Chapter 01

FOUNDATIONS (FND)
Chapter 01 - Foundations

SECTION 01

GENERAL
(FND-GN)
ACUTE CORNER

Scale: \(\frac{\frac{3}{8}''}{1'-0''}\)

- T. and B. wing wall transverse bars
- Transition axis
- Extended wing wall footing transverse bar develop length beyond this line.
- T. and B. abutment transverse bars
- Rear face of footing concrete
- Wing wall longitudinal bars
- Wing wall transition extend development length
- Abutment longitudinal bars
- Concrete of footing
- Rear face length development extend
OBTUSE CORNER

Scale: 1/8" = 1'-0"

Development length

Transition axis

Rear face of footing concrete

Wing wall longitudinal bars

Wing wall transverse bars

Abutment longitudinal bars

Footing intersection

GUIDE SHEET FOR PLAN DEVELOPMENT ONLY - DO NOT INCLUDE THIS SHEET IN CONTRACT PLANS
Chapter 01 - Foundations

SECTION 02

PILE FOUNDATION (FND-PF)
No boulders, rocks, or stumps in this area of fill and all stumps, surface boulders and rocks to be removed from existing ground within these limits.
Limits of temporary fill during compaction of preliminary embankment. Temporary fill within these limits to be removed to finished slope line and used in completing preliminary embankment after abutment is completed. Removal of this overburden and placing of same behind abutments will be measured and paid for as Class 2 Excavation.

Areas to be excavated prior to driving piles (shown double hatched to be paid for as Class 3 Excavation).

Area to be excavated prior to driving piles for abutment and wings.

Limit of preliminary embankment prior to driving piles for abutment and wings.

Limit of preliminary embankments prior to driving piles for abutments and wings.

Slope as steep as ground will allow.

Existing groundline

Slope top of preliminary embankment to drain to bottom of embankment (i.e., midway between outside shoulders) and from abutment to rear of fill along fill, to carry drainage down rear embankment slope to sediment trap or other erosion control device.

Temporarily seed and mulch front and back slopes to original groundline. Permanent seed and mulch on side slopes. Install 4'-0" wide soil stabilization matting in top swale to original groundline.

Note A:

No boulders, rocks, or stumps in this area of fill and all stumps, surface boulders and rocks to be removed from existing ground within these limits.

Limits of completed preliminary embankment.

Finished groundline outside of wing wall.

Area to be excavated prior to driving piles (shown double hatched to be paid for as Class 3 Excavation).

Bottom of subgrade inside of wing wall.

Front face of abutment footing.

Abutment stem

Rear of abutment footing.

End of wing wall.

Finished groundline

* Proposed finished slope 2:1 unless otherwise designated.

** Slope ratio depends upon fill height.

Slope to drain

Finished slope or top of proposed slope protection.

Note A:

No boulders, rocks, or stumps in this area of fill and all stumps, surface boulders and rocks to be removed from existing ground within these limits.
**TYPICAL PIER FOOTING PLANS.**

**Scale: 3/8"=1'-0"**

Notes:
1. All rebars shall be 3'-6" @ 4" c/c centered over piles as shown.
2. Lower mat of bars shall be 3" (vertical) above top of center line of pile.
3. All piles shall be crossed at least twice with no more than 3 crossings per pile.
4. The direction taken by bars shall wherever possible be, the shortest distance between piles.
5. In all cases the total pattern shall be shown on Contract Documents with Pile Layout Plan.
6. Ø denotes all piling, cast-in-place, steel H piles, etc. When showning on Contract Documents H piles shall be shown with the normal "H" symbol.
7. In laying out pile plan, if possible, piles shall be positioned to minimize need for diagonal bars.
8. A note in area of rebar pattern shall appear on Contract Documents as follows: "Shop plans shall show how rebars are to be tied as well as how they will be held in place above piling while pour is being made."
TYPICAL ABUTMENT FOOTING PLANS

Scale: \( \frac{\frac{1}{8}}{=1'-0''} \)

