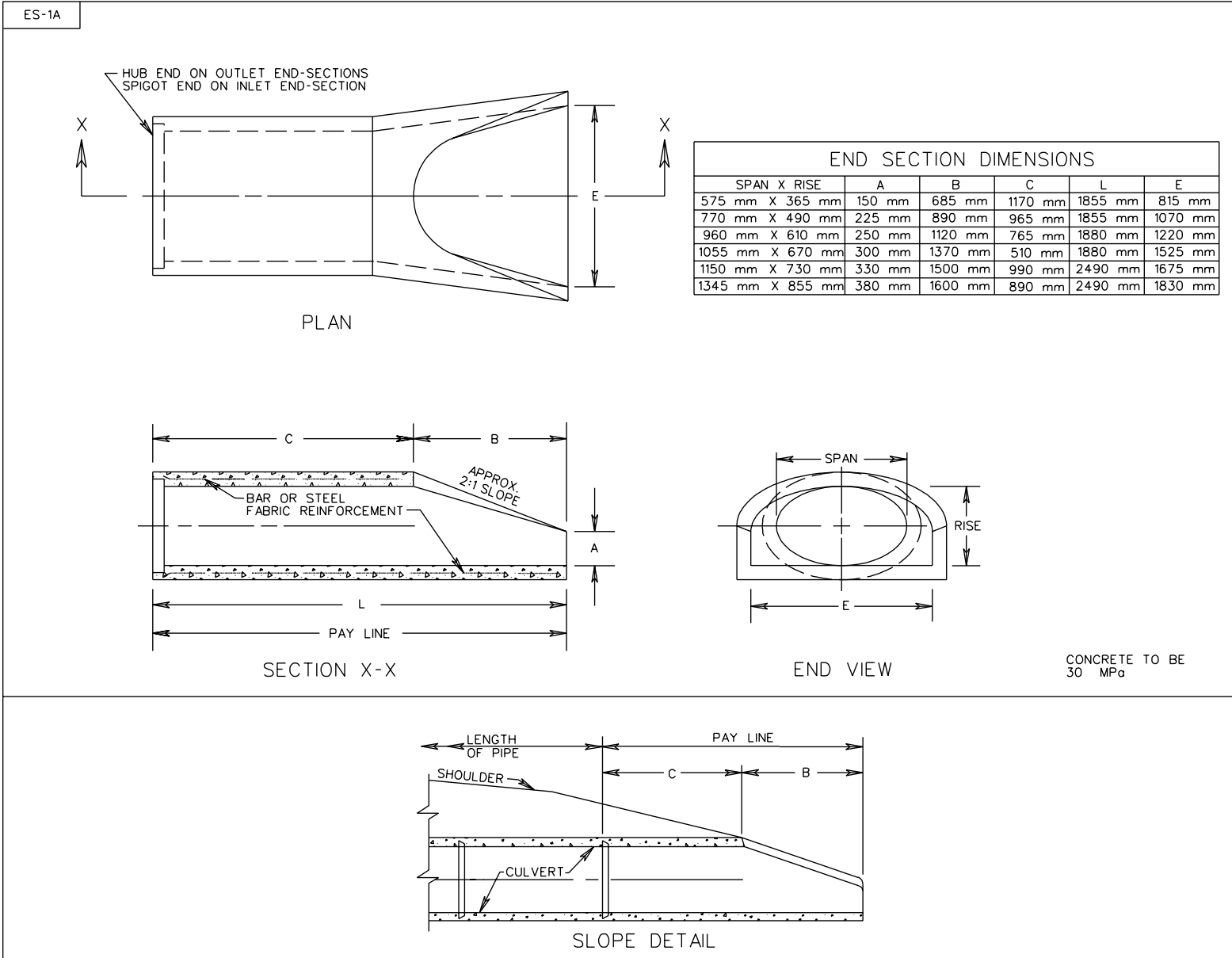


SPECIFICATION REFERENCE 302	<h2 style="margin: 0;">FLARED END-SECTION FOR CONCRETE PIPE CULVERTS</h2> <p style="margin: 0;">VIRGINIA DEPARTMENT OF TRANSPORTATION</p>	REV. 7/01 UNLESS OTHERWISE NOTED, ALL DIMENSIONS ON THIS SHEET ARE IN MILLIMETERS	102.01
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FLARED END-SECTION FOR 575 mm X 365 mm TO 1345 mm X 855 mm
ELLIPTICAL CONCRETE PIPE CULVERTS

REV. 7/01

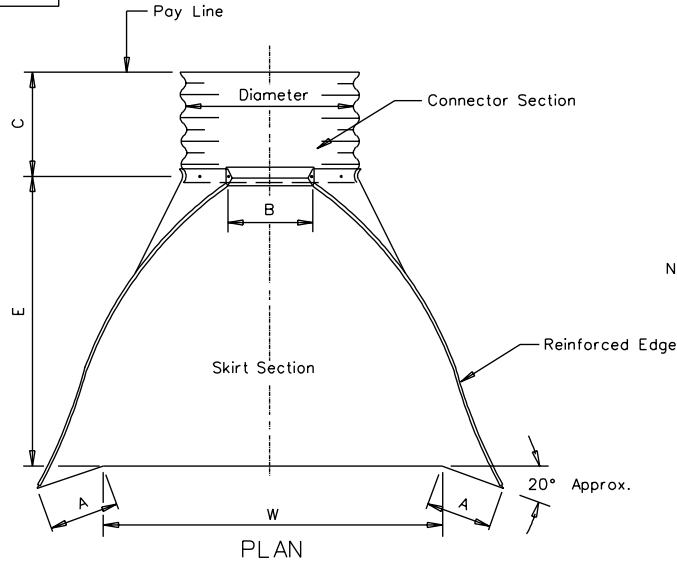
102.01A UNLESS OTHERWISE NOTED, ALL DIMENSIONS ON THIS SHEET ARE IN MILLIMETERS

VIRGINIA DEPARTMENT OF TRANSPORTATION

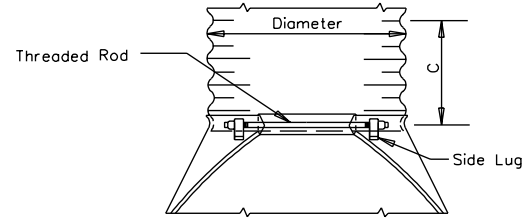
SPECIFICATION REFERENCE

302

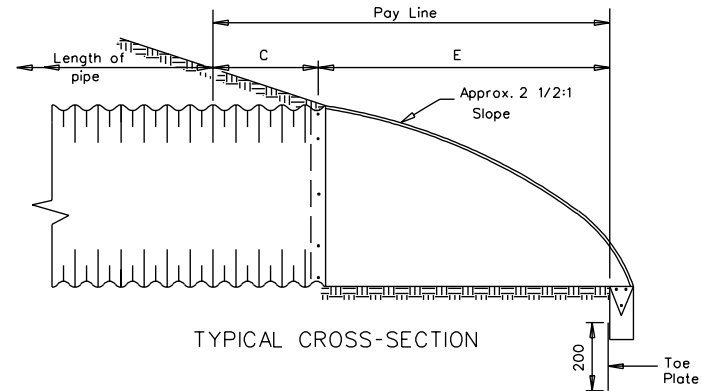
ES-2



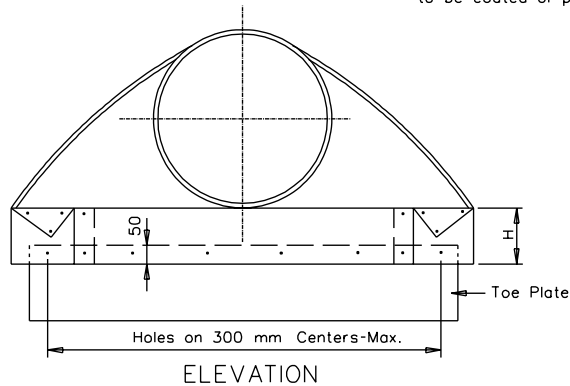
ALTERNATE CONNECTION



Notes: Toe plate to be punched to match holes in skirt lip. M10 galvanized bolts to be furnished. Length of toe plate is $W + 250$ mm for 300 mm to 750 mm diameter pipe and $W + 560$ mm for 900 mm to 1500 mm diameter pipe. Skirt Section for 300 mm to 750 mm diameter pipe to be made in one piece. Skirt Section for 900 mm to 1350 mm diameter pipe may be made from two sheets joined by riveting or bolting on center line, 1500 mm may be constructed in 3 pieces. Connector Section, Corner Plate and Toe Plate to be same sheet thickness as skirt. End-sections and fittings are to be steel or aluminum alloy for use with like pipe.



Where Flared End-Sections are to be used with asphalt coated and paved metal pipe, end sections do not need to be coated or paved.



PIPE DIAMETER	SHEET THICKNESS		DIMENSIONS					
	STEEL	ALUMINUM	A 25 mm TOL.	B MAX.	H 25 mm TOL.	E 40 mm TOL.	W 50 mm TOL.	C
300	1.63	1.52	150	150	150	525	600	600
375	1.63	1.52	175	200	150	650	750	600
450	1.63	1.52	200	250	150	775	925	600
525	1.63	1.52	250	300	150	900	1075	600
600	1.63	1.52	250	325	150	1025	1225	600
675/750	1.63	1.91	300	400	200	1300	1525	600
900	1.63	1.91	350	475	225	1525	1825	600
1050	1.63	2.67	400	550	275	1750	2125	600
1200	1.63	2.67	450	675	300	1975	2275	600
1350	1.63	2.67	450	750	300	2125	2600	600
1350	2.01	2.67	450	750	300	2125	2600	600
1500	1.63	2.67	450	825	300	2200	2900	600
1500	2.77	3.43	450	825	300	2200	2900	600

FLARED END-SECTION FOR 300 mm - 1500 mm METAL PIPE CULVERTS

REV. 7/01

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE

302

102.02

UNLESS OTHERWISE NOTED, ALL DIMENSIONS ON THIS SHEET ARE IN MILLIMETERS

EXTRA STRENGTH CLAY PIPE		
DIAMETER (mm)	AREA (m ²)	ALLOWABLE MAXIMUM COVER (m)
300	0.07	4.57
375	0.11	4.57
450	0.17	4.57
525	0.22	4.57
600	0.29	4.57
750	0.46	3.96
900	0.66	3.96

NOTES:

ALL VITRIFIED CLAY PIPE IS TO BE EXTRA STRENGTH.

MAXIMUM HEIGHTS OF COVER SHOWN IN TABLE ARE FOR FINISHED CONSTRUCTION.

TO PROTECT PIPE DURING CONSTRUCTION MINIMUM HEIGHT OF COVER PRIOR TO ALLOWING CONSTRUCTION TRAFFIC TO CROSS INSTALLATION IS TO BE 900 mm. THIS COVER IS TO EXTEND THE FULL LENGTH OF THE PIPE CULVERT. THE APPROACH FILL RAMP IS TO EXTEND A MINIMUM OF 10 (DIA.+900 mm) ON EACH SIDE OF THE CULVERT, OR TO THE INTERSECTION WITH A CUT.

MINIMUM FINISHED HEIGHT OF COVER TO BE 600 mm, EXCEPT PIPE UNDER ENTRANCES AND MEDIAN CROSSEOVERS WHERE A 230 mm MINIMUM WILL BE PERMITTED.

METHOD "A" BEDDING IS TO BE USED FOR ALL INSTALLATIONS UNLESS OTHERWISE DESIGNATED ON PLANS.

VITRIFIED CLAY

POLYETHYLENE CORRUGATED PIPE CULVERT		
DIAMETER (mm)	AREA (m ²)	ALLOWABLE MAXIMUM COVER (m)
300	0.07	6.3
375	0.11	6.3
450	0.17	6.0
600	0.22	6.0
750	0.45	5.7
900	0.65	5.4
* 1050	0.89	5.4
* 1200	1.17	5.1

* FOR TYPE D ONLY.

NOTE: FOR DETAILS OF BEDDING FOR POLYETHYLENE PIPE CULVERT SEE STANDARD PB-1.

POLYVINYLCHLORIDE RIBBED PIPE CULVERT		
DIAMETER (mm)	AREA (M ²)	ALLOWABLE MAXIMUM COVER (m)
450	0.16	6.0
525	0.21	5.7
600	0.28	5.7
750	0.44	5.4
900	0.64	5.4
1200	1.14	5.4

NOTES:

COVER HEIGHTS INDICATED IN TABLES ARE FOR FINISHED CONSTRUCTION.

TO PROTECT PIPE DURING CONSTRUCTION, MINIMUM HEIGHT OF COVER TO BE AS FOLLOWS PRIOR TO ALLOWING CONSTRUCTION TRAFFIC TO CROSS INSTALLATION.

PIPE DIAMETER	** MINIMUM COVER HEIGHT DURING CONSTRUCTION
300 TO 750	450 mm
900 AND ABOVE	DIAMETER 2

MINIMUM FINISHED HEIGHT OF COVER TO BE 1/8 DIAMETER OR 300 mm WHICHEVER IS GREATER, EXCEPT PIPE UNDER ENTRANCES AND MEDIAN CROSSEOVERS WHERE A 230 mm MINIMUM WILL BE PERMITTED FOR PIPE UP TO 600 mm DIAMETER.

