Hydrologic & Hydraulic Data

Precast segment length shall be 5 feet minimum, 16 feet maximum.

Culverts with 17 feet or more total opening length measured in accordance with National Bridge
County Engineer for review and approval prior to performing the work if there is any change.

The precast culvert units shall be tightened using prestressing strands along the full length of the
structure. See Sheet C1-8 for details.

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

Post Tensioning:

Waterproofing:

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

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.

Contact:

Env T. Beckert, P.E., Chief, Phone: 301-883-5714, Email: etbeckert@co.pg.md.us
Jay Shah, P.E., Project Manager, Phone: 301-883-5713, Email: joshah@co.pg.md.us
Highway and Bridge Design Division
Office of Engineering and Project Management
Prince George’s County DPW&T
1. Install chain link safety fence along top of headwall and wingwalls. For chain link safety fence details, see Sheet C1-8.

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. 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 work, 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 a 4'x4'x8" concrete slab. See sheet M-3 for details.

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-4.

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 use precast concrete headwalls. 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.
Geometric Layout

Working Point Table

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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.
1. Install chain link safety fence along top of headwall and wingwalls. For chain link safety fence details, see DPW&T Std. No. 300.27.  
2. For Bridge No. and year built marking, see MD SHA Std. No. SI-103 and DPW&T Std. No. 300.  
3. If the culvert has 3 feet of fill or less over the structure, a reinforced concrete deck slab shall be provided. For details, see Sheet M-3.  
4. 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 design/plan shall be prepared by a Professional Engineer registered in the state of Maryland.  
5. The wingwall II design can follow SHA Std. RW-101 & RW-101 & RW-301 on Sheet M-5 & M-6. Consider designing toewall to replace shear key as necessary.  
6. The wingwall footing design should follow sha Std. RW-101 & RW-101 & RW-301 on Sheet M-5 & M-6. All numerals shall be indented in concrete.  
7. For traffic barrier over culvert, the preferred option is standard traffic barrier for roadway (see SHA Std. MD 605.26).  
8. If neither option 1 or 2 works, the 3rd option is anchoring the guardrail post on the deck slab. The anchoring details are the same as 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 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 the 4'x4'x8'' concrete slab. See sheet M-3 for details.
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.
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, an option is SHA Std MD 605.26 traffic barrier W Beam post placement details for spanning 12'-2" to 18'-5" openings. If 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 3rd option is anchoring the guardrail post on the concrete wingwall footing. See Sheet M-3 details. When the fill is less than 1'-6", the 4th option is to anchor the guardrail post on the dock 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-4. 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 neither option 1 or 2 works, the 3rd option is anchoring the guardrail post on the 4'x4'x8" concrete 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 the selected option 3. These detail plans shall be prepared and sealed 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 the selected option 3. 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.

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

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

APPROVED:

PRINCE GEORGE'S COUNTY, MD

SHEET
C1-6
Wing Wall Dimensions Table

<table>
<thead>
<tr>
<th>Location</th>
<th>Angle δ</th>
<th>Height H1</th>
<th>Height H2</th>
<th>Footing X</th>
<th>Footing Y</th>
<th>Footing bottom Elevation</th>
<th>MDOT SHA Detail No.</th>
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<td>Wingwall IV</td>
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</tr>
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</table>

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.
Notes for Precast Concrete Box Culvert:

1. Fabricator shall provide all details for post-tension connections.
2. Post-tensioning strands shall be ASTM A416 Grade 270, low relaxation 7-wire (uncoated) each strand shall be stressed to 28,900 lbs. Fabricator shall provide all details for post-tension connections.
3. Snug fit all joints before post-tensioning.
4. Anchor plates shall be grouted in field by contractor using non-shrink grout at mid span.
5. Additional PVC duct of post-tensioned strand for span ≥10’.
6. #57 Stone drainage system exterior wall only.
7. Geotextile (Class E, nonwoven) envelope Joint overlap of 5” by 5”.
8. Post-tensioning recesses shall be grouted in field by contractor using non-shrink grout. Snug fit all joints before post-tensioning.
9. Post-tensioning and grouting shall be completed before backfilling and allowing traffic over the structure. Grout shall reach minimum strength before backfilling. Post-tensioning details and procedures must be approved by the County Engineer.
10. Minimum length of precast box segment is 5 feet and maximum length is 16 feet.
11. For rebar size and spacing, see sheet C1-11 to C1-12.
12. The contractor has the option to use 2” dia. sch 40 PVC duct for post-tensioning strand.
13. The contractor has the option to use different strand, post-tensioning, splice/anchor details upon the County Engineer's review/approval.

