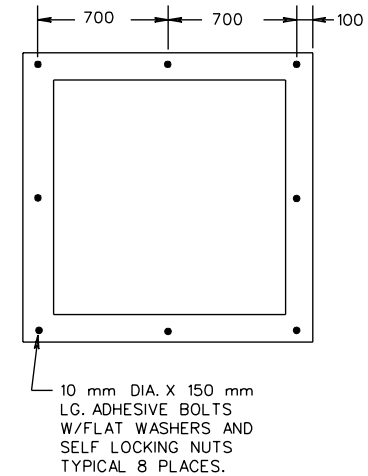
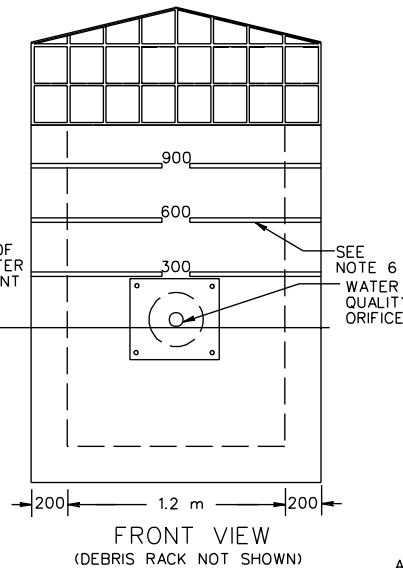
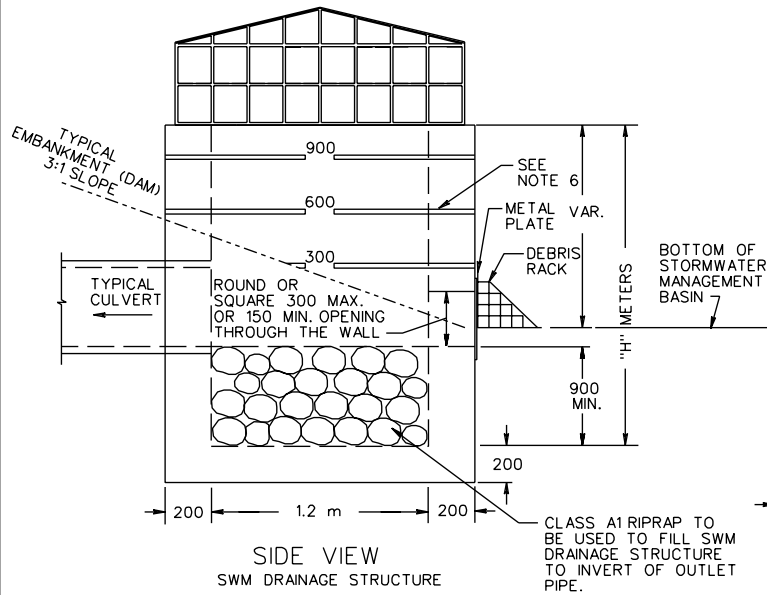
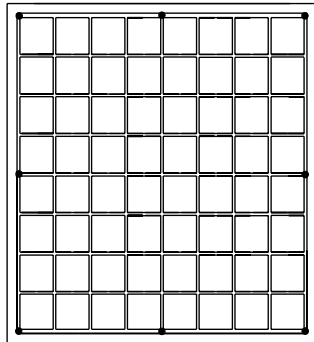


NOTES:

1. GRATE AND COLLAR ARE TO BE GALVANIZED AFTER FABRICATION. COST OF THIS GRATE AND COLLAR ARE TO BE INCLUDED IN THE PRICE BID FOR STORMWATER MANAGEMENT DRAINAGE STRUCTURE.
2. STRUCTURE MAY BE PRECAST OR CAST IN PLACE. SEE SHEET 2 OF 3 FOR [DETAILS ON PRECAST STRUCTURE](#).
3. WEEP HOLES SHALL NOT BE PROVIDED.
4. STEPS ARE TO BE PROVIDED WHEN HEIGHT OF STRUCTURE IS 1.2 m OR GREATER ABOVE INVERT OF OUTLET PIPE. FOR STEP DETAILS SEE [STANDARD ST-1](#).
5. FOR DETAILS ON METAL PLATE AND DEBRIS RACK SEE STANDARD [SWM-DR](#).
6. MARK HEIGHT OF STRUCTURE, IN BLACK, WITH 100 mm HIGH NUMERALS AND 25 mm WIDE HORIZONTAL STRIPES AT 300 mm INTERVALS FROM INVERT OF WATER QUALITY ORIFICE (ALL VISIBLE SIDES).
7. THE PERMANENT STORMWATER MANAGEMENT DRAINAGE STRUCTURE, STANDARD SWM-1 MAY BE MODIFIED WHERE THE STORMWATER MANAGEMENT BASIN IS TO BE USED AS A TEMPORARY SEDIMENT BASIN DURING PROJECT CONSTRUCTION. SEE [STANDARD SWM-DR](#), SHEET 1 OF 6, FOR TEMPORARY MODIFICATION DETAILS.



APPROXIMATE QUANTITIES
CAST-IN-PLACE CLASS 20 CONCRETE TO BE USED.
MAXIMUM DEPTH (H) TO BE 4 m.

PIPE SIZE	300	375	450	600	750	900	1050
MINIMUM DEPTH H	1.5	1.61	1.69	1.86	2.02	2.19	2.35
CU. YDS. CONCRETE	1.94	2.05	2.13	2.28	2.42	2.55	2.66.

INCREMENT METER OF ADDITIONAL DEPTH 1.12 CU. METERS.

