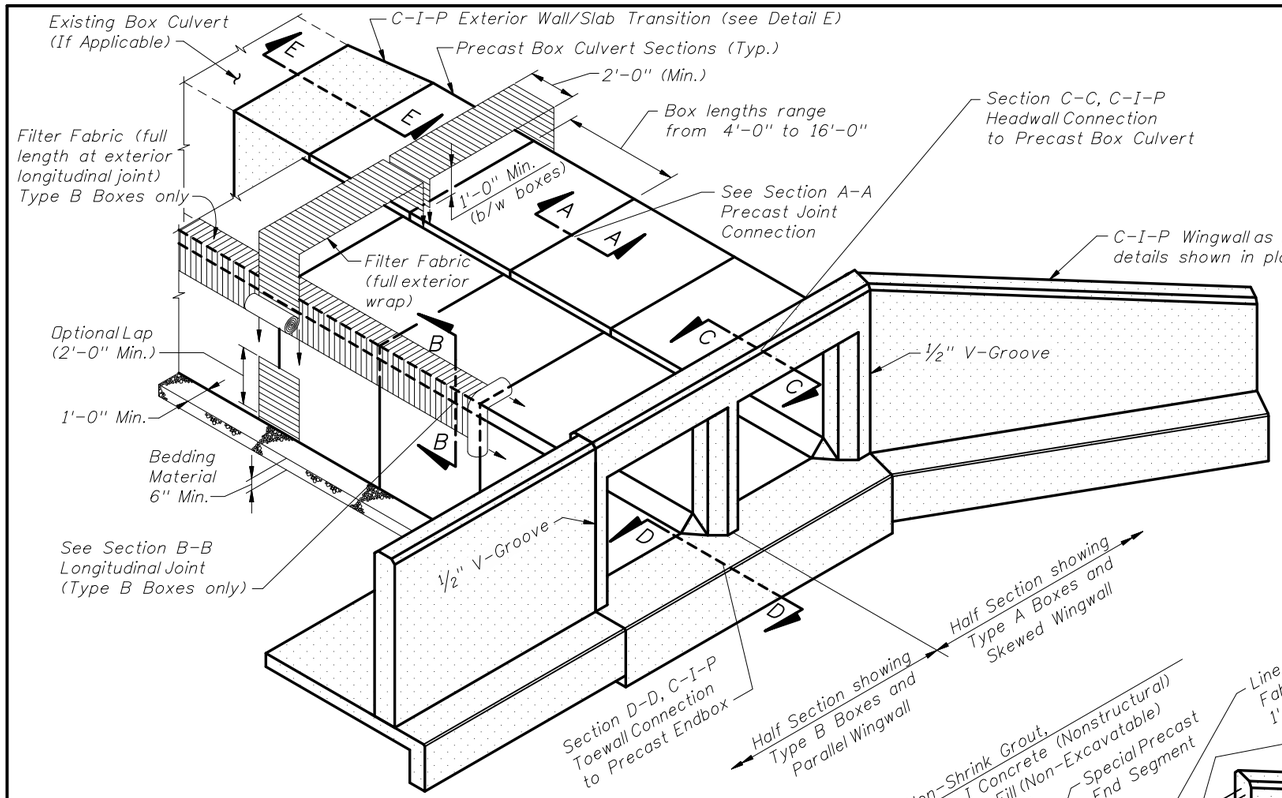
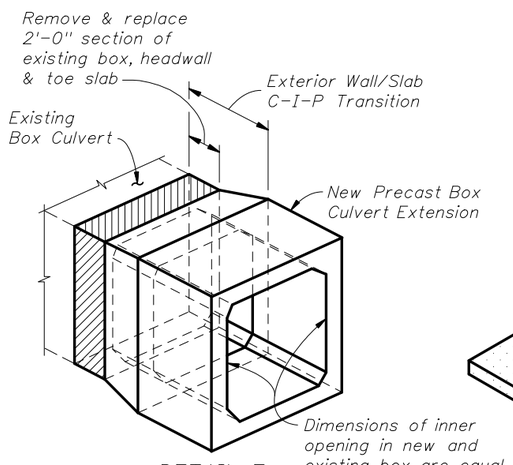
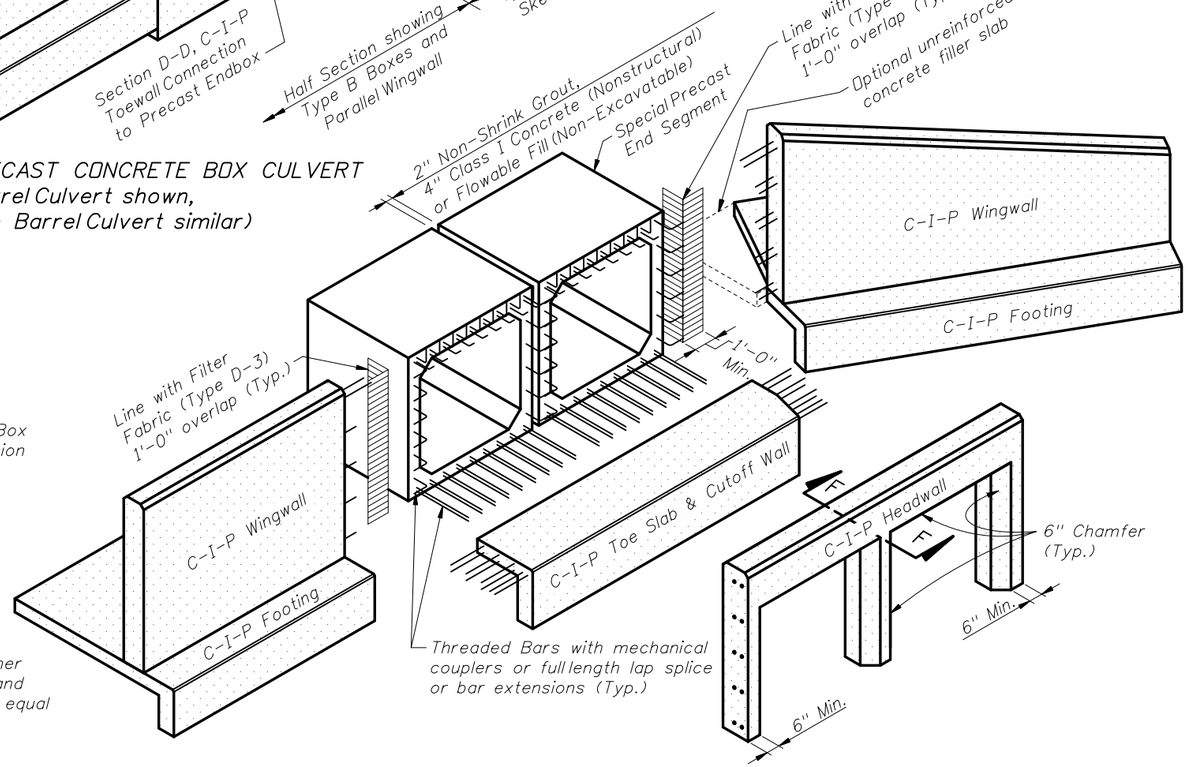