** THE COVER SHALL EXTEND THE FULL LENGTH OF THE PIPE. THE APPROACH FILL IS TO EXTEND A MINIMUM OF (15)(DIAMETER + 1/2 DIAMETER) ON EACH SIDE OF THE STRUCTURE, OR TO THE INTERSECTION WITH A CUT.

THE ALLOWABLE COVER TABLES SHOWN ARE BASED ON A SOIL MODULUS OF 4.8 MPa. ALL OTHER DESIGN CRITERIA ARE IN ACCORDANCE WITH THE AASHTO SPECIFICATIONS AND VDOT MODIFICATIONS FOR SOIL THERMOPLASTIC PIPE INTERACTION SYSTEMS.

PLASTIC PIPE

SHEET 16 OF 17

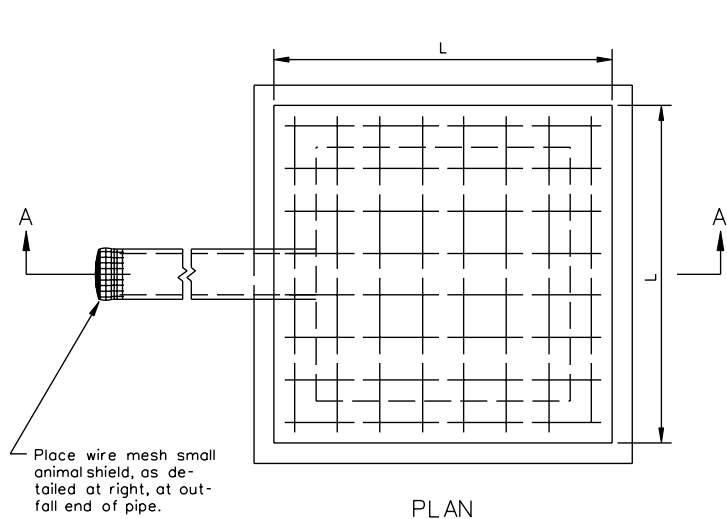
SPECIFICATION REFERENCE
232 302

VITRIFIED CLAY AND PLASTIC PIPE
MAXIMUM COVER TABLE FOR H-18 LIVE LOAD

REV. 7/01

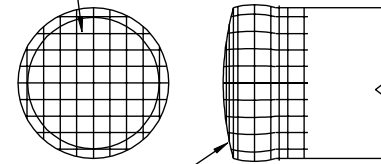
REVISED ON 3/03

SB-1



PLAN

19 mm x 19 mm Mesh, Min. 1.2 mm, Galvanized After Weaving, Hardware Cloth.



Crimp around outlet end of pipe and secure to pipe with galvanized steel wire.

Notes:

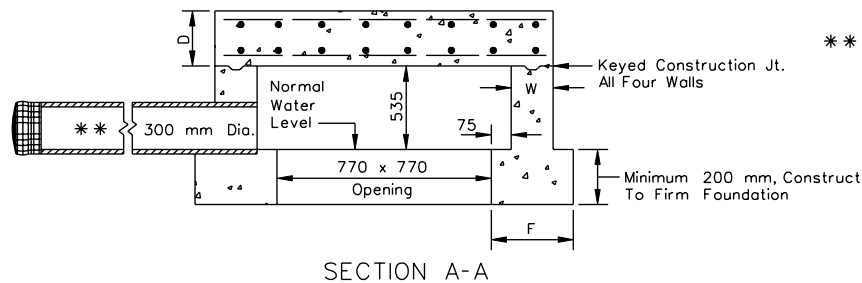
All concrete to be Class 20 if cast in place. For precast see Sheet 110.02.

Concrete quantities shown are based on a 300 mm ductile iron water line. If other size or type of pipe is used quantities are to be adjusted accordingly.

Cost of wire mesh shield at outfall end of pipe is to be included in price bid for pipe.

This item may be precast or cast in place.

HEIGHT OF FILL	SIZE (L)	TOP SLAB (D)	SIDEWALLS (W)	FOOTING WIDTH (F)	REINFORCING STEEL				QUANTITIES		
					NO. REQ'D.	LENGTH	SIZE	SPACING C-C	m ³ CONC.	REINF. STEEL kg	INCREMENT * m ³
BELOW 7.6 m	1220	200	150	300	32	1145	#13	150	1.03	36	0.03
7.6 - 15.2 m	1320	200	200	350	32	1245	#16	150	1.20	62	0.04



* Quantities shown are based on a 200 mm depth of footing, add incremental quantity for each additional 25 mm of depth.

** Standard recommended pipe is 300 mm ductile iron water line, push on joints: class to be specified based upon height of cover.

STANDARD SPRING BOX

REV. 7/01

110.01

UNLESS OTHERWISE NOTED, ALL DIMENSIONS ON THIS SHEET ARE IN MILLIMETERS

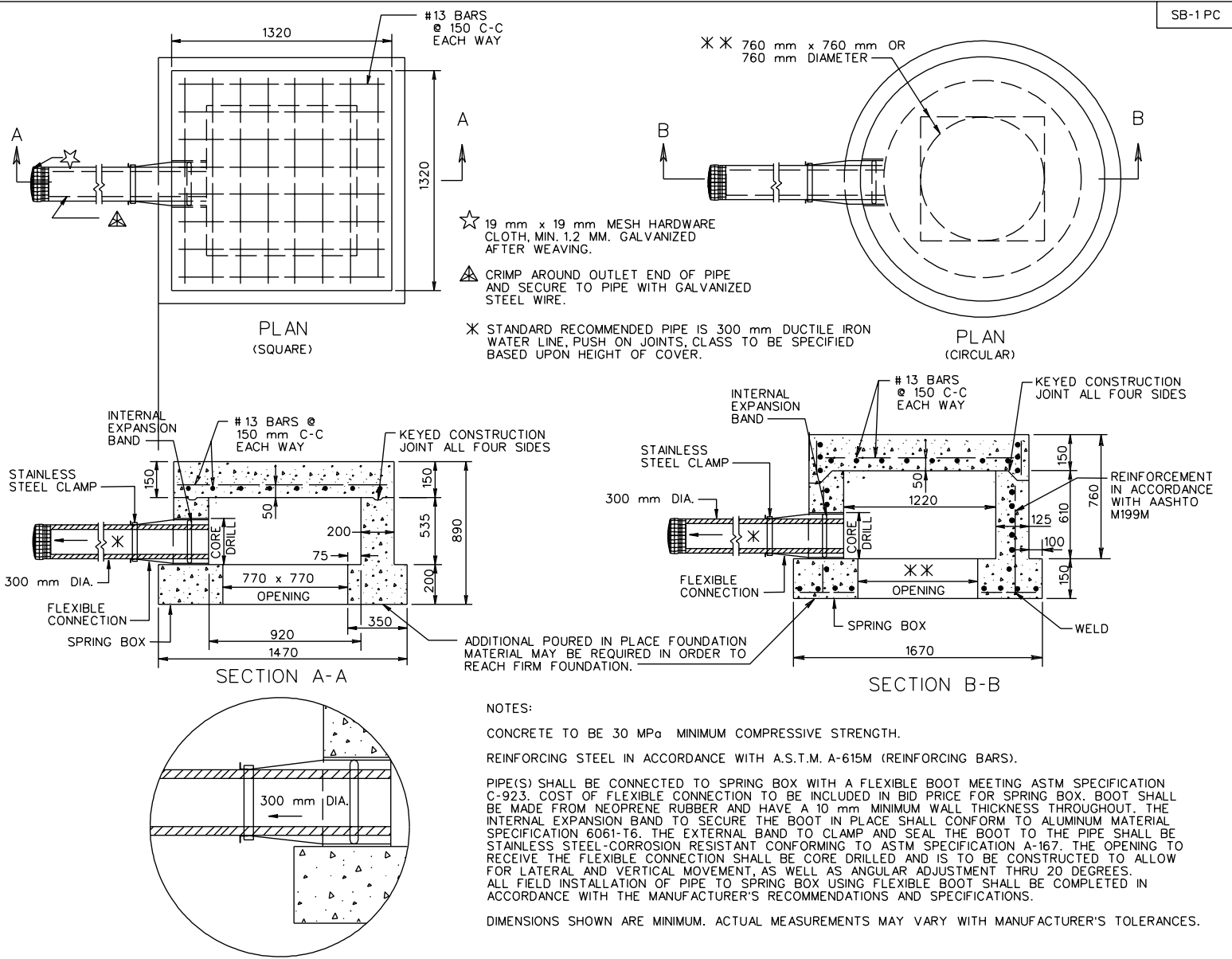
VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE

105
232
302

REVISED ON 3/03

SB-1 PC



SPECIFICATION REFERENCE
105

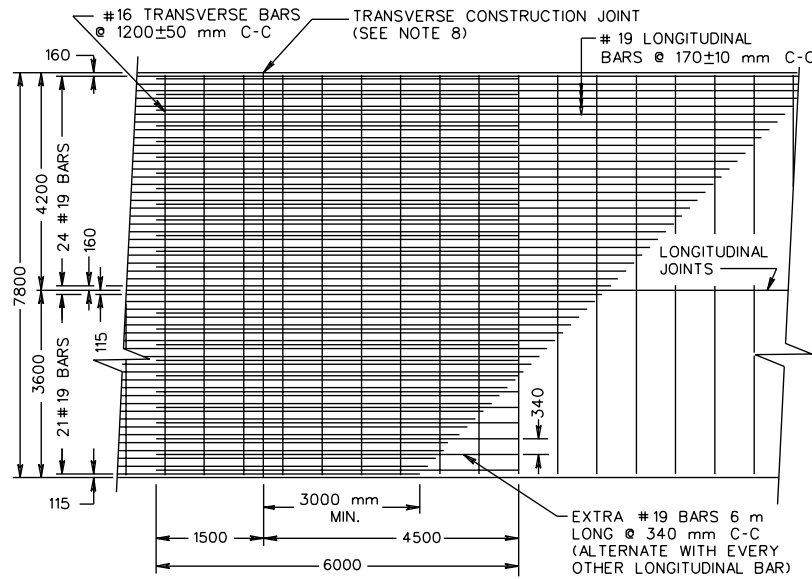
PRECAST SPRING BOX
 VIRGINIA DEPARTMENT OF TRANSPORTATION

UNLESS OTHERWISE NOTED, ALL DIMENSIONS ON THIS SHEET ARE IN MILLIMETERS.	REV. 7/01 110.02
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REVISED ON 3/03

<p style="text-align: center;">DROP INLET SILT TRAP (TYPE A)</p> <p style="text-align: center;">TYPICAL TREATMENT FOR DROP INLET WITH CONCRETE GUTTER</p> <p style="text-align: center;">SECTION A-A</p> <p>* IF CHECK DAM IS LOCATED INSIDE CLEAR ZONE AND ADJACENT TO A TRAVELWAY, SLOPE FACING ON COMING TRAFFIC IS TO BE 6:1 AND MAXIMUM H IS TO BE 0.3 m.</p> <p style="text-align: center;">SECTION B-B</p> <p>NOTES</p> <ol style="list-style-type: none"> 1. POSTS AND TOP RAIL SHALL BE A NOMINAL 63 mm X 63 mm OR A 75 mm DIA. NO. 2 SOUTHERN PINE, A NOMINAL 50 mm X 50 mm OAK, OR STEEL HAVING A MIN. MASS OF 1.86 kg/m AND A MIN. LENGTH OF 1.5 m FOR TEMPORARY SILT FENCES. 2. END OF FILTER BARRIER TO BE EMBEDDED INTO AGGREGATE. 3. IF A DROP INLET IS LOCATED IN A SAG IN THE DITCH GRADE, A CHECK DAM IS REQUIRED FOR EACH SIDE OF THE INLET THAT RECEIVES DITCH FLOW. 4. WHERE DRAINAGE AREAS EXCEED 0.4 HECTARES OR DITCH GRADE EXCEEDS 3%, A TEMPORARY SEDIMENT FOREBAY SHALL BE INSTALLED WITH MINIMUM DIMENSIONS OF 0.3 m DEPTH, 0.6 m WIDTH AND 1.8 m LENGTH. 	<p style="text-align: center;">DROP INLET SILT TRAP TYPE B (BLOCK AND GRAVEL)</p> <p style="text-align: right;">EC-6</p> <p style="text-align: center;">SECTION VIEW</p> <p>SPECIFIC APPLICATION</p> <p>THIS METHOD OF INLET PROTECTION IS APPLICABLE AT CURB INLETS WHERE AN OVERFLOW CAPABILITY IS NECESSARY TO PREVENT EXCESSIVE PONDING IN FRONT OF THE STRUCTURE.</p> <p style="text-align: center;">ALTERNATE DROP INLET SILT TRAP TYPE B (GRAVEL)</p> <p style="text-align: center;">SECTION VIEW</p> <p>SPECIFIC APPLICATION</p> <p>THIS METHOD OF INLET PROTECTION IS APPLICABLE AT CURB INLETS WHERE PONDING IN FRONT OF THE STRUCTURE IS NOT LIKELY TO CAUSE INCONVENIENCE OR DAMAGE TO ADJACENT STRUCTURES AND UNPROTECTED AREAS.</p>		
<p>SPECIFICATION REFERENCE</p> <p>107 242 303</p>	<p style="font-size: 1.2em;">DROP INLET SILT TRAP (TYPE A AND B)</p> <p>VIRGINIA DEPARTMENT OF TRANSPORTATION</p>		<p style="text-align: right;">REV. 7/01</p> <p style="text-align: right; font-size: 0.8em;">UNLESS OTHERWISE NOTED, ALL DIMENSIONS ON THIS SHEET ARE IN MILLIMETERS</p> <p style="text-align: right;">114.07</p>