REV. 11/02
SHEET 1 OF 2

SPECIFICATION REFERENCE
302

STORMWATER MANAGEMENT DRAINAGE STRUCTURE

VIRGINIA DEPARTMENT OF TRANSPORTATION

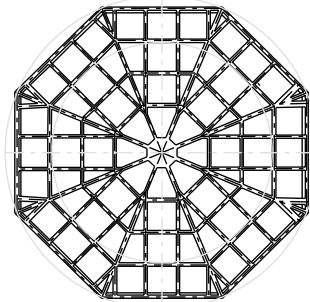
REV. 11/02

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

116.01

REVISED ON 3/03

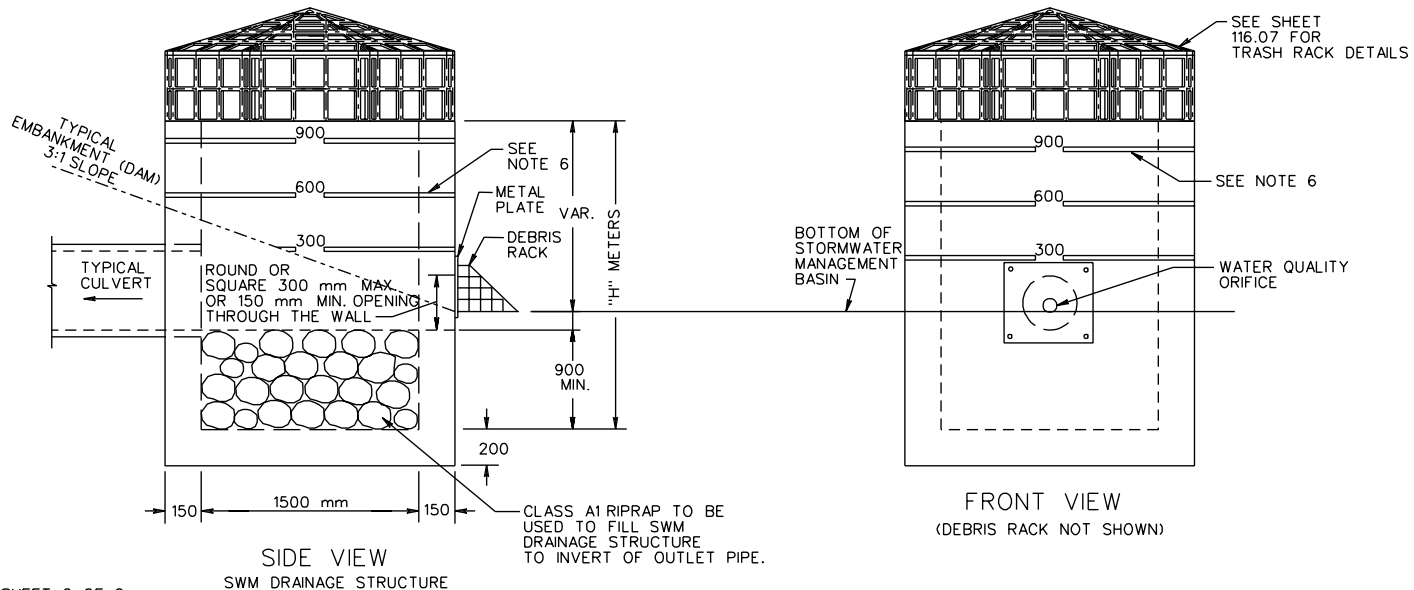
SWM-1



PLAN VIEW

NOTES:

1. COST OF TRASH AND DEBRIS RACK ARE TO BE INCLUDED IN THE PRICE BID FOR STORMWATER MANAGEMENT DRAINAGE STRUCTURE.
2. STRUCTURE MAY BE PRECAST OR CAST IN PLACE. SEE SHEET 1 OF 2 FOR DETAILS ON CAST IN PLACE STRUCTURE.
3. WEEP HOLES SHALL NOT BE PROVIDED. ANY LIFT HOLES SHALL BE PLUGGED.
4. STEPS ARE TO BE PROVIDED WHEN HEIGHT OF STRUCTURE IS 1.2 m OR GREATER ABOVE INVERT OF OUTLET PIPE. FOR STEP DETAILS SEE STANDARD ST-1.
5. SEE STANDARD SWM-DR FOR DETAILS ON PLATE, DEBRIS AND TRASH RACK.
6. MARK HEIGHT OF STRUCTURE, IN BLACK, WITH 100 mm HIGH NUMERALS AND 25 mm WIDE HORIZONTAL STRIPES AT 300 mm INTERVALS FROM INVERT OF WATER QUALITY ORIFICE (ALL VISIBLE SIDES).
7. THE PERMANENT STORMWATER MANAGEMENT DRAINAGE STRUCTURE, STANDARD SWM-1 MAY BE MODIFIED WHERE THE STORMWATER MANAGEMENT BASIN IS TO BE USED AS A TEMPORARY SEDIMENT BASIN DURING PROJECT CONSTRUCTION. SEE STANDARD SWM-DR, SHEET 1 OF 6 FOR TEMPORARY MODIFICATION DETAILS.



SHEET 2 OF 2

PRECAST STORMWATER MANAGEMENT DRAINAGE STRUCTURE

REV. 11/02

VIRGINIA DEPARTMENT OF TRANSPORTATION

116.02

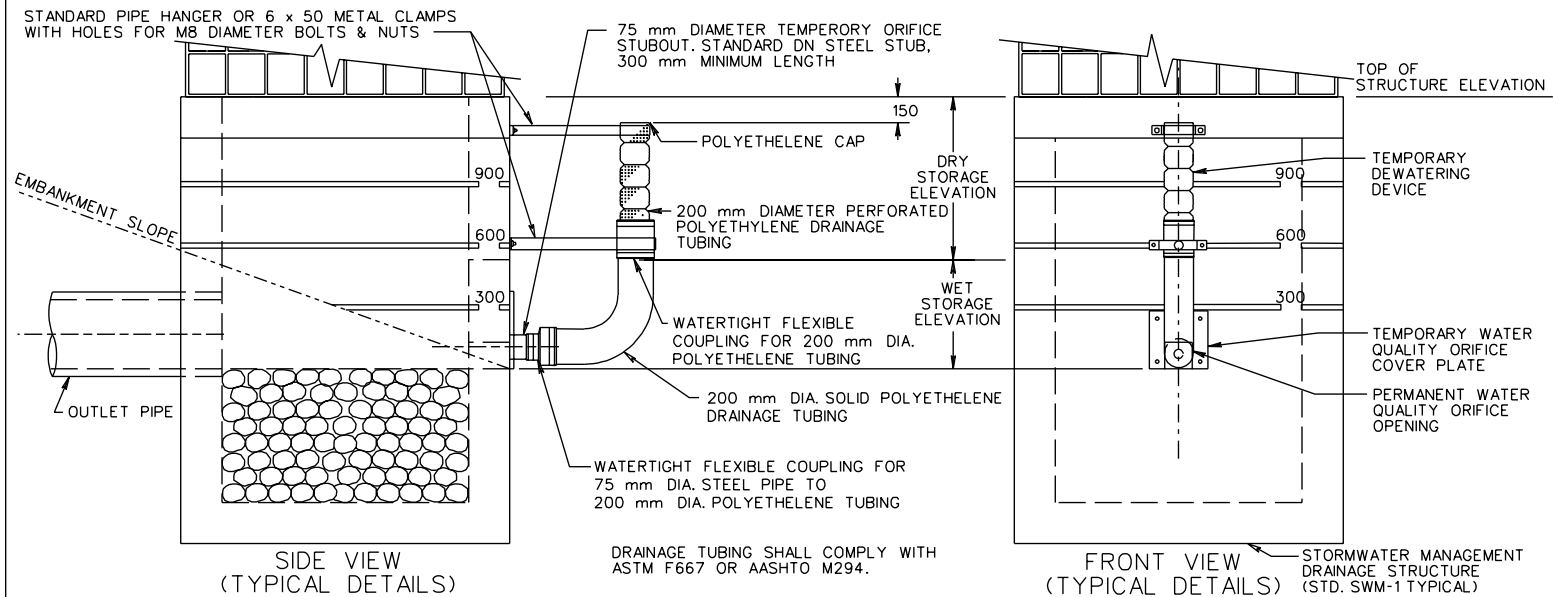
UNLESS OTHERWISE NOTED, ALL DIMENSIONS ON THIS SHEET ARE IN MILLIMETERS

SPECIFICATION REFERENCE

105 302

REVISED ON 3/03

SWM-DR



NOTE:

1. THESE DETAILS ARE TO BE USED TO MODIFY THE PERMANENT STORMWATER MANAGEMENT DRAINAGE STRUCTURE WHERE THE STORMWATER MANAGEMENT BASIN IS TO BE USED FOR A TEMPORARY SEDIMENT BASIN DURING PROJECT CONSTRUCTION.
2. GRADE STORMWATER MANAGEMENT BASIN AS SHOWN IN PLANS.
3. ALL OPENINGS (IF ANY) IN SIDE OF STRUCTURE (OTHER THEN PERMANENT WATER QUALITY ORIFICE) ARE TO BE COVERED WITH SOLID METAL PLATES WHILE THE BASIN IS BEING USED FOR SEDIMENT CONTROL.
4. DEWATERING DEVICE AND COMPONENTS AND TEMPORARY METAL PLATES (IF ANY), AS SHOWN IN THE DETAIL, ARE TO BE REMOVED AND PERMANENT STEEL PLATE WITH WATER QUALITY ORIFICE IS TO BE INSTALLED WHEN BASIN IS NO LONGER NEEDED FOR SEDIMENT CONTROL.
5. SIMILAR DEVICE MAY ALSO BE USED ON OTHER STORMWATER MANAGEMENT DRAINAGE STRUCTURES.
6. COST OF TEMPORARY DEWATERING DEVICE AND TEMPORARY METAL PLATES (IF ANY) SHALL BE INCLUDED IN THE BID PRICE FOR STORMWATER MANAGEMENT DRAINAGE STRUCTURE.
7. THE TEMPORARY 200 mm DIA. POLYETHYLENE DRAINAGE TUBING IS TO BE SOLID FOR THE LENGTH BELOW WET STORAGE ELEVATION AND IS TO BE PERFORATED ABOVE THE WET STORAGE ELEVATION. THE COUPLING IS TO BE WATERTIGHT.

