option WV Series bars may be spliced at top of the footing in order to facilitate construction. Splice lengths shall be in accordance with Table C on Sheet 1. No additional compensation shall be provided for the increase in reinforcing steel quantity due to the splices.

Miscellaneous

Weepholes shall be placed at the lowest point feasible for free drainage away from the wing.

Four Type I Wings are to be used for straight crossings and skews up to 20°. Two Type I and two Type II Wings are to be used for skews from 25° to 45°. For skews above 45°, special design wings are required. The wingwall to be used for each culvert is shown on the BC series sheets.

The designs shown are applicable for a 45° skew with the roadway and other conditions indicated. Any change in these conditions invalidates these designs.

Quantities shown are for one wing.

WING	Wall Quantities		qr_min ksf High End	qr_min ksf Low End
	Concrete CY	Reinforcement LB		
A	2.1	201	1.10	0.47
B	2.5	236	1.28	0.47
C	2.9	263	1.50	0.47
D	3.4	292	1.68	0.47
E	3.9	331	1.88	0.47
F	4.5	361	2.08	0.47
G	5.1	416	2.28	0.47
H	5.9	467	2.49	0.47
I	6.6	671	2.71	0.47
J	7.3	731	2.93	0.47
K	8.0	853	3.15	0.47
L	8.9	935	3.25	0.47
M	9.6	972	3.61	0.47
N	10.6	1064	3.70	0.47
O	11.8	1209	3.80	0.47
P	12.6	1304	4.17	0.47
Q	13.7	1463	4.26	0.47
R	14.9	1670	4.35	0.47
S	17.2	1800	4.64	0.51
T	19.9	2056	4.93	0.55
U	21.4	2504	5.04	0.55
V	23.0	2779	5.15	0.55
W	24.0	3342	5.49	0.55
X	26.9	3415	5.83	0.55
Y	28.7	3602	5.93	0.55
Z	30.6	3846	6.04	0.55
AA	32.5	4425	6.16	0.55
BB	34.5	5408	6.28	0.55
CC	36.3	5571	6.51	0.55
DD	38.7	6063	6.53	0.55
EE	42.1	7235	6.48	0.55

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VDOT
ROAD AND BRIDGE STANDARDS

SHEET 1 OF 8 | REVISION DATE
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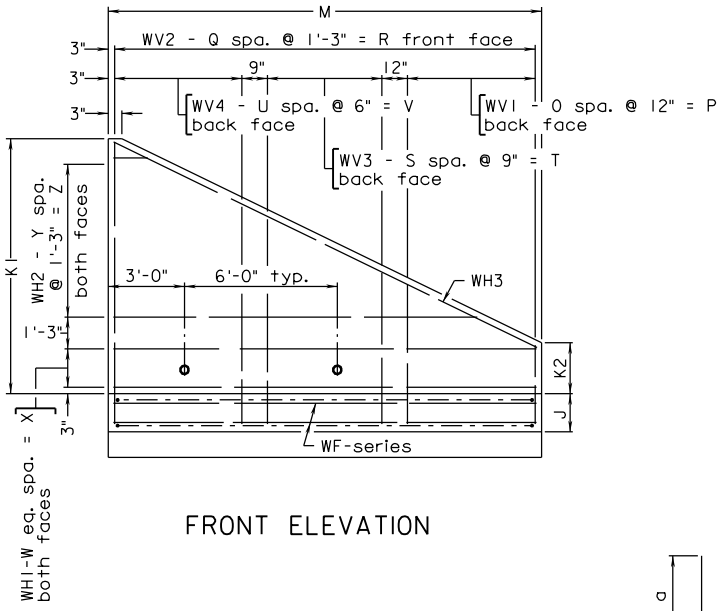
WING DETAIL

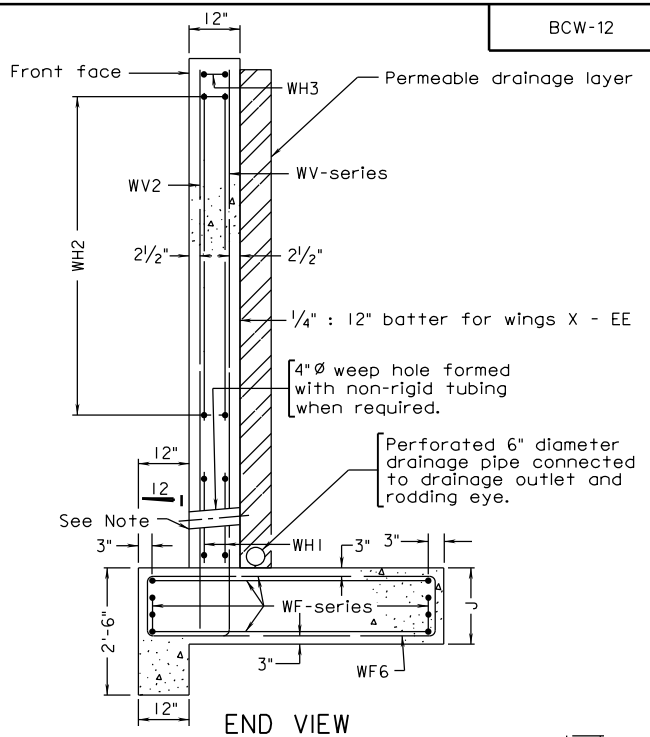
1½: 1 FILL SLOPE - TYPE II

VIRGINIA DEPARTMENT OF TRANSPORTATION

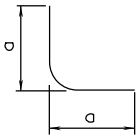
SPECIFICATION REFERENCE



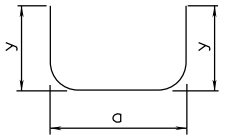
FRONT ELEVATION



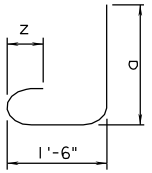
END VIEW



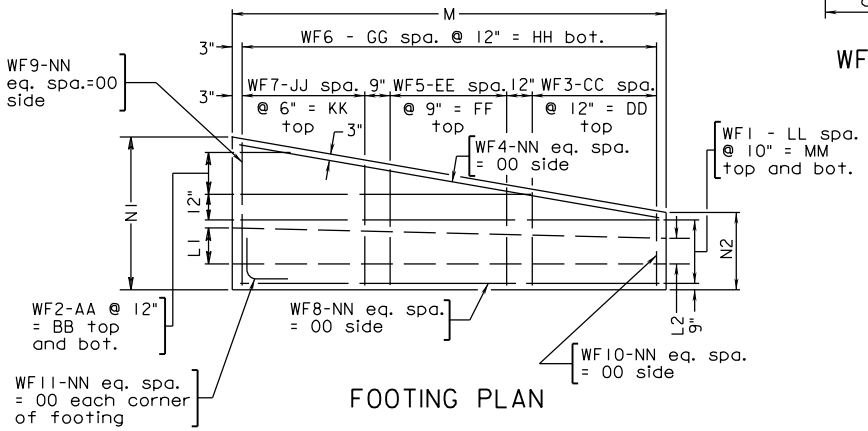
WF11



WF1 TO WF3, WF5 TO WF7



WV1, WV3, WV4



FOOTING PLAN

TABLE A	
Wall	y
A-W	9½"
X	1'-0½"
Y-CC	1'-3½"
DD-EE	1'-9½"

TABLE B		
Bar Size	Pin Dia.	Z
#3	2¼"	4"
#4	3"	4½"
#5	3¾"	5"
#6	4½"	6"
#7	5¼"	7"
#8	6"	8"
#9	9"	10⅛"

TABLE C	
Bar Size	Splice Length
#4	1'- 9"
#5	2'- 4"
#6	2'- 7"
#7	3'- 3"
#8	4'- 2"
#9	5'- 4"

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SPECIFICATION REFERENCE

WING DETAIL

1½: 1 FILL SLOPE - TYPE II

VIRGINIA DEPARTMENT OF TRANSPORTATION

VDOT
ROAD AND BRIDGE STANDARDS

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BCW-12

WING	WALL DIMENSIONS								No. WEEP HOLES	FOOTING BAR SPACINGS													
	J	K1	K2	L1	L2	M	N1	N2		WF1		WF2		WF3		WF4, WF8 to WF10		WF5		WF6		WF7	
										LL	MM	AA	BB	CC	DD	NN	OO	EE	FF	GG	HH	JJ	KK
A	1'-6"	4'-0"	1'-0"	1'-0"	1'-0"	6'-6"	4'-0"	3'-0"	-	3	2'-6"	-	-	7	7'-0"	1	0'-8"	-	-	6	6'-0"	-	-
B	1'-6"	4'-6"	1'-0"	1'-0"	1'-0"	7'-6"	4'-0"	3'-0"	-	3	2'-6"	-	-	8	8'-0"	1	0'-8"	-	-	7	7'-0"	-	-
C	1'-6"	5'-0"	1'-0"	1'-0"	1'-0"	8'-6"	4'-0"	3'-0"	-	3	2'-6"	-	-	9	9'-0"	1	0'-8"	-	-	8	8'-0"	-	-
D	1'-6"	5'-6"	1'-0"	1'-0"	1'-0"	9'-6"	4'-3"	3'-0"	-	3	2'-6"	-	-	10	10'-0"	1	0'-8"	-	-	9	9'-0"	-	-
E	1'-6"	6'-0"	1'-0"	1'-0"	1'-0"	10'-6"	4'-6"	3'-0"	-	3	2'-6"	-	-	11	11'-0"	1	0'-8"	-	-	10	10'-0"	-	-
F	1'-6"	6'-6"	1'-0"	1'-0"	1'-0"	11'-6"	4'-9"	3'-0"	-	3	2'-6"	-	-	12	12'-0"	1	0'-8"	-	-	11	11'-0"	-	-
G	1'-6"	7'-0"	1'-0"	1'-0"	1'-0"	12'-6"	5'-0"	3'-0"	-	3	2'-6"	-	-	7	7'-0"	1	0'-8"	5	3'-9"	12	12'-0"	-	-
H	1'-6"	7'-6"	1'-0"	1'-0"	1'-0"	14'-0"	5'-3"	3'-0"	-	3	2'-6"	-	-	8	8'-0"	1	0'-8"	6	4'-6"	13	13'-0"	-	-
I	1'-6"	8'-0"	1'-0"	1'-0"	1'-0"	15'-0"	5'-6"	3'-0"	-	3	2'-6"	1	1'-0"	6	6'-0"	1	0'-8"	8	6'-0"	14	14'-0"	12	6'-0"
J	1'-6"	8'-6"	1'-0"	1'-0"	1'-0"	16'-0"	5'-9"	3'-0"	-	3	2'-6"	1	1'-0"	6	6'-0"	1	0'-8"	8	6'-0"	15	15'-0"	12	6'-0"
K	1'-6"	9'-0"	1'-0"	1'-0"	1'-0"	17'-0"	6'-0"	3'-0"	-	3	2'-6"	1	1'-0"	6	6'-0"	1	0'-8"	8	6'-0"	16	16'-0"	12	6'-0"
L	1'-6"	9'-6"	1'-0"	1'-0"	1'-0"	18'-0"	6'-6"	3'-0"	-	3	2'-6"	2	2'-0"	6	6'-0"	1	0'-8"	8	6'-0"	17	17'-0"	12	6'-0"
M	1'-6"	10'-0"	1'-0"	1'-0"	1'-0"	19'-0"	6'-6"	3'-0"	-	3	2'-6"	2	2'-0"	6	6'-0"	1	0'-8"	8	6'-0"	18	18'-0"	12	6'-0"
N	1'-6"	10'-6"	1'-0"	1'-0"	1'-0"	20'-0"	7'-0"	3'-0"	1	3	2'-6"	2	2'-0"	7	7'-0"	1	0'-8"	10	7'-6"	19	19'-0"	14	7'-0"
O	1'-6"	11'-0"	1'-0"	1'-0"	1'-0"	21'-6"	7'-6"	3'-0"	1	3	2'-6"	3	3'-0"	7	7'-0"	1	0'-8"	10	7'-6"	21	20'-0"	14	7'-0"
P	1'-6"	11'-6"	1'-0"	1'-0"	1'-0"	22'-6"	7'-6"	3'-0"	1	3	2'-6"	3	3'-0"	8	8'-0"	1	0'-8"	11	8'-3"	22	22'-0"	16	8'-0"
Q	1'-6"	12'-0"	1'-0"	1'-0"	1'-0"	23'-6"	8'-0"	3'-0"	1	3	2'-6"	3	3'-0"	8	8'-0"	1	0'-8"	11	8'-3"	23	23'-0"	16	8'-0"
R	1'-6"	12'-6"	1'-0"	1'-0"	1'-0"	24'-6"	8'-6"	3'-0"	1	3	2'-6"	4	4'-0"	8	8'-0"	1	0'-8"	11	8'-3"	24	24'-0"	16	8'-0"
S	1'-9"	13'-0"	1'-0"	1'-0"	1'-0"	25'-6"	9'-0"	3'-0"	2	3	2'-6"	4	4'-0"	8	8'-0"	1	0'-11"	11	8'-3"	25	25'-0"	16	8'-0"
T	2'-0"	13'-6"	1'-0"	1'-0"	1'-0"	26'-6"	9'-6"	3'-0"	2	3	2'-6"	5	5'-0"	9	9'-0"	1	1'-2"	12	9'-0"	26	26'-0"	18	9'-0"
U	2'-0"	14'-0"	1'-0"	1'-0"	1'-0"	27'-6"	10'-0"	3'-0"	2	3	2'-6"	5	5'-0"	9	9'-0"	1	1'-2"	12	9'-0"	27	27'-0"	18	9'-0"
V	2'-0"	14'-6"	1'-0"	1'-0"	1'-0"	28'-6"	10'-6"	3'-0"	2	3	2'-6"	6	6'-0"	10	10'-0"	1	1'-2"	14	10'-6"	28	28'-0"	20	10'-0"
W	2'-0"	15'-0"	1'-0"	1'-0"	1'-0"	29'-6"	10'-6"	3'-0"	2	3	2'-6"	6	6'-0"	10	10'-0"	1	1'-2"	14	10'-6"	29	29'-0"	20	10'-0"
X	2'-0"	15'-6"	1'-0"	1'-3¾"	1'-1⅛"	31'-0"	11'-0"	3'-0"	3	3	2'-6"	6	6'-0"	11	11'-0"2	2	0'-7"	15	11'-3"	30	30'-0"	22	11'-0"
Y	2'-0"	16'-0"	1'-0"	1'-4"	1'-1⅛"	32'-0"	11'-6"	3'-0"	3	3	2'-6"	7	7'-0"	11	11'-0"	2	0'-7"	15	11'-3"	31	31'-0"	22	11'-0"
Z	2'-0"	16'-6"	1'-0"	1'-4⅛"	1'-1¼"	33'-0"	12'-0"	3'-0"	3	3	2'-6"	7	7'-0"	11	11'-0"	2	0'-7"	15	11'-3"	32	32'-0"	22	11'-0"
AA	2'-0"	17'-0"	1'-0"	1'-4¼"	1'-1¼"	34'-0"	12'-6"	3'-0"	3	3	2'-6"	8	8'-0"	11	11'-0"	2	0'-7"	15	11'-3"	33	33'-0"	22	11'-0"
BB	2'-0"	17'-6"	1'-0"	1'-4⅜"	1'-1¼"	35'-0"	13'-0"	3'-0"	4	3	2'-6"	8	8'-0"	12	12'-0"	2	0'-7"	16	12'-0"	34	34'-0"	24	12'-0"
CC	2'-0"	18'-0"	1'-0"	1'-4½"	1'-1¼"	36'-0"	13'-3"	3'-0"	4	3	2'-6"	8	8'-0"	12	12'-0"	2	0'-7"	16	12'-0"	35	35'-0"	24	12'-0"
DD	2'-0"	18'-6"	1'-0"	1'-4⅝"	1'-1⅜"	37'-0"	14'-0"	3'-0"	4	3	2'-6"	9	9'-0"	13	13'-0"	2	0'-7"	18	13'-6"	36	36'-0"	26	13'-0"
EE	2'-0"	19'-0"	1'-0"	1'-4¾"	1'-1⅜"	38'-6"	15'-0"	3'-0"	4	3	2'-6"	10	10'-0"	13	13'-0"	2	0'-7"	18	13'-6"	38	38'-0"	26	13'-0"

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VDOT
ROAD AND BRIDGE STANDARDS

SHEET 3 OF 8 | REVISION DATE
1006.11 | 07/12

WING DETAILS

1½: 1 FILL SLOPE - TYPE II

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE

WING	WF1				WF2								WF3						
	SIZE	a	LENGTH	* Ea	SIZE	a			LENGTH			* Ea	SIZE	a			LENGTH		
						FROM	TO	VARY BY	FROM	TO	VARY BY			FROM	TO	VARY BY	FROM	TO	VARY BY
A	4	5′-11"	7′-3"	2	4	1′-0"	7′-6"	-	2′-5"	8′-11"	-	2	4	3′-5"	2′-4"	0′-1 7/8"	4′-9"	3′-8"	0′-1 7/8"
B	4	6′-11"	8′-3"	2	4	1′-3"	8′-9"	-	2′-8"	10′-2"	-	2	4	3′-5"	2′-4"	0′-1 1/2"	4′-9"	3′-8"	0′-1 1/2"
C	4	7′-11"	9′-3"	2	4	1′-6"	10′-0"	-	2′-11"	11′-5"	-	2	4	3′-5"	2′-4"	0′-1 3/8"	4′-9"	3′-8"	0′-1 3/8"
D	4	8′-11"	10′-3"	2	4	3′-2"	10′-9"	-	4′-7"	12′-2"	-	2	4	3′-8"	2′-4"	0′-1 1/2"	5′-0"	3′-8"	0′-1 1/2"
E	4	9′-11"	11′-3"	2	4	4′-8"	4′-8"	-	6′-0"	6′-0"	-	2	4	3′-11"	2′-4"	0′-1 5/8"	5′-3"	3′-8"	0′-1 5/8"
F	4	10′-11"	12′-3"	2	4	5′-11"	5′-11"	-	7′-4"	7′-4"	-	2	4	4′-2"	2′-4"	0′-1 7/8"	5′-6"	3′-8"	0′-1 7/8"
G	4	11′-11"	13′-3"	2	4	7′-2"	7′-2"	-	8′-7"	8′-7"	-	2	4	3′-7"	2′-6"	0′-1 7/8"	5′-0"	3′-10"	0′-1 7/8"
H	4	13′-5"	14′-9"	2	4	8′-9"	8′-9"	-	10′-1"	10′-1"	-	2	4	3′-9"	2′-5"	0′-1 7/8"	5′-1"	3′-10"	0′-1 7/8"
I	4	14′-5"	15′-9"	2	4	9′-11"	3′-11"	6′-0"	11′-3"	5′-3"	6′-0"	2	4	2′-7"	1′-7"	0′-2"	4′-0"	3′-0"	0′-2"
J	4	15′-5"	16′-9"	2	4	11′-0"	5′-2"	5′-9 3/4"	12′-5"	6′-7"	5′-9 3/4"	2	4	2′-9"	1′-8"	0′-2"	4′-2"	3′-1"	0′-2"
K	4	16′-5"	17′-9"	2	4	12′-2"	6′-6"	5′-8"	13′-6"	7′-10"	5′-8"	2	4	2′-11"	1′-11"	0′-2"	4′-4"	3′-3"	0′-2"
L	4	17′-5"	18′-9"	2	4	13′-6"	3′-3"	5′-1 5/8"	14′-11"	4′-7"	5′-1 5/8"	2	4	3′-2"	2′-0"	0′-2 1/4"	4′-7"	3′-5"	0′-2 1/4"
M	4	18′-5"	19′-9"	2	4	14′-4"	3′-5"	5′-5 1/8"	15′-8"	4′-10"	5′-5 1/8"	2	4	3′-4"	2′-3"	0′-2 1/8"	4′-9"	3′-7"	0′-2 1/8"
N	4	19′-5"	20′-9"	2	4	15′-8"	5′-8"	5′-0"	17′-0"	7′-0"	5′-0"	2	4	3′-1"	1′-9"	0′-2 3/8"	4′-6"	3′-1"	0′-2 3/8"
O	4	20′-11"	22′-3"	2	4	17′-4"	3′-0"	4′-9 1/4"	18′-8"	4′-4"	4′-9 1/4"	2	4	3′-6"	2′-0"	0′-2 1/2"	4′-10"	3′-4"	0′-2 1/2"
P	4	21′-11"	23′-3"	2	4	18′-2"	3′-2"	5′-0"	19′-6"	4′-6"	5′-0"	2	4	3′-3"	1′-8"	0′-2 3/8"	4′-8"	3′-1"	0′-2 3/8"
Q	4	22′-11"	24′-3"	2	4	19′-4"	5′-3"	4′-8 3/8"	20′-9"	6′-8"	4′-8 3/8"	2	4	3′-6"	1′-10"	0′-2 1/2"	4′-11"	3′-2"	0′-2 1/2"
R	4	23′-11"	25′-3"	2	4	20′-6"	2′-9"	4′-5 3/8"	21′-11"	4′-1"	4′-5 3/8"	2	4	3′-10"	2′-0"	0′-2 5/8"	5′-2"	3′-5"	0′-2 5/8"
S	4	24′-11"	26′-9"	2	4	21′-8"	4′-8"	4′-3"	23′-7"	6′-7"	4′-3"	2	4	4′-1"	2′-3"	0′-2 7/8"	6′-0"	4′-1"	0′-2 7/8"
T	4	25′-11"	28′-3"	2	4	22′-10"	2′-5"	4′-0 7/8"	25′-2"	4′-10"	4′-0 7/8"	2	4	4′-0"	1′-10"	0′-2 7/8"	6′-5"	4′-2"	0′-2 7/8"
U	4	26′-11"	29′-3"	2	4	23′-11"	4′-3"	3′-11 1/8"	26′-4"	6′-8"	3′-11 1/8"	2	4	4′-4"	2′-0"	0′-3"	6′-8"	4′-5"	0′-3"
V	4	27′-11"	30′-3"	2	4	25′-0"	2′-3"	3′-9 1/2"	27′-5"	4′-7"	3′-9 1/2"	2	4	4′-0"	1′-4"	0′-3 1/8"	6′-4"	3′-9"	0′-3 1/8"
W	4	28′-11"	31′-3"	2	5	25′-11"	2′-4"	3′-11 1/8"	28′-3"	4′-8"	3′-11 1/8"	2	4	4′-2"	1′-8"	0′-3"	6′-7"	4′-0"	0′-3"
X	4	30′-5"	32′-9"	2	5	27′-6"	4′-3"	3′-10 1/2"	29′-10"	6′-7"	3′-10 1/2"	2	4	4′-2"	1′-4"	0′-3"	6′-6"	3′-8"	0′-3"
Y	4	31′-5"	33′-9"	2	5	28′-7"	2′-2"	3′-9 1/8"	30′-10"	4′-6"	3′-9 1/8"	2	4	4′-6"	1′-7"	0′-3 1/8"	6′-10"	3′-11"	0′-3 1/8"
Z	4	32′-5"	34′-9"	2	5	29′-8"	4′-0"	3′-8"	31′-11"	6′-3"	3′-8"	2	4	4′-10"	1′-10"	0′-3 1/4"	7′-2"	4′-2"	0′-3 1/4"
AA	4	33′-5"	35′-9"	2	5	30′-8"	2′-1"	3′-6 7/8"	33′-0"	4′-5"	3′-6 7/8"	2	4	5′-2"	2′-1"	0′-3 1/4"	7′-6"	4′-5"	0′-3 1/4"
BB	4	34′-5"	36′-9"	2	5	31′-9"	3′-9"	3′-6"	34′-1"	6′-1"	3′-6"	2	4	5′-0"	1′-7"	0′-3 3/8"	7′-4"	3′-11"	0′-3 3/8"
CC	4	35′-5"	37′-9"	2	5	32′-9"	4′-8"	3′-6 1/8"	35′-1"	7′-0"	3′-6 1/8"	2	4	5′-3"	1′-10"	0′-3 3/8"	7′-8"	4′-3"	0′-3 3/8"
DD	4	36′-5"	38′-9"	2	5	33′-10"	3′-7"	3′-4 1/4"	36′-2"	5′-11"	3′-4 1/4"	2	4	4′-11"	1′-1"	0′-3 1/2"	7′-4"	3′-5"	0′-3 1/2"
EE	4	37′-11"	40′-3"	2	5	35′-6"	3′-5"	3′-2 3/8"	37′-10"	5′-9"	3′-2 3/8"	2	4	5′-6"	1′-6"	0′-3 5/8"	7′-11"	3′-10"	0′-3 5/8"

