General Notes for Box Culvert

Specifications:

Design - AASHTO LRFD Bridge Design Specifications (latest edition), the Prince George's County DPW&T "Specifications and Standards for Roadways and Bridges" (latest edition).

Construction - Maryland Department of Transportation State Highway Administration (MDOT SHA) Standard Specifications for Construction and Materials (latest edition).

Design Loads:

HL-93 with 2-inch future wearing surface.

Materials:

Self Consolidating Concrete (SCC) with f'c=5,000 psi (minimum) and epoxy-coated reinforcing steel shall be used for the entire precast concrete units for any depth of fill. Cast-In-Place (C.I.P.) concrete shall be SHA Mix. No. 3 (3,500 psi.)

If the culvert has 3 feet of fill or less over the structure, a reinforced concrete deck slab with epoxy coated reinforcement shall be provided over box. Concrete for the deck slab shall be SHA Mix No. 11 or 12. The top of deck slab (including the sidewalk) shall receive a protective coating (Silane Penetrant Sealer). See Sheet M-3, Slab Details.

Reinforcing steel shall conform to ASTM A615 Grade 60. Only grade 60 can be used on the project. All rebars shall be epoxy coated. The Contractor has the option to use epoxy coated welded wire reinforcement conforming to ASTM A1064. However, there shall be no more than 2 layers of welded wire reinforcement in each slab / wall.

A minimum of 2-inch clear concrete cover to all reinforcement bars shall be provided unless noted otherwise.

The contractor shall supply shop drawings to the County Engineer for review and approval. No material shall be ordered or fabricated until written approval is received for the proposed structure.

The contractor has the option to use C.I.P. box culvert with 3" clear concrete cover at the bottom of the bottom slab. In this case, these standards may not apply. The plans and calculations shall be submitted to County Engineer for review and approval. The design shall be done by a Professional Engineer registered in the State of Maryland.

Any changes to the enclosed details must be submitted to the County Engineer for review and approval.

Chamfer:

All exposed corners of all concrete structures shall be chamfered with 3/4"x3/4" milled chamfered strips unless noted otherwise.

Waterproofing:

The exterior sides and top of all box culverts shall be covered with roll or sheet waterproofing membrane in accordance with SHA Specification 422.03.07. Joints shall receive a 16-inch width of waterproofing membrane in addition the waterproofing applied to the full length of the structure. See Sheet C1-8 for details.

Post Tensioning:

The precast culvert units shall be tightened using prestressing strands along the full length of the culvert. All joints between the culvert units and between the end units and wing walls shall be water proof. Contractor shall provide details and procedure of post-tensioning application to the County Engineer for review and approval prior to performing the work if there is any change.

Structure Length/Height:

Culverts with 17 feet or more total opening length measured in accordance with National Bridge Inspection Standards (NBIS) 23CFR650.305 shall be resized to provide a minimum length of 20 feet as measured along the centerline of the roadway, see Sheet M-3. Culvert is not allowed to have more than 3 cells. Single box cell opening width is not allowed to be more than 20 feet. Precast segment length shall be 5 feet minimum, 16 feet maximum.

Box culverts require a minimum horizontal (span) and vertical (rise) opening of 5 feet. Culvert 75 or more feet in length require a rise of 6 feet.

Criteria for Utility Line Crossing:

Place utility line away from the structure, minimum of 5 feet outside of the county structural components. This is the preferred option for new construction. For details, see Sheet M-2.

Stream Diversion:

The designer shall prepare stream diversion plans as needed and submit to Soil Conservation District (SCD) for review and approval. State and Federal permits may be required

Tables:

The designer shall fill out the blank tables as necessary in this set of drawings and Hydrologic and Hydraulic Data Tables on Sheet M-1.

Right of Way / Easement:

The Developer must provide R.O.W./ drainage easement at least 10 feet outside of structure foundation and riprap for maintenance of structure (see Geometric Layout Sheet).

Bridge Number:

The designer shall send request to DPW&T (Department of Public Works and Transportation) via DPIE to assign a bridge number to the new structure.

Restrictions for Placing and Using Equipment on Existing or New Structure/or Storing Materials on/or Against Structures:

There are restrictions on placing equipment on existing and new structure(s) and storing materials on/or against existing and new structure(s) elements. The limitations basically relate to loads that are beyond Maryland's legal vehicles and/or posted load limits (where applicable) and materials stockpiled on/or against structure or structure's elements. For details of such restrictions see section SHA Std Specs. TC 6.14 titled "STORING MATERIALS AND EQUIPMENT ON/ AGAINST STRUCTURES RESTRICTION" in the contract documents. In order to comply with this article, The contractor shall read section TC 6.14 prior to commencing any work on structure(s) in this contract.

Vehicles shall not be allowed to cross over the culvert until a minimum of 3 feet of compacted fill has been placed over the culvert, or approved by the County Engineer.

Foundation Requirements:

Undercutting and backfilling with aggregate(1 foot thick, min., Crusher Run Aggregate CR-6, or Graded Aggregate Base GAB) may be necessary in order to achieve the required factored soil bearing resistance. Geotechnical report must be submitted with the plans. The report shall be prepared by a Professional Geotechnical Engineer registered in the State of Maryland per SHA PPM D-79-17 (4). Geotechnical report shall include foundation recommendation, required bearing capacity, and recommendation for undercut/backfill to achieve the required bearing capacity. The geotechnical engineer shall certify that the bearing capacity meets or exceeds the footing design requirements prior to the installation of precast concrete box.

Load Rating:

Load rating analysis shall be performed per SHA PPM D-97-47(4) based on LRFR methods prior to the construction permit approval. During construction phase, if there is a change in the site conditions then the load rating analysis shall be recalculated and resubmitted for County's approval prior to as-built approval and bond release.

HL-93	
LRFR Inventory	LRFR Operating

Legal Truck	Operating (Tons)
H-15	
Type 4	
HS-20	
3S2	

Permit Truck	Operating (Tons)
150K	
90K Comb.	
90K Crane	
90K Cargo	
80K Cargo	
120K Spec.	
108K Crane	
120K Crane	

Date: April 8, 2020

Index of Sheets

Contact:
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Highway and Bridge Design Division
Office of Engineering and Project Management
Prince George's County DPW&T

APPROVED:

DIRECTOR DATE

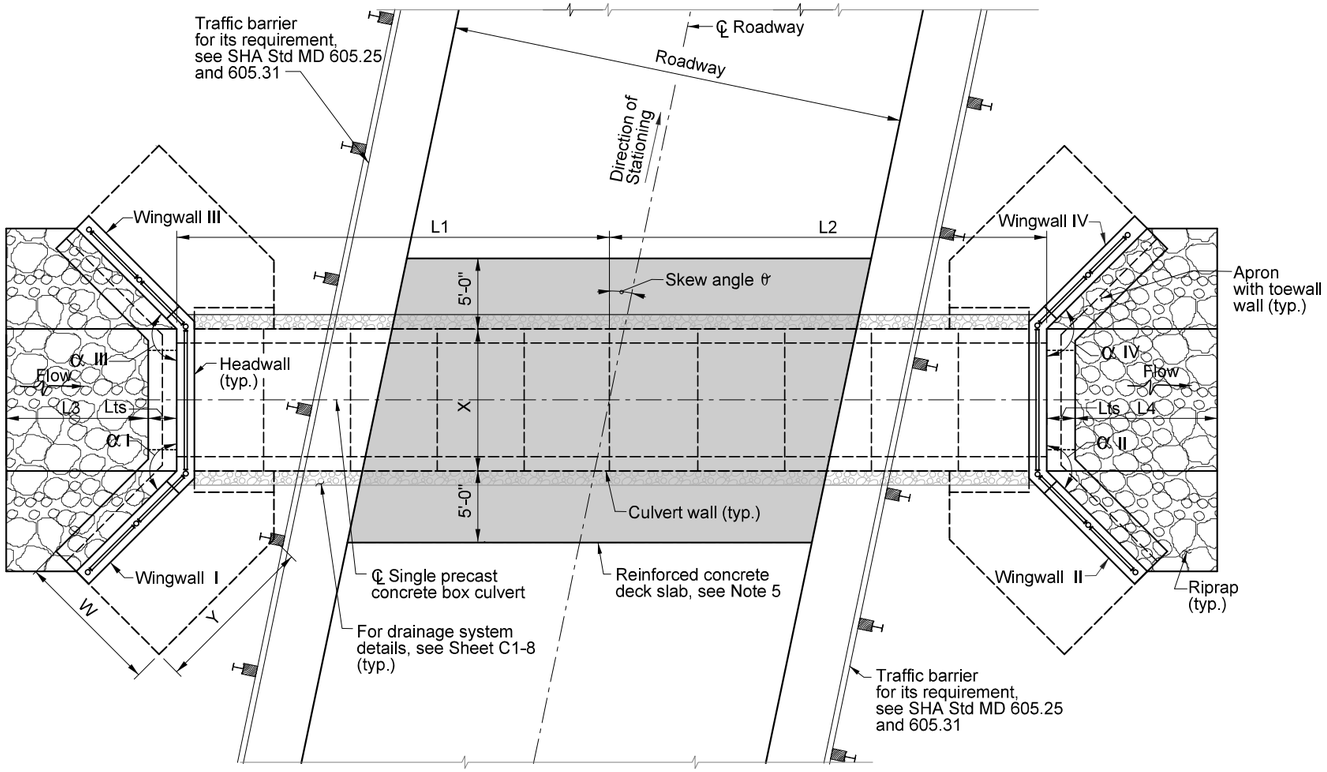
REVISION DATE:	APPROVED BY:
04-08-2020	

Phone: 301-883-5642

DEPARTMENT OF PUBLIC WORKS
AND TRANSPORTATION
Prince George's County, MD

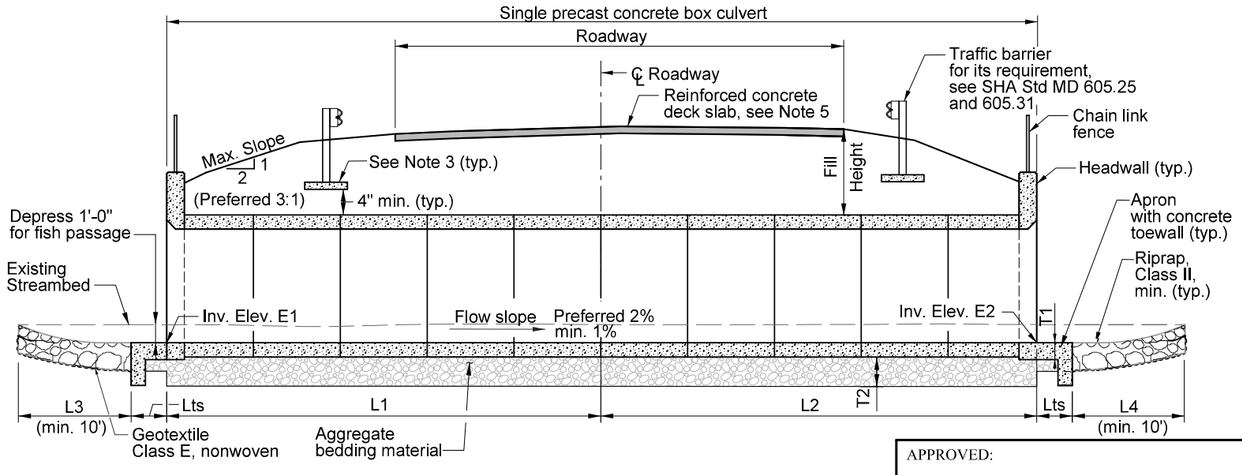
Standard Precast Concrete Box Culvert General Notes

SHEET C1-1



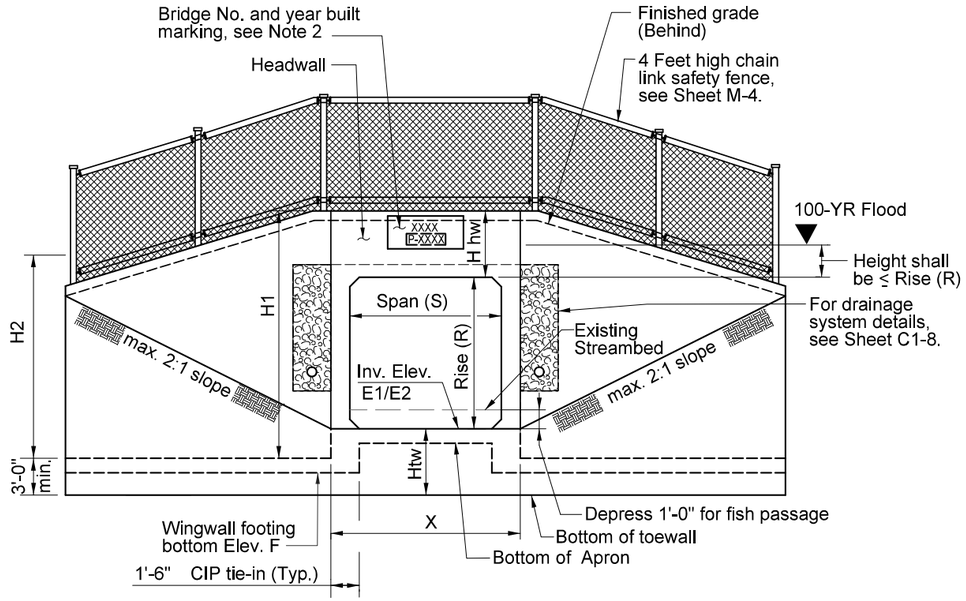
Plan - Single Culvert

Scale: N.T.S.



Longitudinal Section

Scale: N.T.S.



Elevation

Scale: N.T.S.

Notes:

1. Install chain link safety fence along top of headwall and wingwalls. For chain link safety fence details, see DPW&T Std. Nos. 300.27 and 300.28, "Chain Link Fence (Commercial Property Installation)" on Sheet M-4.
2. For Bridge No. and year built marking, see MD SHA Std. No. SI-103 and DPWT Std. No. 300.32 on Sheet M-4 & M-5. All numerals shall be indented in concrete.
3. For traffic barrier over culvert, the preferred option is standard traffic barrier for roadway (see SHA Std. MD 605.25). If the fill is not deep enough to accommodate the guardrail post, the 2nd option is SHA Std. MD 605.26 traffic barrier W Beam post placement details for spanning 12'-2" to 18'-5" openings. If neither option 1 or 2 works, the 3rd option is anchoring the guardrail post on the 4'x4'x8" concrete slab. See sheet M-3 for details. When the fill is less than 1'-6", the 4th option is to anchor the guardrail post on the deck slab. The anchoring details are the same as option 3. The deck slab shall be widened as needed.
4. The wingwall design can follow SHA Std. RW-101 to RW-107 & RW-301 on Sheet M-5 & M-6. Consider designing toewall to replace shear key as necessary.
5. If the culvert has 3 feet of fill or less over the structure, a reinforced concrete deck slab shall be provided. For detail, see Sheet M-3.
6. For precast concrete box culvert details, see Sheet C1-8 to C1-12.
7. The wingwall footing and the headwall shall be C.I.P. concrete. The Contractor has the option to build the C.I.P. headwall on top of the precast concrete box culvert and the option to use precast concrete wingwalls. It is the responsibility of the Contractor to develop the detail plans related to these options if selected. These detail plans shall be prepared and sealed by a Professional Engineer registered in the State of Maryland and submitted to the County Engineer for review and approval before any material is ordered or fabricated.

APPROVED:

DIRECTOR DATE

REVISION DATE:	APPROVED BY:
04-08-2020	

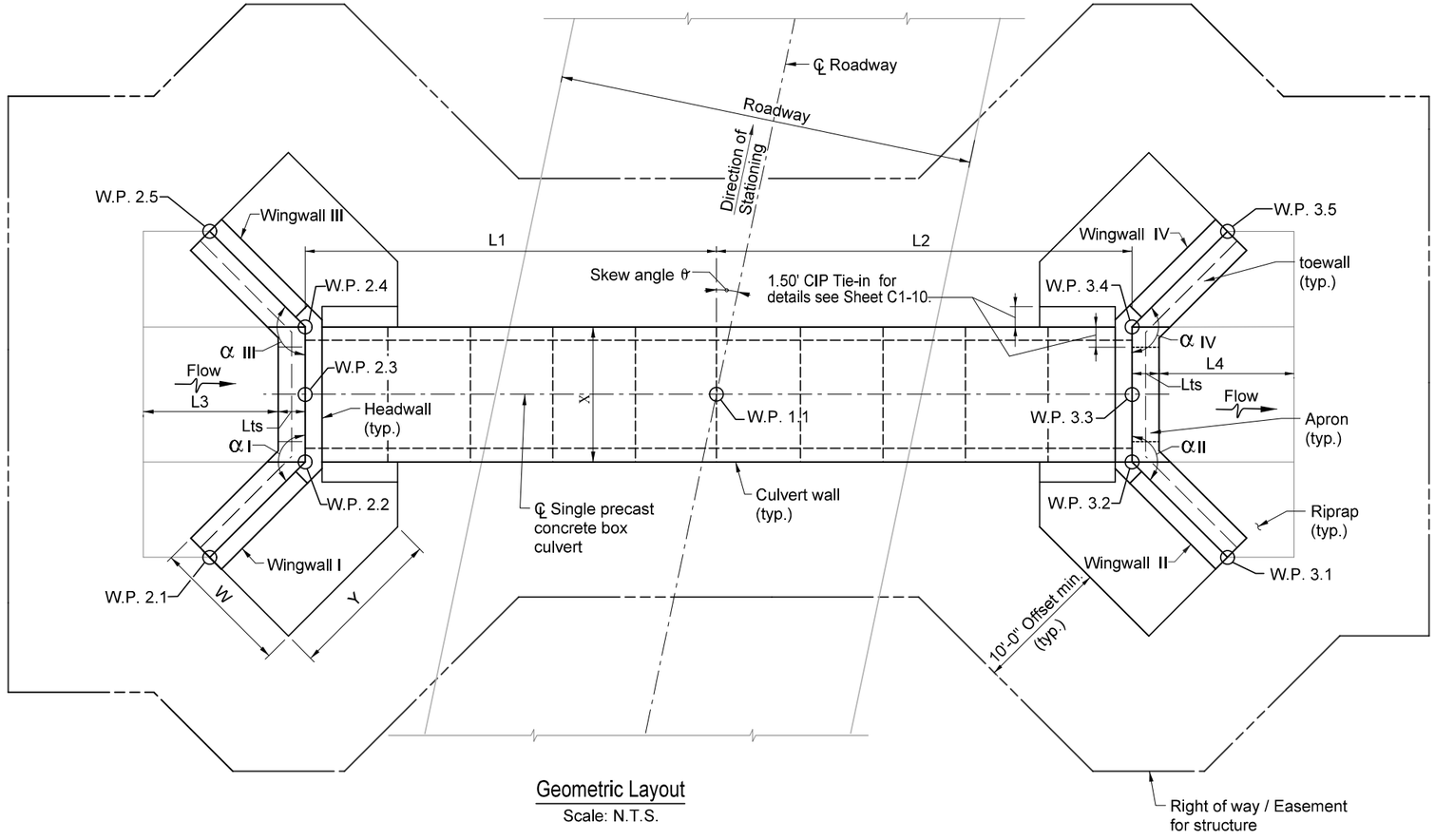
Phone: 301-883-5642

DEPARTMENT OF PUBLIC WORKS
AND TRANSPORTATION
Prince George's County, MD

Standard Precast Concrete Box Culvert General Plan & Elevation (Single Box)

SHEET C1-2

FILE: U:\2026031141\26 PGDPWT Culvert Standards\700 CADD\706 Struct\R2-CI-2-SINGLE BOX PLAN AND ELEV.dgn



Geometric Layout
Scale: N.T.S.

Working Point Table				
Point	Station	Offset	North	East
W.P.1.1				
W.P.2.1				
W.P.2.2				
W.P.2.3				
W.P.2.4				
W.P.2.5				
W.P.3.1				
W.P.3.2				
W.P.3.3				
W.P.3.4				
W.P.3.5				

Culvert Dimension Table																		
Culvert Length L1	Culvert Length L2	Max. Fill Height	Skew θ	Riprap Class		Riprap L3	Riprap L4	Box Span, S	Box Rise, R	Width X	Headwall Hhw	Toewall Htw	Apron T1	Apron Upstream Lts	Apron Downstream Lts	Bedding Materials Thickness T2	Inv. Elev. E1	Inv. Elev. E2
				Upstream	Downstream													

Wing Wall Dimensions Table							
Location	Angle α	Height H1	Height H2	Footing W	Footing Y	Footing bottom Elev. F	MDOT SHA Detail No.
Wingwall I							
Wingwall II							
Wingwall III							
Wingwall IV							

Notes:

1. For general notes, see Sheet C1-1.
2. For general plan and elevation, see Sheet C1-2.
3. For culvert dimension and reinforcement tables, see Sheet C1-11 to C1-12.
4. Riprap scour protection is not shown for clarity.

APPROVED:

DIRECTOR DATE

REVISION DATE:	APPROVED BY:
04-08-2020	

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DEPARTMENT OF PUBLIC WORKS
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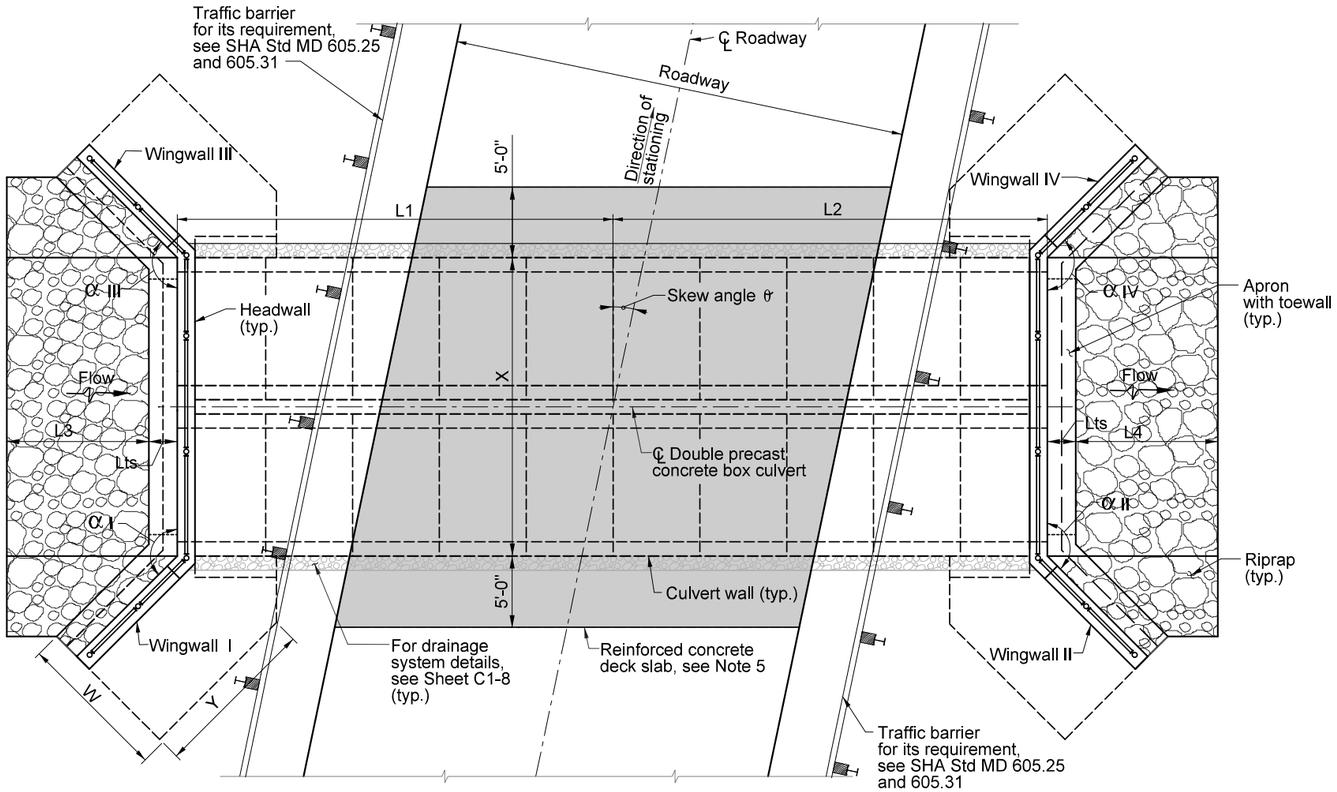
Prince George's County, MD

Standard Precast Concrete Box Culvert Geometric Layout (Single Box)

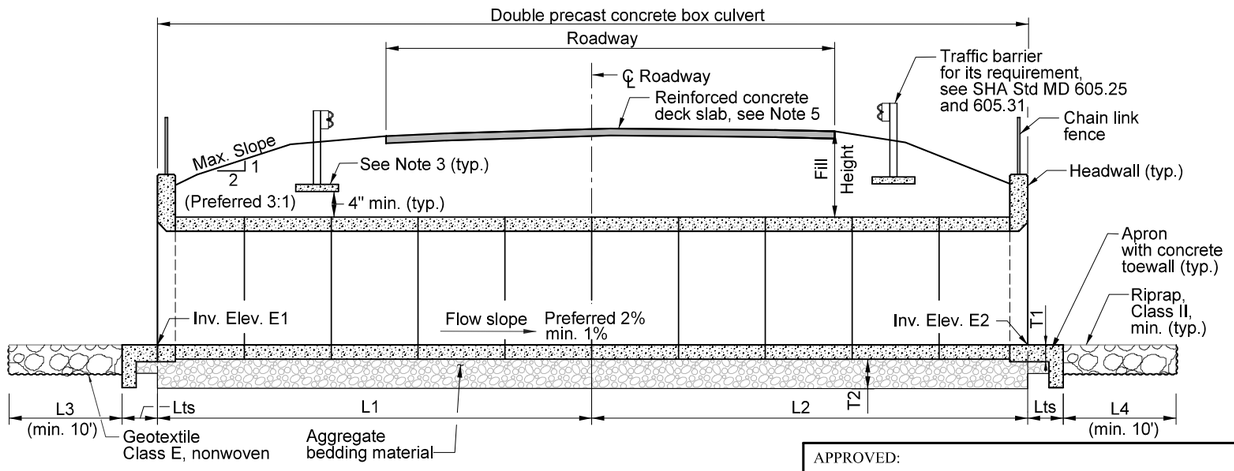
SHEET C1-3

FILE: U:\2026031141\26 PGDPWT Culvert Standards\700 CADD\706 Struct\R2-CI-3-SINGLE BOX G LAYOUT.dgn



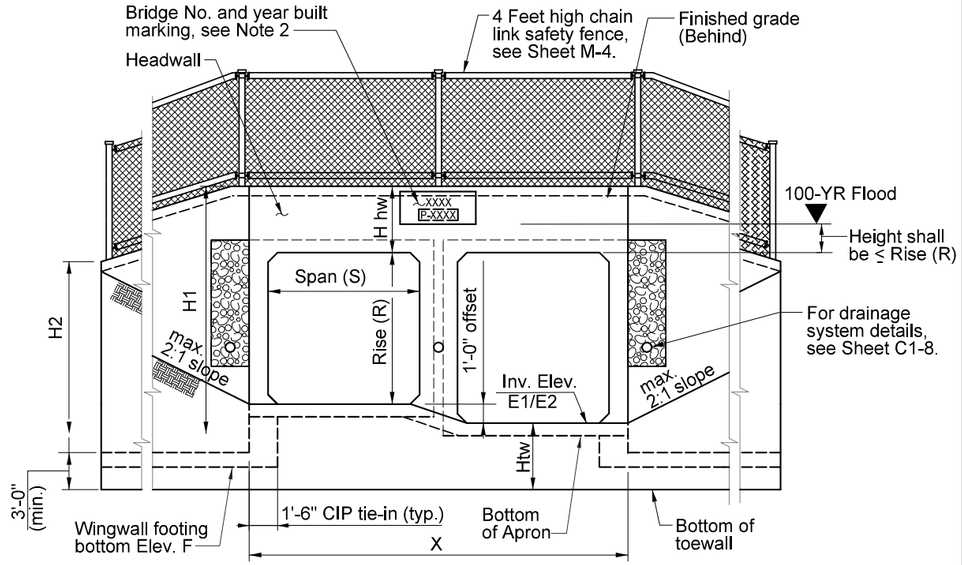
Plan - Double Culvert

Scale: N.T.S.



Longitudinal Section

Scale: N.T.S.



Elevation

Scale: N.T.S.

Notes:

1. Install chain link safety fence along top of headwall and wingwalls. For chain link safety fence details, see DPW&T Std. Nos. 300.27 and 300.28, "Chain Link Fence (Commercial Property Installation)" on Sheet M-4.
2. For Bridge No. and year built marking, see MD SHA Std. No. SI-103 and DPWT Std. No. 300.32 on Sheet M-4 & M-5. All numerals shall be indented in concrete.
3. For traffic barrier over culvert, the preferred option is standard traffic barrier for roadway (see SHA Std. MD 605.25). If the fill is not deep enough to accommodate the guardrail post, the 2nd option is SHA Std. MD 605.26 traffic barrier W Beam post placement details for spanning 12'-2" to 18'-5" openings. If neither option 1 or 2 works, the 3rd option is anchoring the guardrail post on the 4'x4'x8" concrete slab. See sheet M-3 for details. When the fill is less than 1'-6", the 4th option is to anchor the guardrail post on the deck slab. The anchoring details are the same as option 3. The deck slab shall be widened as needed.
4. The wingwall design can follow SHA Std. RW-101 to RW-107 & RW-301 on Sheet M-5 & M-6. Consider designing toewall to replace shear key as necessary.
5. If the culvert has 3 feet of fill or less over the structure, a reinforced concrete deck slab shall be provided. For detail, see Sheet M-3.
6. If the size of box with a higher rise is not shown on Sheet C1-11 to C1-12, it is the responsibility of the designer to submit the designs and plans to DPIE for review and approval. The designs/plans shall be prepared by a Professional Engineer registered in the state of Maryland.
7. For precast concrete box culvert details, see Sheet C1-8 to C1-12.
8. The wingwall footing and the headwall shall be C.I.P. concrete. The Contractor has the option to build the C.I.P. headwall on top of the precast concrete box culvert and the option to use precast concrete wingwalls. It is the responsibility of the Contractor to develop the detail plans related to these options if selected. These detail plans shall be prepared and sealed by a Professional Engineer registered in the State of Maryland and submitted to the County Engineer for review and approval before any material is ordered or fabricated.

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DEPARTMENT OF PUBLIC WORKS
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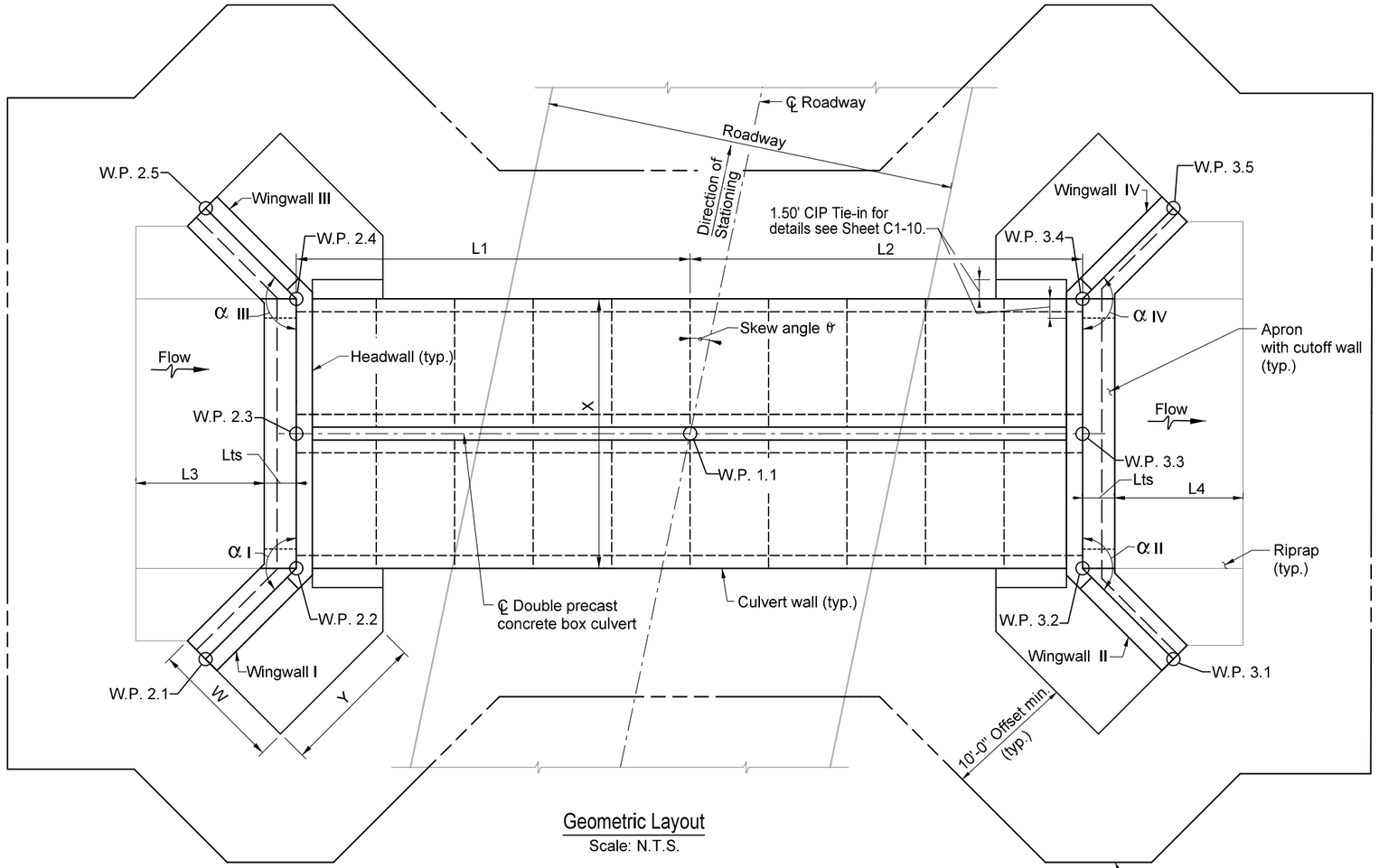
Prince George's County, MD

Standard Precast Concrete Box Culvert General Plan & Elevation (Double Boxes)

SHEET C1-4

FILE: U:\20260311 41\26 PGDPWT Culvert Standards\700 CADD\706 Struct\R2-C1-4-DOUBLE BOX PLAN AND ELEV.dgn



Geometric Layout
Scale: N.T.S.

