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* Refer to http://www.dot.state.mn.us/bridge/ for current Bridge CADD Standards
## BRIDGE DETAILS MANUAL PART I *

### (B-DETAILS)

**June 12, 2019**  
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* Refer to  http://www.dot.state.mn.us/bridge/  for current Bridge CADD Standards
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* Refer to [http://www.dot.state.mn.us/bridge/] for current Bridge CADD Standards
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**ARCHIVED 05-24-2011**

* Refer to [http://www.dot.state.mn.us/bridge/] for current Bridge CADD Standards
LETTERS AND NUMBERS SHALL CONFORM TO THOSE SHOWN.

FURNISH 2 STEEL BOLTS \( \frac{3}{4}'' \) DIA. \( \times \) 3'' LONG WITH EACH PLATE.

DATA TO BE SHOWN ON NAMEPLATE IS AS FOLLOWS:

- **BRIDGE**
- **YEAR**

1234567890

NUMBERS FOR NAMEPLATE

NOTES:

- MATERIAL SHALL COMPLY WITH SPEC. 3327.
- LETTERS AND NUMBERS SHALL CONFORM TO THOSE SHOWN.
- DRAFT ON LETTERS AND NUMBERS SHALL NOT BE MORE THAN 3'' IN 12''.
- HORIZONTAL SPACING OF LETTERS AND NUMBERS SHALL PRODUCE A BALANCED LAYOUT IN PROPORTION TO SPACING SHOWN.
- TOP SURFACE OF LETTERS, NUMBERS AND FRAMES SHALL BE BURNISHED.
- FURNISH 2 STEEL BOLTS \( \frac{3}{4}'' \) DIA. \( \times \) 3'' LONG WITH EACH PLATE.
- ALL DIMENSIONS FOR \( \frac{3}{4}'' \) HIGH LETTERS AND NUMBERS SHALL BE IN DIRECT PROPORTION TO THOSE SHOWN FOR THE 1'' HIGH LETTERS AND NUMBERS.
NO SHOP DRAWING REQUIRED. LETTERS AND NUMBERS SHALL CONFORM TO THOSE SHOWN.

FURNISH 2 STEEL BOLTS \( \frac{1}{4}'' \) DIA. x 3'' LONG WITH EACH PLATE.

DRAFT ON LETTERS AND NUMBERS SHALL NOT BE MORE THAN 3'' IN 12''.

TOP SURFACE OF LETTERS, NUMBERS AND FRAMES SHALL BE BURNISHED.

BALANCED LAYOUT IN PROPORTION TO SPACING SHOWN.

MATERIAL SHALL COMPLY WITH SPEC. 3327.

THE DASHED NUMBERS SHOWN ABOVE ARE FOR ILLUSTRATION.

DATA TO BE SHOWN ON NAMEPLATE IS AS FOLLOWS:

BRIDGE:  
YEAR:  
YEAR:  

1234567890  

NOTES:

NO SHOP DRAWING REQUIRED.

MATERIAL SHALL COMPLY WITH SPEC. 3327.

LETTERS AND NUMBERS SHALL CONFORM TO THOSE SHOWN.

DRAFT ON LETTERS AND NUMBERS SHALL NOT BE MORE THAN 3'' IN 12''.

HORIZONTAL SPACING OF LETTERS AND NUMBERS SHALL PRODUCE A BALANCED LAYOUT IN PROPORTION TO SPACING SHOWN.

BALANCED LAYOUT IN PROPORTION TO SPACING SHOWN.

TOP SURFACE OF LETTERS, NUMBERS AND FRAMES SHALL BE BURNISHED.

FURNISH 2 STEEL BOLTS \( \frac{1}{4}'' \) DIA. x 3'' LONG WITH EACH PLATE.

ALL DIMENSIONS FOR \( \frac{3}{4}'' \) HIGH LETTERS AND NUMBERS SHALL BE IN DIRECT PROPORTION TO THOSE SHOWN FOR THE 1'' HIGH LETTERS AND NUMBERS.
NOTES:

APPROVED COMMERCIAL PILE SPLICE BACK-UP RING MAY BE USED IN LIEU OF THE TYPE DETAILED, PROVIDED THAT 1/4" ROOT IS MAINTAINED. BACK-UP RING SHALL HAVE A TIGHT FIT.

WELDING ELECTRODES SHALL BE CELLULOSIC TYPE ELECTRODES E-6010 OR E-6011.

ELECTRODES WHICH HAVE BECOME WET, SOILED OR DAMAGED SHALL NOT BE USED.

WELDING SHALL NOT BE DONE WHEN THE AMBIENT TEMPERATURE IS LOWER THAN 0° F. OR WHEN THE PILE IS WET OR EXPOSED TO FALLING RAIN OR SNOW. WHEN THE PILE METAL TEMPERATURE IS BELOW 32° F., THE PILE METAL IN THE AREA OF THE WELD SHALL BE HEATED TO A MINIMUM TEMPERATURE OF 70° F. AND MAINTAINED AT THIS TEMPERATURE DURING WELDING.

1 FOR PILE SHELL THICKNESSES GREATER THAN 1/4", USE A B-U4d WELD CONFIGURATION. SEE DETAIL "A".
SECTION AT SPLICE

B-14a

SECTION A-A

100% BUTT WELDED PILE SPLICE

NOTES:

CELLULOSIC TYPE ELECTRODES E-6010 OR E-6011 SHALL BE USED FOR 100% BUTT WELDED SPLICES.

ELECTRODES WHICH HAVE BECOME WET, SOILED OR DAMAGED SHALL NOT BE USED.

WELDING SHALL NOT BE DONE WHEN THE AMBIENT TEMPERATURE IS LOWER THAN 0°F, OR WHEN THE PILE IS WET OR EXPOSED TO FALLING RAIN OR SNOW. WHEN THE PILE METAL TEMPERATURE IS BELOW 32°F, THE PILE METAL IN THE AREA OF THE WELD SHALL BE HEATED TO A MINIMUM TEMPERATURE OF 70°F, AND MAINTAINED AT THIS TEMPERATURE DURING WELDING.
DEPARTMENT OF TRANSPORTATION
STATE OF MINNESOTA

SOLE PLATE
(FOR BEARINGS WITH PINTLES)
(PRESTRESSED CONCRETE BEAMS)

SOLE PLATE
(SIDES ONLY)
CHAMFER

SECTION A-A

NOTES:

1. PROVIDE STRUCTURAL STEEL PER SPEC. 3306.
2. PROVIDE WELDED STUDS OF WELDABLE CARBON STEEL PER SPEC. 3391.2D.
3. GALVANIZE SOLE PLATE FOR BEARING ASSEMBLY PER SPEC. 3394 AFTER FABRICATION.
4. ENSURE PINTLE HOLES ARE FREE OF ZINC BUILD UP FROM GALVANIZING.
5. SOLE PLATES ARE INCIDENTAL TO PRESTRESSED CONCRETE BEAMS.
6. BEARINGS AND PORTION OF THE BEAM THAT CANTILEVERS BEYOND THE BEARING.
7. CONSIDER THE EFFECTS ON THE BEAM THAT CANTILEVERS BEYOND THE BEARING.

IF THIS SHEET IS MODIFIED, ADD A NOTE ON THE BEAM SHEET INDICATING THAT THE SOLE PLATE HAS BEEN MODIFIED. REFER TO B303.

DESIGNER NOTE REMOVE PRIOR TO PLOTTING FINAL PLAN; ADJUST THIS DIMENSION FOR LARGE MOVEMENT BEARINGS AND CONSIDER THE EFFECTS ON THE BEARINGS AND PORTION OF THE BEAM THAT CANTILEVERS BEYOND THE BEARING.

FOR 1½" DIA. PINTLES.

1½" BEVEL ALL AROUND
1½" DIA.

3/4" DIA., POLYSTYRENE, TYPE B, PLUG, REMOVE PLUG PRIOR TO BEAM INSTALLATION.

APPROVED: SEPTEMBER 22, 2011

SOLE PLATE (PRESTRESSED CONCRETE BEAMS) (FOR BEARINGS WITH PINTLES)

STATE OF MINNESOTA
DEPARTMENT OF TRANSPORTATION

REVISION
01-05-2017
12-20-208

DETAIL NO.
B303
BEAM NOT SHOWN

PER SPEC. 3394, EXCEPT AS NOTED.
GALVANIZE STRUCTURAL STEEL BEARING ASSEMBLY AFTER FABRICATION PER SPEC. 3741.

PROVIDE ELASTOMERIC MATERIALS AND PAD CONSTRUCTION.

PROVIDE STEEL PLATES PER SPEC. 3306.

PROVIDE ANCHOR RODS PER SPEC. 3306. GALVANIZE PER SPEC. 3394.

GALVANIZE STRUCTURAL STEEL BEARING ASSEMBLY AFTER FABRICATION PER SPEC. 3394, EXCEPT AS NOTED.

PAYMENT FOR BEARING ASSEMBLY INCLUDES ALL MATERIAL ON THIS DETAIL.

NOTES:

PROVIDE ELASTOMERIC MATERIALS AND PAD CONSTRUCTION PER SPEC. 3741.

PROVIDE STEEL PLATES PER SPEC. 3306.

PROVIDE ANCHOR RODS PER SPEC. 3306. GALVANIZE PER SPEC. 3394.

GALVANIZE STRUCTURAL STEEL BEARING ASSEMBLY AFTER FABRICATION PER SPEC. 3394, EXCEPT AS NOTED.

PAYMENT FOR BEARING ASSEMBLY INCLUDES ALL MATERIAL ON THIS DETAIL.

THE TOTAL THICKNESS SHOWN INCLUDES THE STEEL PLATES.