SPECIFICATION REFERENCE

STORMWATER MANAGEMENT (SWM) DETAILS TRASH RACK

VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 11/02

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116.03

REVISED ON 3/03

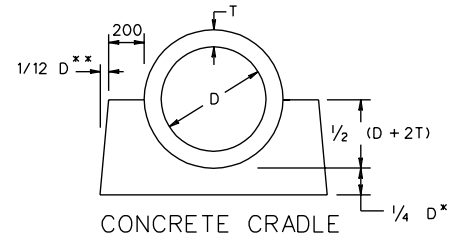
SWM-DR

NOTES:

TO PROVIDE THE REQUIRED WATER QUALITY ORIFICE, ALL STORMWATER MANAGEMENT (SWM) BASINS SHALL BE CONSTRUCTED WITH THE FOLLOWING:

1. FOR SWM DRAINAGE STRUCTURES, SWM DAMS OR SWM RISER PIPES OF CONCRETE, AN OPENING SHALL BE PROVIDED IN THE CONCRETE WALL: 300 mm MAX. OR 150 mm MIN. AND SHALL BE COVERED WITH THE 10 mm METAL PLATE.
2. DEBRIS RACK SHALL BE ATTACHED TO SWM DRAINAGE STRUCTURE, SWM DAM OR SWM RISER PIPE TO COVER WATER QUALITY ORIFICE.
3. SIZE OF WATER QUALITY ORIFICE IS TO BE SPECIFIED FOR EACH BASIN.

FOR DETAILS OF SWM DRAINAGE STRUCTURE SEE STANDARD SWM-1.



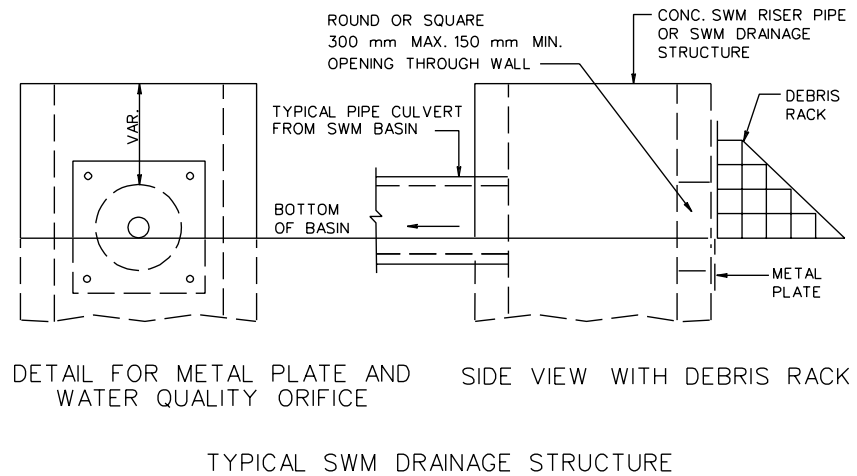
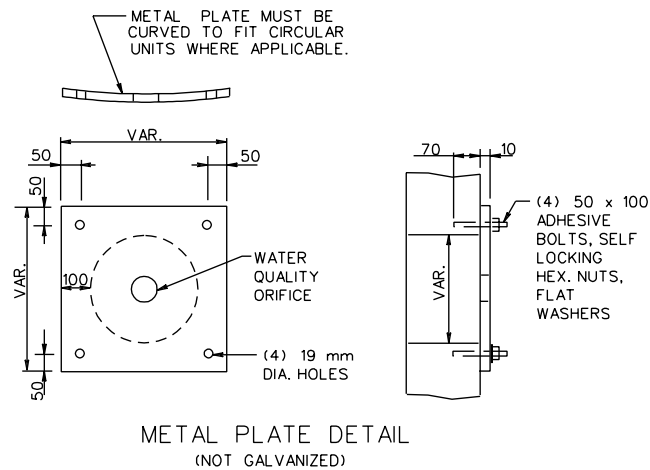
CONCRETE CRADLE