Additional PVC duct of post-tensioned strand

10’ x 12’ Long

#57 Stone drainage system exterior wall only.

Geotextile (Class E, nonwoven) envelope Joint overlap of 5” by 5”.

Note 8: Fill recess with non-shrink grout after tensioning.
Standard Precast Concrete Box Culvert

Details (2 of 3)

APPROVED:

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

SHEET C1-9
Elevation View at Precast Segment Joints

- Optional mechanical rebar splice
- Embedded end (1'-0" min.)
- Thread length per manufacturer for mechanical splice
- Face of precast end segment

Optional mechanical rebar splice

#4 Bar End Cap Anchor

Bar Bend Diagram

Scale: N.T.S.

Precast box culvert side wall
Precast box culvert bottom slab

Top elev. of box culvert bottom slab
#4@1'-0" (max.)
3@6"

#4@1'-0" Each face
3@6"
1'-3" (min.)

C.I.P. Tie-in

Place sheet metal (aluminum or steel) beneath full width of culvert to prevent bedding material from entering joint when connecting precast segments.

Tie-in Detail for Precast Box Culvert

Bottom Slab and Wingwall Footing

Scale: N.T.S.

- C.I.P. Apron reinforcing steel
- 3@6" (typ.)
- Slope as steep as ground will allow

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

C.I.P. Apron

Tie-in Detail for C.I.P. Apron and Wingwall Footing

Scale: N.T.S.

- Footing reinforcing
- Precast box culvert side wall

#4@1'-0"
3@6"

#4@1'-0" Each face
3@6"
1'-3" (min.)

C.I.P. Tie-in

#4@1'-0" (max.)
3@6"

C.I.P. Tie-in

Slope as steep as ground will allow

C.I.P. Tie-in

Standard Precast Concrete Box Culvert Details (3 of 3)
### Table 2 - Standard Precast Box Culvert Design - 7' Spans

<table>
<thead>
<tr>
<th>Span x Rise (FL)</th>
<th>Slab / Wall Thickness</th>
<th>Design earth cover above top slab</th>
<th>Reinforcement</th>
<th>Min. req'd factored soil brg. resistance STR 1 (ksf)</th>
</tr>
</thead>
<tbody>
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<td>Ex. of slabs &amp; walls</td>
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<tr>
<td></td>
<td></td>
<td>Bot. of slab</td>
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</tr>
<tr>
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<td></td>
<td>Top of slab</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Top slab long.</td>
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</tr>
<tr>
<td>6' x 6'</td>
<td>8 8 8 6</td>
<td>7' x 6'</td>
<td>#4 @ 12&quot;</td>
<td>4.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7' x 5'</td>
<td>6 6 6</td>
<td>7' x 5'</td>
<td>#4 @ 6&quot;</td>
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### Table 3 - Standard Precast Box Culvert Design - 8' Spans

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<th>Min. req'd factored soil brg. resistance STR 1 (ksf)</th>
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<td>Top of slab</td>
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<tr>
<td></td>
<td></td>
<td>Top slab long.</td>
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<tr>
<td>6' x 6'</td>
<td>9 9 9</td>
<td>8' x 6'</td>
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<tr>
<td>7' x 5'</td>
<td>9 9 9</td>
<td>7' x 5'</td>
<td>#4 @ 6&quot;</td>
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### Notes:

1. All longitudinal bars to be #4 with a maximum spacing of 12" 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.
### Table 4 - Standard Precast Box Culvert Design - 9' Spans

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<th>Span x Rise (S)</th>
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### Table 5 - Standard Precast Box Culvert Design - 10' Spans

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<tr>
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<td>S1 @ 6&quot;</td>
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<td></td>
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<td>S1 @ 6&quot;</td>
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<td>12' x 7'</td>
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### Table 7 - Standard Precast Box Culvert Design - 12' Spans

