Chapter 02 - Substructure

SECTION 01

DRAINAGE (SUB-DR)
If inlets are required at each side of bridge, and distance between inlets is less than 60', then cross pipe shall be considered with outlet used on lower inlet. If length is greater than 60' or it would be more economical to provide a separate outlet for pipes less than 60', then each inlet shall have its own outlet pipe, etc. For details see sht. 2 of 2.

Secure traffic barrier three beam to end posts as per SHA Standard for pipes less than 60', then each inlet shall have Runoff Flow of Roadway. Pavement Portion of shoulder to remain as called for on typical highway section.

Notes:
1. Payment for Drainage Inlet at End of Bridge Structure shall be on an each basis. Cost for entire installation of hatched area, curb and gutter, inlet, etc. Cross pipe, outlet pipe, elbows and concrete end section shall be incidental to the unit cost of inlet. Outlet pad will be paid for separately.
2. Open Approach Roadway is defined as a highway with full shoulders, no curbed sections, sidewalks and/or raised medians.
3. See note on General Plan and Elevation as to which ends of structure will require inlets.
4. Traffic barrier posts shall be driven prior to placing concrete gutter pan except if option above is utilized.
5. See sheet 2 of 2 for additional details.
Modified Type A Combination Curb and Gutter; Gutter Pan shall be as shown hatched, 9'' in depth. Single hatched area shall be sloped to follow shoulder configuration. Double hatched area to be sloped at 10%, see Section A-A.

Outlet pipe - 18'' Reinforced Concrete Pipe, Class I, with Std. Concrete End Section (MD 368.01).

Pipe should empty onto new or existing slope protection. If not feasible, provide a 4' x 4' x 4'' outlet block of Mix No. 1 Concrete or Class I Riprap.

This side of pad to be built up to dissipate flow.

PLAN OF INLET AREA
Scale: 1/8'' = 1'-0''

Shoulder

Shoulder Cross Slope 10% 9'' Gutter Pan
3'-0'' Varies

SECTION A-A
Scale: 1/4'' = 1'-0''

STATE OF MARYLAND
DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF STRUCTURES

DRAINAGE INLET
AT END OF BRIDGE STRUCTURE
(OPENS APPROACH ROADWAY)

DETAIL NO. SUB-DR-101 SHEET 2 OF 2
Notes:

1. To be used for all fixed abutments or expansion abutments with lengths contributing to expansion less than or equal to 70 feet.

2. Minimum slope of Pipe Underdrain Outlets is \( \frac{1}{4} \)"/ft.

3. For Section A-A see Sheet No. 2, 3 or 4.

4. The drainage system behind each wing wall can be connected to the drainage system behind the abutment using 2 - 90° bends and a short length of pipe. This will necessitate the drainage system behind the wing wall be slightly higher.

5. For wing walls over 15 ft. long, the drainage system behind them may be independent of the drainage system behind the abutment. They can be outletted directly through the wing wall.

6. The cost of the PVC underdrains complete in place will be incidental to the Substructure Concrete item.

7. For section through wing wall, see Detail No. SUB-DR-203.

8. All joints glued.

STATE OF MARYLAND
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DRAINAGE SYSTEM AND BACKFILL FOR ABUTMENTS WITH FIXED BEARINGS OR EXPANSION BEARINGS WITH LENGTHS CONTRIBUTING TO EXPANSION LESS THAN OR EQUAL TO 70 FEET

APPROVAL
DIRECTOR
OFFICE OF STRUCTURES

STATE HIGHWAY ADMINISTRATION
OFFICE OF STRUCTURES

DATE: 10/02/2014

VERSION
1.0

DETAIL NO. SUB-DR-201

SHEET OF 4
**NOTES:**

1. Graded aggregate base to be placed and compacted in 6" lifts in conformance with Section 501.
2. Porous backfill (refer to Section 469) shall be placed as shown behind the abutment and to the same geometrics behind the abutment wing walls when they parallel the highway. (See sheet 5 of 5)
3. The Contractor must provide a well compacted surface to place the geotextile and stone fill against. In fill areas it will be necessary to overfill a sufficient distance so that a well compacted surface will be produced when the overfill is removed. The removed material will be incidental to the pertinent Structure Concrete Items.
4. The cost of the geotextile within the limits shown will be incidental to the pertinent Structure Concrete Items.