See notes on Sheet 1 of 3.
See notes on Sheet 1 of 3.
PLAN - PILES (SHOWING MAXIMUM SPACING OF BAR SUPPORTS)

Scale: \( \frac{1}{4}" = 1'-0" \)

TYPE 25

ISOMETRIC VIEW

SEE TYPICAL BAR SHEET FOR DIMENSIONS

<table>
<thead>
<tr>
<th>SIZE</th>
<th>HEIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>#4</td>
<td>0'-7&quot; &amp; H \leq 1'-6&quot;</td>
</tr>
<tr>
<td>#5</td>
<td>1'-6&quot; &amp; H \leq 3'-6&quot;</td>
</tr>
</tbody>
</table>

** Tie each base leg at two intersections to bottom footing bars for stability.

SECTION A-A

Scale: None

DIMENSIONS AND QUANTITIES TO BE SUPPLIED BY CONTRACTOR

* Top bar cannot be dropped to act as a support bar. If support bar is required, separate *5 bars are to be used.
Note A:
End of weld to be smooth and flush with web cut, \( \frac{1}{4}" \) min. effective throat.

Note B:
Bar MC to be tack welded to flange at splice to back up end of flange weld, remove MC after weld is completed. End of weld must be smooth and flush with edge of flange. Grind weld smooth with edge of flange if pile is unsupported in weld area such as: in air, water, or soft mud, \( \frac{1}{4}" \) min. effective throat.

Note C:
Let welds cool to air temperature before driving piles.

Note D:
No pile splicing to be allowed on any portion of pile that is to remain exposed or to be above finished groundline in completed structure.

Material Required:
- All Material to ASTM A-36.
Notes:
1. Material: Cast Steel A.S.T.M. A27 65/35. All fillets shall be 3/8".
2. Point to be welded to pile with a continuous single bevel groove weld along outside face of flange. Either the exterior face of the flange or the prefabricated pile tip shall contain a 45° bevel to allow for placement of the weld.
3. For each shipment of points a foundry certificate verifying material meets the Specifications is required.

* See Note 2.

<table>
<thead>
<tr>
<th>Size of Pile</th>
<th>Size of 45 Bevel</th>
<th>Size of Groove Weld</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 x 42</td>
<td>1/4</td>
<td>3/16</td>
</tr>
<tr>
<td>10 x 57</td>
<td>1/4</td>
<td>3/16</td>
</tr>
</tbody>
</table>

TOOTHED PILE POINT FOR 10" H PILE

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

TOOTHED PILE POINT FOR 10" H PILE

DETAIL NO. FND-PF-302

04/03/2018
Notes:
1. Material: Cast Steel A.S.T.M. A27 65/35. All fillets shall be ⅜".
2. Point to be welded to pile with a continuous single bevel groove weld along outside face of flange. Either the exterior face of the flange or the prefabricated pile tip shall contain a 45° bevel to allow for placement of the weld.
3. For each shipment of points a foundry certificate verifying material meets the Specifications is required.

<table>
<thead>
<tr>
<th>Size of Pile</th>
<th>Size of 45 Bevel</th>
<th>Size of Groove Weld</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 x 53</td>
<td>⅛</td>
<td>⅜</td>
</tr>
<tr>
<td>12 x 74</td>
<td>⅛</td>
<td>⅜</td>
</tr>
</tbody>
</table>

* See Note 2.
Notes:

1. Material: Cast Steel A572 Gr. 65/35.
   All fillets shall be \( \frac{5}{32} \)".

2. Point to be welded to pile with a continuous single bevel groove weld along outside face of flange. Either the exterior face of the flange or the prefabricated pile tip shall contain a 45° bevel to allow for placement of the weld.

