<table>
<thead>
<tr>
<th>FIGURE NO.</th>
<th>DESCRIPTION</th>
<th>DATE APPROVED</th>
<th>DATE REVISED</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-395.100(A)</td>
<td>Precast Concrete Box Culvert - Basis of Design</td>
<td>Mar. 24, 2011</td>
<td>Nov. 08, 2018</td>
</tr>
<tr>
<td>5-395.100(B)</td>
<td>Precast Concrete Box Culvert Tables</td>
<td>Mar. 24, 2011</td>
<td>Oct. 09, 2015</td>
</tr>
<tr>
<td>5-395.100(C)</td>
<td>Precast Concrete Box Culvert Tables</td>
<td>Mar. 24, 2011</td>
<td>Oct. 09, 2015</td>
</tr>
<tr>
<td>5-395.100(D)</td>
<td>Precast Concrete Box Culvert Tables</td>
<td>Mar. 24, 2011</td>
<td>Oct. 09, 2015</td>
</tr>
<tr>
<td>5-395.100(E)</td>
<td>Precast Concrete Box Culvert Tables</td>
<td>Mar. 24, 2011</td>
<td>Oct. 09, 2015</td>
</tr>
<tr>
<td>5-395.101(A)</td>
<td>Precast Concrete Barrel Details</td>
<td>Mar. 24, 2011</td>
<td>Feb. 22, 2018</td>
</tr>
<tr>
<td>5-395.101(B)</td>
<td>Precast Concrete Barrel Details (Special Design)</td>
<td>Mar. 24, 2011</td>
<td>Feb. 22, 2018</td>
</tr>
<tr>
<td>5-395.102</td>
<td>Precast Concrete End Section</td>
<td>Mar. 24, 2011</td>
<td>Feb. 22, 2018</td>
</tr>
<tr>
<td>5-395.104(A)</td>
<td>Precast Concrete End Section</td>
<td>Mar. 24, 2011</td>
<td>Feb. 22, 2018</td>
</tr>
<tr>
<td>5-395.104(B)</td>
<td>Precast Concrete End Section</td>
<td>Mar. 24, 2011</td>
<td>Oct. 09, 2015</td>
</tr>
<tr>
<td>5-395.110(A)</td>
<td>Precast Concrete End Section</td>
<td>Mar. 24, 2011</td>
<td>Feb. 22, 2018</td>
</tr>
<tr>
<td>5-395.110(B)</td>
<td>Precast Concrete End Section</td>
<td>Mar. 24, 2011</td>
<td>Oct. 09, 2015</td>
</tr>
<tr>
<td>5-395.115</td>
<td>Embankment Protection for Box Culverts</td>
<td>Sept. 11, 2014</td>
<td>Oct. 22, 2019</td>
</tr>
</tbody>
</table>

* Refer to [http://www.dot.state.mn.us/bridge/](http://www.dot.state.mn.us/bridge/) for current Bridge CADD Standards
Basis of Design

The bridge was designed in accordance with the 2017 AASHTO Bridge Design Specifications and MnDOT Bridge Design Manual.

Materials: Properties
- Reinforced Concrete: Minimum specified yield stress 65 ksi
- Prestressed Concrete: Minimum specified yield stress 60 ksi

Concrete: Minimum specified compressive strength 5 ksi on 6 ksi (see Table)

Soil Data
- Unit Weight: 1.75 lbs/ft³
- Ratio of Lateral to Vertical Pressure: 0.640 plf

Distribution: Per AASHTO 3.6.1.2.4

Load Factors (Strength)
- Live Load: 1.35
- Earth Load: 1.0

Load Combinations
- Beam: Water + Live Load + Earth Load
- Slab: Shear + Flexure

Loading Data
- Load Modifiers: Ductile Structures
- Load Factors: Strength
  - Truck Axle Load: 32 kips
  - Truck Axle Load: 2 at 25 kips each

Live Load Distribution
- Direction Perpendicular to Span:
  - Truck Axle Load: 2 at 25 kips each
- Direction Parallel to Span:
  - Truck Axle Load: 32 kips

Construction Load
- 25 kips distributed over 48 in. by 24 in.