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**SCALE: 1/4"=1'-0"**

**SECTION A-A**

- 6" Perforated PVC Circular Pipe Underdrain
- 6" Non-Perforated PVC Circular Pipe Underdrain Outlet
- Slope 1/4" / ft.
- Damproof
- Porous backfill placed and tamped in conformance with Section 210
- Slope as steep as ground will allow (Typ) 1:2 maximum 
- Slope 2" / ft.
- Place Class SD Type I nonwoven geotextile between porous backfill and approach embankment
- Varies - 1'-4" Min.
- *5 Threaded rebar dowel coupler at 1'-6" c/c*
- *5's spaced* as shown
- *5 @ 1'-6" c/c*
- Place Class SD Type II nonwoven geotextile between porous backfill and approach embankment
- Varies - 1'-4" Min.
- Place Concrete Base (Mix No.1 or better)
- Slope Protection
- Class SD Type I nonwoven geotextile, Cost to be incidental to the paving items.
- Approach Roadway
- Pavement
- 30'-0" Max. (measured along & approach roadway)
Notes:
1. Graded aggregate base to be placed and compacted in 6″ lifts in conformance with Section 501.
2. Porous backfill (refer to Section 469) shall be placed as shown behind the abutment and to the same geometrics behind the abutment wing walls when they parallel the highway. (See sheet 5 of 5).
3. The Contractor must provide a well compacted surface to place the geotextile and stone fill against. In fill areas it will be necessary to overfill a sufficient distance so that a well compacted surface will be produced when the overfill is removed. The removed material will be incidental to the pertinent Structure Concrete Items.
4. The cost of the geotextile within the limits shown will be incidental to the pertinent Structure Concrete Items.

If 1'-6" width of the concrete base is poured to rest on top of footing, the reinforcing can be eliminated. No additional compensation will be allowed for this option.
**Notes:**

1. Graded aggregate base to be placed and compacted in 6" lifts in conformance with Section 501.
2. Porous backfill (refer to Section 469) shall be placed as shown behind the abutment and to the same geometrics behind the abutment wing walls when they parallel the highway. (See sheet 5 of 5)
3. The Contractor must provide a well compacted surface to place the geotextile and stone fill against. In fill areas it will be necessary to overfill a sufficient distance so that a well compacted surface will be produced when the overfill is removed. The removed material will be incidental to the pertinent Structure Concrete Items.
4. The cost of the geotextile within the limits shown will be incidental to the pertinent Structure Concrete Items.
Notes:
1. To be used for all expansion abutments where an expansion cross beam is called for.
2. Minimum slope of Pipe Underdrain Outlets is 1/4''/ft.
3. For Section A-A see Sheet No. 2, 3 or 4
4. The drainage system behind wing walls shall be independent of the drainage system behind the abutment. They shall be outletted directly through the wing wall.
5. The cost of the PVC underdrains complete in place will be incidental to the Substructure Concrete item.
6. For section through wing wall, see Detail No. SUB-DR-203.

Note:
The expansion joint cross beam is not shown for clarity.

PLAN
Scale: 1/20'' = 1'-0''
### SECTION A-A

**Slope Protection**

- #5 Threaded rebar dowel coupler at 1'-6'' c/c

**6'' Perforated PVC Circular Pipe Underdrain**

**Concrete Base (Mix No. 1 or better)**

30'-0'' Max. (measured along & approach roadway)

2'-0'' Graded aggregate base

**Notes:**

1. Graded aggregate base to be placed and compacted in 6'' lifts in conformance with Section 501.
2. Porous backfill (refer to Section 469) shall be placed as shown behind the abutment and to the same geometries behind the abutment wing walls when they parallel the highway. (See sheet 5 of 5)
3. The Contractor must provide a well compacted surface to place the geotextile and stone fill against. In infill areas it will be necessary to overfill a sufficient distance so that a well compacted surface will be produced when the overfill is removed. The removed material will be incidental to the pertinent Structure Concrete Items.
4. The cost of the geotextile within the limits shown will be incidental to the pertinent Structure Concrete Items.