DO NOT GALVANIZE THESE PLATES.

REFER TO BEARING PAD RESTRAINT B-DETAIL FOR ADDITIONAL INFORMATION AND DETAILS.

DESIGNER NOTE REMOVE PRIOR TO PLOTTING FINAL PLAN.

FOR PARAPET AND SEMI-INTEGRAL ABUTMENT BRIDGES ON GRADES EXCEEDING 3%, MODIFY THIS DETAIL TO PROVIDE A TAPERED BEARING PLATE PER DETAIL B309.

PER NOTE 3 INCLUDE B307 AND MODIFY AS NECESSARY.

DESIGN DATA:

MAX. FACTORED SHEAR RESISTANCE:
- 50.3 KIPS PER 1" DIA. PINTLE
- 36.2 KIPS PER 1/2" DIA. ANCHOR ROD

STATE OF MINNESOTA
DEPARTMENT OF TRANSPORTATION

ELASTOMERIC FIXED BEARING ASSEMBLY
(PRESTRESSED CONCRETE BEAMS)
(FOR REPLACEMENT OF INPLACE BEARINGS ONLY)

APPROVED: NOVEMBER 22, 2002
STATE BRIDGE ENGINEER

REVISION
01-05-2017
11-02-2017
11-08-2018

DETAIL NO.
B304
**DIAPHRAGMS OR INTEGRAL ABUTMENTS.**

USE "UNREINFORCED PAD WITH CONTINUITY (PRESTRESSED CONCRETE BEAMS)"

**DETAIL NO.**

DEPARTMENT OF TRANSPORTATION

STATE OF MINNESOTA

**PLATE**

(BEAM NOT SHOWN)

**SIDE ELEVATION**

**SECTION X-X**

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<td>A B</td>
<td>D (1)</td>
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<td></td>
<td></td>
<td>12 24 1/2</td>
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**NOTES:**

USE NEOPRENE OR NATURAL RUBBER AND FABRICATE PAD PER SPEC. 3741.

PAYMENT FOR ELASTOMERIC BEARING PAD INCLUDED IN ITEM "ELASTOMERIC BEARING PAD" PER EACH.

1) "D" INDICATES THE THICKNESS OF THE BEARING PAD.

DESIGNER NOTE
(REMOVE DESIGNER NOTE PRIOR TO PLOTTING FINAL PLAN)
USE 1/8" UNREINFORCED PAD WITH CONTINUITY DIAPHRAGMS OR INTEGRAL ABUTMENTS.

**APPROVED: NOVEMBER 22, 2002**

STATE BRIDGE ENGINEER

STATE OF MINNESOTA

DEPARTMENT OF TRANSPORTATION

ELASTOMERIC BEARING PAD
(PRESTRESSED CONCRETE BEAMS)

REVISION
12-17-2008
05-24-2012
01-13-2015
05-10-2017

DETAIL NO. B305
**PATTERN A-1**

(View at bottom of bearing plate)

- Bearing assembly
- 10" x 10" Elastomeric bearing pad

**PATTERN A-2**

(View at bottom of bearing plate)

- Bearing assembly
- 6" clear (TYP.)
- 12" x 24" Elastomeric bearing pad

**PATTERN A-3**

(View at bottom of bearing plate)

- Bearing assembly
- 10" x 8" Elastomeric bearing pad
- 10" x 10" Elastomeric bearing pad

**PATTERN A-4**

(View at bottom of bearing plate)

- Bearing assembly
- 3/8" x 3/8" x 10" solid bar (TYP.)
- 3/8" clear (TYP.)
- 12" x 30" Elastomeric bearing pad

**NOTES:**

- Install 3/8" x 3/8" solid restraint bars symmetric to center of bearing plate with clear distance of 3/8" from edge of bearing pad to inside face of restraint bar.
- Restraint bars included in payment for bearing assembly.
**BEARING PLATE DETAIL**

**SIDE ELEVATION**

**SECTION X-X**

**TABLE**

<table>
<thead>
<tr>
<th>ASSEMBLY TYPE</th>
<th>LOCATION</th>
<th>BEAM SIZE</th>
<th>BEARING PAD SIZE</th>
<th>SHAPE FACTOR</th>
<th>BEARING PLATE SIZE</th>
<th>ASSEMBLY HEIGHT</th>
<th>RESTRAINT PATTERN</th>
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<tbody>
<tr>
<td>RB, M &amp; MN</td>
<td>12 24 1/2</td>
<td>8.0</td>
<td>14&quot; 26&quot;</td>
<td>A-B-D 3</td>
<td>C-E-F-G</td>
<td>A-1</td>
<td></td>
</tr>
<tr>
<td>MH</td>
<td>12 30 1/2</td>
<td>8.6</td>
<td>14&quot; 32&quot;</td>
<td>A-B-D 3</td>
<td>C-E-F-G</td>
<td>A-3</td>
<td></td>
</tr>
</tbody>
</table>

**NOTES:**

- PROVIDE ELASTOMERIC MATERIALS AND PAD CONSTRUCTION PER SPEC. 3741.
- PROVIDE STEEL PLATES PER SPEC. 3306.
- PROVIDE PINTLES PER SPEC. 3309.
- GALVANIZE STRUCTURAL STEEL BEARING ASSEMBLY AFTER FABRICATION PER SPEC. 3594.
- PAYMENT FOR TAPERED BEARING PLATE ASSEMBLY INCLUDES ALL MATERIAL ON THIS DETAIL.

- MARK THICKER SIDE OF SLOPED PLATES WITH AN "H" FOR PLACEMENT. SEE FRAMING PLAN SHEET NO....
- BEARING PAD AND BEARING PLATE THICKNESS AT 4 BEARING.
- "D" INDICATES THE THICKNESS OF THE BEARING PAD.
- REFER TO BEARING PAD RESTRAINT B-Detail FOR ADDITIONAL INFORMATION AND DETAILS.

**DESIGN DATA:**

MAX. FACTORED SHEAR RESISTANCE: - 50.3 KIPS PER 1/2" DIA. PINTLE

**APPROVED:** DECEMBER 20, 2018

**STATE BRIDGE ENGINEER**
**DEPARTMENT OF TRANSPORTATION**  
**STATE OF MINNESOTA**

**B310**  
**DESIGN DATA:**

**CURVED PLATE BEARING ASSEMBLY**  
(PRESTRESSED CONCRETE BEAMS)  
(FIXED)

**NOTES:**
- PROVIDE ELASTOMERIC MATERIALS AND PAD CONSTRUCTION PER SPEC. 3741.
- PROVIDE STEEL PLATES PER SPEC. 3306.
- PROVIDE ANCHOR RODS PER SPEC. 3306. GALVANIZE PER SPEC. 3394.
- PROVIDE PINTLES PER SPEC. 3309.
- GALVANIZE STRUCTURAL STEEL BEARING ASSEMBLY AFTER FABRICATION PER SPEC. 3394, EXCEPT AS NOTED.
- PAYMENT FOR BEARING ASSEMBLY INCLUDES ALL MATERIAL ON THIS DETAIL.
  - **1.** THE MIN. RADIUS IS 16" UNLESS OTHERWISE SPECIFIED IN THE TABLE.  
  - THE MAX. RADIUS IS 24". FINISH TO 250 MICRO. THE FINISHED THICKNESS OF THE PLATE MAY BE 1/4" LESS THAN SHOWN.
  - **2.** "+" DENOTES OFFSET AS SHOWN.  
  - "-" DENOTES OFFSET OPPOSITE OF SHOWN.
  - **3.** REFER TO BEARING PAD RESTRAINT B-DETAIL FOR ADDITIONAL INFORMATION AND DETAILS.

**DESIGN DATA:**
- MAX. FACTORED SHEAR RESISTANCE:  
  - 50.3 KIPS PER 1/2" DIA. PINTLE  
  - 36.2 KIPS PER 1/2" DIA. ANCHOR ROD

**TABLE**

<table>
<thead>
<tr>
<th>ASSEMBLY LOCATION</th>
<th>BEARING PAD SIZE</th>
<th>SHAPE FACTOR</th>
<th>BEARING PLATE SIZE</th>
<th>CURVED PLATE SIZE</th>
<th>ANCHOR ROD OFFSET</th>
<th>ASSY. HEIGHT</th>
<th>RESTRAINT PATTERN</th>
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<tr>
<td>RB, M, &amp; MN</td>
<td>12&quot; 24&quot; 1/2&quot;</td>
<td>8.0</td>
<td>14&quot; 1/2&quot; 26&quot; 1/4&quot;</td>
<td>8.6</td>
<td>14&quot; 1/2&quot; 26&quot; 1/4&quot;</td>
<td>3/4&quot; A-1</td>
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<tr>
<td>MW</td>
<td>16&quot; 36&quot; 1/2&quot;</td>
<td>11.1</td>
<td>18&quot; 1/2&quot; 38&quot; 1/4&quot;</td>
<td>11.1</td>
<td>18&quot; 1/2&quot; 38&quot; 1/4&quot;</td>
<td>3/4&quot; A-2</td>
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<td>12&quot; 30&quot; 1/2&quot;</td>
<td>8.6</td>
<td>14&quot; 1/2&quot; 32&quot; 1/4&quot;</td>
<td>8.6</td>
<td>14&quot; 1/2&quot; 32&quot; 1/4&quot;</td>
<td>3/4&quot; A-3</td>
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**STATE BRIDGE ENGINEER**  
**APPROVED: DECEMBER 20, 2018**
## TABLE

