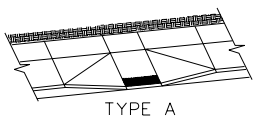
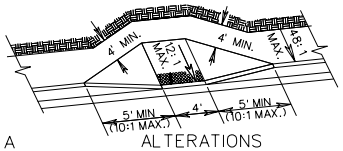
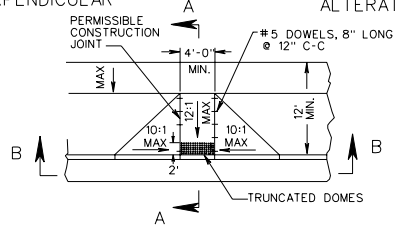
SURVEYED BY _____
SUPERVISED BY AAA
DESIGNED BY BBB

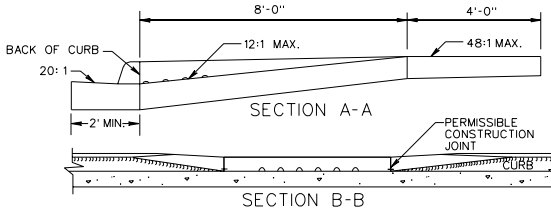


TYPE A
PERPENDICULAR



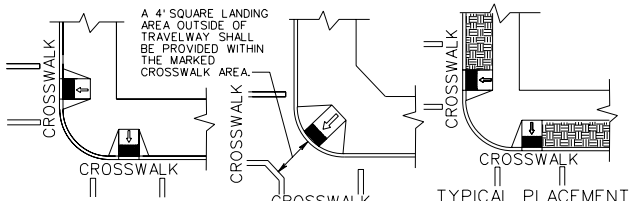
ALTERATIONS





SECTION A-A

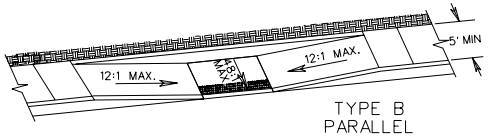
SECTION B-B



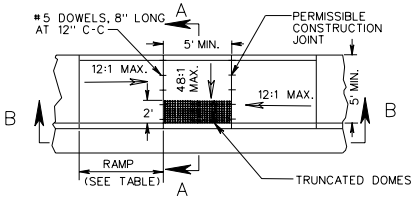
TYPICAL PLACEMENT AT INTERSECTION WITHIN CROSSWALK

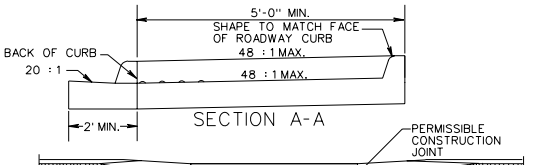
CROSSWALK DIAGONAL VARIATION

TYPICAL PLACEMENT AT INTERSECTION WITHIN CROSSWALK (WITH BUFFER STRIP)

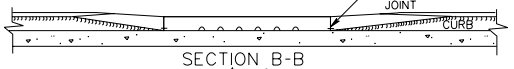


TYPE B
PARALLEL

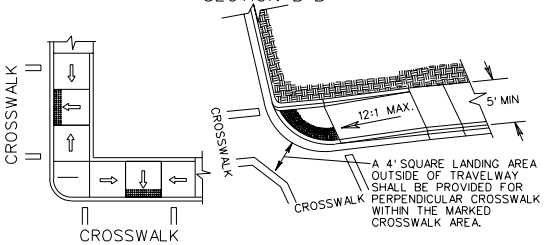




SECTION A-A



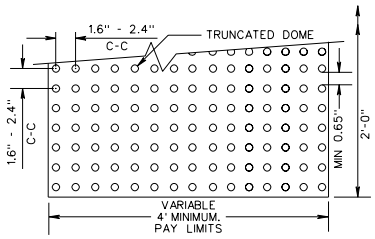
SECTION B-B



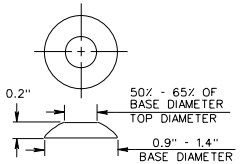
TYPICAL PLACEMENT AT INTERSECTION WITHIN CROSSWALK

DESIGN FEATURES RELATING TO CONSTRUCTION OR TO REGULATION AND CONTROL OF TRAFFIC MAY BE SUBJECT TO CHANGE AS DEEMED NECESSARY BY THE DEPARTMENT

REVISED	STATE	FEDERAL AID PROJECT	STATE ROUTE	STATE PROJECT	SHEET NO.
	VA.				



DETECTABLE WARNING DETAIL



TRUNCATED DOME DETAIL

TYPE B PARALLEL APPLICATION		
ROADWAY GRADE IN PERCENT	MINIMUM RAMP LENGTH IN FEET	
	4" CURB	6" CURB
0	4	6
1	5	7
2	5	8
3	6	9
4	8	12
5	10	15
6	14	15

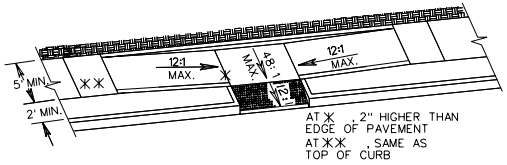
NOTE:

THE REQUIRED LENGTH OF A PARALLEL RAMP IS LIMITED TO 15 FEET, REGARDLESS OF THE SLOPE.

TYPE C PARALLEL & PERPENDICULAR APPLICATION		
ROADWAY GRADE IN PERCENT	MINIMUM RAMP LENGTH IN FEET	
	4" CURB	6" CURB
0	2	4
1	2	5
2	3	5
3	3	6
4	4	8
5	5	10
6	7	14
7	13	15
8	15	15

NOTES:

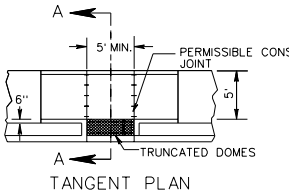
1. THE DETECTABLE WARNING SHALL BE PROVIDED BY TRUNCATED DOMES.
2. DETECTABLE WARNING TO BE CLASS A-3 CONCRETE (CLASS A-4 IF PRECAST) WITH SLIP RESISTANT INTEGRAL SURFACE COVERING THE FULL WIDTH OF THE RAMP FLOOR BY 2' IN LENGTH IN THE DIRECTION OF PEDESTRIAN TRAVEL. OTHER TYPES OF MATERIAL WITH THE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



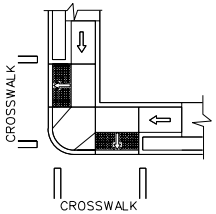
TYPE C
PARALLEL & PERPENDICULAR

THE SELECTION OF CURB TYPE AND THE CONFIGURATION OF THE UTILITY STRIP MAY VARY TO MEET EXISTING FIELD CONDITIONS AND ROADWAY GEOMETRICS PROVIDING THE DIMINSIONS AND SLOPES ARE AS NOTED.

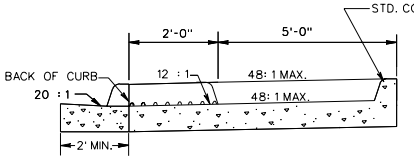
THIS COMBINED (PARALLEL & PERPENDICULAR) DESIGN FOR ALTERATIONS CAN BE USED WITH ADJOINING BUFFER STRIP. LANDING AT BOTTOM OF TWO SLOPING SIDES WITH 60" X 60" MIN. DIMENSIONS. THE SHORT PERPENDICULAR RUN TO THE STREET CAN BE PROTECTED BY A LANDSCAPED SETBACK OR CONNECTED TO THE SIDEWALK WITH A WARPED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



TANGENT PLAN



TYPICAL PLACEMENT AT INTERSECTION WITH BUFFER STRIP



SECTION A-A

REV. 7/05
SPECIAL DESIGN SECTION
DRAWING NO. A 59

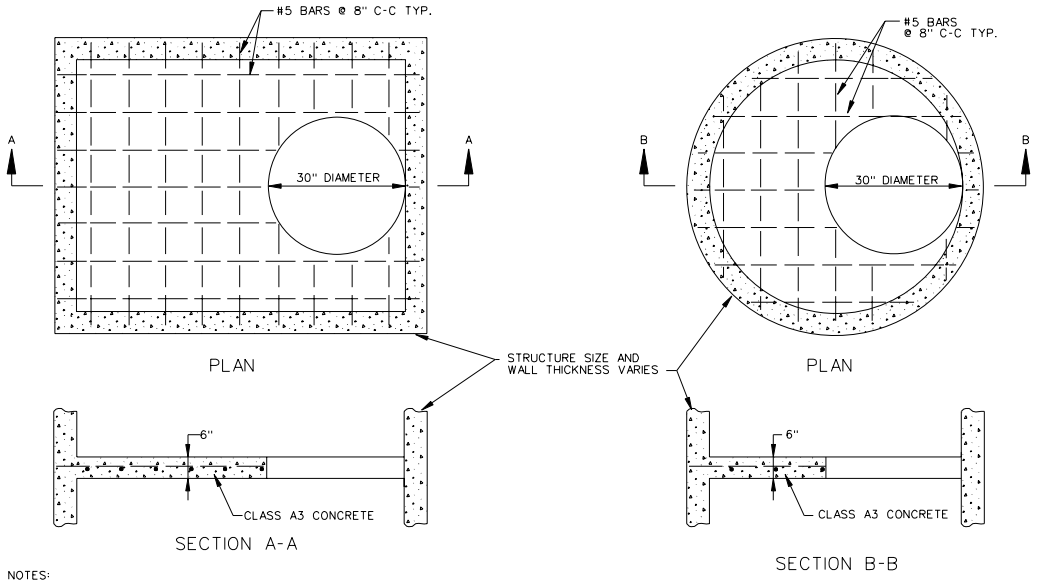
PLAN NO.	PROJECT	FILE NO.	SHEET NO.

SURVEYED BY
SUPERVISED BY AAA
DESIGNED BY BBB

DESIGN FEATURES RELATING TO CONSTRUCTION OR TO REGULATION AND CONTROL OF TRAFFIC MAY BE SUBJECT TO CHANGE AS DEEMED NECESSARY BY THE DEPARTMENT

REVISED	STATE	FEDERAL AID PROJECT	STATE ROUTE	STATE PROJECT	SHEET NO.
	VA.				

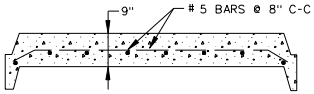
SL-1



NOTES:

1. STANDARD SL-1, MANHOLE SAFETY SLAB, IS REQUIRED AS PART OF THE DRAINAGE DESIGN FOR MANHOLES, JUNCTION BOXES AND DROP INLETS WITH HEIGHTS GREATER THAN 12 FEET. THE SPACING OF ADJACENT SAFETY SLABS SHALL BE 8' TO 12' WITH NO SAFETY SLAB LOCATED WITHIN 6 FEET OF THE TOP OR BOTTOM OF THE STRUCTURE. SAFETY SLABS SHALL NOT BE LOCATED BELOW ANY INLET PIPE OF 30" DIAMETER OR GREATER.
2. THE COST OF THE SL-1 IS INCLUDED IN THE COST OF THE STRUCTURE.
3. ACCESS OPENINGS ARE TO BE STAGGERED FROM ONE SIDE OF STRUCTURE TO THE OTHER WHERE APPLICABLE. STEPS ARE TO BE STAGGERED ACCORDINGLY.
4. SAFETY SLAB MAY BE CAST-IN-PLACE OR PRECAST. CAST-IN-PLACE CONCRETE TO BE CLASS A3 (3000 PSI). PRECAST CONCRETE IS TO BE A4 (4000 PSI). REINFORCING STEEL TO BE IN ACCORDANCE WITH AASHTO M31.
5. ACCESS OPENINGS MAY BE 30" DIAMETER OR 30" SQUARE. WHEN STRUCTURE WIDTH IS LESS THAN 30" THE ACCESS OPENING SHALL BE RECTANGULAR (STRUCTURE WIDTH BY 30" LONG).

SEE CAST IN PLACE DRAWINGS FOR FURTHER DETAILS



TYPICAL PRECAST UNIT

SPECIFICATION REFERENCE
302

TYPICAL CONCRETE SAFETY SLAB FOR DROP INLETS, MANHOLES AND JUNCTION BOXES

VIRGINIA DEPARTMENT OF TRANSPORTATION

106.14

REV. 7/05
SPECIAL DESIGN SECTION
DRAWING NO. A 62

PLAN NO.	PROJECT	FILE NO.	SHEET NO.

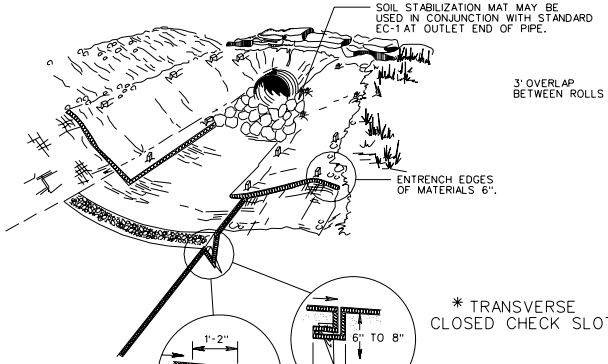
SURVEYED BY
SUPERVISED BY AAA
DESIGNED BY BBB

DESIGN FEATURES RELATING TO CONSTRUCTION OR TO REGULATION AND CONTROL OF TRAFFIC MAY BE SUBJECT TO CHANGE AS DEEMED NECESSARY BY THE DEPARTMENT

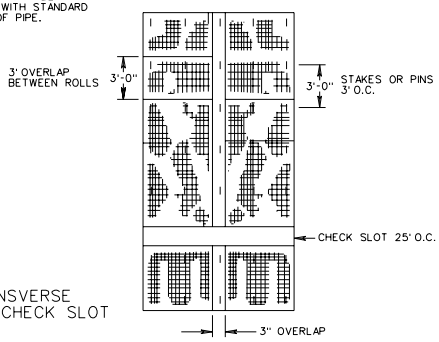
REVISED	STATE	FEDERAL AID PROJECT	STATE ROUTE	STATE PROJECT	SHEET NO.
	VA.				

EC-3

TYPICAL INSTALLATION AT END OF PIPE



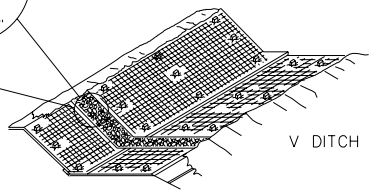
STAKING DETAIL



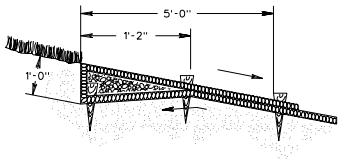
* TRANSVERSE CLOSED CHECK SLOT

* TRANSVERSE CHECK SLOT TO BE CONSTRUCTED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATION FOR PREFERRED INSTALLATION.

* TRANSVERSE OPEN CHECK SLOT



V DITCH



UPSTREAM AND DOWNSTREAM TERMINAL

NOTES:

1. STAKES SHALL BE WOOD OR METAL AS RECOMMENDED BY THE MANUFACTURER AND SHALL BE A MINIMUM OF 12" IN LENGTH. IN SANDY SOILS METAL STAKES A MINIMUM OF 18" IN LENGTH SHALL BE USED.
2. SOIL STABILIZATION MAT TYPE A AND B ARE TO BE IN ACCORDANCE WITH THE APPROVED PRODUCTS LIST.
3. SOIL STABILIZATION MAT SHOULD BE INSTALLED TO THE SHOULDER BREAK POINT OR EXISTING GROUND THEN EMBEDDED 6". MATERIAL ON BOTH SIDES OF THE DITCH SHALL BE INSTALLED TO THE SAME ELEVATIONS.
4. IF MORE THAN 3 LINES OF MATERIAL ARE REQUIRED PARALLEL TO THE ℄ OF THE DITCH, MATERIAL SHALL BE INSTALLED PERPENDICULAR TO THE CENTER LINE OF THE DITCH, STARTING AT THE LOWEST ℄ ELEVATION OF THE DITCH.
5. FOR SOURCES OF APPROVED MATERIALS SEE VDOT'S APPROVED PRODUCTS LIST FOR ST'D. EC-3, TYPE A OR B.

SHEET 1 OF 2

SPECIFICATION REFERENCE
606 244

SOIL STABILIZATION MAT
DITCH INSTALLATION TYPE A OR B

VIRGINIA DEPARTMENT OF TRANSPORTATION

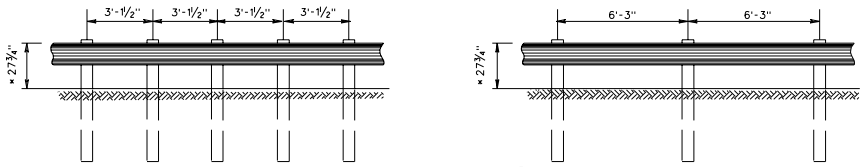
REV. 7/05

114.03

REV. 7/05
SPECIAL DESIGN SECTION
DRAWING NO. A 70

PLAN NO.	PROJECT	FILE NO.	SHEET NO.

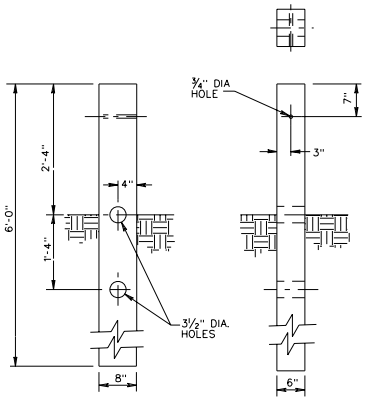
GR-2,2A



* HEIGHT TOLERANCE ± ¾"

GR-2A
(3'-1½" POST SPACING)
MAX DYNAMIC DEFLECTION = 2'

GR-2
(6'-3" POST SPACING)
MAX DYNAMIC DEFLECTION = 3'



CRT POST

NOTES:

GUARDRAIL LOCATIONS SHOWN ON PLANS ARE APPROXIMATE ONLY AND CAN BE ADJUSTED DURING CONSTRUCTION IF AND AS DIRECTED BY THE ENGINEER.

FOR DETAILS OF POST AND BLOCKOUTS SEE SHEET NO. 501.05.

FOR DETAILS OF RAIL ELEMENT, RAIL SPLICE JOINT, W-BEAM BACK-UP PLATE, AND ASSOCIATED HARDWARE SEE SHEET NOS. 501.01 AND 501.02.

RAIL ELEMENTS ARE FURNISHED SHOP CURVED FOR RADII BETWEEN 5 FEET AND 150 FEET.

ALL GUARDRAIL POSTS SHALL BE SET PLUMB. POST SHALL NOT BE SET WITH A VARIATION OF MORE THAN ⅛" FROM VERTICAL. W-BEAM, BLOCKOUTS, AND POSTS SHALL BE SET AND ALIGNED WITHOUT ALTERATION OR FORCE, AS PER SECTION 505 OF THE SPECIFICATIONS.

ALL GR-2 AND GR-2A RAIL SHALL BE MAINTAINED AT A HEIGHT OF 27¾" ± ¾" TOLERANCE BASED OFF THE FINISHED GRADE CENTERLINE ELEVATION, PAVEMENT CROSS SLOPE, OR SHOULDER SLOPE.

ALL W-BEAM RAILS SHALL BE LAPPED IN THE DIRECTION OF VEHICULAR TRAVEL FOR THE FINISHED ROADWAY.

SHEET 1 OF 2

SPECIFICATION REFERENCE
221
505

STANDARD BLOCKED-OUT W BEAM GUARDRAIL (STRONG POST SYSTEM)

VIRGINIA DEPARTMENT OF TRANSPORTATION

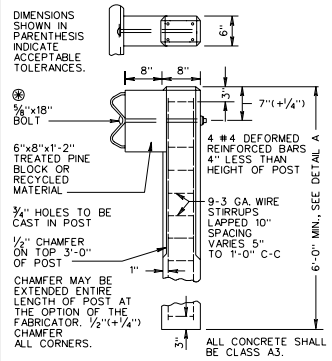
REV. 7/05

501.04

GR-2,2A

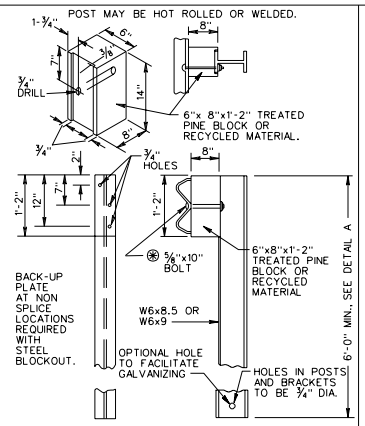
BLOCKOUT FOR CONCRETE POST TO BE CUT TO FIT POST SHAPE TO PREVENT BLOCKOUT FROM ROTATING.

DIMENSIONS SHOWN IN PARENTHESIS INDICATE ACCEPTABLE TOLERANCES.

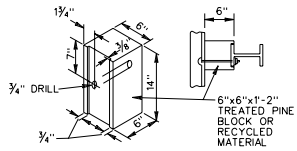


CONCRETE POST

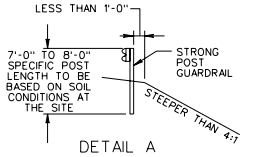
POST MAY BE HOT ROLLED OR WELDED.



STEEL POST

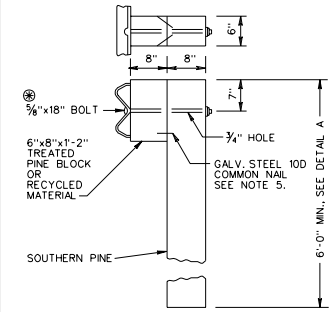


BLOCKOUT FOR MAINTENANCE REPAIR ONLY

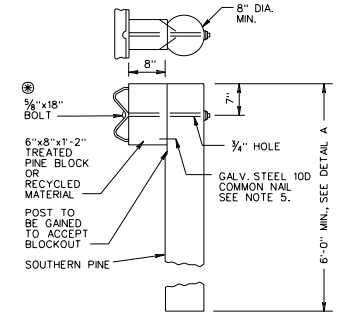


DETAIL A

GUARDRAIL INSTALLATION SITES REQUIRING LONGER GUARDRAIL POSTS



6x8 WOOD POST



ROUND WOOD POST

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 2688 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 ⅝" x 18 BOLT IS INSTALLED.

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

SHEET 2 OF 2

STANDARD BLOCKED-OUT W BEAM GUARDRAIL (STRONG POST SYSTEM) POST AND BLOCKOUT DETAILS

REV. 7/03

501.05

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE
221
236
505

REV. 7/05
SPECIAL DESIGN SECTION
DRAWING NO. A-87

SURVEYED BY
SUPERVISED BY
DESIGNED BY

DESIGN FEATURES RELATING TO CONSTRUCTION OR TO REGULATION AND CONTROL OF TRAFFIC MAY BE SUBJECT TO CHANGE AS DEEMED NECESSARY BY THE DEPARTMENT

REVISIONS	STATE	FEDERAL AID PROJECT	STATE PROJECT
	VA		

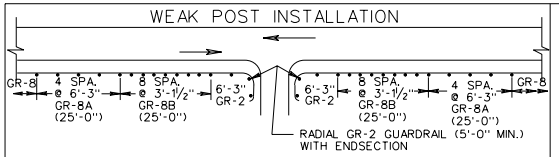
SURVEYED BY _____
SUPERVISED BY _____
DESIGNED BY _____

DESIGN FEATURES RELATING TO CONSTRUCTION OR TO REGULATION AND CONTROL OF TRAFFIC MAY BE SUBJECT TO CHANGE AS DEEMED NECESSARY BY THE DEPARTMENT

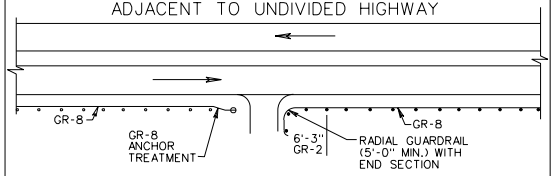
REVISED	STATE	FEDERAL AID PROJECT	STATE ROUTE	STATE PROJECT	SHEET NO.
	VA.				

GR-INS

WEAK POST INSTALLATION

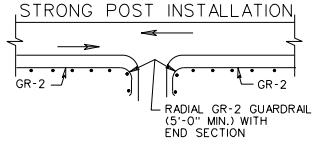


ADJACENT TO UNDIVIDED HIGHWAY

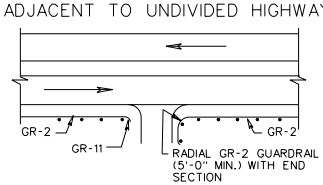


ADJACENT TO DIVIDED HIGHWAY

STRONG POST INSTALLATION



ADJACENT TO UNDIVIDED HIGHWAY

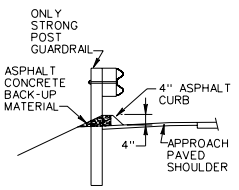


ADJACENT TO DIVIDED HIGHWAY
(ST'D GR-2 ONLY)

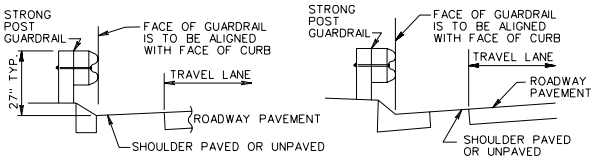
INSTALLATION AT PRIVATE ENTRANCE

(NOT TO BE USED IN PLACE OF ST'D GR-6,7, OR 9 NCHRP 350 TERMINAL)

FACE OF GUARDRAIL IS TO BE ALIGNED WITH FACE OF CURB.



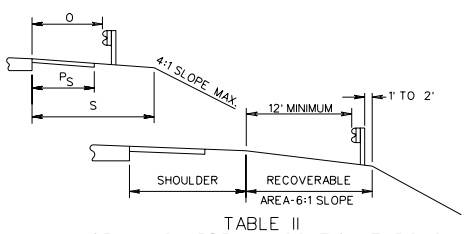
ASPHALT CURB SECTION

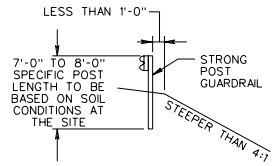


CURB SECTION — CURB & GUTTER SECTION

INSTALLATION ADJACENT TO CURBED SECTIONS

(NOT APPLICABLE TO URBAN DESIGN WITH SIDEWALK OR SIDEWALK SPACE)
ALL CURBS MUST BE MOUNTABLE





GUARDRAIL INSTALLATION SITES REQUIRING LONGER GUARDRAIL POSTS

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'

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'

GUARDRAIL LOCATION ON RECOVERABLE SLOPE

SHEET 6 OF 8

SPECIFICATION REFERENCE
221 505

W BEAM GUARDRAIL INSTALLATION CRITERIA

VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 7/05

501.38

REV. 7/05
SPECIAL DESIGN SECTION
DRAWING NO. A-92

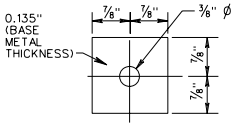
PLAN NO.	PROJECT	FILE NO.	SHEET NO.

