

EW-12

PLAN

SECTION A-A

BEVEL SLOT DETAIL (PERMITTED FOR EASY FORM REMOVAL)

ISOMETRIC

UNDERDRAIN OUTLET MARKER DETAIL

NOTES:

1. TYPICAL ENDWALL TO BE PLACED AT THE ENDS OF ALL UNDERDRAIN OUTLETS, BARRING LOCATIONS WHERE UNDERDRAIN IS TIED INTO OTHER DRAINAGE STRUCTURES. ENDWALL TO BE INSTALLED PERPENDICULAR TO ROADWAY AND FLUSH WITH THE SLOPE.
2. OUTLET PIPES SHALL BE RIGID NONPERFORATED, SMOOTH-BORE PIPE, MEETING THE REQUIREMENTS OF 70 PSI TESTED ACCORDING TO ASTM 2412.
3. EXPANDED STEEL MESH (FLATTENED) SHALL HAVE OPENINGS OF APPROX. 1/2" X 1" AND WEIGH APPROX. 0.82 LBS. PER SQ. FT. MESH SHALL BE GALVANIZED IN ACCORDANCE WITH ASTM A-123. THE MESH SHALL EXTEND A MINIMUM OF 1" ABOVE THE O.D. OF THE PIPE, AND IS A BARRIER FOR RODENTS, ETC. THE SLOT FOR THE STEEL MESH IS TO BE CONSTRUCTED SO THAT THE MESH CAN BE REMOVED FOR CLEANOUT PURPOSES.
4. THIS ITEM MAY BE PRECAST OR CAST IN PLACE.
5. STEEL POSTS AND PLATES TO BE PAINTED OR GALVANIZED IN ACCORDANCE WITH THE ROAD AND BRIDGE SPECIFICATIONS. IF PAINTED THE FINAL COAT SHALL BE NO. 13 ALUMINUM PAINT OR NO. 11 WHITE PAINT.
6. MARKER TO BE PLACED AT OUTLET END OF ALL UNDERDRAIN INSTALLATIONS BARRING LOCATIONS WHERE UNDERDRAIN IS TIED INTO OTHER DRAINAGE STRUCTURES.
7. MARKER WILL BE PAID FOR IN ACCORDANCE WITH SECTION 501 OF THE ROAD AND BRIDGE SPECIFICATIONS.

PIPE I.D.	SLOPE	DIMENSIONS		CLASS A3 CONCRETE CUBIC YARDS
		L	H	
4"	2:1	2'-5 1/2"	1'-2 3/4"	0.17
4"	4:1	4'-5"	1'-1 1/4"	0.28
6"	2:1	2'-10 1/2"	1'-5 1/4"	0.21
6"	4:1	5'-3"	1'-3 3/4"	0.35

REV. 7/03

STANDARD ENDWALL FOR PIPE UNDERDRAIN

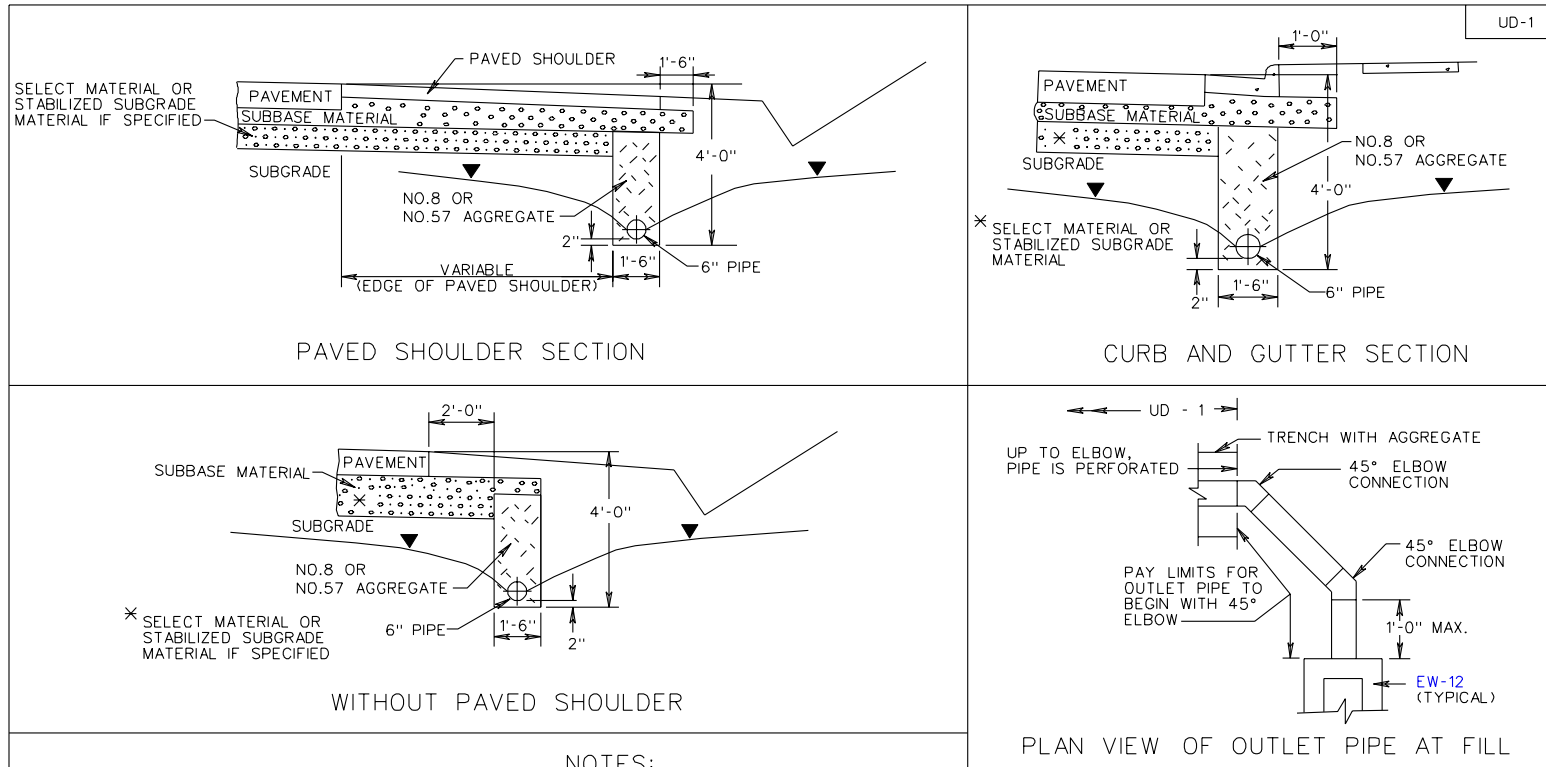
VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE

105
233
302
501

101.32

INSERTABLE SHEET A80



NOTES:

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

LONGITUDINAL PERFORATED PIPE

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

NON-PERFORATED OUTLET PIPE

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

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

SPECIFICATION REFERENCE
240
501
701

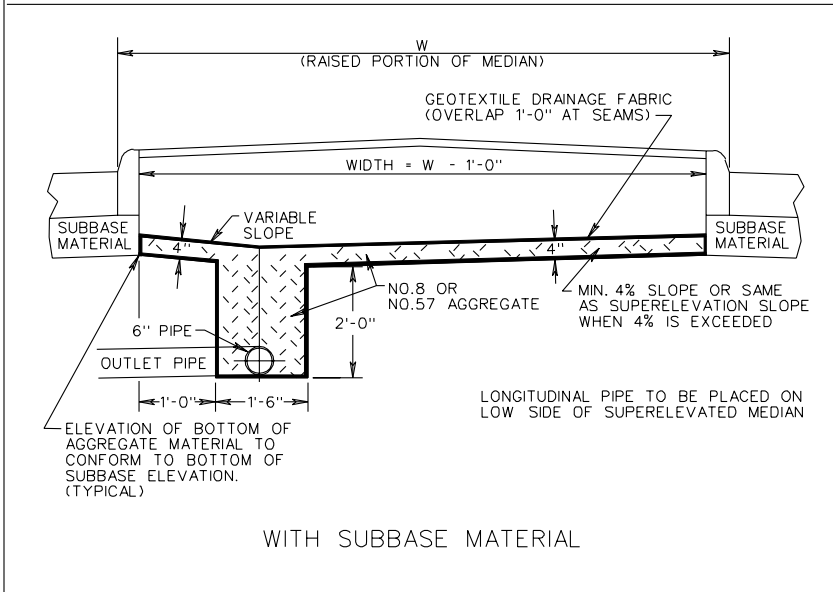
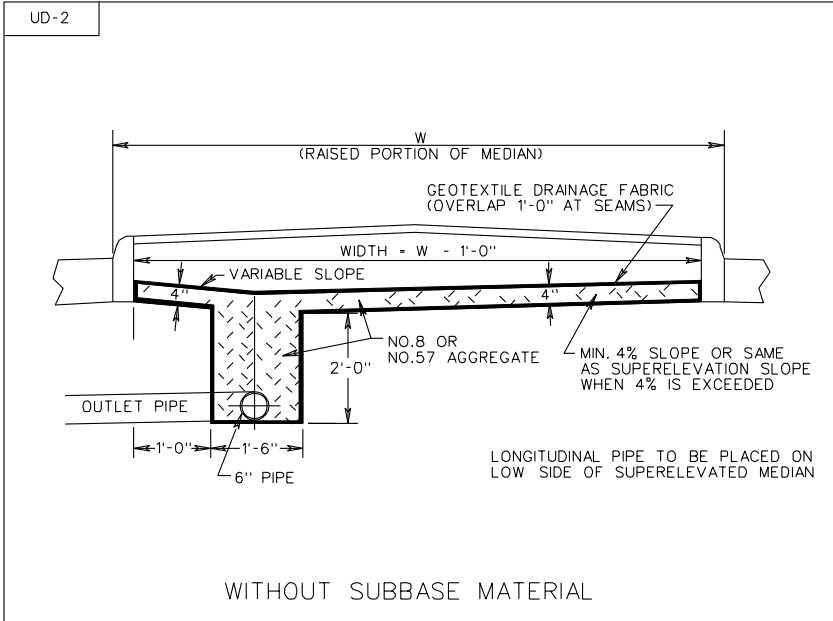
STANDARD GROUNDWATER UNDERDRAIN

VIRGINIA DEPARTMENT OF TRANSPORTATION

7/03

108.01

INSERTABLE SHEET A80



LONGITUDINAL PERFORATED PIPE

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

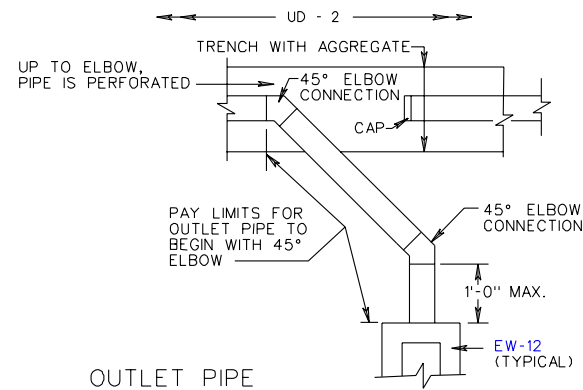
NON-PERFORATED OUTLET PIPE

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

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

NOTES:

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

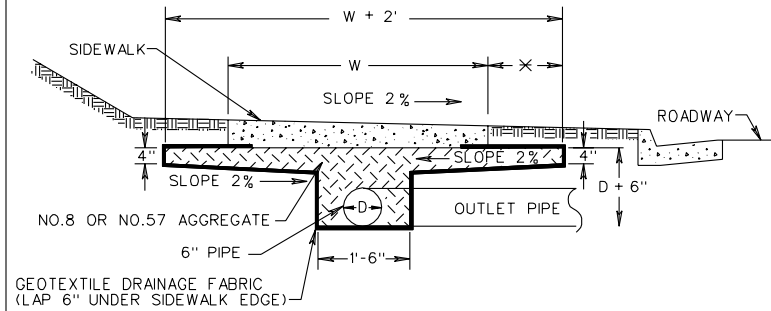


STANDARD UNDERDRAIN FOR USE WITH RAISED GRASS MEDIAN STRIPS

REV. 7/03
 108.02

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE
240
501
701



NOTES:

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

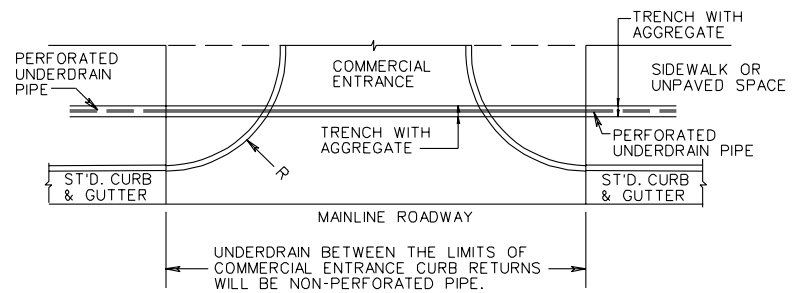
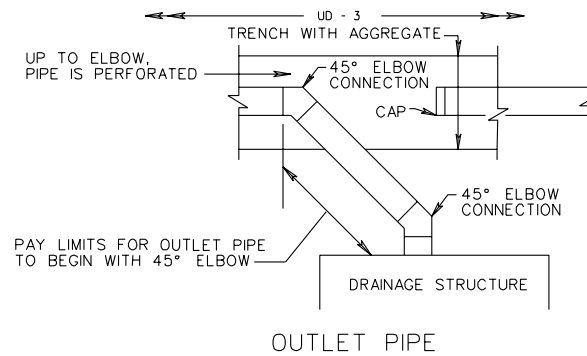
LONGITUDINAL PERFORATED PIPE

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

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

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

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

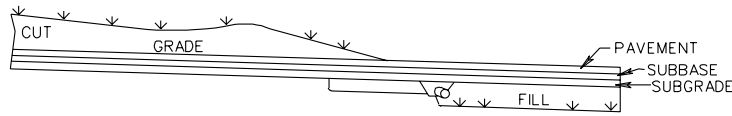


SPECIFICATION REFERENCE
232
501
701

STANDARD SIDEWALK UNDERDRAIN

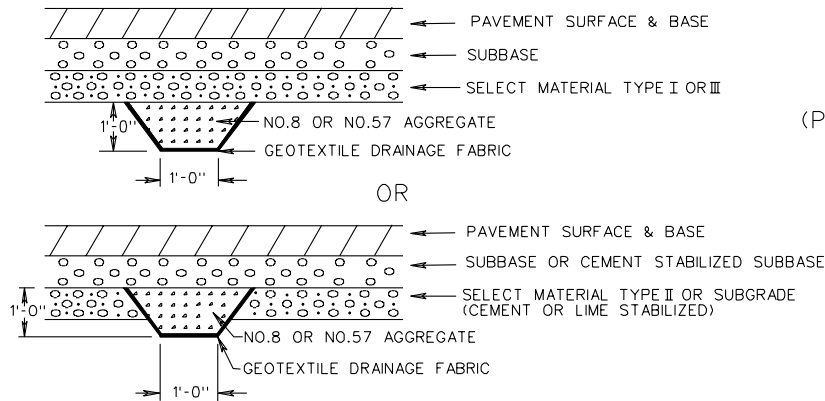
VIRGINIA DEPARTMENT OF TRANSPORTATION

CD-1



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

TRENCH PLACEMENT

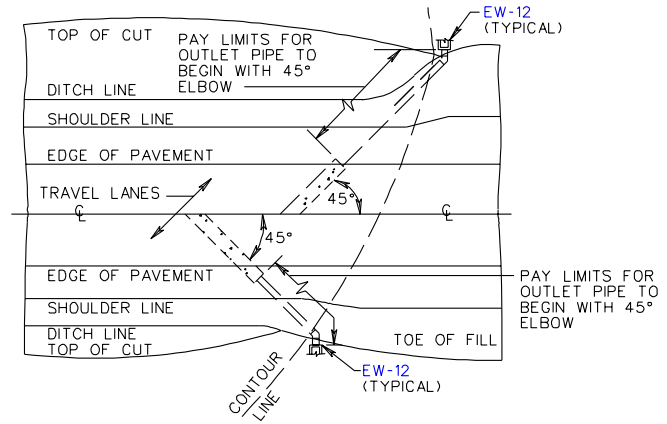


OR

NON-PERFORATED OUTLET PIPE

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

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



PLAN VIEW
(PLACEMENT OF CD-1 COMBINATION UNDERDRAIN)

GENERAL NOTES

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

STANDARD COMBINATION UNDERDRAIN
(AT LOWER END OF CUTS)

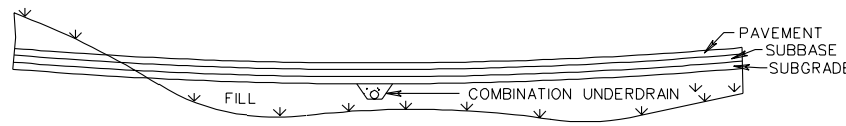
SPECIFICATION
REFERENCE

232
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701

Rev. 7/03

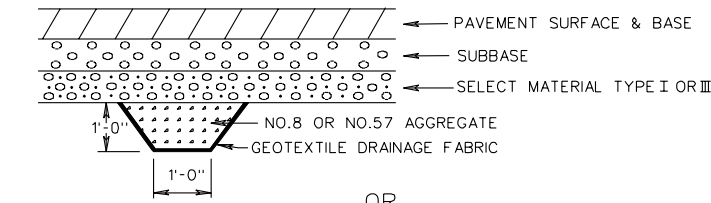
108.04

VIRGINIA DEPARTMENT OF TRANSPORTATION

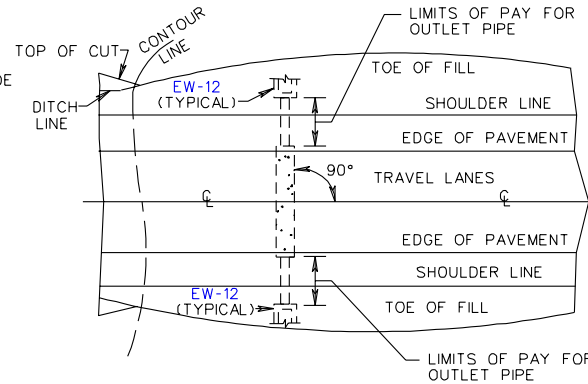
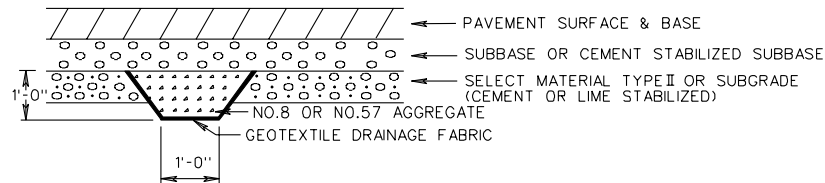


COMBINATION UNDERDRAIN CD-2 ON FILLS
CENTER LINE SECTION
(WITH TYPE I SELECT MATERIAL)

TRENCH PLACEMENT



OR



PLAN VIEW SHOWING PLACEMENT OF
CD-2 UNDERDRAIN

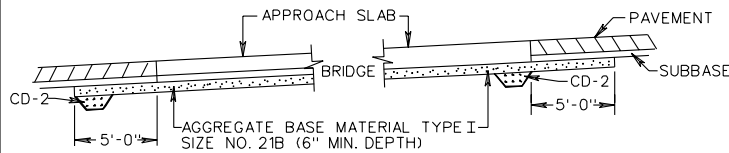
NON-PERFORATED OUTLET PIPE

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

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

GENERAL NOTES

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



PLACEMENT OF CD-2 UNDERDRAIN AT
BRIDGE APPROACH SLABS

SPECIFICATION
REFERENCE

232
501
701

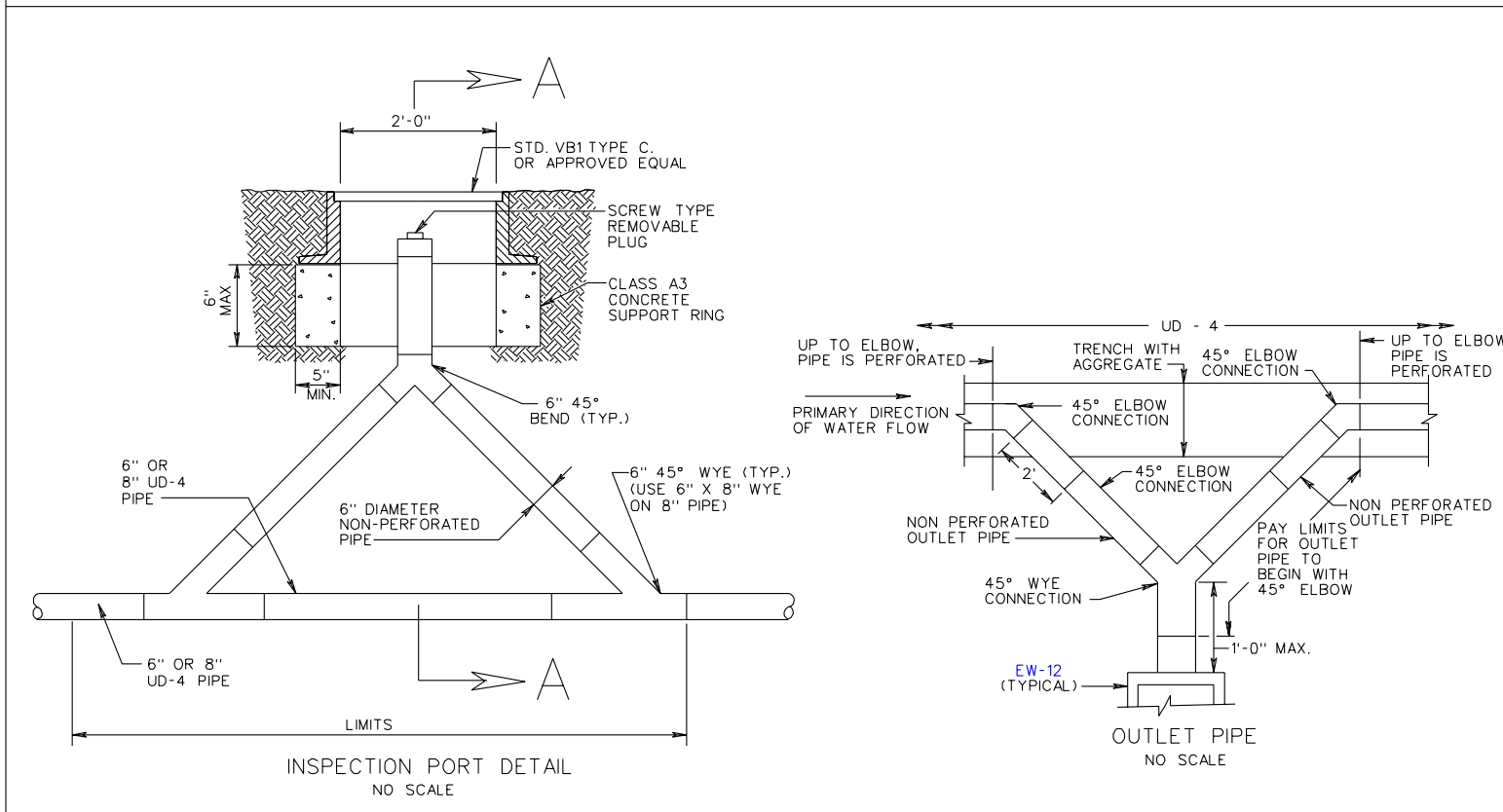
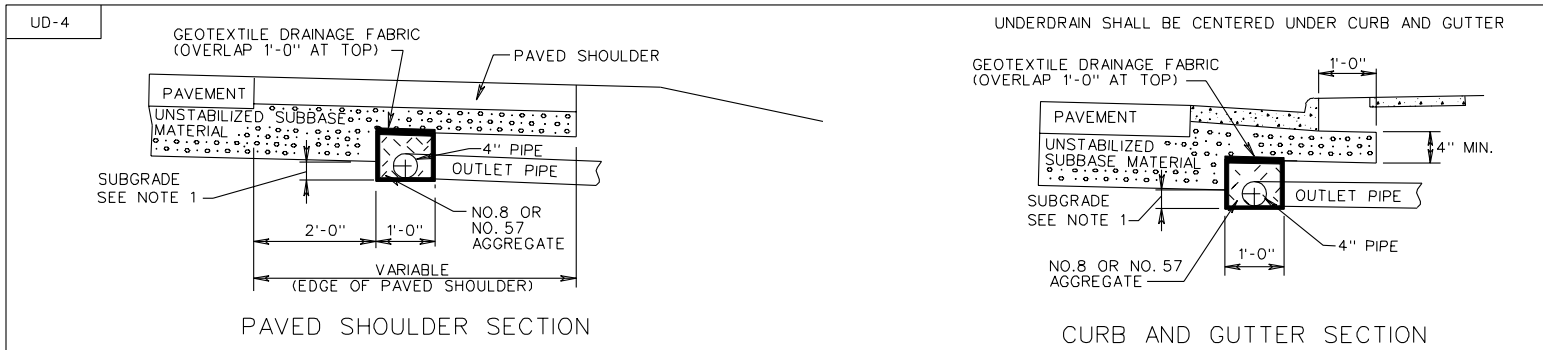
STANDARD COMBINATION UNDERDRAIN
(AT GRADE SAGS AND BRIDGE APPROACHES)

