Missouri Department of Transportation

This set of standard plans has been approved by the Missouri Highways and Transportation Commission for highway construction projects and constitutes a contract document in accordance with Section 101.2 of the Standard Specifications for Highway Construction.

This set of Standard Plans is effective beginning with the October 2020 bid opening.

www.modot.org/business/standards_and_specs/standardplans.htm
MISSOURI HIGHWAYS AND TRANSPARATION COMMISSION
MISSOURI STANDARD PLANS FOR HIGHWAY CONSTRUCTION

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Grolind Line

SOLID AREA INDICATES ADDITIONAL AREA TO BE ADDED TO PAY LIMITS WHERE STABILIZED SHOULDERS ARE USED.

RIGID PAVEMENT

FLEXIBLE PAVEMENT

SOLID AREA INDICATES ADDITIONAL AREA TO BE ADDED TO PAY LIMITS WHERE FULL WIDTH BASE IS USED.

EXCAVATION PAY LIMITS

SOLID AREA INDICATES ADDITIONAL EMBANKMENT WHERE STABILIZED SHOULDERS ARE NOT USED.

EMBANKMENT LIMITS

SOLID AREA INDICATES ADDITIONAL EMBANKMENT WHERE FULL WIDTH BASE IS NOT USED.

INTERCEPTION DITCH AND/OR LEVEE

LEVEE

LEVEE AND DITCH

SUBSURFACE LOGS OF MATERIALS OBTAINED DURING THE SOIL SURVEY FOR THE PURPOSE OF CUT CLASSIFICATION MAY BE ACQUIRED FROM THE DISTRICT OFFICE UPON REQUEST.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

DATE EFFECTIVE: 08/01/1998
DATE PREPARED: 8/27/2009
203.00E SHEET NO. 1 OF 1
IN ROCK OVER ENTIRE WIDTH OF ROADBED WITH 18" ROCK BASE

IN ROCK OVER ENTIRE WIDTH OF ROADBED WITH TYPE 5 AGGREGATE BASE

IN ROCK OVER PARTIAL WIDTH OF ROADBED
GENERAL NOTES:

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

UNDERGRADING
TYPICAL DETAILS

DATE EFFECTIVE: 01/01/2004
DATE PREPARED: 8/23/2009
SHEET NO. 2 OF 2
Spiraled Curve and Widening Transitions

General Notes:
A practical control for the length of spiral "Ls" is considered to be the super-elevation runoff "Ls". See standard plans 203.22 sheet 1 of 2.

"W" - Widening for Surfacing at Inside Shoulders. See standard plans 203.22 sheet 2 of 2.

Widening transition varies in direct proportion to distance.

Spiral curves are used on all roadways that have design traffic greater than 400 vehicles per day, and have a radius less than the values listed in the "Maximum Radius for Use of a Spiral Curve Transition" table.

Table Note: The effect of spiral curve transition on lateral acceleration is likely to be negligible for larger radii.

Maximum Radius for Use of a Spiral Curve Transition

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Table: Maximum Radii for Use of a Spiral Curve Transition (FOOT)

Spiral Curves and Widening Undivided Highways
SUPERELEVATION
SPIRALS AND WIDENING
UNDIVIDED HIGHWAYS

CASE NUMBER 1

NOTE:
- PROFIL OF OUTSIDE EDGE OF TRAVELED WAY INDICATES CURVE END.
- PROFIL OF INSIDE EDGE INDICATES CURVE END (INDICATED)
- OUTSIDE EDGE OF TRAVELED WAY IS AT CENTERLINE OR TANGENT SECTION.
- OUTSIDE EDGE OF TRAVELED WAY IS TANGENT EDGE OR TANGENT SECTION.

SECTION A-A

SECTION B-B

SECTION C-C

SECTION D-D

CASE NUMBER 1

NOTE:
- PROFIL OF OUTSIDE EDGE OF TRAVELED WAY INDICATES CURVE END.
- PROFIL OF INSIDE EDGE INDICATES CURVE END (INDICATED)
- OUTSIDE EDGE OF TRAVELED WAY IS AT CENTERLINE OR TANGENT SECTION.
- OUTSIDE EDGE OF TRAVELED WAY IS TANGENT EDGE OR TANGENT SECTION.
STRAIGHT LINE METHODS OF ATTAINING SUPERELEVATION
SUPERELEVATION SPIRALS AND WIDENING
UNDIVIDED HIGHWAYS

STRAIGHT LINE METHOD OF ATTAINING SUPERELEVATION

NOTE: SHORT VERTICAL CURVES MAY BE INSERTED AT POINTS OF SPLAYS OR SLOPES OR EDGES IN THE FIELD.

SUPER ELEVATION RISEOFF = L - X

CASE NUMBER 3

PLANE SURFACE

SECTION H-H

OUTSIDE EDGE OF
P AVEMENT (REF.
TO HORIZ. CURVE)

INSIDE EDGE OF
P AVEMENT (REF.
TO HORIZ. CURVE)

SECTION G-G

OUTSIDE EDGE OF
P AVEMENT (REF.
TO HORIZ. CURVE)

INSIDE EDGE OF
P AVEMENT (REF.
TO HORIZ. CURVE)

PLAN OF ALIGNMENT
FOR CASE NUMBER 3

L (SEE STANDARD PLANS 203.22 SHEET 1 OF 2)
**Spiral Curve and Widening Transitions**

**Section on Superelevated Curve Curve to Left (Illustrated)**

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<tr>
<td>3.0</td>
<td>2.25</td>
</tr>
<tr>
<td>3.5</td>
<td>2.50</td>
</tr>
</tbody>
</table>

**Example:** A six lane divided highway is 150 ft wide. The superelevation factor is 1.75. The lane widening factor is 3.0. Therefore, the overall widening factor is 1.75 x 3.0 = 5.25.

---

**General Notes**

A practical control for the length of spiral "L" is considered to be the superelevation ratio "L". See Standard Plans 203.29, Sheet 7 of 7.

"S" is the widening for superelevation at inside shoulder. See Standard Plans 203.29, Sheet 8 of 7.

Widening transition varies in effect proportion to distance.

**Table:**

<table>
<thead>
<tr>
<th>Design Speed</th>
<th>Maximum Radius (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>456</td>
</tr>
<tr>
<td>35</td>
<td>620</td>
</tr>
<tr>
<td>40</td>
<td>810</td>
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<td>45</td>
<td>1025</td>
</tr>
<tr>
<td>50</td>
<td>1265</td>
</tr>
<tr>
<td>55</td>
<td>1521</td>
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<tr>
<td>60</td>
<td>1822</td>
</tr>
<tr>
<td>65</td>
<td>2138</td>
</tr>
<tr>
<td>70</td>
<td>2475</td>
</tr>
</tbody>
</table>

*Table note: The effect of spiral curve transition on lateral acceleration is likely to be negligible for larger radius.*
**MAXIMUM RADIUS FOR USE OF A SPIRAL CURVE TRANSITION**

<table>
<thead>
<tr>
<th>DESIGN SPEED</th>
<th>MAXIMUM RADIUS (FT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>456</td>
</tr>
<tr>
<td>35</td>
<td>629</td>
</tr>
<tr>
<td>40</td>
<td>810</td>
</tr>
<tr>
<td>45</td>
<td>1035</td>
</tr>
<tr>
<td>50</td>
<td>1265</td>
</tr>
<tr>
<td>55</td>
<td>1021</td>
</tr>
<tr>
<td>60</td>
<td>1822</td>
</tr>
<tr>
<td>65</td>
<td>2138</td>
</tr>
<tr>
<td>70</td>
<td>2415</td>
</tr>
</tbody>
</table>

**Table Note:** The effect of spiral curve transition on lateral acceleration is likely to be negligible for larger radii.

---

**General Notes:**

A practical control for the length of spiral "L" is considered to be the super elevation length "L". See standard plans 203.22 sheet 1 of 2.

"L" is the widening for surfacing at inside shoulder. See standard plans 203.22 sheet 2 of 2.

Widening transition varies in direct proportion to distance.

**Superelevation, Spirals, and Widening of Divided Highways**

---

**Maximum Radius for Use of a Spiral Curve Transition**

- **L** = "L" (length of spiral)
- **S** = "S" (speed in mph)
- **a** = "a" (acceleration in g)

**Equation:**

\[ R = \frac{S^2}{a} \]

**Example:**

- For a speed of 65 mph and an acceleration of 0.4 g, the radius is calculated as follows:
  \[ R = \frac{65^2}{0.4} = 10312.5 \text{ ft} \]

**Spiral Curves:***

Spiral curves are used on all roadways that have design speeds greater than 40 mph. For example, if the radius is smaller than the value calculated, 0.5 g should be used for the *S* value in the equation for the maximum radius for use of a spiral curve transition table.
### Minimum Radii for Design Super-elevation Rates, Design Speeds, and $\gamma_{max} = 4\%$

#### Design Speed (MPH)

<table>
<thead>
<tr>
<th>RADIOUS (FT)</th>
<th>L1</th>
<th>L2</th>
<th>L3</th>
<th>L4</th>
<th>L5</th>
<th>L6</th>
<th>L7</th>
<th>L8</th>
<th>L9</th>
<th>L10</th>
<th>L11</th>
<th>L12</th>
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<tbody>
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<td>5</td>
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<td>4.5</td>
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</tr>
<tr>
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<td>2.3</td>
<td>2.9</td>
<td>3.2</td>
<td>3.4</td>
<td>3.9</td>
<td>4.2</td>
<td>4.5</td>
<td>4.8</td>
<td>5.1</td>
<td>5.6</td>
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<td>6.6</td>
</tr>
<tr>
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<td>2.3</td>
<td>2.6</td>
<td>2.9</td>
<td>3.3</td>
<td>3.5</td>
<td>3.8</td>
<td>4.1</td>
<td>4.3</td>
<td>4.8</td>
<td>5.1</td>
<td>5.4</td>
</tr>
<tr>
<td>20</td>
<td>1.6</td>
<td>2.2</td>
<td>2.4</td>
<td>2.6</td>
<td>2.9</td>
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</tr>
<tr>
<td>25</td>
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<td>2.0</td>
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<td>2.3</td>
<td>2.6</td>
<td>2.7</td>
<td>2.9</td>
<td>3.1</td>
<td>3.3</td>
<td>3.6</td>
<td>3.8</td>
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<td>1.4</td>
<td>1.9</td>
<td>2.0</td>
<td>2.2</td>
<td>2.4</td>
<td>2.5</td>
<td>2.7</td>
<td>2.9</td>
<td>3.0</td>
<td>3.3</td>
<td>3.4</td>
<td>3.5</td>
</tr>
<tr>
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<td>1.8</td>
<td>1.9</td>
<td>2.0</td>
<td>2.2</td>
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<td>2.6</td>
<td>2.7</td>
<td>3.0</td>
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<td>3.2</td>
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<td>2.9</td>
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<td>3.1</td>
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<td>1.9</td>
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<td>2.4</td>
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<td>1.9</td>
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<td>2.1</td>
<td>2.2</td>
<td>2.5</td>
<td>2.6</td>
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<td>2.2</td>
<td>2.4</td>
<td>2.5</td>
<td>2.6</td>
</tr>
</tbody>
</table>

#### Table Notes:

- "NC" denotes normal cross slope.
- "AD" denotes adverse cross slope, super-elevated at normal cross slope.
- "SK" denotes the super-elevation in percent (%).

### Missour iHighways and Transportation Commission

- **Superelevation, Spirals, and Widening**

**Rate Effective:** 09/20/21

**Rate Number:** 0203.22

**Sheet:** 1 of 2

**Missouri Highways and Transportation Commission**

105 West Capitol
Jefferson City, MO 65102
1-800-483-MOARD (66273)
### Calculated and Design Values for Traveled Way Widening on Open Highway Curves

<table>
<thead>
<tr>
<th>Curve Radius (FT)</th>
<th>24' Roadway #8H</th>
<th>22' Roadway #8H</th>
<th>20' Roadway #8H</th>
<th>Design Speed (MPH)</th>
<th>Design Speed (MPH)</th>
<th>Design Speed (MPH)</th>
</tr>
</thead>
<tbody>
<tr>
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<td>5.5</td>
<td>4.5</td>
<td>10</td>
<td>9.0</td>
<td>8.0</td>
</tr>
</tbody>
</table>

**Table Notes:**
- "W" is the widening in feet for surfacing at inside shoulders.
- Values shown are for 24'- or 20'-design vehicle.
- Values less than 2.0 feet may be disregarded.
- For 3-lane highways, multiply above values by 1.5.
- For 4-lane highways, multiply above values by 2.0.
* ADD 2' FOR EACH ADDITIONAL MAILBOX

GENERAL NOTES:

IN NO CASE WILL "W" BE LESS THAN SHOULDER WIDTH. "W" WILL BE 8' UNLESS OTHERWISE NOTED ON THE PLANS.

WHEN ENTRANCES ARE ADJACENT TO MAILBOX TURNOUTS, THE AREA AND SURFACING OF THE ENTRANCE MAY BE USED FOR A PortION OF THE MAILBOX TURNOUT.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-MODOT (1-888-663-6868)
DATE EFFECTIVE: 08/01/1981
DATE PREPARED: 08/23/2000
MAILBOX TURNOUTS

DATE affected: 08/01/1981
DATE PREPARED: 08/23/2000

203.35A SHEET NO. 1 OF 1
TYPICAL DETAILS ON AND OFF RAMPS

DIAMOND INTERCHANGES AND OUTER RAMPS OF CLOVERLEAF INTERCHANGES

DATE EFFECTIVE: 10/01/2007
DATE PREPARED: 8/20/2009

RAMP WIDTH

ONE LANE, ONE WAY OPERATION WITH

14' NO PROVISION FOR PASSING STALLED VEHICLES. DESIGN TRUCK VOLUMES
6.5%.

ONE LANE, ONE WAY OPERATION WITH

12' NO PROVISION FOR PASSING STALLED VEHICLES. DESIGN TRUCK VOLUMES
5.5%.

GENERAL NOTES:

SEE OTHER DRAWINGS FOR JOINT LAYOUTS AND STRIPING DETAILS.

THIS DRAWING IS FOR GENERAL INFORMATION ONLY. FOR ACTUAL CONSTRUCTION DETAILS AND PAVEMENT TYPES, SEE OTHER DRAWINGS.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

TYPICAL DETAIL ON AND OFF RAMPS

NOTE:

(1) FOR RAMP SHOULDER WIDTH, SEE TYPICAL SECTIONS.

(2) SEE ROADWAY PLANS.
PLAN VIEW "OFF" RAMPS

SECTION H-H

SECTION G-G

SECTION F-F

SECTION E-E

NOTES:

(1) FOR RAMP SHOULDER WIDTH, SEE TYPICAL SECTIONS.

(2) SEE ROADWAY PLANS.
TYPICAL DETAILS
ON AND OFF RAMPS
DIAMOND INTERCHANGES AND OUTER RAMPS OF CLOVERLEAF INTERCHANGES
(ROADWAYS WITH 6:1 FORESLOPES)
20 FOOT PAVEMENT STRUCTURE

DATE EFFECTIVE: 01/01/1995
DATE PREPARED: 08/23/2009

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

STANDARD SLOPES

SECTION A-A

SECTION D-D

SECTION C-C

SECTION B-B

GENERAL NOTES:

(1) FOR RAMP SHOULDER WIDTH, SEE TYPICAL SECTIONS.

(2) SEE ROADWAY PLANS.

STANDARD ROADWAY DITCH

MAINLINE PAVEMENT CONSTRUCTION BASE

PROFILE GRADE (RAMP)

S.E. SLOPE

VARIABLE SLOPE (S.E. TRANS.)

RAMP CONSTRUCTION BASE

MAINLINE PAVEMENT CONSTRUCTION BASE

DATE EFFECTIVE: 01/01/1995
DATE PREPARED: 08/23/2009

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

STANDARD SLOPES

SECTION A-A

SECTION D-D

SECTION C-C

SECTION B-B

GENERAL NOTES:

(1) FOR RAMP SHOULDER WIDTH, SEE TYPICAL SECTIONS.

(2) SEE ROADWAY PLANS.

STANDARD ROADWAY DITCH

MAINLINE PAVEMENT CONSTRUCTION BASE

PROFILE GRADE (RAMP)

S.E. SLOPE

VARIABLE SLOPE (S.E. TRANS.)

RAMP CONSTRUCTION BASE

MAINLINE PAVEMENT CONSTRUCTION BASE

DATE EFFECTIVE: 01/01/1995
DATE PREPARED: 08/23/2009

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

STANDARD SLOPES

SECTION A-A

SECTION D-D

SECTION C-C

SECTION B-B

GENERAL NOTES:

(1) FOR RAMP SHOULDER WIDTH, SEE TYPICAL SECTIONS.

(2) SEE ROADWAY PLANS.

STANDARD ROADWAY DITCH

MAINLINE PAVEMENT CONSTRUCTION BASE

PROFILE GRADE (RAMP)

S.E. SLOPE

VARIABLE SLOPE (S.E. TRANS.)

RAMP CONSTRUCTION BASE

MAINLINE PAVEMENT CONSTRUCTION BASE

DATE EFFECTIVE: 01/01/1995
DATE PREPARED: 08/23/2009

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

STANDARD SLOPES

SECTION A-A

SECTION D-D

SECTION C-C

SECTION B-B

GENERAL NOTES:

(1) FOR RAMP SHOULDER WIDTH, SEE TYPICAL SECTIONS.

(2) SEE ROADWAY PLANS.

STANDARD ROADWAY DITCH

MAINLINE PAVEMENT CONSTRUCTION BASE

PROFILE GRADE (RAMP)

S.E. SLOPE

VARIABLE SLOPE (S.E. TRANS.)

RAMP CONSTRUCTION BASE

MAINLINE PAVEMENT CONSTRUCTION BASE

DATE EFFECTIVE: 01/01/1995
DATE PREPARED: 08/23/2009

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

STANDARD SLOPES

SECTION A-A

SECTION D-D

SECTION C-C

SECTION B-B

GENERAL NOTES:

(1) FOR RAMP SHOULDER WIDTH, SEE TYPICAL SECTIONS.

(2) SEE ROADWAY PLANS.

STANDARD ROADWAY DITCH

MAINLINE PAVEMENT CONSTRUCTION BASE

PROFILE GRADE (RAMP)

S.E. SLOPE

VARIABLE SLOPE (S.E. TRANS.)

RAMP CONSTRUCTION BASE

MAINLINE PAVEMENT CONSTRUCTION BASE

DATE EFFECTIVE: 01/01/1995
DATE PREPARED: 08/23/2009

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

STANDARD SLOPES

SECTION A-A

SECTION D-D

SECTION C-C

SECTION B-B

GENERAL NOTES:

(1) FOR RAMP SHOULDER WIDTH, SEE TYPICAL SECTIONS.

(2) SEE ROADWAY PLANS.

STANDARD ROADWAY DITCH

MAINLINE PAVEMENT CONSTRUCTION BASE

PROFILE GRADE (RAMP)

S.E. SLOPE

VARIABLE SLOPE (S.E. TRANS.)

RAMP CONSTRUCTION BASE

MAINLINE PAVEMENT CONSTRUCTION BASE

DATE EFFECTIVE: 01/01/1995
DATE PREPARED: 08/23/2009

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

STANDARD SLOPES

SECTION A-A

SECTION D-D

SECTION C-C

SECTION B-B

GENERAL NOTES:

(1) FOR RAMP SHOULDER WIDTH, SEE TYPICAL SECTIONS.

(2) SEE ROADWAY PLANS.
NOTES FOR TYPE I MEDIAN OPENINGS:

MEDIAN OPENINGS AND TAPERS SHALL BE CONSTRUCTED OF THE SAME MATERIAL AND THICKNESS AS THE TRAVELED WAY.

SHOULDERs ADJACENT TO THE MEDIAN OPENING AND TAPERS SHALL BE AS SHOULDERs FOR INTERSTATE AND MAJOR ROADWAYS OR AS SHOULDERs FOR LOW VOLUME MAJORs AND MINOR ROADs.

IN ADDITION TO THE IDENTIFIED SLOPES, SLOPES ADJACENT TO MEDIAN OPENING SHOULDERs SHALL NOT BE STEEPER THAN 5:1.

FOR PRIVATE ENTRANCES, MINOR SIDE ROADS OR FIELD ENTRANCES

**TYPE I MEDIAN OPENING**

<table>
<thead>
<tr>
<th>TAPER LENGTH</th>
<th>&quot;L&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-40 MPH</td>
<td>112.5'</td>
</tr>
<tr>
<td>7-40 MPH</td>
<td>225'</td>
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</table>

SEE TAPER TREATMENT DETAIL A (SHEET 2 OF 2)

SEE TAPER TREATMENT DETAIL B (SHEET 2 OF 2)

NOTES FOR TYPE II MEDIAN OPENINGS:

MEDIAN OPENINGS AND TAPERS SHALL BE CONSTRUCTED OF THE SAME MATERIAL AND THICKNESS AS THE TRAVELED WAY.

SHOULDERs ADJACENT TO THE MEDIAN OPENING AND TAPERS SHALL BE AS SHOULDERs FOR INTERSTATE AND MAJOR ROADWAYS OR AS SHOULDERs FOR LOW VOLUME MAJORs AND MINOR ROADs.

IN ADDITION TO THE IDENTIFIED SLOPES, SLOPES ADJACENT TO MEDIAN OPENING SHOULDERs SHALL NOT BE STEEPER THAN 5:1.

FOR MAJOR SIDE ROADS, STATE ROUTES AND MAJOR COMMERCIAL ENTRANCES

**TYPE II MEDIAN OPENING**

<table>
<thead>
<tr>
<th>TAPER LENGTH</th>
<th>&quot;L&quot;</th>
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</thead>
<tbody>
<tr>
<td>5-40 MPH</td>
<td>125'</td>
</tr>
<tr>
<td>7-40 MPH</td>
<td>250'</td>
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FULL DECELERATION LENGTH

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<th>MINIMUM LENGTH</th>
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<tr>
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<td>480 FT.</td>
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<tr>
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<td>530 FT.</td>
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<tr>
<td>65 MPH</td>
<td>570 FT.</td>
</tr>
<tr>
<td>70 MPH</td>
<td>615 FT.</td>
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</table>
SECTION ALONG MEDIAN OPENING &

THEORETICAL TAPER
CONCRETE MAY BE
OMITTED

EDGE OF PAVEMENT
STRUCTURE

6" SHOULDER

THEORETICAL TAPER

EDGE OF PAVEMENT
STRUCTURE

TAPER TREATMENT

SHOULDER TAPER
TREATMENT

DETAIL A

ISLAND DETAIL

ISLAND WILL BE PAIRED FOR
AS CONCRETE MEDIAN STRIP.

LOW PROFILE ISLAND DETAIL

DETAIL B

TYPICAL MEDIAN OPENING
DIVIDED HIGHWAYS
DRIVEWAY TYPICAL SECTION

IN FILLS

PROFILE VIEW

IN CUTS

GENERAL NOTES:

NO PART OF THE DRIVEWAY EXCLUDING TAPERS SHALL BE CONSTRUCTED BEYOND THE PROPERTY LINE.

SURFACING SHALL BE AS SHOWN ON THE PLANS OR DEPART.

4 INCHES OF TYPE 1 OR 5 BASE SHALL BE PLACED AND COMPACTED BENEATH THE APEX SURFACE OF CONCRETE AND ASPHALT DRIVeways.

LENGTH OF TYPE 1 BASE SHALL BE DETERMINED BY DEPTH AS LOCATION OR BETON MINIMUM 72 INCHES LENGTH OF MINIMUM 15 " DIAMETER PIPE, SEE PLANS.

THIS DRAWING ILLUSTRATES DRIVEWAY DETAILS FOR MINIMUM SITUATIONS. TRAFFIC VOLUMES, SAFETY CONSIDERATIONS, LOCAL REQUIREMENTS, ETC., MAY DEMAND MORE EXTENSIVE IMPROVEMENTS THAN ILLUSTRATED.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-800-345-MADC (6232) 1-573-526-5000
END CURVE AT RADIUS

4' BARRIER CONCRETE OR ASPHALT CUBE OR CONCRETE CUBE AND CUTTER (OPTIONAL, SEE PLANS).

GREAT VARIABLE (SEE PLANS)

RADIUS (SEE PLANS)

CROWN SECTION
(WITH PIPE)

PLAN VIEW

FILL SECTION OR CROWN SECTION
(WITHOUT PIPE)

DITCH SECTION
(WITH PIPE)

PLAN VIEW

GENERAL NOTES:

RECOMMENDED WIDTH OF ROADWAY - 24' WITHOUT PARKING ON ROAD AND 32' WITH PARKING ON ROAD.

SURFACING SHALL BE AS SHOWN ON THE PLANS OR PERMIT.

4 INCHES OF TYPE I OR S BASE SHALL BE PLACED AND COMPACTED BELOW THE APEX SURFACE OF ASPHALT AND CONCRETE DRIVEWAYS.

LENGTH OF PIPE SHALL BE DETERMINED BY DEPTH AND LOCATION OF DITCH (SEE PLANS).

IF A FAVED APPROX IS REQUIRED REFER TO STANDARD PLANS 660.00 FOR CONSTRUCTION DETAILS AND CONSTRUCT CURB UP TO CURB OR FAVED APPROX TRANSITION REQUIRED FROM 3' CUBE TO 6" CUBE.

CURB OR CUBE AND CUTTER BETWEEN RIGHT-OF-WAY LINE AND PIPE MAY MEET LOCAL AGENCY STANDARDS.

THIS DRAWING ILLUSTRATES DETAILS FOR HORIZONTAL SITUATIONS, TRAFFIC VOLUMES, SAFETY CONSIDERATIONS, DRAINAGE (CONTRIBUTING), LOCAL REQUIREMENTS, ETC., MAY DEICTE MORE EXTENSIVE IMPROVEMENTS THAN ILLUSTRATED.

PIPE SIZE AND LOCATION TO BE DETERMINED BY GEOMETRIC AND TRAFFIC CONDITIONS (SEE PLANS).

A MINIMUM 10'-FOOT RIGHT DISTANCE TRIANGLE MEASURED ALONG THE CENTERLINE OF THE INTERSECTING ROADWAY, SHOULD BE PROVIDED.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-699-MADOT (6236) 1-888-327-9696

DRIVEWAY
TYPE II

DATE MEASURED: 4/29/2020
DATE PREPARED: 4/29/2020
GENERAL NOTES:

A. FOR LIGHT DUTY (3000 GRT) DRIVEWAYS BEGIN AT EDGE OF PAVEMENT.

B. RECOMMENDED WIDTH OF DRIVEWAY 40'-0". SKETCH OR PLAN REQUIRED.

C. NO PART OF THE DRIVEWAY EXCLUDING TAPPERS SHALL BE CONSTRUCTED OUTSIDE OF THE PROPERTY FRONTAGE.

D. SURFACING SHALL BE AS SHOWN ON THE PLANS OR PERMIT.

E. 4 INCHES OF TYPE 1 OR 5 BASE SHALL BE PLACED AND COMPACTED BEHIND THE IEEE SURFACE OF CONCRETE AND ASPHALT DRIVEWAYS.

F. LENGTH OF PIPE SHALL BE DETERMINED BY DEPTH AND LOCATION OF DITCH (SEE PLANS).

G. IF A PAVED APPROACH IS REQUIRED, REFER TO STANDARD PLAN NO. 2155. CONSTRUCTION DETAILS OF CURB AND GUTTER WERE INCLUDED IN THE PLAN (SEE PLANS).

H. CURB OR C境界 AND GUTTER BETWEEN DRIVEWAY AND PIPE MAY MEET LOCAL AGENCY STANDARDS.

I. PIPE SIZE AND LOCATION TO BE DETERMINED BY GEOMETRIC AND DRAINAGE CONDITIONS (SEE PLANS).

THIS DRAWING ILLUSTRATES DRIVEWAY DETAILS FOR MINIMUM SITUATION. TRAFFIC VOLUME, SAFETY CONSIDERATIONS, DRAINAGE CONSIDERATIONS, LOCAL REQUIREMENTS, ETC., MAY REQUIRE MORE EXTENSIVE IMPROVEMENTS THAN ILLUSTRATED.

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DRIVEWAY
TYPE III

SIZE: 11" x 8.5"
DRAWN BY: 
CHECKED BY: 
DATE: 7/11/2012
DATE OF ISSUE: 4/20/2010
SHEET NO: 1 OF 2

203.63C
EMBANKMENT CONTROL STAKE

GROUND SURFACE

3"± PORTLAND CEMENT MORTAR LEVELING COURSE

STEEL SETTLEMENT PLATE

1 1/2" DIA. COVER PIPE

GROUND SURFACE

SETTLEMENT GAUGE

ORDINARY BACKFILL

3" PORTLAND CEMENT MORTAR LEVELING COURSE

2" X 4" SPLICE IF REQUIRED

SOUND LUMBER OR 3" ROUND WOOD POST

DI A. RISER PIPE

1/2" CONTINUOUS WELD

3" X 12" X 12"

3" X 4" SPLICE IF REQUIRED

SOUND LUMBER

EMBANKMENT CONTROL MEASURING DEVICES

DATE EFFECTIVE: 04/01/1983
DATE PREPARED: 08/23/2009
204.000
SHEET NO. 1 OF 1

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)
GENERAL NOTES:

- For elevation A and Elevation B Station, locations and embankment control limits. See roadway plans.

**DETAIL A-1**
- Protective steel box or container for storage of excess tubing and terminals. Box to be detachable for casing extensions.
- Coupling welded to steel box or container & screwed tight to casing.
- Jacketed tubing of sufficient length to avoid extensions through embankment.
- 3" casing.

**DETAIL B-1**
- Pipe cap with 1/8 hole in top.
- Nipple.
- Coupling.
- 1/8 PVC pipe extension made with solvent welded couplings.
- 3" casing.

**DETAIL A-2**
- Type A
- 1 1/2" PVC pipe.
- Jacketed tubing.
- 6" - 12" epoxy seal.
- Transducer assembly.
- Porous stone below 2" reducing coupling.
- 2" PVC pipe with 60 - 1/8 holes.

**DETAIL B-2**
- Type B
- 1 1/2" PVC pipe.
- 6" to 12" epoxy seal.
- Solvent welded coupling.
- 1 1/2" PVC pipe with 50 - 1/8 holes drilled in 1/2" extension below pipe coupling.

**GENERAL**
- See detail A-1 & B-1.

**DETAIL A-1**
- 3" iron or steel casing.
- Plywood plate 6" x 4" x 4 layers 1/2" exterior or marine with 3" dia. hole.
- Leveling course of sand.
- Thick bentonite slurry.
- 1 1/2" PVC pipe with solvent welded couplings.
- Compacted moist bentonite balls.
- See detail A-2 & B-2.

**DETAIL A-2**
- Type A
- 1 1/2" PVC pipe.
- Jacketed tubing.
- 6" - 12" epoxy seal.
- Transducer assembly.
- Porous stone below 2" reducing coupling.
- 2" PVC pipe with 60 - 1/8 holes.

**DETAIL B-2**
- Type B
- 1 1/2" PVC pipe.
- 6" to 12" epoxy seal.
- Solvent welded coupling.
- 1 1/2" PVC pipe with 50 - 1/8 holes drilled in 1/2" extension below pipe coupling.

**GENERAL**
- See detail A-1 & B-1.
**OPTION 1**

Mainline Base

Pay limit for mainline base

Incidental base (no direct pay)

**OPTION 2**

Mainline Base

Pay limit for mainline base

Incidental base (no direct pay)

**OPTION 3**

PCC Pavement

Mainline Base

Pay limit for mainline base

Incidental base (no direct pay)

GENERAL NOTE:

The final finish on concrete shoulders may be obtained by the use of a strip consisting of a seamless strip of tar (asphalt), cotton fiber, plastic, turf, or other suitable material capable of providing a uniform surface or gritty texture.

The quantity for additional base material resulting from the variable thickness material of construction methods of Type A2 shoulder will be considered incidental.

Incidental base shall consist of Type 1 or 2 aggregate for base, or an alternate material that meets the approval of the Engineer.

RCC (roller compacted concrete) or PCC (portland cement concrete)

HMA (hot mix asphalt)

**TYPE A2 SHOULDERS**

Pavement on rock base

Use 12" RF-1 over 4" PIR unless otherwise specified on the plans.
GENERAL NOTES:

THE SAFETY EDGE™ SHALL BE CONSTRUCTED AT A SLICE OF 45º FROM THE HORIZONTAL AT THE LENGTH AS MEASURED ALONG THE SLICE, SHALL BE APPROXIMATELY 7 TIMES THE DEPTH, UP TO A MAXIMUM LENGTH OF 6".

THE SAFETY EDGE™ SHALL BE CONSTRUCTED INCONELICENTLY WITH THE SHOULDER OR PAVERMENT.

THE SAFETY EDGE™ SHALL BE BUFFERED AS SHOWN.

Regardless of pavement type, when payment for paverment or shoulder is made per square yard, the material necessary to construct the Safety Edge™ is considered incidental to the payment for shoulder. No measurement will be made for the material used in the Safety Edge™ except when payment for paverment or shoulder is made in volume or weight.

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SAFETY EDGE™

- RCC (ROLLER COMPACTED CONCRETE) OR PCC (PORTLAND CEMENT CONCRETE)
- HMA (HOT MIX ASPHALT)
- BASE MATERIAL (IF APPLICABLE)
STREET BROOMS WITH NYLON BRISTLES

1/4" CHAIN WITH HOOKS

DATE EFFECTIVE: 07/01/2004
DATE PREPARED: 08/25/2009

SCRUB SEAL BROOM CONFIGURATION
TRANSVERSE JOINT SPACING 15'-0" (MAX.)

IF NECESSARY TO PLACE A CONSTRUCTION JOINT OVER A PORTION OF THE PAVEMENT, A CONTRACTION JOINT SHOULD BE PLACED AS SHOWN IN THE REMAINING PORTION.

INTERCHANGE

G 20'-0" 15'-0" *
PCC SHOULDER 3/4" PTM, EXP. JT.
1/4" JT. FILLER
PREMOLDED FILLER MATERIAL
BRIDGE APPROACH SLAB (SEE BRIDGE PLANS)
FULL WIDTH

THEORETICAL TAPER CONCRETE MAY BE OMITTED

TO FLEXIBLE SURFACED ROADS THE E-JOINTS MAY BE ELIMINATED

TAPER TREATMENT

NON-INTERCHANGE

CONCRETE PAVEMENT AND BASE APPURTEENICES FOR 15' JOINT SPACING

DATE EFFECTIVE: 01/01/2020
DATE PREPARED: 10/17/2019
502.05P
SHEET NO. 1 OF 4
PCC SHOULDER 1' TO 4' C1 C1 C1 C1 C1 C1

 DETAIL B
 (FROM SHEET 1 OF 4)

 C1 JOINT SPACING 15'® C1 OR C1

 DETAIL A
 (FROM SHEET 1 OF 4)

 PCC SHOULDER 1' TO 2' L3

 THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

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 CONCRETE PAVEMENT AND BASE APPURTEANCES FOR 15' JOINT SPACING

 DATE EFFECTIVE: 01/01/2020
 DATE PREPARED: 10/17/2019
 SHEET NO. 2 OF 4

 502.05P
CONSTRUCTION JOINT

THE HEADER BOARD SHALL BE SUFFICIENTLY RIGID TO PREVENT EXTENSION FROM THE TYPICAL SECTION AND SOLUTIONS TO STRAIGHT LINE FROM PAVEMENT EDGE TO PAVEMENT EDGE.

THE CONSTRUCTION JOINT MAY BE MAKING WITH THE LENGTHS OF THE HOLES FOR CONTOURS OR HOLE ENDS, ALL SHAIL BE PROFESSIONAL TO PREVENT DAMAGE.

THE CONCRETE BARS SHALL BE JOINED WITH EPOXY OR PAVEMENT MATERIALS AS SPECIFIED IN SECTION 1029.

THE HOLES OF THE PAVEMENT WITHIN THE HOLES SHALL BE CONCRETE WITH AN APPROPRIATE RETRANSMISSION.

LONGITUDINAL CONSTRUCTION JOINT (EXISTING PAVEMENT)
GENERAL NOTES:

THE DOWEL SUPPORTING UNITS SHALL BE FACTORY ASSEMBLED AND CAPABLE OF HOLDING THE DOWELS IN THEIR REQUIRED POSITIONS. IN THE COMPLETED JOINT INSTALLATION, DOWELS SHALL BE POSITIONED WITHIN 1/2" OF THE VERTICAL AND HORIZONTAL PLANE AND IN THE LONGITUDINAL DIRECTION. THE SKEW TOLERANCE SHALL BE 1/4".

THE FREE END OF EACH EPOXY COATED DOWEL SHALL BE MARKED WITH A SPOT OF PAINT AT LEAST ONE INCH IN DIAMETER AND CONTRASTING IN COLOR WITH THE EPOXY COATING.

WIRE SIZES SHOWN ARE MINIMUM REQUIRED.

WIRES, BARS OR CLIPS SHALL BE USED AS NECESSARY TO STRENGTHEN THE ASSEMBLIES.

THE DIAMETER OF THE SPACER WIRE SHALL NOT EXCEED 0.200".

SPACER WIRE MAY BE CUT OR LEFT INTACT.

STAKING PINS SHALL BE FABRICATED FROM 0.306" DIAMETER WIRE MINIMUM WITH A SUITABLE HOOK.

STAKING PINS SHALL HAVE A MINIMUM LENGTH OF 12" FOR DOWEL ASSEMBLIES UNLESS OTHERWISE DIRECTED BY THE ENGINEER.

MINOR VARIATIONS IN THE CONFIGURATION OF THE SUPPORT UNITS WILL BE ALLOWED.

---

**Dowel Supporting Units**

**Approved for use with Transverse Joints**

**Missouri Highways and Transportation Commission**

**Date Effective:**

**Date Prepared:**

**Sheet No.:**

---

**Dowel Bars**

<table>
<thead>
<tr>
<th>PAVEMENT THICKNESS</th>
<th>BAR SIZE</th>
<th>LENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>10&quot; and less</td>
<td>1½&quot;</td>
<td>18&quot;</td>
</tr>
<tr>
<td>Greater than 10&quot;</td>
<td>1½&quot;</td>
<td>18&quot;</td>
</tr>
</tbody>
</table>

---

**Section A-A**

- For pavements having thickness in ¼" increments, dowel baskets shall be half the pavement thickness minus ¼".
- Coat with approved lubricant. Do not lubricate. Keep clean.
- Subgrade
- Top of pavement
- Same joint
- Different leg shapes may be used provided the dowel bars are maintained at the proper position during concrete placement.

---

**Note:**

*For pavements having thickness in ¼" increments, dowel baskets shall be half the pavement thickness minus ¼".*
FOR PAVEMENTS HAVING THICKNESS IN 1/4' INCREMENTS, DOWEL SHALL BE PLACED HALF THE PAVEMENT THICKNESS MINUS 1/4'.

SECTION C-C

GENERAL NOTES:
IN THE COMPLETED JOINT INSTALLATION, DOWELS SHALL BE POSITIONED WITHIN 1/2" OF THE VERTICAL AND HORIZONTAL PLANE AND IN THE LONGITUDINAL DIRECTION. THE SKEW TOLERANCE SHALL BE 1/4".

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SECTION A-A

LIMITS OF CONCRETE APPROACH PAVEMENT

SECTION B-B

LIMITS OF CONCRETE APPROACH PAVEMENT

SECTION C-C

GENERAL NOTES:

SEE STANDARD DRAWING 60510 FOR PIPE OUTLET DETAIL FROM SHOULDER POINT TO INCLINE.

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CONCRETE APPROACH PAVEMENT
(MAJOR ROAD)

504.00K SHEET No.
3 OF 3
LOCATION SURVEY RIGHT-OF-WAY MARKER

FACE TOWARD E
DRAIN PIPE
OFFSET POST LATERALLY FROM PIPE OUTLET

IN EARTH
DRAIN MARKER

IN ROCK

GENERAL NOTES:
WHEN STEEL AND LOCATION SURVEY R/W MARKERS ARE NOT SUITABLE DUE TO NATURAL GROUND FEATURES OR MAN-MADE STRUCTURES; ALTERNATIVE MONUMENTATION (IN COMPLIANCE WITH THE APPROVED MONUMENTATION, AS SPECIFIED BY THE MISSOURI MINIMUM STANDARDS FOR PROPERTY BOUNDARY SURVEYS) MAY BE SET.
**LEGEND**

**EXISTING**
- STEEL R/W MARKER
- LOCATION SURVEY R/W MARKER
- CONCRETE R/W MARKER

**NEW**
- POLYURETHANE FOAM OR POST MAY BE DRIVEN

**TYPICAL LOCATIONS**

Witness posts, when used, are to be set on MoDOT R/W line either 1' in front or behind R/W Monument.
PIPE CULVERT HEADWALLS

GENERAL NOTES:

USE RIGHT ANGLE HEADWALL FOR ALL INSTALLATIONS.

SKEW PIPE BY USING A BEVELED END OR ELBOW ON PIPE.

IN SPECIAL CASES, HEADWALL MAY BE TURNED TO FIT PIPE SKEW AND 1V TO 6H SLOPE WARPED TO FIT HEADWALL.

ALL CONCRETE SHALL BE CLASS "B".

THIS DRAWING AND THE CONCRETE QUANTITIES SHOWN ARE BASED ON THE USE OF CONCRETE PIPE. QUANTITIES OF CONCRETE SHOWN WILL BE USED FOR PAYMENT REGARDLESS OF ANY QUANTITY CHANGES NECESSARY DUE TO THE USE OF ANY OTHER TYPE PIPE SPECIFIED OR PERMITTED.

FLOW LINE OF HEADWALL IS TO BE PLACED HORIZONTALLY.

PRECAST NOTES:

THE CONTRACTOR MAY, SUBJECT TO APPROVAL OF THE ENGINEER, FURNISH PRECAST UNITS IN LIEU OF CAST-IN-PLACE. IF A PRECAST UNIT IS FURNISHED, IT SHALL CONFORM IN ALL RESPECTS TO THE REQUIREMENTS FOR CAST-IN-PLACE UNITS INCLUDING DIMENSIONS AND REINFORCEMENT, EXCEPT THAT THE FORMS MAY BE TAPERED TO FACILITATE REMOVAL OF THE UNIT FROM THE FORMS. SHOP DRAWINGS OF THE PRECAST UNIT SHALL BE SUBMITTED FOR APPROVAL PRIOR TO FIRST USE OF THE PRECAST FORMS.

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PIPE SIZE

COMMISSION 6/20/06 1-888-ASK-MODOT (1-888-275-6636)

12" TO 24" DIAMETERS - 1V:6H SLOPES

SECTIONS:

PLAN VIEW

END SECTION

SECTION A-A

SECTION B-B

SECTION C-C

BENDING DETAILS

SUBMITTED FOR APPROVAL PRIOR TO FIRST USE OF THE CONCRETE SHOWN WILL BE USED FOR PAYMENT REGARDLESS OF ANY QUANTITY CHANGES NECESSARY DUE TO THE USE OF ANY OTHER TYPE PIPE SPECIFIED OR PERMITTED.

DATE EFFECTIVE: 08/01/2006
DATE PREPARED: 9/3/2009

604.05D SHEET NO. 1 OF 2

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
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TOTAL LENGTH = "L" + 5'-9"

SECTION B-B

SECTION C-C

GENERAL NOTES:

SEE GENERAL NOTES ON SHEET 1.

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PIECE CULVERT HEADWALLS
TYPE S
27" TO 36" DIAMETERS - 1V:6H SLOPES

DATE EFFECTIVE: 08/01/2006
DATE PREPARED: 9/3/2009
604.05D SHEET NO. 2 OF 2

BENDING DETAILS
NOTE: BEND OR CUT A1 AND A2 BARS IN FIELD TO CLEAR PIPE.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1" UNLESS SHOWN OTHERWISE.

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DATE EFFECTIVE:
DATE PREPARED:

PIECE CULVERT HEADWALL
ENERGY DISSIPATOR (IMPACT TYPE)
FOR 48" CONCRETE PIPE

DESIGN UNIT STRESSES
CLASS B CONCRETE
REINFORCING STEEL (GRADE 60) f_y = 60,000 psi

DESIGN UNIT STRESSES
CLASS B CONCRETE
REINFORCING STEEL (GRADE 60) f_y = 60,000 psi

TOTAL CU. YD.
LBS.

DIMENSIONS
DRAWINGS ARE NOT TOSCALE. FOLLOW DIMENSIONS.

BENDING DIAGRAMS
CLASS B CONCRETE
REINFORCING STEEL

NOTE: ALL STANDARD HOOKS AND BENDS OTHER THAN 180 DEG. TO BE BENT WITH SAME PROCEEDURE AS FOR 90 DEG. STANDARD HOOKS. HOOKS AND BENDS SHALL BE IN ACCORDANCE WITH THE SPECIFICATIONS SHOWN IN THIS SHEET. NORMAL LENGTHS ARE BASED ON OUT TO OUT DIMENSIONS SHOWN IN BENDING DIAGRAMS AND ARE USED FOR FABRICATORS USE. PAYMENTS ARE BASED ON ACTUAL LENGTHS.

LENGTH = TOTAL LENGTHS ARE MEASURED ALONG CENTERLINE BAR TO THE NEAREST INCH.

DING DIMENSIONS VARIED IN EQUAL INCREMENTS BETWEEN DIMENSIONS SHOWN IN THIS LINE AND THE FOLLOWING LINE.

N.B.: = NUMBER OF BARS OF EACH LENGTH.

Piping CULVERT HEADWALL
ENERGY DISSIPATOR (IMPACT TYPE)
FOR 48" CONCRETE PIPE

DATE EFFECTIVE:
DATE PREPARED:

PIECE CULVERT HEADWALL
ENERGY DISSIPATOR (IMPACT TYPE)
FOR 48" CONCRETE PIPE

DESIGN UNIT STRESSES
CLASS B CONCRETE
REINFORCING STEEL (GRADE 60) f_y = 60,000 psi

DESIGN UNIT STRESSES
CLASS B CONCRETE
REINFORCING STEEL (GRADE 60) f_y = 60,000 psi

TOTAL CU. YD.
LBS.

DIMENSIONS
DRAWINGS ARE NOT TOSCALE. FOLLOW DIMENSIONS.

BENDING DIAGRAMS
CLASS B CONCRETE
REINFORCING STEEL

NOTE: ALL STANDARD HOOKS AND BENDS OTHER THAN 180 DEG. TO BE BENT WITH SAME PROCEEDURE AS FOR 90 DEG. STANDARD HOOKS. HOOKS AND BENDS SHALL BE IN ACCORDANCE WITH THE SPECIFICATIONS SHOWN IN THIS SHEET. NORMAL LENGTHS ARE BASED ON OUT TO OUT DIMENSIONS SHOWN IN BENDING DIAGRAMS AND ARE USED FOR FABRICATORS USE. PAYMENTS ARE BASED ON ACTUAL LENGTHS.

LENGTH = TOTAL LENGTHS ARE MEASURED ALONG CENTERLINE BAR TO THE NEAREST INCH.

DING DIMENSIONS VARIED IN EQUAL INCREMENTS BETWEEN DIMENSIONS SHOWN IN THIS LINE AND THE FOLLOWING LINE.

N.B.: = NUMBER OF BARS OF EACH LENGTH.

PIECE CULVERT HEADWALL
ENERGY DISSIPATOR (IMPACT TYPE)
FOR 48" CONCRETE PIPE

DATE EFFECTIVE:
DATE PREPARED:

PIECE CULVERT HEADWALL
ENERGY DISSIPATOR (IMPACT TYPE)
FOR 48" CONCRETE PIPE

DESIGN UNIT STRESSES
CLASS B CONCRETE
REINFORCING STEEL (GRADE 60) f_y = 60,000 psi

DESIGN UNIT STRESSES
CLASS B CONCRETE
REINFORCING STEEL (GRADE 60) f_y = 60,000 psi

TOTAL CU. YD.
LBS.

DIMENSIONS
DRAWINGS ARE NOT TOSCALE. FOLLOW DIMENSIONS.

BENDING DIAGRAMS
CLASS B CONCRETE
REINFORCING STEEL

NOTE: ALL STANDARD HOOKS AND BENDS OTHER THAN 180 DEG. TO BE BENT WITH SAME PROCEEDURE AS FOR 90 DEG. STANDARD HOOKS. HOOKS AND BENDS SHALL BE IN ACCORDANCE WITH THE SPECIFICATIONS SHOWN IN THIS SHEET. NORMAL LENGTHS ARE BASED ON OUT TO OUT DIMENSIONS SHOWN IN BENDING DIAGRAMS AND ARE USED FOR FABRICATORS USE. PAYMENTS ARE BASED ON ACTUAL LENGTHS.

LENGTH = TOTAL LENGTHS ARE MEASURED ALONG CENTERLINE BAR TO THE NEAREST INCH.

DING DIMENSIONS VARIED IN EQUAL INCREMENTS BETWEEN DIMENSIONS SHOWN IN THIS LINE AND THE FOLLOWING LINE.

N.B.: = NUMBER OF BARS OF EACH LENGTH.
NORMAL SLOPE OF 2'-3" -'
GUTTER AT THIS POINT
(4 ) E 2 -BAR
(3 ) E 1 -BARS 4 BZ-BARS AT 9" CTRS. 6" 3 B 1 -BARS
(2 ) 2 LAYERS co
I
(1) SEE DRAWING 609.00 OR SPECIAL
CURB DRAWING FOR THESE DIMENSIONS

NORMAL SLOPE OF GUTTER AT THIS POINT
2'-3"

DIRECT ON TO HERE 7
NORMAL SLOPE MINUS 1 '/

SECTION A-A
INTAKE BOX

6" 1'-8"

1'-0"

SECTION C-C
EXTENSION

EDGE OF CONCRETE PAVEMENT STRUCTURE

PLAN

GENERAL NOTES:
TOP OF DROP INLET WALLS SHALL BE LEVEL AND TO THE ELEVATION OF BOTTOM OF SLAB AT EDGE OF TRAVELED WAY OR BOTTOM OF CURB AND GUTTER AT DROP INLET.

ALL CONCRETE ABOVE THE TAR-PAPER SEPARATION JOINT IS TO BE CONSTRUCTED DURING PAVING OPERATIONS OR CURB AND GUTTER CONSTRUCTION AND WILL BE PAID FOR AS SQUARE YARDS OF CONCRETE PAVEMENT OR LINEAR FEET OF CURB AND GUTTER.

ALL CONCRETE BELOW THE TAR-PAPER SEPARATION JOINTS SHALL BE CLASS "B" CONCRETE. CONCRETE IN INVERTS SHALL BE PLACED AFTER DROP INLET HAS BEEN CONSTRUCTED.

REINFORCING BARS SHALL BE CUT AND/OR BENT AT PIPE OPENINGS. ALL U AND F-BARS SHALL BE SECURELY TIED TOGETHER AND FASTENED TO SECURE AGAINST ANY POSSIBLE DISPLACEMENT DURING THE PLACING OF CONCRETE. THE REINFORCING STEEL SHOWN ON THIS DRAWING IS IN ADDITION TO ANY REINFORCING SHOWN ON DRAWINGS FOR CONCRETE PAVEMENT OR CURB AND GUTTER.

NO DIRECT PAYMENT WILL BE MADE FOR CUTTING PIPE NOR FOR CUTTING AND BENDING REINFORCING BARS.

NO TRANSVERSE JOINTS THROUGH PAVEMENT BETWEEN THESE LIMITS
VARIABLE (6'-0" MIN. - 11'-0" MAX.)

TRANSITION 1SEE DETAILS ON LEFT
NORMAL 2" DEPTH OF GUTTER AT THIS POINT

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JEFFERSON CITY, MO 65102
105 WEST CAPITOL
COMMISSION

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JEFFERSON CITY, MO 65102
105 WEST CAPITOL
COMMISSION
The maximum depth of manhole using #4 horizontal bars at 12" centers is 20".

Over 20" depth, horizontal bars shall be increased to #6 bars at 12" centers to a maximum depth of 30".

Over 30" depth will require a special design.

Bottom steel at more than 20" depth to a maximum depth of 30" is increased to #6 bars at 7" centers.