SURVEYED BY _____
SUPERVISED BY _____
DESIGNED BY _____

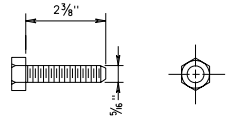
DESIGN FEATURES RELATING TO CONSTRUCTION OR TO REGULATION AND CONTROL OF TRAFFIC MAY BE SUBJECT TO CHANGE AS DEEMED NECESSARY BY THE DEPARTMENT

REVISED	STATE	FEDERAL AID PROJECT	STATE ROUTE	STATE PROJECT	SHEET NO.
	VA.				

MB-5

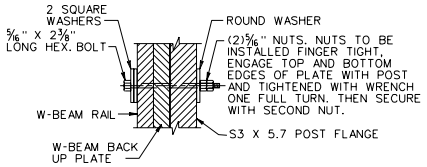


SQUARE WASHER

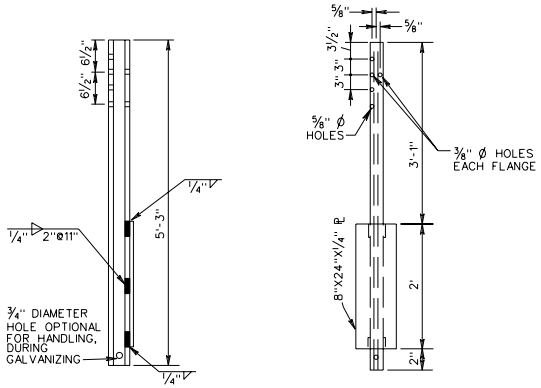


BOLT AND NUT SHALL HAVE 4000 POUNDS MIN. TENSILE STRENGTH.

5/16" HEX BOLT AND NUT



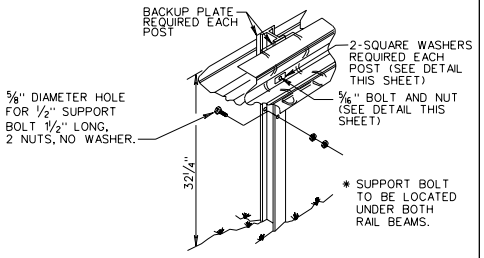
GUARDRAIL POST CONNECTION DETAIL



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.

S3X5.7 STEEL POST

* 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.



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 7'-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.

SHEET 1 OF 2

SPECIFICATION REFERENCE
221 505

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

VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 7/05

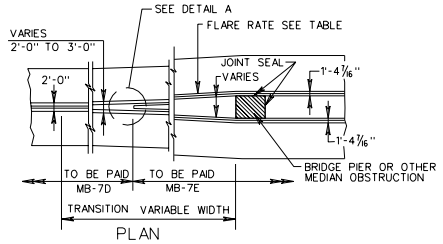
501.42

REV. 7/05
SPECIAL DESIGN SECTION
DRAWING NO. A-95

PLAN NO.	PROJECT	FILE NO.	SHEET NO.

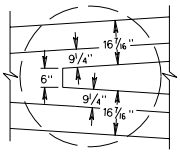
SURVEYED BY
SUPERVISED BY
DESIGNED BY

MB-7D,7E,7F



PLAN

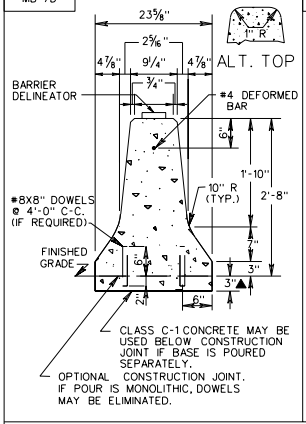
* SUGGESTED MAXIMUM FLARE RATE FOR RIGID BARRIER SYSTEMS.



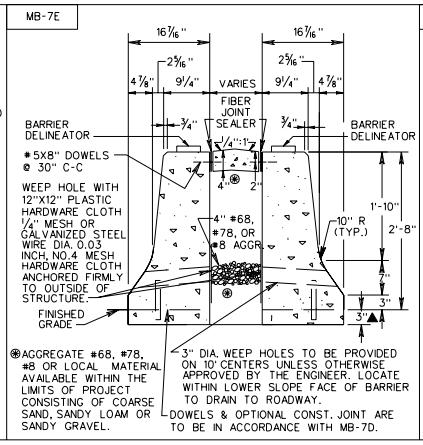
DETAIL A

FLARE RATES			
DESIGN SPEED	INSIDE SHY LINE		BEYOND SHY LINE
MPH	SHY LINE LS	FLARE RATE	FLARE RATE
70	10'	30:1	20:1 *
60	8'	26:1	18:1 *
50	6.5'	21:1	14:1 *
40	5'	16:1	10:1 *
30	3.5'	13:1	8:1 *

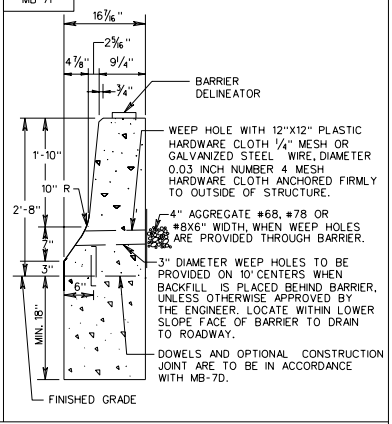
MB-7D



MB-7E



MB-7F



NOTES:
IF THE CONTRACTOR ELECTS TO USE THE OPTIONAL CONSTRUCTION JOINT, TRANSVERSE JOINTS FOR CRACK CONTROL AND EXPANSION JOINTS ARE TO BE PROVIDED IN BOTH FOOTING AND BARRIER AT THE SAME LOCATION.

TRANSVERSE JOINTS ARE TO COINCIDE WITH JOINTS IN ADJACENT PAVEMENT WITH A MAXIMUM SPACING OF 20 FEET C-C.

CONCRETE MEDIAN BARRIER MAY BE PRECAST, CAST IN PLACE OR SLIP-FORMED. FOR PRECAST DESIGN SEE STANDARD MB-7D PC.

HORIZONTAL REINFORCING STEEL BARS ARE TO BE SEPARATED AT ALL EXPANSION AND CONTRACTION JOINTS. A 2" CONCRETE COVER IS REQUIRED OVER THE ENDS OF THE REINFORCING STEEL.

BARRIER DELINEATOR SIZE, COLOR, AND SPACING TO BE IN ACCORDANCE WITH THE SPECIFICATIONS.

COST OF DELINEATOR TO BE INCLUDED IN THE PRICE BID FOR MEDIAN BARRIER.

REFLECTIVE SURFACE OF BARRIER DELINEATOR IN ALL INSTANCES, TO BE FACING ONCOMING TRAFFIC.

ALTERNATE TOP DESIGN SHOWN ON MB-7D. MAY ALSO BE APPLIED TO MB-7E AND MB-7F.

CONCRETE TO BE CLASS A3 IF CAST IN PLACE, 4000 PSI IF PRECAST.

▲ DEPTH OF CONCRETE BASE MAY BE EXTENDED AT THE CONTRACTOR'S OPTION TO COINCIDE WITH BOTTOM OF PAVEMENT COURSE IN WHICH BASE TERMINATES; HOWEVER, THE COST OF ADDITIONAL CONCRETE SHALL BE INCLUDED IN UNIT PRICE BID PER LINEAR FOOT OF BARRIER.

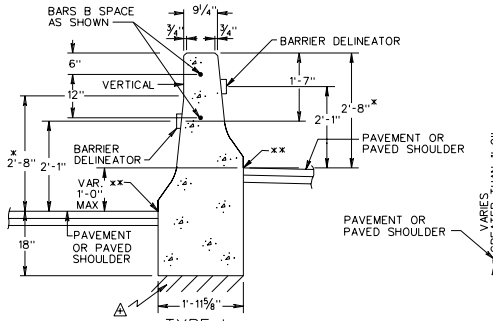
SPECIFICATION REFERENCE
105 502

CONCRETE MEDIAN BARRIER

VIRGINIA DEPARTMENT OF TRANSPORTATION

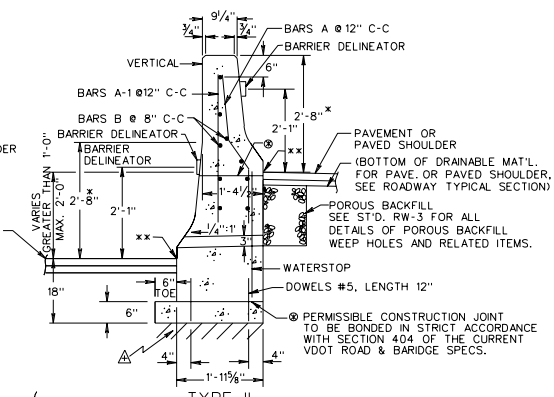
REV. 7/05
501.44

MB-8A



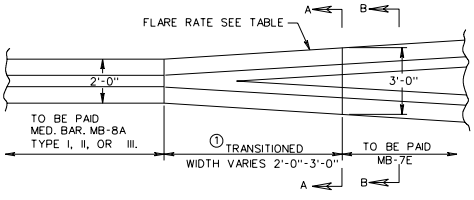
TYPE I

TYPE I (GREATER THAN 0 HT. DIFF., MAX. 1'-0")



TYPE II

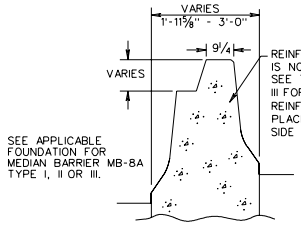
TYPE II (GREATER THAN 1'-0" HT. DIFF., MAX. 2'-0")



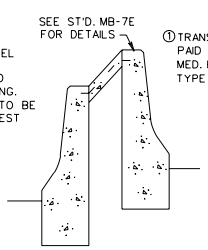
* MB-7D BARRIER FACE

** DENOTES FINISHED GRADE ELEVATION

⚠ FOUNDATION MATERIAL UNDER MEDIAN BARRIER IS TO BE COMPACTED.



SECTION A-A
(FOUNDATION NOT SHOWN)



SECTION B-B
(STD. MB-7E)

① TRANSITIONED TO BE PAID FOR AS MED. BARRIER MB-8A TYPE I, II OR III.

FLARE RATES			
DESIGN SPEED	INSIDE SHY LINE		BEYOND SHY LINE
MPH	SHY LINE LS	FLARE RATE	FLARE RATE
70	10'	30 : 1	20 : 1 ②
60	8'	26 : 1	18 : 1 ②
50	6.5'	21 : 1	14 : 1 ②
40	5'	16 : 1	10 : 1 ②
30	3.5'	13 : 1	8 : 1 ②

② MAXIMUM FLARE RATE FOR RIGID BARRIER SYSTEMS.

SPECIAL DESIGN SECTION
DRAWING NO. A-98
REV. 7/05

REV. 1/04
501.47

CONCRETE MEDIAN BARRIER TYPE I, II OR III

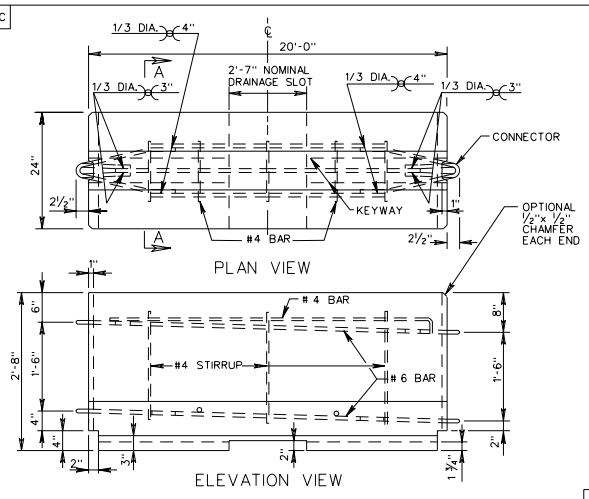
VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE
105 404 502

DESIGN FEATURES RELATING TO CONSTRUCTION OR TO REGULATION AND CONTROL OF TRAFFIC MAY BE SUBJECT TO CHANGE AS DEEMED NECESSARY BY THE DEPARTMENT

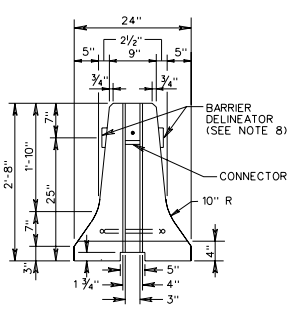
BRIDGE
STATE
FEDERAL AID PROJECT
STATE PROJECT

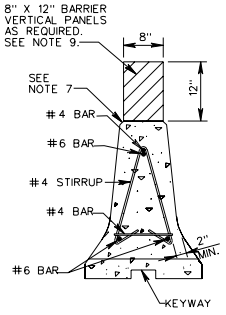
MB-7D PC



NOTES:

1. FOR POSITIVE CONNECTION DETAILS AND DIMENSIONS SEE SHEETS 501.59 - 501.61.
2. AT THE OPTION OF THE MANUFACTURER, ADDITIONAL REINFORCING MAY BE ADDED TO THE PRECAST CONCRETE BARRIER FOR HANDLING.
3. CONCRETE SHALL BE 4000 P.S.I. MINIMUM.
4. BARRIER DELINEATOR SIZE, COLOR AND SPACING SHALL BE IN ACCORDANCE WITH THE SPECIFICATIONS.
5. COST OF DELINEATOR SHALL BE INCLUDED IN THE PRICE BID FOR TRAFFIC BARRIER SERVICE.
6. OTHER PRECAST TRAFFIC BARRIER SERVICE CONCRETE DESIGNS THAT MEET NCHRP 350 TEST REQUIREMENTS AND HAVE BEEN ACCEPTED BY VDOT AS AN ACCEPTABLE ALTERNATE TO THE STANDARD DESIGN MAY BE SUBSTITUTED.
7. A 1" RADIUS MAY BE USED AS AN ALTERNATE FOR THE ¾" CHAMFER.
8. BARRIER DELINEATOR REFLECTIVE SURFACE IN ALL INSTANCES SHALL BE FACING ONCOMING TRAFFIC.
9. BARRIER VERTICAL PANELS SHALL BE SPACED IN ACCORDANCE WITH VIRGINIA WORK AREA PROTECTION MANUAL.





WHEN USING VDOT STANDARD MB-7D PC WITH THE PIN AND LOOP POSITIVE CONNECTION, ALLOW FOR A 6'-0" DYNAMIC DEFLECTION. PROVIDE MIN. 60' OF BARRIER UPSTREAM AND DOWNSTREAM OF WORK ZONE FOR ANCHORAGE.
FOR APPROVED NON-VDOT DESIGNS, REFER TO MANUFACTURER'S INSTALLATION INSTRUCTIONS FOR DEFLECTIONS AND ANCHORAGE.

FLARE RATES *			
DESIGN SPEED	INSIDE SHY LINE		BEYOND SHY LINE
MPH	SHY LINE LS	FLARE RATE	FLARE RATE
70	10'	30:1	20:1
60	8'	26:1	18:1
50	6.5'	21:1	14:1
40	5'	16:1	10:1
30	3.5	13:1	8:1

*SUGGESTED MAXIMUM FLARED RATE FOR RIGID BARRIER SYSTEMS.

SHEET 1 OF 2

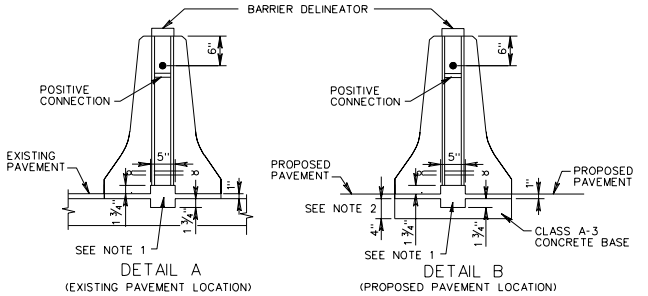
PRECAST TRAFFIC BARRIER SERVICE CONCRETE

VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 7/05
501.45

SPECIFICATION REFERENCE
105
512

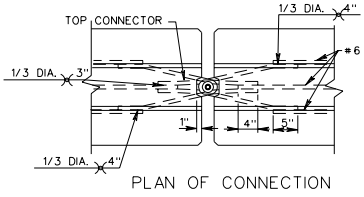
MB-7D PC

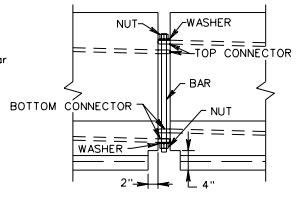


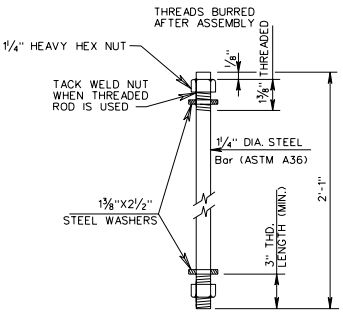
PERMANENT INSTALLATION

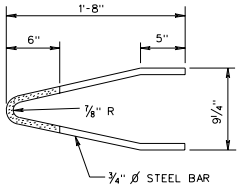
NOTES:

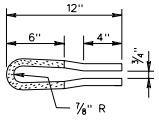
1. HIGH STRENGTH GROUT OR MORTAR SHALL BE IN ACCORDANCE WITH SECTION 218 OF THE SPECIFICATIONS.
2. 4" MIN. OR VARIABLE TO COINCIDE WITH SUBGRADE COURSE.
3. WHEN USED AS MEDIAN BARRIER IN A PERMANENT LOCATION, DRAINAGE SLOTS WILL BE COMPLETELY FILLED AND SEALED WITH MORTAR OR GROUT UNLESS UNIT WILL BE LOCATED OVER MEDIAN DRAINAGE STRUCTURE.
4. BARRIER DELINEATOR SIZE, COLOR, AND SPACING SHALL BE IN ACCORDANCE WITH THE SPECIFICATIONS.
5. COST OF DELINEATOR TO BE INCLUDED IN THE PRICE BID FOR MEDIAN BARRIER.
6. REFLECTIVE SURFACE OF BARRIER DELINEATOR IN ALL INSTANCES SHALL BE FACING ONCOMING TRAFFIC.
7. PIN AND CONNECTORS SHALL BE ASTM-A36. REINFORCING STEEL BARS SHALL BE ASTM A 615 GRADE 60. ONE CONNECTOR PIN ASSEMBLY WITH EACH BARRIER SECTION.

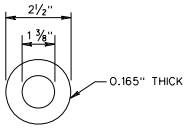












SHEET 2 OF 2

PRECAST TRAFFIC BARRIER SERVICE CONCRETE

VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 7/05
501.46

SPECIFICATION REFERENCE
105
512

SURVEYED BY
SUPERVISED BY AAL
DESIGNED BY BBD

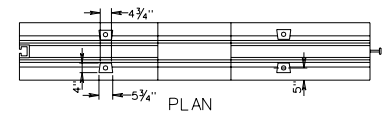
DESIGN FEATURES RELATING TO CONSTRUCTION OR TO REGULATION AND CONTROL OF TRAFFIC MAY BE SUBJECT TO CHANGE AS DEEMED NECESSARY BY THE DEPARTMENT

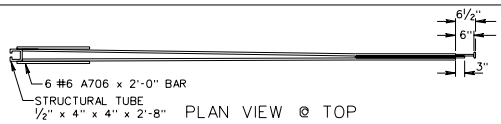
REVISED
VA. STATE
FEDERAL AID PROJECT
ROUTE
STATE PROJECT
SHEET NO.

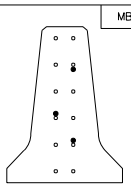
PLAN NO.
PROJECT
FILE NO.
SHEET NO.

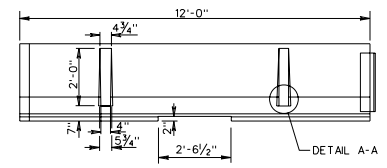
SPECIAL DESIGN SECTION
DRAWING NO. A103
REV. 7/05

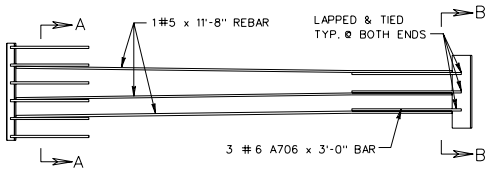
MB-INS

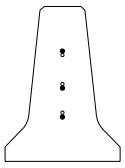


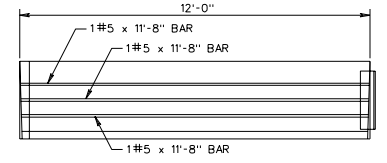


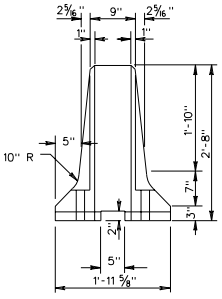








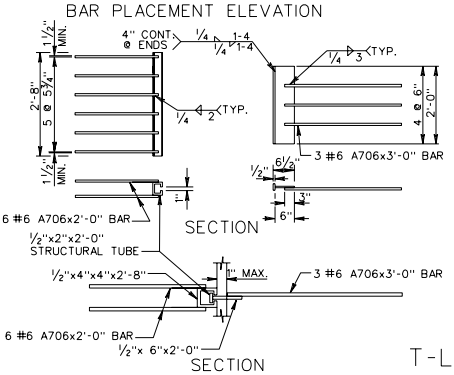


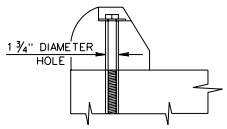


LEGEND
- ● = 11'-8" BAR
- ○ = 2' AND 3' BAR

NOTES:

1. MINIMUM COMPRESSIVE STRENGTH OF CONCRETE AT THE AGE OF 28 DAYS SHALL BE 4000 PSI.
2. ALL REINFORCEMENT SHALL CONFORM TO TO ASTM A615, GRADE 60.
3. STANDARD BARRIER SECTIONS SHALL BE 12'-0" AS SHOWN OR 18'-0" SHORTER SECTIONS SHALL BE CAST IN REQUIRED LENGTHS AS ONE UNIT. LONGER SECTIONS SHALL BE CAST TO REQUIRED DIMENSIONS IN TWO UNITS.
4. ALL EXPOSED METAL IS TO BE GALVANIZED FOR PERMANENT LOCATIONS.
5. ALL EXPOSED METAL SHALL BE GALVANIZED FOR TEMPORARY LOCATIONS.
6. T-LOK AS MANUFACTURED BY ROCKINGHAM PRECAST
7. BEGINNING WITH JANUARY 2000 ADVERTISEMENT ALL POSITIVE CONNECTIONS MUST BE APPROVED BY THE FHWA IN ACCORDANCE WITH NCHRP 350 TEST REQUIREMENTS.
8. REFER TO MANUFACTURER FOR TEMPORARY INSTALLATION DETAILS.





WHEN USING T-LOK BARRIER, ALLOW FOR A 3'-10" DYNAMIC DEFLECTION. PROVIDE MINIMUM 60' OF BARRIER UPSTREAM AND DOWNSTREAM OF WORK ZONE FOR ANCHORAGE.

T-LOK® DETAILS

SHEET 2 OF 5

SPECIFICATION REFERENCE

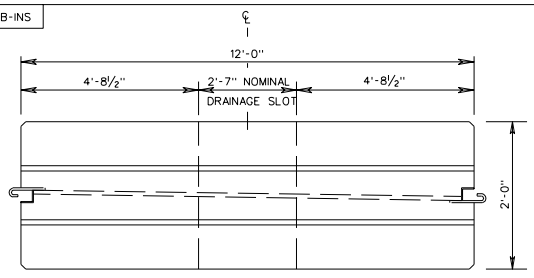
PRECAST CONCRETE MEDIAN BARRIER
POSITIVE CONNECTION OPTIONS

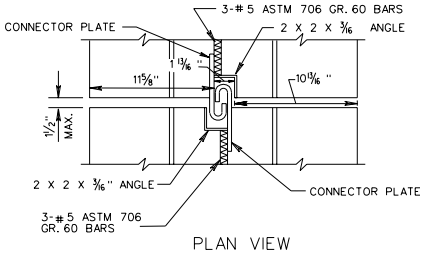
VIRGINIA DEPARTMENT OF TRANSPORTATION

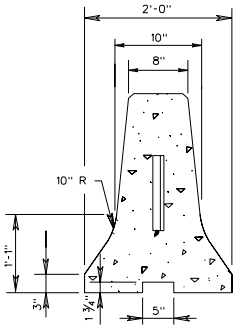
REV. 7/05

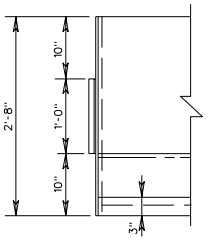
501.60

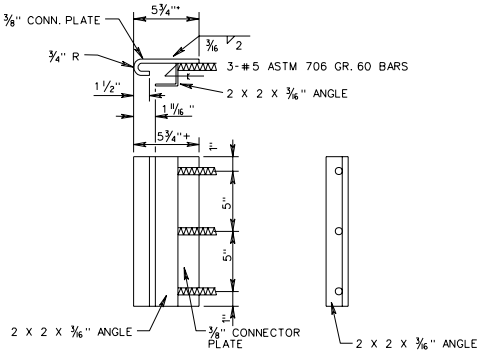
MB-INS











NOTES:

1. MINIMUM COMPRESSIVE STRENGTH OF CONCRETE AT THE AGE OF 28 DAYS SHALL BE 4000 PSI.
2. ALL REINFORCEMENT SHALL CONFORM TO TO ASTM A615, GRADE 60.
3. ALL EXPOSED METAL TO BE GALVANIZED FOR PERMANENT LOCATIONS.
4. ALL EXPOSED METAL SHALL BE GALVANIZED FOR TEMPORARY LOCATIONS.
5. J-J HOOK AS MANUFACTURED BY SMITH-MIDLAND.
6. BEGINNING WITH JANUARY 2000 ADVERTISEMENT ALL POSITIVE CONNECTIONS MUST BE APPROVED BY THE FHWA IN ACCORDANCE WITH NCHRP 350 TEST REQUIREMENTS.
7. REFER TO MANUFACTURER FOR TEMPORARY INSTALLATION DETAILS.

WHEN USING J-J HOOK BARRIER, ALLOW FOR A 4'-4" DYNAMIC DEFLECTION. PROVIDE A MIN. 69'-7" OF BARRIER UPSTREAM AND DOWN-STREAM OF WORK ZONE FOR ANCHORAGE.

