**DESIGNER NOTES**

1. For Girders with 1" Elastomeric Bearing Pads, two cases listed below:
   - For Beam Seats may be angled to match skew at the design cap parallel to grade. See Standard 18.01.
   - Beam Seats may be used on both the outer and inner edges of the beam seats. See Standard 13.01.
   - See Standard 13.01 for minimum offsets from bearings to sides of cap and to adjacent Beam Seat areas.
   - Beam Seats may be used on both the outer and inner edges of the Beam Seats. See Standard 13.01.
   - For concrete slab superstructures, refer to Standard 2.13.01.

2. For concrete slab superstructures, refer to Standard 2.13.01.

**PLAN NOTES**

- The bar spacing at the optional keyed construction joints may be eliminated whether or not the joint is utilized. Payment will be for the actual bars installed.

**BUREAU OF STRUCTURES**

**HAMMERHEAD PIER**

**BILL OLIVA**

**DATE:** 1/15
PILE ENCASED PIER

**NOTES**
- Concrete placed underwater will be allowed and shall be done in accordance with standard 502.3.5.3. Concrete placed underwater shall not exceed 10.0 feet in depth unless approved standard.
- Cofferdam required and shall be done in accordance with standard 502.3.5.3.
- Concrete poured underwater shall not exceed 10.0 feet in depth unless approved standard.
- Cofferdam required and shall be done in accordance with standard 502.3.5.3.

**DESIGNER NOTES**
- See bridge manual section 13.2.3 and standard 13.02 for guidance on pier types, details, and applicable bid items.
- See bridge manual section 13.11.5 for guidance on pier types, details, and applicable bid items.
- See bridge manual section 13.2.3 and standard 13.09 for guidance on pier types, details, and applicable bid items.

**PILE ENCASED PIER**

**SECTION A-A**

**CAP TYPE DETAIL**

**PLAN**

**ELEVATION**

**END VIEW**

**DETAIL Bars adjacent to each pile location, on one side only.**

**STANDARD 13.03**

**APPENDED:**

**Bill Oliva**

**DATE:** 7-19
PILE BENT

**NOTES**

- Piles shall be painted in accordance with section 550.3.11.3 of the Standard Specifications.

**DESIGNER NOTES**

- All bar splices to be based on Class C tension lap splice unless otherwise shown.

- Pile caps to be level except for those cases shown.

- Pile caps may be angled to match skew at the design engineer's discretion.

- See Standard 12.01 for additional reinforcing steel in bearing area for beam seats of non-sloped caps that are 4" or more above lowest beam seat.

- Bevel 2"x6" keyway. See Const. JT. formed by surfacing 2'-0" long.

- When the bottom of the girders slope more than 1%, see Standard 13.01 for criteria when to slope bottom of cap.

- Beam seats are 4" or more above lowest beam seat.

- Beam seats may be angled to match skew at the design engineer's discretion.

- See Standard 12.01 for alternative construction joint for concrete slab superstructures where the top of the cap parallels to slope, see Standard 13.01.

- See Standard 13.04 for additional reinforcing steel in bearing area for beam seats of non-sloped caps that are 4" or more above lowest beam seat.

- Piles shall be painted in accordance with section 550.3.11.3 of the Standard Specifications.

- All bar splices to be based on Class C tension lap splice unless otherwise shown.

- Pile caps to be level except for those cases shown.

- Pile caps may be angled to match skew at the design engineer's discretion.

- See Standard 12.01 for additional reinforcing steel in bearing area for beam seats of non-sloped caps that are 4" or more above lowest beam seat.

- Bevel 2"x6" keyway. See Const. JT. formed by surfacing 2'-0" long.

- When the bottom of the girders slope more than 1%, see Standard 13.01 for criteria when to slope bottom of cap.

- Beam seats are 4" or more above lowest beam seat.

- Beam seats may be angled to match skew at the design engineer's discretion.

- See Standard 12.01 for alternative construction joint for concrete slab superstructures where the top of the cap parallels to slope, see Standard 13.01.

- See Standard 13.04 for additional reinforcing steel in bearing area for beam seats of non-sloped caps that are 4" or more above lowest beam seat.

- Piles shall be painted in accordance with section 550.3.11.3 of the Standard Specifications.

- All bar splices to be based on Class C tension lap splice unless otherwise shown.

- Pile caps to be level except for those cases shown.

- Pile caps may be angled to match skew at the design engineer's discretion.