Working Point Table				
Point	Station	Offset	North	East
W.P.1.1				
W.P.2.1				
W.P.2.2				
W.P.2.3				
W.P.2.4				
W.P.2.5				
W.P.3.1				
W.P.3.2				
W.P.3.3				
W.P.3.4				
W.P.3.5				

Culvert Dimension Table																		
Culvert Length L1	Culvert Length L2	Max. Fill Height	Skew θ	Riprap Class		Riprap L3	Riprap L4	Box Span, S	Box Rise, R	Width X	Headwall Hhw	Toewall Htw	Apron T1	Apron Upstream Lts	Apron Downstream Lts	Bedding Materials Thickness T2	Inv. Elev. E1	Inv. Elev. E2
				Upstream	Downstream													

Wing Wall Dimensions Table							
Location	Angle α	Height H1	Height H2	Footing W	Footing Y	Footing bottom Elev. F	MDOT SHA Detail No.
Wingwall I							
Wingwall II							
Wingwall III							
Wingwall IV							

Notes:

1. For general notes, see Sheet C1-1.
2. For general plan and elevation, see Sheet C1-4.
3. For culvert dimension and reinforcement tables, see Sheet C1-11 to C1-12
4. Riprap scour protection is not shown for clarity.

APPROVED:

DIRECTOR DATE

REVISION DATE:	APPROVED BY:
04-08-2020	

Phone: 301-883-5642

DEPARTMENT OF PUBLIC WORKS
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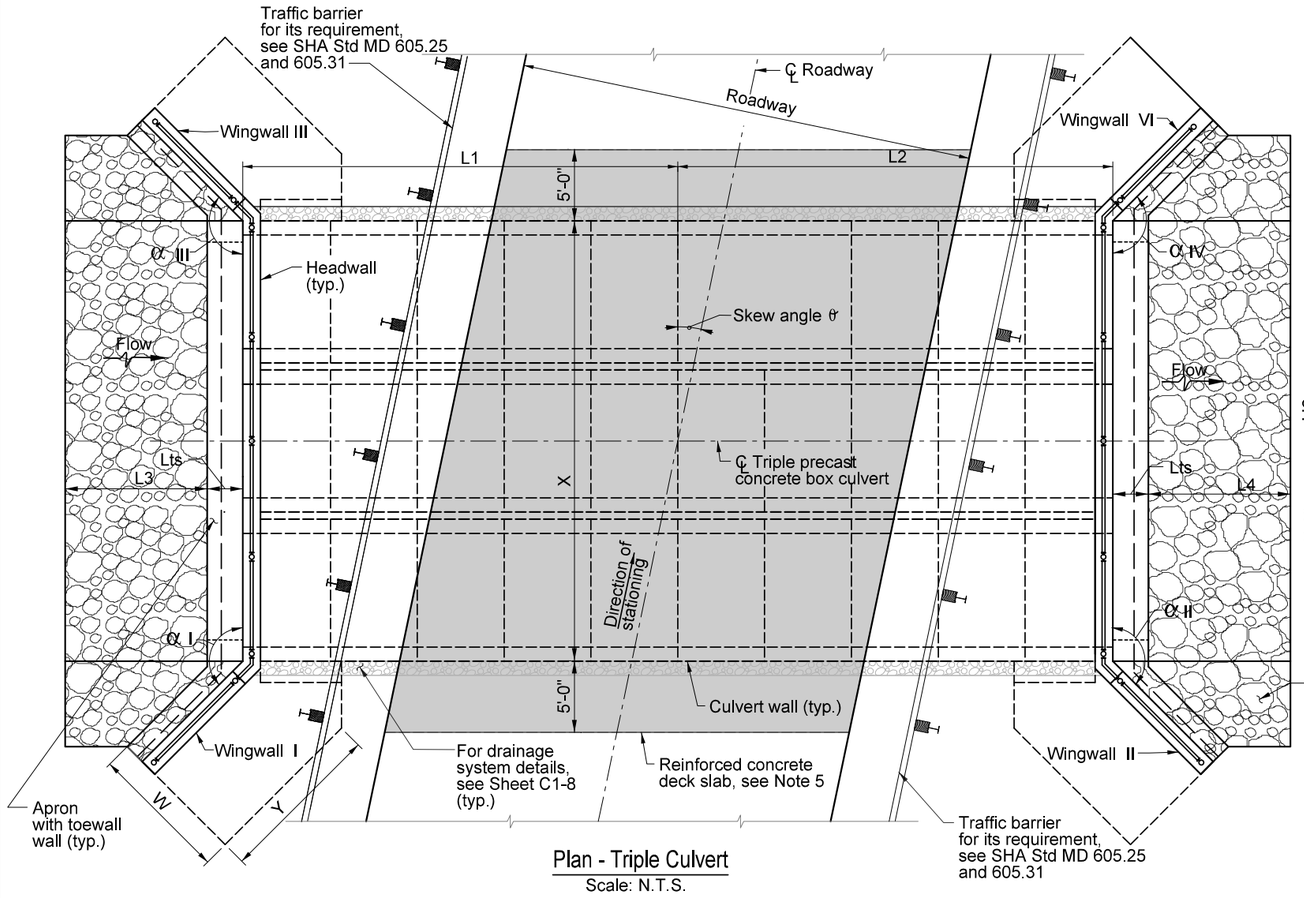
Prince George's County, MD

Standard Precast Concrete Box Culvert Geometric Layout (Double Boxes)

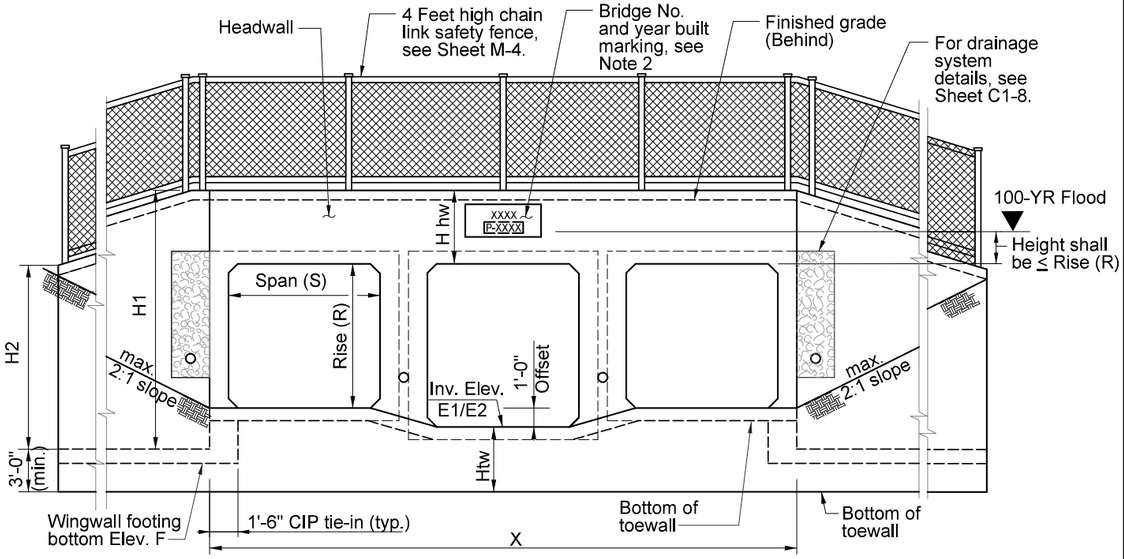
SHEET
C1-5

FILE: U:\2026031141\26 PGDPWT Culvert Standards\700 CADD\706 Struct\R2-C1-5-DOUBLE BOX G LAYOUT.dgn



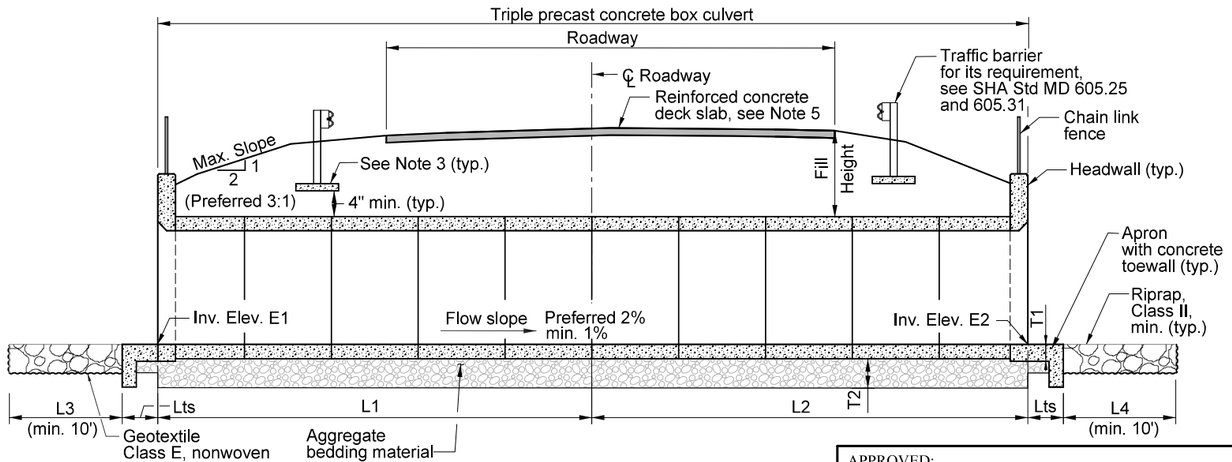
Plan - Triple Culvert

Scale: N.T.S.



Elevation

Scale: N.T.S.



Longitudinal Section

Scale: N.T.S.

Notes:

1. Install chain link safety fence along top of headwall and wingwalls. For chain link safet fence details, see DPW&T Std. Nos. 300.27 and 300.28, "Chain Link Fence (Commercial Property Installation)" on Sheet M-4.
2. For Bridge No. and year built marking, see MD SHA Std. No. SI-103 and DPWT Std. No. 300.32 on Sheet M-4 & M-5. All numerals shall be indented in concrete.
3. For traffic barrier over culvert, the preferred option is standard traffic barrier for roadway (see SHA Std MD 605.25). If the fill is not deep enough to accommodate the guardrail post, the 2nd option is SHA Std. MD 605.26 traffic barrier W Beam post placement details for spanning 12'-2" to 18'-5" openings. If neither option 1 or 2 works, the 3rd option is anchoring the guardrail post on the 4'x4'x8" concrete slab. See sheet M-3 for details. When the fill is less than 1'-6", the 4th option is to anchor the guardrail post on the deck slab. The anchoring details are the same as option 3. The deck slab shall be widened as needed.
4. The wingwall design can follow SHA Std. RW-101 to RW-107 & RW-301 on Sheet M-5 & M-6. Consider designing toewall to replace shear key as necessary.
5. If the culvert has 3 feet of fill or less over the structure, a reinforced concrete deck slab shall be provided. For detail, see Sheet M-3.
6. If the size of middle box with a higher rise is not shown on Sheet C1-11 to C1-12, it is the responsibility of the designer to submit the designs and plans to DPIE for review and approval. The designs/plans shall be prepared by a Professional Engineer registered in the state of Maryland.
7. For precast concrete box culvert details, see Sheet C1-8 to C1-12.
8. The wingwall footing and the headwall shall be C.I.P. concrete. The Contractor has the option to build the C.I.P. headwall on top of the precast concrete box culvert and the option to use precast concrete wingwalls. It is the responsibility of the Contractor to develop the detail plans related to these options if selected. These detail plans shall be prepared and sealed by a Professional Engineer registered in the State of Maryland and submitted to the County Engineer for review and approval before any material is ordered or fabricated.

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DIRECTOR DATE

REVISION DATE:	APPROVED BY:
04-08-2020	

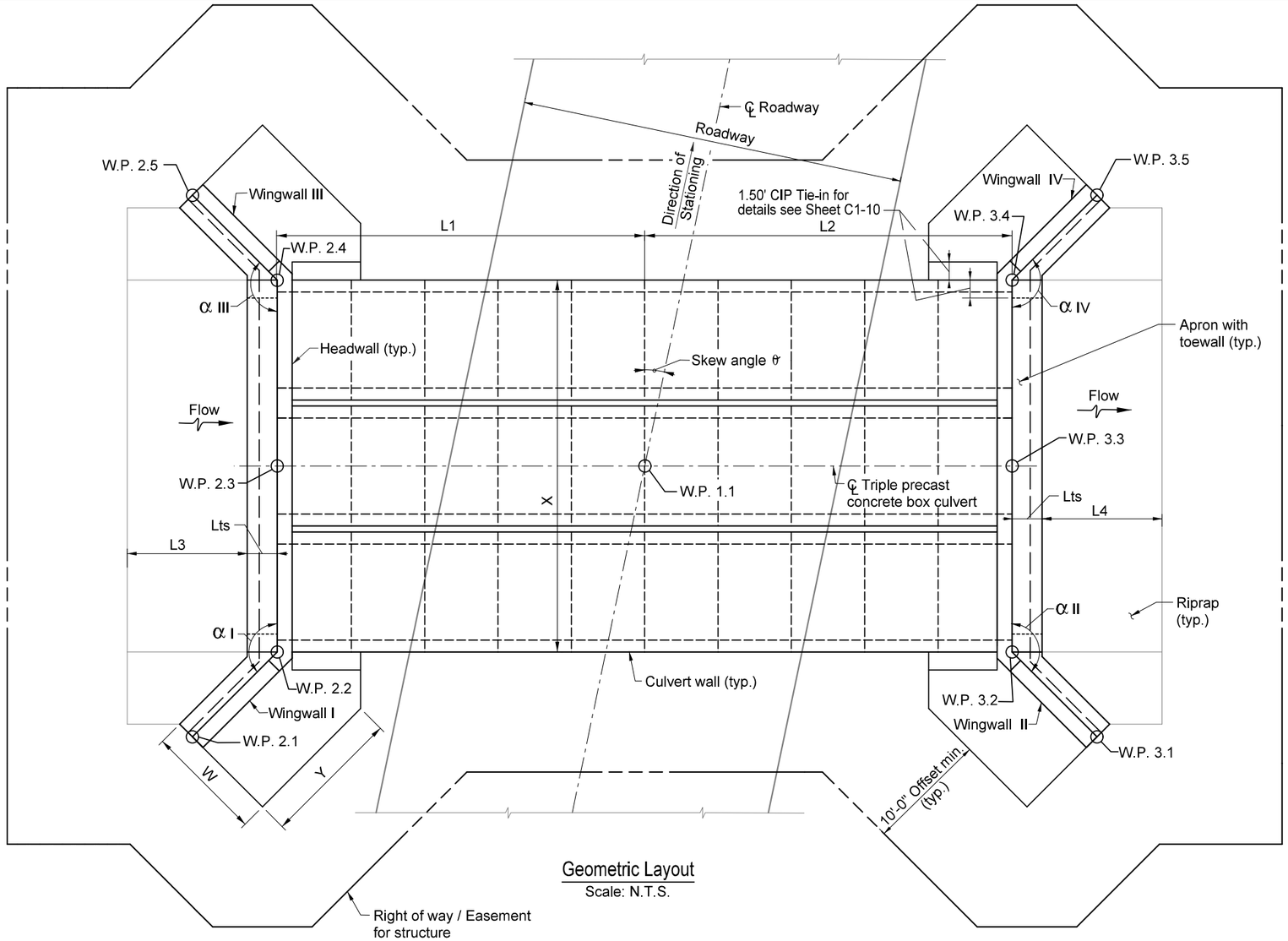
Phone: 301-883-5642

DEPARTMENT OF PUBLIC WORKS
AND TRANSPORTATION
Prince George's County, MD

Standard Precast Concrete Box Culvert General Plan and Elevation (Triple Boxes)

SHEET C1-6

FILE: U:\20260311 41\26 PGDPWT Culvert Standards\700 CADD\706 Struct\R2-CI-6-TRIPLE BOX PLAN AND ELEV.dgn



Geometric Layout
Scale: N.T.S.

Working Point Table				
Point	Station	Offset	North	East
W.P.1.1				
W.P.2.1				
W.P.2.2				
W.P.2.3				
W.P.2.4				
W.P.2.5				
W.P.3.1				
W.P.3.2				
W.P.3.3				
W.P.3.4				
W.P.3.5				

Culvert Dimension Table																		
Culvert Length L1	Culvert Length L2	Max. Fill Height	Skew θ	Riprap Class		Riprap L3	Riprap L4	Box Span, S	Box Rise, R	Width X	Headwall Hhw	Toewall Htw	Apron T1	Apron Upstream Lts	Apron Downstream Lts	Bedding Materials Thickness T2	Inv. Elev. E1	Inv. Elev. E2
				Upstream	Downstream													

Wing Wall Dimensions Table							
Location	Angle α	Height H1	Height H2	Footing W	Footing Y	Footing bottom Elev. F	MDOT SHA Detail No.
Wingwall I							
Wingwall II							
Wingwall III							
Wingwall IV							

Notes:

1. For general notes, see Sheet C1-1.
2. For general plan and elevation, see Sheet C1-6.
3. For culvert dimension and reinforcement tables, see Sheet C1-11 to C1-12.
4. Riprap scour protection is not shown for clarity.

APPROVED:

DIRECTOR DATE

REVISION DATE:	APPROVED BY:
04-08-2020	

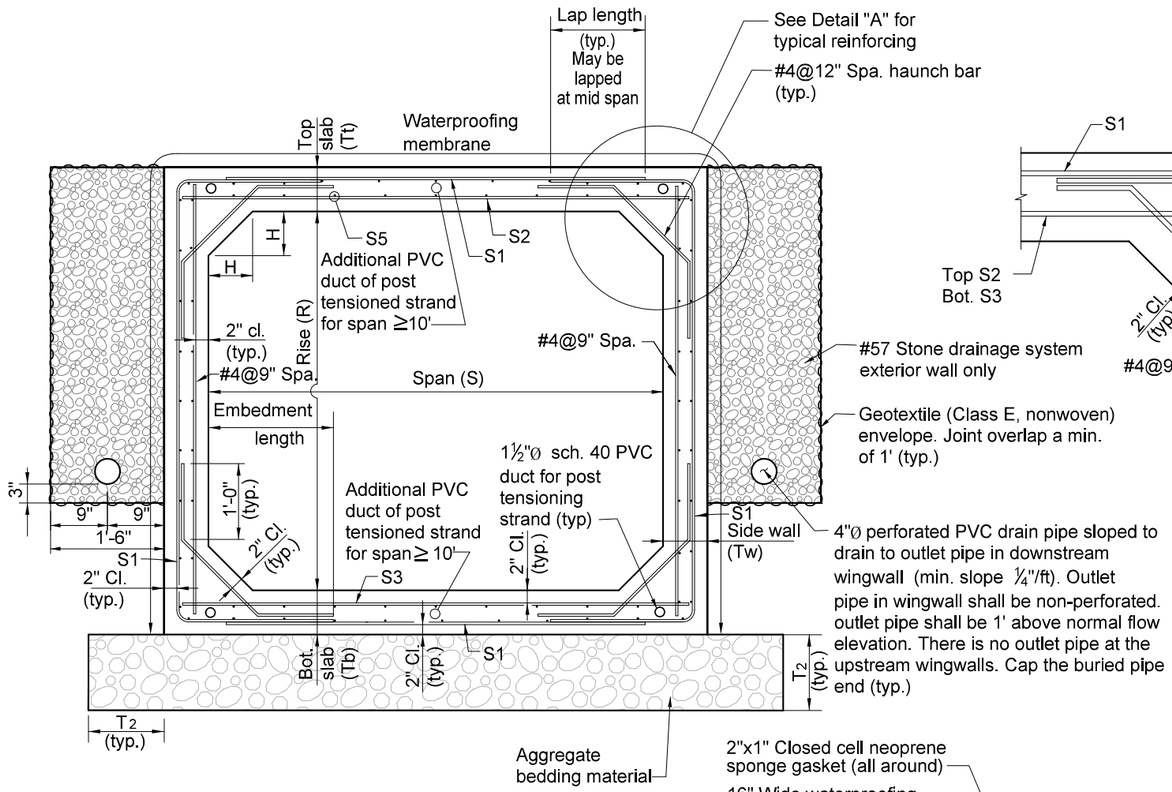
Phone: 301-883-5642

DEPARTMENT OF PUBLIC WORKS
AND TRANSPORTATION
Prince George's County, MD

Standard Precast Concrete Box Culvert Geometric Layout (Triple Boxes)

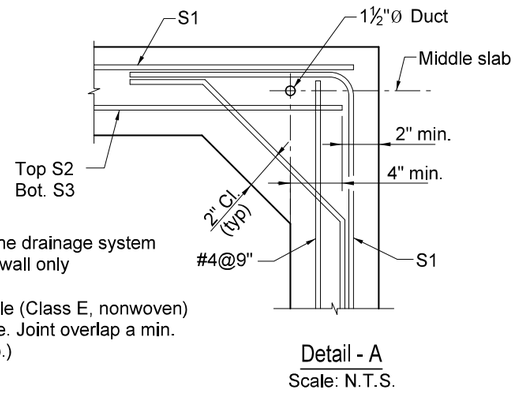
SHEET C1-7

FILE: U:\2026031141\26 PGDPWT Culvert Standards\700 CADD\706 Struct\R2-C1-7-TRIPLE BOX G LAYOUT.dgn



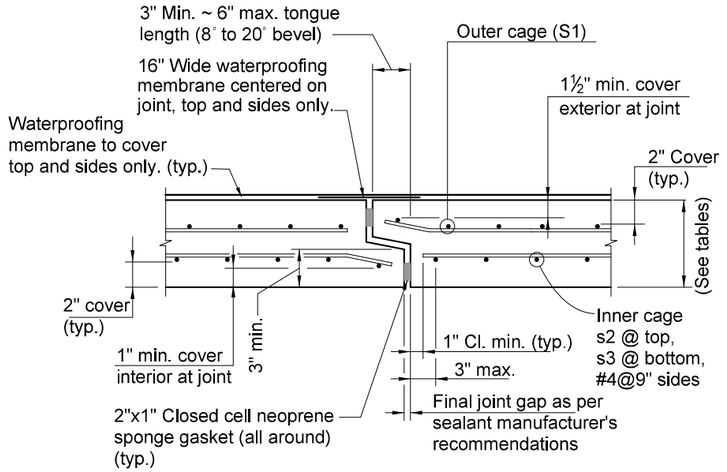
Typical Box Section

Scale: N.T.S.



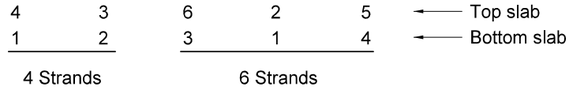
Detail - A

Scale: N.T.S.



Typical Section Thru Joint

Scale: N.T.S.

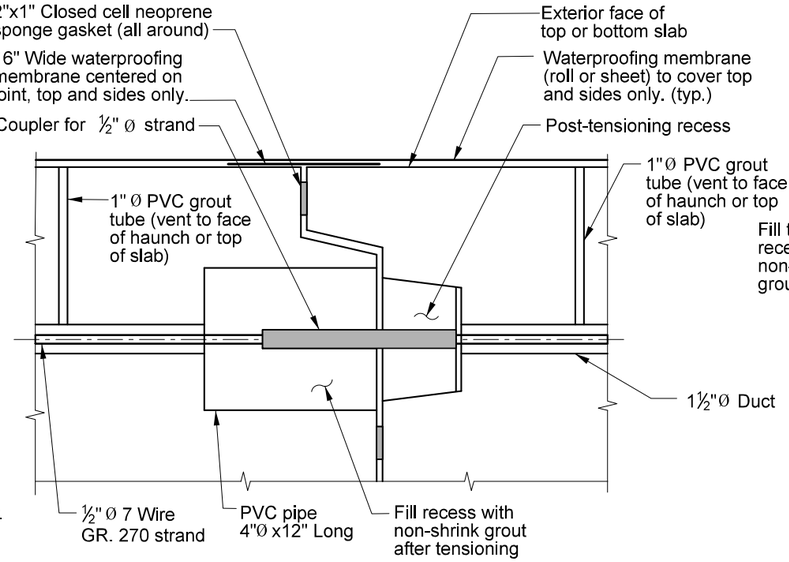


Post Tensioning Sequence

Scale: N.T.S.

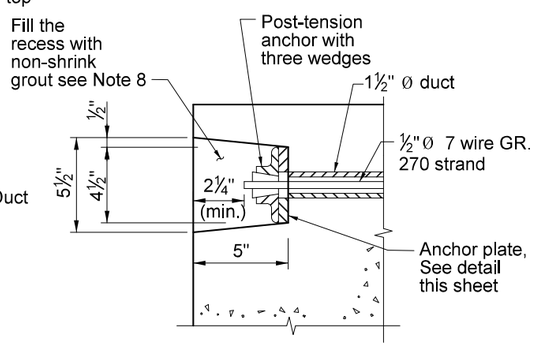
Notes:

1. Complete tensioning in three passes. ⅓, ½ and full post tensioning force.
2. First and second tensioning order of strands may be altered as required to maintain proper alignment of the culvert.



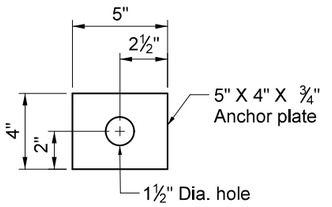
Post-Tensioning Splice Joint Detail

Scale: 3"=1'-0"



Post-Tensioning Recess Detail

Scale: 3"=1'-0"



Post-Tensioning Anchor Plate Detail

Scale: 3"=1'-0"

Notes for Precast Concrete Box Culvert:

1. Fabricator shall provide all details for post-tension connections.
2. Prestressing strands shall be ½" dia. AASHTO M 203 grade 270, low relaxation 7-wire (uncoated) each strand shall be stressed to 28,900 lbs.
3. Fabricator shall show all post-tensioning procedures including stressing sequence steps.
4. Snug fit all joints before post-tensioning.
5. Post-tensioning ducts shall be sealed at joints with seals or gaskets and grouted by contractor.
6. Strand anchor recesses shall be grouted in field by contractor using non-shrink grout after post-tensioning operations are complete.
7. All post-tensioning details and procedures must be approved by the County Engineer.
8. After post-tensioning is approved, strands shall be cut to provide a minimum of 2¼" clear from the outside face of concrete. anchorage and strands shall be coated with coal tar epoxy. recess shall be coated with an approved epoxy bonding compound before filling with non-shrink grout.
9. Post-tensioning and grouting shall be completed before backfilling and allowing traffic over the structure. Grout shall reach minimum strength before backfilling. The grout shall have corrosion inhibitor.
10. Minimum length of precast box segment is 5 feet and maximum length is 16 feet.
11. For rebar size and space, see sheet C1-11 to C1-12.
12. The contractor has the option to use 2" dia. sch 40 PVC duct for post tensioned strands.
13. The contractor has the option to use different strand, post-tensioning, splice/anchor details upon the County Engineer's review/approval.

APPROVED:

DIRECTOR DATE

REVISION DATE:	APPROVED BY:
04-08-2020	

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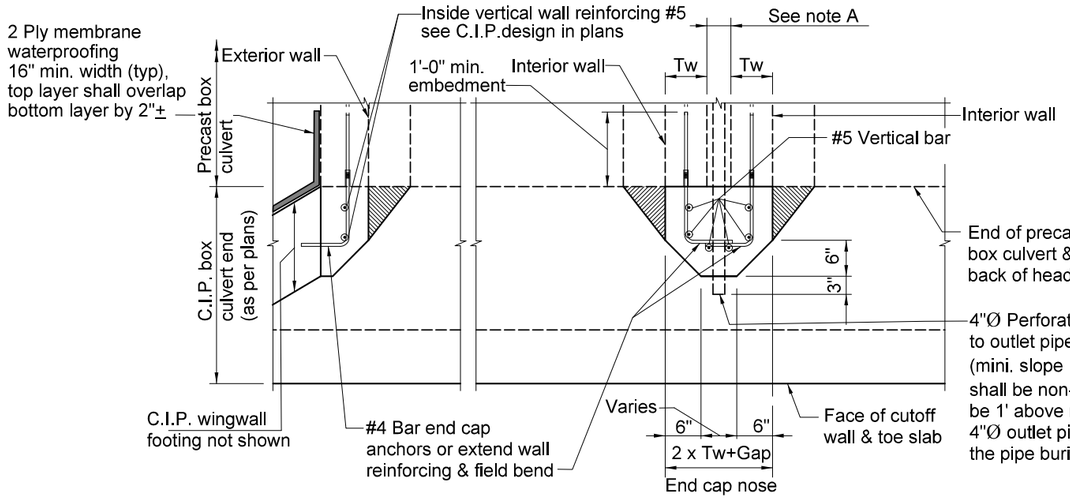
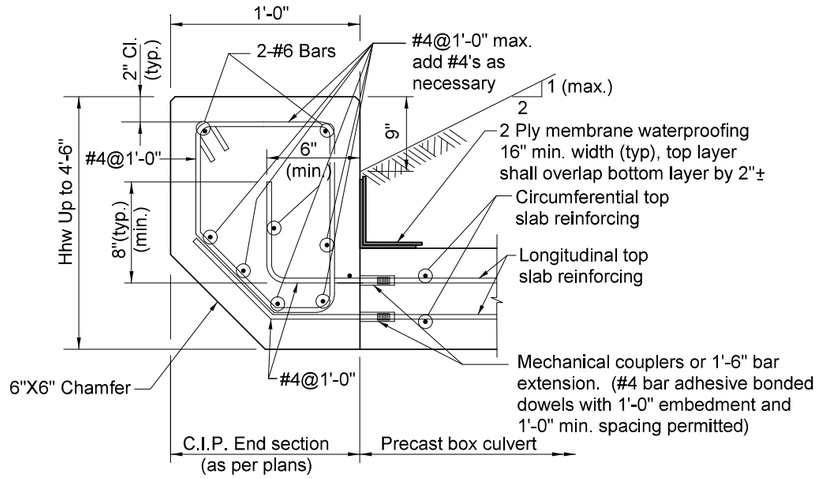
Standard Precast Concrete Box Culvert Details (1 of 3)

SHEET C1-8

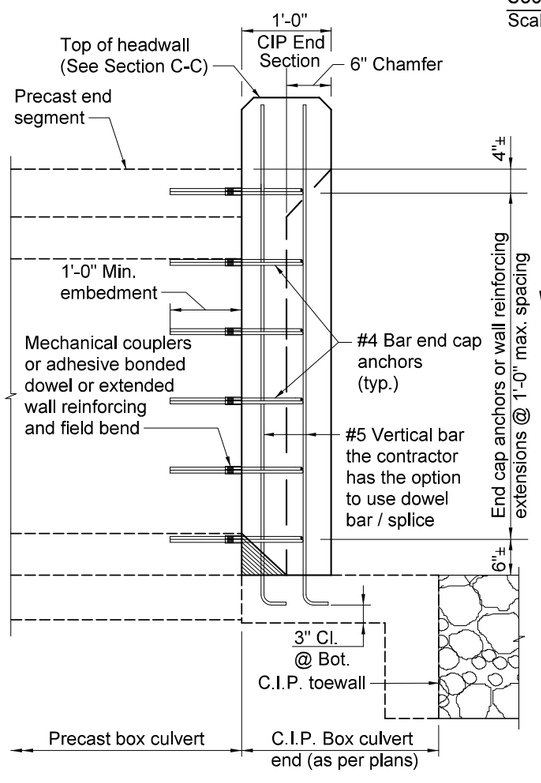
FILE: U:\2026031141\26 PGDPWT Culvert Standards\700 CADD\706 Struct\R2-C1-8- DETAILS.dgn



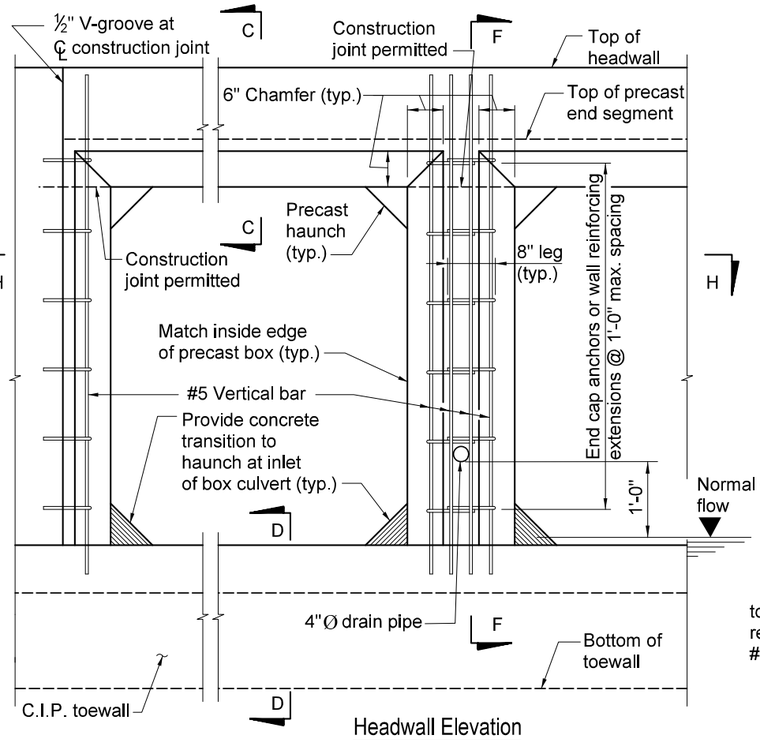
Note A
Gap 6" (min. between single cell units) filled by #57 stone, which shall be separated from adjacent soil by geotextile. #57 stone shall be placed in lifts and compacted. In lieu of No. 57 stone, Contractor has the options to use 4" (min. gap) flowable fill without additional cost to the County, and to remove the 4" Ø drain pipe in the gap.