J-J HOOK® DETAILS

SHEET 3 OF 5

SPECIFICATION REFERENCE

PRECAST CONCRETE MEDIAN BARRIER
POSITIVE CONNECTION OPTIONS

VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 7/05

501.61

SPECIAL DESIGN SECTION
DRAWING NO. A 105-1
REV. 7/05

SURVEYED BY
SUPERVISED BY
DESIGNED BY

DESIGN FEATURES RELATING TO CONSTRUCTION OR TO REGULATION AND CONTROL OF TRAFFIC MAY BE SUBJECT TO CHANGE AS DEEMED NECESSARY BY THE DEPARTMENT

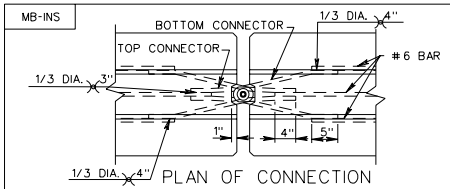
REVISED
STATE
FEDERAL AID PROJECT
DATE
STATE PROJECT

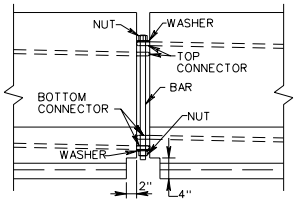
SURVEYED BY
SUPERVISED BY
DESIGNED BY

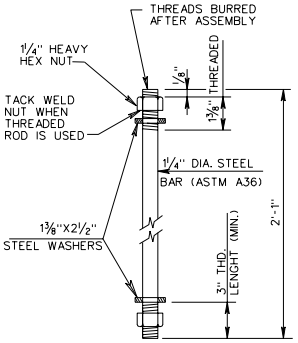
DESIGN FEATURES RELATING TO CONSTRUCTION OR TO REGULATION AND CONTROL OF TRAFFIC MAY BE SUBJECT TO CHANGE AS DEEMED NECESSARY BY THE DEPARTMENT

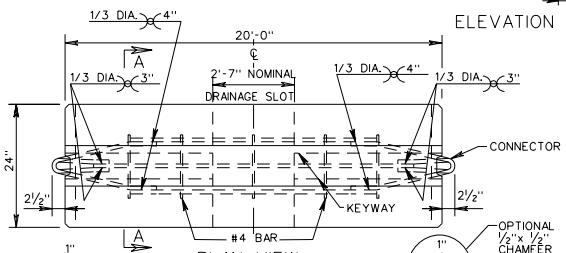
REVISED	STATE	FEDERAL AID PROJECT	STATE ROUTE	STATE PROJECT	SHEET NO.
	VA.				

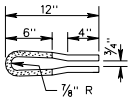
MB-INS

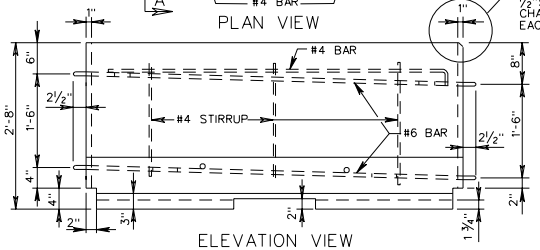


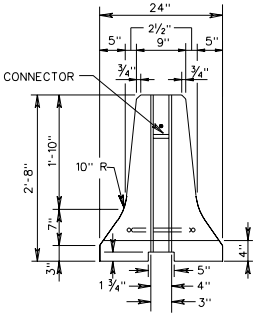


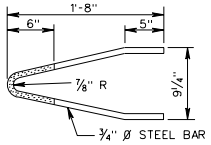








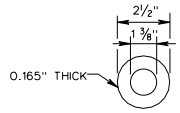




NOTES:

1. PIN AND CONNECTORS ARE TO BE ASTM A-36 REINFORCING. STEEL BARS ARE TO BE ASTM A 615, GRADE 60. ONE CONNECTOR PIN ASSEMBLY WITH EACH BARRIER SECTION.
2. THE CONNECTION PIN, NUTS AND WASHERS SHALL BE GALVANIZED IN ACCORDANCE WITH AASHTO M-111.
3. BEGINNING WITH THE JANUARY 2000 ADVERTISEMENT, ALL POSITIVE CONNECTIONS MUST BE APPROVED BY THE FHWA IN ACCORDANCE WITH NCHRP 350 TEST REQUIREMENTS.

WHEN USING VDOT STANDARD MB-7D PC WITH THE PIN AND LOOP POSITIVE CONNECTION, ALLOW FOR A 6'-0" DYNAMIC DEFLECTION. PROVIDE MIN. 60' OF BARRIER UPSTREAM AND DOWNSTREAM OF WORK ZONE FOR ANCHORAGE.
FOR APPROVED NON-VDOT DESIGNS, REFER TO MANUFACTURER'S INSTALLATION INSTRUCTIONS FOR DEFLECTIONS AND ANCHORAGE.



PIN AND LOOP DETAILS

SHEET 1 OF 5

REV. 7/05

501.59

PRECAST CONCRETE MEDIAN BARRIER
POSITIVE CONNECTION OPTIONS

VIRGINIA DEPARTMENT OF TRANSPORTATION

SPECIFICATION REFERENCE

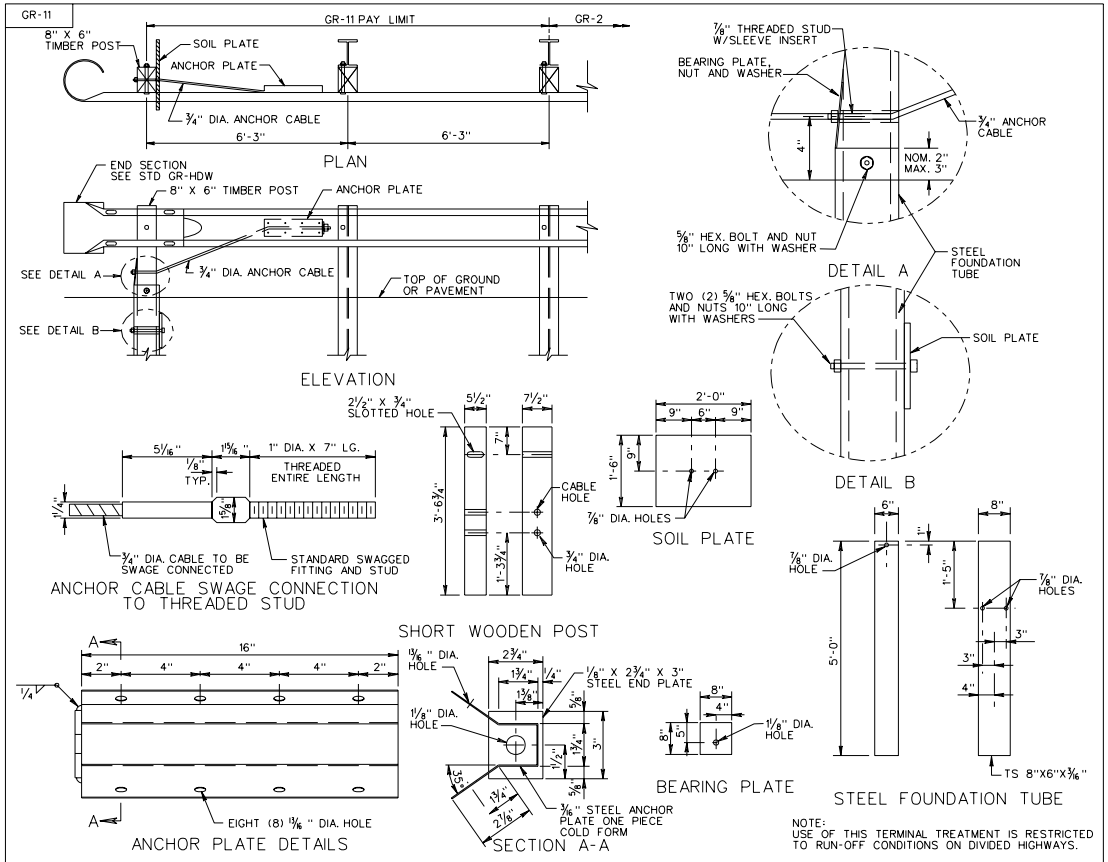
NEW 7/05
SPECIAL DESIGN SECTION
DRAWING NO. A 105_2

PLAN NO.	PROJECT	FILE NO.	SHEET NO.

DESIGN FEATURES RELATING TO CONSTRUCTION OR TO REGULATION AND CONTROL OF TRAFFIC MAY BE SUBJECT TO CHANGE AS DEEMED NECESSARY BY THE DEPARTMENT

REVISED	STATE	FEDERAL AID PROJECT	STATE ROUTE	STATE PROJECT	SHEET NO.
	VA.		WWW	XXX YYY	VV

GR-11



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

TRAILING END TERMINAL TREATMENT

VIRGINIA DEPARTMENT OF TRANSPORTATION

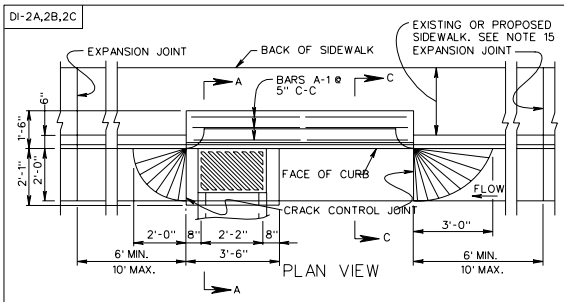
REV. 7/05
501.21

SPECIFICATION REFERENCE
505
221

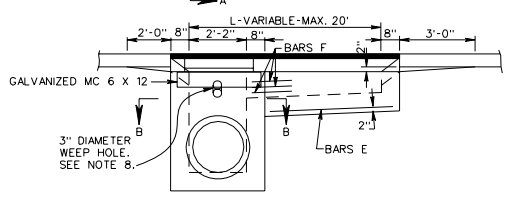
REV. 7/05
SPECIAL DESIGN SECTION
DRAWING NO. A-145

SURVEYED BY
SUPERVISED BY AAA
DESIGNED BY BBB

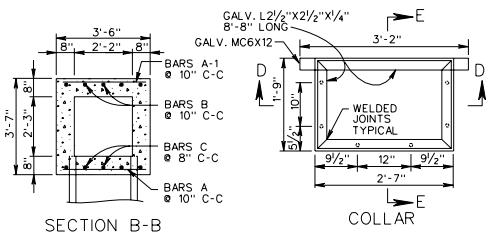
DI-2A,2B,2C



PLAN VIEW

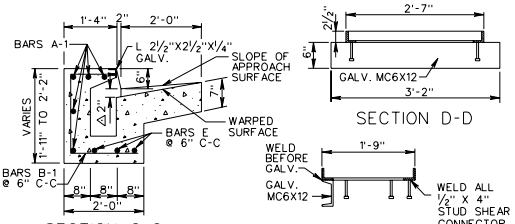


FRONT ELEVATION



SECTION B-B

COLLAR

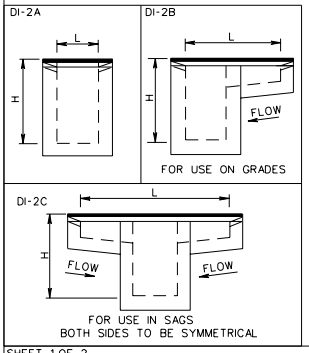


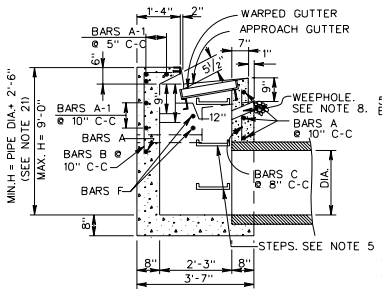
SECTION C-C

△DECREASE TO 1" WHEN INLET IS USED WITH MEDIANS.

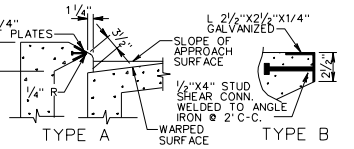
SECTION D-D

SECTION E-E





SECTION A-A
FOR STEP DETAILS SEE STD. ST-1.



TYPE A TYPE B

NOSE DETAILS

TYPE A NOSE DETAIL SHALL BE USED WITH CG-7 STANDARD.
TYPE B NOSE DETAIL SHALL BE USED WITH CG-6 STANDARD.
GALVANIZED PLATE FOR TYPE A TO BE BENT ON AN ANGLE OF 68° 30' AND IS TO BE ANCHORED WITH ½"X4" STUD SHEAR CONNECTORS WELDED TO BENT PLATE AT 2' C-C.

SHEET 1 OF 2

STANDARD CURB DROP INLET
12" - 24" PIPE: MAXIMUM DEPTH (H) = 9'

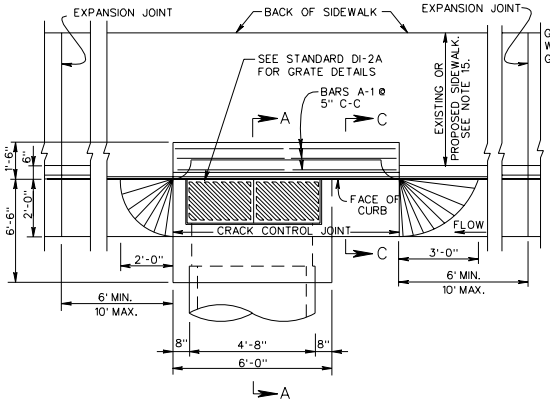
VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 7/05
104.03

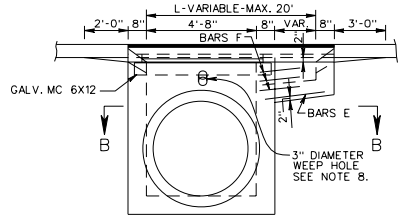
SPECIFICATION REFERENCE
233
302

DESIGN FEATURES RELATING TO CONSTRUCTION OR TO REGULATION AND CONTROL OF TRAFFIC MAY BE SUBJECT TO CHANGE AS DEEMED NECESSARY BY THE DEPARTMENT

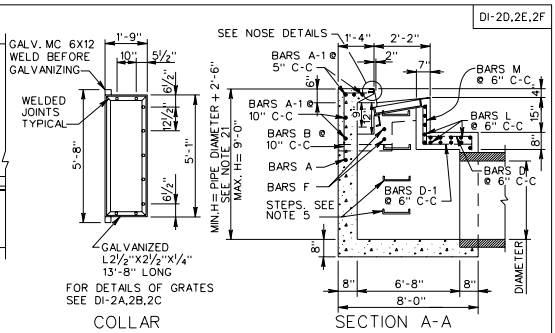
DI-2D,2E,2F



PLAN VIEW

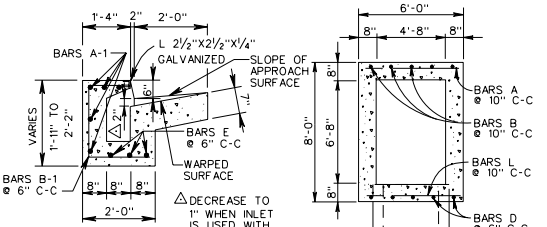


FRONT ELEVATION



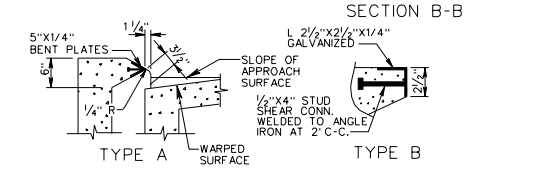
COLLAR

SECTION A-A



SECTION C-C

SECTION B-B

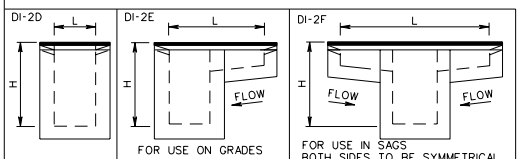


TYPE A TYPE B

NOSE DETAILS

TYPE A NOSE DETAIL SHALL BE USED WITH CG-7 STANDARD.
TYPE B NOSE DETAIL SHALL BE USED WITH CG-6 STANDARD.
GALVANIZED PLATE FOR TYPE A TO BE BENT ON AN ANGLE OF 68° 30' AND IS TO BE ANCHORED WITH ½"X4" STUD SHEAR CONNECTORS WELDED TO BENT PLATE AT 2' C-C.

SHEET 1 OF 2



STANDARD CURB DROP INLET
30" - 48" PIPE: MAXIMUM DEPTH (H) = 9'

VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 7/05
104.06

SPECIFICATION REFERENCE
233
302

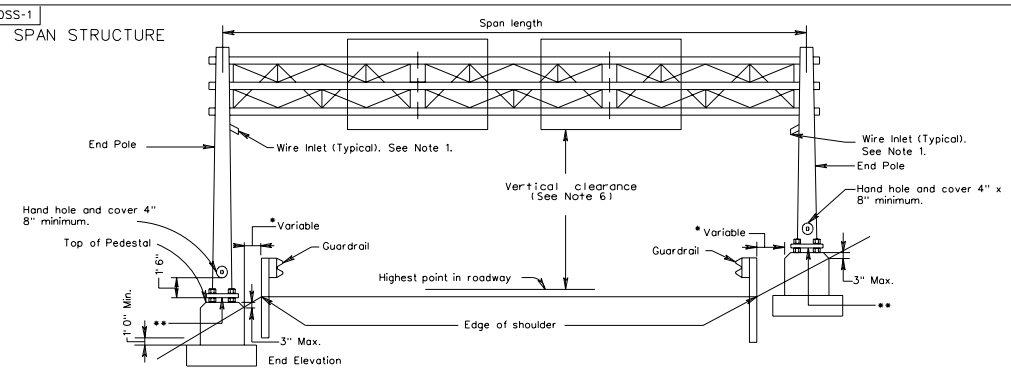
SPECIAL DESIGN SECTION DRAWING NO. A-153
REV. 7/05

PLAN NO. | PROJECT | FILE NO. | SHEET NO.

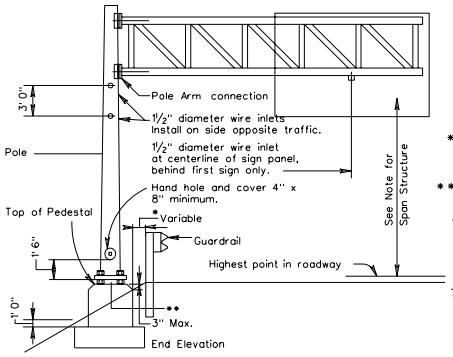
REVISED | STATE | FEDERAL AID PROJECT | ROUTE | STATE PROJECT | SHEET NO.

OSS-1

SPAN STRUCTURE



CANTILEVER STRUCTURE



NOTES:

1. 1½" diameter wire inlets shall be provided at the following locations:
   - A. On span structures on the front leg of end pole 12" below bottom chord.
   - B. On cantilever structures on pole 12" below bottom chord.
   - C. On span structures below bottom chord at centerline behind first sign panel from each end pole.
   - D. On cantilever structures below bottom chord at centerline behind first sign panel from pole.
2. All unused wire inlets shall be capped water tight.
3. * Distance shall be no less than the minimum indicated in Standard GR-INS.
4. No mortar, grout, or concrete shall be placed between bottom of base plate and top of pedestal.
5. ** The maximum space beetween the bottom of the base plate and the top of the foundation shall be no more than the diameter of the anchor bolt plus one inch.
6. Vertical clearance for overhead and bridge mounted sign structures shall be no less than 19 feet 0 inch and no more than 21 feet 0 inch from the bottom of the lowest mounted sign panel to the crown of the roadway, unless otherwise specified on the plans. Luminaire assemblies shall a vertical clearence of no less than 17 feet six inches from the bottom of the assembly to the crown of the roadway.
7. All poles/uprights for overhead sign structures including "butterfly" structures shall have a minimum of six anchor bolts, each having a minimum diameter of 1½".

TYPICAL DETAILS FOR OVERHEAD SIGN STRUCTURES

VIRGINIA DEPARTMENT OF TRANSPORTATION

REV.5/05
REV.4/04
REV. 1 /04

1301.72

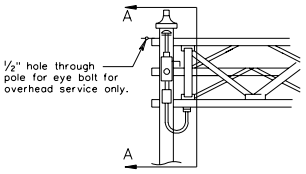
SURVEYED BY: ___
SUPERVISED BY: ___
DESIGNED BY: BBB

OSS-1

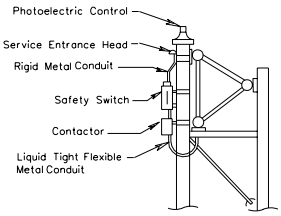
ELECTRIC DETAILS FOR SIGN LIGHTING

SPAN SIGN STRUCTURE

FRONT VIEW

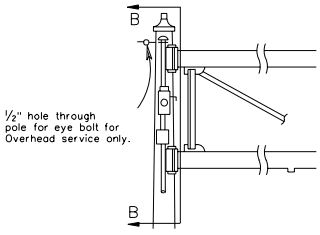


SECTION A-A

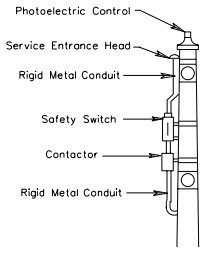


CANTILEVER SIGN STRUCTURE

FRONT VIEW



SECTION B-B



Note:

A safety switch shall be installed on all sign structures requiring electrical power. Electrical service for sign structures not controlled by a control center shall be have a photocell and a photocell controlled contactor to control the electrical power to luminaires. The contactor shall be in a NEMA 3R enclosure within 24 inches of the safety switch.

All conduit located in or on overhead sign structure shall be ¾" minimum.

TYPICAL DETAILS FOR OVERHEAD SIGN STRUCTURES

VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 7 /05
REV. 1 / 04
REV. 1 / 04

1301.73

DESIGN FEATURES RELATING TO CONSTRUCTION OR TO REGULATION AND CONTROL OF TRAFFIC MAY BE SUBJECT TO CHANGE AS DEEMED NECESSARY BY THE DEPARTMENT

REVISED	STATE	FED/AID PROJECT	ROUTE	STATE PROJECT	SHEET NO.
	VA.				

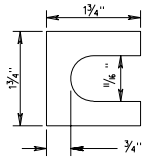
PLAN NO. | PROJECT | FILE NO. | SHEET NO.

SPECIAL DESIGN SECTION
DRAWING NO. A - 154

REV. 7/05

SSP-VA

SHIM DETAIL



Furnish 2 @ 0.63" thick and 2 @ .032" thick shims per post. Shims shall be fabricated from brass conforming to ASTM B36M or from stainless steel with a minimum chromium content of 11.50% . No more than 2 shims shall be used per bolt with a maximum of 4 shims per post.

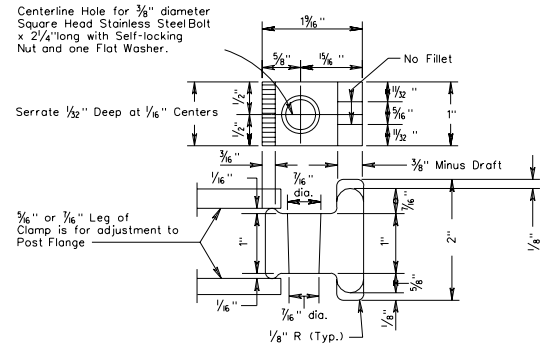
POST CLAMP DETAIL

Galvanized Gray - Iron or Aluminum Casting

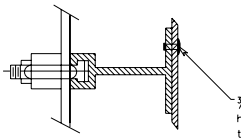
Centerline Hole for ⅜" diameter Square Head Stainless Steel Bolt x 2¼"long with Self-locking Nut and one Flat Washer.

Serrate 1/32" Deep at 1/16" Centers

⅝" or 7/16" Leg of Clamp is for adjustment to Post Flange

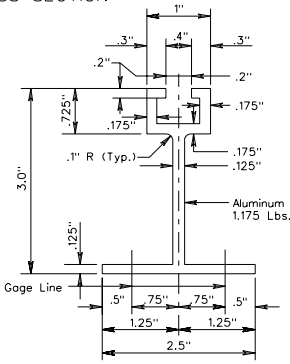


FASTENING



3/16" diameter rivet. -Rivets shall be dome head,break mandrel, blind rivets conforming to Industrial Fasteners Institute Standard IFI-114, Style 1, Grades 10 or 11 except that the minimum ultimate tensile strength shall be 360 pounds. Rivets shall have a grip range accommodating the combined thickness of the sign panel and zee bar and shall be installed in accordance with the manufacturer's recommendations.

TEE CROSS SECTION



TYPICAL DETAILS FOR TYPE VA SIGN STRUCTURES

VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 7/05
REV. 4/04

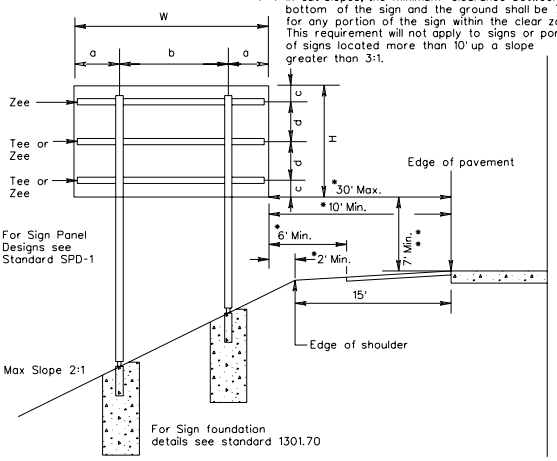
1301.63

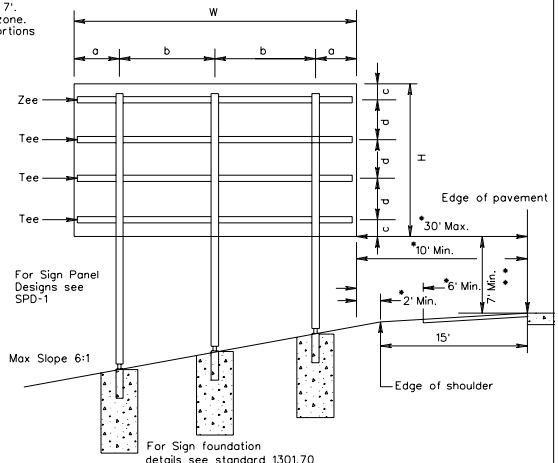
SSP-VI A

The spacing between sign posts shall be a minimum of 8' center to center.

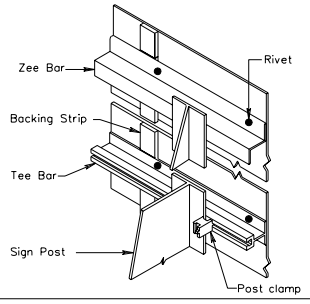
*Signs shall be located to provide optimum viewing and safety within the indicated view limits for lateral placement.