ISOMETRIC VIEW OF PRECAST CONCRETE BOX CULVERT
(Double Barrel Culvert shown,
Single or Multiple Barrel Culvert similar)

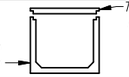
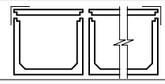
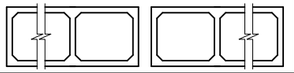



DETAIL E
PICTORIAL VIEW OF EXTERIOR
WALL/SLAB TRANSITION




EXPLODED VIEW OF CONNECTIONS AT END OF CULVERT
(Double Barrel Culvert shown, Single or Multiple Barrel Culvert similar)

## PERMITTED PRECAST ALTERNATE BOX SECTIONS

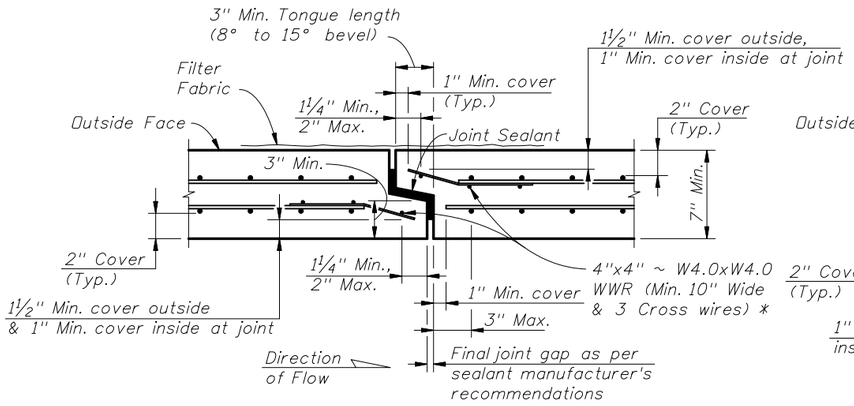
| TYPE | DESCRIPTION | SINGLE BARREL | MULTIPLE BARRELS | DESIGN NOTES |
|---|---|---|---|---|
| A | Single Cell Monolithic (Four Sided) | | | Index No. 292 or Contractor Design |
| B | Single Cell Two-Piece (Four Sided) |   |  | Contractor Design |
| C | Multicell Monolithic | Not Applicable |  | Contractor Design |

## GENERAL NOTES:

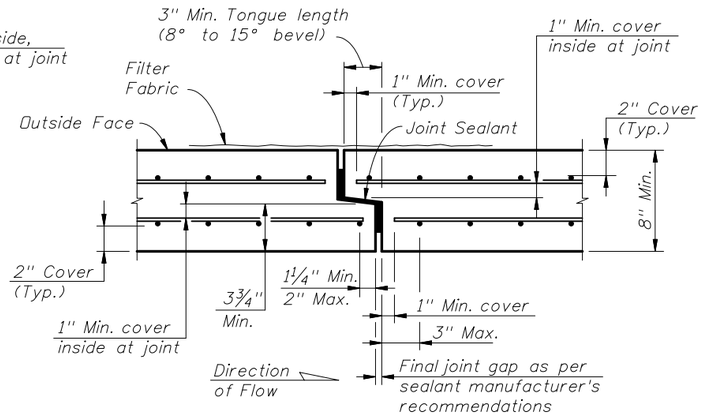
1. Specifications:
   - General:
     FDOT Standard Specifications for Road and Bridge Construction, Section 410 (current edition, and supplements thereto).
   - Concrete (Precast):
     Class III or Class II Modified (5,000 psi) for slightly aggressive environments.
     Class IV (5,500 psi) for moderately to extremely aggressive environments.
   - Concrete (Cast-In-Place):
     Class II (3,400 psi) for slightly aggressive environments.
     Class IV (5,500 psi) for moderately to extremely aggressive environments.
   - Reinforcing Steel:
     ASTM A615 Grade 60 deformed bar unless otherwise noted, with a 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. 289 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.