CONCRETE SHALL BE CLASS 20
* BUT NOT LESS THAN 150 mm

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

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

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



SHEET 3 OF 5

SPECIFICATION REFERENCE

302

STORMWATER MANAGEMENT (SWM) DETAILS

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

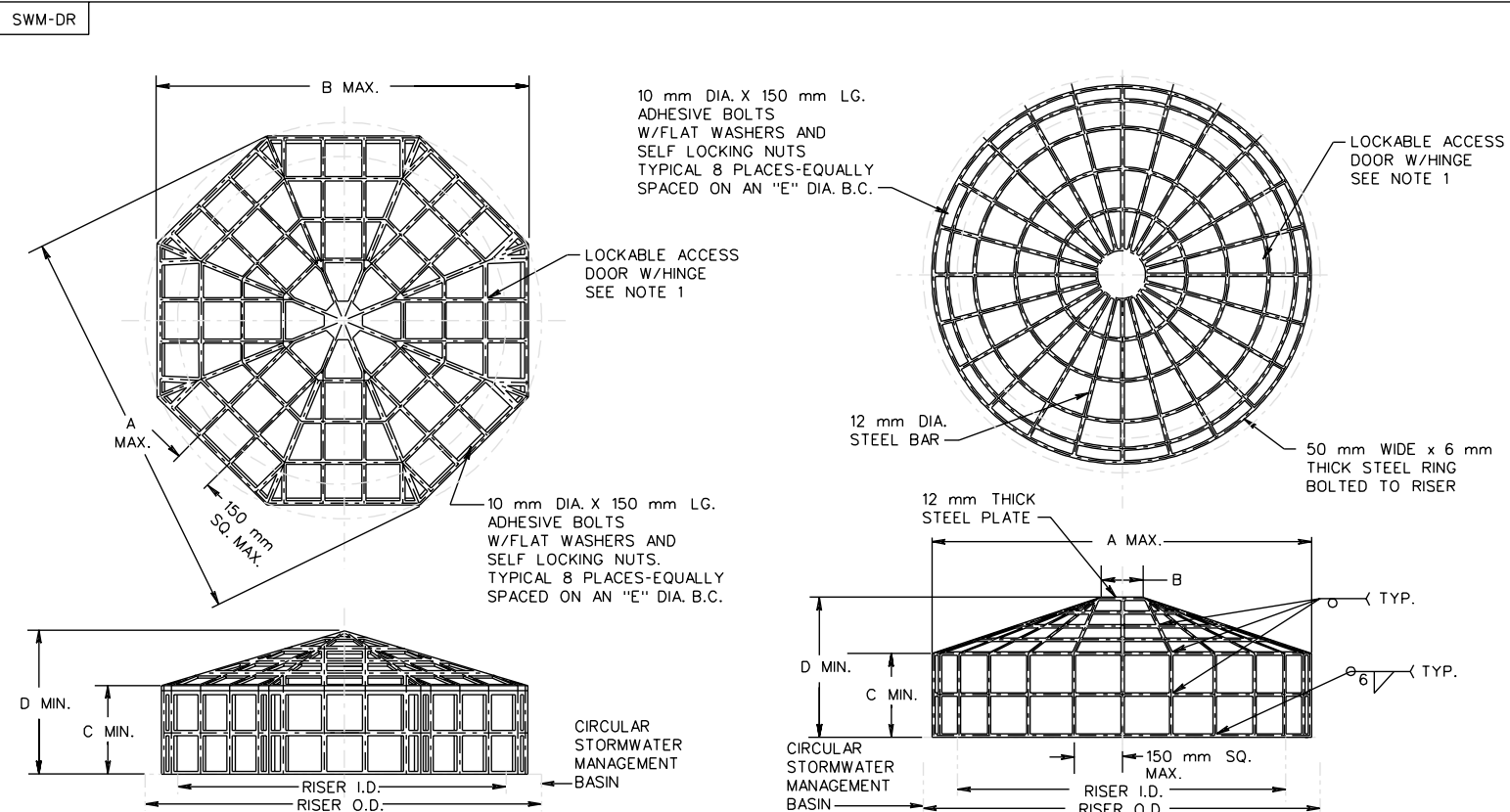
REV. 11/02

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116.05

REVISED ON 3/03



RISER PIPE DIMENSIONS		TRASH RACK DIMENSIONS					APPROX. WT. (Kg.)
PIPE I.D.	PIPE O.D.	A MAX.	B	C MIN.	D MIN.	E (BC)	
600	760	790	725	175	280	685	11
900	1120	1145	1055	330	480	1015	27
1200	1475	1500	1385	330	535	1345	39
1500	1830	1855	1715	430	710	1675	61
1800	2185	2210	2040	585	890	2005	93
2100	2540	2565	2370	635	990	2335	121
2400	2900	2920	2700	560	965	2670	138

HIGH DENSITY POLYETHYLENE

- NOTES:
- A HINGED, LOCKABLE ACCESS DOOR SHALL BE PROVIDED ON ALL TRASH RACKS:
 - TOTAL WEIGHT IS GREATER THAN 34 Kgs.
 - IF THE TRASH RACK IS TO BE PLACED ON A SWM-1 WITH AN "H" DIMENSION GREATER THAN 2.2 m.

RISER PIPE DIMENSIONS		TRASH RACK DIMENSIONS					APPROX. WT. (Kg.)	
PIPE I.D.	PIPE O.D.	A MAX.	B	C MIN.	D MIN.	E (BC)	SEGMENT	
600	760	735	150	175	250	685	15	21
900	1120	1070	150	330	460	1015	22	37
1200	1475	1400	225	330	510	1350	29	55
1500	1830	1725	225	430	660.4	1675	36	77
1800	2185	2060	225	585	860	2000	42	103
2100	2540	2930	300	635	939.8	2340	49	132
2400	2900	2720	300	560	910	2670	56	155

METAL

- ANTI-VORTEX PLATE IS TO BE USED WHEN SPECIFIED ON THE PLANS. COST OF FURNISHING AND PLACING THE ANTI-VORTEX PLATE IS TO BE INCLUDED IN THE BID PRICE FOR THE STRUCTURE.

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

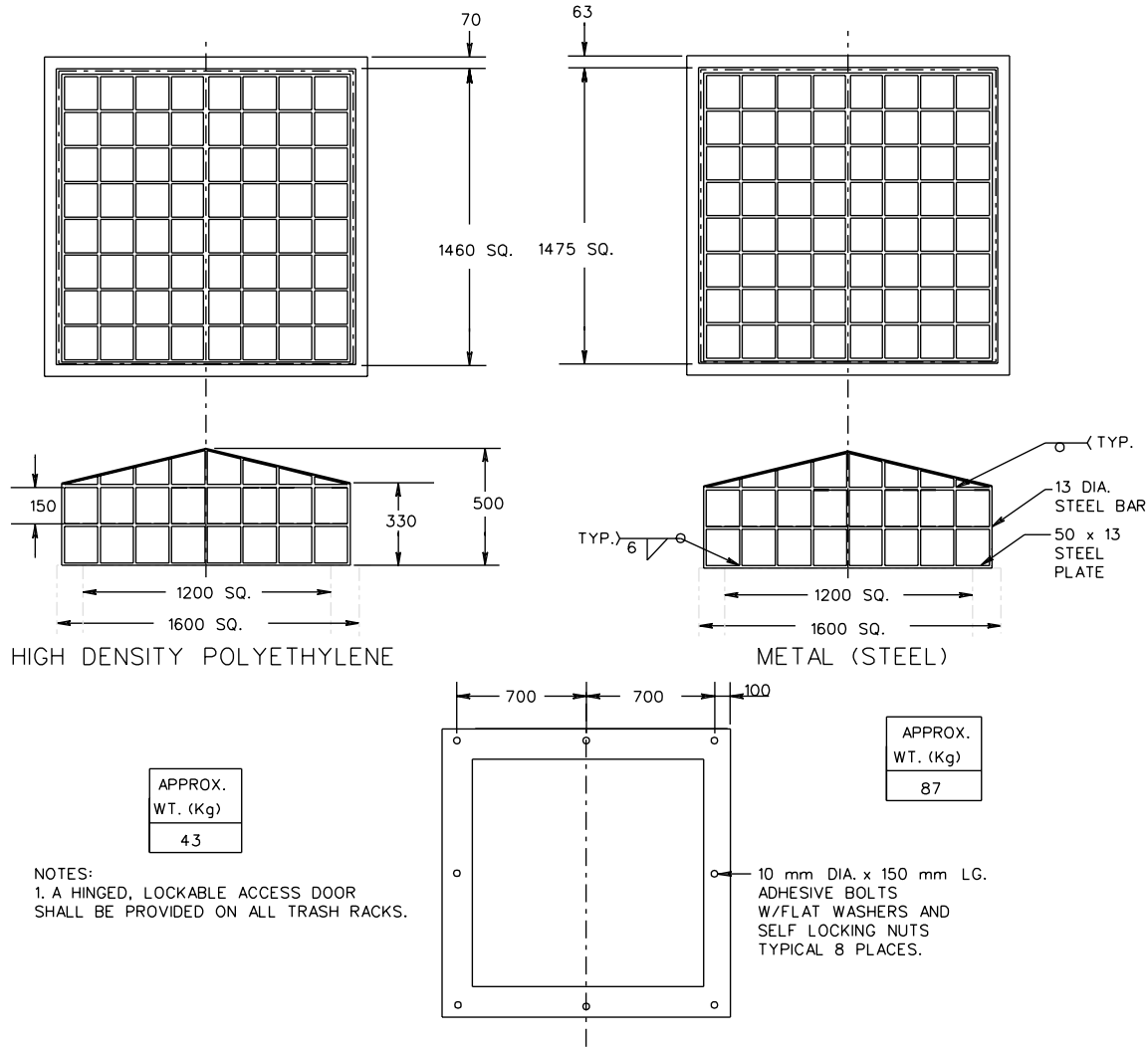
NEW 11/02

116.06

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VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE



SPECIFICATION REFERENCE

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

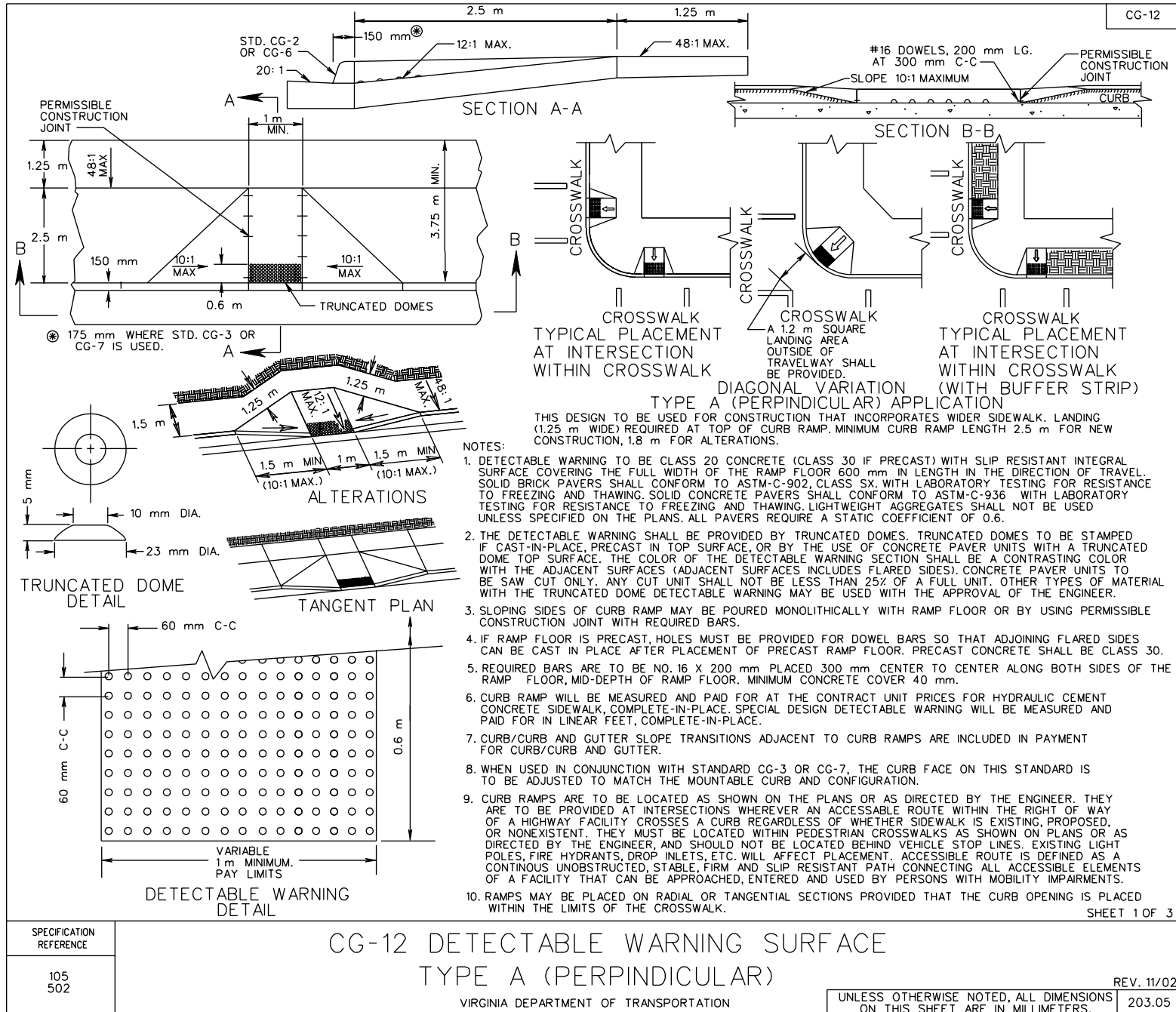
VIRGINIA DEPARTMENT OF TRANSPORTATION

NEW 11/02

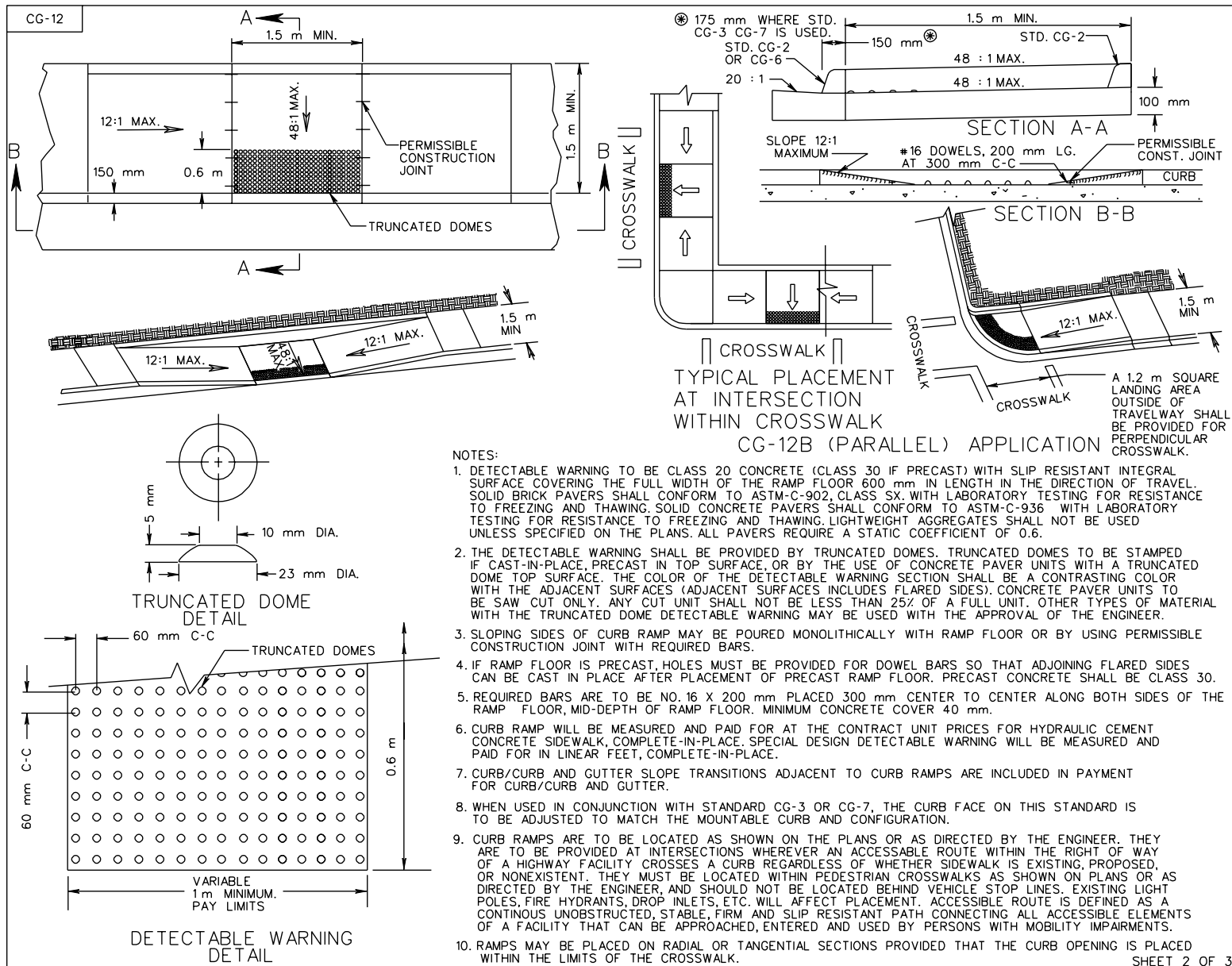
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116.07