** In cut slopes, the minimum clearance between the bottom of the sign and the ground shall be 7', for any portion of the sign within the clear zone. This requirement will not apply to signs or portions of signs located more than 10' up a slope greater than 3:1.

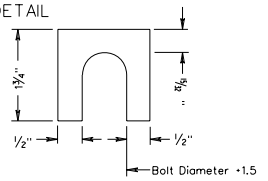




ISOMETRIC VIEW

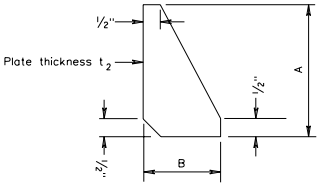


SHIM DETAIL



Furnish 2 each .063"± and 2 each .032± mm thick shims per pole. Shims shall be fabricated from brass conforming to ASTM B36 or from stainless steel with a minimum chromiun content of 11.50 %. No more than 2 shims shall be used per bolt with a maximum of 4 shims per pole.

STIFFENER PLATE DETAIL



TYPICAL DETAILS FOR TYPE VI A INTERSTATE SIGN STRUCTURE

VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 7/05
REV. 4/04

1301.67

SURVEYED BY: AAL
SUPERVISED BY:
DESIGNED BY: BBB

DESIGN FEATURES RELATING TO CONSTRUCTION OR TO REGULATION AND CONTROL OF TRAFFIC MAY BE SUBJECT TO CHANGE AS DEEMED NECESSARY BY THE DEPARTMENT

SPECIAL DESIGN SECTION DRAWING NO. A-136

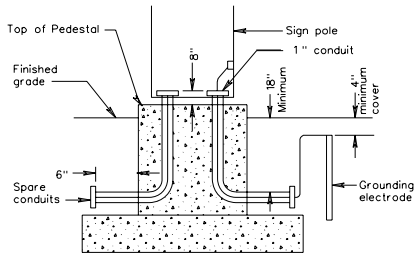
NEW 4/04
REV. 7/05

PLAN NO.
PROJECT
FILE NO.
SHEET NO.

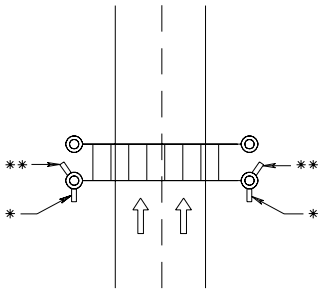
REVISED
VA. STATE
FEDERAL AID PROJECT
ROUTE
STATE PROJECT
SHEET NO.

OSS-1

TYPICAL SIGN FOOTING DETAIL WITH CONDUIT



LOCATION OF FUTURE USE CONDUITS FOR DOUBLE END POLE STRUCTURES



* Future use conduits placed parallel to the roadway

** Future use conduits placed at an angle to miss the back foundation or anchor bolts in a spread footing foundation.

NOTES:

The type, size, number and orientation of conduits entering and exiting footings may vary per sign location.

In addition to the conduits specified on the plans, one - 1" conduit required for ground wire and two - 2" pvc heavy wall conduits required for future use. Future use conduits shall be stubbed out and capped. Future use conduits shall be oriented to run parallel to the roadway. For location of future use conduits in foundations for double end pole structures, see drawing at right.

Each foundation shall be permanently marked to indicate all sides from which conduits pass. This mark shall be made with a trowel when finishing the concrete and shall be 1/4" deep and 4" to 6" long. Locations of empty conduits shall have an additional 2" long mark made perpendicular to and centered on this mark.

Foundations above finished grade shall be chamfered 3/4" on all edges.

Grounding bushings shall be installed on each end of metal conduits.

Bell ends shall be installed on each end of PVC conduits.

Bell ends & bushings of empty conduits shall be plugged to prevent moisture and rodent entry.

Voids remaining after conductors exit or enter bell ends or bushings of conduits shall be sealed with silicone to prevent moisture and rodent entry.

No mortar, grout, or concrete shall be placed between bottom of base plate and top of pedestal.

The maximum space between the bottom of the base plate and the top of the foundation shall be no greater than the diameter of the anchor bolt plus one inch.

Overhead sign structures including "buterfly" structures shall have a minimum of six anchor bolts, each having a minimum diameter of 1½".

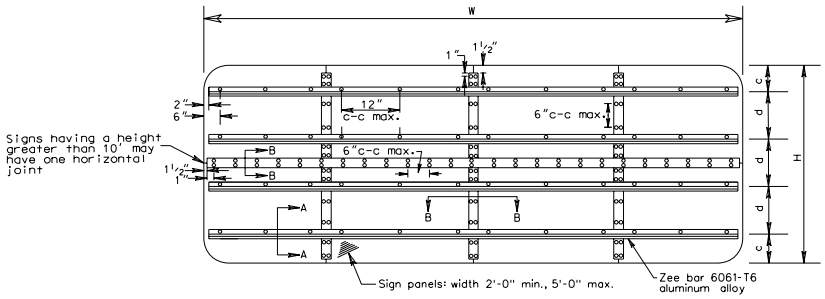
TYPICAL DETAILS FOR OVERHEAD SIGN STRUCTURES

REV. 7/05
REV. 4/04

VIRGINIA DEPARTMENT OF TRANSPORTATION

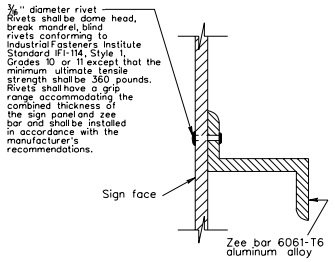
1301.76

SPD-1

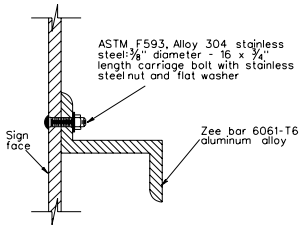


SECTION A-A

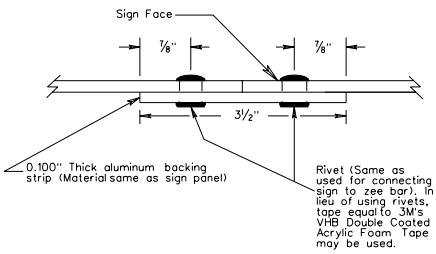
ALL INSTALLATIONS EXCEPT TOP AND BOTTOM ZEE BARS ON OVERHEAD SIGNS



TOP AND BOTTOM ZEE BAR INSTALLATION ON OVERHEAD SIGNS



SECTION B-B



SIGN PANEL DESIGN

REV. 7/05
REV. 4/04

VIRGINIA DEPARTMENT OF TRANSPORTATION

1301.79

SURVEYED BY: ___
SUPERVISED BY: AAL
DESIGNED BY: BBB

DESIGN FEATURES RELATING TO CONSTRUCTION OR TO REGULATION AND CONTROL OF TRAFFIC MAY BE SUBJECT TO CHANGE AS DEEMED NECESSARY BY THE DEPARTMENT

PLAN NO.
PROJECT
FILE NO.
SHEET NO.

SPECIAL DESIGN SECTION
DRAWING NO. A - 157

REV. 7/05
NEW 4/04

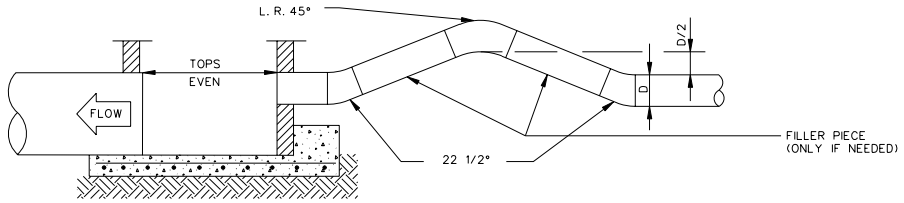
REVISED
VA. STATE
FEDERAL AID PROJECT
ROUTE
STATE PROJECT
SHEET NO.

SURVEYED BY
SUPERVISED BY AAA
DESIGNED BY BBB

DESIGN FEATURES RELATING TO CONSTRUCTION OR TO REGULATION AND CONTROL OF TRAFFIC MAY BE SUBJECT TO CHANGE AS DEEMED NECESSARY BY THE DEPARTMENT

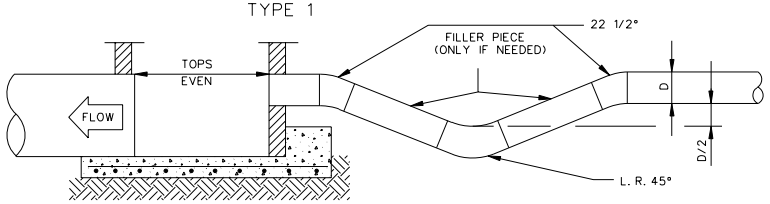
REVISED	STATE	FEDERAL AID PROJECT	STATE ROUTE	STATE PROJECT	SHEET NO.
	VA.				

SMH-1



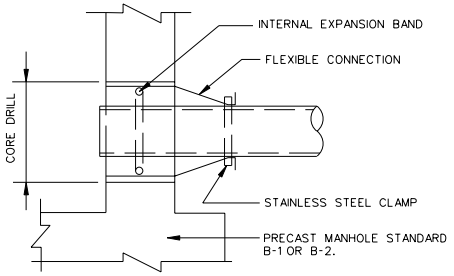
ALL JOINTS SHALL BE RESTRAINED BY
RETAINER GLANDS OR THREADED RODS (GALV.)

FORCE MAIN DISCHARGE
TYPE 1



ALL JOINTS SHALL BE RESTRAINED BY
RETAINER GLANDS OR THREADED RODS (GALV.)

FORCE MAIN DISCHARGE
TYPE 2



FLEXIBLE CONNECTION

PIPE TO PRECAST MANHOLE CONNECTIONS SHALL BE MADE WITH A FLEXIBLE BOOT. THE BOOT SHALL MEET ASTM SPECIFICATION C-923 AND CONSIST OF NEOPRENE RUBBER, EPDM RUBBER, OR POLYISOPRENE RUBBER, WHERE PREFERENCE MAY BE GIVEN TO A CERTAIN MATERIAL IN PROJECT SPECIFIC INSTANCES. THE INTERNAL EXPANSION BAND TO SECURE THE BOOT IN PLACE SHALL BE COMPOSED OF STAINLESS STEEL OR A NON-METALLIC MATERIAL. THE EXTERNAL BAND TO CLAMP AND SEAL THE BOOT TO THE PIPE SHALL BE CORROSION RESISTANT STAINLESS STEEL CONFORMING TO ASTM SPECIFICATION A-167. THE PORT TO RECEIVE THE BOOT SHALL BE CORE DRILLED AND SHOULD BE MANUFACTURED TO ALLOW FOR LATERAL AND VERTICAL MOVEMENT. ALL FIELD INSTALLATION OF PIPE THRU MANHOLE SEAL SHALL BE DONE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS AND SPECIFICATIONS.

SHEET 2 OF 2

SANITARY SEWER MANHOLE
WATER AND SANITARY SEWER FACILITIES

VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 7/05

1411.02

NEW 7/05
SPECIAL DESIGN SECTION
DRAWING NO. A 162

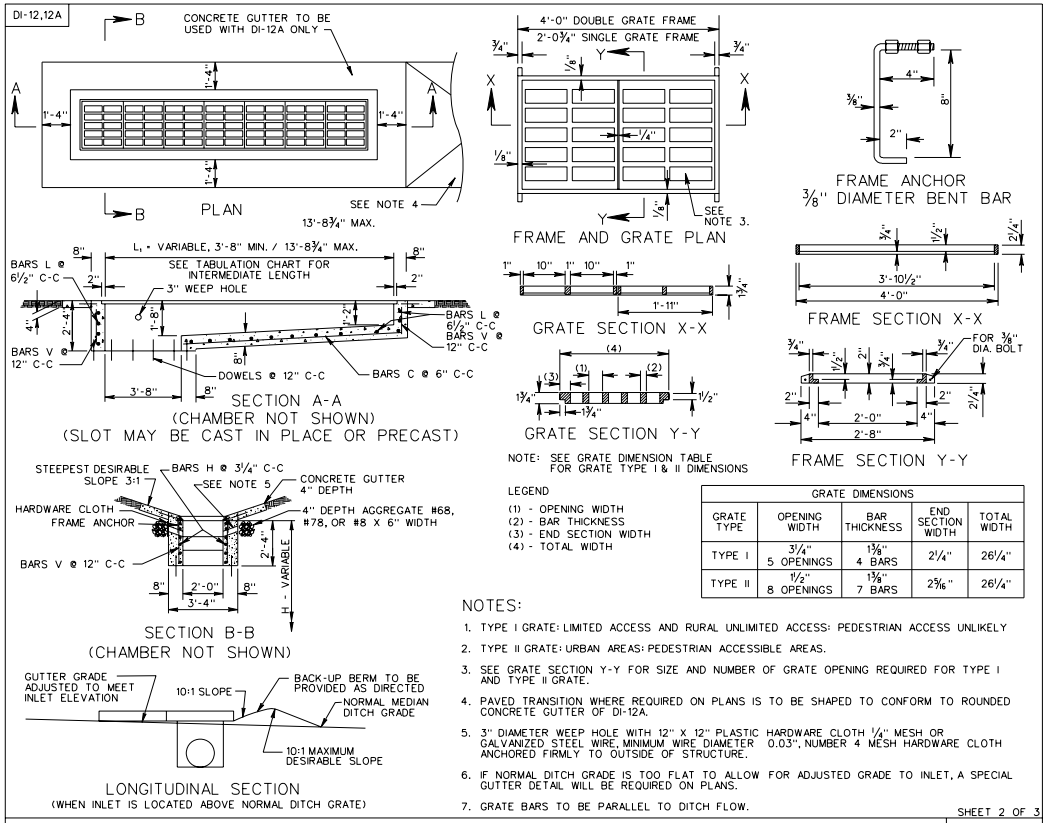
PLAN NO.	PROJECT	FILE NO.	SHEET NO.

SURVEYED BY
SUPERVISED BY AAA
DESIGNED BY BBB

DESIGN FEATURES RELATING TO CONSTRUCTION OR TO REGULATION AND CONTROL OF TRAFFIC MAY BE SUBJECT TO CHANGE AS DEEMED NECESSARY BY THE DEPARTMENT

REVISED	STATE	FEDERAL AID PROJECT	STATE ROUTE	STATE PROJECT	SHEET NO.
	VA.				

DI-12,12A



NOTE: SEE GRATE DIMENSION TABLE FOR GRATE TYPE I & II DIMENSIONS

LEGEND
(1) - OPENING WIDTH
(2) - BAR THICKNESS
(3) - END SECTION WIDTH
(4) - TOTAL WIDTH

GRATE DIMENSIONS				
GRATE TYPE	OPENING WIDTH	BAR THICKNESS	END SECTION WIDTH	TOTAL WIDTH
TYPE I	3¼" 5 OPENINGS	1⅜" 4 BARS	2¼"	26¼"
TYPE II	1½" 8 OPENINGS	1⅜" 7 BARS	2⅝"	26¼"

NOTES:

1. TYPE I GRATE: LIMITED ACCESS AND RURAL UNLIMITED ACCESS: PEDESTRIAN ACCESS UNLIKELY
2. TYPE II GRATE: URBAN AREAS: PEDESTRIAN ACCESSIBLE AREAS.
3. SEE GRATE SECTION Y-Y FOR SIZE AND NUMBER OF GRATE OPENING REQUIRED FOR TYPE I AND TYPE II GRATE.
4. PAVED TRANSITION WHERE REQUIRED ON PLANS IS TO BE SHAPED TO CONFORM TO ROUNDED CONCRETE GUTTER OF DI-12A.
5. 3" DIAMETER WEEP HOLE WITH 12" X 12" PLASTIC HARDWARE CLOTH ¼" MESH OR GALVANIZED STEEL WIRE, MINIMUM WIRE DIAMETER 0.03", NUMBER 4 MESH HARDWARE CLOTH ANCHORED FIRMLY TO OUTSIDE OF STRUCTURE.
6. IF NORMAL DITCH GRADE IS TOO FLAT TO ALLOW FOR ADJUSTED GRADE TO INLET, A SPECIAL GUTTER DETAIL WILL BE REQUIRED ON PLANS.
7. GRATE BARS TO BE PARALLEL TO DITCH FLOW.

SHEET 2 OF 3

MULTIGRATE DROP INLET FOR PIPE SIZES 12" TO 72"

VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 7/05
104.31

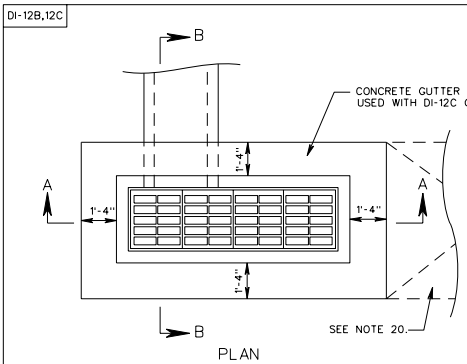
SPECIFICATION REFERENCE
233
302

NEW 7/05
SPECIAL DESIGN SECTION
DRAWING NO. A 16.3

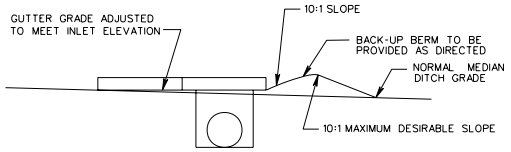
PLAN NO.	PROJECT	FILE NO.	SHEET NO.

SURVEYED BY ___
SUPERVISED BY AAL
DESIGNED BY BBB

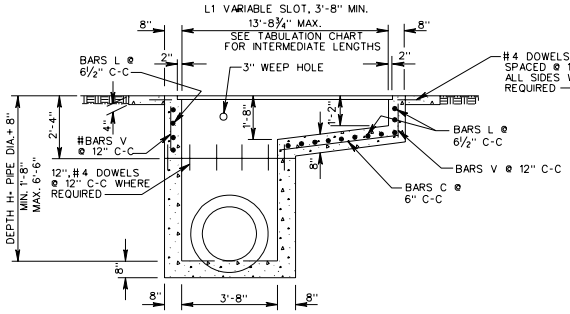
DI-12B,12C



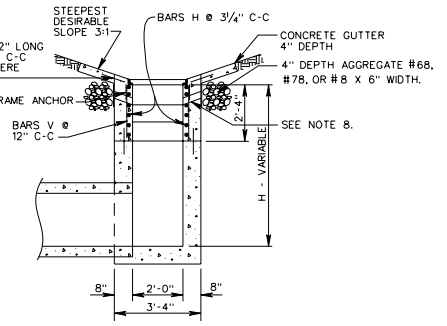
PLAN



LONGITUDINAL SECTION
(WHEN INLET IS LOCATED ABOVE NORMAL DITCH GRADE)
SEE NOTE 16.



SECTION A-A



SECTION B-B

SHEET 1 OF 2

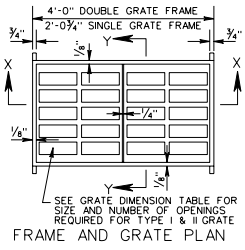
MULTIGRATE DROP INLET FOR PIPE SIZES 12" TO 36"

VIRGINIA DEPARTMENT OF TRANSPORTATION

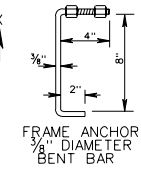
REV. 7/05
104.33

SPECIFICATION REFERENCE
241
503

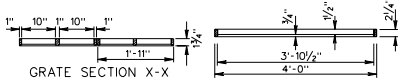
DI-12B,12C



FRAME AND GRATE PLAN

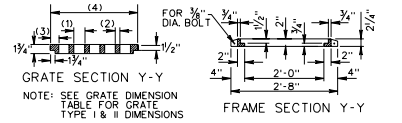


FRAME ANCHOR ⅜" DIAMETER BENT BAR



GRATE SECTION X-X

FRAME SECTION X-X



GRATE SECTION Y-Y

FRAME SECTION Y-Y

NOTE: SEE GRATE DIMENSION TABLE FOR GRATE TYPE I & II DIMENSIONS

LEGEND
(1) - OPENING WIDTH
(2) - BAR THICKNESS
(3) - END SECTION WIDTH
(4) - TOTAL WIDTH

GRATE DIMENSIONS				
GRATE TYPE	OPENING WIDTH	BAR THICKNESS	END SECTION WIDTH	TOTAL WIDTH
TYPE I	3¼" 5 OPENINGS	1⅜" 4 BARS	2¼"	26¼"
TYPE II	1½" 8 OPENINGS	1⅜" 7 BARS	2⅝"	26¼"

NOTES

1. DEPTH OF INLET (H) TO BE SHOWN ON PLANS. FOR DEPTH GREATER THAN 6'-6", USE ST'D. DI-12, DI-12A.
2. THE "H" DIMENSION SHOWN ON THE STANDARDS AND SPECIFIED ON THE PLANS WILL BE MEASURED FROM THE INVERT OF THE OUTFALL PIPE TO THE TOP OF THE STRUCTURE. PLAN "H" DIMENSIONS ARE APPROXIMATE ONLY FOR ESTIMATING PURPOSES AND THE ACTUAL DIMENSIONS SHALL BE DETERMINED BY THE CONTRACTOR FROM FIELD CONDITIONS.
3. WHEN SPECIFIED ON THE PLANS THE INVERT IS TO BE SHAPED IN ACCORDANCE WITH STANDARD IS-1. THE COST OF FURNISHING AND PLACING ALL MATERIALS INCIDENTAL TO THE SHAPING IS TO BE INCLUDED IN THE BID PRICE FOR THE STRUCTURE.
4. IN THE EVENT THE INVERT OF THE OUTFALL PIPE IS HIGHER THAN THE BOTTOM OF THE STRUCTURE, THE INVERT OF THE STRUCTURE SHALL BE SHAPED WITH CEMENT MORTAR TO PREVENT STANDING OR PONDING OF WATER IN THE STRUCTURE. THE COST OF FURNISHING AND PLACING ALL MATERIALS INCIDENTAL TO THE SHAPING IS TO BE INCLUDED IN THE BID PRICE FOR THE STRUCTURE.
5. STEPS ARE TO BE PROVIDED WHEN H IS 4'-0" OR GREATER. FOR DETAILS SEE STANDARD ST-1.
6. THIS ITEM MAY BE PRECAST OR CAST-IN-PLACE.
7. # 4 DOWELS 12" LONG, 12" C-C TO BE PLACED IN ALL AREAS ADJACENT TO ABUTTING CONCRETE TO PREVENT SETTLEMENT.
8. 3" DIAMETER WEEP HOLE 12"X12" PLASTIC HARDWARE CLOTH ¼" MESH OR GALVANIZED STEEL WIRE, MINIMUM WIRE DIAMETER 0.03". NUMBER 4 MESH HARDWARE CLOTH ANCHORED FIRMLY TO THE OUTSIDE OF THE STRUCTURE.
9. ALL REINFORCING STEEL SHALL HAVE A MIN. COVER OF 2".
10. ALL REINFORCING STEEL TO BE CUT CLEAR OF ALL OPENINGS BY 2".
11. CAST-IN PLACE CONCRETE IS TO BE CLASS A3 (3000 PSI). PRECAST CONCRETE IS TO BE 4000 PSI.
12. LENGTH OF SLOT (L) WILL, IN EVERY CASE, BE SHOWN ON PLANS.
13. ALL REINFORCING BARS TO BE #4.
14. DI-12C CONCRETE GUTTER INCREMENT: ADD 0.07 CU. YDS. CLASS A3 CONCRETE FOR EACH ADDITIONAL FOOT OF SLOT LENGTH GREATER THAN MINIMUM 3'-8".
15. GRATE BARS TO BE INSTALLED SO THEY WILL BE ALIGNED PARALLEL TO THE DITCH FLOW.
16. IF NORMAL DITCH GRADE IS TOO FLAT TO ALLOW FOR ADJUSTED GRADE TO INLET A SPECIAL GUTTER DETAIL WILL BE REQUIRED ON PLANS.
17. DI-12B-----NO GUTTER. DI-12C----PERIPHERAL GUTTER.
18. PAVED DITCHES ARE TO BE TRANSITIONED TO MEET INLET GUTTER AS SHOWN IN STANDARD PG-2A.
19. QUANTITIES SHOWN ARE FOR INLETS WITHOUT PIPES. PIPE DISPLACEMENTS MUST BE DEDUCTED TO OBTAIN TRUE QUANTITIES.
20. PAVED TRANSITION WHERE REQUIRED ON PLANS. TRANSITION IS TO BE SHAPED TO CONFORM TO ROUNDED CONCRETE GUTTER OF DI-12C.
21. TYPE I GRATE: LIMITED ACCESS AND RURAL UNLIMITED ACCESS. PEDESTRIAN ACCESS UNLIKELY.
22. TYPE II GRATE: URBAN AREAS: PEDESTRIAN ACCESSIBLE AREAS.
23. L = LENGTH ROUNDED FOR PLAN USE.
24. DI-12C: FOR APPROX. QUANTITIES FOR DI-12C, ADD 0.36 CU. YDS. OF CLASS A3 CONCRETE TO DI-12B QUANTITIES FOR CONCRETE GUTTER. QUANTITY SHOWN IS FOR A MINIMUM SLOT LENGTH OF 3'-8". FOR OTHER LENGTHS SEE CONCRETE GUTTER INCREMENT BELOW.

TABULATION CHARTS

APPROXIMATE QUANTITIES DI-12B ONLY (SEE NOTES 19 & 24)					
(MINIMUM HEIGHT) SLOT 4' TO 14' (SEE NOTE 23)					
L (SEE NOTE 23)	L1	CONCRETE CU. YDS.	REINFORCING STEEL LBS.	NUMBER GRATES	CONCRETE CHAMBER INCREMENTS PER FOOT CU. YDS.
4	3'-8"	0.99	81.27	2	
6	5'-8¾"	1.28	122.81	3	
8	7'-8"	1.48	161.90	4	.35
10	9'-8¾"	1.79	203.37	5	
12	11'-8"	2.09	242.45	6	
14	13'-8¾"	2.40	283.93	7	

SHEET 2 OF 2

MULTIGRATE DROP INLET FOR PIPE SIZES 12" TO 36"

VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 7/05
104.34

SPECIFICATION REFERENCE
241
503

DESIGN FEATURES RELATING TO CONSTRUCTION OR TO REGULATION AND CONTROL OF TRAFFIC MAY BE SUBJECT TO CHANGE AS DEEMED NECESSARY BY THE DEPARTMENT

REVISED
VA. STATE
FEDERAL AID PROJECT
ROUTE
STATE PROJECT
SHEET NO.

PLAN NO.
PROJECT
FILE NO.
SHEET NO.