Dynamic Load Allowance
- Live Load Per AASHTO 5.12(8A)
- Truck Axle Load: Not applicable

Approaching Vehicle Load (Parallel to Span)
- 120 kips for a double-axle truck

Approaching Vehicle Load (Perpendicular to Span)
- 55 kips distributed over 84 in. by 24 in.

Shear
- Concrete Cover over reinforcement all faces: 2 in.
- Concrete Cover over reinforcement all faces: 1.5 in.

Shear
- Reinforcement spacing: 12 in. max.
- Reinforcement in center of transverse wires not less than 2" nor more than 4'

Shear
- Reinforcement, including As1, As2, As3, As4, As7, As8:
  - Minimum reinforcing parallel to span:
  - Maximum reinforcing parallel to the culvert span:

Crack Control
- Crack control per AASHTO 5.13.3.6.1.

Serviceability Limit State
- Crack control per AASHTO 5.13.3.6.1.

Reinforcement Spacing
- Shear
  - Space center to center of transverse wires not less than 2" nor more than 4'

Serviceability Limit State
- Crack control per AASHTO 5.13.3.6.1.

Reinforcement Spacing
- Shear
  - Space center to center of transverse wires not less than 2" nor more than 4'

Serviceability Limit State
- Crack control per AASHTO 5.13.3.6.1.

Reinforcement Spacing
- Shear
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Serviceability Limit State
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Reinforcement Spacing
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Serviceability Limit State
- Crack control per AASHTO 5.13.3.6.1.

Reinforcement Spacing
- Shear
  - Space center to center of transverse wires not less than 2" nor more than 4'

Serviceability Limit State
- Crack control per AASHTO 5.13.3.6.1.

Reinforcement Spacing
- Shear
  - Space center to center of transverse wires not less than 2" nor more than 4'

Serviceability Limit State
- Crack control per AASHTO 5.13.3.6.1.

Reinforcement Spacing
- Shear
  - Space center to center of transverse wires not less than 2" nor more than 4'

Serviceability Limit State
- Crack control per AASHTO 5.13.3.6.1.

Reinforcement Spacing
- Shear
  - Space center to center of transverse wires not less than 2" nor more than 4'

Serviceability Limit State
- Crack control per AASHTO 5.13.3.6.1.

Reinforcement Spacing
- Shear
  - Space center to center of transverse wires not less than 2" nor more than 4'

Serviceability Limit State
- Crack control per AASHTO 5.13.3.6.1.

Reinforcement Spacing
- Shear
  - Space center to center of transverse wires not less than 2" nor more than 4'

Serviceability Limit State
- Crack control per AASHTO 5.13.3.6.1.

Reinforcement Spacing
- Shear
  - Space center to center of transverse wires not less than 2" nor more than 4'

Serviceability Limit State
- Crack control per AASHTO 5.13.3.6.1.
BARREL AND DISTRIBUTION SLAB.

PLACE 6" THICK CAST-IN-PLACE DISTRIBUTION SLABS WITH NO. 5 BARS AT 1'-0" SPANS BETWEEN BARREL AND DISTRIBUTION SLAB.

OF ROADWAY AND SHOULDERS.

GENERAL NOTES

SEE STANDARD FIG. 6-10-10 FOR ADDITIONAL INFORMATION.