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

SPECIFICATION REFERENCE

WING DETAILS

1 1/2 : 1 FILL SLOPE - TYPE II

VIRGINIA DEPARTMENT OF TRANSPORTATION

VDOT
ROAD AND BRIDGE STANDARDS

REVISION DATE 07/12

1006.12

WING	WF4		WF5							WF6						
	SIZE	LENGTH	SIZE	a			LENGTH			SIZE	a			LENGTH		
				FROM	TO	VARY BY	FROM	TO	VARY BY		FROM	TO	VARY BY	FROM	TO	VARY BY
A	4	5′-8"	-	-	-	-	-	-	-	4	3′-4"	2′-5"	Ø′-1⅞"	4′-9"	3′-9"	Ø′-1⅞"
B	4	6′-8"	-	-	-	-	-	-	-	4	3′-4"	2′-5"	Ø′-1½"	4′-9"	3′-9"	Ø′-1½"
C	4	7′-8"	-	-	-	-	-	-	-	4	3′-4"	2′-5"	Ø′-1⅜"	4′-9"	3′-9"	Ø′-1⅜"
D	4	8′-9"	-	-	-	-	-	-	-	4	3′-7"	2′-5"	Ø′-1½"	5′-Ø"	3′-9"	Ø′-1½"
E	4	9′-9"	-	-	-	-	-	-	-	4	3′-10"	2′-5"	Ø′-1⅝"	5′-3"	3′-9"	Ø′-1⅝"
F	4	10′-9"	-	-	-	-	-	-	-	4	4′-1"	2′-5"	Ø′-1⅞"	5′-6"	3′-9"	Ø′-1⅞"
G	4	11′-9"	4	4′-4"	3′-9"	Ø′-1⅜"	5′-9"	5′-2"	Ø′-1⅜"	4	4′-4"	2′-5"	Ø′-1⅞"	5′-9"	3′-9"	Ø′-1⅞"
H	4	13′-4"	4	4′-8"	3′-11"	Ø′-1⅜"	6′-Ø"	5′-3"	Ø′-1⅜"	4	4′-7"	2′-6"	Ø′-1⅞"	6′-Ø"	3′-10"	Ø′-1⅞"
I	4	14′-4"	4	3′-9"	2′-9"	Ø′-1½"	5′-2"	4′-2"	Ø′-1½"	4	4′-10"	2′-6"	Ø′-2"	6′-3"	3′-11"	Ø′-2"
J	4	15′-4"	4	4′-Ø"	2′-11"	Ø′-1½"	5′-4"	4′-4"	Ø′-1½"	4	5′-1"	2′-6"	Ø′-2"	6′-5"	3′-11"	Ø′-2"
K	4	16′-5"	5	4′-2"	3′-1"	Ø′-1½"	5′-6"	4′-5"	Ø′-1½"	4	5′-4"	2′-6"	Ø′-2"	6′-8"	3′-11"	Ø′-2"
L	4	17′-6"	5	4′-7"	3′-5"	Ø′-1¾"	5′-11"	4′-9"	Ø′-1¾"	4	5′-10"	2′-6"	Ø′-2¼"	7′-2"	3′-11"	Ø′-2¼"
M	4	18′-5"	5	4′-8"	3′-6"	Ø′-1⅝"	5′-11"	4′-10"	Ø′-1⅝"	4	5′-10"	2′-6"	Ø′-2⅛"	7′-2"	3′-11"	Ø′-2⅛"
N	4	19′-6"	4	4′-10"	3′-4"	Ø′-1¾"	6′-2"	4′-8"	Ø′-1¾"	4	6′-4"	2′-6"	Ø′-2⅜"	7′-8"	3′-11"	Ø′-2⅜"
O	4	21′-1"	4	5′-3"	3′-8"	Ø′-1⅞"	6′-7"	5′-1"	Ø′-1⅞"	4	6′-10"	2′-5"	Ø′-2½"	8′-2"	3′-10"	Ø′-2½"
P	4	22′-1"	4	5′-1"	3′-6"	Ø′-1¾"	6′-6"	4′-10"	Ø′-1¾"	4	6′-10"	2′-5"	Ø′-2⅜"	8′-2"	3′-10"	Ø′-2⅜"
Q	4	23′-2"	4	5′-6"	3′-9"	Ø′-1⅞"	6′-11"	5′-1"	Ø′-1⅞"	4	7′-4"	2′-5"	Ø′-2½"	8′-8"	3′-10"	Ø′-2½"
R	4	24′-3"	4	5′-11"	4′-1"	Ø′-2"	7′-4"	5′-5"	Ø′-2"	4	7′-10"	2′-5"	Ø′-2⅝"	9′-2"	3′-10"	Ø′-2⅝"
S	4	25′-4"	4	6′-4"	4′-4"	Ø′-2"	8′-2"	6′-3"	Ø′-2"	4	8′-4"	2′-5"	Ø′-2⅞"	10′-2"	4′-4"	Ø′-2⅞"
T	4	26′-5"	4	6′-6"	4′-3"	Ø′-2⅛"	8′-10"	6′-8"	Ø′-2⅛"	4	8′-10"	2′-5"	Ø′-2⅞"	11′-2"	4′-10"	Ø′-2⅞"
U	4	27′-6"	4	6′-10"	4′-7"	Ø′-2¼"	9′-3"	6′-11"	Ø′-2¼"	4	9′-4"	2′-5"	Ø′-3"	11′-8"	4′-10"	Ø′-3"
V	4	28′-7"	4	7′-Ø"	4′-3"	Ø′-2¼"	9′-5"	6′-8"	Ø′-2¼"	4	9′-10"	2′-5"	Ø′-3⅛"	12′-2"	4′-10"	Ø′-3⅛"
W	4	29′-7"	5	7′-1"	4′-5"	Ø′-2¼"	9′-5"	6′-9"	Ø′-2¼"	5	9′-10"	2′-5"	Ø′-3"	12′-2"	4′-9"	Ø′-3"
X	4	31′-2"	5	7′-4"	4′-5"	Ø′-2¼"	9′-8"	6′-9"	Ø′-2¼"	5	10′-4"	2′-7"	Ø′-3"	12′-8"	4′-11"	Ø′-3"
Y	4	32′-3"	5	7′-9"	4′-9"	Ø′-2⅜"	10′-1"	7′-1"	Ø′-2⅜"	5	10′-10"	2′-7"	Ø′-3⅛"	13′-2"	4′-11"	Ø′-3⅛"
Z	4	33′-4"	5	8′-2"	5′-1"	Ø′-2⅜"	10′-6"	7′-5"	Ø′-2⅜"	5	11′-4"	2′-7"	Ø′-3¼"	13′-8"	4′-11"	Ø′-3¼"
AA	4	34′-5"	6	8′-7"	5′-5"	Ø′-2½"	10′-10"	7′-8"	Ø′-2½"	5	11′-10"	2′-7"	Ø′-3¼"	14′-2"	4′-11"	Ø′-3¼"
BB	4	35′-7"	6	8′-8"	5′-3"	Ø′-2½"	11′-Ø"	7′-7"	Ø′-2½"	5	12′-4"	2′-7"	Ø′-3⅜"	14′-8"	4′-11"	Ø′-3⅜"
CC	4	36′-7"	6	9′-Ø"	5′-7"	Ø′-2½"	11′-3"	7′-10"	Ø′-2½"	5	12′-7"	2′-7"	Ø′-3⅜"	14′-11"	4′-11"	Ø′-3⅜"
DD	4	37′-9"	6	9′-3"	5′-3"	Ø′-2⅝"	11′-6"	7′-6"	Ø′-2⅝"	5	13′-4"	2′-7"	Ø′-3½"	15′-7"	4′-11"	Ø′-3½"
EE	4	39′-6"	6	10′-1"	5′-10"	Ø′-2¾"	12′-4"	8′-1"	Ø′-2¾"	5	14′-4"	2′-5"	Ø′-3⅝"	16′-7"	4′-9"	Ø′-3⅝"

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

VDOT
ROAD AND BRIDGE STANDARDS

WING DETAILS

1½: 1 FILL SLOPE - TYPE II

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE

WING	WF7							WF8		WF9		WF10		WF11			
	SIZE	a			LENGTH			SIZE	LENGTH	SIZE	LENGTH	SIZE	LENGTH	SIZE	a	LENGTH	* Ea
		FROM	TO	VARY BY	FROM	TO	VARY BY										
A	-	-	-	-	-	-	-	4	5'-8"	4	3'-2"	4	2'-2"	4	2'-2"	4'-2"	4
B	-	-	-	-	-	-	-	4	6'-8"	4	3'-2"	4	2'-2"	4	2'-2"	4'-2"	4
C	-	-	-	-	-	-	-	4	7'-8"	4	3'-2"	4	2'-2"	4	2'-2"	4'-2"	4
D	-	-	-	-	-	-	-	4	8'-8"	4	3'-5"	4	2'-2"	4	2'-2"	4'-2"	4
E	-	-	-	-	-	-	-	4	9'-8"	4	3'-8"	4	2'-2"	4	2'-2"	4'-2"	4
F	-	-	-	-	-	-	-	4	10'-8"	4	3'-11"	4	2'-2"	4	2'-2"	4'-2"	4
G	-	-	-	-	-	-	-	4	11'-8"	4	4'-2"	4	2'-2"	4	2'-2"	4'-2"	4
H	-	-	-	-	-	-	-	4	13'-2"	4	4'-5"	4	2'-2"	4	2'-2"	4'-2"	4
I	5	4'-11"	3'-11"	0'-0 7/8"	6'-2"	5'-2"	0'-0 7/8"	4	14'-2"	4	4'-8"	4	2'-2"	4	2'-2"	4'-2"	4
J	5	5'-1"	4'-1"	0'-1"	6'-5"	5'-5"	0'-1"	4	15'-2"	4	4'-11"	4	2'-2"	4	2'-2"	4'-2"	4
K	5	5'-4"	4'-4"	0'-1"	6'-8"	5'-8"	0'-1"	4	16'-2"	4	5'-2"	4	2'-2"	4	2'-2"	4'-2"	4
L	5	5'-10"	4'-8"	0'-1 1/8"	7'-2"	6'-0"	0'-1 1/8"	4	17'-2"	4	5'-8"	4	2'-2"	4	2'-2"	4'-2"	4
M	5	5'-10"	4'-9"	0'-1"	7'-2"	6'-1"	0'-1"	4	18'-2"	4	5'-8"	4	2'-2"	4	2'-2"	4'-2"	4
N	5	6'-4"	5'-0"	0'-1 1/8"	7'-8"	6'-3"	0'-1 1/8"	4	19'-2"	4	6'-2"	4	2'-2"	4	2'-2"	4'-2"	4
O	5	6'-10"	5'-5"	0'-1 1/4"	8'-2"	6'-9"	0'-1 1/4"	4	20'-8"	4	6'-8"	4	2'-2"	4	2'-2"	4'-2"	4
P	5	6'-10"	5'-3"	0'-1 1/8"	8'-2"	6'-7"	0'-1 1/8"	4	21'-8"	4	6'-8"	4	2'-2"	4	2'-2"	4'-2"	4
Q	6	7'-4"	5'-8"	0'-1 1/4"	8'-8"	6'-11"	0'-1 1/4"	4	22'-8"	4	7'-2"	4	2'-2"	4	2'-2"	4'-2"	4
R	6	7'-10"	6'-1"	0'-1 1/4"	9'-2"	7'-4"	0'-1 1/4"	4	23'-8"	4	7'-8"	4	2'-2"	4	2'-2"	4'-2"	4
S	6	8'-4"	6'-6"	0'-1 3/8"	10'-2"	8'-3"	0'-1 3/8"	4	24'-8"	4	8'-2"	4	2'-2"	4	2'-2"	4'-2"	4
T	6	8'-10"	6'-7"	0'-1 3/8"	11'-2"	8'-11"	0'-1 3/8"	4	25'-8"	4	8'-8"	4	2'-2"	4	2'-2"	4'-2"	4
U	7	9'-4"	7'-1"	0'-1 1/2"	11'-7"	9'-3"	0'-1 1/2"	4	26'-8"	4	9'-2"	4	2'-2"	4	2'-2"	4'-2"	4
V	7	9'-10"	7'-3"	0'-1 1/2"	12'-1"	9'-5"	0'-1 1/2"	4	27'-8"	4	9'-8"	4	2'-2"	4	2'-2"	4'-2"	4
W	7	9'-10"	7'-4"	0'-1 1/2"	12'-1"	9'-6"	0'-1 1/2"	4	28'-8"	4	9'-8"	4	2'-2"	4	2'-2"	4'-2"	4
X	7	10'-4"	7'-6"	0'-1 1/2"	12'-7"	9'-9"	0'-1 1/2"	4	30'-2"	4	10'-2"	4	2'-2"	4	2'-2"	4'-2"	4
Y	7	10'-10"	7'-11"	0'-1 1/2"	13'-1"	10'-2"	0'-1 1/2"	4	31'-2"	4	10'-8"	4	2'-2"	4	2'-2"	4'-2"	4
Z	7	11'-4"	8'-4"	0'-1 5/8"	13'-7"	10'-7"	0'-1 5/8"	4	32'-2"	4	11'-2"	4	2'-2"	4	2'-2"	4'-2"	4
AA	7	11'-10"	8'-9"	0'-1 5/8"	14'-1"	11'-0"	0'-1 5/8"	4	33'-2"	4	11'-8"	4	2'-2"	4	2'-2"	4'-2"	4
BB	8	12'-4"	8'-11"	0'-1 5/8"	14'-6"	11'-1"	0'-1 5/8"	4	34'-2"	4	12'-2"	4	2'-2"	4	2'-2"	4'-2"	4
CC	8	12'-7"	9'-2"	0'-1 5/8"	14'-9"	11'-4"	0'-1 5/8"	4	35'-2"	4	12'-5"	4	2'-2"	4	2'-2"	4'-2"	4
DD	8	13'-4"	9'-6"	0'-1 3/4"	15'-6"	11'-8"	0'-1 3/4"	4	36'-2"	4	13'-2"	4	2'-2"	4	2'-2"	4'-2"	4
EE	9	14'-4"	10'-3"	0'-1 3/4"	16'-4"	12'-4"	0'-1 3/4"	4	37'-8"	4	14'-2"	4	2'-2"	4	2'-2"	4'-2"	4