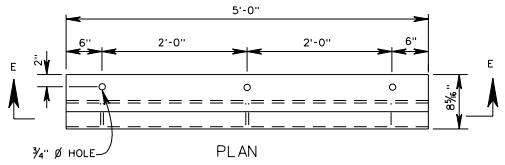
NEW 7/05
SPECIAL DESIGN SECTION
DRAWING NO. A 164

SURVEYED BY
SUPERVISED BY AAA
DESIGNED BY BBB

DESIGN FEATURES RELATING TO CONSTRUCTION OR TO REGULATION AND CONTROL OF TRAFFIC MAY BE SUBJECT TO CHANGE AS DEEMED NECESSARY BY THE DEPARTMENT

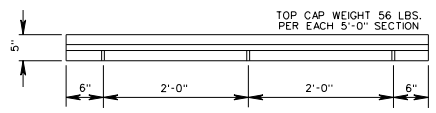
REVISED	STATE	FEDERAL AID PROJECT	STATE ROUTE	STATE PROJECT	SHEET NO.
	VA.				

DI-13

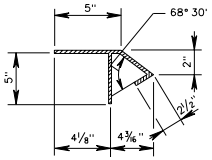


NOTES

1. SEE SHEET 1 OF 2 (104.35) OF ROAD AND BRIDGE STANDARDS FOR ADDITIONAL DESIGN AND PLACING INFORMATION.
2. TOP CAP IS TO BE FABRICATED FROM A-36 STEEL PLATE ¼" THICK. ALL JOINTS ARE TO BE WELDED USING ¼" FILLET WELDS AND THE COMPLETE UNIT IS TO BE GALVANIZED.
3. GUARDRAIL MUST BE FLUSH WITH THE FACE OF CURB.

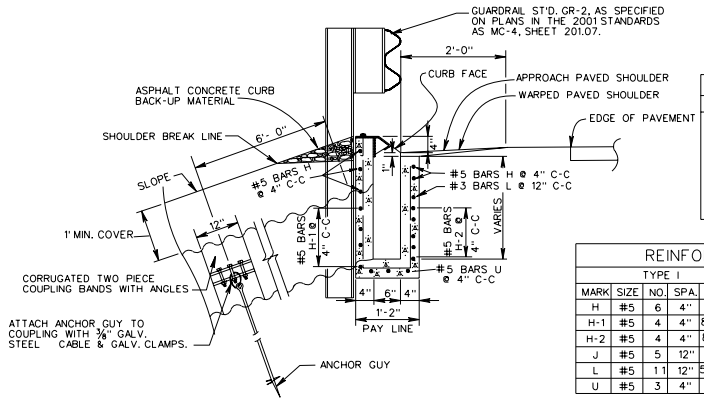


SECTION E-E
TOP CAP DETAIL



END VIEW

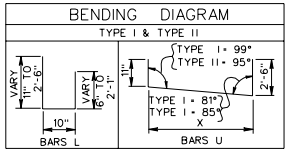
TYPICAL METHOD OF INSTALLATION
FOR PIPE ON FILL SLOPE



SECTION B-B

TYPE I		TYPE II	
MARK	X	MARK	X
U	10'-5½"	U	20'-4¾"

BENDING DIAGRAM
TYPE I & TYPE II



REINFORCING STEEL SCHEDULE

TYPE I					TYPE II				
MARK	SIZE	NO.	SPA.	LENGTH	MARK	SIZE	NO.	SPA.	LENGTH
H	#5	6	4"	10'-4"	H	#5	6	4"	20'-4"
H-1	#5	4	4"	8'-11" TO 2'-8"	H-1	#5	4	4"	12'-8" TO 2'-8"
H-2	#5	4	4"	8'-11" TO 2'-8"	H-2	#5	4	4"	12'-8" TO 2'-8"
J	#5	5	12"	0'-10"	J	#5	5	12"	0'-10"
L	#5	11	12"	5'-5" TO 2'-3"	L	#5	21	12"	5'-5" TO 2'-3"
U	#5	3	4"	13'-10"	U	#5	3	4"	23'-10"

SHEET 2 OF 2

SPECIFICATION REFERENCE

SHOULDER SLOT INLET

VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 7/05
104.36

NEW 7/05
SPECIAL DESIGN SECTION
DRAWING NO. A 165

PLAN NO.	PROJECT	FILE NO.	SHEET NO.

DIAMETER INCHES	AREA SQ. FT.	MAXIMUM HEIGHT OF COVER IN FEET				DIAMETER INCHES
		NONREINFORCED CONCRETE (STRENGTH) (SEE NOTE 4)	REINFORCED CONCRETE CLASS			
			III	IV	V	
12	0.8	14' (1800)	14'	19'	29'	12
15	1.2	14' (2125)	14'	19'	29'	15
18	1.8	14' (2400)	14'	20'	29'	18
21	2.4	13' (2700)	14'	20'	29'	21
24	3.1	13' (3000)	14'	20'	29'	24
27	4.0		14'	20'	29'	27
30	4.9		14'	20'	29'	30
33	5.9		14'	20'	29'	33
36	7.1		14'	20'	30'	36
42	9.6		14'	21'	30'	42
48	12.6		14'	21'	30'	48
54	15.9		14'	21'	30'	54
60	19.6		14'	21'	30'	60
66	23.8		14'	21'	30'	66
72	28.3		14'	21'	30'	72
78	33.2		14'	21'	30'	78
84	38.5		14'	21'	30'	84
90	44.4		14'	21'	30'	90
96	50.3		14'	21'	30'	96
102	56.7		14'	21'	30'	102
108	63.6		14'	21'	30'	108

NOTES:

1. COVER HEIGHTS INDICATED IN TABLES ARE FOR FINISHED CONSTRUCTION.
2. TO PROCTET PIPE DURING CONSTRUCTION, MINIMUM HEIGHTS OF COVER PRIOR TO ALLOWING CONSTRUCTION TRAFFIC TO CROSS INSTALLATION ARE TO BE ½ DIAMETER OR 3'0", WHICHEVER IS GREATER. THE COVER SHALL EXTEND THE FULL LENGTH OF THE PIPE. THE APPROACH FILL RAMP IS TO EXTEND A MINIMUM OF 10(DIAMETER + 36") ON EACH SIDE OF THE PIPE, OR TO THE INTERSECTION WITH A CUT.
3. STANDARD MINIMUM FINISHED HEIGHT OF COVER FOR ALL PIPES, EXCEPT THOSE UNDER ENTRANCES, SHALL BE 2.0' OR ½ DIAMETER, WHICHEVER IS GREATER. IN CASES IN WHICH THESE COVER HEIGHTS CANNOT BE ACHIEVED, AN ABSOLUTE MINIMUM FINISHED COVER HEIGHT OF 1.0' WILL BE ALLOWED ONLY IF ALL POSSIBLE MEANS TO OBTAIN THE STANDARD VALUE HAVE BEEN EXHAUSTED. THE MINIMUM FINISHED HEIGHT OF COVER FOR PIPES UNDER ENTRANCES IS 9".
4. CRUSHING STRENGTH (POUNDS PER LINEAR FOOT ULTIMATE STRENGTH)
5. FOR HEIGHT OF COVER GREATER THAN THAT SHOWN FOR CLASS V, A SPECIAL DESIGN CONCRETE PIPE IS REQUIRED.
6. NONREINFORCED PIPE TO BE USED ONLY UNDER ENTRANCES AND LOWER FUNCTIONAL CLASSIFICATION (LFC) ROADWAYS (SEE SHEET 17 OF 18).
7. SEE STANDARD PB-1 FOR PIPE BEDDING AND BACKFILL REQUIREMENTS.
8. PIPE WITH LESS THAN THE STANDARD MINIMUM COVER IS TO BE MINIMUM CLASS III REINFORCED.

SPECIFICATION REFERENCE: 302, 232

CONCRETE PIPE
HEIGHT OF COVER TABLE FOR H-20 LIVE LOAD

VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 7/05
107.05

HORIZONTAL INSTALLATION ←SPAN→ RISE			
EQUIVALENT ROUND SIZE INCHES	SPAN X RISE INCHES	MAX. HEIGHT OF COVER IN FEET CLASS HE - III	HE - IV
18	23 x 14	13'	21'
24	30 x 19	13'	21'
27	34 x 22	13'	21'
30	38 x 24	13'	21'
33	42 x 27	13'	21'
36	45 x 29	13'	21'
39	49 x 32	13'	21'
42	53 x 34	13'	21'
48	60 x 38	13'	21'
54	68 x 43	13'	21'
60	76 x 48	13'	21'
66	83 x 53	13'	21'
72	91 x 58	13'	21'
78	98 x 63	13'	21'
84	106 x 68	13'	21'

VERTICAL INSTALLATION SPAN RISE			
SPAN X RISE INCHES	MAX. HEIGHT OF COVER IN FEET CLASS VE - III	VE - IV	VE - V
29 x 45	13	21	29
32 x 49	13	21	29
34 x 53	13	21	29
38 x 60	13	21	29
43 x 68	13	21	29
48 x 76	13	21	29
53 x 83	13	21	29
58 x 91	13	21	29
63 x 98	13	21	29
68 x 106	13	21	29

NOTES:

1. COVER HEIGHTS INDICATED IN TABLES ARE FOR FINISHED CONSTRUCTION.
2. TO PROTECT PIPE DURING CONSTRUCTION, MINIMUM HEIGHTS OF COVER PRIOR TO ALLOWING CONSTRUCTION TRAFFIC TO CROSS INSTALLATION ARE TO BE ½ SPAN OR 3', WHICHEVER IS GREATER. THE COVER SHALL EXTEND THE FULL LENGTH OF THE PIPE. THE APPROACH FILL RAMP IS TO EXTEND A MINIMUM OF 10(SPAN + 36") ON EACH SIDE OF THE PIPE OR TO THE INTERSECTION WITH A CUT.
3. STANDARD MINIMUM FINISHED HEIGHT OF COVER FOR ALL PIPES SHALL BE 2.0' OR ½ SPAN, WHICHEVER IS GREATER. IN CASES IN WHICH THESE COVER HEIGHTS CANNOT BE ACHIEVED, AN ABSOLUTE MINIMUM FINSHED COVER HEIGHT OF 1.0' WILL BE ALLOWED ONLY IF ALL POSSIBLE MEANS TO OBTAIN THE STANDARD VALUE HAVE BEEN EXHAUSTED. MINIMUM FINISHED HEIGHT OF COVER FOR PIPE UNDER ENTRANCES IS 9".
4. SEE STANDARD PB-1 FOR PIPE BEDDING AND BACKFILL REQUIREMENTS.

REINFORCED ELLIPTICAL CONCRETE PIPE
HEIGHT OF COVER TABLES FOR H-20 LIVE LOAD

VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 7/05
107.06

SPECIFICATION REFERENCE: 302, 232

NEW 7/05
SPECIAL DESIGN SECTION
DRAWING NO. A 166_1

PLAN NO. | PROJECT | FILE NO. | SHEET NO.

SURVEYED BY: ___
SUPERVISED BY: AAL
DESIGNED BY: BBD

DESIGN FEATURES RELATING TO CONSTRUCTION OR TO REGULATION AND CONTROL OF TRAFFIC MAY BE SUBJECT TO CHANGE AS DEEMED NECESSARY BY THE DEPARTMENT

VA. | STATE | FEDERAL AID PROJECT | ROUTE | STATE PROJECT | SHEET NO. | REVISED

PC-1

CORRUGATED STEEL PIPE
2 2/3" x 1/2" CORRUGATIONS

PIPE DIAMETER INCHES	AREA SQ. FT.	MAXIMUM HEIGHT OF COVER IN FEET — SHEET THICKNESS IN INCHES (GAUGE)					MINIMUM SHEET THICKNESS FOR ENTRANCE PIPES WITH LESS THAN 1 FT COVER INCHES (GAUGE)
		0.064 (16)	0.079 (14)	0.109 (12)	0.138 (10)	0.168 (8)	
12	0.79	18	100				0.064 (16)
15	1.23	18	80	100	100		0.064 (16)
18	1.77	18	55	71	89	94	0.064 (16)
21	2.40	18	41	51	62	74	0.079 (14)
24	3.14	17	33	40	47	55	0.109 (12)
27	3.98	17	28	33	38	44	
30	4.91	17	25	28	32	36	
33	5.94	17	23	25	28	31	
36	7.1	16	21	23	26	28	
42	9.6	16	20	21	22	24	
48	12.6	15	19	19	20	21	
54	16.0		18	19	19	20	
60	19.6			18	19	19	
66	23.8				18	18	
72	28.3				18	18	
78	33.2					18	
84	38.5					17	

CORRUGATED STEEL PIPE
3" x 1" AND 5" x 1" CORRUGATIONS

PIPE DIAMETER INCHES	AREA SQ. FT.	MAXIMUM HEIGHT OF COVER IN FEET — SHEET THICKNESS IN INCHES (GAUGE)				
		0.064 (16)	0.079 (14)	0.109 (12)	0.138 (10)	0.168 (8)
36	7.1	16	38	47	57	66
42	9.6	16	30	36	42	48
48	12.6	15	26	30	34	38
54	16.0	15	23	26	28	31
60	19.6	14	21	23	25	27
66	23.8	14	20	22	23	25
72	28.3	13	19	20	22	23
78	33.2	13	19	20	21	21
84	38.5	12	18	19	20	21
90	44.2	12	18	19	19	20
96	50.3		18	18	19	19
102	56.7		18	18	18	19
108	63.6			18	18	18
114	70.9			18	18	18
120	78.5			17	18	18
132	95.0				17	18
144	113.0					17

NOTES:

1. COVER HEIGHTS INDICATED IN TABLES ARE FOR FINISHED CONSTRUCTION.
2. TO PROTECT PIPE DURING CONSTRUCTION, MINIMUM HEIGHT OF COVER TO BE IN ACCORDANCE WITH TABLE A PRIOR TO ALLOWING CONSTRUCTION TRAFFIC TO CROSS INSTALLATION. THE COVER SHALL EXTEND THE FULL LENGTH OF THE PIPE. THE APPROACH FILL RAMP IS TO EXTEND A MINIMUM OF 15 DIAMETERS ON EACH SIDE OF THE PIPE OR THE INTERSECTION WITH A CUT.
3. STANDARD MINIMUM FINISHED HEIGHT OF COVER FOR ALL PIPES, EXCEPT UNDER ENTRANCES, SHALL BE 2.0' OR 1/2 DIAMETER, WHICHEVER IS GREATER. IN CASES IN WHICH THESE COVER HEIGHTS CANNOT BE ACHIEVED, AN ABSOLUTE MINIMUM FINISHED COVER HEIGHT OF 1.0' OR 1/8 DIAMETER, WHICHEVER IS GREATER, WILL BE ALLOWED ONLY IF ALL POSSIBLE MEANS TO OBTAIN THE STANDARD VALUE HAVE BEEN EXHAUSTED. THE MINIMUM FINISHED HEIGHT OF COVER FOR PIPES UNDER ENTRANCES IS 9" FOR PIPE DIAMETERS LESS THAN OR EQUAL TO 24" AND 12" OR 1/8 DIAMETER, WHICHEVER IS GREATER, FOR PIPE DIAMETERS GREATER THAN 24". WHERE A POLYMER COATED PIPE WILL BE USED AND THE SURFACE OVER THE TOP OF THE PIPE WILL BE ASPHALT, CLASS I BACKFILL MATERIAL IS TO BE PLACED UP TO A MINIMUM OF 6" ABOVE THE TOP OF THE PIPE.
4. 16 GAUGE PIPE LIMITED TO THOSE LOCATIONS WHERE PIPE DIAMETER PLUS COVER IS LESS THAN 20'.
5. THE MAXIMUM HEIGHT OF COVER SHOWN IN THE COVER TABLES IS BASED ON A SOIL MODULUS OF 700 PSI. ALL OTHER DESIGN CRITERIA ARE IN ACCORDANCE WITH THE AASHTO SPECIFICATIONS AND VDOT MODIFICATIONS FOR SOIL CORRUGATED METAL STRUCTURE INTERACTION SYSTEMS.
6. SEE STANDARD PB-1 FOR PIPE BEDDING AND BACKFILL REQUIREMENTS.

TABLE A	
PIPE DIAMETER	MINIMUM COVER HEIGHT DURING CONSTRUCTION (SEE NOTE 2)
12" TO 30"	18"
36" AND ABOVE	1/2 DIAMETER

CONCRETE- LINED CORRUGATED STEEL PIPE
MAXIMUM HEIGHT OF COVER TO BE IN ACCORDANCE WITH THE TABLES BUT SHALL NOT EXCEED 30'.

SHEET 3 OF 18

SPECIFICATION REFERENCE
302 232

CORRUGATED STEEL PIPE
HEIGHT OF COVER TABLES FOR H-20 LIVE LOAD

VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 7/05
107.07

PC-1

CORRUGATED ALUMINUM ALLOY PIPE-
2 2/3" x 1/2" CORRUGATIONS

PIPE DIAMETER INCHES	AREA SQ. FT.	MAXIMUM HEIGHT OF COVER IN FEET — SHEET THICKNESS IN INCHES (GAUGE)					MINIMUM SHEET THICKNESS FOR ENTRANCE PIPES WITH LESS THAN 1 FT. COVER
		0.060 (16)	0.075 (14)	0.105 (12)	0.135 (10)	0.164 (8)	
12	0.8	18	50	80	90	93	0.060
15	1.2	18	39	49	60	71	0.105
18	1.8	18	30	35	41	48	0.135
21	2.4	18	25	28	32	36	
24	3.1	17	22	25	27	30	
27	4.0	17	20	22	24	26	
30	4.9	17	19	21	22	23	
33	5.9	17	18	20	21	22	
36	7.1	16	16	19	20	21	
42	9.6	16	18	18	19	19	
48	12.6			18	18	18	
54	15.9			16	18	18	
60	19.6				15	17	
66	23.8					14	
72	28.3					11	

CORRUGATED ALUMINUM ALLOY
PIPE- 3" x 1" CORRUGATIONS

PIPE DIAMETER INCHES	AREA SQ. FT.	MAXIMUM HEIGHT OF COVER IN FEET — SHEET THICKNESS IN INCHES (GAUGE)				
		0.60 (16)	0.75 (14)	0.105 (12)	0.35 (10)	0.164 (8)
36	7.1	16	24	27	30	34
42	9.6	16	21	23	25	27
48	12.6	15	20	21	22	24
54	16.0	15	19	20	21	22
60	19.6	14	18	19	20	20
66	23.8		18	18	19	19
72	28.3		18	18	18	19
78	33.2		17	18	18	18
84	38.5			17	18	18
90	44.2			15	17	18
96	50.3			12	16	17
102	56.7				14	17
108	63.6				11	14
114	70.9					12
120	78.5					10

NOTES:

1. COVER HEIGHTS INDICATED IN TABLES ARE FOR FINISHED CONSTRUCTION.
2. TO PROTECT PIPE DURING CONSTRUCTION, MINIMUM HEIGHT OF COVER TO BE IN ACCORDANCE WITH TABLE A PRIOR TO ALLOWING CONSTRUCTION TRAFFIC TO CROSS INSTALLATION. THE COVER SHALL EXTEND THE FULL LENGTH OF THE PIPE. THE APPROACH FILL RAMP IS TO EXTEND A MINIMUM OF 20 DIAMETERS ON EACH SIDE OF THE PIPE, OR TO THE INTERSECTION WITH A CUT.
3. STANDARD MINIMUM FINISHED HEIGHT OF COVER FOR ALL PIPES, EXCEPT THOSE UNDER ENTRANCES, SHALL BE 2.0' OR 1/2 DIAMETER, WHICHEVER IS GREATER. IN CASES IN WHICH THESE COVER HEIGHTS CANNOT BE ACHIEVED, AN ABSOLUTE MINIMUM FINISHED COVER HEIGHT OF 1.0' OR 1/8 DIAMETER, WHICHEVER IS GREATER, WILL BE ALLOWED ONLY IF ALL POSSIBLE MEANS TO OBTAIN THE STANDARD VALUE HAVE BEEN EXHAUSTED. THE MINIMUM FINISHED HEIGHT OF COVER FOR PIPES UNDER ENTRANCES IS 9" FOR PIPE DIAMETERS EQUAL TO OR LESS THAN 18" AND 12" OR 1/8 DIAMETER, WHICHEVER IS GREATER, FOR PIPE DIAMETERS GREATER THAN 18".
4. 16 GAUGE PIPE LIMITED TO THOSE LOCATIONS WHERE PIPE DIAMETER PLUS COVER IS LESS THAN 20'.
5. THE MAXIMUM HEIGHT OF COVER SHOWN IN THE TABLES IS BASED ON A SOIL MODULUS OF 700 PSI. ALL OTHER DESIGN CRITERIA ARE IN ACCORDANCE WITH THE AASHTO SPECIFICATIONS AND VDOT MODIFICATIONS FOR SOIL CORRUGATED METAL STRUCTURE INTERACTION SYSTEMS.
6. SEE STANDARD PB-1 FOR PIPE BEDDING AND BACKFILL REQUIREMENTS.

TABLE A	
PIPE DIAMETER	MINIMUM COVER HEIGHT DURING CONSTRUCTION (SEE NOTE 2)
12" TO 24"	18"
30" AND OVER	EQUAL TO DIAMETER

SHEET 4 OF 18

CORRUGATED ALUMINUM ALLOY PIPE
HEIGHT OF COVER TABLE FOR H-20 LIVE LOAD

VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 7/05
107.08

SPECIFICATION REFERENCE
302 232

SURVEYED BY: ___
SUPERVISED BY: AAL
DESIGNED BY: BBD

DESIGN FEATURES RELATING TO CONSTRUCTION OR TO REGULATION AND CONTROL OF TRAFFIC MAY BE SUBJECT TO CHANGE AS DEEMED NECESSARY BY THE DEPARTMENT

VA. | REVISED | STATE | FEDERAL AID PROJECT | ROUTE | STATE PROJECT | SHEET NO.

PLAN NO. | PROJECT | FILE NO. | SHEET NO.

NEW 7/05
SPECIAL DESIGN SECTION
DRAWING NO. A 166_2

PC-1

CORRUGATED ALUMINUM ALLOY PIPE- 6" x 1" CORRUGATIONS

PIPE DIAMETER INCHES	AREA SQ. FT.	MAXIMUM HEIGHT OF COVER IN FEET — SHEET THICKNESS IN INCHES (GAUGE)				
		0.060 (16)	0.075 (14)	0.105 (12)	0.135 (10)	0.164 (8)
36	7.1	16	24	26	30	33
42	9.6	16	21	23	25	27
48	12.6	15	20	21	22	23
54	16.0	15	19	20	21	21
60	19.6	14	18	19	19	20
66	23.8	14	18	18	19	19
72	28.3		18	18	18	19
78	33.2		16	18	18	18
84	38.5			17	18	18
90	44.2			15	17	18
96	50.3				16	17
102	56.7				13	16
108	63.6					14
114	70.9					11
120	78.5					

NOTES:

1. COVER HEIGHTS INDICATED IN TABLES ARE FOR FINISHED CONSTRUCTION.
2. TO PROTECT PIPE DURING CONSTRUCTION, MINIMUM HEIGHT OF COVER TO BE IN ACCORDANCE WITH TABLE A AS FOLLOWS PRIOR TO ALLOWING CONSTRUCTION TRAFFIC TO CROSS INSTALLATION, THE COVER SHALL EXTEND THE FULL LENGTH OF THE PIPE. THE APPROACH FILL RAMP IS TO EXTEND A MINIMUM OF 20 DIAMETERS ON EACH SIDE OF THE PIPE, OR TO THE INTERSECTION WITH A CUT.
3. STANDARD MINIMUM FINISHED HEIGHT OF COVER FOR ALL PIPES, EXCEPT THOSE UNDER ENTRANCES, SHALL BE 2.0' OR 1/2 SPAN, WHICHEVER IS GREATER. IN CASES IN WHICH THESE COVER HEIGHTS CANNOT BE ACHIEVED, AN ABSOLUTE MINIMUM FINISHED COVER HEIGHT OF 1.0' OR 1/8 DIAMETER, WHICHEVER IS GREATER, WILL BE ALLOWED ONLY IF ALL POSSIBLE MEANS TO OBTAIN THE STANDARD VALUE HAVE BEEN EXHAUSTED.
4. 16 GAUGE PIPE LIMITED TO THOSE LOCATIONS WHERE PIPE DIAMETER PLUS COVER IS LESS THAN 20'.
5. THE MAXIMUM HEIGHT OF COVER SHOWN IN THE TABLES IS BASED ON A SOIL MODULUS OF 700 PSI. ALL OTHER DESIGN CRITERIA ARE IN ACCORDANCE WITH THE AASHTO SPECIFICATIONS AND VDOT MODIFICATIONS FOR SOIL CORRUGATED METAL STRUCTURE INTERACTION SYSTEMS.

TABLE A	
PIPE DIAMETER	MINIMUM COVER HEIGHT DURING CONSTRUCTION (SEE NOTE 2)
30" AND OVER	EQUAL TO DIAMETER

SHEET 5 OF 18

SPECIFICATION REFERENCE
232 302

CORRUGATED ALUMINUM ALLOY PIPE
HEIGHT OF COVER TABLE FOR H-20 LIVE LOAD

VIRGINIA DEPARTMENT OF TRANSPORTATION

REV.7/05

107.09

PC-1

MINIMUM SHEET THICKNESS AND DESIGN DATA

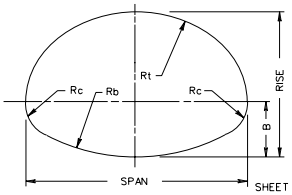
PIPE ARCH DIMENSION					MINIMUM SHEET THICKNESS REQUIRED	MAXIMUM COVER HEIGHT IN FEET	
						MAXIMUM CORNER PRESSURE	
NOMINAL SIZE SPAN - RISE INCHES	EQUIVALENT PIPE DIAMETER INCHES	AREA SQ. FT.	MAXIMUM "B" INCHES (SEE NOTE 7)	Rc INCHES	INCHES (GAUGE)	4000 LBS./SQ. FT. (SEE NOTE 4)	6000 LBS./SQ. FT. (SEE NOTE 6)
2 2/3" x 1/2" CORRUGATIONS							
17 x 13	15	1.1	5¼"	3	0.064 (16)	11	17
21 x 15	18	1.6	6"	3	0.064 (16)	9	14
24 x 18	21	2.2	7¼"	3	0.064 (16)	8	12
28 x 20	24	2.8	8"	3	0.064 (16)	7	10
35 x 24	30	4.4	9½"	3	0.064 (16)	5	8
42 x 29 ⊛	36	6.4	10½"	3½	0.064 (16)	5	8
49 x 33 ⊛	42	8.7	11½"	4	0.079 (14)	5	8
57 x 38 ⊛	48	11.4	13½"	5	0.109 (12)	5	8
64 x 43 ⊛	54	14.3	15"	6	0.109 (12)	6	9
71 x 47 ⊛	60	17.6	16½"	7	0.138 (10)	6	9
77 x 52 ⊛	66	21.3	18"	8	0.168 (8)	6	10
83 x 57 ⊛	72	25.3	20"	9	0.168 (8)	7	10
3" x 1" AND 5" x 1" CORRUGATIONS							
40 x 31 ⊛	36	6.4	9 ¾"	5	0.109 (12)	8	12
46 x 36 ⊛	42	8.7	11½"	6	0.109 (12)	8	12
53 x 41 ⊛	48	11.4	13"	7	0.109 (12)	8	13
60 x 46 ⊛	54	14.3	14 ¾"	8	0.109 (12)	8	13
66 x 51 ⊛	60	17.6	16½"	9	0.109 (12)	9	13
73 x 55 ⊛	66	22.0	21½"	12	0.109 (12)	11	16
81 x 59 ⊛	72	26.0	23"	14	0.109 (12)	11	17
87 x 63	78	31.0	24½"	14	0.109 (12)	10	16
95 x 67	84	35.0	26½"	16	0.109 (12)	11	16
103 x 71	90	40.0	27"	16	0.109 (12)	10	15
112 x 75	96	46.0	29"	18	0.109 (12)	10	16
117 x 79	102	52.0	30¾"	18	0.109 (12)	10	15
128 x 83	108	58.0	29½"	18	0.138 (10)	9	14
137 x 87	114	64.0	30¾"	18	0.138 (10)	8	13
142 x 91	120	71.0	32½"	18	0.168 (8)	8	12

⊛ INDICATES PIPE ARCHES FOR WHICH DIMENSIONS FOR EITHER CORRUGATION MAY BE USED WITHIN HEIGHT OF COVER LIMITATIONS.