<table>
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<tr>
<th>ASSY NO.</th>
<th>LOCATION</th>
<th>BEARING PAD SIZE</th>
<th>STEEL PLATES</th>
<th>LAMINATES</th>
<th>SHAPE FACTOR</th>
<th>BEARING PLATE SIZE</th>
<th>CURVED PLATE SIZE</th>
<th>ASSY HEIGHT</th>
<th>RESTRAINT PATTERN</th>
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<tr>
<td>A-1</td>
<td>RB, M, &amp; MN 12&quot; x 24&quot;</td>
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<td>27&quot;</td>
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<td>4/5&quot;</td>
<td>26&quot;</td>
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<tr>
<td>A-2</td>
<td>MW 16&quot; x 36&quot;</td>
<td>1/4&quot;</td>
<td>1/4&quot;</td>
<td>7.4</td>
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<td>39&quot;</td>
<td>1/2&quot;</td>
<td>4/5&quot;</td>
<td>38&quot;</td>
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<tr>
<td>A-3</td>
<td>WH 12&quot; x 30&quot;</td>
<td>1/4&quot;</td>
<td>1/4&quot;</td>
<td>8.6</td>
<td>14&quot;</td>
<td>33&quot;</td>
<td>1/2&quot;</td>
<td>4/5&quot;</td>
<td>32&quot;</td>
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</tbody>
</table>

### NOTES:

- PROVIDE ELASTOMERIC MATERIALS AND PAD CONSTRUCTION PER SPEC. 3741.
- PROVIDE STEEL PLATES PER SPEC. 3306.
- PROVIDE PINTLES PER SPEC. 3309.
- GALVANIZE STRUCTURAL STEEL BEARING ASSEMBLY AFTER FABRICATION PER SPEC. 3394, EXCEPT AS NOTED.
- PAYMENT FOR BEARING ASSEMBLY INCLUDES ALL MATERIAL ON THIS DETAIL.
- THE MIN. RADIUS IS 16" UNLESS OTHERWISE SPECIFIED IN THE TABLE. THE MAX. RADIUS IS 24", FINISH TO 250 MICRO. THE FINISHED THICKNESS OF THE PLATE MAY BE 1/6" LESS THAN SHOWN.
- DO NOT GALVANIZE THESE PLATES.
- THE TOTAL THICKNESS SHOWN INCLUDES THE STEEL PLATES.

#### DESIGN DATA:

- MAX. FACTORED SHEAR RESISTANCE: - 50.3 KIPS PER 1/2" DIA. PINTLE

---

**STATE BRIDGE ENGINEER**

---

**APPROVED: DECEMBER 20, 2018**
BEARING ASSEMBLY DIMENSIONS

<table>
<thead>
<tr>
<th>ASSEMBLY TYPE</th>
<th>ROTATION</th>
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<table>
<thead>
<tr>
<th>TOTAL LOAD (KIPS)</th>
<th>TOTAL MOVEMENT (INCHES)</th>
<th>PLATE &quot;A&quot; (DIA.)</th>
<th>PLATE &quot;B&quot; (DIA.)</th>
<th>PLATE &quot;C&quot; (MAXIMUM)</th>
<th>PLATE &quot;D&quot; (MAXIMUM)</th>
<th>DIMENSION &quot;L&quot;</th>
<th>DIMENSION &quot;H&quot;</th>
<th>DIMENSION &quot;N&quot;</th>
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</table>

DIMENSION "N" = BOTTOM FLANGE WIDTH OF BEAMS MINUS 1/2"

NOTES:
- PROVIDE MATERIALS, DESIGN AND FABRICATION PER SPECIAL PROVISIONS.
- PROVIDE STEEL PLATES AND PINTLES PER SPEC.3309.
- GALVANIZE PLATES "A", "D" AND PINTLES PER SPEC. 3394.
- METALIZE PLATES "B" & "C" PER SPEC.2471.3L.2.
- PROVIDE ANCHOR RODS PER SPEC.3385, TYPE B.
- GALVANIZE PER SPEC. 3392.
- PERFORM SHIMMING UNDER PLATE "D" WITH FABRIC PADS PER AASHTO LRFD BRIDGE CONSTRUCTION SPEC. SECTION 18.10.
- MANUFACTURER TO SUBMIT ANY BEARING ASSEMBLY DIMENSIONS, DETAILS OR MATERIALS NOT SHOWN TO THE ENGINEER FOR APPROVAL. SHIP UPPER AND LOWER COMPONENTS TOGETHER AS A COMPLETE ASSEMBLY.
- ALL MATERIAL SHOWN IS INCLUDED IN THE PRICE BID FOR EACH BEARING ASSEMBLY, EXCEPT AS NOTED.

1. MINIMUM ROTATION OF .02 RADIANS
2. MARK < OF BRG. PLATES "A" AND "B" TO FACILITATE PLACEMENT.
3. HEIGHT IS MINIMUM DIMENSION IF PLATE IS TAPERED.

DESIGN DATA:
- MAXIMUM HORIZONTAL LOAD IS 70 KIPS FOR 1/2" PINTLES.

APPROVED: NOVEMBER 22, 2002
STATE OF MINNESOTA
DEPARTMENT OF TRANSPORTATION
POT TYPE BEARING ASSEMBLY
(PRESTRESSED CONCRETE BEAMS) (GUIDED EXPANSION)

STATE BRIDGE ENGINEER

REVISION
11-03-2015
02-27-2019
DETAIL NO. B312
**BEARING ASSEMBLY DIMENSIONS**

<table>
<thead>
<tr>
<th>ASSEMBLY TYPE</th>
<th>ROTATION (1)</th>
<th>TOTAL LOAD (KIPS)</th>
<th>TOTAL MOVEMENT (INCHES)</th>
<th>PLATE &quot;A&quot; (DIA)</th>
<th>PLATE &quot;B&quot; (DIAMETER)</th>
<th>PLATE &quot;C&quot; (MAXIMUM)</th>
<th>PLATE &quot;D&quot; (MAXIMUM)</th>
<th>DIMENSION &quot;L&quot;</th>
<th>DIMENSION &quot;H&quot;</th>
<th>DIMENSION &quot;N&quot;</th>
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</thead>
</table>

DIMENSION "N" = BOTTOM FLANGE WIDTH OF BEAMS MINUS 1/2"

**NOTES:**

- PROVIDE MATERIALS, DESIGN AND FABRICATION PER SPECIAL PROVISIONS.
- PROVIDE STEEL PLATES AND PINTLES PER SPEC. 3309.
- GALVANIZE PLATES "A", "D" AND PINTLES PER SPEC. 3394.
- METALIZE PLATES "B" & "C" PER SPEC. 2471.3.L.2.
- PROVIDE ANCHOR RODS PER SPEC. 3385, TYPE B.
- GALVANIZE PER SPEC. 3392.

PERFORM SHIMMING UNDER PLATE "D" WITH FABRIC PADS PER AASHTO LRFD BRIDGE CONSTRUCTION SPEC. SECTION 18.10.

MANUFACTURER TO SUBMIT ANY BEARING ASSEMBLY DIMENSIONS, DETAILS, OR MATERIALS NOT SHOWN TO THE ENGINEER FOR APPROVAL.

ALL MATERIAL SHOWN IS INCLUDED IN THE PRICE BID FOR EACH BEARING ASSEMBLY, EXCEPT AS NOTED.

1. MINIMUM ROTATION OF .02 RADIANS
2. MARK θ OF BRG. PLATES "A" AND "B" TO FACILITATE PLACEMENT.
3. HEIGHT IS MINIMUM DIMENSION IF PLATE IS TAPERED.

APPROVED: NOVEMBER 22, 2002

STATE OF MINNESOTA
DEPARTMENT OF TRANSPORTATION

POT TYPE BEARING ASSEMBLY
(PRESTRESSED CONCRETE BEAMS)
(NON-GUIDED EXPANSION)

STATE BRIDGE ENGINEER

REVISION: 11-03-2015

DETAIL NO.: B313
**NOTES:**

1. Factor loads to LL rotation or 0.02 radians whichever is greater.
2. The sole plate is included in the pot bearing assembly quantity. 1/4" MIN. Thickness is required. Taper sole plate to finished grade including transverse taper for skewed bridges.
3. Pot bearing manufacturers to determine the final dimensions and number of all bearing components including piston, pot, masonry plate, sole plate, threaded fasteners, bolted flange connections, pintles and overall height, and coordinate sharing this information with the beam fabricator and contractor.
4. Factor horizontal resistance is a minimum of 65% of the strength limit state vertical load unless stated otherwise.
5. See framing plan.
6. "+" denotes offset as shown.  "-" denotes offset opposite of shown.