### INSTRUCTIONS TO DESIGNER:

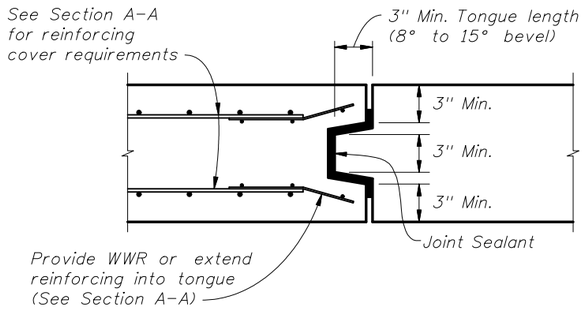
1. Show Differential Settlement ($\Delta Y$) and Effective Length ($L$) for single curvature deflection in the Contract Plans where significant long-term settlement is anticipated. See Sheet 5 of 5 for details.




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

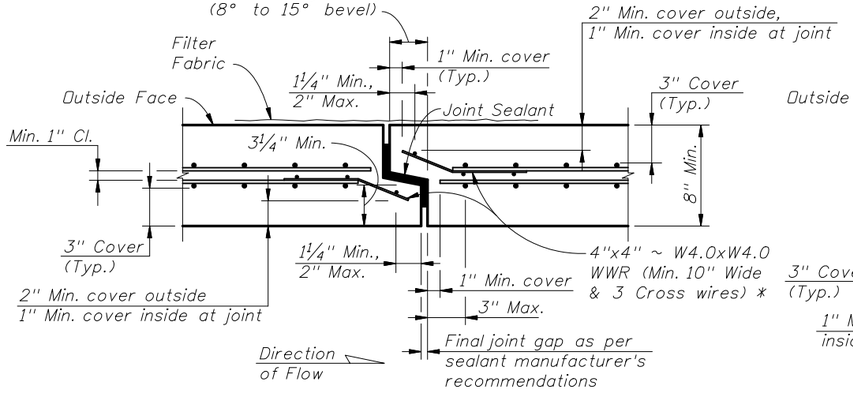



SECTION A-A
(2" Cover - Thick Wall Detail)



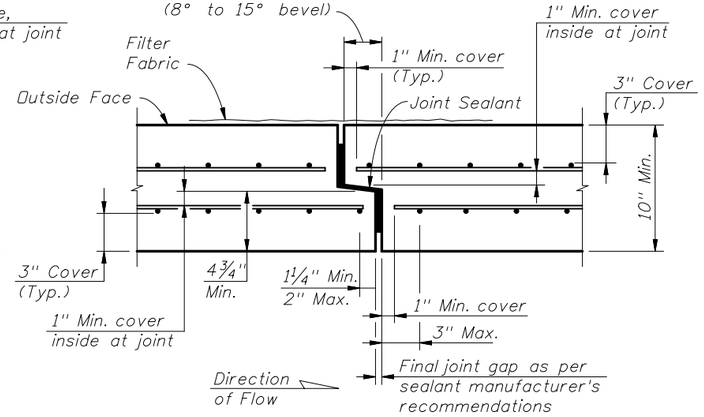

ALTERNATE BOTTOM SLAB TRANSVERSE JOINT
TYPICAL SECTION
(DOUBLE-SIDED TONGUE & GROOVE JOINT)
(All reinforcing not shown for clarity)

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.

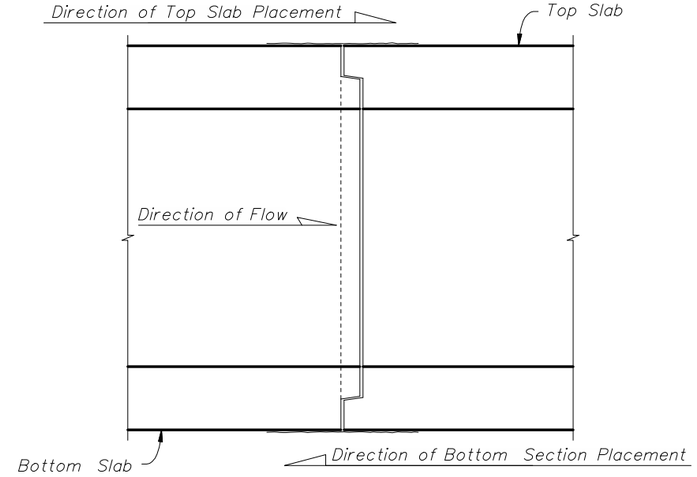



SECTION A-A
(3" Cover - Thin Wall Detail)

* At the Contractor's option when the box culvert reinforcing utilizes WWR, extend wall and slab reinforcing into the joint and bend to maintain cover in lieu of 4"x4" ~ W4.0xW4.0 WWR at joint. Transverse wire in tongue may be cut at corners of box to allow bending of the WWR.



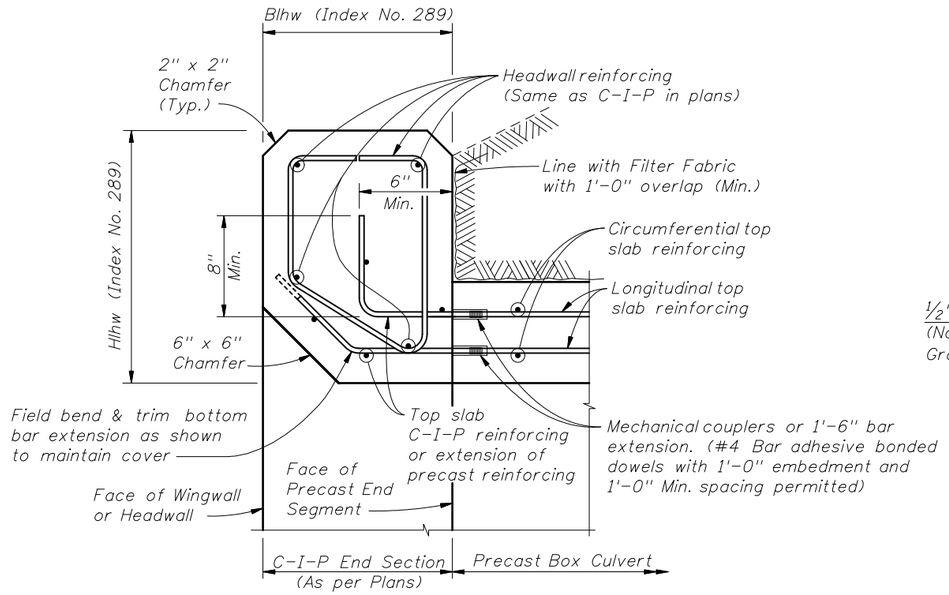

SECTION A-A
(3" Cover - Thick Wall Detail)