PR-8



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 #16 TRANSVERSE BARS. WHERE NECESSARY, ADJUST THE LOCATION OF THE HOOK BOLTS OR TIE BARS TO A 70 mm 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 #19 LONGITUDINAL BARS.
3. #19 LONGITUDINAL BARS ARE TO BE LAPPED AND TIED IN THE SAME HORIZONTAL PLANE.
4. FOR THE 11.4 METER WIDTH PAVEMENT USE SINGLE 3.6 METER LANES WITH TWO LONGITUDINAL CONSTRUCTION JOINTS OR 3.6 METER AND 4.2 METER 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 (7.55 m) FOR SAW CUT OR TAPE INSERT LONGITUDINAL JOINT.
5. SMOOTH SURFACE TO BE STEEL TROWELED 200 mm IN FROM EDGE OF PAVEMENT EVERY 150 m, 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).
6. DOUBLE LAP REQUIREMENT (1000 mm) AND THE EXTRA BAR METHOD APPLY ONLY TO LAPS FALLING WITHIN AN AREA OF 3.00 m 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 #16 TRANSVERSE STEEL IN THE LUGS SHALL BE EXTENDED, LAPPED AND SPLICED AT LEAST 25 DIAMETERS.
8. LONGITUDINAL STEEL TO CONTINUE THROUGH JOINT. EXTRA #19 BARS 6.0 m LONG SHALL BE SPACED AT 340 mm C-C.
9. CONCRETE SHOULD BE ADEQUATELY VIBRATED UNDER BEAM FLANGE TO ELIMINATE HONEYCOMBS.
10. ANCHOR SLAB TYPE I IS TO BE USED IN FIRM SOILS ONLY. FOR AASHTO CLASSIFICATION SOILS A-1 THROUGH A-4, 3 ANCHOR LUGS ARE REQUIRED (ANCHOR SLAB LENGTH = 17 m). FOR AASHTO CLASSIFICATION SOILS A-5 THROUGH A-7, 5 ANCHOR LUGS ARE REQUIRED (ANCHOR SLAB LENGTH = 26 m). USE SAME REINFORCEMENT SIZE AND SPACING AS IN CONTINUOUS PAVEMENT. ANCHOR SLAB TYPE I IS USED TO RESTRICT MOVEMENT AGAINST THE STRUCTURE.
11. ANCHOR SLAB TYPE TYPE II MUST BE USED WHEN COHESIONLESS OR SOFT CLAY SOILS ARE ENCOUNTERED. USE SAME REINFORCEMENT SIZE AND SPACING AS IN CONTINUOUS PAVEMENT. ANCHOR SLAB TYPE II ACCOMODATES MOVEMENT OF THE CONTINUOUS PAVEMENT.
12. WELD STEEL END PLATE TO BOTH ENDS OF WF BEAM TO SEAL ENDS. WELD SHEAR CONNECTORS TO WEB AND FLANGE OF WF BEAM.
13. 50 mm MINIMUM CONCRETE COVER FOR STEEL IN SUB-SLABS.
14. WIDE FLANGE BEAM TO BE TREATED WITH CORROSION INHIBITOR PER SECTION 407 OF THE ROAD AND BRIDGE SPECIFICATIONS.
15. ALL REINFORCING BARS SHALL BE GRADE 400 STEEL.
16. THE USE OF TUBE FEEDING TO PLACE REINFORCEMENT IN THE PLASTIC CONCRETE WILL NOT BE ALLOWED.

SHEET 3 OF 3

300 mm THICK CONTINUOUSLY REINFORCED CONCRETE PAVEMENT
4.2 m TRAVEL LANE

REV. 7/01

301.22

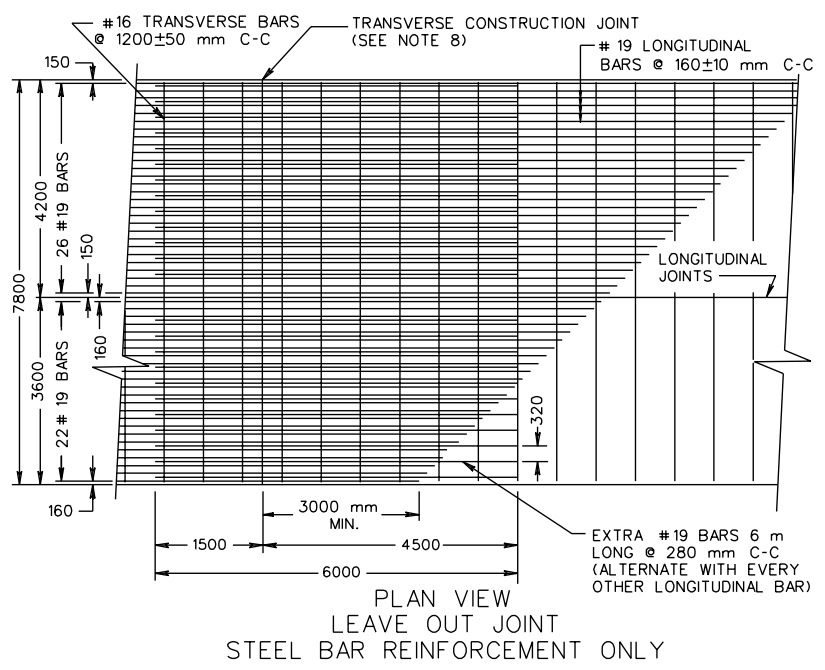
UNLESS OTHERWISE NOTED, ALL DIMENSIONS ON THIS SHEET ARE IN MILLIMETERS

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE

316

PR-9

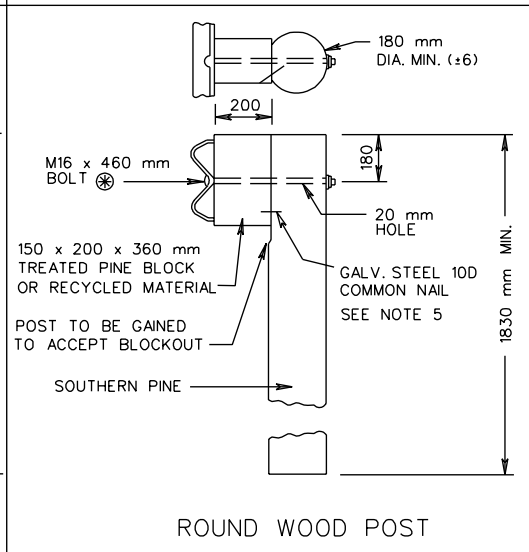
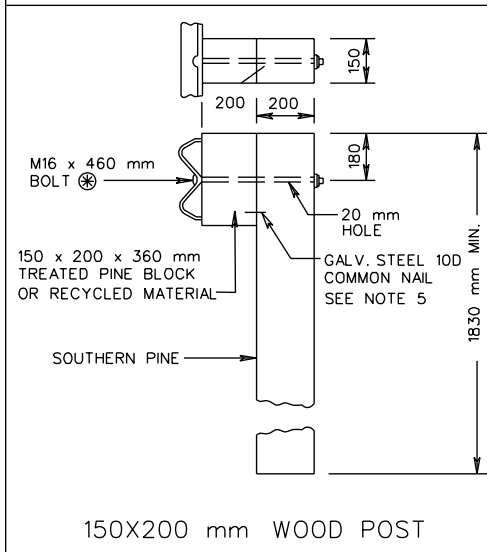
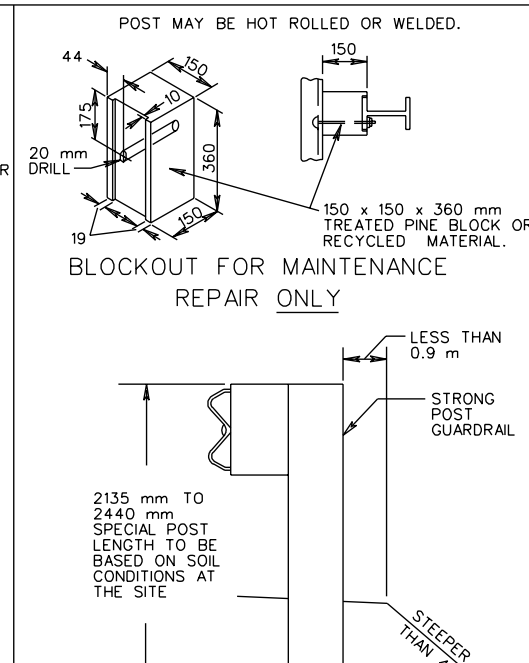
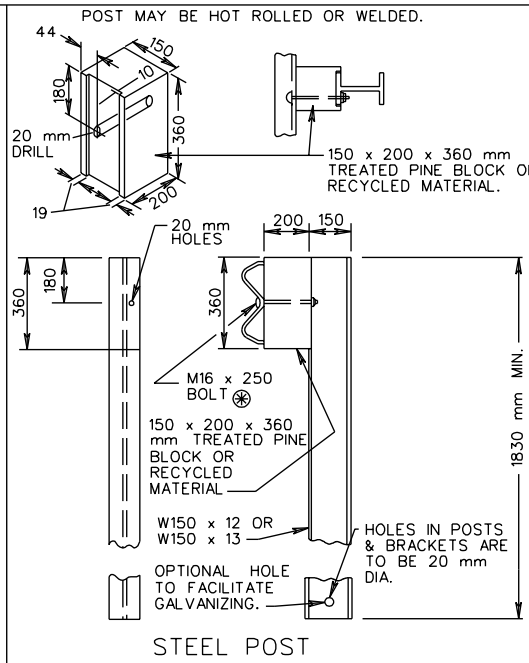
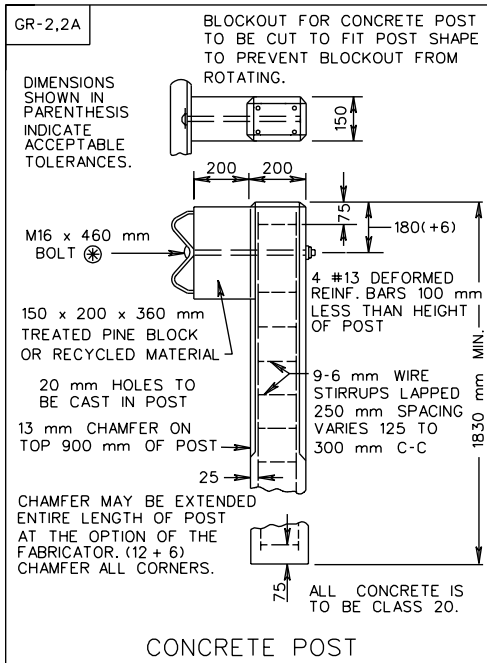


NOTES:

1. HOOK BOLTS OR TIE BARS ARE TO BE PLACED IN THE SAME HORIZONTAL PLANE AS THE #16 TRANSVERSE BARS. WHERE NECESSARY, ADJUST THE LOCATION OF THE HOOK BOLTS OR TIE BARS TO A 70 mm 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 #19 LONGITUDINAL BARS.
3. #19 LONGITUDINAL BARS ARE TO BE LAPPED AND TIED IN THE SAME HORIZONTAL PLANE.
4. FOR THE 11.4 METER WIDTH PAVEMENT USE SINGLE 3.6 METER LANES WITH TWO LONGITUDINAL CONSTRUCTION JOINTS OR 3.6 METER AND 4.2 METER 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 (7.55 m) FOR SAW CUT OR TAPE INSERT LONGITUDINAL JOINT.
5. SMOOTH SURFACE TO BE STEEL TROWELED 200 mm IN FROM EDGE OF PAVEMENT EVERY 150 m, 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).
6. DOUBLE LAP REQUIREMENT (1000 mm) AND THE EXTRA BAR METHOD APPLY ONLY TO LAPS FALLING WITHIN AN AREA OF 3.00 m 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 #16 TRANSVERSE STEEL IN THE LUGS SHALL BE EXTENDED, LAPPED AND SPLICED AT LEAST 25 DIAMETERS.
8. LONGITUDINAL STEEL TO CONTINUE THROUGH JOINT. EXTRA #19 BARS 6.0 m LONG SHALL BE SPACED AT 320 mm C-C.
9. CONCRETE SHOULD BE ADEQUATELY VIBRATED UNDER BEAM FLANGE TO ELIMINATE HONEYCOMBS.
10. ANCHOR SLAB TYPE I IS TO BE USED IN FIRM SOILS ONLY. FOR AASHTO CLASSIFICATION SOILS A-1 THROUGH A-4, 3 ANCHOR LUGS ARE REQUIRED (ANCHOR SLAB LENGTH = 17 m). FOR AASHTO CLASSIFICATION SOILS A-5 THROUGH A-7, 5 ANCHOR LUGS ARE REQUIRED (ANCHOR SLAB LENGTH = 26 m). USE SAME REINFORCEMENT SIZE AND SPACING AS IN CONTINUOUS PAVEMENT. ANCHOR SLAB TYPE I IS USED TO RESTRICT MOVEMENT AGAINST THE STRUCTURE.
11. ANCHOR SLAB TYPE TYPE II MUST BE USED WHEN COHESIONLESS OR SOFT CLAY SOILS ARE ENCOUNTERED. USE SAME REINFORCEMENT SIZE AND SPACING AS IN CONTINUOUS PAVEMENT. ANCHOR SLAB TYPE II ACCOMODATES MOVEMENT OF THE CONTINUOUS PAVEMENT.
12. WELD STEEL END PLATE TO BOTH ENDS OF WF BEAM TO SEAL ENDS. WELD SHEAR CONNECTORS TO WEB AND FLANGE OF WF BEAM.
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15. ALL REINFORCING BARS SHALL BE GRADE 400 STEEL.
16. THE USE OF TUBE FEEDING TO PLACE REINFORCEMENT IN THE PLASTIC CONCRETE WILL NOT BE ALLOWED.