**GENERAL NOTES:**

**STEPS SHALL BE PLACED AT VERTICAL INTERVALS OF 16" MAXIMUM IN ALL MANHOLES HAVING A DEPTH OF MORE THAN 4"-0". STEPS SHALL BEGIN AT AN ELEVATION 6" ABOVE THE TOP OF THE OUTLET PIPE. STEPS SHALL BE SET LEVEL AND IN VERTICAL ALIGNMENT. NO DIRECT PAYMENT WILL BE MADE FOR MANHOLE STEPS.**

**VARIABLE DIMENSIONS**

<table>
<thead>
<tr>
<th>SIZE OF PIPE</th>
<th>W</th>
<th>T</th>
<th>B</th>
<th>M</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>24&quot;</td>
<td>3'-0&quot;</td>
<td>4'-0&quot;</td>
<td>1'</td>
<td></td>
<td>2&quot;</td>
</tr>
<tr>
<td>30&quot;</td>
<td>3'-6&quot;</td>
<td>4'-6&quot;</td>
<td>1'</td>
<td></td>
<td>3&quot;</td>
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<td>36&quot;</td>
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<td>6'-2&quot;</td>
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<td>7&quot;</td>
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</table>

**NOTES:**

- Minimum "W" shall be the outside diameter of largest pipe entering manhole plus 16" carried to the nearest 3".
- Horizontal and vertical bars horizontal and vertical bars around pipes.
### For Pipe Openings

**Pipe Sizes**

<table>
<thead>
<tr>
<th>Size (W)</th>
<th>12&quot;</th>
<th>15&quot;</th>
<th>18&quot;</th>
<th>24&quot;</th>
<th>30&quot;</th>
<th>36&quot;</th>
<th>42&quot;</th>
<th>48&quot;</th>
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<tr>
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<td>0.04</td>
<td>0.06</td>
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<td>0.16</td>
<td>0.23</td>
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<tr>
<td>S</td>
<td>0.05</td>
<td>0.08</td>
<td>0.10</td>
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<td>0.19</td>
<td>0.25</td>
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**Concrete to Deduct**

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<th>18&quot;</th>
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<th>30&quot;</th>
<th>36&quot;</th>
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<td>0.04</td>
<td>0.05</td>
<td>0.06</td>
<td>0.08</td>
<td>0.10</td>
<td>0.12</td>
<td>0.14</td>
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</table>

### Additional Steel Required for Pipe Opening

#### Width of Wall Required for Pipe

- 3'-0" to 3'-0"
- 4'-0" to 4'-0"
- 5'-0" to 5'-0"

#### Length of #6 Bar Required

- 4'-0" to 4'-0"
- 5'-0" to 5'-0"
- 6'-0" to 6'-0"

#### Weight of Bar Lbs.

- 6.0
- 6.8
- 7.5
- 8.3
- 9.0

### Quantities

#### To and Including 20' Depth

<table>
<thead>
<tr>
<th>Size (W)</th>
<th>D=3'-3&quot;</th>
<th>D=4'-3&quot;</th>
<th>Add or Subtract for Each</th>
<th>Add or Subtract in Bottom Difference in #6 and #8 Bars</th>
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<tbody>
<tr>
<td>C</td>
<td>1.62</td>
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</tbody>
</table>

#### To and Including 20-Foot Depth

**Concrete Steel**

- 2.28
- 2.56
- 3.16

**Adjust Totals**

- 2.76
- 2.80

### More Than 20-Foot TD and Including 30-Foot Depth

#### Concrete Steel

- 2.28
- 2.56
- 3.16

#### Adjust Totals

- 2.76
- 2.80

### Total

- 7.40
- 554.5

**Additional Steel in Bottom Difference in #6 and #8 Bars**

**Concrete Steel**

- 3.50

**Add Steel (10 X Quantities for 20-Foot Depth)**

- 242.70

**Concrete Steel in Bottom**

- 39.66

**Total (30-Foot Depth)**

- 10.90
- 836.76

**Use**

- 16.9
- 840.0

---

**Note:**
- To compute the quantities for a pipe ("D") not shown, refer to the table for the size of manhole required. Subtract the "D" value from the table and the "D" value from the plans. Multiply the values shown in the 1-foot column from the table with the full foot increments from the difference between the "D" from the plans and the "D" from the table. Multiply the values shown in the 1-foot column from the table with the remaining fractional foot values per 3" increments. Follow this same process for the steel calculations. See the example below.

**For Example:** Quantities for 3'-0" X 4'-0" manhole with 6'-9" "D" having one 18", one 24" and one 36" pipe openings are determined as follows:

- **D** required = 6'-9"
- **D** given in table = 4'-3"
- **D** additional = 2'-6"

**Concrete Steel**

- 2.28
- 2.56

**Add 12 X Quantities for 1-Foot**

- 0.70
- 0.96

**Add 15" - 2 x 3"**

- 0.18
- 0.25

**Subtotal**

- 3.16
- 5.56

**Adjust Quantities for the Pipe Openings (Deduct Concrete and Add Steel for 3" and 4" walls)**

- 0.40
- 0.95

**Total**

- 7.40
- 554.5

---

**Missouri Highways and Transportation Commission**

**Date Effective:** 02-01-2009

**Date Prepared:** 03-01-2009

**Sheet No.:** 2 of 2

**Concrete Manholes**

---

**Concrete Manholes**

---
TYPE C COLLAR

SECTION B-B

TYPE A COLLAR

SECTION A-A

BENDING DIAGRAM FOR B-BARS

(1) ONE LAYER COMMERCIALLY AVAILABLE 55-POUND ROLL ROOFING.

FOR CONCRETE PIPE TO CONCRETE PIPE

ELEVATION

FLOW LINE

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-354-MODOT 1-888-275-6636

DATE EFFECTIVE: 10/01/2000
DATE PREPARED: 8/23/2009

PIECE COLLARS

604.40F SHEET NO. 1 OF 2
TABLE OF DIMENSIONS

<table>
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<tr>
<th>SIZE</th>
<th>A &amp; B</th>
<th>C</th>
<th>A (#5) REQUIRED</th>
<th>B (#5) REQUIRED</th>
<th>C (#4) REQUIRED</th>
<th>CONCRETE (FT.-IN.)</th>
<th>STEEL (LBS.)</th>
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<tr>
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<td>C</td>
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<td>B (#5)</td>
<td>C (#4)</td>
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MINIMUM WALL THICKNESS SAME AS CONCRETE PIPE

CORRUGATED METAL COLVERT PIPE

COUPLING BAND

CORRUGATED METAL COLVERT PIPE

PIPE PLACEMENT

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

DATE EFFECTIVE: 10/01/2000
DATE PREPARED: 8/23/2009

PIECE COLLARS

DATE EFFECTIVE: 10/01/2000
DATE PREPARED: 8/23/2009

604.40F SHEET NO. 2 OF 2
**SECTION A-A**

**JOINT CONNECTION SECTION**

**DIMENSION SCHEDULE**

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<th>PIPE DIAMETER</th>
<th>B1</th>
<th>B2</th>
<th>B3</th>
<th>B4</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>10 FT.</th>
<th>20 FT.</th>
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<td>25&quot;</td>
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</table>

**JOINT CONNECTION SECTION**

**TYPICAL FOR JOINT CONNECTION SECTION TYPE "A" AND TYPE "B"**

**ISOMETRIC DETAIL**

1. For standard 10 ft., 12" dia. pipe, "C" = 0. FOR ALL OTHER PIPE SIZES, "C" IS IN MULTIPLES OF "A".
2. Locking plate to be installed at:
   A. Each end of drain guide.
   B. Each seam.
   C. Each mid-point of open slot.
3. In 20 ft. section for two piece drain guide, increase number of locking plates by two.

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

**SLOTTED DRAIN TYPE A**

**DATE EFFECTIVE:** 03/01/1994

**DATE PREPARED:** 08/21/2009

**SHEET NO.: 1 OF 2**
**Structural Steel Slotted Drain**

**Type B**

- **Top View**
- **Side View**
- **Section A-A**

**Type C**

- **Top View**
- **Side View**
- **Section A-A**

**Notes:**
- Grate slot welded to pipe. See grate welding detail.
- Grate slot welded to pipe. See grate welding detail.
- Grate slot welded to pipe. See grate welding detail.
- Fillet weld at each side of grate at every other corrugation on the tangent.

**Missouri Highways and Transportation Commission**

105 West Capitol
Jefferson City, MO 65102
1-888-655-MODOT (1-888-655-6636)
GENERAL NOTES:
ON SUPERELEVATED CURVES PLACE LONGITUDINAL UNDERDRAIN ON LOW SIDE ONLY.
CONSTRUCT OUTLETS AT LOW POINT OF SAG CURVE.

DETAIL OF PIPE AGGREGATE DRAIN OUTLETS

<table>
<thead>
<tr>
<th>ROADWAY PROFILE</th>
<th>DISTANCE BETWEEN OUTLETS</th>
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<tr>
<td>#</td>
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<tr>
<td>1</td>
<td>250</td>
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<tr>
<td>1 AND 2</td>
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<td>&gt; 2</td>
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MEDIUM DUTY

HEAVY DUTY

PIVOT UNDERDRAINAGE
PIVOT AGGREGATE PAVEMENT EDGE DRAINS FOR FULL DEPTH SHOULDERS

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

DATE EFFECTIVE: 06/01/2013
DATE PREPARED: 4/1/2013

PIVOT UNDERDRAINAGE
PIVOT AGGREGATE PAVEMENT EDGE DRAINS FOR FULL DEPTH SHOULDERS
**SECTION D-D**

**WITHOUT PERMEABLE BASE**

**SECTION D-D**

**WITH PERMEABLE BASE**

GENERAL NOTES:

- Precast concrete splash pads may be installed as approved by the engineer.
- Top of splash pad shall match existing cross slope.
- Construct bend in splash pad where cross slope changes.
- Dimensions are approximate and can be adjusted as directed by the engineer.

**ITEM** | **2 1/4** | **3 1/4** | **4 1/4** | **6 1/4**
--- | --- | --- | --- | ---
A | 5.48' | 6.19' | 6.95' | 8.58'
B | 2.70' | 3.07' | 3.46' | 4.28'
C | 0.78' | 1.12' | 1.49' | 2.30'
D | 2.00' | 2.00' | 2.00' | 2.00'
E | 2.00' | 2.00' | 2.00' | 2.00'
F | 0.46' | 0.61' | 0.78' | 1.16'
G | 0.71' | 1.07' | 1.46' | 2.27'
H | 2.31' | 2.51' | 2.71' | 3.13'

**CONC.** 0.15 C.Y. 0.17 C.Y. 0.20 C.Y. 0.25 C.Y.
GENERAL NOTES:

AGGREGATE UNDERDRAIN TO BE USED ONLY WHERE DESIGNATED ON PLANS.

AGGREGATE UNDERDRAIN SHALL BE PLACED AT THE LOW POINT OF THE SAG AND THE SPACING OF AGGREGATE UNDERDRAIN SHALL BE APPROX. 500'. AGGREGATE UNDERDRAINS WILL BE OMITTED ON THE CREST VERTICAL CURVES AND ON THE HIGH SIDE OF SUPERELEVATION. THE LOW SIDE OF SUPER-ELEVATION SPACING MAY BE DECREASED AS DIRECTED BY ENGINEER.

PLAN

TYPE A GUARDRAIL

ELEVATION

TYPE B GUARDRAIL

STEEL POST & WOOD OR PLASTIC BLOCK

STEEL POST & WOOD OR PLASTIC BLOCK
PART SECTION SHOWING TYPE E TO TYPE A GUARDRAIL TRANSITION

THE OVERALL DIMENSIONS SHOWN SHALL BE NET. ALTHOUGH THE SHAPE OF THE PLASTIC BLOCK MAY VARY FROM THE SHAPE SHOWN, EXCEPT THE 1 1/2" FLANGE AND THE OVERALL WIDTH DIMENSIONS MAY BE ALTERED IF APPROVED BY PROJECT OPERATIONS.

SECTION B-B

SECTION C-C

GENERAL NOTES:

TYPE E GUARDRAIL SHALL USE 6'-3" FOOT SPACING UNLESS 3'-12" FOOT SPACING IS SPECIFIED.

THE THIN BEAM PAIIL FOR THE TYPE E GUARDRAIL AND THE TRANSITION SECTION SHALL BE MADE OF STEEL AND SHALL BE 18 GA.

FOR PROTECTIVE COATING AND MATERIAL REQUIREMENTS, SEE SECTION 1 OF THE STANDARD SPECIFICATIONS.

SEE SHEET 7 OF 7 FOR REQUIREMENTS FOR SPECIAL INSTALLATIONS.

ALL DIMENSIONS ARE SUBJECT TO MANUFACTURING TOLERANCES EXCEPT WHERE ALLOCABLE TOLERANCES ARE SHOWN.

FOR DETAILS NOT SHOWN, SEE OTHER SHEETS OF THIS DRAWING.
TYPICAL SECTION

1. SHOULDER WIDENING SHALL CONSIST OF ENHANCEMENT MATERIAL COMPACTED IN ACCORDANCE WITH Sec 205.4 OF THE STANDARD SPECIFICATIONS.
2. POST SHALL BE SPACED AT 3'-15" ON CENTER.
3. WHEN GUARDRAIL IS CONSTRUCTED OVER CURBS, THE CURBS SHALL BE CONSTRUCTED AS SHOWN.

ALTERNATE TYPICAL SECTION AT SLOPE BREAKPOINT

TYPE B GUARDRAIL

TYPE A GUARDRAIL

WIDER SHOULDER

NORMAL EDGE OF SHOULDER

LOCATION OTHER THAN CENTER LATERAL PLACEMENT OF GUARDRAIL FOR SHOULDER INSTALLATION

GUARDRAIL LAYOUT

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 N EAGLE CAMPUS
JEFFERSON CITY, MO 65102
1-888-636-MODOT (636-6636)

GUARDRAIL AT CURBS (3)
TYPE E
FOR STEEL POST & WOOD OR PLASTIC BLOCKS (1)

TYPE A AND TYPE B
FOR STEEL POST AND WOOD OR PLASTIC BLOCKS (1)

ALTERNATE DESIGN
FOR WOOD BLOCK

NOTE:
- THE OVERALL NOMINAL DIMENSIONS SHOWN SHALL BE NET, ALTHOUGH THE SHAPE OF THE PLASTIC BLOCK MAY VARY FROM THE SHAPE SHOWN. EXCEPT THE 1 1/2" FLANGE AND THE OVERALL WIDTH DIMENSIONS MAY BE NABER IF APPROVED BY PROJECT OPERATIONS.

DELINEATORS ON NEW GUARDRAIL

GENERAL NOTES:
FOR GUARDRAIL DELINEATION DETAILS SEE
STD PLAN 903.03.
SECTION A-A
ROCK ENCOUNTERED
UP TO 6" BENEATH SURFACE

SECTION B-B
ROCK ENCOUNTERED
6" TO 18" BENEATH SURFACE

SECTION C-C
ROCK ENCOUNTERED
MORE THAN 18" BENEATH SURFACE

SECTION D-D
SETTING POST THROUGH PAVEMENT
(CONCRETE OR ASPHALT > 2" THICK)

SETTING POST IN SOLID ROCK

SETTING POST THROUGH ASPHALT ≤ 2" THICK

GENERAL NOTES:

HOLES IN SOLID ROCK SHALL PROVIDE A DIAMETER OF NOT
LESS THAN 6 INCHES GREATER THAN THE MAXIMUM
TRANSVERSE DIAMETER OF THE POST SECTION.

POST MAY BE SMALLER WHERE PLACED IN A MINIMUM 2 FEET OF SOLID ROCK. STEEL POSTS MAY BE PLACED IN SAW CUTS
WHERE SIZE OF CUT SHALL BE IN ACCORDANCE WITH 740-7304 OF
THE STANDARD SPECIFICATIONS.

GUARDRAIL
SPECIAL INSTALLATIONS
**Elevation**

1. If located within the clear zone of a two-way roadway, the minimum length is 89'-6".
2. Additional guardrail is required including end treatment.
3. The post may be shifted due to the presence of an obstacle such as a curb.
4. Place end treatment no closer to the shifted post than posts 5 and 22.

**Sections**

**Section A-A**
- 69 X 9 steel posts, 6' or 7' long with 8" x 6" x 14" routed wood blockouts.
- Posts 1 through 12 and 13 through 24.

**Section B-B**
- Set wood posts, 6' or 7' long with the 8" x 6" x 14" wood blockouts.
- Posts 1 through 10.
GENERAL NOTES:

WOOD POSTS AND WOOD BLOCKS MAY BE USED ON TYPE E GUARDRAIL.

THE BULLNOSE GUARDRAIL PAY ITEM INCLUDES THE STRUCTURE BETWEEN POST 10 AND THE NOSE. THE REMAINING GUARDRAIL WILL BE PAID FOR AS STANDARD GUARDRAIL ITEMS.

SUITABLE DRAINAGE MUST BE PROVIDED WHEN MEDIAN GRADING IMPEDES NORMAL FLOW.
GENERAL NOTE:
RAILS NUMBERS 1, 2, 3 AND 4 ARE TYPE E GUARDRAIL.
RAIL NUMBER 4 IS A STANDARD THRIE BEAM, NOT SLOTTED.
THREE BEAM ANCHOR POSTS

THREE BEAM CRT POSTS

POSTS 2 THROUGH 8
STANDARD BLOCKS

BLOCKS FOR POSTS 9 AND 10
STANDARD BLOCKS

TAPERED BLOCK

MEDIAN PIER PROTECTION
BULLNOSE GUARDRAIL SYSTEM
POST AND BLOCKS

DATE EFFECTIVE: 08/01/2012
DATE PREPARED: 07/27/2012
606.01F SHEET NO. 4 OF 9
RAIL SECTION 1 (NOSE SECTION)

SPLICE OVERLAP LINE 2" DIA TYPICAL
12'-6"

RAIL SECTION 2

SPLICE OVERLAP LINE 2" DIA TYPICAL
10'-6" (SHOP BEND TO 34'-2" RADIUS)

SPLICE OVERLAP LINE 2'-0" TANGENT SECTION FOR 13:1 OR FLATTER TAPERS

6'-3" (SHOP BEND TO 34'-2 RADIUS)

6'-3" (TANGENT SECTION FOR 6:1 TO 13:1 TAPERS)

12'-6" (TANGENT SECTION FOR 3:6:1 TO 6:1 TAPERS)

RAIL SECTION 3

SPLICE OVERLAP LINE 2" DIA TYPICAL
12'-6"
STEEL PLATE, A306
12 1/2" x 5 1/2" x 4"

(1) STUD, THREADED ENTIRE LENGTH.
"COLD TUFF" BUTTON, S-409 SIZE NO. 12 SB 2 1/2"
STOCK NO. 1040395 FOR 3/8" DIA. (6 x 25) WIRE ROPE
(OR ANY SIMILARLY SIZED SWAGE-GRIP BUTTON FERRULES)
GENERAL NOTES:

(1) TYPE E GUARDRAIL 12'-5" IN LENGTH AND FACTORY FORMED TO THE REQUIRED RADIUS.

(2) PAYMENT FOR THE END TERMINAL WILL BE CONSIDERED FULL COMPENSATION FOR ANY TRANSITION SECTIONS, BACKUP ASSEMBLIES, OR OTHER ITEMS NECESSARY FOR PROPER INSTALLATION AS REQUIRED BY THE MANUFACTURER.

* VARY SLOPE NO STEEPER THAN 15:1 TO UTILIZE A FULL 12.5' LENGTH OF GUARDRAIL WHEN ATTACHING TO THE CRASH WORTHY END TERMINAL.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
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TYPE E MEDIAN PIER PROTECTION
MEDIAN LESS THAN 60'

DATE EFFECTIVE: 08/01/2012
DATE PREPARED: 07/27/2012
SHEET NO. 8 OF 9

MEDIAN WIDTH LESS THAN 50'
SECTION C-C

AREA OF MEDIAN FILL (SEE SECTION C-C)
PIER AT 6" OF MEDIAN

1) TYPE E GUARDRAIL IN THIS REGION SHALL BE 12'6" IN LENGTH AND FACTORY FORMED TO A 75' RADIUS.

2) TYPE A NON-FLARED CRASHWORTHY END TREATMENT.

GENERAL NOTES:

WOOD POSTS AND WOOD BLOCKS MAY BE USED ON TYPE E GUARDRAIL. END ANCHOR SECTION TO BE USED ON TERMINAL END OF TYPE E GUARDRAIL. END ANCHOR TO BE LOCATED BEYOND THE LONGITUDINAL LIMITS OF TYPE A NON-FLARED CRASHWORTHY END TERMINAL.

TYPE A NON-FLARED CRASHWORTHY END TERMINAL SHALL BE THE LATEST VERSION AND SHALL BE INSTALLED ACCORDING TO MANUFACTURER'S RECOMMENDATIONS.
STRUCTURAL STEEL TUBING BLOCK DETAIL

21½" WOOD BLOCK DETAIL

19" WOOD BLOCK DETAIL

14" WOOD BLOCK DETAIL

ALL HOLES DRILLED OR FINISHED 3/16" T.C.

BRIDGE ANCHOR SECTION
SAFETY BARRIER CURB ON BRIDGE
THREE BEAM RAIL SPLICE AT POST

(1) The contractor may, at his option, furnish equivalent sections fabricated from material meeting and in accordance with the requirements of ASTM A763 Grade 36 or 40. The sections shall be galvanized after fabrication in accordance with requirements of ASTM A 117.

TERMINAL CONNECTOR

GENERAL NOTES:

DESIGN BASED ON NCHRP REPORT 550 TEST LEVEL 3.

THE THREE BEAM RAIL, TERMINAL CONNECTOR AND THE TRANSITION SECTION FOR THE BRIDGE ANCHOR SECTION SHALL BE MADE OF STEEL AND SHALL BE S12 GAUGE.

FOR PROTECTIVE COATING AND MATERIAL REQUIREMENTS, SEE SECTION 1040 OF THE STANDARD SPECIFICATIONS.

RAIL POSTS SHALL BE SET PERPENDICULAR TO THE ROADWAY PROFILE GRADE AND VERTICALLY IN CROSS SECTION.

WASHERS SHALL BE USED AT ALL POST BOLTS.

STRUCTURAL TENDING BLOCK SHALL BE FABRICATED FROM ASTM A572 GRADE B STEEL AND GALVANIZED.

USE 1" BUTTON-HEAD DUAL SHOULDER BOLTS WITH HEX NUTS AT ALL SLOTS (THICKNESS OF HEX NUTS = 1/2 IN.).

THE BEARING PLATE SHALL BE FABRICATED FROM GRADE A36 STEEL AND GALVANIZED.

ALL LAP SPLICES, INCLUDING END SHOES, SHALL BE MADE IN THE DIRECTION OF TRAFFIC.

SEE STANDARD PLAN 606.000 FOR DETAILS NOT SHOWN.

THE COST OF FURNISHING, FABRICATING AND INSTALLING TRANSITION SECTION, COMPLETE IN PLACE, WILL BE PAID FOR AT THE CONTRACT UNIT PRICE PER EACH.

THE COST OF FURNISHING FABRICATING AND INSTALLING BRIDGE ANCHOR SECTION (SAFETY BARRIER CURB), COMPLETE IN PLACE, WILL BE PAID FOR AT THE CONTRACT UNIT PRICE PER EACH.

2" BEARING PLATE

SECTION THROUGH THREE BEAM RAIL
GENERAL NOTES:
Cover plate panels are 4'-8" thick.
All stiffeners are 5" thick.
Connector plate shall be fabricated from ASTM Grade A56 STEEL and galvanized.
For galvanized requirements, see Section 1040 of the standard specifications.
All hole diameters shall be 1".

WELDING INSTRUCTION
All fillet welds shall be 1" long spaced at 2".
PART SECTION THROUGH SLAB AT END OF WING

NOTES:

FOR GENERAL NOTES, SEE SHEET 2 OF 5.

FOR FOOT DETAILS AND SECTION VIEWS, SEE SHEET 2 AND 3 OF 5.

(1) AT CONTRACTOR'S OPTION, EQUIVALENT SECTIONS MAY BE FABRICATED FROM MATERIAL MEETING AND IN ACCORDANCE WITH THE REQUIREMENTS OF ASTM A-690.

(2) VERIFY BY RAIL TRANSITION PROJECTIONS.

(3) TRANSITION FROM 31" TO 29" HEIGHT OVER NEXT TWO UPRIGHT 12'-6" A-BEAM FAILS.

BRIDGE ANCHOR SECTION (THREE BEAM RAIL ON BRIDGE)
GENERAL NOTES:

BRIDGE ANCHOR SECTION
(THREE BEAM RAIL ON BRIDGE)
CAP RAIL ANGLE
\(2 \times 3\frac{1}{2} \times 3\frac{1}{2} \times \frac{1}{8}\)

SPLICE PLATE
\(4 \times \frac{3}{4} \times \frac{3}{4} \times \frac{1}{8}\)

TOP VIEW

SIDE VIEW

VERTICAL

2 SLOTTED HOLES
\(\frac{3}{4} \times \frac{3}{4}\)

TOP VIEW

VERTICAL

2 SLOTTED HOLES
\(\frac{3}{4} \times \frac{3}{4}\)

BENT PLATE
CONNECTOR

TOP VIEW

SIDE VIEW

\(\frac{3}{4} \times \frac{3}{4} \times \frac{1}{8}\)

SIDE VIEW

DIRECTOR ASSEMBLY

STRUCTURAL TUBE

\(\frac{3}{4} \times \frac{3}{4} \times \frac{1}{8}\)

STRUCTURAL TUBE

\(\frac{3}{4} \times \frac{3}{4} \times \frac{1}{8}\)

FRONT VIEW

SIDE VIEW

\(\frac{3}{4} \times \frac{3}{4} \times \frac{1}{8}\)
CONCRETE FOUNDATION FOR END ANCHORS

STEEL TUBE FOUNDATION FOR END ANCHORS

SOIL PLATE

SHOP WELDED SOIL PLATE CONNECTION

SECTIONS A-A
EXPANDED POLYSTYRENE FOAM INSTALLATION DETAIL

WOOD BREAKAWAY POST
SEE SECTION 1050

GENERAL NOTES:

1. 5/16" FOR CONCRETE FOUNDATION ALTERNATE.
2. 3/8" FOR CONCRETE FOUNDATION ALTERNATE.

STAINLESS STEEL REBAR SHALL BE SIMILAR IN DESIGN AND PROPERTIES TO REBAR FOR CONCRETE FOUNDATION.

THE CONTRACTOR HAS THE OPTION TO INSTALL WOOD POST 1 AND 2 IN STEEL TUBE OR CONCRETE FOUNDATION.

TRENCHING OF WOOD POSTS MAY BE NECESSARY FOR STEEL TUBE FOUNDATION.

STEEL TUBE FOUNDATIONS SHALL BE FILLED WITH A SUITABLE MATERIAL. WHEN THE SOIL PLATE IS NOT FILLED, IT IS REINFORCED WITH A COMMERICAL STEEL TUBE. THE SOIL PLATE IS WELDED TO THE STEEL TUBE.

GUARDRAIL TERMINAL ANCHOR ENDS

MODOT MISSOURI HIGHWAYS AND TRANSPORTATION DEPARTMENT
100 WEST CAPITOL JEFFERSON CITY, MO 65102 1-888-365-MODOT (663-6638)

DATES EFFECTIVE:
06/01/2017
06/30/2017

SHEET NO.
606.30K
3 OF 7
CONCRETE BLOCK ANCHOR
ANCHOR ASSEMBLY

THREADED INSERTS FOR 2" X 2" GALVANIZED METAL CAP SCREWS.
CAP SCREWS TO BE THREADED A MINIMUM 1-1/2" INSERTS THREADED minimum of 12."
GRADING LIMITS FOR FLARED CRASHWORTHY END TERMINALS

STANDARD GRADING LIMITS FOR CRASHWORTHY END TERMINALS

ALTERNATE GRADING LIMITS FOR CRASHWORTHY END TERMINALS

GENERAL NOTES:

STANDARD GRADING LIMITS SHALL BE USED WHEN CONSTRUCTING A NEW FENCE. ALTERNATE GRADING LIMITS ARE ALLOWABLE ON EXISTING ROADSIDE EXCEPT WHEN STANDARD GRADING IS INDICATED ON THE PLAN.

THE CONTRACTOR SHALL PROVIDE THE ENGINEER WITH APPROVED SHOP DRAWINGS OF THE APPROVED CRASHWORTHY END TERMINAL.

END ANCHORS SHALL BE INSTALLED ON ENDS OF GUARDRAIL RUNS WHERE CRASHWORTHY END TERMINALS ARE NOT REQUIRED.
ANCHOR ASSEMBLY

EXPANDABLE OR SCREW TYPE ANCHOR

GROUND LINE OR SHOULDER ELEVATION

300' MAX. (BETWEEN ANCHORS)

END ANCHOR
LINE POST
INTERMEDIATE ANCHOR

ELEVATION

CABLE END

1/2" CABLE

STEEL POST
(53 X 5.7 STD. BEAM)

WOOD POST
(4" X 4" SQUARE
OR 4" ROUND)

POST DETAILS

CLAMP

1 1/4" BOLT
AND WASHER
1 1/2" HOLE

1 1/4" DIA.
NOT REQUIRED
FOR LINE POST

1" X 1/2" CLAMP

1 1/4" DIA.
NOT REQUIRED
FOR LINE POST

1 1/2" LAG SCREW

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

DATE EFFECTIVE:
07/01/2004

DATE PREPARED:
8/23/2009

ONE-STRAND ACCESS RESTRAINT CABLE

606.40D 1 OF 2
ACCESS-RESTRAINT CABLE GREATER THAN 300 FEET IN LENGTH REQUIRE AN INTER-MEDIATE ANCHOR AS SHOWN.

**SPLICE DETAIL**

**ANCHOR ROD ASSEMBLY**

**CABLE END**

**TYPICAL LOCATION**

**SHOULDER INSTALLATION**
GUARD CABLE TO GUARDRAIL TRANSITION AT MEDIAN BRIDGE END

GENERAL NOTES:

1. WHEN GUARD CABLE IS LOCATED ALONG THE MEDIAN CENTER-LINE NEAR A BRIDGE END OR COMPLETE Closure, IT SHALL BE SHOWN REMOVING THE GUARDRAIL ASSEMBLY WITH THE GUARD CABLE AND RAIL ASSEMBLY. THE GUARD CABLE ASSEMBLY SHALL BE CONSTRUCTED SO THAT IT ISヶRECEIVED BY THE GUARDRAIL.

2. THIS DRAWING EFFECTS OPTIONS FOR THE ATTACHMENT OF GUARD CABLE TO GUARDRAIL. IT DOES NOT INDICATE THAT TWO RINGS OF CABLE ARE REQUIRED.

3. Suitable drainage must be provided when median guardrail impacts normal flow.

TYPICAL GUARD CABLE TO GUARDRAIL TRANSITION ELEVATION
PLAN VIEW

1. Minimum clearance to the face of obstacle with 6'-3" post spacings of 1'-6" minimum clearance to the face of obstacle with 1'-6" post spacings.

2. When site constraints prohibit or exemption cannot be constructed to provide a minimum of 2 feet between the back of the guardrail post and slope break point, 6-foot posts shall be used (see sheet 6 of 8).

SECTION A-A

ELEVATION VIEW

GENERAL NOTES:

1. For initial installation, construct the guardrail within 1/4" of the standard height to the top of the barrier rail. Where required projects, such as relocations, affect the height of existing guardrail, adjustment is not required if finished height is within 1/4" of the standard height.

2. The standard post length is 6'-0" (45'-0" tolerance).

THE SUBSTITUTION OF 8 FOOT POSTS IN LIEU OF REQUIRED 6 FOOT POSTS TO CONSTRUCT LESS THAN THE DESIGNED TYPICAL SECTIONS SHALL NOT BE ALLOWED.

REFER THE ATTACHED SHEET 6 FOR DIMENSIONAL DETAILS OF TYPICAL GUARD RAIL BEAM, SUBMERGED, AND EVO SECTIONS, BEAM SPŁICE, POST END SPLICE BOLTS, NUTS, AND TYPE I K-BEAM TO THREE BEAM TRANSITION SECTIONS.

BEAM WASHERS ARE NOT TO BE USED. BOLT GRADE SHALL BE ASTM A327.

UNLESS OTHERWISE SPECIFIED, K-BEAM RAILS IS 12 GAUGE STEEL WITH AN EFFECTIVE LENGTH OF 6'-0" OR 6'-6", WITH 1/2" x 1-1/4" WELDED SLOT AND 5/8" POST BOLT SLOTS ON 4'-0" CENTERLESS REGARDLESS OF POST SPACING.

FOR PROTECTIVE COATING AND MATERIAL REQUIREMENTS, SEE SECTION 20 OF THE STANDARD SPECIFICATIONS.

LSF SPLICES BETWEEN TWO RAILS OR BETWEEN RAIL AND TERMINAL CONNECTOR IN THE DIRECTION OF TRAFFIC, LSF THE FLARED END SECTIONS IN THE DIRECTION OF TRAFFIC.

MIDWEST GUARDRAIL SYSTEM (MGS) GUARDRAIL

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-606-MODOT (663-6683)

SHEET NO.: 1 OF 8

DATE REVISED: 06/01/2010

606.50D
MGS GUARDRAIL WITH 3'-1 1/2" POST SPACING

11: 25 FEET OF MGS 3'-14" POST SPACING GUARDRAIL IS REQUIRED ON APPROACH AND DEPARTURE ENDS OF 1'-6 1/2" POST SPACING MGS GUARDRAIL.

12: USE AS MANY SEGMENTS AS NEEDED TO SHIELD THE AREA OF CONCERN.

13: REDUCED POST SPACING SHALL USE 6'-0" POSTS. MAX. SPACIATION OF 5'-0" POSTS WILL ONLY BE ALLOWED IN ACCORDANCE WITH SPECIAL INSTALLATIONS AS SHOWN ON SHEET 5 OF 8.

GENERAL NOTES:

- MGS CANNOT BE USED NEAR:
  - POST SPACING IS LESS THAN 6'-0".
  - WITHIN CRASHWORTHY END TERMINALS.
  - WITHIN VERTICAL BARIER TRANSITIONS (606.40).
  - WITHIN BRIDGE APPROACH TRANSITIONS (606.70).
SETTING POST IN SOLID ROCK

SETTING POST THROUGH ASPHALT ≤ 2" THICK

GENERAL NOTES:

Hole in solid rock shall provide a diameter of not less than 4 inches greater than the maximum transverse dimension in the post section.

Post may be shorter where placed in 2 feet of solid rock. Steel posts may be flame or gas cut. Repair of cut shall be in accordance with Section 6.0 of the Standard Specifications.

MIDWEST GUARDRAIL SYSTEM (MGS)
SPECIAL INSTALLATIONS

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-800-ASK-MODOT (1-800-275-6636)

DATE ISSUED: 03/13/2010
DATE REVISED: 10/07/2016
SHEET NO. 5 OF 8
606.50D
ALTERNATE SECTION A-A
MAXIMUM LATERAL PLACEMENT OF 8' STEEL POSTS ADJACENT TO SLOPES

GENERAL NOTES:

SEE STC PLAN 606.81 FOR SITE GRADING REQUIREMENTS FOR CRASHWORTHY END TERMINALS.

8' FOOT POSTS SHALL BE USED WHEN LESS THAN 2 FEET OF ELEVATION IS PRESENT BETWEEN THE TOP OF THE GUARDRAIL POST AND THE SLOPE BREAK POINT. THE SUBSTITUTION OF 6' FOOT POSTS IN LIEU OF REQUIRED ELEVATION TO CONSTRUCT LESS THAN THE DESIGNED TYPICAL SECTION SHALL NOT BE ALLOWED.
PIER AT MEDIAN

1. 3'-0" MINIMUM CLEARANCE TO THE FACE OF OBSTACLE WITH 6'-0" FOOT SPACING IS PREFERRED
   2'-0" MINIMUM CLEARANCE WITH 3'-0" FOOT SPACING
   SEE STANDARD PLANS 606.55 FOR FOOT SPACING DETAILS.

2. TRANSITION CURVE IS REQUIRED FOR MEDIAN WIDTH OF MEDIAN FOR TYPE B CRASHWORTHY END TERMINAL FOR MANUFACTURER'S REQUIREMENTS. SEE STANDARD PLANS 606.55 FOR HEIGHT TRANSITION DETAILS.

3. CONTINUE 10'-0" SLOPE TO OBSTRUCTION OR A MINIMUM OF 2'-0" PAST THE EDGE OF THE GUARDRAIL FOOT.

4. 10'-0" FLAT RATE OR AS RECOMMENDED BY TABLE 5-10 OF THE LATEST VERSION OF THE "ROADWAY DESIGN GUIDE".

MEDIAN WIDTH LESS THAN 60'

EDGE OF TRAVELED WAY

SECTION A-A

GENERAL NOTE:

TYPE B CRASHWORTHY END TERMINAL SHALL BE MGS COMPATIBLE; LATEST VERSION AND SHALL BE INSTALLED ACCORDING TO MANUFACTURER'S RECOMMENDATIONS.
**BRIDGE APPROACH TRANSITION (EXTENDED CURB)(2)**

**GENERAL NOTES:**

*MISS DURGRDRAIL SHALL BE TANGENTAL WITH BRIDGE APPROACH TRANSITION FOR 12' - 6" BEYOND THE TWO HEBEER 6-5" BEAM STIFFNESS TRANSITION AND 25' - 0" BEYOND THREE-BEAM TRANSITION SECTION.*

**AT THE CONTRACTOR'S OPTION, A SIMPLE 10'-0" PIECE OF THREE BEAM MAY BE SUBSTITUTED FOR ONE OF THE 12'-6" PANELS AND THE 6'-5" SECTION AS SHOWN.**

**FOR PROTECTIVE COATINGS AND MATERIAL REQUIREMENTS, SEE SECTION OF THE STANDARD SPECIFICATIONS.**

**RAIL POSTS SHALL BE SET PERPENDICULAR TO THE ROADWAY PROFILE GRADE AND VERTICALLY IN CROSS SECTION. USE 2" BOLT-HOLE SOIL SHARPENED BOLTS WITH HEX NUTS AT ALL SLOTS (THICKNESS OF HEX NUTS = 5⁄8 IN.)**

**THE BEARING PLATE SHALL BE FABRICATED FROM GRADE 50 STEEL AND GUYED.**

**ALL LAY OUTS, INCLUDING END SKIES, SHALL BE MADE IN THE DIRECTION OF TRAFFIC.**

**THE COST OF FABRICATING, FABRICATING, AND INSTALLING BRIDGE APPROACH TRANSITION (EXTENDED CURB), COMPLETE IN PLACE, WILL BE PAID AT THE CONTRACT UNIT PRICE PER EACH.**

**THE CONTRACTOR MAY, AT THEIR OPTION, FABRICATE EQUIVALENT SECTIONS FABRICATED FROM MATERIAL HAVING THE REQUIREMENTS OF ASTM A36 GRADE 36 OR 40. THE SECTIONS SHALL BE DESIGNATED AFTER FABRICATION IN ACCORDANCE WITH REQUIREMENTS OF ASHTO M111.**

**1) PLACE THE FIRST POST OF THE 6-5" FAST THE LAST POST OF THE BRIDGE APPROACH TRANSITION TO KEEP POSTS OFFSET FROM THE RAIL SPIKES.**

**2) WHERE CURB EXCEEDS BURNEST OF POST NO. 11 FOR ORANGE PURPOSES, A STIFFNESS TRANSITION CONSISTING OF AN EXTRA 6-5" BEAM OF 12 GAUGE 6-5" BEAM MUST BE HEATED PRIOR TO THE TRANSITION SECTION (BUSHING POST NO. 11). THE CURB SHALL BE EXTENDED TO THE END OF THE 12' - 6" CURVE 6-5" CURVE TRANSITION SEE 6-5" CURVE 6-5" CURVE TRANSITION SEE PLAN 609.40 FOR DETAILS. CURB CURVE DO NOT EXTEND BEYOND POST NO. 11. PAY FOR A BRIDGE APPROACH TRANSITION (REGULAR CURVE/NO CURVE). FOR DETAILS OF BRIDGE APPROACH TRANSITION (REGULAR CURVE/NO CURVE), SEE SHEET 2 OF 6.**
WELDING INSTRUCTION

- ALL FILLET WELDS SHALL BE ½" LONG SPACED AT 2".

GENERAL NOTES:

COVER PLATE PANELS ARE ⅜" THICK.

ALL STIFFENERS ARE ⅜" THICK.

CONNECTOR PLATE SHALL BE FABRICATED FROM A36 GRADE STEEL AND G60 ELECTRODE.

FOR GAUGING REQUIREMENTS, SEE SECTION 1040 OF THE STANDARD SPECIFICATIONS.

ALL HOLE DIAMETERS SHALL BE ⅜".
WELDING INSTRUCTION
(VIEWED FROM BACK SIDE OF PLATE)

(1) STIFFENER LOCATED AT THE OUTSIDE EDGES OF THE COVER PLATE SHALL BE WELDED AS FOLLOWS:
- SINGLE BEVEL GROOVE WELD ON EXTERNAL SIDES ARE #6 FILLET WELD BY 1" LONG SPACES AT 2° ON INTERNAL SIDES.

(2) STIFFENERS LOCATED ON THE INSIDE OF THE COVER PLATE SHALL BE WELDED AS FOLLOWS:
- #6 FILLET WELD BY 1" LONG SPACES AT 2°.

PLATE AND STIFFENER IDENTIFICATION
(VIEWED FROM BACK SIDE OF PLATE)

CONNECTOR PLATE DIMENSION
(PER ASSEMBLY)

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<th>PLATE</th>
<th>QUANTITY</th>
<th>SHAPE</th>
<th>SIZE (A x B x C x D)</th>
<th>THICKNESS</th>
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<td>1</td>
<td>[ ]</td>
<td>3&quot; x 3&quot;</td>
<td>1&quot;</td>
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</table>

GENERAL NOTES:
- COVER PLATE PANELS ARE 1" THICK.
- ALL STIFFENERS ARE 1" THICK.
- CONNECTOR PLATE SHALL BE FABRICATED FROM ASTM GRADE 50 STEEL AND GALVANIZED.
- FOR GALVANIZED REQUIREMENTS, SEE SECTION 1.1.7 OF THE STANDARD SPECIFICATIONS.
- ALL MILE DIAMETERS SHALL BE 1".
STEEL POST AND WOOD BLOCK

THRIE BEAM RAIL SPlice AT POST

ASYMMETRICAL TRANSITION SECTION
EMBEDDED STEEL POST

- 3 - 1 7/8" Holes to be field drilled in V-beam element and attached with 3 - 1/2" hex head bolts 1½" long each with one square washer and hex nut.

- 1" Hole to be field drilled through V-beam element and through post flange. Attached with 2 - 1/2" hex head bolts 2½" long each with one square washer and hex nut.

2 1/4" FILLET WELD PLATE TO POST BOTH SIDES OF POST

SPECIAL RUBRAIL TO POST CONNECTION AT POST A

EMBEDDED ANCHOR SYSTEM (MGS)
TERMinals ENDS (STEEL POST OPTION)
ELEVATION OF 6' STEEL POST AND BLOCK

ELEVATION 8' STEEL POST AND BLOCK

CONCRETE BLOCK ANCHOR
ANCHOR ASSEMBLY FOR THREADED INSERTS (SEE DETAIL ON THIS SHEET)

FOR ADDITIONAL POST AND BLOCK DETAILS SEE SHEET 606.82.
SHEET 6 OF 7
GRADING LIMITS FOR FLARED CRASHWORTHY END TERMINALS

STANDARD GRADING LIMITS FOR CRASHWORTHY END TERMINALS

ALTERNATE GRADING LIMITS FOR CRASHWORTHY END TERMINALS

GENERAL NOTES:

STANDARD GRADING LIMITS SHALL BE HEED WHEN CONSTRUCTING A NEW PLACED. ALTERNATE GRADING LIMITS ARE ALLOWABLE ON EXISTING ROADS ONLY WHEN STANDARD GRADING IS INDICATED ON THE PLANS.

THE CONTRACTOR SHALL PROVIDE THE ENGINEER WITH APPROVED SHOP DRAWINGS OF THE MASH APPROVED CRASHWORTHY END TERMINAL.

END ANCHORS SHALL BE INSTALLED ON ENDS OF GUARDRAIL RUNS WHERE CRASHWORTHY END TERMINALS ARE NOT REQUIRED.
**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

**CHAIN-LINK FENCE**

**SPECIFICATION**

**DATE EFFECTIVE:** 02/10/2007  
**DATE PREPARED:** 8/21/2009

**WEIGHTS OF MATERIALS SHOWN IN TABLE ARE FOR ASTM F 1043 GROUP IA. SIZES SHOWN ARE FOR STEEL AND ALUMINUM. EQUIVALENT ASTM F 1043 ALTERNATIVES MAY BE USED.**

**PULL POSTS SHALL BE USED AT SHARP BREAKS IN VERTICAL GRADE OR AT APPROXIMATE 500' CENTERS ON STRAIGHT RUNS OR AS DIRECTED BY THE ENGINEER.**

**DRILLED HOLES ≥ IN SOLID ROCK SHALL PROVIDE A DIAMETER OF NOT LESS THAN 2" GREATER THAN THE MAXIMUM TRANSVERSE DIMENSION OF THE POST SECTION.**

**ALL POSTS SHALL HAVE PROVISIONS TO SECURELY HOLD THE TOP TENSION WIRE IN POSITION AND ALLOW FOR REMOVAL AND REPLACEMENT OF A POST WITHOUT DAMAGING THE TOP TENSION WIRE.**

**THE MESH SIZE SHALL BE 2 INCHES ± IN. MEASURED IN EITHER DIRECTION AS THE MINIMUM CLEAR DISTANCE BETWEEN THE WIRES FORMING THE PARALLEL SIDES OF THE MESH.**

**NOTE:** IF POSTS CANNOT BE DRIVEN TO DEPTHS INDICATED BECAUSE OF ROCKY SOILS OR OTHER CONDITIONS, THEY SHALL BE REMOVED AND REPLACED IN EDDITIONS. POST TOPS SHALL BE PROTECTED AGAINST DAMAGE AND ALL POSTS WHICH ARE DAMAGED DURING INSTALLATION SHALL BE REMOVED AND REPLACED.

**POST TOPS TO BE PRESSURE FITTED OR SCREWED. POST TOPS MAY BE ELIMINATED FOR ALL POSTS EXCEPT PIPE POSTS. IF POST TOPS ARE ELIMINATED, POST LENGTH SHALL BE INCREASED 3".**

**GENERAL NOTES:**

**FABRIC TIE SHEET NO. 1 OF 1 607.10V**
**U-BoLT**

**TERMINAL POST**

* Place expansion sleeve at about 30°-0" centers with at least one expansion sleeve between pull posts.

**PART ELEVATION**

(Typical)

**FENCE CONNECTION FOR MSE WALLS**

**GENERAL NOTES:**

Payment for U-BOLTS with nuts, washers, and #4 bars will be considered completely covered by the contract unit price for chain-link fence retaining walls.

Pull post shall be used at sharp breaks in vertical grade or at approximate 100°-0" centers on straight runs.

The chain-link fence shall be in accordance with applicable parts of Sec. 607.

Maximum post spacing in horizontal direction shall be 10°-0".

**MODIFIED TYPE A GUTTER**

**MODIFIED TYPE B GUTTER**
TYPICAL FENCE LOCATION

<table>
<thead>
<tr>
<th>GATE OPENING</th>
<th>GATE POST SIZE</th>
<th>HEIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>3' 6&quot;</td>
<td>2&quot; DIA.</td>
<td>3.65</td>
</tr>
<tr>
<td>4' 0&quot;</td>
<td>2&quot; DIA.</td>
<td>4.07</td>
</tr>
<tr>
<td>5' 0&quot;</td>
<td>2 1/4&quot; DIA.</td>
<td>5.00</td>
</tr>
<tr>
<td>6' 0&quot;</td>
<td>6&quot; DIA.</td>
<td>6.07</td>
</tr>
<tr>
<td>9' 0&quot;</td>
<td>14&quot; DIA.</td>
<td>9.10</td>
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</table>

1. BRACES
2. WIRE TIES
3. 3.8" ADJUSTABLE TRUSS POSTS.

GENERAL NOTES:

STEEL LINE POSTS SHALL BE OF AN APPROVED "O" "N" "M" "L" "K" "T" OR "A" SHAPE, ELECTRO GALVANIZED OR STAINLESS STEEL ANCHOR PLATE. POST FINISHES OF WOOD OR SELF FASTENING NAILS WILL NOT BE PERMITTED.

STAPLES SHALL BE SCREW SHANK TYPE OR EQUIVALENT 1/2" WOOD SHANK STAPLES.

STRETCHED FABRIC AND BARED WIRE ON OUTSIDE OF POST ON CORNERS AND EDGES.

ATTACHMENT OF FABRIC TO STEEL LINE POSTS IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATION.

GATES FOR WOVEN WIRE FENCE SHALL BE IN ACCORDANCE WITH SECTION 607.200 AND APPENDIX A OF THE STANDARD SPECIFICATIONS. EXCEPT THE FILLER SHALL BE WOVEN WIRE FABRIC ON THE SAME SIDE AS FABRIC FOR THE FENCE.

SINGLE LEAF GATES REQUIRE 18" TO 22" OPENING. DOUBLE LEAF GATES REQUIRE OVER 32" OPENING. LOCATION OF DOORS ON GATES SHALL BE AS DETERMINED ON THE PLAN OR AS DIRECTED BY THE ENGINEER.

WOVEN WIRE FENCE
END POST ASSEMBLY
STEEL POST
CORNER OR PULL POST ASSEMBLY

ROADWAY DITCHES OR SMALL SHALLOW CHANNELS
(Span with normal line post spacing)

POORLY DEFINED CHANNELS (SMALL DRAINAGE AREAS)

TYPICAL WATER CROSSING GATE

WELL DEFINED CHANNELS (LARGE DRAINAGE AREAS)

TYPICAL FENCING AT CHANNEL CROSSING
GENERAL NOTES:
WHERE PAVED APPROACH MEETS EXISTING PCC PAVEMENT OR SIDEWALK:
PLACE 1' PREFORMED FIBER EXPANSION JOINT, CUTOFF TO TYPICAL THICKNESS OF PCC PAVEMENT AND 1' FROM JUNCTION WITH EXISTING CONCRETE OR ALONG INSIDE EDGE OF SIDEWALK.
WHERE PAVED APPROACH MEETS EXISTING FORMER CONSTRUCTION UNIT JOINT:
4 INCHES OF TYPE 1 OR 5 BASE SHALL BE PLACED AND COMPACTED BENEATH THE AREA SURFACE OF PAVED APPROACHES.
SEE STANDARD PLAN 608.10 FOR CONCRETE CURB RAVNS.
SEE STANDARD PLAN 520.05 FOR JOINT DETAILS.

SECTION F-F: ELEVATION OF CENTER OF PAVED APPROACH. AT 4 POINTS FROM EDGE OF NEW PAVEMENT SHALL NOT VARY MORE THAN 2" FROM ELEVATION OF EXISTING PAVEMENT AT CENTERLINE OF PAVED APPROACH. IF SIDEWALKS ARE NOT PROPERLY CONNECTED TO THE PAVED APPROACH, PLACE GROUND COVER AS SHOWN ON PLANS. ERASE CURB THROUGH RADIUS. GROUND COVER SHALL CONFORM TO FINISHED GRADES FOR CURB RAVNS.

WHEN FINISHING PERMITTED ON PAVED APPROACH:
AMEN SIDEWALKS ARE PRESENT ADJACENT TO THE PAVED APPROACHES OF STREETS, SIDEROADS, ALLEYS OR COMMERCIAL ENTRANCES, THE SIDEWALK GRADE SHALL BE TRANSITIONED TO THE GRADE OF THE APPROACH BY ANY OF AN APPROPRIATE RAMP AS SHOWN ON THE PLANS. SEE 608.10 FOR RAMP DETAILS.

AMEN SIDEWALKS ARE PRESENT ADJACENT TO THE PAVED APPROACHES OF PRIVATE ENTRANCES, THE APPROACH GRADE SHALL BE TRANSITIONED TO THE GRADE OF THE SIDEWALK.

THE APPROACH GRADE THROUGH THE LIMITS OF A SIDEWALK SHALL NOT EXCEED 2%.
GENERAL NOTES:

- All areas of the pedestrian access route must be compliant with the Americans with Disabilities Act (ADA) guidelines for accessible public rights of way. Exceptions must be approved by the engineer.
- All other areas of non-compliance shall be removed and corrected at the contractor's expense.

- The surfaces of pedestrian access routes and elements, and spaces required to connect to pedestrian access routes, shall be firm, stable, slip resistant, and shall not pond water.

- Where sidewalks are less than 5 ft., 5 ft. x 5 ft. passing spaces every 200 ft. shall be provided and are permitted to overlap pedestrian access routes.

- The cross slope of the continuous pedestrian access route through entrances, alleys, and side road connections with stop or yield control shall be 1.0% to facilitate drainage (2.0% max.).

- Where pedestrian access routes are contained within pedestrian street crossings without yield or stop control, the cross slope of the continuous sidewalk access route on the street or highway grade.

- Stormwater inlets, signs, posts, manhole covers, pull boxes and other access lids should be avoided within the sidewalk. If such a location is necessary, the feature must meet ADA standards.

- The running grade of a sidewalk shall not exceed 5.0% unless it is matching the grade of the adjacent roadway.

- Pedestrian access route shall continue across residential and commercial entrances, alleys, and side road connections.