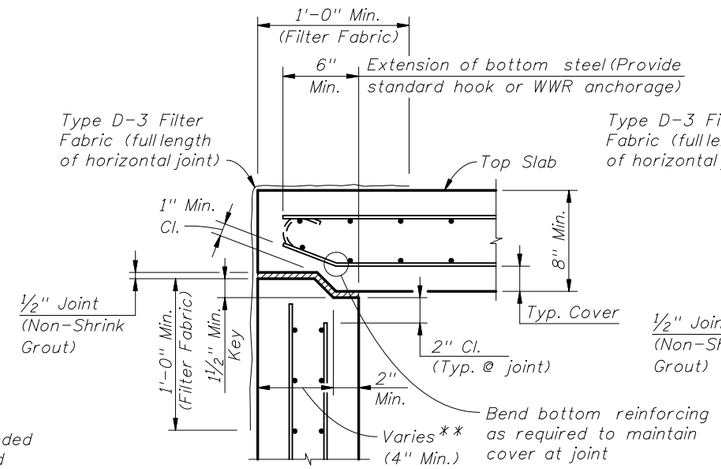

SCHEMATIC A
TYPE B BOX SECTION PLACEMENT
FOR SINGLE TONGUE & GROOVE JOINTS

## PRECAST SEGMENT TO SEGMENT TONGUE & GROOVE TRANSVERSE JOINTS

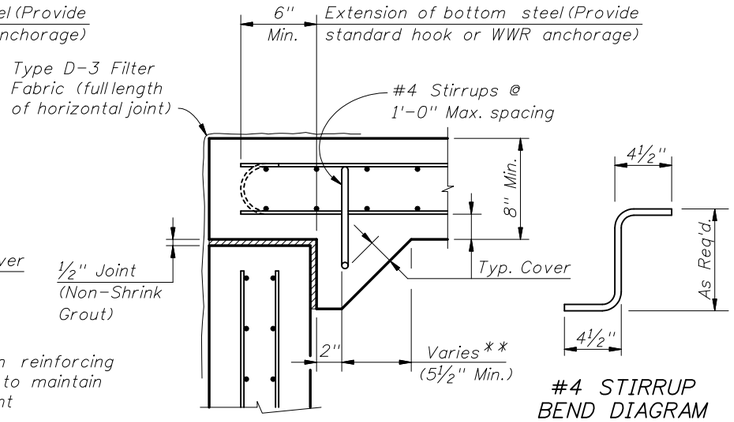
## TWO-PIECE PRECAST SEGMENT ADDITIONAL JOINT DETAILS (TYPE B BOX)




SECTION C-C
C-I-P HEADWALL DETAILS AND CONNECTION TO PRECAST BOX




SECTION B-B
TOP SLAB TO WALL JOINT
(KEYED JOINT)

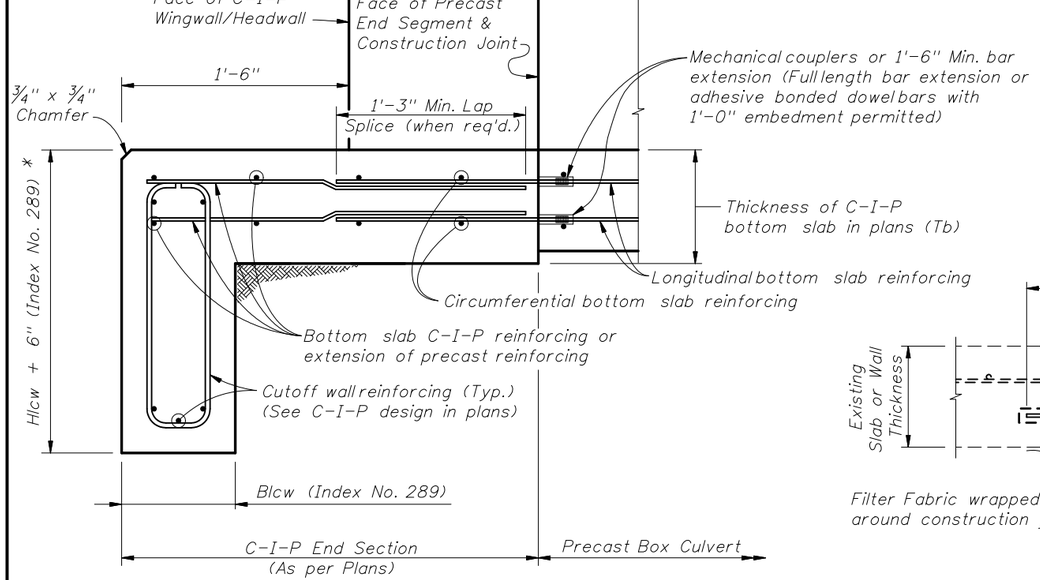



SECTION B-B
TOP SLAB TO WALL JOINT
(HAUNCHED JOINT)