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<th>Min. req'd factored soil brg. resistance</th>
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<td>10</td>
<td>S1 @ 6&quot;</td>
<td>4.1</td>
</tr>
</tbody>
</table>

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.
The Developer must provide R.O.W./drainage easement at least 10 feet outside and Hydrologic and Hydraulic Data Table on Sheet M-1. The designer shall fill out the blank tables as applicable in this set of drawings. Conservation District (SCD) for review and approval. State and Federal permits Stream Diversion: Place utility line away from the structure, Minimum of 5 feet outside of the county Sheet M-3. Culvert is not allowed to have more than 3 cells. minimum length of 20 feet as measured along the centerline of the roadway, see Culverts with 17 feet or more opening length measured in accordance with National All concrete pipe joints shall be sealed in accordance with SHA Spec. Section 303. Pipe Joint: Precast concrete pipe joint shall be sealed in accordance with SHA Spec. Section 303. Structure Layout: Culverts with 17 feet or more opening length measured in accordance with National Bridge Inspection Standards (NBIS) 23 CRF 650.305 shall be resisted 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/divide 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 OPN 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). 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 Site Spec. Section TC 6.14 titled “RESTRICTIONS FOR PLACING AND USING EQUIPMENT ON STRUCTURES, OR STORING MATERIALS ON/AGAINST STRUCTURES” in the contract documents. In order to comply with this article, the contractor shall read section 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.

Foundations Requirements: Undercutting and backfilling with crusher run aggregate CR-4 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. per SHA PPM D-79-17. All 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, recommended bearing capacity, and recommendation for undercut/breakfill to achieve the required bearing capacity.

Construction Sequence: The construction sequence is to place 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 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 Spec. 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 pipes, direct design method might be appropriate. When using indirect design method, if the rating vehicle induces 00.01 load lower than the specified pipe class capacity, its inventory and operating ratings can indicate the tons of the vehicle with a 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(47A) prior to the construction permit approval. During construction phase, if there is change in the site conditions than the load rating analysis shall be recalculated and recomputed for County’s approval prior to as-built approval and bond release.

Contact:
Env T. Becket, P.E., Chief, Phone: 301-883-5714, Email: etbecket@co.pg.md.us
Jay Shah, P.E., Project Manager, Phone: 301-883-5713, Email: joshah@co.pg.md.us
Highway and Bridge Design Division
Office of Engineering and Project Management
Prince George’s County DPW&T
See sheet M-4.

Link safety fence, 4 Feet high chain marking, see Note 2 and year built Bridge No. (behind)

Finished grade

Headwall

100-Yr flood

Height shall be < Di

1% Slope

Slope 2:1 (max)

Inv. Elev. E1/E2

min.

6"

6"

1% Slope

fill

2'-0"

Di

C channel

C Single conc. pipe

L

L

Streambed

Existing

Depress 1'-0"

for fish passage

Elev. E1

Inv.

Apron with toe wall (typ.)

Riprap (typ.)

Headwall

Toe wall

3'-0"

(min.)

(min.)

(min.)

(min. 10')

L1

L2

L3

L4

Roadway

Roadway pavement

Flow slope

Preferred 2%

min. 1%'

Flow

Bedding material

Aggregate

Class E, nonwoven

Geotextile

(min. 10')

4" min. (typ.)

Fill 2' min.

6" min. (typ.)

4" min. (typ.)

Design plunge pool as needed at outlet 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.

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 DPW&T 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 4x4x8" 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 also acceptable. Standard county headwall and wingwall details for pipe culverts can be used. See details on Sheet M-8.

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.
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.
4 Feet high chain link safety fence, see Sheet M-4

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 300.29, "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 DPW&T Std. No. SI-103. 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'-8" 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 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.
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. Subgrades below the pipe bedding is subject to the analysis and recommendations by the geotechnical engineer.

---

**Working Point Table**

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**Culvert Dimension Table**

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<th>Inv Elev. L2</th>
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</table>

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**Pipe Bedding Details**

- Riprap is not shown for clarity.
- Subgrades below the pipe bedding is subject to the analysis and recommendations by the geotechnical engineer.