- Porous backfill (shown shaded) placed and tamped in conformance with Section 210.
- Slope as steep as ground will allow (Typ.) 1:2 maximum
- Slope 2'' / ft.
- Place Class SD Type II nonwoven geotextile between porous backfill and approach embankment.
- Varies - 1'-4'' Min., full length between columns.
- Expansion joint cross beam support columns
- Backwall
- Expansion joint cross beam

**Approach Roadway**

- Pavement
- Dampproof
- Slope to drain toward abutment and wing walls at 1/4'' / ft.

**Backwall**

- Expansion joint cross beam support columns
- Expansion joint cross beam
- Backwall

**Concrete Base (Mix No.1 or better)**

- **#5's spaced**
- as shown
- **#5 @ 1'-6'' c/c**

**Notes:**

- If 1'-6'' width of the concrete base is poured to rest on top of footing, the reinforcing can be eliminated. No additional compensation will be allowed for this option.

**Details:**

- Porous backfill (shown shaded) placed and tamped in conformance with Section 210.
- Slope as steep as ground will allow (Typ.) 1:2 maximum.
- Slope 2'' / ft.
- Place Class SD Type II nonwoven geotextile between porous backfill and approach embankment.
- Varies - 1'-4'' Min., full length between columns.
- Expansion joint cross beam support columns.

**Approach Roadway**

- Pavement
- Dampproof
- Slope to drain toward abutment and wing walls at 1/4'' / ft.

**Backwall**

- Expansion joint cross beam support columns
- Expansion joint cross beam
- Backwall

**Concrete Base (Mix No.1 or better)**

- **#5's spaced**
- as shown
- **#5 @ 1'-6'' c/c**

**Notes:**

- If 1'-6'' width of the concrete base is poured to rest on top of footing, the reinforcing can be eliminated. No additional compensation will be allowed for this option.
**STATE HIGHWAY ADMINISTRATION**

**DEPARTMENT OF TRANSPORTATION**

**STATE OF MARYLAND**

**SHEET OF APPROVAL**

**SECTION A-A**

#5 Threaded rebar dowel coupler at 1'-6'' c/c

6'' Perforated PVC Circular Pipe Underdrain

6'' Non-Perforated PVC Circular Pipe Underdrain Outlet, Slope 1/4''/ft.

Slope protection

Concrete base (Mix No.1 or better)

#5's spaced *

*5 @ 1'-6'' c/c *

Expansion joint cross beam support columns

Place Class SD Type I nonwoven geotextile between porous backfill and approach embankment

Notes:

1. Graded aggregate base to be placed and compacted in 6'' lifts in conformance with Section 50L. The removed material will be incidental to the pertinent Structure Concrete items.
2. Porous backfill (refer to Section 469) shall be placed as shown behind the abutment and to the same geometrics behind the abutment wing walls when they parallel the highway. See sheet 5 of 5.
3. The Contractor must provide a well compacted surface to place the geotextile and stone fill against. In fill areas it will be necessary to overfill a sufficient distance so that a well compacted surface will be produced when the overfill is removed. The removed material will be incidental to the pertinent Structure Concrete items.

4. The cost of the geotextile within the limits shown will be incidental to the pertinent Structure Concrete items.

**CLASS SD Type I nonwoven geotextile.** Cost to be incidental to the paving items.

**SCALE: 1/4'' = 1'-0''**
1. Graded aggregate base to be placed and compacted in 6" lifts in conformance with Section 501.
2. Porous backfill (refer to Section 469) shall be placed as shown behind the abutment and to the same geometrics behind the abutment wing walls when they parallel the highway. (See sheet 5 of 5)
3. The Contractor must provide a well compacted surface to place the geotextile and stone fill against. In fill areas it will be necessary to overfill a sufficient distance so that a well compacted surface will be produced when the overfill is removed. The removed material will be incidental to the pertinent Structure Concrete items.
4. The cost of the geotextile within the limits shown will be incidental to the pertinent Structure Concrete items.