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SPECIFICATION REFERENCE

WING DETAILS

1 1/2 : 1 FILL SLOPE - TYPE II

VIRGINIA DEPARTMENT OF TRANSPORTATION

VDOT
ROAD AND BRIDGE STANDARDS

REVISION DATE 07/12

1006.14

WING	STEM BAR SPACINGS												WV1							WV2			
	WV1		WV2		WV3		WV4		WH1		WH2		SIZE	a			LENGTH			SIZE	LENGTH		
	O	P	Q	R	S	T	U	V	W	X	Y	Z		FROM	TO	VARY BY	FROM	TO	VARY BY		FROM	TO	VARY BY
A	7	7'-0"	4	5'-0"	-	-	-	-	-	-	1	1'-3"	4	4'-11"	1'-8"	0'-5½"	6'-10"	3'-7"	0'-5½"	4	4'-11"	2'-7"	0'-7"
B	8	8'-0"	5	6'-3"	-	-	-	-	1	0'-6"	1	1'-3"	4	5'-5"	1'-8"	0'-5⅝"	7'-4"	3'-7"	0'-5⅝"	4	5'-5"	2'-6"	0'-7"
C	9	9'-0"	6	7'-6"	-	-	-	-	-	-	2	2'-6"	4	5'-11"	1'-8"	0'-5⅝"	7'-10"	3'-7"	0'-5⅝"	4	5'-11"	2'-4"	0'-7⅛"
D	10	10'-0"	7	8'-9"	-	-	-	-	-	-	2	2'-6"	4	6'-5"	1'-8"	0'-5⅝"	8'-4"	3'-7"	0'-5⅝"	4	6'-5"	2'-3"	0'-7⅛"
E	11	11'-0"	8	10'-0"	-	-	-	-	-	-	3	3'-9"	4	6'-11"	1'-8"	0'-5¾"	8'-10"	3'-7"	0'-5¾"	4	6'-11"	2'-1"	0'-7⅛"
F	12	12'-0"	8	10'-0"	-	-	-	-	-	-	3	3'-9"	4	7'-5"	1'-8"	0'-5¾"	9'-4"	3'-7"	0'-5¾"	4	7'-5"	2'-7"	0'-7⅛"
G	7	7'-0"	9	11'-3"	5	3'-9"	-	-	1	0'-6"	3	3'-9"	4	5'-7"	2'-3"	0'-5¾"	7'-6"	4'-2"	0'-5¾"	4	7'-11"	2'-6"	0'-7⅛"
H	8	8'-0"	10	12'-6"	6	4'-6"	-	-	-	-	4	5'-0"	4	5'-9"	2'-1"	0'-5½"	7'-9"	4'-0"	0'-5½"	4	8'-5"	2'-7"	0'-7"
I	6	6'-0"	11	13'-9"	8	6'-0"	12	6'-0"	-	-	4	5'-0"	4	2'-6"	1'-8"	0'-5⅝"	4'-4"	3'-7"	0'-5⅝"	4	8'-11"	2'-6"	0'-7"
J	6	6'-0"	12	15'-0"	8	6'-0"	12	6'-0"	-	-	5	6'-3"	4	2'-11"	1'-8"	0'-5⅝"	4'-10"	3'-7"	0'-5⅝"	4	9'-5"	2'-4"	0'-7"
K	6	6'-0"	13	16'-3"	8	6'-0"	12	6'-0"	-	-	5	6'-3"	4	3'-5"	1'-8"	0'-5⅝"	5'-4"	3'-7"	0'-5⅝"	4	9'-11"	2'-3"	0'-7"
L	6	6'-0"	14	17'-6"	8	6'-0"	12	6'-0"	1	0'-6"	5	6'-3"	4	3'-11"	1'-8"	0'-5⅝"	5'-10"	3'-7"	0'-5⅝"	4	10'-5"	2'-2"	0'-7"
M	6	6'-0"	14	17'-6"	8	6'-0"	12	6'-0"	-	-	6	7'-6"	4	4'-5"	1'-8"	0'-5⅝"	6'-3"	3'-7"	0'-5⅝"	4	10'-11"	2'-7"	0'-7⅛"
N	7	7'-0"	15	18'-9"	10	7'-6"	14	7'-0"	-	-	6	7'-6"	4	3'-8"	1'-8"	0'-5⅝"	5'-7"	3'-7"	0'-5⅝"	4	11'-5"	2'-6"	0'-7⅛"
O	7	7'-0"	16	20'-0"	10	7'-6"	14	7'-0"	-	-	7	8'-9"	4	4'-4"	1'-8"	0'-5½"	6'-3"	3'-7"	0'-5½"	4	11'-11"	2'-7"	0'-7"
P	8	8'-0"	17	21'-3"	11	8'-3"	16	8'-0"	-	-	7	8'-9"	4	4'-0"	1'-8"	0'-5½"	5'-11"	3'-7"	0'-5½"	4	12'-5"	2'-6"	0'-7"
Q	8	8'-0"	18	22'-6"	11	8'-3"	16	8'-0"	1	0'-6"	7	8'-9"	4	4'-6"	1'-8"	0'-5⅝"	6'-4"	3'-7"	0'-5⅝"	4	12'-11"	2'-4"	0'-7"
R	8	8'-0"	19	23'-9"	11	8'-3"	16	8'-0"	-	-	8	10'-0"	4	4'-11"	1'-8"	0'-5⅝"	6'-10"	3'-7"	0'-5⅝"	4	13'-5"	2'-3"	0'-7"
S	8	8'-0"	20	25'-0"	11	8'-3"	16	8'-0"	-	-	8	10'-0"	4	5'-8"	1'-11"	0'-5⅝"	7'-7"	3'-10"	0'-5⅝"	4	14'-2"	2'-4"	0'-7"
T	9	9'-0"	20	25'-0"	12	9'-0"	18	9'-0"	-	-	9	11'-3"	4	5'-7"	1'-8"	0'-5⅝"	7'-6"	3'-7"	0'-5⅝"	4	14'-11"	3'-1"	0'-7"
U	9	9'-0"	21	26'-3"	12	9'-0"	18	9'-0"	-	-	9	11'-3"	4	6'-1"	1'-9"	0'-5⅝"	7'-11"	3'-8"	0'-5⅝"	4	15'-5"	3'-0"	0'-7"
V	10	10'-0"	22	27'-6"	14	10'-6"	20	10'-0"	1	0'-6"	9	11'-3"	4	5'-4"	1'-8"	0'-5⅝"	7'-3"	3'-7"	0'-5⅝"	4	15'-11"	2'-10"	0'-7⅛"
W	10	10'-0"	23	28'-9"	14	10'-6"	20	10'-0"	-	-	10	12'-6"	4	5'-10"	1'-8"	0'-5⅝"	7'-9"	3'-7"	0'-5⅝"	4	16'-5"	2'-9"	0'-7⅛"
X	11	11'-0"	24	30'-0"	15	11'-3"	22	11'-0"	-	-	10	12'-6"	4	5'-8"	1'-8"	0'-5⅝"	7'-7"	3'-7"	0'-5⅝"	4	16'-11"	2'-10"	0'-7"
Y	11	11'-0"	25	31'-3"	15	11'-3"	22	11'-0"	-	-	11	13'-9"	4	6'-2"	1'-8"	0'-5⅝"	8'-0"	3'-7"	0'-5⅝"	4	17'-5"	2'-9"	0'-7"
Z	11	11'-0"	26	32'-6"	15	11'-3"	22	11'-0"	-	-	11	13'-9"	4	6'-7"	1'-8"	0'-5⅝"	8'-6"	3'-7"	0'-5⅝"	4	17'-11"	2'-7"	0'-7"
AA	11	11'-0"	26	32'-6"	15	11'-3"	22	11'-0"	1	0'-6"	11	13'-9"	4	7'-1"	1'-11"	0'-5⅝"	9'-0"	3'-10"	0'-5⅝"	4	18'-5"	3'-1"	0'-7"
BB	12	12'-0"	27	33'-9"	16	12'-0"	36	18'-0"	-	-	12	15'-0"	4	3'-11"	1'-8"	0'-5⅝"	5'-10"	3'-7"	0'-5⅝"	4	18'-11"	3'-0"	0'-7"
CC	12	12'-0"	28	35'-0"	16	12'-0"	36	18'-0"	-	-	12	15'-0"	4	4'-5"	1'-8"	0'-5⅝"	6'-3"	3'-7"	0'-5⅝"	4	19'-5"	2'-10"	0'-7"
DD	13	13'-0"	29	36'-3"	18	13'-6"	39	19'-6"	-	-	13	16'-3"	4	3'-5"	1'-8"	0'-5⅝"	5'-4"	3'-7"	0'-5⅝"	4	19'-11"	2'-9"	0'-7"
EE	13	13'-0"	30	37'-6"	18	13'-6"	39	19'-6"	-	-	13	16'-3"	4	4'-2"	1'-8"	0'-5⅝"	6'-0"	3'-7"	0'-5⅝"	4	20'-5"	2'-10"	0'-7"

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VDOT
ROAD AND BRIDGE STANDARDS

SHEET 7 OF 8 | REVISION DATE
1006.15 | 07/12

WING DETAILS

1½: 1 FILL SLOPE - TYPE II

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE

WING	WV3							WV4							WH1			WH2					WH3	
	SIZE	a			LENGTH			SIZE	a			LENGTH			SIZE	LENGTH	• Ea	SIZE	LENGTH			• EA	SIZE	LENGTH
		FROM	TO	VARY BY	FROM	TO	VARY BY		FROM	TO	VARY BY	FROM	TO	VARY BY					FROM	TO	VARY BY			
A	-	-	-	-	-	-	-	-	-	-	-	-	-	_	4	6'-0"	2	4	4'-8"	2'-0"	2'-7½"	2	4	6'-8"
B	-	-	-	-	-	-	-	-	-	-	-	-	-	_	4	7'-0"	2	4	4'-7"	2'-0"	2'-6⅞"	2	4	7'-9"
C	-	-	-	-	-	-	-	-	-	-	-	-	-	_	4	8'-0"	2	4	7'-2"	2'-0"	2'-6⅞"	2	4	8'-11"
D	-	-	-	-	-	-	-	-	-	-	-	-	-	_	4	9'-0"	2	4	7'-2"	2'-0"	2'-6⅞"	2	4	10'-0"
E	-	-	-	-	-	-	-	-	-	-	-	-	-	_	4	10'-0"	2	4	9'-8"	1'-11"	2'-6¾"	2	4	11'-2"
F	-	-	-	-	-	-	-	-	-	-	-	-	-	_	4	11'-0"	2	4	9'-8"	1'-11"	2'-6¾"	2	4	12'-3"
G	4	7'-11"	6'-1"	0'-4¼"	9'-10"	8'-0"	0'-4¼"	-	-	-	-	-	-	_	4	12'-0"	2	4	9'-8"	1'-11"	2'-6¾"	2	4	13'-4"
H	4	8'-5"	6'-4"	0'-4⅛"	10'-4"	8'-3"	0'-4⅛"	-	-	-	-	-	-	_	4	13'-6"	2	4	12'-8"	2'-0"	2'-7⅞"	2	4	14'-11"
I	4	5'-9"	2'-11"	0'-4⅛"	7'-8"	4'-10"	0'-4⅛"	5	8'-11"	6'-1"	0'-2¾"	10'-10"	8'-1"	0'-2¾"	4	14'-6"	2	4	12'-7"	2'-0"	2'-7½"	2	4	16'-1"
J	4	6'-3"	3'-5"	0'-4⅛"	8'-2"	5'-4"	0'-4⅛"	5	9'-5"	6'-7"	0'-2¾"	11'-4"	8'-6"	0'-2¾"	4	15'-6"	2	4	15'-2"	2'-0"	2'-7½"	2	4	17'-2"
K	4	6'-9"	3'-11"	0'-4¼"	8'-7"	5'-9"	0'-4¼"	6	9'-11"	7'-1"	0'-2¾"	11'-11"	9'-1"	0'-2¾"	4	16'-6"	2	4	15'-1"	2'-0"	2'-7¼"	2	4	18'-3"
L	4	7'-3"	4'-4"	0'-4¼"	9'-1"	6'-3"	0'-4¼"	6	10'-5"	7'-7"	0'-2¾"	12'-5"	9'-7"	0'-2¾"	4	17'-6"	2	4	15'-1"	2'-0"	2'-7⅜"	2	4	19'-5"
M	4	7'-8"	4'-10"	0'-4¼"	9'-7"	6'-9"	0'-4¼"	6	10'-11"	8'-1"	0'-2¾"	12'-11"	10'-1"	0'-2¾"	4	18'-6"	2	4	17'-8"	2'-0"	2'-7¼"	2	4	20'-6"
N	4	7'-9"	4'-2"	0'-4¼"	9'-7"	6'-1"	0'-4¼"	6	11'-5"	8'-1"	0'-2¾"	13'-5"	10'-1"	0'-2¾"	4	19'-6"	2	4	17'-7"	2'-0"	2'-7⅛"	2	4	21'-8"
O	5	8'-4"	4'-10"	0'-4⅛"	10'-3"	6'-9"	0'-4⅛"	6	11'-11"	8'-8"	0'-2¾"	13'-11"	10'-8"	0'-2¾"	4	21'-0"	2	4	20'-8"	2'-0"	2'-7⅞"	2	4	23'-3"
P	5	8'-4"	4'-5"	0'-4⅛"	10'-3"	6'-5"	0'-4⅛"	6	12'-5"	8'-8"	0'-2¾"	14'-5"	10'-8"	0'-2¾"	4	22'-0"	2	4	20'-7"	2'-0"	2'-7¾"	2	4	24'-4"
Q	5	8'-10"	4'-11"	0'-4⅛"	10'-9"	6'-11"	0'-4⅛"	6	12'-11"	9'-2"	0'-2¾"	14'-11"	11'-2"	0'-2¾"	4	23'-0"	2	4	20'-7"	2'-0"	2'-7¾"	2	4	25'-5"
R	5	9'-4"	5'-5"	0'-4⅛"	11'-3"	7'-4"	0'-4⅛"	7	13'-5"	9'-8"	0'-2¾"	15'-6"	11'-9"	0'-2¾"	4	24'-0"	2	4	23'-2"	2'-1"	2'-7½"	2	4	26'-7"
S	5	10'-0"	6'-2"	0'-4⅛"	12'-0"	8'-1"	0'-4⅛"	7	14'-2"	10'-5"	0'-2¾"	16'-3"	12'-6"	0'-2¾"	4	25'-0"	2	4	23'-1"	2'-1"	2'-7½"	2	4	27'-8"
T	5	10'-4"	6'-1"	0'-4¼"	12'-3"	8'-0"	0'-4¼"	7	14'-11"	10'-8"	0'-2¾"	17'-0"	12'-9"	0'-2¾"	4	26'-0"	2	4	25'-8"	2'-0"	2'-7½"	2	4	28'-10"
U	6	10'-10"	6'-6"	0'-4¼"	12'-10"	8'-7"	0'-4¼"	8	15'-5"	11'-2"	0'-2¾"	17'-7"	13'-4"	0'-2¾"	4	27'-0"	2	4	25'-7"	2'-0"	2'-7⅜"	2	4	29'-11"
V	6	10'-10"	5'-10"	0'-4¼"	12'-10"	7'-10"	0'-4¼"	8	15'-11"	11'-2"	0'-2¾"	18'-1"	13'-5"	0'-2¾"	4	28'-0"	2	4	25'-7"	2'-0"	2'-7⅜"	2	4	31'-0"
W	6	11'-4"	6'-4"	0'-4¼"	13'-4"	8'-4"	0'-4¼"	9	16'-5"	11'-8"	0'-2¾"	18'-10"	14'-1"	0'-2¾"	4	29'-0"	2	4	28'-2"	2'-0"	2'-7⅜"	2	4	32'-2"
X	6	11'-5"	6'-2"	0'-4⅛"	13'-5"	8'-2"	0'-4⅛"	8	16'-11"	11'-9"	0'-2¾"	19'-1"	14'-0"	0'-2¾"	4	30'-6"	2	4	28'-7"	2'-0"	2'-7¾"	2	4	33'-9"
Y	6	11'-11"	6'-7"	0'-4⅛"	13'-11"	8'-8"	0'-4⅛"	8	17'-5"	12'-3"	0'-2¾"	19'-7"	14'-5"	0'-2¾"	4	31'-6"	2	4	31'-2"	2'-0"	2'-7¾"	2	4	34'-10"
Z	7	12'-5"	7'-1"	0'-4⅛"	14'-6"	9'-3"	0'-4⅛"	8	17'-11"	12'-9"	0'-2¾"	20'-1"	14'-11"	0'-2¾"	4	32'-6"	2	4	31'-1"	2'-1"	2'-7½"	2	4	35'-11"
AA	7	12'-10"	7'-7"	0'-4⅛"	15'-0"	9'-8"	0'-4⅛"	9	18'-5"	13'-3"	0'-2¾"	20'-10"	15'-8"	0'-2¾"	4	33'-6"	2	4	31'-1"	2'-1"	2'-7½"	2	4	37'-1"
BB	7	10'-1"	4'-5"	0'-4⅛"	12'-2"	6'-6"	0'-4⅛"	9	18'-11"	10'-5"	0'-2¾"	21'-4"	12'-10"	0'-2¾"	4	34'-6"	2	4	33'-8"	2'-0"	2'-7½"	2	4	38'-2"
CC	7	10'-7"	4'-10"	0'-4¼"	12'-8"	7'-0"	0'-4¼"	9	19'-5"	10'-11"	0'-2¾"	21'-10"	13'-4"	0'-2¾"	4	35'-6"	2	4	33'-7"	2'-1"	2'-7½"	2	4	39'-4"
DD	7	10'-4"	3'-11"	0'-4¼"	12'-5"	6'-0"	0'-4¼"	9	19'-11"	10'-8"	0'-2¾"	22'-4"	13'-2"	0'-2¾"	4	36'-6"	2	4	36'-2"	2'-0"	2'-7½"	2	4	40'-5"
EE	7	10'-11"	4'-7"	0'-4⅛"	13'-1"	6'-9"	0'-4⅛"	10	20'-5"	11'-3"	0'-2¾"	22'-10"	13'-9"	0'-2¾"	4	38'-0"	2	4	36'-7"	2'-0"	2'-7¾"	2	4	42'-0"

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SPECIFICATION REFERENCE

WING DETAILS

1½: 1 FILL SLOPE - TYPE II

VIRGINIA DEPARTMENT OF TRANSPORTATION

VDOT
ROAD AND BRIDGE STANDARDS

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GENERAL NOTES

Specifications:

AASHTO LRFD Bridge Design Specifications 5th Edition 2010; 2011 Interim Revisions; and VDOT Modifications

Limits of validity for Standard Wingwall design

The standard wingwall designs are based on the following assumptions:

there is no structural connection between the wall and the box culvert
traffic surcharge loading is neglected.

Backfill

Backfill shall comprise granular material with an internal friction angle Φ' of at least 32°. Cohesive backfill shall not be permitted. Compaction of the backfill material within a distance of one-half the height of the wall shall be by hand compactors only.

Drainage

The Contractor shall provide the drainage system indicated on Sheet 1.

The cost for the drainage system (including porous backfill, 6" diameter non-rigid tubing and other items required) shall be incidental to the cost bid for Concrete.

Concrete

All concrete shall be Class A4.

Reinforcement

Deformed reinforcing bars shall conform to ASTM A615, Grade 60. All reinforcing bar dimensions on the detailed drawings are to centers of bars except where otherwise noted and are subject to fabrication and construction tolerances.

Dimensions on bar diagrams are out-to-out of bars. Bars are straight unless otherwise shown.

The concrete cover to the outermost reinforcement bars shall be as follows:

Wall footing (all faces) 3" minimum cover
Wall stem (all faces) 2½" minimum cover

At the Contractor's option WV Series bars may be spliced at top of the footing in order to facilitate construction. Splice lengths shall be in accordance with Table C on Sheet 1. No additional compensation shall be provided for the increase in reinforcing steel quantity due to the splices.

Miscellaneous

Weepholes shall be placed at the lowest point feasible for free drainage away from the wing.

Four Type I Wings are to be used for straight crossings and skews up to 20°. Two Type I and two Type II Wings are to be used for skews from 25° to 45°. For skews above 45°, special design wings are required. The wingwall to be used for each culvert is shown on the BC series sheets.

The designs shown are applicable for a 45° skew with the roadway and other conditions indicated. Any change in these conditions invalidates these designs.

Quantities shown are for one wing.

WING	Wall Quantities		qr_min ksf High End	qr_min ksf Low End
	Concrete CY	Reinforcement LB		
A	2.3	209	0.91	0.46
B	2.8	245	1.05	0.46
C	3.2	273	1.21	0.49
D	4.0	306	1.49	0.52
E	4.4	346	1.49	0.52
F	4.9	376	1.71	0.52
G	5.6	434	1.79	0.55
H	6.2	463	2.03	0.55
I	7.1	552	2.10	0.60
J	7.7	589	2.36	0.60
K	8.6	672	2.43	0.65
L	9.3	738	2.70	0.65
M	10.3	870	2.76	0.71
N	10.7	950	3.05	0.85
O	11.7	1014	3.10	0.85
P	13.2	1172	3.17	0.88
Q	14.0	1337	3.45	0.88
R	15.3	1444	3.51	0.95
S	16.5	1591	3.58	0.95
T	17.5	1695	3.86	1.03
U	18.8	2002	3.92	1.03
V	20.3	2238	3.99	1.11
W	21.7	2403	4.07	1.11
X	27.0	2884	4.28	1.27
Y	31.7	3334	4.36	1.30
Z	33.9	3578	4.46	1.39
AA	35.9	3876	4.56	1.39
BB	38.8	4522	4.56	1.48
CC	41.0	4747	4.66	1.48
DD	50.0	5689	4.99	1.71
EE	52.6	6313	5.10	1.71

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ROAD AND BRIDGE STANDARDS

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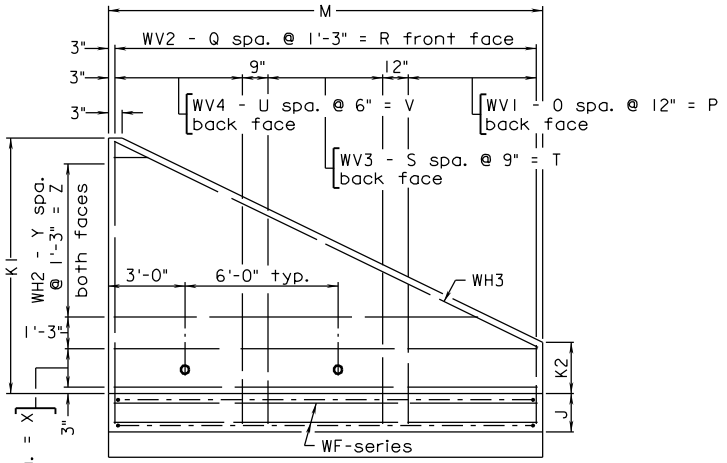
WING DETAIL

