**TABLE 1**

**NOTE:** Splice lengths are based on an AASHTO Class B tension lap splice for the Specification Section 346 concrete class shown.

**SPLICE (CLASS B)**

For Culvert Skew see Contract Plans.

For Headwall Skew and Wingwall Skews, See Schematic "A".

For Headwall Skew and Wingwall Skews, See Schematic "A".

### SCHEMATIC "A" - PLAN VIEW

**HEADWALL & WINGWALL ALIGNMENT**

**NOTE:** All headwall and culvert skew angles are measured in degrees from a line perpendicular to the centerline of culvert (counter-clockwise positive), see Schematic "B".

**GENERAL NOTES:**

**LIVE LOAD:** HL-93

**CONSTRUCTION LOADING:** It is the construction Contractor's responsibility to provide for supporting construction loads that exceed AASHTO HL-93, and any construction load applied prior to 2 feet of compacted fill placed above the top slab.

**SURFACE FINISH:** All concrete surfaces shall receive a general surface finish.

**SKEWED CONSTRUCTION JOINTS:** Construction joints in barrels of culverts with skewed wingwalls may be placed parallel to the headwalls and the reinforcing steel, and the slabs may be cut provided that the cut reinforcing steel extends beyond the construction joint enough for splices to be made in accordance with Table 1 on this sheet. The cost of construction joints and additional reinforcing shall be at the expense of the Contractor.

**CULVERT EXTENSIONS:** For cut backs and ties into existing concrete box culverts see Sheet 6 of 8.

**REINFORCING STEEL:** See the "Box Culvert Data Tables" in the Contract Plans for grade and bar spacing. See the Reinforcing Bar List in the Contract Plans for bar sizes and bar bending details.

**PART PLAN SHOWING PARALLEL WINGWALLS AND LOCATION OF CONSTRUCTION JOINTS**

**NOTE:** Construction joints in wingwalls and footings are located as follows:

- For non-skewed wingwalls they are located adjacent to the exterior face of the exterior barrel wall, when the θ of wingwall and θ of exterior barrel wall results in an acute angle see Left End Wingwall above, and when the angle is obtuse see Left Begin Wingwall above and Detail C (Sheet 5).

**TABLE 1 - MINIMUM BAR SPLICE LENGTHS FOR LONGITUDINAL REINFORCING**

<table>
<thead>
<tr>
<th>BAR SIZE</th>
<th>SPlice (CLASS B) (3400 psi)</th>
<th>BAR SIZE</th>
<th>SPlice (CLASS B) (5500 psi)</th>
</tr>
</thead>
<tbody>
<tr>
<td>#3</td>
<td>1'-4&quot;</td>
<td>#6</td>
<td>1'-4&quot;</td>
</tr>
<tr>
<td>#4</td>
<td>1'-4&quot;</td>
<td>#7</td>
<td>1'-4&quot;</td>
</tr>
<tr>
<td>#5</td>
<td>1'-4&quot;</td>
<td>#8</td>
<td>1'-4&quot;</td>
</tr>
<tr>
<td>#6</td>
<td>1'-4&quot;</td>
<td>#9</td>
<td>1'-4&quot;</td>
</tr>
</tbody>
</table>

**TABLE 1 NOTE:** Splice lengths are based on an AASHTO Class B tension lap splice for the Specification Section 346 concrete class shown.
WINGWALL ELEVATION - Variable Height
(Left End shown - other corners similar)

WINGWALL NOTES:
1. Align construction joint perpendicular to wingwall.
2. In the vicinity of the construction joint, field bend reinforcement as necessary to maintain minimum reinforcement cover.
3. For constant height wingwalls, variable length Bars 403, 405 & 408 are not required, and as such the limits of Bars 401 & 407 extend the full length of the wingwall, and the limits of Bars 402 & 404 extend to the full height of the wingwall.

CULVERT BARREL NOTES:
1. Space Bars 401, 402, 403, 404 & 405 with a bar in each corner, and at the % of interior walls (for multiple barrel culverts only), and the remaining bars placed at equal spacing shown in the Contract Plans. Adjust last bar spacing when required.
2. Place Bars 401, 402, 403, 404 & 405 at spacing shown in the Contract Plans evenly between Bars 400 & 406.
3. Locate the first transverse bar from the ends of the culvert at one half the bar spacing, but provide the minimum reinforcement cover and not greater than 4" clear.

TYPICAL SECTION THRU SINGLE BARREL CULVERT

TYPICAL SECTION THRU MULTIPLE BARREL CULVERT

CONCRETE BOX CULVERT DETAILS
CONCRETE BOX CULVERT DETAILS

NOTES:
2. WP = Working Point, used for wingwall layout and location of construction joint. See Detail "C" (Sheet 5).

