GENERAL NOTES:
1. The twin culvert sections are designed for 8-1/2 live load and earth falls of varying heights.
2. Vertical earth pressure, 0.25 kcf, horizontal earth pressure, 0.25 kcf.
3. The vertical and horizontal earth pressure are for Class I exposure conditions. Exception: Class II exposure condition is utilized for the slab design in full support.
4. All slab and floor reinforcing steel is to be supported at intervals of not more than 12" in either direction as outlined in the standard specifications.
5. The clear distance from face of concrete to near edge on end of reinforcing bars is 0.4 inches minimum except as noted below.
6. Except for bar spacing 4" on slab, longitudinal reinforcing is not to extend beyond the construction joints.
7. Floor reinforcing bars are aligned smooth, ends of footing are to be formed to insure correct line and grade.
8. Reinforcement permitted for this application shall be none.
9. Reinforcement utilized for this application shall be none.
10. Reinforcement utilized for this application shall be none.

INDEX FOR TWIN CULVERT STANDARDS:
- TWIN BARREL DETAILS
- TWIN BELL JOINTS
- TWIN FLARED HEADWALLS
- TWIN PARAPET & CURTAIN WALL DETAILS
- TWIN APRON DETAILS
- TWIN DIMENSION PLANS
- TWIN QUANTITIES TABLES
- TWIN SPECIFICATIONS

SPECIFICATIONS:
- DESIGN
- CONSTRUCTION
- MATERIALS
- DIMENSIONS
- REINFORCEMENT
- PLACING
- COMPRESSIVE STRENGTH
- CEMENT CONTENT
- WATER/Cement RATIO

DESIGN STRESSES:
- DESIGN STRESSES FOR THE FOLLOWING MATERIALS ARE IN ACCORDANCE WITH THE ASHRO AND BRIDGE DESIGN SPECIFICATIONS, SHC, SERIES OF 2000.
- CONSTRUCTION
- MATERIALS
- DIMENSIONS
- REINFORCEMENT
- PLACING
- COMPRESSIVE STRENGTH
- CEMENT CONTENT
- WATER/CEMENT RATIO

INDEX & GENERAL NOTES
- TWIN REINFORCED CONCRETE BOX CULVERTS
- APRIL 2012
END SECTION PLAN VIEWS

NOTE: END SECTION DETAILS SHOWN ARE FOR A 15° SKEW BARREL.
USE FOR SKEWS OF 30° & 45° BY INCREASING THE NUMBER OF TRANSVERSE REINFORCING BARS REQUIRED TO BE CUT & RELOCATED.

STANDARD SECTION PLAN VIEW

NOTE: KEYWAY (TYP.)
2x4 BEVELED
BARREL DETAILS

TOP SLAB CONSTRUCTION JOINT DETAIL

NOTE: ONE SET OF 3" x 3" DOWEL BARS & END SPACING REQUIRED IN SLAB AT ALL CULVERT BARREL JOINTS EXCEPT JOINTS WITH CELLS. SEE TABLE FOR NUMBER REQUIRED AND TOTAL WEIGHT.

TOP OF SLAB

BOTTOM OF SLAB

TOP OF FLOOR

BOTTOM OF FLOOR

TOP OF SLAB

BOTTOM OF SLAB

TOP OF FLOOR

BOTTOM OF FLOOR

TOP OF SLAB

BOTTOM OF SLAB
VARIABLE DIMENSIONS AND QUANTITIES FOR TWIN 8 x 5 BARREL SECTIONS

ALTERNATE SPACING

ALTERNATE SPACING

CONSTRUCTION JOINT
SYMMETRICAL ABOUT E

NOTES:
1. DIMENSIONS LISTED ON THIS SHEET TO BE USED IN CONSTRUCTION WITH SHEET TWRCB 8-5-12
2. DIMENSIONS "A", "B", "C", "D", AND "SP.", LISTED IN THE BAR LIST ARE IN INCHES.

3. ALL DIMENSIONS ARE OUT TO OUT, D = PIN DIAMETER.
4. THE BAR LIST ARE IN INCHES.

IOWA DOT
HIGHWAY DIVISION
TWIN REINFORCED CONCRETE BOX CULVERTS
APRIL, 2012

CULVERT BARREL DETAILS
B 8 x 5 BARREL SECTIONS

TWRCB 8-5-12
VARIABLE DIMENSIONS AND QUANTITIES FOR TWIN 8 x 8 BARREL SECTIONS

<table>
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<th>DIMENSIONS</th>
<th>BAR LIST</th>
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PERMISSIBLE "C"

14-SP @ 1'-6; e2 BARS

SPACING ALTERNATE

TWIN 8 x 8 BARREL SECTION

NOTES:

1. DIMENSIONS LISTED ON THIS SHEET TO BE USED IN CONJUNCTION WITH SHEET TWRCB 8-8-12.
2. DIMENSIONS "A", "B", "C", "D", "E", AND "SP." LISTED IN THE BAR LIST ARE IN INCHES.

IOWA DOT

STANDARD DESIGN

TWIN REINFORCED CONCRETE BOX CULVERTS

APRIL, 2012

CULVERT BARREL DETAILS

8 x 8 BARREL SECTIONS

TWRCB 8-8-12
VARIABLE DIMENSIONS AND QUANTITIES FOR TWIN 8 x 9 BARREL SECTIONS

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<tr>
<th>DIMENSIONS</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>L</th>
<th>W</th>
<th>X</th>
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BAR LIST

<table>
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<tr>
<th>MATERIAL</th>
<th>SIZE (IN)</th>
<th>QUANTITY</th>
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<tbody>
<tr>
<td>STEEL</td>
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</table>

BENT BAR DETAIL

NOTE:

1. DIMENSIONS LISTED ON THIS SHEET TO BE USED IN CONJUNCTION WITH SHEET TWRCB 8-9-12.
2. DIMENSIONS "A," "B," "C," AND "D" LISTED IN THE BAR LIST ARE IN INCHES.