REINFORCEMENT REQUIREMENTS

PRECAST CONCRETE BOX CULVERT TABLES

FIG. 5-395.1008

DO NOT INCLUDE TABLES WITH PLAN

REVISED 10-09-2015
APPROVED MARCH 24, 2011
### Reinforcement Requirements

<table>
<thead>
<tr>
<th>Size</th>
<th>SLP x Pre</th>
<th>f’c</th>
<th>Fill Height Range (ft)</th>
<th>T1</th>
<th>T2</th>
<th>T3</th>
<th>Weight (lbs/ft)</th>
<th>As1</th>
<th>As2</th>
<th>As3</th>
<th>As4</th>
<th>As7/As8</th>
</tr>
</thead>
<tbody>
<tr>
<td>12x4</td>
<td>5000</td>
<td>C3</td>
<td>9 0 0</td>
<td>4275</td>
<td>0.25</td>
<td>12°F</td>
<td>3x8°F</td>
<td>0.69</td>
<td>12.0°F</td>
<td>0.63</td>
<td>12.0°F</td>
<td>0.20</td>
</tr>
<tr>
<td>12x5</td>
<td>5000</td>
<td>C3</td>
<td>9 0 0</td>
<td>4275</td>
<td>0.83</td>
<td>12°F</td>
<td>3x8°F</td>
<td>0.63</td>
<td>12.0°F</td>
<td>0.63</td>
<td>12.0°F</td>
<td>0.20</td>
</tr>
<tr>
<td>12x6</td>
<td>5000</td>
<td>C3</td>
<td>9 0 0</td>
<td>4275</td>
<td>0.74</td>
<td>13°F</td>
<td>3x8°F</td>
<td>0.74</td>
<td>13.0°F</td>
<td>0.94</td>
<td>13.0°F</td>
<td>0.20</td>
</tr>
<tr>
<td>12x7</td>
<td>5000</td>
<td>C3</td>
<td>9 0 0</td>
<td>4275</td>
<td>0.83</td>
<td>13°F</td>
<td>3x8°F</td>
<td>0.83</td>
<td>13.0°F</td>
<td>0.57</td>
<td>13.0°F</td>
<td>0.20</td>
</tr>
<tr>
<td>12x8</td>
<td>5000</td>
<td>C3</td>
<td>9 0 0</td>
<td>4275</td>
<td>0.74</td>
<td>13°F</td>
<td>3x8°F</td>
<td>0.74</td>
<td>13.0°F</td>
<td>0.57</td>
<td>13.0°F</td>
<td>0.20</td>
</tr>
<tr>
<td>12x9</td>
<td>5000</td>
<td>C3</td>
<td>9 0 0</td>
<td>4275</td>
<td>0.83</td>
<td>13°F</td>
<td>3x8°F</td>
<td>0.83</td>
<td>13.0°F</td>
<td>0.11</td>
<td>13.0°F</td>
<td>0.20</td>
</tr>
<tr>
<td>12x10</td>
<td>5000</td>
<td>C3</td>
<td>9 0 0</td>
<td>4275</td>
<td>0.83</td>
<td>13°F</td>
<td>3x8°F</td>
<td>0.83</td>
<td>13.0°F</td>
<td>0.83</td>
<td>13.0°F</td>
<td>0.20</td>
</tr>
</tbody>
</table>

### General Notes

- See standard FSL-350.001 for bases of design. Full height is defined as the distance from the top of the culvert to the top of the pavement on top of fill if there is no pavement.
- Designs for full heights greater than shown in the tables are available from the Whitemud Bridge Office.

### Box Culvert Cross Section

- General notes for fill heights greater than shown in the tables are available from the Whitemud Bridge Office.
- See standard FSL-350.001 for additional information.
- Transverse reinforcement is parallel to the culvert span. Longitudinal reinforcement is perpendicular to the culvert span.

### Prestressed Concrete Box Culvert Tables

- Prestressed concrete box culvert tables are available from the Whitemud Bridge Office.

### Culvert Weight

- The weight of the culvert is based on an 18-foot length with a minimum size of 12 inches.
# General Notes

**Standard Fill/Drainage**
- For basis of design, fill height is defined as the distance from the top of the culvert to the top of the pavement on top of fill. If there is no pavement, design for fill heights greater than shown in the tables are available from the designer.

**Roadway**
- Includes fill heights of less than 3 in. require a distribution slab.
- Extends the width of the distribution slab to the outside edges of the roadway shoulders unless otherwise directed by the engineer.