- See plans for width.
- See standard 608.00.
- Curb to be monolithic with PCC mainline pavement. Curb to be Type 5 with asphalt concrete mainline pavement. See standard plan 609.00.
- Min. 1/2 depth joint.
- See typical pavement section.
- Slope 1.0% (2.0% max.)
- Spacing equal to width of walk.
**SAFETY RAIL DETAILS**

**STAIRWAY STEP DETAILS**

**RAILING & POST SPECIFICATIONS**

<table>
<thead>
<tr>
<th>TYPE</th>
<th>SIZE (IN)</th>
<th>WEIGHT (LBS./FT)</th>
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</thead>
<tbody>
<tr>
<td>ROUND</td>
<td>1⅛</td>
<td>0.940</td>
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<tr>
<td>SQUARE</td>
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**STEP DIMENSIONS**

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<th>TREAD</th>
<th>RISE</th>
<th>X</th>
<th>Y</th>
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<tr>
<td>1:1</td>
<td>10½&quot;</td>
<td>7&quot;</td>
<td>10½&quot;</td>
<td>5½&quot;</td>
</tr>
<tr>
<td>1:2</td>
<td>12&quot;</td>
<td>6&quot;</td>
<td>10½&quot;</td>
<td>5½&quot;</td>
</tr>
<tr>
<td>1:3</td>
<td>14½&quot;</td>
<td>4½&quot;</td>
<td>9½&quot;</td>
<td>5½&quot;</td>
</tr>
</tbody>
</table>

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**GENERAL NOTES:**

- STAIRWAY SHALL HAVE SAFETY RAILS AT BOTH SIDES OF ALL STEPS.
- RAILINGS AND POSTS MAY BE EITHER ROUND OR SQUARE STEEL OF GOOD COMMERCIAL WELDABLE QUALITY OR ALUMINUM ALLOY 6061-T6 OR 6063-T6.
- STEEL RAILINGS AND POSTS SHALL BE GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH ASHMT WT-11.
- ALL JOINTS SHALL BE CONTINUOUS WELDED AND GROUND SMOOTH.
- ALL RAILING SHALL HAVE A 1/4" WEEP HOLE NEAR ALL INTERSECTING RAILING CONNECTIONS.
# Quantities for Concrete Steps

**Concrete C.Y. Steel lb.**

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<tr>
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<th>3'</th>
<th>4'</th>
<th>5'</th>
<th>6'</th>
<th>7'</th>
<th>8'</th>
<th>9'</th>
<th>10'</th>
<th>11'</th>
<th>12'</th>
<th>13'</th>
<th>14'</th>
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<tbody>
<tr>
<td>N</td>
<td>No. Steps</td>
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<td>3'</td>
<td>4'</td>
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<td>11'</td>
<td>12'</td>
<td>13'</td>
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<td>101/2'' Tread</td>
<td>111/2'' Slope</td>
<td>7'' Rise</td>
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<td>97</td>
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<td>6'</td>
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MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

DATE EFFECTIVE: 04/01/2015
DATE PREPARED: 02/21/2016

CONCRETE STAIRS

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SECTION A-A
CONCRETE MEDIAN STRIP

TIE BAR LOCATIONS FOR
CONCRETE MEDIAN STRIP

TIE BAR LOCATIONS FOR
CONCRETE MEDIAN STRIP (ISLAND)

CONCRETE MEDIAN STRIP JOINT LOCATION

DETAIL A

CONCRETE MEDIAN STRIP

EXISTING PAVEMENT

1' RADIUS

SEE SCHEDULE 205.50 FOR
DETAILS OF LOW PROFILE ISLANDE

MEDIAN HEIGHT BAR LENGTH
5' 8'
4' 9'
3' 10'
2' 11'
1' 12'

GENERAL NOTES:
TIE BARS SHALL BE EPOXY COATED, REINFORCING
BAR MEETING THE REQUIREMENTS OF SECTION 103.10 AND
103.20.
BENDING FOR TIE BARS SHALL BE EPOXY OR POLYESTER
BONDING AGENTS AS SPECIFIED IN SECTION 1039.
THE FACE OF THE MEDIAN MAY BE CONSTRUCTED WITHOUT
BATTERY WHEN CONSTRUCTED ON A RADIUS OF 8' OR LESS.
WHEN CONCRETE MEDIAN ARE CONSTRUCTED DIRECTLY
BELOW GRASSIL, THE MEDIAN HEIGHT WILL BE 4'.
SIDEWALK HANDRAILING WITHOUT BALUSTERS

SIDEBAND WITHOUT BUFFER STRIP
(SECTION A-A)

CONCRETE SIDEWALK
FACED WITH STONE
CONCRETE CURB
FACED WITH STONE
CONCRETE CURB
FACED WITH STONE

SIDEWALK WITH BUFFER STRIP
(SECTION A-A)

CONCRETE SIDEWALK
FACED WITH STONE
CONCRETE CURB
FACED WITH STONE
CONCRETE CURB
FACED WITH STONE

4" CONCRETE SIDEWALK
HANDRAILING

MISSOURI HIGHWAYS AND TRANSPORTATION
COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-800-365-MODOT (1-800-365-6636)

HANDRAIL FIGURE

FOR GENERAL NOTES AND HANDRAILING REQUIREMENTS ON FULL SHEET SEE SHEET 2 OF 4

SHEET 3

DATE REVIEWED: 5/9/200

STATE OF MISSOURI
OFFICE OF THE ATTORNEY GENERAL
ARCHITECT OF THE STATE

608.40 1 OF 4
SIDEWALK SAFETY RAIL WITH BALUSTERS AND HANDRAIL

SIDEWALK WITHOUT BUFFER STRIP
(SECTION A-A)

SIDEWALK WITH BUFFER STRIP
(SECTION A-A)

FOR GENERAL NOTES AND MATERIAL REQUIREMENTS ON FILL SHAPES SEE SHEET 3 OF 4.
**Handrail Requirements**

<table>
<thead>
<tr>
<th>Fill Slope/Height</th>
<th>Handrail</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1V:3H) or Flatter</td>
<td>Not Required</td>
</tr>
<tr>
<td>6 ft. or Steeper</td>
<td>Required</td>
</tr>
<tr>
<td>4 ft. or Steeper</td>
<td>Required</td>
</tr>
<tr>
<td>1 ft. or Steeper</td>
<td>Required</td>
</tr>
</tbody>
</table>

**Railing and Post Specification**

<table>
<thead>
<tr>
<th>Description</th>
<th>Type</th>
<th>Size (Dia.)</th>
<th>Weight (Lbs./Ft.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Railing &amp; Post</td>
<td>Round</td>
<td>1 1/2&quot;</td>
<td>0.940/2.720</td>
</tr>
<tr>
<td></td>
<td>Square</td>
<td>2&quot; x 2&quot;</td>
<td>1.398/4.310</td>
</tr>
<tr>
<td></td>
<td>Rect.</td>
<td>3/8&quot; x 1/2&quot; Stl.</td>
<td>0.231/0.668</td>
</tr>
<tr>
<td></td>
<td>Square</td>
<td>1/2&quot; x 1/2&quot; ALUM.</td>
<td>0.294/</td>
</tr>
</tbody>
</table>

**General Notes:**
- Railings and posts may be either round or square steel of good commercial weldable quality or aluminum alloy 6061-T6 or 6063-T6.
- Steel railings and posts shall be galvanized after fabrication in accordance with AASHTO M11.
- All joints shall be continuous welded and ground smooth.
- Metal safety rail must be compliant with the "American's with Disabilities Act Accessibility Guidelines (ADAAG)", exceptions must be approved by the Engineer. All other areas of non-compliance shall be removed and corrected at the Contractor's expense.
- All posts shall have a 1/4" weep hole immediately above the mounting plate.
- When installed the posts shall be plumb and railings shall match the slope of the sidewalk.

**Missouri Highways and Transportation Commission**

105 West Capitol
Jefferson City, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

**Handrail**

**Date Effective:** 04/01/2015
**Date Prepared:** 02/20/2015

**Sheet No:** 3 of 4
HANDRAILING

DETAIL A - HANDRAIL

HANDRAIL NOTES:

- HANDRAILS SHALL BE STEEL OF GOOD COMMERCIAL WELDABLE QUALITY OR ALUMINUM ALLOY 6061-T6 OR 6063-T6.
- HANDRAILS SHALL BE GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH AASHTO M111.
- HANDRAILS SHALL BE AT A CONSISTENT HEIGHT ABOVE WALKING SURFACES.
- HANDRAIL GRIPPING SURFACES SHALL BE CONTINUOUS ALONG THEIR LENGTH AND SHALL NOT BE OBSTRUCTED ALONG THEIR TOPS OR SIDES.
- THE BOTTOMS OF HANDRAIL GRIPPING SURFACES SHALL NOT BE OBSTRUCTED FOR MORE THAN 20 PERCENT OF THEIR LENGTH.
- WHERE HANDRAILS ARE PROVIDED ALONG WALKING SURFACES WITH SLOPES NOT STEEPER THAN 1:20, THE BOTTOMS OF HANDRAIL GRIPPING SURFACES SHALL BE PERMITTED TO BE OBSTRUCTED ALONG THEIR LENGTH IN ORDER TO PROVIDE INTEGRAL BUMPER GUARDS.
- THE DISTANCE BETWEEN HORIZONTAL PROJECTIONS AND THE BOTTOM OF THE GRIPPING SURFACE SHALL BE PERMITTED TO BE REDUCED BY A QUANTITY EQUAL TO EACH PERIMETER DIMENSION THAT EXCEEDS 4".
- HANDRAIL SURFACES AND ANY SURFACES ADJACENT TO SUCH SHALL BE FREE OF SHARP OR ABRASIVE ELEMENTS AND SHALL HAVE ROUNDED EDGES.
- HANDRAILS SHALL NOT ROTATE WITHIN THEIR FITTINGS.

CIRCULAR CROSS SECTION

- 4" - 6" PERIMETER MAX.
- 1/2" - 2" D.O.D. MAX.

NON-CIRCULAR CROSS SECTION

- 4" - 6" PERIMETER MAX.
GENERAL NOTES:

ALL AREAS OF THE PEDESTRIAN ACCESS ROUTE MUST BE COMPLIANT WITH THE AMERICANS WITH DISABILITIES ACT—GUIDELINES FOR ACCESSIBLE PUBLIC RIGHTS OF WAY. EXCEPTIONS MUST BE APPROVED BY THE ENGINEER. ALL OTHER AREAS OF NON-COMPLIANCE SHALL BE REMOVED AND CORRECTED AT THE CONTRACTOR’S EXPENSE.

THE SURFACES OF PEDESTRIAN ACCESS ROUTES AND ELEMENTS, AND SPACES REQUIRED TO CONNECT TO PEDESTRIAN ACCESS ROUTES, SHALL BE FIRM, STABLE, SLIP RESISTANT, AND SHALL NOT POND WATER.

SIDEWALK, RAMP AND LANDING CROSS SLOPES SHALL BE 1.00% TO FACILITATE DRAINAGE (2.00% MAX). THE CROSS SLOPE OF THE CONTINUOUS PEDESTRIAN ACCESS ROUTE THROUGH ENTRANCES, ALLEYS, AND SIDEROAD CONNECTIONS WITH STOP OR YIELD CONTROL SHALL BE 1.00% TO FACILITATE DRAINAGE (2.00% MAX).

WHERE PEDESTRIAN ACCESS ROUTES ARE CONTAINED WITHIN PEDESTRIAN STREET CROSSINGS WITHOUT YEILD OR STOP CONTROL, THE CROSS SLOPE OF THE PEDESTRIAN ACCESS ROUTE SHALL BE 5.00% MAXIMUM.

WHERE PEDESTRIAN ACCESS ROUTES ARE CONTAINED WITHIN MIDBLOCK PEDESTRIAN STREET CROSSINGS, THE CROSS SLOPE OF THE PEDESTRIAN ACCESS ROUTE SHALL BE PERMITTED TO EQUAL THE STREET OR HIGHWAY GRADE.

30"x48" CLEAR SPACE SHALL BE PROVIDED CENTERED ON THE PEDESTRIAN PUSH BUTTON.

B EYOND THE BOTTOM GRADE BREAK OF A CURB RAMP, A CLEAR SPACE 4' MINIMUM BY 4' MINIMUM SHALL BE PROVIDED WITHIN THE WIDTH OF THE PEDESTRIAN STREET CROSSING AND WHOLLY OUTSIDE THE PARALLEL VEHICLE TRAVEL LANE.

SIDE FLARES OF CURB RAMPS, IN THE PATH OF PEDESTRIAN TRAVEL (TRAVERSABLE), SHALL NOT EXCEED A SLOPE OF 1:20H. SIDE FLARES OUTSIDE THE PEDESTRIAN PATH (NONTRAVERSABLE) MAY BE VERTICAL.

TRANSITION FROM SIDEWALK OR CURB RAMP TO GUTTER SHALL BE FLUSH.

DETECTABLE WARNING SURFACES (TRUNCATED DOMES) SHALL BE PREFORMED AND INSTALLED AS PER MANUFACTURER’S RECOMMENDATIONS. STAMPED CONCRETE WILL NOT BE ACCEPTED.

THE DETECTABLE WARNING SURFACE SHALL CONTRAST VISUALLY WITH ADJOINING SURFACES. EITHER LIGHT-ON-DARK OR DARK-ON-LIGHT. TRUNCATED DOMES SHALL SPAN THE FULL WIDTH OF THE RAMP OR LANDING 24" DEEP.

DETECTABLE WARNING SURFACES SHALL BE ALIGNED PERPENDICULAR OR RADIAL TO THE BREAK BETWEEN THE RAMP, LANDING OR BLENDED TRANSITION, AND THE STREET.

WHERE THE BOTTOM GRADE BREAK OF A CURB RAMP IS LESS THAN 5’ FROM THE BACK OF CURB, DETECTABLE WARNINGS SHALL BE LOCATED ON THE RAMP SURFACE AT THE BACK OF THE CURB. WHERE THE GRADE BREAK IS GREATER THAN 5’ FROM THE BACK OF CURB, THE DETECTABLE WARNING SHALL BE LOCATED ON THE LOWER LANDING.

* SOME DETECTABLE WARNING PRODUCTS REQUIRE A CONCRETE BORDER FOR PROPER INSTALLATION. THE CONCRETE BORDER SHALL NOT EXCEED 2 INCH PER SIDE.
6' WIDTH NEXT TO CURB OR
5' WIDTH W/ MIN. 2' LAWN SPACE

EXISTING GROUNDLINE

1% (2% MAX.)

VARIABLE HEIGHT TYPE A BARRIER CURB

EXISTING CURB

VARIABLE HEIGHT CURB TIE INTO
EXISTING CURB FLUSH WITH RAMP

6' WIDTH NEXT TO CURB OR
5' WIDTH W/ MIN. 2' LAWN SPACE

PEDESTRIAN PUSH BUTTON (6)

RAMP

5' MIN. LANDING

5' MIN.

VARIABLE HEIGHT TYPE A BARRIER CURB AS NEEDED

RAMP

5' MIN. LANDING

5' MIN.

RAMP

5' MIN. LANDING

5' MIN.

RAMP

5' MIN. LANDING

5' MIN.

CONCRETE

PEDESTRIAN PUSH BUTTON (6).

SOD

PEDESTRIAN PUSH BUTTON (6).
**GENERAL NOTES:**

1. 1.0% MINIMUM, 2.0% MAXIMUM.
2. VERTICAL OR 1° FLARE. IF TRAVERSABLE USE A MAX. 1:10 FLARE MEASURED PARALLEL TO THE CURB LINE.
3. ENSURE THAT THE INSIDE EDGE OF CURVED RAMPS MAINTAIN AN 8.3% (1V:12H) MAXIMUM SLOPE.
4. 1.0" MINIMUM, 2.0" MAXIMUM.
5. THE COUNTER SLOPE OF THE GUTTER OR STREET AT THE FOOT OF CURB RAMP RUNS, BLENDED TRANSITIONS, AND TURNING SPACES SHALL BE 5% MAXIMUM.
6. BEYOND THE BOTTOM GRADE BREAK, A CLEAR SPACE 4' X 4' MINIMUM SHALL BE PROVIDED WITHIN THE WIDTH OF THE PEDESTRIAN STREET CROSSING AND WHOLLY OUTSIDE THE PARALLEL VEHICLE TRAVEL LANE.
7. THE FACE OF PEDESTRIAN PUSH BUTTONS SHALL BE 10" OFFSET FOR FRONT APPROACH AND 10" MAX. FOR SIDE APPROACH TO THE CURB FACE.

**CURB RAMPS**

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JEFFERSON CITY, MO 65102

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(2) Pedestrian push buttons shall be 20" offset from the front approach and 10" max. from the side approach to the curb face.

Detectable warning surfaces shall be placed at the edges of the pedestrian island and shall be separated by 2' min. length of surface without detectable warnings.

Island cut through typical:
- Ramp or cut-through depending on island width. If ramped, provide 4' min. landing and slope ramps at 1:12 max.
- Ramps must be constructed to drain to the outside.

Detectable warning surfaces shall be omitted if length is < 6', because refuge space is deemed too small.
GENERAL NOTES:
A minimum 4" Type 1 or 5 aggregate base shall be placed beneath all curb and gutter sections and included within the mainline base pay limits.

When curbs are constructed directly beneath guardrail, curb height shall be a 4 inch barrier curb, as shown on standard plan 609.00.

Curb, gutter and curb and gutter constructed along and attached to concrete pavement or base shall have:
1. Joint as one-quarter depth of curb and gutter thickness as a continuation of each contraction joint in the base or pavement.
2. Joint as continuation of 2" expansion joint in the concrete base or pavement shall extend and continue through the curb, gutter, and curb and gutter.
3. Joint through curb and curb and gutter at the beginning and end of each paved approach.

Curb, gutter and curb and gutter constructed apart or separated from concrete base or pavement or as a form for asphaltic concrete pavement shall have a joint entirely through the curb, curb and gutter and gutter, at the beginning and end of each "paved approach" and a joint to 1/4 depth of curb and gutter thickness at intervals of 30 feet between approaches.

Joints through curb shall be filled with preformed filler material and sealed with hot poured filler for joints.

Joint in gutter shall be filled with preformed filler and sealed with hot filler material.

Preformed filler material shall be placed to provide 1" hot poured filler for joints.

The barrier class curbs may be constructed without batter when constructed on a radius of 6 feet or less. The 6" will be required.

Where a sidewalk intersects a curb, the sidewalk shall be ramped no steeper than 1:121 slope to provide access for wheelchair across approaches.

When allowed by the engineer, Types A and B gutter may be precast to conform to the dimensions shown. The precaster shall submit shop drawings indicating the section length, section connection, and proposed joint sealing system. When precast sections cannot conform to any vertical or horizontal curve designated on the plans, the gutter shall be cast-in-place, a combination of cast-in-place and precast gutter may be permitted.
FLAT BOTTOM DITCH
WITHOUT BEDDING MATERIAL

SHOULDER, FINISHED GRADE, OR NATURAL GROUND

VARIABLE

MIN. THICKNESS

DEPTH

VARIABLE

WIDTH

VARIABLE

EROSION CONTROL GEOTEXTILE FABRIC (IF REQUIRED) SEE SPECIAL PROVISIONS

FLAT BOTTOM DITCH
WITH BEDDING MATERIAL

TYPICAL DITCH LINER DETAILS

TYPE | ROCK DITCH LINER MIN. THICKNESS | BEDDING MATERIAL MIN. THICKNESS
--- | --- | ---
1 | 8" | --
2 | 12" | --
3 | 22" | 8"
4 | 30" | 12"
CONSTRUCT LINING ON BACKSLOPE AT CULVERT OUTLET WHEN ROADWAY DITCH IS INTERCEPTED AND FLOW IS CARRIED IN ROADWAY DITCH FOR SOME DISTANCE.

<table>
<thead>
<tr>
<th>ROCK LINING FOR CULVERT OUTLETS</th>
</tr>
</thead>
<tbody>
<tr>
<td>CULVERT SIZE, DIA (IN.)</td>
</tr>
<tr>
<td>16</td>
</tr>
<tr>
<td>24</td>
</tr>
<tr>
<td>30</td>
</tr>
<tr>
<td>42</td>
</tr>
<tr>
<td>48</td>
</tr>
<tr>
<td>54</td>
</tr>
<tr>
<td>60</td>
</tr>
<tr>
<td>66</td>
</tr>
<tr>
<td>72</td>
</tr>
<tr>
<td>84</td>
</tr>
<tr>
<td>96</td>
</tr>
<tr>
<td>108</td>
</tr>
</tbody>
</table>

GENERAL NOTES:
THE DIMENSIONS SHOWN IN THE TABLE CAN BE APPLIED TO BOX OR ARCH CULVERTS OF EQUIVALENT WATERWAY AREA.

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ELEVATION (SLOPE PROTECTION)

A - SEE BRIDGE PLANS
B - BERM SHALL BE CONSTRUCTED TO ELEVATION SHOWN ON PLANS WITH A MINIMUM OF 4'-0" BELOW BOTTOM OF SUPERSTRUCTURE.
C - DIMENSION OF BERM (SEE BRIDGE PLANS).

RAISE EDGE 3" IN 2'-0" TO 12" ± FROM FINISHED GROUND LINE (TYP.).
LIMIT OF SLOPE PROTECTION (TYP.).

LIMIT OF SLOPE PROTECTION (3)

SQUARE

APRON

PART PLAN

SKewed

GENERAL NOTES:
SLOPE PROTECTION SHALL BE MADE CONTINUOUS BETWEEN STRUCTURES WHEN MEDIAN IS 60' OR LESS.
CONCRETE SLOPE PROTECTION SHALL BE FORMED AROUND ANY UNDISTURBED ROCK THAT IS PERMITTED TO REMAIN WITHIN THE SLOPE PROTECTION AREA.

NOTE:
IF SLOPE PROTECTION FOOTING FALLS ON OR AROUND OTHER FOOTINGS, ONE LAYER OF 50# ROOFING FELT SHALL BE PLACED BETWEEN CONTACT SURFACES OF FOOTINGS.
ATTENUATOR LAYOUT:

ALL SAND FILLED ATTENUATORS SHOULD MEET MANUFACTURER'S RECOMMENDATIONS FOR THE ARRAY AND SAND WEIGHT.

10" x 10" TYPE I OBJECT MARKER WITH MID-FLUORESCENT ORANGE SHEETING

10" x 10" TYPE I OBJECT MARKER WITH MID-FLUORESCENT TYPE 3 YELLOW SHEETING

TRAFFIC PASSING TO BOTH LEFT AND RIGHT

TRAFFIC PASSING TO LEFT
FLIP FOR TRAFFIC TO RIGHT

TYPE 3 OBJECT MARKER PLACEMENT FOR PERMANENT INSTALLATIONS

GENERAL NOTES:

OBJECT MARKERS SHALL BE CENTERED VERTICALLY OR PLACED AS DIRECTED BY THE ENGINEER.

SAND FILLED IMPACT ATTENUATORS
CONSTRUCT (C) JOINT(S) IF LENGTH OF REPAIR IS GREATER THAN OR EQUAL TO 10 FT. JOINTS SHALL BE AS EQUALLY SPACED AS POSSIBLE.

CONSTRUCT (C) JOINT IF LENGTH OF REPAIR IS GREATER THAN OR EQUAL TO 30 FT.

EXISTING CONSTRUCTION
JOINTS OR STABLE CRACK

INSTALL (C) JOINT IF LENGTH OF REPAIR IS GREATER THAN OR EQUAL TO 30 FT.

EXISTING REINFORCING

SECTION A-A

THIN CIRCULAR DISK

1. SMOOTH EPOXY-COATED COWLES SHALL BE USED IN ALL FULL DEPTH PAVEMENT REPAIR TRANSVERSE JOINTS.

2. THE ANCHORING MATERIAL (EPOXY OR POLYESTER) SHALL BE PLACED TO THE EDGE OF THE PREDRIRED HOLE BEFORE INSERTING THE DOWEL BAR.

3. THE DOWEL IS INSERTED INTO THE HOLE WITH A TWISTING MOTION SO THAT THE MATERIAL IN THE BACK OF THE HOLE IS FORCED UP AND AROUND THE BAR.

4. EXPOSED END OF DOWEL SHALL BE COATED WITH A THIN LAYER OF CORROSION RESISTANT EPOXY. DOWEL BARS MAY BE INSTALL IN COMPLIANCE WITH MISSOURI STANDARD PLAN 502.10, IN LIEU OF CORROSION RESISTANT DOWEL BARS. FOR DETAILS OF TYPE (A) JOINTS, SEE DETAIL B.

5. REPAIR ONLY ONE LANE AT A TIME.

NON-REINFORCED AND REINFORCED PORTLAND CEMENT CONCRETE
1) REMOVE ALL CONCRETE TO LIMITS SHOWN TO MAX. OF 1/2 THE PAVEMENT DEPTH OF TOP OF COWELS BY MILLING.

2) PLACE COMPRESSIBLE INSERT IN JOINT OR CRACK. INSERT SHALL BE THICKNESS OF JOINT OR CRACK WIDTH, BUT NOT LESS THAN 1/8".

3) CHIP VERTICAL REPAIR EDGES AT APPROXIMATE 1:1 SLOPE.

4) PLACE 4" MIN. COMPRESSIBLE INSERT ADJACENT TO LONGITUDINAL LANE OF SHOULDER JOINT.

5) EXPOSED SURFACE SHALL BE CLEANED BY SANDBLASTING OR SNOWBLASTING.

6) EXPOSED SURFACE OF COWEL BARS SHALL BE COATED WITH AN APPROVED BONDING.

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PAVEMENT REPAIR
PARTIAL DEPTH
CLASS A

AREA TO BE REMOVED

SECTION A-A
SECTION B-B
SECTION C-C
SECTION D-D
SECTION E-E
CROSS STITCHING PLAN

GENERAL NOTES:

1. AT EACH REPAIR LOCATION, HOLES SHALL BE DRILLED AT 90° ANGLES TO THE PAVEMENT SURFACE, PERPENDICULAR TO THE CRACK. THE DRILL BIT DIAMETER SHALL NOT EXCEED 1/8".

2. DRILLING SHALL ALTERNATE EACH ADJACENT HOLE ON EITHER SIDE OF THE LONGITUDINAL CRACK FROM HOLE TO HOLE.

3. DRILLED HOLES SHALL NOT PENEatrATE THROUGH THE SLAB BOTTOM.

4. DRILLED HOLES SHALL BE CLEANED OF LOOSE DEBRIS AND DIRT. EPoxy OR PolyESTER BONDING AGENTS FOR CONCRETE, MEETING THE MATERIAL REQUIREMENTS OF SECTION 1005, SHALL BE INJECTED OR PLACED INTO EACH HOLE. A CROSS-STITCH BAR SHALL BE INSERTED IN EACH MIfE SUCH THAT THE EPoxy MATERIAL IS EVENLY DISTRIBUTED AROUND THE BAR AND EXTENDING FROM THE SURFACE WEAVING. EACH BAR SHALL BE INSERTED FOR ENOUGH TO ALLOW 1/2 OF COVER AS SHOWN IN THE PROFILE DETAIL.

5. THE SURFACE SHALL HAVE ALL EXCESS EPoXY REMOVED AND HAVE A FLUSH FINISH.

GENERAL NOTES:

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

PAVEMENT REPAIR

CROSS STITCHING

SECTION A-A
1. 1/2" DIAMETER DOWEL BAR X 18" LENGTH.
2. DOWEL BAR SLOTS SHALL BE PARALLEL TO FLEXWAY.
3. TIP OF COMPRESSIBLE INSERT SHALL BE FLUSH WITH SURFACE.
4. CRACK PERIMETER IN SLOT SHALL BE SEAL WITH SILICONE.
5. COMPRESSIBLE INSERT SHALL BE PLACED AT MIDDLE OF DOWEL BAR.

CONCRETE PAVEMENT

SECTION A-A

PAVEMENT REPAIR
DOWEL BAR RETROFIT

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1-888-MODOT-9672 (6672) or 1-888-663-6722
The diagram provided is a technical drawing for grates and bearing plates. It includes various dimensions, weights, and notes for construction purposes. The drawing contains detailed specifications for the design and installation of grates and bearing plates, including dimensions for openings, lengths, angles, and slot sizes. The notes explain the tolerances and requirements for the installation, such as the full depth of bars, and the use of washers and bolts. The drawing also includes a table with weight and dimensions data for different sizes of grates and bearing plates. The general notes emphasize the importance of proper cleaning and sealing, as well as the use of the correct hardware for assembly. The drawing is prepared by the Missouri Highways and Transportation Commission and is intended for use in the construction of grates and bearing plates.
INSTALLATION INSTRUCTIONS:

DRILL AND TAP FRAME.
INSTALL 1/2" DIA. BOLTS WITHOUT WASHERS BEFORE CONCRETE POUR TO FORM 1/2" BOLT EXTENSION INTO CONCRETE BELOW FRAME. LUBRICATE EXPOSED THREADS.

AFTER CONCRETE HARDENS SUFFICIENTLY, FINAL INSTALLATION SHALL REMOVE AND REINSTALL 1/2" DIA. BOLTS AND LOCK WASHERS THROUGH GRATE AND FRAME. TORQUE 1/2" DIA. BOLTS TO 35-40 FT. LB. APPLY THREAD ADHESIVE TO ALL 1/2" DIA. STAINLESS STEEL BOLTS.

GENERAL NOTES:
GRATES TO BE CONSTRUCTED OF CAST GRAY IRON AND MEET REQUIREMENTS OF AASHTO M 306. MINOR VARIATIONS IN VANE SHAPE TO MEET MANUFACTURER'S STANDARD PRACTICE ARE PERMITTED.

MINIMUM CLEAR OPEN AREA: 2.10 SQUARE FEET.

NOMINAL DIMENSIONS AND WEIGHTS

<table>
<thead>
<tr>
<th>OPENING</th>
<th>WEIGHT</th>
<th>ANCHOR BOLTS</th>
<th>STAINLESS STEEL BOLTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>2'-0&quot; x 2'-0&quot;</td>
<td>200</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>2'-0&quot; x 2'-0&quot;</td>
<td>24&quot;</td>
<td>4</td>
<td>8</td>
</tr>
</tbody>
</table>

NOTE: TWO 2' X 2' GRATES MAY BE USED IN LIEU OF SINGLE 4' X 2' GRATE.
WHEN SPECIFIED, USE A LOCK TYPE FRAME AND COVER WITH A MINIMUM OF 3 LOCK BLOCKS AND BOLTS.

A CHECKERED DESIGN TOP SHALL BE FURNISHED.
ELEVATION
ADJUSTING RING
SOLID OR ADJUSTABLE

SECTION B-B

COVER
ADJUSTING RING
FRAME

SECTION A-A

INSTALLATION DETAILS

APPROXIMATE WEIGHT OF FRAME AND COVER 150 LBS.
ALTERNATE TYPE 4 COVER

PLAN

23"

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1-888-435-MODOT (1-888-466-6636)

MANHOLE FRAMES AND COVERS

DATE EFFECTIVE: 03/01/1996
DATE PREPARED: 8/21/2009

614.30E 2 OF 2
### TABLE A

**WORK ZONE SIGN MOUNTING REQUIREMENTS**

<table>
<thead>
<tr>
<th>TYPE</th>
<th>SIGN SUPPORT</th>
<th>SIGN SUBSTRATE</th>
<th>MINIMUM MOUNTING HEIGHT (ft)</th>
<th>USAGE LIMITATIONS</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>POST</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RIGID</td>
<td>PERFORATED SQUARE STEEL TUBE</td>
<td>RURAL UNDIVIDED HIGHWAYS</td>
<td>5'</td>
<td>NONE</td>
<td>POSTS SHALL BE FREE OF ANY BRACING AND EXTEND NO FURTHER ABOVE THE SIGN EXCEPT AS NEEDED FOR WARNING LIGHT ATTACHMENT. FOR DETAILS OF POST INSTALLATION SEE SHEET NO. 2 OF 'M'. GALVANIZATION OF POSTS WILL NOT BE REQUIRED.</td>
</tr>
<tr>
<td>RIGID</td>
<td>U-CHANNEL</td>
<td>RURAL UNDIVIDED HIGHWAYS</td>
<td>7'</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RIGID</td>
<td>T' RURAL DIVIDED HIGHWAYS</td>
<td>T' URBAN HIGHWAYS</td>
<td>7'</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TYPE 2 PORTABLE</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RIGID</td>
<td>FOLD-UP STAND</td>
<td>RURAL UNDIVIDED HIGHWAYS</td>
<td>5'</td>
<td>PERMITTED ONLY WHERE POST MOUNTING IS NOT FEASIBLE.</td>
<td>SYSTEMS SHALL COMPLY WITH CRASH TEST REQUIREMENTS OF NCHRP 350 TEST LEVEL 3 AND MAY BE PLACED ADJACENT TO OR WITHIN THE ROADWAY PROVIDED A MINIMUM LATERAL CLEARANCE OF 3 FEET, MEASURED HORIZONTALLY FROM THE EDGE OF THE SIGN TO THE EDGE OF THE DESIGNATED TRAVELED WAY, IS MAINTAINED.</td>
</tr>
<tr>
<td>RIGID</td>
<td>FLEXIBLE</td>
<td>RURAL UNDIVIDED HIGHWAYS</td>
<td>7'</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RIGID</td>
<td>FLEXIBLE</td>
<td>T' RURAL DIVIDED HIGHWAYS</td>
<td>T' URBAN HIGHWAYS</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>BARRIER</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RIGID</td>
<td>CONCRETE TRAFFIC BARRIER GUARDRAIL</td>
<td>RURAL UNDIVIDED HIGHWAYS</td>
<td>5'</td>
<td>PERMITTED ONLY WHERE LONGITUDINAL BARRIER IS PRESENT.</td>
<td>SYSTEMS SHALL PROVIDE POSITIVE CONNECTION TO THE BARRIER AND MINIMIZE POTENTIAL FOR VEHICLE SNAGGING.</td>
</tr>
<tr>
<td>RIGID</td>
<td>FLEXIBLE</td>
<td>RURAL UNDIVIDED HIGHWAYS</td>
<td>7'</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RIGID</td>
<td>FLEXIBLE</td>
<td>T' RURAL DIVIDED HIGHWAYS</td>
<td>T' URBAN HIGHWAYS</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>VEHICLE</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RIGID</td>
<td>PAVEMENT MARKING EQUIPMENT</td>
<td>FLEXIBLE</td>
<td>48'' (6)</td>
<td>PERMITTED ONLY IN PILOT CAR OR MOVING OPERATIONS.</td>
<td></td>
</tr>
<tr>
<td>RIGID</td>
<td>PILOT CAR</td>
<td>Flexible</td>
<td>48'' (6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RIGID</td>
<td>PROTECTIVE VEHICLE</td>
<td>Flexible</td>
<td>48'' (6)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**GENERAL NOTES:**

1. MEASURED FROM THE BOTTOM OF THE SIGN TO THE NEAR EDGE OF THE PAVEMENT.
2. MOUNTING HEIGHTS FOR REGULATORY AND GUIDE SIGNS SHALL BE AS SPECIFIED FOR POST-MOUNTED SIGNS.
3. SIGNS MOUNTED ON TYPE III BARRICADES, GORE EXIT SIGN, AND SIGNS FOR CROWD/Walk/CURB/CLOSURES MAY BE LEFT IN PLACE FOR MORE THAN 3 DAYS.
4. DEVIATIONS AS APPROVED BY THE ENGINEER.

**LONGITUDINAL SPACING OF SIGNS SHOWN IN THE PLANS ARE PREFERRED MINIMUMS, BUT MAY BE ADJUSTED TO MEET EXISTING FIELD CONDITIONS WITH APPROVAL FROM THE ENGINEER.**

**SIGNS SHALL NOT BE MOUNTED IN OR ON CHANNELIZERS.**

**ALL POSTS AND SIGNS SHALL BE INSTALLED AND MAINTAINED IN A PLUMB POSITION.**

**CONSTRUCTION SIGNS SHALL NOT BE LOCATED ON SIDEWALKS, BICYCLE LANES, OR AREAS DESIGNATED FOR PEDESTRIAN OR BICYCLE TRAFFIC.**

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

**JEFFERSON CITY, MO 65102**

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

**TEMPORARY TRAFFIC CONTROL DEVICES**

**SIGN MOUNTING REQUIREMENTS**

**DATE EFFECTIVE:** 07/01/2020

**DATE PREPARED:** 4/29/2020

**SHEET NO.:** 1 OF 9

---

**HEIGHT AND LATERAL LOCATIONS FOR POST AND PORTABLE SIGN MOUNTING**

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>E' MIN.</td>
<td>12' MAX.</td>
<td></td>
</tr>
</tbody>
</table>
USE OF SPLICE IS OPTIONAL.

SPLICE OVERLAP SHALL BE POSITION ENTIRELY BETWEEN GROUND LINE AND 18" ABOVE GROUND LINE.

+ IF A PLAQUE IS USED, NEITHER THE SIGN NOR PLAQUE SHALL BE POSITIONED WITHIN THE SPLICE OVERLAP AREA.

ONLY ONE SPLICE WILL BE ALLOWED PER POST.

U-CHEANEL POST DETAIL

POST SPACING

WOOD POST DETAIL

PERFORATED SQUARE STEEL TUBE POST DETAIL

POST TYPE

<table>
<thead>
<tr>
<th>SIGN AREA (Sq.Ft.)</th>
<th>U-CHEANEL</th>
<th>WOOD</th>
<th>PERFORATED SQUARE STEEL TUBING</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 10</td>
<td>1 - 3.0 Lb./Ft.</td>
<td>1 - 4&quot; x 4&quot;</td>
<td>1 - 2&quot; x 12</td>
</tr>
<tr>
<td>&gt; 10 ≤ 16</td>
<td>2 - 3.0 Lb./Ft.</td>
<td>2 - 4&quot; x 4&quot;</td>
<td>2 - 2&quot; x 12</td>
</tr>
<tr>
<td>&gt; 16 ≤ 24</td>
<td>2 - 3.0 Lb./Ft.</td>
<td>2 - 4&quot; x 4&quot;</td>
<td>2 - 2&quot; x 12</td>
</tr>
<tr>
<td>&gt; 24 ≤ 72</td>
<td>3 - 3.0 Lb./Ft.</td>
<td>2 - 4&quot; x 6&quot;</td>
<td>2 - 2&quot; x 12</td>
</tr>
<tr>
<td>&gt; 72</td>
<td>3 - 3.0 Lb./Ft.</td>
<td>2 - 4&quot; x 6&quot;</td>
<td>2 - 2&quot; x 12</td>
</tr>
</tbody>
</table>

+ SIGNS GREATER THAN 3 FEET IN HEIGHT, EXCEPT DIAMOND SHAPE SIGNS, REQUIRE THE POST.

++ REQUIRES SLIP BASE PER MANUFACTURER'S RECOMMENDATION.

THE SIGN POST MAY BE ATTACHED TO THE Anchor WITH A CORNER BOLT OR STRAIGHT BOLT PER MANUFACTURER'S SPECIFICATION.

GENERAL NOTES:

ALL POSTS SHALL BE EMBEDDED A MINIMUM OF 3 FEET.

SIGN INSTALLATION DETAILS SHOWN SHALL APPLY TO ALL POSTS IN A MULTI-POST INSTALLATION.

AT THE ENGINEER'S DISCRETION FLUORESCENT PAINT SHALL BE APPLIED HEAVILY TO BOTH SIDES OF U-CHEANEL POST STUB FOR A LENGTH OF AT LEAST 6 INCHES BELOW THE TOP OF THE STUB.

TEMPORARY TRAFFIC CONTROL DEVICES

POST INSTALLATION DETAILS

MOORIS HIGHWAYS AND TRANSPORTATION COMMISSION

105 WEST CAPITAL
JEFFERSON CITY, MO 65102
1-888-MO-DOT-HDV (1-888-663-6838)

TEMPORARY TRAFFIC CONTROL DEVICES

POST INSTALLATION DETAILS

SHEE NO. 616.10AW 2 OF 9

DATE
07/04/2002

SIGN EFFECTIVE:
4/24/2003
**DIRECTION INDICATOR BARRICADE**

Vertical dimensions do not include projections designed for ease of handling.

Direction indicator barricades shall not be used in shifting traffic unless shown on the plans.

The panels shall be securely attached to a support that is portable, capable of remaining upright and entirely free standing.

---

**ADVANCE WARNING RAIL SYSTEM**

Maximum weight of sign shall not exceed 25 lbs.

The sign and rail system may be utilized as two separate crashworthy devices. The rail system shall be located directly in front of the sign 2' to 10' feet separating the two devices.

Where rails are not provided on the backside, steps of 1/2 inch and a Type IV orange reflective sheeting may be applied to the ends of each rail to help delineate the device.

White and orange reflective sheeting shall be in accordance with Sec. 1065.7.4.

---

**CHANNELIZERS**

White, orange, and fluorescent orange reflective sheeting shall be in accordance with Sec. 1064.7.4.2.

**GENERAL NOTES**

White, orange, and fluorescent orange reflective sheeting shall be in accordance with Sec. 1065.4.

Ballast for traffic control devices shall conform to manufacturers' recommendation for field conditions when applicable.

If used, the warning light unit and battery compartment shall be furnished by the device manufacturer or otherwise meet the manufacturer's recommendations for design and shall be resistive on all devices in the series.

Warning lights shall be in accordance with Sec. 1065.4.

Upon approval of the engineer, the contractor may, at no additional cost, use trim-line channelizers in lieu of trim-line channelizers to provide longitudinal channelization within the activity area, where in ramps, intersections or limited lateral clearance exists.

Upon approval of the engineer, the contractor may, at no additional cost, use direction indicator barriercases in lieu of trim-line channelizers in merging traffic.

Upon approval of the engineer, the contractor may, at no additional cost, use vertical panels in lieu of trim-line channelizers to provide longitudinal channelization within the activity area.

Upon approval of the engineer, the contractor may, at no additional cost, use vertical panels in lieu of trim-line channelizers during daytime operations on minor routes.

Panel and rail markings for traffic delineation shall be white, orange, and fluorescent orange reflective sheeting, as shown.

Streets on trim-line channelizers shall be 8" to 8' wide. Streets on drum-like channelizers shall be 4" to 8' wide.

Vertical panels shall be securely attached to a support that is portable, capable of remaining upright and entirely free standing.
Example 1 - One Type 3 Movable Barricade will be required to completely close each 8' of pavement. Pavement shoulder shall be included in the area to be closed.

Signs shall be lightweight (roll-up or plastic) and should not exceed more than 50 percent of the top 2 rails or 75 percent of all three rails.

Warning lights shall be lightweight, less than 10-inches in length, or have battery packs mounted no higher than 10-inches above the ground. The lights shall not cover any portion of the Barricade face.

If warning lights are used, the lights should be installed on the barricades in the direction of traffic.

If signs or lights cannot meet the above requirements, they shall be mounted on separate crashworthy devices at heights specified for post-mounted signs located in Table 6. The barricade shall be located in front of the signs or lights with 7 to 10 feet separating the devices.

Type 3 Movable Barricades shall be entirely free standing and portable. Warning shall only be applied to the front of each rail. If applied to both the front and the back of each rail, provisions the warning on the back does not conflict with intended opposing traffic movement.

White and orange reflective sheeting shall be in accordance with M 104-01-24.

Example 2 - For paved roadways with a width of 20-feet or less and without pavement shoulders, two barricades are acceptable.

Example 3 - Where barricades are placed entirely across a roadway, stripes slope downward in the direction toward which road users must turn.

Example 4 - Where both right and left turns are provided, stripes slope downward in both directions from the center of the barricade or barricades.

Example 5 - Where no turns are intended, stripes positioned to slope upward toward the center of the barricade or barricades.
TWO LANE / TWO WAY TRAFFIC DELINEATION PLAN
FOR DIVIDED HIGHWAY

IF RAILED PAVEMENT MARKERS ARE PRESENT, THE LINES
SHALL BE REMOVED OR COVERED TO THE SATISFACTION
OF THE ENGINEER.

SECTION A-A
TUBULAR DELINEATOR DETAIL

AN ADHESIVE, IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS,
SHALL BE USED TO APPLY THE TUBULAR DELINEATOR TO THE ROADWAY SURFACE.
THE ADHESIVE SHALL PRODUCE A PERMANENT ATTACHMENT TO THE ROADWAY SURFACE.

REFLECTIVE SHEETING APPLIED TO TUBULAR DELINEATORS SHALL BE IN ACCORDANCE
WITH MO DOT 1044.2.C.T.U.

CHANGEABLE MESSAGE SIGN

45 CHANNELIZERS (INCIDENTAL) AT 20' INTERVALS. CHANNELIZERS MAY BE OMITTED
WHERE THE CHANGEABLE MESSAGE SIGN IS LOCATED 15' OR MORE FROM THE EDGE
OF ANY COOLER EDGE OF PAVEMENT SHOULD THERE BE NO SHOULDER.
BESIDE THE EDGE LINE, OR REMAIN A LINE OF PHYSICAL OBSTRUCTION.

TYPE 3 OBJECT MARKERS
FLUORESCENT ORANGE REFLECTIVE SHEETING SHALL BE
IN ACCORDANCE WITH MO DOT 1044.2.C.T.
<table>
<thead>
<tr>
<th>SIGN</th>
<th>SIZE</th>
<th>ARE</th>
<th>SHEETING</th>
<th>COLOR</th>
<th>TYPE O.</th>
<th>DESIGNATION</th>
<th>DESCRIPTION</th>
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<tbody>
<tr>
<td>E01-1</td>
<td>48.76</td>
<td>16.00</td>
<td>11</td>
<td>81</td>
<td>237</td>
<td>FF FL OR SFH</td>
<td>LEFT OPEN</td>
</tr>
<tr>
<td>E01-2</td>
<td>48.76</td>
<td>16.00</td>
<td>11</td>
<td>81</td>
<td>237</td>
<td>FF FL OR SFH</td>
<td>STOP STATION</td>
</tr>
<tr>
<td>E01-3</td>
<td>48.76</td>
<td>16.00</td>
<td>11</td>
<td>81</td>
<td>237</td>
<td>FF FL OR SFH</td>
<td>STOP STATION</td>
</tr>
<tr>
<td>E01-4</td>
<td>48.76</td>
<td>16.00</td>
<td>11</td>
<td>81</td>
<td>237</td>
<td>FF FL OR SFH</td>
<td>STOP STATION</td>
</tr>
<tr>
<td>E01-5</td>
<td>48.76</td>
<td>16.00</td>
<td>11</td>
<td>81</td>
<td>237</td>
<td>FF FL OR SFH</td>
<td>STOP STATION</td>
</tr>
<tr>
<td>E01-6</td>
<td>48.76</td>
<td>16.00</td>
<td>11</td>
<td>81</td>
<td>237</td>
<td>FF FL OR SFH</td>
<td>STOP STATION</td>
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<tr>
<td>E01-7</td>
<td>48.76</td>
<td>16.00</td>
<td>11</td>
<td>81</td>
<td>237</td>
<td>FF FL OR SFH</td>
<td>STOP STATION</td>
</tr>
</tbody>
</table>

**GENERAL NOTES:**

Signs shall be in accordance with the latest edition of "Standard Highway Signs" by the U.S. Department of Transportation - FHWA, unless specified otherwise.

Sign dimensions shown are minimum. No additional payment will be made if contractors use larger signs.

No additional payment will be made for flaps. All flaps shall have a border. Flaps shall not have a border.

**TEMPORARY TRAFFIC CONTROL DEVICES**

**WARNING SIGNS**

**SIZE EFFECTIVE: 07/01/2002**

**SHEET NO:** 6 OF 9

**616.10AW**
### WARNING SIGNS

<table>
<thead>
<tr>
<th>SIGN</th>
<th>SIZE (IN)</th>
<th>AREA (SQ FT)</th>
<th>SHEETING COLOR</th>
<th>DESIGNATION</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>W00-0</td>
<td>42x64</td>
<td>16.00</td>
<td>ASTM D 351</td>
<td>BK</td>
<td>FL</td>
</tr>
<tr>
<td>W00-1</td>
<td>42x64</td>
<td>16.00</td>
<td>ASTM D 351</td>
<td>BK</td>
<td>FL</td>
</tr>
<tr>
<td>W00-2</td>
<td>42x64</td>
<td>16.00</td>
<td>ASTM D 351</td>
<td>BK</td>
<td>FL</td>
</tr>
<tr>
<td>W00-3</td>
<td>42x64</td>
<td>16.00</td>
<td>ASTM D 351</td>
<td>BK</td>
<td>FL</td>
</tr>
<tr>
<td>W00-4</td>
<td>42x64</td>
<td>16.00</td>
<td>ASTM D 351</td>
<td>BK</td>
<td>FL</td>
</tr>
<tr>
<td>W00-5</td>
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<td>16.00</td>
<td>ASTM D 351</td>
<td>BK</td>
<td>FL</td>
</tr>
<tr>
<td>W00-6</td>
<td>42x64</td>
<td>16.00</td>
<td>ASTM D 351</td>
<td>BK</td>
<td>FL</td>
</tr>
<tr>
<td>W00-7</td>
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<td>16.00</td>
<td>ASTM D 351</td>
<td>BK</td>
<td>FL</td>
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<tr>
<td>W00-8</td>
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<td>16.00</td>
<td>ASTM D 351</td>
<td>BK</td>
<td>FL</td>
</tr>
<tr>
<td>W00-9</td>
<td>42x64</td>
<td>16.00</td>
<td>ASTM D 351</td>
<td>BK</td>
<td>FL</td>
</tr>
<tr>
<td>W00-10</td>
<td>42x64</td>
<td>16.00</td>
<td>ASTM D 351</td>
<td>BK</td>
<td>FL</td>
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<tr>
<td>W00-11</td>
<td>42x64</td>
<td>16.00</td>
<td>ASTM D 351</td>
<td>BK</td>
<td>FL</td>
</tr>
<tr>
<td>W00-12</td>
<td>42x64</td>
<td>16.00</td>
<td>ASTM D 351</td>
<td>BK</td>
<td>FL</td>
</tr>
</tbody>
</table>

### GUIDE SIGNS

| G0-1 | 70x48 | 12.00 | ASTM D 351 | BK | FL | OR | SHF | Keep Exit |
| G0-2 | 60x24 | 10.00 | ASTM D 351 | BK | FL | OR | SHF | HIGHWAY MILES |
| G0-3 | 40x24 | 6.00 | ASTM D 351 | BK | FL | OR | SHF | END ROADWAY |
| G0-4 | 40x24 | 6.00 | ASTM D 351 | BK | FL | OR | SHF | PILOT LANE FOLLOW ME PEAK |
| G0-5 | 60x24 | 6.00 | ASTM D 351 | BK | FL | OR | SHF | PILOT LANE FOLLOW ME PEAK |
| G0-6 | 60x24 | 6.00 | ASTM D 351 | BK | FL | OR | SHF | PILOT LANE FOLLOW ME PEAK |
| G0-7 | 60x24 | 6.00 | ASTM D 351 | BK | FL | OR | SHF | PILOT LANE FOLLOW ME PEAK |
| G0-8 | 40x24 | 4.00 | ASTM D 351 | BK | FL | OR | SHF | END DETOUR |
| G0-9 | 40x24 | 4.00 | ASTM D 351 | BK | FL | OR | SHF | END DETOUR |

### REGULATORY SIGNS

| R1-1 | 60x24 | 15.25 | ASTM B | BK | FR | CM | SH | STOP |
| R1-2 | 60x24 | 15.25 | ASTM B | BK | FR | CM | SH | YIELD |
| R1-3 | 60x24 | 15.25 | ASTM B | BK | FR | CM | SH | TO PEDESTRIAN CROSSING |
| R1-4 | 60x24 | 15.25 | ASTM B | BK | FR | CM | SH | PEDESTRIAN CROSSING |
| R1-5 | 60x24 | 15.25 | ASTM B | BK | FR | CM | SH | PEDESTRIAN CROSSING |
| R1-6 | 60x24 | 15.25 | ASTM B | BK | FR | CM | SH | PEDESTRIAN CROSSING |
| R1-7 | 60x24 | 15.25 | ASTM B | BK | FR | CM | SH | PEDESTRIAN CROSSING |
| R1-8 | 60x24 | 15.25 | ASTM B | BK | FR | CM | SH | PEDESTRIAN CROSSING |
| R1-9 | 60x24 | 15.25 | ASTM B | BK | FR | CM | SH | PEDESTRIAN CROSSING |

### SPECIAL SIGNS

| S1-1 | 40x24 | 20.00 | ASTM B | BK | FL | OR | SHF | END WORK ZONE |
| S1-2 | 40x24 | 20.00 | ASTM B | BK | FL | OR | SHF | END WORK ZONE |
| S1-3 | 40x24 | 20.00 | ASTM B | BK | FL | OR | SHF | END WORK ZONE |

### GENERAL NOTES

- Sign layouts shall be in accordance with the latest edition of "Traffic Control Signs" by the U.S. Department of Transportation - FHWA.
- Sign boards shall be conform to the guidelines set forth in the latest edition of "Traffic Control Signs" by the U.S. Department of Transportation - FHWA.

### USE OF A SUPPLEMENTAL PLATE FOR LINE 1 IS ACCEPTABLE.

### PLAN FOR APPLICABLE REGULATORY SIGNS MAY BE MODIFIED AS THE SIGN.
PLAN VIEW
(SYMMETRICAL ABOUT CENTERLINE)
LIMITS OF #4 - #1 BARS SPACED AS SHOWN BELOW
AT TERMINAL ENDS OF BARRIER ONLY

SECTION THROUGH SAWED JOINT

TYPE C
TYPICAL SECTION

NOTE:
1. ALL REINFORCEMENT SHALL BE GRADE 60 EPOXY COATED.
2. BARS APPLIED SHALL BE A MINIMUM OF 24 TIMES THE
   NORMAL DIAMETER OF THE BAR.
3. ANY REINFORCING BAR INSTALLATION METHOD RECOMMENDED BY
   THE CONTRACTOR AND APPROVED BY THE ENGINEER THAT
   WILL ASSURE THE COMPLETELY REINFORCED STEEL WILL
   BE POSITIONED AS SHOWN AS DIMENSIONED WILL BE
   SATISFACTORY.

THE CONTRACTOR HAS THE OPTION TO SLIP-FORM THE
BARRIER. IN SUCH CASE, ADDITIONAL REINFORCEMENT MAY
BE TIED TO THE UPPER TWO-THIRDS OF THE REINFORCING
CAGE TO PROVIDE BULKING.

MOLDING DOWELS MAY BE OMITTED WHEN THE PLANS
SPECIFY A TYPICAL CONCRETE PAVEMENT SURFACE TO BE PLACED
ADJACENT TO BOTH BARRIER FACES.