NOTES:

1. DIMENSIONS LISTED ON THIS SHEET TO BE USED IN CONJUNCTION WITH SHEET TWRCB 8-9-12.
2. DIMENSIONS "A," "B," "C," AND "D" LISTED IN THE BAR LIST ARE IN INCHES.

IOWA DOT

HIGHWAY DIVISION

TWIN REINFORCED CONCRETE
BOX CULVERTS

APRIL, 2012

CULVERT BARREL
DETAILS

8 x 8 BARREL SECTIONS

TWRCB 8-9-12
VARIABLE DIMENSIONS AND QUANTITIES FOR TWIN 10 x 4 BARREL SECTIONS

| Dimensions | A | B | C | D | E | F | G | H | I | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y | Z |
| Fill       | 9 | 10| 11| 12| 13| 14| 15| 16| 17| 18| 19| 20| 21| 22| 23| 24| 25| 26| 27| 28| 29| 30| 31| 32| 33|
| Sheet      | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y | Z |
| Sheet      | 9 | 10| 11| 12| 13| 14| 15| 16| 17| 18| 19| 20| 21| 22| 23| 24| 25| 26| 27| 28| 29| 30| 31| 32| 33|
| Sheet      | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y | Z |
| Sheet      | 9 | 10| 11| 12| 13| 14| 15| 16| 17| 18| 19| 20| 21| 22| 23| 24| 25| 26| 27| 28| 29| 30| 31| 32| 33|
| Sheet      | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y | Z |
| Sheet      | 9 | 10| 11| 12| 13| 14| 15| 16| 17| 18| 19| 20| 21| 22| 23| 24| 25| 26| 27| 28| 29| 30| 31| 32| 33|
| Sheet      | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y | Z |
| Sheet      | 9 | 10| 11| 12| 13| 14| 15| 16| 17| 18| 19| 20| 21| 22| 23| 24| 25| 26| 27| 28| 29| 30| 31| 32| 33|

**BENT BAR DETAIL**

**NOTE:**

- All dimensions are to line out.
- **D** is pipe diameter.
VARIABLE DIMENSIONS AND QUANTITIES FOR TWIN 10 x 7 BARREL SECTIONS

**BENT BAR DETAIL**

- **BARS**
  - 0
  - 4
  - 5
  - 10

**NOTE:**
- All dimensions are out to out, D = pin diameter.

**THE BAR LIST ARE IN INCHES.**

**NOTE:**
- Dimensions listed on this sheet are to be used in conjunction with sheet BAR/L/12A.
- Dimensions "A", "B", "C", and "D" listed in the bar list are in inches.

**STEEL**

- 329.61
- 337.08
- 340.53
- 323.68
- 334.89
- 332.92
- 328.58
- 331.39
- 334.89
- 340.53
- 328.58
- 332.92
- 334.89
- 340.53
- 329.61

**DIMENSIONS**

| A | B | C | D | E | C | D | E | C | D | E | C | D | E | C | D | E | C | D | E |
| 5 | 10 | 7 | 4 | 2 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |
| 5 | 10 | 7 | 4 | 2 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |
| 5 | 10 | 7 | 4 | 2 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |
| 5 | 10 | 7 | 4 | 2 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |
| 5 | 10 | 7 | 4 | 2 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |

**QUANTITIES**

**NOTES:**
1. Dimensions listed on this sheet are to be used in conjunction with sheet BAR/L/12A.
2. Dimensions "A", "B", "C", and "D" listed in the bar list are in inches.
# VARIABLE DIMENSIONS AND QUANTITIES FOR TWIN 10 x 8 BARREL SECTIONS

<table>
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<th>DIMENSIONS</th>
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<th>F</th>
<th>E</th>
<th>D</th>
<th>C</th>
<th>B</th>
<th>A</th>
<th>L1</th>
<th>L2</th>
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**BENT BAR DETAIL**

- **BARS**
  - 0
  - 5 SPA @ 1'-0; f1 BARS
  - 0 @ 1'-3

- **DIMENSIONS**
  - All dimensions are out to out.

**NOTES:**

1. Dimensions listed on this sheet to be used in conjunction with sheet TWRB 10-12.
2. Dimensions "A", "B", "C", "D", and "SP." listed in the bar list are in inches.

---

**IOWA DOT STANDARD DESIGN**

**TWIN REINFORCED CONCRETE BOX CULVERTS**

APRIL, 2012

**CULVERT BARREL DETAILS**

10 x 8 BARREL SECTIONS

---

**APPROVED BY BRIDGE ENGINEER**

---

**Highway Division**

---

**CULVERT BARREL DETAILS**

10 x 8 BARREL SECTIONS

---

**TWRB 10-12**

---
VARIABLE DIMENSIONS AND QUANTITIES FOR TWIN 10 x 9 BARREL SECTIONS

<table>
<thead>
<tr>
<th>BAR</th>
<th>SPACING</th>
</tr>
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<tbody>
<tr>
<td>5</td>
<td>1'-6; 62 BARS</td>
</tr>
<tr>
<td>8</td>
<td>1'-0; 68 BARS</td>
</tr>
<tr>
<td>8</td>
<td>1'-0; 71 BARS</td>
</tr>
<tr>
<td>5</td>
<td>1'-6; 47 BARS</td>
</tr>
</tbody>
</table>