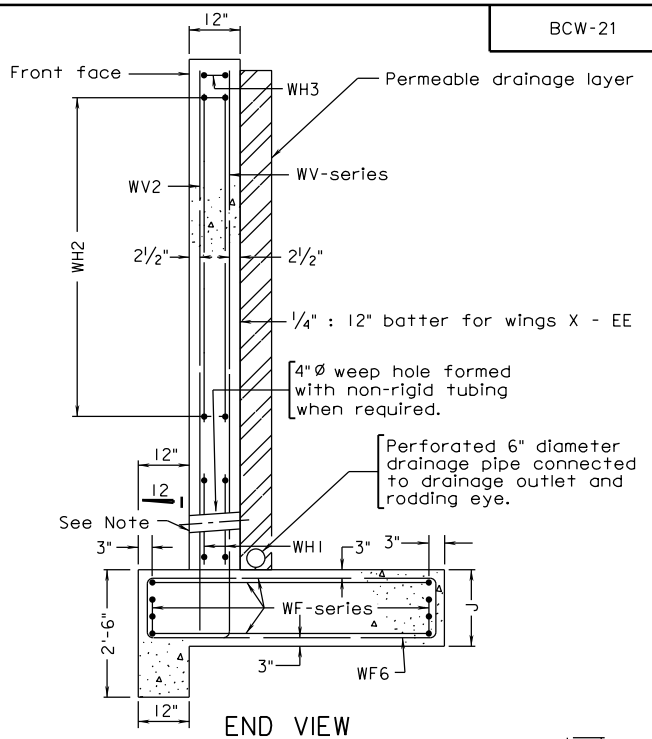
2:1 FILL SLOPE - TYPE I

VIRGINIA DEPARTMENT OF TRANSPORTATION

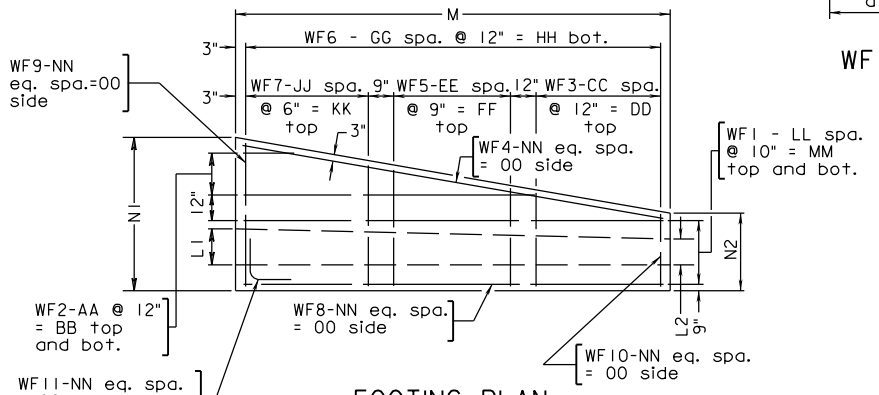
SPECIFICATION REFERENCE



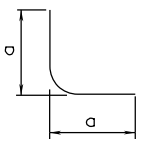
FRONT ELEVATION



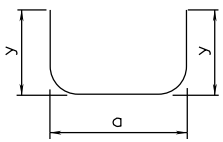
END VIEW



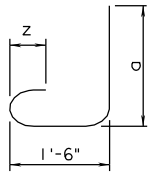
FOOTING PLAN



WF11



WF1 TO WF3, WF5 TO WF7



WV1, WV3, WV4

TABLE A	
Wall	y
A-W	9½"
X	1'-0½"
Y-CC	1'-3½"
DD-EE	1'-9½"

TABLE B		
Bar Size	Pin Dia.	Z
#3	2¼"	4"
#4	3"	4½"
#5	3¾"	5"
#6	4½"	6"
#7	5¼"	7"
#8	6"	8"
#9	9"	10⅛"

TABLE C	
Bar Size	Splice Length
#4	1'- 9"
#5	2'- 4"
#6	2'- 7"
#7	3'- 3"
#8	4'- 2"
#9	5'- 4"

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SPECIFICATION REFERENCE

WING DETAIL

2:1 FILL SLOPE - TYPE I

VIRGINIA DEPARTMENT OF TRANSPORTATION

VDOT
ROAD AND BRIDGE STANDARDS

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BCW-21

WING	WALL DIMENSIONS								No. WEEP HOLES	FOOTING BAR SPACINGS													
	J	K1	K2	L1	L2	M	N1	N2		WF1		WF2		WF3		WF4, WF8 to WF10		WF5		WF6		WF7	
										LL	MM	AA	BB	CC	DD	NN	OO	EE	FF	GG	HH	JJ	KK
A	1'-6"	4'-0"	1'-6"	1'-0"	1'-0"	7'-0"	4'-0"	3'-0"	-	3	2'-6"	-	-	6	6'-0"	1	0'-8"	-	-	6	6'-0"	-	-
B	1'-6"	4'-6"	1'-6"	1'-0"	1'-0"	8'-0"	4'-0"	3'-0"	-	3	2'-6"	-	-	7	7'-0"	1	0'-8"	-	-	7	7'-0"	-	-
C	1'-6"	5'-0"	1'-9"	1'-0"	1'-0"	9'-0"	4'-0"	3'-0"	-	3	2'-6"	-	-	8	8'-0"	1	0'-8"	-	-	8	8'-0"	-	-
D	1'-6"	5'-6"	2'-0"	1'-0"	1'-0"	10'-0"	4'-6"	3'-0"	-	3	2'-6"	-	-	9	9'-0"	1	0'-8"	-	-	9	9'-0"	-	-
E	1'-6"	6'-0"	2'-0"	1'-0"	1'-0"	11'-0"	4'-6"	3'-0"	-	3	2'-6"	-	-	10	10'-0"	1	0'-8"	-	-	10	10'-0"	-	-
F	1'-6"	6'-6"	2'-0"	1'-0"	1'-0"	12'-0"	4'-6"	3'-0"	-	3	2'-6"	-	-	11	11'-0"	1	0'-8"	-	-	11	11'-0"	-	-
G	1'-6"	7'-0"	2'-3"	1'-0"	1'-0"	13'-0"	5'-0"	3'-0"	-	3	2'-6"	-	-	12	12'-0"	1	0'-8"	-	-	12	12'-0"	-	-
H	1'-6"	7'-6"	2'-3"	1'-0"	1'-0"	14'-0"	5'-0"	3'-0"	-	3	2'-6"	-	-	13	13'-0"	1	0'-8"	-	-	13	13'-0"	-	-
I	1'-6"	8'-0"	2'-6"	1'-0"	1'-0"	15'-0"	5'-6"	3'-0"	-	3	2'-6"	1	1'-0"	9	9'-0"	1	0'-8"	6	4'-6"	14	14'-0"	-	-
J	1'-6"	8'-6"	2'-6"	1'-0"	1'-0"	16'-0"	5'-6"	3'-0"	-	3	2'-6"	1	1'-0"	9	9'-0"	1	0'-8"	7	5'-3"	15	15'-0"	-	-
K	1'-6"	9'-0"	2'-9"	1'-0"	1'-0"	17'-0"	6'-0"	3'-0"	-	3	2'-6"	1	1'-0"	10	10'-0"	1	0'-8"	7	5'-3"	16	16'-0"	-	-
L	1'-6"	9'-6"	2'-9"	1'-0"	1'-0"	18'-0"	6'-0"	3'-0"	-	3	2'-6"	1	1'-0"	10	10'-0"	1	0'-8"	8	6'-0"	17	17'-0"	-	-
M	1'-6"	10'-0"	3'-0"	1'-0"	1'-0"	19'-0"	6'-6"	3'-0"	-	3	2'-6"	2	2'-0"	11	11'-0"	1	0'-8"	8	6'-0"	18	18'-0"	-	-
N	1'-6"	10'-6"	3'-6"	1'-0"	1'-0"	19'-0"	6'-6"	3'-0"	-	3	2'-6"	2	2'-0"	11	11'-0"	1	0'-8"	8	6'-0"	18	18'-0"	-	-
O	1'-6"	11'-0"	3'-6"	1'-0"	1'-0"	20'-0"	7'-0"	3'-0"	1	3	2'-6"	2	2'-0"	12	12'-0"	1	0'-8"	8	6'-0"	19	19'-0"	-	-
P	1'-6"	11'-6"	3'-9"	1'-0"	1'-0"	21'-0"	7'-6"	3'-6"	1	3	2'-6"	3	3'-0"	12	12'-0"	1	0'-8"	10	7'-6"	20	20'-0"	-	-
Q	1'-6"	12'-0"	3'-9"	1'-0"	1'-0"	22'-0"	7'-6"	3'-6"	1	3	2'-6"	3	3'-0"	13	13'-0"	1	0'-8"	10	7'-6"	21	21'-0"	-	-
R	1'-6"	12'-6"	4'-0"	1'-0"	1'-0"	23'-0"	8'-0"	3'-6"	1	3	2'-6"	3	3'-0"	10	10'-0"	1	0'-8"	9	6'-9"	22	22'-0"	8	4'-0"
S	1'-6"	13'-0"	4'-0"	1'-0"	1'-0"	24'-0"	8'-6"	3'-6"	1	3	2'-6"	4	4'-0"	11	11'-0"	1	0'-8"	9	6'-9"	23	23'-0"	8	4'-0"
T	1'-6"	13'-6"	4'-3"	1'-0"	1'-0"	25'-0"	8'-6"	3'-6"	2	3	2'-6"	4	4'-0"	12	12'-0"	1	0'-8"	9	6'-9"	24	24'-0"	8	4'-0"
U	1'-6"	14'-0"	4'-3"	1'-0"	1'-0"	26'-0"	9'-0"	3'-6"	2	3	2'-6"	4	4'-0"	12	12'-0"	1	0'-8"	9	6'-9"	25	25'-0"	10	5'-0"
V	1'-6"	14'-6"	4'-6"	1'-0"	1'-0"	27'-0"	9'-6"	3'-6"	2	3	2'-6"	5	5'-0"	10	10'-0"	1	0'-8"	13	9'-9"	26	26'-0"	10	5'-0"
W	1'-6"	15'-0"	4'-6"	1'-0"	1'-0"	28'-0"	10'-0"	3'-6"	2	3	2'-6"	5	5'-0"	11	11'-0"	1	0'-8"	13	9'-9"	27	27'-0"	10	5'-0"
X	1'-9"	15'-6"	4'-9"	1'-3¾"	1'-1⅛"	29'-0"	11'-0"	4'-0"	2	4	3'-4"	5	5'-0"	11	11'-0"	1	0'-11"	13	9'-9"	28	28'-0"	12	6'-0"
Y	2'-0"	16'-0"	4'-9"	1'-4"	1'-1⅛"	30'-0"	12'-0"	4'-6"	3	4	3'-4"	6	6'-0"	10	10'-0"	2	0'-7"	17	12'-9"	29	29'-0"	10	5'-0"
Z	2'-0"	16'-6"	5'-0"	1'-4⅛"	1'-1¼"	31'-0"	12'-6"	4'-6"	3	4	3'-4"	7	7'-0"	10	10'-0"	2	0'-7"	17	12'-9"	30	30'-0"	12	6'-0"
AA	2'-0"	17'-0"	5'-0"	1'-4¼"	1'-1¼"	32'-0"	13'-0"	4'-6"	3	4	3'-4"	7	7'-0"	11	11'-0"	2	0'-7"	17	12'-9"	31	31'-0"	12	6'-0"
BB	2'-0"	17'-6"	5'-3"	1'-4⅜"	1'-1¼"	33'-0"	14'-0"	4'-6"	3	4	3'-4"	8	8'-0"	12	12'-0"	2	0'-7"	17	12'-9"	32	32'-0"	12	6'-0"
CC	2'-0"	18'-0"	5'-3"	1'-4½"	1'-1¼"	34'-0"	14'-6"	4'-6"	3	4	3'-4"	9	9'-0"	13	13'-0"	2	0'-7"	17	12'-9"	33	33'-0"	12	6'-0"
DD	2'-6"	18'-6"	5'-6"	1'-4⅝"	1'-1⅜"	35'-0"	15'-0"	5'-0"	4	5	4'-2"	8	8'-0"	12	12'-0"	2	0'-10"	17	12'-9"	34	34'-0"	16	8'-0"
EE	2'-6"	19'-0"	5'-6"	1'-4¾"	1'-1⅜"	36'-0"	15'-6"	5'-0"	4	5	4'-2"	9	9'-0"	12	12'-0"	2	0'-10"	17	12'-9"	35	35'-0"	18	9'-0"

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

VDOT
ROAD AND BRIDGE STANDARDS

SHEET 3 OF 8 | REVISION DATE
1007.03 | 07/12

WING DETAILS
2:1 FILL SLOPE -TYPE I
VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE

WING	WF1				WF2								WF3						
	SIZE	a	LENGTH	* Ea	SIZE	a			LENGTH			* Ea	SIZE	a			LENGTH		
						FROM	TO	VARY BY	FROM	TO	VARY BY			FROM	TO	VARY BY	FROM	TO	VARY BY
A	4	6'-5"	7'-9"	2	4	1'-2"	8'-2"	-	2'-6"	9'-6"	-	2	4	3'-5"	2'-6"	0'-1¾"	4'-9"	3'-11"	0'-1¾"
B	4	7'-5"	8'-9"	2	4	1'-5"	9'-5"	-	2'-9"	10'-9"	-	2	4	3'-5"	2'-6"	0'-1½"	4'-9"	3'-11"	0'-1½"
C	4	8'-5"	9'-9"	2	4	1'-8"	10'-8"	-	3'-0"	12'-0"	-	2	4	3'-5"	2'-6"	0'-1⅓"	4'-9"	3'-11"	0'-1⅓"
D	4	9'-5"	10'-9"	2	4	4'-5"	4'-5"	-	5'-9"	5'-9"	-	2	4	3'-11"	2'-6"	0'-1¾"	5'-3"	3'-11"	0'-1¾"
E	4	10'-5"	11'-9"	2	4	4'-11"	4'-11"	-	6'-3"	6'-3"	-	2	4	3'-11"	2'-6"	0'-1⅝"	5'-3"	3'-11"	0'-1⅝"
F	4	11'-5"	12'-9"	2	4	5'-5"	5'-5"	-	6'-9"	6'-9"	-	2	4	3'-11"	2'-6"	0'-1½"	5'-3"	3'-11"	0'-1½"
G	4	12'-5"	13'-9"	2	4	7'-6"	7'-6"	-	8'-11"	8'-11"	-	2	4	4'-5"	2'-6"	0'-1¾"	5'-9"	3'-11"	0'-1¾"
H	4	13'-5"	14'-9"	2	4	8'-2"	8'-2"	-	9'-6"	9'-6"	-	2	4	4'-5"	2'-6"	0'-1¾"	5'-9"	3'-11"	0'-1¾"
I	4	14'-5"	15'-9"	2	4	9'-11"	3'-11"	6'-0"	11'-3"	5'-3"	6'-0"	2	4	4'-0"	2'-6"	0'-2"	5'-4"	3'-10"	0'-2"
J	4	15'-5"	16'-9"	2	4	10'-7"	4'-2"	6'-4⅞"	11'-11"	5'-7"	6'-4⅞""	2	4	3'-11"	2'-6"	0'-1⅞"	5'-3"	3'-10"	0'-1⅞"
K	4	16'-5"	17'-9"	2	4	12'-2"	6'-6"	5'-8"	13'-6"	7'-10"	5'-8"	2	4	4'-3"	2'-6"	0'-2¼"	5'-8"	3'-11"	0'-2¼"
L	4	17'-5"	18'-9"	2	4	12'-11"	6'-11"	6'-0"	14'-3"	8'-3"	6'-0"	2	4	4'-3"	2'-7"	0'-2"	5'-7"	3'-11"	0'-2"
M	4	18'-5"	19'-9"	2	4	14'-4"	3'-5"	5'-5⅛"	15'-8"	4'-10"	5'-5⅛"	2	4	4'-7"	2'-7"	0'-2⅛"	5'-11"	3'-11"	0'-2⅛"
N	4	18'-5"	19'-9"	2	4	14'-4"	3'-5"	5'-5⅛"	15'-8"	4'-10"	5'-5⅛"	2	4	4'-7"	2'-7"	0'-2⅛"	5'-11"	3'-11"	0'-2⅛"
O	4	19'-5"	20'-9"	2	4	15'-8"	5'-8"	5'-0"	17'-0"	7'-0"	5'-0"	2	4	5'-0"	2'-7"	0'-2⅜"	6'-4"	3'-11"	0'-2⅜"
P	4	20'-5"	21'-9"	2	4	19'-1"	3'-4"	5'-3"	20'-5"	4'-8"	5'-3"	2	4	5'-3"	3'-0"	0'-2⅜"	6'-8"	4'-4"	0'-2⅜"
Q	4	21'-5"	22'-9"	2	4	20'-0"	3'-6"	5'-6"	21'-5"	4'-11"	5'-6"	2	4	5'-4"	3'-0"	0'-2⅛"	6'-8"	4'-4"	0'-2⅛"
R	4	22'-5"	23'-9"	2	4	21'-1"	5'-9"	5'-1⅓"	22'-6"	7'-2"	5'-1⅓"	2	4	4'-11"	3'-0"	0'-2½"	6'-4"	4'-4"	0'-2½"
S	4	23'-5"	24'-9"	2	4	22'-2"	3'-0"	4'-9½"	23'-7"	4'-4"	4'-9½"	2	4	5'-4"	3'-0"	0'-2⅜"	6'-8"	4'-4"	0'-2⅜"
T	4	24'-5"	25'-9"	2	4	23'-2"	3'-2"	5'-0"	24'-6"	4'-6"	5'-0"	2	4	5'-4"	3'-0"	0'-2½"	6'-9"	4'-4"	0'-2½"
U	4	25'-5"	26'-9"	2	4	24'-2"	5'-3"	4'-8¾"	25'-7"	6'-8"	4'-8¾"	2	4	5'-6"	3'-0"	0'-2⅝"	6'-11"	4'-4"	0'-2⅝"
V	4	26'-5"	27'-9"	2	4	25'-3"	2'-9"	4'-6"	26'-8"	4'-2"	4'-6"	2	4	5'-2"	3'-0"	0'-2¾"	6'-7"	4'-4"	0'-2¾"
W	4	27'-5"	28'-9"	2	4	26'-4"	4'-9"	4'-3¾"	27'-8"	6'-2"	4'-3¾"	2	4	5'-6"	3'-0"	0'-2⅞"	6'-11"	4'-4"	0'-2⅞"
X	4	28'-5"	30'-3"	2	5	26'-0"	5'-3"	4'-1¾"	27'-9"	7'-1"	4'-1¾"	2	5	6'-2"	3'-6"	0'-3"	8'-0"	5'-4"	0'-3"
Y	4	29'-5"	31'-9"	2	5	29'-1"	5'-1"	4'-0"	31'-4"	4'-8"	4'-0"	2	5	6'-6"	4'-0"	0'-3"	8'-10"	6'-4"	0'-3"
Z	4	30'-5"	32'-9"	2	5	30'-1"	2'-11"	3'-10½"	32'-5"	5'-3"	3'-10½"	2	5	6'-7"	4'-0"	0'-3⅛"	8'-11"	6'-4"	0'-3⅛"
AA	4	31'-5"	33'-9"	2	5	31'-1"	4'-9"	3'-9⅛"	33'-5"	7'-0"	3'-9⅛"	2	5	6'-11"	4'-0"	0'-3½"	9'-3"	6'-4"	0'-3½"
BB	4	32'-5"	34'-9"	2	5	32'-1"	4'-4"	3'-5⅝"	34'-5"	6'-7"	3'-5⅝"	2	5	7'-5"	4'-0"	0'-3½"	9'-9"	6'-4"	0'-3½"
CC	4	33'-5"	35'-9"	2	5	33'-1"	2'-6"	3'-4¾"	35'-5"	4'-10"	3'-4¾"	2	5	7'-10"	4'-0"	0'-3½"	10'-2"	6'-4"	0'-3½"
DD	5	34'-5"	37'-8"	2	5	32'-11"	4'-11"	3'-6"	36'-3"	8'-3"	3'-6"	2	5	7'-11"	4'-6"	0'-3½"	11'-3"	7'-10"	0'-3½"
EE	5	35'-5"	38'-8"	2	5	33'-11"	3'-1"	3'-5⅛"	37'-3"	6'-5"	3'-5⅛"	2	5	8'-0"	4'-6"	0'-3½"	11'-4"	7'-10"	0'-3½"