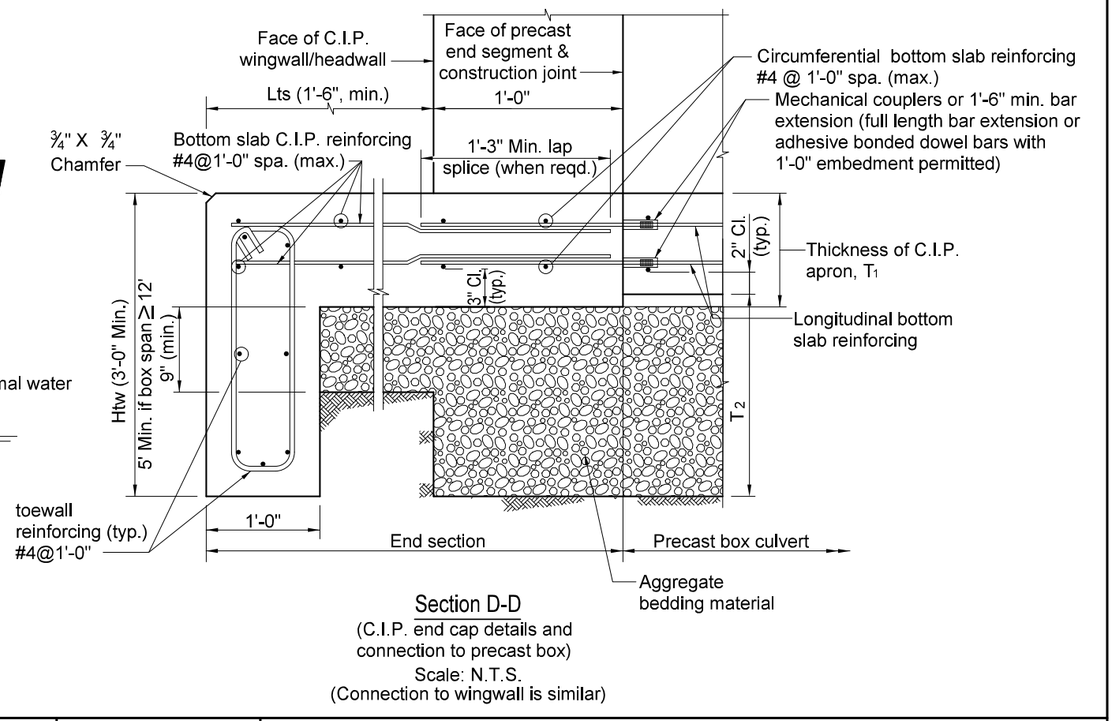
Section C-C
(C.I.P. headwall details and connection to precast box)
Scale: N.T.S.



Section F-F
(C.I.P. end cap details and connection to precast box)
Scale: N.T.S.



Headwall Elevation
(Headwall, toe slab and cutoff wall reinforcing not shown for clarity)
Scale: N.T.S.



Section D-D
(C.I.P. end cap details and connection to precast box)
Scale: N.T.S.
(Connection to wingwall is similar)

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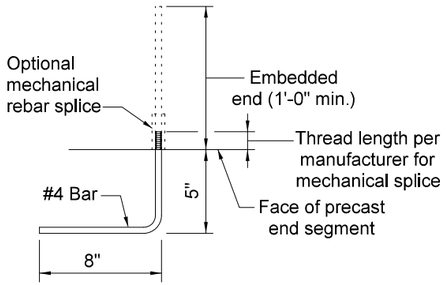
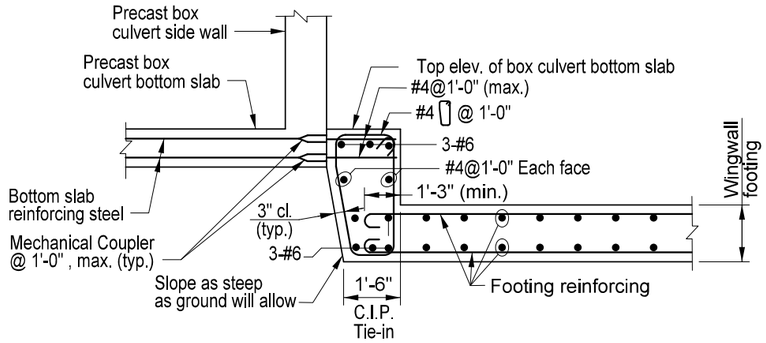
Standard Precast Concrete Box Culvert Details (2 of 3)

SHEET
C1-9

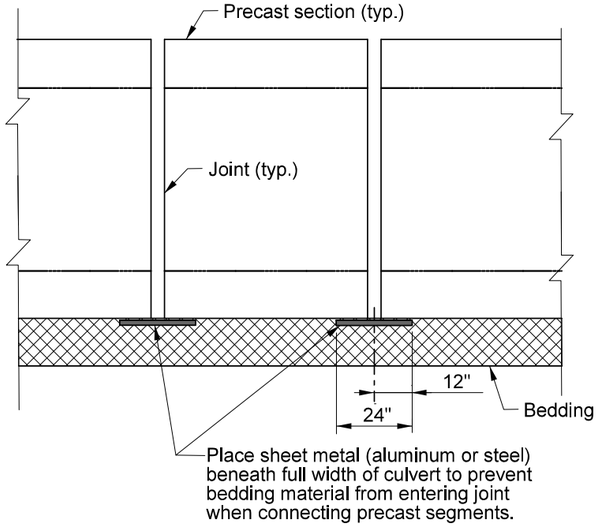


#4 Bar End Cap Anchor
Bar Bend Diagram
Scale: N.T.S.

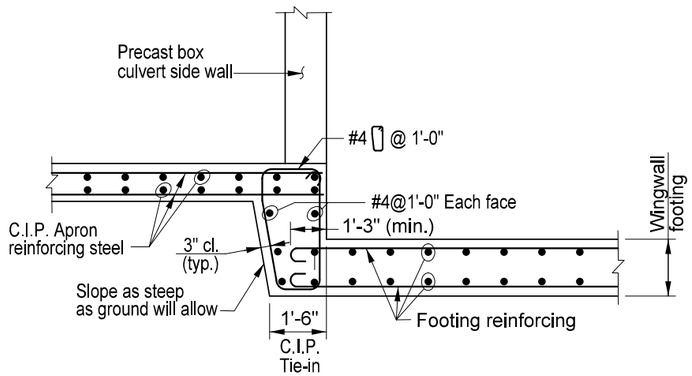


Note: For Tie-in length, see SHA STD. BC-501

Tie-in Detail for Precast Box Culvert
Bottom Slab and Wingwall Footing
Scale: N.T.S.



Elevation View at Precast Segment Joints
Scale: N.T.S.



Tie-in Detail for CIP Apron
and Wingwall Footing
Scale: N.T.S.

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04-08-2020	

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Standard Precast Concrete Box Culvert Details (3 of 3)

SHEET
C1-10

FILE: U:\20260311 41\26 PGDPWT Culvert Standards\700 CADD\706 Struct\R2-C1-10 DETAILS.dgn

Table 1 - Standard Precast Box Culvert Design - 5' & 6' Spans

Span x Rise (S) (R) (Ft.)	Slab / Wall thickness Top (Tt) (in.)	Bot. (Tb) (in.)	Side (Tw) (in.)	Haunch (H) (in.)	Design earth cover above top slab	Reinforcement S1 Exterior of slabs & walls	S2 Bot. of top slab	S3 Top of bot. slab	S5 Top slab bot. longit.	Min. req'd factored soil brg. resistance STR-I, (ksf)
5' x 5'	8	8	8	6	2'	#4 @ 9"	#5 @ 6"	#6 @ 9"	#5 @ 12"	5.8
					5'	#4 @ 9"	#6 @ 9"	#6 @ 9"	#4 @ 12"	3.4
					10'	#4 @ 9"	#6 @ 9"	#6 @ 9"		3.4
					15'	#4 @ 6"	#6 @ 6"	#5 @ 6"		4.3
					20'	#4 @ 6"	#6 @ 6"	#5 @ 6"		5.2
					25'	#4 @ 6"	#6 @ 6"	#6 @ 6"		6.1
6' x 5'	8	8	8	6	2'	#4 @ 6"	#6 @ 6"	#5 @ 6"	#5 @ 9"	5.0
					5'	#4 @ 9"	#6 @ 9"	#6 @ 9"	#4 @ 12"	3.4
					10'	#4 @ 9"	#5 @ 6"	#6 @ 9"		3.3
					15'	#4 @ 6"	#5 @ 6"	#6 @ 6"		4.2
					20'	#4 @ 6"	#6 @ 6"	#6 @ 6"		5.2
					25'	#4 @ 6"	#7 @ 6"	#6 @ 6"		6.1
6' x 6'	8	8	8	6	2'	#4 @ 6"	#6 @ 6"	#5 @ 6"	#5 @ 9"	5.3
					5'	#4 @ 9"	#6 @ 9"	#6 @ 9"	#4 @ 12"	3.5
					10'	#4 @ 9"	#5 @ 6"	#6 @ 9"		3.4
					15'	#4 @ 6"	#5 @ 6"	#6 @ 6"		4.3
					20'	#4 @ 6"	#6 @ 6"	#6 @ 6"		5.3
					25'	#4 @ 6"	#7 @ 6"	#6 @ 6"		6.2

Table 2 - Standard Precast Box Culvert Design - 7' Spans

Span x Rise (S) (R) (Ft.)	Slab / Wall thickness Top (Tt) (in.)	Bot. (Tb) (in.)	Side (Tw) (in.)	Haunch (H) (in.)	Design earth cover above top slab	Reinforcement S1 Exterior of slabs & walls	S2 Bot. of top slab	S3 Top of bot. slab	S5 Top slab bot. longit.	Min. req'd factored soil brg. resistance STR-I, (ksf)
7' x 5'	8	9	8	6	2'	#4 @ 6"	#6 @ 6"	#5 @ 6"	#5 @ 9"	4.5
		8			5'	#4 @ 6"	#7 @ 9"	#5 @ 6"	#4 @ 12"	3.4
					10'	#4 @ 6"	#6 @ 6"	#5 @ 6"		3.3
					15'	#5 @ 6"	#6 @ 6"	#6 @ 6"		4.2
				9	20'	#5 @ 6"	#7 @ 6"	#6 @ 6"		5.2
					25'	#6 @ 6"	#8 @ 6"	#7 @ 6"		6.1
7' x 6'	8	9	8	6	2'	#4 @ 6"	#6 @ 6"	#5 @ 6"	#5 @ 9"	4.6
		8			5'	#4 @ 6"	#7 @ 9"	#5 @ 6"	#4 @ 12"	3.4
					10'	#4 @ 6"	#6 @ 6"	#5 @ 6"		3.4
					15'	#4 @ 6"	#6 @ 6"	#6 @ 6"		4.3
				9	20'	#5 @ 6"	#7 @ 6"	#7 @ 6"		5.3
					25'	#5 @ 6"	#8 @ 6"	#7 @ 6"		6.2
7' x 7'	8	9	8	6	2'	#4 @ 6"	#6 @ 6"	#5 @ 6"	#5 @ 9"	4.6
		8			5'	#4 @ 6"	#6 @ 6"	#5 @ 6"	#4 @ 12"	3.5
					10'	#4 @ 6"	#6 @ 6"	#5 @ 6"		3.5
					15'	#4 @ 6"	#6 @ 6"	#6 @ 6"		4.4
				9	20'	#5 @ 6"	#7 @ 6"	#7 @ 6"		5.4
					25'	#5 @ 6"	#8 @ 6"	#7 @ 6"		6.2

Table 3 - Standard Precast Box Culvert Design - 8' Spans

Span x Rise (S) (R) (Ft.)	Slab / Wall thickness Top (Tt) (in.)	Bot. (Tb) (in.)	Side (Tw) (in.)	Haunch (H) (in.)	Design earth cover above top slab	Reinforcement S1 Exterior of slabs & walls	S2 Bot. of top slab	S3 Top of bot. slab	S5 Top slab bot. longit.	Min. req'd factored soil brg. resistance STR-I, (ksf)
8' x 5'	9	9	9	9	2'	#5 @ 6"	#6 @ 6"	#5 @ 6"	#5 @ 9"	4.3
				6	5'	#4 @ 6"	#7 @ 9"	#5 @ 6"	#4 @ 12"	3.4
					10'	#4 @ 6"	#6 @ 6"	#5 @ 6"		3.4
					15'	#5 @ 6"	#6 @ 6"	#6 @ 6"		4.3
				9	20'	#6 @ 6"	#7 @ 6"	#7 @ 6"		5.2
					25'	#6 @ 6"	#8 @ 6"	#7 @ 6"		6.1
8' x 6'	9	9	9	9	2'	#4 @ 6"	#6 @ 6"	#5 @ 6"	#5 @ 9"	4.4
				6	5'	#4 @ 6"	#5 @ 6"	#5 @ 6"	#4 @ 12"	3.5
					10'	#4 @ 6"	#6 @ 6"	#5 @ 6"		3.4
					15'	#5 @ 6"	#7 @ 6"	#6 @ 6"		4.3
				9	20'	#6 @ 6"	#7 @ 6"	#7 @ 6"		5.3
					25'	#6 @ 6"	#8 @ 6"	#7 @ 6"		6.1
8' x 7'	9	9	9	9	2'	#4 @ 6"	#6 @ 6"	#5 @ 6"	#5 @ 9"	4.5
				6	5'	#4 @ 6"	#5 @ 6"	#5 @ 6"	#4 @ 12"	3.6
					10'	#4 @ 6"	#6 @ 6"	#5 @ 6"		3.5
					15'	#5 @ 6"	#7 @ 6"	#6 @ 6"		4.4
				9	20'	#5 @ 6"	#7 @ 6"	#7 @ 6"		5.3
					25'	#6 @ 6"	#8 @ 6"	#7 @ 6"		6.2
8' x 8'	9	9	9	9	2'	#4 @ 6"	#6 @ 6"	#5 @ 6"	#5 @ 9"	4.5
				6	5'	#4 @ 6"	#5 @ 6"	#5 @ 6"	#4 @ 12"	3.6
					10'	#4 @ 6"	#6 @ 6"	#5 @ 6"		3.6
					15'	#4 @ 6"	#7 @ 6"	#6 @ 6"		4.5
				9	20'	#5 @ 6"	#7 @ 6"	#7 @ 6"		5.4
					25'	#5 @ 6"	#8 @ 6"	#7 @ 6"		6.3

Notes:

1. All longitudinal bars to be #4 with a maximum spacing of 1'-0" c/c except the longitudinal bars S5 at the bottom of top slab as shown in the table.

2. The contractor has the option to provide an alternative design. The design must be prepared by a professional engineer registered in the state of Maryland and submitted to the County Engineer for review and approval.

APPROVED:

DIRECTOR _____ DATE _____

REVISION DATE:	APPROVED BY:
04-08-2020	

Phone: 301-883-5642

DEPARTMENT OF PUBLIC WORKS
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Standard Precast Concrete Box Culvert Reinforcement Table (1 of 2)

SHEET
C1-11

FILE: U:\20260311 4\26 PGDPWT Culvert Standards\700 CADD\706 Struct\R2-C1-11 TABLE.dgn

Table 4 - Standard Precast Box Culvert Design - 9' Spans

Span x Rise (S) (R) (Ft.)	Slab / Wall thickness Top (Tt) (in.)	Bot. (Tb) (in.)	Side (Tw) (in.)	Haunch (H) (in.)	Design earth cover above top slab	REINFORCEMENT S1 Exterior of slabs & walls	S2 Bot. of top slab	S3 Top of bot. slab	S5 Top slab bot. longit.	Min. req'd factored soil brg. resistance STR-I, (ksf)
9' x 5'	10	10	10	9	2'	#5 @ 6"	# 6 @ 6"	#5 @ 6"	#5 @ 12"	4.1
				6	5'	#6 @ 9"	#5 @ 6"	#5 @ 6"		3.4
					10'	#5 @ 6"	#6 @ 6"	#5 @ 6"		3.4
					15'	#5 @ 6"	#7 @ 6"	#6 @ 6"	#4 @ 12"	4.3
		11		9	20'	#6 @ 6"	#7 @ 6"	#7 @ 6"		5.2
					25'	#7 @ 6"	#8 @ 6"	#7 @ 6"		6.1
9' x 6'	10	10	10	9	2'	#6 @ 9"	#6 @ 6"	#5 @ 6"	#5 @ 12"	4.2
				6	5'	#6 @ 9"	#5 @ 6"	#5 @ 6"		3.4
					10'	#6 @ 9"	#6 @ 6"	#5 @ 6"		3.5
					15'	#5 @ 6"	#7 @ 6"	#6 @ 6"	#4 @ 12"	4.4
		11		9	20'	#6 @ 6"	#7 @ 6"	#7 @ 6"		5.3
					25'	#6 @ 6"	#8 @ 6"	#7 @ 6"		6.2
9' x 7'	10	10	10	9	2'	#6 @ 9"	#6 @ 6"	#5 @ 6"	#5 @ 12"	4.3
				6	5'	#6 @ 9"	#5 @ 6"	#5 @ 6"		3.5
					10'	#6 @ 9"	#6 @ 6"	#5 @ 6"		3.6
					15'	#5 @ 6"	#7 @ 6"	#6 @ 6"	#4 @12"	4.5
		11		9	20'	#6 @ 6"	#7 @ 6"	#7 @ 6"		5.4
					25'	#6 @ 6"	#8 @ 6"	#7 @ 6"		6.3
9' x 8'	10	10	10	9	2'	#6 @ 9"	#6 @ 6"	#6 @ 6"	#5 @ 12"	4.4
				6	5'	#5 @ 9"	#6 @ 6"	#5 @ 6"		3.6
					10'	#6 @ 9"	#6 @ 6"	#5 @ 6"		3.7
					15'	#7 @ 9"	#7 @ 6"	#6 @ 6"	#4 @ 12"	4.5
		11		9	20'	#7 @ 9"	#8 @ 6"	#7 @ 6"		5.5
					25'	#6 @ 6"	#8 @ 6"	#8 @ 6"		6.4
9' x 9'	10	10	10	9	2'	#6 @ 9"	#6 @ 6"	#6 @ 6"	#5 @ 12"	4.4
				6	5'	#5 @ 9"	#6 @ 6"	#5 @ 6"		3.7
					10'	#6 @ 9"	#6 @ 6"	#6 @ 6"		3.7
					15'	#7 @ 9"	#8 @ 6"	#6 @ 6"	#4 @ 12"	4.6
		11		9	20'	#7 @ 9"	#8 @ 6"	#7 @ 6"		5.5
					25'	#6 @ 6"	#8 @ 6"	#8 @ 6"		6.4

Table 5 - Standard Precast Box Culvert Design - 10' Spans

Span x Rise (S) (R) (Ft.)	Slab / Wall thickness Top (Tt) (in.)	Bot. (Tb) (in.)	Side (Tw) (in.)	Haunch (H) (in.)	Design earth cover above top slab	REINFORCEMENT S1 Exterior of slabs & walls	S2 Bot. of top slab	S3 Top of bot. slab	S5 Top slab bot. longit.	Min. req'd factored soil brg. resistance STR-I, (ksf)
10' x 5'	11	11	11	6	2'	#5 @ 6"	#6 @ 6"	#5 @ 6"	#5 @ 12"	4.0
					5'	#5 @ 6"	#5 @ 6"	#5 @ 6"		3.3
					10'	#5 @ 6"	#6 @ 6"	#6 @ 6"		3.9
					15'	#6 @ 6"	#7 @ 6"	#6 @ 6"	#4 @ 12"	4.3
		12		9	20'	#6 @ 6"	#7 @ 6"	#7 @ 6"		5.2
					25'	#7 @ 6"	#8 @ 6"	#7 @ 6"		6.1
10' x 6'	11	11	11	6	2'	#5 @ 6"	#6 @ 6"	#5 @ 6"	#5 @ 12"	4.1
					5'	#6 @ 9"	#6 @ 6"	#5 @ 6"		3.4
					10'	#5 @ 6"	#6 @ 6"	#6 @ 6"		4.0
					15'	#5 @ 6"	#7 @ 6"	#6 @ 6"	#4 @ 12"	4.4
		12		9	20'	#6 @ 6"	#8 @ 6"	#7 @ 6"		5.3
					25'	#7 @ 6"	#8 @ 6"	#8 @ 6"		6.2
10' x 8'	11	11	11	9	2'	#6 @ 9"	#6 @ 6"	#6 @ 6"	#5 @ 12"	4.2
				6	5'	#6 @ 9"	#6 @ 6"	#5 @ 6"		3.6
					10'	#6 @ 9"	#6 @ 6"	#6 @ 6"		4.2
					15'	#5 @ 6"	#7 @ 6"	#7 @ 6"	#4 @ 12"	4.6
		12		9	20'	#6 @ 6"	#8 @ 6"	#7 @ 6"		5.5
					25'	#6 @ 6"	#8 @ 6"	#8 @ 6"		6.4
10' x 10'	11	11	11	9	2'	#6 @ 9"	#6 @ 6"	#6 @ 6"	#5 @ 12"	4.4
				6	5'	#6 @ 9"	#6 @ 6"	#6 @ 6"		3.8
					10'	#6 @ 9"	#6 @ 6"	#6 @ 6"		4.3
					15'	#5 @ 6"	#7 @ 6"	#7 @ 6"	#4 @ 12"	4.8
		12		9	20'	#5 @ 6"	#8 @ 6"	#7 @ 6"		5.7
					25'	#6 @ 6"	#9 @ 6"	#8 @ 6"		6.6

Table 6 - Standard Precast Box Culvert Design - 11' Spans

Span x Rise (S) (R) (Ft.)	Slab / Wall thickness Top (Tt) (in.)	Bot. (Tb) (in.)	Side (Tw) (in.)	Haunch (H) (in.)	Design earth cover above top slab	REINFORCEMENT S1 Exterior of slab & walls	S2 Bot. of top slab	S3 Top of bot. slab	S5 Top of top slab	Min. req'd factored soil brg. resistance STR-I, (ksf)
11' x 6'	12	12	12	6	2'	#5 @ 6"	#6 @ 6"	#5 @ 6"	#5 @ 12"	4.0
					5'	#6 @ 9"	#6 @ 6"	#6 @ 6"		3.5
					10'	#6 @ 6"	#6 @ 6"	#6 @ 6"		4.0
					15'	#6 @ 6"	#7 @ 6"	#7 @ 6"	#4 @ 12"	4.4
		13		9	20'	#6 @ 6"	#8 @ 6"	#8 @ 6"		5.3
					25'	#7 @ 6"	#9 @ 6"	#8 @ 6"		6.2
11' x 8'	12	12	12	6	2'	#6 @ 9"	#6 @ 6"	#6 @ 6"	#5 @ 12"	4.2
					5'	#6 @ 9"	#6 @ 6"	#6 @ 6"		3.7
					10'	#5 @ 6"	#6 @ 6"	#6 @ 6"		4.2
					15'	#5 @ 6"	#7 @ 6"	#7 @ 6"	# 4 @ 12"	4.6
		13		9	20'	#6 @ 6"	#8 @ 6"	#7 @ 6"		5.5
					25'	#6 @ 6"	#9 @ 6"	#8 @ 6"		6.4
11' x 10'	12	12	12	6	2'	#6 @ 9"	#6 @ 6"	#6 @ 6"	#5 @ 12"	4.4
					5'	#6 @ 9"	#6 @ 6"	#6 @ 6"		3.8
					10'	#6 @ 9"	#7 @ 6"	#6 @ 6"		4.4
					15'	#6 @ 6"	#7 @ 6"	#7 @ 6"	#4 @ 12"	4.8
		13		9	20'	#6 @ 6"	#8 @ 6"	#8 @ 6"		5.7
					25'	#6 @ 6"	#9 @ 6"	#8 @ 6"		6.6

Table 7 - Standard precast box culvert designs -12' spans

Span x Rise (S) (R) (Ft.)	Slab / Wall thickness Top (Tt) (in.)	Bot. (Tb) (in.)	Side (Tw) (in.)	Haunch (H) (in.)	Design earth cover above top slab	Reinforcement S1 Exterior of slabs & walls	S2 Bot. of top slab	S3 Top of bot. slab	S5 Top slab bot. longit.	Min. req'd factored soil brg. resistance STR-I, (ksf)
12'x6'	13	13	13	6	2'	#5 @ 6"	#6 @ 6"	#5 @ 6"	#5 @ 12"	3.8
					5'	#5 @ 6"	#6 @ 6"	#5 @ 6"		3.5
					10'	#5 @ 6"	#6 @ 6"	#6 @ 6"		4.0
					15'	#6 @ 6"	#7 @ 6"	#7 @ 6"	#4 @ 12"	4.5
		14		9	20'	#7 @ 6"	#8 @ 6"	#7 @ 6"		5.4
					25'	#7 @ 6"	#9 @ 6"	#8 @ 6"		6.3
12'x8'	13	13	13	6	2'	#6 @ 9"	#6 @ 6"	#6 @ 6"	#5 @ 12"	4.0
					5'	#6 @ 9"	#6 @ 6"	#6 @ 6"		3.7
					10'	#5 @ 6"	#7 @ 6"	#6 @ 6"		4.2
					15'	#6 @ 6"	#7 @ 6"	#7 @ 6"	#4 @ 12"	4.6
		14		9	20'	#6 @ 6"	#8 @ 6"	#8 @ 6"		5.5
					25'	#7 @ 6"	#9 @ 6"	#8 @ 6"		6.4
12'x10'	13	13	13	6	2'	#6 @ 9"	#6 @ 6"	#6 @ 6"	#5 @ 12"	4.1
					5'	#6 @ 9"	#6 @ 6"	#6 @ 6"		3.9
					10'	#5 @ 6"	#7 @ 6"	#6 @ 6"		4.4
					15'	#5 @ 6"	#7 @ 6"	#7 @ 6"	#4 @ 12"	4.8
		14		9	20'	#6 @ 6"	#8 @ 6"	#8 @ 6"		5.7
					25'	#6 @ 6"	#9 @ 6"	#8 @ 6"		6.6

Notes:

1. All longitudinal bars to be #4 with a maximum spacing of 1'-0" c/c except the longitudinal bars S5 at the bottom of top slab as shown in the table.
2. The contractor has the option to provide an alternative design. The design must be prepared by a professional engineer registered in the state of Maryland and submitted to the County Engineer for review and approval.

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REVISION DATE:	APPROVED BY:
04-08-2020	

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Prince George's County, MD

Standard Precast Concrete Box Culvert Reinforcement Table (2 of 2)

SHEET C1-12

FILE: U:\2026031141\26 PGDPWT Culvert Standards\700 CADD\706 Struct\R2-C1-12-TABLE.dgn

General Notes for Pipe Culvert

Specifications:
Design - AASHTO LRFD Bridge Design Specifications (latest edition), The Prince George's County DPW&T " Specifications and Standards for Roadways and Bridges" (latest edition).

Construction - Maryland Department of Transportation State Highway Administration (MDOT SHA) Standard Specifications for Construction and Materials (latest edition)

Design Loads:
HL-93 with 2-inch future wearing surface.

Design Reference:
Concrete pipe design manual (latest edition), American Concrete Pipe Association.

Fill Height:
A minimum 2 feet of earth cover over the pipes is required.

Materials for precast concrete pipe:
Precast concrete pipe type shall be Class IV or V per ASTM C76. Class type I, II or III are not allowed. The shown pipe in this set of standards is round. They are also applicable to elliptical pipes with equivalent round pipe cross section.

Materials for C.I.P. concrete:
The headwall concrete shall be SHA Mix. No. 3 (3,500 psi) unless noted otherwise. Reinforcing steel shall conform to ASTM A615 grade 60. ONLY GRADE 60 CAN BE USED ON THE PROJECT. All rebars shall be epoxy coated. A minimum of 2-inch clear concrete cover to all reinforcement bars shall be provided unless noted otherwise. The contractor shall supply shop drawings to the County Engineer for review and approval. No material shall be ordered or fabricated until written approval is received for the proposed structure. Any changes to the enclosed details must be submitted to the County Engineer for review and approval.

Chamfer:
All exposed corners of all concrete structures shall be chamfered with ¾"x¾" milled chamfered strips unless noted otherwise.

Pipe Joint:
All concrete pipe joints shall be sealed in accordance with SHA Spec. Section 303.

Structure Length:
Culverts with 17 feet or more opening length measured in accordance with National Bridge Inspection Standards (NBIS) 23 CRF 650.305 shall be resized to provide a minimum length of 20 feet as measured along the centerline of the roadway, see Sheet M-3. Culvert is not allowed to have more than 3 cells.

Criteria for Utility Line Crossing:
Place utility line away from the structure, Minimum of 5 feet outside of the county structural components. This is the preferred option for new construction. For Details, see Sheet M-2.

Stream Diversion:
The designer shall prepare stream diversion plans as needed and submit to Soil Conservation District (SCD) for review and approval. State and Federal permits may be required

Tables:
The designer shall fill out the blank tables as applicable in this set of drawings and Hydrologic and Hydraulic Data Table on Sheet M-1.

Right of Way/Easement:
The Developer must provide R.O.W./drainage easement at least 10 feet outside of structure foundation and riprap for maintenance of structure (See Geometric Layout Sheet.)

Bridge Number:
The designer shall send request to DPW&T (Department of Public Works and Transportation) via DPIE to assign a bridge number to the new structure.

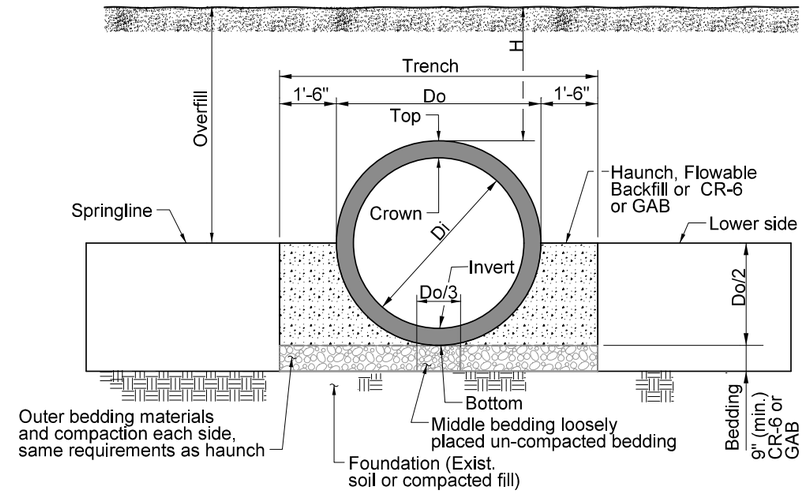
Restrictions for Placing and Using Equipment on Existing or New Structure/or Storing Materials on/or Against Structures:
There are restrictions on placing equipment on existing and new structure(s) and storing materials on/or against existing and new structure(s) elements. The limitations basically relate to loads that are beyond Maryland's legal vehicles and/or posted load limits (where applicable) and materials stockpiled on/or against structure's or structure's elements. for details of such restrictions see SHA Std Spec. Section TC 6.14 titled "RESTRICTIONS FOR PLACING AND USING EQUIPMENT ON STRUCTURES, OR STORING MATERIALS ON/OR AGAINST STRUCTURES" in the contract documents. in order to comply with this article, the contractor shall read section tc 6.14 prior to commencing any work on structure(s) in this contract. Vehicles shall not be allowed to cross over the culvert until a minimum of 3 feet of compacted fill has been placed over the culvert, or approved by the County Engineer.

Foundation Requirements:
Undercutting and backfilling with crusher run aggregate CR-6 or graded aggregate base GAB may be necessary in order to achieve the required factored bearing resistance. Geotechnical report must be submitted with the plans. The report shall be prepared by a Professional Geotechnical Engineer registered the State of Maryland per SHA PPM D-79-17(4). Compact the material that is in lower side zone to at least 95 percent of the maximum dry density per AASHTO T180. The report shall include foundation recommendation, required bearing capacity, and recommendation for undercut/backfill to achieve the required bearing capacity.

Construction Sequence:
The construction sequence is to place the bedding to grade; install the pipe to grade; compact the bedding outside of the middle-third of the pipe; and then place and compact the haunch area up to the springline of the pipe. The bedding outside the middle-third of the pipe may be compacted prior to placing the pipe.

Load Rating:
There are two methods for design of reinforced concrete pipe - indirect design and direct design methods. Indirect design method, using D-loads, is a widely used empirical method for selecting and specifying pipes. The specified D-load for a pipe is the minimum test load where cracks no more than 0.01 inch in width are generated in a three-edge bearing test. Direct design method follows the principles of strength of material and reinforced concrete design. Standard installation type 2 per AASHTO LRFD Specs. Section 12.10.2.1 is assumed for the design and load rating of pipes. It is preferred that pipes less than 72 inches in diameter be designed using indirect method. For larger diameter pipe, direct design might be more appropriate. When using indirect design method, if the rating vehicle induces D0.01 load lower than the specified pipe class capacity, its inventory and operating ratings can indicate the tons of the vehicle with a RF=1.0 for both inventory and operating rating. D-load to produce a 0.01 inch crack for Class IV and Class V reinforced concrete pipe is 2,000 and 3,000 pounds per linear foot per foot of inside diameter respectively.

Load rating analysis shall be performed per SHA PPM D-97-47(4) prior to the construction permit approval. During construction phase, if there is change in the site conditions then the load rating analysis shall be recalculated and resubmitted for County's approval prior to as-built approval and bond release.