**PERMISSIBLE CONSTRUCTION JOINT**

**ALLENTED KEYWAY**

**BENT BAR DETAIL**

**BAR LIST**

**FILL**

**NOTES:**
1. DIMENSIONS LISTED ON THIS SHEET TO BE USED IN CONJUNCTION WITH SHEET TWRCB G2-12.
2. DIMENSIONS "A", "B", "C", "D", "E", AND "SP." LISTED IN THE BAR LIST ARE IN METERS.
3. STEEL VARIABLE DIMENSIONS AND QUANTITIES FOR TWIN 10 x 9 BARREL SECTIONS

Highway Division

IOWA DOT

STANDARD DESIGN

TWIN REINFORCED CONCRETE BOX CULVERTS

APRIL, 2012

CULVERT BARREL DETAILS

TWRCB 10-9-12
# VARIABLE DIMENSIONS AND QUANTITIES FOR TWIN 10 x 10 BARREL SECTIONS

## BAR LIST

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<th>NO.</th>
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<th>S</th>
<th>L</th>
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<td>24</td>
<td>6</td>
<td>12</td>
<td>18</td>
<td>24</td>
<td>30</td>
<td>36</td>
<td>42</td>
<td>48</td>
<td>54</td>
<td>60</td>
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<td>24</td>
<td>30</td>
<td>36</td>
<td>42</td>
<td>48</td>
<td>54</td>
<td>60</td>
</tr>
</tbody>
</table>

## NOTES:

1. Dimensions listed on this sheet to be used in conjunction with SHEET TWRCB 10-01.
2. Dimensions "A", "B", "C", "D", "E", and "SP." listed in the bar list are in inches.

---

**TWIN 10 x 10 BARREL SECTION**

**BENT BAR DETAIL**

**NOTES:**

1. All dimensions are cut to O.D. 2 1/2 in diameter.
VARIABLE DIMENSIONS AND QUANTITIES FOR TWIN 10 x 11 BARREL SECTIONS

NOTES:
1. DIMENSIONS LISTED ON THIS SHEET TO BE USED IN CONJUNCTION WITH SHEET TWRD 11-12.
2. DIMENSIONS "SP, "ALTERNATE", and "VARIABLE" LISTED IN THE BAR LIST ARE IN INCHES.

PERMISSIBLE DIMENSIONS

INCHES

NOTES:

BENT BAR DETAIL

CULVERT BARREL

TWIN REINFORCED CONCRETE BOX CULVERTS

APRIL 2012

CULVERT BARREL DETAILS

TWRCB 10-11-12
VARIABLE DIMENSIONS AND QUANTITIES FOR TWIN 10 x 12 BARREL SECTIONS

Dimensions

| Fill | Steel | M | A | B | C | D | E | F | G | H | L | M | N | K | L | Q | R | S | T | U | V | W | X | Y | Z |
| 15' 0 | 15' 0 | 15' 0 | 15' 0 | 15' 0 | 15' 0 | 15' 0 | 15' 0 | 15' 0 | 15' 0 | 15' 0 | 15' 0 | 15' 0 | 15' 0 | 15' 0 | 15' 0 | 15' 0 | 15' 0 | 15' 0 | 15' 0 | 15' 0 | 15' 0 | 15' 0 | 15' 0 | 15' 0 | 15' 0 | 15' 0 |

Bent Bar Detail

<table>
<thead>
<tr>
<th>BARS</th>
<th>NO.</th>
<th>5'</th>
<th>6'</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5</td>
<td>6</td>
<td>6</td>
</tr>
</tbody>
</table>

Bar List

<table>
<thead>
<tr>
<th>1. Culvert Barrel</th>
<th>Twin Reinforced Concrete Box Culverts</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 x 12 Barrel Sections</td>
<td></td>
</tr>
</tbody>
</table>

Notes:
1. Dimensions listed on this sheet to be used in conjunction with Sheet TWRB 10-12.
2. Dimensions "L", "V", "Q", and "SP." listed in the bar list are in inches.

Iowa DOT

Standard Design

Twin Reinforced Concrete Box Culverts

April, 2017

Culvert Barrels

Details

K4 & m4

NOTE: All dimensions are cut to cut, d x 1/2" minimum.
VARIABLE DIMENSIONS AND QUANTITIES FOR TWIN 12 x 4 BARREL SECTIONS

<table>
<thead>
<tr>
<th>NUMBER</th>
<th>WIDTH</th>
<th>HEIGHT</th>
<th>DIAMETER</th>
<th>LENGTH</th>
<th>MATERIAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>12</td>
<td>4</td>
<td>364.84</td>
<td>11.11</td>
<td>STEEL</td>
</tr>
<tr>
<td>2</td>
<td>12</td>
<td>4</td>
<td>363.16</td>
<td>11.11</td>
<td>STEEL</td>
</tr>
<tr>
<td>3</td>
<td>12</td>
<td>4</td>
<td>417.89</td>
<td>11.11</td>
<td>STEEL</td>
</tr>
</tbody>
</table>

Conclusions and drawings related to the design and construction of Culvert Barrels for Highway Bridge Projects.