SAWED JOINTS SHALL BE LOCATED AT PAVEMENT TRANSVERSE
J OINTS.

1. REINFORCING BARS WITH AN EPOXY MOULDED SYSTEM MAY
   BE SUBSTITUTED FOR GRADE 1 DOWEL REINFORCING STEEL.

FOR CONCRETE TRAFFIC BARRIER DETAIL DETAILS SEE
STD PLAN 905.05.
LIMITS OF V1 - V1 SPACED AS SHOWN BELOW AT TERMINAL ENDS OF рабочий проложк

EXISTING CONCRETE WALL

1" DIAM. ROUND STEEL

PLATE FOR 11 REINFORCEMENT DETAIL SEE SHEET A

PLAN VIEW

V1 BAR (#4)

ELEVATION

SECTION A-A

NOTES:

ALL REINFORCEMENT SHALL BE GRADE 60 EPOXY COATED.

BAR SPLICES SHALL BE A MINIMUM OF 24 TIMES THE

NORMAL DIAMETER OF THE BAR.

ANY METHOD DEVISED BY THE CONTRACTOR AND APPROVED BY

THE ENGINEER THAT WILL ASSURE THE LONGITUDINAL

REINFORCING STEEL WILL BE FIXTURED 2 1/2 INCH AS

EQUIVALENTS WILL BE SATISFACTORY.

THE CONTRACTOR HAS THE OPTION TO SLIP-FORM THE

BARRIER. IN SUCH CASE, ADDITIONAL REINFORCEMENT MAY

BE TIED TO THE UPPER TWO-THIRDS OF THE REINFORCING

BAR TO PROVIDE BENDING.

THIS BARRIER SHALL NOT BE USED TO SUPPORT HIGHWAY

LIGHTING FILES.

THIS BARRIER SHALL NOT BE USED FOR BRIDGE RAILWAY

APPLICATIONS.

SAME JOINTS SHALL BE LOCATED AT PAVEMENT TRANSVERSE

JOINTS.

TYPE D SHALL BE USED ONLY AT LOCATIONS SHOWN ON

PLAN.

REINFORCING BARS WITH AN EPOXY ANCHOR SYSTEM MAY

BE SUBSTITUTED FOR SMOOTH 1" DIAMETER ROUND STEEL

BARS.

FOR CONCRETE TRAFFIC BARRIER ELEVATION DETAILS SEE

Sheet Plan 703-03.
ALL REINFORCEMENT SHALL BE GR8 EPOXY COATED.
BAR SPACINGS SHALL BE A MINIMUM OF 24 TIMES THE
MINIMAL DIAMETER OF THE BAR.
MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1/2", UNLESS OTHERWISE SHOWN.
ANY METHOD RECOMMENDED BY THE CONTRACTOR AND APPROVED BY
THE ENGINEER THAT WILL MINIMIZE THE LENGTH AND REINFORCING STEEL WILL BE POSITIONED 1/2" FROM THE DIAMETER WILL BE SATISFACTORY.
THE CONTRACTOR HAS THE OPTION TO REINFORCE THE BARRIER. IN MOST CASES ADDITIONAL REINFORCEMENT MAY BE TIED TO THE OUTER TWO-THIRDS OF THE REINFORCING CAGE TO PROVIDE BACKING.
THIS BARRIER SHALL NOT BE USED TO SUPPORT HIGHWAY LIGHTING FIXTURES.
THIS BARRIER SHALL NOT BE USED FOR BRIDGE ROADWAY APPLICATIONS.
SERRATED JOINTS SHALL BE SPACED AT 15'-0". SEE STANDARD PLANS FOR SERRATED JOINT DETAIL.
TYPE D BARRIER SHALL BE USED ONLY AT LOCATIONS SHOWN ON PLANS.
REINFORCING BARS WITH AN EPOXY ANCHOR SYSTEM MAY BE RECOMMENDED FOR SMOOTH 1" DIAMETER ROUND STEEL BARS.
FOR COMPLETE TRAFFIC BARRIER DETAIL AND INSTALLATION INSTRUCTIONS SEE STD PLAN NoTH.03.
PLAN VIEW

Note: Gutter not shown for clarity.

LIMITS OF M-V1 SPA. AS SHOWN BELOW

ELEVATION

REINFORCEMENT DETAILS

PART SECTION OF M-V1 BAR

SECTION A-A

FOR SLOPING AND NONSLOPING BACKSLOPE

GENERAL NOTES:

CONCRETE SHALL BE CLASS B (F' = 4,000 PSI).

ALL REINFORCEMENT SHALL BE GRADE 60 EPoxy Coated.

ANGLE OF INTERNAL FRICTION: 25° FOR BACKFILL MATERIAL.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1"-12" UNLESS OTHERWISE SHOWN.

BAR SPACINGS SHALL BE A MINIMUM OF 24 TIMES THE BAR DIAMETER OF THE BAR.

ANY METHOD CHOSEN BY THE CONTRACTOR AND APPROVED BY THE ENGINEER THAT WILL ASSURE THE STRUCTURAL REQUIREMENTS WILL BE SATISFACTORY.

THE CONTRACTOR HAS THE OPTION TO SELF-FINISH THE BARRIER. IN WHICH CASE, ADDITIONAL REINFORCEMENT MAY BE TIED TO THE UPPER TWO-THIRDS OF THE REINFORCING CAGE TO PROVIDE FLEXIBILITY.

THIS BARRIER SHALL NOT BE USED TO SUPPORT HIGHWAY ILLUMINATING fixtures.

THIS BARRIER SHALL NOT BE USED FOR BRIDGE FUNDAMENTAL APPLICATION.

Sewn JOINTS SHALL BE SPACED AT 12'-0". SEE MISSOURI STANDARDS PLAN FOR Sewn JOINT DETAIL.

TYPE D BARRIER IS IDENTIFIED WITH HORIZONTAL SLAB SHALL BE USED ONLY AT LOCATIONS SHOWN IN PLANS.

FOR CONCRETE TRAFFIC BARRIER DELINEATION DETAILS SEE STP PLAN 903.05.

REINFORCEMENT SYSTEM SHALL BE DRILLED IN THE PAINTED.

WHEN BARRIER HEIGHT EXCEEDS 42" OR SLAB EXCEEDS 5" H.O.W. OF LIVE LOAD IS WITHIN 5'-0", CONTACT BRIDGE DIVISION FOR SPECIAL DESIGN.
CONCRETE BARRIER END ANCHORAGE ON GRADE

GENERAL NOTES:

ALL REINFORCEMENT SHALL BE GRADE 60 EPOXY COATED.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1/2" UNLESS OTHERWISE SHOWN.

1/2" BUFFER REQUIRED WITHIN THE LIMITS OF THE TRAFFIC BARRIER EXCLUDING THE END ANCHORAGE SECTIONS.

FOR CONCRETE TRAFFIC BARRIER DETAILING DETAILS SEE STD PLAN 903.05.

PAVEMENT SURFACE DIFFERENTIAL SHALL NOT EXCEED 1/2".

BAR SPLICES SHALL BE A MINIMUM OF 24 TIMES THE MINIMAL DIAMETER OF THE BAR.

TRAFFIC BARRIER ON TOP OF MSE WALL

PERMANENT CONCRETE TRAFFIC BARRIER
TYPE E ATOP MSE WALL
#6 B BAR ELEVATION

#6 B BAR PLAN

#4 A BARS

#6 E BAR

<table>
<thead>
<tr>
<th>REINFORCING BARS</th>
<th>PER 12'-6&quot; BARRIER SECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>BAR SIZE</td>
<td>NO. OF BARS</td>
</tr>
<tr>
<td>a</td>
<td>14</td>
</tr>
<tr>
<td>B</td>
<td>6</td>
</tr>
<tr>
<td>E</td>
<td>6</td>
</tr>
</tbody>
</table>

GENERAL NOTE:
DIMENSIONS ARE OUT TO OUT OF BARS UNLESS OTHERWISE NOTED.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

STATE OF MISSOURI

TEMPORARY CONCRETE TRAFFIC BARRIER
TYPE F

CONCRETE VOLUME 1.3 CU YDS APPROXIMATELY WEIGHT 5601 LBS.
PRECAST BARRIER HEIGHT TRANSITION
(Temporary installations only)

(1) Optional 4" ID PLASTIC TUBING SLIDE FOR LIFT HOLE ALLOWED. THE LOCATION OF THE HOE SLIT OBTAIN TO ACCOMMODATE THE REQUIRED HEIGHT DISTRIBUTIONS OF TRANSITION SECTIONS.

(2) 3" x 1 1/2" SLOTS FOR LIFTING - TWO PER SECTION. LOCATION TO BE DETERMINED BY CONTRACTOR.

GENERAL NOTES:

REINFORCING STEEL CLEARANCE TO EDGE OF CONCRETE SHALL BE 1" UNLESS OTHERWISE SHOWN.

HEIGHT TRANSITIONS SHALL NOT BE USED IN INTERSTATE OR FREEWAY LOCATIONS WHERE THE ADJACENT SPEED LIMIT IS GREATER THAN 35 MPH.

No TIE-ROD MALLETS SHALL BE USED WITH TRANSITION BARRIER.

AT THE OPTION OF THE CONTRACTOR, HEIGHT TRANSITIONS MAY BE MANUFACTURED IN ONE SECTION. THE PLANS FOR REINFORCEMENT ACROSS JOINT SHALL BE APPROVED BY THE ENGINEER PRIOR TO MANUFACTURE.
#5 J BAR

1. Tie-down strap anchor shall be one of the following:

- 2" drip in anchor with a 3/4" thread and 1/2" x 18" long Grade 5 bolt.

- Red Head Large Diameter Tapcon (length: 4" x 4" long with a 1/2" thread).

- Simpson Titex: 3/4" Dia. x 5" long with a 3/4" thread.

2. Rigid pavement only (see General Notes).

3. See other sheets for details not shown.

General Notes:

Tie-down strap systems are only applicable on rigid pavements.

Contractor shall verify all dimensions in field before ordering new material.

See other sheets for details not shown.

Missouri Highways and Transportation Commission
105 West Capitol
Jefferson City, MO 65102
1-800-392-MADOT (622-6368)
ELEVATION OF BARRIER WITH ANCHOR PINS

GENERAL NOTES:
CONTRACTOR SHALL VERIFY ALL DIMENSIONS IN FIELD BEFORE MOUNTING NEW MATERIAL.
WHERE EXISTING FLEXIBLE PAVEMENT OR RIGID PAVEMENT IS NOT PRESENT A 3" THICK X 30" WIDE MINIMUM ASPHALT PAE SHALL BE CONSTRUCTED.
COST OF FURNISHING AND INSTALLING THE ASPHALT PAE COMPLETE IN-PLACE WILL BE CONSIDERED INCIDENTAL TO OTHER PAY ITEMS.
SEE OTHER SHEETS FOR DETAILS NOT SHOWN.
AFTER REMOVAL OF ANCHOR PIN HOLES SHALL BE FILLED WITH QUALIFIED SPECIAL MIXTURE IN ACCORDANCE WITH SECTION 704.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-MODOT-3667 1-888-663-6837

TEMPORARY CONCRETE TRAFFIC BARRIER
ANCHORED (PIN SYSTEM)

DATE EFFECTIVE: 6/1/2016 SHEET NO. 7 OF 8
FOR SHOULDERS

EDGE LINE

AS SHOWN ON PLANS

EDGE OF TRAVELER WAY

2 WAY 2 LANE
(SEE TYPICAL STRIPING FOR RUMBLE STRIPS)

L + Lateral deviation shall not exceed one inch in 100 feet.
1. Stop lines shall be placed 80' to the roadway.
2. If railroad traffic is present the stop line shall be 8' from gate.

**Symbol Detail**

1. The distance from the railroad crossing warning to the nearest track will vary according to the approach speed and the sight distance of the vehicle traffic approaching but shall be no less than 50 feet.
2. Three-line railway shall be marked with a centerline for two-line approach operation on the approach to a crossing on multi-line railroad the transverse lines shall extend across all approach lanes and individual rail symbols shall be inset in each approach lane.
3. Placement of yield-to-sign by others.

**Railroad Grade Crossing**

**Letter Detail**

1. 6" by 6" cross bar line shall extend to the face of the curb.
2. Variable based on the slope line width.
3. Varies based on distance of line to curb, but shall not exceed 100.

**Pedestrian Crosswalks**

**Pavement Marking**

**White Midblock Crosswalk (Zebra)**

**White Yield Line Triangles**

Direction of Travel

The triangles shall be uniformly spaced and occupy the complete width of the travel lane. Spacing shall be adjusted so there are no partial triangles within the yield marking.
SIGN SPACING FOR MAINLINE

SIGNAL SPACING AT STATE ROUTE INTERSECTIONS

GENERAL NOTES:

SIGN (2) AND TEMPORARY PAVEMENT MARKING INSTALLED WHERE CENTERLINE STRIPING HAS BEEN COVERED OR REMOVED SHOULD BE REMAIN IN PLACE UNTIL THE PERMANENT CENTERLINE STRIPING HAS BEEN INSTALLED.

SIGN (3) IS PLACED AT APPROXIMATEMELY THIRTY-FIVE INTERVALS AND AT STATE ROUTE JUNCTIONS, UNTIL THE INSTALLATION AT A JUNCTION IS WITHIN ONE-FOURTH MILE OF THE NORMAL MAINLINE SIGN (3). THE LATTER MAY BE ELIMINATED.

ALL SIGNS SHALL BE POST MOUNTED AND IN ACCORDANCE WITH STANDARD PLAN 616.11 AND 903.00.

WHEN SHOULDER CUTOFF SIGNS ARE IN PLACE FOR GREATER THAN THREE DAYS, THE SHOULDER CUTOFF PLACARD SHOULD BE USED IN ADDITION WITH THE SHOULDER CUTOFF SIGN.

TEMPORARY PAVEMENT MARKING
TWO-LANE TWO-WAY HIGHWAY
SIGN SPACING FOR DIVIDED OR MULTI-LANE HIGHWAY

GENERAL NOTES:
- For details of temporary pavement marking, see Sheet 1-A of 5.
- All signs shall be post mounted and in accordance with standard plans 505.10 and 505.03.
- When shoulder drop-off signs are in place for greater than three days, the shoulder drop-off plaque should be used in addition with the shoulder drop-off sign.

SIGN SPACING AT STATE ROUTE INTERSECTIONS

SIGN SPACING AT RAMPS

STATE HIGHWAY AND TRANSPORTATION COMMISSION
105 WEST CAPITAL
JEFFERSON CITY, MO 65102
1-888-688-MODOT (6636) 1-800-247-9656

TEMPORARY PAVEMENT MARKING
DIVIDED AND MULTI-LANE HIGHWAYS

DATE EFFECTIVE: 05/03/2017
DATE PREPARED: 05/03/2017
620.10G SHEET NO. 5 OF 5
* This hole should only be used on patches existing prior to construction. The hole should be located close to the center of the patch. By using this hole, the two holes located at the shoulder could be eliminated.

**Patch**

- **Crack**

- **Joint**

  "Travel" lane for multiple lanes or both lanes of two lane directional roadway.
INTERSECTIONS ACCELERATION OR DECELERATION LANE

EXPRESSWAY DIVIDED

RUMBLE STRIP LAYOUTS

ACCELERATION OR DECELERATION LANE

RUMBLE STRIP LAYOUTS

OUTER ROAD

RUMBLE STRIPS

RESIDENTIAL, COMMERCIAL OR OUTER ROAD

RUMBLE STRIPS

SHOULDER

EDGE OF TRAVELED WAY

EDGE OF TRAVELED WAY

EDGE OF PAVEMENT

EDGE OF PAVEMENT

EDGE OF PAVEMENT

EDGE OF PAVEMENT

14' PAVEMENT STRUCTURES, ALL SHOULDER TYPES

13' PAVEMENT STRUCTURES, ALL SHOULDER TYPES

PAVEMENT STRUCTURES ≤ 12' WITH A2 SHOULDER

PAVEMENT STRUCTURES ≤ 12' WITH A3 SHOULDER

PAVEMENT STRUCTURES ≤ 12' WITH EARTH OR AGGREGATE SHOULDERS

GENERAL NOTES:

* = LATERAL DEVIATION SHALL NOT EXCEED ONE INCH IN 100 FEET.

SEE STANDARD PLAN 620.00 FOR PAVEMENT MARKING.

RUMBLE STRIPS SHALL BE OMITTED IF SHOULDERS ARE LESS THAN 2' WIDE.

ALL RUMBLE STRIPS SHALL BE MILLED.

RUMBLE STRIPS SHALL NOT BE MILLED INTO TRANSVERSE JOINTS.

RUMBLE STRIPS SHALL NOT BE PLACED ON BRIDGES.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

RUMBLE STRIP CROSS SECTION VIEW

RUMBLE STRIP PLAN VIEW

DATE EFFECTIVE: 06/01/2009
DATE PREPARED: 02/20/2009

SHEET NO. 1 OF 2
GENERAL NOTES:

SEE STANDARD PLAN 620.00 FOR PAVEMENT MARKING.

RUMBLE STRIPS SHALL NOT BE PLACED ON BRIDGES.

ALL RUMBLE STRIPS SHALL BE MILLED.

CENTERLINE RUMBLE STRIPS SHALL BE CONTINUOUS THROUGH CONNECTIONS OF SIDEROADS WITH NO LEFT TURN LANES.

DISCONTINUE CENTERLINE RUMBLE STRIPS THROUGH THE LIMITS OF ALL LEFT TURN LANES, INCLUDING ANY LANE TAPER SECTIONS.
GENERAL ELEVATION A-A

CHANNEL BOTTOM SHALL BE GRADED WITHIN RIGHT OF WAY FOR TRANSITION OF CHANNEL BED TO CULVERT OPENINGS. CHANNEL BANKS SHALL BE TAPERED TO MATCH CULVERT OPENINGS.

EQUATIONS FOR COMPUTING A, B, C AND D

\[ A = \text{ANGLE OF BARREL SLOPE WITH HORIZONTAL NORMAL TO ROADWAY OR MEDIAN} = \arctan\left(\frac{E_1 - E_2}{W}\right) \]

\[ B = \text{ANGLE OF FILL SLOPE WITH HORIZONTAL NORMAL TO ROADWAY OR MEDIAN} = \arctan\left(\frac{A_1 - A_2}{W}\right) \]

\[ C = \text{HORIZONTAL DISTANCE FROM UPSTREAM EDGE OF SHOULDER TO = ROADWAY OR MEDIAN} \]

\[ D = \text{HORIZONTAL DISTANCE FROM DOWNSTREAM EDGE OF SHOULDER TO = ROADWAY OR MEDIAN} \]

\[ E = \text{DIAMETER} \]

\[ F = \text{CROWN, LINES AND SHOULDERS} \]

\[ G = \text{POSITIVE IF RISING} \]

\[ H = \text{NEGATIVE IF FALLING AWAY FROM ROADWAY OR MEDIAN} \]

\[ I = \text{TOTAL LENGTH NORMAL TO ROADWAY OR MEDIAN} \]

\[ J = \text{ADJUSTED FOR UNSYMMETRICAL AND NONSTANDARD ROADWAYS.} \]

\[ K = \text{THIS TERM SHALL BE ADJUSTED FOR ENVIRONMENTAL REQUIREMENTS.} \]

GENERAL NOTES:

DESIGN SPECIFICATIONS:

2010 MISSOURI HIGHWAY BRIDGE DESIGN SPECIFICATIONS AND 2010 INTERIM REVISIONS

DESIGN LOADING:

VEHICULAR = 0.93 WINDS LANE LOAD, EARTH = 120 LB/FT, EQUIVALENT FLUID PRESSURE = 30 LB/CF, MIN. 60 LB/CF, MAX. 120 LB/CF

REINFORCING STEEL (GRADE 60) fy = 60,000 PSI

TYPICAL PRECAST CONCRETE SINGLE BOX CULVERT:

1-888-ASK-MODOT (1-888-275-6636)

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

105 WEST CAPITOL

JEFFERSON CITY, MO 65102

1-888-456-MODOT 11-888-275-6636

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

CONCRETE SINGLE BOX CULVERT

SKEW: SQUARED

WINGS: STRAIGHT

LAYOUT

DATE PREPARED: 07/01/2015

DATE PREPARED: 07/01/2015

703-10J

1 OF 3
GENERAL NOTES:
FOR SECTIONS THRU BARREL, WINGS AND HEADWALLS, SEE SHEET 3 OF 3. FOR BAR SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT EXCEPT J5 BARS, SEE 703.17. FOR J5 BARS, SEE 703.37.
CONSTRUCTION JOINT KEY NOT SHOWN FOR CLARITY IN HALF PLANS AND ELEVATION. SEE SHEET 3 OF 3 FOR DETAILS.
DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.
MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1.5".
LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.
BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.
(a) SAME SIZE AND SPACING AS B2 BARS
(b) VARIOUS: 12" MAXIMUM
(c) J5 BAR SPACING
(d) NOT SPECIFIED ON THIS SHEET
(e) NOT SPECIFIED ON THIS SHEET
(f) NOT SPECIFIED ON THIS SHEET
(g) NOT SPECIFIED ON THIS SHEET
(h) FOR DESIGN FILLS OVER 2 FT
(i) FOR DESIGN FILLS 2 FEET OR LESS THE FOLLOWING SHALL APPLY:
MINIMUM END SECTION LENGTH SHALL BE 3 FEET MEASURED ALONG THE SHORTEST WALL FROM THE INSIDE FACE OF HEADWALL TO THE TRANSVERSE JOINT.
TO AVOID LOCATING TRANSVERSE JOINTS UNDER A TRAVELED WAY WITH TRANVERSE JOINTS, THE JOINTS SHALL BE LOCATED TO MINIMIZE THE LENGTH OF JOINT UNDER A TRAVELED WAY.
TRAVELED WAY IS THE ROADWAY WIDTH WITH WINGS SHOULDER WIDTHS.
FOR OUT SECTION DETAILS, SEE T03.16.

LAYING OUT TRANVERSE JOINTS
UNLESS SHOWN ON ROADWAY OR BRIDGE PLANS

USE A TRANSVERSE JOINT WHEN BARREL LENGTH IS OVER 80 FEET. USE ADDITIONAL JOINTS TO LIMIT SECTION LENGTH AND END SECTION BARREL LENGTH MEASURED ALONG CENTER LINE OF CULVERT TO 50 FEET.
MINIMUM END SECTION LENGTH SHALL BE 3 FEET MEASURED ALONG THE SHORTEST WALL FROM THE INSIDE FACE OF HEADWALL TO THE TRANSVERSE JOINT.
TO AVOID LOCATING TRANSVERSE JOINTS UNDER A TRAVELED WAY WITH DESIGN FILLS 2 FEET OR LESS THE FOLLOWING SHALL APPLY:
BARREL LENGTH UP TO 90 FEET WITHOUT A TRANSVERSE JOINT CUTF SECTION LENGTHS UP TO 30 FEET WHEN BARREL AND OUT SECTION LENGTH RESTRICTIONS REQUIRE TRANSVERSE JOINTS TO BE LOCATED UNDER A TRAVELED WAY WITH DESIGN FILLS 2 FEET OR LESS, THE JOINTS SHALL BE LOCATED TO MINIMIZE THE LENGTH OF JOINT UNDER A TRAVELED WAY.
TRANSVERSE BAR MAY BE BENT IN FIELD OR SHOP.

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JEFFERSON CITY, MO 65102
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CONCRETE SINGLE BOX CULVERT
SKEW: SQUARED WINGS: STRAIGHT
REINFORCEMENT

DATE EFFECTIVE: 07/01/2015
DATE PREPARED: 05/13/2015
703.10J SHEET NO. 2 OF 3
STITCHED TO ONE FACE OF THE CONCRETE WITH 10 GA. COPPER WIRE OR 12 GA. SOFT DRAWN GALVANIZED STEEL WIRE. THICKNESS SHALL BE CENTERED ON TRANSVERSE JOINTS. FILTER CLOTH WILL BE CONSIDERED COMPLETELY COVERED BY THE CONTRACT UNIT PRICE FOR OTHER ITEMS. FILTER CLOTH 3 FEET IN WIDTH AND DOUBLE A SUBSURFACE DRAINAGE GEOTEXTILE IN ACCORDANCE WITH SEC 1011. COST OF FURNISHING AND INSTALLING IN TOP SLAB AND SIDEWALLS WITH EDGES SEALED WITH MASTIC OR TWO SIDED TAPE. FILTER CLOTH SHALL BE TRANSVERSE JOINT THRU BARREL.

TRANSVERSE JOINT THRU BARREL
PREFORMED FIBER EXPANSION JOINT MATERIAL IN ACCORDANCE WITH SEC 703.045. SHALL BE SECURELY STITCHED TO ONE FACE OF THE CONCRETE WITH #8 CORR. #6 OR #10 GA. SOFT DRAWN GALVANIZED STEEL WIRE. FILTER CLOTH A FEET IN WIDTH AND DOUBLE THICKNESS SHALL BE CENTERED ON TRANSVERSE JOINTS IN TOP SLAB AND SIDEWALLS WITH EDGES SEALED WITH WASTIC OR TWO SIDED TAPE. FILTER CLOTH SHALL BE A SUBSURFACE DRAINAGE GEOTEXTILE IN ACCORDANCE WITH SEC 1011. FILTER CLOTH WILL BE FULLY COVERED BY THE CONTRACT UNIT PRICE FOR OTHER ITEMS.

UPSTREAM HEADWALL REINFORCEMENT
2-#5-R1 BARS "AT 12" CTS.

DOWNSTREAM HEADWALL REINFORCEMENT
2-#5-R2 BARS "AT 12" CTS.

BARREL REINFORCEMENT
FOR DESIGN FILLS 2'-0" OR LESS
2-#4-3 BARS "AT 14" CTS.

GENERAL NOTES:
FOR MEMBER THICKNESS AND BAR SIZES, SPACING, AND DIMENSIONS OF REINFORCEMENT, SEE SEC 1011.

BARREL AND WINGS SECTIONS ARE SYMMETRICAL ABOUT AND NORMAL TO LONG DIRECTION OF HEADWALL.

DRAWING NOT TO SCALE, FOLLOW DIMENSIONS.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1'-0".

DATE EFFECTIVE: 07/01/2015
DATE PREPARED: 05/15/2015
CULVERT
BARREL AT ABOUT 14 CENTERS
M4-F BARS AT ABOUT 14 CENTERS
J5 BARS AT ABOUT 14 CENTERS
J4 BARS AT ABOUT 14 CENTERS
M4-F BARS AT ABOUT 14 CENTERS
J5-1 BARS AT ABOUT 14 CENTERS
J4 BARS AT ABOUT 14 CENTERS
M4-F BARS AT ABOUT 14 CENTERS
J5-1 BARS AT ABOUT 14 CENTERS
GENERAL ELEVATION A-A

Channel bottom shall be graded within right of way for transition of channel bed to culvert openings. Channel banks shall be tapered to match culvert openings.

GENERAL NOTES:
- Design specifications:
  2010 AASHTO LRFD Bridge Design Specifications and 2010 Interim Revisions

- Design loadings:
  D-60/93 and M-24 loads
  Equivalent fluid pressure = 50 psi
  Design unit stresses:
  Class IV Concrete Box Culvert: f_c = 4,000 psi
  Reinforcing steel (grade 60) f_y = 60,000 psi

- Miscellaneous:
  For reinforcement details, see Sheet 2 or 3. For section details, see Sheet 3 of 3. For member thickness, see 703.17.

- Drawing not to scale. Follow dimensions.
- Dimensions are in inches unless otherwise noted.
- When alternate precast concrete box culvert sections are used, the minimum distance from inside face of headwalls to precast box culvert shall be determined using the information from the Missouri Standard Plans.
- Dimensions and dimensions for wings and headwalls shall be in accordance with Missouri Standard Plans.

EQUATIONS FOR COMPUTING A, B, C AND D

A = ANGLE OF BARREL SLOPE WITH HORIZONTAL NORMAL TO E ROADSIDE OR E MEDIUM = ARCTAN(ELEV. 1 - ELEV. 2)
B = ANGLE OF FILL SLOPE WITH HORIZONTAL NORMAL TO E ROADSIDE OR E MEDIUM = ARCTAN(Z)
C = HORIZONTAL DISTANCE FROM UPSTREAM EDGE OF SHOULDER TO CULVERT OPENING = ACS - ALTAND
D = HORIZONTAL DISTANCE FROM DOWNSTREAM EDGE OF SHOULDER TO CULVERT OPENING = ACS - ALTAND

P(SEC 20') + D = HT + TS - 12" + TANex + TAN med
Q TX(SEC 20') + D = HT + TS - 12" + TANex + TAN med
R = 2V(SEC 20') + D = HT + TS - 12" + TANex + TAN med
S/2 + U = HT + TS - 12" + TANex + TAN med

PLAN OF LAYOUT DIMENSIONS

(x) Ahead station where stream flows left to right.
(y) Ahead station where stream flows right to left.

LAYOUT DIMENSIONS

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MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

JEFFERSON CITY, MO 65102
1-888-452-MODOT 1-888-275-6636

703.11J SHEET NO. 1 OF 3

OATE PREPARED:

DATE EFFECTIVE:
07/03/2010

O DATE PREPARED:
07/03/2010

105 WEST CAPITOL
MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

CONCRETE SINGLE BOX CULVERT
SKEW: SQUARED
WINGS: FLARED

LAYOUT
GENERAL NOTES:

FOR SECTIONS THROUGH BARREL, WINGS AND HEADWALLS, SEE SHEET 3 OF 3. FOR BAR SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT EXCEPT J5 BARS, SEE 703.17. FOR J5 BARS, SEE 703.37.

CONSTRUCTION JOINT KEY NOT SHOWN FOR CLARITY IN HALF PLANS AND ELEVATION. SEE SHEET 3 OF 3 FOR DETAILS.

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1/4".

LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.

BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

(a) SAME SIZE AND SPACING AS B2 BARS
(b) VARYS. 12" MAXIMUM
(c) J4 BAR SPACING
(d) SAME SIZE AND SPACING AS B2 BARS
(e) A2 BAR SPACING
(f) NOT SPECIFIED ON THIS SHEET
(g) NOT SPECIFIED ON THIS SHEET
(h) FOR DESIGN FILLS OVER 2'-0" OR LESS

DATE PREPARED: 07/01/2015
DATE REVISED: 09/13/2015

J1 AND J4 BARS MAY BE BENT IN FIELD OR SHOP.

DEVELOPED ELEVATION

LAYING OUT TRANVERSE JOINTS

UNLESS SHOWN ON ROADWAY OR BRIDGE PLANS

USE A TRANVERSE JOINT WHEN BARREL LENGTH IS OVER 80 FEET. USE ADDITIONAL JOINTS TO LIMIT SECTION LENGTH AND END SECTION BARREL LENGTH MEASURED ALONG CENTERLINE OF CULVERT TO 50 FEET.

MINIMUM END SECTION LENGTH SHALL BE 3 FEET MEASURED ALONG THE SHORTEST WALL FROM THE INSIDE FACE OF HEADWALL TO THE TRANVERSE JOINT.

TO AVOID LOCATING TRANVERSE JOINTS UNDER A TRAVELED WAY WITH DESIGN FILLS 2 FEET OR LESS THE FOLLOWING SHALL APPLY:

BARREL LENGTH UP TO 90 FEET WITHOUT A TRANVERSE JOINT

CUT SECTION LENGTHS UP TO 60 FEET

WHEN BARREL AND CUT SECTION LENGTH RESTRICTIONS REQUIRE TRANVERSE JOINTS TO BE LOCATED UNDER A TRAVELED WAY WITH DESIGN FILLS 2.5 FEET OR LESS, THE JOINTS SHALL BE LOCATED AT MINIMUM THE LENGTH OF JOINT UNDER A TRAVELED WAY

TRAVELED WAY IS THE ROADWAY WIDTH LESS WING SHOULDER WIDTHS.

FOR OUT SECTION DETAILS, SEE TO-3.16.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

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JEFFERSON CITY, MO 65102

1-888-452-MODOT 1-888-452-6636

CONCRETE SINGLE BOX CULVERT

SKEW: SQUARED

WINGS: FLARED

REINFORCEMENT

DATE EFFECTIVE: 07/01/2015
DATE PREPARED: 09/13/2015

703.11J SHEET NO. 2 OF 3
STITCHED TO ONE FACE OF THE CONCRETE WITH 10-GAGE COPPER WIRE OR 12-GAGE SOFT DRAWN GALVANIZED STEEL WIRE.

THICKNESS SHALL BE CENTERED ON TRANSVERSE JOINTS

FILTER CLOTH WILL BE CONSIDERED COMPLETELY COVERED BY THE CONTRACT UNIT PRICE FOR OTHER ITEMS.

PREFORMED FIBER EXPANSION JOINT MATERIAL IN ACCORDANCE WITH SEC 1057 SHALL BE SECURELY INSTALLED IN TOP SLAB AND SIDEWALLS WITH EDGES SEALED WITH MASTIC OR TWO SIDED TAPE. FILTER CLOTH SHALL BE TRANSVERSE JOINT THRU BARREL

(a) APPROXIMATELY ONE-THIRD OF WALL

TRANVERSE JOINT THRU BARREL

PREFORMED FIBER EXPANSION JOINT MATERIAL IN ACCORDANCE WITH SEC 1057 SHALL BE SECURELY INSTALLED IN TOP SLAB AND SIDEWALLS WITH EDGES SEALED WITH MASTIC OR TWO SIDED TAPE. FILTER CLOTH SHALL BE TRANSVERSE JOINT THRU BARREL

GRANULAR BACKFILL LIMITS AND MEMBER DIMENSIONS

GENERAL NOTES:

FOR MEMBER THICKNESS AND BAR SIZES, SPACING AND DIMENSIONS OF REINFORCING BARS, SEE 703.11. FOR JS BARS, SEE 703.17.

BARREL AND WINGS SECTIONS ARE SYMMETRICAL ABOUT THE LONG DIRECTION OF THE WING. DRAWING NOT TO SCALE, FOLLOW DIMENSIONS.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1½".

DATE PREPARED: 01/10/2019
DATE EFFECTIVE: 01/10/2019

SHEET NO. 3 OF 3
GENERAL ELEVATION A-A

CHANNEL BOTTOM SHALL BE GRADED WITHIN RIGHT OF WAY FOR TRANSITION OF CHANNEL BED TO CULVERT OPENINGS. CHANNEL BANKS SHALL BE TAPERED TO MATCH CULVERT OPENINGS.

EQUATIONS FOR COMPUTING A, B, C AND D

A = ANGLE OF BARREL SLOPE WITH HORIZONTAL NORMAL TO E ROADWAY OR E MEDIAN = ARCH. ELEV. 1 - ELEV. 2
B = ANGLE OF FILL SLOPE WITH HORIZONTAL NORMAL TO E ROADWAY OR E MEDIAN = ARCH.
C = HORIZONTAL DISTANCE FROM UPSTREAM EDGE OF SHOULDER TO E ROADWAY OR E MEDIAN
D = HORIZONTAL DISTANCE FROM DOWNSTREAM EDGE OF SHOULDER TO E ROADWAY OR E MEDIAN

G = CROSS SLOPE OF EACH PART OF ROADWAY INCLUDING CROWN LINES AND SHOULDERS. G IS POSITIVE IF RISING AND NEGATIVE IF FALLING AWAY FROM E ROADWAY OR E MEDIAN.
H = SKEW ANGLE
I = TOTAL LENGTH NORMAL TO E ROADWAY OR E MEDIAN

DESIGN SPECIFICATIONS:
2010 AMERICAN LRFD BRIDGE DESIGN SPECIFICATIONS AND 2010 INTERIM REVISIONS

DESIGN LOADS:
SPECULAR = 93 WINGS LANE LOAD. EARTH = 120 LBF/FT. EQUIVALENT FLUID PRESSURE = 30 LBF/FT. MIN. 40 LBF/FT. MAX. 60 LBF/FT.

DESIGN UNIT STRESSES:
CLASS 1: CONCRETE BOX CULVERT F'c = 4000 PSI
REINFORCING STEEL (GRADE 60) f_y = 60000 PSI

MISCELLANEOUS:
FOR REINFORCEMENT DETAILS, SEE SHEET 2 OF 3. FOR SECTION DETAILS, SEE SHEET 3 OF 3. FOR MEMBER THICKNESS, SEE 703.12.1. DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.

WHEN ALTERNATE PRECAST CONCRETE BOX CULVERT SECTIONS ARE USED, THE MINIMUM DISTANCE FROM INSIDE FACE OF HEADWALLS TO PRECAST ELEVATIONS 1 AND 2 SHOULDER TO E ROADWAY OR E MEDIAN MAY BE BELOW THE NATURAL STREAM BOTTOM DUE TO ENVIRONMENTAL REQUIREMENTS. THE TERM "A(CS)" IS THE DIFFERENCE IN ELEVATION BETWEEN E ROADWAY OR E MEDIAN AND THE TOP OF THE FILL SLOPE TO ACCOUNT FOR A VARYING PROFILE.

GENERAL NOTES:
DESIGN UNIT STRESSES: CLASS 1: CONCRETE BOX CULVERT F'c = 4000 PSI
REINFORCING STEEL (GRADE 60) f_y = 60000 PSI

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105 WEST CAPITOL JEFFERSON CITY, MO 65101 1-888-456-MODOT 1-888-275-66331

CONCRETE SINGLE BOX CULVERT
SKEW: LEFT ADVANCE WINGS: STRAIGHT

LAYOUT
LAYING OUT TRANVERSE JOINTS

UNLESS SHOWN ON ROADWAY OR BRIDGE PLANS

USE A TRANSVERSE JOINT WHEN BARREL LENGTH IS OVER 80 FEET. USE ADDITIONAL JOINTS TO LIMIT CUT SECTION LENGTH AND END SECTION LENGTH MEASURED ALONG CENTERLINE OF CULVERT TO 50 FEET. MINIMUM END SECTION LENGTH SHALL BE 3 FEET MEASURED ALONG THE SHORTEST WALL FROM THE INSIDE FACE OF HEADWALL TO THE TRANSVERSE JOINT.

TO AVOID LOCATING TRANSVERSE JOINTS UNDER A TRAVELED WAY WITH DESIGN FILLS 2 FEET OR LESS THE FOLLOWING SHALL APPLY:

- BARREL LENGTH UP TO 90 FEET WITHOUT A TRANSVERSE JOINT
- CUT SECTION LENGTHS UP TO 60 FEET

WHEN BARREL AND CUT SECTION LENGTH RESTRICTIONS REQUIRE TRANSVERSE JOINTS TO BE LOCATED UNDER A TRAVELED WAY WITH DESIGN FILLS 2 FEET OR LESS, THE JOINTS SHALL BE LOCATED TO MINIMIZE THE LENGTH OF JOINT UNDER THE TRAVELED WAY.

TRAVELED WAY IS THE ROADWAY WIDTH MINUS SHOULDER WIDTHS.

FOR CUT SECTION DETAILS, SEE 703.16.

GENERAL NOTES:

- FOR SECTIONS THROUGH BARREL, WINGS AND HEADWALLS, SEE SHEET 3 OF 3 FOR BAR SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT EXCEPT J5 BARS. SEE 703.17. FOR J5 BARS, SEE 703.37.
- CONSTRUCTION JOINT KEY NOT SHOWN FOR CLARITY IN HALF PLANS AND ELEVATION. SEE SHEET 3 OF 3 FOR DETAILS.
- DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.
- MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1/2".
- LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.
- BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.
- (a) SAME SIZE AND SPACING AS B2 BARS
- (b) VARIES. 12" MAXIMUM
- (c) J4 BAR SPACING
- (d) SAME SIZE AND SPACING AS A2 BARS
- (e) A2 BAR SPACING
- (f) SAME SIZE AND SPACING AS A1 BARS
- (g) A1 BAR SPACING
- (h) FOR DESIGN FILLS OVER 2'-0"
- (i) FOR DESIGN FILLS 2'-0" OR LESS

CONCRETE SINGLE BOX CULVERT

SKEW: LEFT ADVANCE
WINGS: STRAIGHT

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT 1-888-275-6636

DATE EFFECTIVE:
07/01/2015

DATE PREPARED:
01/13/2015

511312015

703.12J SHEET NO.
2 OF 3

REINFORCEMENT
STITCHED TO ONE FACE OF THE CONCRETE WITH 10-GAGE COPPER WIRE OR 12-GAGE SOFT DRAWN GALVANIZED STEEL WIRE.

THICKNESS SHALL BE CENTERED ON TRANSVERSE JOINTS.

FILTER CLOTH WILL BE CONSIDERED COMPLETELY COVERED BY THE CONTRACT UNIT PRICE FOR OTHER ITEMS.

FILTER CLOTH 3 FEET IN WIDTH AND DOUBLE PREFORMED FIBER EXPANSION JOINT MATERIAL IN ACCORDANCE WITH SEC 1057 SHALL BE SECURELY A SUBSURFACE DRAINAGE GEOTEXTILE IN ACCORDANCE WITH SEC 1011. COST OF FURNISHING AND INSTALLING IN TOP SLAB AND SIDEWALLS WITH EDGES SEALED WITH MASTIC OR TWO SIDED TAPE. FILTER CLOTH SHALL BE TRANSVERSE JOINT THRU BARREL OR LESS.

UPSTREAM AND DOWNSTREAM WINGS REINFORCEMENT

TRANSVERSE JOINT THRU BARREL

PREFORMED FIBER EXPANSION JOINT MATERIAL IN ACCORDANCE WITH SEC 1057 SHALL BE SECURELY STITCHED TO ONE FACE OF THE CONCRETE WITH 10-GAGE COPPER WIRE OR 12-GAGE SOFT DRAWN GALVANIZED STEEL WIRE.

FILTER CLOTH A FEET IN WIDTH AND DOUBLE THICKNESS SHALL BE CENTERED ON TRANSVERSE JOINTS IN TOP SLAB AND SIDEWALLS WITH EDGES SEALED WITH WAX OR TWO SIDED TAPE. FILTER CLOTH SHALL BE A SUBSURFACE DRAINAGE GEOTEXTILE IN ACCORDANCE WITH SEC 1011. COST OF FURNISHING AND INSTALLING FILTER CLOTH WILL BE CONSIDERED COMPLETELY COVERED BY THE CONTRACT UNIT PRICE FOR OTHER ITEMS.

BARREL REINFORCEMENT FILL OVER 2'-0" OR LESS

GENERAL NOTES:

FOR MEMBER THICKNESS AND FOR BAR SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT, SEE 703.37, FOR J5 BARS, SEE 703.37.

BARREL AND WINGS SECTIONS ARE SYMMETRICAL ABOUT AND NORMAL TO THE LONG DIRECTION OF HEADWALL.

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 11/2'.

DATE PREPARED: 07/01/2015
DATE EFFECTIVE: 07/13/2015

3 OF 3
GENERAL ELEVATION A-A

CHANNEL BOTTOM SHALL BE GRADED WITHIN RIGHT OF WAY FOR TRANSITION OF CHANNEL BED TO CULVERT OPENINGS. CHANNEL BANKS SHALL BE TAPPED TO MATCH CULVERT OPENINGS.

PLAN OF LAYOUT DIMENSIONS

(0) AHEAD STATION WHERE STREAM FLOWS LEFT TO RIGHT. (1) AHEAD STATION WHERE STREAM FLOWS RIGHT TO LEFT.

CONSTRUCTION JOINT KEY NOT SHOWN FOR CLARITY. SEE SHEET 3 OF 3 FOR DETAILS.

E EROSION OF UNSUITABLE MATERIAL AND FURNISHING AND PLACING OF GRANULAR BACKFILL SHALL BE IN ACCORDANCE WITH MAXIMUM SKEW ANGLE.

E 0°-180° ± 1°

GENERAL NOTES:

DESIGN SPECIFICATIONS:
2010 MISSOURI AASHTO BRIDGE DESIGN SPECIFICATIONS AND 2010 INTERIM REVISIONS

DESIGN LOADS:
VEHICULAR LB/CF MIN.) 120 LB/CF (MAX.)

DESIGN UNIT STRESSES:
CLASS B-1 CONCRETE BOX CULVERT F'0 = 4,000 PSI REINFORCING STEEL (GRADE 60) Fy = 60,000 PSI

WELDING:
FOR REINFORCEMENT DETAILS. SEE SHEET 2 OF 3. FOR SECTION DETAILS SEE SHEET 3 OF 3. FOR MEMBER THICKNESS. SEE 703.17.

DRAWING NOT TO SCALE, FOLLOW DIMENSIONS.

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.

CONCRETE SINGLE BOX CULVERT

SKEW: LEFT ADVANCE

WINGS: FLARED

LAYOUT

DATE EFFECTIVE: 07/01/2015

DATE PREPARED: 07/01/2015

703.13J SHEET NO. 1 OF 3

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)
105 WEST CAPITOL

1 OF 3 SHEETS

IN ACCORDANCE WITH MISSOURI STANDARD PLANS.
STITCHED TO ONE FACE OF THE CONCRETE WITH 10GAGE COPPER WIRE OR 12 GAGE SOFT DRAWN GALVANIZED STEEL WIRE.

THICKNESS SHALL BE CENTERED ON TRANSVERSE JOINTS

FILTER CLOTH WILL BE CONSIDERED COMPLETELY COVERED BY THE CONTRACT UNIT PRICE FOR OTHER ITEMS.

FILTER CLOTH 3 FEET IN WIDTH AND DOUBLE THICKNESS SHAL BE CENTERED ON TRANSVERSE JOINTS.

GRANULAR BACKFILL LIMITS

AND MEMBER DIMENSIONS

TRANVERSE JOINT THRU BARREL

PREFORMED FIBER EXPANSION JOINT MATERIAL IN ACCORDANCE WITH SECTION 703.13. FILTER CLOTH SHALL BE SECURELY STITCHED TO ONE FACE OF THE CONCRETE WITH 10GAGE COPPER WIRE OR 12GAGE SOFT DRAWN GALVANIZED STEEL WIRE.

FILTER CLOTH IS A FEET IN WIDTH AND DOUBLE THICKNESS SHALL BE CENTERED ON TRANSVERSE JOINTS IN TOP SLAB AND SIDWALLS WITH EDGES SEALED WITH MASTIC OR TWO SIDED TAPE. FILTER CLOTH SHALL BE A SUBSURFACE DRAINAGE DECKFILL IN ACCORDANCE WITH SECTION 703.15. PREFORMED FIBER EXPANSION JOINT MATERIAL WILL BE CONSIDERED COMPLETELY COVERED BY THE CONTRACT UNIT PRICE FOR OTHER ITEMS.

REINFORCEMENT

FILTER CLOTH

FILTER CLOTH

BARREL REINFORCEMENT

FOR DESIGN FILLS OVER 2'-0"
CONSTRUCTION JOINT KEY NOT SHOWN FOR CLARITY. SEE SHEET 3 OF 3 FOR DETAILS.

If unsuitable material is encountered, excavation of unsuitable material and furnishing and placing of granular backfill shall be in accordance with Sec 206.

CHANNEL BOTTOM SHALL BE GRADED WITHIN RIGHT OF WAY FOR TRANSITION OF CHANNEL BED TO CULVERT OPENINGS, CHANNEL BANKS SHALL BE TAPERED TO MATCH CULVERT OPENINGS.

**GENERAL ELEVATION A-A**

- Channel bottom shall be graded within right of way for transition of channel bed to culvert openings.
- Channel banks shall be tapered to match culvert openings.

**PLAN OF LAYOUT DIMENSIONS**

- **A** ahead station where stream flows left to right.
- **B** ahead station where stream flows right to left.

**EQUATIONS FOR COMPUTING A, B, C AND D**

- **A** = angle of barrel slope with horizontal normal to roadway or median = arc tan (ELEV. 1 - ELEV. 2) / HORIZ.
- **B** = horizontal distance from upstream edge of shoulder to = L(ROADWAY FILL) - (A+C) - ALT.
- **C** = horizontal distance from downstream edge of shoulder to = L(ROADWAY FILL) - (A+C) - ALT.
- **D** = cross slope of each part of roadway including crown, lanes and shoulders. **D** is positive if rising and negative if falling away from roadway or median.

This term "Alt" is the difference in elevation between roadway or median and the top of the fill slope normal to roadway or median. This term shall be adjusted for unsymmetrical and nonstandard roadways.

To account for a varying profile grade the roadway fill shall be based on stations that correspond to the corners of the inside face of the headwalls that produce mean values for B and C.

See roadway plans for slopes, linear elevations and flow lines 1 and 2. Elevations 1 and 2 correspond to upper and lower flow line elevations and may be below the natural stream bottom due to environmental requirements.

**GENERAL NOTES:**

**DESIGN SPECIFICATIONS:**

2010 AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS AND 2010 INTERIM REVISIONS

**DESIGN LOADS:**

- Vehicular - HL-93 minus lane load, earth = 120 lb/ft
- Equivalent fluid pressure = 30 lb/ft² (MIN. 60 LB/FT² MAX. 1)

**DESIGN UNIT STRESSES:**

- Class B-1 concrete (box culvert) f'c = 4000 psi
- Reinforcing steel (grade 60) fy = 60,000 psi

**MISCELLANEOUS:**

- For reinforcement details, see sheet 2 of 3. For sections details, see sheet 3 of 3. For member thickness, see 703.17.
- Drawings not to scale, follow dimensions.

Dimensions are in inches unless otherwise noted.

When alternate precast concrete box culvert sections are used, the minimum distance from inside face of headwalls to precast units is 5 feet.

**DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.**

**LAYOUT**

**DATE EFFECTIVE:** 07/01/12015

**DATE PREPARED:** 08/10/12015

**Sheet No.:** 103-14J

**1 OF 3**
GENERAL NOTES:

CONSTRUCTION JOINT KEY NOT SHOWN FOR CLARITY IN HALF PLANS AND ELEVATION. SEE SHEET 3 OF 3 FOR DETAILS.

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1/2".

LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.

BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

(a) SAME SIZE AND SPACING AS B2 BARS

(b) VARIES. 12" MAXIMUM

(c) J4 BAR SPACING

(d) SAME SIZE AND SPACING AS A2 BARS

(e) A2 BAR SPACING

(f) SAME SIZE AND SPACING AS A1 BARS

(g) AT BAR SPACING

(h) FOR DESIGN FILLS OVER 2'-0"

(i) FOR DESIGN FILLS 2'-0" OR LESS

ADDITIONAL JOINTS TO LIMIT CUT SECTION LENGTH AND END SECTION BARREL LENGTH MEASURED ALONG CENTERLINE OF CULVERT TO 50 FEET.

MINIMUM END SECTION LENGTH SHALL BE 3 FEET MEASURED ALONG THE SHORTEST WALL FROM THE INSIDE FACE OF HEADWALL TO THE TRANSVERSE JOINT.

TO AVOID LOCATING TRANSVERSE JOINTS UNDER A TRAVELED WAY WITH DESIGN FILLS 2 FEET OR LESS, THE JOINTS SHALL BE LOCATED TO MINIMIZE THE LENGTH OF JOINT UNDER A TRAVELED WAY.

TRAVELED WAY IS THE ROADWAY WIDTH MINUS SHOULDER WIDTHS.

FOR CUT SECTION DETAILS, SEE 703.16.

DESIGN FILLS 2 FEET OR LESS THE FOLLOWING SHALL APPLY:

FOR CUT SECTION DETAILS, SEE 703.16.

WHEN BARREL AND CUT SECTION LENGTH RESTRICTIONS REQUIRE TRANSVERSE JOINTS TO BE LOCATED UNDER A TRAVELED WAY WITH DESIGN FILLS 2 FEET OR LESS, THE JOINTS SHALL BE LOCATED TO MINIMIZE THE LENGTH OF JOINT UNDER A TRAVELED WAY.

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(e) A2 BAR SPACING

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(g) AT BAR SPACING

(h) FOR DESIGN FILLS OVER 2'-0"

(i) FOR DESIGN FILLS 2'-0" OR LESS

ADDITIONAL JOINTS TO LIMIT CUT SECTION LENGTH AND END SECTION BARREL LENGTH MEASURED ALONG CENTERLINE OF CULVERT TO 50 FEET.

MINIMUM END SECTION LENGTH SHALL BE 3 FEET MEASURED ALONG THE SHORTEST WALL FROM THE INSIDE FACE OF HEADWALL TO THE TRANSVERSE JOINT.

TO AVOID LOCATING TRANSVERSE JOINTS UNDER A TRAVELED WAY WITH DESIGN FILLS 2 FEET OR LESS, THE JOINTS SHALL BE LOCATED TO MINIMIZE THE LENGTH OF JOINT UNDER A TRAVELED WAY.

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FOR CUT SECTION DETAILS, SEE 703.16.

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STITCHED TO ONE FACE OF THE CONCRETE WITH 10-GAGE COPPER WIRE OR 12-GAGE SOFT DRAWN GALVANIZED STEEL WIRE.

THICKNESS SHALL BE CENTERED ON TRANSVERSE JOINTS.

FILTER CLOTH WILL BE CONSIDERED COMPLETELY COVERED BY THE CONTRACT UNIT PRICE FOR OTHER ITEMS.

FILTER CLOTH 3 FEET IN WIDTH AND DOUBLE PREFORMED FIBER EXPANSION JOINT MATERIAL IN ACCORDANCE WITH SEC 1057 SHALL BE SECURELY INSTALLED A SUBSURFACE DRAINAGE GEOTEXTILE IN ACCORDANCE WITH SEC 1011. COST OF FURNISHING AND INSTALLING IN TOP SLAB AND SIDEWALLS WITH EDGES SEALED WITH mastIC OR TWO SIDED TAPE. FILTER CLOTH SHALL BE EXPOSED TO FILTER CLOTH THRU BARREL.