Pipe Installation Terminology

Date: April 8, 2020

HL-93	
LRFR Inventory	LRFR Operating

Legal Truck	Operating (Tons)
H-15	
Type 4	
HS-20	
3S2	

Permit Truck	Operating (Tons)
150K	
90K Comb.	
90K Crane	
90K Cargo	
80K Cargo	
120K Spec.	
108K Crane	
120K Crane	

Index of Sheets

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Jay Shah, P.E., Project Manager, Phone: 301-883-3173, Email: jdshah@co.pg.md.us
Highway and Bridge Design Division
Office of Engineering and Project Management
Prince George's County DPW&T

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DIRECTOR DATE

REVISION DATE:	APPROVED BY:
04-08-2020	

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DEPARTMENT OF PUBLIC WORKS
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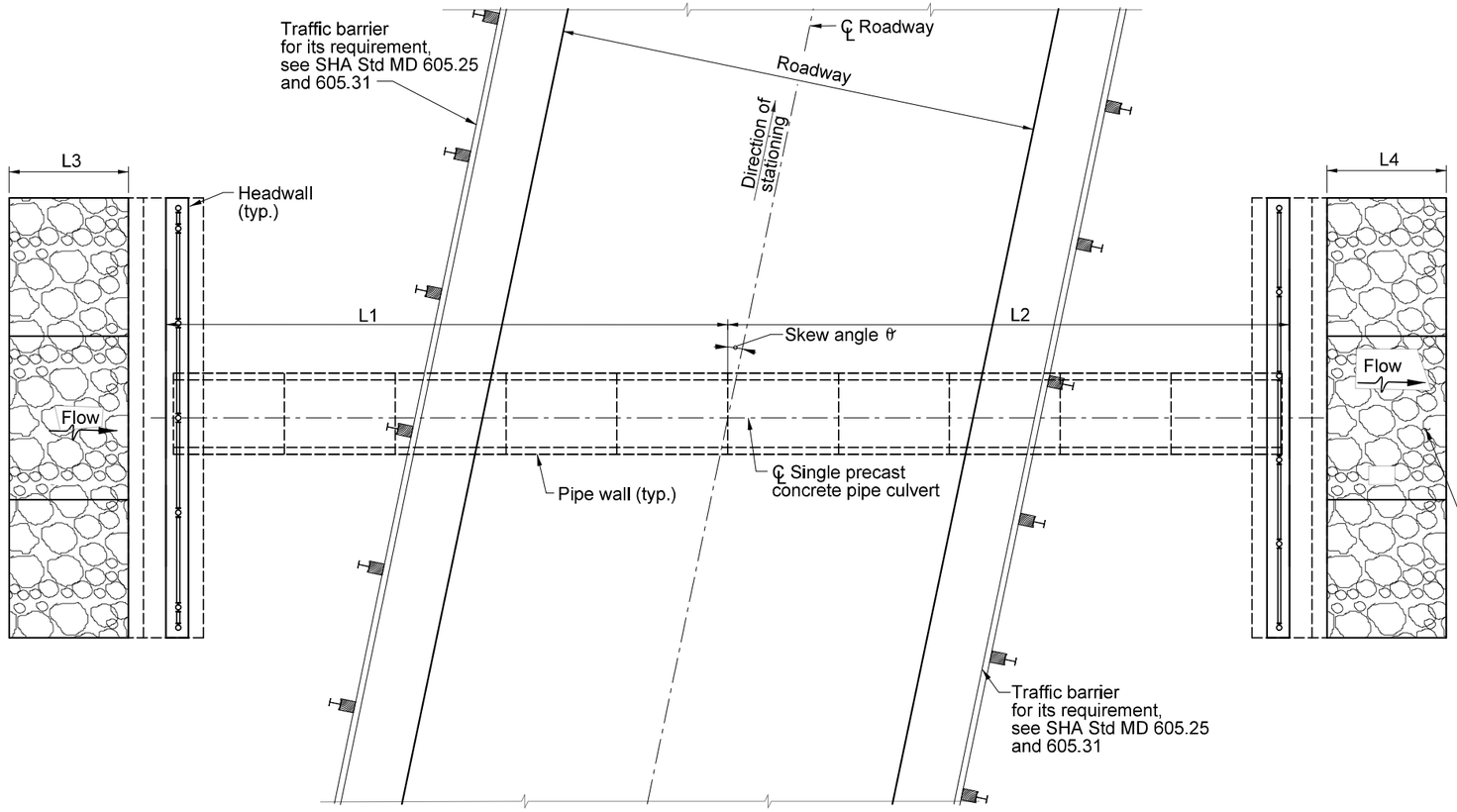
Prince George's County, MD

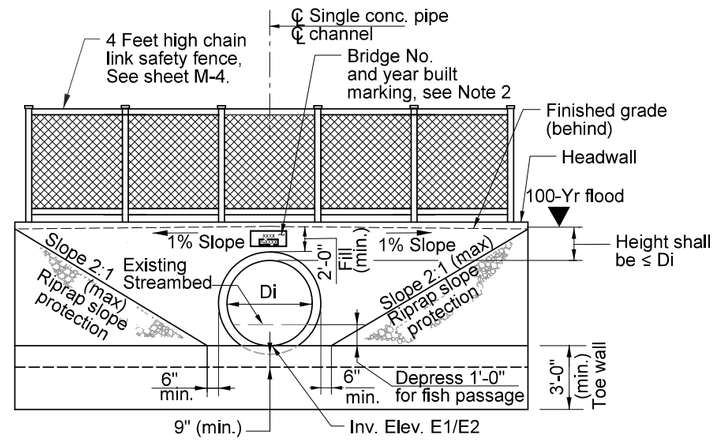
Standard Precast Concrete Pipe Culvert General Notes

SHEET C2-1



Plan - Single Culvert

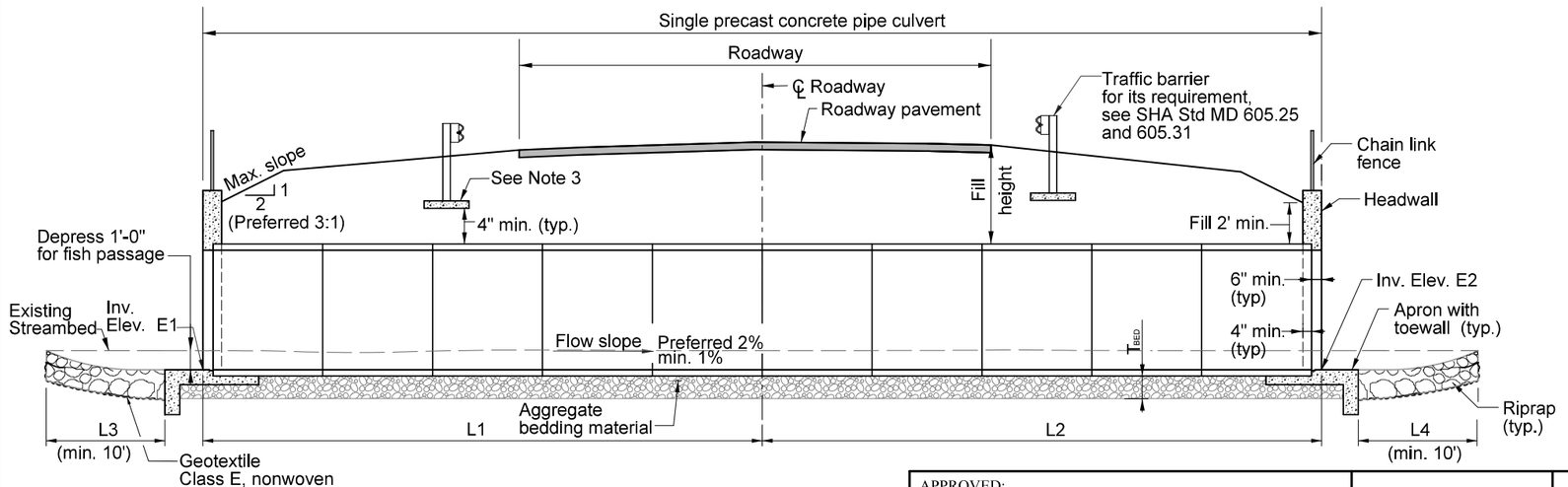
Scale: N.T.S.



Elevation

Scale: N.T.S.

Design plunge pool as needed at outfall in accordance with the latest Prince George's county SWM design manual and Maryland standards and specifications for soil erosion and sediment control, see details on Sheet M-7.



Longitudinal Section

Scale: N.T.S.

Notes:

1. Install chain link safety fence along top of headwall and wingwalls. For chain link safety fence details, see PG DPW&T Std. Nos. 300.27 and 300.28, "Chain Link Fence (Commercial Property Installation)" on Sheet M-4.
2. For Bridge No. and year built marking, see MD SHA Std. No. SI-103 and DPWT Std. No. 300.32 on Sheet M-4 & M-5. All numerals shall be indented in concrete.
3. For traffic barrier over culvert, the preferred option is standard traffic barrier for roadway (See SHA Std MD 605.25). If the fill is not deep enough to accommodate the guardrail post, the 2nd option is SHA Std. MD 605.26 traffic barrier W Beam post placement details for spanning 12'-2" to 18'-5" openings. If neither option 1 or 2 works, the 3rd option is anchoring the guardrail post on the 4'x4'x8" concrete slab. See sheet M-3 for details.
4. See sheet C2-1 for general notes.
5. Allowable pipe inside diameter for single pipe culvert is from 48" to 72".
6. Straight concrete endwall (no wingwalls) is shown. It is intended for use outside of the road clear zone. winged concrete endwall (skew angle between endwall and wingwall) is also acceptable. Standard county headwall and wingwall details for pipe culverts can be used. See details on Sheet M-6.
7. It is the responsibility of the designer to submit the designs and plans to DPIE for review and approval. The designs/plans shall be prepared by a Professional Engineer registered in the State of Maryland.
8. The construction of pipe culverts shall be in accordance with Maryland SHA Specs. Section 303.

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REVISION DATE:	APPROVED BY:
04-08-2020	

Prince George's County DPW&T

Phone: 301-883-5642

DEPARTMENT OF PUBLIC WORKS
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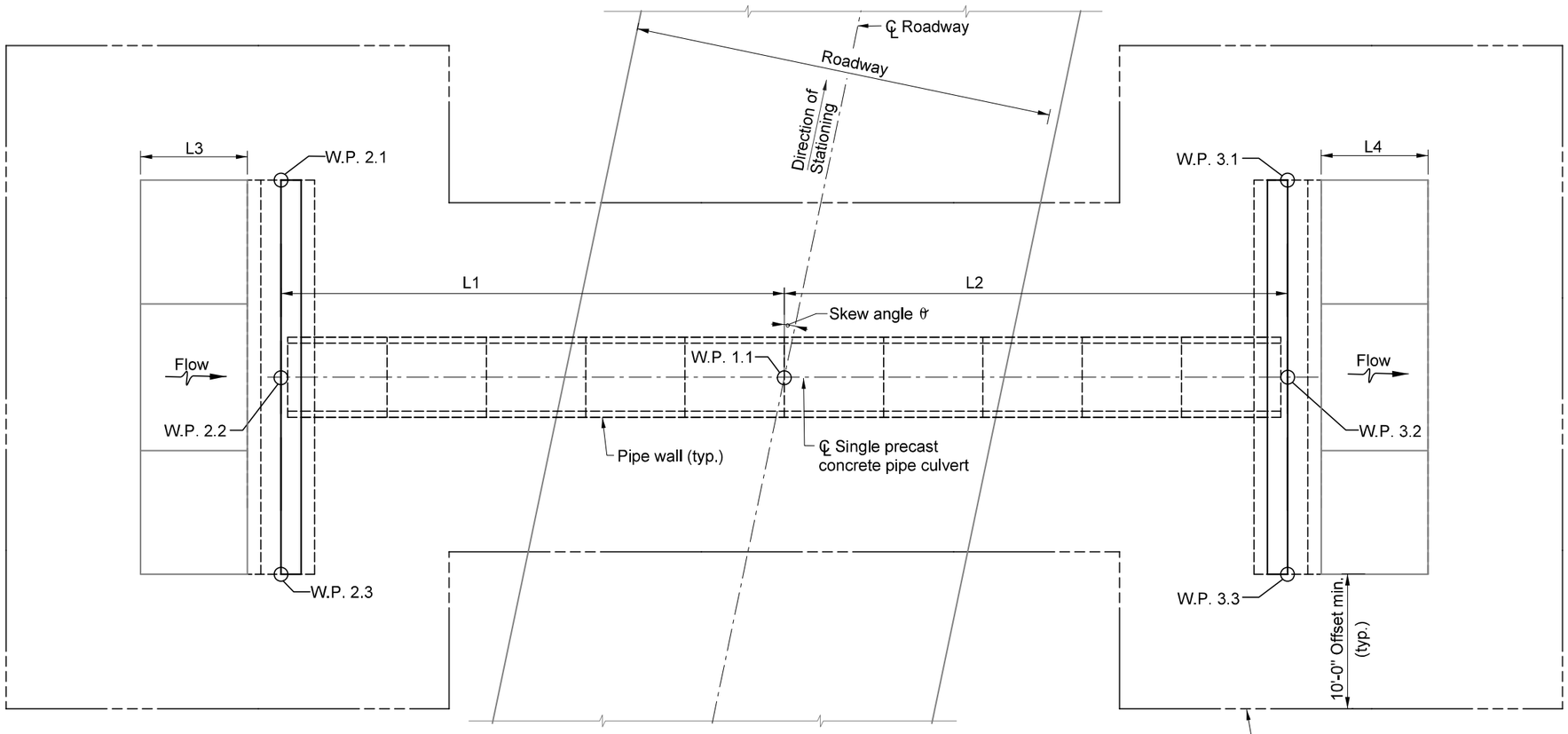
Prince George's County, MD

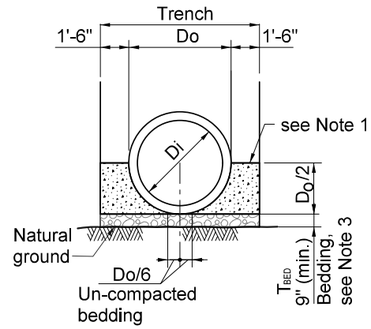
Standard Precast Concrete Pipe Culvert General Plan & Elevation (Single Pipe, 48" Ø - 72" Ø)

SHEET
C2-2

FILE: U:\20260311 4\26 PGDPWT Culvert Standards\700 CADD\706 Struct\R2-C2-2-SINGLE PIPE.dgn



Geometric Layout
Scale: N.T.S.



Pipe Bedding Details
Scale: N.T.S.

Working Point Table				
Point	Station	Offset	North	East
W.P.1.1				
W.P.2.1				
W.P.2.2				
W.P.2.3				
W.P.3.1				
W.P.3.2				
W.P.3.3				

Culvert Dimension Table										
Culvert Length L1	Culvert Length L2	Skew θ	Riprap Class		Riprap L3	Riprap L4	Inside Dia. Di	Bedding Materials Thickness TBED	Inv. Elev. E1	Inv. Elev. E2
			Upstream	Downstream						

Notes:

1. The gap between reinforced concrete pipes and trench shall be filled with flowable backfill or CR-6 or GAB aggregate up to center of the pipe and both sides shall be done simultaneously.
2. The contractor shall ensure complete and satisfactory tamping of backfill material in the area immediately adjacent to the lower portion of pipes with extra care and it shall be extended to the bottom of roadway subgrade.
3. Bedding material for reinforced concrete pipe and subgrade material under head wall shall be CR-6 or GAB, 9" thickness minimum.
4. All pipe joints shall use rubber gasket.
5. Riprap is not shown for clarity.
6. Subgrade below the pipe bedding is subject to the analysis and recommendations by the geotechnical engineer.

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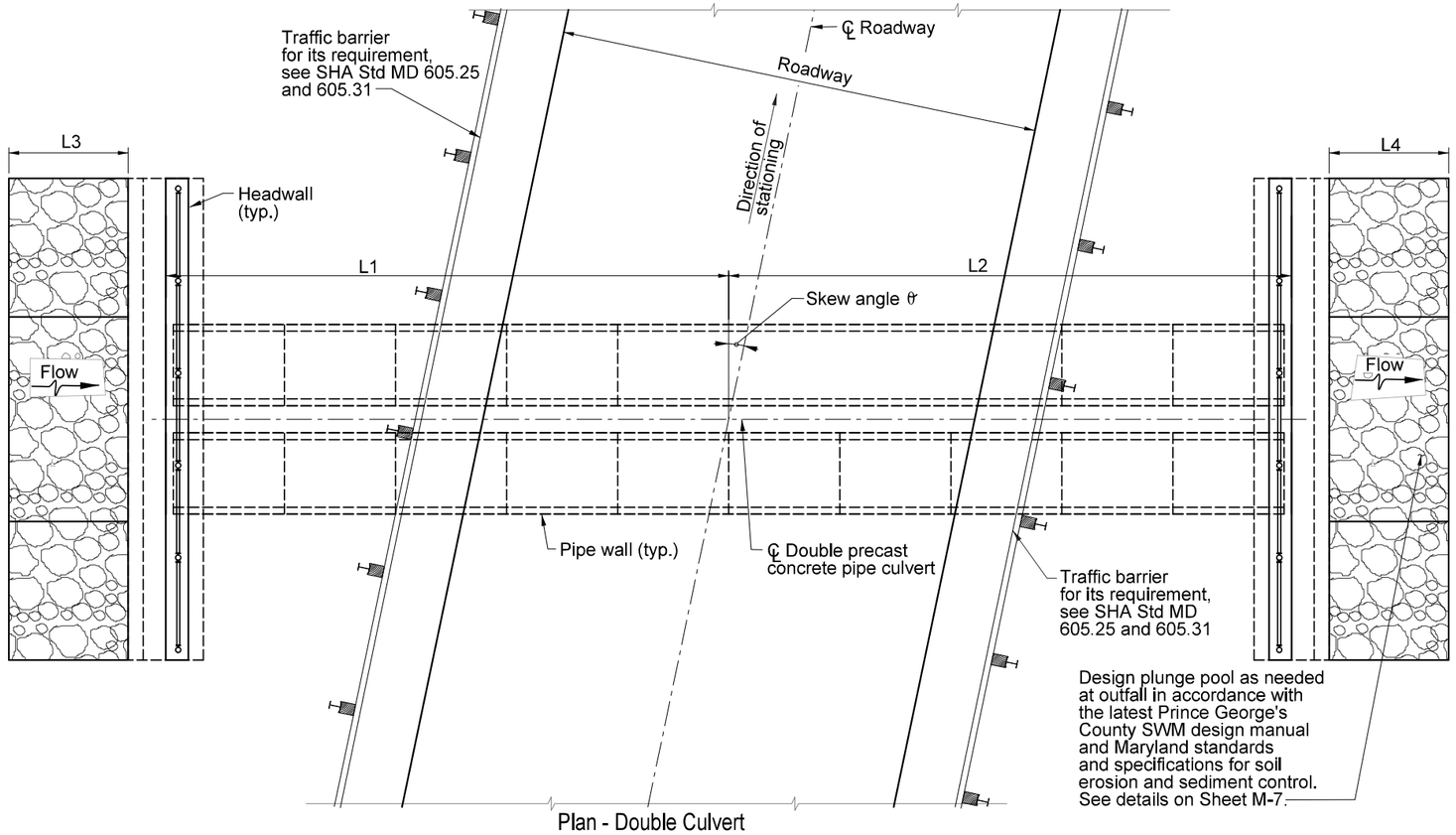
Prince George's County, MD

Standard Precast Concrete Pipe Culvert Geometric Layout (Single Pipe, 48" Ø - 72" Ø)

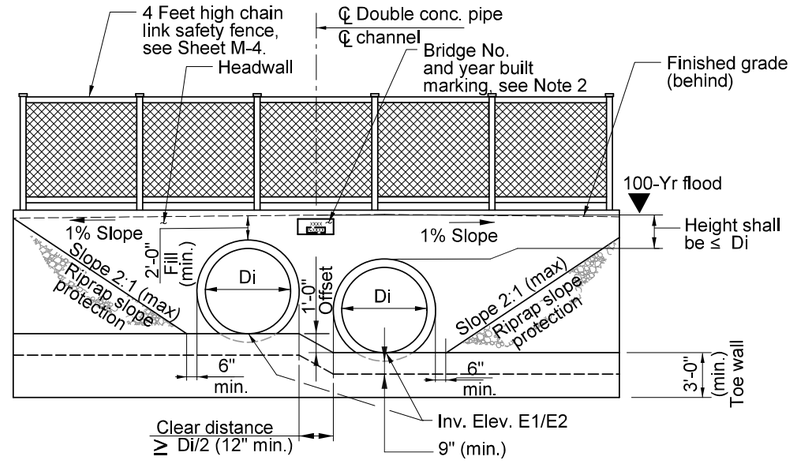
SHEET
C2-3

FILE: U:\2026031141\26 PGDPWT Culvert Standards\700 CADD\706 Struct\R2-C2-3-SINGLE PIPE G LAYOUT.dgn



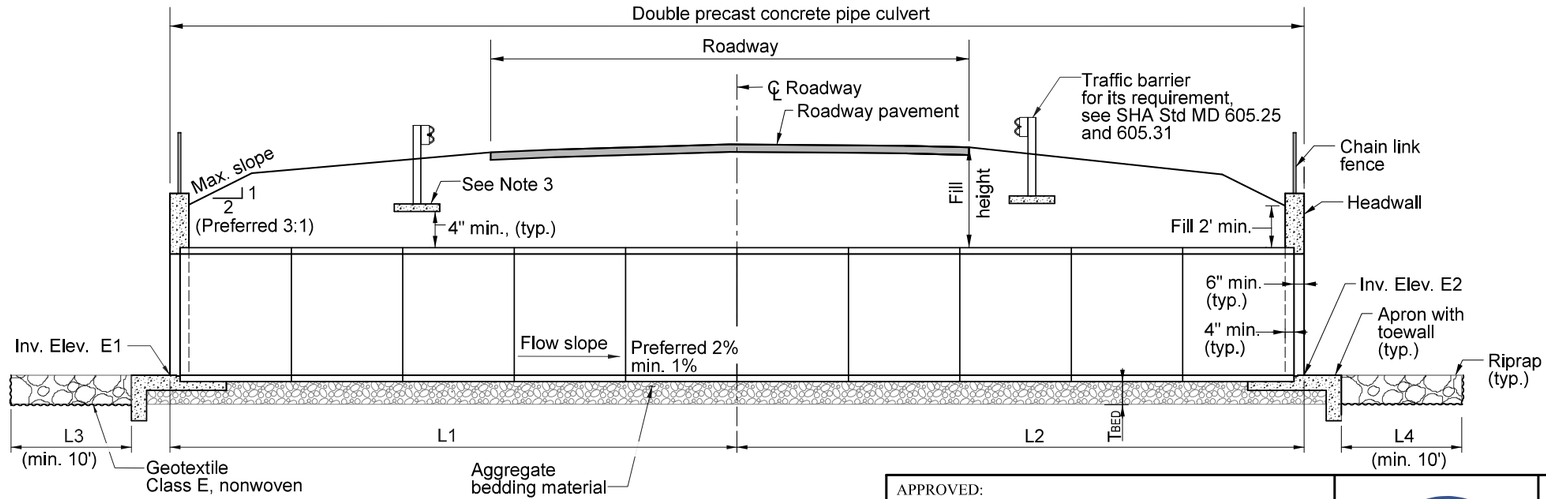
Plan - Double Culvert

Scale: N.T.S.



Elevation

Scale: N.T.S.



Longitudinal Section

Scale: N.T.S.

Notes:

1. Install chain link safety fence along top of headwall and wingwalls. For chain link safety fence details, see DPW&T Std. Nos. 300.27 and 300.28, "Chain Link Fence (Commercial Property Installation)" on Sheet M-4.
2. For Bridge No. and year built marking, see MD SHA Std. No. SI-103 and DPWT Std. No. 300.32 on Sheet M-4 & M-5. All numerals shall be indented in concrete.
3. For traffic barrier over culvert, the preferred option is standard traffic barrier for roadway (see SHA Std MD 605.25). If the fill is not deep enough to accommodate the guardrail post, the 2nd option is SHA Std. MD 605.26 traffic barrier W Beam post placement details for spanning 12'-2" to 18'-5" openings. If neither option 1 or 2 works, the 3rd option is anchoring the guardrail post on the 4'x4'x8" concrete slab. See sheet M-3 for details.
4. See sheet C2-1 for general notes.
5. Allowable pipe inside diameter for double pipe culvert is from 24" to 72".
6. Straight concrete endwall (no wingwalls) is shown. It is intended for use outside of the road clear zone. winged concrete endwall (skew angle between endwall and wingwall) is also acceptable. Standard county headwall and wingwall details for pipe culverts can be used as guidlines. See details on Sheet M-6.
7. It is the responsibility of the designer to submit the designs and plans to DPIE for review and approval. The designs/plans shall be prepared by a Professional Engineer registered in the State of Maryland.
8. The construction of pipe culverts shall be in accordance with Maryland SHA Specs. Section 303.

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DIRECTOR DATE

REVISION DATE:	APPROVED BY:
04-08-2020	

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DEPARTMENT OF PUBLIC WORKS
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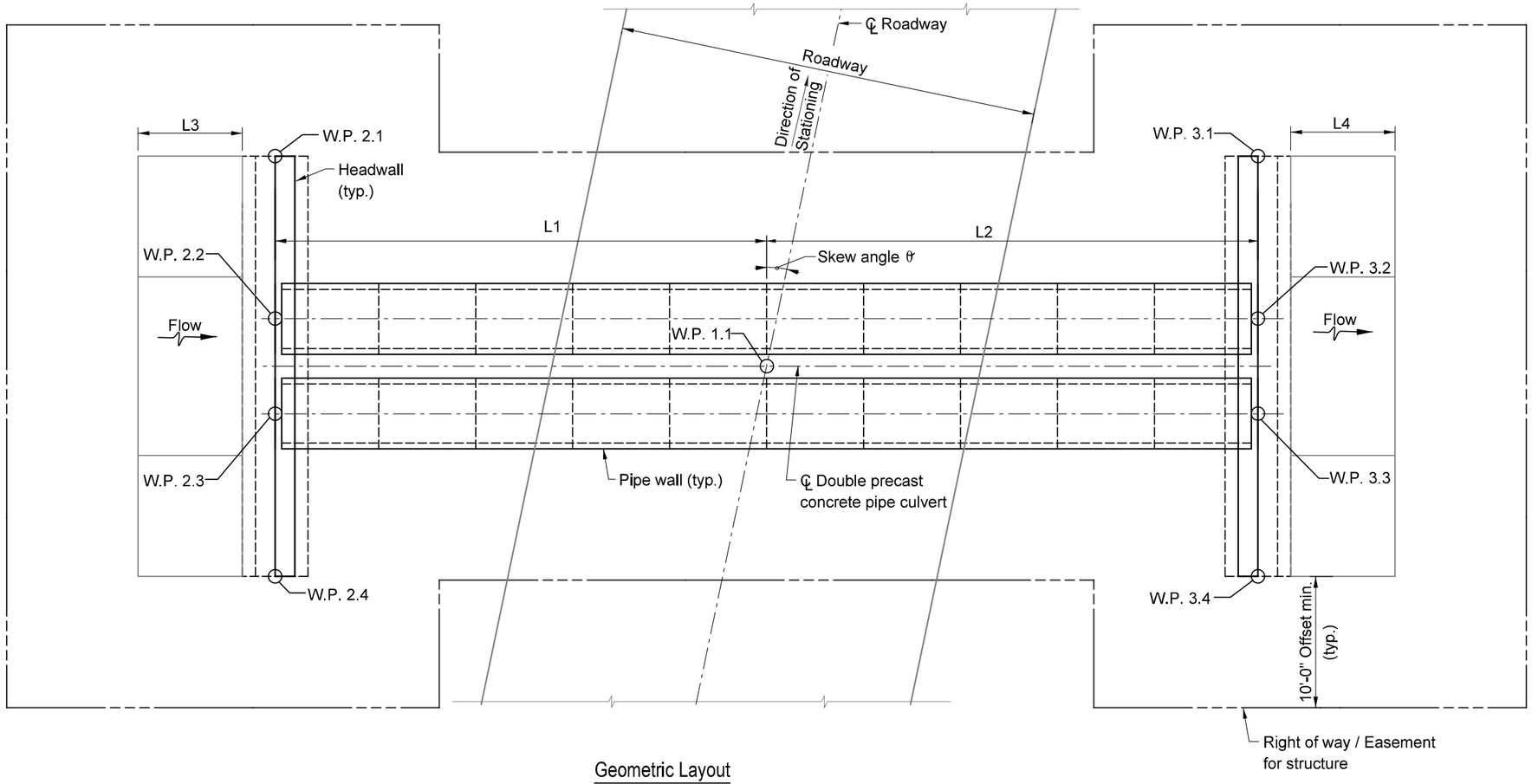
Prince George's County, MD

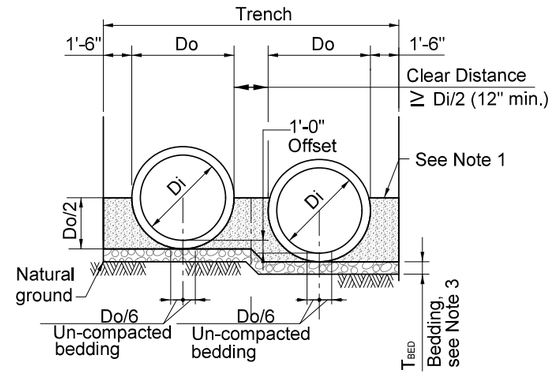
Standard Precast Concrete Pipe Culvert General Plan & Elevation (Double Pipe , 24" Ø - 72" Ø)

SHEET
C2-4

FILE: U:\20260311 4\26 PGDPWT Culvert Standards\700 CADD\706 Struct\R2-C2-4-DOUBLE PIPE.dgn



Geometric Layout
Scale: N.T.S.



Pipe Bedding Details
Scale: N.T.S.

Working Point Table				
Point	Station	Offset	North	East
W.P.1.1				
W.P.2.1				
W.P.2.2				
W.P.2.3				
W.P.2.4				
W.P.3.1				
W.P.3.2				
W.P.3.3				
W.P.3.4				

Culvert Dimension Table										
Culvert Length L1	Culvert Length L2	Skew θ	Riprap Class		Riprap L3	Riprap L4	Inside Dia. Di	Bedding Materials Thickness TBED	Inv. Elev. E1	Inv. Elev. E2
			Upstream	Downstream						

Notes:

1. The gap between reinforced concrete pipes and trench shall be filled with flowable backfill or CR-6 or GAB aggregate up to center of the pipe and both sides shall be done simultaneously.
2. The contractor shall ensure complete and satisfactory tamping of backfill material in the area immediately adjacent to the lower portion of pipes with extra care and it shall be extended to the bottom of roadway subgrade.
3. Bedding material for reinforced concrete pipe and subgrade material under head wall shall be CR-6 or GAB, 9" thickness minimum.
4. All pipe joints shall use rubber gasket.
5. Riprap is not shown for clarity.
6. Subgrade below the pipe bedding is subject to the analysis and recommendations by the geotechnical engineer.

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DEPARTMENT OF PUBLIC WORKS
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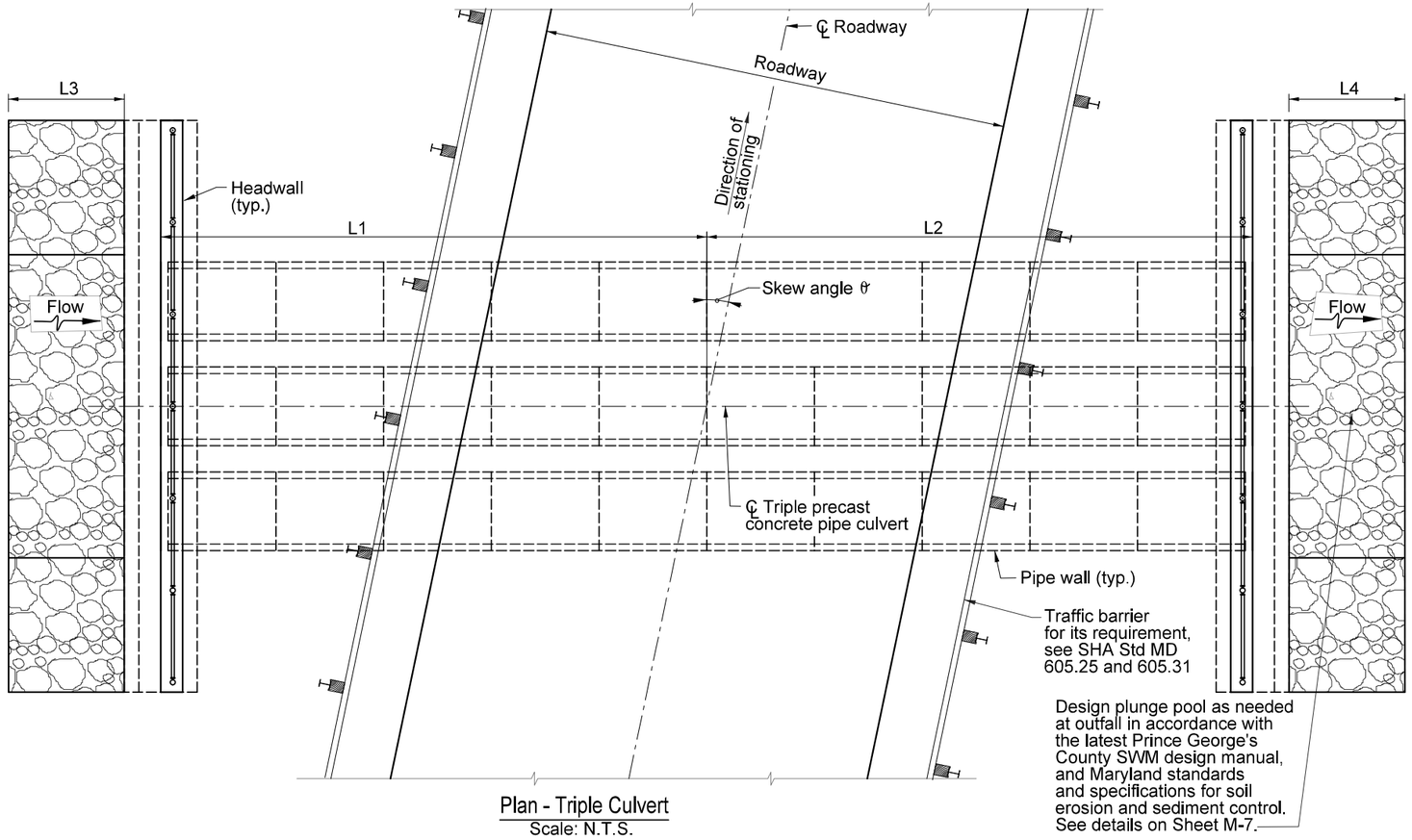
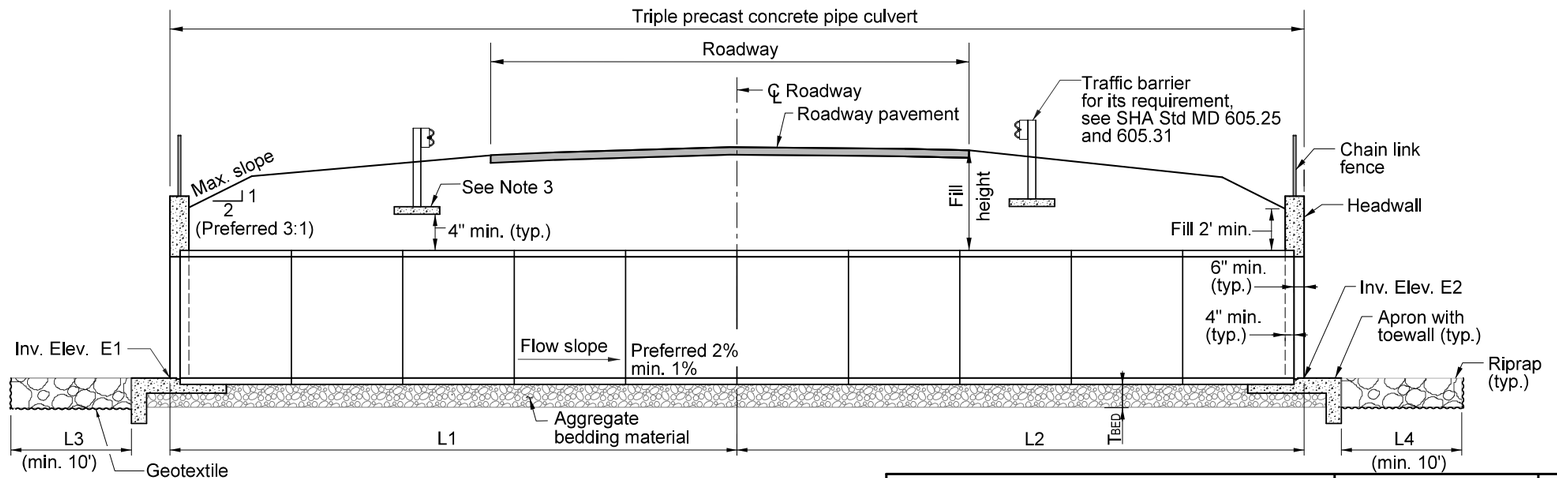
Prince George's County, MD

Standard Precast Concrete Pipe Culvert Geometric Layout (Double Pipe, 24" Ø - 72" Ø)

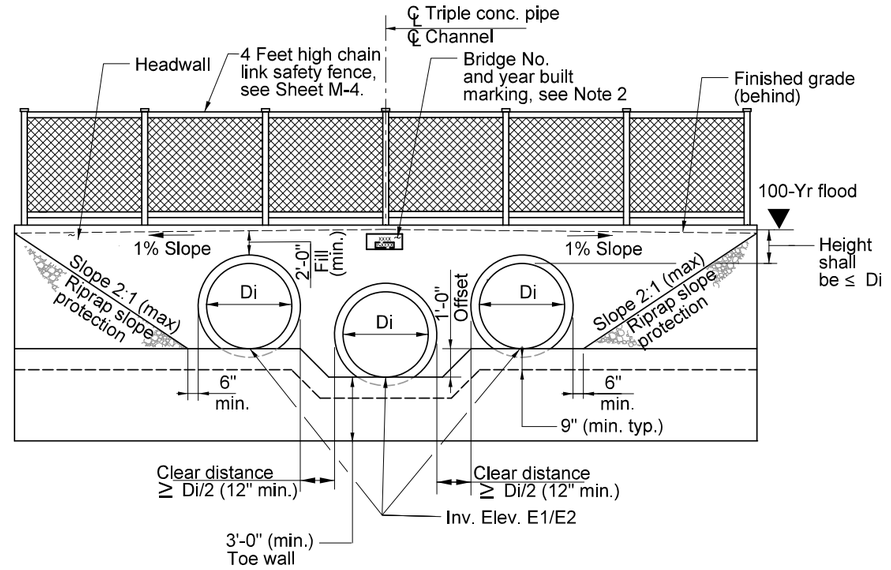
SHEET
C2-5



Plan - Triple Culvert
Scale: N.T.S.