- See Standard 12.01 for additional reinforcing steel in bearing area for beam seats of non-sloped caps that are 4" or more above lowest beam seat.

- Bevel 2"x6" keyway. See Const. JT. formed by surfacing 2'-0" long.

- When the bottom of the girders slope more than 1%, see Standard 13.01 for criteria when to slope bottom of cap.

- Beam seats are 4" or more above lowest beam seat.

- Beam seats may be angled to match skew at the design engineer's discretion.

- See Standard 12.01 for alternative construction joint for concrete slab superstructures where the top of the cap parallels to slope, see Standard 13.01.

- See Standard 13.04 for additional reinforcing steel in bearing area for beam seats of non-sloped caps that are 4" or more above lowest beam seat.

- Piles shall be painted in accordance with section 550.3.11.3 of the Standard Specifications.

- All bar splices to be based on Class C tension lap splice unless otherwise shown.

- Pile caps to be level except for those cases shown.

- Pile caps may be angled to match skew at the design engineer's discretion.

- See Standard 12.01 for additional reinforcing steel in bearing area for beam seats of non-sloped caps that are 4" or more above lowest beam seat.

- Bevel 2"x6" keyway. See Const. JT. formed by surfacing 2'-0" long.

- When the bottom of the girders slope more than 1%, see Standard 13.01 for criteria when to slope bottom of cap.

- Beam seats are 4" or more above lowest beam seat.

- Beam seats may be angled to match skew at the design engineer's discretion.

- See Standard 12.01 for alternative construction joint for concrete slab superstructures where the top of the cap parallels to slope, see Standard 13.01.

- See Standard 13.04 for additional reinforcing steel in bearing area for beam seats of non-sloped caps that are 4" or more above lowest beam seat.

- Piles shall be painted in accordance with section 550.3.11.3 of the Standard Specifications.

- All bar splices to be based on Class C tension lap splice unless otherwise shown.

- Pile caps to be level except for those cases shown.

- Pile caps may be angled to match skew at the design engineer's discretion.

- See Standard 12.01 for additional reinforcing steel in bearing area for beam seats of non-sloped caps that are 4" or more above lowest beam seat.

- Bevel 2"x6" keyway. See Const. JT. formed by surfacing 2'-0" long.

- When the bottom of the girders slope more than 1%, see Standard 13.01 for criteria when to slope bottom of cap.

- Beam seats are 4" or more above lowest beam seat.

- Beam seats may be angled to match skew at the design engineer's discretion.

- See Standard 12.01 for alternative construction joint for concrete slab superstructures where the top of the cap parallels to slope, see Standard 13.01.

- See Standard 13.04 for additional reinforcing steel in bearing area for beam seats of non-sloped caps that are 4" or more above lowest beam seat.

- Piles shall be painted in accordance with section 550.3.11.3 of the Standard Specifications.

- All bar splices to be based on Class C tension lap splice unless otherwise shown.

- Pile caps to be level except for those cases shown.

- Pile caps may be angled to match skew at the design engineer's discretion.

- See Standard 12.01 for additional reinforcing steel in bearing area for beam seats of non-sloped caps that are 4" or more above lowest beam seat.

- Bevel 2"x6" keyway. See Const. JT. formed by surfacing 2'-0" long.

- When the bottom of the girders slope more than 1%, see Standard 13.01 for criteria when to slope bottom of cap.

- Beam seats are 4" or more above lowest beam seat.

- Beam seats may be angled to match skew at the design engineer's discretion.

- See Standard 12.01 for alternative construction joint for concrete slab superstructures where the top of the cap parallels to slope, see Standard 13.01.
STIRRUPS TO BE DESIGNED

STIRRUPS TO BE DESIGNED

STIRRUPS TO BE DESIGNED

STIRRUPS TO BE DESIGNED

PLAN OF PIER CAP

END VIEW

ELEVATION

LEVEL

LOOKING UP STATION

STREET CONSTRUCTION JOINT.

OPTIONAL KEYED CONSTRUCTION JOINT NEAR POINT OF MAXIMUM LENGTH OF SINGLE POUR = 65'-0".

WHEN REQUIRED, PLACE KEYED VERTICAL CONSTRUCTION JOINT NEAR POINT OF MAXIMUM LENGTH OF SINGLE POUR = 65'-0".