Notes:
- Porous backfill placed and tamped in conformance with Section 210
- Place Class SD Type II nonwoven geotextile between porous backfill and approach embankment
- Slope as steep as ground will allow (Typ.) 1:2 maximum
- Slope to drain toward abutment and wing walls at 1/4'' / ft.
- Scale: 1/4'' = 1'-0''
- Cost to be incidental to the paving items.

**#5 Threaded rebar dowel coupler at 1'-6'' c/c**

**Concrete base (Mix No.1 or better)**

**6'' Perforated PVC Circular Pipe Underdrain**

**6'' Non-Perforated PVC Circular Pipe Underdrain**

**Porous backfill placed and tamped in conformance with Section 210**

**Approach Roadway Pavement**

**30'-0'' Max. (measured along & approach roadway)**

**Bottom of pavement**

**Concrete base**

**Slope 2'' / ft.**

**Slope 2'' / ft.**

**3'' Finished groundline**

**Varies - 1'-4'' Min., full length between columns**

**2'-0''**

**#5's spaced as shown**

**#5's spaced as shown**

**Concrete base**

**Slope 2'' / ft.**

**Slope 2'' / ft.**

**Slope as steep as ground will allow (Typ.) 1:2 maximum**

**Place Class SD Type I nonwoven geotextile between porous backfill and approach embankment**

**Notes:**
- Porous backfill placed and tamped in conformance with Section 210.
- Place Class SD Type I nonwoven geotextile as shown behind the abutment and to the same geometrics behind the abutment wing walls when they parallel the highway. (See sheet 5 of 5).
- The Contractor must provide a well compacted surface to place the geotextile and stone fill against. In fill areas it will be necessary to overfill a sufficient distance so that a well compacted surface will be produced when the overfill is removed. The removed material will be incidental to the pertinent Structure Concrete items.
- The cost of the geotextile within the limits shown will be incidental to the pertinent Structure Concrete items.

**SECTION A-A**

**Scale: 1/4'' = 1'-0''**

**Notes:**
- Graded aggregate base to be placed and compacted in 6" lifts in conformance with Section 501.
- Porous backfill (refer to Section 469) shall be placed as shown behind the abutment and to the same geometrics behind the abutment wing walls when they parallel the highway. (See sheet 5 of 5).
- The Contractor must provide a well compacted surface to place the geotextile and stone fill against. In fill areas it will be necessary to overfill a sufficient distance so that a well compacted surface will be produced when the overfill is removed. The removed material will be incidental to the pertinent Structure Concrete items.
- The cost of the geotextile within the limits shown will be incidental to the pertinent Structure Concrete items.

**1.0**

**APPENDIX**

**PERCENTAGE OF COMPLIANCE**

**DATE:**

**DIRECTOR OFFICE OF STRUCTURES**

**SHEET OF APPROVAL**

**OFFICE OF STRUCTURES**

**STATE HIGHWAY ADMINISTRATION**

**DEPARTMENT OF TRANSPORTATION**

**STATE OF MARYLAND**
Slope to drain toward abutment and wing walls at $\frac{1}{4}'' \text{/ ft.}$

Graded aggregate base to be placed and compacted in 6'' lifts in conformance with Section 501.

Class SD Type I nonwoven geotextile, Cost to be incidental to the paving items.

Porous backfill placed and tamped in conformance with Section 210

Slope as steep as ground will allow (Typ.) 1:2 maximum

Place Class SD Type II nonwoven geotextile between porous backfill and approach embankment

Concrete base (Mix No. 1 or better)

#5 Threaded rebar dowel coupler at 1'-6'' c/c

Finished groundline

#5's spaced as shown

Notes:
1. Graded aggregate base to be placed and compacted in 6'' lifts in conformance with Section 501.
2. Porous backfill (refer to Section 469) shall be placed as shown behind the abutment wing walls when they parallel the highway.
3. The Contractor must provide a well compacted surface to place the geotextile and stone fill against. In fill areas it will be necessary to overfill a sufficient distance so that a well compacted surface will be produced when the overfill is removed. The removed material will be incidental to the pertinent Structure Concrete items.
4. The cost of the geotextile within the limits shown will be incidental to the pertinent Structure Concrete items.
5. For bridges with wing walls that are not parallel to the highway see std. no. RW-301 for details.