NOTES:
1. Dimensions listed on this sheet to be used in conjunction with Sheet Twin Culvert.
2. Dimensions in "AB, CD, EF, and GH" listed in the Bar List are in Inches.
3. Bar List:
   - Bars 0
   - Bars 32
   - Bars 42

Bent Bar Detail:
- k4 & m4

Construction Joint:
- Beveled Keyway

Twin 12 x 4 Barrel Section

Approved by Bridge Engineer:

Highway Division

IOWA DOT

TWIN REINFORCED CONCRETE BOX CULVERTS

CULVERT BARREL DETAILS

TWRCB 12-4-12
VARIABLE DIMENSIONS AND QUANTITIES FOR TWIN 12 x 5 BARREL SECTIONS

<table>
<thead>
<tr>
<th>BAR LIST</th>
<th>DIMENSIONS</th>
<th>QUANTITIES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTES:**
1. Dimensions listed on this sheet to be used in conjunction with sheet TWRCB G2-12.
2. Dimensions "A", "B", "C", "D", "E", and "SP." listed in the bar list are in inches.

**TWIN 12 x 5 BARREL SECTION**

**BENT BAR DETAIL**

- **bars:**
  - 5 32
  - 6 42
  - 7 32

**ALTERNATE**

- **steel:**
  - 375.00
  - 394.45
  - 413.21

- **symmetrical about e**

- **alternate spacing**

- **alternate keyway**

- **alternative spacing**

**CONSTRUCTION JOINT**

- **permissible**

**APPROVED BY BRIDGE ENGINEER**

**IOWA DOT**

**HIGHWAY DIVISION**

**TWIN REINFORCED CONCRETE BOX CULVERTS**

**APRIL 2012**

**TWR12 12-5-12**
VARIABLE DIMENSIONS AND QUANTITIES FOR TWIN 12 x 11 BARREL SECTIONS

<table>
<thead>
<tr>
<th>BAR LIST</th>
<th>DIMENSIONS</th>
<th>QUANTITIES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**BENT BAR DETAIL**

- **BARS**
  - 5
  - 6
  - 7

**NOTE:**
- All dimensions are cut to cut, D = pin diameter.

**TWIN 12 x 11 BARREL SECTION**

**NOTES:**
1. Dimensions listed on this sheet to be used in conjunction with Sheet TWRCB 12-11-12.
2. Dimensions "A", "B", "C", "D", and "SP." listed in the bar list are in inches.
**Notes:**

1. Bar spacings and positions shown are similar for all sizes of headwalls in this standard.
2. Headwall bars consistently referenced from end of wing for all headwalls.
3. Top transverse floor bars are referenced approximately 4', from the back of the parapet for all headwalls.
4. There are no bar bands in the 4' & 5' height headwalls.
5. Bar bands used only in the 6', 7', & 8' height headwalls.
6. For dimension tables, see sheet TWH 0-1-12.
7. For reinforcement in curtain wall, see curtain wall details this sheet.

**Plan View - Top & Bottom of Apron Reinforcing Bars**
TYPICAL VIEW - FRONT FACE REINFORCING

TYPICAL VIEW - INTERIOR WALL

TYPICAL VIEW - BACK FACE REINFORCING

TYPICAL SECTION - NEAR CENTER OF APRON

SECTION THRU PARAPET

NOTES:
1. BAR SPACING AND POSITIONS SHOWN ARE SIMILAR FOR ALL SIZES OF HEADWALL IN THIS STANDARD.
2. TWO 4c3 BARS FOR 4, 5, 6, & 7'-0' HEIGHT HEADWALLS. ONE 4c3 BAR FOR 8'-0' & 9'-0' HEIGHT HEADWALLS.
3. TWO 5c7 BARS FOR 4, 5, 6, & 7'-0' HEIGHT HEADWALLS. ONE 5c7 BAR FOR 8'-0' & 9'-0' HEIGHT HEADWALLS.
4. NOT APPLICABLE FOR 4 & 5'-0' HEIGHT HEADWALLS.
5. NOT APPLICABLE FOR 4'-0' THRU 7'-0' HEIGHT HEADWALLS.
6. FOR DIMENSION TABLE SEE SHEET TWH 0-1-12.
### BILL OF REINFORCING FOR ONE HEADWALL 0° SKEW CULVERT SPAN x CULVERT HEIGHT

<table>
<thead>
<tr>
<th>BAR</th>
<th>LOCATION</th>
<th>SHEET</th>
<th>LENGTH</th>
<th>WT.</th>
<th>VAR.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TRUCK ANCHOR SHEAR</td>
<td></td>
<td>4'-10 TO 6'-3</td>
<td>175</td>
<td>125</td>
</tr>
<tr>
<td>303</td>
<td>WALL</td>
<td></td>
<td>4'-0 TO 17'-11</td>
<td>135</td>
<td>100</td>
</tr>
<tr>
<td>281</td>
<td>WALL</td>
<td></td>
<td>4'-0 TO 17'-11</td>
<td>135</td>
<td>100</td>
</tr>
<tr>
<td>305</td>
<td>INTERIOR WALL, BOTH FA</td>
<td></td>
<td>4'-0 TO 17'-11</td>
<td>135</td>
<td>100</td>
</tr>
<tr>
<td>313</td>
<td>WALL</td>
<td></td>
<td>4'-0 TO 17'-11</td>
<td>135</td>
<td>100</td>
</tr>
</tbody>
</table>