#4 STIRRUP
BEND DIAGRAM

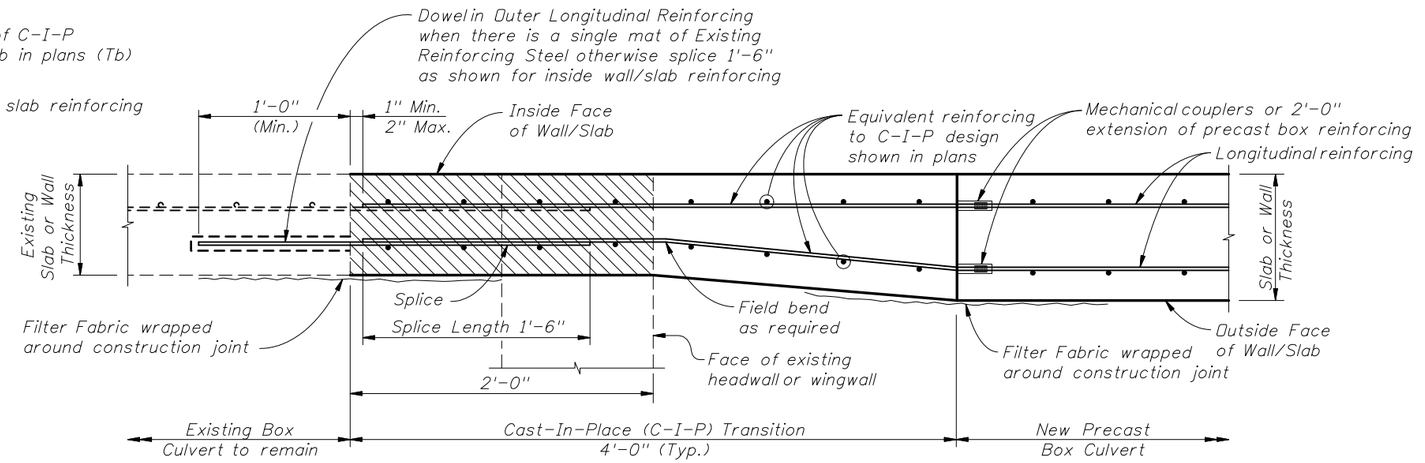
** Provide adequate width to satisfy shear strength requirements at joint

## TYPE B BOX LONGITUDINAL JOINTS



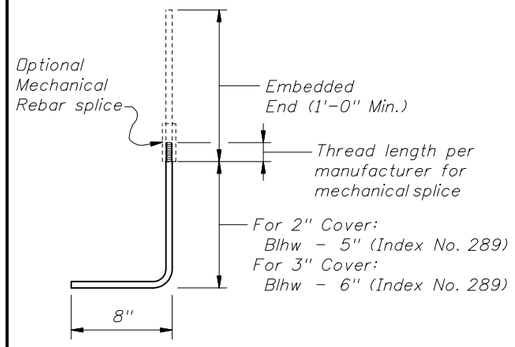

SECTION D-D
C-I-P TOE SLAB & CUTOFF WALL DETAILS
AND CONNECTION TO PRECAST BOX

* Provide additional 6" depth of cutoff wall at no additional cost.

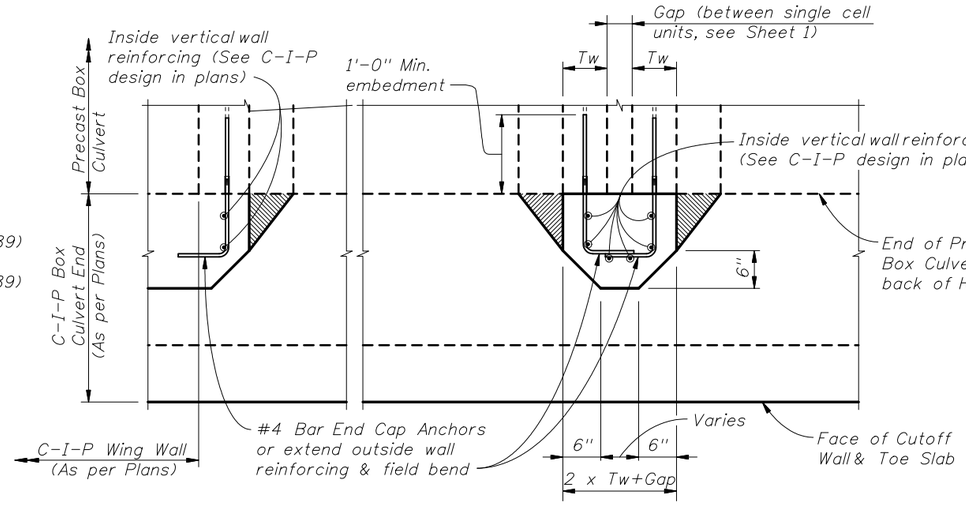



Section of Existing Box Culvert to be removed and replaced.