VIRGINIA DEPARTMENT OF TRANSPORTATION

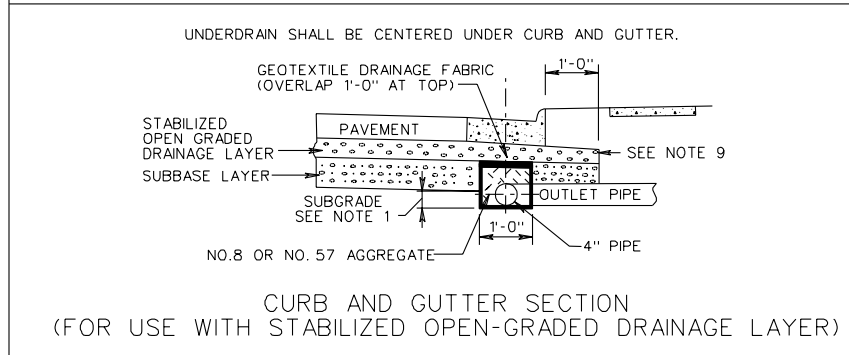
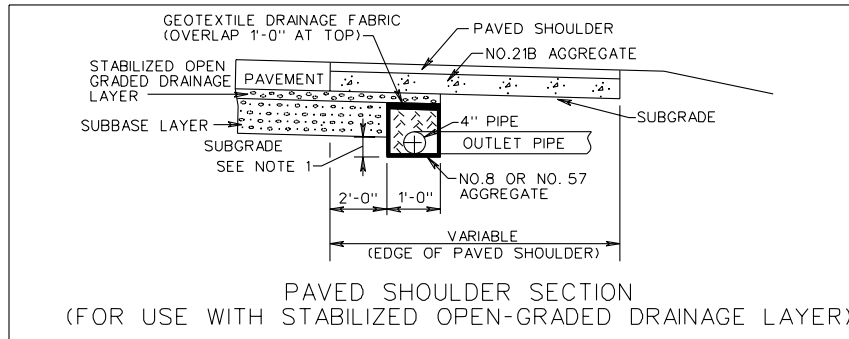
Rev. 7/03

108.05

INSERTABLE SHEET A81



INSERTABLE SHEET A81



NOTES:

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

LONGITUDINAL PERFORATED PIPE

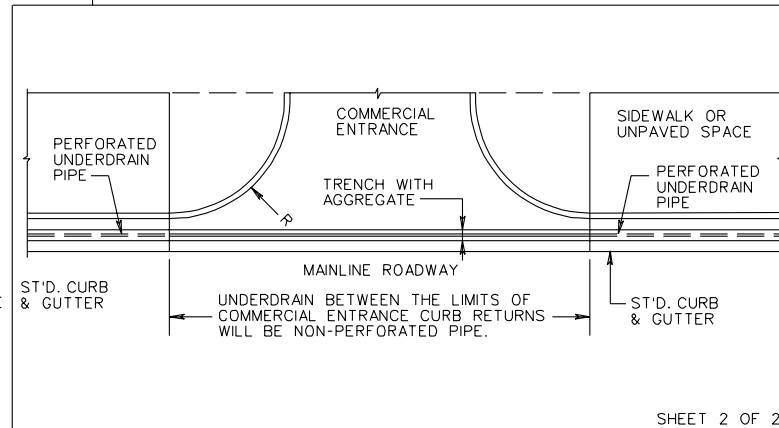
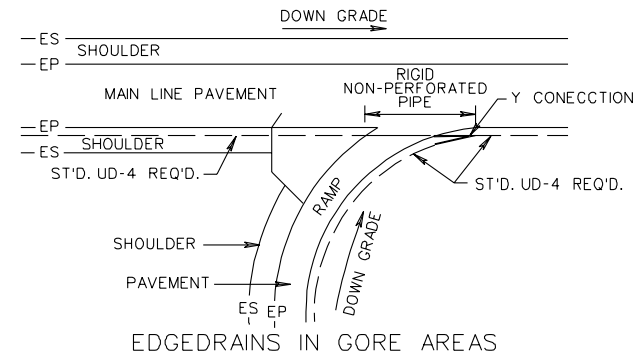
UD-4

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

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

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

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



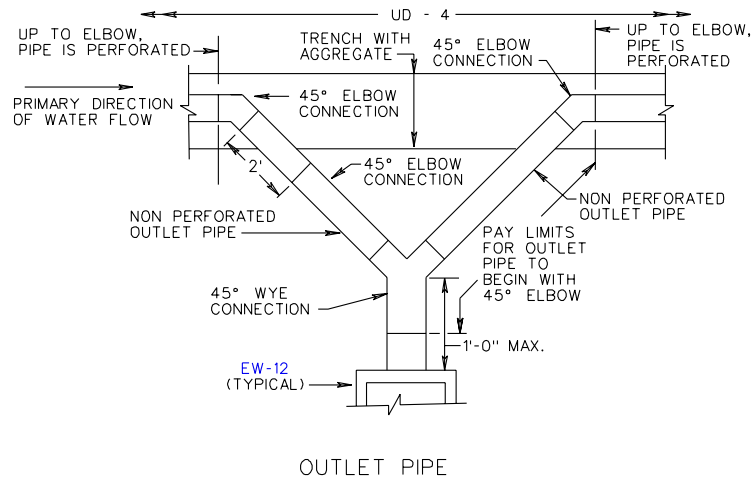
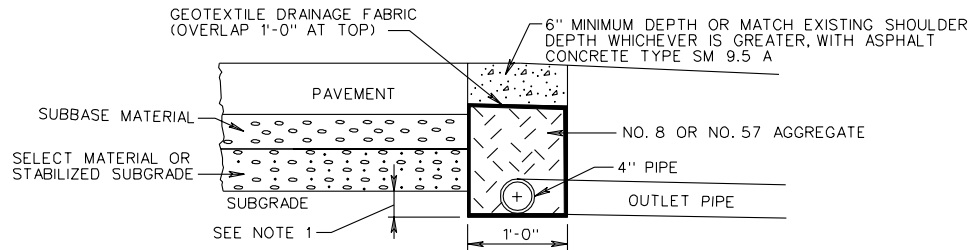
SHEET 2 OF 2

SPECIFICATION REFERENCE
240
258
501
701

STANDARD PAVEMENT EDGEDRAIN

VIRGINIA DEPARTMENT OF TRANSPORTATION

Rev. 7/03
108.07



NOTES:

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

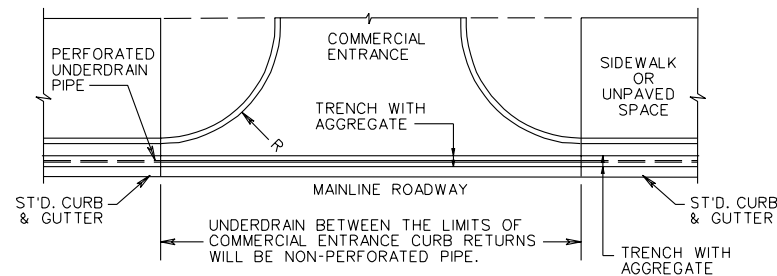
LONGITUDINAL PERFORATED PIPE

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

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

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

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



SPECIFICATION REFERENCE

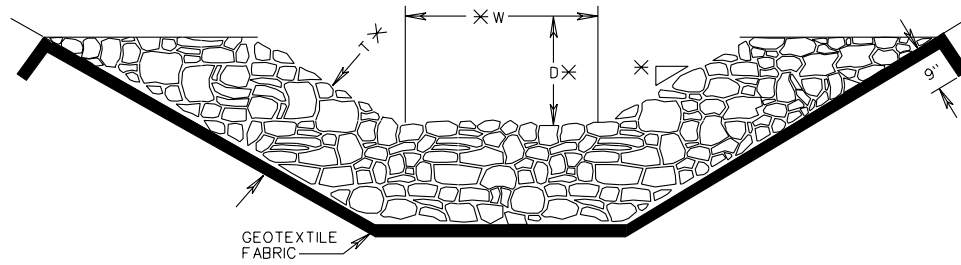
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STANDARD RETROFIT EDGEDRAIN

VIRGINIA DEPARTMENT OF TRANSPORTATION

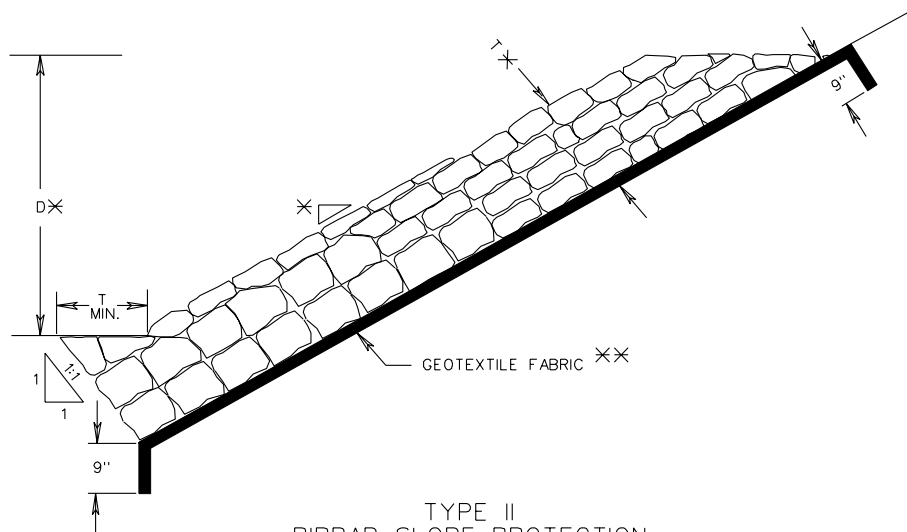
Rev. 7/03

108.09



TYPE I
RIPRAP DITCH PROTECTION

MINIMUM THICKNESS "T"	
RIP RAP CLASS	MINIMUM "T"
CLASS AI	20"
CLASS I	26"
CLASS II	38"
CLASS III	53"



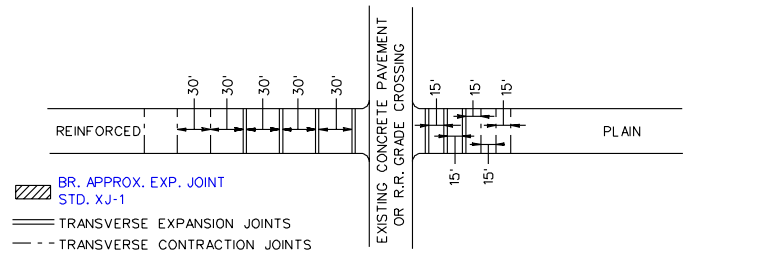
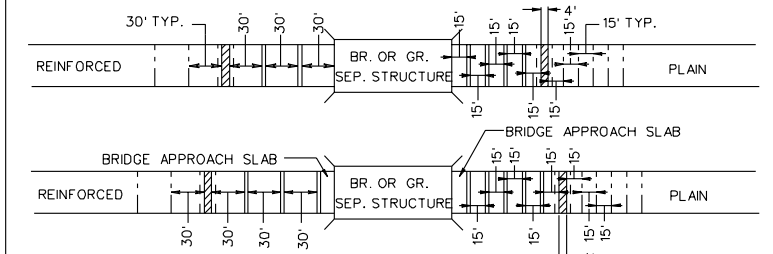
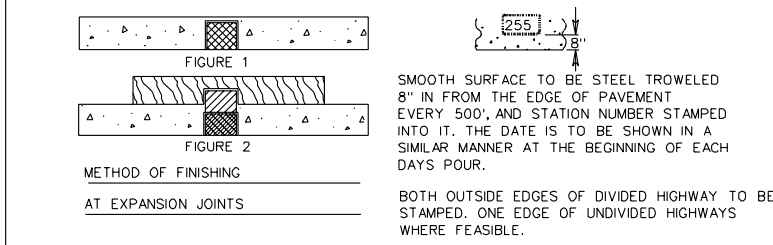
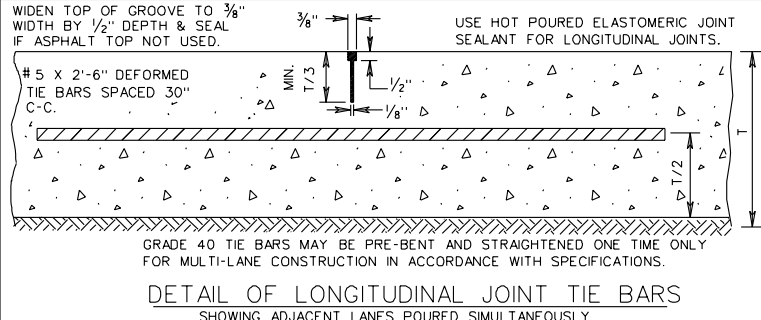
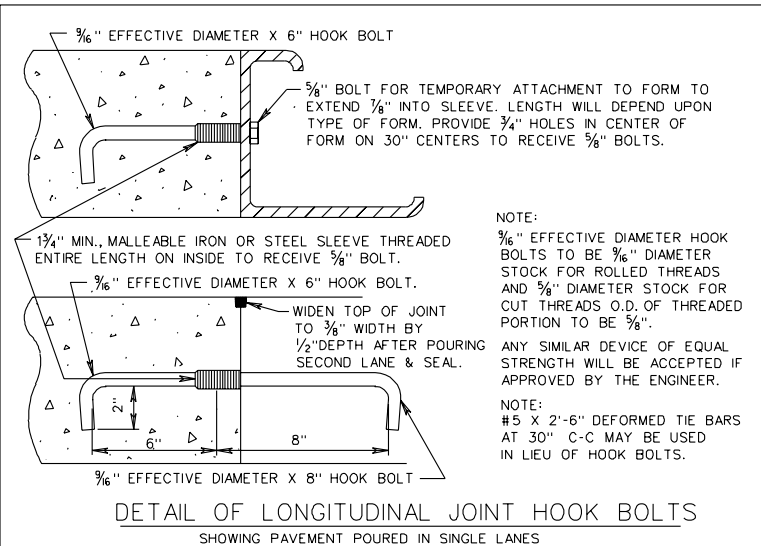
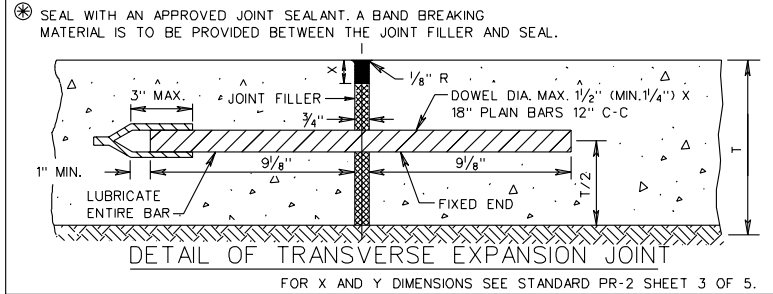
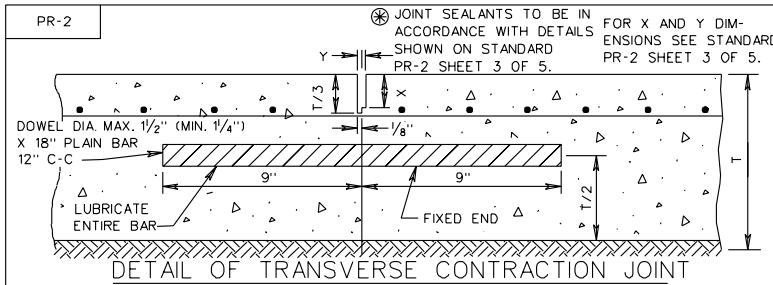
TYPE II
RIPRAP SLOPE PROTECTION

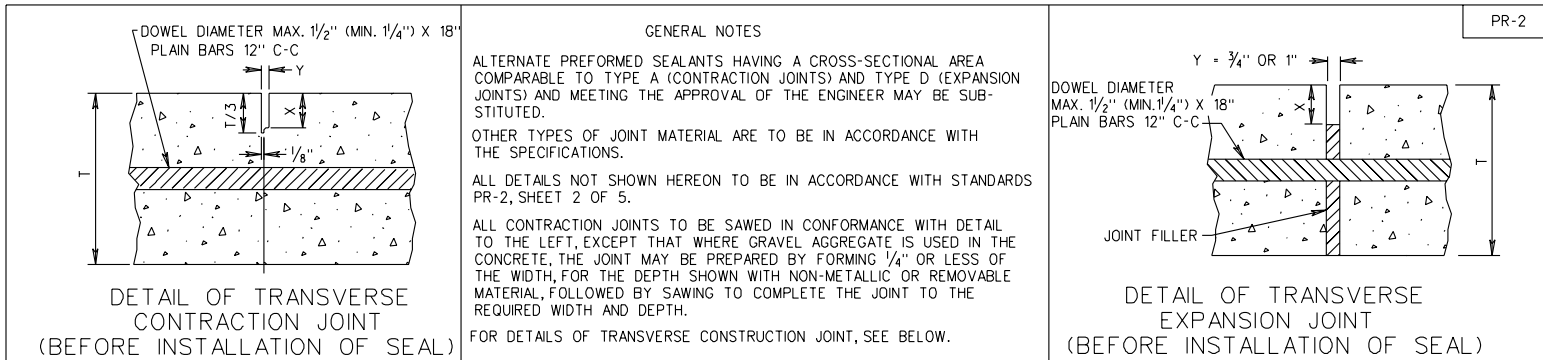
NOTES:

- ×× RIP RAP BEDDING MATERIAL
- GEOTEXTILE FABRIC TO BE PROVIDED UNDER ALL RIPRAP INSTALLATIONS CLASS AI, CLASS I AND CLASS II UNLESS OTHERWISE NOTED ON THE PLANS OR DIRECTED BY THE ENGINEER.
- RIPRAP INSTALLATIONS OF CLASS III SHALL HAVE AN INTERMEDIATE AGGREGATE BEDDING LAYER(S) AS SPECIFIED ON THE PLANS BASED ON GEOTECHNICAL RECOMMENDATIONS.
- × SEE TYPICAL SECTION SHOWN ON PLANS FOR SIDE SLOPE, BOTTOM WIDTH AND DEPTH OF CHANNEL AND RIPRAP THICKNESS.

SPECIFICATION REFERENCE
245 414

STANDARD RIP RAP DITCH & SLOPE PROTECTION
PG-3





GENERAL NOTES

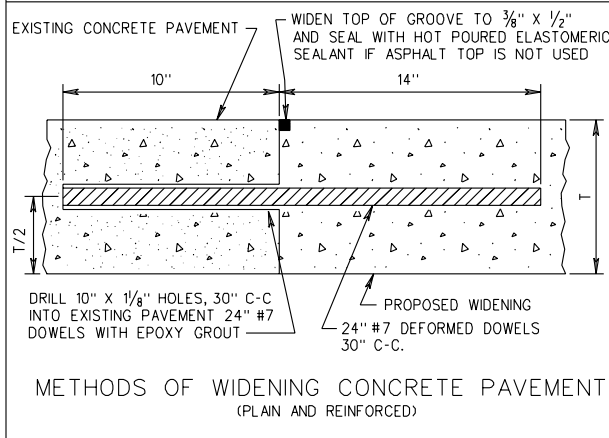
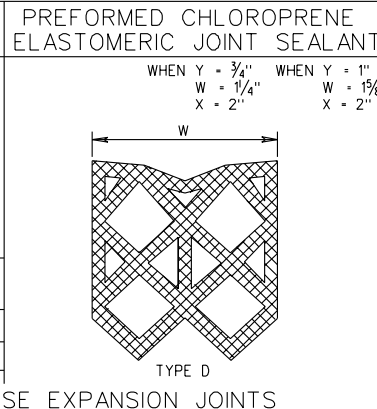
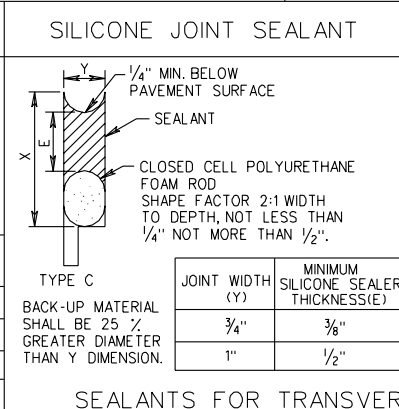
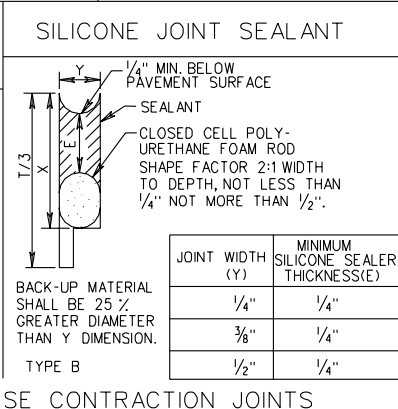
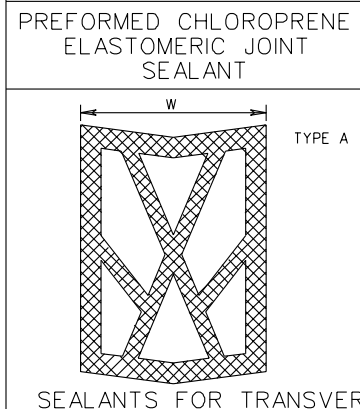
ALTERNATE PREFORMED SEALANTS HAVING A CROSS-SECTIONAL AREA COMPARABLE TO TYPE A (CONTRACTION JOINTS) AND TYPE D (EXPANSION JOINTS) AND MEETING THE APPROVAL OF THE ENGINEER MAY BE SUBSTITUTED.

OTHER TYPES OF JOINT MATERIAL ARE TO BE IN ACCORDANCE WITH THE SPECIFICATIONS.

ALL DETAILS NOT SHOWN HEREON TO BE IN ACCORDANCE WITH STANDARDS PR-2, SHEET 2 OF 5.

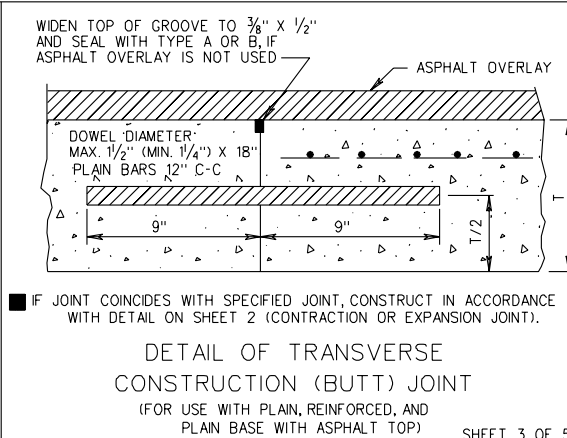
ALL CONTRACTION JOINTS TO BE SAWED IN CONFORMANCE WITH DETAIL TO THE LEFT, EXCEPT THAT WHERE GRAVEL AGGREGATE IS USED IN THE CONCRETE, THE JOINT MAY BE PREPARED BY FORMING 1/4" OR LESS OF THE WIDTH, FOR THE DEPTH SHOWN WITH NON-METALLIC OR REMOVABLE MATERIAL, FOLLOWED BY SAWING TO COMPLETE THE JOINT TO THE REQUIRED WIDTH AND DEPTH.

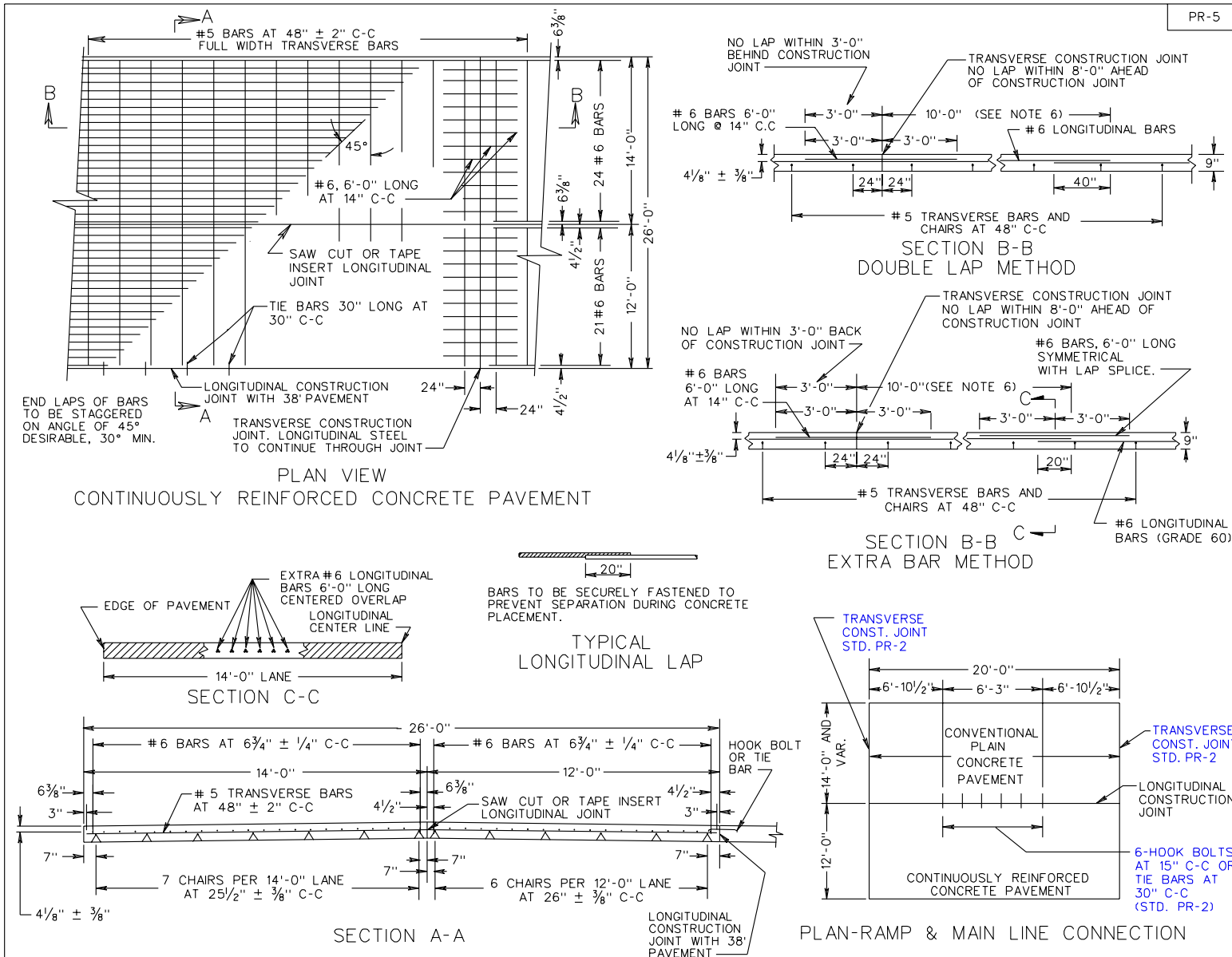
FOR DETAILS OF TRANSVERSE CONSTRUCTION JOINT, SEE BELOW.