SEE BRIDGE MANUAL 13.4.10 FOR MULTI-COLUMNED PIER STIFFING.
GIVE ELEV. OF BEAM SEATS OF PIER
ANGLE REF. LINE ROADWAY OF PIER
OF GIRDER LINE PIER REF.
PIER HEIGHT BE DESIGNED
STIRRUPS TO #6 BARS
#4 BARS
#4 BARS
BARS TO BE DESIGNED
BARS TO BE DESIGNED
#4 BARS OR SPLICE BARS @ FULL LENGTH ACROSS CAP
EXTEND TOP BAR STEEL 15°-20° MIN.
DESIGNED BARS TO BE #4 STIRRUPS MIN.
NOT REQUIRED.
FOR UPLIFT. OTHERWISE WHEN FOOTING IS DESIGNED
BARS TO BE DESIGNED
CONSTRUCTION JOINT.
OPTIONAL KEYED
UPPER LIMIT OF 3'-6" MIN. FOR SLABS
4'-0" MIN. FOR GIRDERS
BE DESIGNED STIRRUPS TO MAKE TOP OF CAP PARALLEL TO GRADE FOR CONCRETE SLAB SUPERSTRUCTURE.
1'-0"
4'-0"
3"
3" CL.
9" MIN.
12" MAX.
HAMMERHEAD LENGTH = 'L'
APPROX. 0.30 'L'
APPROX. 0.35 'L'

DESIGNER NOTES

ELEVATION
ENGLISH FEATURES
STIRRUPS TO BE DESIGNED
STIRRUPS TO BE DESIGNED
STIRRUPS TO BE DESIGNED

SECTION P1

PLAN OF PIER CAP
LOOKING UP STATION

SECTION P2

NOTES

THE BAR SPACERS AT THE OPTIONAL VITREOUS CONSTRUCTION JOINTS MAY BE EXCLUDED WHERE ON OR OUT OF THE GIRDER OR PIER, PAYMENT WILL BE FOR THE ACTUAL BARS INSTALLED.

DESIGNER NOTES (CONT.)

THE MAXIMUM VERT. BAR SPACING APPLIES ONLY WHEN THE ADJACENT REINFORCEMENT IS ON ONE SIDE OF THE CROSS CONCRETE AREA.

CONSTRUCTION JOINTS INTERSECTING VERTICAL BARS ARE TO BE FULLY DEVELOPED IN BOTH DIRECTIONS, (MIN. MAT STEEL = #6 @ 1'-0"
BARS TO BE DESIGNED

SUPERSTRUCTURES. REFER TO GIRDERS ON PRESTRESSED GIRDER STANDARD 19.33, 19.34, 19.35.

CONCRETE MASONRY SEE STANDARD 13.02 FOR SEAL DETAILS.

RESTRAINED (TIED ACROSS MEMBER) VERTICAL BAR IS 24 INCHES MAXIMUM SPACING BETWEEN UNRESTRAINED VERTICAL BAR AND SPACED 1'-0" VERTICALLY.
LAYER OF TIES. TIES ARE HOOKS AT EACH VERTICAL OF THE 90° AND 180° ALTERNATE THE POSITION

STANDARD 18.01.
MAKE THE TOP OF CAP PARALLEL TO GRADE. SEE STANDARD 2. WHEN A CAP IS USED FOR CONCRETE SLAB SUPERSTRUCTURES

ENGINEER'S DISCRETION.
BEAM SEATS MAY BE ANGLED TO MATCH SKEW AT THE DESIGN
FORMERLY: TWO CASES LISTED BELOW:
BEARING SEAT AREAS SHALL BE LEVEL EXCEPT FOR THE SIDE BY SIDE.
AND NOT BEVELED.
SHAFT. EXPOSED EDGES OF CONSTRUCTION JOINT SHALL BE FLUSH
4" DEEP X 1/3 THICKNESS OF SHAFT X 4'-0" LESS THAN LENGTH OF KEYED CONSTRUCTION JOINTS SHALL BE FORMED BY BEVELED KEYWAY OF THE 90° AND 180° ALTERNATE THE POSITION