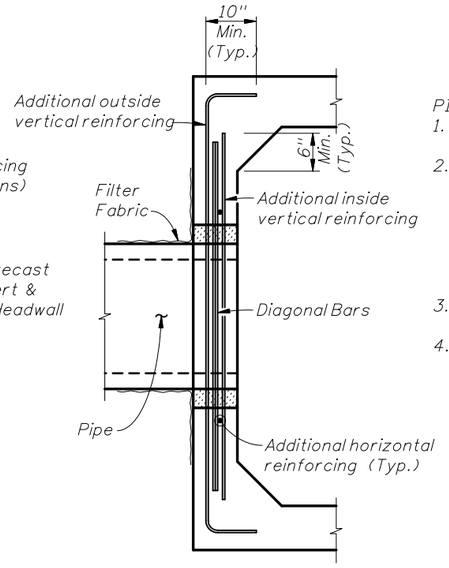
SECTION E-E
EXTERIOR WALL/SLAB TRANSITION DETAIL FOR PRECAST EXTENSION




#4 BAR END CAP ANCHOR
BAR BEND DIAGRAM

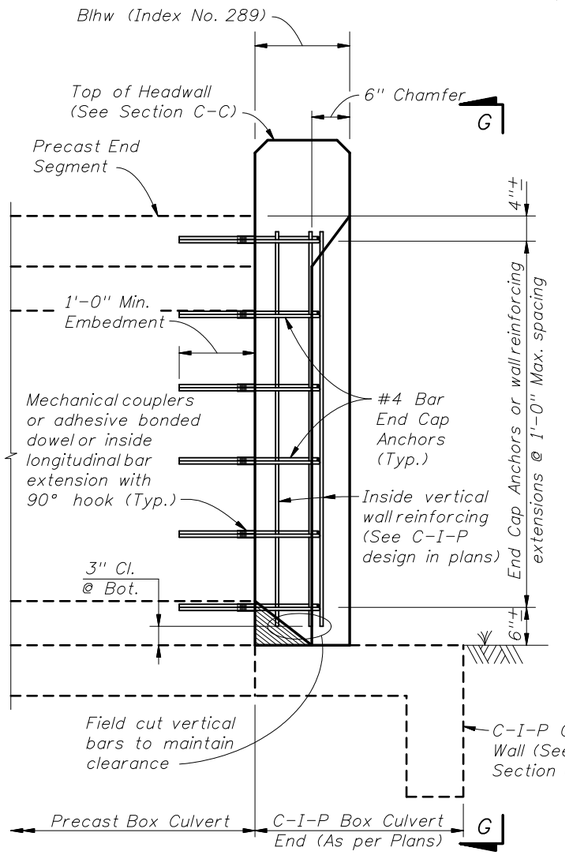



SECTION H-H

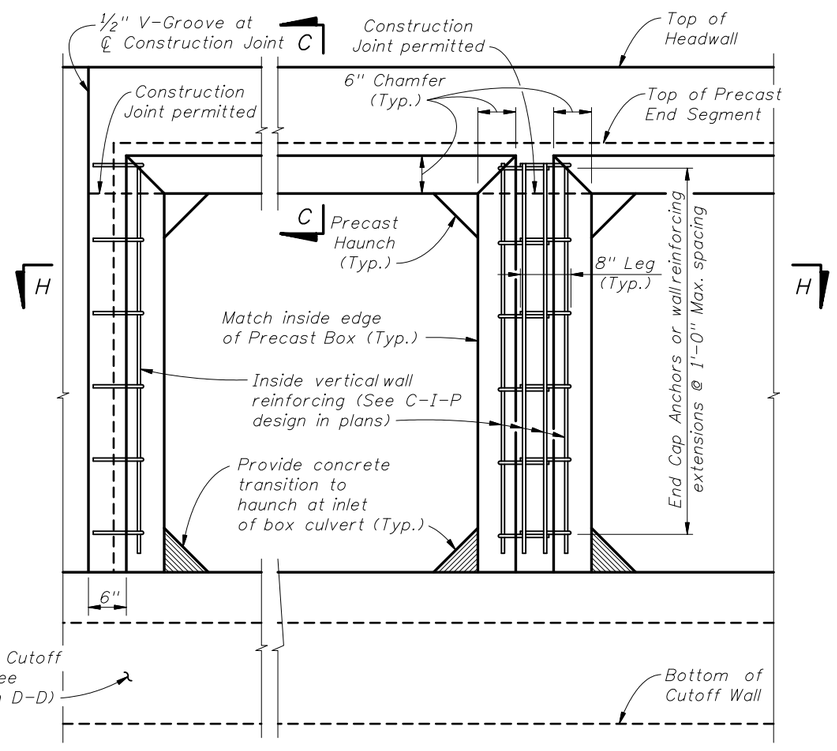



PIPE BLOCKOUT NOTES:
1. Cut box culvert reinforcement as required to maintain 2" cover.
2. For Precast Sections construct opening a minimum of 1'-6" away from any box to box joint, except opening may be a minimum of 1'-0" away from joint when at least 2'-0" of clearance to the box to box joint is provided 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.

SECTION I-I
(Showing additional blockout reinforcing only)

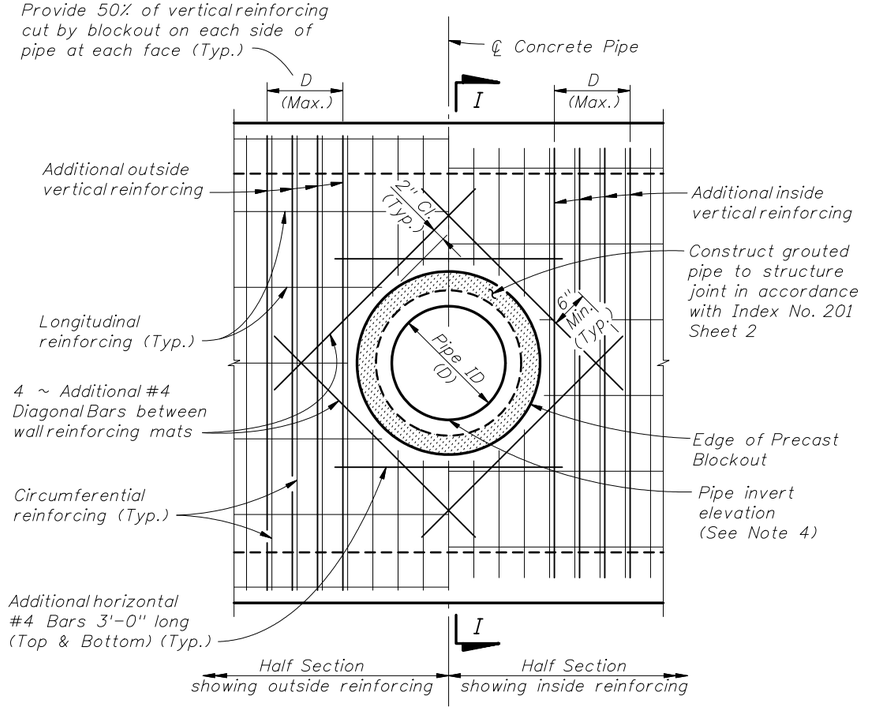



SECTION F-F




VIEW G-G
(Headwall, Toe Slab and Cutoff Wall Reinforcing not shown for clarity)