3. For each shipment of points a foundry certificate verifying material meets the Specifications is required.

<table>
<thead>
<tr>
<th>Size of Pile</th>
<th>Size of 45 Bevel</th>
<th>Size of Groove Weld</th>
</tr>
</thead>
<tbody>
<tr>
<td>14 x 73</td>
<td>( \frac{1}{4} )&quot;</td>
<td>( \frac{5}{8} )&quot;</td>
</tr>
<tr>
<td>14 x 89</td>
<td>( \frac{5}{8} )&quot;</td>
<td>( \frac{5}{8} )&quot;</td>
</tr>
<tr>
<td>14 x 102</td>
<td>( \frac{3}{8} )&quot;</td>
<td>( \frac{5}{8} )&quot;</td>
</tr>
<tr>
<td>14 x 117</td>
<td>( \frac{7}{8} )&quot;</td>
<td>( \frac{7}{8} )&quot;</td>
</tr>
</tbody>
</table>

* See Note 2.
Notes:
1. Plate to be welded to pile with a continuous single bevel groove weld along outside face of pile.
2. Either the exterior face of pile or the pile tip be beveled at 45°, to allow for placement of the weld.
3. Circular steel plate shall have a diameter that is 1/2" larger than outside diameter of steel pipe pile.

* End of weld to be smooth and flush with pipe pile wall-out, 1/4" min. effective throat.
Note:
1. Unless otherwise indicated on substructure contract drawing.
2. Full height of pile above finished groundline plus 10' unless otherwise indicated on substructure contract drawings.
3. Unless otherwise indicated on other Contract Plans or in the Special Provisions the Steel Pile Shell shall be a minimum #5 gauge. This will apply to pile shells with or without deformations.
4. Cage required for all pile shells with or without deformations.
5. All materials and dimensions shown are minimums. Engineer shall design.

For Cast-in-Place Concrete Piles

10/09/2007

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State of Maryland
Department of Transportation
Office of Structures

Detail No. FND-PF-501
Continuous fillet weld, minimum size equal to thickness of pile shell.

Burn four equally spaced slots in the lower section before inserting extension.

After pile is aligned, tack weld at all four slots prior to commencing full weld operations.

If "male end" is not factory tapered, it shall be tapered just enough to fit into lower section.

Top extension shall be inserted and driven if necessary into bottom section (after "V" cutting is done) until entire area of weldment is in tight contact before alignment tack welding is initiated.

Note:
No pile splicing to be allowed on any portion of pile that is to remain exposed in completed structure.
Notes:

ELEVATION OF SPLICE
(USING ALL WELDED ALTERNATE)
Scale: 3" = 1'-0"

After seating pile, weld with continuous 3/8" fillet weld, top and bottom.

For pile shells 3/8" thick of less.
For pile shells over 3/8" thick.

2" minimum (Typical).

Note:
Back-up plate to be cut from same pile size as is being spliced. Cut and bend to fit inside diameter of pile.

SECTION B-B
Scale: None

Notes:

1. No pile splicing to be allowed on any portion of pile that is to remain exposed in completed structure.
2. Splicer sleeve material shall be steel conforming to ASTM A-36.
3. Contractor has the option of using either the "Splicer Sleeve" or "All Welded" alternates.
Notes:
1. The Contractor has the option of using any of the spacers shown for the reinforcement cage. The spacing of the spacers for proprietary items shall be as recommended by the manufacturer.
2. The pitch of spiral reinforcement must be considered for some wheel type spacers.
3. Concrete spacer blocks to be tied to main reinforcing with a double tie of #16 tie wire or equivalent.
4. For size and number of main reinforcing steel and size of spiral or tie reinforcing steel see other details elsewhere.
5. Use 3 spacers per horizontal plane for caissons less than 36" in diameter. Use 4 spacers per horizontal plane for caissons 36" in diameter and greater or as recommended by the manufacturer of the proprietary items.

* See Note 1
Front face of Abutment.

Limits of measurement for basis of Payment for Slope Protection.

Place inlet on all downhill ends where crown is forcing water to that location.

4' width Soil Stabilization Matting.

1'-0'' from outside of slope protection to outside face of superstructure.

Soil Stabilization Matting shown hatched.