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SPECIFICATION REFERENCE

WING DETAILS

2:1 FILL SLOPE -TYPE I

VIRGINIA DEPARTMENT OF TRANSPORTATION

VDOT
ROAD AND BRIDGE STANDARDS

REVISION DATE 07/12

WING	WF4		WF5							WF6						
	SIZE	LENGTH	SIZE	a			LENGTH			SIZE	a			LENGTH		
				FROM	TO	VARY BY	FROM	TO	VARY BY		FROM	TO	VARY BY	FROM	TO	VARY BY
A	4	6'-2"	-	-	-	-	-	-	-	4	3'-4"	2'-6"	Ø'- 1⅝"	4'-9"	3'-10"	Ø'- 1⅝"
B	4	7'-2"	-	-	-	-	-	-	-	4	3'-4"	2'-6"	Ø'- 1½"	4'-9"	3'-10"	Ø'- 1½"
C	4	8'-2"	-	-	-	-	-	-	-	4	3'-4"	2'-6"	Ø'- 1⅓"	4'-9"	3'-10"	Ø'- 1⅓"
D	4	9'-3"	-	-	-	-	-	-	-	4	3'-10"	2'-6"	Ø'- 1¾"	5'-3"	3'-10"	Ø'- 1¾"
E	4	10'-3"	-	-	-	-	-	-	-	4	3'-10"	2'-6"	Ø'- 1⅝"	5'-3"	3'-10"	Ø'- 1⅝"
F	4	11'-3"	-	-	-	-	-	-	-	4	3'-10"	2'-6"	Ø'- 1½"	5'-3"	3'-10"	Ø'- 1½"
G	4	12'-3"	-	-	-	-	-	-	-	4	4'-4"	2'-6"	Ø'- 1¾"	5'-9"	3'-10"	Ø'- 1¾"
H	4	13'-3"	-	-	-	-	-	-	-	4	4'-4"	2'-6"	Ø'- 1⅝"	5'-9"	3'-10"	Ø'- 1⅝"
I	4	14'-4"	4	4'-11"	4'-2"	Ø'- 1½"	6'-3"	5'-6"	Ø'- 1½"	4	4'-10"	2'-6"	Ø'- 2"	6'-3"	3'-11"	Ø'- 2"
J	4	15'-4"	4	4'-11"	4'-1"	Ø'- 1⅜"	6'-3"	5'-5"	Ø'- 1⅜"	4	4'-10"	2'-6"	Ø'- 1⅞"	6'-3"	3'-10"	Ø'- 1⅞"
K	4	16'-5"	4	5'-5"	4'-5"	Ø'- 1½"	6'-9"	5'-10"	Ø'- 1½"	4	5'-4"	2'-6"	Ø'- 2"	6'-9"	3'-11"	Ø'- 2"
L	4	17'-5"	4	5'-5"	4'-5"	Ø'- 1½"	6'-9"	5'-9"	Ø'- 1½"	4	5'-4"	2'-6"	Ø'- 2"	6'-9"	3'-11"	Ø'- 2"
M	4	18'-5"	5	5'-11"	4'-9"	Ø'- 1⅝"	7'-2"	6'-1"	Ø'- 1⅝"	4	5'-10"	2'-6"	Ø'- 2⅛"	7'-2"	3'-11"	Ø'- 2⅛"
N	4	18'-5"	5	5'-11"	4'-9"	Ø'- 1⅝"	7'-2"	6'-1"	Ø'- 1⅝"	4	5'-10"	2'-6"	Ø'- 2⅛"	7'-2"	3'-11"	Ø'- 2⅛"
O	4	19'-6"	5	6'-4"	5'-2"	Ø'- 1¾"	7'-8"	6'-6"	Ø'- 1¾"	4	6'-4"	2'-6"	Ø'- 2⅜"	7'-8"	3'-11"	Ø'- 2⅜"
P	4	20'-6"	6	6'-11"	5'-5"	Ø'- 1⅝"	8'-2"	6'-9"	Ø'- 1⅝"	4	6'-10"	3'-0"	Ø'- 2¼"	8'-2"	4'-5"	Ø'- 2¼"
Q	4	21'-6"	6	6'-11"	5'-6"	Ø'- 1⅝"	8'-2"	6'-9"	Ø'- 1⅝"	4	6'-10"	3'-0"	Ø'- 2⅛"	8'-2"	4'-5"	Ø'- 2⅛"
R	4	22'-7"	5	6'-5"	5'-1"	Ø'- 1¾"	7'-9"	6'-5"	Ø'- 1¾"	4	7'-4"	3'-0"	Ø'- 2¼"	8'-8"	4'-5"	Ø'- 2¼"
S	4	23'-7"	5	6'-11"	5'-6"	Ø'- 1⅞"	8'-2"	6'-10"	Ø'- 1⅞"	4	7'-10"	3'-0"	Ø'- 2½"	9'-2"	4'-5"	Ø'- 2½"
T	4	24'-7"	6	6'-11"	5'-7"	Ø'- 1⅝"	8'-2"	6'-10"	Ø'- 1⅝"	4	7'-10"	3'-0"	Ø'- 2⅜"	9'-2"	4'-5"	Ø'- 2⅜"
U	4	25'-9"	6	7'-2"	5'-9"	Ø'- 1⅞"	8'-5"	7'-0"	Ø'- 1⅞"	4	8'-4"	3'-0"	Ø'- 2½"	9'-8"	4'-5"	Ø'- 2½"
V	4	26'-10"	6	7'-7"	5'-5"	Ø'- 2"	8'-10"	6'-8"	Ø'- 2"	4	8'-10"	3'-1"	Ø'- 2⅝"	10'-2"	4'-5"	Ø'- 2⅝"
W	4	27'-11"	7	8'-0"	5'-9"	Ø'- 2"	9'-3"	7'-0"	Ø'- 2"	4	9'-4"	3'-1"	Ø'- 2¾"	10'-8"	4'-5"	Ø'- 2¾"
X	4	29'-0"	6	8'-9"	6'-4"	Ø'- 2⅛"	10'-6"	8'-2"	Ø'- 2⅛"	5	10'-4"	3'-7"	Ø'- 2⅞"	12'-2"	5'-5"	Ø'- 2⅞"
Y	4	30'-1"	6	9'-11"	6'-9"	Ø'- 1¼"	12'-2"	9'-0"	Ø'- 1¼"	5	11'-4"	4'-1"	Ø'- 3"	13'-8"	6'-5"	Ø'- 3"
Z	4	31'-2"	6	10'-1"	6'-10"	Ø'- 2⅓"	12'-5"	9'-1"	Ø'- 2⅓"	5	11'-10"	4'-1"	Ø'- 3"	14'-2"	6'-5"	Ø'- 3"
AA	4	32'-3"	7	10'-7"	7'-2"	Ø'- 2⅜"	12'-9"	9'-5"	Ø'- 2⅜"	5	12'-4"	4'-1"	Ø'- 3⅛"	14'-8"	6'-5"	Ø'- 3⅛"
BB	4	33'-6"	7	11'-5"	7'-9"	Ø'- 2½"	13'-7"	9'-11"	Ø'- 2½"	5	13'-4"	4'-1"	Ø'- 3⅜"	15'-8"	6'-5"	Ø'- 3⅜"
CC	4	34'-7"	7	11'-10"	8'-1"	Ø'- 2⅝"	14'-1"	10'-4"	Ø'- 2⅝"	5	13'-10"	4'-1"	0'- 3½"	16'-2"	6'-5"	0'- 3½"
DD	5	35'-7"	7	11'-10"	8'-2"	Ø'- 2½"	15'-1"	11'-5"	Ø'- 2½"	5	14'-4"	4'-7"	Ø'- 3⅜"	17'-8"	7'-11"	Ø'- 3⅜"
EE	5	36'-8"	7	12'-0"	8'-3"	Ø'- 2⅝"	15'-3"	11'-6"	Ø'- 2⅝"	5	14'-10"	4'-7"	Ø'- 3½"	18'-2"	7'-11"	Ø'- 3½"

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

VDOT
ROAD AND BRIDGE STANDARDS

WING DETAILS

2:1 FILL SLOPE - TYPE I

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE

WING	WF7							WF8		WF9		WF10		WF11			
	SIZE	a			LENGTH			SIZE	LENGTH	SIZE	LENGTH	SIZE	LENGTH	SIZE	a	LENGTH	* Ea
		FROM	TO	VARY BY	FROM	TO	VARY BY										
A	-	-	-	-	-	-	-	4	6'-2"	4	3'-2"	4	2'-2"	4	2'-2"	4'-2"	4
B	-	-	-	-	-	-	-	4	7'-2"	4	3'-2"	4	2'-2"	4	2'-2"	4'-2"	4
C	-	-	-	-	-	-	-	4	8'-2"	4	3'-2"	4	2'-2"	4	2'-2"	4'-2"	4
D	-	-	-	-	-	-	-	4	9'-2"	4	3'-8"	4	2'-2"	4	2'-2"	4'-2"	4
E	-	-	-	-	-	-	-	4	10'-2"	4	3'-8"	4	2'-2"	4	2'-2"	4'-2"	4
F	-	-	-	-	-	-	-	4	11'-2"	4	3'-8"	4	2'-2"	4	2'-2"	4'-2"	4
G	-	-	-	-	-	-	-	4	12'-2"	4	4'-2"	4	2'-2"	4	2'-2"	4'-2"	4
H	-	-	-	-	-	-	-	4	13'-2"	4	4'-2"	4	2'-2"	4	2'-2"	4'-2"	4
I	-	-	-	-	-	-	-	4	14'-2"	4	4'-8"	4	2'-2"	4	2'-2"	4'-2"	4
J	-	-	-	-	-	-	-	4	15'-2"	4	4'-8"	4	2'-2"	4	2'-2"	4'-2"	4
K	-	-	-	-	-	-	-	4	16'-2"	4	5'-2"	4	2'-2"	4	2'-2"	4'-2"	4
L	-	-	-	-	-	-	-	4	17'-2"	4	5'-2"	4	2'-2"	4	2'-2"	4'-2"	4
M	-	-	-	-	-	-	-	4	18'-2"	4	5'-8"	4	2'-2"	4	2'-2"	4'-2"	4
N	-	-	-	-	-	-	-	4	18'-2"	4	5'-8"	4	2'-2"	4	2'-2"	4'-2"	4
O	-	-	-	-	-	-	-	4	19'-2"	4	6'-2"	4	2'-2"	4	2'-2"	4'-2"	4
P	-	-	-	-	-	-	-	4	20'-2"	4	6'-8"	4	2'-8"	4	2'-2"	4'-2"	4
Q	-	-	-	-	-	-	-	4	21'-2"	4	6'-8"	4	2'-8"	4	2'-2"	4'-2"	4
R	5	7'-4"	6'-7"	0'-1⅛"	8'-8"	7'-11"	0'-1⅛"	4	22'-2"	4	7'-2"	4	2'-8"	4	2'-2"	4'-2"	4
S	6	7'-10"	7'-0"	0'-1¼"	9'-2"	8'-4"	0'-1¼"	4	23'-2"	4	7'-8"	4	2'-8"	4	2'-2"	4'-2"	4
T	6	7'-10"	7'-1"	0'-1⅛"	9'-2"	8'-4"	0'-1⅛"	4	24'-2"	4	7'-8"	4	2'-8"	4	2'-2"	4'-2"	4
U	6	8'-4"	7'-4"	0'-1¼"	9'-8"	8'-7"	0'-1¼"	4	25'-2"	4	8'-2"	4	2'-8"	4	2'-2"	4'-2"	4
V	6	8'-10"	7'-9"	0'-1⅓"	10'-2"	9'-0"	0'-1⅓"	4	26'-2"	4	8'-8"	4	2'-8"	4	2'-2"	4'-2"	4
W	6	9'-4"	8'-2"	0'-1⅜"	10'-8"	9'-6"	0'-1⅜"	4	27'-2"	4	9'-2"	4	2'-8"	4	2'-2"	4'-2"	4
X	6	10'-4"	8'-11"	0'-1⅜"	12'-2"	10'-8"	0'-1⅜"	4	28'-2"	4	10'-2"	4	3'-2"	4	2'-2"	4'-2"	4
Y	7	11'-4"	10'-1"	0'-1½"	13'-7"	12'-4"	0'-1½"	4	29'-2"	4	11'-2"	4	3'-8"	4	2'-2"	4'-2"	4
Z	7	11'-10"	10'-4"	0'-1½"	14'-1"	12'-6"	0'-1½"	4	30'-2"	4	11'-8"	4	3'-8"	4	2'-2"	4'-2"	4
AA	7	12'-4"	10'-9"	0'-1½"	14'-7"	13'-0"	0'-1½"	4	31'-2"	4	12'-2"	4	3'-8"	4	2'-2"	4'-2"	4
BB	7	13'-4"	11'-7"	0'-1⅝"	15'-7"	13'-10"	0'-1⅝"	4	32'-2"	4	13'-2"	4	3'-8"	4	2'-2"	4'-2"	4
CC	7	13'-10"	12'-1"	0'-1¾"	16'-1"	14'-4"	0'-1¾"	4	33'-2"	4	13'-8"	4	3'-8"	4	2'-2"	4'-2"	4
DD	7	14'-4"	12'-1"	0'-1⅝"	17'-7"	15'-3"	0'-1⅝"	5	34'-2"	5	14'-2"	5	4'-2"	5	2'-9"	5'-4"	4
EE	7	14'-10"	12'-3"	0'-1¾"	18'-1"	15'-5"	0'-1¾"	5	35'-2"	5	14'-8"	5	4'-2"	5	2'-9"	5'-4"	4

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

SPECIFICATION REFERENCE

WING DETAILS

2:1 FILL SLOPE - TYPE I

VIRGINIA DEPARTMENT OF TRANSPORTATION

VDOT
ROAD AND BRIDGE STANDARDS

REVISION DATE 07/12

WING	STEM BAR SPACINGS												WV1							WV2			
	WV1		WV2		WV3		WV4		WH1		WH2		SIZE	a			LENGTH			SIZE	LENGTH		
	O	P	Q	R	S	T	U	V	W	X	Y	Z		FROM	TO	VARY BY	FROM	TO	VARY BY		FROM	TO	VARY BY
A	6	6'-0"	5	6'-3"	-	-	-	-	-	-	1	1'-3"	4	4'-11"	2'-9"	0'-4⅓"	6'-10"	4'-8"	0'-4⅓"	4	4'-11"	2'-8"	0'-5⅜"
B	7	7'-0"	6	7'-6"	-	-	-	-	1	0'-6"	1	1'-3"	4	5'-5"	2'-9"	0'-4½"	7'-4"	4'-8"	0'-4½"	4	5'-5"	2'-7"	0'-5⅝"
C	8	8'-0"	6	7'-6"	-	-	-	-	1	1'-0"	1	1'-3"	4	5'-11"	3'-0"	0'-4⅜"	7'-10"	4'-11"	0'-4⅜"	4	5'-11"	3'-2"	0'-5⅜"
D	9	9'-0"	7	8'-9"	-	-	-	-	-	-	2	2'-6"	4	6'-11"	3'-3"	0'-4⅝"	8'-10"	5'-2"	0'-4⅝"	4	6'-11"	3'-5"	0'-6"
E	10	10'-0"	8	10'-0"	-	-	-	-	1	0'-9"	2	2'-6"	4	6'-11"	3'-3"	0'-4⅜"	8'-10"	5'-2"	0'-4⅜"	4	6'-11"	3'-3"	0'-5⅜"
F	11	11'-0"	9	11'-3"	-	-	-	-	1	1'-3"	2	2'-6"	4	7'-5"	3'-3"	0'-4½"	9'-4"	5'-2"	0'-4½"	4	7'-5"	3'-2"	0'-5⅝"
G	12	12'-0"	10	12'-6"	-	-	-	-	2	1'-9"	2	2'-6"	4	7'-11"	3'-6"	0'-4⅜"	9'-10"	5'-5"	0'-4⅜"	4	7'-11"	3'-4"	0'-5½"
H	13	13'-0"	10	12'-6"	-	-	-	-	1	1'-0"	3	3'-9"	4	8'-5"	3'-6"	0'-4½"	10'-4"	5'-5"	0'-4½"	4	8'-5"	3'-8"	0'-5⅝"
I	9	9'-0"	11	13'-9"	6	4'-6"	-	-	2	1'-6"	3	3'-9"	4	6'-11"	3'-7"	0'-4⅜"	8'-9"	5'-6"	0'-4⅜"	4	8'-11"	3'-10"	0'-5½"
J	9	9'-0"	12	15'-0"	7	5'-3"	-	-	2	2'-0"	3	3'-9"	4	7'-1"	3'-8"	0'-4½"	8'-11"	5'-7"	0'-4½"	4	9'-5"	3'-9"	0'-5⅝"
K	10	10'-0"	13	16'-3"	7	5'-3"	-	-	1	1'-3"	4	5'-0"	4	7'-7"	3'-11"	0'-4⅜"	9'-6"	5'-10"	0'-4⅜"	4	9'-11"	3'-11"	0'-5½"
L	10	10'-0"	14	17'-6"	8	6'-0"	-	-	2	1'-9"	4	5'-0"	4	7'-9"	4'-0"	0'-4½"	9'-8"	5'-11"	0'-4½"	4	10'-5"	3'-10"	0'-5⅝"
M	11	11'-0"	14	17'-6"	8	6'-0"	-	-	2	2'-3"	4	5'-0"	4	8'-4"	4'-3"	0'-4⅜"	10'-3"	6'-2"	0'-4⅜"	4	10'-11"	4'-5"	0'-5½"
N	11	11'-0"	14	17'-6"	8	6'-0"	-	-	3	2'-9"	4	5'-0"	5	8'-10"	4'-9"	0'-4⅜"	10'-9"	6'-8"	0'-4⅜"	4	11'-5"	4'-11"	0'-5½"
O	12	12'-0"	15	18'-9"	8	6'-0"	-	-	2	2'-0"	5	6'-3"	5	9'-3"	4'-9"	0'-4½"	11'-3"	6'-8"	0'-4½"	4	11'-11"	4'-10"	0'-5⅝"
P	12	12'-0"	16	20'-0"	10	7'-6"	-	-	2	2'-6"	5	6'-3"	5	9'-3"	4'-10"	0'-4⅜"	11'-3"	6'-9"	0'-4⅜"	4	12'-5"	5'-0"	0'-5½"
Q	13	13'-0"	17	21'-3"	10	7'-6"	-	-	3	3'-0"	5	6'-3"	5	9'-9"	4'-10"	0'-4½"	11'-8"	6'-9"	0'-4½"	4	12'-11"	4'-11"	0'-5⅝"
R	10	10'-0"	18	22'-6"	9	6'-9"	8	4'-0"	3	3'-6"	5	6'-3"	5	8'-9"	5'-1"	0'-4⅜"	10'-9"	7'-0"	0'-4⅜"	4	13'-5"	5'-1"	0'-5½"
S	11	11'-0"	18	22'-6"	9	6'-9"	8	4'-0"	3	2'-9"	6	7'-6"	5	9'-3"	5'-1"	0'-4½"	11'-2"	7'-0"	0'-4½"	4	13'-11"	5'-5"	0'-5⅝"
T	12	12'-0"	19	23'-9"	9	6'-9"	8	4'-0"	3	3'-3"	6	7'-6"	5	9'-9"	5'-4"	0'-4⅜"	11'-9"	7'-3"	0'-4⅜"	4	14'-5"	5'-7"	0'-5½"
U	12	12'-0"	20	25'-0"	9	6'-9"	10	5'-0"	3	3'-9"	6	7'-6"	5	9'-10"	5'-4"	0'-4½"	11'-9"	7'-3"	0'-4½"	4	14'-11"	5'-6"	0'-5⅝"
V	10	10'-0"	21	26'-3"	13	9'-9"	10	5'-0"	3	3'-0"	7	8'-9"	5	9'-3"	5'-7"	0'-4⅜"	11'-3"	7'-6"	0'-4⅜"	4	15'-5"	5'-8"	0'-5½"
W	11	11'-0"	22	27'-6"	13	9'-9"	10	5'-0"	3	3'-6"	7	8'-9"	5	9'-9"	5'-7"	0'-4½"	11'-8"	7'-6"	0'-4½"	4	15'-11"	5'-7"	0'-5⅝"
X	11	11'-0"	22	27'-6"	13	9'-9"	12	6'-0"	4	4'-0"	7	8'-9"	5	10'-2"	6'-1"	0'-4⅜"	12'-1"	8'-0"	0'-4⅜"	4	16'-8"	6'-5"	0'-5½"
Y	10	10'-0"	23	28'-9"	17	12'-9"	10	5'-0"	3	3'-3"	8	10'-0"	5	10'-1"	6'-4"	0'-4½"	12'-0"	8'-3"	0'-4½"	4	17'-5"	6'-7"	0'-5⅝"
Z	10	10'-0"	24	30'-0"	17	12'-9"	12	6'-0"	3	3'-9"	8	10'-0"	5	10'-4"	6'-7"	0'-4⅜"	12'-3"	8'-6"	0'-4⅜"	4	17'-11"	6'-9"	0'-5½"
AA	11	11'-0"	25	31'-3"	17	12'-9"	12	6'-0"	4	4'-3"	8	10'-0"	5	10'-9"	6'-7"	0'-4½"	12'-8"	8'-6"	0'-4½"	4	18'-5"	6'-8"	0'-5⅝"
BB	12	12'-0"	26	32'-6"	17	12'-9"	12	6'-0"	4	4'-9"	8	10'-0"	6	11'-3"	6'-10"	0'-4⅜"	13'-4"	8'-10"	0'-4⅜"	4	18'-11"	6'-10"	0'-5½"
CC	13	13'-0"	26	32'-6"	17	12'-9"	12	6'-0"	4	4'-0"	9	11'-3"	6	11'-9"	6'-10"	0'-4½"	13'-9"	8'-10"	0'-4½"	4	19'-5"	7'-2"	0'-5⅝"
DD	12	12'-0"	27	33'-9"	17	12'-9"	16	8'-0"	4	4'-6"	9	11'-3"	6	12'-1"	7'-7"	0'-4⅜"	14'-1"	9'-7"	0'-4⅜"	4	20'-5"	7'-10"	0'-5½"
EE	12	12'-0"	28	35'-0"	17	12'-9"	18	9'-0"	4	5'-0"	9	11'-3"	6	12'-1"	7'-7"	0'-4½"	14'-1"	9'-7"	0'-4½"	4	20'-11"	7'-9"	0'-5⅝"