OF CAP AND TO ADJACENT BEARING SEAT STEPS.
SEE STANDARD 13.01 FOR MINIMUM OFFSETS FROM BEARINGS TO SIDES
SIDE BY SIDE.
FOR "HAMMERHEAD LENGTH" GREATER THAN 45'-0", CONSIDER A TWO
SEAT.
AREA FOR BEAM SEATS THAT ARE 4" OR MORE ABOVE LOWEST BEAM
SEE STANDARD 12.01 FOR ADDITIONAL REINFORCING STEEL IN BEARING
ENGINEER'S DISCRETION.
BEAM SEATS MAY BE ANGLED TO MATCH SKEW AT THE DESIGN
FORMERLY: TWO CASES LISTED BELOW:
BEARING SEAT AREAS SHALL BE LEVEL EXCEPT FOR THE SIDE BY SIDE.
AND NOT BEVELED.
SHAFT. EXPOSED EDGES OF CONSTRUCTION JOINT SHALL BE FLUSH
4" DEEP X 1/3 THICKNESS OF SHAFT X 4'-0" LESS THAN LENGTH OF KEYED CONSTRUCTION JOINTS SHALL BE FORMED BY BEVELED KEYWAY OF THE 90° AND 180° ALTERNATE THE POSITION

OF CAP AND TO ADJACENT BEARING SEAT STEPS.
SEE STANDARD 13.01 FOR MINIMUM OFFSETS FROM BEARINGS TO SIDES
SIDE BY SIDE.
FOR "HAMMERHEAD LENGTH" GREATER THAN 45'-0", CONSIDER A TWO
SEAT.
AREA FOR BEAM SEATS THAT ARE 4" OR MORE ABOVE LOWEST BEAM
SEE STANDARD 12.01 FOR ADDITIONAL REINFORCING STEEL IN BEARING
ENGINEER'S DISCRETION.
BEAM SEATS MAY BE ANGLED TO MATCH SKEW AT THE DESIGN
FORMERLY: TWO CASES LISTED BELOW:
BEARING SEAT AREAS SHALL BE LEVEL EXCEPT FOR THE SIDE BY SIDE.
AND NOT BEVELED.
SHAFT. EXPOSED EDGES OF CONSTRUCTION JOINT SHALL BE FLUSH
4" DEEP X 1/3 THICKNESS OF SHAFT X 4'-0" LESS THAN LENGTH OF KEYED CONSTRUCTION JOINTS SHALL BE FORMED BY BEVELED KEYWAY OF THE 90° AND 180° ALTERNATE THE POSITION

OF CAP AND TO ADJACENT BEARING SEAT STEPS.
SEE STANDARD 13.01 FOR MINIMUM OFFSETS FROM BEARINGS TO SIDES
SIDE BY SIDE.
FOR "HAMMERHEAD LENGTH" GREATER THAN 45'-0", CONSIDER A TWO
SEAT.
AREA FOR BEAM SEATS THAT ARE 4" OR MORE ABOVE LOWEST BEAM
SEE STANDARD 12.01 FOR ADDITIONAL REINFORCING STEEL IN BEARING
ENGINEER'S DISCRETION.
BEAM SEATS MAY BE ANGLED TO MATCH SKEW AT THE DESIGN
FORMERLY: TWO CASES LISTED BELOW:
BEARING SEAT AREAS SHALL BE LEVEL EXCEPT FOR THE SIDE BY SIDE.
AND NOT BEVELED.
SHAFT. EXPOSED EDGES OF CONSTRUCTION JOINT SHALL BE FLUSH
4" DEEP X 1/3 THICKNESS OF SHAFT X 4'-0" LESS THAN LENGTH OF KEYED CONSTRUCTION JOINTS SHALL BE FORMED BY BEVELED KEYWAY OF THE 90° AND 180° ALTERNATE THE POSITION

OF CAP AND TO ADJACENT BEARING SEAT STEPS.
SEE STANDARD 13.01 FOR MINIMUM OFFSETS FROM BEARINGS TO SIDES
SIDE BY SIDE.
FOR "HAMMERHEAD LENGTH" GREATER THAN 45'-0", CONSIDER A TWO
SEAT.
AREA FOR BEAM SEATS THAT ARE 4" OR MORE ABOVE LOWEST BEAM
SEE STANDARD 12.01 FOR ADDITIONAL REINFORCING STEEL IN BEARING
ENGINEER'S DISCRETION.
BEAM SEATS MAY BE ANGLED TO MATCH SKEW AT THE DESIGN
FORMERLY: TWO CASES LISTED BELOW:
BEARING SEAT AREAS SHALL BE LEVEL EXCEPT FOR THE SIDE BY SIDE.
SEAT DETAILS

SLOPING BEAM

END VIEW

MULTI-COLUMNED PIER WITH RECTANGULAR COLUMNS

SECTION P2

SECTION P1

BUREAU OF STRUCTURES

MULTI-COLUMNED PIER WITH RECTANGULAR COLUMNS

PART 7

RECOMMENDED PRACTICES FOR AASHTO LRFD DESIGN

Approved:

Date:

STANDARD 13.07

Bill Oliva
**PIER CAP REINFORCEMENT DETAILING**

**DESIGNER NOTES**

- **Plan**
  - Cap width
  - Support main reinforcement.
  - Provide reinforcement necessary to section thru pier cap.