SHEET 3 OF 3

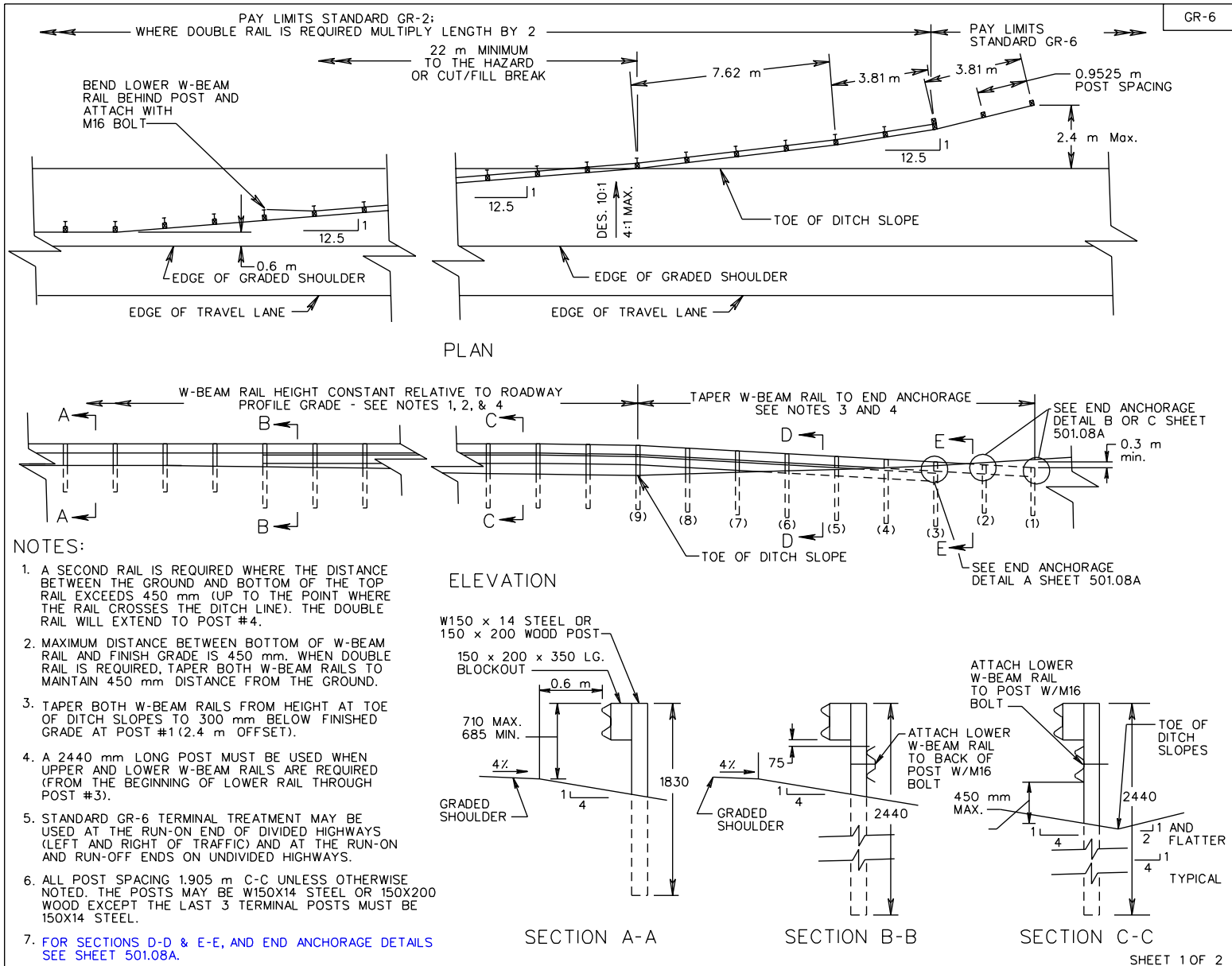
SPECIFICATION REFERENCE 316	<h2 style="margin: 0;">325 mm THICK CONTINUOUSLY REINFORCED CONCRETE PAVEMENT</h2> <h3 style="margin: 0;">4.2 m TRAVEL LANE</h3>	VIRGINIA DEPARTMENT OF TRANSPORTATION	UNLESS OTHERWISE NOTED ALL DIMENSIONS ONB THIS SHEET ARE IN MILLIMETERS	REV. 7/01 301.25
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1. 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 NO'S. 501.01 AND 501.02
 4. THE GUARDRAIL AND MEDIAN BARRIER COMPONENTS DEPICTED IN AASHTO - AGC - ARTBA "A GUIDE TO STANDARDIZED HIGHWAY BARRIER HARDWARE" MAY BE SUBSTITUTED IF INTERCHANGEABLE WITH THE STANDARDS FOR GUARDRAIL (GR) OR MEDIAN BARRIER (MB) AND APPROVED BY THE ENGINEER.
 5. DRIVE NAIL WITHIN 50 mm OF THE TOP OR BOTTOM OF BLOCKOUT AFTER M16 x 460 mm BOLT IS INSTALLED.
- ⊗ STANDARD WASHER TO BE USED ON LAST 15 m OF RUN OFF END.

STANDARD BLOCKED-OUT W BEAM GUARDRAIL (STRONG POST SYSTEM) POST AND BLOCKOUT DETAILS		SHEET 2 OF 2
REV. 7/01	UNLESS AND OTHERWISE NOTED, ALL DIMENSIONS ON THIS SHEET ARE IN MILLIMETERS	SPECIFICATION REFERENCE
501.05	VIRGINIA DEPARTMENT OF TRANSPORTATION	221 236 505

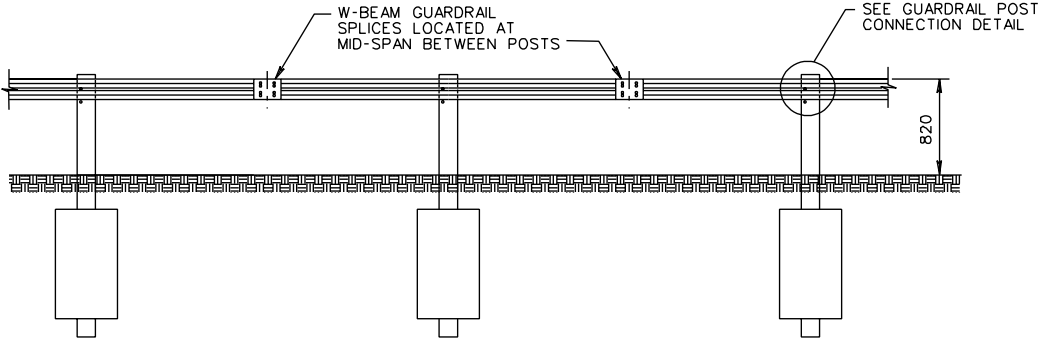
REVISED ON 7/02



SPECIFICATION REFERENCE	TERMINAL TREATMENT FOR W BEAM GUARDRAIL		REV. 7/01
505 221	VIRGINIA DEPARTMENT OF TRANSPORTATION		UNLESS OTHERWISE NOTED, ALL DIMENSIONS ON THIS SHEET ARE IN MILLIMETERS
			501.08

INSERTABLE SHEET MA91

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



TYPICAL INSTALLATION

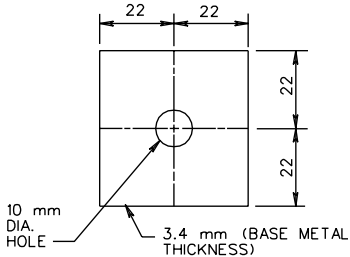
STANDARD	POST SPACING (m)	DEFLECTION (m)
GR-8	3.8	2.15
GR-8A	1.9	1.525
GR-8B	0.95	1.20
GR-8C	1.27	1.375

FOR ROCK INSTALLATION, 200 X 660 X 6 PLATE IS TO BE ELIMINATED. DRILL OR EXCAVATE HOLE FOR POST, PLACE POST AND BACKFILL WITH CRUSHER RUN AGGREGATE TO LEVEL OF ROCK.

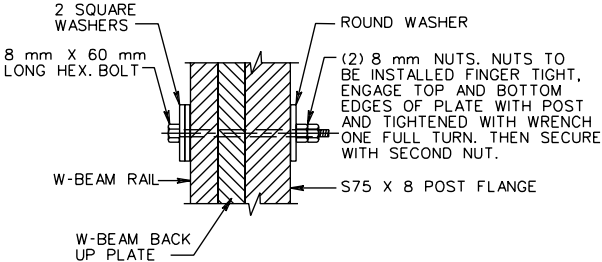
ALL POSTS, BOLTS, NUTS AND WASHERS ARE TO BE GALVANIZED.

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.

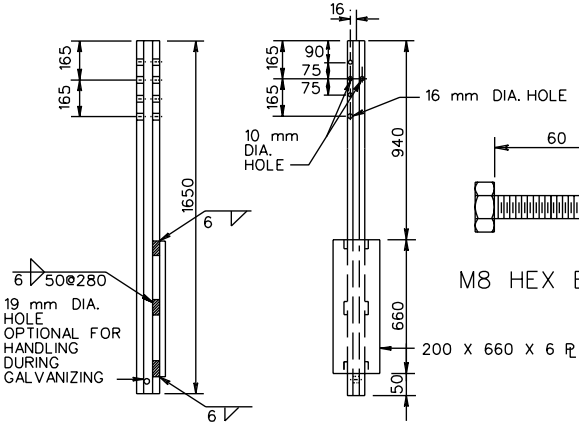


SQUARE WASHER

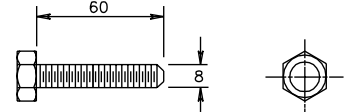


GUARDRAIL POST CONNECTION DETAIL

POST SPACING ON CURVES	
PAVEMENT ϕ RADIUS	POST SPACING
> 67 m R	3.8 m
66.9 m - 33.6 m	1.9 m
33.5 m - 23.1 m	1.27 m
23.0 m - 15.0 m	0.95 m
< 15.0 m	USE NOT RECOMMENDED