### BENT BAR DETAILS

- **4b1, 5b3, 4 & 6f3**: 
  - Length: 4'-11 to 5'-9
  - Weight: 230 to 270 lb

- **5c7, 8, 9**: 
  - Length: 6'-3 to 6'-4
  - Weight: 230 to 270 lb

- **6s4**: 
  - Length: 6'-8 to 7'-0
  - Weight: 230 to 270 lb

- **6f3**: 
  - Weight: 150 to 175 lb

### HEADWALL NOTES:

1. SEE DRAWING THRU 5-10 FOR GENERAL INFORMATION SPECIFICATIONS, AND DESIGN SPECIFICATIONS.
2. THIS BILLING IS BASED ON A 30'-6" NORMAL TO CENTERLINE OF ROADWAY.
3. THE SHAPES OF THE SHEAR ARMS ARE TO BE FORMED TO INSURE CONCRETE AND GRACE.
4. ALL CAP AND FLOOR REINFORCING STEEL IS TO BE SUPPORTED BY BAR CHAMPS AT INTERVALS OF NOT MORE THAN 3'-0" IN EITHER DIRECTION AS SPECIFIED IN THE STANDARD SPECIFICATIONS.
5. CLEAR DISTANCE FROM FACE OF CONCRETE TO NEAR REINFORCING BAR IS TO BE 3'-0" FOR SHEAR ARMS.
6. CONCRETE AND FLOOR REINFORCING STEEL IS TO BE SUPPORTED BY BAR CHAMPS AT INTERVALS OF NOT MORE THAN 3'-0" IN EITHER DIRECTION AS SPECIFIED IN THE STANDARD SPECIFICATIONS.
7. HORIZONTAL TAIL OF BARS 5'-0" ESTIMATES TO EXTEND PAST REINFORCEMENT MISTS INTARIO TO END OF CEMENT AND 4'-0" ESTIMATES TO PROJECT INTO END SECTION OF SHEAR A MINIMUM OF 2'-0" BEYOND REINFORCEMENT MISTS INTARIO.
8. THE LENGTH COLUMN REFLECTS TOTAL NUMBER OF FEET NECESSARY TO MEET THESE REQUIREMENTS.

---

IOWA DOT

**TWIN REINFORCED CONCRETE BOX CULVERTS**

**APRIL, 2012**

**FLARED WING HEADWALLS**

**TWH 0-4-12**

**2° SKIN**
### Headwall Notes:
1. See drawings sheets 5-3 for general information, specifications, and design criteria.
2. This requirement based on a 30° skew normal to centerline of roadway.
3. The sizes of the footing are to be formed to provide concrete line and grade.
4. All slab and floor reinforcing steel is to be supported by bar charts at intervals of not more than 5-in either direction as specified in the standard specifications.
5. Clear distance from face of concrete to near reinforcing bar is to be shown on the drawing section of detail.
6. Concrete quantities are estimated from back of parapet.
7. Horizontal tails of bars are to be extended 2'-0 beyond parapet, longitudinal bars are 2'-8 to 2'-9, and 2'-9 to 2'-10.
8. The length column reflects total number of feet necessary to meet these requirements.

### Bill of Reinforcing for One Headwall 0° Skew Culvert Span x Culvert Height

<table>
<thead>
<tr>
<th>Slab</th>
<th>Location</th>
<th>B.F.</th>
<th>Slab</th>
<th>Location</th>
<th>B.F.</th>
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</thead>
<tbody>
<tr>
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</table>

### Bent Bar Details

<table>
<thead>
<tr>
<th>Orientation</th>
<th>B.F.</th>
<th>Slab</th>
<th>Slab</th>
<th>Slab</th>
<th>Slab</th>
<th>Slab</th>
<th>Slab</th>
<th>Slab</th>
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</tr>
</tbody>
</table>

### General Information

- The lengths column reflects total number of feet necessary to meet these requirements.
- Headwalls are to be formed to provide concrete line and grade.

### Twin Reinforced Concrete Box Culverts

**FLARED WING HEADWALLS**

<table>
<thead>
<tr>
<th>Location</th>
<th>Slab</th>
<th>Slab</th>
<th>Slab</th>
<th>Slab</th>
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</tbody>
</table>

**IOWA DOT**

Standard Design
Highway Division

**TWIN REINFORCED CONCRETE BOX CULVERTS**

**FLARED WING HEADWALLS**

TWH 0-5-12

*5'-0" BEYOND BACK OF PARAPET.*
## Dimension Table

<table>
<thead>
<tr>
<th>S</th>
<th>H</th>
<th>E</th>
<th>D</th>
<th>C</th>
<th>B</th>
<th>A</th>
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<tbody>
<tr>
<td>27'-0&quot;</td>
<td>26'-0&quot;</td>
<td>19'-0&quot;</td>
<td>25'-0&quot;</td>
<td>22'-0&quot;</td>
<td>16'-0&quot;</td>
<td>15'-0&quot;</td>
</tr>
<tr>
<td>20'-0&quot;</td>
<td>19'-0&quot;</td>
<td>14'-0&quot;</td>
<td>15'-0&quot;</td>
<td>16'-0&quot;</td>
<td>18'-0&quot;</td>
<td>19'-0&quot;</td>
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<tr>
<td>25'-0&quot;</td>
<td>24'-0&quot;</td>
<td>20'-0&quot;</td>
<td>19'-0&quot;</td>
<td>16'-0&quot;</td>
<td>17'-0&quot;</td>
<td>18'-0&quot;</td>
</tr>
<tr>
<td>22'-0&quot;</td>
<td>21'-0&quot;</td>
<td>17'-0&quot;</td>
<td>16'-0&quot;</td>
<td>13'-0&quot;</td>
<td>14'-0&quot;</td>
<td>14'-0&quot;</td>
</tr>
<tr>
<td>20'-0&quot;</td>
<td>19'-0&quot;</td>
<td>14'-0&quot;</td>
<td>15'-0&quot;</td>
<td>16'-0&quot;</td>
<td>18'-0&quot;</td>
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<td>15'-0&quot;</td>
<td>16'-0&quot;</td>
<td>18'-0&quot;</td>
<td>19'-0&quot;</td>
</tr>
<tr>
<td>16'-0&quot;</td>
<td>15'-0&quot;</td>
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<td>15'-0&quot;</td>
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<td>15'-0&quot;</td>
<td>16'-0&quot;</td>
<td>18'-0&quot;</td>
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<tr>
<td>14'-0&quot;</td>
<td>14'-0&quot;</td>
<td>14'-0&quot;</td>
<td>15'-0&quot;</td>
<td>16'-0&quot;</td>
<td>18'-0&quot;</td>
<td>19'-0&quot;</td>
</tr>
</tbody>
</table>