NOTES:

1. COVER HEIGHTS INDICATED IN TABLES ARE FOR FINISHED CONSTRUCTION.
2. TO PROTECT PIPE DURING CONSTRUCTION, MINIMUM HEIGHT OF COVER TO BE IN ACCORDANCE WITH TABLE A PRIOR TO ALLOWING CONSTRUCTION TRAFFIC TO CROSS INSTALLATION. THE COVER SHALL EXTEND THE FULL LENGTH OF THE PIPE ARCH. THE APPROACH FILL RAMP IS TO EXTEND A MINIMUM OF 10(HEIGHT + 1/2 SPAN) ON EACH SIDE OF THE PIPE, OR TO THE INTERSECTION WITH A CUT.
3. STANDARD MINIMUM FINISHED HEIGHT OF COVER FOR ALL PIPES SHALL BE 2'0" OR 1/2 SPAN, WHICHEVER IS GREATER. IN CASES IN WHICH THESE COVER HEIGHTS CANNOT BE ACHIEVED, AN ABSOLUTE MINIMUM FINSHED COVER HEIGHT OF 1.0' OR 1/8 SPAN, WHICHEVER IS GREATER, WILL BE ALLOWED ONLY IF ALL POSSIBLE MEANS TO OBTAIN THE STANDARD VALUE HAVE BEEN EXHAUSTED. WHERE POLYMER COATED PIPE WILL BE USED AND THE SURFACE OVER THE TOP OF THE PIPE WILL BE ASPHALT, CLASS I BACKFILL MATERIAL IS TO BE PLACED UP TO A MINIMUM OF 6" ABOVE THE TOP OF THE PIPE.
4. SEE STANDARD PB-1 FOR PIPE BEDDING AND BACKFILL REQUIREMENTS.
5. THE MAXIMUM HEIGHT OF COVER SHOWN IN THE TABLES IS BASED ON A SOIL MODULUS OF 700 PSI. ALL OTHER DESIGN CRITERIA ARE IN ACCORDANCE WITH THE AASHTO SPECIFICATIONS AND VDOT MODIFICATIONS FOR SOIL CORRUGATED METAL STRUCTURE INTERACTION SYSTEMS.
6. WHEN DESIGN HEIGHT OF COVER REQUIRES THE USE OF THIS CATEGORY OF PIPE, FOUNDATION AND BACKFILL MUST BE APPROVED BY THE ENGINEER.
7. SPAN OF PIPE ARCHES IS MEASURED "B" INCHES ABOVE THE INVERT. SEE DIAGRAM BELOW FOR ILLUSTRATION OF "B" DIMENSION.

TABLE A	
PIPE ARCH SPAN	MINIMUM COVER HEIGHT DURING CONSTRUCTION (SEE NOTE 2)
17" TO 35"	18"
42" AND ABOVE	1/2 SPAN



SHEET 6 OF 18

CORRUGATED STEEL PIPE ARCH
HEIGHT OF COVER TABLE FOR H-20 LIVE LOAD

VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 7/05

107.10

SPECIFICATION REFERENCE
232 302

SURVEYED BY
SUPERVISED BY AAL
DESIGNED BY BBD
CHECKED BY

DESIGN FEATURES RELATING TO CONSTRUCTION OR TO REGULATION AND CONTROL OF TRAFFIC MAY BE SUBJECT TO CHANGE AS DEEMED NECESSARY BY THE DEPARTMENT

REVISED
STATE
FEDERAL AID PROJECT
ROUTE
STATE PROJECT
SHEET NO.

PLAN NO.
PROJECT
FILE NO.
SHEET NO.

NEW 7/05
SPECIAL DESIGN SECTION
DRAWING NO. A 166_3

SURVEYED BY: ___
SUPERVISED BY: AAL
DESIGNED BY: BBP

PC-1

MINIMUM SHEET THICKNESS AND DESIGN DATA

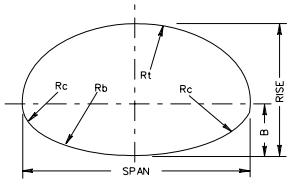
PIPE ARCH DIMENSION				MINIMUM SHEET THICKNESS REQUIRED	MAXIMUM COVER HEIGHT IN FEET	
					MAXIMUM CORNER PRESSURE	
NOMINAL SIZE SPAN-RISE INCHES	EQUIVALENT PIPE DIAMETER INCHES	AREA SQ. FT.	Rc INCHES	INCHES (GAUGE)	4000 LBS./SQ. FT. (SEE NOTE 4)	6000 LBS./SQ. FT. (SEE NOTE 6)
2 2/3" x ½" CORRUGATIONS						
17 x 13	15	1.1	3"	0.060 (16)	11	17
21 x 15	18	1.6	3"	0.060 (16)	9	14
24 x 18	21	2.2	3"	0.060 (16)	8	12
28 x 20	24	2.8	3"	0.075 (14)	7	10
35 x 24	30	4.4	3"	0.075 (14)	5	8
42 x 29 ⊛	36	6.4	3½"	0.105 (12)	5	8
49 x 33 ⊛	42	8.7	4"	0.105 (12)	5	8
57 x 38 ⊛	48	11.4	5"	0.135 (10)	5	8
64 x 43 ⊛	54	14.3	6"	0.135 (10)	6	9
71 x 47 ⊛	60	17.6	7"	0.164 (8)	6	9
3" x 1" CORRUGATIONS						
40 x 31 ⊛	36	6.4	5"	0.060 (16)	8	12
46 x 36 ⊛	42	8.7	6"	0.060 (16)	8	12
53 x 41 ⊛	48	11.4	7"	0.060 (16)	8	13
60 x 46 ⊛	54	14.3	8"	0.075 (14)	8	13
66 x 51 ⊛	60	17.6	9"	0.075 (14)	9	13
73 x 55	66	22.0	12"	0.105 (12)	11	16
81 x 59	72	26.0	14"	0.105 (12)	11	17
87 x 63	78	31.0	14"	0.135 (10)	10	16
95 x 67	84	35.0	16"	0.135 (10)	11	16
103 x 71	90	40.0	16"	0.164 (8)	10	15
112 x 75	96	46.0	18"	0.164 (8)	10	13
117 x 79	102	52.0	18"	0.164 (8)	10	11

⊛ INDICATES PIPE ARCHES FOR WHICH DIMENSIONS FOR EITHER CORRUGATION MAY BE USED WITHIN HEIGHT OF COVER LIMITATIONS.

NOTES:

1. COVER HEIGHTS INDICATED IN TABLES ARE FOR FINISHED CONSTRUCTION.
2. TO PROTECT PIPE DURING CONSTRUCTION, MINIMUM HEIGHT OF COVER TO BE IN ACCORDANCE WITH TABLE A PRIOR TO ALLOWING CONSTRUCTION TRAFFIC TO CROSS INSTALLATION, THE COVER SHALL EXTEND THE FULL LENGTH OF THE PIPE ARCH. THE APPROACH FILL RAMP IS TO EXTEND A MINIMUM OF 10(HEIGHT + ½ SPAN) ON EACH SIDE OF THE STRUCTURE OR TO THE INTERSECTION WITH A CUT.
3. STANDARD MINIMUM FINISHED HEIGHT OF COVER FOR ALL PIPES SHALL BE 2'0" OR ½ SPAN, WHICHEVER IS GREATER. IN CASES IN WHICH THESE COVER HEIGHTS CANNOT BE ACHIEVED, AN ABSOLUTE MINIMUM FINISHED COVER HEIGHT OF 1.0' OR ⅛ SPAN, WHICHEVER IS GREATER, WILL BE ALLOWED ONLY IF ALL POSSIBLE MEANS TO OBTAIN THE STANDARD VALUE HAVE BEEN EXHAUSTED.
4. SEE STANDARD PB-1 FOR PIPE BEDDING AND BACKFILL REQUIREMENTS.
5. THE MAXIMUM HEIGHT OF COVER SHOWN IN THE TABLES IS BASED ON A SOIL MODULUS OF 700 PSI. ALL OTHER DESIGN CRITERIA ARE IN ACCORDANCE WITH THE AASHTO SPECIFICATIONS AND VDOT MODIFICATIONS FOR SOIL CORRUGATED METAL STRUCTURE INTERACTION SYSTEMS.
6. WHEN DESIGN HEIGHT OF COVER REQUIRES THE USE OF THIS CATEGORY OF PIPE BEDDING FOUNDATION AND BACKFILL MUST BE APPROVED BY THE ENGINEER.
7. LAPPED LONGITUDINAL SEAMS SHALL BE STAGGERED SO AS TO ALTERNATE ON EACH SIDE OF THE CENTER OF ARCH TOP BY APPROXIMATELY 15 PERCENT OF THE PERIPHERY.
8. A TOLERANCE OF PLUS, OR MINUS, 1" IS PERMISSIBLE FOR DIMENSIONS OF SPAN, RISE, AND CORNER RADIUS.

TABLE A	
PIPE DIAMETER	MINIMUM COVER HEIGHT DURING CONSTRUCTION (SEE NOTE 2)
17" TO 35"	18"
42" AND ABOVE	½ SPAN



SHEET 7 OF 18

SPECIFICATION REFERENCE
232 302

CORRUGATED ALUMINUM ALLOY PIPE ARCH
HEIGHT OF COVER TABLE FOR H-20 LIVE LOAD

VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 7/05

107.11

PC-1

STRUCTURAL PLATE STEEL PIPE- 6" x 2" CORRUGATIONS

PIPE DIAMETER INCHES	AREA SQ. FT.	MINIMUM HEIGHT OF COVER IN FEET — SHEET THICKNESS IN INCHES (GAUGE)						
		0.109 (12)	0.138 (10)	0.168 (8)	0.188 (7)	0.218 (5)	0.249 (3)	0.280 (1)
60	20	43	50	58	63	71	79	88
66	24	36	42	48	51	58	64	70
72	28	32	36	40	43	48	53	58
78	33	28	32	35	38	41	45	49
84	38	26	29	32	33	36	39	43
90	44	24	27	29	30	33	35	38
96	50	23	25	27	28	30	32	34
102	57	22	23	25	26	28	29	31
108	64	21	22	24	25	26	27	29
114	71	20	21	23	23	25	26	27
120	78	20	21	22	22	23	24	25
132	95	19	20	20	21	22	22	23
144	113	18	19	20	20	21	21	22
156	133	18	18	19	19	20	20	21
168	154	17	18	18	19	19	19	20
180	177	15	18	18	18	19	19	19
192	201		18	18	18	18	19	19
204	227		17	18	18	18	18	18
216	254			17	18	18	18	18
228	284			17	17	18	18	18
240	314				16	17	18	18

NOTES:

1. COVER HEIGHTS INDICATED IN TABLE ARE FOR FINISHED CONSTRUCTION.
2. TO PROTECT PIPE DURING CONSTRUCTION MINIMUM HEIGHT OF COVER PRIOR TO ALLOWING CONSTRUCTION TRAFFIC TO CROSS INSTALLATION IS TO BE ½ DIAMETER. THIS COVER SHALL EXTEND THE FULL LENGTH OF THE PIPE. THE APPROACH FILL RAMP IS TO EXTEND A MINIMUM OF 10(DIAMETER + 36") ON EACH SIDE OF THE PIPE OR TO THE INTERSECTION WITH A CUT.
3. STANDARD MINIMUM FINISHED HEIGHT OF COVER FOR ALL PIPES SHALL BE 2.0' OR ½ DIAMETER, WHICHEVER IS GREATER. IN CASES IN WHICH THESE COVER HEIGHTS CANNOT BE ACHIEVED, AN ABSOLUTE MINIMUM FINISHED COVER HEIGHT OF 1.0' OR ⅛ DIAMETER WILL BE ALLOWED ONLY IF ALL POSSIBLE MEANS TO OBTAIN THE STANDARD VALUE HAVE BEEN EXHAUSTED.
4. THE MAXIMUM HEIGHT OF COVER SHOWN IN THE TABLES IS BASED ON A SOIL MODULUS OF 700 PSI. ALL OTHER DESIGN CRITERIA ARE IN ACCORDANCE WITH AASHTO SPECIFICATIONS AND VDOT MODIFICATIONS FOR SOIL CORRUGATED METAL STRUCTURE INTERSECTION SYSTEMS.
5. STRUCTURAL PLATE PIPE DIMENSIONS ARE TO INSIDE CREST AND ARE SUBJECT TO MANUFACTURING TOLERANCES.
6. SEE STANDARD PB-1 FOR BEDDING AND BACKFILL REQUIREMENTS.

SHEET 8 OF 18

SPECIFICATION REFERENCE
232 302

STRUCTURAL PLATE STEEL PIPE
HEIGHT OF COVER TABLE FOR H-20 LIVE LOAD

VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 7/05

107.12

NEW 7/05
SPECIAL DESIGN SECTION
DRAWING NO. A 166_4

PLAN NO.
PROJECT
FILE NO.
SHEET NO.

DESIGN FEATURES RELATING TO CONSTRUCTION OR TO REGULATION AND CONTROL OF TRAFFIC MAY BE SUBJECT TO CHANGE AS DEEMED NECESSARY BY THE DEPARTMENT

REVISED
VA. STATE
FEDERAL AID PROJECT
ROUTE
STATE PROJECT
SHEET NO.

PC-1

STRUCTURAL PLATE ALUMINUM ALLOY PIPE
9" x 2½" CORRUGATIONS

PIPE DIAMETER	AREA	MAXIMUM HEIGHT OF COVER IN FEET						
		SHEET THICKNESS IN INCHES						
INCHES	SQ. FT.	0.10	0.125	0.15	0.175	0.20	0.225	0.25
60	20	29	32	35	38	41	45	48
66	24	26	28	31	33	35	38	40
72	28	24	25	27	29	31	33	35
78	33	22	24	25	26	28	29	31
84	38	21	22	23	25	26	27	28
90	44	20	21	22	23	24	25	26
96	50	19	20	21	22	23	23	24
102	57	18	20	20	21	22	22	23
108	64	17	19	20	20	21	21	22
114	71	16	19	19	20	20	21	21
120	78	15	18	19	19	20	20	20
132	95	14	18	18	19	19	19	19
144	113	12	18	18	18	18	19	19
156	133		17	18	18	18	18	18
168	154			17	18	18	18	18
180	177				17	18	18	18
192	201					17	17	17
204	227					14	16	17
216	254						13	15
228	284							13

NOTES:

1. COVER HEIGHTS INDICATED IN TABLE ARE FOR FINISHED CONSTRUCTION.
2. TO PROTECT PIPE DURING CONSTRUCTION, MINIMUM HEIGHT OF COVER PRIOR TO ALLOWING CONSTRUCTION TRAFFIC TO CROSS INSTALLATION SHALL BE ½ DIAMETER. THIS COVER SHALL EXTEND THE FULL LENGTH OF THE PIPE. THE APPROACH FILL RAMP IS TO EXTEND A MINIMUM OF 10(DIAMETER + 36") ON EACH SIDE OF THE PIPE OR TO THE INTERSECTION WITH A CUT.
3. STANDARD MINIMUM FINISHED HEIGHT OF COVER FOR ALL PIPES SHALL BE 2.0' OR ½ DIAMETER, WHICHEVER IS GREATER. IN CASES IN WHICH THESE COVER HEIGHTS CANNOT BE ACHIEVED, AND ABSOLUTE MINIMUM FINISHED COVER HEIGHT OF 1.0' OR ⅛ DIAMETER, WHICHEVER IS GREATER, WILL BE ALLOWED ONLY IF ALL POSSIBLE MEANS TO OBTAIN THE STANDARD VALUE HAVE BEEN EXHAUSTED.
4. SEE STANDARD PB-1 FOR PIPE BEDDING AND BACKFILL REQUIREMENTS.
5. THE MAXIMUM HEIGHT OF COVER SHOWN IN THE TABLES IS BASED ON A SOIL MODULUS OF 700 PSI. ALL OTHER DESIGN CRITERIA ARE IN ACCORDANCE WITH AASHTO SPECIFICATIONS AND VDOT MODIFICATIONS FOR SOIL CORRUGATED METAL STRUCTURE INTERACTION SYSTEMS.
6. STEEL BOLTS ONLY TO BE USED. BOLTS ARE ¾" DIAMETER HIGH STRENGTH TO MEET CURRENT AASHTO DESIGNATION M-164 AND GALVANIZED TO MEET CURRENT ASTM DESIGNATION A-394. BOLTS ARE TO BE LOCATED IN THE VALLEY AND CREST OF EACH CORRUGATION IN DOUBLE ROWS SPACED 1¼" APART.

SHEET 9 OF 18

SPECIFICATION REFERENCE
232 302

STRUCTURAL PLATE ALUMINUM ALLOY PIPE
HEIGHT OF COVER TABLE FOR H-20 LIVE LOAD

VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 7/05

107.13

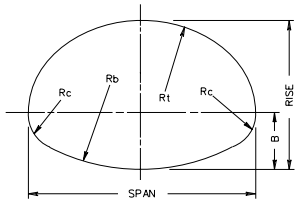
PC-1

MINIMUM THICKNESS-STRUCTURAL PLATE STEEL PIPE ARCHES
6" x 2" CORRUGATIONS

PIPE ARCH DIMENSION				MINIMUM SHEET THICKNESS REQUIRED	MAXIMUM ALLLOWABLE COVER HEIGHT IN FEET	
NOMINAL SIZE		AREA	Rc		MAXIMUM CORNER PRESSURE	
SPAN	RISE	SQ. FT.	INCHES	GAUGE	4000 LBS./SQ.FT. (SEE NOTE 4)	6000 LBS./SQ.FT. (SEE NOTE 6)
6'-1"	4'-7"	22	18	12	16	24
6'-4"	4'-9"	24	18	12	15	23
6'-9"	4'-11"	26	18	12	14	22
7'-0"	5'-1"	28	18	12	14	21
7'-3"	5'-3'	31	18	12	13	20
7'-8"	5'-5"	33	18	12	12	19
7'-11"	5'-7"	35	18	12	12	18
8'-2"	5'-9"	38	18	12	12	18
8'-7"	5'-11"	40	18	12	11	17
8'-10"	6'-1"	43	18	12	11	16
9'-4"	6'-3"	46	18	12	10	16
9'-6"	6'-5"	49	18	12	10	15
9'-9"	6'-7"	52	18	12	10	15
10'-3"	6'-9"	55	18	12	9	14
10'-8"	6'-11"	58	18	12	9	14
10'-11"	7'-1"	61	18	12	9	13
11'-5"	7'-3"	64	18	12	8	13
11-7"	7'-5"	67	18	12	8	12
11'-10"	7'-7"	71	18	12	8	12
12'-4"	7'-9"	74	18	12	8	12
12'-6"	7'-11"	78	18	12	8	12
12'-8"	8'-1"	81	18	12	7	11
12'-10"	8'-4"	85	18	12	7	11
13'-5"	8'-5"	89	18	12	7	11
13-11"	8'-7"	93	18	12	7	10
14'-1"	8'-9"	97	18	12	7	10
14'-3"	8'-11"	101	18	12	6	10
14'-10"	9'-1"	105	18	12	6	10
15'-4"	9'-3"	109	18	12	6	9
15'-6"	9'-5"	113	18	12	6	9
15'-8"	9'-7"	118	18	12	6	9
15'-10"	9'-10"	122	18	12	6	9
16'-5"	9'-11"	126	18	12	6	9
16'-7"	10'-1"	131	18	12	6	9

NOTES

1. COVER HEIGHTS INDICATED IN TABLE ARE FOR FINISHED CONSTRUCTION.
2. TO PROTECT PIPE DURING CONSTRUCTION, MINIMUM HEIGHT OF COVER PRIOR TO ALLOWING CONSTRUCTION TRAFFIC TO CROSS INSTALLATION SHALL BE ½ SPAN. THE COVER SHALL EXTEND THE FULL LENGTH OF THE PIPE ARCH. THE APPROACH FILL RAMP IS TO EXTEND A MINIMUM OF 10(HEIGHT + ½ SPAN) ON EACH SIDE OF THE STRUCTURE, OR TO THE INTERSECTION WITH A CUT.
3. STANDARD MINIMUM FINISHED HEIGHT OF COVER FOR ALL PIPES SHALL BE 2.0' OR ½ SPAN, WHICHEVER IS GREATER. IN CASES IN WHICH THESE COVER HEIGHTS CANNOT BE ACHIEVED, AN ABSOLUTE MINIMUM FINISHED COVER HEIGHT OF 1.0' OR ⅛ SPAN, WHICHEVER IS GREATER, WILL BE ALLOWED ONLY IF ALL POSSIBLE MEANS TO OBTAIN THE STANDARD VALUE HAVE BEEN EXHAUSTED.
4. SEE STANDARD PB-1 FOR PIPE BEDDING AND BACKFILL REQUIREMENTS.
5. THE MAXIMUM HEIGHT OF COVER SHOWN IN THE TABLES IS BASED ON A SOIL MODULUS OF 700 PSI. ALL OTHER DESIGN CRITERIA ARE IN ACCORDANCE WITH THE AASHTO SPECIFICATIONS AND VDOT MODIFICATIONS FOR SOIL CORRUGATED METAL STRUCTURE INTERACTION SYSTEMS.
6. WHEN DESIGN HEIGHT OF COVER REQUIRES THE USE OF THIS CATEGORY OF PIPE, BEDDING AND BACKFILL MUST BE APPROVED BY THE ENGINEER.
7. STRUCTURAL PLATE PIPE-ARCH DIMENSIONS ARE TO INSIDE OF CREST AND ARE SUBJECT TO MANUFACTURING TOLERANCES.



SHEET 10 OF 18

STRUCTURAL PLATE STEEL PIPE ARCH
HEIGHT OF COVER TABLE FOR H-20 LIVE LOAD

VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 7/05

107.14

SPECIFICATION REFERENCE
232 302

NEW 7/05
SPECIAL DESIGN SECTION
DRAWING NO. A 166_5

PLAN NO.
PROJECT
FILE NO.
SHEET NO.

SURVEYED BY
SUPERVISED BY AAL
DESIGNED BY BBB

DESIGN FEATURES RELATING TO CONSTRUCTION OR TO REGULATION AND CONTROL OF TRAFFIC MAY BE SUBJECT TO CHANGE AS DEEMED NECESSARY BY THE DEPARTMENT

VA.

REVISED
STATE
FEDERAL AID PROJECT
ROUTE
STATE PROJECT
SHEET NO.

PC-1

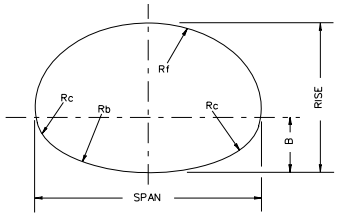
MINIMUM THICKNESS-STRUCTURAL PLATE STEEL PIPE ARCHES 6" x 2" CORRUGATIONS

PIPE ARCH DIMENSION				MINIMUM SHEET THICKNESS REQUIRED	MAXIMUM ALLOWABLE COVER HEIGHT IN FEET	
					MAXIMUM CORNER PRESSURE	
SPAN	RISE	AREA SQ. FT.	Rc INCHES	GAUGE	4000 LBS./SQ. FT. (SEE NOTE 4)	6000 LBS./SQ. FT. (SEE NOTE 6)
13'-3"	9'-4"	97	31	12	12	18 ⊛
13'-6"	9'-6"	102	31	12	12	17 ⊛
14'-0"	9'-8"	105	31	12	12	17 ⊛
14'-2"	9'-10"	109	31	12	12	16 ⊛
14'-5"	10'-0"	114	31	12	11	16 ⊛
14'-11"	10'-2"	118	31	12	11	16 ⊛
15'-4"	10'-4"	123	31	12	11	15 ⊛
15'-7"	10'-6"	127	31	12	11	15 ⊛
15'-10"	10'-8"	132	31	12	10	14 ⊛
16'-3"	10'-10"	137	31	12	10	14 ⊛
16'-6"	11'-0"	142	31	12	10	14 ⊛
17'-0"	11'-2"	146	31	12	10	14 ⊛
17'-2"	11'-4"	151	31	12	10	13 ⊛
17'-5"	11'-6"	157	31	12	9	13 ⊛
17'-11"	11'-8"	161	31	12	9	13 ⊛
18'-1"	11'-10"	167	31	12	9	13 ⊛
18'-7"	12'-0"	172	31	12	9	12 ⊛
18'-9"	12'-2"	177	31	12	9	12 ⊛
19'-3"	12'-4"	182	31	10	8	13
19'-6"	12'-6"	188	31	10	8	13
19'-8"	12'-8"	194	31	10	8	13
19'-11"	12'-10"	200	31	10	8	12
20'-5"	13'-0"	205	31	10	8	12
20'-7"	13'-2"	211	31	10	8	12

⊛ MAXIMUM COVER HEIGHTS SHOWN MAY BE INCREASED BY A MAXIMUM OF 12" IF A SHEET THICKNESS GREATER THAN 12 GAUGE IS USED.