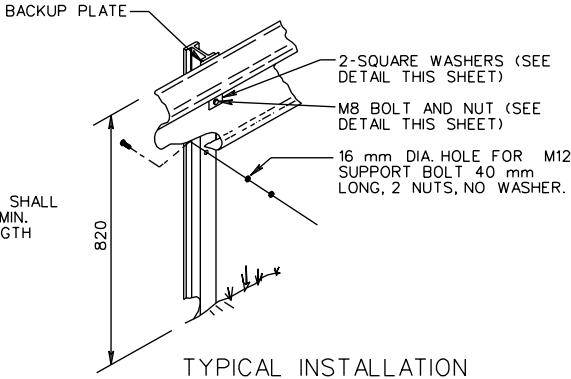


S 75 X 8 STEEL POST



M8 HEX BOLT AND NUT

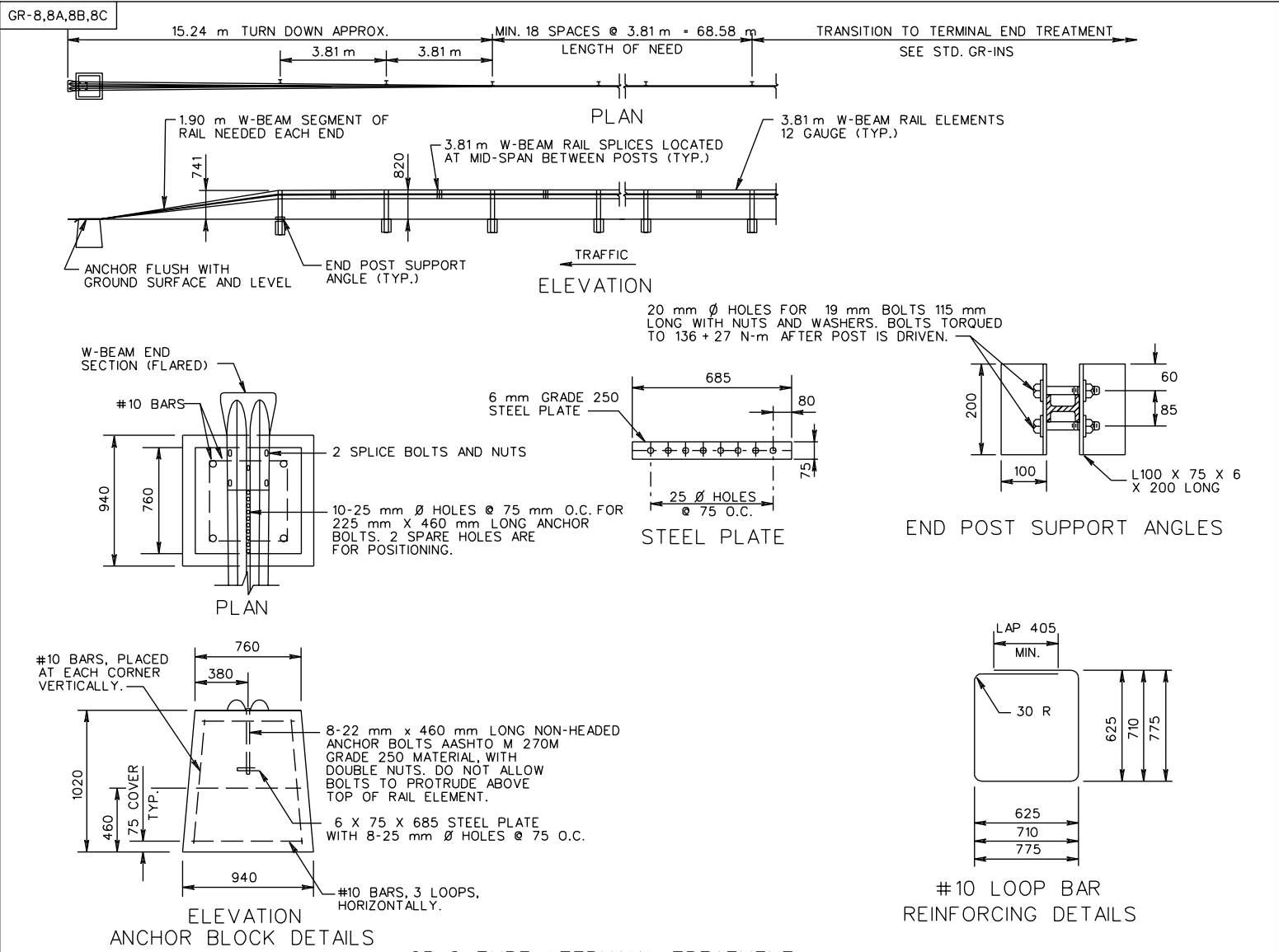
BOLT AND NUT SHALL HAVE 17.8 kN MIN. TENSILE STRENGTH



TYPICAL INSTALLATION

SHEET 1 OF 2

SPECIFICATION REFERENCE	STANDARD W BEAM GUARDRAIL (WEAK POST SYSTEM) TL-3 (>70 km/h) VIRGINIA DEPARTMENT OF TRANSPORTATION	REV. 7/01
221 505		



GR-8 TYPE II TERMINAL TREATMENT (RUN-OFF ANCHORAGE)

SHEET 2 OF 2

STANDARD W BEAM GUARDRAIL (WEAK POST SYSTEM)
 TL-3 (>70 km/h)

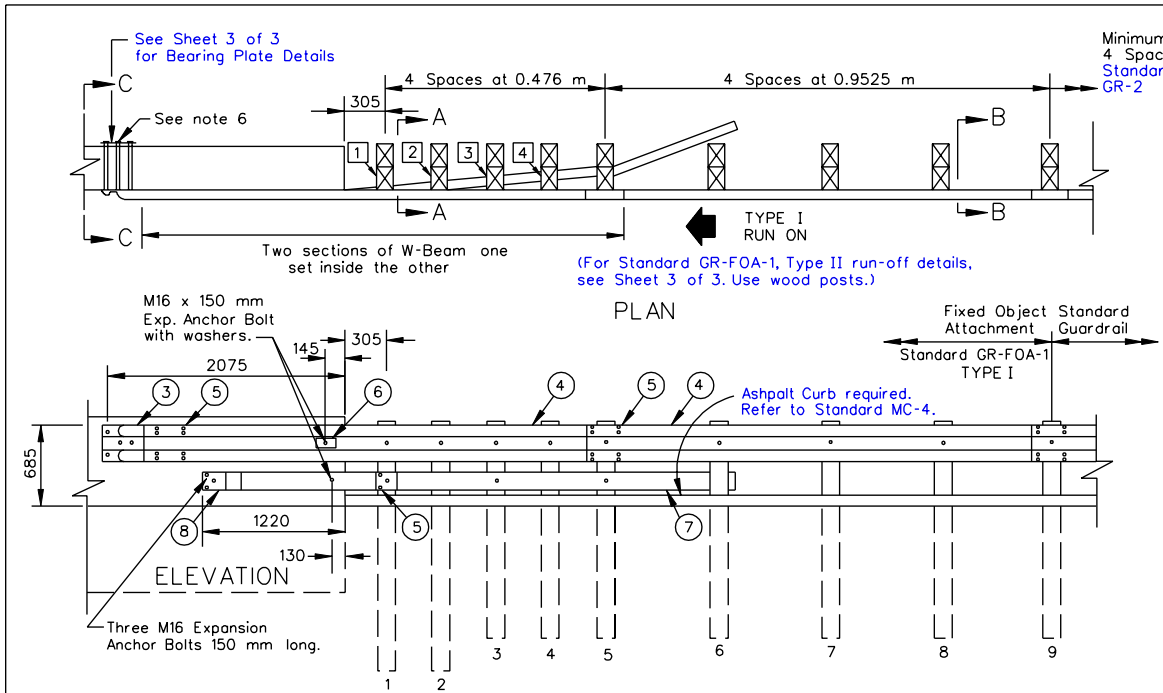
REV. 7/01

501.13 UNLESS OTHERWISE NOTED, ALL DIMENSIONS ON THIS SHEET ARE IN MILLIMETERS

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE

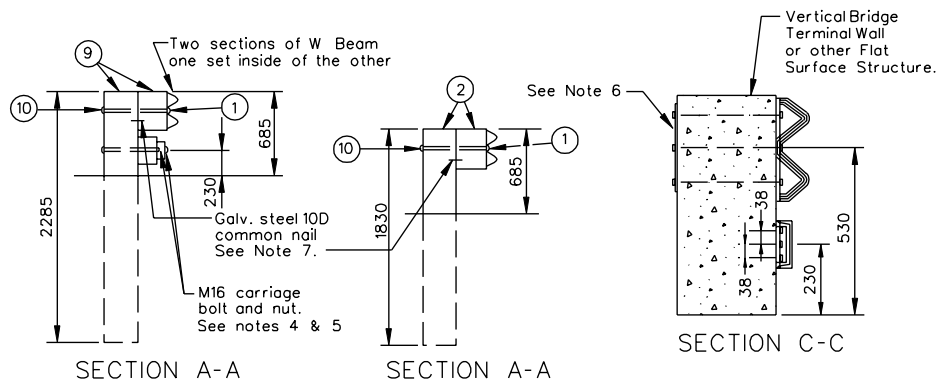
221 505



Notes:

1. Fixed objects may consist of bridge rails, abutments, piers, retaining walls, or other flat surfaced structures with a vertical face.
2. Bridge rail ends and bridge parapets must be of adequate strength to accept full impact loading.
3. Guardrail components to be in accordance with VDOT Road and Bridge Standards.
4. Posts 1,2,3,4 and 5 require an additional hole to attach lower blocks and/or rubrail. Rubrail is not bolted to post 2 and 4.
5. Bottom wood blocks located on posts 1 through 4 are center drilled and secured with M16 carriage bolts. (Length as required.)
6. Appropriate length M22 diameter ASTM A325 hex bolts must be used with hru drilled holes with a 16 mm bearing plate on the back side of the bridge parapet or Terminal wall.
7. Drive nail within 50 mm of the top or bottom of the blockout after M16 x 460 bolt is installed.
8. See Sheet 3 of 3 for Rubrail Blockout details.

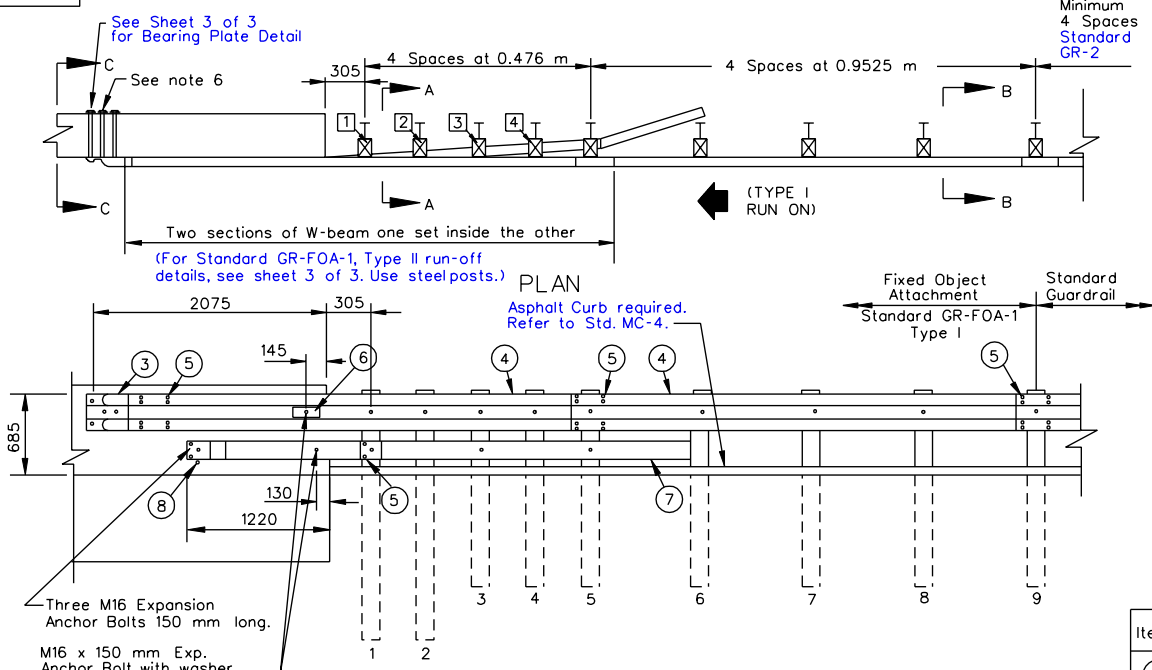
New Bridges - Attachments
 One Way Traffic - Run-on, 2-GR-FOA-1, Type I
 - Run-off, 2-GR-FOA-1, Type II
 Two Way Traffic - Run On, 4-GR-FOA-1, Type I
 Existing bridge attachments as shown on plans.



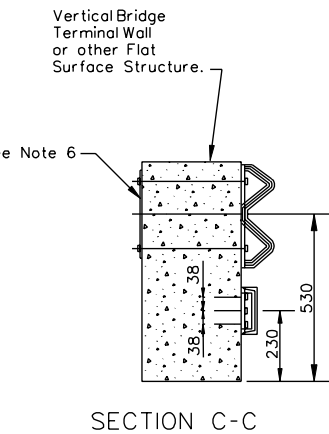
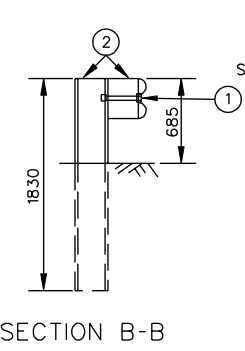
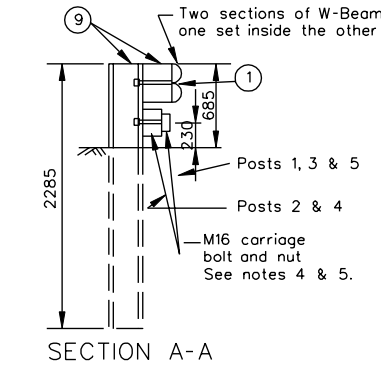
Item	Material/Specifications/Notes
①	M16 x 460 mm Guardrail bolt & Recessed nut
②	Standard 150 x 200 mm Wood post & Block
③	Standard W-beam terminal connector
④	Standard W-beam rail
⑤	M16 x 50 mm Guardrail bolt & Recessed nut (See Standard GR-HDW)
⑥	Rectangular Plate Washer (See Standard GR-HDW)
⑦	Bent plate rubrail (See sheet 3 of 3)
⑧	C150 x 12 rubrail (See sheet 3 of 3)
⑨	200 x 200 mm Wood post & 200 x 200 x 360 long treated pine block or recycled material. (2285 mm length post)
⑩	Washer for M16 bolt

SPECIFICATION REFERENCE 505	<h2 style="margin: 0;">W-BEAM GUARDRAIL - FIXED OBJECT ATTACHMENT</h2> <h3 style="margin: 0;">FOR USE BETWEEN VERTICAL FIXED OBJECTS AND GUARDRAIL (WOOD POSTS)</h3> <p style="margin: 0; font-size: small;">VIRGINIA DEPARTMENT OF TRANSPORTATION</p>	UNLESS OTHERWISE NOTED, ALL DIMENSIONS ON THIS SHEET ARE IN MILLIMETERS	501.22
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GR-FOA-1



New Bridges - Attachments
 One-Way Traffic - Run-On, 2-GR-FOA-1, Type I
 - Run-Off, 2-GR-FOA-1, Type II
 Two-Way Traffic - Run-On, 4-GR-FOA-1, Type I
 Existing bridge attachments as shown on plans.