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

VDOT
ROAD AND BRIDGE STANDARDS

SHEET 7 OF 8 | REVISION DATE
1007.07 | 07/12

WING DETAILS

2:1 FILL SLOPE - TYPE I

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE

WING	WV3							WV4							WH1			WH2					WH3	
	SIZE	a			LENGTH			SIZE	a			LENGTH			SIZE	LENGTH	• Ea	SIZE	LENGTH			• EA	SIZE	LENGTH
		FROM	TO	VARY BY	FROM	TO	VARY BY		FROM	TO	VARY BY	FROM	TO	VARY BY					FROM	TO	VARY BY			
A	-	-	-	-	-	-	-	-	-	-	-	-	-	_	4	6'-6"	2	4	6'-0"	2'-7"	3'-4⅛"	2	4	6'-11"
B	-	-	-	-	-	-	-	-	-	-	-	-	-	_	4	7'-6"	2	4	5'-9"	2'-6"	3'-2½"	2	4	8'-1"
C	-	-	-	-	-	-	-	-	-	-	-	-	-	_	4	8'-6"	2	4	6'-0"	2'-7"	3'-4¼"	2	4	9'-1"
D	-	-	-	-	-	-	-	-	-	-	-	-	-	_	4	9'-6"	2	4	9'-1"	2'-6"	3'-3¼"	2	4	10'-1"
E	-	-	-	-	-	-	-	-	-	-	-	-	-	_	4	10'-6"	2	4	9'-4"	2'-7"	3'-4⅛"	2	4	11'-1"
F	-	-	-	-	-	-	-	-	-	-	-	-	-	_	4	11'-6"	2	4	9'-1"	2'-6"	3'-3⅛"	2	4	12'-4"
G	-	-	-	-	-	-	-	-	-	-	-	-	-	_	4	12'-6"	2	4	9'-4"	2'-7"	3'-4¼"	2	4	13'-4"
H	-	-	-	-	-	-	-	-	-	-	-	-	-	_	4	13'-6"	2	4	12'-4"	2'-6"	3'-3⅜"	2	4	14'-4"
I	4	8'-11"	7'-3"	0'-3¼"	10'-10"	9'-2"	0'-3¼"	-	-	-	-	-	-	_	4	14'-6"	2	4	12'-7"	2'-7"	3'-4⅛"	2	4	15'-6"
J	4	9'-5"	7'-5"	0'-3⅜"	11'-4"	9'-4"	0'-3⅜"	-	-	-	-	-	-	_	4	15'-6"	2	4	12'-4"	2'-6"	3'-3⅜"	2	4	16'-6"
K	5	9'-11"	8'-0"	0'-3¼"	11'-10"	9'-11"	0'-3¼"	-	-	-	-	-	-	_	4	16'-6"	2	4	16'-0"	2'-7"	3'-4⅛"	2	4	17'-6"
L	5	10'-5"	8'-2"	0'-3⅜"	12'-4"	10'-1"	0'-3⅜"	-	-	-	-	-	-	_	4	17'-6"	2	4	15'-9"	2'-7"	3'-3½"	2	4	18'-9"
M	6	10'-11"	8'-8"	0'-3¼"	12'-11"	10'-9"	0'-3¼"	-	-	-	-	-	-	_	4	18'-6"	2	4	16'-0"	2'-7"	3'-4⅛"	2	4	19'-9"
N	6	11'-5"	9'-2"	0'-3¼"	13'-5"	11'-3"	0'-3¼"	-	-	-	-	-	-	_	4	18'-6"	2	4	16'-0"	2'-7"	3'-4⅛"	2	4	19'-9"
O	6	11'-11"	9'-8"	0'-3⅜"	13'-11"	11'-8"	0'-3⅜"	-	-	-	-	-	-	_	4	19'-6"	2	4	19'-0"	2'-6"	3'-3⅝"	2	4	20'-9"
P	6	12'-5"	9'-8"	0'-3¼"	14'-5"	11'-8"	0'-3¼"	-	-	-	-	-	-	_	4	20'-6"	2	4	19'-3"	2'-7"	3'-4⅛"	2	4	21'-11"
Q	7	12'-11"	10'-1"	0'-3⅜"	15'-0"	12'-3"	0'-3⅜"	-	-	-	-	-	-	-	4	21'-6"	2	4	19'-0"	2'-6"	3'-3⅝"	2	4	23'-0"
R	6	11'-8"	9'-2"	0'-3¼"	13'-8"	11'-2"	0'-3¼"	6	13'-5"	11'-11"	0'-2⅛"	15'-5"	14'-0"	0'-2⅛"	4	22'-6"	2	4	19'-3"	2'-7"	3'-4⅛"	2	4	24'-0"
S	6	12'-2"	9'-7"	0'-3⅜"	14'-2"	11'-7"	0'-3⅜"	6	13'-11"	12'-5"	0'-2¼"	15'-11"	14'-5"	0'-2¼"	4	23'-6"	2	4	22'-5"	2'-7"	3'-3⅝"	2	4	25'-2"
T	6	12'-8"	10'-2"	0'-3¼"	14'-8"	12'-2"	0'-3¼"	6	14'-5"	12'-11"	0'-2⅛"	16'-5"	15'-0"	0'-2⅛"	4	24'-6"	2	4	22'-8"	2'-7"	3'-4⅛"	2	4	26'-2"
U	7	12'-9"	10'-3"	0'-3⅜"	14'-10"	12'-4"	0'-3⅜"	7	14'-11"	13'-0"	0'-2¼"	17'-0"	15'-2"	0'-2¼"	4	25'-6"	2	4	22'-5"	2'-7"	3'-3⅝"	2	4	27'-3"
V	7	13'-3"	9'-8"	0'-3¼"	15'-5"	11'-9"	0'-3¼"	7	15'-5"	13'-7"	0'-2⅛"	17'-6"	15'-8"	0'-2⅛"	4	26'-6"	2	4	26'-0"	2'-7"	3'-4⅛"	2	4	28'-3"
W	7	13'-9"	10'-1"	0'-3⅜"	15'-10"	12'-2"	0'-3⅜"	7	15'-11"	14'-0"	0'-2¼"	18'-0"	16'-2"	0'-2¼"	4	27'-6"	2	4	25'-9"	2'-6"	3'-3¾"	2	4	29'-5"
X	7	14'-2"	10'-6"	0'-3¼"	16'-3"	12'-8"	0'-3¼"	7	16'-8"	14'-5"	0'-2⅛"	18'-9"	16'-7"	0'-2⅛"	4	28'-6"	2	4	26'-0"	2'-7"	3'-4⅛"	2	4	30'-5"
Y	7	15'-3"	10'-6"	0'-3⅜"	17'-4"	12'-7"	0'-3⅜"	7	17'-5"	15'-6"	0'-2¼"	19'-6"	17'-8"	0'-2¼"	4	29'-6"	2	4	29'-0"	2'-7"	3'-3¾"	2	4	31'-6"
Z	7	15'-5"	10'-8"	0'-3¼"	17'-6"	12'-9"	0'-3¼"	7	17'-11"	15'-8"	0'-2⅛"	20'-0"	17'-10"	0'-2⅛"	4	30'-6"	2	4	29'-3"	2'-7"	3'-4⅛"	2	4	32'-7"
AA	7	15'-11"	11'-1"	0'-3⅜"	18'-0"	13'-2"	0'-3⅜"	7	18'-5"	16'-2"	0'-2¼"	20'-6"	18'-3"	0'-2¼"	4	31'-6"	2	4	29'-0"	2'-7"	3'-3¾"	2	4	33'-7"
BB	8	16'-5"	11'-8"	0'-3¼"	18'-7"	13'-10"	0'-3¼"	8	18'-11"	16'-8"	0'-2⅛"	21'-1"	18'-11"	0'-2⅛"	4	32'-6"	2	4	29'-3"	2'-7"	3'-4⅛"	2	4	34'-7"
CC	8	16'-11"	12'-1"	0'-3⅜"	19'-1"	14'-4"	0'-3⅜"	8	19'-5"	17'-2"	0'-2¼"	21'-7"	19'-4"	0'-2¼"	4	33'-6"	2	4	32'-4"	2'-7"	3'-3¾"	2	4	35'-10"
DD	8	17'-2"	12'-5"	0'-3¼"	19'-4"	14'-7"	0'-3¼"	8	20'-5"	17'-5"	0'-2⅛"	22'-7"	19'-8"	0'-2⅛"	4	34'-6"	2	4	32'-7"	2'-8"	3'-4"	2	4	36'-10"
EE	8	17'-3"	12'-6"	0'-3⅜"	19'-6"	14'-8"	0'-3⅜"	9	20'-11"	17'-6"	0'-2¼"	23'-4"	20'-0"	0'-2¼"	4	35'-6"	2	4	32'-4"	2'-7"	3'-3¾"	2	4	37'-11"

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SPECIFICATION REFERENCE

WING DETAILS

2:1 FILL SLOPE - TYPE I

VIRGINIA DEPARTMENT OF TRANSPORTATION

VDOT
ROAD AND BRIDGE STANDARDS

REVISION DATE	SHEET 8 OF 8
07/12	1007.08

GENERAL NOTES

Specifications:

AASHTO LRFD Bridge Design Specifications 5th Edition 2010; 2011 Interim Revisions; and VDOT Modifications

Limits of validity for Standard Wingwall design

The standard wingwall designs are based on the following assumptions:

there is no structural connection between the wall and the box culvert
traffic surcharge loading is neglected.

Backfill

Backfill shall comprise granular material with an internal friction angle Φ' of at least 32 °. Cohesive backfill shall not be permitted. Compaction of the backfill material within a distance of one-half the height of the wall shall be by hand compactors only.

Drainage

The Contractor shall provide the drainage system indicated on Sheet 2.

The cost for the drainage system (including porous backfill, 6" diameter non-rigid tubing and other items required) shall be incidental to the cost bid for Concrete.

Concrete

All concrete shall be Class A4.

Reinforcement

Deformed reinforcing bars shall conform to ASTM A615, Grade 60. All reinforcing bar dimensions on the detailed drawings are to centers of bars except where otherwise noted and are subject to fabrication and construction tolerances.

Dimensions on bar diagrams are out-to-out of bars. Bars are straight unless otherwise shown.

The concrete cover to the outermost reinforcement bars shall be as follows:

Wall footing (all faces) 3" minimum cover
Wall stem (all faces) 2½" minimum cover

At the Contractor's option WV Series bars may be spliced at top of the footing in order to facilitate construction. Splice lengths shall be in accordance with Table C on Sheet 2. No additional compensation shall be provided for the increase in reinforcing steel quantity due to the splices.

Miscellaneous

Weepholes shall be placed at the lowest point feasible for free drainage away from the wing.

Four Type I Wings are to be used for straight crossings and skews up to 20°. Two Type I and two Type II Wings are to be used for skews from 25° to 45°. For skews above 45°, special design wings are required. The wingwall to be used for each culvert is shown on the BC series sheets.

The designs shown are applicable for a 45° skew with the roadway and other conditions indicated. Any change in these conditions invalidates these designs.

Quantities shown are for one wing.

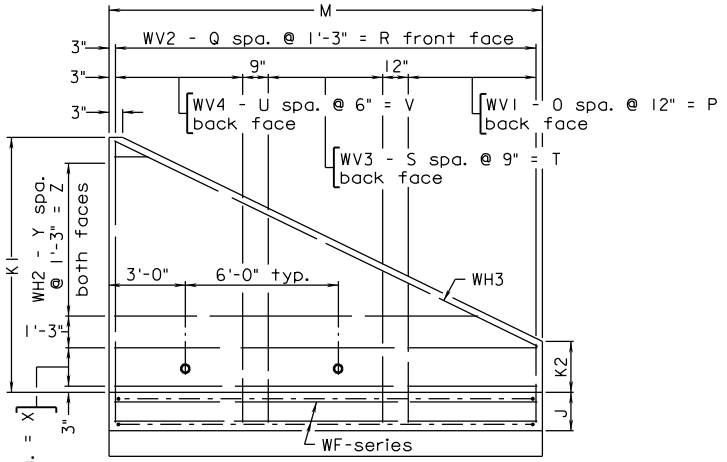
WING	Wall Quantities		qr_min ksf High End	qr_min ksf Low End
	Concrete CY	Reinforcement LB		
A	2.9	253	0.91	0.41
B	3.5	309	1.05	0.41
C	3.9	334	1.21	0.41
D	4.6	371	1.40	0.41
E	5.5	434	1.49	0.41
F	6.2	472	1.71	0.41
G	7.1	550	1.79	0.41
H	7.9	590	2.03	0.41
I	8.8	661	2.10	0.41
J	9.7	742	2.36	0.41
K	10.9	856	2.43	0.41
L	11.8	950	2.70	0.41
M	13.1	1124	2.76	0.41
N	14.1	1241	3.05	0.41
O	15.3	1350	3.10	0.41
P	16.8	1508	3.17	0.41
Q	17.9	1773	3.45	0.41
R	19.1	1812	3.76	0.41
S	20.8	2030	3.80	0.41
T	22.0	2223	4.13	0.41
U	23.5	2475	4.16	0.41
V	25.3	2682	4.21	0.41
W	29.2	3124	4.43	0.44
X	34.5	3479	4.85	0.48
Y	36.3	3853	5.19	0.48
Z	38.8	4162	5.23	0.48
AA	41.0	4469	5.28	0.48
BB	42.9	4902	5.61	0.48
CC	46.6	5345	5.40	0.48
DD	50.5	5863	5.28	0.48
EE	52.5	6610	5.55	0.48

WING DETAIL

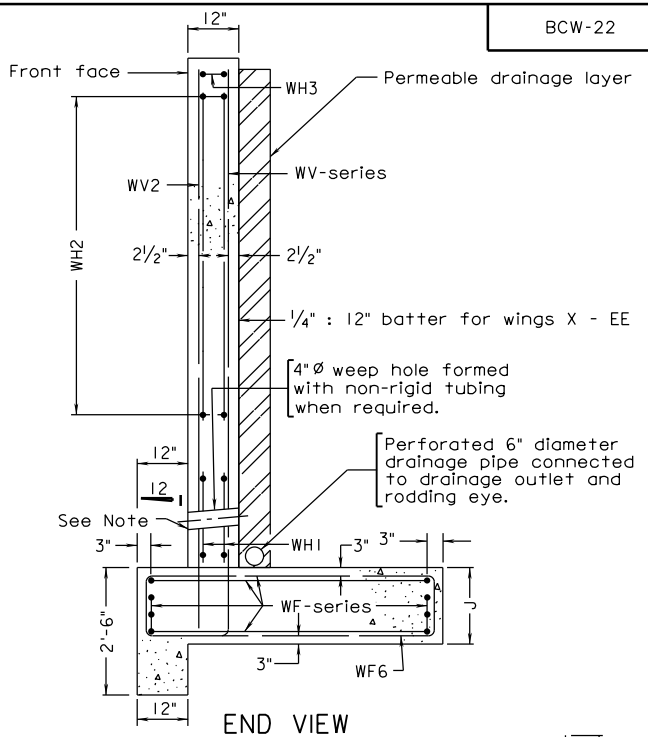
2:1 FILL SLOPE - TYPE II

VIRGINIA DEPARTMENT OF TRANSPORTATION

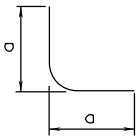
SPECIFICATION REFERENCE



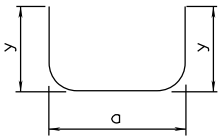
FRONT ELEVATION



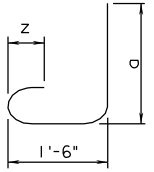
END VIEW



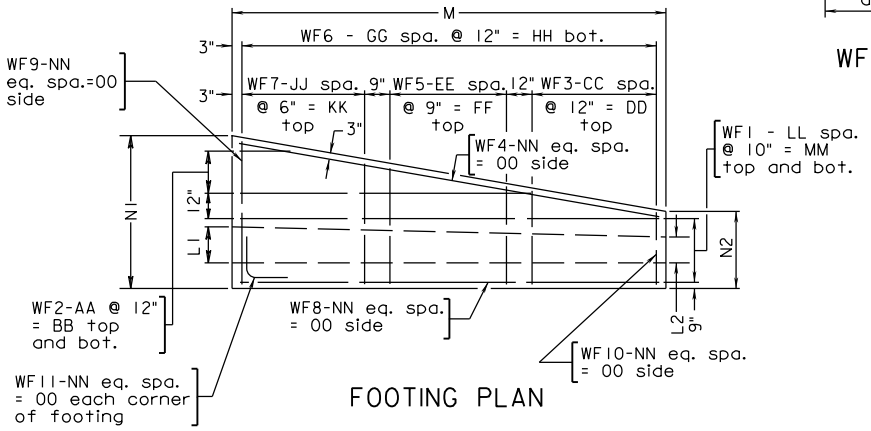
WF11



WF1 TO WF3, WF5 TO WF7



WV1, WV3, WV4



FOOTING PLAN

TABLE A	
Wall	y
A-W	9½"
X	1'-0½"
Y-CC	1'-3½"
DD-EE	1'-9½"

TABLE B		
Bar Size	Pin Dia.	Z
#3	2¼"	4"
#4	3"	4½"
#5	3¾"	5"
#6	4½"	6"
#7	5¼"	7"
#8	6"	8"
#9	9"	10⅛"

TABLE C	
Bar Size	Splice Length
#4	1'- 9"
#5	2'- 4"
#6	2'- 7"
#7	3'- 3"
#8	4'- 2"
#9	5'- 4"