Longitudinal Section
Scale: N.T.S.



Elevation
Scale: N.T.S.

Notes:

1. Install chain link safety fence along top of headwall and wingwalls. For chain link safety fence details, see DPW&T Std. Nos. 300.27 and 300.28, "Chain Link Fence (Commercial Property Installation)" on Sheet M-4.
2. For Bridge No. and year built marking, see MD SHA Std. No. SI-103 and DPWT Std. No. 300.32 on Sheet M-4 & M-5. All numerals shall be indented in concrete.
3. For traffic barrier over culvert, the preferred option is standard traffic barrier for roadway (See SHA Std MD 605.25). If the fill is not deep enough to accommodate the guardrail post, the 2nd option is SHA Std. MD 605.26 traffic barrier W Beam post placement details for spanning 12'-2" to 18'-5" openings. If neither option 1 or 2 works, the 3rd option is anchoring the guardrail post on the 4'x4'x8" concrete slab. See sheet M-3 for details.
4. See sheet C2-1 for general notes.
5. Allowable pipe inside diameter for triple pipe culvert is from 24" to 72".
6. Straight concrete endwall (no wingwalls) is shown. It is intended for use outside of the road clear zone. winged concrete endwall (skew angle between endwall and wingwall) is also acceptable. Standard county headwall and wingwall details for pipe culverts can be used as guidelines. See details on Sheet M-6.
7. It is the responsibility of the designer to submit the designs and plans to DPIE for review and approval. The designs/plans shall be prepared by a Professional Engineer registered in the State of Maryland.
8. The construction of pipe culverts shall be in accordance with Maryland SHA Specs. Section 303.

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DIRECTOR DATE

REVISION DATE:	APPROVED BY:
04-08-2020	

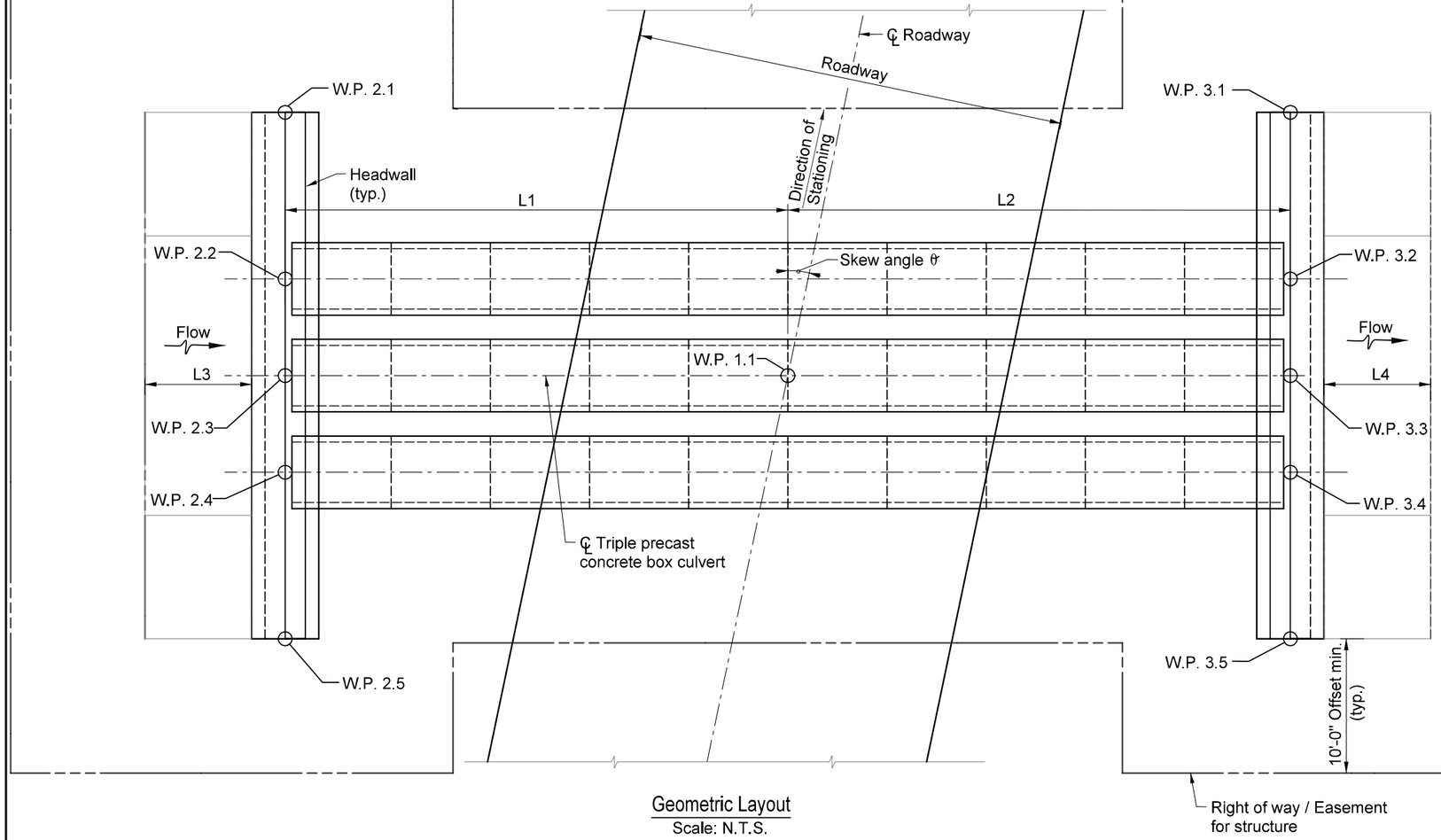
Phone: 301-883-5642

DEPARTMENT OF PUBLIC WORKS
AND TRANSPORTATION
Prince George's County, MD

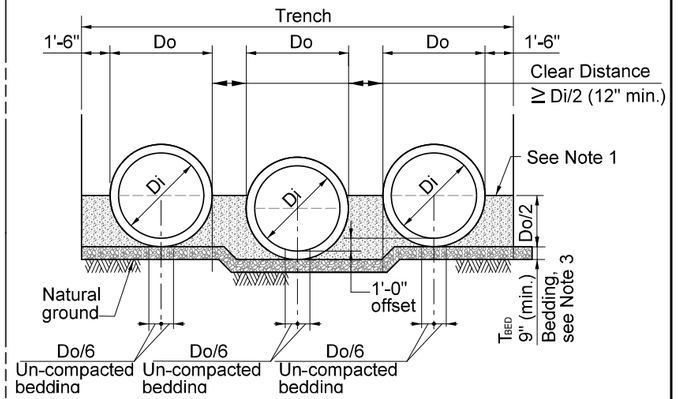
Standard Precast Concrete Pipe Culvert General Plan & Elevation (Triple Pipe , 24" Ø - 72" Ø)

SHEET
C2-6

FILE: U:\2026031141\26 PGDPWT Culvert Standards\700 CADD\706 Struct\R2-C2-6-TRIPLE PIPE.dgn



Geometric Layout
Scale: N.T.S.



Pipe Bedding Details
Scale: N.T.S.

Working Point Table				
Point	Station	Offset	North	East
W.P.1.1				
W.P.2.1				
W.P.2.2				
W.P.2.3				
W.P.2.4				
W.P.3.1				
W.P.3.2				
W.P.3.3				
W.P.3.4				
W.P.3.5				

Culvert Dimension Table										
Culvert Length L1	Culvert Length L2	Skew θ	Riprap Class		Riprap L3	Riprap L4	Inside Dia. Di	Bedding Materials Thickness T_{BED}	Inv. Elev. E1	Inv. Elev. E2
			Upstream	Downstream						

Notes:

1. The gap between reinforced concrete pipes and trench shall be filled with flowable backfill or CR -6 or GAB aggregate up to center of the pipe and both sides shall be done simultaneously.
2. The contractor shall ensure complete and satisfactory tamping of backfill material in the area immediately adjacent to the lower portion of pipes with extra care and it shall be extended to the bottom of roadway subgrade.
3. Bedding material for reinforced concrete pipe and subgrade material under head wall shall be CR -6 or GAB, 9" thickness minimum.
4. All pipe joints shall use rubber gasket.
5. Riprap is not shown for clarity.
6. Subgrade below the pipe bedding is subject to the analysis and recommendations by the geotechnical engineer.

APPROVED:

DIRECTOR DATE

REVISION DATE:	APPROVED BY:
04-08-2020	

Phone: 301-883-5642

DEPARTMENT OF PUBLIC WORKS
AND TRANSPORTATION
Prince George's County, MD

Standard Precast Concrete Pipe Culvert Geometric Layout (Triple Pipe, 24" Ø - 72" Ø)

SHEET
C2-7

FILE: U:\2026031141\26 PGDPWT Culvert Standards\700 CADD\706 Struct\R2-C2-7-TRIPLE PIPE G LAYOUT.dgn

General Notes for Bottomless Culvert

Specifications:
Design - AASHTO LRFD Bridge Design Specifications (latest edition), the Prince George's County DPW&T "Specifications and Standards for Roadways and Bridges" (latest edition).

Construction - Maryland Department of Transportation State Highway Administration (MDOT SHA) Standard Specifications for Construction and Materials (latest edition).

Design Loads:
HL-93 with 2-inch future wearing surface.

Materials:
Self Consolidating Concrete (SCC) with f'c=5,000 psi (Minimum) and epoxy-coated reinforcing steel shall be used for the entire precast concrete units for any depth of fill. Cast-In-Place (C.I.P.) concrete shall be SHA Mix. No. 3 (3,500 psi.)

If the culvert has minimum 3 feet of fill or less over the structure, a reinforced concrete deck slab with epoxy coated reinforcement shall be provided over culvert. Concrete for the deck slab shall be SHA Mix No. 11 or 12. The top of deck slab (including the sidewalk) shall receive a protective coating (Silane Penetrant Sealer). See Sheet M-3, Slab Details.

Reinforcing steel shall conform to ASTM A615 Grade 60. Only grade 60 can be used on the project. All rebars shall be epoxy coated. The Contractor has the option to use epoxy coated welded wire reinforcement conforming to ASTM A1064. However, there shall be no more than 2 layers of welded wire reinforcement in each slab/wall.

A minimum of 2-inch clear concrete cover to all reinforcement bars shall be provided unless noted otherwise.

The contractor shall supply shop drawings to the County Engineer for review and approval. No material shall be ordered or fabricated until written approval is received for the proposed structure.

Any changes to the enclosed details must be submitted to Engineer for review and approval.

Chamfer:
All exposed corners of all concrete structures shall be chamfered with 3/4"x3/4" milled chamfered strips unless noted otherwise.

Waterproofing:
The exterior sides and top of bottomless culverts shall be covered with roll or sheet waterproofing membrane in accordance with SHA Specification 422.03.07, or manufacturer's recommendation as directed by the County Engineer.

Structure Length:
Culverts with 17 feet or more opening length measured in accordance with national bridge inspection standards (NBIS) 23 CFR 650.305 shall be resized to provide a minimum length of 20 feet as measured along the centerline of the roadway. See Sheet M-3.

Culvert Size:
Culverts require a minimum horizontal (span) and vertical (rise) opening of 5 feet. Culverts 75 or more feet in length require a rise of 6 feet.

Installation:
The installation and backfill of precast structural elements shall follow the manufacturer's recommendation. Do not perform backfilling during wet or freezing weather. No backfill shall be placed against any structural elements until they have been approved by the County Engineer.

Footings:
Design: Geotechnical report must be submitted with the plans. The report shall be prepared by a Professional Geotechnical Engineer registered in the State of Maryland per SHA PPM D-79-17(4). Geotechnical report shall include foundation recommendation, required bearing capacity, and recommendation to achieve the required bearing capacity. A spread footing foundation is only allowed if keyed one-foot minimum into scour resistant rock.

Construction:
Do not over excavate foundations unless directed by Geotechnical Engineer to remove unsuitable soil. Undercutting and backfilling with crusher run aggregate CR-6 or graded aggregate base GAB may be necessary in order to achieve the required factored bearing resistance. The Geotechnical Engineer shall certify that the bearing capacity meets or exceeds the footing design requirements, prior to the contractor pouring of the footings. A copy of the report shall be submitted to inspector prior to the installation of precast concrete elements. A keyway shall be formed in the top surface of the bridge footing as specified on the plans. No keyway is required in the wingwall footings, unless otherwise specified on the plans. The footings shall be given a smooth float finish and shall reach a compressive strength of 2,000 psi before placement of the bridge and wingwall elements. Backfilling shall not begin until the footing has reached the full design compressive strength.

Scour:
Scour depth shall be calculated using methodology approved by Maryland SHA for calculation of scour as stated in the Chapter 11 (evaluating scour at bridges) of SHA "Manual on Hydrologic and Hydraulic Design" (latest revision) and using the latest SHA bridge scour program (abscour) which is available from SHA.

Criteria for Utility Line Crossing:
Place utility line away from the structure, minimum of 5 feet outside of the county structural components. This is the preferred option for new construction. For details, see Sheet M-2.

Tables:
The desiginer shall fill out the blank tables as necessary in this set of drawings and Hydrologic and Hydraulic Data tables on Sheet M-1.

Right of Way / Easement:
The developer must provide ROW/ Drainage Easement at least 10 feet outside of structure foundation and riprap for maintenance of structure (See Geometric Layout Sheet)

Bridge Number:
The designer shall send request to DPW&T (Department of Public Works and Transportation) via DPIE to assign a Bridge number to the new structure.

Restrictions for Placing and Using Equipment on Existing or New Structure/or Storing Materials on/or Against Structures:
There are restrictions on placing equipment on existing and new structure(s) and storing materials on/or against existing and new structure(s) elements. The limitations basically relate to loads that are beyond Maryland's legal vehicles and/or posted load limits (where applicable) and materials stockpiled on/or against structure or structure's elements. For details of such restrictions see SHA Std Specs. Section TC 6.14 titled "Restrictions for placing and using equipment on structures, or storing materials on/or against structures" in the contract documents. In order to comply with this article, The contractor shall read section TC 6.14 prior to commencing any work on structure(s) in this contract.

Vehicles shall not be allowed to cross over the culvert until a minimum of 3 feet of compacted fill has been placed over the culvert, or approved by the County Engineer.

Load Rating:
Load rating analysis shall be performed per SHA PPM D-97-47(4) based on LRFR method prior to the construction permit approval. During construction phase, if there is a change in the site conditions then the load rating analysis shall be recalculated and resubmitted for approval prior to As-Built approval and bond release.

HL-93	
LRFR Inventory	LRFR Operating

Legal Truck	Operating (Tons)
H-15	
Type 4	
HS-20	
3S2	

Permit Truck	Operating (Tons)
150K	
90K Comb.	
90K Crane	
90K Cargo	
80K Cargo	
120K Spec.	
108K Crane	
120K Crane	

Date: April 8, 2020

Index of Sheets

Contact:
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Jay Shah, P.E., Project Manager, Phone: 301-883-3173, Email: jdshah@co.pg.md.us
Highway and Bridge Design Division
Office of Engineering and Project Management
Prince George's County DPW&T

APPROVED:

DIRECTOR DATE

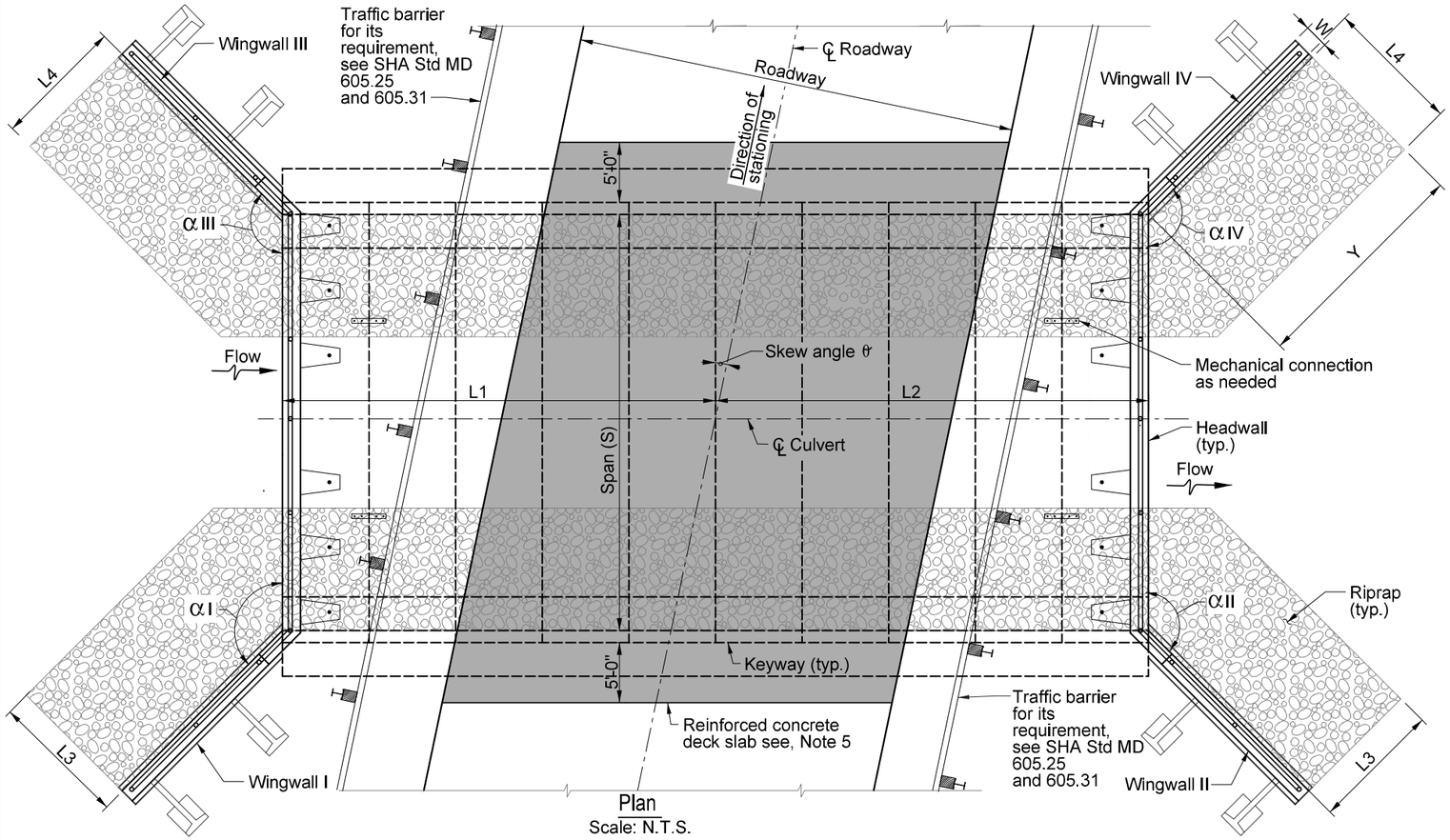
REVISION DATE:	APPROVED BY:
04-08-2020	

Phone: 301-883-5642

DEPARTMENT OF PUBLIC WORKS
AND TRANSPORTATION
Prince George's County, MD

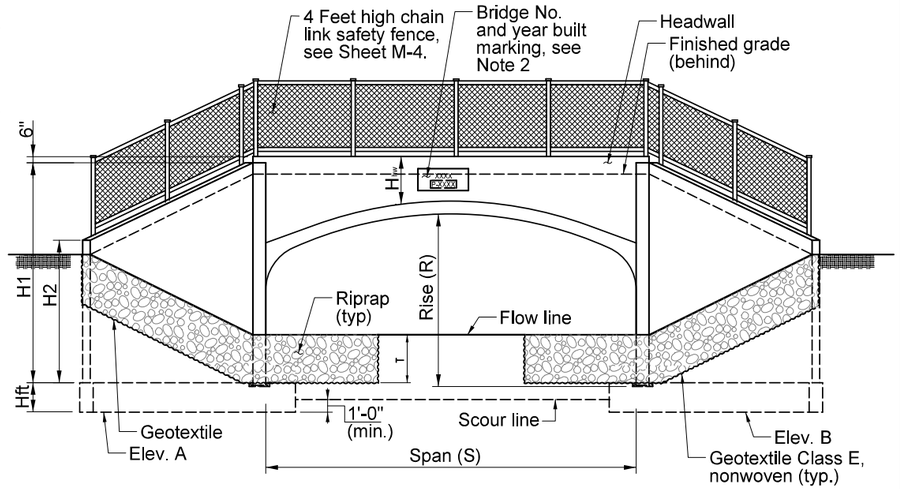
Standard Precast Concrete Bottomless Culvert General Notes

SHEET C3-1



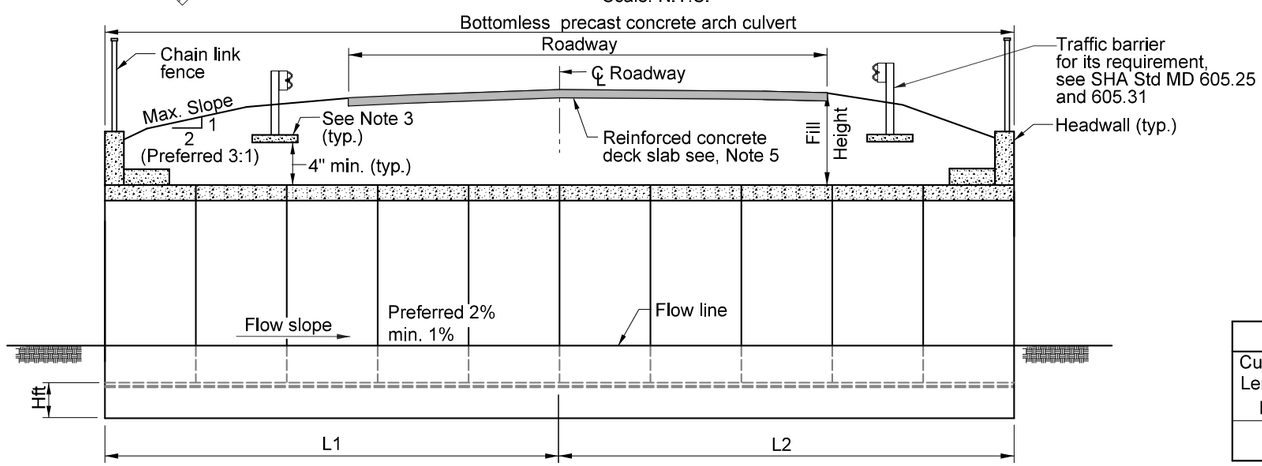
Plan

Scale: N.T.S.



Elevation

Scale: N.T.S.



Longitudinal Section

Scale: N.T.S.

Notes:

1. Install chain link safety fence along top of headwall anwingwalls. For chain link safety fence details, see DPW&T Std. Nos. 300.27 and 300.28, "Chain Link Fence (Commercial Property Installation)" on Sheet M-4.
2. For bridge No. and year built marking, see MD SHA Std. No. SI-103 and DPWT Std. No. 300.32 on Sheet M-4 & M-5. All numerals shall be indented in concrete.
3. For traffic barrier over culvert, the preferred option is standard traffic barrier for roadway (see SHA Std 605.25). If the fill is not deep enough to accommodate the guardrail post, the 2nd option is SHA Std. MD 605.26 traffic barrier W Beam post placement details for spanning 12'-2" to 18'-5" openings. If neither option 1 or 2 works, the 3rd option is anchoring the guardrail post on the 4'x4'x8" concrete slab. See Sheet M-3 for details.
4. The shown wingwall and headwall are precast concrete. The contractor has the option to use cast-in-place wingwall and headwall. The design of wingwall and headwall is the responsibility of the designer and must be prepared by a Professional Engineer registered in the state of Maryland, and submitted to the County Engineer for review and approval prior to the construction. The wingwall design can follow SHA Std. RW-101 to RW-501.
5. If the culvert has 3 feet of fill or less over the structure, a reinforced concrete deck slab shall be provided. For detail, see Sheet M-3.

Culvert Dimension Table													
Culvert Length L1	Culvert Length L2	Skew θ	Riprap Class		Riprap L3	Riprap L4	Riprap T	Span S	Rise R	Elev. A	Elev. B	Riprap L4	Head Wall Hhw (min. to max.)	Footing Hft
			Upstream	Downstream										

Wing Wall Dimensions Table						
Location	Angle α	Height H1	Height H2	Footing W	Footing Y	MDOT SHA Detail No.
Wingwall I						
Wingwall II						
Wingwall III						
Wingwall IV						

APPROVED:

DIRECTOR DATE

REVISION DATE:	APPROVED BY:
04-08-2020	

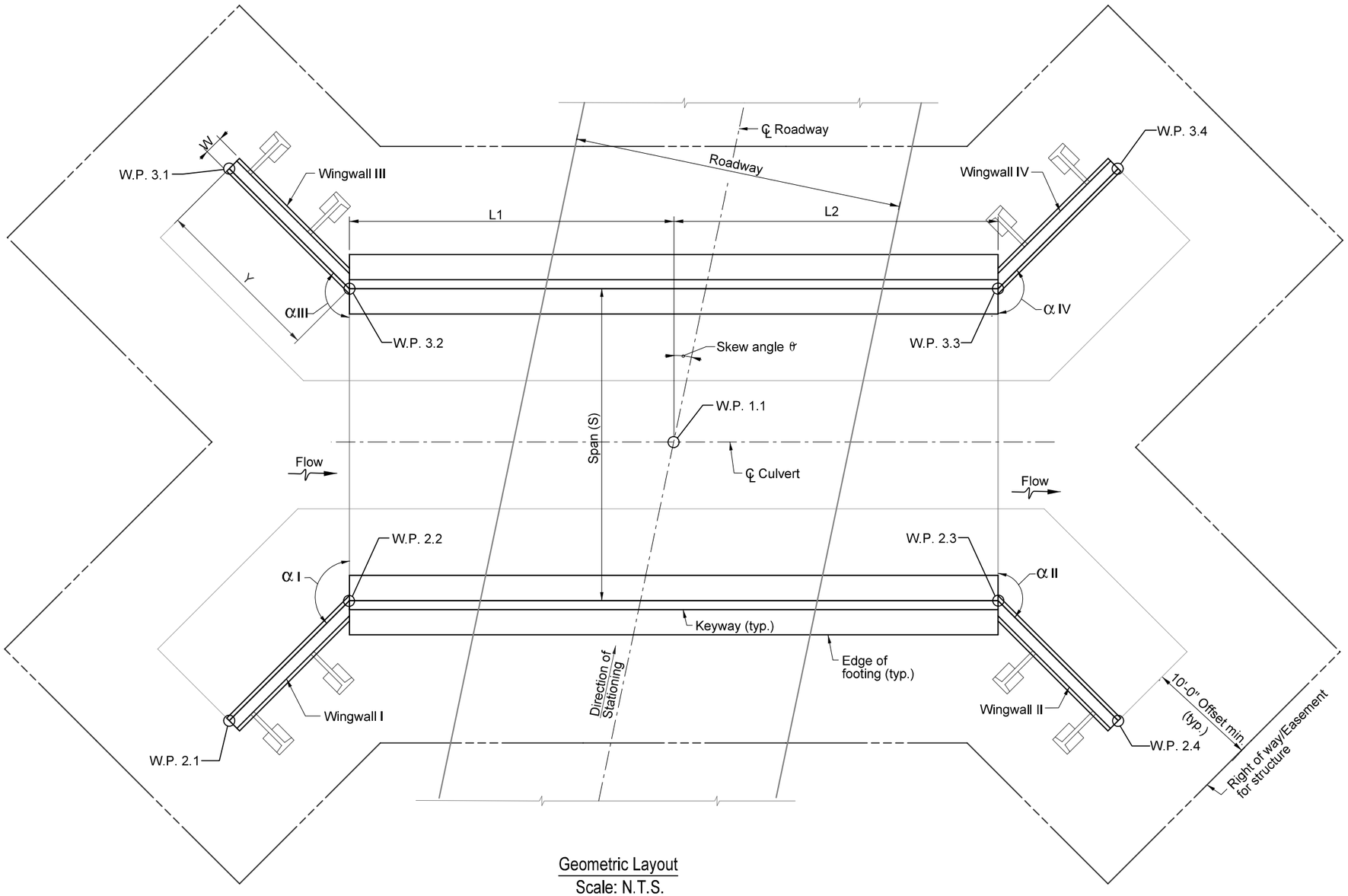
Phone: 301-883-5642

DEPARTMENT OF PUBLIC WORKS
AND TRANSPORTATION
Prince George's County, MD

Standard Precast Concrete Bottomless Culvert General Plan & Elevation

SHEET C3-2

FILE: U:\2026031141\26 PGDPWT Culvert Standards\700 CADD\706 Struct\R2-C3-2 PLAN BOT LESS CULVERT.dgn



Geometric Layout
Scale: N.T.S.

Working Point Table				
Point	Station	Offset	North	East
W.P.1.1				
W.P.2.1				
W.P.2.2				
W.P.2.3				
W.P.2.4				
W.P.3.1				
W.P.3.2				
W.P.3.3				
W.P.3.4				

Notes:

1. For general notes, see Sheet C3-1.
2. For culvert dimensions, see Sheet C3-2.
3. Riprap scour protection around abutment and wingwall is not shown for clarity.

APPROVED:

DIRECTOR _____ DATE _____

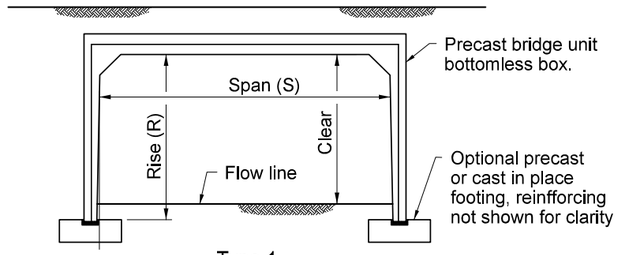
REVISION DATE:	APPROVED BY:
04-08-2020	

Phone: 301-883-5642

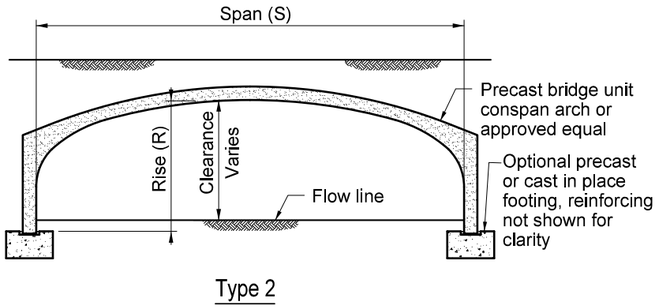
DEPARTMENT OF PUBLIC WORKS
AND TRANSPORTATION
Prince George's County, MD

Standard Precast Concrete Bottomless Culvert Geometric Layout

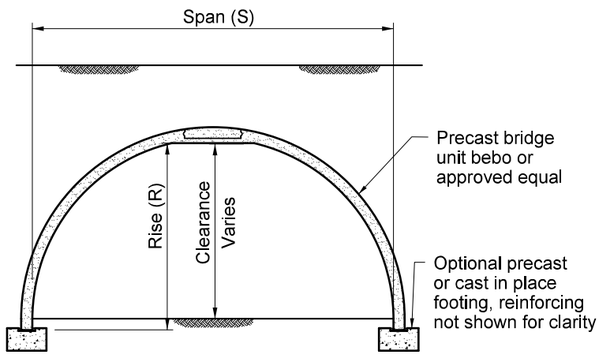
SHEET
C3-3



Type 1



Type 2

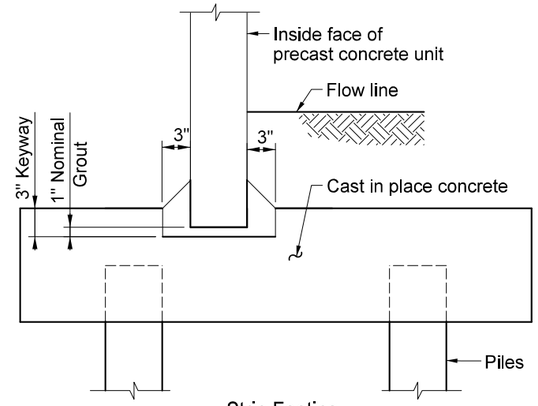


Type 3

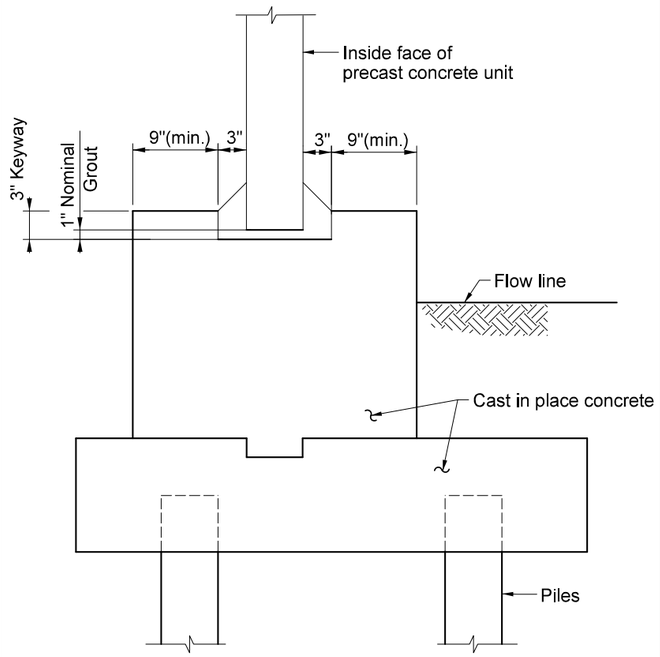
Structure Types
Scale: N.T.S.