REVISED ON 3/03



REVISED ON 3/03



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

SHEET 2 OF 3

SPECIFICATION
REFERENCE

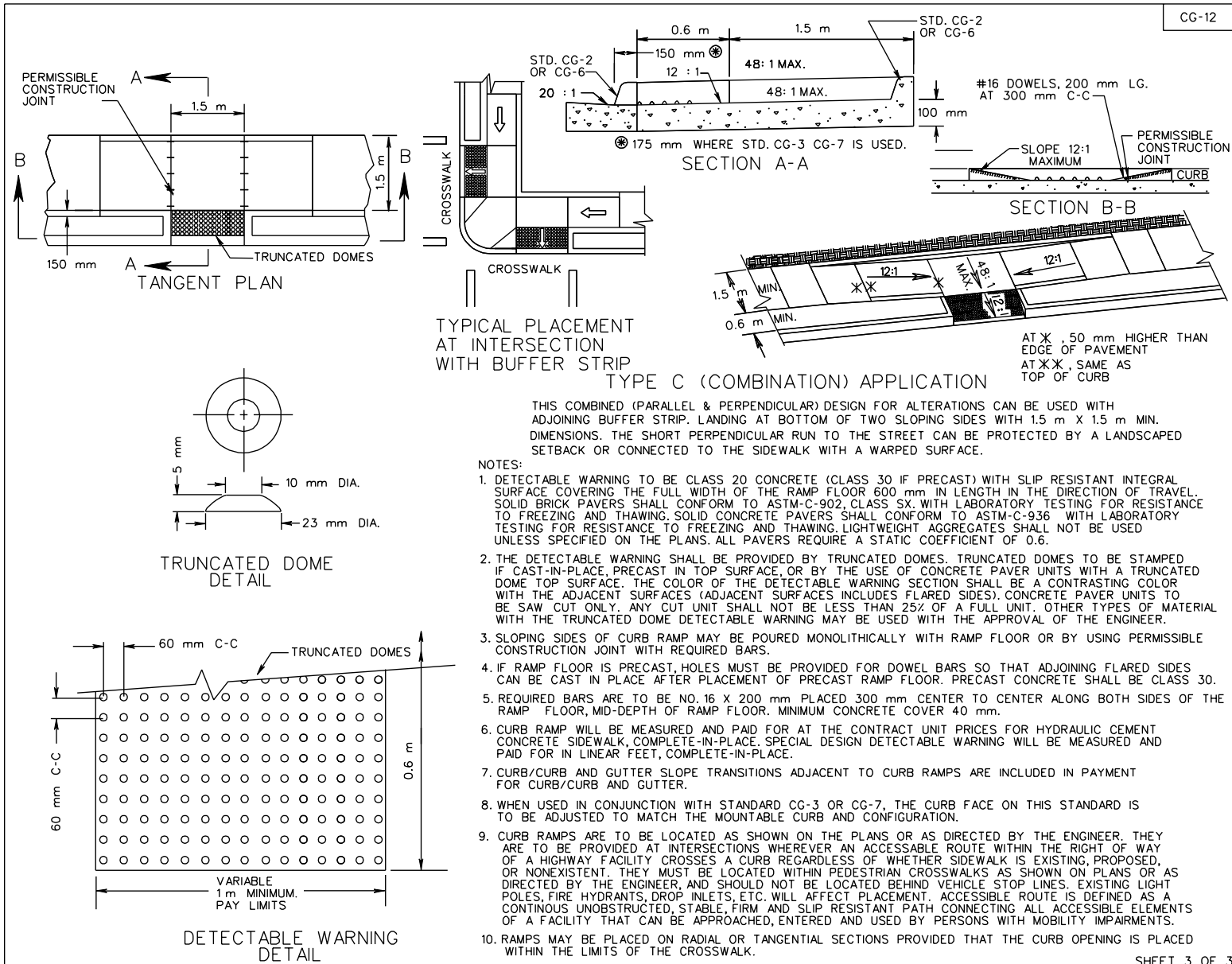
105
502

NEW 11/02

203.05A UNLESS OTHERWISE NOTED, ALL DIMENSIONS
ON THIS SHEET ARE IN MILLIMETERS.

VIRGINIA DEPARTMENT OF TRANSPORTATION

REVISED ON 3/03



CG-12

SHEET 3 OF 3

SPECIFICATION REFERENCE

105
502

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

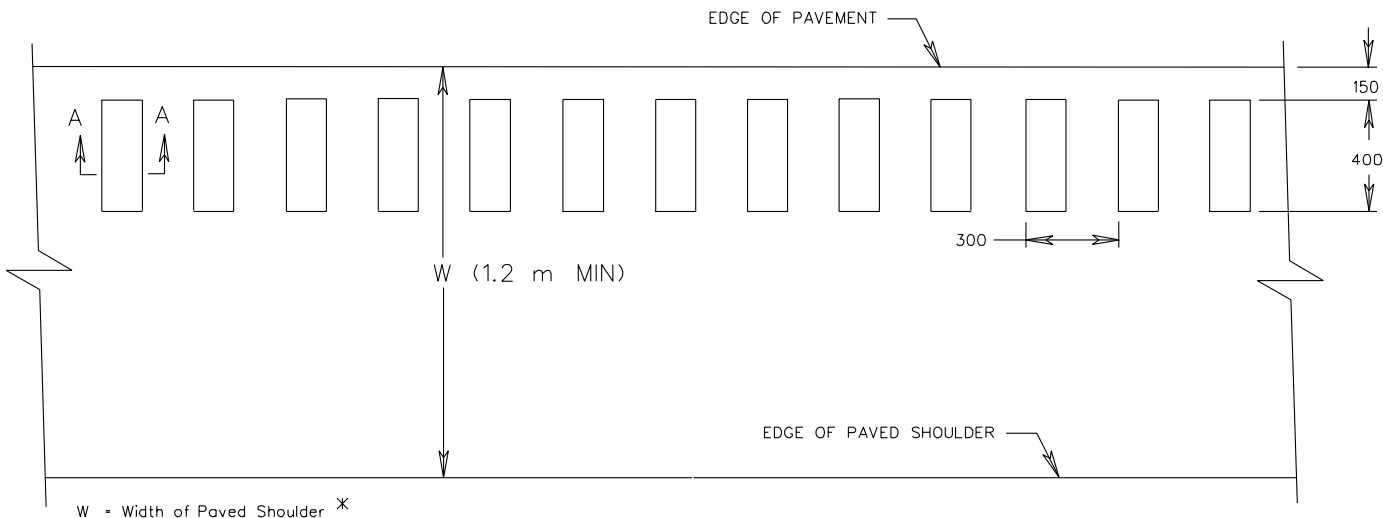
VIRGINIA DEPARTMENT OF TRANSPORTATION

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

NEW 11/02

203.05B

RS-1

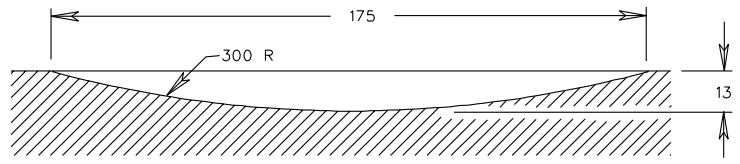


W - Width of Paved Shoulder *

PLAN VIEW

NOTES

- Rumble Strips shall be placed continuously as directed by the Engineer.
- Rumble Strips shall not be placed within limits of Bridge Drainage Aprons or Special Design Shoulder Slot Inlets.
- Rumble Strips shall be placed on mainline shoulders only.
- * Where bicycles are not prohibited, the minimum width of the outside paved shoulder shall be 2.4 m.