- Notes:
1. Fixed objects may consist of bridge rails, abutments, piers, retaining walls, or other flat surfaced structures with a vertical face.
 2. Bridge railends and bridge parapets must be of adequate strength to accept full impact loading.
 3. Guardrail components to be in accordance with VDOT Road and Bridge Standards.
 4. Posts 1,2,3,4 and 5 require an additional hole to attach lower blocks and/or rubrail. Rubrail is not bolted to post 2 and 4.
 5. Bottom wood blocks located on posts 1 through 4 are center drilled and secured with M16 carriage bolts. (Length as required.)
 6. Appropriate length M22 diameter ASTM A325 hex bolts must be used with hru drilled holes with a 16 mm bearing plate on the back side of the bridge parapet or Terminal wall.
 7. See Sheet 3 of 3 for rubrail blockout details.

Item	Material/Specifications/Notes
①	M16x250 Guardrail bolt and Recessed nut
②	Standard W150x13.5 Steel Post and Standard 150x200x360 mm Treated Pine Block or Recycled Material
③	Standard W-beam terminal connector
④	Standard W-beam rail
⑤	M16x50 Guardrail bolt & Recessed Nut. (See Standard GR-HDW)
⑥	Rectangular plate washer (See Standard GR-HDW)
⑦	Bent plate rubrail (See sheet 3 of 3)
⑧	C150x12 rubrail (See sheet 3 of 3)
⑨	W200x19x2285 long steelpost with Std. 150x200x300 long treated pine block of recycled material
⑩	Washer for M16 bolt

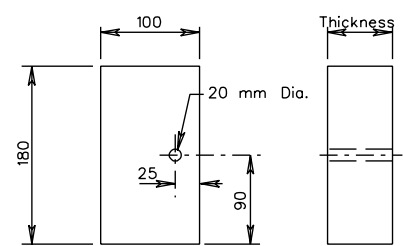
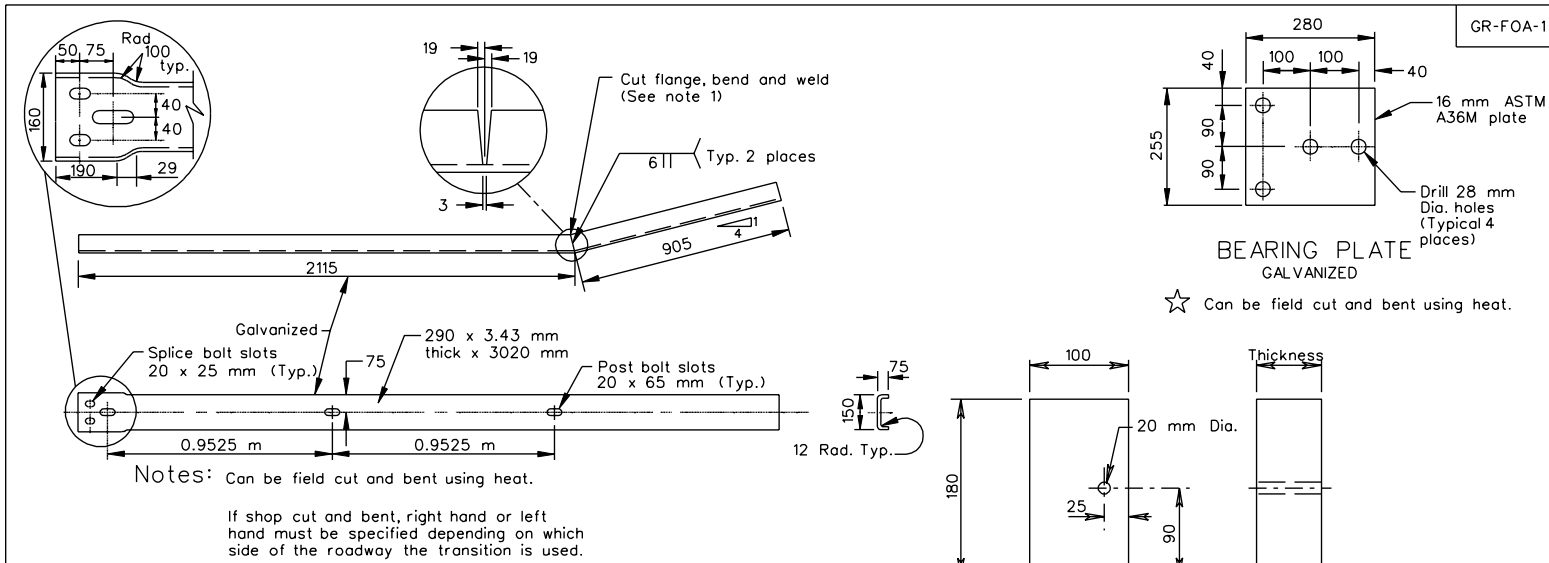
Sheet 2 of 3

**W-BEAM GUARDRAIL-FIXED OBJECT ATTACHMENT
 FOR USE BETWEEN VERTICAL FIXED OBJECTS AND GUARDRAIL (STEEL POSTS)**

REV. 7/01
 501.23 UNLESS OTHERWISE NOTED, ALL DIMENSIONS ON THIS SHEET ARE IN MILLIMETERS

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE
 505



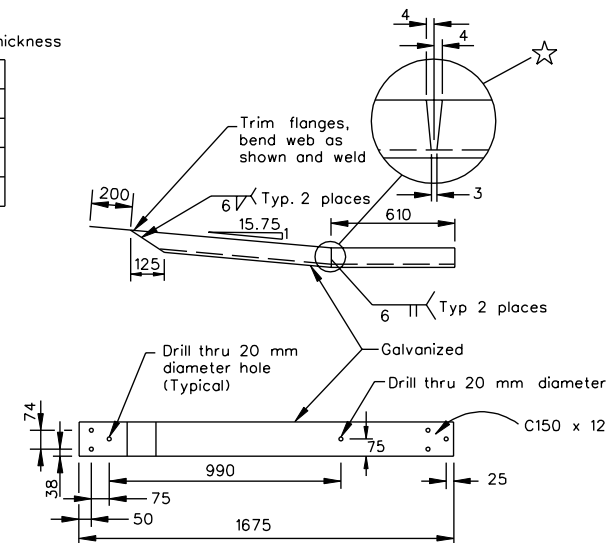
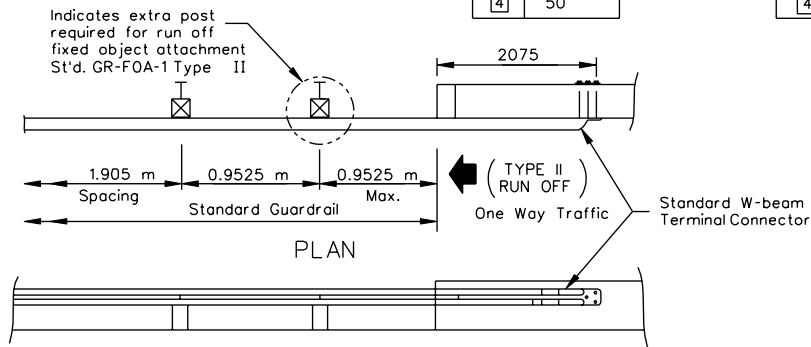
ITEM ⑦ DETAIL

WOOD POSTS
RUBRAIL BLOCKOUTS
180 mm x 100 mm x THICKNESS

Post	Thickness
1	170
2	130
3	90
4	50

STEEL POSTS
RUBRAIL BLOCKOUTS
180 mm x 100 mm x Thickness

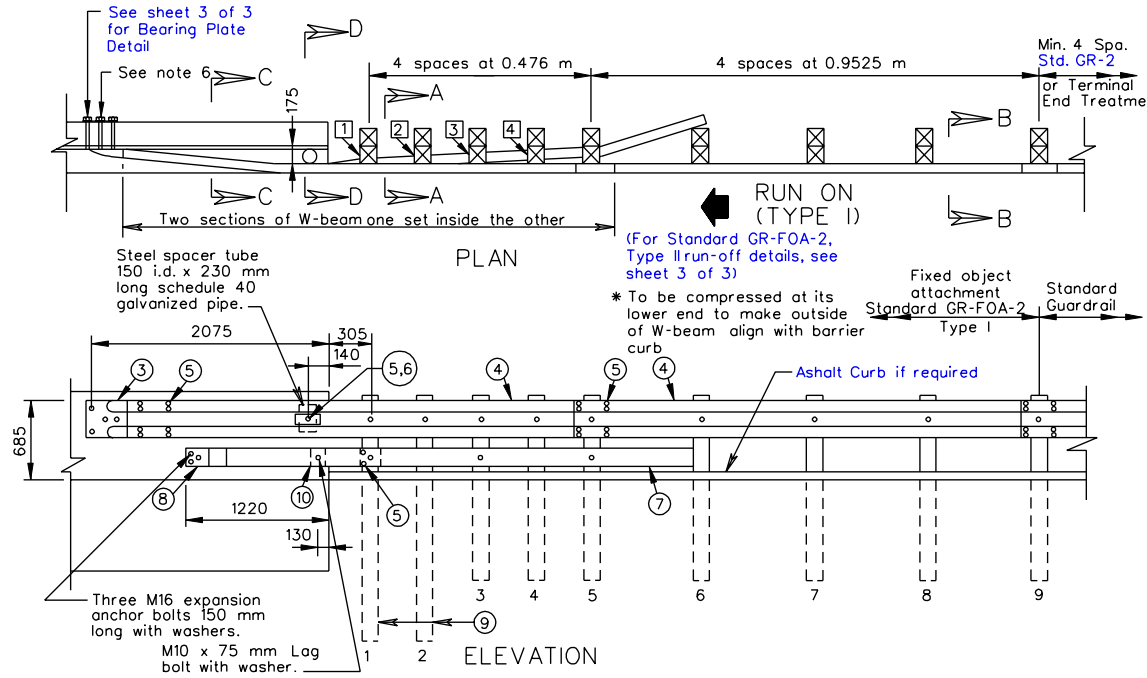
Post	Thickness
1	125
2	100
3	70
4	35



Sheet 3 of 3

SPECIFICATION REFERENCE	W BEAM GUARDRAIL - FIXED OBJECT ATTACHMENT RUBRAIL AND HARDWARE DETAILS	REV. 7/01
505	VIRGINIA DEPARTMENT OF TRANSPORTATION	UNLESS OTHERWISE NOTED, ALL DIMENSIONS ON THIS SHEET ARE IN MILLIMETERS 501.24

GR-FOA-2



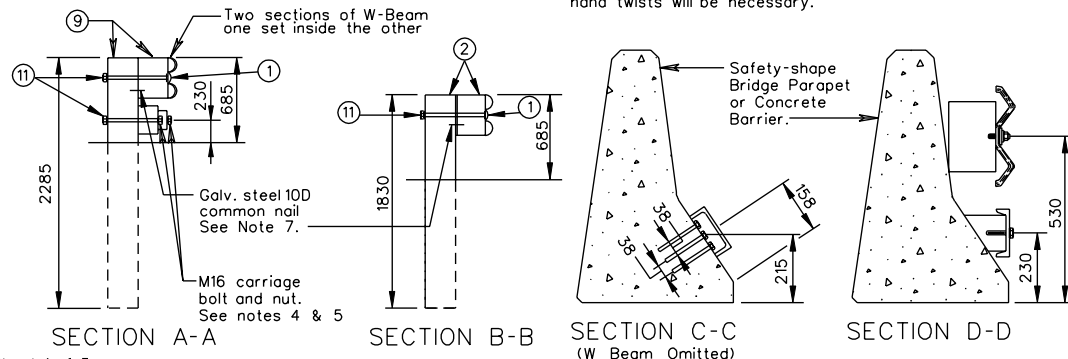
- Notes:
1. Fixed objects may consist of safety shaped bridge parapets or concrete barriers.
 2. Bridge rail ends and bridge parapets must be of adequate strength to accept full impact loading.
 3. Guardrail components to be in accordance with VDOT Road and Bridge Standards.
 4. Posts 1,2,3,4 and 5 require an additional hole to attach lower blocks and/or rubrail. Rubrail is not bolted to posts 2 and 4.
 5. Bottom wood blocks located on posts 1 through 4 are center drilled and secured with M16 carriage bolts. (Length as required)
 6. Appropriate length M22 ASTM A325M hex bolts with washers must be used with thru drilled holes with a 16 mm bearing plate back side of the bridge parapet or concrete barrier.
 7. Drive nail within 50 mm of the top or bottom of the blockout after M16 x 460 bolt is installed.
 8. See sheet 3 of 3 for rubrail blockout details.

New Bridges - Attachments

- One - Way Traffic-Run-on, 2-GR-FOA-2, Type I
- Run-off, 2-GR-FOA-2, Type II
- Two - Way Traffic-Run-on, 4-GR-FOA-2, Type I

Existing bridge attachments as shown on plans.

Note:
Rubrail must be twisted 35° between Section C-C and D-D. Shop fabrication may be required. Right hand and left hand twists will be necessary.