Notes:

1. The installation of precast units shall follow the manufacturer's instructions.
2. The precast units shall be aligned properly in the keyway of footing.
3. Mechanical connection between adjacent units shall be provided to hold the units to work together.
4. All bridge unit joints, headwall/bridge joints and lift points shall be sealed for water proofing.

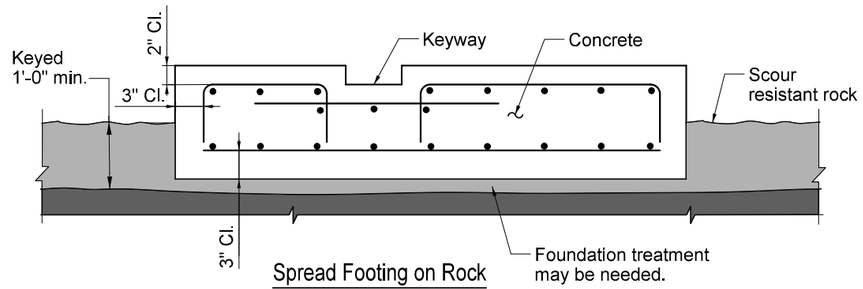


Strip Footing

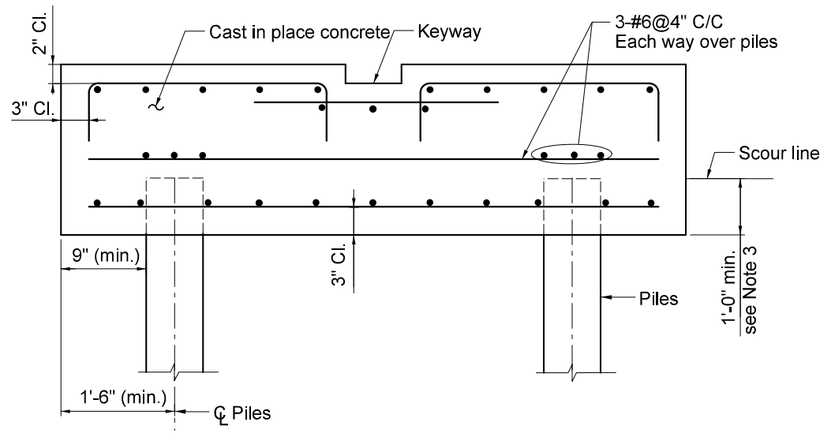


Pedestal Wall Footing

Footing Types
Scale: N.T.S.



Spread Footing on Rock



Pile Foundation on Soil

Foundation Types
Scale: N.T.S.

Notes:

1. Footings for bottomless culverts shall be installed on piles or keyed into scour resistant rock.
2. The design of footing and piles is the responsibility of the designer and must be prepared by a Professional Engineer registered in the state of Maryland, and submitted to the County Engineer for review and approval prior to the construction.
3. The bottom of footing shall be at least 1 foot below the scour line for pile foundation.

APPROVED:

DIRECTOR DATE

REVISION DATE:	APPROVED BY:
04-08-2020	

Phone: 301-883-5642

DEPARTMENT OF PUBLIC WORKS
AND TRANSPORTATION
Prince George's County, MD

Standard Precast Concrete Bottomless Culvert Details

SHEET
C3-4

FILE: U:\2026031141\26 PGDPWT Culvert Standards\700 CADD\706 Struct\R2-C3-4- BOT LESS DETAILS.dgn

Hydrologic data

I. Source: _____

Prepared by: ☐ SHA ☐ Consultant: _____ Date: _____

File Location: _____

II. Drainage Area: Acres _____ Square Miles _____

III. Method(S) Of Analysis:

_____ Usgs Gage Data Analysis
- Gaging station No. _____
- Location _____
- Drainage area _____
- Years of continuous record _____

_____ USGS Regression equations
Reference _____

_____ SCS TR - 20 Method - version used (Date) _____
- RCN (Existing-Homogeneous Watershed)[1] _____
- RCN (Ultimate Homogeneous Watershed)[1] _____
- T_C (Homogeneous Watershed) _____

_____ FEMA base flood (100-year) discharge _____ (CFS) Method used by FEMA _____

_____ Other (Describe) _____

Has flood routing been used in determining flood discharges? Yes _____ No _____

Method Selected _____

IV. Computed flood discharges

Return period (Years)	Flood discharge (CFS)	
	Based on existing watershed development	Based on ultimate watershed development

V. Historic floods

Year	Magnitude (CFS)	High water elevation	Where measured	Source of Data

VI. Stream Morphology

Stream Type _____ Valley Type _____

Stream Bed Material:
Description _____ D16 _____ D50 _____ D84 _____

Bank full characteristics:
Q _____ Area _____ Width _____ Depth _____
Slope _____ Mannings "n" Value _____ Sinuosity _____

VII. Tidal Flows

100-Year storm tide elevation (FT) _____ Maximum discharge (CFS) _____
500-Year storm tide elevation (FT) _____ Maximum discahrge (CFS) _____
Source of information _____

Design Discharge _____ (CFS) Return Period _____ Years Tidal period (Hrs) _____
How Determined? (Explain) _____
Water surface-elevation for design condition (FT)
(if tidal flow governs hydraulic design) _____

VIII. Comments: _____

Hydralulic data

I. Source: _____

Prepared By: ☐ SHA ☐ Consultant: _____ Date: _____

File location: _____ Item 71 Rating _____

Method(s) of analysis: _____

II. Hydraulic Data

Flow Conditions[3]	Channel Cross-Section	Structure waterway area[4]	Energy Slope[4]	Water Surface Elevation[4]	Channel[5] Q	W	V	D	Left overbank looking downstream[5] Q	W	V	D	Right overbank looking downstream[5] Q	W	V	D	Discharge over road
Q_{10} Describe _____	Approach[8] (Describe location below)																
	Upstream at structure																
	Downstream at structure																
Q_{100} Describe _____	Approach[8] (Describe location below)																
	Upstream at structure																
	Downstream at Structure																
$Q_{Overtopping}$ or other discharge Describe _____	Approach[8] (describe location below)																
	Upstream at Structure																
	Downstream at Structure																

III. Bridge scour data _____

A. Scour evaluation study Title: _____

Prepared by: ☐ SHA ☐ Consultant: _____ Date: _____

File location: _____ Item 113 Rating[2] _____

B. Scour estimates:

	Design conditions (Describe special conditions such as overtopping, low tailwater, Influence of confluences, etc.)	Flood Discharge Return Period (Years)	Flood Discharge Magnitude (CFS)	Long Term Degradation / Aggradation (Ft)	Contraction[9] Scour depth (Looking downstream) (Ft) LT Overbank	MAIN Channel	RT Overbank	Channel bed load (Descrtoe)	Type of Scour (live bed/clear water)
Design Flood for scour									
Check Flood for scour									
Other									

Total Scour: Estimated total scour at substructure/ channel elements (includes long term degradation/aggradation plus contraction scour, plus local scour)

Location of channel or substructure element	Elevation of bottom of stream channel bed or scour hole (Ft)[10] Design flood (100-Yr)	Check flood (500-Yr)	Scour counter measures ☐ Existing ☐ New
Channel Thalweg			
Abutment:			
Abutment:			
Pier No.			
Pier No.			
Pier No.			
Pier No.			
Pier No.			
Pier No.			
Pier No.			
Pier No.			
Pier No.			
Pier No.			
Pier No.			
Pier No.			
Pier No.			
Pier No.			
Pier No.			
Pier No.			

Notes:

Blank spaces indicate that data is not available or is not applicable.

1. Parameters computed assuming the watershed is homogeneous without subdivisions.
2. Item 71 rating and item 113 rating refer to federal bridge inventory items.
3. Record flow conditions used in analysis: discharge (Q), tailwater condition and how selected, etc. (for depressed culverts, indicate under comments the assumptions made as to whether sediment will remain during floods).
4. For culverts, use these three columns to record:
   - Depth of flow at culvert inlet and outlet
   - Water-surface elevation at culvert inlet and outlet
   - Energy slope for culvert barrel
5. Symbols used:
   Q = Flow or discharge (CFS)
   W = Channel width or floodplain width (FT)
   V = Flow velocity (FPS)
   D = Depth of flow (FT)
6. For culverts, record outlet velocity here.
7. For culverts , record tailwater depth here.
8. Approach section should be selected as per guidance in abscour users manual.
9. Enter contraction scour depths only (approximate line 121 in abscour output) - not abutment scour.
10. If scour resistent bedrock controls scour, enter bedrock Elevation and note this condition under comments.
11. Record incipient overtopping discharge (Q) and recurrence Interval.
12. Record clearance between water surface elevation and low chord for design discharge.
13. Record total flow area under structure (Downstream end) for 100 & 500 year floods.

IV. Roadway and structure data

Item	Existing structure	Proposed structure
Name of waterway		
Date built		
Overtopping elevation		
Overtopping location (Describe)		
Incipient Overtopping flow condition[11] (Overtopping Q < 100 Yr flood)		
FREEBOARD[12]		
Total structure waterway area[13]		
Structure description[14]		
Inlet treatment[15]		
Outlet treatment[15]		
Mannings "N" Value[16]		

V. Survey book numbers _____
Reference datum for elevations _____

VI. Flood plain management data

Date of flood insurance study _____ Community panel No. _____
Project location (Check below):

_____ Beyond fema program limits (Not in "A" Hazard zone)

_____ Fema hazard zone "A"; No base flood elevations established

_____ Fema hazard zone "A-2"; base flood elevations established

Regulatory floodway YES _____ NO _____
Maximum change in water surface elevation upstream of Bridge due to highway project (Max. backwater) _____ FT.
Location of max. backwater from Upstream face of bridge _____ Ft.
Describe type of study done to determine consistency With NFIP Standards _____
Date community acknowledgement form issued: _____

Is the project consistent with the code of federal regulations, Part 650 A, Location and hydraulic design of encroachments on Flood plains (23 CFR 650 A). Y/N _____

Is the project consistent with the annotated Code of Maryland (Comar 08, 05, 03)? Y/N _____

VII. Comments: _____

14. For bridges:
    Enter type, span length and maximum vertical clearance
    For culverts:
    Enter size, number of cells, and length;
    Describe any special features under comments.
15. For culverts, describe type of inlet/outlet and erosion protection.
16. Composite "N" Value of structure.
17. The design storm used for open channels is the 10-year storm for less than 50 acres and 100-year storm for greater than 50 acres.

APPROVED: _____

DIRECTOR _____ DATE

REVISION DATE:	APPROVED BY:
04-08-2020	

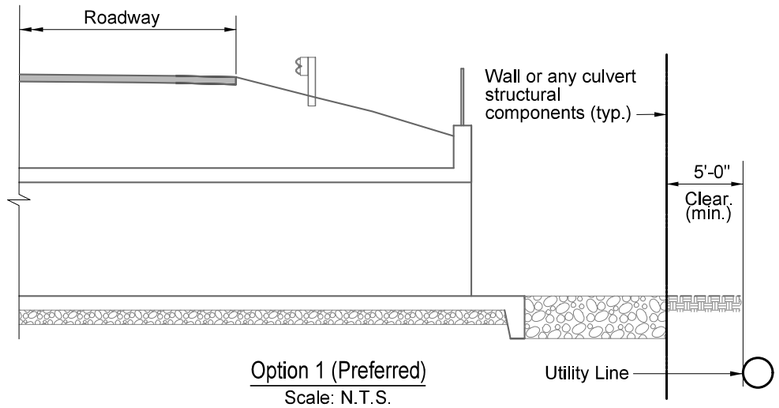
Prince George's County DPW&T
Phone: 301-883-5642

DEPARTMENT OF PUBLIC WORKS
AND TRANSPORTATION
Prince George's County, MD

Standard Precast Concrete Culvert Miscellaneous Details
Hydrologic & Hydraulic Data

SHEET
M-1

FILE: U:\20260311 4\26 PGDPWT Culvert Standards\700 CADD\706 Struct\R2-1-M H AND H SHEET.dgn



Option 1 (Preferred)
Scale: N.T.S.

General notes

The following criteria apply to all DPW&T culverts and the designer shall submit the plans of utility line crossing to DPIE for review and approval. The submittal shall include plan, profile and cross section, which show the culvert structure and the proposed utility. The designer has the following 3 options for utility lines crossing County's culvert structures.

Storm drainge pipes for roadway surface storm water discharge purpose only are not considered utility.

Option 1 (preferred):

Place the utility line away from the structure, minimum 5 feet outside of the existing county structural components or riprap if this option is not possible, then the following 2 options can be considered on a case-by-case basis. However, Option 1 is the preferred option for new culvert construction.

Option 2 :

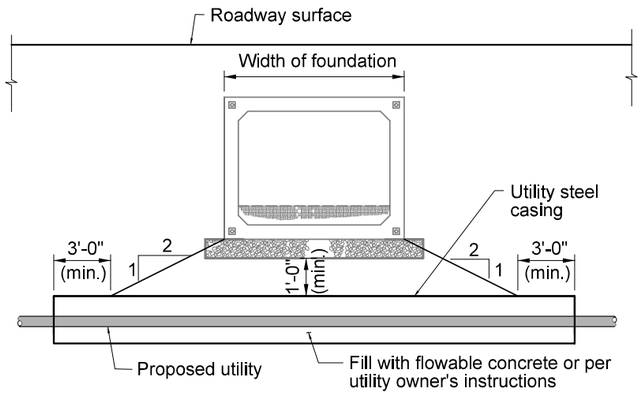
This option is for a utility crossing under the structure. The utility has to meet the following criteria.

- Length of casing will be width of structure foundation + load zone for a 2:1 slope from the bottom of the structure foundation + 3 feet on each side.
- Provide one (1) foot minimum vertical clearance measured from the bottom of the structure foundation to the top of the proposed utility casing.
- Utility casing shall sustain the loading of an additional 10 feet of earth in addition to the field loads.

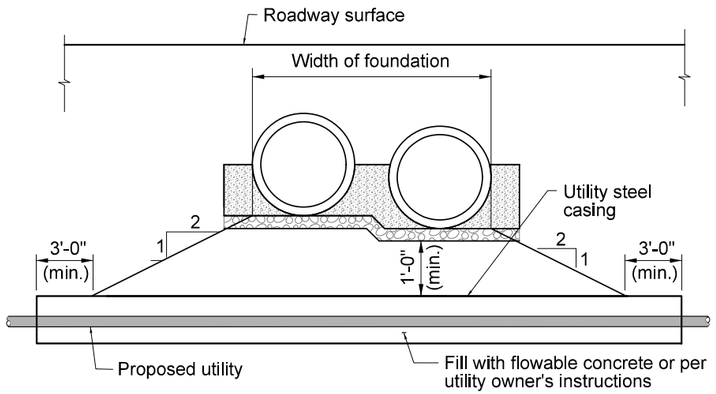
Option 3:

This option is for a utility crossing over the structure. This option is strongly discouraged by DPW&T. A waiver request shall be submitted to DPIE for review/approval. The utility has to meet the following criteria.

- Length of casing will be width of structure + load zone for a 2:1 slope from the bottom of the structure foundation + 3 feet on each side.
- Provide minimum one (1) foot clearance between structures and utility casing.
- Utility casing should be able to sustain the loading of an additional 10 feet of earth in addition to the field loads.



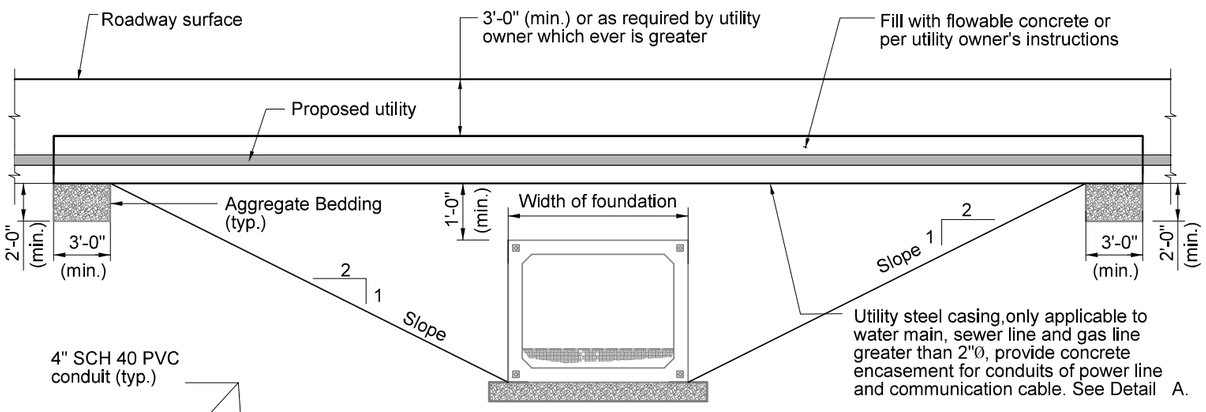
Option 2 (Box Culvert)
Scale: N.T.S.



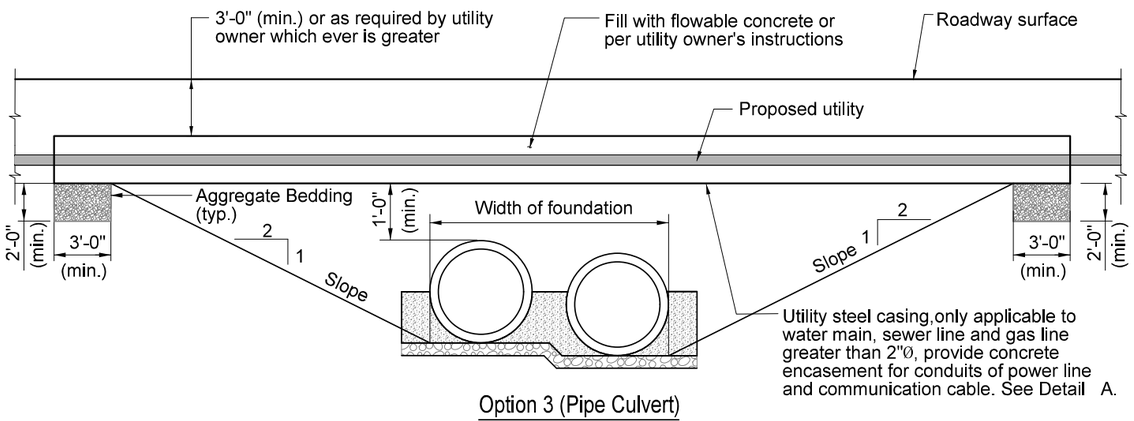
Option 2 (Pipe Culvert)
Scale: N.T.S.

Notes for concrete encasement - Detail A

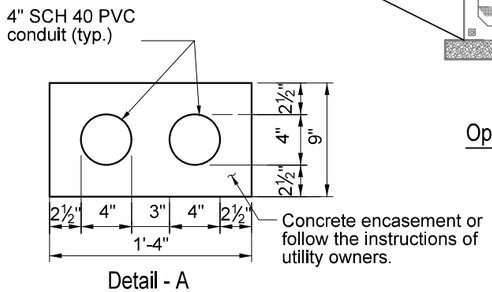
1. Concrete encasement shall be provided for the conduits of powerline and communication cable.
2. Two conduits are shown. Other number of conduits are similar.
3. The cast-in-place encasement concrete shall be SHA Mix. No. 3 (3,500 psi).
4. After concrete cures for 24 hours, backfill around the encasement with clean select soil and mechanically tamped 8" lifts.
5. Contractor shall pull a mandrel (½" smaller in diameter than the conduit and 6" long) through each duct prior to cable installation, followed by a polyolefin (1,500 lbs test) pull-in cord which shall remain in the duct.



Option 3 (Box Culvert)
Scale: N.T.S.



Option 3 (Pipe Culvert)
Scale: N.T.S.



Detail - A
Scale: N.T.S.

APPROVED:

DIRECTOR DATE

REVISION DATE:	APPROVED BY:
04-08-2020	

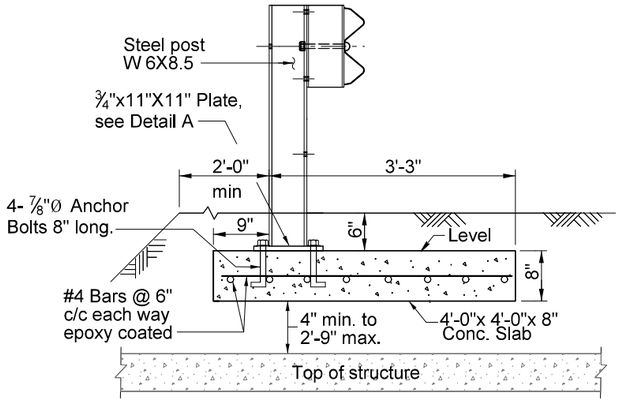
Phone: 301-883-5642

DEPARTMENT OF PUBLIC WORKS
AND TRANSPORTATION
Prince George's County, MD

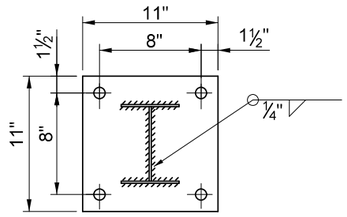
Standard Precast Concrete Culvert Miscellaneous Details Criteria for Utility Line Crossing

SHEET
M-2

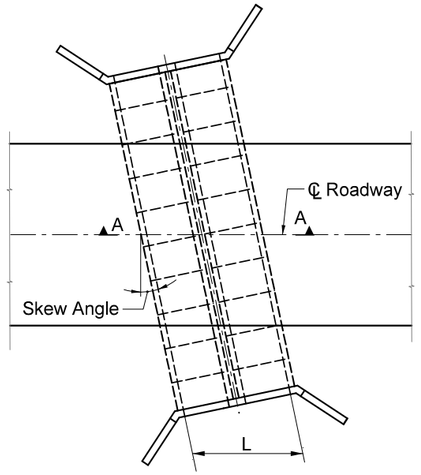
FILE: U:\2026031141\26 PGDPWT Culvert Standards\700 CADD\706 Struct\R2-2-M DETAILS.dgn



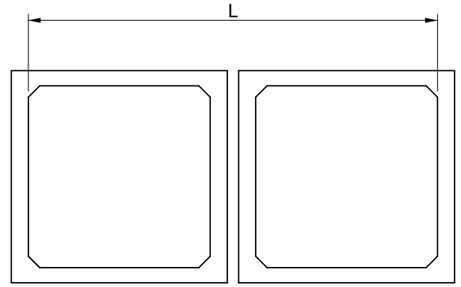
Steel Posts
Over Underground Structures
Scale: N.T.S.



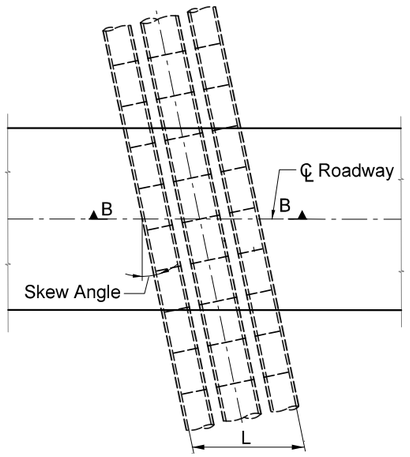
Detail - A
Over Underground Structures
(Plate thickness is 3/4")
(All holes 1" unless other wise noted.)
Scale: N.T.S.



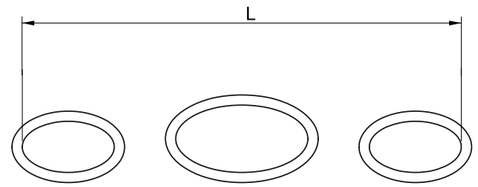
Box Culvert - Structure Length
Scale: N.T.S.



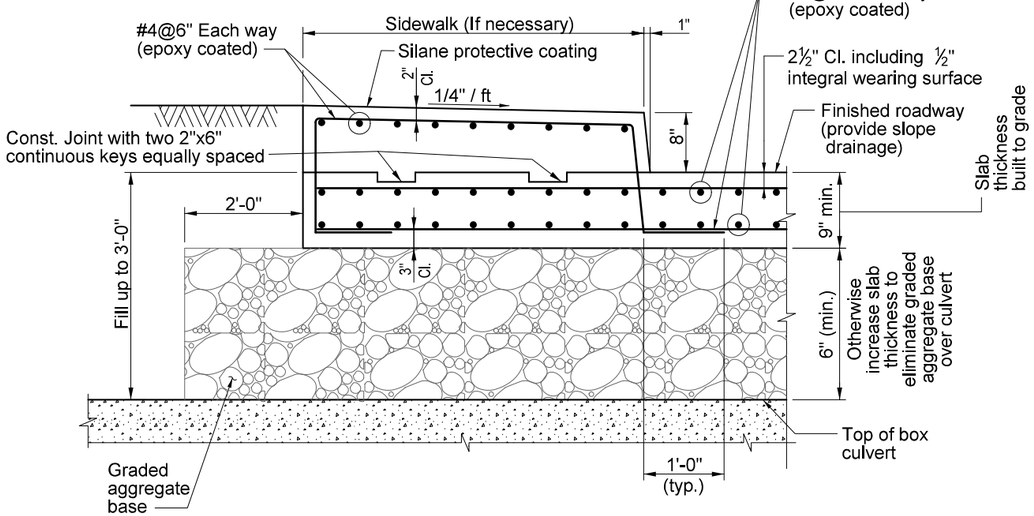
Section A-A
Scale: N.T.S.



Pipe Culvert - Structure Length
Scale: N.T.S.



Section B-B
Scale: N.T.S.



Reinforced Deck Slab Details
(For Fill Depth ≤ 3 ft.)
Scale: N.T.S.

Notes for Reinforced Concrete Deck Slab

1. For material specification, see general notes.
2. For slab layout, see structure general plan & elevation.
3. The slab base shall be graded aggregate to be placed and compacted in 6" lift in accordance with SHA specification Section 501.
4. The minimum fill height shall be 9".

Notes for Structure Length

1. L - Structure length
2. Culvert lengths should be measured along the centerline of roadway regardless of their depth below grade. measurement should be made from the inside faces of the exterior walls.

APPROVED:

DIRECTOR DATE

REVISION DATE:	APPROVED BY:
04-08-2020	

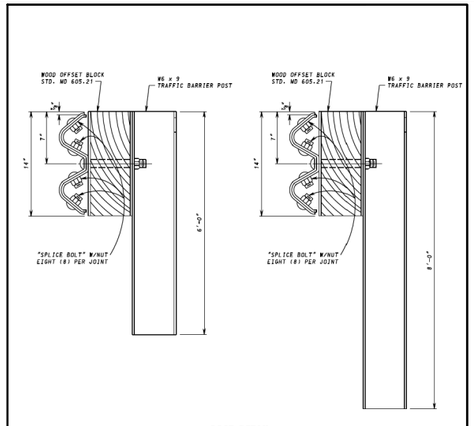
Phone: 301-883-5642

DEPARTMENT OF PUBLIC WORKS
AND TRANSPORTATION
Prince George's County, MD

Standard Precast Concrete Culvert Miscellaneous Details Slab Details

SHEET
M-3

FILE: U:\2026031141\26 PGDPWT Culvert Standards\700 CADD\706 Struct\R2-3-M DETAILS.dgn



POST DETAIL

NOTE

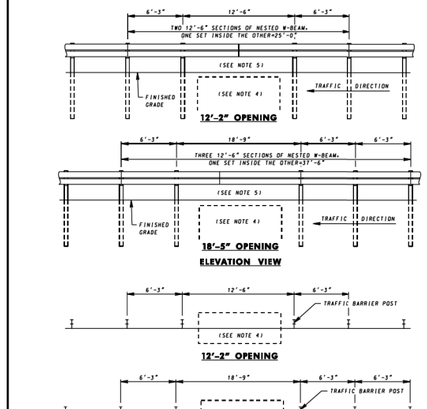
1. FOR METAL POSTS, WOOD OFFSET BLOCKS, SPLICES, SPLICE BOLTS AND OTHER DETAILS SEE STANDARD NO 605.23.
2. FOR TRAFFIC BARRIER W BEAM SEE STANDARD NO 605.22.
3. FOR COMPOSITE OFFSET BLOCKS SEE NOTE 5 ON NO 605.21
4. POSTS SHALL BE SPACED 6'-3" C/C, UNLESS OTHERWISE STATED ON THE PLANS OR DIRECTED BY THE ENGINEER.

SPECIFICATION 605	CATEGORY CODE ITEMS
APPROVED: Kirk G. Mallet, DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT	

SHA	APPROVAL + SHA REVISIONS	APPROVAL + FEDERAL HIGHWAY ADMINISTRATION
State Highway Administration	APPROVAL 11-18-99	APPROVAL 7-3-99
	REVISED 11-08-04	REVISED 10-20-04
	REVISED	REVISED
	REVISED	REVISED

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES
TRAFFIC BARRIER W BEAM WITH WOOD OFFSET BLOCK USING 6 FOOT OR 8 FOOT POSTS

STANDARD NO. MD 605.25



NOTES

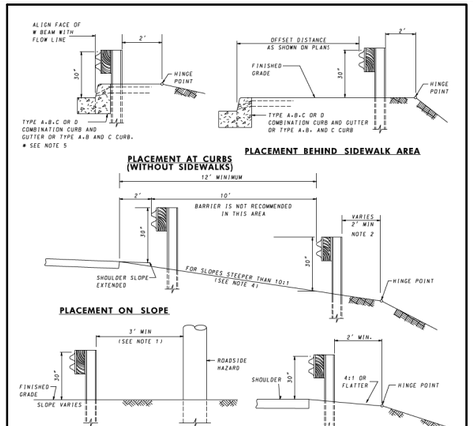
1. ALL POSTS SHALL BE W6 X 9 AS SHOWN ON STANDARD NO 605.23.
2. WOOD OFFSET BLOCKS SHALL BE AS SHOWN ON STANDARD NO 605.21.
3. THE TRAFFIC BARRIER W-BEAM SECTIONS SHALL BE LAPPED IN THE DIRECTION OF TRAFFIC.
4. MAY SPAN 5', 10' & 15' CQG OR CQS INLETS. LOW FILL BOX CULVERT OR OTHER OBJECT WHICH INTERFERES WITH NORMAL PLACEMENT OF POST.
5. THE SPLICE ON BOTH RAILS MUST BE COINCIDENT.

SPECIFICATION 605	CATEGORY CODE ITEMS
APPROVED: Kirk G. Mallet, DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT	

SHA	APPROVAL + SHA REVISIONS	APPROVAL + FEDERAL HIGHWAY ADMINISTRATION
State Highway Administration	APPROVAL 11-18-99	APPROVAL 7-3-97
	REVISED 10-1-01	REVISED 7-3-99
	REVISED	REVISED
	REVISED	REVISED

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES
TRAFFIC BARRIER W BEAM POST PLACEMENT DETAILS FOR SPANNING 12'-2" TO 18'-5" OPENINGS

STANDARD NO. MD 605.26



NOTES

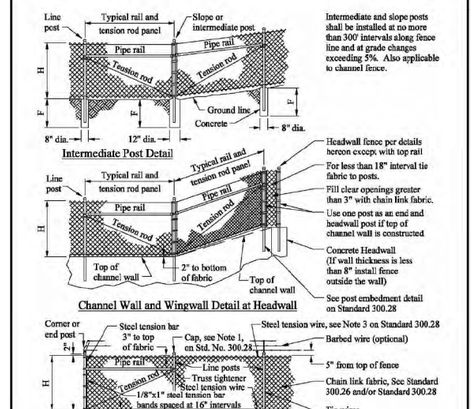
1. THE MINIMUM DIMENSION SHOWN CAN BE REDUCED BY STIFFENING THE TRAFFIC BARRIER SYSTEM.
2. 8'-0" LONG POSTS ARE TO BE USED WHEN THE DISTANCE FROM THE BACK OF THE W BEAM POST TO THE HINGE POINT IS LESS THAN 2' AND THE SLOPE BEYOND THE HINGE IS STEEPER THAN 4:1.
3. WHEN THE FACE OF THE TRAFFIC BARRIER IS MORE THAN 2' FROM THE SHOULDER EDGE 'HE HEIGHT MEASURED FROM THE EXISTING GROUND SHALL BE 30".
4. WHEN SLOPE IS STEEPER THAN 6:1, THE FACE OF THE BARRIER MUST BE ALIGNED WITH THE EDGE OF SHOULDER.
5. STIFFEN THE TRAFFIC BARRIER W BEAM WHEN TYPE 'A' or 'B' COMBINATION CURB/GUTTER OR TYPE 'A' or 'B' CURB IS USED AT POSTED SPEEDS 45 MPH OR GREATER.