FOR 15' SLAB LENGTHS (PLAIN)				
DIMENSION	SEALANT TYPE			
	A	B	C	D
X	1 3/4"	1 1/4"	1 3/4" - 2"	2"
Y	1/4"	1/4"	3/4" OR 1"	3/4" OR 1"
W	3/8" ± 1/16"	-	-	-

FOR 30' SLAB LENGTHS (REINFORCED)				
DIMENSION	SEALANT TYPE			
	A	B	C	D
X	1 3/4"	1 1/4"	1 3/4" OR 2"	2"
Y	3/8"	3/8"	3/4" OR 1"	3/4" OR 1"
W	1 1/4" ± 1/16"	-	-	-



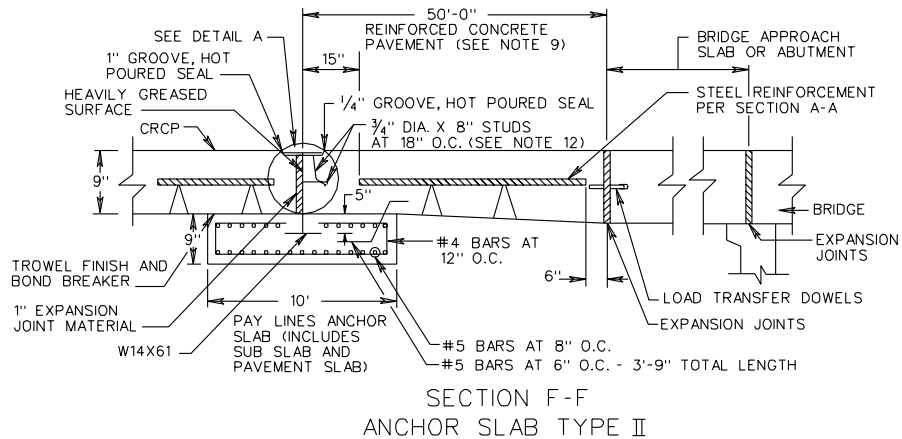
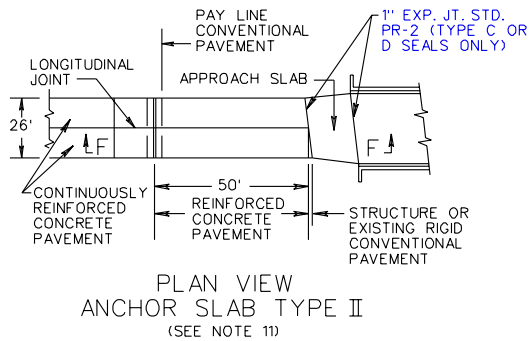
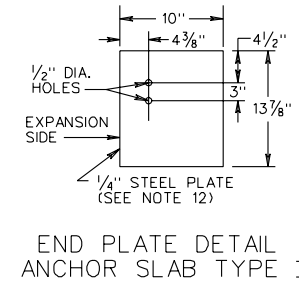
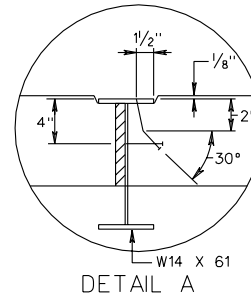
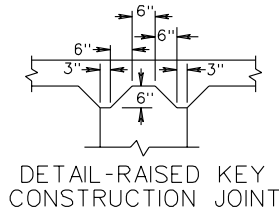
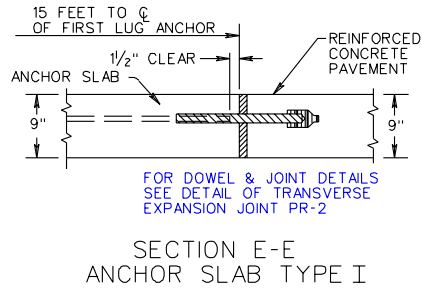
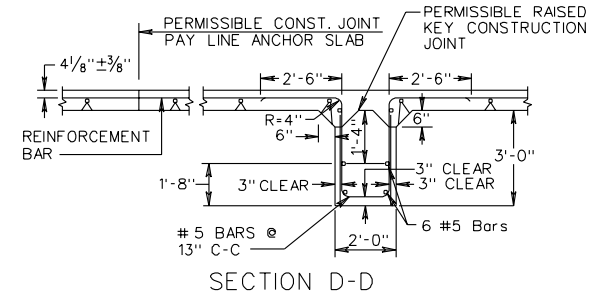
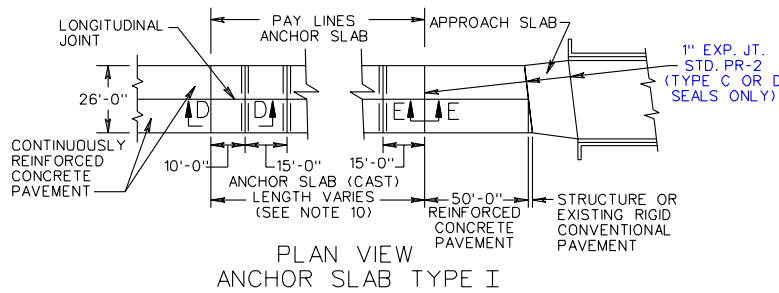


SEE SHEET 3 OF 3 FOR NOTES.

SHEET 1 OF 3

SPECIFICATION REFERENCE	<p>9" THICK CONTINUOUSLY REINFORCED CONCRETE PAVEMENT</p> <p>14 FOOT TRAVEL LANE</p> <p>VIRGINIA DEPARTMENT OF TRANSPORTATION</p>	<p>REV. 7/03</p> <p>301.13</p>
316		

PR-5



SHEET 2 OF 3

SEE SHEET 3 OF 3 FOR NOTES.

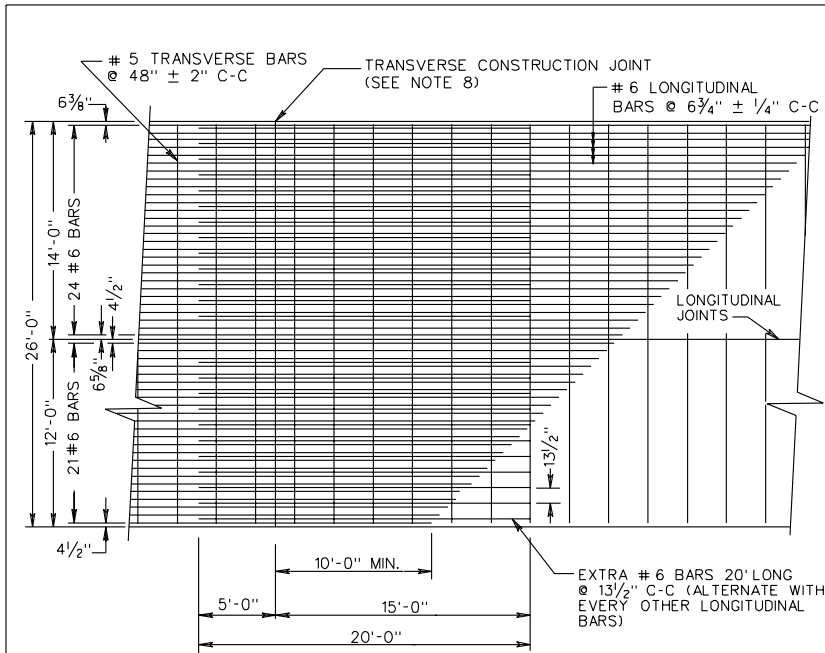
9" THICK CONTINUOUSLY REINFORCED CONCRETE PAVEMENT
14 FOOT TRAVEL LANE

REV. 7/03
301.14

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION
REFERENCE

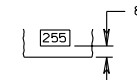
316



PLAN VIEW
LEAVE OUT JOINT
STEEL BAR REINFORCEMENT ONLY

NOTES:

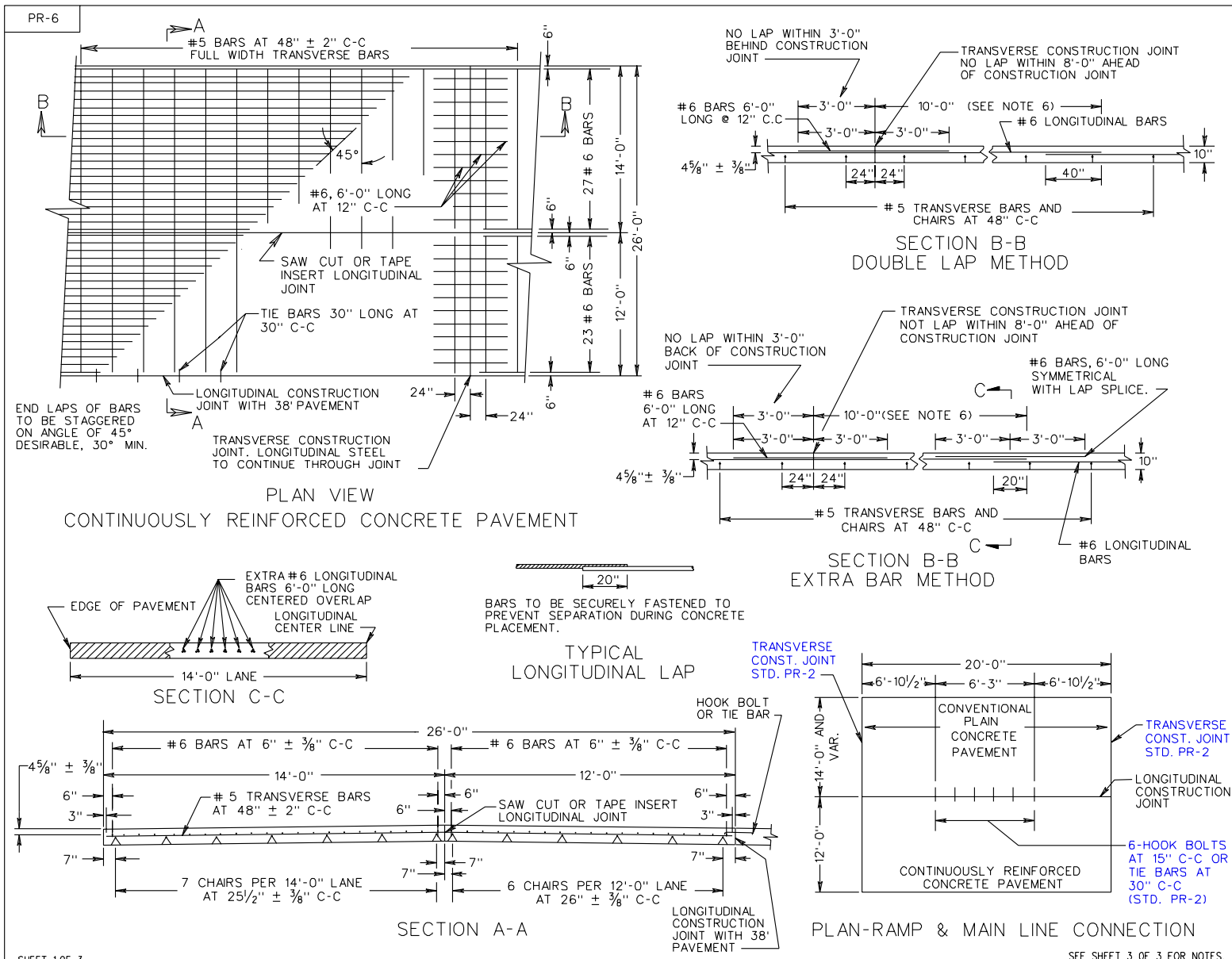
1. HOOK BOLTS OR TIE BARS ARE TO BE PLACED IN THE SAME HORIZONTAL PLANE AS THE # 5 TRANSVERSE BARS. WHERE NECESSARY, ADJUST THE LOCATION OF THE HOOK BOLTS OR TIE BARS TO A 2 1/2" MINIMUM CLEARANCE BETWEEN HOOK BOLTS OR TIE BARS AND TRANSVERSE BARS.
2. TRANSVERSE CONSTRUCTION JOINT BARS ARE TO BE PLACED IN THE SAME HORIZONTAL PLANE AS THE #6 LONGITUDINAL BARS.
3. # 6 LONGITUDINAL BARS ARE TO BE LAPPED AND TIED IN THE SAME HORIZONTAL PLANE.
4. FOR THE 38 FOOT WIDTH PAVEMENT USE SINGLE 12 FOOT LANES WITH TWO LONGITUDINAL CONSTRUCTION JOINTS OR 12 FOOT AND 14 FOOT LANES WITH ONE LONGITUDINAL CONSTRUCTION JOINT AND ONE SAW CUT OR TAPE INSERT LONGITUDINAL JOINT. TRANSVERSE BARS SHALL NOT EXTEND THROUGH LONGITUDINAL CONSTRUCTION JOINTS, BUT SHALL EXTEND FULL LENGTH (25'-6") FOR SAW CUT OR TAPE INSERT LONGITUDINAL JOINT.
5. SMOOTH SURFACE TO BE STEEL TROWELED 8" IN FROM EDGE OF PAVEMENT EVERY 500 FT., AND THE STATION NUMBER STAMPED INTO IT AS SHOWN BELOW. THE DATE IS TO BE SHOWN IN A SIMILAR MANNER AT THE BEGINNING OF EACH DAYS POUR. BOTH OUTSIDE EDGES OF DIVIDED HIGHWAY IS TO BE STAMPED. ONE EDGE OF UNDIVIDED HIGHWAY WHERE FEASIBLE (TRAVEL LANE).

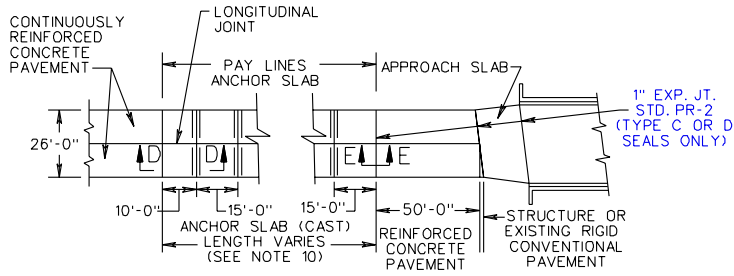


6. DOUBLE LAP REQUIREMENT (40") AND THE EXTRA BAR METHOD APPLY ONLY TO LAPS FALLING WITHIN AN AREA OF 10' BEYOND THE CONSTRUCTION JOINT.
7. CONCRETE FOR LUG ANCHORS SHALL BE POURED AGAINST COMPACTED SUBGRADE. CONCRETE FOR LUGS AND ANCHOR SLAB MAY BE POURED MONOLITHICALLY OR POURED USING RAISED KEY CONSTRUCTION JOINT METHOD. ADEQUATE CONSOLIDATION OF CONCRETE IN LUGS WILL BE OBTAINED WITHOUT DISPLACING LONGITUDINAL CONTINUOUS STEEL, BY THE USE OF INTERNAL VIBRATION. WHEN LESS THAN FULL WIDTH LUG AND PAVEMENT SLAB IS PLACED, THE # 5 TRANSVERSE STEEL IN THE LUGS SHALL BE EXTENDED, LAPPED AND SPLICED AT LEAST 25 DIAMETERS.
8. LONGITUDINAL STEEL TO CONTINUE THROUGH JOINT. EXTRA # 6 BARS 20' LONG SHALL BE SPACED AT 13 1/2" C-C.
9. CONCRETE SHOULD BE ADEQUATELY VIBRATED UNDER BEAM FLANGE TO ELIMINATE HONEYCOMBS.
10. IN CONDITIONS OF SOFT CLAY UNDERLYING SOILS (AASHTO SOIL CLASSIFICATION OF GROUP A-4, A-5, A-6, OR A-7) INCLUSIVE OF SUBGROUPS (PER AASHTO MATERIALS SPECIFICATIONS M 145), AN ANCHOR SLAB TYPE I UTILIZING 5 ANCHOR LUGS (ANCHOR SLAB LENGTH = 85") OR AN ANCHOR SLAB TYPE II SHALL BE USED. REINFORCEMENT STEEL SIZE AND SPACING WILL BE THE SAME AS THE CONTINUOUS CONCRETE PAVEMENT.

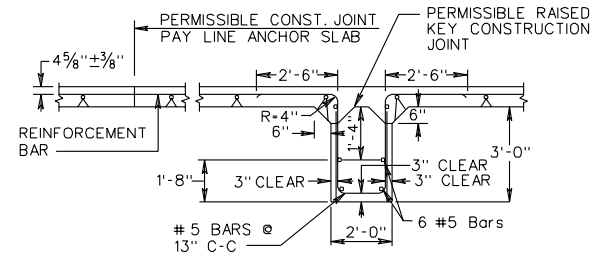
IN CONDITIONS OF GRANULAR UNDERLYING SOILS ONLY (AASHTO SOIL CLASSIFICATION OF GROUP A-1, A-2, OR A-3) INCLUSIVE OF SUBGROUPS (PER AASHTO MATERIALS SPECIFICATIONS M 145), AN ANCHOR SLAB TYPE I UTILIZING 3 ANCHOR LUGS (ANCHOR SLAB LENGTH = 55") OR AN ANCHOR SLAB TYPE II MAY BE USED. REINFORCEMENT STEEL SIZE AND SPACING WILL BE THE SAME AS THE CONTINUOUS CONCRETE PAVEMENT.
11. WELD STEEL END PLATE TO BOTH ENDS OF WF BEAM TO SEAL ENDS. WELD SHEAR CONNECTORS TO WEB AND FLANGE OF WF BEAM.
12. 2 INCH MINIMUM CONCRETE COVER FOR STEEL IN SUB-SLABS.
13. WIDE FLANGE BEAM TO BE TREATED WITH CORROSION INHIBITOR PER SECTION 407 OF THE ROAD AND BRIDGE SPECIFICATIONS.
14. ALL REINFORCED BARS SHALL BE GRADE 60 STEEL.
15. THE USE OF TUBE FEEDING TO PLACE REINFORCEMENT IN PLASTIC CONCRETE WILL NOT BE ALLOWED.

<p>SPECIFICATION REFERENCE</p> <p>316</p>	<p>9" THICK CONTINUOUSLY REINFORCED CONCRETE PAVEMENT 14 FOOT TRAVEL LANE</p> <p>VIRGINIA DEPARTMENT OF TRANSPORTATION</p>	<p>REV. 7/03</p> <p>301.15</p>
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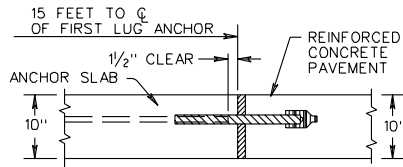




PLAN VIEW ANCHOR SLAB TYPE I

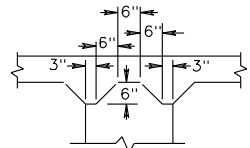


SECTION D-D

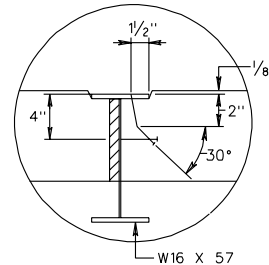


SECTION E-E ANCHOR SLAB TYPE I

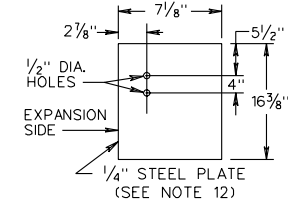
FOR DOWEL & JOINT DETAILS SEE DETAIL OF TRANSVERSE EXPANSION JOINT PR-2



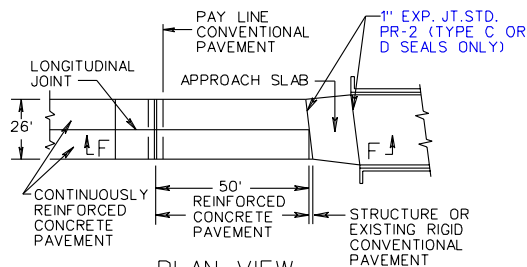
DETAIL-RAISED KEY CONSTRUCTION JOINT



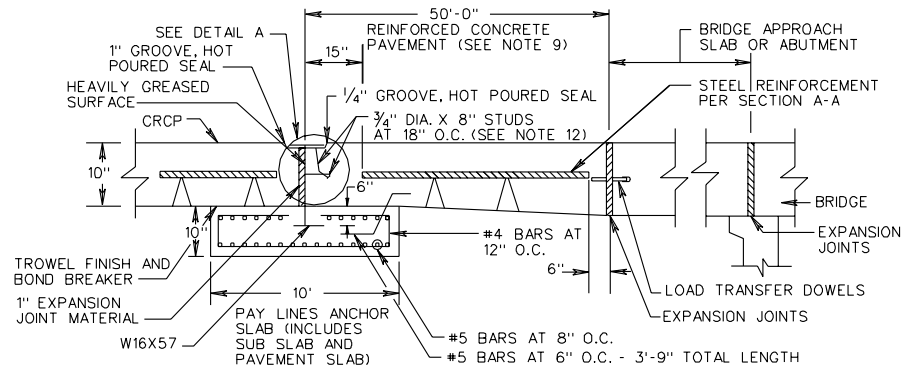
DETAIL A



ANCHOR SLAB TYPE II END PLATE DETAIL



PLAN VIEW ANCHOR SLAB TYPE II (SEE NOTE 11)



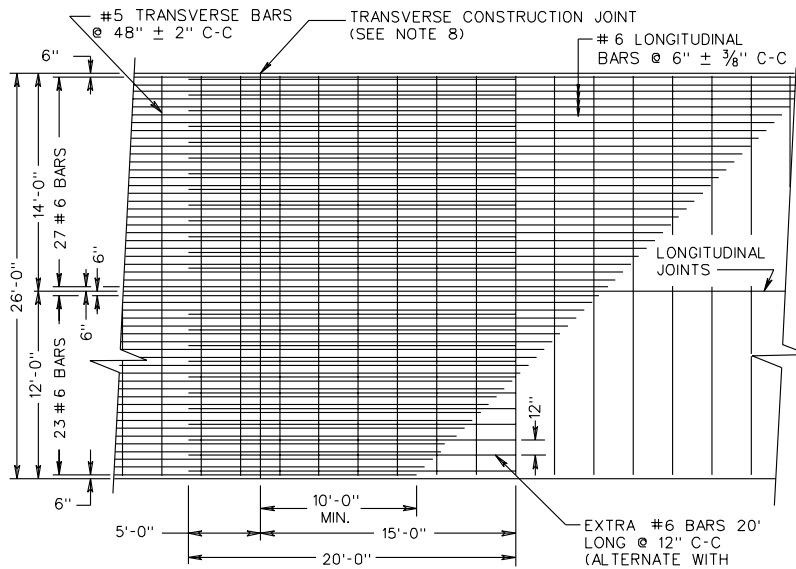
SECTION F-F ANCHOR SLAB TYPE II

SEE SHEET 3 OF 3 FOR NOTES

SHEET 2 OF 3

SPECIFICATION REFERENCE	<p>10" THICK CONTINUOUSLY REINFORCED CONCRETE PAVEMENT 14 FOOT TRAVEL LANE</p> <p>VIRGINIA DEPARTMENT OF TRANSPORTATION</p>	REV. 7/03
316		301.17

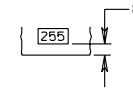
PR-6



PLAN VIEW
LEAVE OUT JOINT
STEEL BAR REINFORCEMENT ONLY

NOTES:

1. HOOK BOLTS OR TIE BARS ARE TO BE PLACED IN THE SAME HORIZONTAL PLANE AS THE # 5 TRANSVERSE BARS. WHERE NECESSARY, ADJUST THE LOCATION OF THE HOOK BOLTS OR TIE BARS TO A 2 1/2" MINIMUM CLEARANCE BETWEEN HOOK BOLTS OR TIE BARS AND TRANSVERSE BARS.
2. TRANSVERSE CONSTRUCTION JOINT BARS ARE TO BE PLACED IN THE SAME HORIZONTAL PLANE AS THE #6 LONGITUDINAL BARS.
3. # 6 LONGITUDINAL BARS ARE TO BE LAPPED AND TIED IN THE SAME HORIZONTAL PLANE.
4. FOR THE 38 FOOT WIDTH PAVEMENT USE SINGLE 12 FOOT LANES WITH TWO LONGITUDINAL CONSTRUCTION JOINTS OR 12 FOOT AND 14 FOOT LANES WITH ONE LONGITUDINAL CONSTRUCTION JOINT AND ONE SAW CUT OR TAPE INSERT LONGITUDINAL JOINT. TRANSVERSE BARS SHALL NOT EXTEND THROUGH LONGITUDINAL CONSTRUCTION JOINTS, BUT SHALL EXTEND FULL LENGTH (25'-6') FOR SAW CUT OR TAPE INSERT LONGITUDINAL JOINT.
5. SMOOTH SURFACE TO BE STEEL TROWELED 8" IN FROM EDGE OF PAVEMENT EVERY 500 FT., AND THE STATION NUMBER STAMPED INTO IT AS SHOWN BELOW. THE DATE IS TO BE SHOWN IN A SIMILAR MANNER AT THE BEGINNING OF EACH DAYS POUR. BOTH OUTSIDE EDGES OF DIVIDED HIGHWAY IS TO BE STAMPED. ONE EDGE OF UNDIVIDED HIGHWAY WHERE FEASIBLE (TRAVEL LANE).