**Concrete Mix 3S52**
- Used for the distribution slab.

**Placement**
- Place 4 in. thick cast-in-place distribution slabs with no bars at 1-in. centers. Reinforcement is in-place and top coat of concrete is used over reinforcement for all distribution slabs. Reinforcement is perpendicular to the culvert span.

**Design**
- Includes distribution slab for the worst pavement design manual if it is used as pavement surface.

**Concrete Weight**
- Based on 150 psi. with a slump of 8 in.

**Reinforcement**
- Area of reinforcement determined as As in all slabs and walls with a minimum of 3 in. by 3 ft.

## Box Culvert Cross Section

![Box Culvert Cross Section](image)

### Table: Reinforcement Requirements

<table>
<thead>
<tr>
<th>Size</th>
<th>Class</th>
<th>Fill Height Range</th>
<th>T+</th>
<th>T-</th>
<th>T</th>
<th>Weight</th>
<th>As1</th>
<th>As2</th>
<th>As3</th>
<th>As4</th>
<th>As7/As8</th>
</tr>
</thead>
<tbody>
<tr>
<td>16x4</td>
<td>1</td>
<td>5000</td>
<td>10</td>
<td>11</td>
<td>12</td>
<td>5800</td>
<td>4.53</td>
<td>16.5</td>
<td>1.27</td>
<td>16.5</td>
<td>1.27</td>
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<tr>
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<td>5000</td>
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<td>11</td>
<td>12</td>
<td>6050</td>
<td>5.62</td>
<td>15.7</td>
<td>1.29</td>
<td>15.7</td>
<td>1.29</td>
</tr>
<tr>
<td>16x6</td>
<td>1</td>
<td>5000</td>
<td>10</td>
<td>11</td>
<td>12</td>
<td>6250</td>
<td>6.24</td>
<td>16.2</td>
<td>1.28</td>
<td>16.2</td>
<td>1.28</td>
</tr>
<tr>
<td>16x7</td>
<td>1</td>
<td>5000</td>
<td>10</td>
<td>11</td>
<td>12</td>
<td>6550</td>
<td>7.35</td>
<td>17.3</td>
<td>1.37</td>
<td>17.3</td>
<td>1.37</td>
</tr>
</tbody>
</table>

**Fig. 5-395.100(E)**

- Place longitudinal reinforcement denoted as As and As in all slabs and walls with a minimum of 3 in. by 3 ft.

---

**General Notes**

- See standard Fill/Drainage for basis of design. Fill height is defined as the distance from the top of the culvert to the top of the pavement on top of fill. If there is no pavement, design for fill heights greater than shown in the tables are available from the designer.

- Design for fill heights greater than 3 in. require a distribution slab.

- Extends the width of the distribution slab to the outside edges of the roadway shoulders unless otherwise directed by the engineer.

- Concrete Mix 3S52 for the distribution slab.

- Place 4 in. thick cast-in-place distribution slabs with no bars at 1-in. centers. Reinforcement is in-place and top coat of concrete is used over reinforcement for all distribution slabs. Reinforcement is perpendicular to the culvert span.

- Use concrete construction for the distribution slab.

- Precast distribution slabs with the same reinforcement may be used for fill heights over 3 in. (2 in. for center distribution slabs) when used over barrel segments. **Precast** concrete material per spec. **Preframe** elbow to elbow between barrel and distribution slab.

- Design distribution slab for the worst pavement design manual if it is used as pavement surface.

- Concrete weight based on 150 psi. with a slump of 8 in.

- Reinforcement areas are in square inches per linear foot of barrel. All reinforcement lengths and areas are minimum requirements. Reinforcement requirements are for welded wire reinforcement with minimum specified yield strength of 60 ksi. If bar reinforcement is substituted for welded wire reinforcement, verify the area of reinforcement by design and submit design calculations verifying compliance with 23-207/3.6.1.5/2.1.5 control cracking by distribution of reinforcement.