- **Section Thru Pier Cap**
  - Cap width
  - Provide adequate clearance for post-installed anchors.

- **Note**
  - Provide transverse stirrup bars as needed to displace transverse stirrup bars and reinforcement.
  - Provide reinforcement necessary to support main reinforcement.

**Bill Oliva**

**STANDARD 13.08**
### DESIGNER NOTES

The pile types shown on this standard are based on the observed water elevation, stream type, stream bed stability, and remaining design life. Use the information provided to help select the appropriate bid items and plan notes.

**PILE ENCASED PIER TYPES**
- **Type 1** - Cofferdams not provided. **Consider providing underwater inspection bid item.**
- **Type 2** - Cofferdams and underwater inspection bid items required.
- **Type 3** - Cofferdams and seal of piers required.

**PILE ENCASED PIER ALTERNATIVES:**
- **Solid wall as shown on this standard**
- **Hammerhead as standard**

**PILE ENCASED PIER TYPES:**
- **Type 1** - Cofferdams and seal bid items required.
- **Type 2** - Cofferdams and underwater inspection bid items required.
- **Type 3** - Cofferdams and seal of piers required.

**PILE ENCASED PIER ALTERNATIVES:**
- **Solid wall as shown on this standard**
- **Hammerhead as standard**

---

**PILE ENCASED PIER (TYPES)**

<table>
<thead>
<tr>
<th>Bid Item</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>502.1100</td>
<td>CY</td>
</tr>
<tr>
<td>206.5000</td>
<td>LS</td>
</tr>
<tr>
<td>002.0000</td>
<td>CY</td>
</tr>
</tbody>
</table>

---

**PILE ENCASED PIER (TYPES)**

<table>
<thead>
<tr>
<th>Bid Item</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>502.1100</td>
<td>CY</td>
</tr>
<tr>
<td>206.5000</td>
<td>LS</td>
</tr>
<tr>
<td>002.0000</td>
<td>CY</td>
</tr>
</tbody>
</table>
51-INCH CONCRETE INTEGRAL BARRIER

NOTES

DETAILS OF CONSTRUCTION MATERIALS AND WORKMANSHIP

MUST CONFORM TO THE REQUIREMENTS OF THE STANDARDS SPECIFICATION

AND THE APPLICABLE SPECIAL PROVISIONS.

BARRIER AND FOOTING SHALL CONSIST OF CAST IN PLACE CONCRETE MASONRY CONCRETE.

DO NOT CUT OR DRILL INTO EXISTING COLUMN BAR STEEL.

ALL REINFORCEMENT SHALL BE EPOXY-COATED.

USE 1-INCH MINIMUM BAR CLEARANCE, EXCEPT AT FOOTINGS AND THE APPLICABLE SPECIAL PROVISIONS.

PLACE REINFORCEMENT SUCH THAT IT WILL NOT CONFLICT WITH THE ANCHOR ASSEMBLY FOR THRIE BEAM ATTACHMENT.

SEE STANDARD 13.11 FOR DESIGNER NOTES.

SEE STANDARD 13.10 FOR ADDITIONAL DETAILS.

REINFORCEMENT FOR CIRCULAR AND RECTANGULAR COLUMNS

DETAILS FOR CIRCULAR AND RECTANGULAR COLUMNS

Does not conflict with the anchor assembly for the thribe beam attachment.

Provides spacing between columns.

Place in 2'-7" in adjacent pour.

Provide spacing between columns.

Optional construction joints in footings placed along e. of column.

Lap longitudinal reinforcement 2'-7" in adjacent pour.

Reinforcement between columns.

Provide spacing between columns.

Elevations looking at B.F. of barrier.

Noted 51" barrier refers to the distance from the top of the shoulder to the top of the barrier.

Place 1/2" filler between column and concrete footing (TYP.)
5'-1" VERTICAL CONCRETE BARRIER AND TRANSITION

SECTION A-A

SECTION B-B

BARS AND BENDING DIAGRAMS

DESIGNER NOTES

INTEGRAL BARRIER DETAILS

BUREAU OF STRUCTURES

STANDARD 13.11