6. DOUBLE LAP REQUIREMENT (40") AND THE EXTRA BAR METHOD APPLY ONLY TO LAPS FALLING WITHIN AN AREA OF 10' BEYOND THE CONSTRUCTION JOINT.
7. CONCRETE FOR LUG ANCHORS SHALL BE POURED AGAINST COMPACTED SUBGRADE. CONCRETE FOR LUGS AND ANCHOR SLAB MAY BE POURED MONOLITHICALLY OR POURED USING RAISED KEY CONSTRUCTION JOINT METHOD. ADEQUATE CONSOLIDATION OF CONCRETE IN LUGS WILL BE OBTAINED WITHOUT DISPLACING LONGITUDINAL CONTINUOUS STEEL. BY THE USE OF INTERNAL VIBRATION. WHEN LESS THAN FULL WIDTH LUG AND PAVEMENT SLAB IS PLACED, THE #5 TRANSVERSE STEEL IN THE LUGS SHALL BE EXTENDED, LAPPED AND SPLICED AT LEAST 25 DIAMETERS.
8. LONGITUDINAL STEEL TO CONTINUE THROUGH JOINT. EXTRA #6 BARS 20' LONG SHALL BE SPACED AT 13 1/2" C-C.
9. CONCRETE SHOULD BE ADEQUATELY VIBRATED UNDER BEAM FLANGE TO ELIMINATE HONEYCOMBS.
10. IN CONDITIONS OF SOFT CLAY UNDERLYING SOILS (AASHTO SOIL CLASSIFICATION OF GROUP A-4, A-5, A-6, OR A-7) INCLUSIVE OF SUBGROUPS (PER AASHTO MATERIALS SPECIFICATIONS M 145), AN ANCHOR SLAB TYPE I UTILIZING 5 ANCHOR LUGS (ANCHOR SLAB LENGTH = 85') OR AN ANCHOR SLAB TYPE II SHALL BE USED. REINFORCEMENT STEEL SIZE AND SPACING WILL BE THE SAME AS THE CONTINUOUS CONCRETE PAVEMENT.
- IN CONDITIONS OF GRANULAR UNDERLYING SOILS ONLY (AASHTO SOIL CLASSIFICATION OF GROUP A-1, A-2, OR A-3) INCLUSIVE OF SUBGROUPS (PER AASHTO MATERIALS SPECIFICATIONS M 145), AN ANCHOR SLAB TYPE I UTILIZING 3 ANCHOR LUGS (ANCHOR SLAB LENGTH = 55') OR AN ANCHOR SLAB TYPE II MAY BE USED. REINFORCEMENT STEEL SIZE AND SPACING WILL BE THE SAME AS THE CONTINUOUS CONCRETE PAVEMENT.
11. WELD STEEL END PLATE TO BOTH ENDS OF WF BEAM TO SEAL ENDS. WELD SHEAR CONNECTORS TO WEB AND FLANGE OF WF BEAM.
12. 2 INCH MINIMUM CONCRETE COVER FOR STEEL IN SUB-SLABS.
13. WIDE FLANGE BEAM TO BE TREATED WITH CORROSION INHIBITOR PER SECTION 407 OF THE ROAD AND BRIDGE SPECIFICATIONS.
14. ALL REINFORCED BARS SHALL BE GRADE 60 STEEL.
15. THE USE OF TUBE FEEDING TO PLACE REINFORCEMENT IN PLASTIC CONCRETE WILL NOT BE ALLOWED.

SHEET 3 OF 3

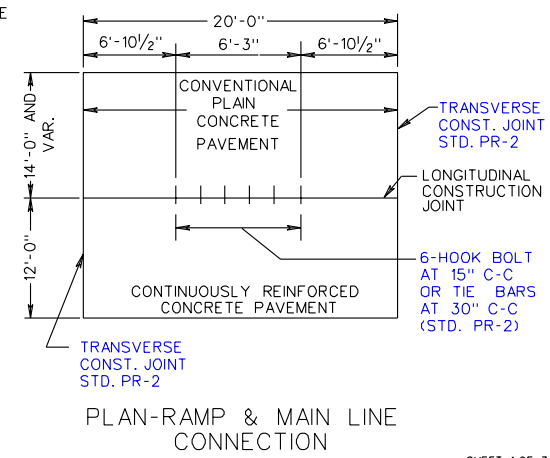
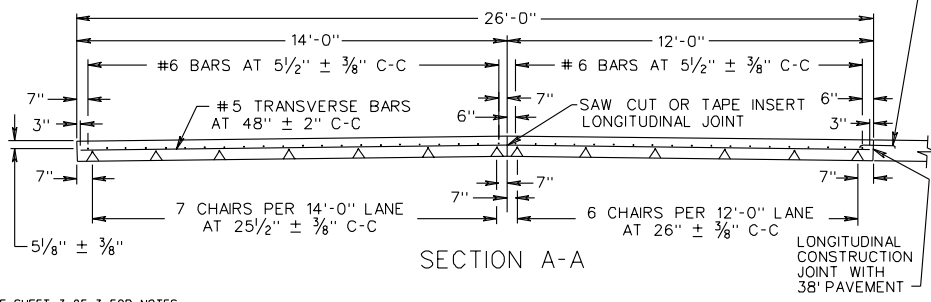
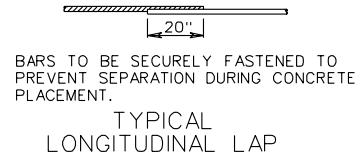
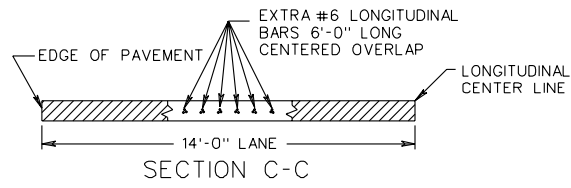
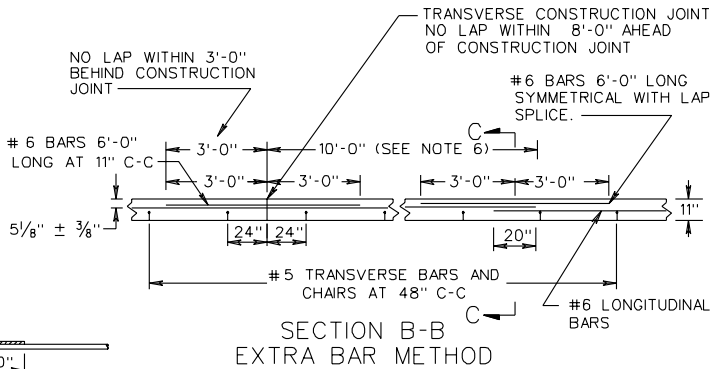
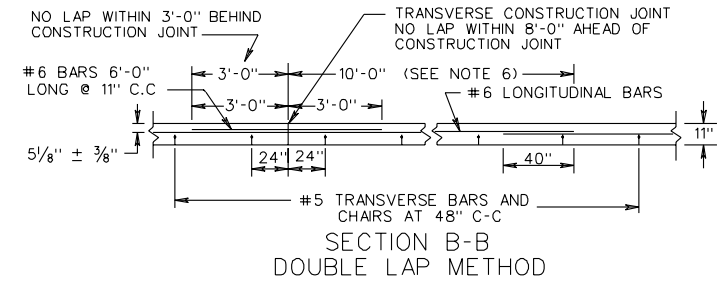
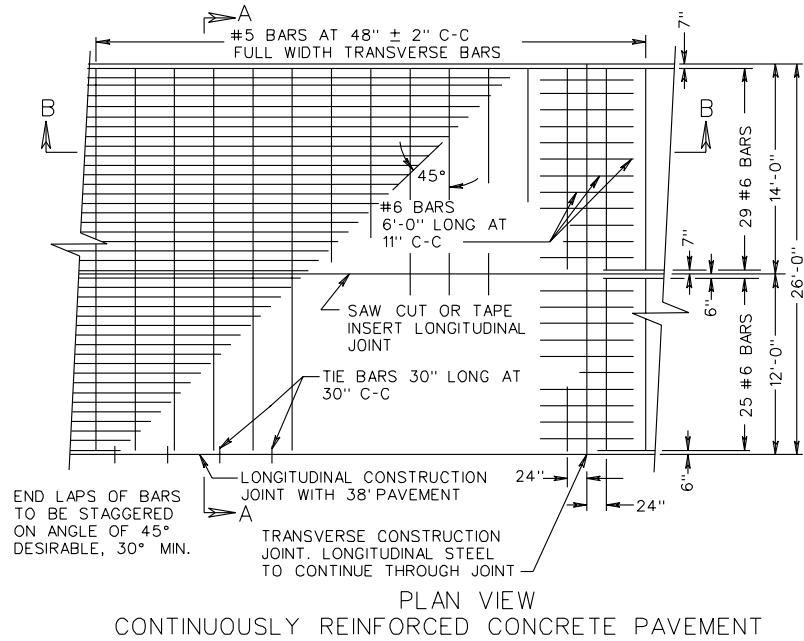
10" THICK CONTINUOUSLY REINFORCED CONCRETE PAVEMENT
14 FOOT TRAVEL LANE

REV. 7/03
301.18

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION
REFERENCE

316

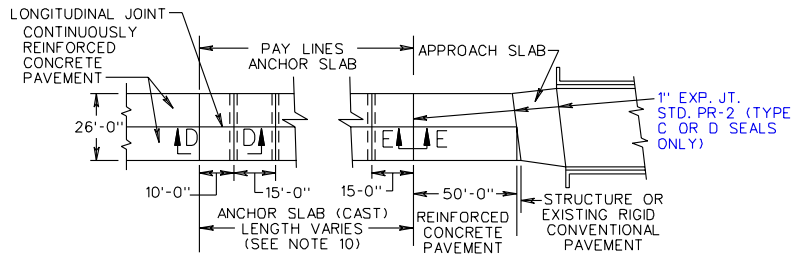


SEE SHEET 3 OF 3 FOR NOTES

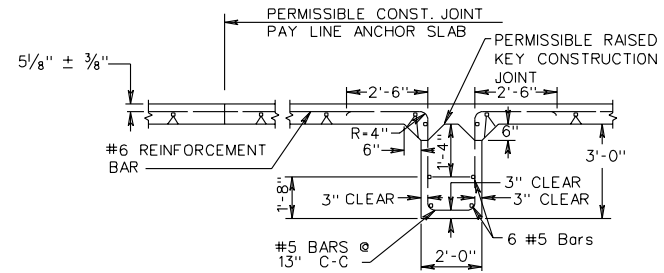
SHEET 1 OF 3

SPECIFICATION REFERENCE	11" THICK CONTINUOUSLY REINFORCED CONCRETE PAVEMENT 14 FOOT TRAVEL LANE
316	VIRGINIA DEPARTMENT OF TRANSPORTATION
	REV. 7/03 301.19

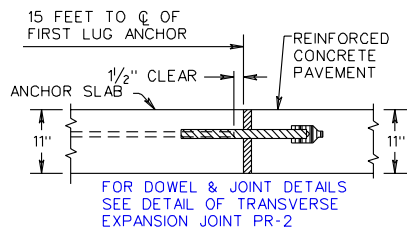
PR-7



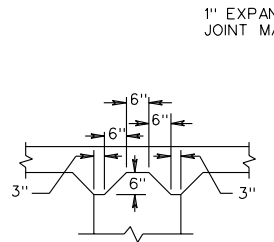
PLAN VIEW
ANCHOR SLAB TYPE I



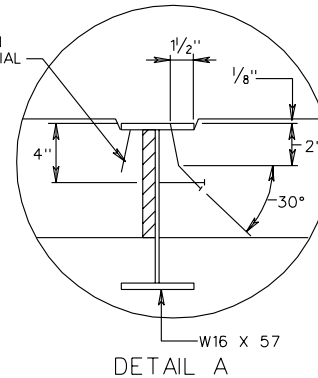
SECTION D-D



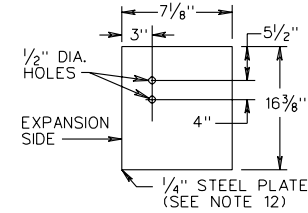
SECTION E-E
ANCHOR SLAB TYPE I



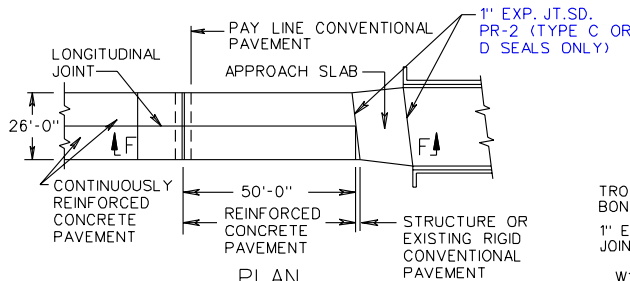
DETAIL-RAISED KEY
CONSTRUCTION JOINT



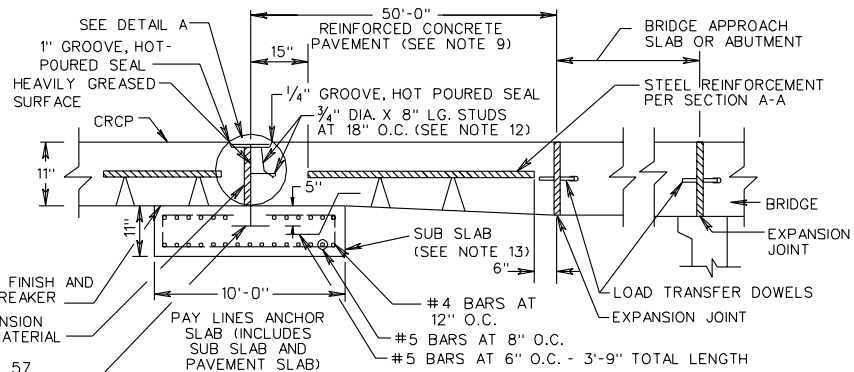
DETAIL A



ANCHOR SLAB TYPE II
END PLATE DETAIL



PLAN
ANCHOR SLAB TYPE II
(SEE NOTE 11)



SECTION F-F
ANCHOR SLAB TYPE II

SHEET 2 OF 3

SEE SHEET 3 OF 3 FOR NOTES

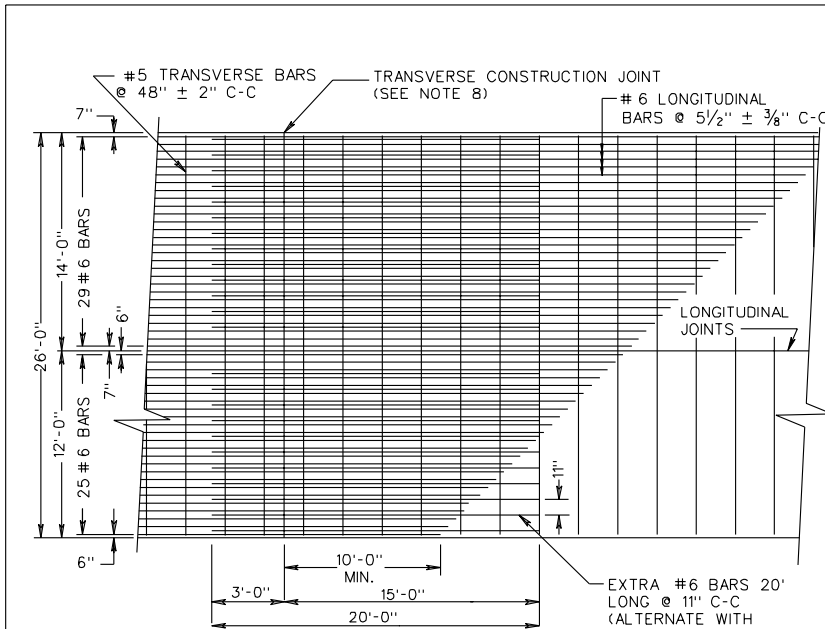
11" THICK CONTINUOUSLY REINFORCED CONCRETE PAVEMENT
14 FOOT TRAVEL LANE

REV. 7/03
301.20

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION
REFERENCE

316



PLAN VIEW
LEAVE OUT JOINT
STEEL BAR REINFORCEMENT ONLY

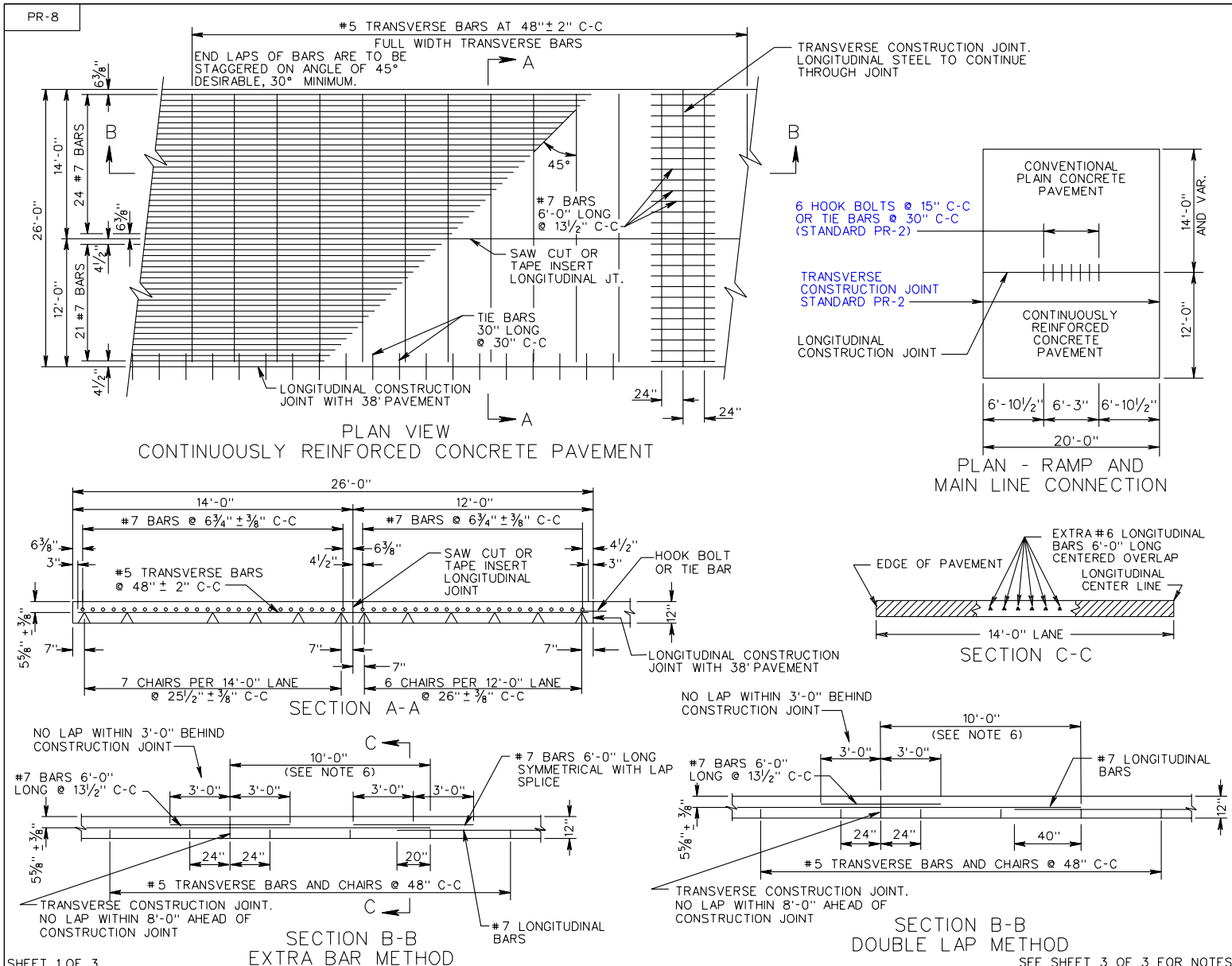
NOTES:

1. HOOK BOLTS OR TIE BARS ARE TO BE PLACED IN THE SAME HORIZONTAL PLANE AS THE #5 TRANSVERSE BARS. WHERE NECESSARY, ADJUST THE LOCATION OF THE HOOK BOLTS OR TIE BARS TO A 2 1/2" MINIMUM CLEARANCE BETWEEN HOOK BOLTS OR TIE BARS AND TRANSVERSE BARS.
2. TRANSVERSE CONSTRUCTION JOINT BARS ARE TO BE PLACED IN THE SAME HORIZONTAL PLANE AS THE #6 LONGITUDINAL BARS.
3. #6 LONGITUDINAL BARS ARE TO BE LAPPED AND TIED IN THE SAME HORIZONTAL PLANE.
4. FOR THE 38 FOOT WIDTH PAVEMENT USE SINGLE 12 FOOT LANES WITH TWO LONGITUDINAL CONSTRUCTION JOINTS OR 12 FOOT AND 14 FOOT LANES WITH ONE LONGITUDINAL CONSTRUCTION JOINT AND ONE SAW CUT OR TAPE INSERT LONGITUDINAL JOINT. TRANSVERSE BARS SHALL NOT EXTEND THROUGH LONGITUDINAL CONSTRUCTION JOINTS, BUT SHALL EXTEND FULL LENGTH (25'-6") FOR SAW CUT OR TAPE INSERT LONGITUDINAL JOINT.
5. SMOOTH SURFACE TO BE STEEL TROWELED 8" IN FROM EDGE OF PAVEMENT EVERY 500 FT., AND THE STATION NUMBER STAMPED INTO IT AS SHOWN BELOW. THE DATE IS TO BE SHOWN IN A SIMILIAR MANNER AT THE BEGINNING OF EACH DAYS POUR. BOTH OUTSIDE EDGES OF DIVIDED HIGHWAY ARE TO BE STAMPED. ONE EDGE OF UNDIVIDED HIGHWAY WHERE FEASIBLE (TRAVEL LANE).
6. DOUBLE LAP REQUIREMENT (40") AND THE EXTRA BAR METHOD APPLY ONLY TO LAPS FALLING WITHIN AN AREA OF 10' BEYOND THE CONSTRUCTION JOINT.
7. CONCRETE FOR LUG ANCHORS SHALL BE POURED AGAINST COMPACTED SUBGRADE. CONCRETE FOR LUGS AND ANCHOR SLAB MAY BE POURED MONOLITHICALLY OR POURED USING RAISED KEY CONSTRUCTION JOINT METHOD. ADEQUATE CONSOLIDATION OF CONCRETE IN LUGS WILL BE OBTAINED WITHOUT DISPLACING LONGITUDINAL CONTINUOUS STEEL BY THE USE OF INTERNAL VIBRATION. WHEN LESS THAN FULL WIDTH LUG AND PAVEMENT SLAB IS PLACED, THE #5 TRANSVERSE STEEL IN THE LUGS SHALL BE EXTENDED, LAPPED AND SPLICED AT LEAST 25 DIAMETERS.
8. LONGITUDINAL STEEL TO CONTINUE THROUGH JOINT. EXTRA #6 BARS 20' LONG SHALL BE SPACED AT 13 1/2" C-C.
9. CONCRETE SHOULD BE ADEQUATELY VIBRATED UNDER BEAM FLANGE TO ELIMINATE HONEYCOMBS.
10. IN CONDITIONS OF SOFT CLAY UNDERLYING SOILS (AASHTO SOIL CLASSIFICATION OF GROUP A-4, A-5, A-6, OR A-7) INCLUSIVE OF SUBGROUPS (PER AASHTO MATERIALS SPECIFICATIONS M 145), AN ANCHOR SLAB TYPE I UTILIZING 5 ANCHOR LUGS (ANCHOR SLAB LENGTH = 85') OR AN ANCHOR SLAB TYPE II SHALL BE USED. REINFORCEMENT STEEL SIZE AND SPACING WILL BE THE SAME AS THE CONTINUOUS CONCRETE PAVEMENT.