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SPECIFICATION REFERENCE

WING DETAIL

2:1 FILL SLOPE - TYPE II

VIRGINIA DEPARTMENT OF TRANSPORTATION

VDOT
ROAD AND BRIDGE STANDARDS

REVISION DATE	SHEET 2 OF 8
07/12	1007.10

WING	J	K1	K2	L1	L2	M	N1	N2	NO. WEEP HOLES	FOOTING BAR SPACINGS													
										WF1		WF2		WF3		WF4, WF8 TO WF10		WF5		WF6		WF7	
										LL	MM	AA	BB	CC	DD	NN	OO	EE	FF	GG	HH	JJ	KK
A	1'-6"	4'-0"	1'-0"	1'-0"	1'-0"	9'-0"	4'-Ø"	3'-0"	-	3	2'-6"	-	-	8	8'-0"	1	0'-8"	-	-	8	8'-0"	-	-
B	1'-6"	4'-6"	1'-0"	1'-0"	1'-0"	10'-6"	4'-Ø"	3'-Ø"	-	3	2'-6"	-	-	10	10'-0"	1	0'-8"	-	-	10	10'-0"	-	-
C	1'-6"	5'-0"	1'-0"	1'-0"	1'-0"	11'-6"	4'-Ø"	3'-0"	-	3	2'-6"	-	-	11	11'-0"	1	0'-8"	-	-	11	11'-0"	-	-
D	1'-6"	5'-6"	1'-0"	1'-0"	1'-0"	13'-0"	4'-Ø"	3'-0"	-	3	2'-6"	-	-	12	12'-0"	1	0'-8"	-	-	12	12'-0"	-	-
E	1'-6"	6'-0"	1'-0"	1'-0"	1'-0"	14'-6"	4'-6"	3'-0"	-	3	2'-6"	-	-	14	14'-0"	1	0'-8"	-	-	14	14'-0"	-	-
F	1'-6"	6'-6"	1'-0"	1'-0"	1'-0"	16'-0"	4'-6"	3'-0"	-	3	2'-6"	-	-	15	15'-0"	1	0'-8"	-	-	15	15'-0"	-	-
G	1'-6"	7'-0"	1'-0"	1'-0"	1'-0"	17'-6"	5'-Ø"	3'-0"	-	3	2'-6"	-	-	17	17'-0"	1	0'-8"	-	-	17	17'-0"	-	-
H	1'-6"	7'-6"	1'-0"	1'-0"	1'-0"	19'-0"	5'-Ø"	3'-0"	-	3	2'-6"	-	-	18	18'-0"	1	0'-8"	-	-	18	18'-0"	-	-
I	1'-6"	8'-0"	1'-0"	1'-0"	1'-0"	20'-0"	5'-6"	3'-0"	-	3	2'-6"	1	1'-0"	12	12'-0"	1	0'-8"	8	6'-0"	19	19'-0"	-	-
J	1'-6"	8'-6"	1'-0"	1'-0"	1'-0"	21'-6"	5'-6"	3'-0"	-	3	2'-6"	1	1'-0"	12	12'-0"	1	0'-8"	10	7'-6"	21	21'-0"	-	-
K	1'-6"	9'-0"	1'-0"	1'-0"	1'-0"	23'-0"	6'-Ø"	3'-0"	-	3	2'-6"	1	1'-0"	13	13'-0"	1	0'-8"	11	8'-3"	22	22'-0"	-	-
L	1'-6"	9'-6"	1'-0"	1'-0"	1'-0"	24'-6"	6'-Ø"	3'-0"	-	3	2'-6"	1	1'-0"	14	14'-0"	1	0'-8"	12	9'-0"	24	24'-0"	-	-
M	1'-6"	10'-0"	1'-0"	1'-0"	1'-0"	26'-0"	6'-6"	3'-0"	2	3	2'-6"	2	2'-0"	15	15'-0"	1	0'-8"	12	9'-0"	25	25'-0"	-	-
N	1'-6"	10'-6"	1'-0"	1'-0"	1'-0"	27'-6"	6'-6"	3'-0"	2	3	2'-6"	2	2'-0"	16	16'-0"	1	0'-8"	13	9'-9"	27	27'-0"	-	-
O	1'-6"	11'-0"	1'-0"	1'-0"	1'-0"	28'-6"	7'-Ø"	3'-0"	2	3	2'-6"	2	2'-0"	17	17'-0"	1	0'-8"	13	9'-9"	28	28'-0"	-	-
P	1'-6"	11'-6"	1'-0"	1'-0"	1'-0"	30'-0"	7'-6"	3'-0"	3	3	2'-6"	3	3'-0"	18	18'-0"	1	0'-8"	14	10'-6"	29	29'-0"	-	-
Q	1'-6"	12'-0"	1'-0"	1'-0"	1'-0"	31'-6"	7'-6"	3'-0"	3	3	2'-6"	3	3'-0"	18	18'-0"	1	0'-8"	16	12'-0"	31	31'-0"	-	-
R	1'-6"	12'-6"	1'-0"	1'-0"	1'-0"	33'-0"	7'-6"	3'-0"	3	3	2'-6"	3	3'-0"	15	15'-0"	1	0'-8"	13	9'-9"	32	32'-0"	12	6'-0"
S	1'-6"	13'-0"	1'-0"	1'-0"	1'-0"	34'-6"	8'-Ø"	3'-0"	3	3	2'-6"	3	3'-0"	15	15'-0"	1	0'-8"	13	9'-9"	34	34'-0"	15	7'-6"
T	1'-6"	13'-6"	1'-0"	1'-0"	1'-0"	36'-0"	8'-Ø"	3'-0"	4	3	2'-6"	3	3'-0"	14	14'-0"	1	0'-8"	15	11'-3"	35	35'-0"	17	8'-6"
U	1'-6"	14'-0"	1'-0"	1'-0"	1'-0"	37'-0"	8'-6"	3'-0"	4	3	2'-6"	4	4'-0"	14	14'-0"	1	0'-8"	17	12'-9"	36	36'-0"	16	8'-0"
V	1'-6"	14'-6"	1'-0"	1'-0"	1'-0"	38'-6"	9'-Ø"	3'-0"	4	3	2'-6"	4	4'-0"	15	15'-0"	1	0'-8"	17	12'-9"	38	38'-0"	17	8'-6"
W	1'-9"	15'-0"	1'-0"	1'-0"	1'-0"	40'-0"	9'-6"	3'-Ø"	5	3	2'-6"	5	5'-0"	15	15'-0"	1	0'-11"	19	14'-3"	39	39'-0"	17	8'-6"
X	2'-0"	15'-6"	1'-0"	1'-3¾"	1'-0¼"	41'-6"	10'-Ø"	3'-Ø"	5	3	2'-6"	5	5'-0"	17	17'-0"	2	0'-7"	17	12'-9"	41	41'-0"	19	9'-6"
Y	2'-0"	16'-0"	1'-0"	1'-4"	1'-0¼"	43'-0"	10'-Ø"	3'-Ø"	5	3	2'-6"	5	5'-0"	20	20'-0"	2	0'-7"	15	11'-3"	42	42'-0"	19	9'-6"
Z	2'-0"	16'-6"	1'-0"	1'-4⅛"	1'-0¼"	44'-6"	10'-6"	3'-Ø"	5	3	2'-6"	6	6'-0"	20	20'-0"	2	0'-7"	17	12'-9"	44	44'-0"	19	9'-6"
AA	2'-0"	17'-0"	1'-0"	1'-4¼"	1'-0¼"	45'-6"	11'-Ø"	3'-Ø"	6	3	2'-6"	6	6'-0"	19	19'-0"	2	0'-7"	19	14'-3"	45	45'-0"	20	10'-0"
BB	2'-0"	17'-6"	1'-0"	1'-4⅜"	1'-0¼"	47'-0"	11'-Ø"	3'-Ø"	6	3	2'-6"	6	6'-0"	20	20'-0"	2	0'-7"	19	14'-3"	46	46'-0"	21	10'-6"
CC	2'-0"	18'-0"	1'-0"	1'-4½"	1'-0¼"	48'-6"	12'-Ø"	3'-Ø"	6	3	2'-6"	7	7'-0"	19	19'-0"	2	0'-7"	21	15'-9"	48	48'-0"	23	11'-6"
DD	2'-0"	18'-6"	1'-0"	1'-4⅝"	1'-0¼"	50'-0"	13'-Ø"	3'-Ø"	7	3	2'-6"	8	8'-0"	18	18'-0"	2	0'-7"	23	17'-3"	49	49'-0"	25	12'-6"
EE	2'-0"	19'-0"	1'-0"	1'-4¾"	1'-0¼"	51'-6"	13'-Ø"	3'-Ø"	7	3	2'-6"	8	8'-0"	18	18'-0"	2	0'-7"	25	18'-9"	51	51'-0"	25	12'-6"

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VDOT
ROAD AND BRIDGE STANDARDS

SHEET 3 OF 8 | REVISION DATE
1007.11 | 07/12

WING DETAILS

2:1 FILL SLOPE - TYPE II

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE

WING	WF1				WF2								WF3							
	SIZE	a	LENGTH	* Ea	SIZE	a			LENGTH			* Ea	SIZE	a			LENGTH			
						FROM	TO	VARY BY	FROM	TO	VARY BY			FROM	TO	VARY BY	FROM	TO	VARY BY
A	4	8'-4"	9'-9"	2	4	1'-8"	10'-8"	-	3'-0"	12'-0"	-	2	4	3'-5"	2'-6"	0'-1¼"	4'-9"	3'-11"	0'-1¼"
B	4	9'-11"	11'-3"	2	4	2'-0"	12'-6"	-	3'-5"	13'-11"	-	2	4	3'-5"	2'-5"	0'-1⅛"	4'-9"	3'-10"	0'-1⅛"
C	4	10'-11"	12'-3"	2	4	2'-3"	13'-9"	-	3'-8"	15'-2"	-	2	4	3'-5"	2'-5"	0'-1"	4'-9"	3'-10"	0'-1"
D	4	12'-4"	13'-9"	2	4	2'-8"	15'-8"	-	4'-0"	17'-0"	-	2	4	3'-5"	2'-6"	0'-0¾"	4'-9"	3'-10"	0'-0¾"
E	4	13'-11"	15'-3"	2	4	6'-8"	6'-8"	-	8'-0"	8'-0"	-	2	4	3'-11"	2'-5"	0'-1⅛"	5'-3"	3'-10"	0'-1⅛"
F	4	15'-4"	16'-9"	2	4	7'-5"	7'-5"	-	8'-9"	8'-9"	-	2	4	3'-11"	2'-6"	0'-1⅛"	5'-3"	3'-10"	0'-1⅛"
G	4	16'-11"	18'-3"	2	4	10'-4"	10'-4"	-	11'-8"	11'-8"	-	2	4	4'-5"	2'-5"	0'-1⅜"	5'-9"	3'-10"	0'-1⅜"
H	4	18'-5"	19'-9"	2	4	11'-3"	11'-3"	-	12'-8"	12'-8"	-	2	4	4'-5"	2'-6"	0'-1¼"	5'-9"	3'-10"	0'-1¼"
I	4	19'-5"	20'-9"	2	4	13'-5"	5'-5"	8'-0"	14'-9"	6'-9"	8'-0"	2	4	4'-0"	2'-6"	0'-1½"	5'-5"	3'-11"	0'-1½"
J	4	20'-11"	22'-3"	2	4	14'-5"	5'-10"	8'-7⅛"	15'-10"	7'-2"	8'-7⅛"	2	4	3'-11"	2'-6"	0'-1⅜"	5'-3"	3'-11"	0'-1⅜"
K	4	22'-5"	23'-9"	2	4	16'-8"	9'-0"	7'-8"	18'-0"	10'-4"	7'-8"	2	4	4'-2"	2'-6"	0'-1½"	5'-7"	3'-10"	0'-1½"
L	4	23'-11"	25'-3"	2	4	17'-9"	9'-7"	8'-2"	19'-2"	11'-0"	8'-2"	2	4	4'-2"	2'-5"	0'-1⅜"	5'-6"	3'-10"	0'-1⅜"
M	4	25'-5"	26'-9"	2	4	19'-10"	4'-11"	7'-5⅛"	21'-2"	6'-4"	7'-5⅛"	2	4	4'-6"	2'-6"	0'-1½"	5'-11"	3'-11"	0'-1½"
N	4	26'-11"	28'-3"	2	4	21'-0"	5'-3"	7'-10¼"	22'-4"	6'-8"	7'-10¼"	2	4	4'-6"	2'-6"	0'-1½"	5'-11"	3'-10"	0'-1½"
O	4	27'-11"	29'-3"	2	4	22'-6"	8'-3"	7'-1½"	23'-11"	9'-8"	7'-1½"	2	4	4'-10"	2'-6"	0'-1⅝"	6'-3"	3'-10"	0'-1⅝"
P	4	29'-5"	30'-9"	2	4	24'-5"	4'-5"	6'-8"	25'-9"	5'-9"	6'-8"	2	4	5'-2"	2'-5"	0'-1¾"	6'-6"	3'-10"	0'-1¾"
Q	4	30'-11"	32'-3"	2	4	25'-8"	4'-8"	7'-0"	27'-0"	6'-0"	7'-0"	2	4	5'-0"	2'-5"	0'-1⅝"	6'-5"	3'-10"	0'-1⅝"
R	4	32'-4"	33'-9"	2	4	26'-11"	4'-11"	7'-4"	28'-3"	6'-3"	7'-4"	2	4	4'-6"	2'-5"	0'-1⅝"	5'-10"	3'-10"	0'-1⅝"
S	4	33'-11"	35'-3"	2	4	28'-8"	8'-0"	6'-10¾"	30'-1"	9'-5"	6'-10¾"	2	4	4'-8"	2'-5"	0'-1⅝"	6'-0"	3'-10"	0'-1⅝"
T	4	35'-4"	36'-9"	2	4	30'-0"	8'-5"	7'-2⅜"	31'-4"	9'-9"	7'-2¼"	2	4	4'-5"	2'-5"	0'-1⅝"	5'-9"	3'-10"	0'-1⅝"
U	4	36'-4"	37'-9"	2	4	31'-4"	4'-5"	6'-8⅝"	32'-8"	5'-10"	6'-8⅝"	2	4	4'-6"	2'-5"	0'-1¾"	5'-11"	3'-10"	0'-1¾"
V	4	37'-11"	39'-3"	2	4	33'-1"	7'-5"	6'-5"	34'-5"	8'-9"	6'-5"	2	4	4'-10"	2'-5"	0'-1¾"	6'-2"	3'-10"	0'-1¾"
W	4	39'-4"	41'-3"	2	5	34'-9"	4'-0"	6'-1¾"	36'-7"	5'-10"	6'-1¾"	2	4	4'-11"	2'-5"	0'-1¾"	6'-9"	4'-4"	0'-1¾"
X	4	40'-11"	43'-3"	2	5	36'-5"	6'-9"	5'-11⅛"	38'-9"	9'-1"	6'-11⅛"	2	4	5'-4"	2'-6"	0'-2"	7'-8"	4'-10"	0'-2"
Y	4	42'-4"	44'-9"	2	5	37'-9"	7'-1"	6'-1⅝"	40'-1"	9'-5"	6'-1⅝"	2	4	5'-9"	2'-5"	0'-1¾"	8'-1"	4'-10"	0'-1¾"
Z	4	43'-11"	46'-3"	2	5	39'-5"	3'-10"	5'-11⅛"	41'-9"	6'-2"	5'-11⅛"	2	4	5'-10"	2'-6"	0'-2"	8'-2"	4'-10"	0'-2"
AA	4	44'-11"	47'-3"	2	5	40'-7"	6'-6"	5'-8¼"	42'-11"	8'-10"	5'-8¼"	2	4	5'-10"	2'-6"	0'-2"	8'-2"	4'-10"	0'-2"
BB	4	46'-4"	48'-9"	2	5	42'-0"	6'-9"	5'-10½"	44'-4"	9'-1"	5'-10½"	2	4	5'-10"	2'-6"	0'-2"	8'-3"	4'-10"	0'-2"
CC	4	47'-11"	50'-3"	2	5	43'-10"	6'-1"	5'-4⅝"	46'-2"	8'-5"	5'-4⅝"	2	4	6'-0"	2'-6"	0'-2⅛"	8'-4"	4'-10"	0'-2⅛"
DD	4	49'-4"	51'-9"	2	5	45'-8"	5'-8"	5'-0"	47'-11"	7'-11"	5'-0"	2	4	6'-1"	2'-6"	0'-2⅜"	8'-5"	4'-10"	0'-2⅜"
EE	4	50'-11"	53'-3"	2	5	47'-0"	5'-10"	5'-1¾"	49'-4"	8'-2"	5'-1¾"	2	4	6'-0"	2'-6"	0'-2¼"	8'-4"	4'-10"	0'-2¼"

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

SPECIFICATION REFERENCE

WING DETAILS

2:1 FILL SLOPE - TYPE II

VIRGINIA DEPARTMENT OF TRANSPORTATION

VDOT
ROAD AND BRIDGE STANDARDS

REVISION DATE 07/12

WING	WF4		WF5							WF6						
	SIZE	LENGTH	SIZE	a			LENGTH			SIZE	a			LENGTH		
				FROM	TO	VARY BY	FROM	TO	VARY BY		FROM	TO	VARY BY	FROM	TO	VARY BY
A	4	8'-2"	-	-	-	-	-	-	-	4	3'-4"	2'-6"	0'-1¼"	4'-9"	3'-10"	0'-1¼"
B	4	9'-8"	-	-	-	-	-	-	-	4	3'-4"	2'-5"	0'-1⅛"	4'-9"	3'-9"	0'-1⅛"
C	4	10'-8"	-	-	-	-	-	-	-	4	3'-4"	2'-5"	0'-1"	4'-9"	3'-9"	0'-1"
D	4	12'-2"	-	-	-	-	-	-	-	4	3'-4"	2'-5"	0'-0¾"	4'-9"	3'-10"	0'-0¾"
E	4	13'-8"	-	-	-	-	-	-	-	4	3'-10"	2'-5"	0'-1⅛"	5'-3"	3'-9"	0'-1⅛"
F	4	15'-2"	-	-	-	-	-	-	-	4	3'-10"	2'-5"	0'-1⅛"	5'-3"	3'-10"	0'-1⅛"
G	4	16'-9"	-	-	-	-	-	-	-	4	4'-4"	2'-5"	0'-1⅜"	5'-9"	3'-9"	0'-1⅜"
H	4	18'-3"	-	-	-	-	-	-	-	4	4'-4"	2'-5"	0'-1¼"	5'-9"	3'-10"	0'-1¼"
I	4	19'-3"	4	4'-11"	4'-2"	0'-1⅛"	6'-3"	5'-6"	0'-1⅛"	4	4'-10"	2'-6"	0'-1½"	6'-3"	3'-10"	0'-1½"
J	4	20'-9"	4	4'-11"	4'-0"	0'-1"	6'-3"	5'-5"	0'-1"	4	4'-10"	2'-5"	0'-1⅜"	6'-3"	3'-9"	0'-1⅜"
K	4	22'-4"	4	5'-5"	4'-4"	0'-1⅛"	6'-9"	5'-8"	0'-1⅛"	4	5'-4"	2'-6"	0'-1½"	6'-9"	3'-10"	0'-1½"
L	4	23'-10"	4	5'-5"	4'-3"	0'-1"	6'-9"	5'-8"	0'-1"	4	5'-4"	2'-5"	0'-1⅜"	6'-9"	3'-9"	0'-1⅜"
M	4	25'-4"	5	5'-11"	4'-8"	0'-1⅛"	7'-2"	6'-0"	0'-1⅛"	4	5'-10"	2'-6"	0'-1½"	7'-3"	3'-10"	0'-1½"
N	4	26'-10"	5	5'-11"	4'-8"	0'-1⅛"	7'-2"	6'-0"	0'-1⅛"	4	5'-10"	2'-5"	0'-1½"	7'-3"	3'-9"	0'-1½"
O	4	27'-11"	5	6'-5"	5'-0"	0'-1¼"	7'-8"	6'-4"	0'-1¼"	4	6'-4"	2'-5"	0'-1⅝"	7'-9"	3'-9"	0'-1⅝"
P	4	29'-6"	6	6'-11"	5'-4"	0'-1¼"	8'-2"	6'-7"	0'-1¼"	4	6'-10"	2'-6"	0'-1¾"	8'-3"	3'-10"	0'-1¾"
Q	4	30'-11"	6	6'-11"	5'-2"	0'-1¼"	8'-2"	6'-5"	0'-1¼"	4	6'-10"	2'-5"	0'-1⅝"	8'-3"	3'-9"	0'-1⅝"
R	4	32'-5"	5	6'-0"	4'-8"	0'-1⅛"	7'-3"	5'-11"	0'-1⅛"	4	6'-10"	2'-6"	0'-1⅝"	8'-3"	3'-10"	0'-1⅝"
S	4	34'-0"	5	6'-2"	4'-9"	0'-1¼"	7'-6"	6'-1"	0'-1¼"	4	7'-4"	2'-5"	0'-1⅝"	8'-9"	3'-9"	0'-1⅝"
T	4	35'-6"	5	6'-1"	4'-6"	0'-1⅛"	7'-5"	5'-10"	0'-1⅛"	4	7'-4"	2'-6"	0'-1⅝"	8'-9"	3'-10"	0'-1⅝"
U	4	36'-6"	5	6'-7"	4'-8"	0'-1¼"	7'-11"	6'-0"	0'-1¼"	4	7'-10"	2'-6"	0'-1¾"	9'-3"	3'-10"	0'-1¾"
V	4	38'-1"	5	6'-11"	4'-11"	0'-1⅜"	8'-3"	6'-3"	0'-1⅜"	4	8'-4"	2'-5"	0'-1¾"	9'-9"	3'-9"	0'-1¾"
W	4	39'-8"	5	7'-4"	5'-1"	0'-1⅜"	9'-2"	6'-11"	0'-1⅜"	5	8'-10"	2'-6"	0'-1¾"	10'-8"	4'-4"	0'-1¾"
X	4	41'-3"	5	7'-8"	5'-6"	0'-1½"	10'-0"	7'-10"	0'-1½"	5	9'-4"	2'-5"	0'-2"	11'-8"	4'-9"	0'-2"
Y	4	42'-8"	5	7'-8"	5'-11"	0'-1⅜"	10'-0"	8'-2"	0'-1⅜"	5	9'-4"	2'-6"	0'-1¾"	11'-8"	4'-10"	0'-1¾"
Z	4	44'-3"	6	8'-2"	6'-0"	0'-1½"	10'-5"	8'-3"	0'-1½"	5	9'-10"	2'-5"	0'-2"	12'-2"	4'-9"	0'-2"
AA	4	45'-4"	6	8'-6"	6'-0"	0'-1½"	10'-9"	8'-3"	0'-1½"	5	10'-4"	2'-5"	0'-2"	12'-8"	4'-9"	0'-2"
BB	4	46'-10"	6	8'-6"	6'-0"	0'-1½"	10'-9"	8'-4"	0'-1½"	5	10'-4"	2'-6"	0'-2"	12'-8"	4'-10"	0'-2"
CC	4	48'-6"	6	9'-1"	6'-2"	0'-1⅝"	11'-4"	8'-5"	0'-1⅝"	5	11'-4"	2'-5"	0'-2⅛"	13'-8"	4'-9"	0'-2⅛"
DD	4	50'-2"	6	9'-9"	6'-3"	0'-1¾"	12'-0"	8'-6"	0'-1¾"	5	12'-4"	2'-6"	0'-2⅜"	14'-8"	4'-10"	0'-2⅜"
EE	4	51'-7"	7	9'-10"	6'-2"	0'-1⅝"	12'-0"	8'-4"	0'-1⅝"	5	12'-4"	2'-5"	0'-2¼"	14'-8"	4'-9"	0'-2¼"

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VDOT
ROAD AND BRIDGE STANDARDS