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




ELEVATION VIEW

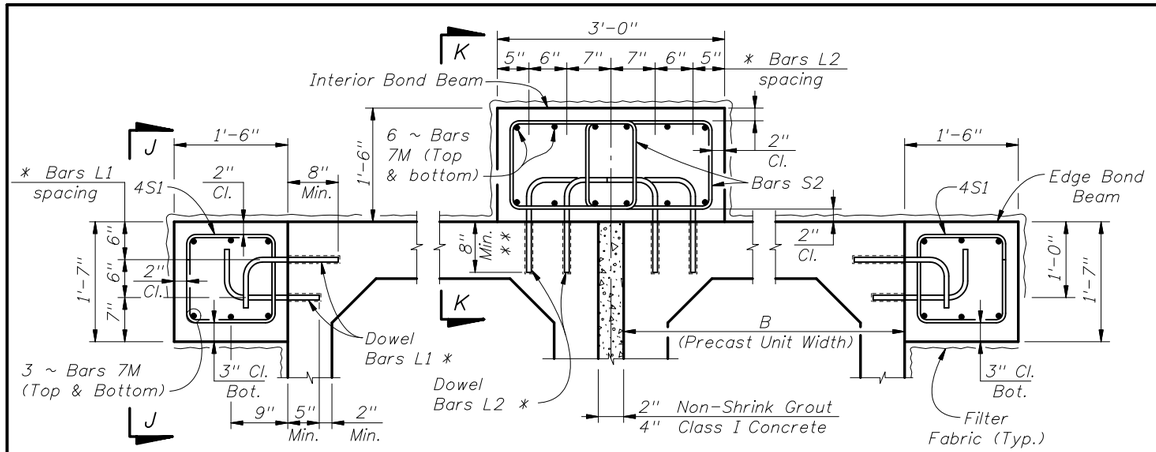
PIPE BLOCKOUT DETAILS

2008 FDOT Design Standards

# SUPPLEMENTAL DETAILS FOR PRECAST CONCRETE BOX CULVERTS

| Last Revision | Sheet No. |
|---|---|
| 07/01/07 | 4 of 5 |

Index No. 291

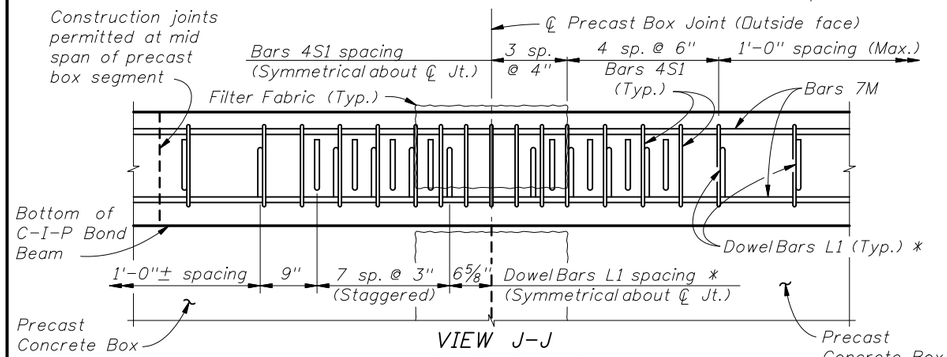



EDGE BOND BEAM TYPICAL SECTION

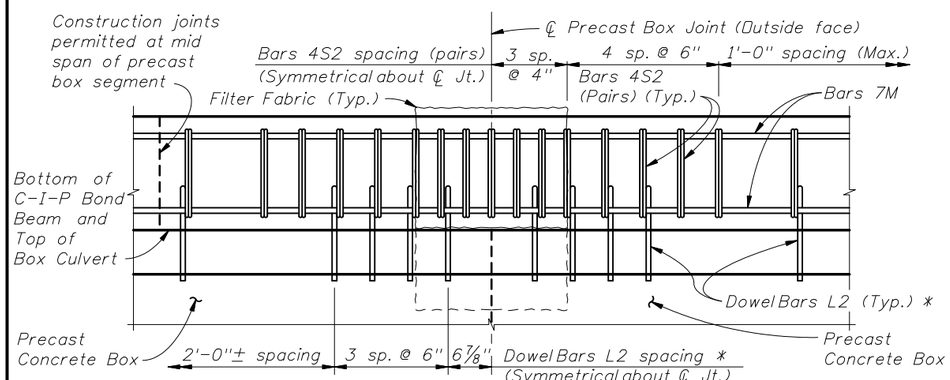
INTERIOR BOND BEAM TYPICAL SECTION

* The Contractor may substitute mechanical couplers in lieu of adhesive bonded dowels. Shift dowels to clear box culvert reinforcing.

** For top slabs less than 8" thick, reduce embedment of outside bars L2 to 1" less than thickness of top slab.




VIEW J-J
EDGE BOND BEAM




VIEW K-K
INTERIOR BOND BEAM

BOND BEAM NOTES:

1. Provide Bond Beams to mitigate settlement of precast box culverts when the differential settlement shown in the plans exceeds the following limits.

$$\frac{\Delta Y \times R \times W}{(L)^2} \leq \frac{1}{760}$$

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 Bond Beams to back face of headwalls and to limits of existing box culverts for extensions.