SECTION A-A

REVISED 11/02

SPECIFICATION REFERENCE
315

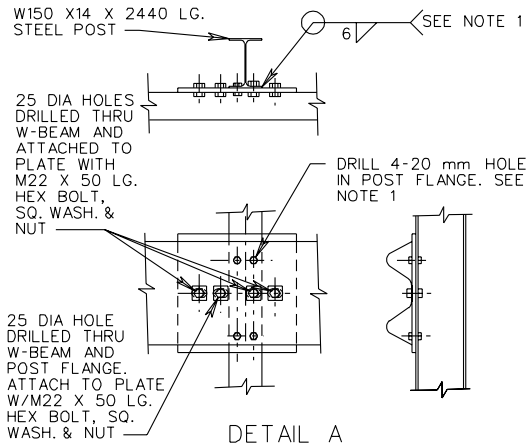
RUMBLE STRIPS

VIRGINIA DEPARTMENT OF TRANSPORTATION

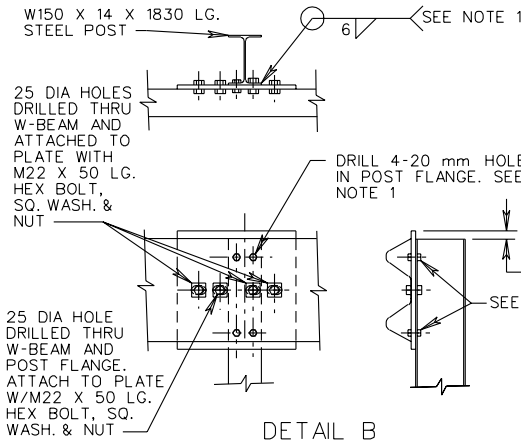
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304.01

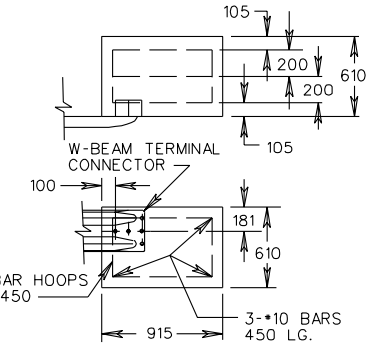
GR-6



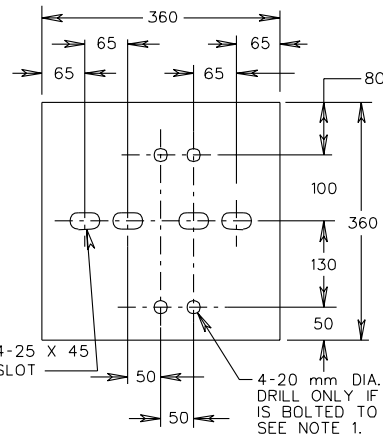
DETAIL A
END ANCHORAGE



DETAIL B
END ANCHORAGE (POST)



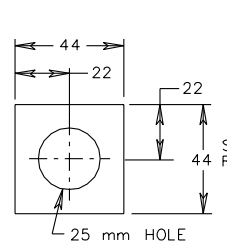
DETAIL C
END ANCHORAGE (CONCRETE)



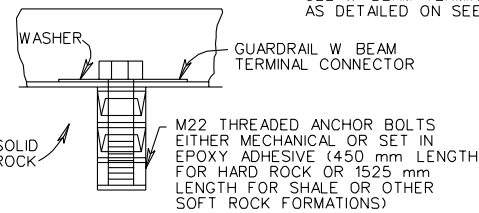
DETAIL D
13 mm THICK STEEL PLATE

NOTE:

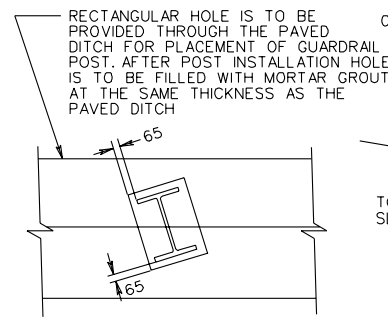
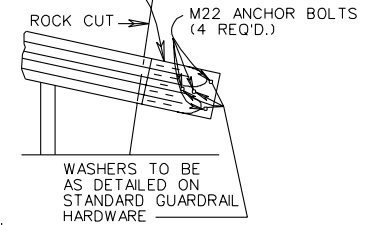
1. 13 mm STEEL PLATE MAY BE WELDED OR BOLTED TO POST. IF PLATE IS BOLTED TO POST USE 4-M16 X 40 LG. HEX HEAD BOLTS W/ HEX NUTS. IF PLATE IS WELDED TO POST DO NOT DRILL 20 mm HOLES IN PLATE OR IN POST FLANGES.
2. CONCRETE END ANCHORAGE MAY BE USED IN PLACE OF STEEL POST AT 2.4 m OFFSET.



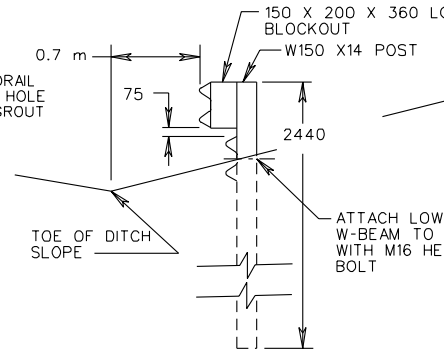
DETAIL E
25 mm HOLE
5 mm THICK SQUARE WASHER



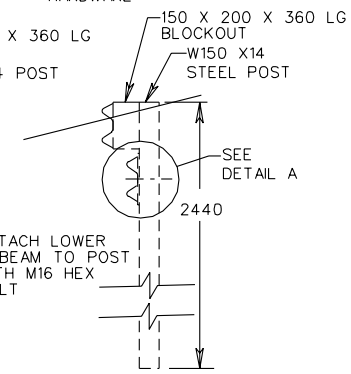
DETAIL F
SOLID ROCK CUT INSTALLATION



PAVED DITCH DETAIL



SECTION D-D



SECTION E-E

SHEET 2 OF 2

TERMINAL TREATMENT FOR W BEAM GUARDRAIL

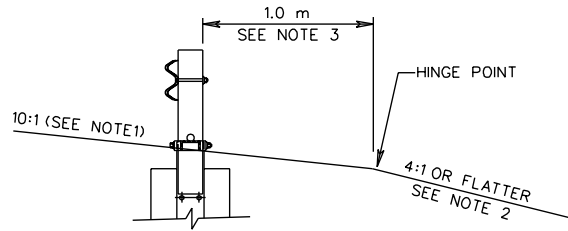
REVISED 11/02

501.08A UNLESS OTHERWISE NOTED, ALL DIMENSIONS ON THIS SHEET ARE IN MILLIMETERS

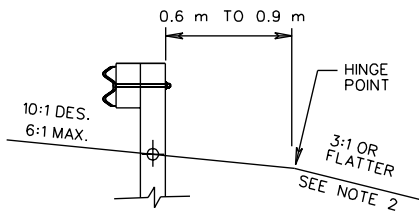
VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE

505
221



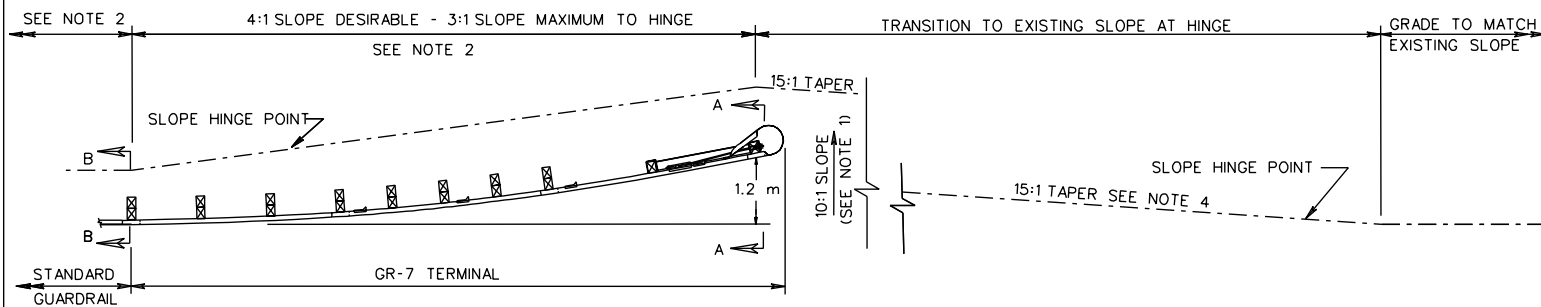
SECTION A-A



SECTION B-B

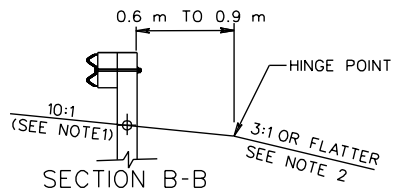
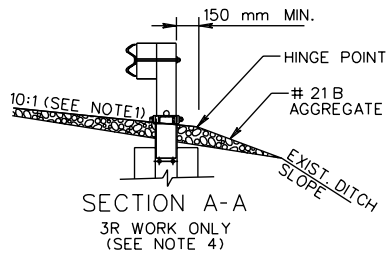
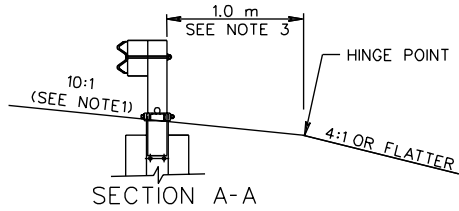
NOTES:

1. DESIRABLY, THE CROSS SLOPE OF THE GRADE APPROACHING THE GUARDRAIL TERMINAL, AND ADJACENT TO FOR ITS FULL LENGTH, MUST BE 10:1. IF THE EXISTING GRADE IS FLAT OR IS A POSITIVE SLOPE DUE TO THE SUPERELEVATION OF THE ROADWAY PAVEMENT, THE MINIMUM OFFSET FROM BEHIND THE POST TO THE HINGE POINT, AS SHOWN, IS REQUIRED.
2. THE AREA IMMEDIATELY BEHIND AND BEYOND THE TERMINAL SHOULD BE TRAVERSABLE AND FREE FROM FIXED OBJECTS. IF A CLEAR RUN OUT IS NOT ATTAINABLE THIS AREA SHOULD AT LEAST BE SIMILAR IN CHARACTER TO THE UPSTREAM UNSHIELDED ROADSIDE AREAS.
3. FOR NEW CONSTRUCTION AND RECONSTRUCTION THE 10:1 SLOPE GRADING MUST EXTEND A MINIMUM OF 1.0 m BEHIND THE END POST.



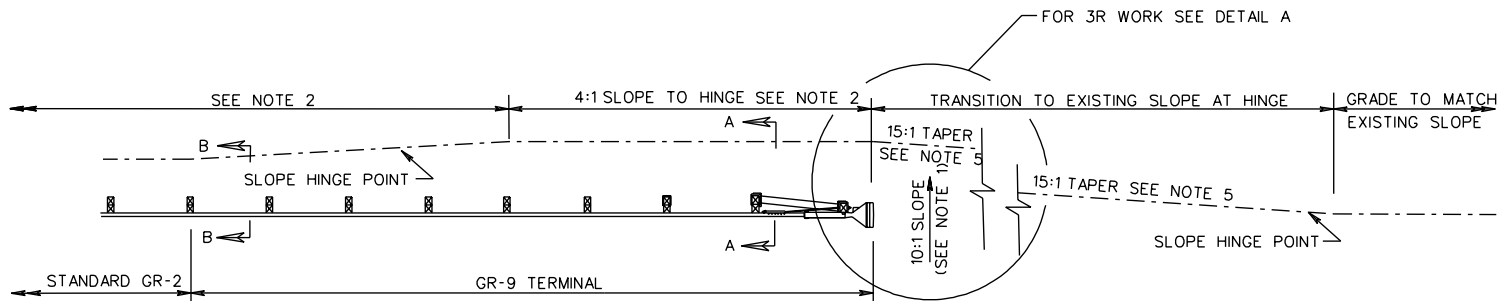
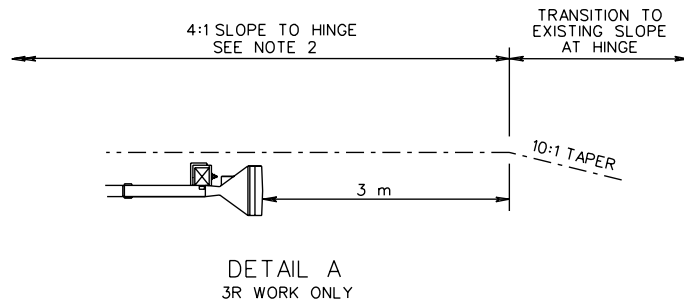
<p>SPECIFICATION REFERENCE</p>	<p>GUARDRAIL TERMINAL INSTALLATION SITE PREPARATION REQUIREMENTS FOR GR-7</p>	<p>REV. 11/02</p>
	<p>VIRGINIA DEPARTMENT OF TRANSPORTATION</p>	<p>UNLESS OTHERWISE NOTED, ALL DIMENSIONS ON THIS SHEET ARE IN MILLIMETERS</p>

GR-SP



NOTES:

1. THE CROSS SLOPE OF THE GRADE APPROACHING THE GUARDRAIL TERMINAL, AND ADJACENT TO FOR ITS FULL LENGTH, MUST BE 10:1. IF THE EXISTING GRADE IS FLAT OR IS A POSITIVE SLOPE DUE TO THE SUPERELEVATION OF THE ROADWAY PAVEMENT, THE MINIMUM OFFSET FROM BEHIND THE POST TO THE HINGE POINT, AS SHOWN, IS REQUIRED.
2. THE AREA IMMEDIATELY BEHIND AND BEYOND THE TERMINAL SHOULD BE TRAVERSABLE AND FREE FROM FIXED OBJECTS. IF A CLEAR RUN OUT IS NOT ATTAINABLE THIS AREA SHOULD AT LEAST BE SIMILAR IN CHARACTER TO THE UPSTREAM UNSHIELDED ROADSIDE AREAS.
3. FOR NEW CONSTRUCTION AND RECONSTRUCTION THE 10:1 SLOPE GRADING MUST EXTEND A MINIMUM OF 1.0 m BEHIND THE END POST.
4. FOR 3R WORK, THE GRADING SHOULD BE AS CLOSE AS POSSIBLE TO THE NEW CONSTRUCTION WITH THE SLOPE EXTENDING A MINIMUM OF 150 mm BEHIND THE END POST. FROM THE HINGE POINT, TIE THE GRADED SLOPE INTO THE EXISTING DITCH SLOPE TO COVER THE FOUNDATION TUBES AND SOIL PLATES WITHOUT EXTENDING THIS SLOPE BEYOND THE DITCH BOTTOM. USE #21B AGGREGATE, OR OTHER SUITABLE MATERIAL AS APPROVED BY THE ENGINEER, AT ROADWAY SHOULDERS.
5. THE TAPER FOR NEW CONSTRUCTION WILL BE 15:1. FOR 3R WORK THE MINIMUM ALLOWABLE TAPER IS 10:1.



SITE PREPARATION REQUIREMENTS FOR GR-9

SHEET 2 OF 2

GUARDRAIL TERMINAL INSTALLATION SITE PREPARATION REQUIREMENTS FOR GR-9

REV. 11/02

501.15A UNLESS OTHERWISE NOTED, ALL DIMENSIONS ON THIS SHEET ARE IN MILLIMETERS

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SPECIFICATION REFERENCE