Item	Material/Specifications/Notes
①	M16 x 450 Guardrail bolt & recessed nut
②	Standard 150 x 200 Wood post & Block
③	Standard W-beam terminal connector
④	Standard W-beam rail
⑤	M16 x 50 Guardrail bolt & recessed nut (See Standard GR-HDW)
⑥	Rectangular Plate Washer (See Standard GR-HDW)
⑦	Bent plate rubrail (see sheet 3 of 3)
⑧	C150 x 12 rubrail (See sheet 3 of 3)
⑨	200 x 200 x 2285 mm long wood post & 200 x 200 x 360 long treated pine block or recycled material
⑩	Wood blockout for rubrail (see sheet 3 of 3)
⑪	Washer for M16 bolt

Sheet 1 of 3
REV. 7/01

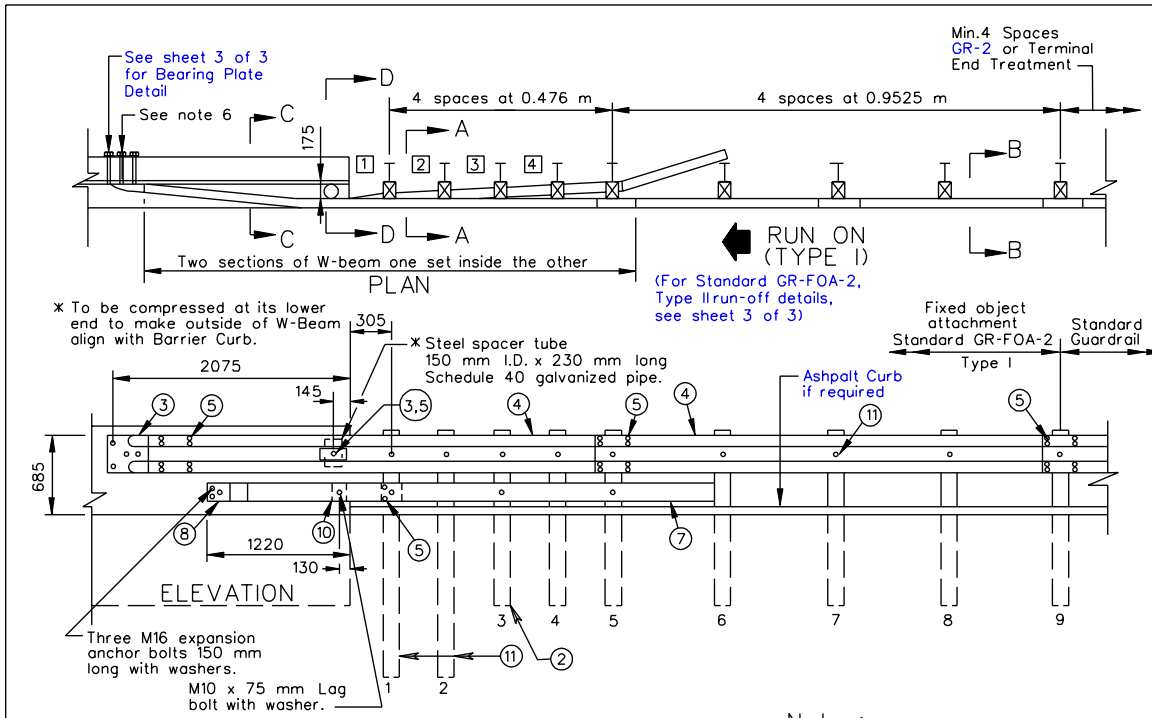
W-BEAM GUARDRAIL - FIXED OBJECT ATTACHMENT
FOR USE BETWEEN SAFETY SHAPE AND GUARDRAIL (WOOD POSTS)

SPECIFICATION REFERENCE

506

501.25 UNLESS OTHERWISE NOTED, ALL DIMENSIONS ON THIS SHEET ARE IN MILLIMETERS

VIRGINIA DEPARTMENT OF TRANSPORTATION



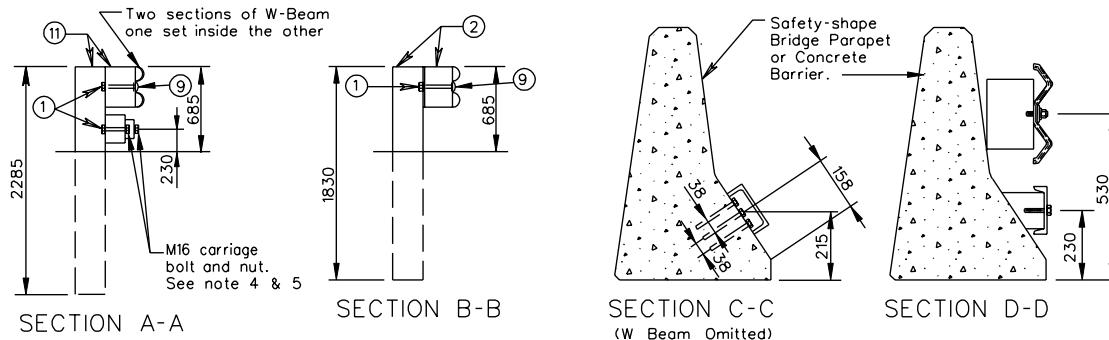
Notes:

1. Fixed objects may consist of safety shaped bridge parapets or concrete barriers.
2. Bridge rail ends and bridge parapets must be of adequate strength to accept full impact loading.
3. Guardrail components to be in accordance with VDOT Road and Bridge Standards.
4. Posts 1,2,3,4 and 5 require an additional hole to attach lower blocks and/or rubrail. Rubrail is not bolted to posts 2 and 4.
5. Bottom wood blocks located on posts 1 through 4 are center drilled and secured with M16 carriage bolts. (Length as required)
6. Appropriate length M22 ASTM A325M hex bolts must be used with washers thru drilled holes with a M16 bearing plate on the back side of the bridge parapet or concrete barrier.
7. See Sheet 3 of 3 for Rubrail Blockout Details.

New Bridges - Attachments
 One - Way Traffic-Run-on, 2-GR-FOA-2, Type I
 -Run-off, 2-GR-FOA-2, Type II
 Two - Way Traffic-Run-on, 4-GR-FOA-2, Type I
 Existing bridge attachments as shown on plans.

Notes:

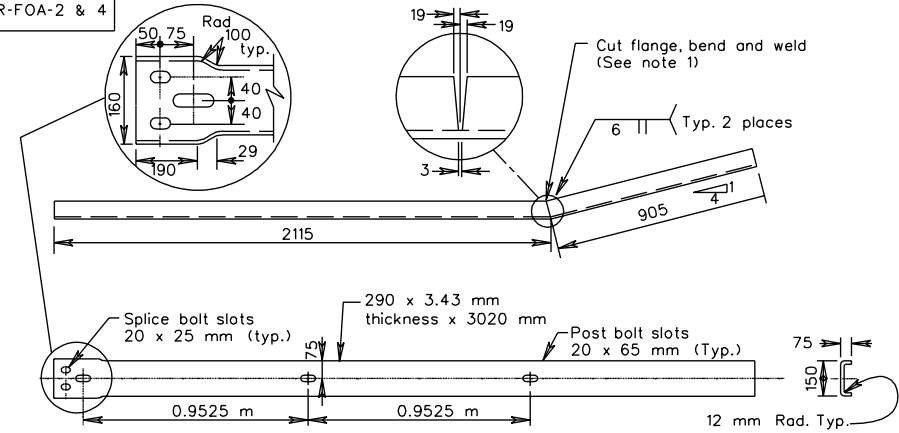
Rubrail must be twisted 35° between Section C-C and D-D. Shop fabrication may be required. Right hand and left hand twists will be necessary.



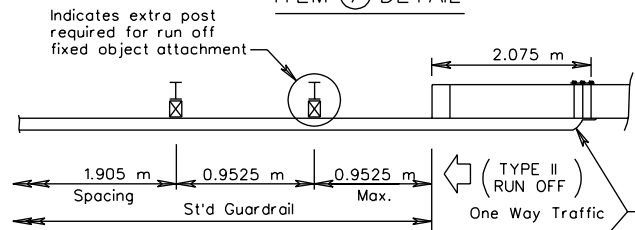
Item	Material/Specifications/Notes
①	Washer for M16 bolt.
②	Standard W150x13.5 Steel Post with Standard 150x200x360 mm Treated Pine Block or Recycled Material
③	Rectangular plate washer (See Standard GR-HDW)
④	Standard W-beam rail
⑤	M16 x 50 Guardrail bolt and Recessed nut (See Std.GR-HDW)
⑥	Standard W-beam back-up plate
⑦	Bent plate rubrail (See sheet 3 of 3)
⑧	C150 x 12 rubrail (See sheet 3 of 3)
⑨	M16 x 250 long Hex. Bolt, Nut & Washer
⑩	Wood blockout for rubrail (See sheet 3 of 3)
⑪	W200 X 19 X 2285 long steel post with Std. 150 X 200 X 360 long treated pine block or recycled material

SPECIFICATION REFERENCE 506	<h2 style="margin: 0;">W-BEAM GUARDRAIL - FIXED OBJECT ATTACHMENT</h2> <h3 style="margin: 0;">FOR USE WITH SAFETY SHAPE - STEEL POSTS</h3>	Rev. 7/01 501.26
VIRGINIA DEPARTMENT OF TRANSPORTATION		
UNLESS OTHERWISE NOTED, ALL DIMENSIONS ON THIS SHEET ARE IN MILLIMETERS		

GR-FOA-2 & 4



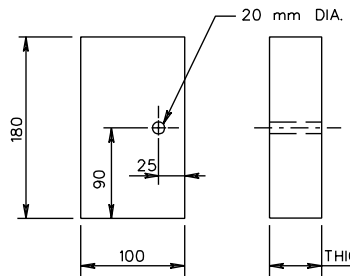
ITEM 7 DETAIL



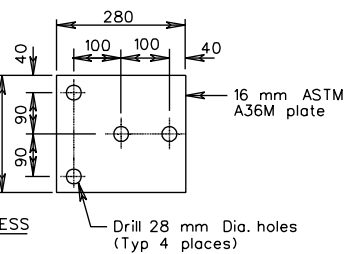
PLAN



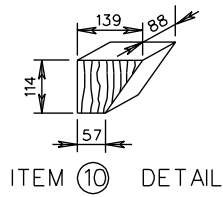
ELEVATION



RUBRAIL BLOCKOUT DETAIL



BEARING PLATE



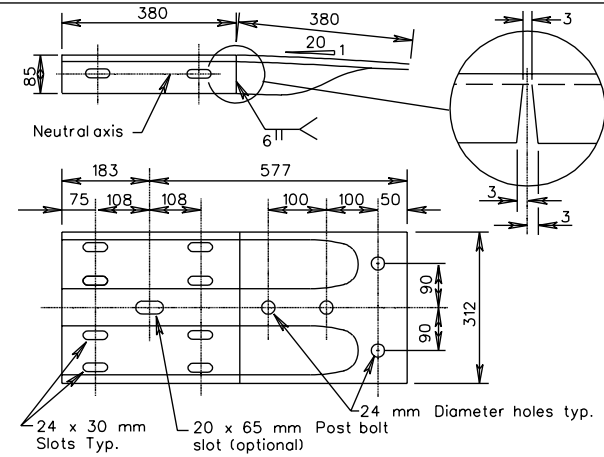
ITEM 10 DETAIL

WOOD POSTS
RUBRAIL BLOCKOUTS
190 mm x 100 mm

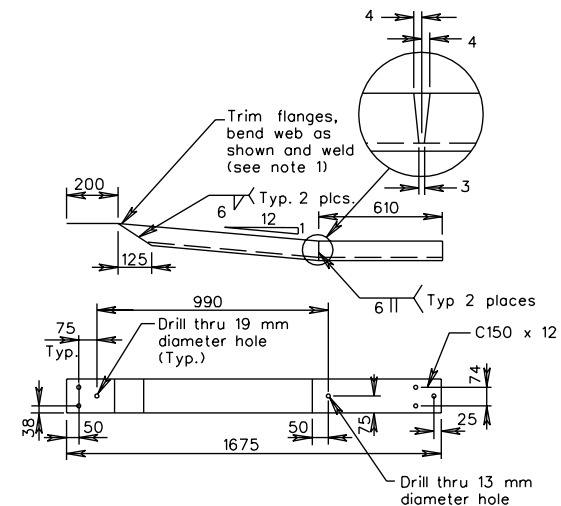
Post	Thickness
1	158
2	117
3	79
4	40

STEEL POSTS
RUBRAIL BLOCKOUTS
180 mm x 100 mm

Post	Thickness
1	108
2	83
3	50
4	25



W-BEAM TERMINAL CONNECTOR (MOD.)



ITEM 8 DETAIL

- Notes:
- Can be field cut and bent using heat. If shop cut and bent, right hand or left hand must be specified depending on which side of the roadway the transition is used.