KEYED CONSTRUCTION JOINT (a) APPROXIMATELY ONE-THIRD OF WALL THICKNESS.

KEYED CONSTRUCTION JOINT (TYP.) IN ACCORDANCE WITH SEC 1057. FOR 12-GAGE SOFT DRAWN GALVANIZED STEEL WIRE. FOR DESIGN FILLS OVER 2'-0" OR LESS.

GRANULAR BACKFILL LIMITS AND MEMBER DIMENSIONS.

TRANSVERSE JOINT THRU BARREL PREFORMED FIBER EXPANSION JOINT MATERIAL IN ACCORDANCE WITH SEC 703.37. FOR DESIGN FILLS OVER 2'-0" OR LESS.

BARREL REINFORCEMENT FOR DESIGN FILLS OVER 2'-0" OR LESS.

GENERAL NOTES:

FOR MEMBER THICKNESS AND FOR BAR SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT EXCEPT J5 BARS, SEE 703.17. FOR J5 BARS, SEE 703.14.

BARREL AND WINGS SECTIONS ARE SYMMETRICAL ABOUT AND NORMAL TO DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1/2".
GENERAL NOTES:

1. FOR SECTIONS THRU BARREL, WINGS AND HEADWALLS, SEE SHEET 3 OF 3. FOR BAR SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT CONSTRUCTION JOINT KEY NOT SHOWN FOR CLARITY IN HALF PLANS AND ELEVATION. SEE SHEET 2 OF 3 FOR DETAILS.

2. LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.

3. BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

4. SAME SIZE AND SPACING AS A2 BARS

5. SAME SIZE AND SPACING AS A1 BARS

6. SAME SIZE AND SPACING AS A2 BARS

7. BAR SPACING

8. FOR DESIGN FILLS 2 FEET OR LESS THE FOLLOWING SHALL APPLY:
   - SAME SIZE AND SPACING AS A2 BARS
   - SAME SIZE AND SPACING AS A1 BARS
   - BAR SPACING
   - FOR DESIGN FILLS OVER 2'-0" WINGS SHOULDER WIDTHS

9. CUT SECTION LENGTHS UP TO 60 FEET

10. BARREL LENGTH UP TO 90 FEET WITHOUT A TRANSVERSE JOINT

11. ADDITIONAL JOINTS TO LIMIT CUT SECTION LENGTH AND END SECTION LENGTH MEASURED ALONG CENTERLINE OF CULVERT TO 50 FEET.

12. MINIMUM END SECTION LENGTH SHALL BE 3 FEET MEASURED ALONG THE SHORTEST WALL FROM THE INSIDE FACE OF HEADWALL TO THE TRANSVERSE JOINT.

13. TO AVOID LOCATING TRANSVERSE JOINTS UNDER A TRAVELED WAY WITH DESIGN FILLS 2 FEET OR LESS, SEE SHEET 3 OF 3 FOR DETAILS.

14. THE JOINTS SHALL BE LOCATED TO MINIMIZE THE LENGTH UNDER THE TRAVELED WAY.

15. FOR CUT SECTION DETAILS, SEE 703.16.

16. TRANSVERSE JOINTS TO BE LOCATED UNDER A TRAVELED WAY WITH DESIGN FILLS 2 FEET OR LESS, SEE SHEET 3 OF 3 FOR DETAILS.

17. MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1/2".

18. FOR TRANSVERSE JOINTS THE FOLLOWING SHALL APPLY:
   - SAME SIZE AND SPACING AS A2 BARS
   - SAME SIZE AND SPACING AS A1 BARS
   - BAR SPACING
   - FOR DESIGN FILLS 2'-0" OR LESS

19. LAYING OUT TRANSVERSE JOINTS UNLESS SHOWN ON ROADWAY OR BRIDGE PLANS

20. FOR ELLIPSES, CIRCLES, TRANSVERSE JOINTS, USE SCALE TO DETERMINE JOINT SPACING.

21. FOR TRANSVERSE JOINTS UNDER A TRAVELED WAY WITH DESIGN FILLS 2 FEET OR LESS, THE JOINTS SHALL BE LOCATED TO MINIMIZE THE LENGTH UNDER THE TRAVELED WAY.

22. FOR DESIGN FILLS 2'-0" OR LESS THE FOLLOWING SHALL APPLY:
   - SAME SIZE AND SPACING AS A2 BARS
   - SAME SIZE AND SPACING AS A1 BARS
   - BAR SPACING

23. FOR CUT SECTION DETAILS, SEE 703.16.
STITCHED TO ONE FACE OF THE CONCRETE WITH 10 GAUGE COPPER WIRE OR 12 GAUGE SOFT DRAWN COPPER WIRE.

THICKNESS SHALL BE CENTERED ON TRANSVERSE JOINTS.

FILTER CLOTH WILL BE CONSIDERED COMPLETELY COVERED BY THE CONTRACT UNIT PRICE FOR OTHER ITEMS.

FILTER CLOTH 3 FEET IN WIDTH AND DOUBLE PREFORMED FIBER EXPANSION JOINT MATERIAL IN ACCORDANCE WITH SEC 1057 SHALL BE SECURELY ATTACHED TO A SUBSURFACE DRAINAGE GEOTEXTILE IN ACCORDANCE WITH SEC 1011. COST OF FURNISHING AND INSTALLING THE FILTER CLOTH SHALL BE INCLUDED IN THE CONTRACT UNIT PRICE.

TRANSVERSE JOINT THRU BARREL

PREFORMED FIBER EXPANSION JOINT MATERIAL MOUNTED ON SURFACE OF FILTER CLOTH IN TOP SLAB AND SIDWALLS WITH EDGES SEALED WITH MASTIC OR TWO SIDED TAPE. FILTER CLOTH SHALL BE A SUBSURFACE DRAINAGE GEOTEXTILE IN ACCORDANCE WITH SEC 1011. COST OF FURNISHING AND INSTALLING THE FILTER CLOTH WILL BE INCLUDED IN THE CONTRACT UNIT PRICE.

KEYED CONSTRUCTION JOINT

FILTER CLOTH A FEET IN WIDTH AND DOUBLE PREFERRED FIBER EXPANSION JOINT MATERIAL ON TOP SLAB AND SIDWALLS WITH EDGES SEALED WITH MASTIC OR TWO SIDED TAPE. FILTER CLOTH SHALL BE A SUBSURFACE DRAINAGE GEOTEXTILE IN ACCORDANCE WITH SEC 1011. COST OF FURNISHING AND INSTALLING THE FILTER CLOTH WILL BE INCLUDED IN THE CONTRACT UNIT PRICE.

UPSTREAM FLARED WINGS REINFORCEMENT

BARREL REINFORCEMENT FOR DESIGN FILLS OVER 2'-0" OR LESS.
**KEYED CONSTRUCTION JOINT**

1. **Approximately one-third of wall thickness**

**GRANULAR BACKFILL LIMITS AND MEMBER DIMENSIONS**

**FILTER CLOTH**

- 3 feet in width
- With Sec 1011. Cost of furnishing and installing filter cloth will be

**TRANVERSE JOINT**

- Thru Barrel

**EXPANSION JOINT MATERIAL**

- Prefomed fiber expansion joint material in accordance with Sec 1101.63 (1)

- Shall be centered on transverse joints in top slab and sidewalks with edges sealed.

- Filter cloth shall be a 3 foot filter cloth in accordance with Sec 1011. Cost of furnishing and installing filter cloth will be considered complete covered by the contract unit price for other items.

**REINFORCEMENT**

- For design fills of 2'-0" or less, symmetrical about and normal to culvert.

**GENERAL NOTES**

- DESIGN SPECIFICATIONS: 2010 MODIFIED LFD DESIGN SPECIFICATIONS AND 2010 INTERIM REVISIONS.

- DESIGN LOADING:

  - Vehicular = HL-93 Single Lane Load, Earth = 120 LF/pcf

  - Equivalent Fluid Pressure = 30 LF/pcf (Min.), 60 LF/pcf (Max.)

- DESIGN UNIT STRESSES:

  - Class B1 Concrete (Box Culvert): f'c = 4,000 psi

  - Reinforcing Steel (Grade 60): fy = 60,000 psi

- MISCELLANEOUS:

  - For member thickness and for bar sizes, spacing and dimensions, see Sec 703.17.

  - Construction joint key not shown for clarity in part plans and elevation. Drawing not to scale. Follow dimensions.

  - Minimum clearance to reinforcing steel shall be 12".

**DATE EFFECTIVE:** 04/20/2011

**DATE PREPARED:** 05/10/2015

**703.16 SHEET NO. 1 OF 1**

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

**JEFFERSON CITY, MO 65102**
GENERAL NOTES:

IF DESIGN FILL IS BETWEEN TABULATED DESIGN FILLS, USE THE NEXT GREATER TABULATED DESIGN FILL.

THE ANNEXED DESIGN CURVES ARE ANTI-SEISMIC CURVES. THEY CAN BE USED FOR DESIGN FILLS BETWEEN 2 AND 7 FEET. USE "BASE CURVES" FROM THE ANNEXED DESIGN CURVES.
### DESIGN THICKNESS A1 BARS

<table>
<thead>
<tr>
<th>SPAN (S)</th>
<th>HEIGHT (H) = 6 FT</th>
<th>3 FT OR 4 FT OR 5 FT</th>
<th>WALL BARS</th>
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<td>50 FT</td>
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</tbody>
</table>

### MEMBERS

- **J3 BAR**
- **P1 BAR**
- **A1 BAR**
- **A2 BAR**

### ALTERNATE J3 BAR

- At construction's option, alternate J3 bars may be used when the distance between the ends of J3 bars in the top slab is less than 2'-0". Dimension J1 (footnote 1) shall be used with alternate J3 bars.

### GENERAL NOTES:

- If design fill is between tabulated design fills, use the next greater tabulated design fill.

### CONCRETE

- **Single Box Culvert**

### Members

- **J3 Bar**
- **P1 Bar**
- **A1 Bar**
- **A2 Bar**

### Bar Dimensions Diagram

#### Bar Dimensions Diagram

- **Synthetic about & Culvert**

### Date Effective:

- **04/01/2011**

### Sheet No:

- **703.17**

### page:

- **4 OF 14**
### Design Thickness

<table>
<thead>
<tr>
<th>DESIGN (S)</th>
<th>SPAN (S)</th>
<th>HEIGHT (H)</th>
<th>MEMBER THICKNESS</th>
<th>WALL BARS</th>
<th>WALL BARS</th>
<th>BOTTOM SLAB BARS</th>
<th>TOP SLAB BARS</th>
<th>J3 BARS</th>
<th>J4 BARS</th>
<th>J5 BARS</th>
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</thead>
<tbody>
<tr>
<td>65 6</td>
<td>8 FT</td>
<td>4 FT OR 5 FT OR 6 FT</td>
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<td>65</td>
<td>53</td>
<td>65</td>
<td>65</td>
<td>65</td>
<td>65</td>
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<tr>
<td>65 6</td>
<td>8 FT</td>
<td>4 FT OR 5 FT OR 6 FT</td>
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<tr>
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</table>

### General Notes:

1. **Design Fill is 12 feet.**
2. **Span (S) is 8 feet.**
3. **Height (H) is 10 feet or 11 feet.**

### Alternate J3 Bar

- **Alternate J3 Bars may be used when the distance between the ends of J3 Bars in the top slab is less than 2 feet.**
- **Dimensions:** 40.5 feet.
- **Spacing:** 40.5 feet.
- **Concrete Strength:** 600 psi.

### Member Thickness

**Note:** J4 bars are required with alternate J3 bars of a length equal to J3 bars. No additional payment will be made for this substitution.

### Missouri Highways and Transportation Commission

**Date Effective:** 02/25/2010

**Date Prepared:** 4/23/2010

**703.17**

6 OF 14
### SPAN (s) = 9 FT

<table>
<thead>
<tr>
<th>DESIGN</th>
<th>MEMBER THICKNESS</th>
<th>BOTTOM SLAB BARS</th>
<th>J3 BARS</th>
<th>J4 BARS</th>
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<td>11 x 5</td>
<td>9 x 5</td>
<td>7 x 5</td>
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<td>7 x 5</td>
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<td>11 x 5</td>
<td>9 x 5</td>
<td>7 x 5</td>
</tr>
</tbody>
</table>

### GENERAL NOTES:
- If design fill is between tabulated design fills, use the next greater tabulated design fill. Tabulated design fills between 2 feet and 4 feet shall be used.
- If design fill is between 2 feet and 4 feet, tabulated design fills shall be used with alternation J3 bars.
- If design fill is between 2 feet and 4 feet, tabulated design fills shall be used with alternation J3 bars.
- If design fill is between 2 feet and 4 feet, tabulated design fills shall be used with alternation J3 bars.
- If design fill is between 2 feet and 4 feet, tabulated design fills shall be used with alternation J3 bars.
- If design fill is between 2 feet and 4 feet, tabulated design fills shall be used with alternation J3 bars.
- If design fill is between 2 feet and 4 feet, tabulated design fills shall be used with alternation J3 bars.

### CONCRETE
- Single Box Culvert
- Member thickness
- Bar size, spacing & dimensions

### SPAN (s) = 9 FT

<table>
<thead>
<tr>
<th>DESIGN</th>
<th>MEMBER THICKNESS</th>
<th>BOTTOM SLAB BARS</th>
<th>J3 BARS</th>
<th>J4 BARS</th>
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<td>11 x 5</td>
<td>9 x 5</td>
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<td>15 x 5</td>
<td>13 x 5</td>
<td>11 x 5</td>
<td>9 x 5</td>
<td>7 x 5</td>
</tr>
</tbody>
</table>

### ALTERNATE J3 BAR
- Alts: J3 bars may be used when the distance between the ends of J3 bars in the top slab is less than 2'-0". Dimension L1 shall be used with alternate J3 bars. The alternate J3 bars shall be required with alternate J3 bars. No additional payment will be made for this substitution.
### SPAN (S) = 11 FT

|スペイン|h |アンテナ|h |スキッティング|h |ベール|h |ベール|h |
|---|---|---|---|---|---|---|---|
|15 FT|1180|1180|1180|1180|1180|1180|1180|
|12 FT|1110|1110|1110|1110|1110|1110|1110|
|10 FT|1040|1040|1040|1040|1040|1040|1040|
|8 FT|970|970|970|970|970|970|970|
|6 FT|890|890|890|890|890|890|890|
|4 FT|800|800|800|800|800|800|800|

### HEIGHT (HT) = 6 FT OR 7 FT OR 8 FT

|スペイン|h |アンテナ|h |スキッティング|h |ベール|h |ベール|h |
|---|---|---|---|---|---|---|---|
|15 FT|1180|1180|1180|1180|1180|1180|1180|
|12 FT|1110|1110|1110|1110|1110|1110|1110|
|10 FT|1040|1040|1040|1040|1040|1040|1040|
|8 FT|970|970|970|970|970|970|970|
|6 FT|890|890|890|890|890|890|890|
|4 FT|800|800|800|800|800|800|800|

### GENERAL NOTES:

- If design fill is between tabulated design fills, use the next greater design fill tabulation. If tabulated design fills are not used, use the greater member thickness, and A2 or B2 bars instead of any A1 or J1 bars. Dimensions of HFT and 4 FT tabulated design fills must be used for the 2 feet and 4 feet tabulated design fills. Area of reinforcement equals bar area per foot spacing.

### CONCRETE SINGLE BOX CULVERT

- Member thickness bar size, spacing, and dimensions are in inches unless otherwise specified.

- General notes and requirements for the design fill are based on the load resistances for the culvert itself.
### SPAN (S) = 13 FT
#### HEIGHT (Ht) = 7 FT OR 8 FT OR 9 FT

<table>
<thead>
<tr>
<th>SPAN (S)</th>
<th>DESIGN THICKNESS</th>
<th>TOP SLAB BARS</th>
<th>BOTTOM BARS</th>
<th>WALL BARS</th>
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</thead>
<tbody>
<tr>
<td>13 FT</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>13 FT</td>
<td>5</td>
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<td>2</td>
<td>2</td>
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<td>13 FT</td>
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<tr>
<td>13 FT</td>
<td>7</td>
<td>5</td>
<td>4</td>
<td>4</td>
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</table>

### SPAN (S) = 15 FT
#### HEIGHT (Ht) = 13 FT OR 14 FT

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<thead>
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<th>DESIGN THICKNESS</th>
<th>TOP SLAB BARS</th>
<th>BOTTOM BARS</th>
<th>WALL BARS</th>
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<tbody>
<tr>
<td>15 FT</td>
<td>4</td>
<td>2</td>
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<td>1</td>
</tr>
<tr>
<td>15 FT</td>
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<tr>
<td>15 FT</td>
<td>6</td>
<td>4</td>
<td>3</td>
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### SPAN (S) = 15 FT
#### HEIGHT (Ht) = 15 FT OR 16 FT

<table>
<thead>
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<th>SPAN (S)</th>
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<th>TOP SLAB BARS</th>
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<tbody>
<tr>
<td>15 FT</td>
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<td>2</td>
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<tr>
<td>15 FT</td>
<td>5</td>
<td>3</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

### GENERAL NOTES:
- Design fills are tabulated for fills between 2 feet and 4 feet. For fills greater than 4 feet, use the next greater tabulated fill. For fills less than 2 feet, use the fill for 2 feet and add 1/2 inch for each additional foot. Special designs are required for fills less than 2 feet. For fills greater than 3 feet and 4 feet, use the fill for 3 feet and add 1/2 inch for each additional foot.
- Design fills are based on standard 96-inch-long and 72-inch-long reinforcing bars. Special requirements may apply for other sizes.

### CONCRETE BOX Culvert
- Membrane thickness: 1/2" at top, 1/2" at bottom, and 1/4" at sides.
- Bar size: 3/4" diameter at top, 3/4" diameter at bottom, and 1/2" diameter at sides.
- Fill requirements: 12" clear distance for fills between 2 feet and 4 feet.

### ALT E R N AT E J3 B AR
- At contractor's option, alternate J3 bars may be used when the distance between the ends of J3 bars exceeds 18 feet.
- J3 bars shall be used with alternate J3 bars in all spans.

### SINGLE BOX Culvert
- Date effective: 04/15/2011
- Date prepared: 04/18/2011
- SHEET NO: 703.17
- 11 of 14
<table>
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<th>SPAN (S)</th>
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</table>

**GENERAL NOTES:**
- J3 BAR AT CONTRACTOR'S OPTION. ALTERNATE J3 BARS MAY BE USED WHEN THE DISTANCE BETWEEN THE ENDS OF J3 BARS IN THE TOP SLAB IS LESS THAN 2 FT. DIMENSION 1 (FT) SHALL BE USED WITH ALTERNATE J3 BARS.
- J3 BARS ARE STRONGER THAN J1 AND J2 BARS. USE J3 BARS ON VARIOUS J1 AND J2 BARS AS REQUIRED WITH ALTERNATE J3 BARS TO A LENGTH EQUAL TO 15 BARS AND SIZE AND SPACING EQUAL J3 BARS. NO ADDITIONAL PAYMENT WILL BE MADE FOR THIS SUBSTITUTION.

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

**CONCRETE SINGLE BOX CULVERT**

**MEMBER THICKNESS**

**BAR SIZE:** SPACING & DIMENSIONS

**SPAN (S):** 15 FEET

**HEIGHT (H):** 8 TO 16 FEET

**DATE EFFECTIVE:** 04/21/2010

**DATE PREPARED:** 04/20/2010

**SHEET NO.:** 13 OF 14
### Table 1: SPAN (S) = 16 FT

<table>
<thead>
<tr>
<th>SPAN (S)</th>
<th>HEIGHT (HT)</th>
<th>WALL BARS</th>
<th>SUBTOP BARS</th>
<th>TOP SLAB BARS</th>
<th>BOTTOM SLAB BARS</th>
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<td>1 J3</td>
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### Table 2: SPAN (S) = 16 FT

<table>
<thead>
<tr>
<th>SPAN (S)</th>
<th>HEIGHT (HT)</th>
<th>WALL BARS</th>
<th>SUBTOP BARS</th>
<th>TOP SLAB BARS</th>
<th>BOTTOM SLAB BARS</th>
<th>COLUMN BARS</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 FT 13</td>
<td>14 FT</td>
<td>1 J3</td>
<td>1 J3</td>
<td>1 J3</td>
<td>1 J3</td>
<td>1 J3</td>
</tr>
<tr>
<td>11 FT 14</td>
<td>16 FT</td>
<td>1 J3</td>
<td>1 J3</td>
<td>1 J3</td>
<td>1 J3</td>
<td>1 J3</td>
</tr>
<tr>
<td>18 FT 17</td>
<td>20 FT</td>
<td>1 J3</td>
<td>1 J3</td>
<td>1 J3</td>
<td>1 J3</td>
<td>1 J3</td>
</tr>
<tr>
<td>20 FT 19</td>
<td>20 FT</td>
<td>1 J3</td>
<td>1 J3</td>
<td>1 J3</td>
<td>1 J3</td>
<td>1 J3</td>
</tr>
<tr>
<td>14 FT 16</td>
<td>18 FT</td>
<td>1 J3</td>
<td>1 J3</td>
<td>1 J3</td>
<td>1 J3</td>
<td>1 J3</td>
</tr>
<tr>
<td>12 FT 14</td>
<td>16 FT</td>
<td>1 J3</td>
<td>1 J3</td>
<td>1 J3</td>
<td>1 J3</td>
<td>1 J3</td>
</tr>
<tr>
<td>4 FT 12</td>
<td>8 FT</td>
<td>1 J3</td>
<td>1 J3</td>
<td>1 J3</td>
<td>1 J3</td>
<td>1 J3</td>
</tr>
<tr>
<td>12 FT 14</td>
<td>16 FT</td>
<td>1 J3</td>
<td>1 J3</td>
<td>1 J3</td>
<td>1 J3</td>
<td>1 J3</td>
</tr>
<tr>
<td>16 FT 19</td>
<td>20 FT</td>
<td>1 J3</td>
<td>1 J3</td>
<td>1 J3</td>
<td>1 J3</td>
<td>1 J3</td>
</tr>
<tr>
<td>22 FT 21</td>
<td>22 FT</td>
<td>1 J3</td>
<td>1 J3</td>
<td>1 J3</td>
<td>1 J3</td>
<td>1 J3</td>
</tr>
<tr>
<td>4 FT 12</td>
<td>8 FT</td>
<td>1 J3</td>
<td>1 J3</td>
<td>1 J3</td>
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<td>24 FT 22</td>
<td>24 FT</td>
<td>1 J3</td>
<td>1 J3</td>
<td>1 J3</td>
<td>1 J3</td>
<td>1 J3</td>
</tr>
<tr>
<td>12 FT 14</td>
<td>16 FT</td>
<td>1 J3</td>
<td>1 J3</td>
<td>1 J3</td>
<td>1 J3</td>
<td>1 J3</td>
</tr>
</tbody>
</table>

### General Notes:
- If design fill is between tabulated design fills, use the next greater design fill; if design fill is between 2 tabulated design fills, use the greater member thickness, area of reinforcement and bar spacing. Dimensions are in inches unless otherwise specified.
- Special details are required when the design fill is less than 1 foot or greater than 50 feet.
- Dimensions are in inches unless otherwise specified.
- Design fill is measured from the top of top slab to the top of earth fill or roadway.
### AREA OF STEEL REQUIRED FOR J5 BARS IN WINGS (SQ. IN./FT.)

#### WALL HEIGHT VS. WALL THICKNESS

<table>
<thead>
<tr>
<th>Wall Thickness (TX, in.)</th>
<th>Wall height (ft.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td>0.168</td>
<td>0.168</td>
</tr>
<tr>
<td>0.168</td>
<td>0.244</td>
</tr>
<tr>
<td>0.168</td>
<td>0.456</td>
</tr>
<tr>
<td>0.168</td>
<td>0.471</td>
</tr>
<tr>
<td>0.168</td>
<td>0.626</td>
</tr>
<tr>
<td>0.168</td>
<td>0.809</td>
</tr>
<tr>
<td>0.168</td>
<td>1.466</td>
</tr>
<tr>
<td>0.168</td>
<td>2.003</td>
</tr>
</tbody>
</table>

**NOTE:**

- The wall height is equal to the barrel height (HT) plus the top slab thickness (TS). When wall height is in between or outside tabulated wall heights, the area of steel required should be interpolated between or extrapolated from adjacent areas of steel using the actual wall height.

- If area of steel in the wall of the culvert (J4 bars) is greater than that indicated in the table, use the same size and spacing for the J5 bars in the wings. However, if the area of steel provided by matching size and spacing of the J4 bars is insufficient, increase the size of the J5 bars (max.) and/or decrease the spacing of the J4 bars (min.). Use smallest bar size possible based on minimum spacing.

- Minimum steel to be used in the wings for J5 bars is #6 bars at 14" centers (area of steel = 0.1683 sq. in./ft.).

**DATE EFFECTIVE:**

04/01/2011

**DATE PREPARED:**

4/18/2011

**SHEET NO.:**

1 OF 2
# WING BACKFILL TABLE

<table>
<thead>
<tr>
<th>Wing Skew (Degrees)</th>
<th>A (Degrees)</th>
<th>B (Transition Angle, Degrees)</th>
<th>C (Backfill Slope) (H:V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>&gt;90</td>
<td>65</td>
<td>3:1</td>
</tr>
<tr>
<td>5</td>
<td>90</td>
<td>65</td>
<td>3:1</td>
</tr>
<tr>
<td>10</td>
<td>85</td>
<td>58</td>
<td>3:1</td>
</tr>
<tr>
<td>15</td>
<td>75</td>
<td>43</td>
<td>3:1</td>
</tr>
<tr>
<td>20</td>
<td>70</td>
<td>37</td>
<td>3:1</td>
</tr>
<tr>
<td>25</td>
<td>65</td>
<td>29</td>
<td>3:1</td>
</tr>
<tr>
<td>30</td>
<td>60</td>
<td>22</td>
<td>3:1</td>
</tr>
<tr>
<td>35</td>
<td>55</td>
<td>19</td>
<td>3:1</td>
</tr>
<tr>
<td>40</td>
<td>50</td>
<td>14</td>
<td>2:1</td>
</tr>
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<td>45</td>
<td>14</td>
<td>2:1</td>
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<td>14</td>
<td>2:1</td>
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<td>35</td>
<td>14</td>
<td>2:1</td>
</tr>
<tr>
<td>60</td>
<td>30</td>
<td>10</td>
<td>2:1</td>
</tr>
</tbody>
</table>

**Plan of Wings and Slope Transition Lines**

Notes: Backfill transition angle and backfill slope shall apply to all box culverts regardless of type - single, double, or triple.

**NOTE:** Use 65° for angle E for all wings which make an angle D greater than 90°.
**CONCRETE BOX CULVERTS**

**CUTTING DETAILS**

**EXTENSION TO STRAIGHT WINGS**

**GENERAL NOTES:**

The hatched parts of these drawings indicate those portions of the existing culvert which are to be removed.

All reinforcing bars within areas shown to be removed, that are bonded in undisturbed old concrete, shall be cleanly stripped, straightened, and extended into new concrete.

See standard specifications for required bushhammering and treating of old concrete surfaces which are to receive new concrete.

A continuous V-groove at least 1" in depth shall be cut on the face of the concrete as a guide for the line of break and to prevent spallng.

The box extension opening shall be built to match the existing box opening. When the existing opening does not match a size from the tables, the next larger size shall be used for determining the member sizes and reinforcement.

---

**DATE EFFECTIVE:** 10-01-2009

**DATE PREPARED:** 8/18/2009

**SHEET NO.:** 1 OF 2
GENERAL NOTES:

THE HATCHED PARTS OF THESE DRAWINGS INDICATE THOSE PORTIONS OF THE EXISTING CULVERT WHICH ARE TO BE REMOVED.

ALL REINFORCING BARS WITHIN AREAS SHOWN TO BE REMOVED, THAT ARE BONDED IN UNDISTURBED OLD CONCRETE, SHALL BE CLEANLY STRIPPED, STRAIGHTENED, AND EXTENDED INTO NEW CONCRETE.

SEE STANDARD SPECIFICATIONS FOR REQUIRED BUSHHAMMERING AND TREATING OF OLD CONCRETE SURFACES WHICH ARE TO RECEIVE NEW CONCRETE.

A CONTINUOUS V-GROOVE AT LEAST 3/8 IN DEPTH SHALL BE CUT ON THE FACE OF THE CONCRETE AS A GUIDE FOR THE LINE OF BREAK AND TO PREVENT SPALLING.

THE BOX EXTENSION OPENING SHALL BE BUILT TO MATCH THE EXISTING BOX OPENING. WHEN THE EXISTING OPENING DOES NOT MATCH A SIZE FROM THE TABLES, THE NEXT LARGER SIZE SHALL BE USED FOR DETERMINING THE MEMBER SIZES AND REINFORCEMENT.
GENERAL NOTES:
FOR SECTIONS THRU BARREL, WINGS AND HEADWALLS, SEE SHEET 3 OF 3. FOR BAR SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT EXCEPT J5 BARS, SEE 703.47. FOR J5 BARS, SEE 703.37.
CONSTRUCTION JOINT KEY NOT SHOWN FOR CLARITY IN PLAN AND SECTION. SEE SHEET 3 OF 3 FOR DETAILS.
DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.
MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1/2 IN.
LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.
BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.
(a) SAME SIZE AND SPACING AS ADJACENT BARS
(b) VARIES, 12" MAXIMUM
(c) NOT SPECIFIED ON THIS SHEET
(d) NOT SPECIFIED ON THIS SHEET
(e) NOT SPECIFIED ON THIS SHEET
(f) NOT SPECIFIED ON THIS SHEET
(g) NOT SPECIFIED ON THIS SHEET
(h) FOR DESIGN FILLS OVER 2'-0" OR LESS
(i) FOR DESIGN FILLS 2'-0" OR LESS
(j) NOT REQUIRED FOR CLEAR SPANS 6'-0" OR LESS
(k) FOR CLEAR SPAN 12'-0"
(l) FOR CLEAR SPAN 15'-0"
(m) IF REQUIRED, THE MINIMUM LENGTH EACH SIDE OF E WALL SHALL BE THE GREATER OF 48 IN. STARTERS OR CLEAR SPAN.
THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

CONCRETE
DOUBLE BOX CULVERT
SKEW: SQUARED
WINGS: STRAIGHT
REINFORCEMENT

DATE PREPARED: 5/13/2015
DATE REVIEWED: 6/13/2015

JEFFERSON CITY, MO 65102
1-888-ASK-MODOT 1-888-275-6636

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
COMMISSION
REINFORCEMENT

DATE EFFECTIVE: 12/01/2011
DATE PREPARED: 5/13/2015

MOZAR HEATER-ENERgy ELECTRONICS INC.

103-40H SHEET NO.
2 OF 3
STITCHED TO ONE FACE OF THE CONCRETE WITH 10-GAGE COPPER WIRE OR 12-GAGE SOFT DRAWN GALVANIZED STEEL WIRE.

FILTER CLOTH WILL BE CONSIDERED COMPLETELY COVERED BY THE CONTRACT UNIT PRICE FOR OTHER ITEMS.

FILTER CLOTH 3 FEET IN WIDTH AND DOUBLE PREFORMED FIBER EXPANSION JOINT MATERIAL IN ACCORDANCE WITH SEC 1057 SHALL BE SECURELY TRANSVERSE JOINT THRU BARREL.

(a) APPROXIMATELY ONE-THIRD OF WALL KEYED CONSTRUCTION JOINT

GRANULAR BACKFILL LIMITS AND MEMBER DIMENSIONS

(a) TRANVERSE JOINT THRU BARREL

PREFORMED FIBER EXPANSION JOINT MATERIAL IN ACCORDANCE WITH SEC 1057 SHALL BE SECURELY STITCHED TO ONE FACE OF THE CONCRETE WITH 10-GAGE COPPER WIRE OR 12-GAGE SOFT DRAWN GALVANIZED STEEL WIRE.

FILTER CLOTH A FEET IN WIDTH AND DOUBLE THICKNESS SHALL BE CENTERED ON TRANSVERSE JOINTS IN TOP SLAB AND SIDWALLS WITH EDGES SEALING WITH WASTIC OR TWO SIDED TAPE. FILTER CLOTH SHALL BE SUBSURFACE DRAINING, GEOTEXTILE IN ACCORDANCE WITH SEC 1057. FILTER CLOTH ATHREE TIMES HIS DEPTH FROM EXPOSED SURFACE. FILTER CLOTH WILL BE CONSIDERED COMPLETELY COVERED BY THE CONTRACT UNIT PRICE FOR OTHER ITEMS.

UPSTREAM HEADWALL REINFORCEMENT NEAR MIDSPAN

UPSTREAM HEADWALL REINFORCEMENT NEAR MIDSPAN

DOWNSTREAM HEADWALL REINFORCEMENT NEAR MIDSPAN

DOWNSTREAM HEADWALL REINFORCEMENT NEAR MIDSPAN

UPSTREAM AND DOWNSTREAM WINGS REINFORCEMENT

BARREL REINFORCEMENT FOR DESIGN FILLS OVER 2'-0"
GENERAL NOTES:

FOR SECTIONS THRU BARREL, WINGS AND HEADWALLS, SEE SHEET 3 OF 3. FOR BARS SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT EXCEPT J5 BARS, SEE 703.47. FOR J5 BARS, SEE 703.37.

CONSTRUCTION JOINT KEY NOT SHOWN FOR CLARITY IN PLAN AND SECTION, SEE SHEET 3 OF 3 FOR DETAILS.

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1".

LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.

BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

(a) SAME SIZE AND SPACING AS ADJACENT B BARS

(b) VARIES. 12" MAXIMUM

(c) NOT SPECIFIED ON THIS SHEET

(d) SAME SIZE AND SPACING AS A2 BARS

(e) A2 BAR SPACING

(f) NOT SPECIFIED ON THIS SHEET

(g) NOT SPECIFIED ON THIS SHEET

(h) FOR DESIGN FILLS OVER 2'-0"-

(i) FOR DESIGN FILLS 2'-0" OR LESS

(j) NOT REQUIRED FOR CLEAR SPANS > 10'-0"

(k) FOR CLEAR SPAN > 10'-0"-

(l) FOR CLEAR SPAN > 13'-0"

(*FRIED: THE MINIMUM LENGTH EACH SIDE OF A WALL SHALL BE THE GREATER OF 48 BAR DIAMETERS OR 11' FOR CLEAR SPAN > 13'-0"

THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT 1-888-275-6636)

JEFFERSON CITY, MO 65102
5/1312015

10'-0"

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT 1-888-275-6636)

JEFFERSON CITY, MO 65102
5/1312015

10'-0"

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT 1-888-275-6636)

JEFFERSON CITY, MO 65102
5/1312015

10'-0"
STITCHED TO ONE FACE OF THE CONCRETE WITH 10GAGE COPPER WIRE OR 12 GAGE SOFT DRAWN STEEL REINFORCEMENT.

THICKNESS SHALL BE CENTERED ON TRANSVERSE JOINTS.

PREFORMED FIBER EXPANSION JOINT MATERIAL IN ACCORDANCE WITH SEC 1057 SHALL BE SECURELY KEPT IN PLACE.

A SUBSURFACE DRAINAGE GEOTEXTILE IN ACCORDANCE WITH SEC 1011. COST OF FURNISHING AND INSTALLING GEOTEXTILE SHALL NOT BE EXCLUDED.

GRANULAR BACKFILL LIMITS AND MEMBER DIMENSIONS.

TRANSVERSE JOINT THRU BARREL REINFORCEMENT.

PREFORMED FIBER EXPANSION JOINT MATERIAL IN ACCORDANCE WITH SEC 1057 SHALL BE SECURELY STITCHED TO ONE FACE OF THE CONCRETE WITH 10 GAGE COPPER WIRE OR 12 GAGE SOFT DRAWN GALVANIZED STEEL WIRE.

FILTER CLOTH A FEET IN WIDTH AND DOUBLE THICKNESS SHALL BE CENTERED ON TRANSVERSE JOINTS IN TOP SLAB AND SIDEWALLS WITH EDGES SEATED WITH MASTIC OR TWO SIDES TAPE. FILTER CLOTH SHALL BE SECURED TO TOP SLAB AND SIDEWALLS.

FILTER CLOTH WILL BE CONSIDERED COMPLETELY KEPT IN PLACE.

FOR DESIGN FILLS OVER 2'-0".

COST OF FURNISHING AND INSTALLING GEOTEXTILE SHALL NOT BE EXCLUDED.

UPSTREAM HEADWALL REINFORCEMENT.

NEAR INTERIOR WALL.

IF 02 BARS ARE REQUIRED, THE MINIMUM LENGTH EACH SIDE OF WALL SHALL BE THE GREATER OF 48 BAR DIAMETERS OR 1 CLEAR SPAN. THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

UPSTREAM HEADWALL REINFORCEMENT.

NEAR MIDSPAN.

IF 02 BARS ARE REQUIRED, THE MINIMUM LENGTH EACH SIDE OF WALL SHALL BE THE GREATER OF 48 BAR DIAMETERS OR 1 CLEAR SPAN. THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

UPSTREAM FLARED WINGS REINFORCEMENT.

ERECTED BY THE CONTRACT UNIT PRICE FOR OTHER ITEMS.

NOTE: FOR MEMBER THICKNESS AND FOR BAR SIZES, SPACING AND DIMENSIONS OF BARS, SEE: 1053.47, FOR 02 BARS.

SEE 103.31.

BARREL REINFORCEMENT: FOR DESIGN FILLS OVER 2'-0" OR LESS.

BARREL REINFORCEMENT: FOR DESIGN FILLS OVER 2'-0" OR LESS.

REFERENCES:

105 WEST CAPITOL STREET
JEFFERSON CITY, MO 65102
1-888-456-MODOT (1-888-266-6686)
MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

DATE PREPARED: 5/13/2009
DATE EFFECTIVE: 3/20/2011
703.41H SHEET NO. 3 OF 3

CONCRETE DOUBLE BOX CULVERT

SKEW: SQUARED
WINGS: FLARED

SECTIONS

GENERAL NOTES:

BARREL AND WINGS SECTIONS ARE SYMMETRICAL ABOUT MIDSPAN AND NORMAL TO LONG DIRECTION OF HEADWALL.

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1".
LAYING OUT TRANVERSE JOINTS
UNLESS SHOWN ON BRIDGE PLAN

USE A TRANSVERSE JOINT WHEN BARREL LENGTH IS OVER 80 FEET. USE ADDITIONAL JOINTS TO LIMIT CUT SECTION LENGTH AND END SECTION BARREL LENGTH MEASURED ALONG CENTERLINE OF CULVERT TO 50 FEET. MINIMUM END SECTION LENGTH SHALL BE 3 FEET MEASURED ALONG THE SHORTEST WALL FROM THE INSIDE FACE OF HEADWALL TO THE TRANVERSE JOINT.

TO AVOID LOCATING TRANVERSE JOINTS UNDER A TRAVELED WAY WITH DESIGN FILLS 2 FEET OR LESS THE FOLLOWING SHALL APPLY:

- BARREL LENGTH UP TO 90 FEET WITHOUT A TRANSVERSE JOINT
- CUT SECTION LENGTHS UP TO 60 FEET
- WHEN BARREL AND CUT SECTION LENGTH RESTRICTIONS REQUIRE TRANVERSE JOINTS TO BE LOCATED UNDER A TRAVELED WAY WITH DESIGN FILLS 2 FEET OR LESS THE JOINTS SHALL BE LOCATED TO MINIMIZE THE LENGTH OF JOINT UNDER A TRAVELED WAY.
- TRAVELED WAY IS THE ROADWAY WIDTH MINUS SHOULDER WIDTHS.

FOR CUT SECTION DETAILS SEE 703.46.

GENERAL NOTES:
FOR SECTIONS THRU BARREL, WINGS AND HEADWALLS, SEE SHEET 3 OF 3. FOR BAR SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT EXCEPT J5 BARS, SEE 703.43. FOR J5 BARS, SEE 703.37.

CONSTRUCTION JOINT KEY NOT SHOWN FOR CLARITY IN PLAN AND ELEVATION. SEE SHEET 3 OF 3 FOR DETAILS.

DRAWN NOT TO SCALE. FOLLOW DIMENSIONS.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1/8".
LAP LONGITUDINAL BARS A MINIMUM OF 2" AT SPACES.
BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.
(a) SAME SIZE AND SPACING AS ADJACENT B BARS
(b) VARIES. 12" MAXIMUM
(c) J4 BAR SPACING
(d) SAME SIZE AND SPACING AS A2 BARS
(e) A2 BAR SPACING
(f) SAME SIZE AND SPACING AS A1 BARS
(g) A1 BAR SPACING
(h) AT BAR SPACING

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL CITY, MO 65102
1-888-ASK-MODOT 1-888-275-6636

CONCRETE DOUBLE BOX CULVERT
SKEW: LEFT ADVANCE
WINGS: STRAIGHT

REINFORCEMENT
DATE PREPARED: 5/13/2015
DATE EFFECTIVE: 5/13/2015

703.42H SHEET NO. 1 OF 3
GENERAL NOTES:

FOR SECTIONS THRU BARREL, WINGS AND HEADWALLS, SEE SHEET 3 OF
3. FOR BAR SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT
EXCEPT #5 BARS, SEE 703.47. FOR #5 BARS, SEE 703.37.

CONSTRUCTION JOINT KEY NOT SHOWN FOR CLARITY IN PLAN AND
SECTION. SEE SHEET 5 OF 3 FOR DETAILS.

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1/2.

LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.

BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

(a) SAME SIZE AND SPACING AS ADJACENT B BARS

(b) VARIES: 12" MAXIMUM

(c) NOT SPECIFIED ON THIS SHEET

(d) SAME SIZE AND SPACING AS A2 BARS

(e) A2 BAR SPACING

(f) SAME SIZE AND SPACING AS AT BARS

(g) AT BAR SPACING

(h) FOR DESIGN FILLS OVER 2'-0" OR LESS

(i) FOR DESIGN FILLS 2'-0" OR LESS

(j) NOT REQUIRED FOR CLEAR SPANS 5'-0" OR LESS

(k) FOR CLEAR SPAN 5'-0" OR LESS

(l) FOR CLEAR SPAN 10'-0"

(m) IF REQUIRED, THE MINIMUM LENGTH EACH SIDE OF B BARS SHALL

BE THE GREATER OF 48 BAR DIAMETERS OR A CLEAR SPAN.

THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

(n) #5 BARS AS REQUIRED, QUANTITY OF BARS VARIES WITH SHEET.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1/2.

LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.

BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

(a) SAME SIZE AND SPACING AS ADJACENT B BARS

(b) VARIES: 12" MAXIMUM

(c) NOT SPECIFIED ON THIS SHEET

(d) SAME SIZE AND SPACING AS A2 BARS

(e) A2 BAR SPACING

(f) SAME SIZE AND SPACING AS AT BARS

(g) AT BAR SPACING

(h) FOR DESIGN FILLS OVER 2'-0" OR LESS

(i) FOR DESIGN FILLS 2'-0" OR LESS

(j) NOT REQUIRED FOR CLEAR SPANS 5'-0" OR LESS

(k) FOR CLEAR SPAN 5'-0" OR LESS

(l) FOR CLEAR SPAN 10'-0"

(m) IF REQUIRED, THE MINIMUM LENGTH EACH SIDE OF B BARS SHALL

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(d) SAME SIZE AND SPACING AS A2 BARS

(e) A2 BAR SPACING

(f) SAME SIZE AND SPACING AS AT BARS

(g) AT BAR SPACING

(h) FOR DESIGN FILLS OVER 2'-0" OR LESS

(i) FOR DESIGN FILLS 2'-0" OR LESS

(j) NOT REQUIRED FOR CLEAR SPANS 5'-0" OR LESS

(k) FOR CLEAR SPAN 5'-0" OR LESS

(l) FOR CLEAR SPAN 10'-0"

(m) IF REQUIRED, THE MINIMUM LENGTH EACH SIDE OF B BARS SHALL

BE THE GREATER OF 48 BAR DIAMETERS OR A CLEAR SPAN.

THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

(n) #5 BARS AS REQUIRED, QUANTITY OF BARS VARIES WITH SHEET.
STITCHED TO ONE FACE OF THE CONCRETE WITH 10-GAGE COPPER WIRE OR 12-GAGE SOFT DRAWN FILTER CLOTH 3 FEET IN WIDTH AND DOUBLE TRANSVERSE JOINT THRU BARREL BACKFILL GRANULAR EXPANSION JOINT MATERIAL FOR DESIGN FILLS > 2"-

UPSTREAM AND DOWNSTREAM WINGS REINFORCEMENT

BARREL REINFORCEMENT FOR DESIGN FILLS > 2"-

GENERAL NOTES:
- FOR MEMBER THICKNESS AND FOR BAR SIZE, SPACING AND DIMENSIONS OF REINFORCING STEEL, SEE 703.34.
- SEE 703.3.1.
- BARREL AND WINGS SECTIONS ARE SYMMETRICAL. AXES OF CULVERT HEADWALL SECTIONS ARE NORMAL TO LONG DIRECTION OF HEADWALL.
- DRAWING NOT TO SCALE, FOLLOW DIMENSIONS.
- MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1/16."
LAYING OUT TRANVERSE JOINTS

drawings not to scale. follow dimensions.
minimum clearance to reinforcing steel shall be 1½".
longitudinal bars a minimum of 23" at splices.
beveled headwall shall be located at upstream end.
(a) same size and spacing as adjacent b bars
(b) varies. 12" maximum
(c) j4 bar spacing
(d) same size and spacing as a2 bars
(e) a2 bar spacing
(f) same size and spacing as a1 bars
(g) a1 bar spacing

LAYS A TRANSVERSE JOINT WHEN BARREL LENGTH IS OVER 80 FEET. USE ADDITIONAL JOINTS TO LIMIT CUT SECTION LENGTH AND END SECTION BARREL LENGTH MEASURED ALONG CENTERLINE OF CULVERT TO 50 FEET. MINIMUM END SECTION LENGTH SHALL BE 3 FEET MEASURED ALONG THE SHORTEST WALL FROM THE INSIDE FACE OF HEADWALL TO THE TRANSVERSE JOINT.

TO AVOID LOCATING TRANVERSE JOINTS UNDER A TRAVELED WAY WITH DESIGN LENGTHS 2 FEET OR LESS THE FOLLOWING SHALL APPLY:

BARREL LENGTH UP TO 90 FEET WITHOUT A TRANSVERSE JOINT
BARREL LENGTH UP TO 60 FEET

WHEN BARREL AND CUT SECTION LENGTH RESTRICTIONS REQUIRE TRANVERSE JOINTS TO BE LOCATED UNDER A TRAVELED WAY WITH DESIGN LENGTHS 2 FEET OR LESS, THE JOINTS SHALL BE LOCATED TO MINIMIZE THE LENGTH OF JOINT UNDER THE TRAVELED WAY.

TRANSVERSE JOINT

PLAN OF BOTTOM SLAB

Developed elevation of exterior wall

7/1 and J6 bars may be bent in field or shop.

Missouri Highways and Transportation Commission
105 West Capitol
Jefferson City, MO 65102
1-888-ASK-MODOT 1-888-275-6636

Concrete Double Box Culvert
Skew: Left Advance
Wings: Flared
Reinforcement

Date prepared: 1/31/2015
703.43H Sheet No. 1 of 3
GENERAL NOTES:
1. CONSTRUCTION JOINT KEY NOT SHOWN FOR CLARITY IN PLAN AND SECTION. SEE SHEET 3 OF 3 FOR DETAILS.
2. DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.
3. MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1/2".
4. LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.
5. BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.
6. SAME SIZE AND SPACING AS ADJACENT BARS
7. NOT SPECIFIED ON THIS SHEET
8. SAME SIZE AND SPACING AS A2 BARS
9. A2 BAR SPACING
10. SAME SIZE AND SPACING AS AT BARS
11. AT BAR SPACING
12. FOR DESIGN FILLS OVER 2'-0"
13. FOR DESIGN FILLS OVER 2'-0" OR LESS
14. NOT REQUIRED FOR CLEAR SPANS > 13'-0"
15. #9 FOR CLEAR SPAN > 13'-0" OR LESS
16. BE THE GREATER OF 48 BAR DIAMETERS OR IF REQUIRED. THE MINIMUM LENGTH EACH SIDE OF
17. IF REQUIRED. THE MINIMUM LENGTH EACH SIDE OF BARS VARY WITH SKEW.
18. THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.
19. H2 BARS AS REQUIRED. QUANTITY OF BARS VARIES WITH SKEW.

FIGURE 703.43H
REINFORCEMENT
SKEW: LEFT ADVANCE
WINGS: FLARED
MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
JEFFERSON CITY, MO 65102
(1-888-ASK-MODOT 1-888-275-6636)
CONCRETE DOUBLE BOX CULVERT
DATE EFFECTIVE: 3/1/2011
DATE PREPARED: 3/13/2009
SHEET NO. 2 OF 3
1010112011
WALL SHALL
© 2011 MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
ROLL 703.43H 10/26/04
STITCHED TO ONE FACE OF THE CONCRETE WITH 10GAGE COPPER WIRE OR 12 GAGE SOFT DRAWN GALVANIZED STEEL WIRE.

FILTER CLOTH WILL BE CONSIDERED COMPLETELY COVERED BY THE CONTRACT UNIT PRICE FOR OTHER ITEMS.

FILTER CLOTH 3 FEET IN WIDTH AND DOUBLE PREFORMED FIBER EXPANSION JOINT MATERIAL IN ACCORDANCE WITH SEC 1057 SHALL BE SECURELY SECURED TO SUBSURFACE DRAINAGE GEOTEXTILE IN ACCORDANCE WITH SEC 1011. COST OF FURNISHING AND INSTALLING IN TOP SLAB AND SIDEWALLS WITH EDGES SEALED WITH MASTIC OR TWO SIDED TAPE. FILTER CLOTH SHALL BE SECURED TO SUBSURFACE DRAINAGE GEOTEXTILE IN ACCORDANCE WITH SEC 1011.

GRANULAR BACKFILL LIMITS AND MEMBER DIMENSIONS:

PREFORMED FIBER EXPANSION JOINT MATERIAL IN ACCORDANCE WITH SEC 1057 SHALL BE SECURELY STITCHED TO ONE FACE OF THE CONCRETE WITH 10 GAUGE COPPER WIRE OR 12 GAUGE SOFT DRAWN GALVANIZED STEEL WIRE.

FILTER CLOTH A FEET IN WIDTH AND DOUBLE THICKNESS SHALL BE CENTERED ON TRANSVERSE JOINTS IN TOP SLAB AND SIDEWALLS WITH EDGES SEALED WITH WASTIC OR TWO SIDED TAPE. FILTER CLOTH SHALL BE SECURELY SECURED TO SUBSURFACE DRAINAGE GEOTEXTILE IN ACCORDANCE WITH SEC 1011.

FILTER CLOTH WILL BE CONSIDERED COMPLETELY COVERED BY THE CONTRACT UNIT PRICE FOR OTHER ITEMS.

TRANSVERSE JOINT THRU BARREL:

PREFORMED FIBER EXPANSION JOINT MATERIAL IN ACCORDANCE WITH SEC 1057 SHALL BE SECURELY STITCHED TO ONE FACE OF THE CONCRETE WITH 10 GAUGE COPPER WIRE OR 12 GAUGE SOFT DRAWN GALVANIZED STEEL WIRE.

FILTER CLOTH A FEET IN WIDTH AND DOUBLE THICKNESS SHALL BE CENTERED ON TRANSVERSE JOINTS IN TOP SLAB AND SIDEWALLS WITH EDGES SEALED WITH WASTIC OR TWO SIDED TAPE. FILTER CLOTH SHALL BE SECURELY SECURED TO SUBSURFACE DRAINAGE GEOTEXTILE IN ACCORDANCE WITH SEC 1011.

FILTER CLOTH WILL BE CONSIDERED COMPLETELY COVERED BY THE CONTRACT UNIT PRICE FOR OTHER ITEMS.

STITCHED TO ONE FACE OF THE CONCRETE WITH 10GAGE COPPER WIRE OR 12 GAGE SOFT DRAWN GALVANIZED STEEL WIRE.

FILTER CLOTH WILL BE CONSIDERED COMPLETELY COVERED BY THE CONTRACT UNIT PRICE FOR OTHER ITEMS.

FILTER CLOTH 3 FEET IN WIDTH AND DOUBLE PREFORMED FIBER EXPANSION JOINT MATERIAL IN ACCORDANCE WITH SEC 1057 SHALL BE SECURELY SECURED TO SUBSURFACE DRAINAGE GEOTEXTILE IN ACCORDANCE WITH SEC 1011. COST OF FURNISHING AND INSTALLING IN TOP SLAB AND SIDEWALLS WITH EDGES SEALED WITH MASTIC OR TWO SIDED TAPE. FILTER CLOTH SHALL BE SECURED TO SUBSURFACE DRAINAGE GEOTEXTILE IN ACCORDANCE WITH SEC 1011.

GRANULAR BACKFILL LIMITS AND MEMBER DIMENSIONS:

PREFORMED FIBER EXPANSION JOINT MATERIAL IN ACCORDANCE WITH SEC 1057 SHALL BE SECURELY STITCHED TO ONE FACE OF THE CONCRETE WITH 10 GAUGE COPPER WIRE OR 12 GAUGE SOFT DRAWN GALVANIZED STEEL WIRE.