IN CONDITIONS OF GRANULAR UNDERLYING SOILS ONLY (AASHTO SOIL CLASSIFICATION OF GROUP A-1, A-2, OR A-3) INCLUSIVE OF SUBGROUPS (PER AASHTO MATERIALS SPECIFICATIONS M 145), AN ANCHOR SLAB TYPE I UTILIZING 3 ANCHOR LUGS (ANCHOR SLAB LENGTH = 55') OR AN ANCHOR SLAB TYPE II MAY BE USED. REINFORCEMENT STEEL SIZE AND SPACING WILL BE THE SAME AS THE CONTINUOUS CONCRETE PAVEMENT.
11. WELD STEEL END PLATE TO BOTH ENDS OF WF BEAM TO SEAL ENDS. WELD SHEAR CONNECTORS TO WEB AND FLANGE OF WF BEAM.
12. 2 INCH MINIMUM CONCRETE COVER FOR STEEL IN SUB-SLABS.
13. WIDE FLANGE BEAM TO BE TREATED WITH CORROSION INHIBITOR PER SECTION 407 OF THE ROAD AND BRIDGE SPECIFICATIONS.
14. ALL REINFORCED BARS SHALL BE GRADE 60 STEEL.
15. THE USE OF TUBE FEEDING TO PLACE REINFORCEMENT IN PLASTIC CONCRETE WILL NOT BE ALLOWED.

SHEET 3 OF 3

SPECIFICATION REFERENCE	11" THICK CONTINUOUSLY REINFORCED CONCRETE PAVEMENT 14 FOOT TRAVEL LANE
316	VIRGINIA DEPARTMENT OF TRANSPORTATION



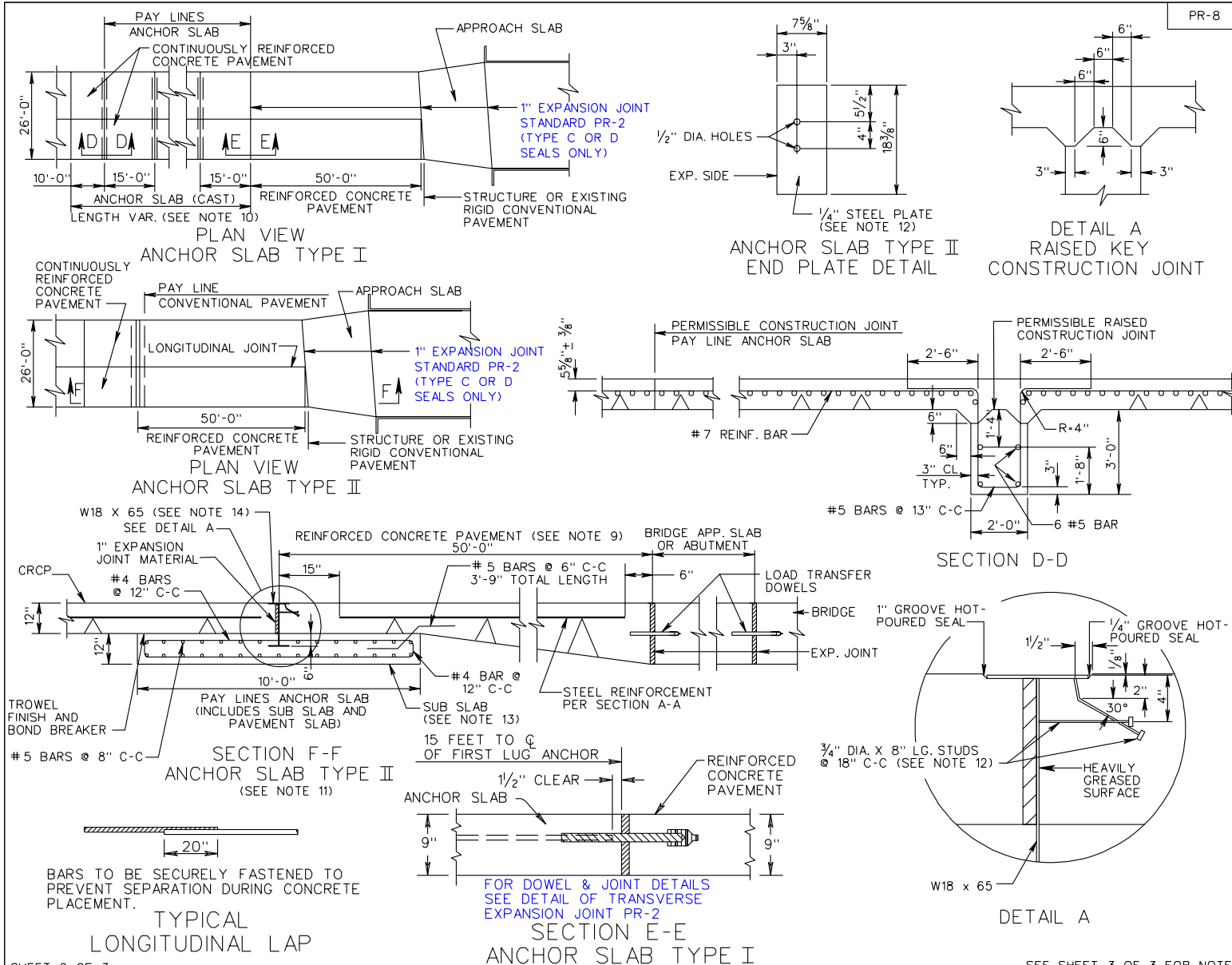
SHEET 1 OF 3

SEE SHEET 3 OF 3 FOR NOTES

REV. 7/03
301.22

12" THICK CONTINUOUSLY REINFORCED CONCRETE PAVEMENT-14' TRAVEL LANE
VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE
316

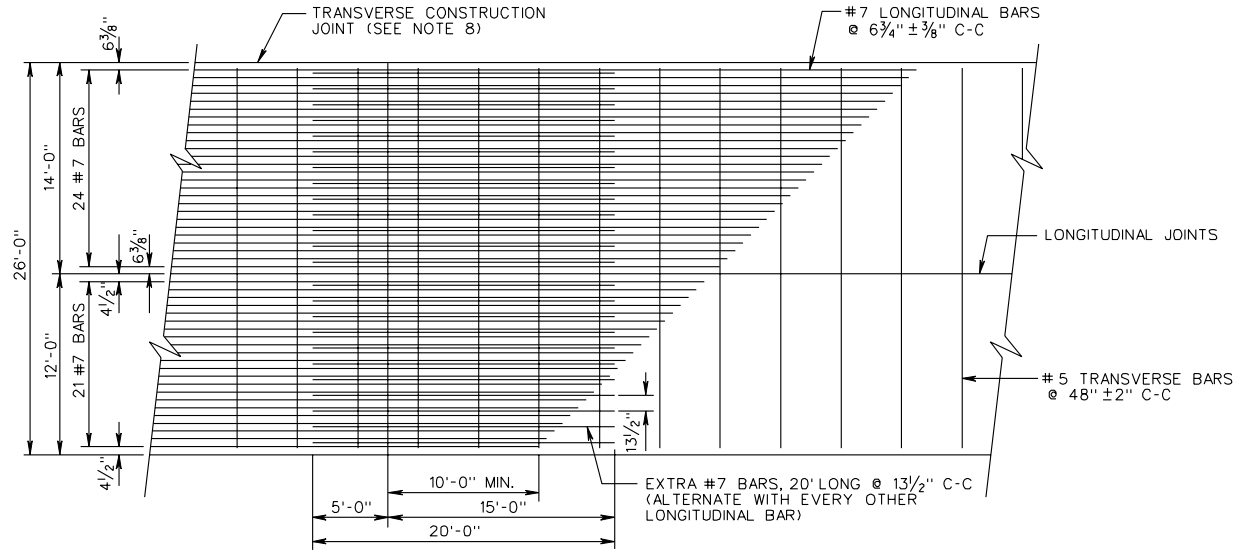


SHEET 2 OF 3

SEE SHEET 3 OF 3 FOR NOTES

SPECIFICATION REFERENCE	<p>12" THICK CONTINUOUSLY REINFORCED CONCRETE PAVEMENT 14' TRAVEL LANE</p>
316	
VIRGINIA DEPARTMENT OF TRANSPORTATION	
REV. 7/03 301.23	

PR-8



PLAN VIEW
LEAVE OUT JOINT STEEL BAR REINFORCEMENT ONLY

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 THE HOOK BOLTS OR TIE BARS TO A 2 1/2" MIN. CLEARANCE BETWEEN HOOK BOLTS OR TIE BARS AND TRANSVERSE BARS.
- TRANSVERSE CONSTRUCTION JOINT BARS ARE TO BE PLACED IN THE SAME HORIZONTAL PLANE AS THE #7 LONGITUDINAL BARS.
- #7 LONGITUDINAL BARS ARE TO BE LAPPED AND TIED IN THE SAME HORIZONTAL PLANE.
- FOR THE 38 FOOT WIDTH PAVEMENT USE SINGLE 12 FOOT LANES WITH TWO LONGITUDINAL CONSTRUCTION JOINTS OR 12 FOOT AND 14 FOOT LANES WITH ONE LONGITUDINAL CONSTRUCTION JOINT AND ONE SAW CUT OR TAPE INSERT LONGITUDINAL JOINT. TRANSVERSE BARS SHALL NOT EXTEND THROUGH LONGITUDINAL CONSTRUCTION JOINTS, BUT SHALL EXTEND FULL LENGTH (25'-6") FOR SAW CUT OR TAPE INSERT LONGITUDINAL JOINT.
- SMOOTH SURFACE TO BE STEEL TROWELED 8" FROM EDGE OF PAVEMENT EVERY 500 FT. AND THE STATION NUMBER STAMPED INTO IT AS SHOWN BELOW. THE DATE IS TO BE SHOWN IN A SIMILAR MANNER AT THE BEGINNING OF EACH DAYS POUR. BOTH OUTSIDE EDGES OF DIVIDED HIGHWAY ARE TO BE STAMPED. ONE EDGE OF UNDIVIDED HIGHWAY WHERE FEASIBLE (TRAVEL LANE).

255	301
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- DOUBLE LAP REQUIREMENT (40") AND THE EXTRA BAR METHOD APPLY ONLY TO LAPS FALLING WITHIN AN AREA OF 10' BEYOND THE CONSTRUCTION JOINT.
- CONCRETE FOR LUG ANCHORS SHALL BE POURED AGAINST COMPACTED SUBGRADE. CONCRETE FOR LUGS AND ANCHOR SLAB MAY BE POURED MONOLITHICALLY OR USING RAISED KEY CONSTRUCTION JOINT METHOD. ADEQUATE CONSOLIDATION OF CONCRETE IN LUGS WILL BE OBTAINED WITHOUT DISPLACING LONGITUDINAL CONTINUOUS STEEL, BY THE USE OF INTERNAL VIBRATION. WHEN LESS THAN FULL WIDTH LUG AND PAVEMENT SLAB IS PLACED, THE #5 TRANSVERSE STEEL IN THE LUGS SHALL BE EXTENDED, LAPPED AND SPLICED AT LEAST 25 DIAMETERS.
- LONGITUDINAL STEEL TO CONTINUE THROUGH JOINT. EXTRA #6 BARS 20' LONG SHALL BE SPACED AT 13 1/2" C-C.
- CONCRETE SHOULD BE ADEQUATELY VIBRATED UNDER BEAM FLANGE TO ELIMINATE HONEYCOMBS.
- IN CONDITIONS OF SOFT CLAY UNDERLYING SOILS (AASHTO SOIL CLASSIFICATION OF GROUP A-4, A-5, A-6, OR A-7) INCLUSIVE OF SUBGROUPS (PER AASHTO MATERIALS SPECIFICATIONS M 145), AN ANCHOR SLAB TYPE I UTILIZING 5 ANCHOR LUGS (ANCHOR SLAB LENGTH = 85') OR AN ANCHOR SLAB TYPE II SHALL BE USED. REINFORCEMENT STEEL SIZE AND SPACING WILL BE THE SAME AS THE CONTINUOUS CONCRETE PAVEMENT.

 IN CONDITIONS OF GRANULAR UNDERLYING SOILS ONLY (AASHTO SOIL CLASSIFICATION OF GROUP A-1, A-2, OR A-3) INCLUSIVE OF SUBGROUPS (PER AASHTO MATERIALS SPECIFICATIONS M 145), AN ANCHOR SLAB TYPE I UTILIZING 3 ANCHOR LUGS (ANCHOR SLAB LENGTH = 55') OR AN ANCHOR SLAB TYPE II MAY BE USED. REINFORCEMENT STEEL SIZE AND SPACING WILL BE THE SAME AS THE CONTINUOUS CONCRETE PAVEMENT.
- WELD STEEL END PLATE TO BOTH ENDS OF WF BEAM TO SEAL ENDS. WELD SHEAR CONNECTORS TO WEB AND FLANGE OF WF BEAM.
- 2 INCH MINIMUM CONCRETE COVER FOR STEEL IN SUB-SLABS.
- WIDE FLANGE BEAM TO BE TREATED WITH CORROSION INHIBITOR PER SECTION 407 OF THE ROAD AND BRIDGE SPECIFICATIONS.
- ALL REINFORCED BARS SHALL BE GRADE 60 STEEL.
- THE USE OF TUBE FEEDING TO PLACE REINFORCEMENT IN PLASTIC CONCRETE WILL NOT BE ALLOWED.

SHEET 3 OF 3

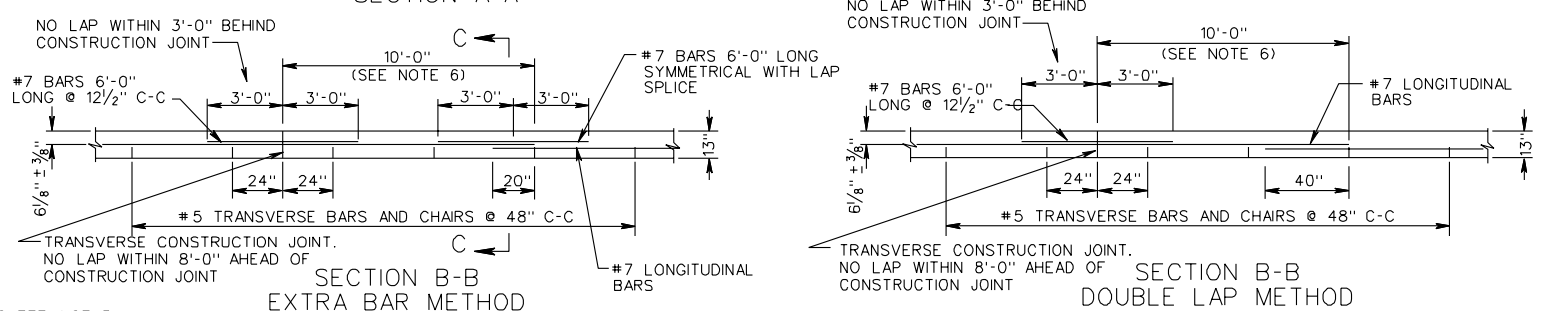
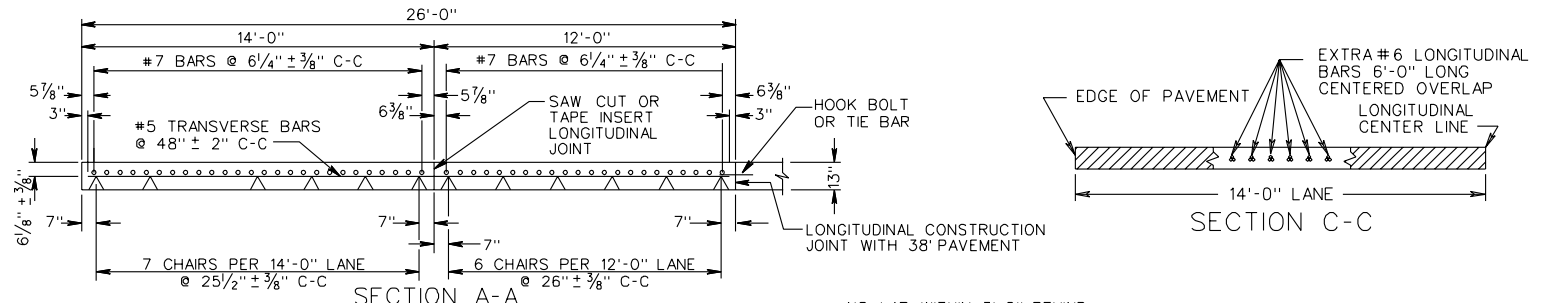
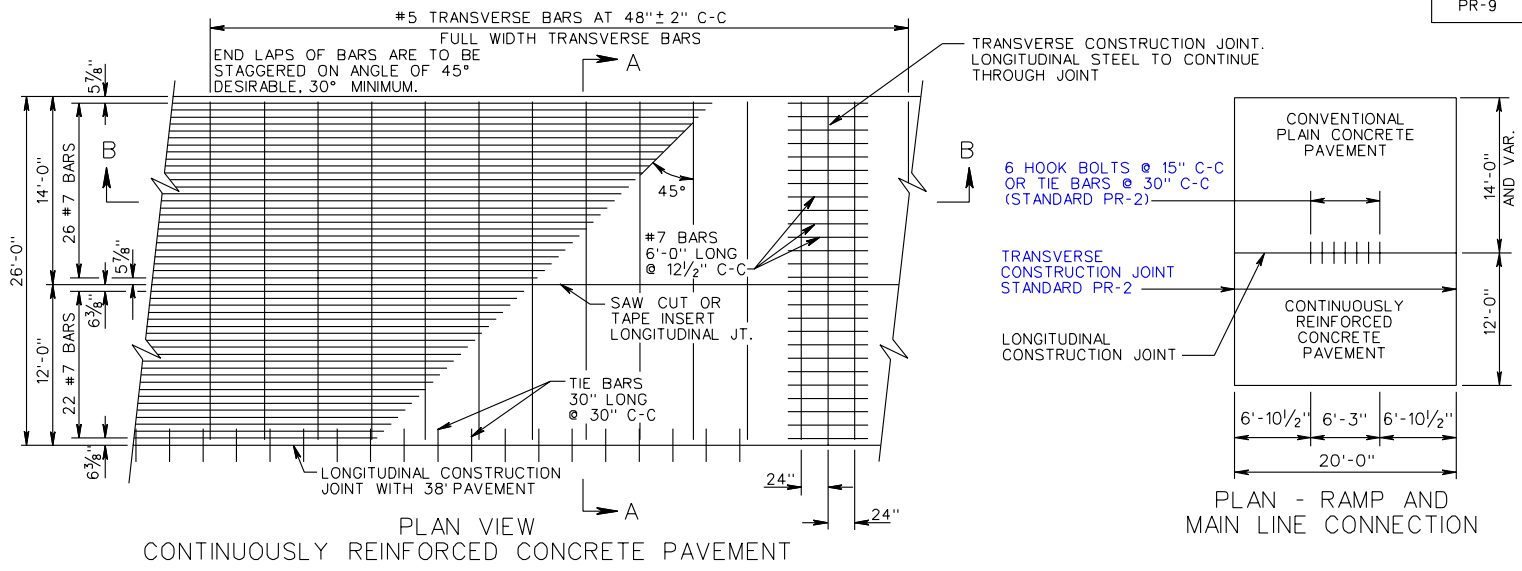
12" CONTINUOUSLY REINFORCED CONCRETE PAVEMENT
14' TRAVEL LANE

REV. 7/03
301.24

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION
REFERENCE

316



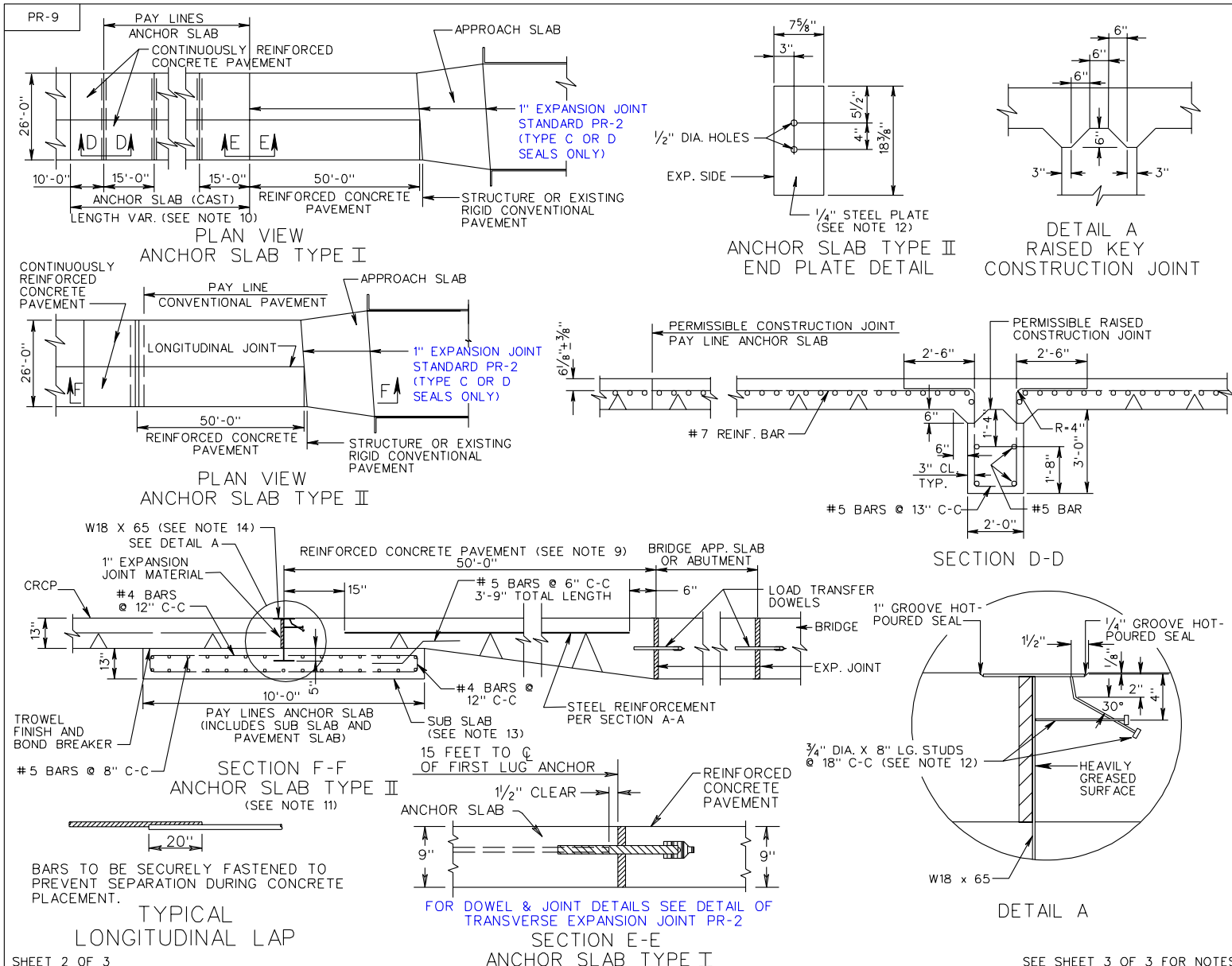
SHEET 1 OF 3

SPECIFICATION REFERENCE
316

13" THICK CONTINUOUSLY REINFORCED CONCRETE PAVEMENT-14' TRAVEL LANE

VIRGINIA DEPARTMENT OF TRANSPORTATION

SEE SHEET 3 OF 3 FOR NOTES



SHEET 2 OF 3

SEE SHEET 3 OF 3 FOR NOTES

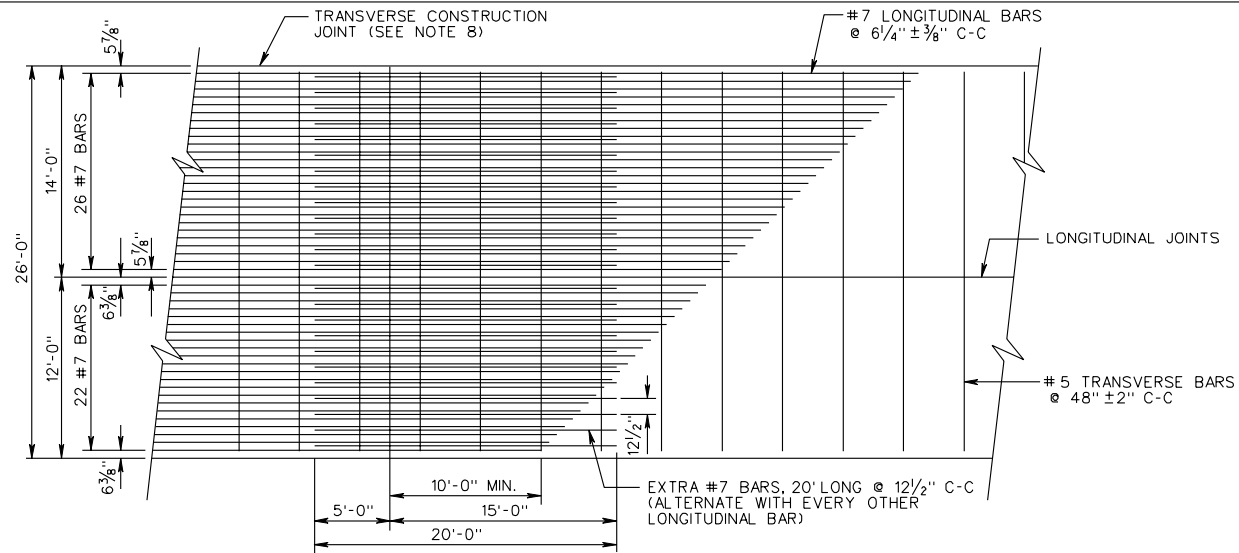
13" THICK CONTINUOUSLY REINFORCED CONCRETE PAVEMENT
 14' TRAVEL LANE

REV. 7/03
 301.26

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION
 REFERENCE

316



PLAN VIEW
LEAVE OUT JOINT STEEL BAR REINFORCEMENT ONLY

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 THE HOOK BOLTS OR TIE BARS TO A 2 1/2" MIN. CLEARANCE BETWEEN HOOK BOLTS OR TIE BARS AND TRANSVERSE BARS.
- TRANSVERSE CONSTRUCTION JOINT BARS ARE TO BE PLACED IN THE SAME HORIZONTAL PLANE AS THE #7 LONGITUDINAL BARS.
- #7 LONGITUDINAL BARS ARE TO BE LAPPED AND TIED IN THE SAME HORIZONTAL PLANE.
- FOR THE 38 FOOT WIDTH PAVEMENT USE SINGLE 12 FOOT LANES WITH TWO LONGITUDINAL CONSTRUCTION JOINTS OR 12 FOOT AND 14 FOOT LANES WITH ONE LONGITUDINAL CONSTRUCTION JOINT AND ONE SAW CUT OR TAPE INSERT LONGITUDINAL JOINT. TRANSVERSE BARS SHALL NOT EXTEND THROUGH LONGITUDINAL CONSTRUCTION JOINTS, BUT SHALL EXTEND FULL LENGTH (25'-6") FOR SAW CUT OR TAPE INSERT LONGITUDINAL JOINT.
- SMOOTH SURFACE TO BE STEEL TROWELED 8" FROM EDGE OF PAVEMENT EVERY 500 FT. AND THE STATION NUMBER STAMPED INTO IT AS SHOWN BELOW. THE DATE IS TO BE SHOWN IN A SIMILAR MANNER AT THE BEGINNING OF EACH DAYS POUR. BOTH OUTSIDE EDGES OF DIVIDED HIGHWAY ARE TO BE STAMPED. ONE EDGE OF UNDIVIDED HIGHWAY WHERE FEASIBLE (TRAVEL LANE).