NOTES:

1. COVER HEIGHTS INDICATED IN TABLES ARE FOR FINISHED CONSTRUCTION.
2. TO PROTECT PIPE DURING CONSTRUCTION, MINIMUM HEIGHT OF COVER PRIOR TO ALLOWING CONSTRUCTION TRAFFIC TO CROSS INSTALLATION SHALL BE ½ SPAN. THE COVER SHALL EXTEND THE FULL LENGTH OF THE PIPE ARCH. THE APPROACH FILL RAMP IS TO EXTEND A MINIMUM OF 10(HEIGHT + ½ SPAN) ON EACH SIDE OF THE STRUCTURE OR TO THE INTERSECTION WITH A CUT.
3. STANDARD MINIMUM FINISHED HEIGHT OF COVER FOR ALL PIPES SHALL BE ¼ SPAN. IN CASES IN WHICH THIS COVER HEIGHT CANNOT BE ACHIEVED, AN ABSOLUTE MINIMUM FINSHED COVER HEIGHT OF ⅛ SPAN WILL BE ALLOWED ONLY IF ALL POSSIBLE MEANS TO OBTAIN THE STANDARD VALUE HAVE BEEN EXHAUSTED.
4. SEE STANDARD PB-1 FOR PIPE BEDDING AND BACKFILL REQUIREMENTS.
5. STRUCTURAL PLATE PIPE-ARCH DIMENSIONS ARE TO INSIDE OF CREST AND ARE SUBJECT TO MANUFACTURING TOLERANCES.
6. WHEN DESIGN HEIGHT OF COVER REQUIRES THE USE OF THIS CATEGORY OR PIPE, BEDDING AND BACKFILL MUST BE APPROVED BY THE ENGINEER.
7. THE MAXIMUM HEIGHT OF COVER SHOWN IN THE TABLES IS BASED ON A SOIL MODULUS OF 700 PSI. ALL OTHER DESIGN CRITERIA ARE IN ACCORDANCE WITH THE AASHTO SPECIFICATIONS AND VDOT MODIFICATIONS FOR SOIL CORRUGATED METAL STRUCTURE INTERACTION SYSTEMS.



SHEET 11 OF 18

SPECIFICATION REFERENCE
232 302

STRUCTURAL PLATE STEEL PIPE ARCH HEIGHT OF COVER TABLE FOR H-20 LIVE LOAD

VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 7/05

107.15

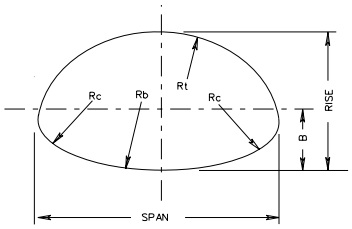
PC-1

STRUCTURAL PLATE ALUMINUM ALLOY PIPE ARCHES 9' x 2½" CORRUGATIONS

SPAN	RISE	CORNER RADIUS	MAXIMUM COVER HEIGHT IN FEET — MINIMUM SHEET THICKNESS IN INCHES — MAXIMUM CORNER PRESSURE IN LBS./SQ. FT.							AREA SQ.FT.
			0.100"	0.125"		0.150"		0.175"		
			4000 (SEE NOTE 4)	4000 (SEE NOTE 4)	6000 (SEE NOTE 6)	4000 (SEE NOTE 4)	6000 (SEE NOTE 6)	4000 (SEE NOTE 6)	6000 (SEE NOTE 6)	
6'-2"	5'-0"	31.8	25	28	36	28	42	28	42	24.7
6'-7"	4'-11"	31.8	23	26	34	26	40	26	40	26.6
6'-7"	5'-8"	31.8	23	26	34	26	40	26	40	29.6
6'-11"	5'-9"	31.8	22	25	32	25	38	25	38	31.9
7'-3"	5'-11"	31.8	21	24	31	24	36	24	36	34.3
7'-9"	6'-0"	31.8	20	22	29	22	34	22	34	36.8
8'-1"	6'-1"	31.8	19	21	28	21	32	21	32	39.3
8'-5"	6'-3"	31.8	18	20	27	20	31	20	31	41.9
8'-10"	6'-4"	31.8	17	20	25	20	30	20	30	44.5
9'-3"	6'-5"	31.8	16	19	24	19	28	19	28	45.1
9'-7"	6'-6"	31.8	16	18	23	18	27	18	27	49.9
9'-11"	6'-8"	31.8	15	17	22	17	26	17	26	52.7
10'-3"	6'-9"	31.8	15	17	22	17	25	17	25	55.5
10'-9"	6'-10"	31.8	14	16	21	16	24	16	24	58.4
11'-1"	7'-0"	31.8	14	15	20	15	23	15	23	61.4
11'-5"	7'-1"	31.8	13	15	19	15	23	15	23	64.4
11'-9"	7'-2"	31.8	13	15	19	15	22	15	22	67.5
12'-3"	7'-3"	31.8	12	14	18	14	21	14	21	70.5
12'-7"	7'-5"	31.8	12	14	18	14	21	14	21	73.7
12'-11"	7'-6"	31.8	12	13	17	13	20	13	20	77.0
13'-1"	8'-2"	31.8	11	13	17	13	20	13	20	83.0
13'-1"	8'-4"	31.8	11	13	17	13	20	13	20	86.8
13'-11"	8'-5"	31.8	11	12	16	12	19	12	19	90.3
14'-0"	8'-7"	31.8	11	12	16	12	18	12	18	94.2
13'-11"	9'-5"	31.8	11	12	16	12	19	12	19	101.5
14'-3"	9'-7"	31.8	10	12	15	12	18	12	18	105.7
14'-8"	9'-8"	31.8		12	14	12	17	12	18	109.9
14'-11"	9'-10"	31.8		11	13	11	16	11	17	114.2
15'-4"	10'-0"	31.8		11	12	11	14	11	17	118.6
15'-7"	10'-2"	31.8		11	11	11	14	11	16	123.1
16'-1"	10'-4"	31.8		10		10	12	10	15	127.6
16'-4"	10'-6"	31.8				10	12	10	14	132.3
16'-9"	10'-8"	31.8				10	11	10	13	136.9
17'-0"	10'-10"	31.8				10		10	12	141.8
17'-3"	11'-0"	31.8				10		10	12	
18'-0"	11'-4"	31.8						9	10	

NOTES:

1. COVER HEIGHTS INDICATED IN TABLE ARE FOR FINISHED CONSTRUCTION.
2. TO PROTECT PIPE DURING CONSTRUCTION, MINIMUM HEIGHT OF COVER PRIOR TO ALLOWING CONSTRUCTION TRAFFIC TO CROSS INSTALLATION TO BE ½ SPAN. THE COVER SHALL EXTEND THE FULL LENGTH OF THE PIPE ARCH. THE APPROACH FILL RAMP IS TO EXTEND A MINIMUM OF 10(RISE + ½ SPAN) ON EACH SIDE OF THE PIPE, OR TO THE INTERSECTION WITH A CUT.
3. STANDARD MINIMUM FINISHED HEIGHT OF COVER FOR ALL PIPES SHALL BE 2.0' OR ¼ SPAN, WHICHEVER IS GREATER. IN CASES IN WHICH THESE COVER HEIGHTS CANNOT BE ACHIEVED, AN ABSOLUTE MINIMUM FINISHED COVER HEIGHT OF 1.0' OR ⅛ SPAN, WHICHEVER IS GREATER, WILL BE ALLOWED ONLY IF ALL POSSIBLE MEANS TO OBTAIN THE STANDARD VALUE HAVE BEEN EXHAUSTED.
4. SEE STANDARD PB-1 FOR BEDDING AND BACKFILL REQUIREMENTS.
5. THE MAXIMUM HEIGHT OF COVER SHOWN IN THE TABLES IS BASED ON A SOIL MODULUS OF 700 PSI. ALL OTHER DESIGN CRITERIA ARE IN ACCORDANCE WITH THE AASHTO SPECIFICATIONS AND VDOT MODIFICATIONS FOR SOIL CORRUGATED METAL STRUCTURE INTERACTION SYSTEMS.
6. WHEN DESIGN HEIGHT OF COVER REQUIRES THE USE OF THIS CATEGORY OF PIPE, BEDDING AND BACKFILL MUST BE APPROVED BY THE ENGINEER.
7. BOLTS ARE ¾" DIAMETER, HIGH STRENGTH TO MEET CURRENT A.S.T.M. DESIGNATION M-164 AND GALVANIZED TO MEET CURRENT A.S.T.M. DESIGNATION A-394. BOLTS ARE TO BE LOCATED IN THE VALLEY AND CREST OF EACH CORRUGATION IN DOUBLE ROWS SPACED 1¾" APART.
8. STRUCTURAL PLATE PIPE-ARCH DIMENSIONS ARE TO INSIDE CREST AND ARE SUBJECT TO MANUFACTURING TOLERANCES.



SHEET 12 OF 18

STRUCTURAL PLATE ALUMINUM ALLOY PIPE ARCH HEIGHT OF COVER TABLE FOR H-20 LIVE LOAD

VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 7/05

107.16

SPECIFICATION REFERENCE
232 302

NEW 7/05
SPECIAL DESIGN SECTION
DRAWING NO. A 166_6

PLAN NO.
PROJECT
FILE NO.
SHEET NO.

SURVEYED BY: ___
SUPERVISED BY: AAL
DESIGNED BY: BBD

DESIGN FEATURES RELATING TO CONSTRUCTION OR TO REGULATION AND CONTROL OF TRAFFIC MAY BE SUBJECT TO CHANGE AS DEEMED NECESSARY BY THE DEPARTMENT

REVISED	VA. STATE	FEDERAL AID PROJECT	ROUTE	STATE PROJECT	SHEET NO.

SURVEYED BY ___
SUPERVISED BY AAL
DESIGNED BY BBD

PC-1

ALUMINUM SPIRAL RIB PIPE 3/4" WIDE x 3/4" DEEP RIBS SPACED @ 7 1/2"

PIPE DIAMETER INCHES	AREA SQ. FT.	MAXIMUM HEIGHT OF COVER IN FEET — SHEET THICKNESS IN INCHES (GAUGE)				MINIMUM SHEET THICKNESS FOR ENTRANCE PIPES WITH LESS THAN 1 FT. COVER
		0.064 (16)	0.079 (14)	0.109 (12)	0.135 (10)	INCHES (GUAGE)
12	0.8	18	95	100		0.064 (16)
15	1.2	18	57	78	100	0.109 (12)
18	1.8	18	40	52	65	0.135 (10)
21	2.4	18	31	39	47	
24	3.1	17	26	32	37	
27	4.0	17	24	27	31	
30	4.9	17	22	24	27	
36	7.1	16	20	21	23	
42	9.6	16	18	19	20	
48	12.6		18	18	19	
54	16.0			18	18	
60	19.6			18	18	
66	23.8				18	
72	28.3				17	

NOTES:

1. COVER HEIGHTS INDICATED IN TABLES ARE FOR FINISHED CONSTRUCTION.
2. TO PROTECT PIPE DURING CONSTRUCTION, MINIMUM HEIGHT OF COVER TO BE IN ACCORDANCE WITH TABLE A PRIOR TO ALLOWING CONSTRUCTION TRAFFIC TO CROSS INSTALLATION. THE COVER SHALL EXTEND THE FULL LENGTH OF THE PIPE. THE APPROACH FILL RAMP IS TO EXTEND A MINIMUM OF 20 DIAMETERS ON EACH SIDE OF THE PIPE, OR TO THE INTERSECTION WITH A CUT.
3. STANDRD MINIMUM FINISHED HEIGHT OF COVER FOR ALL PIPES, EXCEPT THOSE UNDER ENTRANCES, SHALL BE 2'0" OR 1/2 DIAMETER, WHICHEVER IS GREATER. IN CASES IN WHICH THESE COVER HEIGHTS CANNOT BE ACHIEVED, AN ABSOLUTE MINIMUM FINISHED COVER HEIGHT OF 1.0' OR 1/4 DIAMETER, WHICHEVER IS GREATER, WILL BE ALLOWED ONLY IF ALL POSSIBLE MEANS TO OBTAIN THE STANDARD VALUE HAVE BEEN EXHAUSTED. THE MINIMUM FINISHED HEIGHT OF COVER FOR PIPES UNDER ENTRANCES IS 9" FOR PIPE DIAMETERS LESS THAN OR EQUAL TO 18" OR 12" OR 1/4 DIAMETER, WHICHEVER IS GREATER, FOR PIPE DIAMETERS GREATER THAN 18".
4. SEE STANDARD PB-1 FOR PIPE BEDDING AND BACKFILL REQUIREMENTS.
5. THE MAXIMUM HEIGHT OF COVER SHOWN IN THE TABLES IS BASED ON A SOIL MODULUS OF 700 PSI. ALL OTHER DESIGN CRITERIA ARE IN ACCORDANCE WITH THE AASHTO SPECIFICATIONS AND VDOT MODIFICATIONS FOR SOIL CORRUGATED METAL STRUCTURE INTERSECTION SYSTEMS.
6. 16 GAUGE PIPE LIMITED TO THOSE LOCATIONS WHERE PIPE DIAMETER PLUS COVER IS LESS THAN 20'.

TABLE A	
PIPE DIAMETER	MINIMUM COVER HEIGHT DURING CONSTRUCTION (SEE NOTE 2)
12" TO 24"	18"
30" AND OVER	EQUAL TO DIAMETER

SHEET 13 OF 18

SPECIFICATION REFERENCE: 232, 302

ALUMINUM SPIRAL RIB PIPE
HEIGHT OF COVER TABLE FOR H-20 LIVE LOAD

VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 7/05

107.17

PC-1

STEEL SPIRAL RIB PIPE 3/4" WIDE x 3/4" RIBS SPACED @ 7 1/2"

PIPE DIAMETER INCHES	AREA SQ. FT.	MAXIMUM HEIGHT OF COVER IN FEET — SHEET THICKNESS IN INCHES (GAUGE)			MINIMUM SHEET THICKNESS FOR ENTRANCE PIPES WITH LESS THAN 1 FT. COVER INCHES (GAUGE)
		0.064 (16)	0.079 (14)	0.109 (12)	
12	0.8	18			0.064 (16)
15	1.2	18			0.064 (16)
18	1.8	18	92	130	0.064 (16)
21	2.4	18	64	88	0.079 (14)
24	3.1	17	48	65	0.109 (12)
27	4.0	17	39	50	
30	4.9	17	33	41	
36	7.1	16	26	31	
42	9.6	16	23	26	
48	12.6	15	21	23	
54	16.0	15	19	21	
60	19.6	14	19	20	
66	23.8		18	19	
72	28.3		18	18	
78	33.2			18	
84	38.6			18	

NOTES:

1. COVER HEIGHTS INDICATED IN TABLES ARE FOR FINISHED CONSTRUCTION.
2. TO PROTECT PIPE DURING CONSTRUCTION, MINIMUM HEIGHT OF COVER TO BE IN ACCORDANCE WITH TABLE A PRIOR TO ALLOWING CONSTRUCTION TRAFFIC TO CROSS INSTALLATION. THE COVER SHALL EXTEND THE FULL LENGTH OF THE PIPE. THE APPROACH FILL IS TO EXTEND A MINIMUM OF 15 DIAMETERS ON EACH SIDE OF THE PIPE OR TO THE INTERSECTION WITH THE CUT.
3. MINIMUM FINISHED HEIGHT OF COVER FOR ALL PIPES, EXCEPT THOSE UNDER ENTRANCES, SHALL BE 2.0' OR 1/2 DIAMETER, WHICHEVER IS GREATER. IN CASES IN WHICH THESE COVER HEIGHTS CANNOT BE ACHIEVED, AN ABSOLUTE MINIMUM FINISHED COVER HEIGHT OF 1.0' OR 1/4 DIAMETER, WHICHEVER IS GREATER, WILL BE ALLOWED ONLY IF ALL POSSIBLE MEANS TO OBTAIN THE STANDARD VALUE HAVE BEEN EXHAUSTED. THE MINIMUM FINISHED HEIGHT OF COVER FOR PIPES UNDER ENTRANCES IS 9" FOR PIPE DIAMETERS LESS THAN OR EQUAL TO 24" AND 12" OR 1/4 DIAMETER, WHICHEVER IS GREATER, FOR PIPE DIAMETERS GREATER THAN 24". WHERE POLYMER COATED PIPE WILL BE USED AND THE SURFACE OVER THE TOP OF THE PIPE WILL BE ASPHALT, CLASS I BACKFILL MATERIAL IS TO BE PLACED UP TO A MINIMUM OF 6" ABOVE THE TOP OF THE PIPE.
4. SEE STANDARD PB-1 FOR PIPE BEDDING AND BACKFILL REQUIREMENTS.
5. 16 GAUGE PIPE LIMITED TO THOSE LOCATIONS WHERE PIPE DIAMETER PLUS COVER IS LESS THAN 20'.
6. THE MAXIMUM HEIGHT OF COVER SHOWN IN THE TABLES IS BASED ON A SOIL MODULUS OF 700 PSI. ALL OTHER DESIGN CRITERIA ARE IN ACCORDANCE WITH THE AASHTO SPECIFICATIONS AND VDOT MODIFICATIONS FOR SOIL CORRUGATED METAL STRUCTURE INTERACTION SYSTEMS.
7. A MAXIMUM HEIGHT OF COVER TABLE FOR STEEL SPRIAL RIB WITH 3/4" WIDE x 1" DEEP RIPS SPACED AT 11 1/2" IS AVAILIBLE UPON REQUEST.

TABLE A	
PIPE DIAMETER	MINIMUM COVER HEIGHT DURING CONSTRUCTION (SEE NOTE 4)
12" TO 30"	18"
36" AND ABOVE	1/2 DIAMETER

SHEET 14 OF 18

STEEL SPIRAL RIB PIPE
HEIGHT OF COVER TABLE FOR H-20 LIVE LOAD

VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 7/05

107.18

SPECIFICATION REFERENCE: 232, 302

NEW 7/05
SPECIAL DESIGN SECTION
DRAWING NO. A 166_7

PLAN NO.
PROJECT
FILE NO.
SHEET NO.

DESIGN FEATURES RELATING TO CONSTRUCTION OR TO REGULATION AND CONTROL OF TRAFFIC MAY BE SUBJECT TO CHANGE AS DEEMED NECESSARY BY THE DEPARTMENT

REVISED
VA. STATE
FEDERAL AID PROJECT
ROUTE
STATE PROJECT
SHEET NO.

SURVEYED BY ___
SUPERVISED BY AAL
DESIGNED BY ABD

PC-1

CAST IRON PIPE CULVERT DESIGNATION				
DIAMETER INCHES	AREA SQ. FT.	MAXIMUM HEIGHT OF COVER IN FEET		
		1-13	14-21	22-35 (2)
12 (2)	0.8	STANDARD PIPE	HEAVY PIPE	EXTRA HEAVY PIPE
15 (3)	1.2			
16 (2) (4)	1.4			
18 (1)	1.8			
24 (1)	3.1			
30 (1)	4.9			
36 (1)	7.1			
42 (2)	9.6			
48 (2)	12.6			

(1) PIPE MAY BE SMOOTH CAST IRON, CORRUGATED CAST IRON, OR RIBBED CAST IRON.

(2) PIPE TO BE SMOOTH CAST IRON ONLY.

(3) PIPE TO BE CORRUGATED CAST IRON OR RIBBED CAST IRON.

(4) MAY BE SUBSTITUTED FOR 15" PIPE CULVERT AT NO INCREASE IN PRICE BID FOR 15" PIPE, WHERE APPROVED BY THE ENGINEER.

(5) CRUSHING STRENGTH (LBS. PER. LIN. FT.)

NOTES:

1. MAXIMUM HEIGHT OF COVER SHOWN IN TABLE IS FOR FINISHED CONSTRUCTION.
2. TO PROTECT PIPE DURING CONSTRUCTION, MINIMUM HEIGHT OF COVER PRIOR TO ALLOWING CONSTRUCTION TRAFFIC TO CROSS INSTALLATION IS TO BE 24". THIS COVER IS TO EXTEND THE FULL LENGTH OF THE PIPE CULVERT. THE APPROACH FILL RAMP IS TO EXTEND A MINIMUM OF 10 (DIAMETER + 36") ON EACH SIDE OF THE CULVERT, OR TO THE INTERSECTION WITH A CUT.
3. MINIMUM FINISHED HEIGHT OF COVER TO BE 24", EXCEPT PIPE UNDER ENTRANCES AND MEDIAN CROSSOVERS WHERE A 9" MINIMUM WILL BE PERMITTED.
4. SEE STANDARD PB-1 FOR PIPE BEDDING AND BACKFILL REQUIREMENTS.

SHEET 15 OF 18

SPECIFICATION REFERENCE
232 302

CAST IRON PIPE
HEIGHT OF COVER TABLE FOR H-20 LIVE LOAD

VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 7/05
107.19

PC-1

POLYETHYLENE CORRUGATED PIPE (PE) (SEE NOTE 6)		
DIAMETER INCHES	AREA SQ. FT.	MAXIMUM HEIGHT OF COVER FEET
12	0.8	21
15	1.2	21
18	1.8	20
24	3.1	20
30	4.9	19
36	7.1	18
42	7.1	18
48	7.1	17

POLYVINYLCHLORIDE RIBBED PIPE (PVC)		
DIAMETER INCHES	AREA SQ. FT.	MAXIMUM HEIGHT OF COVER FEET
18	1.7	20
21	2.3	19
24	3.0	19
30	4.7	18
36	6.9	18
48	12.3	18

NOTES:

1. COVER HEIGHTS INDICATED IN TABLES ARE FOR FINISHED CONSTRUCTION.
2. TO PROTECT PIPE DURING CONSTRUCTION, MINIMUM HEIGHT OF COVER TO BE IN ACCORDANCE WITH TABLE A PRIOR TO ALLOWING CONSTRUCTION TRAFFIC TO CROSS INSTALLATION. THE COVER SHALL EXTEND THE FULL LENGTH OF THE PIPE. THE APPROACH FILL IS TO EXTEND A MINIMUM OF 10(DIAMETER + ½ DIAMETER) ON EACH SIDE OF THE PIPE OR TO THE INTERSECTION WITH A CUT.
3. STANDARD MINIMUM FINISHED HEIGHT OF COVER FOR ALL PIPES, EXCEPT THOSE UNDER ENTRANCES, SHALL BE 2.0' OR ½ DIAMETER WHICHEVER IS GREATER. IN CASES IN WHICH THESE COVER HEIGHTS CANNOT BE ACHIEVED, AN ABSOLUTE MINIMUM FINISHED COVER HEIGHT OF 1.0' OR ⅛ DIAMETER WHICHEVER IS GREATER WILL BE ALLOWED ONLY IF ALL POSSIBLE MEANS TO OBTAIN THE STANDARD VALUE HAVE BEEN EXHAUSTED. THE MINIMUM FINISHED HEIGHT OF COVER FOR PIPES UNDER ENTRANCES IS 9" FOR PIPE DIAMETERS LESS THAN OR EQUAL TO 24" AND 12" OR ⅛ DIAMETER, WHICHEVER IS GREATER, FOR PIPE DIAMETERS GREATER THAN 24". WHERE THE SURFACE OVER THE TOP OF THE PIPE WILL BE ASPHALT, A MINIMUM OF 6" OF CLASS I BACKFILL MATERIAL IS TO BE PLACED BETWEEN THE TOP OF THE PIPE AND THE BOTTOM OF THE ASPHALT.
4. SEE STANDARD PB-1 FOR PIPE BEDDING AND BACKFILL REQUIREMENTS.
5. THE MAXIMUM HEIGHT OF COVER SHOWN IN THE TABLES IS BASED ON A SOIL MODULUS OF 700 PSI. ALL OTHER DESIGN CRITERIA ARE IN ACCORDANCE WITH THE AASHTO SPECIFICATIONS AND VDOT MODIFICATIONS FOR SOIL THERMOPLASTIC PIPE INTERACTION SYSTEMS.
6. HEIGHT OF COVER VALUES FOR 12" TO 36" DIAMETER APPLY TO TYPE C, D, OR S. HEIGHT OF COVER VALUES FOR 42" AND 48" APPLY TO TYPE D ONLY.

TABLE A	
PIPE DIAMETER	MINIMUM COVER HEIGHT DURING CONSTRUCTION (SEE NOTE 4)
12" TO 30"	18"
36" AND ABOVE	½ DAMETER

PLASTIC PIPE

EXTRA STRENGTH CLAY PIPE		
DIAMETER INCHES	AREA SQ. FT.	MAXIMUM HEIGHT OF COVER FEET
12	0.8	19
15	1.2	15
18	1.8	15
21	2.4	15
24	3.1	15
30	4.9	13
36	7.1	13

NOTES:

1. ALL VITRIFIED CLAY PIPE IS TO BE EXTRA STRENGTH.
2. MAXIMUM HEIGHTS OF COVER SHOWN IN TABLE ARE FOR FINISHED CONSTRUCTION.
3. TO PROTECT PIPE DURING CONSTRUCTION, MINIMUM HEIGHT OF COVER PRIOR TO ALLOWING CONSTRUCTION TRAFFIC TO CROSS INSTALLATION IS TO BE 36". THIS COVER IS TO EXTEND THE FULL LENGTH OF THE PIPE. THE APPROACH FILL RAMP IS TO EXTEND A MINIMUM OF [10(DIAMETER + 36")] ON EACH SIDE OF THE PIPE, OR TO THE INTERSECTION WITH A CUT.
4. MINIMUM FINISHED HEIGHT OF COVER TO BE 24", EXCEPT PIPE UNDER ENTRANCES WHERE A 9" MINIMUM WILL BE PERMITTED.
5. METHOD A BEDDING IS TO BE USED FOR ALL INSTALLATIONS UNLESS OTHERWISE DESIGNATED ON THE PLANS.

VITRIFIED CLAY

SHEET 16 OF 18

VITRIFIED CLAY AND PLASTIC PIPE
HEIGHT OF COVER TABLES FOR H-20 LIVE LOAD

VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 7/05
107.20

SPECIFICATION REFERENCE
232 302

DESIGN FEATURES RELATING TO CONSTRUCTION OR TO REGULATION AND CONTROL OF TRAFFIC MAY BE SUBJECT TO CHANGE AS DEEMED NECESSARY BY THE DEPARTMENT

NEW 7/05
SPECIAL DESIGN SECTION
DRAWING NO. A 166_8

PLAN NO.
PROJECT
FILE NO.
SHEET NO.

VA.
REVISED
STATE
FEDERAL AID PROJECT
ROUTE
STATE PROJECT
SHEET NO.