- Place longitudinal reinforcement denoted as As and As in all slabs and walls with a minimum of 3 in. by 3 ft.
REFER TO SPEC. 2412 FOR SEALANT REQUIREMENTS.

38" FOR 11" WALL THICKNESS

INSIDE FACE

3" FOR 6" MIN.

OUTSIDE FACE

NO. 3 MUNCH BARS @ 1'-0" SPACING

TONGUE AND GROOVE DETAIL

PLACE THE WIRES OF THE WELDED WIRE REINFORCEMENT AS SHOWN WHEN MORE THAN ONE LAYER OF WELDED WIRE REINFORCEMENT IS UTILIZED IN LIEU OF NYLON BOOTS.

WRAP XY-SPACED WIRES TO FORM A CONTINUOUS CAGE.

TRANSVERSE BARREL SECTION

SECTION FORMING DETAIL

REINFORCEMENT LAYER DETAIL

WHEN MORE THAN ONE LAYER OF WELDED WIRE REINFORCEMENT IS UTILIZED IN LIEU OF NYLON BOOTS:

REINFORCEMENT NOT SHOWN FOR CLARITY

LONGITUDINAL REINFORCEMENT

WHEN USING AS1, AS7, AND AS8 REINFORCEMENT AS ONE CONTINUOUS CAGE WITH NO BREAKS OCCURRING IN THE CENTER OF THE TOP AND BOTTOM OF THE BOX SECTION, THE MIN. LAP LENGTH FOR THE AS7 AND AS8 IS 15".

BEND OR CUT INSIDE REINFORCEMENT AS NECESSARY TO FIT TONGUE AT CORNERS

NO. 3 BAR, CUT AS NECESSARY TO FIT TONGUE AT CORNERS.

STATE BRIDGE ENGINEER

TIE HOLES 1, 2, 3

TIE HOLES 4, 5, 6

BARREL DETAILS

CONSTRUCTION NOTES

PLACE CAST-IN-PLACE DISTRIBUTION SLABS WITH 3" MIN. SELECT GRANULAR MATERIAL PER SPEC. 3149.2.B.2. USE 12" VERTICAL, 12" HORIZONTAL HAUNCHES ON ALL BOX SIZES.

REINFORCEMENT, EXCEPT THAT THE ORIGINAL WELDING REQUIRED TO MANUFACTURE WELDED WIRE REINFORCEMENT IS NOT PERMITTED ON REINFORCEMENT BARS OR WELDED WIRE REINFORCEMENT. ANY OF THE FOLLOWING COMBINATIONS OF STEEL REINFORCEMENT MAY BE USED:

1" OR 2 LAYERS OF WELDED WIRE REINFORCEMENT OR 1 LAYER OF REINFORCEMENT BARS.

REINFORCEMENT REQUIRED TO MANUFACTURE WELDED WIRE REINFORCEMENT EXCEPT THAT THE ORIGINAL WELDING REQUIRED TO MANUFACTURE BARRELS OF ADJACENT BOXES AND TO STANDARD FIGURE 5-395.115 FOR MATERIAL PROPERTIES AND WALLS WITH A MINIMUM OF 0.06 SQ. IN./FT.

CONVEY CONCRETE TO THE CONCRETE PLACING AREAS AND ALLOW AT LEAST 12 HOURS FOR THE CONCRETE TO HARDEN. USE CONCRETE MIX NO. 3W82 WITH NO CALCIUM CHLORIDE ALLOWED. USE CONCRETE MIX NO. 3W82 WITH NO CALCIUM CHLORIDE ALLOWED.

PROJECTED REINFORCEMENT SHEAR REINFORCEMENT AND REINFORCEMENT BARS PER THE APPLICABLE REQUIREMENTS OF AS4094.

SHEAR REINFORCEMENT, EXCEPT FOR TONGUE AND GROOVE DETAIL.

CONSTRUCT CULVERTS PER SPEC. 2412 EXCEPT AS NOTED.