FILTER CLOTH A FEET IN WIDTH AND DOUBLE THICKNESS SHALL BE CENTERED ON TRANSVERSE JOINTS IN TOP SLAB AND SIDEWALLS WITH EDGES SEALED WITH WASTIC OR TWO SIDED TAPE. FILTER CLOTH SHALL BE SECURELY SECURED TO SUBSURFACE DRAINAGE GEOTEXTILE IN ACCORDANCE WITH SEC 1011.

FILTER CLOTH WILL BE CONSIDERED COMPLETELY COVERED BY THE CONTRACT UNIT PRICE FOR OTHER ITEMS.
GENERAL NOTES:

1. FOR SECTIONS THRU BARRER, WINGS AND HEADWALLS, SEE SHEET 3 OF 3. FOR BAR SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT EXCEPT J5 BARS. SEE 703.47. FOR J5 BARS. SEE 703.46.

2. MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1½".

3. LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.

4. BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

5. DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

6. MINIMUM END SECTION LENGTH SHALL BE 3 FEET MEASURED ALONG THE SHORTEST WALL FROM THE INSIDE FACE OF HEADWALL TO THE TRANSVERSE JOINT.

7. TO AVOID LOCATING TRANSVERSE JOINTS UNDER A TRAVELED WAY WITH DESIGN FILLS 2 FEET OR LESS THE FOLLOWING SHALL APPLY:

   a) BARRER LENGTH TO 90 FEET WITHOUT A TRANSVERSE JOINT
   b) BARREL LENGTH TO 80 FEET WITH A TRANSVERSE JOINT
   c) CUT SECTION LENGTHS UP TO 50 FEET
   d) ADDITIONAL JOINTS TO LIMIT CUT SECTION LENGTH AND END SECTION BARREL LENGTH MEASURED ALONG CENTERLINE OF CULVERT TO 50 FEET.
   e) MINIMUM END SECTION LENGTH SHALL BE 3 FEET MEASURED ALONG THE SHORTEST WALL FROM THE INSIDE FACE OF HEADWALL TO THE TRANSVERSE JOINT.

8. WHEN BARREL AND CUT SECTION LENGTH RESTRICTIONS REQUIRE TRANSVERSE JOINTS TO BE LOCATED UNDER A TRAVELED WAY WITH DESIGN FILLS 2 FEET OR LESS, THE JOINTS SHALL BE LOCATED TO MINIMIZE THE LENGTH OF JOINT UNDER THE TRAVELED WAY. THE TRAVELED WAY IS THE ROADWAY WIDTH MINUS WING SHOULDER Widths.

9. FOR CUT SECTION DETAILS, SEE 703.46.

10. WHEN BARREL AND CUT SECTION LENGTH RESTRICTIONS REQUIRE TRANSVERSE JOINTS TO BE LOCATED UNDER A TRAVELED WAY WITH DESIGN FILLS 2 FEET OR LESS, THE JOINTS SHALL BE LOCATED TO MINIMIZE THE LENGTH OF JOINT UNDER THE TRAVELED WAY. THE TRAVELED WAY IS THE ROADWAY WIDTH MINUS WING SHOULDER Widths.

11. FOR CUT SECTION DETAILS, SEE 703.46.

12. WHEN BARREL AND CUT SECTION LENGTH RESTRICTIONS REQUIRE TRANSVERSE JOINTS TO BE LOCATED UNDER A TRAVELED WAY WITH DESIGN FILLS 2 FEET OR LESS, THE JOINTS SHALL BE LOCATED TO MINIMIZE THE LENGTH OF JOINT UNDER THE TRAVELED WAY. THE TRAVELED WAY IS THE ROADWAY WIDTH MINUS WING SHOULDER Widths.

13. FOR CUT SECTION DETAILS, SEE 703.46.
PLAN OF TOP SLAB
0 BARS IN WALLS ARE NOT SHOWN FOR CLARITY.
FOR PLACEMENT, SEE SHEET 1 OF 3.

VARIED A BARS AT BOTTOM (f)

GENERAL NOTES:
FOR SECTIONS THRU BARR I WINGS AND HEADWALLS, SEE SHEET 3 OF 3.
FOR BAR SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT EXCEPT BARS, SEE 703.47.
FOR BARS, SEE 703.37.
CONSTRUCTION JOINT KEY NOT SHOWN FOR CLARITY IN PLAN AND SECTION, SEE SHEET 5 OF 3 FOR DETAILS.
DRAWING NOT TO SCALE, FOLLOW DIMENSIONS.
MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1/2".
LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.
BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.
(g) SAME SIZE AND SPACING AS A1 BARS
(h) VARIES: 12" MAXIMUM
(i) NOT SPECIFIED ON THIS SHEET
(j) SAME SIZE AND SPACING AS A2 BARS
(k) A2 BAR SPACING (l) SAME SIZE AND SPACING AS AT BARS
(l) AT BAR SPACING
(m) FOR DESIGN FILLS OVER 2'-0"
(n) FOR DESIGN FILLS 2'-0" OR LESS
(o) NOT REQUIRED FOR CLEAR SPANS 5'-10"-0"
(p) FOR CLEAR SPAN 7'-10"-0"
(q) FOR CLEAR SPAN 13'-0"
IF REQUIRED, THE MINIMUM LENGTH EACH SIDE OF "E" BARS SHALL BE THE GREATER OF 38 BAR DIAMETERS OR 1/2 CLEAR SPAN.
THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.
(r) A1 BARS AS REQUIRED. QUANTITY OF BARS VARIES WITH SKEW.

REINFORCEMENT

MISSOURI HIGHWAYS AND TRANSPORTATION
COMMISSION
110 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT 1-888-275-6636
CONCRETE
DOUBLE BOX CULVERT
SKEW: RIGHT ADVANCE
WINGS: STRAIGHT

DATE PREPARED: 6/13/2016
DATE EFFECTIVE: 10/1/2011
703.44H SHEET NO. 2 OF 3

JEFFERSON CITY, MO 65102
STITCHED TO ONE FACE OF THE CONCRETE WITH 10-GAGE COPPER WIRE OR 12-GAGE SOFT DRAWN FILTER CLOTH WILL BE CONSIDERED COMPLETELY COVERED BY THE CONTRACT UNIT PRICE FOR OTHER ITEMS.

(a) APPROXIMATELY ONE-THIRD OF WALL KEYED CONSTRUCTION JOINT:

- FILTER CLOTH A FEET IN WIDTH AND DOUBLE THICKNESS SHALL BE CENTERED ON TRANSVERSE JOINTS IN TOP SLAB AND SIDEWALLS WITH EDGES SEATED WITH WAXIC ON TWO-SIDED TAPE. FILTER CLOTH SHALL BE SUBURFACED DRaining. SEE CONTRACT PRODUCED FILTER CLOTH WILL BE CONSIDERED COMPLETELY COVERED BY THE CONTRACT UNIT PRICE FOR OTHER ITEMS.

- BARS:
  - #8 FOR CLEAR SPAN > 10'-0".
  - #9 NOT REQUIRED FOR CLEAR SPANS 5'-0" TO 10'-0".
  -IMER, BARS SPAN. THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

- BARS:
  - #4-F BARS AT ABOUT 14" CENTERS
  - 2-#4-F BARS
  - 2-#8-01

- MINIMUM CLEARANCE TO REINFORCING BARREL AND WINGS SECTIONS ARE DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

- ALL REINFORCEMENT EXCEPT #5 BARS, SEE 703.47, FOR #5 BARS.

- BARREL REINFORCEMENT FOR DESIGN FILLS OVER 2'-0".

- SEE 703.37. FOR MEMBER THICKNESS AND FOR BAR SIZES, SPACING AND DIMENSIONS OF REINFORCEMENT, SEE 703.37. FOR #5 BARS. SEE 703.31.

- BARREL AND WINGS SECTIONS ARE NORMAL TO LONG DIRECTION OF HEADWALL.

- DRAving NOT TO SCALE. FOLLOW DIMENSIONS.

- MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1'.

- HEADWALL AND CULVERT WINDS SECTIONS ARE NORMAL TO LONG DIRECTION OF HEADWALL.
Laying Out Transverse Joints

Use a transverse joint when barrel length is 5 over 90 feet. Use additional joints to limit cut section length and end section barrel length measured along centerline of culvert to 90 feet. Minimum end section length shall be 3 feet measured along the shortest wall from the inside face of headwall to the transverse joint.

To avoid locating transverse joints under a traveled way with design fills 2 feet or less the following shall apply:

- Barrel length up to 90 feet without a transverse joint cut section lengths up to 60 feet

When barrel and cut section length restrictions require transverse joints to be located under a traveled way with design fills 2 feet or less, the joints shall be located to minimize the length of joint under a traveled way.

Traveled way is the roadway width with wings shoulder widths.

For cut section details, see 703.46.

General Notes:

For sections thru barrel, wings and headwalls, see sheet 3 of 3. For bar sizes, spacing and dimensions of all reinforcement except J5 bars, see 703.47. For J5 bars, see 703.37.

Construction joint key not shown for clarity in plan and elevation, see sheet 3 of 3 for details.

Drawing not to scale. Follow dimensions.

Minimum clearance to reinforcing steel shall be 1/4.

Lap longitudinal bars a minimum of 23 at splices.

Beveled headwall shall be located at upstream end.

(a) Same size and spacing as adjacent B bars
(b) Same size and spacing as adjacent B bars
(c) J4 bar spacing
(d) J4 bar spacing
(e) A2 bar spacing
GENERAL NOTES:

1. FOR SECTIONS THRU BARRIERS, WINGS AND HEADWALLS. SEE SHEET 3 OF 3. FOR BAR SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT EXCEPT J1 BARS. SEE 703.47. FOR J1 BARS, SEE 703.17.

2. CONSTRUCTION JOINT KEY NOT SHOWN FOR CLARITY IN PLAN AND SECTION. SEE SHEET 5 OF 3 FOR DETAILS.

3. DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

4. MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1/2".

5. LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES. BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

6. (a) SAME SIZE AND SPACING AS ADJACENT B BARS

7. (b) VARIES: 12" MAXIMUM

8. (c) NOT SPECIFIED ON THIS SHEET

9. (d) SAME SIZE AND SPACING AS A2 BARS

10. (e) A2 BAR SPACING

11. (f) SAME SIZE AND SPACING AS A1 BARS

12. (g) A1 BAR SPACING

13. (h) FOR DESIGN FILLS OVER 2'-0"

14. (i) NOT REQUIRED FOR CLEAR SPANS 2'-0" OR LESS

15. (j) NOT REQUIRED FOR CLEAR SPANS 5'-0" OR LESS

16. (k) H2 BARS AS REQUIRED. QUANTITY OF BARS VARIES WITH SKEW.

17. FOR SECTIONS THRU BARREL, WINGS AND HEADWALLS, SEE SHEET 3 OF 3. FOR BAR SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT EXCEPT J1 BARS. SEE 703.47. FOR J1 BARS, SEE 703.17.

18. CONSTRUCTION JOINT KEY NOT SHOWN FOR CLARITY IN PLAN AND SECTION. SEE SHEET 5 OF 3 FOR DETAILS.

19. DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

20. MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1/2".

21. LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES. BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

22. (a) SAME SIZE AND SPACING AS ADJACENT B BARS

23. (b) VARIES: 12" MAXIMUM

24. (c) NOT SPECIFIED ON THIS SHEET

25. (d) SAME SIZE AND SPACING AS A2 BARS

26. (e) A2 BAR SPACING

27. (f) SAME SIZE AND SPACING AS A1 BARS

28. (g) A1 BAR SPACING

29. (h) FOR DESIGN FILLS OVER 2'-0"

30. (i) NOT REQUIRED FOR CLEAR SPANS 2'-0" OR LESS

31. (j) NOT REQUIRED FOR CLEAR SPANS 5'-0" OR LESS

32. (k) H2 BARS AS REQUIRED. QUANTITY OF BARS VARIES WITH SKEW.

SKEW: RIGHT ADVANCE

WINGS: FLARED

REINFORCEMENT
KEYED CONSTRUCTION JOINT
(1) APPROXIMATELY ONE-THIRD OF WALL THICKNESS

CONSIDERED COMPLETELY COVERED BY GAGE COPPER WIRE OR 1Z GAGE SOFT ONE FACE OF THE CONCRETE WITH 10 ON TRANSVERSE JOINTS IN TOP SLAB FILTER CLOTH SHALL BE A SUBSURFACE DRAINAGE GEOTEXTILE IN ACCORDANCE WITH SEC PREFORMED FIBER EXPANSION JOINT DOUBLE THICKNESS SHALL BE CENTERED AND SIDEWALLS WITH EDGES SEALED THE CONTRACT UNIT PRICE FOR OTHER (0) APPROXIMATELY ONE-THIRD OF WALL ITEMs.

GENERAL NOTES

DESIGN SPECIFICATIONS:
JDG ARCHITECTURE DESIGN SPECIFICATIONS AND 2010 INTERIM REVISIONS

DESIGN LOADING:
VEHICULAR = HC-93 MINUS LANE LOAD, EARTH = 120 LBSF EQUIVALENT FLUID PRESSURE = 60 LBSF MIN. 1.60 LBSF MAX.

DESIGN UNIT STRESSES:
SLAB = CONCRETE (BOX CULVERT) f^s = 4,000 PSI REINFORCING STEEL (GRADE 60) f_y = 60,000 PSI

MISCELLANEOUS:
FOR MEMBER THICKNESS AND FOR BAR SIZES, SPACING AND DIMENSIONS, SEE 703.47.
CONSTRUCTION JOINT KEY NOT SHOWN FOR CLARITY IN PART PLANS, PART ELEVATION AND PART SECTION.
DRAWING NOT TO SCALE. FOLLOW DIMENSIONS. MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 11/16 INCH.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

CONCRETE DOUBLE BOX CULVERT
CUT SECTION

DATE EFFECTIVE: 02/01/2011
DATE PREPARED: 02/13/2011
703.46 SHEET NO. 1 OF 1
### Table: SPAN (S) = 3 FT

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**GENERAL NOTES:**

- IF DESIGN FILL IS BETWEEN TABULATED DESIGN FILLS, USE THE NEXT GREATER TABULATED DESIGN FILL, EXCEPT FOR DESIGN FILLS BETWEEN 2 FEET AND 4 FEET. USE EARTH FILL OR ROADWAY.
- THE GREATER MEMBER THICKNESS, AREA OF REINFORCEMENT AND BAR SPACING & DIMENSIONS FROM THE FEET AND 4 FEET TABULATED DESIGN FILLS.
- AREA OF REINFORCEMENT EQUALS BAR AREA PER FOOT SPACING.

**SPECIAL DESIGNS ARE REQUIRED WHEN THE DESIGN FILL IS LESS THAN 1 FOOT OR GREATER THAN 50 FEET.**

**DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.**

**DESIGN FILLS ARE MEASURED FROM THE TOP OF TOP SLAB TO THE TOP OF EARTH FILL OR ROADWAY.**

**CULVERTS MEET STRENGTH AND SERVICEABILITY REQUIREMENTS FOR THE DESIGN WIND LOAD H2-Y3 WINDS THE LANE LOAD.**

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

**JEFFERSON CITY, MO 65102**

**DATE EFFECTIVE:**

**DATE PREPARED:**

**CONCRETE DOUBBLE BOX CULVERT**

**MEMBER THICKNESS**

**BAR SIZE, SPACING & DIMENSIONS**

**SPAN (S) = 3 FEET**

**HEIGHT (HT) = 2 FT THRU 6 FT**

**SHEET NO:**

**703.47**

**1 OF 27**
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</tr>
</tbody>
</table>

**GENERAL NOTES:**
- If design fill is between tabulated design fills, use the next greater tabulated design fill. Except for design fills between 2 and 2.5 feet, use the next greater tabulated design fill.
- Design fills greater than 30 feet shall be used for the greater member thickness, except as noted.
- Use the larger member thickness and area of reinforcement to fill area of reinforcement equals bar area per foot of spacing.
- Design fills shall be measured from the top of the top slab to the top of the fill where the lane load.

**CULVERTS MEET STRENGTH AND SERVICEABILITY REQUIREMENTS FOR THE variable LIVE LOAD HL-93 WITH THE EXCEPT FOR WIND LOAD H-83.**
SPAN (S) = 4 FT
HEIGHT (HT) = 6 FT OR 7 FT

GENERAL NOTES:
If design fill is between tabulated design fills, use the next greater tabulated design fill. Except for design fills between 2' and 4' use the greater member thickness, area of reinforcement and bar dimensions from the 2' and 4' tabulated design fills. Area of reinforcement equals bar area per foot spacing.

Special designs are required when the design fill is less than 1' or greater than 50' feet.
Dimensions are in inches unless otherwise specified.
Design fills are measured from the top of top slab to the top of earth fill drain roadway.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

CONCRETE DOUBLE BOX CULVERT
MEMBER THICKNESS
BAR SIZE, SPACING & DIMENSIONS

DATE EFFECTIVE:
DATE PREPARED:
10/1/2011
9/8/2011
703.47
3 OF 27
GENERAL NOTES:

IF DESIGN FILL IS BETWEEN TABULATED DESIGN FILLS, USE THE NEXT GREATER TABULATED DESIGN FILL. EXCEPT FOR DESIGN FILLS BETWEEN 2 & 4 FEET, USE THE GREATER MEMBER THICKNESS, AREA OF REINFORCEMENT AND BAR DIMENSIONS FROM THE 2 FEET TABULATED DESIGN FILLS. AREA OF REINFORCEMENT EQUALS BAR AREA PER FOOT SPACING.

SPECIAL DESIGNS ARE REQUIRED WHEN THE DESIGN FILL IS LESS THAN 1 FOOT OR GREATER THAN 50 FEET.

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

DESIGN FILLS ARE MEASURED FROM THE TOP OF THE TOP SLAB TO THE TOP OF EARTH FILL OR ROADWAY.

CULVERTS MEET STRENGTH AND SERVICEABILITY REQUIREMENTS FOR THE DESIGN VERTICALLY LOAD HD-83 WINDS THE LANE LOAD.
<table>
<thead>
<tr>
<th>Member Thickness</th>
<th>Top Slab Bars</th>
<th>Bottom Slab Bars</th>
<th>Wall Bars</th>
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</thead>
<tbody>
<tr>
<td>AT Bars</td>
<td>J3 Bars</td>
<td>H1 Bars</td>
<td>B1 Bars</td>
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<tr>
<td>B1 Bars</td>
<td>J2 Bars</td>
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<td>D2 Bars</td>
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<td>C6 Bars</td>
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<td></td>
<td>H6 Bars</td>
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</table>

### Design Table

<table>
<thead>
<tr>
<th>SPAN (S)</th>
<th>HEIGHT (H) = 8 FT</th>
<th>HEIGHT (H) = 10 FT OR 11 FT</th>
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</thead>
<tbody>
<tr>
<td>5 FT</td>
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<td>7 FT</td>
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<tr>
<td>51 FT</td>
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</tbody>
</table>

### General Notes:

- If design fill is between tabulated design fills, use the next greater tabulated design fill. Except for design fills between 2 feet and 4 feet, use the next greater member thickness. Area of reinforcement and bar dimensions from the greater tabulated design fills. If design fill is between 2 feet and 4 feet, use the next greater member thickness, area of reinforcement and bar dimensions from the greater tabulated design fills. Area of reinforcement equals bar area per foot spacing.

- Special designs are required when the design fill is less than 1 foot or greater than 50 feet.

- Dimensions are in inches unless otherwise specified.

- Design fills are measured from the top of top slab to the top of earth fill or roadway.

- Culverts meet strength and serviceability requirements for the design without live load HL-93 minus the lane load.

---

**Date Prepared:** 09/19/2011
**Date Effective:** 10/01/2011
**Sheet No.:** 703.47
**10 of 27**
### SPAN (S) = 9 FT

<table>
<thead>
<tr>
<th>SPAN (S) = 9 FT</th>
<th>HEIGHT (H) = 5 FT OR 6 FT OR 7 FT</th>
<th>5 FT</th>
<th>6 FT</th>
<th>7 FT</th>
<th>8 FT</th>
<th>10 FT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 FT</td>
<td>13 10 8 5 6 5 4 4 3 2 1 1</td>
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<td>13 10 8 5 6 5 4 4 3 2 1 1</td>
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<td>3 FT</td>
<td>13 10 8 5 6 5 4 4 3 2 1 1</td>
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<td>6 FT</td>
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<td>7 FT</td>
<td>13 10 8 5 6 5 4 4 3 2 1 1</td>
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<td>8 FT</td>
<td>13 10 8 5 6 5 4 4 3 2 1 1</td>
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</tbody>
</table>

### GENERAL NOTES:

- If design fill is between tabulated design fills, use the next greater tabulated design fill. Exception: Design fills between 2 and 4 feet may be used to the next greater tabulated design fill. Use the greater member thickness, area of reinforcement, and bar dimensions from the next greater tabulated design fill. Area of reinforcement equals bar area per foot spacing.

- Special designs are required when the design fill is less than 1 foot or greater than 50 feet.

- Dimensions are in inches unless otherwise specified.

- Design fills are measured from the top of top slab to the top of earth fill or roadway.

**Concrete Double Box Culvert**

Member Thickness

Bar Size, Spacing, and Dimensions

Span (S): 9 Feet

### MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

105 West Capitol
Jefferson City, MO 65102
1-888-Ask-MoDOT 1-888-275-6631

**Concrete Double Box Culvert**

Member Thickness

Bar Size, Spacing & Dimensions

Span (S): 9 Feet

**EARTH FILL OR ROADWAY.**

**DESIGN VEHICULAR LIVE LOAD HL-93 MINUS THE LANE LOAD.**

**DESIGN FILLS ARE MEASURED FROM THE TOP OF TOP SLAB TO THE TOP OF EARTH FILL OR ROADWAY.**

**CULVERTS MEET STRENGTH AND SERVICEABILITY REQUIREMENTS FOR THE DESIGN VENTILATION LIVE LOAD H-83 WINDS THE LANE LOAD.**

**SYMMETRICAL ABOUT 1/16." CULVERT.**
SPAN
DESIGN
FILL
1 FT
2 FT
4 FT
6 FT
8 FT
10FT
12 FT
14 FT
16 FT
18 FT
20 FT
22 FT
24 FT
26 FT
28 FT
30 FT
32 FT
34 FT
36 FT
38 FT
40 FT
42 FT
44 FT
46 FT
48 FT
50 FT

(S)

HEIGHT (HT) =

= 9 FT

TOP SLAB BARS

MEMBER
THICKNESS

A1 BARS

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59.6
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FT OR

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FT

BOTTOM SLAB BARS
WALL BARS
J4 BARS
H3 BARS
B1 BARS
A2 BARS
B2 BARS
K3
C4
C7
SIZE SPA. SIZE SPA.
SIZE SPA.
SIZE SPA. SIZE SPA. G1
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GENERAL NOTES:
IF DESIGN FILL IS BETWEEN TABULATED DESIGN FILLS. USE THE NEXT
GREATER TABULATED DESIGN FILL. EXCEPT FOR DESIGN FILLS BETWEEN 2
FEET AND 4 FEET.
FOR DESIGN FILLS BETWEEN 2 FEET AND 4 FEET USE
THE GREATER MEMBER THICKNESS. AREA OF REINFORCEMENT AND BAR
DIMENSIONS FROM THE 2 FEET AND 4 FEET TABULATED DESIGN FILLS.
AREA OF REINFORCEMENT EQUALS BAR AREA PER FOOT SPACING.
SPECIAL DESIGNS ARE REQUIRED WHEN THE DESIGN FILL IS LESS THAN 1
FOOT OR GREATER THAN 50 FEET.
DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.
DESIGN FILLS ARE MEASURED FROM THE TOP OF TOP SLAB TO THE TOP OF
EARTH FILL DR ROADWAY.
CULVERTS MEET STRENGTH AND SERVICEABILITY REQUIREMENTS FOR THE
DESIGN VEHICULAR LIVE LOAD HL-93 MINUS THE LANE LOAD.
C1
J3 BAR,

C5
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C6

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BAR~ H2 BAR,I

Ii. CULVERT

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MISSOURI HIGHWAYS AND TRANSPORTATION
COMMISSION
105 WEST CAPITOL
JEFFERSON CITY. MO 65102
1-888-ASK-MODOT (1-888-275-6636)

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DOUBLE BOX CULVERT

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I H3 BAR-----1~
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BAR DIMENSIONS DIAGRAM
syMMETRICAL ABOUT Ii. CULVERT.

MEMBER THICKNESS
BAR SIZE. SPACING & DIMENSIONS
SPAN (S): 9 FEET
HEIGHT (HT): 11 THRU 12 FEET

2"
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V1
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~
'-----3" CL.


DATE EFFECTIVE:
DATE PREPARED:

1010112011
9/812011

SHEET NO.

703.47

13 OF 27


<table>
<thead>
<tr>
<th>Design</th>
<th>Member</th>
<th>Bottom Slab</th>
<th>Walls</th>
<th>Top Slab</th>
<th>Bottom Slab</th>
<th>Walls</th>
<th>Top Slab</th>
</tr>
</thead>
<tbody>
<tr>
<td>T5 B5 T1 T2</td>
<td>Spacing (S)</td>
<td>10 FT</td>
<td>10 FT</td>
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**Notes:**
- If design fill is between tabulated design fills, use the next greater tabulated design fill. Except for design fills between 2 ft and 4 ft, special design considerations may be necessary to use the greater member thicknesses, area of reinforcement, and bar dimensions in the 4 ft cell and 4 ft tabulated design fills. The area of reinforcement equals one area per foot spacing.
- Special designs are recommended when the design fill is less than 1 foot or greater than 50 feet.
- Dimensions are in inches unless otherwise specified.
- Design fills are measured from the top of top slab to the top of earth fill or roadway.

**Culverts Meet Strength and Serviceability Requirements for the Design Wortular Live Load H-25 and the Lane Load H-20.**

**Number of Members:**
- Double box culvert

**Concrete:**
- Bar size, spacing, and dimensions

**Design Fill:**
- 10 feet (H1 = 7 ft to 10 feet)

**Sheet No.:**
- 14

**Date Prepared:**
- 9/11/2011

**Date Effective:**
- 10/1/2011

**Compliance:**
- Missouri Highways and Transportation Commission

**Date:**
- 10/1/2011

**Page:**
- 703.47

**Page 7 of 27**
### Design Thickness

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### General Notes:

If the design fill is between tabulated design fills, use the next greater tabulated design fill. If the design fill is between design fills less than 2 feet or 4 feet, use the greater member thickness. The area of reinforcement is equal to the area of reinforcement per foot spacing, if design fills are measured from the top of top slab to the top of fill or roadway. CULVERTS MEET STRENGTH AND SERVICEABILITY REQUIREMENTS FOR THE DESIGN VEHICULAR LIVE LOAD HL-93 MINUS THE LANE LOAD.

### Missouri Highways and Transportation Commission

**Double Box Culvert**

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**Date Effective:** 10/30/2016

**Date Prepared:** 8/3/2017

**Report No:** 703.47

**Sheet No:** 15 of 27
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**GENERAL NOTES:**
- If design fill is between tabulated design fills, use the next greater tabulated design fill. Except for design fills between 2 and 4 feet, use the smaller tabulated design fills. For design fills greater than 50 feet, use the greater member thickness, area of reinforcement, and bar dimensions from the 2 feet and 4 feet tabulated design fills. Area of reinforcement equals bar area per foot spacing.
- Special design fills are measured from the top of top slab to the top of earth fill or roadway.
- Culverts meet strength and serviceability requirements for the design condition and live load H-25 when the lane load H-25.

**COVEכר fırsat**
- If design fill is between tabulated design fills, use the next greater tabulated design fill. Except for design fills between 2 and 4 feet, use the smaller tabulated design fills. For design fills greater than 50 feet, use the greater member thickness, area of reinforcement, and bar dimensions from the 2 feet and 4 feet tabulated design fills. Area of reinforcement equals bar area per foot spacing.
- Special design fills are measured from the top of top slab to the top of earth fill or roadway.
- Culverts meet strength and serviceability requirements for the design condition and live load H-25 when the lane load H-25.

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**
- 105 West Capitol, Jefferson City, MO 65102
- 1-888-AHA-MO DOT (1-888-243-6676)

**CONCRETE DOUBBLE BOX CULVERT**
- MEMBER THICKNESS
- BAR SIZE, SPACING & DIMENSIONS

**SPAN (S) = 11 FT**
- HEIGHT (H) = 6 FT OR 7 FT OR 8 FT

**DATE EFFECTIVE:**
- 10/20/2020

**SHEET NO:**
- 16 OF 27
GENERAL NOTES:

IF DESIGN FILL IS BETWEEN TABULATED DESIGN FILLS, USE THE NEXT GREATER TABULATED DESIGN FILL. EXCEPT FOR DESIGN FILL BETWEEN 2 FEET AND 4 FEET USE THE GREATER MEMBER THICKNESS, AREA OF REINFORCEMENT AND BAR DIMENSIONS. FOR DESIGN FILLS BETWEEN 2 FEET AND GREATER THAN 50 FEET, USE THE GREATER MEMBER THICKNESS, AREA OF REINFORCEMENT AND BAR DIMENSIONS. FOR DESIGN FILLS BETWEEN 2 FEET AND GREATER THAN 50 FEET, USE THE GREATER MEMBER THICKNESS, AREA OF REINFORCEMENT AND BAR DIMENSIONS.

SPECIAL DESIGNS ARE REQUIRED WHEN THE DESIGN FILL IS LESS THAN 1 FOOT OR GREATER THAN 50 FEET.

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

DESIGN FILLS ARE MEASURED FROM THE TOP OF TOP SLAB TO THE TOP OF WALL.

CONCRETE DOUBLE BOX CULVERT

SPAN (S) = 11 FT
HEIGHT (HT) = 12 FT OR 13 FT OR 14 FT

MEMBER SIZE, SPACING & DIMENSIONS

DATE PREPARED: 9/8/2011
DATE EFFECTIVE: 9/8/2011
SHR No.: 703.47
17 OF 27
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### Table 5: Design Fill

<table>
<thead>
<tr>
<th>Design Fill</th>
<th>Member Thickness</th>
<th>Span (s)</th>
<th>Height (h)</th>
<th>Bottom Slab Bars</th>
<th>Top Slab Bars</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 12 FT</td>
<td>6-11 FT</td>
<td>12 FT</td>
<td>6-11 FT</td>
<td>12 FT</td>
<td></td>
</tr>
<tr>
<td>2 12 FT</td>
<td>6-11 FT</td>
<td>12 FT</td>
<td>6-11 FT</td>
<td>12 FT</td>
<td></td>
</tr>
<tr>
<td>3 12 FT</td>
<td>6-11 FT</td>
<td>12 FT</td>
<td>6-11 FT</td>
<td>12 FT</td>
<td></td>
</tr>
<tr>
<td>4 12 FT</td>
<td>6-11 FT</td>
<td>12 FT</td>
<td>6-11 FT</td>
<td>12 FT</td>
<td></td>
</tr>
<tr>
<td>5 12 FT</td>
<td>6-11 FT</td>
<td>12 FT</td>
<td>6-11 FT</td>
<td>12 FT</td>
<td></td>
</tr>
</tbody>
</table>

### General Notes:

- If design fill is between tabulated design fills, use the next greater tabulated design fill except for design fills between 2 and 3 ft where use the next smaller tabulated design fill.
- Use the greater member thickness, area of reinforcement, and bar dimensions from the next larger tabulated design fill.
- Use the greater member thickness, area of reinforcement equals bar area per foot spacing.
- Special designs are required when the design fill is less than 1 ft or greater than 50 ft.

- Dimensions are in inches unless otherwise specified.

**Missouri Highways and Transportation Commission**

105 West Capitol
Jefferson City, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

**Concrete Double Box Culvert**

**Member Thickness**

**Bar Size, Spacing & Dimensions**

**Span (s) = 12 FT**

**Height (h) = 6 FT OR 7 FT OR 8 FT**

**Span (s) = 12 FT**

**Height (h) = 9 FT OR 10 FT OR 11 FT**

**Date Prepared:** 9/8/2011
**Date Effective:** 10/10/2011
**Sheet No:** 18 OF 27

**703.47**
<table>
<thead>
<tr>
<th>DESIGN</th>
<th>SPAN (S)</th>
<th>HEIGHT (HT)</th>
<th>SPAN (S)</th>
<th>HEIGHT (HT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5</td>
<td>12</td>
<td>10</td>
<td>1.5</td>
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<td>1.5</td>
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<td>10</td>
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<td>12</td>
</tr>
<tr>
<td>1.5</td>
<td>12</td>
<td>10</td>
<td>1.5</td>
<td>12</td>
</tr>
</tbody>
</table>

**GENERAL NOTES:**

If design fill is between tabulated design fills, use the next greater tabulated design fill. Fill except for design fills between 2 feet and 4 feet tabulated design fills. Use the greater member thickness, area of reinforcement, and bar area of reinforcement equals bar area per foot spacing.

- Special designs are used when the design fill is less than 1 foot or greater than 50 feet.
- Dimensions are in inches unless otherwise specified.

- Design fills are measured from the top of top slab to the top of earth fill or roadway.

**CULVERTS MEET STRENGTH AND SERVICEABILITY REQUIREMENTS FOR THE DESIGN WIND LOAD H-33 WINDS THE LANE LOAD.**

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

**105 WEST CAPITOL**

**JEFFERSON CITY, MO 65102**

**1-888-ASK-MODOT (1-888-275-6636)**

**DATE PREPARED:**

**DATE EFFECTIVE:**

**DRAFT:**

**SHEET NO.:**

**CONCRETE DOUBLE BOX CULVERT**

**MEMBER THICKNESS BAR SIZE, SPACING & DIMENSIONS**

**SPAN (S): 12 FEET**

**HEIGHT (HT): 12 FT OR 15 FT**

**MEMBER THICKNESS TOP SLAB BARS**

**BOTTOM SLAB BARS**

**WALL BARS**

**SPAN (S): 12 FT**

**HEIGHT (HT): 14 FT OR 15 FT**

**MEMBER THICKNESS TOP SLAB BARS**

**BOTTOM SLAB BARS**

**WALL BARS**

**MEMBER THICKNESS TOP SLAB BARS**

**BOTTOM SLAB BARS**

**WALL BARS**
<table>
<thead>
<tr>
<th>MEMBERS</th>
<th>TOP SLAB BARS</th>
<th>BOTTOM SLAB BARS</th>
<th>WALL BARS</th>
</tr>
</thead>
<tbody>
<tr>
<td>CL. (H3, J4, B1)</td>
<td>51.8</td>
<td>154</td>
<td>166</td>
</tr>
<tr>
<td>CL. (H1, H2, J3, B1)</td>
<td>50.4</td>
<td>148</td>
<td>160</td>
</tr>
<tr>
<td>CL. (H1, H2, J3, B1)</td>
<td>49.0</td>
<td>142</td>
<td>164</td>
</tr>
</tbody>
</table>

**HEIGHT (HT):** 7 THRU 12 FEET  
**SPAN (S):** 13 FEET  
**DIMENSIONS FROM THE 2 FEET AND 4 FEET TABULATED DESIGN FILLS.**  
**EXCEPT FOR DESIGN FILLS BETWEEN 2 AND 4 FEET, USE THE GREATER MEMBER THICKNESS, AREA OF REINFORCEMENT AND BAR DIMENSIONS FROM THE 2 FEET AND 4 FEET TABULATED DESIGN FILLS.**  
**AREA OF REINFORCEMENT EQUALS BAR AREA PER FOOT SPACING.**

**SPECIAL DESIGN ARE MEASURED FROM THE TOP OF TOP SLAB TO THE TOP OF EARTH FILL OR HARDY.**

**CULVERTS MEET STRENGTH AND SERVICEABILITY REQUIREMENTS FOR THE DESIGN VENETRIC LIVE LOAD H-23 WINDS THE LANE LOAD.**
SPAN ($) = 14 FT  
HEIGHT (HT) = 15 FT OR 16 FT  

SPAN ($) = 14 FT  
HEIGHT (HT) = 15 FT OR 16 FT  

GENERAL NOTES:  
IF DESIGN FILL IS BETWEEN TABULATED DESIGN FILLS, USE THE NEXT SMALLER TABULATED DESIGN FILL.  
IF DESIGN FILL IS BETWEEN 2 TABLES, USE THE NEXT SMALLER TABULATED DESIGN FILL.  
IF SUPERINTENDENT FILL IS LESS THAN 1 FOOT OR THE FILL IS LESS THAN 1 FOOT, USE THE GREATER MEMBER THICKNESS.  
AREA OF REINFORCEMENT AND BAR DIMENSIONS FROM THE 1 FOOT AND 2 FOOT TABLES DESIGNED FOR FILL AREAS OF REINFORCEMENT EQUALS BAR AREA PER SQUARE FOOT.  
SPECIAL DESIGNS ARE REQUIRED WHEN THE DESIGN FILL IS LESS THAN 1 FOOT OR GREATER THAN 50 FEET.  
DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.  
DESIGN FILLS ARE MEASURED FROM THE TOP OF TOP SLAB TO THE TOP OF EARTH FILL OR ROADWAY.  
CULVERTS MEET STRENGTH AND SERVICEABILITY REQUIREMENTS FOR THE DESIGN VERTICALLY LIVED LOAD (H-20) WINDS THE LOAD.
### Member Thickness, Bar Size, Spacing & Dimensions

#### General Notes:
- If design fill is between tabulated design fills, use the next greater tabulated design fill. Except for design fills between 2 and 4 feet, use the longer tabulated fill. For design fills of 2 feet or less, use the greater member thickness. Area of reinforcement and bar dimensions from the feet and 4 feet tabulated fills, area of reinforcement equals bar area per foot. Specific design fills are measured when the design fill is less than 1 foot or greater than 50 feet.
- Dimensions are in inches unless otherwise specified.
- Design fills are measured from the top of top slab to the top of earth fill or roadway.

#### Culvert Meet Strength and Serviceability Requirements for the Design Vertical Live Load HL-93 minus the Lane Load.

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**Concrete Double Box Culvert**

**Member Thickness**

**Bar Size, Spacing & Dimensions**

**Span (S): 15 FT**

**Height (H): 11 FT or 12 FT OR 13 FT**

<table>
<thead>
<tr>
<th>Design Fill</th>
<th>Member Thickness</th>
<th>Bar Size, Spacing &amp; Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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**General Notes:**

1. If design fill is between tabulated design fills, use the next greater tabulated design fill. Except for design fills between 2 and 4 feet, use the longer tabulated fill. For design fills of 2 feet or less, use the greater member thickness. Area of reinforcement and bar dimensions from the feet and 4 feet tabulated fills, area of reinforcement equals bar area per foot. Specific design fills are measured when the design fill is less than 1 foot or greater than 50 feet.

2. Dimensions are in inches unless otherwise specified.

3. Design fills are measured from the top of top slab to the top of earth fill or roadway.

### Missouri Highways and Transportation Commission

**105 West Capitol**

**Jefferson City, MO 65102**

**1-888-ASK-MODOT (1-888-275-6636)**

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**Date Effective:**

10/10/2011

**Date Prepared:**

9/8/2011

**Sheet No.:**

703.47

24 of 27
GENERAL NOTES:

IF DESIGN FILL IS BETWEEN TABULATED DESIGN FILLS, USE THE NEXT GREATER TABULATED DESIGN FILL. EXCEPT FOR DESIGN FILLS BETWEEN 2 FEET AND 4 FEET USE SPECIAL DESIGNS ARE REQUIRED WHEN THE DESIGN FILL IS LESS THAN 1 FOOT OR GREATER THAN 50 FEET.

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

DESIGN FILLS ARE MEASURED FROM THE TOP OF TOP SLAB TO THE TOP OF EARTH FILL OR ROADWAY.

CULVERTS MEET STRENGTH AND SERVICEABILITY REQUIREMENTS FOR THE DESIGN WIND OR LIVE LOAD AS DESIGNED.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

CONCRETE DOUBLE BOX CULVERT
MEMBER THICKNESS
BAR SIZE, SPACING & DIMENSIONS

SPAN (S) = 16 FT
HEIGHT (HT) = 8 FT OR 9 FT OR 10 FT

SPAN (S) = 16 FT
HEIGHT (HT) = 11 FT OR 12 FT OR 13 FT

MEMBER THICKNESS
BAR SIZE, SPACING & DIMENSIONS

DATE PREPARED: 9/29/2011
SHEET NO.: 26 OF 27

07.03.47
PART ELEVATION OF EXTERIOR WALL
(Pipe diameter = 24" or more)
(Wall thickness = 8" to 12")

NOTE:
- Solid bars represent plan reinforcement.
- Dashed bars indicate additional M bars.
- Bar cover from face of concrete = 1-1/2".

See road plans for location, size and type of pipe.

Place 5/16" joint filler around reinforced concrete pipe and emulsified asphalt around corrugated metal pipe at pipe inlet.

The block-out may be eliminated at contractor's election if block-out is eliminated, reinforcement shall be as shown except plan reinforcement may be bent to clear pipe.

Additional reinforcement required for block-out is not included in estimated quantities. No separate payment will be made for additional reinforcing required.

CONCRETE PIPE AND EMULSIFIED ASPHALT AROUND CORRUGATED METAL PIPE AT PIPE INLET.

THE BLOCK-OUT MAY BE ELIMINATED AT CONTRACTOR'S ELECTION. IF BLOCK-OUT IS ELIMINATED, REINFORCEMENT SHALL BE AS SHOWN EXCEPT PLAN REINFORCEMENT MAY BE BENT TO CLEAR PIPE.

ADDITIONAL REINFORCEMENT REQUIRED FOR BLOCK-OUT IS NOT INCLUDED IN ESTIMATED QUANTITIES. NO SEPARATE PAYMENT WILL BE MADE FOR ADDITIONAL REINFORCING REQUIRED.

NOTE:
- Dashed bars represent plan reinforcement.
- Solid bars indicate additional M bars.
- Bar cover from face of concrete = 1-1/2".
GENERAL NOTES:
FOR SECTIONS THRU BARREL, WINGS AND HEADWALLS, SEE SHEET 5 OF 5. FOR BAR SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT EXCEPT J5 BARS, SEE 703.87. FOR J5 BARS, SEE 703.37.
CONSTRUCTION JOINT KEY NOT SHOWN FOR CLARITY IN PLAN AND SECTION. SEE SHEET 3 OF 3 FOR DETAILS.
DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.
MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1/2".
LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.
BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.
(a) SAME SIZE AND SPACING AS ADJACENT BARS
(b) VARIES 12" MAXIMUM
(c) NOT SPECIFIED ON THIS SHEET
(d) NOT SPECIFIED ON THIS SHEET
(e) NOT SPECIFIED ON THIS SHEET
(f) NOT SPECIFIED ON THIS SHEET
(g) NOT SPECIFIED ON THIS SHEET
(h) FOR DESIGN FILL OVER 2'-0"
(i) FOR DESIGN FILL 2'-0" OR LESS
(j) NOT REQUIRED FOR CLEAR SPANS 10'-0"
(k) FOR CLEAR SPAN 10'-10"
(l) FOR CLEAR SPAN 13'-0"

IF REQUIRED, THE MINIMUM LENGTH EACH SIDE OF A WALL SHALL BE THE GREATER OF 40 BAR DIAMETERS OR CLEAR SPAN. THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
MO-105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-455-MODOT 1-888-275-6631

DATE EFFECTIVE: 02/01/2011
DATE PREPARED: 03/10/2011
703-80H SHEET 2 OF 3

CONCRETE TRIPLE BOX CULVERT
SKEW: SQUARED
WINGS: STRAIGHT
REINFORCEMENT
D2 BAR (b) -N (TYP.)

STITCHED TO ONE FACE OF THE CONCRETE WITH 10GAGE COPPER WIRE OR 12 GAGE SOFT DRAWN GALVANIZED STEEL NAIL.

THICKNESS SHALL BE CENTERED ON TRANSVERSE JOINTS IN TOP SLAB AND SIDEWALLS WITH EDGES SEALED WITH FILTER CLOTH 3 FEET IN WIDTH AND DOUBLE MASTIC OR TWO SIDED TAPE. FILTER CLOTH SHALL BE A SUBSURFACE DRAINAGE GEOTEXTILE IN ACCORDANCE WITH REQUIREMENTS OF LOCAL AUTHORITY.

KEYED CONSTRUCTION JOINT

PREFORMED FIBER EXPANSION JOINT MATERIAL MOLDED TO A PATTERN TO FORM JOINT MATERIAL WHICH WILL BE SECURELY STITCHED TO ONE FACE OF THE CONCRETE WITH 10GAGE COPPER WIRE OR 12 GAGE SOFT DRAWN GALVANIZED STEEL NAIL.

FILTER CLOTH A FEET IN WIDTH AND DOUBLE THICKNESS SHALL BE CENTERED ON TRANSVERSE JOINTS IN TOP SLAB AND SIDEWALLS WITH EDGES SEALED WITH WAXED OR TWO SIDED TAPE. FILTER CLOTH SHALL BE A SUBSURFACE DRAINAGE GEOTEXTILE IN ACCORDANCE WITH REQUIREMENTS OF LOCAL AUTHORITY.

FILTER CLOTH WILL BE CONSIDERED COMPLETELY COVERED BY THE CONTRACT UNIT PRICE FOR OTHER ITEMS.

UPSTREAM HEADWALL REINFORCEMENT NEAR MIDSSPAN

GENERAL NOTES:

FOR MEMBER THICKNESS AND FOR BAR SIZES, SPACING AND DIAMETERS OF HORIZONTAL AND VERTICAL REINFORCING BARS, SEE 703.17. FOR J5 BARS, SEE 703.37.

BARREL AND WINGS SECTIONS ARE SYMMETRICAL ABOUT AND NORMAL TO THE LONG DIRECTION OF HEADWALL.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1".

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.
GENERAL NOTES:

FOR SECTIONS THRU BARREL, WINGS AND HEADWALLS, SEE SHEET 3 OF T. FOR BAR SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT EXCEPT J5 BARS, SEE T03.07. FOR 25 BARS, SEE T03.37.

CONSTRUCTION JOINT KEY NOT SHOWN FOR CLARITY IN PLAN AND ELEVATION. SEE SHEET 5 OF 3 FOR DETAILS.

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

MINIMUM CLEANCE TO REINFORCING STEEL SHALL BE 1/2".

LAP LONGITUDINAL BARS AA MINIMUM OF 23" AT SPLICES.

BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

(a) SAME SIZE AND SPACING AS ADJACENT B BARS

(b) VARYS. 12" MAXIMUM

(c) J4 BAR SPACING

(d) SAME SIZE AND SPACING AS A2 BARS

(e) A2 BAR SPACING
GENERAL NOTES:

FOR SECTIONS THROU BARREL, WINGS AND HEADWALLS, SEE SHEET 5 OF 3. FOR BAR SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT EXCEPT J5 BARS, SEE TO 3.87. FOR J5 BARS, SEE TO 3.37.

CONSTRUCTION JOINT KEY NOT SHOWN FOR CLARITY IN PLAN AND SECTION. SEE SHEET 3 OF 3 FOR DETAILS.

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1/8".

LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.

BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

(a) SAME SIZE AND SPACING AS ADJACENT B BARS

(b) Varies. 12" maximum

(c) NOT SPECIFIED ON THIS SHEET

(d) SAME SIZE AND SPACING AS A2 BARS

(e) A2 BAR SPACING

(f) NOT SPECIFIED ON THIS SHEET

(g) NOT SPECIFIED ON THIS SHEET

(h) FOR DESIGN FILLS OVER 2'-0" (i) FOR DESIGN FILLS OVER 2'-0" OR LESS

(j) NOT REQUIRED FOR CLEAR SPANS > 10'-0" (k) FOR CLEAR SPAN > 10'-0" (l) IF REQUIRED, THE MINIMUM LENGTH EACH SIDE OF A WALL SHALL BE THE GREATER OF 48 BAR DIAMETERS OR A CLEAR SPAN. THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

PLAN OF TOP SLAB

B BARS IN WALLS ARE NOT SHOWN FOR CLARITY. FOR PLACEMENT, SEE SHEET 1 OF 3.

SECTION NEAR INTERIOR WALL

J1 BARS MAY BE BENT IN FIELD OR SHOP.
FILTER CLOTH WILL BE CONSIDERED COMPLETELY COVERED BY THE CONTRACT UNIT PRICE FOR OTHER ITEMS.

PREFORMED FIBER EXPANSION JOINT MATERIAL IN (a) APPROXIMATELY ONE-THIRD OF WALL AND MEMBER DIMENSIONS

PREPARED FIBER EXPANSION JOINT MATERIAL IN ACCORDANCE WITH Sec (cT) SHALL BE SECURELY STITCHED TO ONE FACE OF THE CONCRETE WITH 10 CPE CORNER RING UP TO 90" CAGE MADE OF GALVANIZED STEEL NIRE.

FILTER CLOTH A FEET IN WIDTH AND DOUBLE THICKNESS SHALL BE CENTERED ON TRANSVERSE JOINTS IN TOP SLAB AND SIDEWALLS WITH EDGES SEEN WITH WASTIC OR TWO SIDED TAPE. FILTER CLOTH SHALL BE A SINGLEPACED STRAIGHT, RESISTING IN ACCORDANCE.

FILTER CLOTH WILL BE CONSIDERED COMPLETELY COVERED BY THE CONTRACT UNIT PRICE FOR OTHER ITEMS.

UPSTREAM FLARED WINGS REINFORCEMENT

DOWNSTREAM WINGS REINFORCEMENT

BARREL REINFORCEMENT FOR DESIGN FILL OVER 2'-0" OR LESS

BARS, SEE 703.87. FOR J5 BARS.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 11/4".

GENERAL NOTES:

DATE PREPARED: 3/13/2011

DATE EFFECTIVE: 3/20/2011

703-81H SHEET NO. 3 OF 3
GENERAL NOTES:

1. FOR SECTIONS THRU BARREL, WINGS AND HEADWALLS, SEE SHEET 5 OF 3. FOR BAR SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT EXCEPT JS BARS, SEE 703.87. FOR JS BARS, SEE 703.87.

2. CONSTRUCTION JOINT KEY NOT SHOWN FOR CLARITY IN PLAN AND ELEVATION. SEE SHEET 3 OF 3 FOR DETAILS.

3. DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

4. MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1".

5. LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.

6. END OF WALL (TYPE)(NOT SHOWN)

7. WHEN BARREL AND CUT SECTION LENGTH RESTRICTIONS REQUIRE TRANSVERSE JOINTS TO BE LOCATED UNDER A TRAVELED WAY WITH DESIGN FILLS 3 FEET OR LESS, THE JOINTS SHALL BE LOCATED TO MINIMIZE THE LENGTH OF JOINT UNDER THE TRAVELED WAY.

8. TRAVELED WAY IS THE ROADWAY WIDTH MINUS SHOULDER WIDTHS.

9. WHEN BARREL LENGTH IS OVER 80 FEET, USE A TRANSVERSE JOINT

10. USE ADDITIONAL JOINTS TO LIMIT CUT SECTION LENGTH AND END SECTION LENGTH TO TWO TIMES THE LENGTH OF SHORTEST WALL FROM THE INSIDE FACE OF HEADWALL TO THE TRANSVERSE JOINT.

11. MINIMUM END SECTION LENGTH SHALL BE 3 FEET MEASURED ALONG THE SHORTEST WALL FROM THE INSIDE FACE OF HEADWALL TO THE TRANSVERSE JOINT.

12. TO AVOID LOCATING TRANSVERSE JOINTS UNDER A TRAVELED WAY WITH DESIGN FILLS 3 FEET OR LESS, THE FOLLOWING SHALL APPLY:

   a) BARREL LENGTH UP TO 90 FEET WITHOUT A TRANSVERSE JOINT

   b) BARREL LENGTH UP TO 90 FEET WITH A TRANSVERSE JOINT

   c) BARREL LENGTH OVER 90 FEET WITH A TRANSVERSE JOINT

13. FOR CUT SECTION DETAILS, SEE 703.86.

14. USE ADDITIONAL JOINTS TO LIMIT CUT SECTION LENGTH AND END SECTION LENGTH.

15. BARREL LENGTH UP TO 80 FEET WITHOUT A TRANSVERSE JOINT

16. BARREL LENGTH OVER 80 FEET WITH A TRANSVERSE JOINT

17. BARREL LENGTH OVER 80 FEET WITH TWO TRANSVERSE JOINTS

18. FOR SECTIONS THRU BARREL, WINGS AND HEADWALLS, SEE SHEET 5 OF 3. FOR BAR SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT EXCEPT JS BARS, SEE 703.87. FOR JS BARS, SEE 703.87.

19. CONSTRUCTION JOINT KEY NOT SHOWN FOR CLARITY IN PLAN AND ELEVATION. SEE SHEET 3 OF 3 FOR DETAILS.

20. DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

21. MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1".

22. LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.

23. END OF WALL (TYPE)(NOT SHOWN)

24. WHEN BARREL AND CUT SECTION LENGTH RESTRICTIONS REQUIRE TRANSVERSE JOINTS TO BE LOCATED UNDER A TRAVELED WAY WITH DESIGN FILLS 3 FEET OR LESS, THE JOINTS SHALL BE LOCATED TO MINIMIZE THE LENGTH OF JOINT UNDER THE TRAVELED WAY.