SURVEYED BY: ___
SUPERVISED BY: AAL
DESIGNED BY: BBP

PC-1

TABLE A - ALLOWABLE TYPE OF PIPE CULVERT

FOR ROADWAYS THAT ARE CONSTRUCTED, FUNDED OR WILL ULTIMATELY BE MAINTAINED BY VDOT

FUNCTIONAL CLASSIFICATION OF ROADS SYSTEM UNDER WHICH PIPE IS TO BE INSTALLED					
	HIGHER FUNCTIONAL CLASS - HFC RURAL PRINCIPAL ARTERIAL, URBAN PRINCIPAL ARTERIAL, RURAL MINOR ARTERIAL, URBAN MINOR ARTERIAL, RURAL COLLECTOR ROADS, URBAN COLLECTOR STREETS, SUBDIVISION STREETS WITH AN ADT GREATER THAN 4000		LOWER FUNCTIONAL CLASS - LFC RURAL LOCAL ROADS, URBAN LOCAL STREETS, SUBDIVISION STREETS WITH AN ADT LESS THAN OR EQUAL TO 4000		ENTRANCE PIPE
ALLOWABLE PIPE CULVERTS NOTES 1 & 2	STATEWIDE EXCEPT LOCATIONS SHOWN IN TABLE B	LOCATION SHOWN IN TABLE B	STATEWIDE EXCEPT LOCATIONS SHOWN IN TABLE B	LOCATION SHOWN IN TABLE B	STATEWIDE
CONCRETE	✓	✓	✓	✓	✓
ALUMINUM COATED TYPE 2 CORRUGATED STEEL NOTE 3	✓		✓		✓
POLYMER COATED (10/10) CORRUGATED STEEL NOTE 3	✓	✓	✓	✓	✓
UNCOATED GALVANIZED CORRUGATED STEEL NOTES 3 & 4					✓
GALVANIZED STEEL STRUCTURAL PLATE NOTE 3			✓		✓
GALVANIZED STEEL STRUCTURAL PLATE WITH CONCRETE INVERT NOTE 3	✓		✓	✓	✓
CORRUGATED ALUMINUM ALLOY NOTE 3	✓	✓	✓	✓	✓
CORRUGATED ALUMINUM ALLOY STRUCTUAL PLATE NOTE 3	✓	✓	✓	✓	✓
POLYVINYLCHLORIDE (PVC) RIBBED PIPE (SMOOTH INTERIOR)	✓	✓	✓	✓	✓
POLYETHYLENE (PE) CORRUGATED TYPE C	✓	✓	✓	✓	
POLYETHYLENE (PE) CORRUGATED TYPE S & D	✓	✓	✓	✓	✓

NOTES:

1. ALLOWABLE TYPES OF PIPES FOR A SPECIFIC AREA ARE TO CONFORM TO THE CRITERIA SHOWN IN TABLES A, A1, B, AND C. ANY DEVIATION MUST BE APPROVED BY THE STATE LOCATION AND DESIGN ENGINEER AND THE DISTRICT MATERIALS ENGINEER.
2. SEE HEIGHT OF COVER TABLES FOR MINIMUM AND MAXIMUM COVER LIMITATIONS FOR EACH TYPE OF PIPE.
3. SEE TABLE C FOR MINIMUM AND MAXIMUM pH, RESISTIVITY, AND VELOCITY LIMITATIONS FOR METAL PIPES.
4. USE ONLY UNDER ENTRANCES WHERE THE PIPE SIZE IS LESS THAN OR EQUAL TO 30" DIAMETER (OR EQUIVALENT) AND THE HEIGHT OF COVER IS LESS THAN OR EQUAL TO 15' AND AS AN OUTLET PIPE FOR STANDARD DI-13 SHOULDER SLOT INLETS.

SHEET 17 OF 18

SPECIFICATION REFERENCE
302
232

ALLOWABLE PIPE CRITERIA FOR CULVERTS AND STORM SEWERS

VIRGINIA DEPARTMENT OF TRANSPORTATION

NEW 7/05

107.20A

PC-1

TABLE A1 - ALLOWABLE TYPE OF STORM SEWER PIPE

FOR ROADWAYS THAT ARE CONSTRUCTED, FUNDED OR WILL ULTIMATELY BE MAINTAINED BY VDOT

FUNCTIONAL CLASSIFICATION OF ROADS SYSTEM UNDER WHICH PIPE IS TO BE INSTALLED			
	HIGHER FUNCTIONAL CLASS - HFC RURAL PRINCIPAL ARTERIAL, URBAN PRINCIPAL ARTERIAL, RURAL MINOR ARTERIAL, URBAN MINOR ARTERIAL, RURAL COLLECTOR ROADS, URBAN COLLECTOR STREETS, SUBDIVISION STREETS WITH AN ADT GREATER THAN 4000	LOWER FUNCTIONAL CLASS - LFC RURAL LOCAL ROADS, URBAN LOCAL STREETS, SUBDIVISION STREETS WITH AN ADT LESS THAN OR EQUAL TO 4000	
ALLOWABLE PIPE CULVERTS NOTES 1 & 2	STATEWIDE	STATEWIDE EXCEPT LOCATIONS SHOWN IN TABLE B	LOCATION SHOWN IN TABLE B
CONCRETE	✓	✓	✓
CORRUGATED STEEL ALUMINUM COATED TYPE 2 FULLY CONCRETE LINED NOTE 3		✓	
ALUMINUM COATED TYPE 2 STEEL SPIRAL RIB NOTE 3		✓	
POLYMER COATED (10/10) CORRUGATED STEEL SPIRAL RIB NOTE 3		✓	✓
POLYMER COATED (10/10) CORRUGATED STEEL DOUBLE WALL (SMOOTH INTERIOR) NOTE 3		✓	✓
ALUMINUM SPIRAL RIB NOTE 3		✓	✓
POLYVINYLCHLORIDE (PVC) RIBBED PIPE (SMOOTH INTERIOR)		✓	✓
POLYETHYLENE (PE) CORRUGATED TYPE S AND TYPE D		✓	✓

TABLE B

EXCEPTIONS TO STATEWIDE APPLICATIONS

COUNTIES (INCLUDING TOWNS)				CITIES
ARLINGTON - EAST OF AND INCLUDING RTES. 95 & 395		SURRY - EAST OF AND INCLUDING RTE. 10		SUFFOLK - EAST OF AND INCLUDING RTE. 32
FAIRFAX - EAST OF AND INCLUDING RTES. 95 & 395		ISLE OF WIGHT - EAST OF AND INCLUDING RTE. 10		CHESAPEAKE WILLIAMSBURG
PRINCE WILLIAM - EAST OF AND INCLUDING RTES. 95 & 395				VIRGINIA BEACH POQUOSON
WESTMORELAND	JAMES CITY	ESSEX	NORTHAMPTON	HAMPTON PORTSMOUTH
LANCASTER	ACCOMACK	MIDDLESEX	STAFFORD	NEWPORT NEWS
MATTHEWS	SPOTSYLVANIA	YORK	KING GEORGE	NORFOLK
GLOUCESTER	NORTHUMBERLAND	RICHMOND		ALEXANDRIA
				FREDERICKSBURG

TABLE C

PIPE TYPE	ALLOWABLE pH RANGE		ALLOWABLE RESISTIVITY RANGE		ALLOWABLE VELOCITY (FPS) (SEE NOTE 5)
	MIN.	MAX.	MIN.	MAX.	MAXIMUM
ALUMINUM COATED TYPE 2 CORRUGATED STEEL	5.0	9.0	1500	-	5
GALVANIZED STEEL STRUCTURAL PLATE WITH CONCRETE INVERT	6.0	9.0	2000	10000	15
GALVANIZED STEEL STRUCTURAL PLATE	6.0	9.0	2000	7000	5
POLYMER COATED (10/10) CORRUGATED STEEL	4.0	9.0	750	-	15
UNCOATED GALVANIZED CORRUGATED STEEL	6.0	10.0	2000	7000	5
CORRUGATED ALUMINUM ALLOY	4.0	9.0	500	-	5
CORRUGATED ALUMINUM ALLOY STRUCTURAL PLATE	4.0	9.0	500	-	5
ALUMINUM SPIRAL RIB	4.0	9.0	500	-	5
ALUMINUM COATED TYPE 2 SPIRAL RIB	5.0	9.0	1500	-	5
CORRUGATED STEEL ALUMINUM COATED TYPE 2 FULLY CONCRETE LINED	5.0	9.0	1500	-	15
POLYMER COATED CORRUGATED STEEL SPIRAL RIB	4.0	9.0	750	-	15
POLYMER COATED CORRUGATED STEEL DOUBLE WALL	4.0	9.0	750	-	15

NOTES:

1. ALLOWABLE TYPES OF PIPES FOR A SPECIFIC AREA ARE TO CONFORM TO THE CRITERIA SHOWN IN TABLES A, A1, B, AND C. ANY DEVIATION MUST BE APPROVED BY THE STATE LOCATION AND DESIGN ENGINEER AND THE DISTRICT MATERIALS ENGINEER.
2. SEE HEIGHT OF COVER TABLES FOR MINIMUM AND MAXIMUM COVER LIMITATIONS FOR EACH TYPE OF PIPE.
3. SEE TABLE C FOR MINIMUM AND MAXIMUM pH, RESISTIVITY, AND VELOCITY LIMITATIONS FOR METAL PIPES.
4. USE ONLY UNDER ENTRANCES WHERE THE PIPE SIZE IS LESS THAN OR EQUAL TO 30" DIAMETER (OR EQUIVALENT) AND THE HEIGHT OF COVER IS LESS THAN OR EQUAL TO 15' AND AS AN OUTLET PIPE FOR STANDARD DI-13 SHOULDER SLOT INLETS.
5. ALLOWABLE VELOCITY WHERE ABRASIVE BEDLOAD IS PRESENT OR ANTICIPATED. MAXIMUM VELOCITY BASED ON 10 YEAR DESIGN DISCHARGE (Q).

SHEET 18 OF 18

SPECIFICATION REFERENCE
302
232

ALLOWABLE PIPE CRITERIA FOR CULVERTS AND STORM SEWERS

VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 7/05

107.21

DESIGN FEATURES RELATING TO CONSTRUCTION OR TO REGULATION AND CONTROL OF TRAFFIC MAY BE SUBJECT TO CHANGE AS DEEMED NECESSARY BY THE DEPARTMENT

VA.

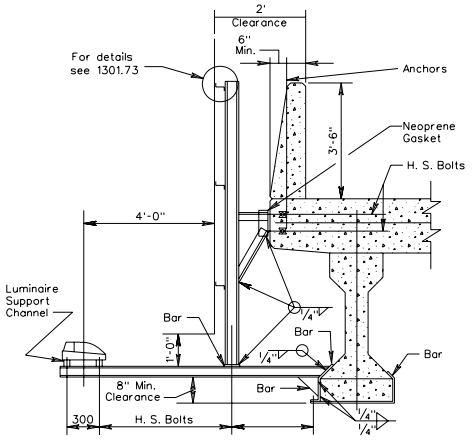
REVISED | STATE | FEDERAL AID PROJECT | ROUTE | STATE PROJECT | SHEET NO.

PLAN NO. | PROJECT | FILE NO. | SHEET NO.

SPECIAL DESIGN SECTION DRAWING NO. A 166_9 NEW 7/05

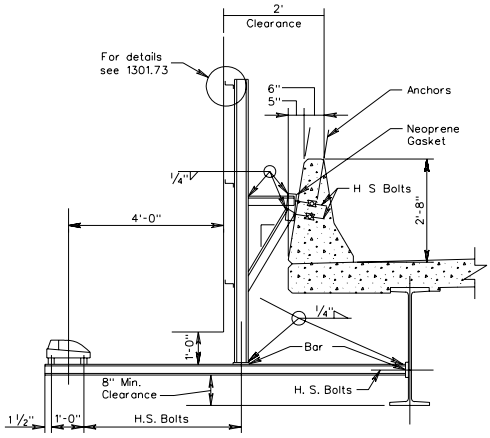
BSS-1

TYPICAL FOR PRESTRESSED CONCRETE



This parapet is typical for bridges with a sidewalk.

TYPICAL FOR STEEL BEAM



NOTES:

The size of members shall be designed by the contractor for the sign to be supported.

Minimum clearances are as specified by AASHTO or approved by the Virginia Department of Transportation.

The supporting frames may be either aluminum or galvanized steel.

The spacing of zees and supports shall be as shown on the plans.

Sign supports shall be braced for lateral forces.

Bolts shall be High-Strength ASTM A325, galvanized.

Anchors shall be cast-in-place. Thru-bolting may also be used for attachments to parapets. When cast-in-place anchors are used, they shall develop the strength of the bolts. When thru-bolting is used, anchorage on the traffic side of the parapet shall be flush with the parapet face.

When required by the plans bridge mounted sign structure luminaires shall be installed on a luminaire retrieval system with supports and electrical system designed for track mounted luminaires. Retrieval system including the electrical system shall be equal to "LUMI-TRAK" and designed for the number of luminaires as indicated on the plans. Spacing of hangers used to support the retrieval system shall be increased to a maximum 7-foot distance only where hangers do not support sign panels. Turntable end of retrieval system shall be of sufficient length to align with the vertical edge of the outside paved shoulder (± 6") or shall extend five feet beyond the vertical edge (± 6") of outermost sign luminaire whichever is greater. The opposite end of retrieval system shall extend a minimum of 6 inches past the outermost vertical edge of the sign hanger arm. Luminaire support channels and associated equipment will not be required with the luminaire retrieval system.

TYPICAL BRIDGE PARAPET SIGN MOUNTING DETAILS

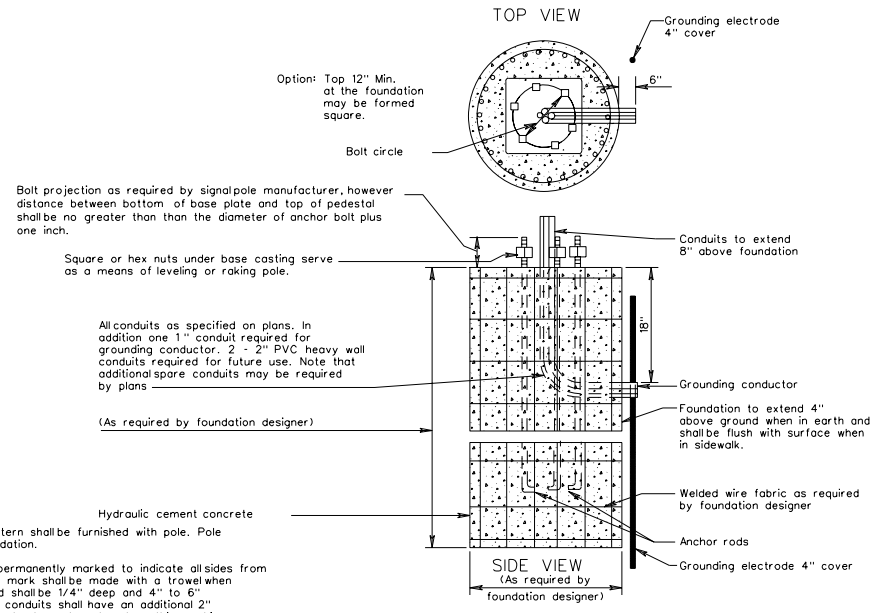
REV 7/05

1301.78

VIRGINIA DEPARTMENT OF TRANSPORTATION

SURVEYED BY: ____
SUPERVISED BY: AAL
DESIGNED BY: BBB

PF-1



CIRCULAR FOUNDATION

Notes:

Anchor bolts and bolt pattern shall be furnished with pole. Pole shall be centered on foundation.

Each foundation shall be permanently marked to indicate all sides from which conduits pass. This mark shall be made with a trowel when finishing the concrete and shall be 1/4" deep and 4" to 6" long. Locations of empty conduits shall have an additional 2" long mark made perpendicular to and centered on this marking.

When foundation extends 4" above finished grade all edges shall be chamfered 3/4".

Grounding bushings shall be installed on each end of metal conduits. Empty conduits shall be plugged to prevent moisture and rodent entry.

Bell ends shall be installed on each end of PVC conduits. Empty conduits shall be plugged to prevent moisture and rodent entry.

Open ends of conduits with conductors installed shall be sealed with an approved soft, pliable, and easily removable waterproof sealant. The sealant shall no have a deleterious effect on cable coverings.
No mortar, grout, or concrete shall be placed between bottom of base plate and top of pedestal.

SIGNAL POLE FOUNDATION INSTALLATION DETAILS

REV. 7/05

1301.11

VIRGINIA DEPARTMENT OF TRANSPORTATION

DESIGN FEATURES RELATING TO CONSTRUCTION OR TO REGULATION AND CONTROL OF TRAFFIC MAY BE SUBJECT TO CHANGE AS DEEMED NECESSARY BY THE DEPARTMENT

REVISED | STATE | FEDERAL AID PROJECT | ROUTE | STATE PROJECT | SHEET NO.

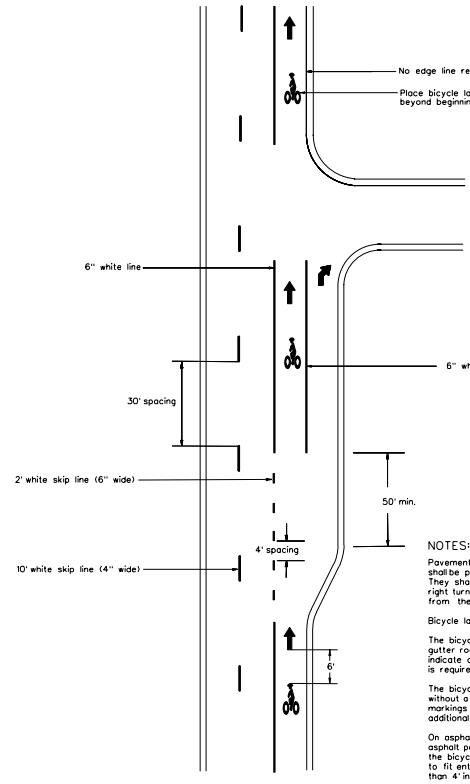
VA.

PLAN NO. | PROJECT | FILE NO. | SHEET NO.

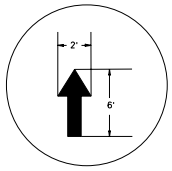
SPECIAL DESIGN SECTION
DRAWING NO. A - 167

NEW 7/05

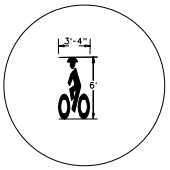
PM-6



ARROW DETAILS



BICYCLE LANE SYMBOL



NOTES:

Pavement markings consisting of arrow and bicycle lane symbols shall be placed at the beginning of the bicycle lane at right turn lanes. They shall also be placed at the end of the bicycle lane at right turn lanes if the solid white line separating the bicycle lane from the right turn lane is greater than 100' in length.

Bicycle lane symbols shall be placed a maximum of 500' apart.

The bicycle lane stripe shall be 4' from the edge of pavement on curb & gutter roadways unless otherwise noted on the plans or existing markings indicate otherwise. (Contact Mobility Management Division if additional guidance is required.)

The bicycle lane stripe shall be 5' from the face of curb on roadways without a gutter pan unless otherwise noted on the plans or existing markings indicate otherwise. (Contact Mobility Management Division if additional guidance is required.)

On asphalt roadways where the bicycle lane is beside curb and gutter and the asphalt portion of the bicycle lane is of insufficient width to allow placement of the bicycle symbol entirely on the asphalt, the symbol shall be reduced in size to fit entirely on the asphalt. The bicycle symbol shall be reduced to no less than 4' in height at these locations.

TYPICAL PAVEMENT MARKINGS FOR BICYCLE LANE

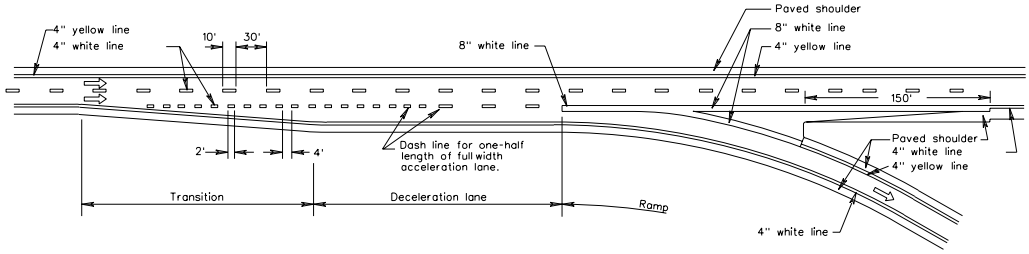
VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 7 /05

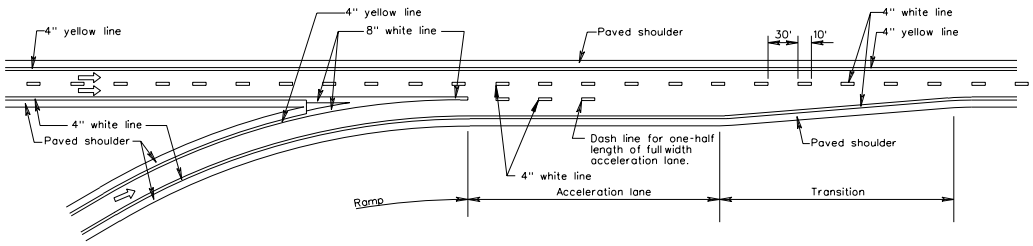
1301.91

PM-1

INTERCHANGE EXIT



INTERCHANGE ENTRANCE

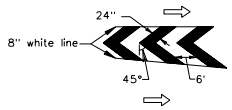


Notes:

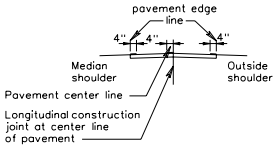
Place pavement center line marking on center line of bituminous surface.

All pavement markings shall be installed in accordance with the MUTCD.

GORE AREA HATCHING OPTIONAL



LATERAL PLACEMENT FOR PAVEMENT LINE MARKING ON HYDRAULIC CEMENT CONCRETE



TYPICAL PAVEMENT MARKING DETAILS

VIRGINIA DEPARTMENT OF TRANSPORTATION

REV. 7 /05

1301.86

SPECIAL DESIGN SECTION
DRAWING NO. A - 168

NEW 7 / 05

DESIGN FEATURES RELATING TO CONSTRUCTION OR TO REGULATION AND CONTROL OF TRAFFIC MAY BE SUBJECT TO CHANGE AS DEEMED NECESSARY BY THE DEPARTMENT

REVISED

STATE

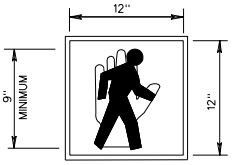
FEDERAL AID PROJECT

ROUTE

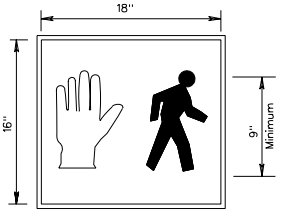
STATE PROJECT

DISTRICT

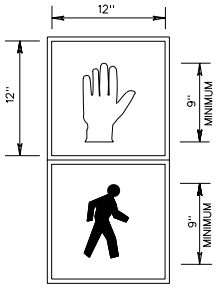
SP-5,6,7,8,9



SP-5

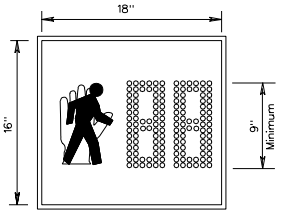


SP-6

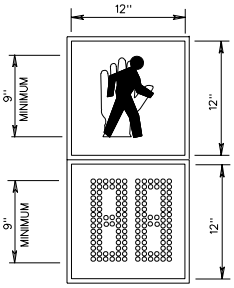


SP-7

Pedestrain Signals shall include Light Emiting Diodes conforming to Section 238 of the Specifications.



SP-8



SP-9

PEDESTRIAN SIGNAL INDICATION DETAILS

VIRGINIA DEPARTMENT OF TRANSPORTATION

REV 7/05

1301.28

SPECIAL DESIGN SECTION
DRAWING NO. A - 169

NEW 7/05

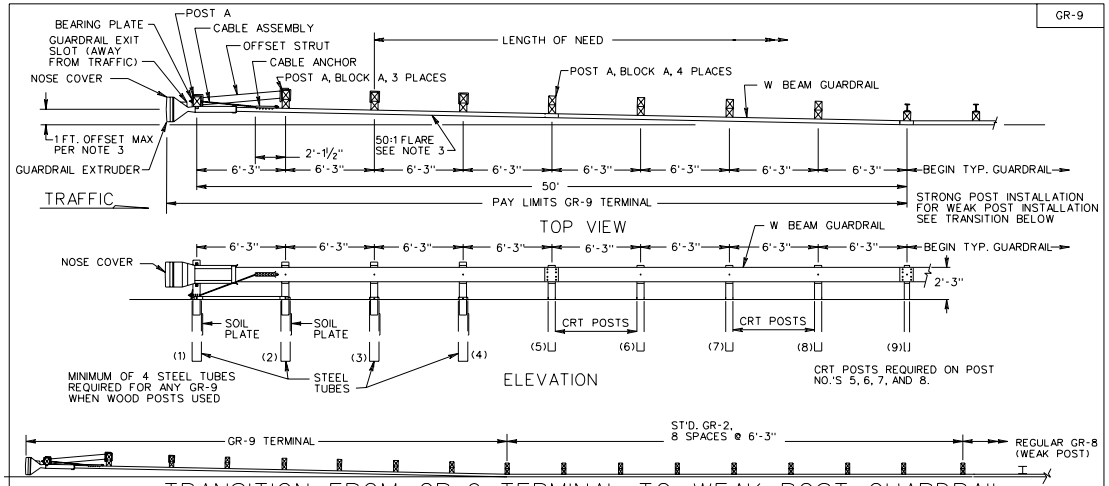
DESIGN FEATURES RELATING TO CONSTRUCTION OR TO REGULATION AND CONTROL OF TRAFFIC MAY BE SUBJECT TO CHANGE AS DEEMED NECESSARY BY THE DEPARTMENT

SURVEYED BY_____
SUPERVISED BY_____
DESIGNED BY_____

DESIGN FEATURES RELATING TO CONSTRUCTION OR TO REGULATION AND CONTROL OF TRAFFIC MAY BE SUBJECT TO CHANGE AS DEEMED NECESSARY BY THE DEPARTMENT

REVISED	STATE	FEDERAL AID PROJECT	STATE ROUTE	STATE PROJECT	SHEET NO.
	VA.				

GR-9



TRANSITION FROM GR-9 TERMINAL TO WEAK POST GUARDRAIL

NOTES:

1. THIS DESIGN SHALL BE USED AFTER AN ANALYSIS INDICATES IT IS MORE COST EFECTIVE 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 ENCROACHING 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

REV. 7/03

501.18

REV. 7/05

SPECIAL DESIGN SECTION
DRAWING NO. 2390

PLAN NO.	PROJECT	FILE NO.	SHEET NO.