### PERMITTED PRECAST ALTERNATE BOX SECTIONS

<table>
<thead>
<tr>
<th>TYPE</th>
<th>DESCRIPTION</th>
<th>SINGLE BARREL</th>
<th>MULTIPLE BARRELS</th>
<th>DESIGN NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Single Cell Movable (Four Sided)</td>
<td>![Image]</td>
<td>![Image]</td>
<td>Index No. 292 or Contractor Design</td>
</tr>
<tr>
<td>B</td>
<td>Single Cell Two-Piece (Four Sided)</td>
<td>![Image]</td>
<td>![Image]</td>
<td>Contractor Design</td>
</tr>
<tr>
<td>C</td>
<td>Multicell Monolithic</td>
<td>![Image]</td>
<td>![Image]</td>
<td>Not Applicable</td>
</tr>
</tbody>
</table>

### GENERAL NOTES:

1. Specifications:
   - General:
     - FDOT Standard Specifications for Road and Bridge Construction, Section 410 (current edition, and supplements thereto).
     - Concrete (Precast):
       - Class III or Class II Modified (5,000 psi) for slightly aggressive environments.
       - Class IV (5,500 psi) for moderately to extremely aggressive environments.
       - Concrete (Cast-In-Place):
         - Class I (3,400 psi) for slightly aggressive environments.
         - Class IV (5,500 psi) for moderately to extremely aggressive environments.
   - Reinforcing Steel:
     - Maintain minimum clearance of 2" for slightly and moderately aggressive environments or 3" for extremely aggressive environments, unless otherwise shown. Equal area substitution of welded wire (WWR) reinforcement is permitted.

2. Work this Index with the Cast-In-Place Concrete Box Culvert Details and Data Tables shown in the plans, Index No. 299 and the Precast Concrete Box Culverts shown in the shop drawings.

3. All joints between precast sections must be tongue & groove with joint sealant. Joints between cast-in-place & precast sections shall have longitudinal reinforcing extending from top, bottom & both side slabs of the precast box tied to the cast-in-place reinforcement. Single barrel culverts may have precast headwalls cast integrally with the end segment when approved by the Engineer.

4. Extension of existing multiple barrel box culverts with multiple single cell precast box culverts is not permitted unless approved by the District Structures Engineer. Full transition details must be shown in the shop drawings when approved.

5. Culverts larger than the specified size may be substituted with no additional payment to the Contractor. Substitution must be approved by the Engineer, minimum earth cover and invert elevations shown in the Contract Documents must be maintained.
**PRECAST SEGMENT TO SEGMENT TONGUE & GROOVE TRANSVERSE JOINTS**

**SECTION A-A**
(2" Cover - Thin Wall Detail)

**SECTION A-A**
(3" Cover - Thin Wall Detail)

**ALTERNATE BOTTOM SLAB TRANSVERSE JOINT**
(TYPICAL SECTION)
(DOUBLE-SIDED TONGUE & GROOVE JOINT)
(All reinforcing not shown for clarity)

NOTE:
Bottom Slab Joints in Type B Boxes may be single tongue & groove joints as shown in Section A-A when the Top Slab Joints are oriented as shown in Schematic "A".

**SCHEMATIC "A"**
TYPE B BOX SECTION PLACEMENT
FOR SINGLE TONGUE & GROOVE JOINTS

**ADDITIONAL JOINT DETAILS**

**TWO-PIECE PRECAST SEGMENT**
ADDITIONAL JOINT DETAILS
(TYPE B BOX)
**C-I-P Headwall Details and Connection to Precast Box**

**SECTION C-C**

- **Face of C-I-P Wingwall/Headwall**
- **Mechanical couplers or 1'-6" bar extension (Full length bar extension) or adhesive bonded dowel bars with 1'-0" embedment permitted**
- **Thick of C-I-P bottom slab in plans (10")**
- **Circumferential bottom slab reinforcing**
- **Bottom slab C-I-P reinforcing or extension of precast reinforcing (See C-I-P design in plans)**

**SECTION D-D**

- **C-I-P Toe Slab & Cutoff Wall Details and Connection to Precast Box**
  - " Provide additional 6" depth of cutoff wall at no additional cost.

**SECTION E-E**

- **Exterior Wall/Slab Transition Detail for Precast Extension**
  - * Type I Connection shown, Type II Connection similar*
PIPE BLOCKOUT NOTES:
1. Cut box culvert reinforcement as required to maintain 2' cover.
2. For Precast Sections construct opening a minimum of 1'-0" away from any box to box joint, except opening may be a minimum of 1'-0" away from joint when at least 2'-0" of clearance to the box to box joint is provided on the opposite side of the pipe opening.
3. Pipe blockout diameter to be 6" greater than pipe outside diameter.
4. See Drainage Plans for size, placement, and invert elevation.

SUPPLEMENTAL DETAILS FOR PRECAST CONCRETE BOX CULVERTS

C-I-P END CAP DETAILS AND CONNECTION TO PRECAST BOX

SECTION F-F
(Headwall, Toe Slab and Cutoff Wall Reinforcing not shown for clarity)

SECTION H-H
(Showing additional blockout reinforcing only)

PIPE INVERT ELEVATION
Additional outside vertical reinforcing
PIPE BLOCKOUT DETAILS
**DIFFERENTIAL SETTLEMENT COUNTERMEASURES FOR PRECAST BOX CULVERTS**

**LINK SLAB NOTES:**

1. Provide a Cast-In-Place Link Slab to ensure uniform joint opening of precast box culverts when the differential settlement shown in the plans exceeds the following limits, except that a Link Slab is not required for differential settlements less than $\Delta Y$:

   \[
   \Delta Y = \frac{760 \times R \times W}{L^2}
   \]

   Where:
   - $\Delta Y$ = Maximum Long-Term Differential Settlement (ft.)
   - $R$ = Exterior height of Box Culvert (ft.)
   - $W$ = Length of Box Culvert Segments (ft.)
   - $L$ = Effective length for single curvature deflection (ft.)

2. Extend Link Slab to back face of headwalls and to limits of existing box culverts for extensions.

**ESTIMATED LINK SLAB QUANTITIES**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>UNIT</th>
<th>QUANTITY</th>
</tr>
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<tbody>
<tr>
<td>Class II or IV Concrete (Culvert)</td>
<td>Lb./SF</td>
<td>0.0216</td>
</tr>
<tr>
<td>Reinforcing Steel (Roadway)</td>
<td>Lb./SF</td>
<td>1.52</td>
</tr>
</tbody>
</table>

**NOTES:**

1. All bar dimensions are out to out.
2. Lap splice length for Bars 4M is 1'-4" minimum.

**SUPPLEMENTAL DETAILS FOR PRECAST CONCRETE BOX CULVERTS**

**BILL OF REINFORCING STEEL**

<table>
<thead>
<tr>
<th>MARK</th>
<th>SIZE</th>
<th>NO. REQ'D</th>
<th>LENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4</td>
<td>2 per Barrel/Ft.</td>
<td>1'-3&quot;</td>
</tr>
<tr>
<td>M</td>
<td>4</td>
<td>As Req'd</td>
<td>As Req'd</td>
</tr>
</tbody>
</table>

**REINFORCING STEEL BENDING DIAGRAMS**

**DESIGN NOTE:**

1. Link Slab required when joint openings exceed $1' \pm$ as determined in Link Slab Note 1.

**REVISION** 01/01/09

**DESCRIPTION:**

FDOT 2014 DESIGN STANDARDS

**INDEX NO.** 291

**SHEET NO.** 5 of 5