PARTIAL PLAN TOP SLAB
(Left Side, Left Skew)

SINGLE BARREL BOX CULVERT
(Skewed Culvert With Parallel Wingwalls Shown)

PARTIAL PLAN BOTTOM SLAB
(Right Side, Right Skew)

LONGITUDINAL SECTION THRU CULVERT
(Transverse Top & Bottom Slab Reinforcing Not Shown For Clarity)
NOTES:
2. WP = Working Point, used for wingwall layout and location of construction joint. See Detail C (Sheet 5).
END ELEVATION
(Showing Constant Height And Variable Height Wingwalls)

**NOTES:**
1. For small angles, the Contractor may elect to fill the area between the box and the wingwall footing with unreinforced concrete. For wingwall skew angles less than 90 degrees, field bend wingwall reinforcement as necessary while maintaining cover. No additional payment will be made for this work.
2. Location of Construction Joint determined by WP at theoretical intersection of:
   - 36° side face of Headwall and outside face of Box Exterior Wall, for SW≥90°.
   - Outside face of Wingwall and outside face of Box Exterior Wall, for SW<90°.
3. Provide 6" chamfer when angle 'A' is greater than 45°. Maintain minimum wall thickness. Field adjust reinforcing to maintain cover.
4. Wingwall Skew Angles (SW) are measured from the adjacent box exterior wall to the wingwall.
5. Turn or extend Wingwall Cutoff Wall as necessary to meet Box Cutoff Wall.
6. Provide additional reinforcement in the top of the top slab below traffic railings to ensure a minimum area of 0.80 sq. in./ft. transverse reinforcing.

**DETAIL "B"**
UNDERDRAIN DETAIL
(Similar to Type II – Index 440-001)

**DETAIL "C" - PLAN VIEW**
WINGWALL TO BOX CONNECTION
(Left Begin Corner Shown, Other Corners Similar)

**DETAIL "D"**
DETAILED ATTACHMENT TO Headwall

**DETAIL "E"**

**DETAIL "F"**

**DETAIL "G"**
SECTION H-H

**DETAIL "H"**

**DETAIL "I"**
TRAFFIC RAILING ATTACHMENT TO HEADWALL

**DETAIL "J"**
LEFT HEADWALL SECTION
(Right Headwall similar)

**DETAIL "K"**
LEFT CUTOFF WALL SECTION
(Right Cutoff Wall similar)

**CROSS REFERENCE:**
See Sheet 3 for locations of Details "D", "E", "F" & "K".
See Sheet 4 for locations of Detail "C".

**Pavement thickness (PT):**
1 0 / 2 3 / 2 0 1 8
1 2 : 1 7 : 0 9
P M

**REV ISIO N**

**L AST  REV ISIO N**

**STANDARD PLANS**

**FY 2019-20**

**CONCRETE BOX CULVERT DETAILS**

**INDEX**

**SHEET**
Type I Connection Details for Concrete Box Culvert Extensions

(Cut Back Existing Concrete)

Notes:
1. The Box Culvert Data Tables and Reinforcing Bar List do not include the additional quantities needed for dowel connections or transitions from double walls of existing concrete box culverts; the cost for additional reinforcement and the thickened concrete wall in the transitional area shall be included in the costs for concrete and steel in the culvert extension.

2. Cost for removal and disposal of material from existing headwalls, wingwalls, and box, and cost of cleaning, straightening and extending or doweling longitudinal reinforcing steel shall be included in the cost for concrete and steel of the culvert extension.

3. Remove existing concrete while avoiding damage to existing reinforcement. Clean and straighten existing reinforcement, lap, and tie onto extension reinforcement.

4. Dowel in #4 Bars @ 1'-0" max. spacing into wall/slab when there is a single mat of existing reinforcing steel, otherwise splice 1'-6" as shown for inside reinforcement. Use an Adhesive Bonding Material System in accordance with Specifications Section 416 & 937.

5. Provide additional transverse bars for top and bottom slab, parallel and full width of any skewed joint connection when shown in the Plans.

6. See Box Culvert Data Table notes in Plans for Connection Types allowed.
Concrete Box Culvert

**SECTION A-A**

- Additional Concrete Haunch Required Only When Normal Slab Thickness is Less Than Minimum Shown.
- Use Extra Base When This Dimension is Less Than 12".

**SECTION B-B**

- Use Extra Base When This Dimension is Less Than 12".
- Friable Base Material

**INLET TYPE A GRATE**

- 2 ~ #7 Bars @ 3" sp.
- For Entire Width of Culvert Slab (Typ.)

**INLET TYPE B GRATE**

- Use Extra Base When This Dimension is Less Than 12".
- Concrete Box Culvert

**ASPHALTIC CONCRETE BASE**

- Place coarse aggregate in 6 inch lifts and compact sufficiently to be firm and unyielding. Provide coarse aggregate gravel or stone meeting the requirements of Specification Section 901-2 or 901-3 respectively. Meet the gradation requirements of Specification Section 901-6, Grades 4, 467, 5, 56 or 57 unless restricted in the plans. Provide Type D-3 filter fabric (see Specification Section 985).

**EXTRA BASE FOR BOX CULVERTS CROSSING UNDER FLEXIBLE PAVEMENT**

- The cost of furnishing and installing extra friable base material shall be included in the cost of the Box Culvert.

**NOTES:**

1. Cost of Steel Grating to be included in cost of Box Culvert.
2. All reinforcing shall be 2" clear for Slightly and Moderately Aggressive Environments, and 3" clear for Extremely Aggressive Environments.

**TOP VIEW OF HEADWALL**

**BRIDGE CULVERT NUMBER LOCATION**

The number is to be placed in the center of the top surface of all bridge culvert headwalls. For Bridge Number see Plan-Profile sheet(s).