**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. Subgrades below the pipe bedding is subject to the analysis and recommendations by the geotechnical engineer.
Flow slope

Preferred 2%
in. 1%

T Bed
(min. 10')

Class E, nonwoven
Geotextile

Inv. Elev. E1

(Preferred 3:1)

2

Max. slope
See Note 3

Roadway pavement
C Roadway

L and 605.31
see SHA Std MD 605.25
for its requirement,

Traffic barrier
Roadway

Triple precast concrete pipe culvert

Pipe wall (typ.)

Traffic barrier for its requirement, see SHA Std MD 605.25 and 605.31

Chain link fence

Bridge No. and year built marking, see Note 2

100-Yr flood

Height shall be ≤ Di

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. 510-100 and DPW&T 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 C-2-1 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.
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.
Hydrologic & Hydraulic Data

Recommendation to achieve the required bearing capacity. A spread footing foundation is only

A Geotechnical report shall include foundation recommendation, required bearing capacity, and

Professional Geotechnical Engineer registered in the State of Maryland per SHA PPM D-79-17(4).

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. If the top of deck slab (including the sidewalk) shall receive a protective coating (Slaine Permeant 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 A1054. However, there shall be no more than 2 layers of welded wire reinforcement in each slabwall.

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.

Chamber:

All exposed corners of all concrete structures shall be chamfered 3/4" x 3/4" 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 (apron) and vertical (rising) 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 sound resistant rock.

Construction:

Do not over excavate foundations unless directed by Geotechnical Engineer to remove unstable soil. Underscutting and backfilling with crusher run aggregate CR-6 or graded aggregate base GAB may be necessary 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.

Soil:

Soil 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 (Abscor) which is available online.

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.

Wright 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 DPWI (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 new and existing 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. See 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.

Veichles 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 RPM 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.

Date: April 8, 2020

General Notes for Bottomless Culvert

Design - AASHSTO LRFD Bridge Design Specifications (latest edition), the Prince George’s County


Contact:

Env. T. Becket, P.E., Chief, Phone: 301-883-5714, Email: etbecket@co.pg.md.us
Jay Shah, P.E., Project Manager, Phone: 301-883-5713, Email: jshah@co.pg.md.us
Highway and Bridge Design Division
Office of Engineering and Project Management
Prince George’s County DPWI
Geometric Layout
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.

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.
**Hydraulic Data**

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**Method of analysis**

- Method(S) for Analysis: LGRS Regression equations
- FEMA base flood (100-year) discharge (CFS)
- FEMA Method - version used (Date)
- Reference
- Code of Maryland (Comar 08.05.03)? Y/N
- Regulations:
  - FEMA hazard zone "A"; No base flood elevations established
  - Fema flood insurance study
  - Date of flood insurance study

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**Scour estimates**

- Scour evaluation study Title:
- Bridge scour data
- Method selected

|----------|----------|----------|----------|----------|----------|----------|----------|

**Scour counter measures**

- Regulatory floodway: YES
- Regulatory floodway: NO
- Flood plain management data
  - Date of flood insurance study
  - Community area No.
  - Regulatory floodway: YES
  - Regulatory floodway: NO

**Hydraulic data**

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**Survey book numbers**

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**Historic floods**

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**Steam Morphology**

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**DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION**

Prince George's County, MD

**Standard Precast Concrete Culvert Miscellaneous Details**

Hydrologic & Hydraulic Data

**APPROVED:**

**REVISED DATE:**

**APPROVED BY:**

**FILE:**

**PREPARED:**

**SHEET**

**M-1**
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.

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 (Pipe Culvert)

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 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 (Pipe Culvert)

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.

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 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 + 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.

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

Standard Precast Concrete Culvert Miscellaneous Details
Criteria for Utility Line Crossing

Approved by:
APPROVED:

Director:

Date:

Revision Date:

Phone:

Sheet:

M-2
The minimum fill height shall be 9".

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

Notes for Reinforced Concrete Deck Slab

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.
3. Notes for Reinforced Concrete Deck Slab
4. For slab layout, see structure general plan & elevation.
All chain link fabric and post shall be black vinyl coated.

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

3" High inventory number to be indented into concrete (unpainted)
Note for all standards:
The designer must use the most current version standards.
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