**DESIGNER NOTE (REMOVE DESIGNER NOTE PRIOR TO PLOTTING FINAL PLANS):**

**TWO 1/4" DIAMETER ANCHOR RODS HAVE A FACTORED HORIZONTAL RESISTANCE OF 95 KIPS. DESIGNER SHALL INCREASE DIAMETER NUMBER OF RODS OR BOTH WHEN NEEDED.**

**WHEN SPECIFYING OFFSET DIMENSION "+", CONSIDER THE SIZE AND PROXIMITY OF THE DIAPHRAGM AND LONGITUDINAL PIER REINFORCEMENT TO ALLOW ADEQUATE ROOM FOR INSTALLATION OF ANCHOR RODS.**

**BEARING ASSEMBLY TABLE**

<table>
<thead>
<tr>
<th>ASSEMBLY TYPE</th>
<th>LOCATION</th>
<th>FACTORED LL ROTATION (°)</th>
<th>TOTAL MOVEMENT (INCHES)</th>
<th>MASONRY PLATE</th>
<th>ANCHOR ROD OFFSET</th>
<th>ASSUMED HEIGHT &quot;H&quot; (INCHES)</th>
<th>BOTTOM FLANGE WIDTH</th>
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**DESIGN LOADS (KIPS):**

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<th>SERVICE LIMIT STATE</th>
<th>STRENGTH LIMIT STATE</th>
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<td>HORIZONTAL</td>
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<tr>
<td>VERTICAL</td>
<td>HORIZONTAL</td>
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**APPROVED: SEPTEMBER 18, 2007**

**STATE OF MINNESOTA**

**DEPARTMENT OF TRANSPORTATION**

**POT BEARING ASSEMBLY**

**(STEEL BEAMS) (GUIDED EXPANSION)**

**REVISION:**

12-17-2008

11-03-2015

**DETAIL NO.: B314**
NOTES:

1. FACTORED LIVE LOAD (LL) ROTATION OR 0.02 RADIANS WHICHEVER IS GREATER.

2. THE SOLE PLATE IS INCLUDED IN THE POT BEARING ASSEMBLY QUANTITY. 1 1/8" MIN. THICKNESS IS REQUIRED, TAPER SOLE PLATE TO FINISHED GRADE INCLUDING TRANSVERSE TAPER FOR SKewed BRIDGES.

3. POT BEARING MANUFACTURER TO DETERMINE THE FINAL DIMENSIONS AND NUMBER OF ALL BEARING COMPONENTS INCLUDING PISTON, POT, MASONRY PLATE, SOLE PLATE, THREADED FASTENERS, BOLTED FLANGE CONNECTIONS, PINTLES AND OVERALL HEIGHT, AND COORDINATE SHARING THIS INFORMATION WITH THE BEAM FABRICATOR AND CONTRACTOR. MINIMUM PINTLE SIZE IS 1 1/8" DIAMETER.

4. FACTORED HORIZONTAL RESISTANCE IS A MINIMUM OF 10% OF THE STRENGTH LIMIT STATE VERTICAL LOAD UNLESS STATED OTHERWISE.

5. SEE FRAMING PLAN

6. "+" DENOTES OFFSET AS SHOWN.

7. "-" DENOTES OFFSET OPPOSITE OF SHOWN.

DESIGNER NOTE (REMOVE DESIGNER NOTE PRIOR TO PLOTTING FINAL PLANS): TWO 1 1/8" DIAMETER ANCHOR RODS HAVE A FACTORED HORIZONTAL RESISTANCE OF 95 KIPS. DESIGNER SHALL INCREASE DIAMETER, NUMBER OF RODS OR BOTH WHEN NEEEDED.

WHEN SPECIFYING OFFSET DIMENSION "++", CONSIDER THE SIZE AND PROXIMITY OF THE DIAPHRAGM AND LONGITUDINAL PIER REINFORCEMENT TO ALLOW ADEQUATE ROOM FOR INSTALLATION OF ANCHOR RODS.

BEARING ASSEMBLY TABLE

<table>
<thead>
<tr>
<th>ASSEMBLY</th>
<th>LOCATION</th>
<th>FACTORED LL</th>
<th>TOTAL MOVEMENT</th>
<th>MASONRY PLATE</th>
<th>ANCHOR ROD</th>
<th>BOTTOM FLANGE</th>
<th>DESIGN LOADS (KIPS)</th>
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<tr>
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<td></td>
<td>ROTATION 1 (RAD)</td>
<td>INCHES</td>
<td>ANCHOR ROD OFFSET</td>
<td>ASSUMED HEIGHT</td>
<td>FLANGE WIDTH</td>
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<td>LONGITUDINAL</td>
<td>A</td>
<td>B</td>
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</table>

AMOUNT OF MATERIAL SHOWN IS INCLUDED IN THE PRICE BID FOR EACH BEARING ASSEMBLY, EXCEPT AS NOTED.

METALIZE PISTON AND POT PER SPEC. 2471.3.1.2.

1. PROVIDE MATERIALS, DESIGN AND FABRICATION PER SPECIAL PROVISIONS.

2. PROVIDE STEEL PLATES AND PINTLES PER SPEC. 3309.

3. GALVANIZE SOLE PLATE, MASONRY PLATE AND PINTLE PLATE PER SPEC. 3394.

4. PROVIDE ANCHOR RODS PER SPEC. 3385, TYPE B. GALVANIZE PER SPEC. 3392.

5. PERFORM SHIMMING UNDER MASONRY PLATE WITH PREFORMED FABRIC PADS PER AASHTO LRFD BRIDGE CONSTRUCTION SPEC. SECTION 16.10.

6. MANUFACTURER TO SUBMIT ANY BEARING ASSEMBLY DIMENSIONS, DETAILS, OR MATERIALS NOT SHOWN TO THE ENGINEER FOR APPROVAL.

7. ALL MATERIAL SHOWN IS INCLUDED IN THE PRICE BID FOR EACH BEARING ASSEMBLY, EXCEPT AS NOTED.
NOTES:

PROVIDE MATERIALS, DESIGN AND FABRICATION PER SPECIAL PROVISIONS.

PROVIDE STEEL PLATES, PINTLES AND ANCHOR RODS PER SPEC. 3309.

1. FACTORED LIVE LOAD (LL) ROTATION OR 0.02 RADIANS WHICHEREVER IS GREATER.

2. THE SOLE PLATE IS INCLUDED IN THE POT BEARING ASSEMBLY QUANTITY. 1/2" MIN. THICKNESS IS REQUIRED. TAPER SOLE PLATE TO FINISHED GRADE INCLUDING TRANSVERSE TAPER FOR SKEWED BRIDGES.

3. POT BEARING MANUFACTURER TO DETERMINE THE FINAL DIMENSIONS AND NUMBER OF ALL BEARING COMPONENTS INCLUDING PISTON, POT, MASONRY PLATE, SOLE PLATE, THREADED FASTENERS, BOLTED FLANGE CONNECTIONS, PINTLES AND OVERALL HEIGHT, AND COORDINATE SHARING THIS INFORMATION WITH THE BEAM FABRICATOR AND CONTRACTOR. MINIMUM PINTLE SIZE IS 1/2" DIAMETER.

4. FACTORED HORIZONTAL RESISTANCE IS A MINIMUM OF 15% OF THE STRENGTH LIMIT STATE VERTICAL LOAD UNLESS STATED OTHERWISE.

5. SEE FRAMING PLAN

6. """" DENOTES OFFSET AS SHOWN, """""" DENOTES OFFSET OPPOSITE OF SHOWN.

DESIGNER NOTE REMOVE DESIGNER NOTE PRIOR TO PLOTTING FINAL PLAN.

TWO 1/2" DIAMETER ANCHOR RODS HAVE A FACTORED HORIZONTAL RESISTANCE OF 95 KIPS. DESIGNER SHALL INCREASE DIAMETER, NUMBER OF RODS OR BOTH WHEN NEEDED.

WHEN SPECIFYING OFFSET DIMENSION "M", CONSIDER THE SIZE AND PROXIMITY OF THE DIAPHRAGM AND LONGITUDINAL PIER REINFORCEMENT TO ALLOW ADEQUATE ROOM FOR INSTALLATION OF ANCHOR RODS.

BEARING ASSEMBLY TABLE

<table>
<thead>
<tr>
<th>ASSEMBLY TYPE</th>
<th>LOCATION FACTORED LL ROTATION</th>
<th>MASONRY PLATE</th>
<th>ANCHOR ROD OFFSET</th>
<th>ASSUMED HEIGHT &quot;H&quot;</th>
<th>BOTTOM FLANGE WIDTH</th>
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<tbody>
<tr>
<td></td>
<td>A B M</td>
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DESIGN LOADS (KIPS)

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<th>STRENGTH LIMIT STATE</th>
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<tr>
<td>HORIZONTAL</td>
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REVISION
12-17-2008
11-03-2015
02-27-2019

STATE OF MINNESOTA
DEPARTMENT OF TRANSPORTATION

POT BEARING ASSEMBLY
(STEEL BEAMS)
(FIXED)

APPROVED: SEPTEMBER 18, 2007

STATE BRIDGE ENGINEER

02-27-2019

B316
### Curved Plate Bearing Assembly

**Steel Beams**

- **Details:**
  - Provide elastomeric materials and pad construction per Spec. 3391.
  - Provide steel plates per Spec. 3306 except the sole plate. Provide sole plate with the same material specification as the steel beams.
  - Provide anchor rods per Spec. 3385, Type A, galvanize per Spec. 3392.
  - For spans up to 150 feet, use 1½" diameter anchor rods. Above 150 foot spans, design anchor rods per AASHTO design criteria.

**Detail except the sole plate.** The sole plate is included in the weight of structural steel.

**Design Data:**

- Max. factored shear resistance:
  - 50.3 kips per 1½" dia. pintle
  - 36.2 kips per 1½" dia. anchor rod

**Notes:**

- Do not galvanize this plate.
- "+" denotes offset as shown.
- "-" denotes offset opposite of shown.
- Refer to bearing pad restraint B-detail for additional information and details.

**Table:**

<table>
<thead>
<tr>
<th>Assembly Type</th>
<th>Location</th>
<th>Beam Flange Width</th>
<th>Bearing Pad Size</th>
<th>Bearing Plate Size</th>
<th>Curved Plate Size</th>
<th>Sole Plate Size</th>
<th>Pintle Dia.</th>
<th>Ass'y Height</th>
<th>Anchor Rod Offset</th>
<th>Restraint Pattern</th>
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**Design Engineer:**

- APPROVED: NOVEMBER 22, 2002
- STATE OF MINNESOTA
- DEPARTMENT OF TRANSPORTATION

**Detail No.:**

- B354
NOTES:

1. The min. radius is 16" unless otherwise specified in the table. The max. radius is 24". Finish to 250 micro. The finished thickness of the plate may be 1/16" less than shown.