PLACE CAST-IN-PLACE DISTRIBUTION SLABS WITH 3" MIN. SELECT GRANULAR MATERIAL PER SPEC. 3149.2.B.2. USE 12" VERTICAL, 12" HORIZONTAL HAUNCHES ON ALL BOX SIZES.

REINFORCEMENT REQUIRED TO MANUFACTURE WELDED WIRE REINFORCEMENT EXCEPT THAT THE ORIGINAL WELDING REQUIRED TO MANUFACTURE WELDED WIRE REINFORCEMENT IS NOT PERMITTED ON REINFORCEMENT BARS OR WELDED WIRE REINFORCEMENT.

ANY OF THE FOLLOWING COMBINATIONS OF STEEL REINFORCEMENT MAY BE USED:

1 OR 2 LAYERS OF WELDED WIRE REINFORCEMENT OR 1 LAYER OF REINFORCEMENT BARS.

REINFORCEMENT REQUIRED TO MANUFACTURE WELDED WIRE REINFORCEMENT.

CONSTRUCTION NOTES

PLACE CAST-IN-PLACE DISTRIBUTION SLABS WITH 3" MIN. SELECT GRANULAR MATERIAL PER SPEC. 3149.2.B.2. USE 12" VERTICAL, 12" HORIZONTAL HAUNCHES ON ALL BOX SIZES.

REINFORCEMENT REQUIRED TO MANUFACTURE WELDED WIRE REINFORCEMENT.
CONSTRUCTION NOTES

SEE STANDARD FIG. 5-395.104A AND FIG. 5-395.104B FOR ADDITIONAL DIMENSIONS AND CONSTRUCTION NOTES.

ALL END SECTIONS REQUIRE CURB ON LINTEL BEAM.

GROUT CONSISTS OF 3 PART CEMENT AND 2 PARTS SAND. USE TYPE I A AIR ENTRAINED PORTLAND CEMENT. GROUT MAXIMUM SLUMP IS 4".

1) ALL 2" CLEAR HOLES THROUGH LINTEL BEAM AND 1" CLEAR HOLE IN TOP OF WALL SECTION. PLACE NO. 8 DOWEL, 1'-0" LONG, IN HOLE AND FILL HOLE WITH GROUT.

2) CHECK THE LOCATION TO DETERMINE WHETHER A TONGUE OR A GROOVE IS USED. TONGUE AND GROOVE TO TERMINATE AT HAUNCH.

3) FOR SPANS UNDER 10'-0" USE NO. 8 BARS. FOR SPANS OF 10'-0" TO 12'-0" USE NO. 9 BARS. FOR 14'-0" AND 16'-0" SPAN USE NO. 10 BARS.

4) ALTERNATE BAR BEND MAY BE USED FOR NO. 4 BENT BAR.

SLUMP IS 4".

TYPE 1A AIR ENTRAINED PORTLAND CEMENT. GROUT CONSISTS OF 1 PART CEMENT AND 2 PARTS SAND. USE ALL END SECTIONS REQUIRE CURB ON LINTEL BEAM.

AND CONSTRUCTION NOTES.
SEE STANDARD FIG. 5-395.101(A) AND FIG. 5-395.101(B) FOR ADDITIONAL DIMENSIONS.

ALTERNATE BAR BEND MAY BE USED FOR NO. 4 BENT BAR.

12'-0" USE NO. 9 BARS. FOR 14'-0" AND 16'-0" SPAN, USE NO. 10 BARS.

FOR SPANS UNDER 10'-0" USE NO. 8 BARS. FOR SPANS OF 10'-0" TO 12'-0" USE NO. 9 BARS. FOR 14'-0" AND 16'-0" SPAN USE NO. 10 BARS.

CHECK THE LOCATION TO DETERMINE WHETHER A TONGUE OR A GROOVE IS USED. TONGUE AND GROOVE TO TERMINATE AT HAUNCH.

WALL SECTION. PLACE NO. 8 DOWEL, 1'-0" LONG, IN HOLE AND FILL HOLE WITH GROUT.