255	10
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- DOUBLE LAP REQUIREMENT (40") AND THE EXTRA BAR METHOD APPLY ONLY TO LAPS FALLING WITHIN AN AREA OF 10' BEYOND THE CONSTRUCTION JOINT.
- CONCRETE FOR LUG ANCHORS SHALL BE POURED AGAINST COMPACTED SUBGRADE. CONCRETE FOR LUGS AND ANCHOR SLAB MAY BE POURED MONOLITHICALLY OR USING RAISED KEY CONSTRUCTION JOINT METHOD. ADEQUATE CONSOLIDATION OF CONCRETE IN LUGS WILL BE OBTAINED WITHOUT DISPLACING LONGITUDINAL CONTINUOUS STEEL, BY THE USE OF INTERNAL VIBRATION. WHEN LESS THAN FULL WIDTH LUG AND PAVEMENT SLAB IS PLACED, THE #5 TRANSVERSE STEEL IN THE LUGS SHALL BE EXTENDED, LAPPED AND SPLICED AT LEAST 25 DIAMETERS.
- LONGITUDINAL STEEL TO CONTINUE THROUGH JOINT. EXTRA #6 BARS 20' LONG SHALL BE SPACED AT 13 1/2" C-C.
- CONCRETE SHOULD BE ADEQUATELY VIBRATED UNDER BEAM FLANGE TO ELIMINATE HONEYCOMBS.
- IN CONDITIONS OF SOFT CLAY UNDERLYING SOILS (AASHTO SOIL CLASSIFICATION OF GROUP A-4, A-5, A-6, OR A-7) INCLUSIVE OF SUBGROUPS (PER AASHTO MATERIALS SPECIFICATIONS M 145), AN ANCHOR SLAB TYPE I UTILIZING 5 ANCHOR LUGS (ANCHOR SLAB LENGTH = 85') OR AN ANCHOR SLAB TYPE II SHALL BE USED. REINFORCEMENT STEEL SIZE AND SPACING WILL BE THE SAME AS THE CONTINUOUS CONCRETE PAVEMENT.

IN CONDITIONS OF GRANULAR UNDERLYING SOILS ONLY (AASHTO SOIL CLASSIFICATION OF GROUP A-1, A-2, OR A-3) INCLUSIVE OF SUBGROUPS (PER AASHTO MATERIALS SPECIFICATIONS M 145), AN ANCHOR SLAB TYPE I UTILIZING 3 ANCHOR LUGS (ANCHOR SLAB LENGTH = 55') OR AN ANCHOR SLAB TYPE II MAY BE USED. REINFORCEMENT STEEL SIZE AND SPACING WILL BE THE SAME AS THE CONTINUOUS CONCRETE PAVEMENT.
- WELD STEEL END PLATE TO BOTH ENDS OF WF BEAM TO SEAL ENDS. WELD SHEAR CONNECTORS TO WEB AND FLANGE OF WF BEAM.
- 2 INCH MINIMUM CONCRETE COVER FOR STEEL IN SUB-SLABS.
- WIDE FLANGE BEAM TO BE TREATED WITH CORROSION INHIBITOR PER SECTION 407 OF THE ROAD AND BRIDGE SPECIFICATIONS.
- ALL REINFORCED BARS SHALL BE GRADE 60 STEEL.
- THE USE OF TUBE FEEDING TO PLACE REINFORCEMENT IN PLASTIC CONCRETE WILL NOT BE ALLOWED.

SPECIFICATION REFERENCE

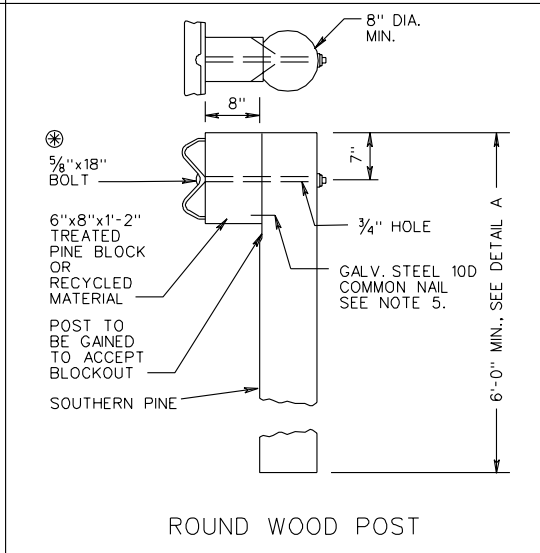
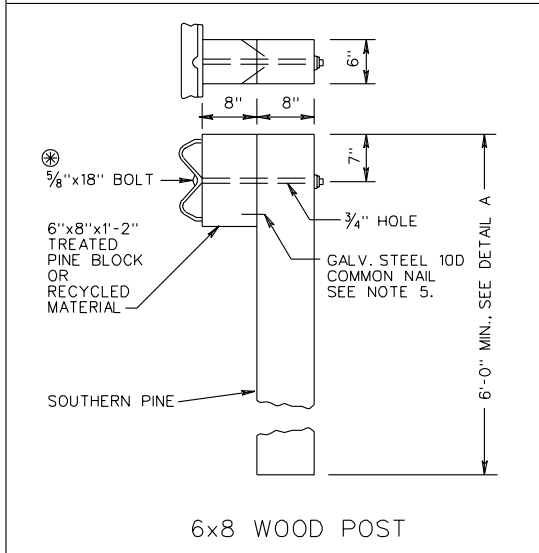
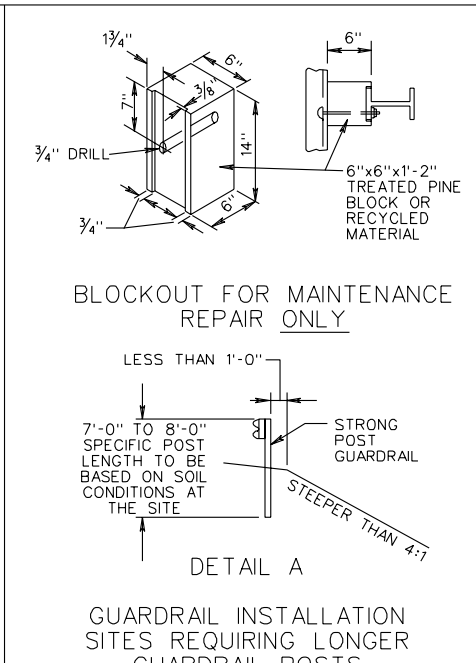
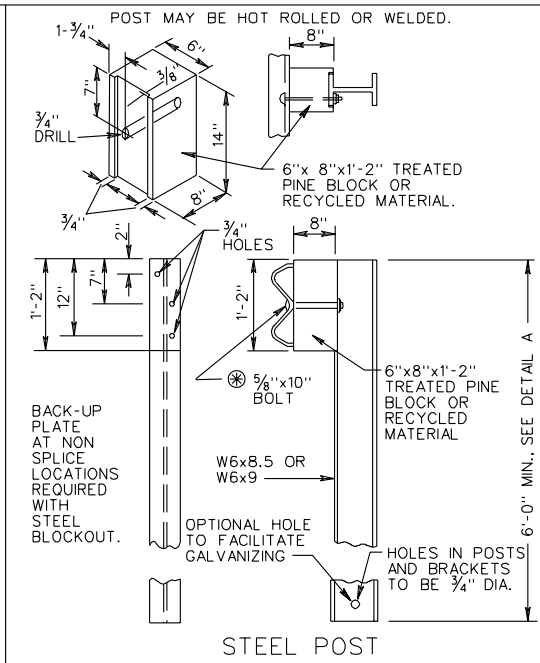
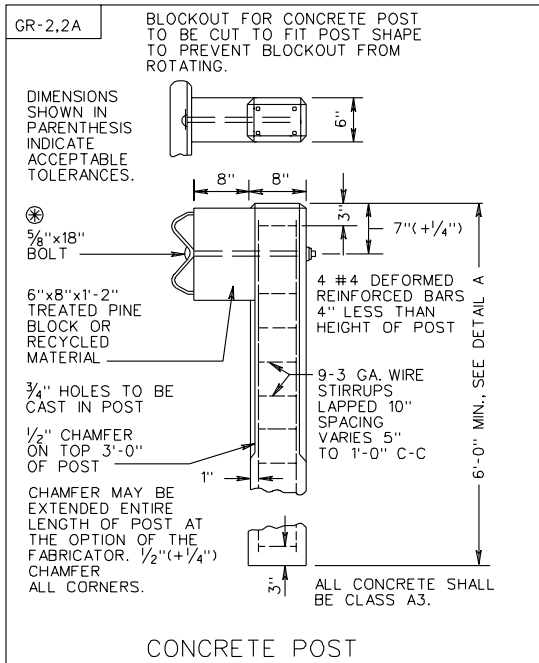
316

13" CONTINUOUSLY REINFORCED CONCRETE PAVEMENT
14' TRAVEL LANE

VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 7/03

301.27

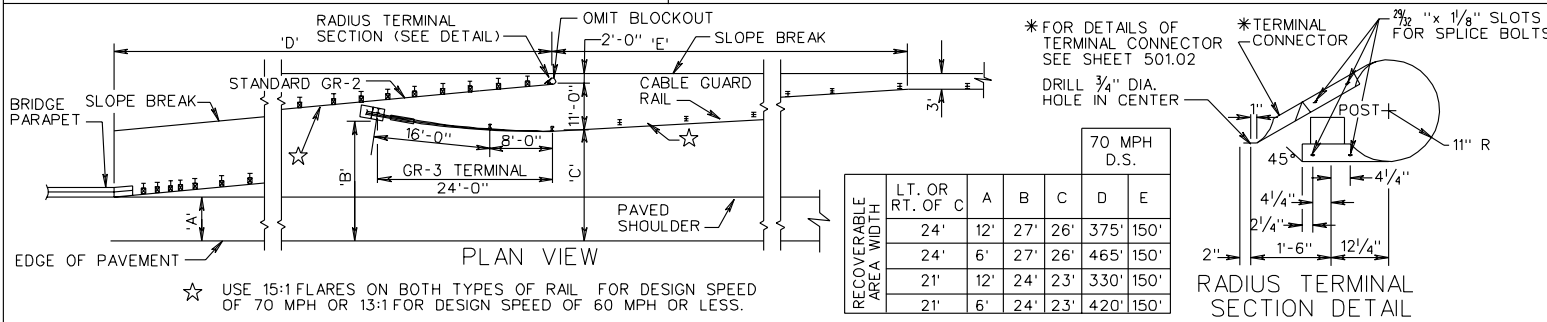
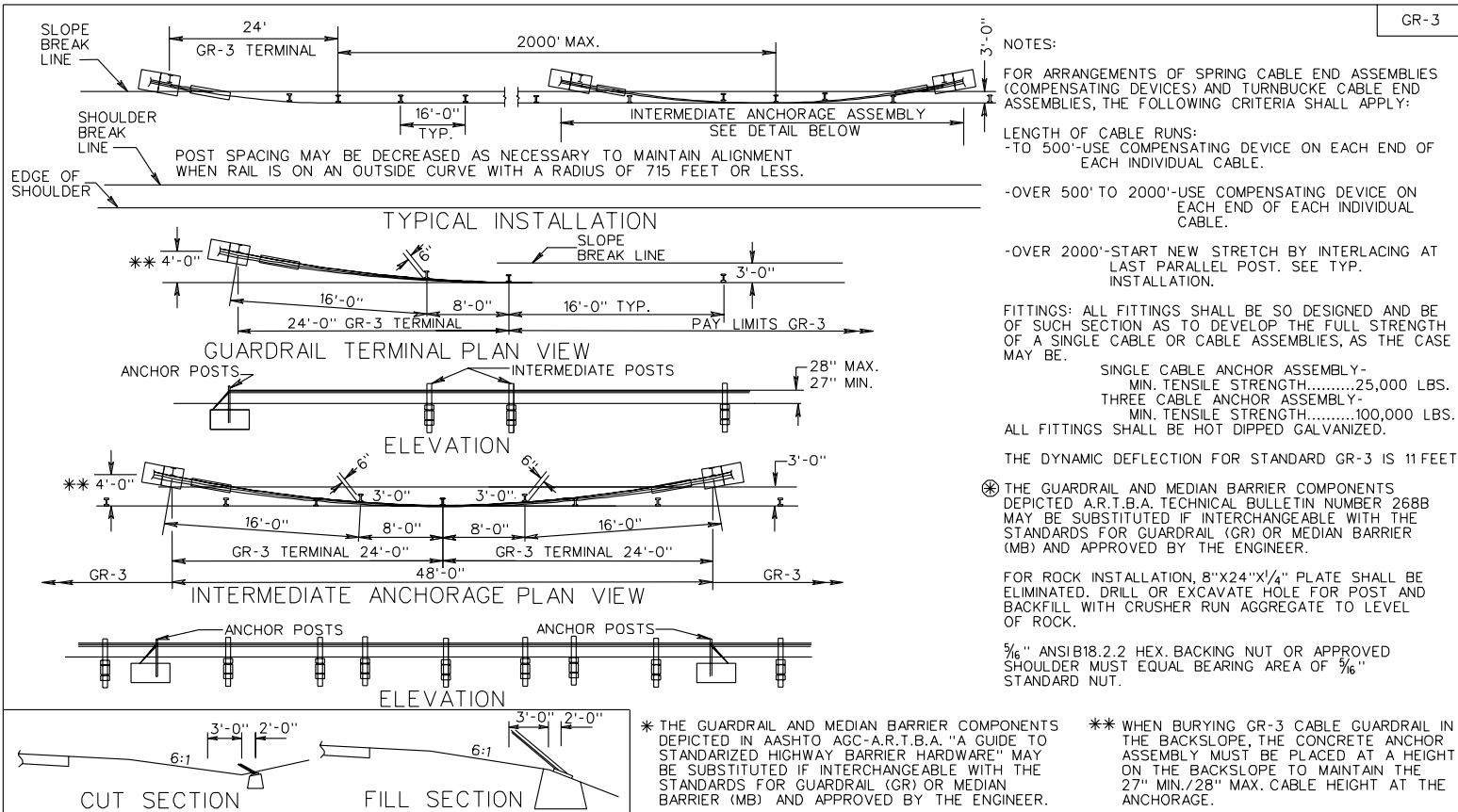


NOTES:

1. ALL BOLTS, NUTS, WASHERS, AND OTHER STEEL ITEMS ARE TO BE GALVANIZED.
2. ALTERNATE TYPE POSTS AND BLOCKOUT MAY BE INTERCHANGED ON ANY ONE PROJECT WITH THE RESTRICTION THAT THE SAME TYPE OF POST AND BLOCKOUT MUST BE USED IN ANY SINGLE RUN OF GUARDRAIL.
3. FOR DETAILS OF GUARDRAIL ELEMENT SPLICE JOINT, HARDWARE, ETC. SEE SHEET NOS. 501.01 & 501.02.
4. THE GUARDRAIL AND MEDIAN BARRIER COMPONENTS DEPICTED IN A.R.T.B.A. TECHNICAL BULLETIN NUMBER 268B MAY BE SUBSTITUTED IF INTERCHANGEABLE WITH THE STANDARDS FOR GUARDRAIL (GR) OR MEDIAN BARRIER (MB) AND APPROVED BY THE ENGINEER.
5. DRIVE NAIL ON BOTH SIDES WITHIN 2" OF THE TOP OR BOTTOM OF BLOCKOUT AFTER 5/8" x 18 BOLT IS INSTALLED.

⊗ STANDARD WASHER TO BE USED ON LAST 50' OF RUN OFF END ONLY.