SPECIFICATION 605	CATEGORY CODE ITEMS
APPROVED: DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT	

SHA	APPROVAL + SHA REVISIONS	APPROVAL + FEDERAL HIGHWAY ADMINISTRATION
State Highway Administration	APPROVAL 6-4-84	APPROVAL 8-1-74
	REVISED 4-5-13	REVISED 11-17-10
	REVISED –	REVISED –
	REVISED	REVISED

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES
TRAFFIC BARRIER W BEAM PLACEMENT DETAILS

STANDARD NO. MD 605.31



Intermediate and slope posts shall be installed at no more than 300' intervals along fence line and at grade changes exceeding 5%. Also applicable to channel fence.

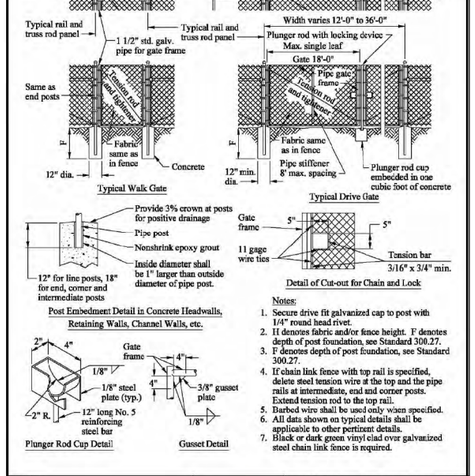
Headwall fence per details hereon except with top rail
For less than 18" interval tie fabric to posts.
Fill clear openings greater than 3" with chain link fabric.
Use one post as an end and headwall post if top of channel wall is constructed
Concrete Headwall (If wall thickness is less than 8" install fence outside the wall)
See post embedment detail on Standard 300.28

H	F
60" or less	30"
Over 60"	36"

H = Height of fence
F = Depth of post foundation

Note: For slat installation, use heavier concrete footing and reinforced tension rod.

APPROVED:		
DIRECTOR	DATE	
REVISION DATE:	APPROVED BY:	DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION Prince George's County, MD
		Chain Link Fence (Commercial Property Installation) - Part I — STD. 300.27

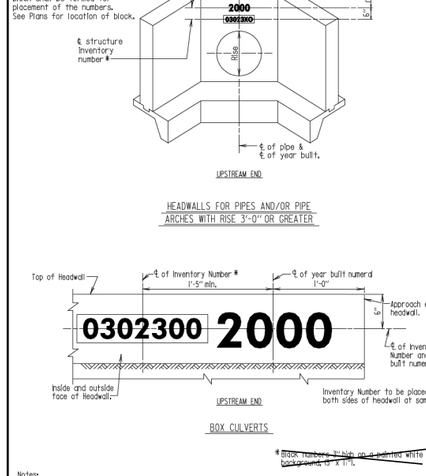


Notes:

1. Secure drive fit galvanized cap to post with 1/4" round head rivet.
2. H denotes fabric and/or fence height. F denotes depth of post foundation, see Standard 300.27.
3. F denotes depth of post foundation, see Standard 300.27.
4. If chain link fence with top rail is specified, delete steel tension wire at the top and the pipe rails at intermediate, end and corner posts. Extend tension rod to the top rail.
5. Barbed wire shall be used only when specified.
6. All data shown on typical details shall be applicable to other pertinent details.
7. Black or dark green vinyl clad over galvanized steel chain link fence is required.

APPROVED:		
DIRECTOR	DATE	
REVISION DATE:	APPROVED BY:	DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION Prince George's County, MD
		Chain Link Fence (Commercial Property Installation) - Part II — STD. 300.28

All chain link fabric and post shall be black vinyl coated.

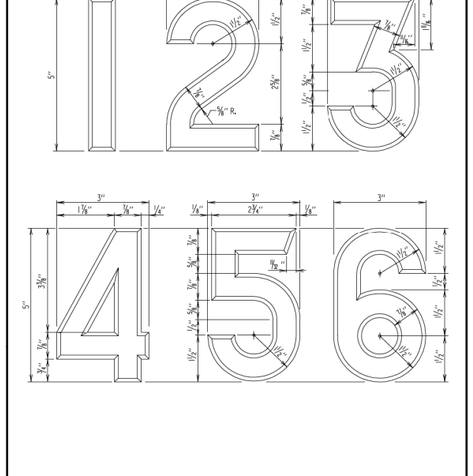


Notes:
1. For existing structures, where a year built is shown on the structure and structure is to be rehabilitated, the marking should read 1962-2000 (old year first - new year).
2. For existing structures with no year built contact Office of Structures for old year.
3. For Year Built Numerals refer to Standard No. SI-201.

APPROVAL	STATE OF MARYLAND DEPARTMENT OF TRANSPORTATION STATE HIGHWAY ADMINISTRATION OFFICE OF STRUCTURES
Lisa Choplin, DIRECTOR OFFICE OF STRUCTURES	LOCATION OF YEAR BUILT MARKING AND STRUCTURE INVENTORY NUMBER ON HEADWALLS FOR PIPES AND BOX CULVERTS
DATE: 9/14/99	STANDARD NO. SI-103 SHEET 1 OF 1
REVISIONS: SHA 3-10-00; FHWA 1-22-01	
FHWA APPROVAL DATE: 10-17-13	

OLD NO. MI0.051-99-332

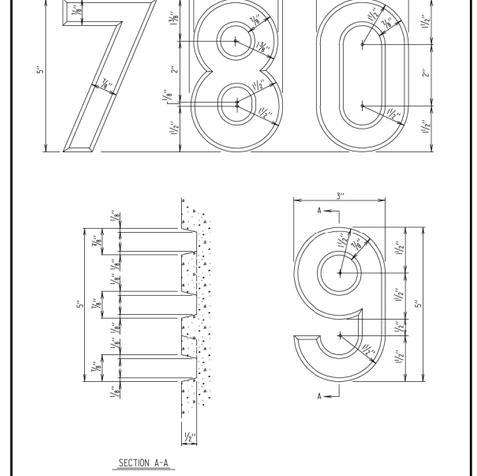
* 3" High inventory number to be indented into concrete (unpainted)



Notes:
Year built numerals to be indented into concrete (unpainted) - as indicated on Standard Nos. SI-101, SI-103 and SI-104.

APPROVAL	STATE OF MARYLAND DEPARTMENT OF TRANSPORTATION STATE HIGHWAY ADMINISTRATION OFFICE OF STRUCTURES
Lisa Choplin, DIRECTOR OFFICE OF STRUCTURES	NUMERALS FOR YEAR BUILT MARKING ON STRUCTURES
DATE: 9/14/99	STANDARD NO. SI-201 SHEET 1 OF 2
REVISIONS: SHA; FHWA	
FHWA APPROVAL DATE:	

OLD NO. MI0.071-99-334



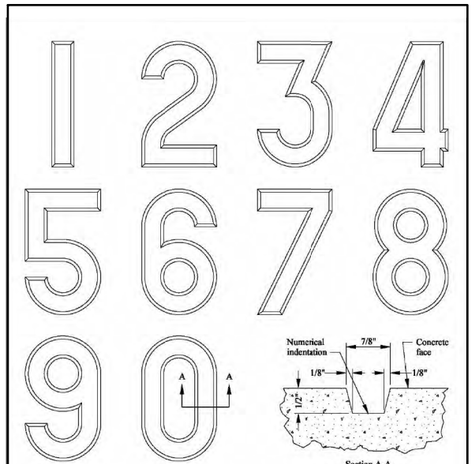
APPROVAL	STATE OF MARYLAND DEPARTMENT OF TRANSPORTATION STATE HIGHWAY ADMINISTRATION OFFICE OF STRUCTURES
Lisa Choplin, DIRECTOR OFFICE OF STRUCTURES	NUMERALS FOR YEAR BUILT MARKING ON STRUCTURES
DATE: 9/14/99	STANDARD NO. SI-201 SHEET 2 OF 2
REVISIONS: SHA; FHWA	
FHWA APPROVAL DATE:	

OLD NO. MI0.071-99-334

Note for all standards:
The designer must use the most current version standards.

APPROVED:		
DIRECTOR	DATE	
REVISION DATE:	APPROVED BY:	DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION Prince George's County, MD
04-08-2020		Standard Precast Concrete Culvert Miscellaneous Details Standard Details - 1 — SHEET M-4

Phone: 301-883-5642



Notes:
1. All numerals are to be 5" high.
2. All numerals are to be 3" wide overall except "1" which will be 7/8" wide.
3. All numerals are to be indented into concrete (unpainted).
4. For more information, refer to MSHA Structural Standards Manual Standard No's. M(0.04)-99-331, M(0.05)-99-332 and M(0.07)-99-334.

APPROVED:

DIRECTOR — DATE

REVISION DATE:	APPROVED BY:

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION
Prince George's County, MD

Year Built Numerals for Structures

STD. 300.32

GENERAL NOTES

2017

Specifications: -SHA Specifications dated ~~July 2008~~ -Revisions thereof and additions thereto and Special Provisions for Materials and Construction

AASHTO LRFD Bridge Design Specifications, 5th edition, 2010.

Concrete Design: LRFD, f'c= 3.0 ksi.

Reinforcing Steel Design: fy = 60.0 ksi.

Concrete: All structure concrete shall be Mix No. 3 (3500 psi) except as noted below under reinforcing steel.

Reinforcing Steels Reinforcing steel shall conform to A 615, Grade 60. All splices, not shown, shall be lapped as per Bar Lap Charts. Minimum cover for any bar shall be 2" unless otherwise noted, with the exception of bars at the bottom and sides of all footings which shall have 3" minimum cover.

If the front face of a retaining wall less than 10 feet from the edge of paved surfaces, epoxy coated reinforcement shall be used in the front face of the stem and Mix No. 6 (4500 psi) concrete shall be used for the stem.

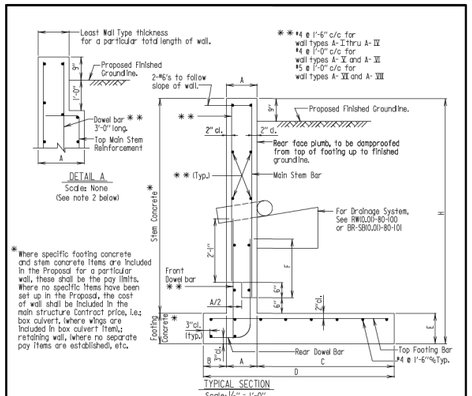
ONLY GRADE 60 CAN BE USED.

Design Parameters: Earth pressure calculated based on Coulomb Theory.

Angle of Internal Friction:
33 degrees for excellent soil
30 degrees for good and poor soils (and all walls on pile footings)

For Wall Types E and F, passive earth pressure from top of footing to bottom of shear key was utilized in the design. In these cases, the top of footing shall have a minimum of 30" cover.

Safe bearing pressures are factored resistances.



Wall Type	H	A	B	C	D	E	F	Rear Dowel Bar	Main Stem Bar	Top Foot. Bar
A-I	6'-0"	1'-0"	9"	2'-0"	3'-9"	1'-0"	2'-2"	#5 @ 1'-0"%	#5 @ 1'-0"%	#5 @ 1'-0"%
A-II	8'-0"	1'-0"	9"	3'-3"	5'-0"	1'-0"	2'-2"	#5 @ 1'-0"%	#5 @ 1'-0"%	#5 @ 1'-0"%
A-III	10'-0"	1'-0"	9"	4'-6"	6'-3"	1'-3"	2'-7"	#5 @ 1'-0"%	#5 @ 1'-0"%	#5 @ 1'-0"%
A-IV	12'-0"	1'-0"	9"	5'-6"	7'-3"	1'-3"	2'-7"	#5 @ 1'-0"%	#5 @ 1'-0"%	#5 @ 1'-0"%
A-V	14'-0"	1'-3"	1'-0"	6'-0"	8'-3"	1'-6"	3'-6"	#7 @ 1'-0"%	#7 @ 1'-0"%	#7 @ 1'-0"%
A-VI	16'-0"	1'-6"	1'-0"	6'-9"	9'-3"	1'-6"	3'-6"	#7 @ 1'-0"%	#7 @ 1'-0"%	#7 @ 1'-0"%
A-VII	18'-0"	1'-9"	1'-3"	7'-3"	10'-3"	1'-6"	3'-6"	#7 @ 1'-0"%	#7 @ 1'-0"%	#7 @ 1'-0"%
A-VIII	20'-0"	2'-3"	1'-6"	7'-9"	11'-3"	1'-6"	4'-7"	#8 @ 1'-0"%	#8 @ 1'-0"%	#8 @ 1'-0"%

Notes:
1. An "Excellent Soil Condition" is that foundation material that can support a safe bearing pressure of 5 ksf and has an angle of friction of 33°.
2. If in the length of a wall the type of wall changes and provides for a different thickness of stem, then "Detail A" shall be used for all walls of greater than the least wall thickness.
3. Contractor has option of lapping main stem reinforcement with rear dowel reinforcement as shown or by extending the rear dowel reinforcement with no splicing. However, no additional compensation to Contractor will be allowed for whichever alternative is selected.
4. These walls are valid if traffic is present on the level area adjacent to the wall.

APPROVAL: Kathleen Freidhoff, DIRECTOR, OFFICE OF STRUCTURES, DATE: 7/8/03
REVISIONS: 7-16-02; 10-5-07; 1-18-12; 5-2-14
FHWA APPROVAL DATE:
STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF STRUCTURES
STANDARD RETAINING WALL GENERAL NOTES
STANDARD NO. RW-101 SHEET __ OF __

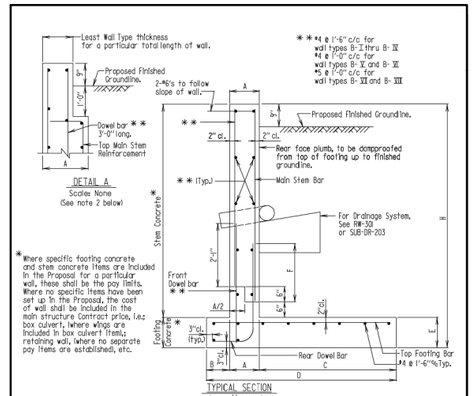
OLD NO. RW(6.02)-83-133(L)

Wall Type	H	A	B	C	D	E	F	Rear Dowel Bar	Main Stem Bar	Top Foot. Bar
B-I	6'-0"	1'-0"	9"	2'-6"	4'-3"	1'-0"	2'-2"	#5 @ 1'-0"%	#5 @ 1'-0"%	#5 @ 1'-0"%
B-II	8'-0"	1'-0"	9"	3'-6"	5'-3"	1'-0"	2'-2"	#5 @ 1'-0"%	#5 @ 1'-0"%	#5 @ 1'-0"%
B-III	10'-0"	1'-0"	1'-0"	4'-6"	6'-6"	1'-3"	2'-7"	#6 @ 1'-0"%	#6 @ 1'-0"%	#6 @ 6"%
B-IV	12'-0"	1'-0"	1'-0"	5'-6"	7'-6"	1'-3"	2'-7"	#6 @ 6"%	#6 @ 1'-0"%	#6 @ 6"%
B-V	14'-0"	1'-3"	1'-3"	6'-0"	8'-6"	1'-6"	3'-6"	#7 @ 6"%	#7 @ 1'-0"%	#7 @ 6"%
B-VI	16'-0"	1'-6"	1'-6"	6'-9"	9'-9"	1'-6"	3'-6"	#7 @ 6"%	#7 @ 1'-0"%	#7 @ 6"%
B-VII	18'-0"	1'-9"	1'-9"	7'-3"	10'-9"	1'-9"	3'-6"	#7 @ 6"%	#7 @ 1'-0"%	#7 @ 6"%
B-VIII	20'-0"	2'-3"	2'-3"	8'-6"	13'-0"	1'-9"	4'-7"	#8 @ 6"%	#8 @ 1'-0"%	#8 @ 6"%

Notes:
1. A "Good Soil Condition" is that foundation material that can support a safe bearing pressure of 4 ksf and has an angle of friction of 30°.
2. If in the length of a wall the type of wall changes and provides for a different thickness of stem, then "Detail A" shall be used for all walls of greater than the least wall thickness.
3. Contractor has option of lapping main stem reinforcement with rear dowel reinforcement as shown or by extending the rear dowel reinforcement with no splicing. However, no additional compensation to Contractor will be allowed for whichever alternative is selected.
4. These walls are valid if traffic is present on the level area adjacent to the wall.

APPROVAL: Kathleen Freidhoff, DIRECTOR, OFFICE OF STRUCTURES, DATE: 6/8/03
REVISIONS: 8-10-04; 5-9-08; 1-18-12; 12-4-13
FHWA APPROVAL DATE: 6-20-05
STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF STRUCTURES
TYPE A RETAINING WALL SECTION (FOR EXCELLENT SOIL CONDITION AND TWO FOOT SURCHARGE)
STANDARD NO. RW-102 SHEET __ OF __

OLD NO. RW(6.03)-83-134

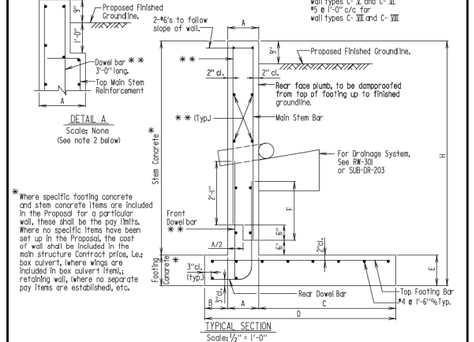


Wall Type	H	A	B	C	D	E	F	Rear Dowel Bar	Main Stem Bar	Top Foot. Bar
B-I	6'-0"	1'-0"	9"	2'-6"	4'-3"	1'-0"	2'-2"	#5 @ 1'-0"%	#5 @ 1'-0"%	#5 @ 1'-0"%
B-II	8'-0"	1'-0"	9"	3'-6"	5'-3"	1'-0"	2'-2"	#5 @ 1'-0"%	#5 @ 1'-0"%	#5 @ 1'-0"%
B-III	10'-0"	1'-0"	1'-0"	4'-6"	6'-6"	1'-3"	2'-7"	#6 @ 1'-0"%	#6 @ 1'-0"%	#6 @ 6"%
B-IV	12'-0"	1'-0"	1'-0"	5'-6"	7'-6"	1'-3"	2'-7"	#6 @ 6"%	#6 @ 1'-0"%	#6 @ 6"%
B-V	14'-0"	1'-3"	1'-3"	6'-0"	8'-6"	1'-6"	3'-6"	#7 @ 6"%	#7 @ 1'-0"%	#7 @ 6"%
B-VI	16'-0"	1'-6"	1'-6"	6'-9"	9'-9"	1'-6"	3'-6"	#7 @ 6"%	#7 @ 1'-0"%	#7 @ 6"%
B-VII	18'-0"	1'-9"	1'-9"	7'-3"	10'-9"	1'-9"	3'-6"	#7 @ 6"%	#7 @ 1'-0"%	#7 @ 6"%
B-VIII	20'-0"	2'-3"	2'-3"	8'-6"	13'-0"	1'-9"	4'-7"	#8 @ 6"%	#8 @ 1'-0"%	#8 @ 6"%

Notes:
1. A "Good Soil Condition" is that foundation material that can support a safe bearing pressure of 4 ksf and has an angle of friction of 30°.
2. If in the length of a wall the type of wall changes and provides for a different thickness of stem, then "Detail A" shall be used for all walls of greater than the least wall thickness.
3. Contractor has option of lapping main stem reinforcement with rear dowel reinforcement as shown or by extending the rear dowel reinforcement with no splicing. However, no additional compensation to Contractor will be allowed for whichever alternative is selected.
4. These walls are valid if traffic is present on the level area adjacent to the wall.

APPROVAL: Kathleen Freidhoff, DIRECTOR, OFFICE OF STRUCTURES, DATE: 6/8/03
REVISIONS: 8-10-04; 5-9-08; 1-18-12; 12-4-13
FHWA APPROVAL DATE: 6-20-05
STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF STRUCTURES
TYPE B RETAINING WALL SECTION (FOR GOOD SOIL CONDITION AND TWO FOOT SURCHARGE)
STANDARD NO. RW-103 SHEET __ OF __

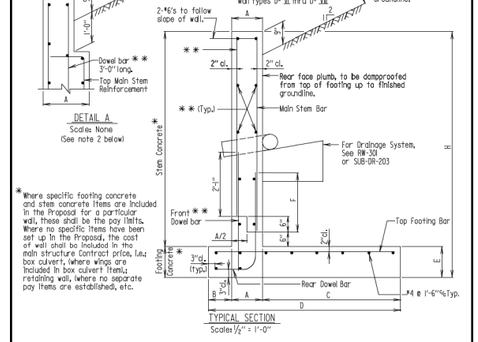
OLD NO. RW(6.04)-83-135



Wall Type	H	A	B	C	D	E	F	Rear Dowel Bar	Main Stem Bar	Top Foot. Bar
C-I	6'-0"	1'-0"	9"	2'-6"	4'-3"	1'-0"	2'-2"	#5 @ 1'-0"%	#5 @ 1'-0"%	#5 @ 1'-0"%
C-II	8'-0"	1'-0"	9"	3'-6"	5'-3"	1'-0"	2'-2"	#5 @ 1'-0"%	#5 @ 1'-0"%	#5 @ 1'-0"%
C-III	10'-0"	1'-0"	1'-0"	4'-6"	6'-6"	1'-3"	2'-7"	#6 @ 6"%	#6 @ 1'-0"%	#6 @ 6"%
C-IV	12'-0"	1'-0"	1'-0"	5'-6"	7'-6"	1'-3"	2'-7"	#6 @ 6"%	#6 @ 1'-0"%	#6 @ 6"%
C-V	14'-0"	1'-3"	1'-6"	6'-0"	8'-9"	1'-6"	3'-6"	#7 @ 6"%	#7 @ 1'-0"%	#7 @ 6"%
C-VI	16'-0"	1'-6"	1'-6"	6'-9"	9'-9"	1'-6"	3'-6"	#7 @ 6"%	#7 @ 1'-0"%	#7 @ 6"%
C-VII	18'-0"	1'-9"	1'-9"	7'-3"	10'-9"	1'-9"	4'-7"	#8 @ 6"%	#8 @ 1'-0"%	#8 @ 6"%
C-VIII	20'-0"	2'-3"	2'-3"	8'-9"	15'-0"	1'-9"	4'-7"	#8 @ 6"%	#8 @ 1'-0"%	#8 @ 6"%

Notes:
1. A "Poor Soil Condition" is that foundation material that can support a safe bearing pressure of 3 ksf and has an angle of friction of 30°.
2. If in the length of a wall the type of wall changes and provides for a different thickness of stem, then "Detail A" shall be used for all walls of greater than the least wall thickness.
3. Contractor has option of lapping main stem reinforcement with rear dowel reinforcement as shown or by extending the rear dowel reinforcement with no splicing. However, no additional compensation to Contractor will be allowed for whichever alternative is selected.
4. These walls are valid if traffic is present on the level area adjacent to the wall.

APPROVAL: Kathleen Freidhoff, DIRECTOR, OFFICE OF STRUCTURES, DATE: 6/8/03
REVISIONS: 8-10-04; 10-5-07; 1-18-12; 12-4-13
FHWA APPROVAL DATE: 6-8-00
STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF STRUCTURES
TYPE C RETAINING WALL SECTION (FOR POOR SOIL CONDITION AND TWO FOOT SURCHARGE)
STANDARD NO. RW-104 SHEET __ OF __

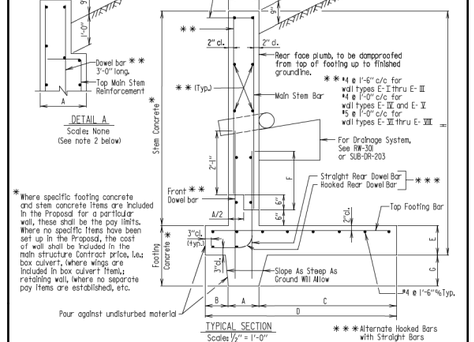


Wall Type	H	A	B	C	D	E	F	Rear Dowel Bar	Main Stem Bar	Top Foot. Bar
D-I	6'-0"	1'-0"	1'-3"	2'-6"	4'-9"	1'-0"	2'-2"	#5 @ 1'-0"%	#5 @ 1'-0"%	#5 @ 1'-0"%
D-II	8'-0"	1'-0"	1'-6"	4'-3"	6'-9"	1'-3"	2'-2"	#5 @ 1'-0"%	#5 @ 1'-0"%	#5 @ 1'-0"%
D-III	10'-0"	1'-0"	1'-6"	6'-0"	8'-6"	1'-6"	2'-7"	#6 @ 1'-0"%	#6 @ 1'-0"%	#6 @ 6"%
D-IV	12'-0"	1'-0"	1'-9"	7'-3"	10'-0"	1'-6"	2'-7"	#6 @ 6"%	#6 @ 1'-0"%	#6 @ 6"%
D-V	14'-0"	1'-9"	1'-9"	8'-3"	11'-9"	1'-6"	3'-6"	#7 @ 1'-0"%	#7 @ 1'-0"%	#7 @ 6"%
D-VI	16'-0"	1'-9"	1'-9"	10'-0"	13'-6"	1'-9"	4'-7"	#8 @ 6"%	#8 @ 1'-0"%	#8 @ 6"%
D-VII	18'-0"	2'-0"	2'-3"	11'-0"	15'-3"	2'-0"	5'-9"	#9 @ 6"%	#9 @ 1'-0"%	#9 @ 6"%
D-VIII	20'-0"	2'-6"	2'-6"	12'-6"	17'-3"	2'-6"	5'-9"	#9 @ 6"%	#9 @ 1'-0"%	#9 @ 6"%

Notes:
1. An "Excellent Soil Condition" is that foundation material that can support a safe bearing pressure of 5 ksf and has an angle of friction of 33°.
2. If in the length of a wall the type of wall changes and provides for a different thickness of stem, then "Detail A" shall be used for all walls of greater than the least wall thickness.
3. Contractor has option of lapping main stem reinforcement with rear dowel reinforcement as shown or by extending the rear dowel reinforcement with no splicing. However, no additional compensation to Contractor will be allowed for whichever alternative is selected.
4. These walls are valid if the sloping backfill levels off and traffic is present on the level area.

APPROVAL: Kathleen Freidhoff, DIRECTOR, OFFICE OF STRUCTURES, DATE: 7/16/02
REVISIONS: 5-9-08; 12-4-13
FHWA APPROVAL DATE:
STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF STRUCTURES
TYPE D RETAINING WALL SECTION (FOR EXCELLENT SOIL CONDITION AND SLOPING GROUNDLINE)
STANDARD NO. RW-105 SHEET __ OF __

OLD NO. RW(6.06)-02-340(L)

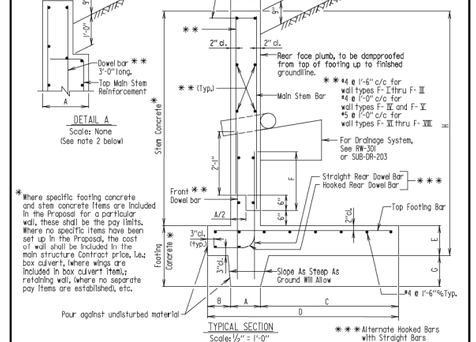


Wall Type	H	A	B	C	D	E	F	G	Straight Rear Dowel Bar	Hooked Rear Dowel Bar	Main Stem Bar	Top Foot. Bar
E-I	6'-0"	1'-0"	1'-9"	4'-6"	7'-3"	1'-0"	2'-2"	1'-0"	#5 @ 2'-0"%	#5 @ 2'-0"%	#5 @ 1'-0"%	#5 @ 6"%
E-II	8'-0"	1'-0"	1'-9"	6'-9"	9'-9"	1'-6"	2'-2"	1'-0"	#5 @ 2'-0"%	#5 @ 2'-0"%	#5 @ 1'-0"%	#5 @ 6"%
E-III	10'-0"	1'-0"	1'-9"	5'-6"	8'-3"	1'-0"	2'-7"	1'-0"	#6 @ 1'-0"%	#6 @ 1'-0"%	#6 @ 1'-0"%	#6 @ 6"%
E-IV	12'-0"	1'-3"	2'-0"	7'-3"	10'-6"	1'-6"	3'-6"	2'-0"	#7 @ 1'-0"%	#7 @ 1'-0"%	#7 @ 1'-0"%	#7 @ 6"%
E-V	14'-0"	1'-6"	2'-6"	7'-6"	11'-6"	1'-9"	3'-6"	3'-0"	#7 @ 1'-0"%	#7 @ 1'-0"%	#7 @ 1'-0"%	#7 @ 6"%
E-VI	16'-0"	1'-9"	3'-0"	8'-6"	13'-3"	2'-0"	4'-7"	3'-0"	#8 @ 1'-0"%	#8 @ 1'-0"%	#8 @ 1'-0"%	#8 @ 6"%
E-VII	18'-0"	2'-3"	3'-6"	10'-3"	16'-0"	2'-3"	5'-9"	3'-0"	#9 @ 1'-0"%	#9 @ 1'-0"%	#9 @ 1'-0"%	#9 @ 6"%
E-VIII	20'-0"	2'-9"	4'-3"	12'-0"	19'-0"	2'-6"	5'-9"	3'-0"	#9 @ 1'-0"%	#9 @ 1'-0"%	#9 @ 1'-0"%	#9 @ 6"%

Notes:
1. A "Good Soil Condition" is that foundation material that can support a safe bearing pressure of 4 ksf and has an angle of friction of 30°.
2. If in the length of a wall the type of wall changes and provides for a different thickness of stem, then "Detail A" shall be used for all walls of greater than the least wall thickness.
3. Contractor has option of lapping main stem reinforcement with rear dowel reinforcement as shown or by extending the rear dowel reinforcement with no splicing. However, no additional compensation to Contractor will be allowed for whichever alternative is selected.
4. These walls are valid if the sloping backfill levels off and traffic is present on the level area.

APPROVAL: Kathleen Freidhoff, DIRECTOR, OFFICE OF STRUCTURES, DATE: 7/16/02
REVISIONS: 12-4-13
FHWA APPROVAL DATE:
STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF STRUCTURES
TYPE E RETAINING WALL SECTION (FOR GOOD SOIL CONDITION AND SLOPING GROUNDLINE)
STANDARD NO. RW-106 SHEET __ OF __

OLD NO. RW(6.07)-02-341



Wall Type	H	A	B	C	D	E	F	G	Straight Rear Dowel Bar	Hooked Rear Dowel Bar	Main Stem Bar	Top Foot. Bar
F-I	6'-0"	1'-0"	1'-9"	4'-6"	7'-3"	1'-0"	2'-2"	1'-0"	#5 @ 2'-0"%	#5 @ 2'-0"%	#5 @ 1'-0"%	#5 @ 6"%
F-II	8'-0"	1'-0"	1'-9"	4'-9"	7'-6"	1'-0"	2'-2"	1'-0"	#5 @ 2'-0"%	#5 @ 2'-0"%	#5 @ 1'-0"%	#5 @ 6"%
F-III	10'-0"	1'-0"	1'-9"	5'-6"	8'-3"	1'-0"	2'-7"	2'-0"	#6 @ 1'-0"%	#6 @ 1'-0"%	#6 @ 1'-0"%	#6 @ 6"%
F-IV	12'-0"	1'-3"	2'-0"	7'-3"	10'-6"	1'-6"	3'-6"	2'-0"	#7 @ 1'-0"%	#7 @ 1'-0"%	#7 @ 1'-0"%	#7 @ 6"%
F-V	14'-0"	1'-6"	3'-0"	7'-6"	12'-0"	1'-9"	3'-6"	3'-0"	#7 @ 1'-0"%	#7 @ 1'-0"%	#7 @ 1'-0"%	#7 @ 6"%
F-VI	16'-0"	1'-9"	3'-0"	8'-6"	14'-3"	2'-0"	4'-7"	3'-0"	#8 @ 1'-0"%	#8 @ 1'-0"%	#8 @ 1'-0"%	#8 @ 6"%
F-VII	18'-0"	2'-3"	5'-0"	10'-3"	17'-6"	2'-3"	5'-9"	3'-0"	#9 @ 1'-0"%	#9 @ 1'-0"%	#9 @ 1'-0"%	#9 @ 6"%
F-VIII	20'-0"	2'-9"	6'-3"	12'-0"	21'-0"	2'-6"	5'-9"	3'-0"	#9 @ 1'-0"%	#9 @ 1'-0"%	#9 @ 1'-0"%	#9 @ 6"%

Notes:
1. A "Poor Soil Condition" is that foundation material that can support a safe bearing pressure of 3 ksf and has an angle of friction of 30°.
2. If in the length of a wall the type of wall changes and provides for a different thickness of stem, then "Detail A" shall be used for all walls of greater than the least wall thickness.
3. Contractor has option of lapping main stem reinforcement with rear dowel reinforcement as shown or by extending the rear dowel reinforcement with no splicing. However, no additional compensation to Contractor will be allowed for whichever alternative is selected.
4. These walls are valid if the sloping backfill levels off and traffic is present on the level area.

APPROVAL: Kathleen Freidhoff, DIRECTOR, OFFICE OF STRUCTURES, DATE: 7/16/02
REVISIONS: 5-9-08; 12-4-13
FHWA APPROVAL DATE:
STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF STRUCTURES
TYPE F RETAINING WALL SECTION (FOR POOR SOIL CONDITION AND SLOPING GROUNDLINE)
STANDARD NO. RW-107 SHEET __ OF __

OLD NO. RW(6.08)-02-342

Note for all standards:
The designer must use the most current version standards.