### Notes:
1. See Sheet Nos. C-1-12 for general information, specifications, and design criteria.
PLAN VIEW - TOP OF APRON REINFORCING BARS

PLAN VIEW - BOTTOM OF APRON REINFORCING BARS

NOTES:
1. Bar spacings and positions shown are similar for all sizes of headwalls in this standard.
2. Wingwall bars consistently referenced from end of wing for all headwalls.
3. Top transverse floor bars are referenced approximately 4" from the back of the parapet for all headwalls.
4. There are no 6c13 bars in the 4' & 5' height headwalls.
5. 4c3 & 4c4 bars used only in the 9', 10', 11' & 12' height headwalls.

**TWIN REINFORCED CONCRETE BOX CULVERTS**
APRIL, 2012

FLARED WING HEADWALLS

IOWA DOT
Highway Division

TWH 15-3-12

1. For reinforcing in curtain wall see curtain wall details on sheet 15-4-12.

* - See Note 4
~ - See Note 5
TYPICAL SECTION - NEAR CENTER OF APRON

CURTAIN WALL PLAN

NOTES:
2. For Dimension Table and Design stresses see Sheet TWH 15-2-12.

CHART WITHIN SHEET

FLARED WING HEADWALLS

TWIN REINFORCED CONCRETE BOX CULVERTS

APRIL, 2012

Highway Division

IOWA DOT

STANDARD DESIGN

E2 SHEET

12/20/2016 10:50:13 AM

E:\Highway\Bridge\MethodsSection\10409 Concept Drafts\C\C\I-22\Culverts\English\TWH\15-4-12 - TWH 15-4-12 - TWH 15-4-12 - TWH 15-4-12.pdf
### Bill of Reinforcing for One Headwall 15° Skew Culvert Span x Culvert Height

<table>
<thead>
<tr>
<th>Bar</th>
<th>Location</th>
<th>Shape</th>
<th>Design Location</th>
<th>Bar</th>
<th>Location</th>
<th>Shape</th>
<th>Design Location</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

**Headwall Notes:**
1. See drawing title GB-42 for general information specifications and design stresses.
2. The headwall is based on a 1:5 slope normal to centerline of roadway.
3. The sides of the footing are to be formed to insure correct line and grade.
4. All bars and reinforcing steel is to be supported by bar stays at intervals of 2'-0.
5. Clearance from face of concrete to reinforcing bar is to be at least 3" otherwise noted or shown. Clearance to the bottom end of vertical bars shall be 3'-0.
6. Concrete quantities are estimated back of parapet.
7. Reinforcement bars to be extended 2'-0 beyond back of parapet (1'-7) to centerline of roadway.
8. All dimensions are out to out.
9. Material of reinforcing steel is A36.

**Bent Bar Details**

<table>
<thead>
<tr>
<th>Bent Bar Details</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Standard Design**

TWIN REINFORCED CONCRETE BOX CULVERTS

FLARED WING HEADWALLS

TWH 15-8-12

IOWA DOT Highway Division

**Bill of Reinforcing for One Headwall 15° Skew Culvert Span x Culvert Height**

<table>
<thead>
<tr>
<th>Bar</th>
<th>Location</th>
<th>Shape</th>
<th>Design Location</th>
<th>Bar</th>
<th>Location</th>
<th>Shape</th>
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<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Headwall Notes:**
1. See drawing title GB-42 for general information specifications and design stresses.
2. The headwall is based on a 1:5 slope normal to centerline of roadway.
3. The sides of the footing are to be formed to insure correct line and grade.
4. All bars and reinforcing steel is to be supported by bar stays at intervals of 2'-0.
5. Clearance from face of concrete to reinforcing bar is to be at least 3" otherwise noted or shown. Clearance to the bottom end of vertical bars shall be 3'-0.
6. Concrete quantities are estimated back of parapet.
7. Reinforcement bars to be extended 2'-0 beyond back of parapet (1'-7) to centerline of roadway.
8. All dimensions are out to out.
9. Material of reinforcing steel is A36.

**Bent Bar Details**

<table>
<thead>
<tr>
<th>Bent Bar Details</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
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</tr>
</tbody>
</table>

**Standard Design**

TWIN REINFORCED CONCRETE BOX CULVERTS

FLARED WING HEADWALLS

TWH 15-8-12

IOWA DOT Highway Division
NOTES:

1. See Sheet TWH 30-1-12 for general information, specifications, and design stresses.

2. See Sheet TWH 30-2-12 for dimension table.

STANDARD DESIGN

BOX CULVERTS

APRIL, 2012

HEADWALLS

FLARED WING

TWH 30-1-12

Highway Division
|    | A | B | C |    | D1 | D2 | E1 | E2 | F1 | G1 | G2 | G3 | G4 | G5 | G6 | G7 | G8 | H1 | H2 | H3 | H4 | H5 | H6 | H7 | H8 | H9 | H10 | H11 | H12 | H13 | H14 | H15 | H16 | H17 | H18 | H19 | H20 | H21 | H22 |
|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| X | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" |
| Y | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" |
| Z | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" | 23'0" |
|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|

**NOTES:**
1. See Sheet TWH 30-1-12 for general information, specifications, and design criteria.
2. See sheets TWH 30-3-12 thru TWH 30-5-12 for location of certain dimensions tabled.