2. When the sole plate is tapered, dimensions "J" and "L" are thickness of sole plate and bearing assembly at centerline of bearing.

3. The total thickness shown includes the steel plates.

4. Do not galvanize this plate.

5. Refer to bearing pad restraint B-detail for additional information and details.

DESIGN DATA:

Max. factored shear resistance: 50.3 kips per 1/2" dia. pintle

Approved: November 22, 2002

State of Minnesota
Department of Transportation

Curved Plate Bearing Assembly (Steel Beams) (Expansion)

Detail No. B355
SYMMETRICAL ABOUT Q OF SPlice

FILL PLATE AS REQUIRED

FILL PLATE AS REQUIRED

TYPICAL WHEN 2 ROWS OF BOLTS ARE USED
TYPICAL WHEN 4 ROWS OF BOLTS ARE USED

THICKNESS ON BOTH SIDES OF THE THINNER WEB.

USE FILL PLATES WHERE THE DIFFERENCE IN WEB THICKNESS IS 1/16" OR GREATER. FILL PLATES SHALL BE STRUCTURAL STEEL WITH MINIMUM THICKNESS OF 1/8". WHEN THE DIFFERENCE IN WEB THICKNESS IS 1/8" OR MORE, PLACE FILL PLATES OF THE SAME THICKNESS ON BOTH SIDES OF THE THINNER WEB.

SECTION Z-Z

SECTION X-X

TABLE

<table>
<thead>
<tr>
<th>BEAM SIZE</th>
<th>PLATE A (IN.)</th>
<th>PLATE B (IN.)</th>
<th>PLATE C (IN.)</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>J</th>
<th>FLANGE FILL PLATE</th>
<th>WEB FILL PLATE</th>
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APPROVED: NOVEMBER 22, 2002

STATE OF MINNESOTA
DEPARTMENT OF TRANSPORTATION
SPLICES FOR STEEL BEAMS

REVISION
10-22-2009
05-24-2012
01-05-2017

DETAIL NO. B400
Table

<table>
<thead>
<tr>
<th>Beam Height</th>
<th>Distance</th>
<th>Channel Size</th>
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</thead>
<tbody>
<tr>
<td>36M</td>
<td>1'-3&quot;</td>
<td>1'-0&quot;</td>
</tr>
<tr>
<td>40MH</td>
<td>1'-5&quot;</td>
<td>1'-0&quot;</td>
</tr>
<tr>
<td>MN45</td>
<td>1'-7½&quot;</td>
<td>1'-0&quot;</td>
</tr>
<tr>
<td>MN54</td>
<td>1'-7½&quot;</td>
<td>1'-9&quot;</td>
</tr>
<tr>
<td>MN63</td>
<td>1'-7½&quot;</td>
<td>2'-6&quot;</td>
</tr>
</tbody>
</table>

Payment Length for Diaphragms

Part Transverse Section at Diaphragm

Diaphragm Connection

For 36M, 40MH and MN45 Beams

Diaphragm Connection

For MN54 and MN63 Beams

Notes:

- Provide Steel per Spec. 3306.
- Install per Spec. 2405.3.K.
- Torque all Bolts, including anchor bolts to 80 ft-lbs.
- Shop bend the leg of the 12" plate to conform to the diaphragm. A ¾" x 6" x 6" angle may be used for diaphragms perpendicular to beams.
- Include all structural steel shown on this detail, including bolts and washers, in unit price bid for diaphragms for prestressed beams.
- Bent Plates may be used in place of channels if the bent plates have the same height as the channels they replace, are ¾" in thickness, and have legs 5" long.
- Galvanize steel plates and shapes per Spec. 3394.
- Galvanize bolts, nuts and washers per Spec. 3392.
- For skew angles under 20°, use 90° less the skew angle. For skew angles over 20°, use 90°.

Approved: November 03, 2015

State Bridge Engineer

State of Minnesota Department of Transportation

Steel Intermediate Diaphragm

(For 36M, 40MH, MN45 - MN63 Prestressed Concrete Beams)

Revision:
01-05-2017
12-20-2018

Detail No.: B403
MIN. BEAM WEB PLATE GUSSET

BEAM SPACING

TYPICAL BEAM SPACING

USE OUTSIDE STIFFENER ONLY WHEN DIAPHRAGM IS ON A BEARING OR WHEN SHOWN IN PLAN

INTERIOR BEAM

DIAPHRAGM CONNECTION STIFFENER

DETAIL "A"

DETAIL "B"

L x x x

ELEVATION

SECTION C-C

FASCIA BEAM

B407

STATE BRIDGE ENGINEER

CROSS FRAME INTERMEDIATE DIAPHRAGM

FOR STRAIGHT STEEL BEAMS

NOTES:

1. DIAPHRAGMS MAY BE PLACED LEVEL PROVIDED MINIMUM CLEARANCES ARE MET. FOR DIAPHRAGMS LOCATED BENEATH DECK JOINT, ORIENT FLANGES OF CROSS FRAME MEMBERS AWAY FROM THE DECK JOINT.

2. SEE BRIDGE FRAMING PLAN AND GIRDER ELEVATIONS FOR ADDITIONAL INFORMATION.

3. MILL TO BEAR AT BEARING STIFFENERS.

4. MINIMUM TOTAL WELD LENGTH EQUAL TO 4 TIMES NOMINAL ANGLE SIZE.

PROVIDE STEEL IN ACCORDANCE WITH SPEC. 3309.
Tight fit, use bolted connections (see detail B410) in area "A" on plans. Weld both sides at all other locations.

Use outside stiffener only when diaphragm is on a bearing or when shown in plan. ②

Customary axis of angles ①

Provide steel in accordance with Spec. 3309.

1. Project neutral axis of member through center of bolt pattern.
2. See bridge framing plan and girder elevations for additional information.
3. Mill to bear at bearing stiffeners.
4. Minimum total weld length equal to 4 times nominal angle size.
5. For diaphragms located beneath deck joint, orient flanges of cross frame members away from the deck joint.

Design note: 
Remove prior to plotting final plans: 
Designer to specify gusset plate thickness. 1/2" minimum filler plate thickness to match gusset.

Approved: March 26, 2009
State Bridge Engineer

State of Minnesota
Department of Transportation

Cross Frame Intermediate Diaphragm
(FOR CURVED STEEL BEAMS)
SECTION A-A
CONNECTION WITH 2 BOLTS AT INTERIOR BEAMS

SECTION B-B
CONNECTION WITH 2 BOLTS

PLAN VIEW
AT INTERIOR BEAMS
(UP TO 20° SKEW)

PLAN VIEW
AT INTERIOR BEAMS

SECTION A-A
CONNECTION WITH 4 BOLTS AT INTERIOR BEAMS

SECTION C-C
CONNECTION WITH 4 BOLTS

NOTES:

1. SEE DETAIL B411.
2. MINIMUM PLATE THICKNESS IS 3/8".
3. BOLT PLATE TO BEAM FLANGE PRIOR TO WELDING PLATE TO DIAPHRAGM STIFFENER.
4. REMOVE LOOSE SCALE AND RUST FROM CONTACT AREA AT DIAPHRAGM CONNECTION, PROVIDE FLAT AND PRIMED SURFACE.
5. BENT PLATE DIAPHRAGMS SHOWN, FOR CROSS FRAME DIAPHRAGM SEE DETAIL B407 FOR STRAIGHT BEAMS AND DETAIL B408 FOR CURVED BEAMS.

DESIGNER NOTE
(REMOVE PRIOR TO PLOTTING FINAL PLAN)
DETAILS SHOWN ARE FOR STRAIGHT BEAMS ONLY, DESIGNER MUST MODIFY THE NUMBER OF BOLTS AS NECESSARY FOR CURVED BEAMS.

STATE OF MINNESOTA
DEPARTMENT OF TRANSPORTATION
BOLTED FLANGE TO STIFFENER DETAIL

APPROVED: NOVEMBER 22, 2002
STATE BRIDGE ENGINEER

REVISI ED
09-11-2004
05-24-2012
01-05-2017

DETAIL NO.
B410
DO NOT WELD IN THIS AREA.
SEE B410 FOR CONNECTION DETAILS.

NOTES:

STATE BRIDGE ENGINEER
APPROVED: OCTOBER 22, 2008

STATE OF MINNESOTA
DEPARTMENT OF TRANSPORTATION

STIFFENER DETAILS
(FOR STEEL BEAMS)
PART TRANSVERSE SECTION

SQUARE BRIDGE SHOWN

SECTION C-C
FASCIA BEAM

SECTION B-B
TYPICAL SECTION AT FASCIA BEAM

INTERMEDIATE DIAPHRAGM
TYPICAL SECTION AT INTERIOR BEAM
WITH CONTINUOUS OR STAGGERED INTERMEDIATE DIAPHRAGMS

NOTES:

PROVIDE STEEL PER SPEC. 3306.

INCLUDE ALL STRUCTURAL STEEL SHOWN ON THIS DETAIL.
INCLUDING BOLTS AND WASHERS, IN THE PAYMENT FOR DIAPHRAGMS FOR Prestressed BEAMS.

INSTALLATION PER SPEC. 2405.3.K

TORQUE ALL BOLTS, INCLUDING ANCHOR BOLTS TO 80 FT. LBS.

GALVANIZE STEEL PLATES AND SHAPES PER SPEC. 3394.

GALVANIZE BOLTS, NUTS AND WASHERS PER SPEC. 3392.