PLAN
Scale: None

SKETCH-PLAN

Notes:
1. For Sections A-A, B-B, and C-C see sheets 2 thru 6 of 6.
2. If limits for slope protection are shown on Contract Drawings, then those limits take precedent over what is shown on this sheet.

Note:
On dual bridges where perpendicular distance between bridge faces is less than 30' or on skewed dual bridges if where the unprotected area for both ends of the bridges (hatched areas in sketch-Plan) were added is less than 200 sq yd, then slope protection is to be continuous thru median area.
SECTION C-C THRU SIDE OF CUTOFF WALL

Scale: \( \frac{\frac{1}{8}}{1' - 0''} \)

Limit of measurement for Riprap Slope Protection,

Outside face of Superstructure,

Slope as steep as ground will allow,

Top of slope protection to match finished ditch or slope line.

Note:
If a barrier configuration is used at bottom of slope, the bottom cut off wall shall be eliminated.

SECTION B-B THRU BOTTOM CUTOFF WALL

Scale: \( \frac{\frac{1}{8}}{1' - 0''} \)

Limit of measurement for riprap slope protection.

Ditch or toe of slope.

Jersey Barrier option, when indicated on General Plan & Elevation.

Finished Groundline

Finished Roadway

Limits of measurement for riprap bottom cut off wall to be bid on a linear foot basis.

Note:
If a barrier configuration is used at bottom of slope, the bottom cut off wall shall be eliminated.
Note:
Pedestal type abutment shown in solid lines.
Cantilever type abutment shown in long dashed lines.

SECTION A-A THRU ABUTMENT
Scale: $\frac{3}{8}'' = 1'-0''$

Notes:
1. Bottom cut off wall may be eliminated if slope protection can be founded in rock.
2. All material for riprap slope protection shall be Class 1 conforming to 901.02.
3. Refer to Section 312 for other requirements.
**SECTION C-C THRU SIDE OF CUTOFF WALL**

Scale: \( \frac{\text{\small 3/8"}}{\text{\small 1'-0"}} \)

- **Substructure**
  - Unit (if applicable)
  - \( \frac{\text{\small 1/2"}}{\text{\small Cork Type Expansion material full contact area where substructure unit is adjacent to slope protection.}} \)

- **Concrete Slope Protection**
  - \( \frac{\text{\small 6 x 6 x W2.1 x W2.1}}{\text{\small Welded Wire Fabric centered in slab, continuous thru joints, and lap spliced.}} \)

- **Limit of measurement for 4" Cast-In-Place Concrete Slope Protection**

- **Limits of measurement for concrete side cut off wall to be bid on a linear foot basis.**

**SECTION B-B BOTTOM OF CUTOFF WALL**

Scale: \( \frac{\text{\small 3/8"}}{\text{\small 1'-0"}} \)

- **Limit of measurement for 4" Cast-In-Place Concrete Slope Protection.**

- **Ditch or toe of slope.**

- **Optional Construction Joint.**

- **Finished Groundline.**

- **Limits of measurement concrete bottom cut off wall to be bid on a linear foot basis.**

**CONCRETE SLOPE PROTECTION FOR BRIDGES CARRYING ROAD OVER ROAD OR RAILROAD**

**STATE OF MARYLAND**
**DEPARTMENT OF TRANSPORTATION**
**STATE HIGHWAY ADMINISTRATION**
**OFFICE OF STRUCTURES**
Note:
Pedestal type abutment shown in solid lines.
Cantilever type abutment shown in long dashed lines.

1/2" Cork Type Exp. Material full contact area where substructure unit is adjacent to slope protection. If open joint remains after slope protection has cured, then fill open joint with an approved joint sealer.

Concrete Slope Protection

SECTION A-A THRU ABUTMENT
Scale: 3/8" = 1'-0"

Notes:
1. Bottom cut off wall may be eliminated if slope protection can be founded in rock.
2. Refer to Section 310 for other requirements.
Scupper outlet

5'-0'" min.
or to face of abutment

Lap geotextile 1'-0" min.
on to concrete flume (typ.)