SHEET 2 OF 2



SHEET 1 OF 3

METHOD OF TRANSITION FROM CABLE GUARDRAIL TO W-BEAM GUARDRAIL AT BRIDGE APPROACHES

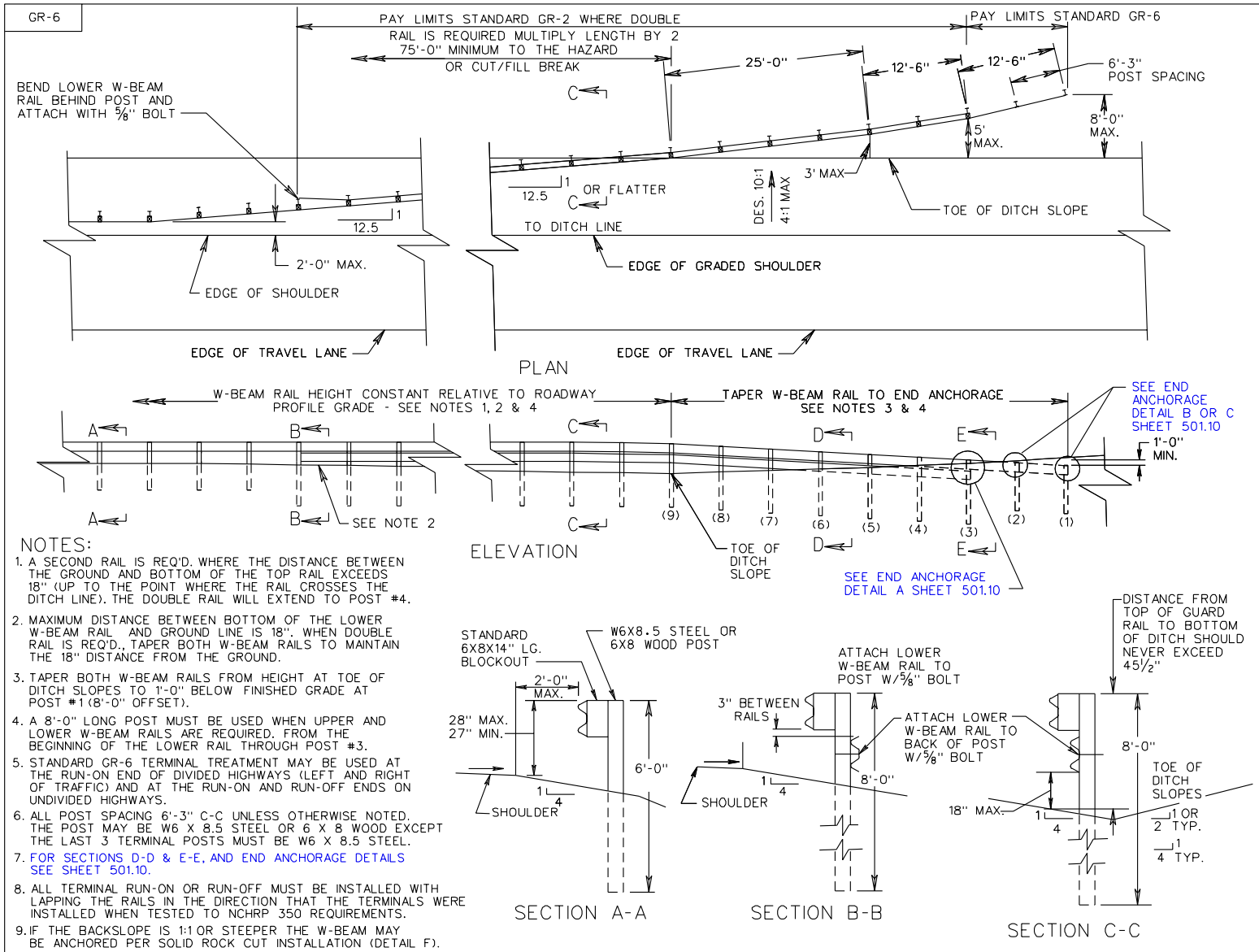
SPECIFICATION REFERENCE
221
505

CABLE GUARDRAIL

VIRGINIA DEPARTMENT OF TRANSPORTATION

Rev. 7/03

501.06



SHEET 1 OF 2

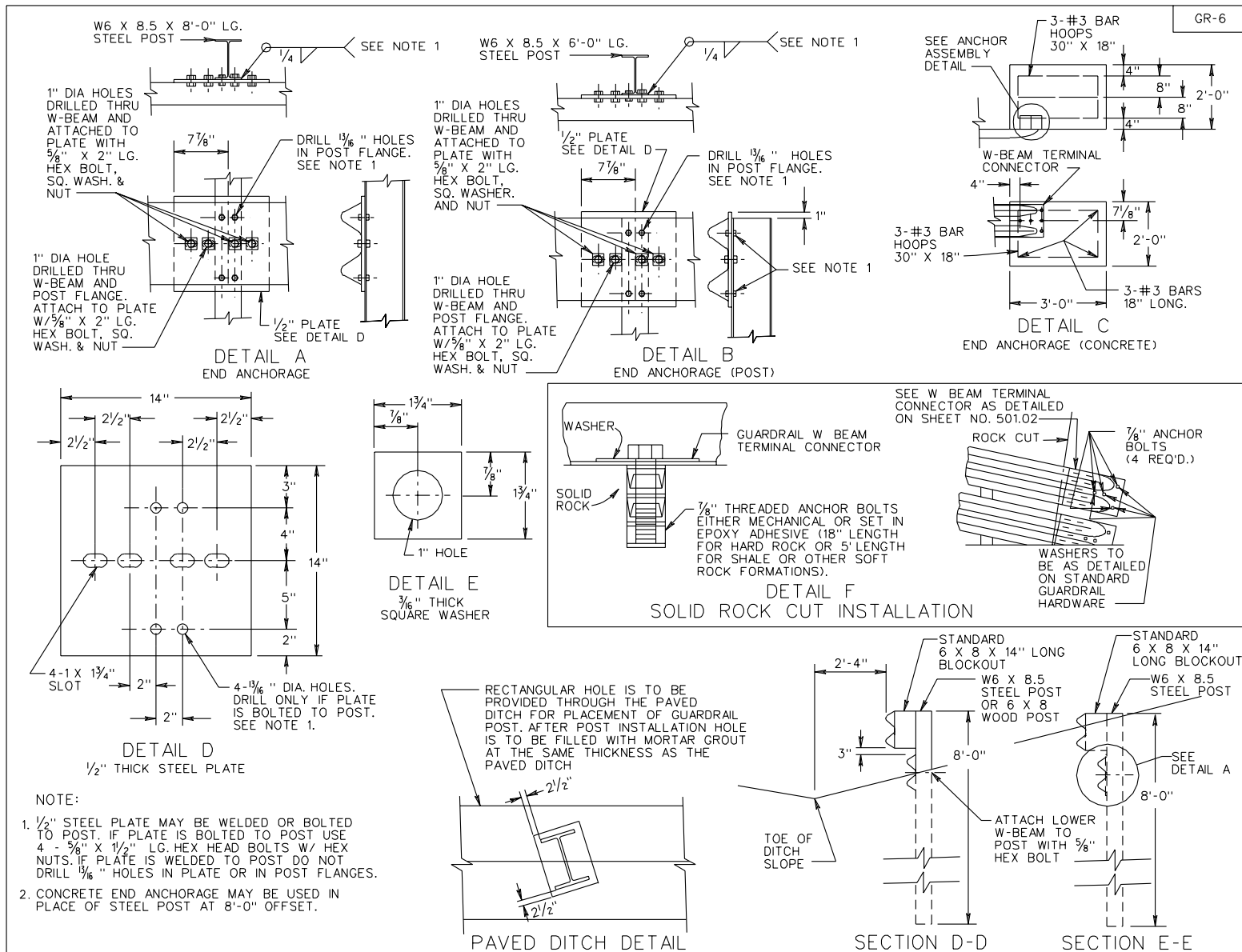
TERMINAL TREATMENT FOR W BEAM GUARDRAIL

REV. 7/03
501.09

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE

505
221



GR-6

SPECIFICATION REFERENCE

505
221

TERMINAL TREATMENT FOR W BEAM GUARDRAIL

VIRGINIA DEPARTMENT OF TRANSPORTATION

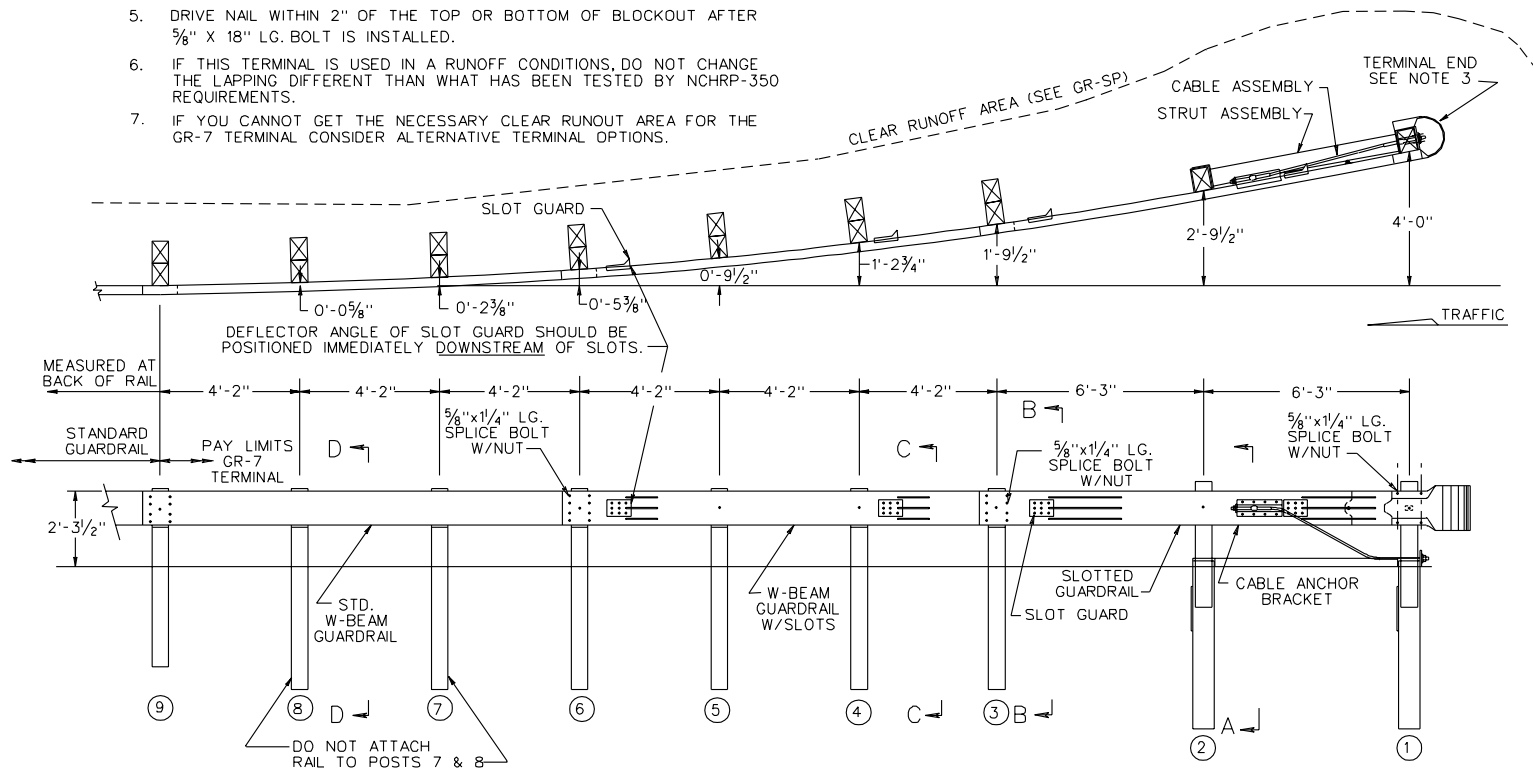
REV. 7/03

501.10

GR-7

NOTES:

1. GUARDRAIL TERMINAL, STD. GR-7 IS TO BE SRT 350 (AS SHOWN) MANUFACTURED BY SYRO STEEL COMPANY, THE FLEAT 350 MANUFACTURED BY ROAD SYSTEMS, INC., OR OTHER VDOT APPROVED EQUAL MEETING NCHRP 350 TESTING CRITERIA UTILIZING A 4 FT. OFFSET.
2. THE POST OFFSET DIMENSIONS ARE GIVEN TO THE CENTER OF THE TRAFFIC FACE OF THE BLOCKOUTS EXCEPT AT THE FIRST TWO POSTS, WHERE THE DIMENSION IS TO THE CENTER OF THE TRAFFIC FACE OF THE POST. OFFSET POINTS ARE TO BE LOCATED BY CHORD MEASUREMENT AT THE BACK OF THE RAIL EQUAL TO THE NOMINAL POST SPACINGS SHOWN. POST ARE TO BE SET APPROXIMATELY RADIAL TO THE RAILING AT EACH POST LOCATION.
3. 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).
4. FOR DETAILS OF GUARDRAIL TERMINAL INSTALLATION SITE PREPARATION REQUIREMENTS SEE STANDARD GR-SP.
5. DRIVE NAIL WITHIN 2" OF THE TOP OR BOTTOM OF BLOCKOUT AFTER 5/8" X 18" LG. BOLT IS INSTALLED.
6. IF THIS TERMINAL IS USED IN A RUNOFF CONDITIONS, DO NOT CHANGE THE LAPPING DIFFERENT THAN WHAT HAS BEEN TESTED BY NCHRP-350 REQUIREMENTS.
7. IF YOU CANNOT GET THE NECESSARY CLEAR RUNOUT AREA FOR THE GR-7 TERMINAL CONSIDER ALTERNATIVE TERMINAL OPTIONS.



SHEET 1 OF 3

BREAKAWAY CABLE TERMINAL
4' FLARE

REV. 7/03

501.11

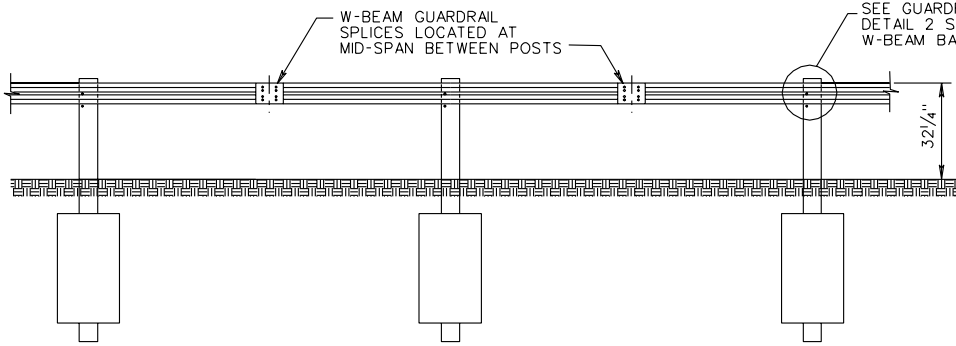
VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION
REFERENCE

221
505

INSERTABLE SHEET A91

GR-8,8A,8B,8C



TYPICAL INSTALLATION

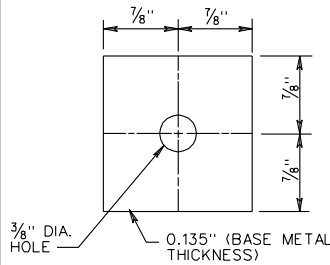
STANDARD	POST SPACING	DEFLECTION
GR-8	12' - 6"	7' - 0"
GR-8A	6' - 3"	5' - 0"
GR-8B	3' - 1 1/2"	4' - 0"
GR-8C	4' - 2"	4' - 6"

FOR ROCK INSTALLATION, 8" X 24" X 1/4" PLATE IS TO BE ELIMINATED. DRILL OR EXCAVATE HOLE FOR POST, PLACE POST AND BACKFILL WITH CRUSHER RUN AGGREGATE TO LEVEL OF ROCK.

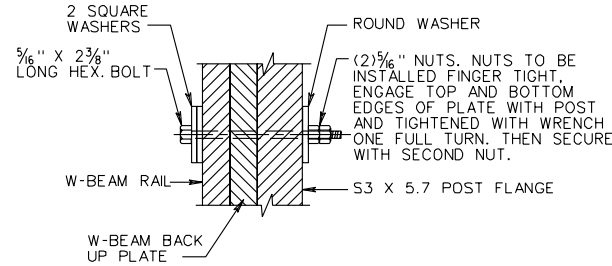
ALL POSTS, BOLTS, NUTS AND WASHERS ARE TO BE GALVANIZED.

FOR DETAILS OF GUARDRAIL ELEMENT, SPLICE JOINT, HARDWARE, ETC. SEE SHEET NO. 501.01.

⊗ THE GUARDRAIL AND MEDIAN BARRIER COMPONENTS DEPICTED IN A.R.T.B.A. TECHNICAL BULLETIN NUMBER 268B MAY BE SUBSTITUTED IF INTERCHANGEABLE WITH THE STANDARDS FOR GUARDRAIL (GR) OR MEDIAN BARRIER (MB) AND APPROVED BY THE ENGINEER.

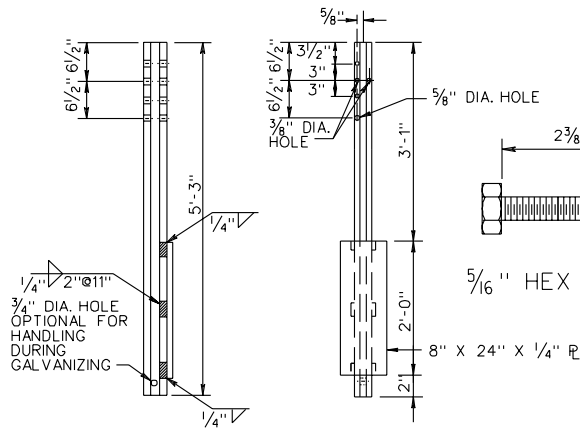


SQUARE WASHER

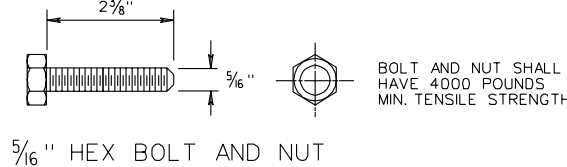


GUARDRAIL POST CONNECTION DETAIL

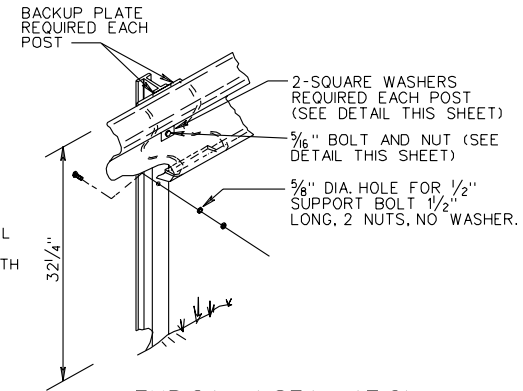
POST SPACING ON CURVES	
PAVEMENT Q RADIUS	POST SPACING
> 220 FT. R	12' - 6"
219 FT. - 111 FT.	6' - 3"
110 FT. - 76 FT.	4' - 2"
75 FT. - 50 FT.	3' - 1 1/2"
< 50 FT.	USE NOT RECOMMENDED



S 3 X 5.7 STEEL POST



BOLT AND NUT SHALL HAVE 4000 POUNDS MIN. TENSILE STRENGTH



TYPICAL INSTALLATION

SHEET 1 OF 2

SPECIFICATION REFERENCE

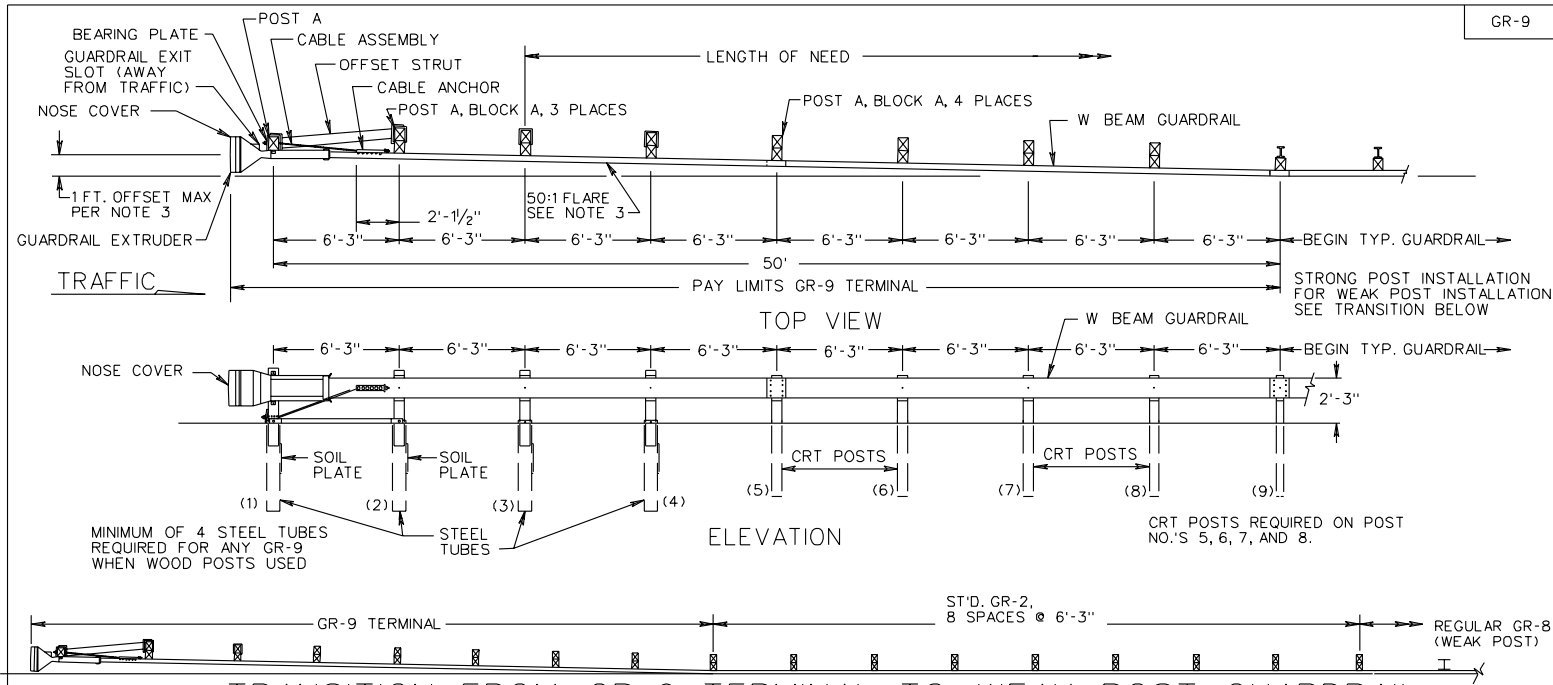
221
505

STANDARD W BEAM GUARDRAIL (WEAK POST SYSTEM) TL-3 (>45 MPH)

VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 7/03

501.14



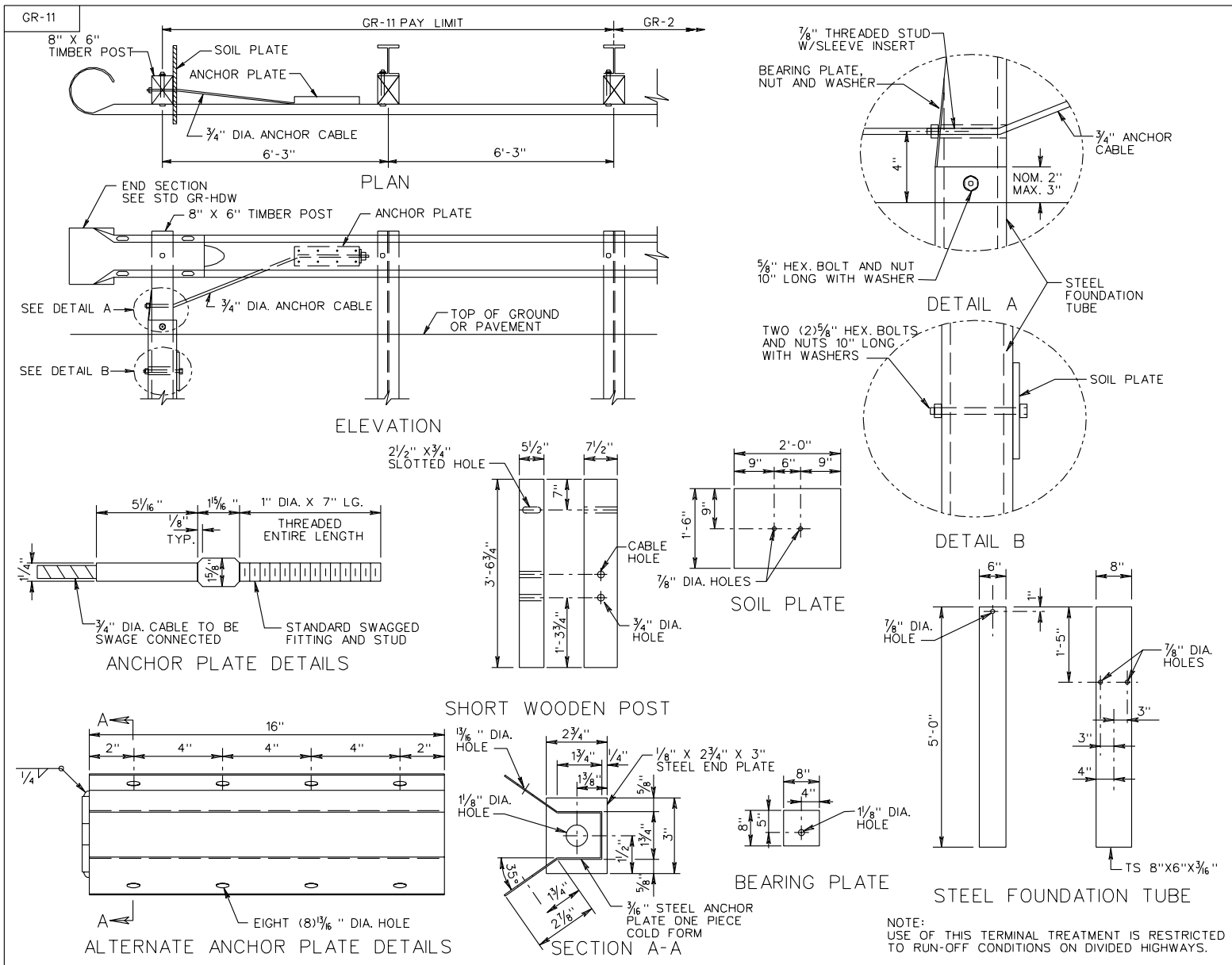
TRANSITION FROM GR-9 TERMINAL TO WEAK POST GUARDRAIL

NOTES:

1. THIS DESIGN SHALL BE USED AFTER AN ANALYSIS INDICATES IT IS MORE COST EFFECTIVE THAN PROVIDING THE FLARE FOR A STANDARD GR-7 OR EXTENDING THE GUARDRAIL TO PROVIDE A STANDARD GR-6 TERMINAL
2. ALL TERMINALS SHALL BE INSTALLED ACCORDING TO THE MANUFACTURE'S INSTALLATION INSTRUCTION WITH THE RESTRICTION THAT WITH VDOT STANDARDS A MINIMUM OF (4) FOUR STEEL TUBES ARE REQUIRED WHEN WOOD POSTS ARE USED.
3. ALTERNATE BREAKAWAY CABLE TERMINAL (GR-9) IS TO BE ET-2000 (AS SHOWN), OR CAT AS MANUFACTURED BY SYRO STEEL COMPANY, BRAKEMASTER AS MANUFACTURED BY ENERGY ABSORPTION SYSTEMS, INC., THE BEST SYSTEM AS MANUFACTURED BY INTERSTATE STEEL CORPORATION, THE SKT-350 AS MANUFACTURED BY ROAD SYSTEMS INC., OR OTHER VDOT APPROVED EQUAL MEETING NCHRP 350 TESTING CRITERIA.
4. ALL STANDARD GR-9 TERMINALS WILL BE INSTALLED WITH AN OFFSET TO PREVENT THE GUARDRAIL EXTRUDER FROM ENCRANCHING ON THE SHOULDER. PLEASE REFER TO THE MANUFACTURE'S INSTALLATION INSTRUCTIONS FOR SPECIFIC INFORMATION ON THEIR TERMINAL SYSTEM'S RECOMMENDED OFFSETS AND STRAIGHT LINE FLARE RATES.
5. FOR DETAILS, DIMENSIONS, QUANTITIES, AND OTHER INFORMATION NOT SHOWN HEREON, SEE INDIVIDUAL MANUFACTURER'S PLANS.
6. THE GUARDRAIL AND MEDIAN BARRIER COMPONENTS DEPICTED IN A.R.T.B.A. TECHNICIAN BULLETIN NUMBER 268B MAY BE SUBSTITUTED IF INTERCHANGEABLE WITH THE STANDARDS FOR GUARDRAIL (GR) OR MEDIAN BARRIER (MB) AND APPROVED BY THE ENGINEER.
7. CRT POSTS REQUIRED ON POST NUMBERS 5, 6, 7, AND 8.
8. DIRECTION OF TAPE SHALL CONFORM TO MUTCD APPLICATION FOR DIAGONAL STRIPES ON OBJECT MARKERS AND BRIDGE END PANELS. COLOR OF TAPE SHALL BE AMBER (YELLOW).