25. TRAVELED WAY IS THE ROADWAY WIDTH MINUS SHOULDER WIDTHS.

26. WHEN BARREL LENGTH IS OVER 80 FEET, USE A TRANSVERSE JOINT

27. USE ADDITIONAL JOINTS TO LIMIT CUT SECTION LENGTH AND END SECTION LENGTH TO TWO TIMES THE LENGTH OF SHORTEST WALL FROM THE INSIDE FACE OF HEADWALL TO THE TRANSVERSE JOINT.

28. MINIMUM END SECTION LENGTH SHALL BE 3 FEET MEASURED ALONG THE SHORTEST WALL FROM THE INSIDE FACE OF HEADWALL TO THE TRANSVERSE JOINT.

29. TO AVOID LOCATING TRANSVERSE JOINTS UNDER A TRAVELED WAY WITH DESIGN FILLS 3 FEET OR LESS, THE FOLLOWING SHALL APPLY:

   a) BARREL LENGTH UP TO 90 FEET WITHOUT A TRANSVERSE JOINT

   b) BARREL LENGTH UP TO 90 FEET WITH A TRANSVERSE JOINT

   c) BARREL LENGTH OVER 90 FEET WITH A TRANSVERSE JOINT

30. FOR CUT SECTION DETAILS, SEE 703.86.

31. USE ADDITIONAL JOINTS TO LIMIT CUT SECTION LENGTH AND END SECTION LENGTH.

32. BARREL LENGTH UP TO 80 FEET WITHOUT A TRANSVERSE JOINT

33. BARREL LENGTH OVER 80 FEET WITH A TRANSVERSE JOINT

34. BARREL LENGTH OVER 80 FEET WITH TWO TRANSVERSE JOINTS

35. FOR SECTIONS THRU BARREL, WINGS AND HEADWALLS, SEE SHEET 5 OF 3. FOR BAR SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT EXCEPT JS BARS, SEE 703.87. FOR JS BARS, SEE 703.87.

36. CONSTRUCTION JOINT KEY NOT SHOWN FOR CLARITY IN PLAN AND ELEVATION. SEE SHEET 3 OF 3 FOR DETAILS.

37. DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

38. MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1".

39. LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.

40. END OF WALL (TYPE)(NOT SHOWN)

41. WHEN BARREL AND CUT SECTION LENGTH RESTRICTIONS REQUIRE TRANSVERSE JOINTS TO BE LOCATED UNDER A TRAVELED WAY WITH DESIGN FILLS 3 FEET OR LESS, THE JOINTS SHALL BE LOCATED TO MINIMIZE THE LENGTH OF JOINT UNDER THE TRAVELED WAY.

42. TRAVELED WAY IS THE ROADWAY WIDTH MINUS SHOULDER WIDTHS.

43. WHEN BARREL LENGTH IS OVER 80 FEET, USE A TRANSVERSE JOINT

44. USE ADDITIONAL JOINTS TO LIMIT CUT SECTION LENGTH AND END SECTION LENGTH TO TWO TIMES THE LENGTH OF SHORTEST WALL FROM THE INSIDE FACE OF HEADWALL TO THE TRANSVERSE JOINT.

45. MINIMUM END SECTION LENGTH SHALL BE 3 FEET MEASURED ALONG THE SHORTEST WALL FROM THE INSIDE FACE OF HEADWALL TO THE TRANSVERSE JOINT.

46. TO AVOID LOCATING TRANSVERSE JOINTS UNDER A TRAVELED WAY WITH DESIGN FILLS 3 FEET OR LESS, THE FOLLOWING SHALL APPLY:

   a) BARREL LENGTH UP TO 90 FEET WITHOUT A TRANSVERSE JOINT

   b) BARREL LENGTH UP TO 90 FEET WITH A TRANSVERSE JOINT

   c) BARREL LENGTH OVER 90 FEET WITH A TRANSVERSE JOINT

47. FOR CUT SECTION DETAILS, SEE 703.86.
STITCHED TO ONE FACE OF THE CONCRETE WITH 10-GAGE COPPER WIRE OR 12-GAGE SOFT DRAWN GALVANIZED STEEL WIRE.

FILTER CLOTH WILL BE CONSIDERED COMPLETELY COVERED BY THE CONTRACT UNIT PRICE FOR OTHER ITEMS.

FILTER CLOTH 3 FEET IN WIDTH AND DOUBLE MASTIC OR TWO SIDED TAPE. FILTER CLOTH SHALL BE A SUBSURFACE DRAINAGE GEOTEXTILE IN ACCORDANCE WITH SEC 1011. COST OF FURNISHING AND INSTALLING ACCORDANCE WITH SEC 1057 SHALL BE SECURELY TRANSVERSE JOINT THRU BARREL KEYED CONSTRUCTION JOINT (APPROXIMATELY ONE-THIRD OF WALL:)

BARREL REINFORCEMENT FOR DESIGN FILLS OVER 2'-0".

GENERAL NOTES:
FOR MEMBER THICKNESS AND FOR BAR SIZES, SPACING AND DIMENSIONS OF BARS, SEE 705.17. FOR 12 GAGE BARS, SEE 703.31.

BARREL AND WINDS SECTIONS ARE DRAWN TO SCALE. DRAWINGS ARE DRAWN IN PLAN, WITH CLEARANCES TO REINFORCING STEEL BEING 11".
Laying Out Transverse Joints

Use a transverse joint when barrel length is over 80 feet.

Use additional joints to limit cut section length and end section barrel length measured along centerline of culvert to 3 feet.

Minimum end section length shall be 3 feet measured along the shortest cut from the inside face of headwall to the transverse joint.

To avoid locating transverse joints under a traveled way with design fills 2 feet or less, the following shall apply:

Barrel length up to 90 feet without a transverse joint.

Cut section lengths up to 60 feet.

When barrel and cut section length restrictions require transverse joints to be located under a traveled way with design fills 2 feet or less, the joints shall be located to minimize the length of joint under the traveled way. Transverse way is the roadway width minus shoulder widths.

For cut section details, see 703.86.

End of wall (typ. not shown)

General Notes:

For sections thru barrel, wing and headwalls, see sheet 5 of 3. For bar sizes, spacing and dimensions of all reinforcement except J5 bars, see 703.37. For J5 bars, see 703.37.

Construction joint not shown for clarity in plan and elevation. See sheet 5 of 3 for details.

Drawing not to scale. Follow dimensions.

Minimum clearance to reinforcing steel shall be 1/2".

Lap longitudinal bars a minimum of 23" at splices.

Beveled headwall shall be located at upstream end. (a) Same size and spacing as adjacent B bars.
(b) Varies. 12" minimum.
(c) J4 bar spacing.
(d) Same size and spacing as A2 bars.
(e) A2 bar spacing.
(f) Same size and spacing as A1 bars.
(g) A1 bar spacing.

Missouri Highways and Transportation Commission
100 West Capitol
Jefferson City, MO 65102
1-888-658-MODOT 1-888-275-6636

CONCRETE TRIPLE BOX CULVERT
SKEW: LEFT ADVANCE
WINGS: FLARED
REINFORCEMENT

DATE EFFECTIVE: 12/01/2011
DATE PREPARED: 5/13/2011
703-83H SHEET NO. 1 OF 3
GRANULAR BACKFILL LIMITS AND MEMBER DIMENSIONS

TRANVERSE JOINT THRU BARREL

Preformed fiber expansion joint material in accordance with Sec 207 shall be securely stitched to one face of the concrete with 10 gauge wire or 12 gauge soft drawn galvanized steel wire.

FILTER CLOTH WILL BE CONSIDERED COMPLETELY COVERED BY THE CONTRACT UNIT PRICE FOR OTHER ITEMS.

FILTER CLOTH 3 FEET IN WIDTH AND DOUBLE PREFORMED FIBER EXPANSION JOINT MATERIAL IN

BARS AT ABOUT 14" CENTERS

UPSTREAM FLARED WINGS REINFORCEMENT

DOWNSTREAM WINGS REINFORCEMENT

BARREL REINFORCEMENT

FOR DESIGN FILLS OVER 2'-0"

FOR DESIGN FILLS 2'-0" OR LESS

GENERAL NOTES:

FOR MEMBER THICKNESSES AND FOR BAR SIZES, SPACING AND DIMENSIONS OF MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1".

BARREL AND WINGS SECTIONS ARE SYMMETRICAL, ARCHED AND NORMAL TO LONG DIRECTION OF HEADWALL.

DRAWING NOT TO SCALE, FOLLOW Dims.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1".

CONCRETE

TRIPLE BOX CULVERT

SKEW: LEFT ADVANCE

WINGS: FLARED

SECTIONS

DATE PREPARED: 3/10/2019

DATE EFFECTIVE: 3/10/2019

703-83H 3 OF 3
Laying Out Transverse Joints

Use a transverse joint when barrel length is over 80 feet. Use additional joints to limit cut section length and end section barrel length measured along centerline of culvert to

Minimum end section length shall be 3 feet measured along the shortest wall from the inside face of headwall to the transverse joint.

To avoid locating transverse joints under a traveled way with design fills 2 feet or less, the following shall apply:

- Barrel length up to 90 feet without a transverse joint
- Cut section lengths up to 60 feet

When barrel and cut section length restrictions require transverse joints, to be located under a traveled way with design fills 2 feet or less. The joints shall be located to minimize the length of joint under the traveled way. Traveled way is the roadway width minus shoulder widths.

For details, see 703.86.

Minimum end section length shall be 3 feet measured along the shortest wall from the inside face of headwall to the transverse joint.

General Notes:

For sections thru barrel, wings and headwalls, see sheet 5 of 703. For bar sizes, spacing and dimensions of all reinforcement except J5 bars, see 703.87. For J5 bars, see 703.37.

Construction joint key not shown for clarity in plan and elevation. See sheet 3 of 703.

Draining not to scale. Follow dimensions.

Minimum clearance to reinforcing steel shall be 1½".

Lap longitudinal bars a minimum of 23" at splices.

Beveled headwall shall be located at upstream end.

(a) Same size and spacing as adjacent B bars
(b) Same size and spacing as A2 bars
(c) J4 bar spacing
(d) Same size and spacing as A1 bars
(e) A2 bar spacing
(f) Same size and spacing as A1 bars
GENERAL NOTES:
FOR SECTIONS THRU BARRIERS, RINGS AND HEADWALLS, SEE SHEET 3 OF 3. FOR BARS SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT EXCEPT J5 BARS. SEE 703.87. FOR J5 BARS, SEE 703.37.
CONSTRUCTION JOINT KEY NOT SHOWN FOR CLARITY IN PLAN AND SECTION. SEE SHEET 3 OF 3 FOR DETAILS.
DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.
MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1½".
LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.
BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.
(i) SAME SIZE AND SPACING AS ADJACENT BARS
(ii) VARIES, 1½" MAXIMUM
(iii) NOT SPECIFIED ON THIS SHEET
(iv) SAME SIZE AND SPACING AS A2 BARS
(v) A1 BAR SPACING
(vi) SAME SIZE AND SPACING AS A3 BARS
(vii) AT BAR SPACING
(viii) FOR DESIGN FILLS OVER 2'-0".
(ix) FOR DESIGN FILLS 2'-0" OR LESS
(x) NOT REQUIRED FOR CLEAN SPANS 5'-0" OR LESS
# FOR CLEAR SPAN 3'-0" OR LESS
# FOR CLEAR SPAN 5'-0" OR LESS
IF REQUIRED, THE MINIMUM LENGTH EACH SIDE OF E WALL SHALL BE THE GREATER OF 48 BAR DIAMETERS OR A CLEAN SPAN. THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.
(j) H3 BARS AS REQUIRED. QUANTITY OF BARS VARIES WITH SKEW.
STITCHED TO ONE FACE OF THE CONCRETE WITH 10GAGE COPPER WIRE OR 12 GAGE SOFT DRAWN FILTER CLOTH WILL BE CONSIDERED COMPLETELY COVERED BY THE CONTRACT UNIT PRICE FOR OTHER ITEMS.

MASTIC OR TWO SIDED TAPE. FILTER CLOTH SHALL BE A SUBSURFACE DRAINAGE GEOTEXTILE IN ACCORDANCE WITH SEC 1011. COST OF FURNISHING AND INSTALLING ACCORDANCE WITH SEC 1057 SHALL BE SECURELY.

GRANULAR BACKFILL LIMITS AND MEMBER DIMENSIONS

TRANSVERSE JOINT THRU BARREL
PREFORMED FIBER EXPANSION JOINT MATERIAL IN ACCORDANCE WITH SECTION SHALL BE SECURELY STITCHED TO ONE FACE OF THE CONCRETE WITH GALVANIZED STEEL NAILS.

FILTER CLOTH A FEET IN WIDTH AND DOUBLE THICKNESS SHALL BE CENTERED ON TRANSVERSE JOINTS ON TOP SLAB AND SIDEWALLS WITH EDGES SEALED WITH MASONIC TAPE. FILTER CLOTH SHALL BE A SUBSURFACE DRAINAGE GEOTEXTILE IN ACCORDANCE WITH SEC 1011. COST OF FURNISHING AND INSTALLING FILTER CLOTH WILL BE CONSIDERED COMPLETELY COVERED BY THE CONTRACT UNIT PRICE FOR OTHER ITEMS.

UPSTREAM HEADWALL REINFORCEMENT NEAR MIDSPAN

UPSTREAM HEADWALL REINFORCEMENT NEAR MIDDLE WALL

DOWNSTREAM HEADWALL REINFORCEMENT NEAR MIDDLE WALL

DOWNSTREAM HEADWALL REINFORCEMENT NEAR MIDSPAN

GENERAL NOTES:
FOR MEMBER THICKNESS AND FOR BAR SIZES, SPACING AND DIMENSIONS OF PRECAST CONCRETE AND SLEEPER CEMENT, SEE 705.57. FOR 25 BAR; SEE 703.13.

CULVERT AND WINGS SECTIONS ARE SYMMETRICAL ABOUT AND NORMAL TO LONG DIRECTION OF HEADWALL. DRAWING NOT TO SCALE. FOLLOW DIMENSIONS. MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1/8".

CONCRETE TRIPLE BOX CULVERT

SKEW: RIGHT ADVANCE
WINGS: STRAIGHT

SECTIONS

DATE EFFECTIVE: 12/01/2011
DATE PREPARED: 06/13/2011
703.84H SHEET NO. 3 OF 3
GENERAL NOTES:

FOR SECTIONS THRU BARREL, WINGS AND HEADWALLS, SEE SHEET 3 OF 3. FOR BAR SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT EXCEPT J5 BARS, SEE 703.87. FOR J5 BARS, SEE 703.37.

CONSTRUCTION JOINT KEY NOT SHOWN FOR CLARITY IN PLAN AND ELEVATION. SEE SHEET 3 OF 3 FOR DETAILS.

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1".

LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPACES.

BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

(a) SAME SIZE AND SPACING AS ADJACENT B BARS
(b) VARYS 12" MAXIMUM
(c) J4 BAR SPACING
(d) SAME SIZE AND SPACING AS A2 BARS
(e) A2 BAR SPACING

CONCRETE TRIPLE BOX CULVERT
SKEW: RIGHT ADVANCE
WINGS: FLARED

REINFORCEMENT

DATE EFFECTIVE: 02/01/2011
DATE PREPARED: 03/10/2011

703.85C SHEET NO. 1 OF 3
GENERAL NOTES:

- For sections thru barrel, wings and headwalls, see Sheet 3 of 3.
- For bar sizes, spacing and dimensions of all reinforcement except J5 bars, see 703.87. For J5 bars, see 703.37.
- Construction joint key not shown for clarity in plan and section. See Sheet 3 of 3 for details.
- Drawing not to scale. Follow dimensions.
- Minimum clearance to reinforcing steel shall be 1".
- Lap longitudinal bars a minimum of 23" at splices.
- Beveled headwall shall be located at upstream end.
- (a) Same size and spacing as adjacent A bars
- (b) May be 12" maximum
- (c) Not specified on this sheet
- (d) Same size and spacing as AZ bars
- (e) A2 bar spacing
- (f) Not required for clear spans ≤ 10' - 0".
- #8 for clear span > 10' - 0".
- #9 for clear span > 13' - 0".
- If required, the minimum length each side of & wall shall be the greater of 48 bar diameters or 5' clear span. The clear span is parallel to long direction of headwall.
- (g) H2 bars as required. Quantity of bars varies with skew.
- For design fills over 2'-0".
- For design fills 2'-0" or less.
- Not required for clear spans ≤ 10' - 0".
- #4 for clear span > 10' - 0".
- #5 for clear span > 15' - 0".

DRAWING SHEET NO. 3 OF 3

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT 11-888-275-6636

DATE EFFECTIVE: 12/01/2011
DATE PREPARED: 3/13/2010

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FOR SECTIONS THRU BARREL, WINGS AND HEADWALLS, SEE SHEET 3 OF 3. FOR BAR SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT EXCEPT J5 BARS, SEE 703.87. FOR J5 BARS, SEE 703.37.

CONSTRUCTION JOINT KEY NOT SHOWN FOR CLARITY IN PLAN AND SECTION. SEE SHEET 3 OF 3 FOR DETAILS.

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1".

LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.

BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

(a) SAME SIZE AND SPACING AS ADJACENT B BARS

(b) MAY BE 12" MAXIMUM

(c) NOT SPECIFIED ON THIS SHEET

(d) SAME SIZE AND SPACING AS AZ BARS

(e) A2 BAR SPACING

(f) SAME SIZE AND SPACING AS A1 BARS

(g) AT BAR SPACING

(h) FOR DESIGN FILLS OVER 2'-0"

(i) FOR DESIGN FILLS 2'-0" OR LESS

(j) NOT REQUIRED FOR CLEAR SPANS ≤ 10'-0"

(k) #4 FOR CLEAR SPAN > 10'-0"

(l) #5 FOR CLEAR SPAN > 15'-0"

IF REQUIRED, THE MINIMUM LENGTH EACH SIDE OF & WALL SHALL BE THE GREATER OF 48 BAR DIAMETERS OR 5' CLEAR SPAN. THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

(n) H2 BARS AS REQUIRED. QUANTITY OF BARS VARIES WITH SKEW.

FLOW

PLAN OF TOP SLAB

B BARS IN WALLS ARE NOT SHOWN FOR CLARITY. FOR PLACEMENT, SEE SHEET 1 OF 3.

SECTION NEAR INTERIOR WALL

J1 BARS MAY BE BENT IN FIELD OR SHOP.

CONCRETE TRIPLE BOX CULVERT

SKEW: RIGHT ADVANCE
WINGS: FLARED

REINFORCEMENT
KEYED CONSTRUCTION JOINT
(a) APPROXIMATELY ONE-THIRD OF WALL
THICKNESS

(b) TRANSVERSE JOINT THRU BARREL
THICKNESS

GRANULAR BACKFILL LIMITS
AND MEMBER DIMENSIONS

PREFORMED FIBER EXPANSION JOINT MATERIAL
IN ACCORDANCE WITH SEC 1057 SHALL BE SECURELY
STITCHED TO ONE FACE OF THE CONCRETE WITH 10
GAUGE COPPER WIRE OR 12 GAUGE SOFT DRAWN
SOLVENT STEEL NAILS.

FILTER CLOTH A FEET IN WIDTH AND DOUBLE
THICKNESS SHALL BE CENTERED ON TRANSVERSE JOINTS
IN TOP SLAB AND SIDEWALLS WITH EDGES DEALI WITH
MASONRY OR TWO SIDED TAPE. FILTER CLOTH SHALL BE
SUBMITTED TO THE CONTRACTING AGENCY FOR
INSPECTION.

VAR. #4-F BARS AT ABOUT 14" CENTERS
FOUR #8-H BARS AT ABOUT 14" CENTERS

UPSTREAM FLARED WINGS REINFORCEMENT

DOWNSTREAM FLARED WINGS REINFORCEMENT

BARREL REINFORCEMENT
FOR DESIGN FILLS OVER 2'-0"

BARREL REINFORCEMENT
FOR DESIGN FILLS 0'-0" OR LESS

GENERAL NOTES:
FOR MEMBER THICKNESS AND FOR BAR
SIZE, SPACING AND DIMENSIONS OF ALL
JOINTS, SEE 703.37. FOR JOINTS.

BARREL AND WINGS SECTIONS ARE
SYMMETRICAL ABOUT AND NORMAL TO
LONG DIRECTION OF HEADWALL.

DRAWING NOT TO SCALE. FOLLOW
MEMBER DIMENSIONS.

MINIMUM CLEARANCE TO REINFORCING
STEEL SHALL BE 1 1/2".

JEFFERSON CITY, MO 65102
1-888-455-MODOT 1-888-275-6636
CONCRETE
TRIPLE BOX CULVERT
SKEW: RIGHT ADVANCE
WINGS: FLARED

MISSOURI HIGHWAYS AND TRANSPORTATION
COMMISSION
10 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-455-MODOT 1-888-275-6636

UPSTREAM HEADWALL REINFORCEMENT NEAR INTERIOR WALL
(b) NOT REQUIRED FOR CLEAR SPANS & 10'-0"
IF D2 AND D4 BARS ARE REQUIRED, THE MINIMUM LENGTH EACH SIDE
OF A WALL SHALL BE THE GREATER OF #2 BARS SPANNED BY A CLEAR
SPAN, THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.
GRANULAR BACKFILL LIMITS

CONSIDERED COMPLETELY COVERED BY 12 GAGE COPPER WIRE OR 12 GAGE SOFT FILTER CLOTH 3 FEET IN WIDTH AND DOUBLE THICKNESS SHALL BE CENTERED DRAWN GALVANIZED STEEL WIRE. WITH SEC 1011. COST OF FURNISHING AND INSTALLING FILTER CLOTH WILL BE

AND SIDEWALLS WITH EDGES SEALED WITH MASTIC OR TWO SIDED TAPE.

(a) APPROXIMATELY ONE-THIRD OF WALL AND MEMBER DIMENSIONS, TX S TIS TIS TX

TRANSVERSE JOINT THRU BARREL

PREFORMED FIBER EXPANSION JOINT MATERIAL IN ACCORDANCE WITH SEC 1079 SHALL BE SECURELY SEALED TO GRANULAR BACKFILL MATERIAL WITH 12 GAGE COPPER WIRE OR 12 GAGE SOFT FILTER CLOTH 3 FEET IN WIDTH AND DOUBLE THICKNESS.

FILTER CLOTH 3 FEET IN WIDTH AND DOUBLED LIKENED MATERIAL CENTERED ON TRANSVERSE JOINTS IN TOP SLAB AND SIDEWALLS WITH EDGES SEALED WITH MASTIC OR TWO SIDED TAPE. FILTER CLOTH SHALL BE A SUBSURFACE DRAINAGE TEXTILE IN ACCORDANCE WITH DETAIL 105. COST OF PURCHASING, INSTALLING, AND SEALED FILTER CLOTH SHALL BE CONSIDERED COMPLETELY COVERED BY THE CONTRACT UNIT PRICE FOR OTHER ITEMS.

DESIGN SPECIFICATIONS:

BARREL REINFORCEMENT FOR DESIGN FILLS 2'0" OR LESS. SYMMETRICAL ABOUT AND NORMAL TO $E$ CULVERT.

GENERAL NOTES

DESIGN SPECIFICATIONS: 2010 MISSOURI HIGHWAY BRIDGE DESIGN SPECIFICATIONS AND 2010 INTERIM REVISIONS

DESIGN LOADING: VEHICULAR - H-25 MINIMUM LANE LOAD, EARTH - 120 LB/FQ; EQUIVALENT FLUID PRESSURE = 60 PSIF (MAX.)

DESIGN UNIT STRESSES: CLASS B-1 CONCRETE (BOX CULVERT) f'c = 4,000 PSI REINFORCING STEEL (GRADE 60) fy = 60,000 PSI

MISCELLANEOUS: FOR MEMBER THICKNESS AND FOR BAR SIZES, SPACING AND DIMENSIONS, SEE 703.87.

CONSTRUCTION JOINT KEY NOT SHOWN FOR CLARITY IN PART PLANS, PART ELEVATION AND PART SECTION. DRAWING NOT TO SCALE. FOLLOW DIMENSIONS. MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1/4".
<table>
<thead>
<tr>
<th>DESIGN</th>
<th>SPAN (S) = 3 FT</th>
<th>SPAN (S) = 5 FT</th>
<th>SPAN (S) = 6 FT</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>TOP SLAB BARS</td>
<td>BOTTOM SLAB BARS</td>
<td>WALL BARS</td>
</tr>
<tr>
<td>1 FT 10 0 8</td>
<td>4</td>
<td>8.5</td>
<td>4</td>
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<tr>
<td>2 FT 10 0 8</td>
<td>4</td>
<td>8.5</td>
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</tr>
<tr>
<td>3 FT 10 0 8</td>
<td>4</td>
<td>8.5</td>
<td>4</td>
</tr>
</tbody>
</table>

| GENERAL NOTES: |
| JV DESIGN FILL IS BETWEEN TABULATED DESIGN FILLS. USE THE NEXT GREATER TABULATED DESIGN FILL, EXCEPT FOR DESIGN FILL BETWEEN 2 AND 3 FEET. FOR MEMBERS 5 FEET OR GREATER THAN 50 FEET, USE THE GREATER MEMBER THICKNESS, AREA OF REINFORCEMENT AND BAR DIMENSIONS. FILL AREAS OF REINFORCEMENT EQUALS BAR AREA PER FOOT SPACING. |
| SPECIAL DESIGNS ARE REQUIRED WHEN THE DESIGN FILL IS LESS THAN 1 FOOT OR GREATER THAN 8 FEET. |
| DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED. |
| DESIGN FILLS ARE MEASURED FROM THE TOP OF TOP SLAB TO THE TOP OF EARTH FILL OR ROADWAY. |

**CONCRETE TRIPLE BOX CULVERT**

**MEMBER THICKNESS**

**BAR SIZE, SPACING & DIMENSIONS**

**SPAN (S): 3 FEET, HEIGHT (H): 2 TO 6 FEET**

**DATE EFFECTIVE:**

9/29/2011

**DATE PREPARED:**

9/29/2011

**SHEET NO:**

1 OR 27

**GENERAL NOTES:**

- JV DESIGN FILL IS BETWEEN TABULATED DESIGN FILLS. USE THE NEXT GREATER TABULATED DESIGN FILL, EXCEPT FOR DESIGN FILL BETWEEN 2 AND 3 FEET. FOR MEMBERS 5 FEET OR GREATER THAN 50 FEET, USE THE GREATER MEMBER THICKNESS, AREA OF REINFORCEMENT AND BAR DIMENSIONS. FILL AREAS OF REINFORCEMENT EQUALS BAR AREA PER FOOT SPACING.
- SPECIAL DESIGNS ARE REQUIRED WHEN THE DESIGN FILL IS LESS THAN 1 FOOT OR GREATER THAN 8 FEET.
- DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.
- DESIGN FILLS ARE MEASURED FROM THE TOP OF TOP SLAB TO THE TOP OF EARTH FILL OR ROADWAY.

**CONCRETE TRIPLE BOX CULVERT**

**MEMBER THICKNESS**

**BAR SIZE, SPACING & DIMENSIONS**

**SPAN (S): 3 FEET, HEIGHT (H): 2 TO 6 FEET**

**DATE EFFECTIVE:**

9/29/2011

**DATE PREPARED:**

9/29/2011

**SHEET NO:**

1 OR 27
### Table: Span (S) = 4 FT, Height (H) = 2 FT or 3 FT

<table>
<thead>
<tr>
<th>Design</th>
<th>Member Thickness</th>
<th>A1 Bars</th>
<th>A2 Bars</th>
<th>B1 Bars</th>
<th>B2 Bars</th>
<th>C1 Bars</th>
<th>C2 Bars</th>
<th>D1 Bars</th>
<th>D2 Bars</th>
<th>E1 Bars</th>
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<td>4</td>
<td>13</td>
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<td>4</td>
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### Table: Span (S) = 4 FT, Height (H) = 4 FT or 5 FT

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<th>B1 Bars</th>
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<th>C2 Bars</th>
<th>D1 Bars</th>
<th>D2 Bars</th>
<th>E1 Bars</th>
<th>E2 Bars</th>
<th>F1 Bars</th>
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</table>

**General Notes:**
- If Design Fill is between tabulated Design Fills, use the next greater tabulated design fill except for design fills between 5 and 8 feet. In this range, use the greater member thickness, area of reinforcement, and bar area of reinforcement equals bar area per foot spacing.
- Special designs are required when the design fill is less than 1 foot or greater than 50 feet.
- Dimensions are in inches unless otherwise specified.
- Design fills are measured from the top of top slab to the top of earth fill or roadway.

**Culverts Meet Strength and Serviceability Requirements for the Design Volume.**

---

**Missouri Highways and Transportation Commission**

**Concrete Triple Box Culvert**

**Member Thickness:**

**Bar Size, Spacing & Dimensions:**

**Sheet No:** 2 of 27
### Design Details

<table>
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<th>Date Prepared:</th>
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#### General Notes:
- If design fill is between tabulated design fills, use the next greater tabulated design fill except for design fills between 2 and 4 feet. In this case, use the next greater member thickness, area of reinforcement and bar spacing.
- Design loads are reduced when the design fill is less than 1 foot or greater than 50 feet.

#### SPAN (S) = 6 FT

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<th>Span (S)</th>
<th>Height (H)</th>
<th>Size (Span)</th>
<th>Spacing (Foot)</th>
<th>Design Fill (Foot)</th>
<th>Member Thickness (In.)</th>
<th>Area of Reinforcement (Square Feet)</th>
<th>Bar Spacing (Foot)</th>
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#### Span (S) = 6 FT to 7 FT

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**Design Notes:**
- General design considerations for the Triple Box Culvert in Missouri Highways and Transportation Commission specifications.
- Dimensions and design fills are specific to the member thickness and bar spacing requirements.
- Culvert spans are designed for both vehicular and pedestrian loads.
- Special considerations for culvert design include environmental factors and regulatory standards.
<table>
<thead>
<tr>
<th>SPAN (S)</th>
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<th>DESIGN VEHICULAR LIVE LOAD HL-93 MINUS THE LANE LOAD</th>
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**GENERAL NOTES:***

- If design fill is between tabulated design fills, use the next greater tabulated design fill except for design fills between 2 and 4 feet, use the greater member thickness, area of reinforcement, and bar dimensions from the 2 foot and 4 foot tabulated design fills. Area of reinforcement equals bar area per foot of spacing.
- Special designs are required when the design fill is less than 1 foot or greater than 50 feet.
- Dimensions are in inches unless otherwise specified.
- Design fills are measured from the top of top slab to the top of earth fill or roadway.

**CULVERTS MEET STRENGTH AND SERVICABILITY REQUIREMENTS FOR THE DESIGN VEHICULAR LIVE LOAD HL-93 MINUS THE LANE LOAD.**

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

**JEFFERSON CITY, MO 65102**

**1-888-ASK-MODOT (1-888-275-6636)**

**DATE EFFECTIVE:** 12/01/11

**DATE PREPARED:** 9/29/11

**SHEET NO.:** 7 OF 27

**CONCRETE TRIPLE BOX CULVERT**

**MEMBER THICKNESS, BAR SIZE, SPACING & DIMENSIONS**

**SPAN (S): 6 FEET**

**HEIGHT (H): 8 FEET OR 9 FEET**

**BAR DIMENSIONS DIAGRAM**
### General Notes:
- If design fill is between tabulated design fills, use the next greater tabulated design fill. Except for design fills between 2 and 3 feet, use the larger fill. Always use the Greater Member Thickness, Area of Reinforcement and Bar Dimensions from the 2 feet and 3 feet tabulated design fills. Area of reinforcement equals bar area per foot spacing.
- Special designs are required when the design fill is less than 1 foot or greater than 50 feet.
- Dimensions are in inches unless otherwise specified.
- Design fills are measured from the top of top slab to the top of earth fill or roadway.

### Concrete Triple Box Culvert

**Member Thickness**

- **Bar Size**
- **Spacing & Dimensions**

**Span (S): 7 Feet**

#### Top Slab Bars

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<th>TX</th>
<th>T1</th>
<th>A1 Bars</th>
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<th>C1</th>
<th>B1 Bars</th>
<th>Bottom Slab Bars</th>
<th>C2</th>
<th>B2 Bars</th>
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**Bottom Slab Bars**

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</table>

### Sheet Information

- **Date Prepared:** 9/28/2011
- **Sheet No.:** 8 of 27
- **Page No.:** 1
- **Design:** T5
- **Height (Ht):** 4 Through 8 Feet
- **Span (S):** 7 Feet
- **Bearing Spacing:** 4 Feet
- **Member Thickness:** 6 Inches
- **Bar Size:** 8 Inches
- **Spacing & Dimensions:** 4 Inches
- **Concrete:** 3000 psi

**Date Effective:** 12/16/2004

**Sheet No.:** 703.87
GENERAL NOTES:

1. IF DESIGN FILL IS BETWEEN TABULATED DESIGN FILLS, USE THE NEXT GREATER TABULATED DESIGN FILL. EXCEPT FOR DESIGN FILLS BETWEEN 2 FEET AND 4 FEET, USE THE GREATER MEMBER THICKNESS, AREA OF REINFORCEMENT AND BAR SPACING.

2. MEMBERS ARE REQUIRED WHEN THE DESIGN FILL IS LESS THAN 1 FOOT OR GREATER THAN 50 FEET.

3. DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

4. DESIGN FILLS ARE MEASURED FROM THE TOP OF TOP SLAB TO THE TOP OF MEMBERS.

5. AREA OF REINFORCEMENT EQUALS BAR AREA PER FOOT SPACING.

CONCRETE TRIPLE BOX CULVERT

MEMBER THICKNESS

BAR SIZE, SPACING & DIMENSIONS

DATE EFFECTIVE: 12/19/2011

DATE PREPARED: 9/28/2011

SHEET NO. 9 OF 27
GENERAL NOTES:
1. IF DESIGN FILL IS BETWEEN TABULATED DESIGN FILLS, USE THE NEXT GREATER TABULATED DESIGN FILL. EXCEPT FOR DESIGN FILLS BETWEEN 2 FEET 4 INCHES AND 10 FEET 11 INCHES, USE THE GREATER MEMBER THICKNESS, AREA OF REINFORCEMENT AND BAR SPACING.
2. DIMENSIONS FROM THE 5 FT AND 7 FT TABULATED DESIGN FILLS.
3. AREA OF REINFORCEMENT EQUALS BAR AREA PER FOOT SPACING.
4. SPECIAL DESIGNS ARE REQUIRED WHEN THE DESIGN FILL IS LESS THAN 1 FOOT OR GREATER THAN 50 FEET.
5. DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.
6. DESIGN FILLS ARE MEASURED FROM THE TOP OF TOP SLAB TO THE TOP OF EARTH FILL OR ROADWAY.

GENERAL NOTES:
1. IF DESIGN FILL IS BETWEEN TABULATED DESIGN FILLS, USE THE NEXT GREATER TABULATED DESIGN FILL. EXCEPT FOR DESIGN FILLS BETWEEN 2 FEET 4 INCHES AND 10 FEET 11 INCHES, USE THE GREATER MEMBER THICKNESS, AREA OF REINFORCEMENT AND BAR SPACING.
2. DIMENSIONS FROM THE 5 FT AND 7 FT TABULATED DESIGN FILLS.
3. AREA OF REINFORCEMENT EQUALS BAR AREA PER FOOT SPACING.
4. SPECIAL DESIGNS ARE REQUIRED WHEN THE DESIGN FILL IS LESS THAN 1 FOOT OR GREATER THAN 50 FEET.
5. DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.
6. DESIGN FILLS ARE MEASURED FROM THE TOP OF TOP SLAB TO THE TOP OF EARTH FILL OR ROADWAY.

GENERAL NOTES:
1. IF DESIGN FILL IS BETWEEN TABULATED DESIGN FILLS, USE THE NEXT GREATER TABULATED DESIGN FILL. EXCEPT FOR DESIGN FILLS BETWEEN 2 FEET 4 INCHES AND 10 FEET 11 INCHES, USE THE GREATER MEMBER THICKNESS, AREA OF REINFORCEMENT AND BAR SPACING.
2. DIMENSIONS FROM THE 5 FT AND 7 FT TABULATED DESIGN FILLS.
3. AREA OF REINFORCEMENT EQUALS BAR AREA PER FOOT SPACING.
4. SPECIAL DESIGNS ARE REQUIRED WHEN THE DESIGN FILL IS LESS THAN 1 FOOT OR GREATER THAN 50 FEET.
5. DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.
6. DESIGN FILLS ARE MEASURED FROM THE TOP OF TOP SLAB TO THE TOP OF EARTH FILL OR ROADWAY.
### General Notes:

1. If design fill is between tabulated design fills, use the next greater tabulated design fill.
2. If design fill is less than 2 ft, use the greater member thickness, area of reinforcement, and bar area of reinforcement equals bar area per foot spacing.
3. Critical design fill is measured when the design fill is less than 1 foot or greater than 50 feet.
4. Dimensions in inches unless otherwise specified.

**Critical Design Fill**

- Area of reinforcement equals bar area per foot spacing.
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<thead>
<tr>
<th>SPAN (S)</th>
<th>HEIGHT (HT)</th>
<th>DESIGN (THICKNESS)</th>
<th>MEMBER</th>
<th>TOP SLAB BARS</th>
<th>BOTTOM SLAB BARS</th>
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<td>J1 BARS</td>
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<td>J2 BARS</td>
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<td>S1 BARS</td>
<td>S1</td>
<td>SIZE: 6</td>
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<tr>
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<td>51.0</td>
<td>S2 BARS</td>
<td>S2</td>
<td>SIZE: 6.5</td>
<td>30.0</td>
<td></td>
</tr>
</tbody>
</table>

**GENERAL NOTES:**

- If design fill is between tabulated design fills, use the next greater tabulated design fill. If tabulated design fills are less than 1 foot or greater than 50 feet, special designs are required when the design fill is less than 1 foot or greater than 50 feet.
- Dimensions are in inches unless otherwise specified.
**GENERAL NOTES:**

1. If design fill is less than tabulated design fills, use the next greater tabulated design fill. Special designs are required when the design fill is less than 1 foot or greater than 50 feet.

2. Culverts meet strength and serviceability requirements for the greater member thickness, area of reinforcement and bar design fills are measured from the top of top slab to the top of earth fill or roadway.

3. Culverts meet strength and serviceability requirements for the design vertical live load HD-33 minus the lane load.

**CONCRETE TRIPLE BOX CULVERT**

**MEMBER THICKNESS**

<table>
<thead>
<tr>
<th>BAR SIZE (INCHES)</th>
<th>12&quot;</th>
<th>14&quot;</th>
<th>16&quot;</th>
<th>18&quot;</th>
<th>20&quot;</th>
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<td>H1 BARS (INCHES)</td>
<td>2</td>
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<tr>
<td>H2 BARS (INCHES)</td>
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<tr>
<td>H3 BARS (INCHES)</td>
<td>2</td>
<td>2</td>
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<td>2</td>
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</table>

**MEMBER TOP SLAB BARS**

**BAR DIMENSIONS DIAGRAM**

**SYMMETRICAL ABOUT X AXIS**

**DATE:** 7/29/2011

**DATE PREPARED:** 2/28/2011

**SHEET NO.:** 703.87

**17 OF 27**
### Table: Design Dimensions

<table>
<thead>
<tr>
<th>Design</th>
<th>Height (ft)</th>
<th>Top Slab Bars</th>
<th>Bottom Slab Bars</th>
<th>Wall Bars</th>
</tr>
</thead>
<tbody>
<tr>
<td>T5 B5 T7 T9</td>
<td>12 FT</td>
<td>A1 &amp; A2 BARS</td>
<td>A3 BARS</td>
<td>B1 &amp; B2 BARS</td>
</tr>
<tr>
<td>T2 ft</td>
<td>14 12 10 10</td>
<td>5 6 7 6.5 6 5 5.5 5 5</td>
<td>5 12 113.5 B15</td>
<td>5 12 15 10 7 7.5 6 6 6 47 47 7 15 57 56 7 15 40 42 7 7 6 7 57.5 165 177 7 6.5 51 60 5 12 6 8 0</td>
</tr>
<tr>
<td>T2 ft</td>
<td>14 12 10 10</td>
<td>5 6 7 6.5 6 5 5.5 5 5</td>
<td>5 12 113.5 B15</td>
<td>5 12 15 10 7 7.5 6 6 6 47 47 7 15 57 56 7 15 40 42 7 7 6 7 57.5 165 177 7 6.5 51 60 5 12 6 8 0</td>
</tr>
<tr>
<td>T3 ft</td>
<td>14 12 10 10</td>
<td>5 6 7 6.5 6 5 5.5 5 5</td>
<td>5 12 113.5 B15</td>
<td>5 12 15 10 7 7.5 6 6 6 47 47 7 15 57 56 7 15 40 42 7 7 6 7 57.5 165 177 7 6.5 51 60 5 12 6 8 0</td>
</tr>
<tr>
<td>T2 ft</td>
<td>14 12 10 10</td>
<td>5 6 7 6.5 6 5 5.5 5 5</td>
<td>5 12 113.5 B15</td>
<td>5 12 15 10 7 7.5 6 6 6 47 47 7 15 57 56 7 15 40 42 7 7 6 7 57.5 165 177 7 6.5 51 60 5 12 6 8 0</td>
</tr>
<tr>
<td>T2 ft</td>
<td>14 12 10 10</td>
<td>5 6 7 6.5 6 5 5.5 5 5</td>
<td>5 12 113.5 B15</td>
<td>5 12 15 10 7 7.5 6 6 6 47 47 7 15 57 56 7 15 40 42 7 7 6 7 57.5 165 177 7 6.5 51 60 5 12 6 8 0</td>
</tr>
</tbody>
</table>

### General Notes:
- If design fill is between tabulated design fills, use the next greater tabulated design fill, except for design fills between 2 feet and 4 feet. Use the next smaller tabulated design fill if you need a design fill less than 2 feet. Use the next greater tabulated design fill, area of reinforcement equals bar area per foot spacing.
- Special designs are required when the design fill is less than 1 foot or greater than 50 feet.
- Dimensions are in inches unless otherwise specified.
- Design fills are measured from the top of top slab to the top of earth fill or roadbed.
- Culverts meet strength and serviceability requirements for the design vertical live load.
- Culverts meet strength and serviceability requirements for the design vertical live load.
- Culverts meet strength and serviceability requirements for the design vertical live load.

### Missouri Highways and Transportation Commission
Jefferson City, MO 65102
1-888-636-MODOT (1-888-636-6636)
### Top Slab Bars

<table>
<thead>
<tr>
<th>Size (FT)</th>
<th>A1 Bars</th>
<th>A2 Bars</th>
<th>Bottom Slab Bars</th>
<th>A3 Bars</th>
<th>B1 Bars</th>
<th>B2 Bars</th>
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<tbody>
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</table>

### General Notes:
- If design fill is between tabled design fills, use the next greater tabled design fill. Except for design fills between 2' and 4' use the greater member thickness. Area of reinforcement equals bar area per foot spacing.
- Special designs are required when the design fill is less than 1' or greater than 50'.
- Dimensions are in inches unless otherwise specified.
- Design fills are measured from the top of top slab to the top of earth fill or roadway.

### Concretes:
- Vestal 842, 862, or 872 concrete is specified for fill sections greater than 2' 0" in height.
- In 2' 0" and shallower fill, the engineer may select a concrete with a higher initial compressive strength to reduce the effects of the restraint at the top of the fill.
- In 2' 0" to 4' 0" fill sections which do not have a directly supported roadway, the engineer may specify the design concrete in the area of fill
- The base slab shall be at least 12" deep and have the same concrete specified for the fill.

### Missouri Highways and Transportation Commission
- 105 West Capitol
- 1-888-ASK-MODOT (1-888-275-6636)
## General Notes:

If design fill is between tabulated design fills, use the next greater tabulated design fill. Except for design fills between 2' and 6', use the greater member thickness, area of reinforcement and bar dimensions from the 6' fill and 1' fill tabulated design fills. Area of reinforcement equals bar area per foot of spacing.

Special designs are required when the design fill is less than 1 foot or greater than 50 feet.

Culverts meet strength and serviceability requirements for the design without live loads for the dead loads indicated.

### Concrete Triple Box Culvert

**Member Thickness**

<table>
<thead>
<tr>
<th>Design (ft)</th>
<th>Top Slab Bars</th>
<th>Bottom Slab Bars</th>
<th>Side Walls</th>
<th>B1 Bars</th>
<th>B2 Bars</th>
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**Bar Size, Spacing & Dimensions**

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<th>Design (ft)</th>
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**Concrete Triple Box Culvert**

**Member Thickness**

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**Bar Size, Spacing & Dimensions**

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### BAR DIMENSIONS DIAGRAM

**SYMMETRICAL ABOUT MEMBER THICKNESS**

- **B1 BAR**
- **B2 BAR**
- **CULVERT**

---

### CONCRETE TRIPLE BOX Culvert

**Member Thickness**

- **A1 BARS**
- **A2 BARS**
- **A3 BARS**
- **B1 BARS**
- **B2 BARS**
- **B3 BARS**
- **C1 BARS**
- **C2 BARS**
- **C3 BARS**
- **C4 BARS**

**Top Slab Bars**

**Bottom Slab Bars**

**WALL BARS**

---

### GENERAL NOTES:

- **If Design Fill is Between Tabulated Design Fills:** Use the Next Greater Tabulated Design Fill. Except for Design Fills Between 2 Tabulated Design Fills, Use the Greater Member Thickness, Area of Reinforcement and Bar Dimensions from the 2 Feet and 4 Feet Tabulated Design Fills. Use the Greater Member Thickness, Area of Reinforcement and Bar Dimensions from the 2 Feet and 4 Feet Tabulated Design Fills.

---

### Concretes Meet Strength and Serviceability Requirements for the Design Vertical Load H23 X 91 Mins. the Lane Load.

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### Date Effective:

**9/09/2011**

**Date Prepared:**

**9/29/2011**

**Sheet No.:**

**703.87**

**23 of 27**

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### Design Fills are Measured from the Top of Top Slab to the Top of Earth Fill or Roadway.
### General Notes:

- All design fills are between tabulated design fills. Use the next greater tabulated fill, except for design fills between 2 and 3 ft.
- Fill areas in the top slab are calculated by using the greater member thickness, area of reinforcement, and bar dimensions from the 2 ft and 3 ft tabulated fill areas if reinforcement equals bar area per foot spacing.
- Special designs are required when the design fill is less than 1 foot or greater than 50 feet.
- Dimensions are in inches unless otherwise specified.

**Concrete Triple Box Culvert**

**Member Thickness, Bar Size, Spacing & Dimensions**

**Span (S) = 15 ft**

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**General Notes:**
- If design fill is between tabulated design fills, use the next greater tabulated design fill. For design fills between 2 feet and 4 feet, use the greater member thickness, area of reinforcement, and bar dimensions from the 2 feet and 4 feet tabulated design fills. Area of reinforcement equals bar area per foot of spacing.
- Special designs are required when the design fill is less than 1 foot or greater than 50 feet.
- Dimensions are in inches unless otherwise specified.
- Design fills are measured from the top of top slab to the top of earth fill or roadway.

**Concrete Triple Box Culvert**

**Missouri Highways and Transportation Commission**

Missouri Department of Transportation (MoDOT)
105 West Capitol
Jefferson City, MO 65102

1-888-641-MODOT (1-888-641-6636)

Date Prepared: 9/28/2011
Date Effective: 12/29/2011

Sheet No.: 25 of 27

**Design Fills and Bar Size, Spacing & Dimensions**

**Concrete Triple Box Culvert**

**Member Thickness**

**Bar Size, Spacing & Dimensions**

**Span (S): 15 Feet**
HEIGHT (HT): 14 Through 16 Feet
| DESIGN | MEMBER | THICKNESS | A1 | BARS | B2 | BARS | H1 | BARS | A3 | BARS | BOTTOM SLAB BARS | C1 | BARS | H2 | BARS | A4 | BARS | H3 | BARS | C2 | BARS |
|--------|--------|-----------|----|------|----|------|----|------|----|------|------------|----|------|----|------|----|------|----|------|----|------|----|------|
| 1 FT   | 11      | 8        | 6   | 7    | 5   | 6    | 6   | 5    | 6   | 5    | 5           | 16.0| 15.0  | 16.0| 15.0  | 16.0| 15.0  | 16.0| 15.0  |
| 2 FT   | 11      | 8        | 6   | 7    | 5   | 6    | 6   | 5    | 6   | 5    | 5           | 14.0| 15.0  | 14.0| 15.0  | 14.0| 15.0  |
| 3 FT   | 11      | 8        | 6   | 7    | 5   | 6    | 6   | 5    | 6   | 5    | 5           | 12.0| 13.0  | 12.0| 13.0  | 12.0| 13.0  |
| 4 FT   | 11      | 8        | 6   | 7    | 5   | 6    | 6   | 5    | 6   | 5    | 5           | 10.0| 11.0  | 10.0| 11.0  | 10.0| 11.0  |
| 5 FT   | 11      | 8        | 6   | 7    | 5   | 6    | 6   | 5    | 6   | 5    | 5           | 8.0 | 9.0   | 8.0 | 9.0   | 8.0 | 9.0   |

**GENERAL NOTES:**
- If design fill is between tabulated design fills, use the next greater tabulated design fill. For design fills between 2 and 10 ft, use the greater member thickness, area of reinforcement, and area of reinforcement equals bar area per foot spacing.
- Special details are required when the design fill is less than 1 foot or greater than 50 feet.
- Dimensions are in inches unless otherwise specified.

**CONCRETE TRIPLE BOX CULVERT**
- MEMBER THICKNESS:
- BAR SIZE: SPACING & DIMENSIONS
- SPAN (S) = 16 FT

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**
- PREPARED:
- DATE EFFECTIVE:
- SHEET NO: 26 OF 27
<table>
<thead>
<tr>
<th>Design Fill</th>
<th>Top Slab Bars</th>
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<th>Wall Bars</th>
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**General Notes:**
- *If Design Fill is between tabulated Design Fills, use the next greater tabulated Design Fill. If less than tabulated Design Fill, use the smaller tabulated Design Fill.*
- *Area of reinforcement equals bar area per foot spacing.*
- *Design Fills are measured from the top of top slab to the top of earth fill or roadway.*

**Concrete Triple Box Culvert:**
- *Member Thickness, Bar Size, Spacing & Dimensions*
- *Design Fills: 16 FT or greater 14 FT to 16 FT*
TYPE A - FINGER TYPE EXPANSION DEVICES

GENERAL NOTES:
- OUTLINE OF THE WORK IS INDICATED BY LIGHT DAMAGED LINES. HEAVY LINES INDICATE NEW WORK.
- THE EXISTING STRUCTURAL STEEL SHALL BE IN ACCORDANCE WITH ADO PRACTICES.
- QUALIFICATION OF WELDING OPERATIONS WILL BE REQUIRED.
- STEEL OR CHROMIUM ELECTRODES SHALL BE USED.
- THE EXISTING STRUCTURAL STEEL SHALL BE CLEAVED OR THICKNESS TESTED TO DETERMINE IF IT IS STRONG ENOUGH TO SUPPORT THE NEW SUPPORTING STRUCTURE. THE FOLLOWING GUIDELINES CAN BE FOLLOWED TO DETERMINE ANY CHANGE TO THE EXISTING STRUCTURE TYPE OF MATERIAL.
- STEEL DAMS SHALL BE ELEVATED AND INSTALLED TO THE CROWN AND 'NEW' COMPONENTS IN THE STRUCTURE.
- STEEL CHAMBERS OR BARS ON BOTH SIDES OF EXPANSION JOINT ARE TO BE CONSIDERED COMpletely SAWN OR SAWED COMPLETELY OFF BY THE CONTRACTOR WITH A STEEL DAM Rizer.
- SHEET EIGHTER SHALL NOT BE REQUIRED FOR STEEL DAM Rizers.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

STEEL DAMS AT EXPANSION DEVICES FOR RESURFACING BRIDGE FLOORS

SIZE FACTOR: 1.000
UNIT PRICE: $712.40L

1 OF 1
TYPICAL TRENCH DETAIL

PIPE INSTALLATION AND BEDDING

NOTE:

A) MINIMUM STRUCTURAL BACKFILL OVER TOP OF PIPE SHALL BE ONE-EIGHTH DIAMETER OF SPAN OF PIPE OR ONE FOOT WHICHEVER IS GREATER.

B) BEDDING BLANKET OF LOOSE FILL SHALL BE ROUGHLY SHAPED TO FIT BOTTOM OF PIPE. MINIMUM THICKNESS BEFORE PLACING PIPE SHALL BE AS FOLLOWS:

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<th>DEPTH OF CORRUGATION</th>
<th>MIN. BEDDING THICKNESS</th>
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C) TRENCH INSTALLATIONS - 2 FEET MINIMUM EACH SIDE OF CULVERT. THIS RECOMMENDED LIMIT SHOULD BE MODIFIED AS NECESSARY TO ACCOUNT FOR VARIABLES SUCH AS POOR IN-SITU SOILS. EMBANKMENT INSTALLATIONS - ONE DIAMETER OR SPAN EACH SIDE OF CULVERT.