SHEET 5 OF 8 | REVISION DATE
1007.13 | 07/12

WING DETAILS

2:1 FILL SLOPE - TYPE II

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE

WING	WF7							WF8		WF9		WF10		WF11			
	SIZE	a			LENGTH			SIZE	LENGTH	SIZE	LENGTH	SIZE	LENGTH	SIZE	a	LENGTH	• Ea
		FROM	TO	VARY BY	FROM	TO	VARY BY										
A	-	-	-	-	-	-	-	4	8'-2"	4	3'-2"	4	2'-2"	4	2'-2"	4'-2"	4
B	-	-	-	-	-	-	-	4	9'-8"	4	3'-2"	4	2'-2"	4	2'-2"	4'-2"	4
C	-	-	-	-	-	-	-	4	10'-8"	4	3'-2"	4	2'-2"	4	2'-2"	4'-2"	4
D	-	-	-	-	-	-	-	4	12'-2"	4	3'-2"	4	2'-2"	4	2'-2"	4'-2"	4
E	-	-	-	-	-	-	-	4	13'-8"	4	3'-8"	4	2'-2"	4	2'-2"	4'-2"	4
F	-	-	-	-	-	-	-	4	15'-2"	4	3'-8"	4	2'-2"	4	2'-2"	4'-2"	4
G	-	-	-	-	-	-	-	4	16'-8"	4	4'-2"	4	2'-2"	4	2'-2"	4'-2"	4
H	-	-	-	-	-	-	-	4	18'-2"	4	4'-2"	4	2'-2"	4	2'-2"	4'-2"	4
I	-	-	-	-	-	-	-	4	19'-2"	4	4'-8"	4	2'-2"	4	2'-2"	4'-2"	4
J	-	-	-	-	-	-	-	4	20'-8"	4	4'-8"	4	2'-2"	4	2'-2"	4'-2"	4
K	-	-	-	-	-	-	-	4	22'-2"	4	5'-2"	4	2'-2"	4	2'-2"	4'-2"	4
L	-	-	-	-	-	-	-	4	23'-8"	4	5'-2"	4	2'-2"	4	2'-2"	4'-2"	4
M	-	-	-	-	-	-	-	4	25'-2"	4	5'-8"	4	2'-2"	4	2'-2"	4'-2"	4
N	-	-	-	-	-	-	-	4	26'-8"	4	5'-8"	4	2'-2"	4	2'-2"	4'-2"	4
O	-	-	-	-	-	-	-	4	27'-8"	4	6'-2"	4	2'-2"	4	2'-2"	4'-2"	4
P	-	-	-	-	-	-	-	4	29'-2"	4	6'-8"	4	2'-2"	4	2'-2"	4'-2"	4
Q	-	-	-	-	-	-	-	4	30'-8"	4	6'-8"	4	2'-2"	4	2'-2"	4'-2"	4
R	5	6'-11"	6'-1"	0'-0¾"	8'-2"	7'-5"	0'-0¾"	4	32'-2"	4	6'-8"	4	2'-2"	4	2'-2"	4'-2"	4
S	6	7'-5"	6'-4"	0'-0¾"	8'-8"	7'-7"	0'-0¾"	4	33'-8"	4	7'-2"	4	2'-2"	4	2'-2"	4'-2"	4
T	6	7'-5"	6'-2"	0'-0¾"	8'-8"	7'-6"	0'-0¾"	4	35'-2"	4	7'-2"	4	2'-2"	4	2'-2"	4'-2"	4
U	6	7'-11"	6'-8"	0'-0¾"	9'-2"	8'-0"	0'-0¾"	4	36'-2"	4	7'-8"	4	2'-2"	4	2'-2"	4'-2"	4
V	6	8'-5"	7'-1"	0'-0¾"	9'-8"	8'-4"	0'-0¾"	4	37'-8"	4	8'-2"	4	2'-2"	4	2'-2"	4'-2"	4
W	6	8'-11"	7'-6"	0'-0¾"	10'-8"	9'-3"	0'-0¾"	4	39'-2"	4	8'-8"	4	2'-2"	4	2'-2"	4'-2"	4
X	6	9'-4"	7'-9"	0'-1"	11'-8"	10'-1"	0'-1"	4	40'-8"	4	9'-2"	4	2'-2"	4	2'-2"	4'-2"	4
Y	7	9'-5"	7'-10"	0'-0¾"	11'-7"	10'-1"	0'-0¾"	4	42'-2"	4	9'-2"	4	2'-2"	4	2'-2"	4'-2"	4
Z	7	9'-10"	8'-3"	0'-1"	12'-1"	10'-6"	0'-1"	4	43'-8"	4	9'-8"	4	2'-2"	4	2'-2"	4'-2"	4
AA	7	10'-4"	8'-7"	0'-1"	12'-7"	10'-10"	0'-1"	4	44'-8"	4	10'-2"	4	2'-2"	4	2'-2"	4'-2"	4
BB	7	10'-4"	8'-7"	0'-1"	12'-7"	10'-10"	0'-1"	4	46'-2"	4	10'-2"	4	2'-2"	4	2'-2"	4'-2"	4
CC	7	11'-4"	9'-3"	0'-1"	13'-7"	11'-5"	0'-1"	4	47'-8"	4	11'-2"	4	2'-2"	4	2'-2"	4'-2"	4
DD	7	12'-4"	9'-10"	0'-1⅛"	14'-7"	12'-1"	0'-1⅛"	4	49'-2"	4	12'-2"	4	2'-2"	4	2'-2"	4'-2"	4
EE	7	12'-4"	9'-11"	0'-1⅛"	14'-7"	12'-2"	0'-1⅛"	4	50'-8"	4	12'-2"	4	2'-2"	4	2'-2"	4'-2"	4

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WING DETAILS

2:1 FILL SLOPE - TYPE II

VIRGINIA DEPARTMENT OF TRANSPORTATION

VDOT
ROAD AND BRIDGE STANDARDS

WING	STEM BAR SPACINGS												WV1							WV2			
	WV1		WV2		WV3		WV4		WH1		WH2		SIZE	a			LENGTH			SIZE	LENGTH		
	O	P	Q	R	S	T	U	V	W	X	Y	Z		FROM	TO	VARY BY	FROM	TO	VARY BY		FROM	TO	VARY BY
A	8	8'-0"	6	7'-6"	-	-	-	-	-	-	1	1'-3"	4	4'-11"	2'-3"	0'-4"	6'-10"	4'-1"	0'-4"	4	4'-11"	2'-5"	0'-5"
B	10	10'-0"	8	10'-0"	-	-	-	-	1	0'-6"	1	1'-3"	4	5'-5"	2'-1"	0'-4"	7'-4"	3'-11"	0'-4"	4	5'-5"	2'-1"	0'-5"
C	11	11'-0"	8	10'-0"	-	-	-	-	-	-	2	2'-6"	4	5'-11"	2'-1"	0'-4 1/8"	7'-10"	4'-0"	0'-4 1/8"	4	5'-11"	2'-5"	0'-5 1/4"
D	12	12'-0"	10	12'-6"	-	-	-	-	-	-	2	2'-6"	4	6'-5"	2'-3"	0'-4 1/8"	8'-4"	4'-2"	0'-4 1/8"	4	6'-5"	2'-1"	0'-5 1/8"
E	14	14'-0"	11	13'-9"	-	-	-	-	-	-	3	3'-9"	4	6'-11"	2'-1"	0'-4 1/8"	8'-10"	4'-0"	0'-4 1/8"	4	6'-11"	2'-2"	0'-5 1/8"
F	15	15'-0"	12	15'-0"	-	-	-	-	-	-	3	3'-9"	4	7'-5"	2'-3"	0'-4 1/8"	9'-4"	4'-2"	0'-4 1/8"	4	7'-5"	2'-3"	0'-5 1/8"
G	17	17'-0"	13	16'-3"	-	-	-	-	1	0'-6"	3	3'-9"	4	7'-11"	2'-1"	0'-4 1/8"	9'-10"	4'-0"	0'-4 1/8"	4	7'-11"	2'-4"	0'-5 1/8"
H	18	18'-0"	14	17'-6"	-	-	-	-	-	-	4	5'-0"	4	8'-5"	2'-3"	0'-4"	10'-4"	4'-2"	0'-4"	4	8'-5"	2'-5"	0'-5 1/8"
I	12	12'-0"	15	18'-9"	8	6'-0"	-	-	-	-	4	5'-0"	4	6'-5"	2'-3"	0'-4 1/8"	8'-4"	4'-2"	0'-4 1/8"	4	8'-11"	2'-4"	0'-5 1/4"
J	12	12'-0"	16	20'-0"	10	7'-6"	-	-	-	-	5	6'-3"	4	6'-5"	2'-3"	0'-4 1/8"	8'-4"	4'-2"	0'-4 1/8"	4	9'-5"	2'-5"	0'-5 1/4"
K	13	13'-0"	18	22'-6"	11	8'-3"	-	-	-	-	5	6'-3"	4	6'-8"	2'-2"	0'-4 1/8"	8'-7"	4'-1"	0'-4 1/8"	4	9'-11"	2'-1"	0'-5 1/8"
L	14	14'-0"	19	23'-9"	12	9'-0"	-	-	1	0'-6"	5	6'-3"	4	6'-11"	2'-1"	0'-4 1/8"	8'-10"	4'-0"	0'-4 1/8"	4	10'-5"	2'-2"	0'-5 1/8"
M	15	15'-0"	20	25'-0"	12	9'-0"	-	-	-	-	6	7'-6"	4	7'-5"	2'-3"	0'-4 1/8"	9'-4"	4'-2"	0'-4 1/8"	4	10'-11"	2'-3"	0'-5 1/8"
N	16	16'-0"	21	26'-3"	13	9'-9"	-	-	-	-	6	7'-6"	5	7'-8"	2'-2"	0'-4 1/8"	9'-8"	4'-1"	0'-4 1/8"	4	11'-5"	2'-4"	0'-5 1/8"
O	17	17'-0"	22	27'-6"	13	9'-9"	-	-	-	-	7	8'-9"	5	8'-2"	2'-2"	0'-4 1/8"	10'-1"	4'-1"	0'-4 1/8"	4	11'-11"	2'-3"	0'-5 1/4"
P	18	18'-0"	23	28'-9"	14	10'-6"	-	-	-	-	7	8'-9"	5	8'-5"	2'-1"	0'-4 1/8"	10'-4"	4'-0"	0'-4 1/8"	4	12'-5"	2'-4"	0'-5 1/4"
Q	18	18'-0"	24	30'-0"	16	12'-0"	-	-	1	0'-6"	7	8'-9"	5	8'-4"	2'-1"	0'-4 1/8"	10'-4"	4'-0"	0'-4 1/8"	4	12'-11"	2'-5"	0'-5 1/4"
R	15	15'-0"	26	32'-6"	13	9'-9"	12	6'-0"	-	-	8	10'-0"	4	7'-4"	2'-1"	0'-4 1/8"	9'-2"	4'-0"	0'-4 1/8"	4	13'-5"	2'-1"	0'-5 1/8"
S	15	15'-0"	27	33'-9"	13	9'-9"	15	7'-6"	-	-	8	10'-0"	4	7'-4"	2'-1"	0'-4 1/8"	9'-2"	4'-0"	0'-4 1/8"	4	13'-11"	2'-2"	0'-5 1/8"
T	14	14'-0"	28	35'-0"	15	11'-3"	17	8'-6"	-	-	9	11'-3"	4	6'-11"	2'-1"	0'-4 1/8"	8'-10"	4'-0"	0'-4 1/8"	4	14'-5"	2'-3"	0'-5 1/8"
U	14	14'-0"	29	36'-3"	17	12'-9"	16	8'-0"	-	-	9	11'-3"	4	7'-0"	2'-1"	0'-4 1/8"	8'-11"	4'-0"	0'-4 1/8"	4	14'-11"	2'-2"	0'-5 1/4"
V	15	15'-0"	30	37'-6"	17	12'-9"	17	8'-6"	1	0'-6"	9	11'-3"	4	7'-4"	2'-1"	0'-4 1/8"	9'-3"	4'-0"	0'-4 1/8"	4	15'-5"	2'-3"	0'-5 1/4"
W	15	15'-0"	31	38'-9"	19	14'-3"	17	8'-6"	-	-	10	12'-6"	4	7'-7"	2'-4"	0'-4 1/8"	9'-6"	4'-3"	0'-4 1/8"	4	16'-2"	2'-7"	0'-5 1/4"
X	17	17'-0"	32	40'-0"	17	12'-9"	19	9'-6"	-	-	10	12'-6"	4	8'-6"	2'-7"	0'-4 1/8"	10'-5"	4'-6"	0'-4 1/8"	4	16'-11"	2'-11"	0'-5 1/4"
Y	20	20'-0"	34	42'-6"	15	11'-3"	19	9'-6"	-	-	11	13'-9"	4	9'-7"	2'-7"	0'-4 1/8"	11'-5"	4'-6"	0'-4 1/8"	4	17'-5"	2'-7"	0'-5 1/8"
Z	20	20'-0"	35	43'-9"	17	12'-9"	19	9'-6"	-	-	11	13'-9"	4	9'-7"	2'-7"	0'-4 1/8"	11'-5"	4'-6"	0'-4 1/8"	4	17'-11"	2'-8"	0'-5 1/8"
AA	19	19'-0"	36	45'-0"	19	14'-3"	20	10'-0"	1	0'-6"	11	13'-9"	4	9'-3"	2'-7"	0'-4 1/8"	11'-2"	4'-6"	0'-4 1/8"	4	18'-5"	2'-7"	0'-5 1/4"
BB	20	20'-0"	37	46'-3"	19	14'-3"	21	10'-6"	-	-	12	15'-0"	4	9'-7"	2'-7"	0'-4 1/8"	11'-6"	4'-6"	0'-4 1/8"	4	18'-11"	2'-8"	0'-5 1/4"
CC	19	19'-0"	38	47'-6"	21	15'-9"	23	11'-6"	-	-	12	15'-0"	4	9'-3"	2'-7"	0'-4 1/8"	11'-2"	4'-6"	0'-4 1/8"	4	19'-5"	2'-9"	0'-5 1/4"
DD	18	18'-0"	39	48'-9"	23	17'-3"	25	12'-6"	-	-	13	16'-3"	4	8'-10"	2'-7"	0'-4 1/8"	10'-9"	4'-6"	0'-4 1/8"	4	19'-11"	2'-10"	0'-5 1/4"
EE	18	18'-0"	40	50'-0"	25	18'-9"	25	12'-6"	-	-	13	16'-3"	4	8'-10"	2'-7"	0'-4 1/8"	10'-9"	4'-6"	0'-4 1/8"	4	20'-5"	2'-11"	0'-5 1/4"

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VDOT
ROAD AND BRIDGE STANDARDS

SHEET 7 OF 8 | REVISION DATE
1007.15 | 07/12

WING DETAILS

2:1 FILL SLOPE - TYPE II

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE

WING	WV3							WV4							WH1			WH2					WH3	
	SIZE	a			LENGTH			SIZE	a			LENGTH			SIZE	LENGTH	• Ea	SIZE	LENGTH			• EA	SIZE	LENGTH
		FROM	TO	VARY BY	FROM	TO	VARY BY		FROM	TO	VARY BY	FROM	TO	VARY BY					FROM	TO	VARY BY			
A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	8'-6"	2	4	6'-6"	2'-10"	3'-7½"	2	4	9'-0"
B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	10'-0"	2	4	6'-7"	2'-10"	3'-8⅜"	2	4	10'-7"
C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	11'-0"	2	4	9'-10"	2'-9"	3'-6⅜"	2	4	11'-7"
D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	12'-6"	2	4	9'-10"	2'-9"	3'-6¼"	2	4	13'-3"
E	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	14'-0"	2	4	13'-6"	2'-9"	3'-6¾"	2	4	14'-10"
F	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	15'-6"	2	4	13'-7"	2'-10"	3'-7"	2	4	16'-5"
G	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	17'-0"	2	4	13'-7"	2'-10"	3'-7"	2	4	18'-0"
H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	18'-6"	2	4	17'-3"	2'-10"	3'-7¼"	2	4	19'-6"
I	4	8'-11"	6'-10"	0'-3⅛"	10'-10"	8'-8"	0'-3⅛"	-	-	-	-	-	-	-	4	19'-6"	2	4	16'-11"	2'-9"	3'-6⅜"	2	4	20'-8"
J	4	9'-5"	6'-9"	0'-3⅛"	11'-4"	8'-8"	0'-3⅛"	-	-	-	-	-	-	-	4	21'-0"	2	4	20'-6"	2'-9"	3'-6½"	2	4	22'-3"
K	5	9'-11"	7'-0"	0'-3⅛"	11'-10"	9'-0"	0'-3⅛"	-	-	-	-	-	-	-	4	22'-6"	2	4	20'-6"	2'-9"	3'-6⅝"	2	4	23'-9"
L	5	10'-5"	7'-3"	0'-3⅛"	12'-4"	9'-3"	0'-3⅛"	-	-	-	-	-	-	-	4	24'-0"	2	4	20'-8"	2'-9"	3'-6⅞"	2	4	25'-5"
M	6	10'-11"	7'-10"	0'-3"	12'-11"	9'-10"	0'-3"	-	-	-	-	-	-	-	4	25'-6"	2	4	24'-3"	2'-9"	3'-6⅞"	2	4	27'-0"
N	6	11'-5"	8'-0"	0'-3"	13'-5"	10'-1"	0'-3"	-	-	-	-	-	-	-	4	27'-0"	2	4	24'-3"	2'-0"	3'-7"	2	4	28'-6"
O	6	11'-11"	8'-6"	0'-3⅛"	13'-11"	10'-6"	0'-3⅛"	-	-	-	-	-	-	-	4	28'-0"	2	4	27'-6"	2'-9"	3'-6⅜"	2	4	29'-8"
P	6	12'-5"	8'-9"	0'-3⅛"	14'-5"	10'-9"	0'-3⅛"	-	-	-	-	-	-	-	4	29'-6"	2	4	27'-6"	2'-9"	3'-6½"	2	4	31'-3"
Q	7	12'-11"	8'-9"	0'-3⅛"	15'-0"	10'-10"	0'-3⅛"	-	-	-	-	-	-	-	4	31'-0"	2	4	27'-8"	2'-9"	3'-6⅝"	2	4	32'-10"
R	6	11'-1"	7'-8"	0'-3⅛"	13'-1"	9'-8"	0'-3⅛"	6	13'-5"	11'-4"	0'-2"	15'-5"	13'-4"	0'-2"	4	32'-6"	2	4	31'-3"	2'-10"	3'-6⅝"	2	4	34'-4"
S	6	11'-0"	7'-8"	0'-3⅛"	13'-1"	9'-8"	0'-3⅛"	6	13'-11"	11'-4"	0'-2"	15'-11"	13'-4"	0'-2"	4	34'-0"	2	4	31'-3"	2'-10"	3'-6¾"	2	4	36'-0"
T	6	11'-2"	7'-3"	0'-3⅛"	13'-3"	9'-4"	0'-3⅛"	6	14'-5"	11'-6"	0'-2"	16'-5"	13'-6"	0'-2"	4	35'-6"	2	4	35'-0"	2'-10"	3'-6⅞"	2	4	37'-7"
U	6	11'-10"	7'-4"	0'-3⅛"	13'-10"	9'-5"	0'-3⅛"	7	14'-11"	12'-1"	0'-2"	17'-0"	14'-3"	0'-2"	4	36'-6"	2	4	34'-7"	2'-9"	3'-6⅜"	2	4	38'-9"
V	6	12'-2"	7'-8"	0'-3⅛"	14'-2"	9'-9"	0'-3⅛"	7	15'-5"	12'-5"	0'-2"	17'-6"	14'-7"	0'-2"	4	38'-0"	2	4	34'-7"	2'-9"	3'-6½"	2	4	40'-4"
W	6	12'-11"	7'-11"	0'-3⅛"	14'-11"	9'-11"	0'-3⅛"	7	16'-2"	13'-2"	0'-2"	18'-3"	15'-4"	0'-2"	4	39'-6"	2	4	38'-3"	2'-10"	3'-6½"	2	4	41'-11"
X	6	13'-4"	8'-10"	0'-3⅛"	15'-4"	10'-11"	0'-3⅛"	7	16'-11"	13'-7"	0'-2"	19'-0"	15'-9"	0'-2"	4	41'-0"	2	4	38'-4"	2'-9"	3'-6⅝"	2	4	43'-6"
Y	7	13'-10"	9'-11"	0'-3⅛"	15'-11"	12'-0"	0'-3⅛"	7	17'-5"	14'-1"	0'-2"	19'-6"	16'-3"	0'-2"	4	42'-6"	2	4	42'-0"	2'-9"	3'-6¾"	2	4	45'-0"
Z	7	14'-4"	9'-11"	0'-3⅛"	16'-6"	12'-0"	0'-3⅛"	7	17'-11"	14'-7"	0'-2"	20'-0"	16'-9"	0'-2"	4	44'-0"	2	4	42'-1"	2'-9"	3'-6⅞"	2	4	46'-7"
AA	7	14'-8"	9'-7"	0'-3⅛"	16'-9"	11'-9"	0'-3⅛"	7	18'-5"	14'-11"	0'-2"	20'-6"	17'-0"	0'-2"	4	45'-0"	2	4	41'-7"	2'-9"	3'-6⅜"	2	4	47'-9"
BB	7	15'-0"	9'-11"	0'-3⅛"	17'-1"	12'-1"	0'-3⅛"	8	18'-11"	15'-3"	0'-2"	21'-1"	17'-5"	0'-2"	4	46'-6"	2	4	45'-3"	2'-9"	3'-6½"	2	4	49'-4"
CC	7	15'-1"	9'-7"	0'-3⅛"	17'-3"	11'-8"	0'-3⅛"	8	19'-5"	15'-5"	0'-2"	21'-7"	17'-7"	0'-2"	4	48'-0"	2	4	45'-4"	2'-10"	3'-6½"	2	4	50'-11"
DD	7	15'-3"	9'-3"	0'-3⅛"	17'-5"	11'-4"	0'-3⅛"	8	19'-11"	15'-6"	0'-2"	22'-1"	17'-9"	0'-2"	4	49'-6"	2	4	49'-0"	2'-9"	3'-6⅝"	2	4	52'-6"
EE	7	15'-9"	9'-3"	0'-3⅛"	17'-11"	11'-4"	0'-3⅛"	9	20'-5"	16'-0"	0'-2"	22'-10"	18'-6"	0'-2"	4	51'-0"	2	4	49'-1"	2'-9"	3'-6¾"	2	4	54'-1"

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WING DETAILS

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REVISION DATE	SHEET 8 OF 8
07/12	1007.16