4" min. concrete flume

Note:
Riprap slope protection not shown.

Geotextile

6 x 6 x W2.1 x W2.1 Welded wire fabric centered in slab

6" Geotextile

Lap geotextile 1'-0" min. onto concrete flume (typ.)

Partial Elevation
Scale: None

Note:
Cost of concrete flume to be included in slope protection items.
GENERAL NOTES

SELECTION OF THE RIPRAP D50 SIZE AND BLANKET THICKNESS:

The FHWA equations from HEC-23, Bridge Scour and Stream Instability Countermeasures (Design Guideline 8, Rock Riprap at Abutments and Piers) should be used to compute the minimum required D50 size of riprap. This value is to be compared with the D50 size of riprap in the table below to select the appropriate riprap Class and blanket thickness. As noted previously, use of Class 1 riprap is not recommended except for certain conditions, see sheet 5 of this detail.

<table>
<thead>
<tr>
<th>RIPRAP CLASS</th>
<th>D50 MINIMUM SIZE (INCHES)</th>
<th>APPROXIMATE D50 WEIGHT (POUNDS)</th>
<th>MINIMUM BLANKET THICKNESS (INCHES)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>9.5</td>
<td>40</td>
<td>19</td>
</tr>
<tr>
<td>II</td>
<td>16</td>
<td>200</td>
<td>32</td>
</tr>
<tr>
<td>III</td>
<td>23</td>
<td>600</td>
<td>46</td>
</tr>
</tbody>
</table>

*These dimensions apply to the upper blanket section only, not the toe section.

DESIGN OF THE TOE SECTION:

A stable riprap toe is the most important feature in the design of riprap abutment protection installations. Guidance on the design of the toe section is provided on sheet 2 of this detail. The following criteria serve to establish the design for the riprap toe:

1. Design the riprap toe extend below the depth of contraction scour in the scour cross-section (see sheet 2 of this detail).
2. The riprap toe should be at least 6 feet thick. (A lesser toe thickness may be appropriate under certain field conditions as depicted on sheets 4 and 5 of this detail.
3. The top width of the riprap toe is typically 12 feet or more in order to fit the riprap geometry to the ground conditions.
4. An aggregate or geotextile filter cloth is normally used with the riprap installation.

RIPRAP SPECIFICATIONS:

The following riprap specification are set forth in the MDOT SHA Standard Specifications for Construction and Materials:

Construction: Section 312, Riprap Slope and Channel Protection,
Materials: Section 901.01, Aggregate; 901.02 Stone for Riprap; 921.09 Geotextile.
T = 32" (min.) Class 2
T = 46" (min.) Class 3

Filter cloth or stone
(Wrap filter cloth back into
the toe at a depth of 3'-0'')

Adjust slope to
field conditions.

TYPICAL RIPRAP BLANKET AND TOE DETAIL

Scale: 1/4" = 1'-0"
T = 46" (min.) Class 3
T = 32" (min.) Class 2
T = 24" (min.) Class 1

See Typical Toe Detail on Sheet No. 2

SECTION A-A
Scale: None

PLAN VIEW
Scale: None

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* GUIDE SHEET FOR PLAN DEVELOPMENT ONLY – DO NOT INCLUDE THIS SHEET IN CONTRACT PLANS *
Note:
This detail is for use when the abutment is set well back from the channel bank with low flow depths and velocities for worst case scour conditions. The Engineer may consider use of Class I riprap for this condition.
ELEVATION VIEW

Scale: None

SECTION A-A
Scale: None

T = 32'' (min.) Class 2
T = 46'' (min.) Class 3

See Typical Toe Detail on Sheet No. 2

6'-0'' min. beyond bridge face
Note:
Piers should be designed to be stable for expected worst-case scour conditions without reliance on scour countermeasures. Where additional scour protection is desired, such protection should be related to the site conditions, but would normally be expected to fall within the limits depicted above.