1. FOR SKEW ANGLES UNDER 20°, USE 90° LESS THE SKEW ANGLE. FOR SKEW ANGLES OVER 20°, USE 90°.

2. SPACE BOLT HOLES SO AS TO MISS PRESTRESSED STRANDS IN CONCRETE BEAMS. SEE PRESTRESSED CONCRETE BEAM SHEETS FOR MORE INFORMATION.

3. DIAPHRAGM SHOWN DESIGNED FOR BEAM SPACING UP TO 13'-0".

STATE OF MINNESOTA
DEPARTMENT OF TRANSPORTATION

STEEL INTERMEDIATE BOLTED DIAPHRAGM
(ALL MW PRESTRESSED CONCRETE BEAMS)

APPROVED: SEPTEMBER 22, 2011

Nancy Duenberger
STATE BRIDGE ENGINEER

REVISED
09-11-2014
11-03-2015
01-05-2017

DETAIL NO. B412
ELEVATION
CONCRETE NOT SHOWN

SECTION A-A

NOTES:
EXTEND PLATES FULL WIDTH OF ROADWAY BETWEEN GUTTER LINES WITH A ¼" OPEN JOINT AT EACH BREAK IN CROWN PROFILE. MAX. LENGTH 22 FT.
PROVIDE STRUCTURAL STEEL PER SPEC. 3306, GALVANIZE AFTER FABRICATION PER SPEC. 3394
SET PLATE TO PROPER GRADE AND CROWN.

STATE OF MINNESOTA
DEPARTMENT OF TRANSPORTATION
PROTECTION PLATE
(FOR END OF SLAB)

APPROVED: NOVEMBER 22, 2002
STATE BRIDGE ENGINEER

REVISION 01-05-2017
DETAIL NO. B553
BRIDGE FLOOR DRAIN
(WELDED BOX)

SECTION A-A
STEEL BEAM SHOWN

SECTION B-B

BRACKET DETAIL

NOTES:

- PROVIDE STRUCTURAL STEEL PLATES PER SPEC. 3306. CAST IRON MAY BE USED AS AN ALTERNATE. FABRICATE GRATE USING AUTOMATICALLY CONTROLLED CUTTING TORCH.
- CAST IRON GRATE, PER SPEC. 3321, CLASS 35B, MAY BE USED AS AN ALTERNATE.
- WORKMANSHIP AND FABRICATION PER SPEC. 2471.
- BLAST CLEAN SCUPPER AND GRATE AFTER FABRICATION. GALVANIZE, EXCEPT CAST IRON, PER SPEC. 3394.
- GALVANIZE HARDWARE PER SPEC. 3392.
- INSTALL GRATE WITH ARROW ON CURB SIDE AND IN DIRECTION OF FLOW.
- PAYMENT FOR FLOOR DRAIN, TYPE ___ INCLUDES ALL MATERIAL ON THIS DETAIL.
- GRATE OPENING AREA IS 106 SQ. IN.

1. ATTACH TO BEAM WITH 3/8" DIA. BOLT, LOCKWASHER AND NUT AS REQUIRED. SEE SPECIAL PROVISIONS FOR APPROVED ANCHORAGE REQUIRED FOR CONCRETE BEAMS. ANCHORAGE TO MISS DRAPED STRANDS.
STATE OF MINNESOTA
DEPARTMENT OF TRANSPORTATION
BRIDGE FLOOR DRAIN
(STRUCTURAL TUBE)

NOTE:
 PROVIDE STRUCTURAL STEEL PER SPEC. 3306.

GALVANIZE BOLTS AND WASHER PER SPEC. 3392.

GALVANIZE OTHER MATERIALS PER SPEC. 3394
AFTER FABRICATION.

PAYMENT FOR FLOOR DRAIN TYPE SHALL
INCLUDE ALL MATERIAL SHOWN ON THIS DETAIL.

APPROVED: NOVEMBER 22, 2002

STATE BRIDGE ENGINEER
NOTES:

MATERIAL TO BE STRUCTURAL STEEL PER Mn/DOT SPEC. 3306.

GALVANIZE MATERIAL PER Mn/DOT SPEC. 3394 AFTER FABRICATION.

PAYMENT FOR FLOOR DRAIN, TYPE ., SHALL INCLUDE ALL MATERIAL SHOWN ON THIS DETAIL.

1. 1" ABOVE BOTTOM OF BEAM EXCEPT ON RURAL STREAM CROSSINGS WHERE DRAIN SHOULD BE EVEN TO BOTTOM OF BEAM.

2. ATTACH TO BEAM WITH 3/4" DIA. BOLT, LOCKWASHER AND NUT AS REQUIRED. SEE SPECIAL PROVISIONS FOR APPROVED ANCHORAGE REQUIRED FOR CONCRETE BEAMS. ANCHORAGE TO MISS DRAPED STRANDS.
PART SECTION THROUGH ABUTMENT AT JOINT

SECTION A-A

NOTES:

CONSIDER THE METHODS AND MATERIALS INDICATED ON THIS SHEET AS SUGGESTIONS ONLY. VARIATIONS WILL BE PERMITTED, SUBJECT TO APPROVAL BY THE ENGINEER, BUT MUST PROVIDE DUMMY JOINTS OF A DEPTH SHOWN, PROVIDE A SEPARATION OF THE HORIZONTAL REINFORCEMENT BARS IN THE BACK OF THE PARAPET AND BACK FACE OF THE ABUTMENT THAT IS NOT LESS THAN 1/2" NOR MORE THAN 3", CENTERED AS SHOWN, REGARDLESS OF THE PROCEDURE USED FOR FORMING THE DUMMY JOINT.

THE BACK STRIP MAY BE GALVANIZED METAL, A SUITABLE PLASTIC, OR OTHER DURABLE MATERIAL SATISFACTORY TO THE ENGINEER. THE BACK STRIP REMAINS IN PLACE AFTER THE FORMS ARE REMOVED.

THE COST OF FORMING THE JOINT IS INCLUDED IN THE PRICE BID FOR OTHER ITEMS.

APPROVED: NOVEMBER 22, 2002

STATE BRIDGE ENGINEER

STATE OF MINNESOTA
DEPARTMENT OF TRANSPORTATION

CONTRACTION JOINT

REVISION
03-30-2010
01-05-2017

DETAIL NO.
B801
CURING PERIOD SHALL REMAIN IN PLACE UNTIL COMPLETION OF SLAB IS USED AT THIS LOCATION, DIAPHRAGM FALSEWORK FOR EXPANSION DEVICE. WHEN CONSTRUCTION JOINT USE OF CONSTRUCTION JOINT REQUIRES CLEARANCE 27 M & 30 M H, 35 M H, 36 M, 40 M H & M N 45 PERMISSIBLE CONSTRUCTION JOINT 8’ 1’-4” 1’-6” MAX. SPACES AT INTERIOR BEAMS.

SD506E (IF L ≤ 8’)
SD508E (IF L > 8’)

PART TRANSVERSE SECTION
(L > 8’ SHOWN)

LONGITUDINAL REINFORCEMENT IN BOTTOM OF DIAPHRAGM

DISTANCE “L” ALONG OF DIAPHRAGM BARS REQUIRED STRAIGHT BENT NO. SIZE NO. SIZE
UP TO 8’ 2 6E 1 5E
OVER 8’ TO 11’ 2 7E 1 5E
OVER 11’ TO 13’ 2 8E 1 8E
OVER 13’ TO 15’ 2 9E 1 10E
OVER 15’ TO 18’ 2 11E 1 11E

BILLS OF REINFORCEMENT FOR END DIAPHRAGM

<table>
<thead>
<tr>
<th>BAR</th>
<th>NO. LENGTH SHAPE</th>
<th>LOCATION</th>
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<tr>
<td>SD401E</td>
<td>5’-0”</td>
<td>VERTICAL TIE</td>
</tr>
<tr>
<td>SD403E</td>
<td>5’-0”</td>
<td>LONG. THRU BEAM</td>
</tr>
<tr>
<td>SD506E</td>
<td>5’-0”</td>
<td>LONG. BOTTOM</td>
</tr>
<tr>
<td>SD508E</td>
<td>5’-0”</td>
<td>VERTICAL TIE</td>
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NOTES:

CONCRETE FOR END DIAPHRAGMS SHALL BE THE SAME MIX AS USED IN DECK.

QUANTITIES FOR END DIAPHRAGM CONCRETE AND REINFORCEMENT SHOWN ON THIS DETAIL SHALL BE LISTED IN SUPERSTRUCTURE QUANTITIES.

THREADED RODS ARE INCIDENTAL TO PRESTRESSED CONCRETE BEAMS.

1. USE OF CONSTRUCTION JOINT REQUIRES CLEARANCE FOR EXPANSION DEVICE. WHEN CONSTRUCTION JOINT IS USED AT THIS LOCATION, DIAPHRAGM FALSEWORK SHALL REMAIN IN PLACE UNTIL COMPLETION OF SLAB CURING PERIOD.

2. PERPENDICULAR TO CENTERLINE OF DIAPHRAGM.

3. 1'-11" (27M & 30MH); 2'-1" (35Mh, 36M, 40MH AND MN45); 2'-5" (MN54 AND MN63); 3'-1" (82MW AND 96MW). BASED ON 3" STOOL AND 9" DECK.

4. 1'-10" (27M, 30MH; 2'-0" (36M, 35MH, 40MH AND MN45); 2'-4" (MN54 AND MN63); 3'-0" (82MW AND 96MW). BASED ON NOTE 3.