3. Multiple single barrel Two-Piece (Type B) precast box culverts are not permitted when Bond Beams are required. For single barrel Two-Piece (Type B) precast box culverts, construct Bond Beam along bottom edge of box culvert.

| ESTIMATED BOND BEAM QUANTITIES | | | |
|---|---|---|---|
| ITEM | UNIT | QUANTITY PER BEAM | |
| | | EDGE | INTERIOR |
| Class II or IV Concrete (Culvert) | CY/Ft. | 0.088 | 0.167 |
| Reinforcing Steel (Roadway) | Lb./Ft. | 25.88 | 56.08 |
| | | | |

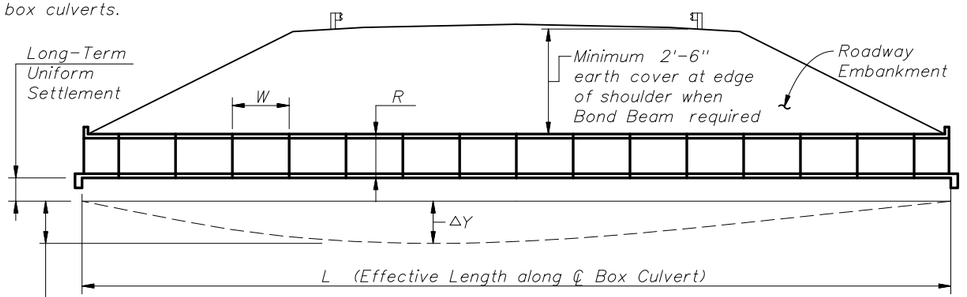
NOTE: Estimated quantities are based on a 8 ft. long precast box sections, and are provided for information only. No additional payment will be made for Bond Beams where these are required for the precast box culverts.

DESIGN NOTES:

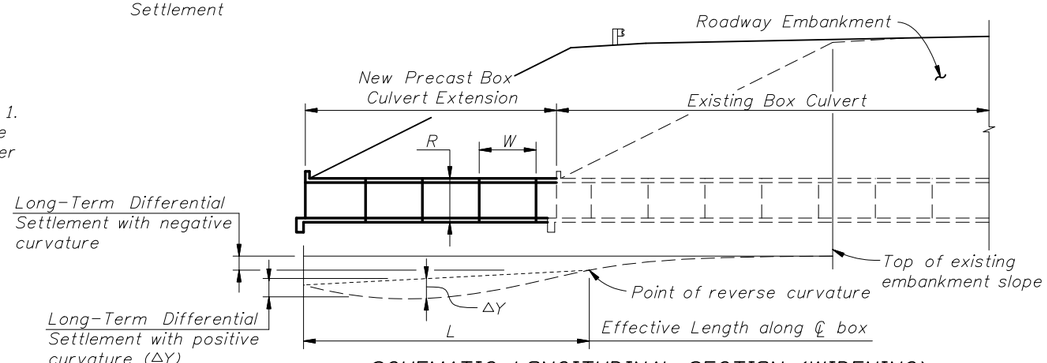
1. Bond beam design limitations are:
   Max. Design Earth Cover (H) = 30'
   Max. Precast Unit Length (W) = 8'
   Max. Precast Unit Width (B) = 14'
   Max. Factored Shear Force/Joint:
   - Edge Beam = 100 kips
   - Interior Beam = 200 kips

2. The precast unit length, width or earth cover limitations may be exceeded provided that the following equation is satisfied:
   $H \times W \times B \leq 3360$

3. Bond Beams are required when joint openings from differential settlement exceed ⅛" as determined in Bond Beam Note 1. The maximum design forces are based on 50% of the earth cover loads.



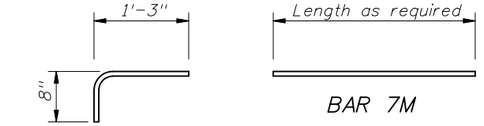

SCHEMATIC LONGITUDINAL SECTION (NEW CONSTRUCTION)




SCHEMATIC LONGITUDINAL SECTION (WIDENING)

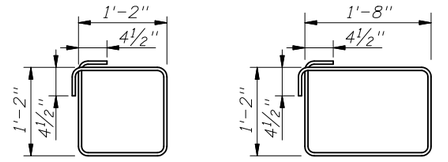
| BILL OF REINFORCING STEEL | | | |
|---|---|---|---|
| MARK | SIZE | NO. REQ'D | LENGTH |
| L1 | 6 (See Note 3) | 19 per Beam/8' Box | 1'-11" |
| L2 | 6 (See Note 3) | 40 per Beam/8' Box | 1'-11" |
| M | 7 | 12 per Barrel | As reqd. |
| S1 | 4 | 16 per Beam/8' Box | 5'-5" |
| S2 | 4 | 32 per Beam/8' Box | 6'-5" |

REINFORCING STEEL BENDING DIAGRAMS




BAR 7M

DOWEL BARS L1 & L2




STIRRUP 4S1 STIRRUP 4S2

NOTES:
1. All bar dimensions are out to out.
2. Lap splice length for Bars 7M is 3'-0" minimum.
3. #4 Bars may be substituted for Bars 6L1 & 6L2 for precast box widths (B) less than 7 ft.

# DIFFERENTIAL SETTLEMENT COUNTERMEASURES FOR PRECAST BOX CULVERTS

2008 FDOT Design Standards

## SUPPLEMENTAL DETAILS FOR PRECAST CONCRETE BOX CULVERTS

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