**APPROVED BY BRIDGE ENGINEER**

**FLARED WING HEADWALLS**

**TWH 30-2-12**
NOTES:

1. Bar spacings and positions shown are similar for all sizes of headwalls in this standard.
2. Headwall bars consistently referenced from end of wing for all headwalls.
3. Top transverse floor bars are referenced approximately 4' from the back of the parapet for all headwalls.
4. There are R25 bars in the 0 & 6' height headwalls.
5. 4c1 & 4c2 bars used only in the 9', 10', 11' & 12' height headwalls.
6. For transverse table see sheet TWH 30-2-12.
7. For reinforcing in curtain wall see curtain wall details on sheet TWH 30-4-12.

**Notes:**

- See Note 4
- See Note 5
TYPICAL SECTION - NEAR CENTER OF APRON

CULVERT SPAN = 6'
CULVERT HEIGHT = 2'-6"

CURTAIN WALL PLAN

SECTION THRU CURTAIN WALL

SECTION THRU PARAPET

TOP OF WINGWALL DETAILS

NOTES:
1. SEE SHEET TWH 30-4-12 FOR GENERAL INFORMATION, SPECIFICATIONS, AND DESIGN STRESSES.
2. FOR DIMENSION TABLE SEE SHEET TWH 30-2-12.

HEADWALLS

FLARED WING

FLARED WING DETAILS

TYPICAL SECTION - NEAR CENTER OF APRON

CURTAIN WALL PLAN

SECTION THRU CURTAIN WALL

SECTION THRU PARAPET

TOP OF WINGWALL DETAILS

NOTES:
1. SEE SHEET TWH 30-4-12 FOR GENERAL INFORMATION, SPECIFICATIONS, AND DESIGN STRESSES.
2. FOR DIMENSION TABLE SEE SHEET TWH 30-2-12.
**BENT BAR DETAILS**

**TWIN REINFORCED CONCRETE**

**BILL OF REINFORCING FOR ONE HEADWALL 30° SKEW CULVERT SPAN X CULVERT HEIGHT**

<table>
<thead>
<tr>
<th>HEADWALL</th>
<th>LENGTH</th>
<th>SUBTOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>WINGWALL, B.F.V. SHORT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WINGWALL, B.F.V. LONG</td>
<td></td>
<td></td>
</tr>
<tr>
<td>INTERIOR WALL, BOTH F.H.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**HEADWALL NOTES:**

- Ensure that reinforcing is placed at the specified locations.
- Check the reinforcing schedule for complete placement.
- Refer to the detail drawings for reinforcement details.

---

**TWIN REINFORCED CONCRETE HEADWALLS**

**TWH 30-7-12**

**FLARED WING BOX CULVERTS**

---

**LATEST REVISION DATE**

Approved by: [signature]

[Date]
<table>
<thead>
<tr>
<th>Location</th>
<th>Footing Est.</th>
<th>Dimensions</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTERIOR WALL, BOTH F.H.</td>
<td>8329 LB</td>
<td>37'-5 x 19'-7</td>
<td>SHAPE</td>
</tr>
<tr>
<td>APRON, LONGIT., BOTT. SHORT LENGTH</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>APRON, TRANS., TOP LENGTH</td>
<td>6'-4</td>
<td>20'-10 x 391</td>
<td>140</td>
</tr>
<tr>
<td>LOCATION</td>
<td></td>
<td></td>
<td>20</td>
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<tr>
<td>7ji</td>
<td>45'-11</td>
<td>2'-10 x 8'-0</td>
<td>110</td>
</tr>
<tr>
<td>6m2</td>
<td>11'-10</td>
<td>10'-6 x 40'-9</td>
<td>5c14</td>
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</tr>
<tr>
<td>22'-11</td>
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<td>1'-9 to 5'-5</td>
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</tr>
<tr>
<td>1'-7</td>
<td></td>
<td>8'-5 to 14'-7</td>
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<tr>
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<td>-</td>
<td>10'-3</td>
<td>VAR.</td>
</tr>
<tr>
<td>20'-5</td>
<td></td>
<td>1'-10 TO 24.2 CY</td>
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</tr>
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<td>23'-1</td>
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<td>369</td>
<td>VAR.</td>
</tr>
<tr>
<td>255</td>
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<td>2'-8 TO 5708 LB</td>
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</tr>
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<td>91</td>
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<td>9</td>
<td>VAR.</td>
</tr>
<tr>
<td>18</td>
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<td>9</td>
<td>VAR.</td>
</tr>
<tr>
<td>42</td>
<td></td>
<td>9</td>
<td>VAR.</td>
</tr>
<tr>
<td>141</td>
<td></td>
<td>2'-9 TO 39'-9</td>
<td>VAR.</td>
</tr>
<tr>
<td>21'-0</td>
<td></td>
<td>8'-9 TO 39'-9</td>
<td>VAR.</td>
</tr>
<tr>
<td>21'-0</td>
<td></td>
<td>5'-3 TO 39'-9</td>
<td>VAR.</td>
</tr>
<tr>
<td>21'-0</td>
<td></td>
<td>2'-9 TO 39'-9</td>
<td>VAR.</td>
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<tr>
<td>21'-0</td>
<td></td>
<td>5'-3 TO 39'-9</td>
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<tr>
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<td>VAR.</td>
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<tr>
<td>21'-0</td>
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<td></td>
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<tr>
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<td>VAR.</td>
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<td></td>
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<td>5'-3 TO 39'-9</td>
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<td>21'-0</td>
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<td>2'-9 TO 39'-9</td>
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<tr>
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<td>5'-3 TO 39'-9</td>
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<td>2'-9 TO 39'-9</td>
<td>VAR.</td>
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<tr>
<td>21'-0</td>
<td></td>
<td>5'-3 TO 39'-9</td>
<td>VAR.</td>
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<tr>
<td>21'-0</td>
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<td>2'-9 TO 39'-9</td>
<td>VAR.</td>
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<td>5'-3 TO 39'-9</td>
<td>VAR.</td>
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<td>21'-0</td>
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<td>2'-9 TO 39'-9</td>
<td>VAR.</td>
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<tr>
<td>21'-0</td>
<td></td>
<td>5'-3 TO 39'-9</td>
<td>VAR.</td>
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<tr>
<td>21'-0</td>
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<td>2'-9 TO 39'-9</td>
<td>VAR.</td>
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<td>21'-0</td>
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<td>5'-3 TO 39'-9</td>
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<td>21'-0</td>
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<td>5'-3 TO 39'-9</td>
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<td>2'-9 TO 39'-9</td>
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<tr>
<td>21'-0</td>
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<td>5'-3 TO 39'-9</td>
<td>VAR.</td>
</tr>
</tbody>
</table>
NOTES:
1. See Sheet TWH 45-12 for general information, specifications, and design stresses.
2. See Sheet TWH 45-2-12 for dimension table.
PLAN VIEW - TOP OF APRON REINFORCING BARS