5. ADD SD507E AND SD508E ONLY IF NO. OF BARS AND LENGTHS ARE INCLUDED IN BILL OF REINFORCEMENT. SPACE SD508E AT 1'-6" MAX. FOR ENTIRE LENGTH OF DIAPHRAGM. REFER TO "PART TRANSVERSE SECTION" ABOVE.
NOTES:

FOR ADDITIONAL DIMENSIONS, DETAILS, REINFORCEMENT, NOTES, AND CONTROL JOINT SPACING SEE BARRIER OR PARAPET SHEET.

PAY QUANTITIES WILL NOT BE ADJUSTED AS A RESULT OF SELECTING SLIPFORM ALTERNATE.

USE A SIMILAR METHOD FOR TALLER BARRIERS OR MODIFIED VERSIONS OF THIS BARRIER.
CONCRETE ROADWAY

INPLACE CONCRETE ROADWAY
TOWARDS BRIDGE

6'-0''

CUT LINE

4''

PREFORMED JOINT FILLER
2'-10''

NO. 4E BARS
5''

ø 1'-0'' SPG.

CUT LINE

PERMISSIBLE CONSTRUCTION JOINT & 2'' x 8'' KEYWAY

2'-0''

2''

CLR.

1'-0''

FILL ANY VOIDS BENEATH PREFORMED FILLER WITH POLYSTYRENE, TYPE ... AS DIRECTED BY THE ENGINEER.

SECTION A-A

1. PLACE TOP OF FILLER 3/4'' TO 1'' BELOW TOP OF PAVEMENT.
PLACE JOINT SEALER PER SPEC. 3720 ABOVE FILLER 3/8'' ± 1/8'' BELOW TOP OF PAVEMENT.

2. CLEAN EXPOSED FACE BY SAND BLASTING AND AIR BLASTING. APPLY APPROVED BONDING GROUT IMMEDIATELY PRIOR TO CONCRETE PLACEMENT. CONCRETE TO BE MIX NO. 3X33.

3. PLACE REBARS PARALLEL TO Q OF ROADWAY ON SKEWS AND TANGENT TO Q ON CURVED ROADWAYS.

4. 2'' NOMINAL DIA., THERMOPLASTIC PERFORATED PIPE PER SPEC. 3245, WRAP PIPE WITH GEOTEXTILE PER SPEC. 3733. SLOPE PIPE TO DITCH ON LOW SIDE, 1/4'' PER FOOT. MINIMUM SLOPE. FURNISHING AND INSTALLING DRAIN SYSTEM IS INCIDENTAL WITH NO DIRECT PAYMENT.

5. BACKFILL WITH FINE AGGREGATE PER SPEC. 3149, MODIFIED TO 0-3% PASSING A NO. 200 SIEVE.
PLAN VIEW

NOTES:

GALVANIZE SIGN ANCHOR INCLUDING THREADED ROD AFTER FABRICATION PER SPEC. 3394

PROVIDE STRUCTURAL STEEL TUBING PER SPEC. 3361, TYPE A, EXCEPT AS NOTED.

SECTION A-A

HSS 4" x 4" x 3/8" x 1/2" LONG

Ø 3/8" DIA. HOLE HYE (TYPI)

%" DIA. BOLT, FLAT WASHER, AND LOCK NUT

SECTION B-B

HSS 3" x 3" x 3/8"

3/8" DIA. X 9" THREADED ROD WITH NUT AND WASHER EACH SIDE.

approval: MAY 10, 2017

MJM

STATE BRIDGE ENGINEER

STATE OF MINNESOTA

DEPARTMENT OF TRANSPORTATION

MEDIAN SIGN POST ANCHOR

B901
PIEVE VIEW - TYPE A

ESTIMATED WEIGHT = 18 LBS.

NOTES:

ALL PIPE DIAMETERS ARE NOMINAL.

SEE SPECIAL PROVISIONS FOR REQUIREMENTS NOT INCLUDED ON THIS SHEET.

STRUCTURAL STEEL PER SPEC. 3306
STRUCTURAL PIPE PER SPEC. 3362

GALVANIZE THE FENCE POST ANCHORAGE AFTER FABRICATION PER SPEC. 3394.
GALVANIZE THE FASTENERS PER SPEC. 3392.

FURNISHING AND INSTALLING FENCE POST ANCHORAGES IS INCIDENTAL TO THE WIRE FENCE.

1. ADHESIVE ANCHORAGE WITH 3/8" DIA. ANCHOR ROD PER SPEC. 3385, TYPE A WITH HEX NUT AND WASHER. PROVIDE AN ADHESIVE WITH A MINIMUM CHARACTERISTIC BOND STRENGTH IN UNCRAKED CONCRETE OF 1.5 KSI. EMBED THE ANCHORAGE NO LESS THAN 9" REGARDLESS OF CHARACTERISTIC BOND STRENGTH. DRILL THROUGH REINFORCEMENT (IF ENCOUNTERED) TO ACHIEVE MINIMUM EMBEDMENT. ENSURE HEX NUT IS IN CONTACT WITH THE ADJACENT SURFACE AND TORQUE TO 60 FT-LBS UNLESS A HIGHER TORQUE IS RECOMMENDED BY THE MANUFACTURER. PROOF LOAD TO 7.8 KIPS. SEE SPECIAL PROVISIONS FOR ADDITIONAL REQUIREMENTS.

2. ETOX ELECTRODES FOR 3/8" POST TO BASE PLATE WELD.

DOUBLE EXTRA STRONG PIPE WEIGHTS:
2" NOMINAL DIA. = 9.03 LBS./FT.

APPROVED: JANUARY 05, 2017

STATE BRIDGE ENGINEER

STATE OF MINNESOTA
DEPARTMENT OF TRANSPORTATION

REVISION
DETAIL NO.

FENCE POST ANCHORAGE
(TYPE A)
**Plan View - Type B**

- Estimated weight: 24 lbs.

**Plan View - Type C**

- Estimated weight: 23 lbs.

**Notes:**

1. Adhesive anchorage with ⅜" dia. anchor rod per Spec. 3385, Type A with hex nut and washer, provide an adhesive with a minimum characteristic bond strength in uncracked concrete of 1.5 ksi. Embed the anchorage no less than 8" regardless of characteristic bond strength. Drill through reinforcement if encountered to achieve minimum embedment. Ensure hex nut is in contact with the adjacent surface and torque to 60 ft-lbs unless a higher torque is recommended by the manufacturer. Proof load to 5.8 kips, see special provisions for additional requirements.

2. E70X electrodes for ⅜" post to base plate weld.

Double extra strong pipe weights:

- 2½" nominal dia. = 13.69 lbs./ft.

All pipe diameters are nominal.

See special provisions for requirements not included on this sheet.

Structural steel per Spec. 3306

Structural pipe per Spec. 3362

Galvanize the fence post anchorage after fabrication per Spec. 3394, galvanize the fasteners per Spec. 3392.

Furnishing and installing fence post anchorages is incidental to the wire fence.

**Section A-A**

- Caulk and shim base plate per special provisions

**Section B-B**

- Caulk and shim base plate per special provisions

**Approved:** January 05, 2017

**State Bridge Engineer:**

**State of Minnesota Department of Transportation**

**Fence Post Anchorage (Type B and C)**

**Revision:** 05-10-2017

**Detail No.:** B906
NOTES:
PAYMENT WILL BE INCLUDED IN THE SINGLE LUMP SUM PRICE FOR "DRAINAGE SYSTEM TYPE (B910)". INCLUDES BUT IS NOT LIMITED TO 4" DIAMETER PERFORATED AND UNPERFORATED PIPE, ELBOWS, END CAPS, COUPLINGS, SLEEVES AND PRECAST CONCRETE HEADWALLS.

ALL PIPE TO COMPLY WITH SPECIAL PROVISION 3245.26(I).
SLEEVE PERFORATED PIPE WITH GEOTEXTILE KNIT SOCK PER SPEC. 3733, TYPE 1. ATTACH TO PIPE PER SPEC. 2502.38.

1 AT CONTRACTOR'S OPTION, TIE APPROACH PANEL DRAINAGE SYSTEM AND ABUTMENT DRAINAGE SYSTEM INTO A SINGLE PRECAST CONCRETE HEADWALL OR INTO A CATCH BASIN AS LONG AS A MINIMUM OF 1% POSITIVE SLOPE CAN BE MAINTAINED.

USE PRECAST CONCRETE HEADWALL WITH RODENT SCREEN. SEE STANDARD PLATE 3131 FOR DETAILS.

2 1/4" PER FT. MINIMUM SLOPE.
3 REFER TO GRADING PLANS FOR ABUTMENT BACKFILL REQUIREMENTS.
THIRD

TOP OF SLAB

PLANS

1" DIA. HOLE

SEE DETAIL "A"

SEE DETAIL "A"

4"

SEE DETAIL "A"

OPTION 1

DO NOT USE ON NEW DECK

REINFORCED BRIDGE DECK

HEAVY HEX NUT, LOCK WASHER AND 1/2" PLATE WASHER, CHECK PLAN FOR NUMBER REQUIRED.

1/8" DIA. SPEC. 3385 TYPE A ANCHOR ROD

2-HEAVY HEX JAM NUTS, 1/2" PLATE WASHER. CHECK PLAN FOR NUMBER REQUIRED.

TOP PLATE WASHER

BARRIER TERMINATION REQUIREMENTS.

REFER TO TRAFFIC CONTROL PLANS FOR DEPLOYMENT LENGTH AND REQUIREMENTS.

SEE SPECIAL PROVISIONS FOR BARRIER INSTALLATION AND REMOVAL.

ANCHORAGE DETAILS

REINFORCEMENT NOT SHOWN

BARRIER DETAILS

SEE STANDARD PLATE 8337 FOR BARRIER DETAILS

OPTION 2

ANCHOR ROD

SPEC. 3385 TYPE A

1" DIA.