Sheet 3 of 3

W BEAM GUARDRAIL - FIXED OBJECT ATTACHMENT
RUBRAIL AND HARDWARE DETAILS

SPECIFICATION
REFERENCE

506

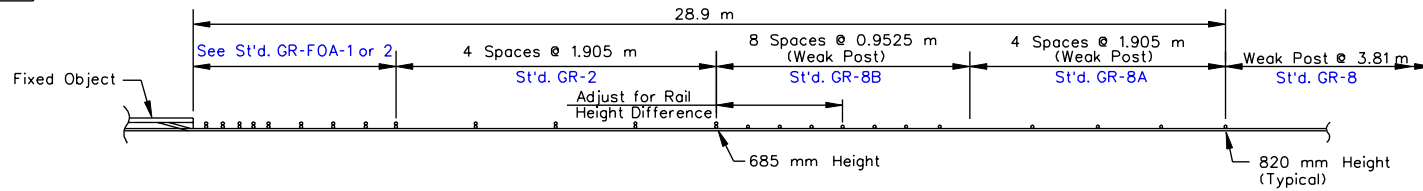
Rev. 7/01

501.27

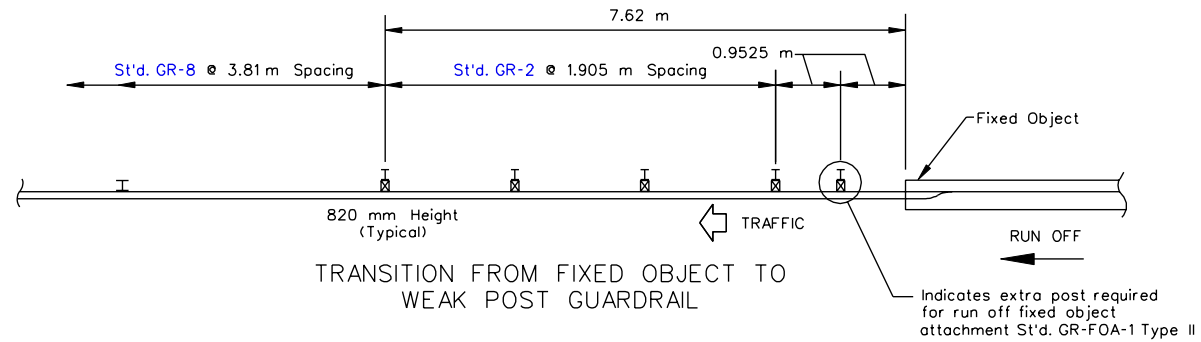
UNLESS OTHERWISE NOTED, ALL DIMENSIONS
ON THIS SHEET ARE IN MILLIMETERS

VIRGINIA DEPARTMENT OF TRANSPORTATION

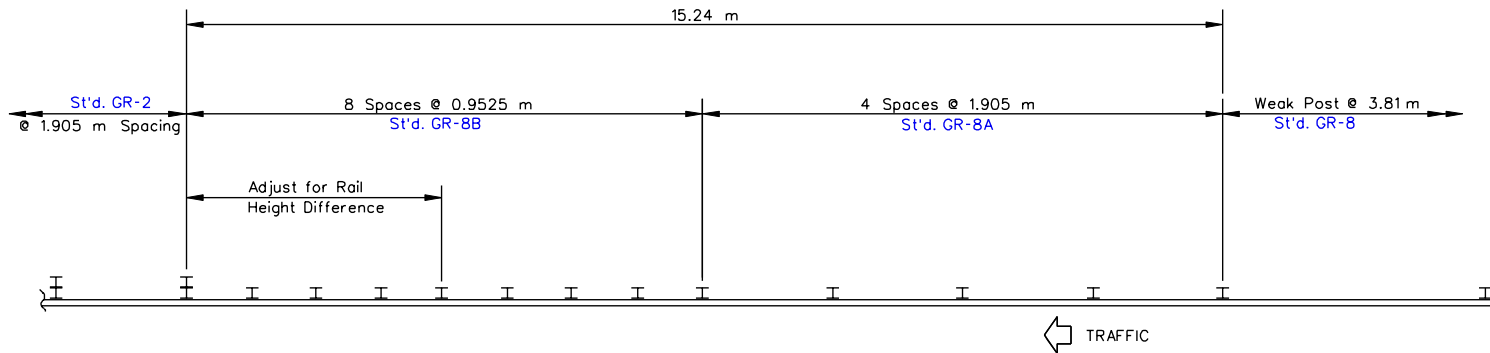
GR-INS



TRANSITION FROM WEAK POST GUARDRAIL TO FIXED OBJECT



TRANSITION FROM FIXED OBJECT TO WEAK POST GUARDRAIL



TRANSITION FROM WEAK POST TO STRONG POST GUARDRAIL

Sheet 7 of 8

W BEAM GUARDRAIL INSTALLATION CRITERIA

Rev. 7/01

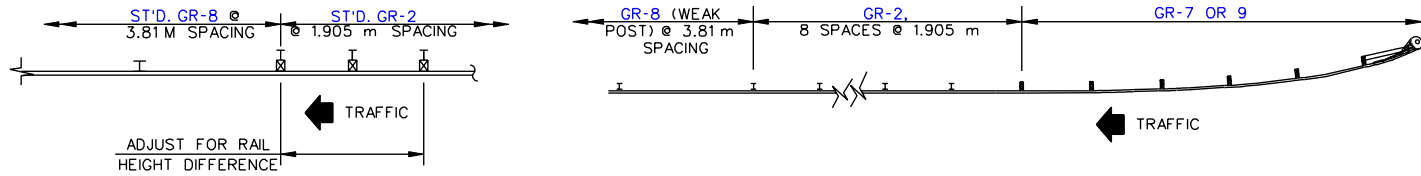
501.36 UNLESS OTHERWISE NOTED, ALL DIMENSIONS ON THIS SHEET ARE IN MILLIMETERS

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE

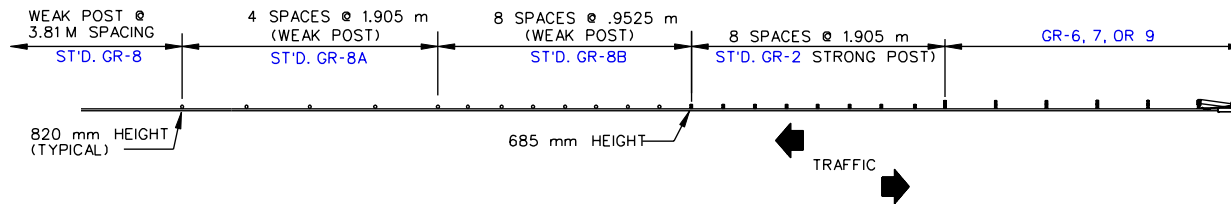
221
505

GR-INS

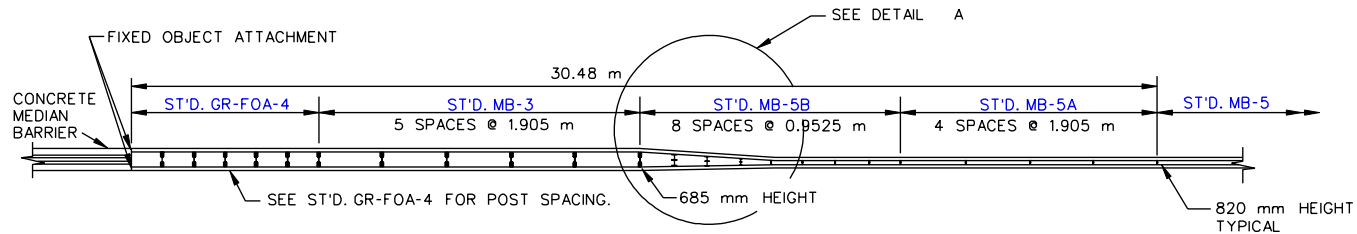


TRANSITION FROM STRONG POST TO WEAK POST GUARDRAIL

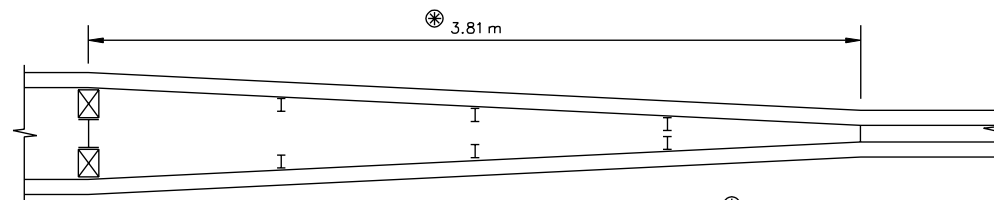
TRANSITION FROM GR-7 & GR-9 TERMINAL TO WEAK POST GUARDRAIL



TRANSITION FROM GR-6, GR-7, OR GR-9 TERMINAL TO WEAK POST GUARDRAIL



TRANSITION FROM WEAK POST MEDIAN BARRIER TO CONCRETE MEDIAN BARRIER



DETAIL A

⊗ COST OF TRANSITION TO BE INCLUDED IN PRICE BID FOR ST'D. MB-5B MEDIAN BARRIER.

SHEET 8 OF 8

SPECIFICATION REFERENCE
221
505

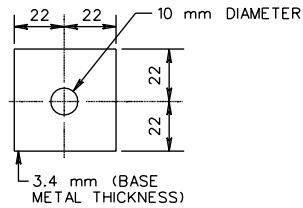
W BEAM GUARDRAIL AND MEDIAN BARRIER INSTALLATION CRITERIA

VIRGINIA DEPARTMENT OF TRANSPORTATION

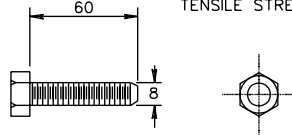
REV. 7/01

UNLESS OTHERWISE NOTED, ALL DIMENSIONS ON THIS SHEET ARE IN MILLIMETERS

501.37



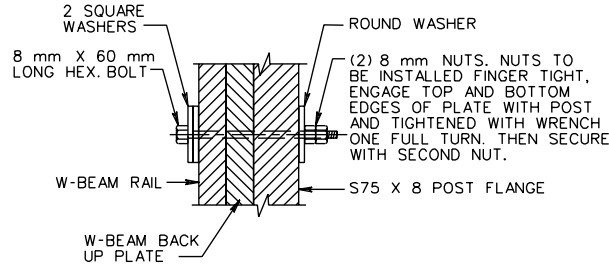
SQUARE WASHER



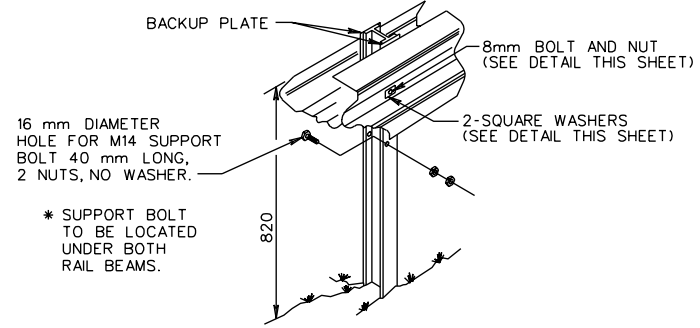
8 mm HEX BOLT AND NUT

BOLT AND NUT SHALL HAVE 17.8 KN 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

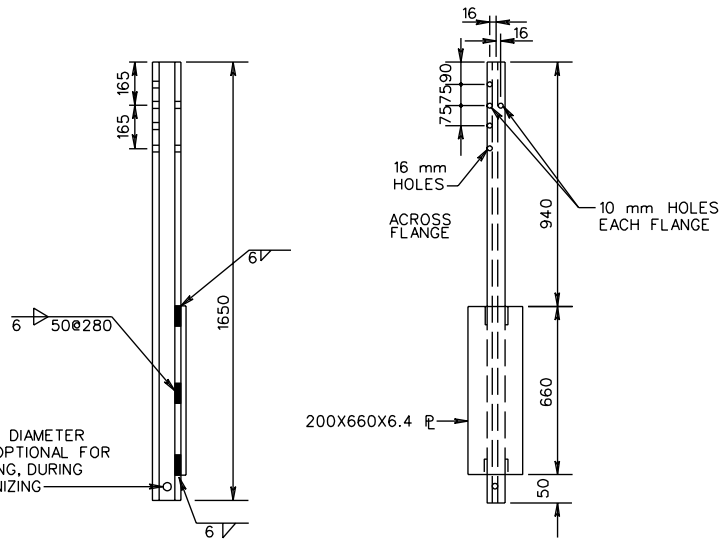
NOTES:

- STANDARD MB-5 POST SPACING IS 3.810 m
- STANDARD MB-5A POST SPACING IS 1.905 m
- STANDARD MB-5B POST SPACING IS 0.9525 m
- STANDARD MB-5 DEFLECTION IS 2.45 m.

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

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

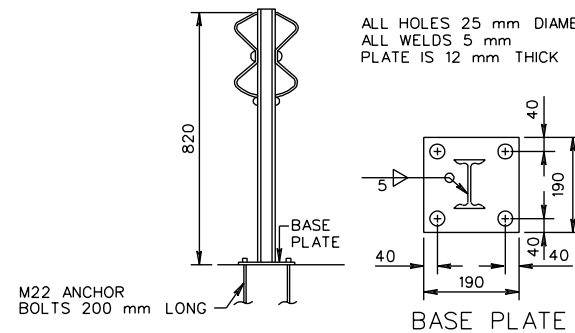
FOR DETAILS OF GUARDRAIL SPLICE JOINT, SEE STD. GR-8 SHOWING AN NCHRP 350 TL-3 INSTALLATION.



FOR ROCK INSTALLATION, 200X660X6.4 mm PLATE IS TO BE ELIMINATED. DRILL OR EXCAVATE HOLE FOR POST, PLACE AND BACKFILL WITH CRUSHER RUN AGGREGATE TO LEVEL OF ROCK.

S75 X 8 mm STEEL POST

ALL HOLES 25 mm DIAMETER
ALL WELDS 5 mm
PLATE IS 12 mm THICK



STRUCTURE MOUNTED BARRIER

SPECIFICATION REFERENCE	STANDARD W BEAM MEDIAN BARRIER (WEAK POST SYSTEM)	
221 505	TL-3 (>70 km/h)	
	VIRGINIA DEPARTMENT OF TRANSPORTATION	
	UNLESS OTHERWISE NOTED, ALL DIMENSIONS ON THIS SHEET ARE IN MILLIMETERS	REV. 7/01 501.39