NOTES:
1. Bar spacings and positions shown are similar for all sizes of headwalls in this standard.
2. Top transverse floor bars are referenced approximately 4" from the back of the parapet for all headwalls.
3. For enddimension table see sheet TWH 45-2-12.
4. For reinforcing in curtain wall see curtain wall details on sheet TWH 45-5-12.
NOTES:
1. Bar spacings and positions shown are similar for all sizes of headwalls in this standard.
2. Headwall bars consistently referenced from end of wing for all headwalls.
3. There are no 6c14 bars in the 4' & 5' headwalls.
4. 6c13 & 4c14 bars used only in the 9', 10', 11' & 12' height headwalls.
5. For dimension table see sheet TWH 45-2-12.
6. For reinforcing in curtain wall see curtain wall details on sheet TWH 45-1-12.
TYPICAL SECTION - NEAR CENTER OF APRON

CURTAIN WALL PLAN

NOTES:
1. SEE SHEET TWH 45-2-12 FOR GENERAL INFORMATION, SPECIFICATIONS, AND DESIGN STRESSES.
2. FOR DIMENSION TABLE SEE SHEET TWH 45-2-12.
### Bill of Reinforcing for One Headwall 45° Skew Culvert Span x Culvert Height

<table>
<thead>
<tr>
<th>Bar</th>
<th>Location</th>
<th>Shape</th>
<th>Dia</th>
<th>Length</th>
<th>Tan</th>
<th>Var.</th>
</tr>
</thead>
<tbody>
<tr>
<td>554</td>
<td>Headwall</td>
<td>Longitudinal</td>
<td>2</td>
<td>5'-10</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>512</td>
<td>Headwall</td>
<td>Longitudinal</td>
<td>2</td>
<td>7'-10</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>554</td>
<td>Headwall</td>
<td>Longitudinal</td>
<td>2</td>
<td>7'-10</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>512</td>
<td>Headwall</td>
<td>Longitudinal</td>
<td>2</td>
<td>8'-8</td>
<td>2</td>
<td>10</td>
</tr>
</tbody>
</table>

**NOTES:**
1. All dimensions are in ft. and in. (0'-0" or 0'-0-0"
2. Bar lengths may include splices as noted
3. Bend bar details are shown on separate sheet
4. Headwall is based on a 1/6 slope normal to centerline of bridge
5. All ties and bend bars are to be supported by bar clamps at intervals of not more than 3'-0" in either direction as outlined in the standard specifications
6. Reinforcement for caps and haunches is to be specified otherwise noted or shown.
7. The bar size, shape, and length are to be based on the calculations of the responsible engineer.
8. Concrete quantities are estimated from plans and specifications, and may be subject to changes.
9. The length column reflects total number of feet necessary to meet these requirements.
NOTES:

1. THE DETAILS SHOWN ON THIS SHEET ARE AN OPTION FOR THE CONTRACTOR TO CONSTRUCT THE FLOOR OF THE BELL JOINT WITH A PERMISSIBLE CONSTRUCTION JOINT AS SHOWN.
2. REINFORCING STEEL WILL BE PLACED PRIOR TO PLACING THE PHASE I CONCRETE.
3. THE COST OF THE WATERSTOP IS CONSIDERED INCIDENTAL TO THE PROJECT.
4. A 2" x 6" BEVELED KEYWAY WILL BE FORMED TO THE DISTANCE SHOWN AND LOCATION NOTED BEFORE PLACING THE CONCRETE.
5. FOR DETAILS AND DIMENSIONS OF THE BELL JOINT REFER TO THE BELL JOINT STANDARD SHEETS.