APPROVED:

DIRECTOR — DATE

REVISION DATE:	APPROVED BY:
04-08-2020	

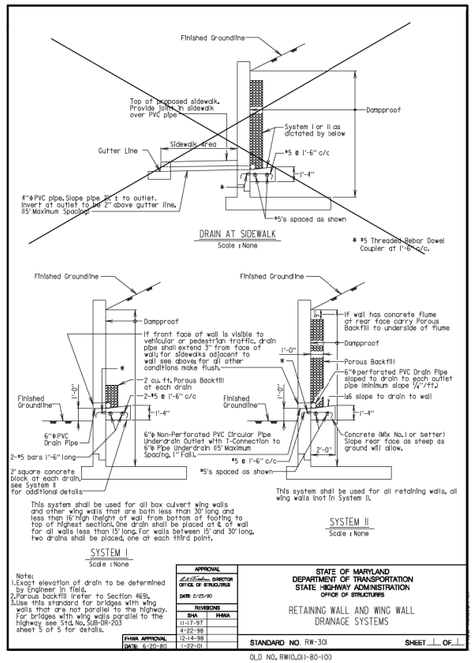
Prince George's County DPW&T
Phone: 301-883-5642

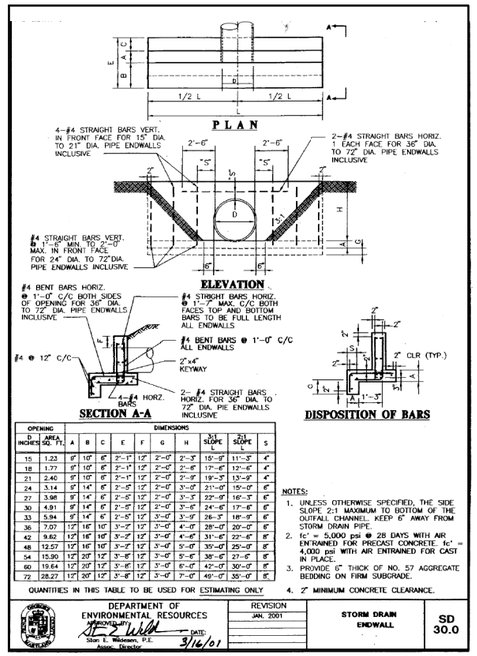
DEPARTMENT OF PUBLIC WORKS
AND TRANSPORTATION
Prince George's County, MD

Standard Precast Concrete Culvert Miscellaneous Details
Standard Details - 2

SHEET
M-5

FILE: U:\2026031141\26 PGDPWT Culvert Standards\700 CADD\706 Struct\R2-4-M STANDARD-1.dgn



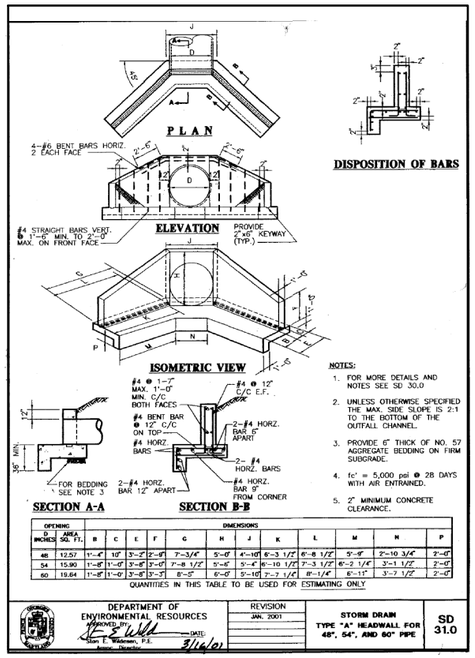


OPENING D (INCHES)	AREA SQ. FT.	A	B	C	E	F	G	H	3:1 SLOPE L	2:1 SLOPE L	S
15	1.23	6"	10"	6"	2'-1"	12"	2'-0"	2'-3"	15'-0"	11'-3"	4"
18	1.77	6"	10"	6"	2'-1"	12"	2'-0"	2'-6"	17'-6"	13'-6"	4"
21	2.40	6"	10"	6"	2'-1"	12"	2'-0"	2'-9"	19'-3"	15'-0"	4"
24	3.14	8"	14"	6"	2'-5"	12"	2'-0"	3'-0"	21'-0"	15'-9"	6"
27	3.98	8"	14"	6"	2'-5"	12"	2'-0"	3'-3"	22'-9"	16'-3"	6"
30	4.91	8"	14"	6"	2'-5"	12"	2'-0"	3'-6"	24'-6"	17'-6"	6"
33	5.94	8"	14"	6"	2'-5"	12"	2'-0"	3'-9"	26'-3"	18'-9"	6"
36	7.07	12"	16"	10"	3'-2"	12"	3'-0"	4'-0"	28'-0"	20'-0"	8"
42	9.62	12"	16"	10"	3'-2"	12"	3'-0"	4'-6"	31'-6"	22'-6"	8"
48	12.57	12"	16"	10"	3'-2"	12"	3'-0"	5'-0"	35'-0"	25'-0"	8"
54	15.90	12"	20"	12"	3'-8"	12"	3'-0"	5'-6"	38'-6"	27'-6"	8"
60	19.64	12"	20"	12"	3'-8"	12"	3'-0"	6'-0"	42'-0"	30'-0"	8"
72	28.27	12"	20"	12"	3'-8"	12"	3'-0"	7'-0"	49'-0"	35'-0"	8"

QUANTITIES IN THIS TABLE TO BE USED FOR ESTIMATING ONLY

NOTES:
1. UNLESS OTHERWISE SPECIFIED, THE SIDE SLOPE 2:1 MAXIMUM TO BOTTOM OF THE OUTFALL CHANNEL. KEEP 6" AWAY FROM STORM DRAIN PIPE.
2. f'_c = 5,000 psi @ 28 DAYS WITH AIR ENTRAINED FOR PRECAST CONCRETE. f'_c = 4,000 psi WITH AIR ENTRAINED FOR CAST IN PLACE.
3. PROVIDE 6" THICK OF NO. 57 AGGREGATE BEDDING ON FIRM SUBGRADE.
4. 2" MINIMUM CONCRETE CLEARANCE.

DEPARTMENT OF ENVIRONMENTAL RESOURCES
APPROVED BY: Stan E. Wildesen, P.E. Assoc. Director DATE: 3/16/01
REVISION: JAN. 2001
STORM DRAIN ENDWALL
SD 30.0

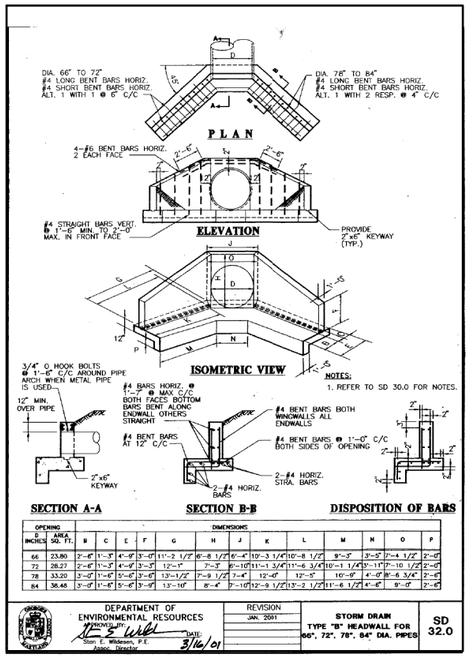


NOTES:
1. FOR MORE DETAILS AND NOTES SEE SD 30.0
2. UNLESS OTHERWISE SPECIFIED THE MAX. SIDE SLOPE IS 2:1 TO THE BOTTOM OF THE OUTFALL CHANNEL.
3. PROVIDE 6" THICK OF NO. 57 AGGREGATE BEDDING ON FIRM SUBGRADE.
4. f'_c = 5,000 psi @ 28 DAYS WITH AIR ENTRAINED.
5. 2" MINIMUM CONCRETE CLEARANCE.

OPENING D (INCHES)	AREA SQ. FT.	B	C	E	F	G	H	J	K	L	M	N	P
48	12.57	1'-4"	10"	3'-2"	2'-0"	7'-3/4"	5'-0"	4'-10"	6'-3 1/2"	6'-8 1/2"	5'-0"	2'-10 3/4"	2'-0"
54	15.90	1'-4"	1'-0"	3'-8"	2'-0"	7'-8 1/2"	5'-6"	5'-4"	6'-10 1/2"	7'-3 1/2"	6'-2 1/4"	3'-1 1/2"	2'-0"
60	19.64	1'-4"	1'-0"	3'-8"	2'-0"	8'-5"	6'-0"	5'-10"	7'-2 1/4"	8'-1 1/4"	6'-11"	3'-2 1/2"	2'-0"

QUANTITIES IN THIS TABLE TO BE USED FOR ESTIMATING ONLY

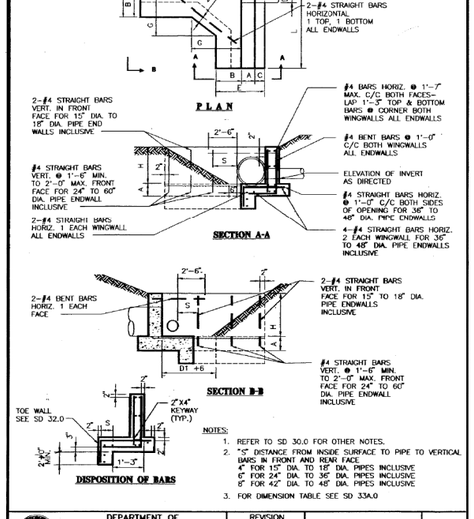
DEPARTMENT OF ENVIRONMENTAL RESOURCES
APPROVED BY: Stan E. Wildesen, P.E. Assoc. Director DATE: 3/16/01
REVISION: JAN. 2001
STORM DRAIN TYPE "A" HEADWALL FOR 48", 54", AND 60" PIPE
SD 31.0



NOTES:
1. REFER TO SD 30.0 FOR NOTES.

OPENING D (INCHES)	AREA SQ. FT.	B	C	E	F	G	H	J	K	L	M	N	O	F
66	23.80	2'-6"	1'-3"	4'-0"	3'-0"	11'-2 1/2"	6'-8 1/2"	6'-4"	10'-3 1/4"	10'-8 1/2"	9'-3"	3'-5"	2'-4 1/2"	2'-0"
72	28.27	2'-6"	1'-3"	4'-0"	3'-0"	12'-1"	7'-3"	8'-10"	11'-1 3/4"	11'-6 3/4"	10'-1 1/4"	3'-11"	2'-10 1/2"	2'-0"
78	33.20	3'-0"	1'-6"	5'-0"	3'-0"	13'-1/2"	7'-9 1/2"	7'-4"	12'-0"	12'-5"	10'-9"	4'-0"	3'-4"	2'-6"
84	38.46	3'-0"	1'-6"	5'-0"	3'-0"	13'-10"	8'-4"	7'-10"	12'-9 1/2"	13'-2 1/2"	11'-6 1/2"	4'-6"	9'-0"	2'-6"

DEPARTMENT OF ENVIRONMENTAL RESOURCES
APPROVED BY: Stan E. Wildesen, P.E. Assoc. Director DATE: 3/16/01
REVISION: JAN. 2001
STORM DRAIN TYPE "B" HEADWALL FOR 66", 72", 78", 84" DIA. PIPES
SD 32.0



NOTES:
1. REFER TO SD 30.0 FOR OTHER NOTES.
2. "S" DISTANCE FROM INSIDE SURFACE TO PIPE TO VERTICAL BARS IN FRONT AND REAR FACE.
   4" FOR 15" DIA. TO 18" DIA. PIPES INCLUSIVE
   6" FOR 24" DIA. TO 36" DIA. PIPES INCLUSIVE
   8" FOR 42" DIA. TO 48" DIA. PIPES INCLUSIVE
3. FOR DIMENSION TABLE SEE SD 33A.0

DEPARTMENT OF ENVIRONMENTAL RESOURCES
APPROVED BY: Stan E. Wildesen, P.E. Assoc. Director DATE: 3/16/01
REVISION: JAN. 2001
STORM DRAIN TYPE "H" ENDWALL
SD 33.0

QUANTITY TABLE

D1	D2	A	B	C	E	H	3:1 SLOPE L	2:1 SLOPE L	G
15"	15"	9"	6"	6"	1'-9"	2'-0"	7'-9"	5'-9"	2'-0"
18"	15"	9"	6"	6"	1'-9"	2'-3"	8'-9"	6'-6"	2'-3"
18"	18"	9"	6"	6"	1'-9"	2'-3"	8'-9"	6'-6"	2'-3"
24"	15"	9"	14"	6"	2'-5"	2'-9"	10'-9"	8'-0"	3'-0"
24"	18"	9"	14"	6"	2'-5"	2'-9"	10'-9"	8'-0"	3'-0"
24"	24"	9"	14"	6"	2'-5"	2'-9"	10'-9"	8'-0"	3'-0"
30"	15"	9"	14"	6"	2'-5"	3'-6"	13'-6"	10'-0"	3'-9"
30"	18"	9"	14"	6"	2'-5"	3'-6"	13'-6"	10'-0"	3'-9"
30"	24"	9"	14"	6"	2'-5"	3'-6"	13'-6"	10'-0"	3'-9"
30"	30"	9"	14"	6"	2'-5"	3'-6"	13'-6"	10'-0"	3'-9"
36"	15"	12"	16"	10"	3'-2"	4'-0"	15'-6"	11'-6"	4'-6"
36"	18"	12"	16"	10"	3'-2"	4'-0"	15'-6"	11'-6"	4'-6"
36"	24"	12"	16"	10"	3'-2"	4'-0"	15'-6"	11'-6"	4'-6"
36"	30"	12"	16"	10"	3'-2"	4'-0"	15'-6"	11'-6"	4'-6"
36"	36"	12"	16"	10"	3'-2"	4'-0"	15'-6"	11'-6"	4'-6"
42"	15"	12"	16"	10"	3'-2"	4'-6"	17'-6"	13'-0"	5'-3"
42"	18"	12"	16"	10"	3'-2"	4'-6"	17'-6"	13'-0"	5'-3"
42"	24"	12"	16"	10"	3'-2"	4'-6"	17'-6"	13'-0"	5'-3"
42"	30"	12"	16"	10"	3'-2"	4'-6"	17'-6"	13'-0"	5'-3"
42"	36"	12"	16"	10"	3'-2"	4'-6"	17'-6"	13'-0"	5'-3"
42"	42"	12"	16"	10"	3'-2"	4'-6"	17'-6"	13'-0"	5'-3"
48"	15"	12"	16"	10"	3'-2"	5'-0"	19'-6"	14'-6"	6'-0"
48"	18"	12"	16"	10"	3'-2"	5'-0"	19'-6"	14'-6"	6'-0"
48"	24"	12"	16"	10"	3'-2"	5'-0"	19'-6"	14'-6"	6'-0"
48"	30"	12"	16"	10"	3'-2"	5'-0"	19'-6"	14'-6"	6'-0"
48"	36"	12"	16"	10"	3'-2"	5'-0"	19'-6"	14'-6"	6'-0"
48"	42"	12"	16"	10"	3'-2"	5'-0"	19'-6"	14'-6"	6'-0"
48"	48"	12"	16"	10"	3'-2"	5'-0"	19'-6"	14'-6"	6'-0"

DEPARTMENT OF ENVIRONMENTAL RESOURCES
APPROVED BY: Stan E. Wildesen, P.E. Assoc. Director DATE: 3/16/01
REVISION: JAN. 2001
STORM DRAIN TYPE "H" ENDWALL QUANTITY TABLE
SD 33A.0

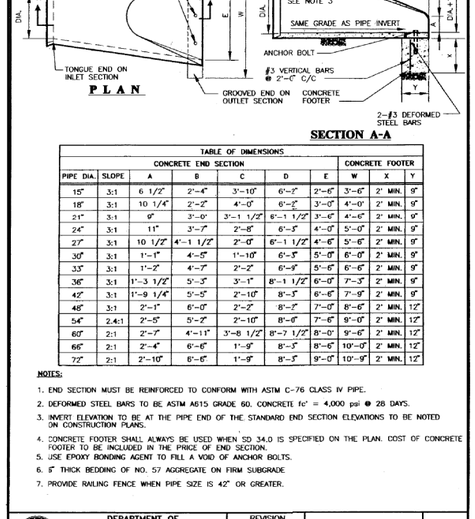
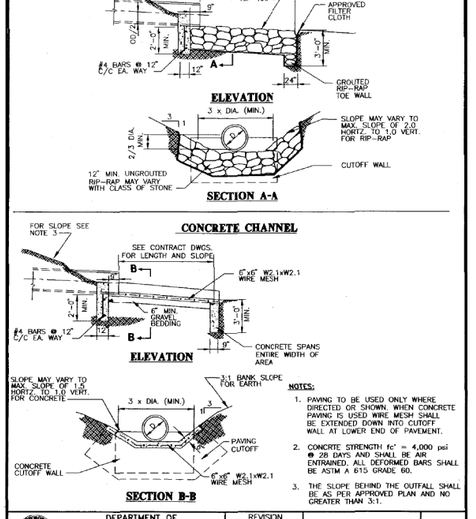


TABLE OF DIMENSIONS									
		CONCRETE END SECTION					CONCRETE FOOTER		
PIPE DIA.	SLOPE	A	B	C	D	E	W	X	Y
15"	3:1	6 1/2"	2'-4"	3'-10"	6'-3"	2'-6"	3'-6"	2" MIN.	9"
18"	3:1	10 1/4"	2'-2"	4'-0"	6'-5"	3'-0"	4'-0"	2" MIN.	9"
21"	3:1	9"	3'-0"	3'-1 1/2"	6'-1 1/2"	3'-6"	4'-6"	2" MIN.	9"
24"	3:1	11"	3'-7"	2'-8"	6'-3"	4'-0"	5'-0"	2" MIN.	9"
27"	3:1	10 1/2"	4'-1 1/2"	2'-0"	6'-1 1/2"	4'-6"	5'-6"	2" MIN.	9"
30"	3:1	1'-1"	4'-5"	1'-10"	6'-5"	5'-0"	6'-0"	2" MIN.	9"
33"	3:1	1'-2"	4'-7"	2'-2"	6'-9"	5'-6"	6'-6"	2" MIN.	9"
36"	3:1	1'-3 1/2"	5'-3"	3'-1"	8'-1 1/2"	6'-0"	7'-3"	2" MIN.	9"
42"	3:1	1'-9 1/4"	5'-5"	2'-10"	8'-5"	6'-6"	7'-9"	2" MIN.	9"
48"	3:1	2'-1"	6'-0"	2'-2"	8'-5"	7'-0"	8'-6"	2" MIN.	12"
54"	2.4:1	2'-5"	5'-2"	2'-10"	8'-6"	7'-6"	9'-0"	2" MIN.	12"
60"	2:1	2'-7"	4'-11"	3'-8 1/2"	8'-7 1/2"	8'-0"	9'-6"	2" MIN.	12"
66"	2:1	2'-4"	6'-6"	1'-9"	8'-5"	8'-6"	10'-0"	2" MIN.	12"
72"	2:1	2'-10"	6'-6"	1'-9"	8'-5"	9'-0"	10'-9"	2" MIN.	12"

NOTES:
1. END SECTION MUST BE REINFORCED TO CONFORM WITH ASTM C-76 CLASS IV PIPE.
2. DEFORMED STEEL BARS TO BE ASTM A615 GRADE 60. CONCRETE f'_c = 4,000 psi @ 28 DAYS.
3. INVERT ELEVATION TO BE AT THE PIPE END OF THE STANDARD END SECTION ELEVATIONS TO BE NOTED ON CONSTRUCTION PLANS.
4. CONCRETE FOOTER SHALL ALWAYS BE USED WHEN SD 34.0 IS SPECIFIED ON THE PLAN. COST OF CONCRETE FOOTER TO BE INCLUDED IN THE PRICE OF END SECTION.
5. USE EPOXY BONDING AGENT TO FILL A VOID OF ANCHOR BOLTS.
6. 5" THICK BEDDING OF NO. 57 AGGREGATE ON FIRM SUBGRADE
7. PROVIDE RAILING FENCE WHEN PIPE SIZE IS 42" OR GREATER.

DEPARTMENT OF ENVIRONMENTAL RESOURCES
APPROVED BY: Stan E. Wildesen, P.E. Assoc. Director DATE: 3/16/01
REVISION: JAN. 2001
STORM DRAIN PRECAST CONCRETE END SECTION ROUND PIPE
SD 34.0



NOTES:
1. PAVING TO BE USED ONLY WHERE DIRECTED OR SHOWN. WHEN CONCRETE PAVING IS USED WIRE MESH SHALL BE EXTENDED DOWN INTO CUTOFF WALL AT LOWER END OF PAVEMENT.
2. CONCRETE STRENGTH f'_c = 4,000 psi @ 28 DAYS AND SHALL BE AIR ENTRAINED. ALL DEFORMED BARS SHALL BE ASTM A 615 GRADE 60.
3. THE SLOPE BEHIND THE OUTFALL SHALL BE AS PER APPROVED PLAN AND NO GREATER THAN 3:1.

DEPARTMENT OF ENVIRONMENTAL RESOURCES
APPROVED BY: Stan E. Wildesen, P.E. Assoc. Director DATE: 3/16/01
REVISION: JAN. 2001
STORM DRAIN CUTOFF WALL AND OUTFALL DETAIL
SD 35.0

Note for all standards:
The designer must use the most current version standards.

APPROVED:

DIRECTOR DATE

REVISION DATE:	APPROVED BY:
04-08-2020	

Phone: 301-883-5642

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION
Prince George's County, MD

Standard Precast Concrete Culvert Miscellaneous Details
Standard Details - 3

SHEET M-6

FILE: U:\2026031141\26 PGDPWT Culvert Standards\700 CADD\706 Struct\R2-4-M STANDARD-1.dgn

D-4-2 STANDARDS AND SPECIFICATIONS

FOR

PLUNGE POOL

Definition

An excavated depression lined with riprap and placed at the outfall of a culvert.

Purpose

To dissipate the energy of a discharge and prevent scour at a pipe outfall.

Conditions Where Practice Applies

Where discharge velocity and energy at a pipe outlet is sufficient to erode the downstream channel reach. This applies to outlets of all types such as road culverts, sediment basins, and stormwater management facilities. Plunge pools are an alternative to rock outlet protection and are preferable in locations where space constraints exist. A plunge pool may be temporary or permanent, based on design.

Design Criteria

1. Select type of plunge pool (larger stone required for Type I):

   Type I: Plunge pool is depressed ½ the size of the culvert rise.
   Type II: Plunge pool is depressed the full height of the culvert rise.

2. Determine the riprap (d_{50}) stone size for the plunge pool type and design storm flow.

   Type I: $d_{50} = (0.0125d^2/Tw) \times (Q/d^{2.5})^{4/3}$
   Type II: $d_{50} = (0.0082d^2/Tw) \times (Q/d^{2.5})^{4/3}$

3. Determine plunge pool dimensions.

   $C = (3 \times d) + (6 \times F)$
   $B = (2 \times d) + (6 \times F)$

   Where: d_{50} = the median stone size in feet (refer to Table H.2: Stone Size)
   d = the culvert diameter or span in feet
   Tw = the tailwater depth in feet
   Q = the design flow for the culvert, minimum 10-year, 24-hour storm, in cfs
   B = the plunge pool width in feet
   C = the plunge pool length in feet
   D = 2 x d_{50} = riprap thickness in feet
   E = the culvert diameter or span in feet equal to d
   3E = the plunge pool bottom length in feet
   2E = the plunge pool bottom width in feet
   F = plunge pool depth in feet = d (for Type II) or 0.5 d (for Type I)

4. For permanent uses, provide a toewall at the downstream end at a depth twice the (D) dimension and at a width equal to the (D) dimension, on nonwoven geotextile. Extend the rip-rap a minimum of 18 inches under the outlet pipe if the outlet does not have a footer or headwall.

5. Provide an underdrain to a suitable outfall if standing water in the plunge pool is an issue or as required by the appropriate approval authority.

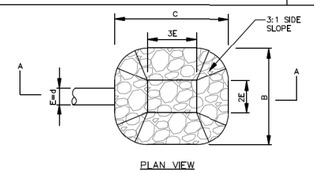
6. Provide the design values on the plans for the following dimensions: B, C, D, E, and F.

Maintenance

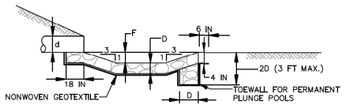
Maintenance needs are generally low for plunge pools. The line, grade and cross section must be maintained, and the outlet must be kept free of erosion. After high flows inspect for scour and dislodged riprap. Repairs must be made immediately. Accumulated sediment and debris must be removed.

DETAIL D-4-2 PLUNGE POOL

STANDARD SYMBOL: PP



PLAN VIEW



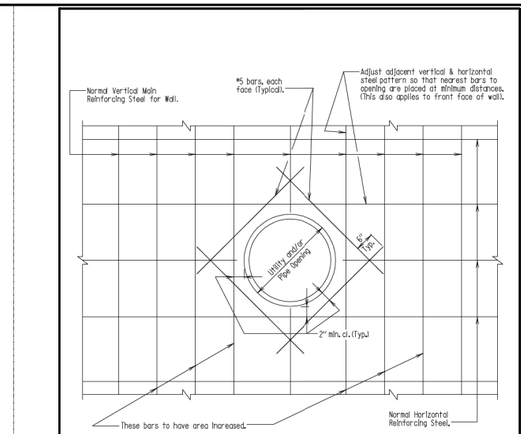
SECTION A–A

CONSTRUCTION SPECIFICATIONS

1. USE SPECIFIED CLASS OF RIPRAP.
2. USE NONWOVEN GEOTEXTILE AS SPECIFIED IN SECTION H–1 MATERIALS, AND PROTECT FROM PUNCHING, CUTTING, OR TEARING. REPAIR ANY DAMAGE OTHER THAN AN OCCASIONAL SMALL HOLE BY PLACING ANOTHER PIECE OF GEOTEXTILE OVER THE DAMAGED PART OR BY COMPLETELY REPLACING THE GEOTEXTILE. PROVIDE A MINIMUM OF ONE FOOT OVERLAP FOR ALL REPAIRS AND FOR JOINING TWO PIECES OF GEOTEXTILE.
3. PREPARE THE SUBGRADE FOR THE PLUNGE POOL TO THE REQUIRED LINES AND GRADES. COMPACT ANY FILL REQUIRED IN THE SUBGRADE TO A DENSITY OF APPROXIMATELY THAT OF THE SURROUNDING UNDISTURBED MATERIAL.
4. EMBED THE GEOTEXTILE A MINIMUM OF 4 INCHES AND EXTEND THE GEOTEXTILE A MINIMUM OF 6 INCHES BEYOND THE EDGE OF THE SCOUR HOLE.
5. STONE FOR THE PLUNGE POOL MAY BE PLACED BY EQUIPMENT. CONSTRUCT TO THE FULL COURSE THICKNESS IN ONE OPERATION AND IN SUCH A MANNER AS TO AVOID DISPLACEMENT OF UNDERLYING MATERIALS. DELIVER AND PLACE THE STONE FOR THE PLUNGE POOL IN A MANNER THAT WILL ENSURE THAT IT IS REASONABLY HOMOGENEOUS WITH THE SMALLER STONES AND SPALLS FILLING THE VOIDS BETWEEN THE LARGER STONES. PLACE STONE FOR THE PLUNGE POOL IN A MANNER TO PREVENT DAMAGE TO THE GEOTEXTILE. HAND PLACE TO THE EXTENT NECESSARY.
6. AT THE PLUNGE POOL OUTLET, PLACE THE STONE SO THAT IT MEETS THE EXISTING GRADE.
7. MAINTAIN LINE, GRADE, AND CROSS SECTION. KEEP OUTLET FREE OF EROSION. REMOVE ACCUMULATED SEDIMENT AND DEBRIS. AFTER HIGH FLOWS INSPECT FOR SCOUR AND DISLODGED RIPRAP. MAKE NECESSARY REPAIRS IMMEDIATELY.

MARYLAND STANDARDS AND SPECIFICATIONS FOR SOIL EROSION AND SEDIMENT CONTROL

U.S. DEPARTMENT OF AGRICULTURE NATURAL RESOURCES CONSERVATION SERVICE	2011	MARYLAND DEPARTMENT OF ENVIRONMENT WATER MANAGEMENT ADMINISTRATION



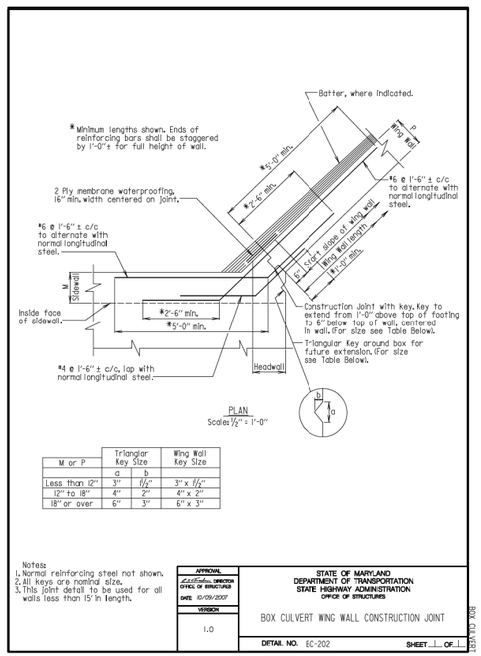
ELEVATION
Scale: None

Note:
1. Increase the size of each of the first three normal main vertical reinforcing steel bars, on each side of the wall opening. New bar size shall be such that each increase in bar area shall at least equal ⅛ the total area of the main reinforcing steel that has been cut.
2. When pipe size is over 3'-0", sufficient horizontal bars shall be added over and below opening to transfer load to adjacent full sections of wall.
3. In no case shall concrete cover be less than 2".

* FOR OFFICE USE ONLY *

APPROVAL	STATE OF MARYLAND DEPARTMENT OF TRANSPORTATION STATE HIGHWAY ADMINISTRATION OFFICE OF STRUCTURES
DIRECTOR OFFICE OF STRUCTURES DATE: 7/25/79	REINFORCEMENT ADJUSTMENT AT UTILITY AND/OR PIPE OPENING IN WALL
REVISIONS: SHA 12-4-84, FHWA 6-8-90; 7-2-93	
FHWA APPROVAL DATE: 12-20-79	STANDARD NO. RW-501 SHEET 1 OF 1
	OLD NO. M6.03-79-77

STATE HIGHWAY ADMINISTRATION

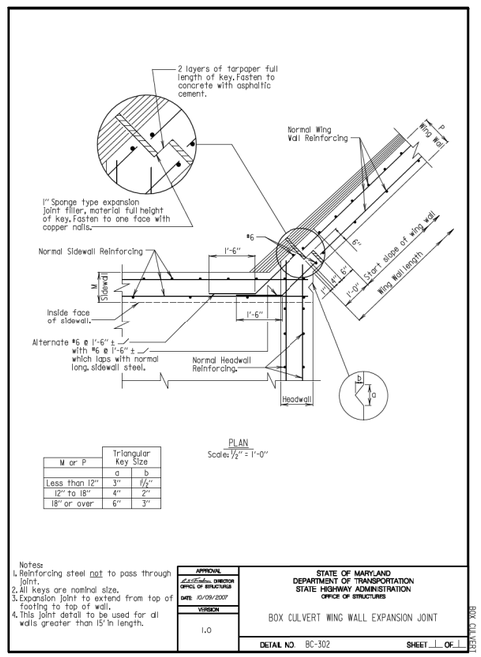


M or P	Triangular Key Size a	b	Wing Wall Key Size
Less than 12"	3"	1½"	3" x 1½"
12" to 18"	4"	2"	4" x 2"
18" or over	6"	3"	6" x 3"

Notes:
1. Normal reinforcing steel not shown.
2. All keys are nominal size.
3. This joint detail to be used for all walls less than 15' in length.

APPROVAL	STATE OF MARYLAND DEPARTMENT OF TRANSPORTATION STATE HIGHWAY ADMINISTRATION OFFICE OF STRUCTURES
DIRECTOR OFFICE OF STRUCTURES DATE: 10/09/2007	BOX CULVERT WING WALL CONSTRUCTION JOINT
VERSION: 1.0	DETAIL NO. EC-202 SHEET 1 OF 1

BOX CULVERT

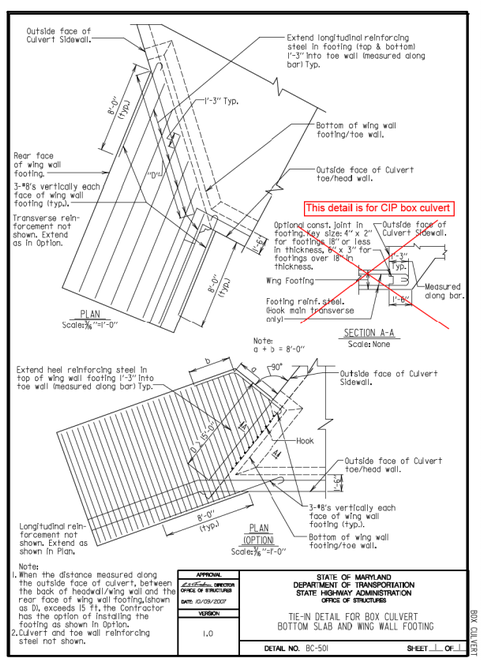


M or P	Triangular Key Size a	b
Less than 12"	3"	1½"
12" to 18"	4"	2"
18" or over	6"	3"

Notes:
1. Reinforcing steel not to pass through joint.
2. All keys are nominal size.
3. Expansion joint to extend from top of footing to top of wall.
4. This joint detail to be used for all walls greater than 15' in length.

APPROVAL	STATE OF MARYLAND DEPARTMENT OF TRANSPORTATION STATE HIGHWAY ADMINISTRATION OFFICE OF STRUCTURES
DIRECTOR OFFICE OF STRUCTURES DATE: 10/09/2007	BOX CULVERT WING WALL EXPANSION JOINT
VERSION: 1.0	DETAIL NO. BC-302 SHEET 1 OF 1

BOX CULVERT



Note:
1. When the distance measured along the outside face of culvert, between the back of headwall/wing wall and the rear face of wing wall footing, shown as D, exceeds 15 ft, the Contractor has the option of installing the footing as shown in Option.
2. Culvert and toe wall reinforcing steel not shown.

APPROVAL	STATE OF MARYLAND DEPARTMENT OF TRANSPORTATION STATE HIGHWAY ADMINISTRATION OFFICE OF STRUCTURES
DIRECTOR OFFICE OF STRUCTURES DATE: 10/09/2007	TIE-IN DETAIL FOR BOX CULVERT BOTTOM SLAB AND WING WALL FOOTING
VERSION: 1.0	DETAIL NO. BC-501 SHEET 1 OF 1

BOX CULVERT

Note for all standards:
The designer must use the most current version standards.

APPROVED:

DIRECTOR — DATE

REVISION DATE:	APPROVED BY:
04-08-2020	

Prince George's County DPW&T
Phone: 301-883-5642

DEPARTMENT OF PUBLIC WORKS
AND TRANSPORTATION
Prince George's County, MD

Standard Precast Concrete Culvert Miscellaneous Details
Standard Details - 4

SHEET
M-7

FILE: U:\2026031141\26 PGDPWT Culvert Standards\700 CADD\706 Struct\R2-4-M STANDARD-1.dgn