3" DIA. HOLE THROUGH LINTEL BEAM AND 2" DIA. HOLE IN TOP OF TONGUE AND GROOVE TO TERMINATE AT HAUNCH.

CHECK THE LOCATION TO DETERMINE WHETHER A TONGUE OR A GROOVE IS USED. TONGUE AND GROOVE TO TERMINATE AT HAUNCH.

HOLE WITH GROUT.

ADDITIONAL REINFORCEMENT IN TONGUE NOT SHOWN.
END VIEW

ALTERNATES 1 & 2 (STEEL SHEET PILING)

PLAN

ELEVATION

END VIEW

ALTERNATES 3 & 4 (GALVANIZED STEEL SHEETS)

PLAN

ELEVATION

CONSTRUCTION NOTES

GALVANIZE ALL FASTENERS AND ANCHORS PER SPEC. 3392.

1. GALVANIZE STEEL ANGLES PER 3394.

2. FASTEN THE STEEL SHEETS TO THE FRONT EDGE OF THE APRON WITH 6" DIAMETER 4" LONG BOLTS AND AN APPROVED ANCHORAGE (10" C.C. CENTER TO CENTER TO THE NEAREST VALLEY).

3. FASTEN THE 6" X 4" X ¾" ANGLE TO THE APRON WITH 6" DIAMETER 4" LONG BOLTS, 1" O.D. WASHER, AND AN APPROVED LOCK WASHER (10" C.C. CENTER TO CENTER TO THE NEAREST VALLEY).

4. USE SOLUTIONS TO TREAT SHEET STEEL BEFORE INSTALLATION.

5. GROUT STEEL PILING, SECTION NO. MP-112 OR EQUAL.

FILL THE VERTICALS WITH CONCRETE OR CONCRETE GROUT, AS APPROVED BY THE ENGINEER.

ALTERNATE DROPWALLS

ANCHORAGE (2'-0" SPACING). FOR NEW CONSTRUCTION ONLY

REVIEW: MARCH 24, 2011

STATE BRIDGE ENGINEER

APPROVED:  MARCH 24, 2011

REVISION:  10-09-2015

NAME:

DATE

CERTIFIED BY

LICENSED PROFESSIONAL ENGINEER
CONSTRUCTION NOTES

THIS PLAN SHEET IS FOR CULVERT EMBANKMENT PROTECTION ONLY. REFER TO THE ORIGIANAL PLANS FOR ADDITIONAL RIPRAP OR OTHER SCOUR PROTECTION MEASURES.

Provide riprap for Specs. 2511 and 3601. EMBANKMENT PROTECTION, INCLUDING MATERIAL PLACED BETWEEN BARRELS THAT ARE LESS THAN 2'-0" APART, IS INCIDENTAL.

1. For type of geotextile filter material required, see specs. 2511, provide geotextile strips continued without overlap, except for the top strip which should single vertical strips. Bury the top edge to prevent undermining.

2. If the distance between double barrels is less than 2'-0" Use either pea rock or lean mix backfill. Space between the culverts as approved by the engineer. If pea rock is used provide approved geotextile cutoff core. Minimum 12" space between the culverts end and provide class I (grouted) riprap in lieu of class III riprap.

3. Refer to the general plan and elevation sheet for the distance between barrels of adjacent boxes.

RIPRAPER CLASS

<table>
<thead>
<tr>
<th>Riprap Class</th>
<th>Riprap Class</th>
<th>T</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>III</td>
<td>1'-0&quot;</td>
<td>1'-0&quot;</td>
<td></td>
</tr>
<tr>
<td>IV</td>
<td>2'-0&quot;</td>
<td>2'-0&quot;</td>
<td></td>
</tr>
</tbody>
</table>

DESIGNER NOTE: REMOVE PRIOR TO PLOTTING FINAL PLAN. DESIGNER TO SELECT EITHER CLASS III OR IV RIPRAPER USING CHK BOX ABOVE.