1/8" MIN.

ADHESIVE

CORDED HOLE

PLATE WASHER

TOP PLATE WASHER

(ONLY USED FOR OPTION 1)

NOTES:

ALL HARDWARE TO BE GALVANIZED PER SPEC. 3392.

ALL STRUCTURAL STEEL TO BE SPEC. 3306 UNLESS OTHERWISE NOTED.

PIN BARRIERS TOGETHER PER STANDARD PLATE 8337.

THROUGH BOLT ANCHOR RODS MUST BE USED IF THE DECK UNDERSIDE IS PENETRATED DURING DRILLING PROCESS.

DO NOT USE OPTION 2 ON BRIDGES WITH A BITUMINOUS OVERLAY.

REFER TO TRAFFIC CONTROL PLANS FOR DEPLOYMENT LENGTH AND BARRIER TERMINATION REQUIREMENTS.

REFER TO STANDARD FIGURE 5-297.680 (1 OF 2) REGARDING ANCHORING BARRIER OVER BRIDGE EXPANSION JOINTS.

ANCHOR ON TRAFFIC SIDE OF BARRIER ONLY.

SEE SPECIAL PROVISIONS FOR BARRIER INSTALLATION AND REMOVAL REQUIREMENTS.

1 HAMMER DRILLING OF THESE HOLES IS NOT PERMITTED.

2 1/8" MINIMUM TO PREVENT BOTTOM OF SLAB FROM SPALLING OR FRACTURING DURING DRILLING.

3 3/4" MINIMUM FOR BRIDGE DECKS WITH TOP MAT REINFORCEMENT AND SOUND CONCRETE.

4 PROVIDE AN ADHESIVE WITH A MINIMUM CHARACTERISTIC BOND STRENGTH IN UNCRACKED CONCRETE OF 1.0 KSI. EMBED THE ANCHORAGE NO LESS THAN 5" REGARDLESS OF CHARACTERISTIC BOND STRENGTH, DRILL THROUGH REINFORCEMENT (IF ENCOUNTERED) TO ACHIEVE MINIMUM EMBEDMENT. ENSURE HEX NUT IS IN CONTACT WITH THE ADJACENT SURFACE. PROOF LOAD TO 7.0 KIPS. SEE SPECIAL PROVISIONS FOR ADDITIONAL REQUIREMENTS.

5 HOLE DIAMETER 1 1/8" MIN., 1/2" MAX.

STATE OF MINNESOTA
DEPARTMENT OF TRANSPORTATION

TEMPORARY PORTABLE PRECAST CONCRETE BARRIER ANCHORAGE INSTALLATION AND REMOVAL.

TEMPORARY USAGE IN LIMITED BARRIER DISPLACEMENT AREAS

APPROVED: DECEMBER 21, 2011

STATE BRIDGE ENGINEER

Nancy Daubenberger

REVISED

DETAIL NO.

B920

05-24-2012

01-30-2019

11-08-2018
STANDARD BRIDGE BEAM SECTION

(OVERLAPPING SPLICE)

ELEVATION

PLAN VIEW

STANDARD BRIDGE BEAM SECTION

(FOR USE WITH TUBULAR SLEEVE SPLICE)

ELEVATION

TRANSITION BEAM SECTION

PLATE WASHER

SPlice PLATE WASher

NOTES:
FABRICATE TUBULAR TRIPLE BEAM RAIL SECTIONS BY WELDING TWO 0210 GAUGE TRIPLE BEAM RAIL ELEMENTS AS SHOWN.
CONSTRUCT TRAFFIC BARRIER PER SPEC. 2554, EXCEPT AS NOTED.

GALV. RAIL COMPONENTS PER SPEC. 3394 AFTER FABRICATION,
PROVIDE TRIPLE AND PLATE BEAM GUARDRAIL HARDWARE DIMENSIONS AND BOLT SPACING PER AASHTO M180.

① FOR ADDITIONAL BOLT HOLE SPACING FOR CONNECTION TO TRANSITION BEAM SECTION, SEE TRANSITION BEAM SECTION.
② TYPICAL POST SPACING, EXCEPT AS NOTED.
③ 60% MIN. WELD PENETRATION TOP AND BOTTOM.
**DEPARTMENT OF TRANSPORTATION**  
**STATE OF MINNESOTA**

**SECTION A-A**  
**ANCHOR BAR ALTERNATE**

**MECHANICAL CAGE ALTERNATE**

MECHANICAL CAGE, DESIGN VARIES WITH FABRICATOR

SEE CONDUIT PLACEMENT DETAIL IN PLANS FOR CONDUIT CLEARANCES

**DETAIL A**

**NOTES:**

ANCHOR PLATE ALTERNATE

ANCHOR BAR ALTERNATE

PARAPET CAN DEVELOP YIELD STRENGTH OF ANCHORAGE RODS.

DESIGNER TO ENSURE REINFORCEMENT IN BARRIER OR PARAPET TYPES

STANDARD BARRIER AND PARAPET TYPES

(SEE PLANS FOR TYPE)

<table>
<thead>
<tr>
<th>ANCHOR ROD LENGTH</th>
<th>ANCHOR ROD TYPE</th>
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</thead>
<tbody>
<tr>
<td>3'-1&quot;</td>
<td>32&quot; TYPE &quot;S&quot; W/O CONCRETE WEARING COURSE</td>
</tr>
<tr>
<td>3'-3&quot;</td>
<td>32&quot; TYPE &quot;S&quot; W/O CONCRETE WEARING COURSE</td>
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<tr>
<td>3'-5&quot;</td>
<td>32&quot; TYPE &quot;F&quot; W/O CONCRETE WEARING COURSE</td>
</tr>
<tr>
<td>3'-7&quot;</td>
<td>32&quot; TYPE &quot;F&quot; W/O CONCRETE WEARING COURSE</td>
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<tr>
<td>3'-9&quot;</td>
<td>32&quot; TYPE &quot;F&quot; W/O CONCRETE WEARING COURSE</td>
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<td>3'-11&quot;</td>
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<td>5'-9&quot;</td>
<td>32&quot; TYPE &quot;F&quot; W/O CONCRETE WEARING COURSE</td>
</tr>
<tr>
<td>6'-0&quot;</td>
<td>32&quot; CONCRETE PARAPET (TYPE P4) W/O CONC. W.C.</td>
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<tr>
<td>6'-2&quot;</td>
<td>32&quot; CONCRETE PARAPET (TYPE P4) W/ CONC. W.C.</td>
</tr>
<tr>
<td>6'-4&quot;</td>
<td>32&quot; CONCRETE PARAPET (TYPE P4) W/ CONC. W.C.</td>
</tr>
</tbody>
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**ELEVATION**  
(ANCHOR PLATE ALTERNATE SHOWN)

**NOTES:**

PROVIDE HEAVY HEX NUTS, JAM NUTS, AND FLAT WASHERS PER SPEC. 3391.2.A FOR 1" DIA. THREADED RODS. TAP NUTS 1/6" OVERSIZED PRIOR TO GALVANIZING, AND RETAP TO STANDARD SIZE AFTER GALVANIZING.

WRAP THE THREADS OF THE TOP 5-6 INCHES OF EACH ANCHOR ROD WITH THREE LAYERS OF PLASTIC ELECTRICAL TAPE TO AVOID CONTAMINATION BY CONCRETE DURING PLACEMENT.

USE A BRUSH TO APPLY ANTI-SIEZE COMPOUND PER MIL-PRF-907E TO THE THREADS OF ANCHOR RODS AND THE FACE OF NUTS AGAINST FLAT WASHERS.

GALVANIZE THREADED RODS, WASHERS, AND NUTS AFTER FABRICATION PER SPEC. 3392.

GALVANIZE PLATES, BARS, AND CAGES PER SPEC. 3394.

TACK WELDING OF ANY COMPONENTS IS PROHIBITED.

SUBSTITUTE MATERIALS ALLOWED PER SPEC. 1605.

1 PROVIDE 1" NOMINAL DIA. ANCHOR RODS WITH 1-BUNC-2A THREADS. USE TYPE C HIGH STRENGTH ANCHOR RODS PER ASTM F1554 GR. 105 PER SPEC 3385.2.C FOR 49' LIGHT STANDARDS WITH TWIN ARMS 10' OR LONGER. USE TYPE B (INTERMEDIATE) STRENGTH ANCHOR RODS PER ASTM F1554 GR. 55 PER SPEC 3385.2.B FOR ALL OTHER INSTALLATIONS (6 REQUIRED).

2 PROVIDE A PLATE, BAR, OR MECHANICAL CAGE FOR ROD ALIGNMENT, STEEL PER SPEC. 3306 (2 REQUIRED PER ASSEMBLY).

3 HEAVY HEX NUTS FOR 1" DIA. RODS (12 REQUIRED PER ASSEMBLY).

4 FLAT WASHERS FOR 1" DIA. RODS (12 REQUIRED PER ASSEMBLY).

5 LOCK NUTS (6 REQUIRED PER ASSEMBLY) OR JAM NUTS (12 REQUIRED PER ASSEMBLY) FOR 1" DIA. ANCHOR RODS.

6 INSTALL TOP OF THE LOWER NUTS FLUSH WITH TOP OF CONCRETE PARAPET OR BARRIER.

**STATE BRIDGE ENGINEER**  
**APPROVED: AUGUST 24, 2016**

**STATE OF MINNESOTA**  
**DEPARTMENT OF TRANSPORTATION**

**ANCHOR ROD CLUSTER FOR LIGHT POLES**

**REVISED 02-22-2018**

**DETAIL NO. B950**