SPECIFICATION REFERENCE
505

ALTERNATE BREAKAWAY CABLE TERMINAL
NO FLARE
VIRGINIA DEPARTMENT OF TRANSPORTATION



TRAILING END TERMINAL TREATMENT

REV. 7/03
501.21

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE
505
221

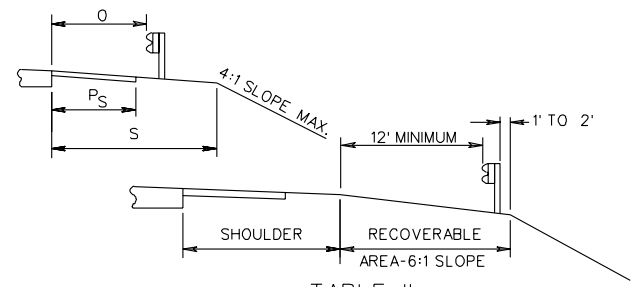
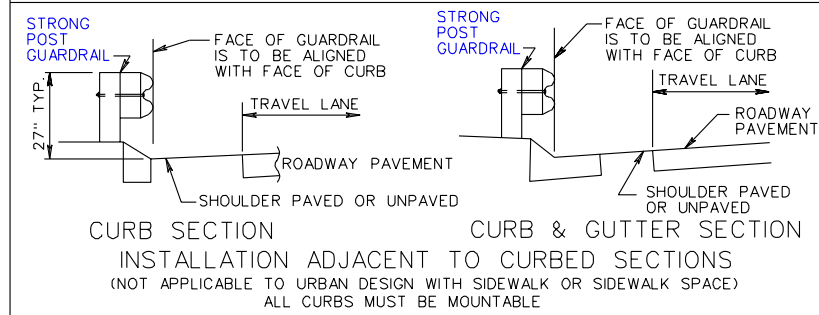
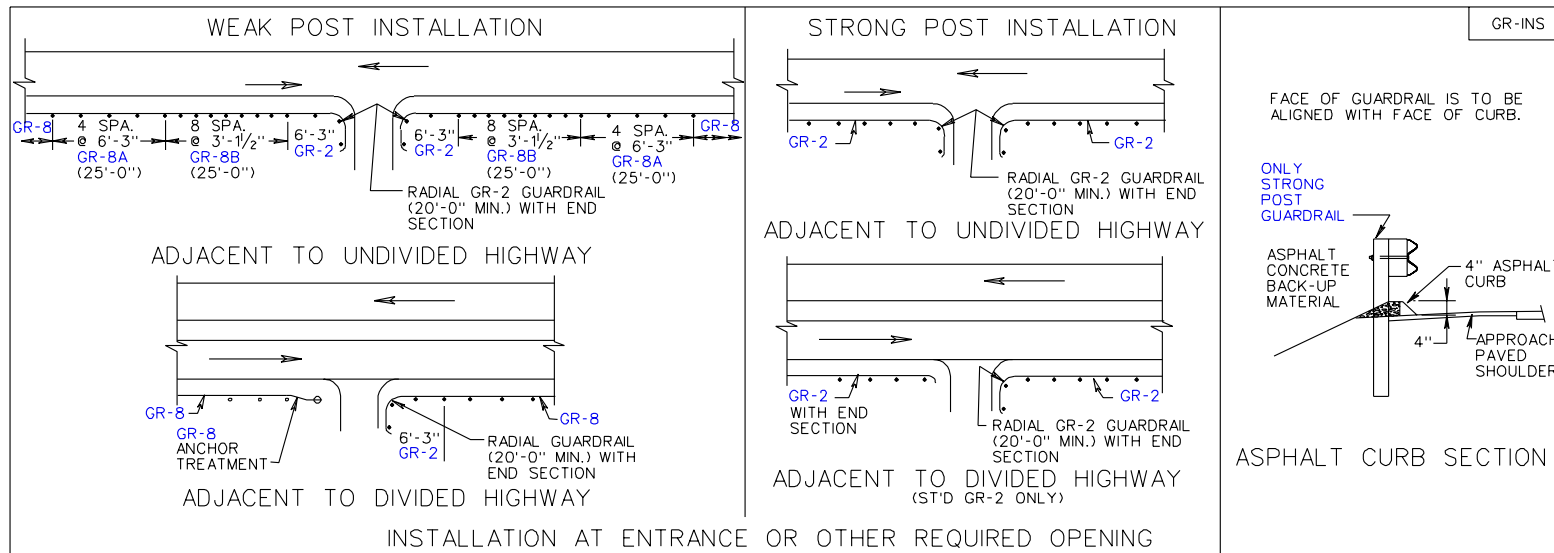


TABLE II
NORMAL GUARDRAIL LOCATION-THROUGH TRAFFIC LANES RIGHT OF TRAFFIC

SHOULDER WIDTH (S)	PAVED SHOULDER WIDTH (P_s)	OFFSET FROM EDGE OF PAVEMENT TO FACE OF GUARDRAIL (O)
15'	6', 10' or 12'	12'
13'	8'	10'
11'	0, 3', 4' or 6'	8'
9'	0, 3' or 4'	6'
7'	0 or 3'	4'
5'	0 or 3'	2'

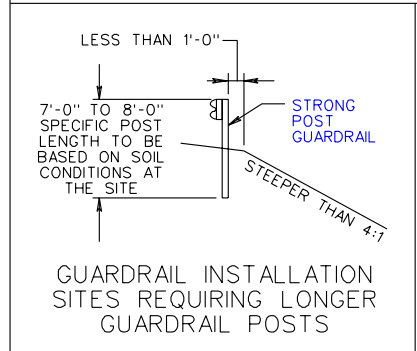


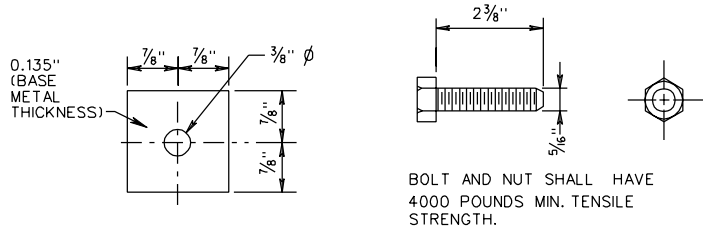
TABLE I
NORMAL GUARDRAIL LOCATION-THROUGH TRAFFIC LANES LEFT OF TRAFFIC

SHOULDER WIDTH (S)	PAVED SHOULDER WIDTH (P_s)	OFFSET FROM EDGE OF PAVEMENT TO FACE OF GUARDRAIL (O)
15'	3', 4', 10' or 12'	12'
13'	3'	10'
12' (MED. 6 LANE)	10'	10'
11'	3'	8'
8' (MED.)	3' or 4'	5'

GUARDRAIL LOCATION-ON RECOVERABLE SLOPE

INSERTABLE SHEET ISD2390

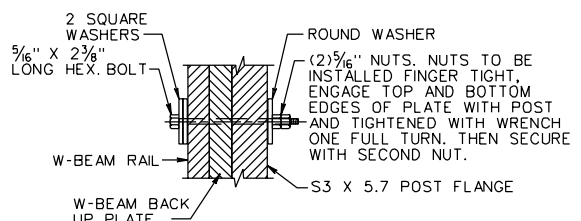
MB-5



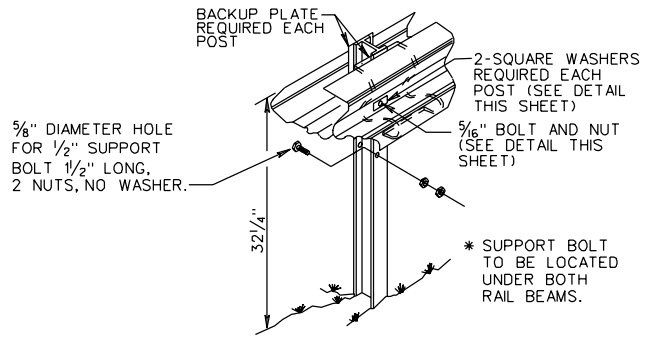
SQUARE WASHER 5/16" HEX BOLT AND NUT

BOLT AND NUT SHALL HAVE 4000 POUNDS MIN. TENSILE STRENGTH.

⊗ THE GUARDRAIL AND MEDIAN BARRIER COMPONENTS DEPICTED IN A.R.T.B.A. TECHNICAL BULLETIN NUMBER 268B MAY BE SUBSTITUTED IF INTERCHANGEABLE WITH THE STANDARDS FOR GUARDRAIL (GR) OR MEDIAN BARRIER (MB) AND APPROVED BY THE ENGINEER.

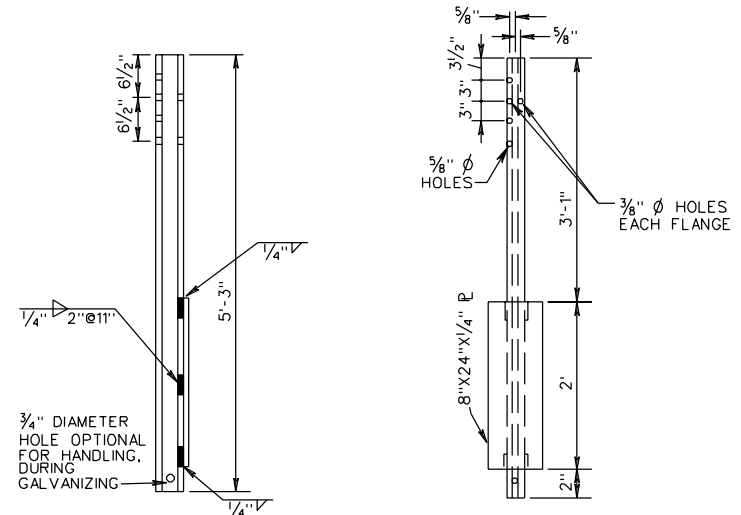


GUARDRAIL POST CONNECTION DETAIL



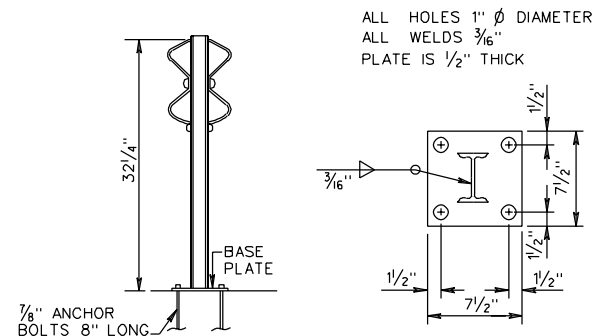
TYPICAL INSTALLATION

NOTES:
 STANDARD MB-5 POST SPACING IS 12'-6"
 STANDARD MB-5A POST SPACING IS 6'-3"
 STANDARD MB-5B POST SPACING IS 3'-1 1/2"
 STANDARD MB-5 DEFLECTION IS 8'-0"
 ALL POSTS, BOLTS, NUTS AND WASHERS ARE TO BE GALVANIZED.
 FOR DETAILS OF GUARDRAIL ELEMENT, HARDWARE, ETC. SEE SHEET NO. 501.01.
 FOR DETAILS OF GUARDRAIL SPLICE JOINT, SEE STD. GR-8 DEPICTING AN NCHRP 350 TL-3 INSTALLATION.



S3X5.7 STEEL POST

FOR ROCK INSTALLATION, 8" X 26" X 1/4" PLATE IS TO BE ELIMINATED. DRILL OR EXCAVATE HOLE FOR POST, PLACE AND BACKFILL WITH CRUSHER RUN AGGREGATE TO LEVEL OF ROCK.



BASE PLATE

STRUCTURE MOUNTED BARRIER

SPECIFICATION REFERENCE	221 505
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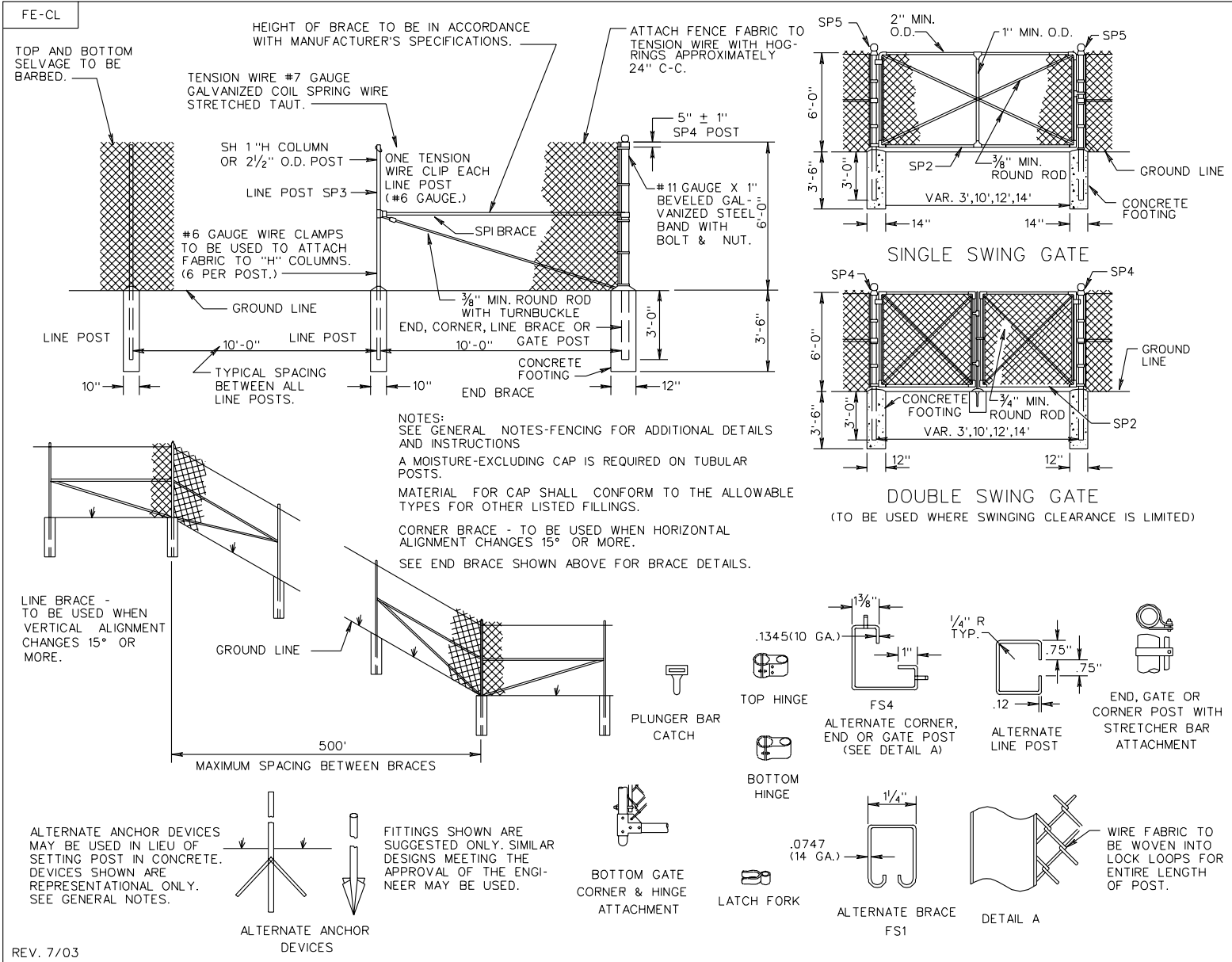
STANDARD W BEAM MEDIAN BARRIER (WEAK POST SYSTEM)
 TL-3 (>45 MPH)

VIRGINIA DEPARTMENT OF TRANSPORTATION

SHEET 1 OF 2

REV. 7/03
 501.42

INSERTABLE SHEET A91



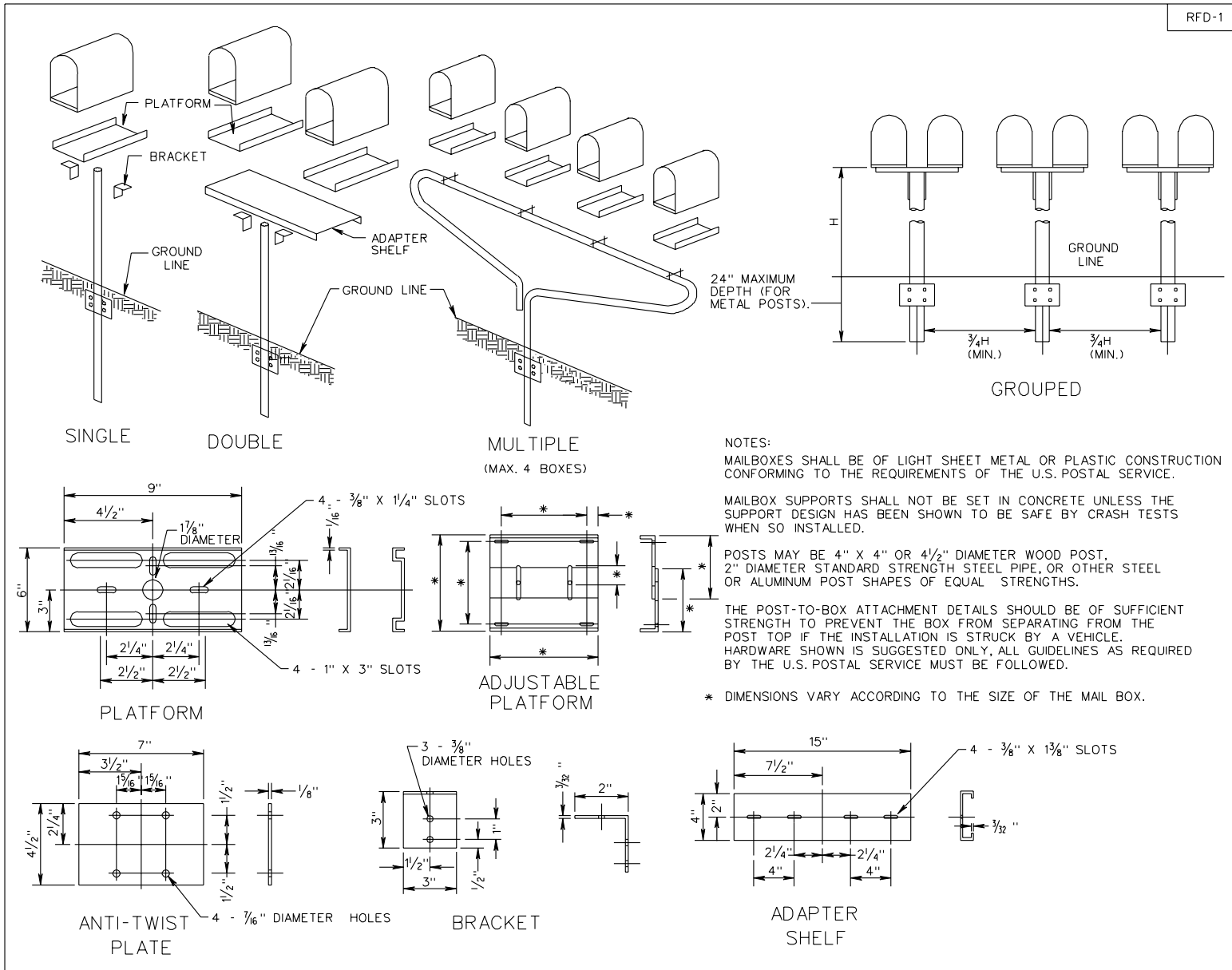
STANDARD FENCE
CHAIN LINK

VIRGINIA DEPARTMENT OF TRANSPORTATION

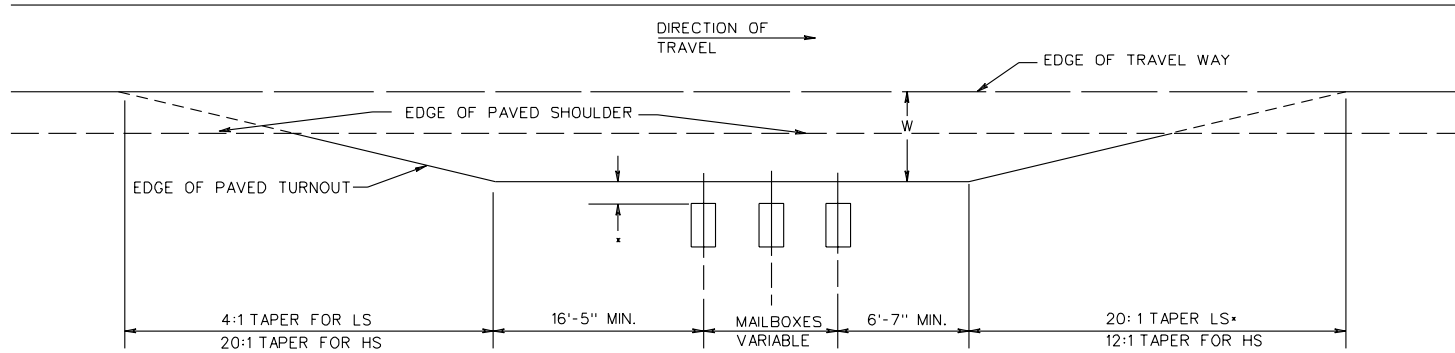
SPECIFICATION
REFERENCE

242
507

502.04



SPECIFICATION REFERENCE	<h2 style="margin: 0;">STANDARD MAILBOX</h2> <p style="margin: 0;">VIRGINIA DEPARTMENT OF TRANSPORTATION</p>	Rev. 7/03
NONE		603.01



LS = A MINIMUM DESIGN FOR ROADS CARRYING LOW-SPEED TRAFFIC AND FOR LOCAL AND COLLECTOR ROADS.
 HS = FOR ROADS CARRYING HIGH-SPEED TRAFFIC.
 W = FOR SUGGESTED WIDTHS, SEE TABLE 11.1.
 MAILBOXES = FOR MAILBOX SPACING AND VARIABLE LENGTH, SEE SECTION 11.2.4, MAILBOX SUPPORT AND ATTACHMENT DESIGN.
 * = A MINIMUM DESIGN FOR ROADS CARRYING LOW-SPEED TRAFFIC AND FOR LOCAL AND COLLECTOR ROADS.

HIGHWAY TYPE AND ADT, (vpd)	WIDTH OF ALL-WEATHER SURFACE TURNOUT OR AVAILABLE SHOULDER AT MAILBOX, 1' (FT.)		DISTANCE ROADSIDE FACE OF MAILBOX IS TO BE OFFSET BEHIND EDGE OF TURNOUT OR USEABLE SHOULDER, (FT.)	
	PREFERRED	MINIMUM	PREFERRED	MINIMUM
RURAL HIGHWAY OVER 10,000	12	8	8 TO 12	0
RURAL HIGHWAY OVER 1,500 TO 10,000	12	8		
RURAL HIGHWAY 400 TO 1,500	10	8		
RURAL HIGHWAY UNDER 400	8	(6) ²		(10) ³
RESIDENTIAL STREET WITHOUT CURB OR ALL-WEATHER SHOULDER	6	0.00		
CURBED RESIDENTIAL STREET	NOT APPLICABLE		(8 TO 12) ⁴	(6) ⁴

ADT=AVERAGE DAILY TRAFFIC
 vpd=VEHICLES PER DAY

NOTES:

- IF THERE IS A NEED TO PROVIDE FOR INCREASED ACCESS, THE FOLLOWING MAY BE CONSIDERED IN CONJUNCTION WITH THE LOCAL POSTMASTER
 - PROVIDE A LEVEL CLEAR FLOOR SPACE 30 in. X 48 in. CENTERED ON THE BOX FOR EITHER SIDE OR FORWARD APPROACH.
 - PROVIDE AN ACCESSIBLE PASSAGE TO AND FROM THE MAILBOX AND PROJECTION INTO A CIRCULATION ROUTE (NO MORE THAN 4 in. IF BETWEEN 28 in. AND 80 in. AFF) SO THAT THE MAILBOX DOES NOT BECOME A PROTRUDING OBJECT FOR PEDESTRIANS WITH IMPAIRED VISION.
- STRIVE FOR A 6 ft. MINIMUM; HOWEVER, IN SOME SITUATIONS THIS MAY NOT BE PRACTICAL. IN THOSE CASES, PROVIDE AS MUCH AS POSSIBLE.
- IF A TURNOUT IS PROVIDED, THIS MAY REDUCE TO ZERO.
- BEHIND TRAFFIC-FACE OF CURB.

SPECIFICATION REFERENCE
302

TURNOUT DETAIL
 VIRGINIA DEPARTMENT OF TRANSPORTATION

URBAN LOW SPEED DESIGN TABLE

DV/NC (MPH)	MAX. f	C	MIN. LS (FEET)
45	0.161	2.75	125
40	0.178	3.00	115
35	0.197	3.25	100
30	0.221	3.50	90
25	0.252	3.75	80
20	0.300	4.00	75

GENERAL DESIGN CONSIDERATIONS

1. WHEN "URBAN LOW SPEED" DESIGNS UTILIZE SUPERELEVATION, THEY WILL BE SUPERELEVATED BY AN AMOUNT EQUAL TO THE NORMAL CROWN (TYPICALLY 2.0%) AND THE APPROXIMATE MAXIMUM SAFE SPEED (DV) AFFORDED THEREBY.
2. WHEN "URBAN LOW SPEED DESIGN" WITH NO SUPERELEVATION, THE APPROXIMATE MAXIMUM SAFE SPEED (NC) IS CALCULATED USING A NEGATIVE NORMAL CROWN (TYPICALLY -2.0 %).
3. WHEN THE CURVE IS SUPERELEVATED, THE LS IS APPLIED IN THE SAME MANNER AS IN URBAN CONDITIONS WITH THE CROWN RUNOFF (CR) BEING EQUAL TO THE LS VALUE. THE CROWN RUNOFF (CR) IS ALWAYS ACHIEVED OUTSIDE OF THE TRANSITION (LS).
4. PLEASE NOTE THAT THE RADIUS VALUES LISTED ON PAGE 802.24 HAVE BEEN ROUNDED UP TO THE NEAREST FOOT.

LEGEND

- C- RATE OF CHANGE OF SIDE FRICTION (f) IN FT./SEC.³
- e- SUPERELEVATION RATE.
- f- FRICTION FACTOR.
- LS- LENGTH OF SUPERELEVATION TRANSITION.
- R- RADIUS OF CURVE.
- DV- DESIGN VELOCITY UTILIZING SUPERELEVATION.
- NC- MAXIMUM VELOCITY WITH NO SUPERELEVATION (NORMAL CROWN).

FRICTION FACTORS (f) FOR ODD VELOCITIES NOT LISTED SHOULD BE DERIVED BY INTERPOLATION.

FOR LS LENGTHS FOR INTERMEDIATE VELOCITIES NOT LISTED IN TABLE USE THE LS FOR NEAREST VELOCITY IN TABLE.

EXAMPLES

DV = 21 mph
 e = +2.0 %
 f = MAX f ± INTERPOLATED DIFFERENCE BETWEEN LISTED FRICTION FACTORS
 $f = 0.300 - [1/5(0.300 - 0.252)] = 0.2904$ (ROUND TO 0.29)
 LS = 47.2 f DV/C
 LS = 47.2(0.29)(21)/4 = 71.862 FT.
 71.862 < 90 THEREFORE LS = 90 FT.
 $R_{min} = DV^2 / 15(e+f)$
 $R_{min} = (21) / 15(0.02 + 0.29) = 94.83870968$ FT.

NC = 37 mph
 e = -2.0 %
 f = MAX f ± INTERPOLATED DIFFERENCE BETWEEN LISTED FRICTION FACTORS
 $f = 0.197 - [2/5(0.197 - 0.178)] = 0.1894$ (ROUND TO 0.189)
 $R_{min} = NC^2 / 15(-e + f)$
 $R_{min} = (37)^2 / 15(-0.02 + 0.189) = 540.0394477$ FT.

METHODOLOGIES FOR CALCULATING TC-5.01 VALUES FOR URBAN LOW-SPEED STREETS

CURVE WIDENING TABLES

SU DESIGN VEHICLE

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

LATERAL CLEARANCE

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

ADJUSTMENT FACTORS

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

RELATIVE GRADIENTS

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

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

DEFINITIONS

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

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

GENERAL DESIGN CONSIDERATIONS

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

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

LS = b_w(W_n n₁E/r_g)
 LS = M(WE/r_g) (ALT. MULTI-LANE)

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

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

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

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

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

$$w = W_C - 2W_n$$

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

METHODOLOGIES FOR CALCULATING TC-5.01 VALUES