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 thrie beam to end posts as per SHA Standard MD-605.41, 605.41-01, 605.41-02, 605.51 and 605.51-01.

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.
DRAINAGE INLET
AT END OF BRIDGE STRUCTURE
(OPEN APPROACH ROADWAY)

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.

Control Joint

2'-0"

3'-0"

3'-0"

Shoulder

9" Gutter Pan

3'-0"

Varies

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

10%

OUTLET PIPE - 18"
Reinforced Concrete Pipe, Class III, with Std. Concrete End Section (MD 368.01).

This angle shall be determined in the field.

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.

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

9" Gutter Pan

3'-0"

Varies

2'-0"

2 - #5 bars epoxy coated, 5'-6" long bent as shown placed in end post and curb.

End of End Post
(Curb, shown shaded, shall be poured monolithically with end post see reinforcing detail below. No joint allowed.)

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.
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 Standard No. SUB-DR-203.

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. 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. The cost of the PVC underdrains complete in place will be incidental to the Substructure Concrete item. For section through wing wall, see Standard No. SUB-DR-203.
**Notations:**

1. Graded aggregate base to be placed and compacted in 6'' lifts in conformance with Section 501.
2. Porous backfill (refer to Section 460) 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
- 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's spaced as shown
- Dampproof
- Grade aggregate base to be placed and compacted in 6'' lifts in conformance with Section 501.
- Place Class SD Type I nonwoven geotextile to be placed and compacted in 6'' lifts in conformance with Section 501.
- Porous backfill (refer to Section 460) 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)
- 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.

**Details:**

- **Concrete Base:** (Mix No. 1 or better)
- **Graded Aggregate Base:**
- **Porous Backfill:** placed and tamped in conformance with Section 210
- **Dampproof:**
- **Approach Roadway Pavement:**
- **Class SD Type I Nonwoven Geotextile:** cost to be incidental to the paving items.

**Dimensions:**

- **Approach Roadway:**
- **Pavement:**
- **Concrete Base:**
- **Graded Aggregate Base:**
- **Porous Backfill:** placed and tamped in conformance with Section 210
- **Dampproof:**
- **Approach Roadway Pavement:**
- **Class SD Type I Nonwoven Geotextile:** cost to be incidental to the paving items.

**Scale:**

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

**Materials:**

- **Concrete Base:** Mix No. 1 or better
- **Graded Aggregate Base:**
- **Porous Backfill:**
- **Dampproof:**
- **Approach Roadway Pavement:**
- **Class SD Type I Nonwoven Geotextile:**

**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.
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:
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. 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.

5. 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.

Finished groundline

Concrete base (Mix No. 1 or better)

* 5 @ 1'-6" c/c

* 5's spaced as shown

6" Perforated PVC Circular Pipe Underdrain

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

Dampproof

Slope 2" / ft.

Varies - 1'-4" Min.

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

Approach Roadway Pavement

Bottom of pavement

Porous backfill placed and tamped in conformance with Section 210

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

Slope to drain toward abutment and wing walls at 1/4" / ft.

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

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

2'-0" min. Graded aggregate base

Porous backfill (refer to Section 469) shall be placed in fill areas. (See sheet 5 of 5)

Outlet, Slope 1/4" / ft.

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.

5. 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.
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 Standard No. SUB-DR-203.

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

Slope Protection

#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.

Concrete Base (Mix No. 1 or better)

30'-0'' Max. (measured along L 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.

Approach Roadway Pavement

Cost to be incidental to the paving items.

Class SD Type I nonwoven geotextile

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

Notes:

1. 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.

Backwall

Expansion joint cross beam

Dampproof

3''

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

DATE:

STATE HIGHWAY ADMINISTRATION

DEPARTMENT OF TRANSPORTATION

STATE OF MARYLAND

OFFICE OF STRUCTURES

DIRECTOR

Expansions contributing to 70 feet

EXPANSION BEARINGS WERE INSTALLED WITH EXPANSION GREATER THAN 70 FEET

EXTRACTION - DRAINAGE

SUB-DR-202

DETAIL NO.

1.0

VERSION

DATE OF SUBMISSION

APPROVAL OF SUBMISSION

SUB-DR-202

DETAIL NO.

2.

OF 4

4.

1.

2.

3.

4.
**STATE HIGHWAY ADMINISTRATION**

**DEPARTMENT OF TRANSPORTATION**

**STATE OF MARYLAND**

**SHEET OF APPROVAL**

**SECTION A-A**

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

2. **6'' Perforated PVC Circular Pipe Underdrain**

3. **6'' Non-Perforated PVC Circular Pipe Underdrain Outlet, Slope 1/4''/ft.**

4. **30'-0'' Max. (measured along & approach roadway)**

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

6. **Notes:**
   - Porous backfill placed and tamped in conformance with Section 210
   - Slope to drain toward abutment and wing walls at 1/4''/ft.

**Notes:**

1. Graded aggregate base to be placed and compacted in 6''lifts in conformance with Section 50L.
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.

**DATE:**

**DIRECTOR OFFICE OF STRUCTURES**

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

**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.**
Expansion Joint cross beam

Backwall

6" Perforated PVC Circular Pipe Underdrain

6" Non-Perforated PVC Circular Pipe Underdrain

Outlet, Slope 1/4'' / ft.

Approach Roadway Pavement

Dampproof

Porous backfill placed and tamped in conformance with Section 210

Expansion Joint cross beam support columns

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

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

Slope 2'' / ft.

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

Concrete base (Mix No. 1 or better)

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

#5's spaced * as shown

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.

SECTION A-A

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

STATE HIGHWAY ADMINISTRATION
DEPARTMENT OF TRANSPORTATION
STATE OF MARYLAND

SHEET OF APPROVAL

OFFICE OF STRUCTURES

DATE:

DIRECTOR

OFFICE OF STRUCTURES

SUB-DR-202

SUBSTRUCTURE - DRAINAGE

FOR ABUTMENTS (FULL CANTILEVER) WITH EXPANSION BEARINGS CONTRIBUTING TO EXPANSION SYSTEM AND BACKFILL

For Abutments with Expansions Greater Than 70 Feet

Cost to be incidental to the pertinent paving items.
6" Ø Perforated PVC Circular Pipe Underdrain

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

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.

* 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.

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

Concrete base (Mix No. 1 or better)

3"

Finished groundline

approach roadway pavement

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

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

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

Slope 2'' / ft.

Varies - 1'-4'' Min.

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

* #5's spaced as shown

2'-0"

2'-0"

SECTION THROUGH WING WALL
Scale 1/4" = 1'-0"

SUB-DR-203
SUBSTRUCTURE - DRAINAGE

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For bridges with wing walls that are not parallel to the highway see std. no. RW-301 for details.