TYPICAL SECTION THRU SINGLE BARREL CULVERT

CULVERT BARREL NOTES:
1. Space Bars 110 and 112 with a bar in each corner, and at the 6" 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 113 and 114 at spacing shown in the Contract Plans evenly between Bars 109 and 111.
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 MULTIPLE BARREL CULVERT

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.
CONCRETE BOX CULVERT DETAILS

**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).

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**SLAB REINFORCING STEEL:**
- Bars within these limits apply for the skewed portion of culvert slabs when the left Headwall is skewed.
- Bars within these limits apply for the nonskewed portion of slabs.

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**LEFT END WINGWALL**
(Restructing Bars 401-412)

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**LEFT BEGIN WINGWALL**
(Restructing Bars 501-512)

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**RIGHT END WINGWALL**
(Restructing Bars 601-612)

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**RIGHT BEGIN WINGWALL**
(Restructing Bars 701-712)

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**DETAILS:**
- See Detail "D", (Sheet 5)
- See Detail "E", (Sheet 5)
- See Detail "J", (Sheet 5)
- See Detail "K" (Sheet 5)

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**DEFINITIONS:**
- Normal Space
- SW (Typ.) Wingwall Skew
- WP (See Note 2)
- Side Slope 1:X
- Depth of fill (do not use upper or lower points in normal or superelevated roadway sections unless so directed by the Structures Design Office.)

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**CONSTRUCTION JOINTS:**
- Bars 105/Bars 106 ~ Exterior Face (Exterior Wall)
- Bars 108 ~ Interior Face (Exterior Wall)
- Bars 101 & 201 ~ (Left Skew)
- Bars 102 & 202 ~ (Right Skew)

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**SEE ALSO:**
- FY 2018-19 STANDARD PLANS
- 400-289

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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:
   - Soil 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 0' 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.
Remove Wingwalls and Footings Sufficient to Construct Culvert Extension

Longitudinal Reinforcing Steel to be Extended into Culvert Extension (See Note 3)

Proposed Side Slope

Length For Estimated Quantities

Culvert Extension (lc, Tabulated on Box Culvert Data Tables for Standard Box Section Extension)

Longitudinal Reinforcing Steel to be Extended into Culvert Extension (See Note 3)

Cut back Existing Walls, Top Slab & Bottom Slab to Beginning of Radius (2'-0" Min.)

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.

DETAIL "M" - TRANSITION FOR INTERIOR DOUBLE WALLS OF BOX CULVERTS

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CONCRETE BOX CULVERT DETAILS

TYPE I CONNECTION DETAILS FOR CONCRETE BOX CULVERT EXTENSIONS
(CUT BACK EXISTING CONCRETE)
Remove Portions of Wingwalls Sufficent to Construct Culvert Extension
Cut back Concrete and Reinforcing to Face of Culvert (See Note 3)

**OUTSIDE WALLS OF BOXES**

**SECTION A-A**

**SECTION B-B**

**INTERIOR DOUBLE WALLS OF BOXES**

**SECTION C-C**

**INTERIOR SINGLE WALLS OF BOXES**

**PLAN VIEWS**

**DETAIL "L" - TRANSITION FOR EXTERIOR WALL/SLAB EXTENSION**

**DETAIL "N" - TRANSITION FOR INTERIOR DOUBLE WALLS OF BOX CULVERTS**

**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 roughening and cleaning existing headwalls, wingwalls and box, and cost of doweling longitudinal reinforcing steel shall be included in the cost for concrete and steel of the culvert extension.
3. Remove existing concrete and reinforcing back to edge of any chamfers exceeding 1'. Roughen and clean existing or exposed surface and coat with a Type A epoxy bonding compound in accordance with the manufacturer's recommendations.
4. Dowels in #5 bars @ 1'-0" max. spacing horizontally into center of wall/slab. Provide vertical dowels in footing to match size, alignment and spacing of outside vertical dowel in the transitional area shall be included in the cost for concrete and steel in the culvert extension.
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. Remove top of existing headwall when necessary to provide 1'-0" clearance below finished grade. Saw cut full width and seal with Type I-2 epoxy compound to protect exposed reinforcing.
7. See Box Culvert Data Table notes in Plans for Connection Types allowed.

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**CONCRETE BOX CULVERT DETAILS**

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

Place coarse aggregate in 6 inch lifts and compact sufficiently as 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). The cost of furnishing and installing the coarse aggregate and filter fabric shall be included in the cost of the Box Culvert.

INLET TYPE B GRATE

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).

Black Plastic Figures 3' in height as approved by the Engineer may be used in lieu of numbers formed by 3/8" V-Grooves. V-Grooves shall be formed by preformed figures.

ASPHALTIC CONCRETE BASE

NOTE: Extra base is required when cross box culverts are located on facilities subject to high speed traffic ( >45 mph) or high traffic volumes ( >1600 ADT) and the cover is within the range specified in the notation above.