DIAMETER X SPAN

TYPICAL CAMBERED FLOW LINE

NOTE:

ON YIELDING SOIL, PIPE CULVERTS SHALL BE PLACED ON A CAMBERED FLOW LINE. THE AMOUNT OF CAMBER WILL VARY WITH SOIL CONDITIONS AND WILL BE SPECIFIED ON THE DESIGN PLANS.
### CORRUGATED METALIC-COATED STEEL CIRCULAR PIPE LOCK SEAM

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<th>MINIMUM COVER</th>
<th>CORRUGATIONS</th>
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<th>C 0.158</th>
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### CORRUGATED METALIC-COATED STEEL CIRCULAR PIPE RIVETED SEAM

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**Note:** For trench installation only.
# Corrugated H32 Aluminum Circular Pipe Lock Seam

## Maximum Allowable Overfill Heights (1)

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### MAXIMUM ALLOWABLE OVERFILL HEIGHTS (1)

- 12 in.: 132 ft
- 15 in.: 106 ft
- 18 in.: 88 ft
- 21 in.: 76 ft
- 24 in.: 66 ft
- 30 in.: 61 ft
- 36 in.: 51 ft
- 42 in.: 43 ft
- 48 in.: 38 ft
- 54 in.: 34 ft
- 60 in.: 30 ft
- 66 in.: 28 ft
- 72 in.: 25 ft
- 78 in.: 29 ft
- 84 in.: 33 ft
- 90 in.: 38 ft
- 96 in.: 41 ft
- 102 in.: 46 ft
- 108 in.: 51 ft
- 114 in.: 57 ft
- 120 in.: 62 ft
- 126 in.: 66 ft

### Specified Thickness of Coated Sheet (In.)

- 0.06
- 0.075
- 0.105
- 0.135
- 0.164

### Comments

- A = 2-2/3" X 1/2" CORRUGATIONS
- B = 3" X 1" CORRUGATIONS
- C = 5" X 1" CORRUGATIONS
- D = 3/4" X 3/4" X 1-1/2" SPIRAL RIB

111 MAXIMUM OVERFILL MEASURED FROM THE TOP OF PIPE TO SURFACE.

---

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

105 West Capitol
Jefferson City, MO 65102

1-888-ASK-MODOT (1-888-275-6636)

**DATE EFFECTIVE:** 04/10/2011

**DATE PREPARED:** 03/19/2011

**SHEET NO.:** 3 OF 5

**725.00C**
### Corrugated H34 Aluminum Circular Pipe Lock Seam

#### Maximum Allowable Overfill Heights (1)

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### Corrugated H34 Aluminum Circular Pipe Riveted Seam

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* For trench installation only

111 Maximum overfill measured from the top of pipe to surface.
### Minimum Cover for Construction Loads (Round and Pipe-Arch)

**Diameter or Pipe Span**

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<tr>
<th>Type</th>
<th>18K Lbs.</th>
<th>50K Lbs.</th>
<th>75K Lbs.</th>
<th>100K Lbs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>12-42</td>
<td>2.0</td>
<td>2.5</td>
<td>3.0</td>
<td>3.0</td>
</tr>
<tr>
<td>48-72</td>
<td>3.0</td>
<td>3.5</td>
<td>4.0</td>
<td>4.0</td>
</tr>
<tr>
<td>78-120</td>
<td>3.5</td>
<td>4.0</td>
<td>4.5</td>
<td>4.5</td>
</tr>
<tr>
<td>126-144</td>
<td>4.0</td>
<td>4.5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The contractor shall provide minimum cover plus any additional cover required to avoid damage to the pipe. In unpaved situations, the surface must be maintained to a level and non-rutted condition.

(2) Minimum cover measured from top of pipe to bottom of flexible pavement or top of rigid pavement.

(3) A tolerance of plus or minus one inch or 2 percent of equivalent circular diameter, whichever is greater, will be permissible in span and rise.

(4) Tolerances in parentheses. No tolerance in opposite direction.

---

### Pipe-Arch Requirements

#### 2-2/3" X 1/2" Corrugations

<table>
<thead>
<tr>
<th>Type</th>
<th>Span (4)</th>
<th>Rise (4)</th>
<th>Galvanized Sheet 3&quot; x 1&quot; Corrugations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(IN.)</td>
<td>(IN.)</td>
<td>Thickness (IN.)</td>
</tr>
<tr>
<td>B1</td>
<td>17</td>
<td>13</td>
<td>0.064</td>
</tr>
<tr>
<td>B2</td>
<td>21</td>
<td>15</td>
<td>0.064</td>
</tr>
<tr>
<td>B3</td>
<td>24</td>
<td>18</td>
<td>0.064</td>
</tr>
<tr>
<td>B4</td>
<td>28</td>
<td>20</td>
<td>0.064</td>
</tr>
<tr>
<td>B5</td>
<td>35</td>
<td>24</td>
<td>0.064</td>
</tr>
<tr>
<td>B6</td>
<td>42</td>
<td>29</td>
<td>0.079</td>
</tr>
<tr>
<td>B7</td>
<td>49</td>
<td>35</td>
<td>0.109</td>
</tr>
<tr>
<td>B8</td>
<td>57</td>
<td>38</td>
<td>0.109</td>
</tr>
<tr>
<td>B9</td>
<td>64</td>
<td>43</td>
<td>0.109</td>
</tr>
<tr>
<td>B10</td>
<td>71</td>
<td>47</td>
<td>0.138</td>
</tr>
<tr>
<td>B11</td>
<td>77</td>
<td>52</td>
<td>0.168</td>
</tr>
<tr>
<td>B12</td>
<td>85</td>
<td>57</td>
<td>0.168</td>
</tr>
</tbody>
</table>

---

### Pipe-Arch Requirements

#### Galvanized Sheet 5" x 1" Corrugations

<table>
<thead>
<tr>
<th>Type</th>
<th>Span (4)</th>
<th>Rise (4)</th>
<th>Galvanized Sheet 5&quot; x 1&quot; Corrugations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(IN.)</td>
<td>(IN.)</td>
<td>Thickness (IN.)</td>
</tr>
<tr>
<td>B8A</td>
<td>53</td>
<td>(-2.4)</td>
<td>0.079</td>
</tr>
<tr>
<td>B9A</td>
<td>60</td>
<td>(-2.7)</td>
<td>0.079</td>
</tr>
<tr>
<td>B10A</td>
<td>61</td>
<td>(-3.0)</td>
<td>0.079</td>
</tr>
<tr>
<td>B11A</td>
<td>64</td>
<td>(-3.3)</td>
<td>0.079</td>
</tr>
<tr>
<td>B12A</td>
<td>67</td>
<td>(-3.6)</td>
<td>0.079</td>
</tr>
<tr>
<td>B13A</td>
<td>87</td>
<td>(-4.4)</td>
<td>0.079</td>
</tr>
<tr>
<td>B14A</td>
<td>95</td>
<td>(-4.8)</td>
<td>0.079</td>
</tr>
<tr>
<td>B15A</td>
<td>100</td>
<td>(-5.2)</td>
<td>0.079</td>
</tr>
<tr>
<td>B16A</td>
<td>112</td>
<td>(-5.6)</td>
<td>0.109</td>
</tr>
<tr>
<td>B17A</td>
<td>117</td>
<td>(-5.9)</td>
<td>0.109</td>
</tr>
<tr>
<td>B18A</td>
<td>128</td>
<td>(-6.4)</td>
<td>0.109</td>
</tr>
<tr>
<td>B19A</td>
<td>137</td>
<td>(-6.9)</td>
<td>0.109</td>
</tr>
<tr>
<td>B20A</td>
<td>142</td>
<td>(-7.4)</td>
<td>0.138</td>
</tr>
</tbody>
</table>

---

**Note:**

- (2) Minimum cover measured from top of pipe to bottom of flexible pavement or top of rigid pavement.
- (3) A tolerance of plus or minus one inch or 2 percent of equivalent circular diameter, whichever is greater, will be permissible in span and rise.
- (4) Tolerances in parentheses. No tolerance in opposite direction.
**General Notes:**

- Metal curtain wall with corrugations vertical.
- Section A-A and Section B-B.
- Weld stub to riser.
- 5 corrugation stubs.
- For pipe arch, band shall be same thickness as curtain wall material.
- Table for metal curtain wall.
- Plan for metal inlets.

**Table for Metal Curtain Wall**

<table>
<thead>
<tr>
<th>Dia.</th>
<th>Galv. Sh.</th>
<th>N</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>0.064</td>
<td>72</td>
<td>35</td>
</tr>
<tr>
<td>21</td>
<td>0.064</td>
<td>72</td>
<td>35</td>
</tr>
<tr>
<td>24</td>
<td>0.064</td>
<td>72</td>
<td>35</td>
</tr>
<tr>
<td>30</td>
<td>0.079</td>
<td>72</td>
<td>49</td>
</tr>
<tr>
<td>36</td>
<td>0.079</td>
<td>72</td>
<td>49</td>
</tr>
<tr>
<td>42</td>
<td>0.079</td>
<td>72</td>
<td>49</td>
</tr>
<tr>
<td>48</td>
<td>0.079</td>
<td>72</td>
<td>49</td>
</tr>
<tr>
<td>54</td>
<td>0.073</td>
<td>108</td>
<td>58-1/2</td>
</tr>
<tr>
<td>60</td>
<td>0.073</td>
<td>120</td>
<td>58-1/2</td>
</tr>
<tr>
<td>66</td>
<td>0.073</td>
<td>132</td>
<td>58-1/2</td>
</tr>
<tr>
<td>72</td>
<td>0.079</td>
<td>132</td>
<td>68-1/2</td>
</tr>
<tr>
<td>78</td>
<td>0.079</td>
<td>132</td>
<td>68-1/2</td>
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<tr>
<td>84</td>
<td>0.079</td>
<td>132</td>
<td>68-1/2</td>
</tr>
<tr>
<td>12</td>
<td>0.064</td>
<td>72</td>
<td>30</td>
</tr>
<tr>
<td>9</td>
<td>0.064</td>
<td>72</td>
<td>30</td>
</tr>
<tr>
<td>6</td>
<td>0.079</td>
<td>72</td>
<td>40</td>
</tr>
<tr>
<td>8</td>
<td>0.079</td>
<td>72</td>
<td>40</td>
</tr>
<tr>
<td>9</td>
<td>0.079</td>
<td>72</td>
<td>40</td>
</tr>
<tr>
<td>10</td>
<td>0.079</td>
<td>72</td>
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<tr>
<td>11</td>
<td>0.079</td>
<td>72</td>
<td>50</td>
</tr>
<tr>
<td>12</td>
<td>0.079</td>
<td>72</td>
<td>50</td>
</tr>
</tbody>
</table>

**Plan for Metal Inlets**

- For pipe arch, band shall be same thickness as curtain wall material.

**Date Effective:** 07/01/2004

**Date Prepared:** 08/23/2009

**Missouri Highways and Transportation Commission**

**Metal Curtain Wall and Metal Inlets**

**Sheet No.:** 725.31C

**1 OF 1**
**Construction Sequence**

1. Place bedding material to grade. Do not compact.
2. Install pipe to grade. Compact bedding outside the middle third of the pipe.
3. Place and compact the haunch area up to the springline.
4. Complete backfill according to specifications.

**Typical Cambered Flow Line**

Not higher than inlet flow line.

**Embankment Installations**

Installation partially below existing ground.

Installation on or above existing ground.

**Middle Bedding Loosely Placed Uncompacted.**

**Maxmum Diameter and Maximum Fill Height**

<table>
<thead>
<tr>
<th>Class of Pipe</th>
<th>Installation Type</th>
<th>Class I</th>
<th>Class II</th>
<th>Class III</th>
<th>Class IV</th>
<th>Class V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Diameter (inches)</td>
<td>Maximum Fill Height (in feet)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type 1</td>
<td>12</td>
<td>15</td>
<td>21</td>
<td>33</td>
<td>51</td>
<td></td>
</tr>
<tr>
<td>Type 2</td>
<td>9</td>
<td>12</td>
<td>17</td>
<td>26</td>
<td>39</td>
<td></td>
</tr>
<tr>
<td>Type 3</td>
<td>7</td>
<td>9</td>
<td>13</td>
<td>20</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>Type 4</td>
<td>4</td>
<td>6</td>
<td>9</td>
<td>13</td>
<td>20</td>
<td></td>
</tr>
</tbody>
</table>

If fill height exceeds 51 feet and pipe diameter is 36 inches or less, a special pipe design and installation procedure shall be required. If fill height exceeds 51 feet and pipe diameter is greater than 36 inches, a special design pipe is not allowed.

**Bedding and Compaction Requirements**

<table>
<thead>
<tr>
<th>Installation Type</th>
<th>Bedding Thickness</th>
<th>Haunch and Outer Bedding</th>
<th>Lower Side Bedding</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Category 1</td>
<td>Category 2</td>
<td>Category 3</td>
</tr>
<tr>
<td></td>
<td>Soil (A)</td>
<td>Soil (B)</td>
<td>Soil (C)</td>
</tr>
<tr>
<td>1</td>
<td>D₀/24 Minimum, not less than 3&quot;, if rock foundation, use D₀/12 Minimum, not less than 6&quot;.</td>
<td>95</td>
<td>N/A</td>
</tr>
<tr>
<td>2</td>
<td>D₀/24 Minimum, not less than 3&quot;, if rock foundation, use D₀/12 Minimum, not less than 6&quot;.</td>
<td>90</td>
<td>95</td>
</tr>
<tr>
<td>3</td>
<td>D₀/24 Minimum, not less than 3&quot;, if rock foundation, use D₀/12 Minimum, not less than 6&quot;.</td>
<td>85</td>
<td>90</td>
</tr>
<tr>
<td>4</td>
<td>D₀/24 Minimum, not less than 3&quot;, if rock foundation, use D₀/12 Minimum, not less than 6&quot;.</td>
<td>No Compaction Required</td>
<td>No Compaction Required</td>
</tr>
</tbody>
</table>

**Legend**

- D₀ = Normal Inside Diameter of Pipe.
- D₀ = Outside Diameter of Pipe.
- H = Fill Cover Height Over Pipe (feet).
- Min. = Minimum.
- N/A = Undisturbed Soil.

**General Notes:**

- Multiple Pipe Culverts shall be installed with a minimum clearance between pipes of 3 D₀ or 12", whichever is greater, but not to exceed 36".
- Class I and Class II Reinforced Concrete Pipe shall not be used for sewers in trenches outside roadbed and street limits.

**Missouri Highways and Transportation Commission**

Missouri Highways and Transportation Commission

105 West Capitol, Jefferson City, MO 65102
1-888-456-MODOT (1-888-275-6636)

Rigid Culvert

Installation Methods

Reinforced Concrete Pipe Culverts

Date Effective: 06/03/2019
Date Prepared: 06/29/2019

726 30J SHEET NO.
1 OF 2
EXTRA STRENGTH

STANDARD STRENGTH

CLASS 3 EXCAVATION LIMITS MEASURED FROM ORIGINAL GROUND LINE TO BOTTOM OF PIPE FOR GROUP I PIPE.

CLASS 3 EXCAVATION LIMITS MEASURED FROM ORIGINAL GROUND LINE TO BOTTOM OF TRENCH WHEN VITRIFIED CLAY PIPE IS SPECIFIED.

HEIGHT OF FILL OVER V.C. PIPE CULVERTS

<table>
<thead>
<tr>
<th>NOMINAL PIPE DIAMETER (INCH)</th>
<th>STANDARD STRENGTH</th>
<th>EXTRA STRENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TRENCH WIDTH AT ONE FOOT ABOVE TOP OF PIPE (FEET)</td>
<td>MINIMUM FILL HEIGHT (FEET)</td>
</tr>
<tr>
<td>6</td>
<td>2.0</td>
<td>1.0</td>
</tr>
<tr>
<td>8</td>
<td>2.0</td>
<td>1.0</td>
</tr>
<tr>
<td>10</td>
<td>2.5</td>
<td>1.0</td>
</tr>
<tr>
<td>12</td>
<td>2.7</td>
<td>1.0</td>
</tr>
<tr>
<td>15</td>
<td>3.5</td>
<td>1.0</td>
</tr>
<tr>
<td>18</td>
<td>3.5</td>
<td>1.0</td>
</tr>
<tr>
<td>21</td>
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<td>1.0</td>
</tr>
<tr>
<td>24</td>
<td>4.0</td>
<td>1.0</td>
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<tr>
<td>30</td>
<td>4.5</td>
<td>1.0</td>
</tr>
<tr>
<td>36</td>
<td>5.0</td>
<td>1.0</td>
</tr>
</tbody>
</table>
### Fill Height Limits

<table>
<thead>
<tr>
<th>Structural Backfill</th>
<th>Polyethylene</th>
<th>Steel Reinforced Polyethylene</th>
<th>Polyvinyl</th>
<th>Double Wall Polypropylene</th>
<th>Triple Wall Polypropylene</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specified Nominal Dia of Pipe (In.)</td>
<td>Compaction/Compaction 90% SPD</td>
<td>Compaction/Compaction 95% SPD</td>
<td>Compaction 90% SPD</td>
<td>Compaction/Compaction 90% SPD</td>
<td>Compaction/Compaction 95% SPD</td>
</tr>
<tr>
<td>12</td>
<td>2.7</td>
<td>3.5</td>
<td>2.3</td>
<td>3.1</td>
<td>2.3</td>
</tr>
<tr>
<td>15</td>
<td>2.9</td>
<td>3.7</td>
<td>2.5</td>
<td>3.3</td>
<td>2.5</td>
</tr>
<tr>
<td>18</td>
<td>3.1</td>
<td>3.9</td>
<td>2.7</td>
<td>3.5</td>
<td>2.7</td>
</tr>
<tr>
<td>24</td>
<td>3.5</td>
<td>4.3</td>
<td>2.9</td>
<td>3.7</td>
<td>2.9</td>
</tr>
<tr>
<td>30</td>
<td>3.9</td>
<td>4.7</td>
<td>3.1</td>
<td>3.9</td>
<td>3.1</td>
</tr>
<tr>
<td>36</td>
<td>4.3</td>
<td>5.1</td>
<td>3.5</td>
<td>4.3</td>
<td>3.5</td>
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<tr>
<td>42</td>
<td>4.7</td>
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<td>3.9</td>
<td>4.7</td>
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<tr>
<td>48</td>
<td>5.1</td>
<td>5.9</td>
<td>4.3</td>
<td>5.1</td>
<td>4.3</td>
</tr>
<tr>
<td>60</td>
<td>5.5</td>
<td>6.3</td>
<td>4.7</td>
<td>5.5</td>
<td>4.7</td>
</tr>
</tbody>
</table>

### Construction Sequence
1. Place bedding material to grade.
2. Compact bedding outside the middle third of the pipe.
3. Install pipe to grade.
4. Complete structural backfill according to specifications.

### Typical Cambered Flow Line

**Flow Line As Laid**

**Fill Height**

**Roadbed Not Higher Than Inlet Flow Line**

**Inlet**

**Flow Line After Expected Settlement**

**Note:**
- On yielding soil, pipe culverts shall be placed on a cambered flow line. The amount of camber will vary with soil condition and will be specified on the design plans.
- Fill height shall be measured from the top of pipe to surface.
- Fill height limits account for short-term temporary water table depths of five feet above springline. Tables are not applicable for long-term permanent water table depths above springline.
- When pipes are used as Group A, fill heights are limited to shaded values.

### Fill Height Measurement

- **Fill Height:** Measured from the top of pipe to surface.
- **Fill Height Limits:** Account for short-term temporary water table depths of five feet above springline. Tables are not applicable for long-term permanent water table depths above springline.
- When pipes are used as Group A, fill heights are limited to shaded values.

---

**Note:**
- SPD = Standard Proctor Density.

**Fill Height Limits:**
- Fill height shall be measured from the top of pipe to surface.
- Fill height limits account for short-term temporary water table depths of five feet above springline. Tables are not applicable for long-term permanent water table depths above springline.
- When pipes are used as Group A, fill heights are limited to shaded values.
PLAN OF FOOTING

BASE SECTION DIMENSIONS

<table>
<thead>
<tr>
<th>TYPE OF PIPE</th>
<th>MIN. DI.</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/4&quot; or SMALLER</td>
<td>4.0</td>
</tr>
<tr>
<td>1&quot;</td>
<td>4.5</td>
</tr>
<tr>
<td>1-1/4&quot;</td>
<td>5.0</td>
</tr>
</tbody>
</table>

+ Other Sections shall not be less than 42" Diameter.

GENERAL NOTES:

1. The Contractor will be permitted to cast in-place the manholes, in accordance with the concrete manhole standards.

2. If the Contractor elects to cast in-place the manholes, payment will be at the contract unit price for precise manholes.

3. The configuration details shown are suggestsive only and may be varied to conform with established manufacturing procedures.

4. To cut out openings, it is understood that precise pipe and fittings are shown on the plans.

5. It is understood that the level shall not be set below the top of the outlet pipe.

REINFORCEMENT SHALL BE CUT AT PIPE OPENINGS.

6. No direct payment will be made for cutting pipe. Nor shall any cutting be done by reinforcing steel.

WHERE THE WIDTH OF THE BASE SECTION IS GREATER THAN OR IS A COMPOSITE TAPER SECTION MAY BE USED TO ALLOW THE USE OF 42" REBAR SECTIONS.

7. The lower transition section as shown on Section A-A is optional.

FOIL WATER DROPS ARE REQUIRED WHEN SPECIFIED IN THE PLANS. NO DIRECT PAYMENT WILL BE MADE FOR THE FOIL WATER DROPS OR THEIR VEHICLE.

8. Sealant should be trim, all trim lines should be made on the trim lines are to be applied to form a foot of the footings.

WHERE PIPE DI AMETER EXCEEDS THE DI AMETER OF THE MANHOLE, ADJUSTMENT TO THE DI AMETERS TO BE MADE WITH THE MANHOLE DI AMETER IN THE OUTER WALLS OF THE HOLES OF THE MANHOLE CLASS 3 ELEVATION WILL NOT BE IT FOR OUTSIDE THE FOOTING LINES.

9. All pipe connected with a manhole will be measured and paid for to the inner wall of the manhole.

CONCRETE MASONRY UNIT INSTALLMENT SHALL BE IN ACCORDANCE WITH THE SPECIFICATIONS TO A MAXIMUM DEPTH OF 25 FEET. OVER 25 FOOT DEPTH THE CONCRETE MASONRY UNIT INSTALLMENT SHALL BE IN ACCORDANCE WITH THE SPECIFICATIONS TO A MAXIMUM DEPTH OF 25 FEET.

FOIL WATER DROPS ARE REQUIRED WHEN SPECIFIED IN THE PLANS. NO DIRECT PAYMENT WILL BE MADE FOR THE FOIL WATER DROPS OR THEIR VEHICLE.

10. The Contractor will be permitted to cast in-place the manholes, in accordance with the concrete manhole standards.

PRECAST MANHOLES

DATE: 07/29/2010
9:30 AM

731.00G SHEET 1 OF 2
NOTE: PERFORATING FOR LBS ON UPLIFT SECTION.

LID FOR ADJACENT SECTIONS

SECTION 0-0
OPTIONAL PRECAST CURB INLET
5'-0" OPENING

OTHER DETAILS SPECIFIED AS FOR THE 3'-0" OPENING CURB INLET THIS SHEET.

GENERAL NOTES:

NOMENCLATURE TO TYPE T:

THE LENGTH AND WIDTH OF THE INLET SHALL BE AS SHOWN ON THE PLANS.

WALLS BETWEEN THE ADJACENT SECTIONS SHALL BE REINFORCED IN AGREEMENT WITH SECTION P-5.3.4 OF THE STANDARD SPECIFICATIONS.

IF DEPTH OF INLET EXCEEDS 6 FEET THE PRECAST UNITS MAY BE FURNISHED IN TWO OR MORE SECTIONS.

IF TWO OR MORE SECTIONS ARE FURNISHED THE TYPE 3 MANHOLE FRAME AND COVER SHALL BE IN THE DOWNSTREAM SECTION ONLY.

IF A 5 FOOT OPENING IS REQUIRED TWO 2'-6" OPENING SECTIONS OR ONE 5 FOOT OPENING SECTION MAY BE PROVIDED AT THE CONTRACTOR'S OPTION.

SEE SHEET 1 FOR STEEL DETAILS AND SHEET 4 FOR GENERAL NOTES.
Details for roadway ditch inlets located within the clear zone.

General Notes:
This drawing is for general information only. Actual construction details shall conform to those shown on the detail plans.
Details on this sheet are only for use with structure located in the median or within the clear zone.

PreCast Drop Inlet
Typical Location Details - Type 5
**Tapered Sleeve Connection for Concrete and Thermoplastic Pipe**

Tapered sleeve shall be firmly wedged into pipe end before backfilling pipe pay length.

**General Notes:**
- Minor variations of detail and dimensions will be accepted to permit the use of a manufacturer's standard methods of fabrication.
- Tapered sleeves shall be fabricated from smooth 12 gauge steel coated in accordance with AASHTO M-230.
- Tapered sleeves shall be firmly wedged into the pipe end before backfilling pipe pay length.
- The length of tapered sleeve shall be sized to protect in sensitive pipe materials from sunlight. The entire cost of the tapered sleeve, hardware, and installation shall be included in the cost of the pipe.
- Tapered sleeves shall have at a minimum a half corrugation or lip designed to provide a secure connection with the end section.

**For 12" thru 24" Round Pipe Only**

**Type 1 Connection**
- 2" x 2" x \( \frac{3}{4} \) angles long with two 3" diameter bolts or bar and strap with two \( \frac{3}{4} \) diameter bolts.
- This end of band grooved to match annular corrugation in end section.

**For 12" thru 42" Pipe and Equivalent Pipe Arch**

**Type 2 Connection**
- 2" x 2" x \( \frac{3}{4} \) angles.
- Angles or bar and strap shall be riveted, bolted or resistance spot welded to the adapter band. Welds shall be painted as per standard specification 1020.19.5.
- Dimpled 10" wide, 0.062" thick adapter band.
- Riveted or bolted.

**For 30" thru 48" Pipe and Equivalent Pipe Arch**

**Type 3 Connection**
- 2" x 2" x \( \frac{3}{4} \) angles long with three \( \frac{3}{4} \) diameter bolts.
- Angles riveted, bolted or resistance spot welded to the adapter band. Welds shall be painted as per standard specification 1020.19.5.
- 10" wide corrugated adapter band.
- Riveted or bolted.

**For 6-12" or E-12a Pipe Arch**

**Type 4 Connection**
- Permissible for all sizes through 84" pipe and E-12 or E-12a pipe arch.

**Type 5 Connection**
- Permissible for all sizes.

**End Section for Pipe and Pipe Arch**

**FLARED END SECTION**

**MATERIALS AND TRANSPORTATION**

**DATE EFFECTIVE:**
- 04/05/2016

**732-005 SHEET NO. 3 DF 3**
BEVELED PIPE ENCASEMENT DETAILS

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BEVELED PIPE ENCASEMENT DETAILS

PLAN VIEW FOR HIGHWAYS

GENERAL NOTES:

- CONCRETE USED IN CONSTRUCTION OF THE BEVELED PIPE ENCASEMENT SHALL BE CLASS B CONCRETE OR AN APPROVED COMMERCIAL MIX MEETING REQUIREMENTS OF SECTION 501 OF THE STANDARD SPECIFICATIONS.
- REINFORCING STEEL USED IN CONSTRUCTION OF THE BEVELED PIPE ENCASEMENT SHALL MEET THE REQUIREMENTS OF SECTION 1036 OF THE STANDARD SPECIFICATIONS.
- THE PRICE BID PER EACH FOR "BEVELED PIPE END TREATMENT" SHALL BE CONSIDERED FULL COMPENSATION FOR FURNISHING ALL MATERIALS AND INSTALLATION OF THE BEVELED PIPE SECTION AND BEVELED PIPE ENCASEMENT AS SHOWN OR AS DIRECTED BY THE ENGINEER.
- THE 3" x 6" BOLT AND NUTS SHALL BE GALVANIZED IN ACCORDANCE WITH AASHTO M33 (ASTM A153) SPECIFICATIONS. LOW CARBON STEEL ANCHOR BOLTS SHALL MEET ASTM A570.
- BEVELED PIPE SHALL BE DRILLED AT LOCATIONS SHOWN ON PLANS FOR PLACEMENT OF 3" x 6" GALVANIZED BOLTS. THE 3" x 6" GALVANIZED BOLTS SHALL BE "DOUBLE NUTTED" AS SHOWN AND PLACED IN THE VALLEY OF PIPE CORRUGATIONS.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-800-352-MODOT (1-800-352-6636)

BEVELED PIPE END TREATMENT FOR HIGHWAYS

DATE EFFECTIVE: 07/01/2004
DATE PREPARED: 12/01/2008

732.05C SHEET NO. 1 OF 2
PIPE END DETAILS FOR PARALLEL DRAINAGE STRUCTURES FOR DRIVEWAYS

(SINGLE PIPE INSTALLATION)

NOTE:
FOR MULTIPLE PIPE INSTALLATIONS, END SECTIONS WITH SAFETY BARS SYSTEM OR OPTIONAL BAR GATE SYSTEM SHALL BE PROVIDED. SEE STANDARD PLAN 732.10.
SEE DRIVEWAY STANDARD PLANS FOR BEVELED END SECTION REQUIREMENTS.

GENERAL NOTES:
CONCRETE USED IN CONSTRUCTION OF THE BEVELED PIPE ENCASEMENT SHALL BE CLASS B CONCRETE OR AN APPROVED COMMERCIAL MIX MEETING REQUIREMENTS OF SECTION 501 OF THE STANDARD SPECIFICATIONS.

REINFORCING STEEL USED IN CONSTRUCTION OF THE BEVELED PIPE ENCASEMENT SHALL MEET THE REQUIREMENTS OF SECTION 1036 OF THE STANDARD SPECIFICATIONS.

BEVELED PIPE ENCASEMENT MAY BE USED WITH EITHER POLYETHYLENE OR CORRUGATED METALLIC COATED STEEL PIPE.

THE PRICE BID PER EACH FOR "BEVELED PIPE END TREATMENT" SHALL BE CONSIDERED FULL COMPENSATION FOR FURNISHING ALL MATERIALS AND INSTALLATION OF THE BEVELED PIPE SECTION AND BEVELED PIPE ENCASEMENT AS SHOWN OR AS DIRECTED BY THE ENGINEER.


BEVELED PIPE SHALL BE DRILLED AT LOCATIONS SHOWN ON PLANS FOR PLACEMENT OF 3/4" x 6" GALVANIZED BOLTS. THE 3/4" x 6" GALVANIZED BOLTS SHALL BE "DOUBLE NUTTED" AS SHOWN AND PLACED IN THE VALLEY OF PIPE CORRUGATIONS.
BOLTS SHALL BE USED TIGHTLY TOGETHER TO HOLD THE SURFACES.

HOLES FOR HEX HEAD BOLTS 1" X STEEL ROD OR NO. 4 GALVANIZED.

DIAMETER GALVANIZED

LONGITUDINAL BAR DETAIL

SIDE ELEVATION CIRCULAR SECTION

BOLTS AT 12" CTRS. (MAX.) SHALL BE ROLLED SNUGLY EDGE OF SIDEWALL SHEET AGAINST STEEL ROD OR BAR.

LONGITUDINAL BAR. WHEN REQUIRED, SHALL BE WELDED TO SAFETY BARS TO FORM SINGLE GRATE STRUCTURE.

LONGITUDINAL BAR IS NOT TO BE USED FOR PARALLEL DRAINAGE STRUCTURES.

END SECTIONS, INCLUDING ALL BOLTS, NUTS, RODS AND STRAPS, SHALL BE FABRICATED FROM GALVANIZED STEEL MEETING THE REQUIREMENTS OF SECTION 1020.

ALL BOLTS UNLESS OTHERWISE SHOWN SHALL BE A307 BOLTS.

WHEN REQUIRED, OPTIONAL TOE PLATE EXTENSION SHALL BE PUNCHED OR DRILLED AND BOLTED TO END SECTION TOP PLATE. STEEL FOR TOE PLATE EXTENSION SHALL BE SAME GAUGE AS END SECTION. DIMENSIONS SHALL BE OVERALL WIDTH LESS 6" BY 8" HIGH.

ATTACHMENT TO CIRCULAR PIPES 15" THROUGH 24" DIAMETER SHALL BE MADE WITH TYPE #1 STRAPS. ALL OTHER SIZES SHALL BE ATTACHED WITH TYPE #2 CONNECTORS.

SAFETY BARS AND LONGITUDINAL BARS SHALL BE FABRICATED FROM STEEL PIPE MEETING THE REQUIREMENTS OF ASTM A-53 SCHEDULE 40 SPECIFICATIONS. SAFETY BARS AND LONGITUDINAL BARS SHALL BE HOT DIPPED GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH SECTION 1020 OF STANDARD SPECIFICATIONS.

INSTALLATION SHALL BE PERFORMED IN ACCORDANCE WITH SECTION 725 AND 732 OF THE STANDARD SPECIFICATIONS.

MINOR VARIATIONS OF DETAIL WILL BE ACCEPTED TO PERMIT THE USE OF A MANUFACTURER'S STANDARD METHODS OF FABRICATION.

END SECTIONS FABRICATED FROM THICKER METAL THAN INDICATED WILL BE ACCEPTED.

ALL BOLTS SHALL BE 3/8" DIAMETER AND GALVANIZED. UNLESS OTHERWISE SHOWN.

SKIRT SECTION IS DEFINED AS THE FLARED PORTION OF THE END SECTION INCLUDING SIDE AND BOTTOM (CENTER) PANELS AND APRON.

SKIRT SECTION FOR 12" THROUGH 24" PIPES SHALL BE MADE IN ONE PIECE.

SKIRT SECTIONS FOR 30" AND LARGER PIPES MAY BE MADE FROM UP TO 2 SHEETS JOINED BY RIVETING OR BOLTING ON CENTERLINE.

SKIRT SECTIONS FROM 48" AND LARGER PIPES MAY BE MADE FROM UP TO 3 SHEETS JOINED BY RIVETING OR BOLTING EQUAL DISTANCE FROM CENTERLINE.

ALL 3 PIECE SKIRTS FOR 60" PIPES SHALL HAVE 0.109" THICK SIDES AND 0.158" THICK BOTTOM (CENTER) PANELS. WIDTH OF BOTTOM PANELS SHALL BE GREATER THAN 20% OF THE PIPE PERIPHERY CONNECTOR SECTION. CORNER PLATES AND TOE PLATES SHALL BE GALVANIZED AND OF THE SAME OR GREATER THICKNESS AS THE SKIRT.

GENERAL NOTES:

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SAFETY SLOPE END SECTION SAFETY SLOPE END SECTION SYSTEM.

NOTE:
SEE DRIVEWAY STANDARD PLANS FOR BEVELED END SECTION REQUIREMENT.
FOR CONNECTION DETAILS, SEE 732.00 SHEET 3 OF 3.

PIPE END DETAILS FOR DRAINAGE STRUCTURES
(SINGLE PIPE INSTALLATION)

NOTE:
SEE DRIVEWAY STANDARD PLANS FOR BEVELED END SECTION REQUIREMENT.
FOR CONNECTION DETAILS, SEE 732.00 SHEET 3 OF 3.

METAL END SECTIONS FOR CIRCULAR PIPES

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</table>

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-658-MODOT (1-888-266-6686)
BAR GRATE SYSTEM DATA

<table>
<thead>
<tr>
<th>PIPE SIZE</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
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<th>J</th>
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<tbody>
<tr>
<td>15&quot;</td>
<td>0</td>
<td>4</td>
<td>2' O&quot;</td>
<td>6&quot;</td>
<td>15&quot;</td>
<td>3&quot;</td>
<td>8'</td>
<td>5-3/4&quot;</td>
<td>18-4&quot;</td>
</tr>
<tr>
<td>21&quot;</td>
<td>0</td>
<td>5</td>
<td>2' 1/2&quot;</td>
<td>6&quot;</td>
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<td>3&quot;</td>
<td>12&quot;</td>
<td>5-3/4&quot;</td>
<td>18-4&quot;</td>
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<td>30&quot;</td>
<td>1</td>
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<td>3'-0&quot;</td>
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<td>12&quot;</td>
<td>4'-3&quot;</td>
<td>18-4&quot;</td>
</tr>
<tr>
<td>42&quot;</td>
<td>2</td>
<td>7</td>
<td>3'-6&quot;</td>
<td>17&quot;</td>
<td>18&quot;</td>
<td>1&quot;</td>
<td>12&quot;</td>
<td>4'-9&quot;</td>
<td>18-4&quot;</td>
</tr>
<tr>
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<td>9</td>
<td>4'-6&quot;</td>
<td>18&quot;</td>
<td>18&quot;</td>
<td>1/2&quot;</td>
<td>13&quot;</td>
<td>5'-3&quot;</td>
<td>18-4&quot;</td>
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</tbody>
</table>

**GENERAL NOTES:**

- **BAR GRATE SYSTEM** is not required for **DRAIN PIPE DIAMETER** of 21" or less, for SINGLE PIPE INSTALLATIONS.
- All steel material for **BAR GRATE SYSTEM** shall be in accordance with **ASTM A575 GRADE 1020 STEEL**.
- All material in grate system shall be galvanized.
- Galvanizing shall be done in accordance with **ASTM A123**.
- All materials, fabrication and installation of optional bar grate system used in lieu of safety bar system shall be included in contract unit price bid for end section (safety slope).

**DATE EFFECTIVE:** 06/01/2013
**DATE PREPARED:** 11/11/2013

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

OPTIMAL BAR GRATE SYSTEM FOR SAFETY SLOPE END SECTION

DATE EFFECTIVE: 06/01/2013
DATE PREPARED: 11/11/2013

732.10H SHEET NO. 3 OF 3
EXTRA STRENGTH CONNECTION DETAILS

GENERAL NOTES:

1. THE TIES SHALL BE MOUNTED ON MATT BAR CONNECTING TOGETHER ONLY FOR FIELD CONSTRUCTION TIMES.

2. THE TIES SHALL BE MOUNTED TO THE MATT BAR CONNECTING TOGETHER ONLY FOR FIELD CONSTRUCTION TIMES.

3. MATT BAR HOLES SHALL BE CUT AND BOLTED TO THE MATT BAR CONNECTING TOGETHER ONLY FOR FIELD CONSTRUCTION TIMES.

4. MATT BAR HOLES SHALL BE MOUNTED TO THE MATT BAR CONNECTING TOGETHER ONLY FOR FIELD CONSTRUCTION TIMES.

EYE BOLT TIE OPTION

DOUBLE CONNECTION TIE OPTION

DOUBLE CONNECTION TIE OPTION

REGULAR STRENGTH CONNECTION DETAILS

HOLE SIZE: 1" D. X 2" D. X 3" D.

HOLE SIZE: 1" D. X 2" D. X 3" D.

HOLE SIZE: 1" D. X 2" D. X 3" D.

HOLE SIZE: 1" D. X 2" D. X 3" D.

HOLE SIZE: 1" D. X 2" D. X 3" D.

HOLE SIZE: 1" D. X 2" D. X 3" D.

HOLE SIZE: 1" D. X 2" D. X 3" D.

HOLE SIZE: 1" D. X 2" D. X 3" D.

HOLE SIZE: 1" D. X 2" D. X 3" D.

HOLE SIZE: 1" D. X 2" D. X 3" D.

HOLE SIZE: 1" D. X 2" D. X 3" D.

HOLE SIZE: 1" D. X 2" D. X 3" D.

HOLE SIZE: 1" D. X 2" D. X 3" D.

HOLE SIZE: 1" D. X 2" D. X 3" D.

HOLE SIZE: 1" D. X 2" D. X 3" D.

HOLE SIZE: 1" D. X 2" D. X 3" D.

HOLE SIZE: 1" D. X 2" D. X 3" D.

HOLE SIZE: 1" D. X 2" D. X 3" D.

HOLE SIZE: 1" D. X 2" D. X 3" D.

HOLE SIZE: 1" D. X 2" D. X 3" D.

HOLE SIZE: 1" D. X 2" D. X 3" D.

HOLE SIZE: 1" D. X 2" D. X 3" D.

HOLE SIZE: 1" D. X 2" D. X 3" D.

HOLE SIZE: 1" D. X 2" D. X 3" D.

HOLE SIZE: 1" D. X 2" D. X 3" D.
ROCK DITCH CHECK

END VIEW

FLOW

SECTION A-A

* GEOTEXTILE LINING MAY BE INSTALLED AS REQUIRED BY THE ENGINEER.

NOTE:
ROCK DITCH CHECK IN THE CLEAR ZONE SHALL BE REMOVED OR LEVELLED IF ALLOWABLE AFTER THE VEGETATION HAS SUFFICIENTLY MATURED TO PROTECT THE DITCH OR SWALE.

EXAMPLE
DITCH CHECK SPACING
FOR STANDARD HEIGHTS

<table>
<thead>
<tr>
<th>DITCH %</th>
<th>SPACING FOR 5&quot; EFF. HEIGHT</th>
<th>SPACING FOR 18&quot; EFF. HEIGHT</th>
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</tr>
<tr>
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<td>7</td>
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</tbody>
</table>

MINIMUM DITCH CHECK SPACING

GENERAL NOTES:
OTHER PROPRIETARY DITCH CHECKS MAY BE SUBSTITUTED IN ACCORDANCE WITH SEC 806 OR AS DIRECTED BY THE ENGINEER.
INSTALLATION OF PROPRIETARY DITCH CHECKS SHALL BE ACCORDING TO THE MANUFACTURER'S RECOMMENDATIONS.

NOTE:
ROCK DITCH CHECK IN THE CLEAR ZONE SHALL BE REMOVED OR LEVELLED (IF ALLOWABLE) AFTER THE VEGETATION HAS SUFFICIENTLY MATURED TO PROTECT THE DITCH OR SWALE.

DATE EFFECTIVE: 04/01/2015
DATE PREPARED: 03/20/2015

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)
SHEET NO. 2 OF 6

2 X 4 BOARD SPACERS, LOG/SOCK

DETAIL C

SEDIMENT TRAP

NOTE:
SEDIMENT TRAP IN THE CLEAR ZONE SHALL BE REMOVED OR LEVELED (IF ALLOWABLE) AFTER THE VEGETATION HAS SUFFICIENTLY MATURATED TO PROTECT THE DITCH OR SWALE.

ELEVATION DETAIL

AGGREGATE FOR DRAINAGE SHALL BE IN ACCORDANCE WITH SEC 1009, GRADE 4 OR GRADE 5.

USE HARDWARE CLOTH 24 GAUGE WIRE MESH WITH \( \frac{1}{4} \) INCH MESH OPENINGS.

INSTALL 5 FT. T-POST WITH A 2 FOOT EMBEDMENT DEPTH (MIN.).

ATTACH HARDWARE CLOTH TO POST WITH WIRE STAPLE OR OTHER ACCEPTABLE METHODS.

SPACE POST A MAXIMUM OF 3 FT.

FOR INSTALLATION BETWEEN SECTIONS OF SILT FENCE, EXTEND AGGREGATE FOR DRAINAGE A MINIMUM OF 12 INCHES ON EACH SIDE OF SPECIAL SEDIMENT CONTROL FENCE SECTION.

INSTALLATION SHALL BE FOR AREA INLETS AND PERIMETER PROTECTION BMP'S.

ROCK/MESH SEDIMENT CONTROL FENCE
EFFECTIVE DEPTH $u_B = \text{MIN. 2}', \text{MAX. 6}' \text{ DEPENDENT UPON CONFIGURATION REQUIRED BY LOCATION AND ESTIMATED VOLUME.}$

SECTION C-C

SECTION D-D

GENERAL NOTES:

SEDIMENT BASINS ARE TO BE INCLUDED IN THE BMP SYSTEM WHEN THE GEOMETRY OF RIGHT-OF-WAY ALLOWS. WHERE INCLUDED, SEDIMENT BASINS ARE TO BE DESIGNED AND CONSTRUCTED TO PROVIDE STORAGE VOLUME FOR THE LOCAL 2-yr, 24-HOUR STORM FOR DISTURBED ACREAGE DRAINING TO THEM. IF THE DESIGN STORM VOLUME HAS NOT BEEN CALCULATED, BASINS ARE TO BE DESIGNED AND CONSTRUCTED TO PROVIDE A STORAGE VOLUME OF AT LEAST 3,600 CUBIC FEET PER DISTURBED ACRE DRAINING TO THE BASINS.

IF SEDIMENT BASIN IS TO BE PERMANENT ITS SLOPES SHALL BE STABILIZED WITH ROCK RIPRAP OR EQUIVALENT.

THE MATERIALS FOR ROCK RIPRAP SHALL MEET THE REQUIREMENTS OF SEC 611.30 FOR TYPE 2 ROCK BLANKET.

SEE PLANS FOR LENGTH, DEPTH AND WIDTH OF BASIN.

SEE PLANS FOR ESTIMATED QUANTITIES OF ROCK RIPRAP - CUBIC YARDS.
NOTE:
IN SOME CASES IT MAY BE NECESSARY TO EMBED METAL OR PLASTIC PIPE INTO THE FILL SLOPE TO SECURE PROPER ANCHORAGE.

SECTION A-A

TEMPORARY BERM
(METAL, FLEXIBLE RUBBER OR PLASTIC PIPE)

NOTE:
MAXIMUM LENGTH BETWEEN SLOPE DRAINS SHALL BE APPROXIMATELY 500 FEET.
TEMPORARY EROSION CONTROL MEASURES
SILT FENCE

GENERAL NOTES:

USE SILT FENCE FOR FILL HEIGHTS GREATER OR EQUAL TO 10 FEET. ON ALL FILLS GREATER THAN 10 FEET HIGH, MID-SLOPE RUNS OF SILT FENCE SHOULD BE CONSIDERED.

FOR FABRIC SILT FENCE:

MINIMUM LONGITUDINAL SPLICE OVERLAP SHALL BE 2' WITH A POST AT EACH END.

SECURE FABRIC TO POSTS.

INSTEAD OF SILT FENCE ACROSS DRAINAGE DITCHES AND DRAINS. DITCH CHECKS SHALL BE USED AS SHOWN ON PLANS OR AS DIRECTED BY ENGINEER.

AT CULVERTS. PLACE SEDIMENT BARRIERS OVER THE TOP OF THE CULVERTS (NOT IN THE STREAM CHANNEL).
SECTION A-A
TYPE C BERM

1. TYPE C BERM SHALL Be PLACED ABOVE THE ORCIENT HIGH WATER MARK (H.W.M.) OR AT AN ELEVATION AS DIRECTED BY THE ENGINEER.

2. VEGETATIVE MULCH CONFORMING TO 2" OR EQUIVALENT EROSION CONTROL BLANKET OR SOIL STABILIZING EMBRACE, IF REQUIRED BY THE ENGINEER.

ROCK COVER, ROCK BLANKET OR AN APPROVED ALTERNATE IF A SEDIMENT BASIN IS NOT AN OPTION.

PLAN VIEW

GENERAL NOTES:

TYPE C BERM SHALL BE BUILT TO HANDLE SIGNIFICANT RAINFALL EVENTS AND SHALL BE INSTALLED PRIOR TO SOIL STABILIZATION OF EMBANKMENT OR FILL IN THE DRAINAGE AREA OF THE BERM.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
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JEFFERSON CITY, MO 65102
1-888-457-MODOT 1-888-457-6636

TEMPORARY EROSION CONTROL MEASURES
BRIDGES AND BOX CULVERTS AT STREAM CROSSINGS

DATE EFFECTIVE: 06/21/2023
DATE AMENDED: 06/21/2023
806.10J SHEET 6 OF 6

SECTION B-B
**Typical Planting Illustrations**

**Method of Supporting Deciduous Trees**

- 3" caliber or larger
- **Method of Supporting Evergreen Trees**
  - 3' or more in height

**Notes:**

- Tree wrap shall be installed before bracing.
- Brace shall be nailed securely to post and brace block.
- Banding shall be done with a commercial banding machine.

**General Note:**

- All number measurements are nominal.

---

**Section A-A**

- Root Ball Diameter 9"
- 2" x 4" Brace
- Steel Band
- Post
- 2 steel bands
- Backfill material
- 9" Root Ball Diameter 9"
- 6' 2" x 2" x 6" Brace Block

**Section B-B**

- Root Ball Diameter 9"
- Twist wire to tighten
- Wire before twisting
- Hose
- Hole
- HOLE

---

**Method of Supporting Deciduous Trees**

- 3" caliber or larger

**Method of Supporting Evergreen Trees**

- 3' or more in height

---

**Sheet No.** 1 OF 3
MEASUREMENT OF SMALL TREES

24" BRANCHES ON ANY STEM MAY BE COUNTED

MULTI-STEM TREES ACCEPTABLE IF ONE STEM IS THE CALIBER SPECIFIED

MEASURE CALIBER

TREE WRAP

MEASUREMENT OF LARGE TREES

MEASURE CALIBER FOR TREES 4" OR LESS.

MEASURE CALIBER FOR TREES MORE THAN 4"

BASE WIDTH MEASURED NOT MORE THAN 10" ABOVE THE GROUND LINE

MEASUREMENT OF EVERGREEN TREES

MEASUREMENT OF DECIDUOUS SHRUBS

MEASURE TIP TO TIP

THINNING CUT

PRUNING CUTS

MEASURE CALIBER FOR TREES 4" OR LESS.

MEASURE CALIBER FOR TREES MORE THAN 4"

TYPICAL PLANTING ILLUSTRATIONS

MEASUREMENT AND PRUNING CUTS

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-458-MODOT (1-888-266-6636)

DATE EFFECTIVE: 07/01/2004
DATE PREPARED: 08/28/2009
808.00 SHEET NO. 2 OF 3
MINIMUM DISTANCE FOR PLANTING
ON TYPICAL CROSS SECTION

LOCATION OF SHRUBS
IN A TYPICAL PLANT BED

EVERGREEN AND
DECIDUOUS TREES

MINIMUM CLEAR
DISTANCE AS SPECIFIED
IN THE PLANS

GROUNDCOVER

MINIMUM DISTANCE FOR PLANTING
ON TYPICAL CROSS SECTION

LOCATION OF SHRUBS
IN A TYPICAL PLANT BED

EVERGREEN SHRUB
SLOPE PLANTING

DECIDUOUS SHRUB
SLOPE PLANTING

EVERGREEN SHRUB
SLOPE PLANTING

VINES AND SEEDLINGS

SPREAD MEASURED NO
MORE THAN 10" ABOVE
THE GROUND LINE.
GENERAL NOTES:

HOLES SHALL BE FINISHED ONLY FOR SPECIFIED BOLT CIRCLE.

TYPE A POLES SHALL BE EQUIPPED WITH THE GRADING LUG INSIDE THE TRANSFORMER BASE. TYPE B POLES SHALL BE EQUIPPED WITH A GRADING LUG OUTSIDE THE POLE.

TRANSFORMER BASES FOR 30-FOOT MOUNTING HEIGHT SHALL BE FINISHED AT ONE 1½" SCREW AND TAPPED HOLES FOR GRADING EQUIPMENT.


4½" MANGLE HOLES SO THAT THE PIPE IS BETWEEN THE FLOOR FURTHER AND THE MOUNTING. THE PIPE MUST BE APPROVED 4½ X 1¼" MANGLE HOLES SHALL BE REINFORCED SO THAT THE MANGLE STRENGTH IS NOT REDUCED.

ALL MANGLE HOLES SHALL CONFORM TO SECTION 13.107 OF THE TRANSFORMER BASE SPECIFICATIONS.

IF CABLE-CONNECTOR IS SPECIFIED, CABLE CONNECTORS MUST BE CONTINUOUS AND UNFLEXIBLE TO THE FIRST LAYER IXE.

THE CABLE ENTANCE AT THE BRACKET ARM SHALL BE A FIELD-FITTED 1¼" DIAMETER HOLE.

FOOT SHALL BE GRAINED FROM GROUND LUG IN FOOT WITH BOLT AND EYE CONNECTED TO CONCRETE-VARIOUS GROUND LUG SHALL BE SET OR DRILL FROM THE MANGLE.

DESIGN OF STRUCTURAL SUPPORTS SHALL COMPLY WITH ASME STANDARD SPECIFICATIONS FOR STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LAMINATES, AND TRAFFIC SIGNALS 2001 AND SUBSEQUENT 2005.

SIGNS SHALL NOT BE MOUNTED ON LIGHTING POLES.
ANCHOR BOLTS SHALL BE PLACED ONLY FOR 1 1/2" DIA. BOLT CIRCLE.

NOTES:
1. FLOOR HOLE AS NECESSARY TO CLEAR BOLT HEAD.
2. FOUNDATIONS SHALL BE INSTALLED SO THAT CONNECTOR PLATES ARE LEVEL AND PARALLEL TO THE BRACKET ARR. AND SPACED FOR FUEL PUMP PARALLEL TO THE JETTER ARR.
3. AT THE AULT OF THE CONTRACTOR THE CONCRETE FOUNDATION WILL BE POUR. IF POUR IS NOT POSSIBLE, THEN THEY SHALL BE SET IN DRILLED HOLES 5 FEET DEEPER THAN THE BOTTOM OF THE CONCRETE FOUNDATION. THE BOTTOM 5 INCHES OF THE MOUNTING PILLAR SHOULDED BE BACKFILLED WITH SET TAPERED 1/4" TAPERED LIME-TOP SCREENINGS IN LAYERS NOT EXCEEDING 12 INCHES.

GENERAL NOTES:
ALL CLASSIFICATIONS ARE BOTH HOLES OTHERWISE NOTED. SEE DRAWING SPECIFICATIONS FOR CLASSIFICATIONS NOT SHOWN.
ALL CONNECTOR PLATE ARE CLOSURE PLATE THICKNESS SHOWN ARE 0.050 INCH THICKNESS.
ALL ANCHOR BOLTS SHALL BE FULLY GALVANIZED 1/2" DIAM. MILD STEEL BOLTS.
ALL STEEL COMPONENTS SHALL NOT BE DIP GALVANIZED.
**MANUFACTURER FABRICATION DATE**

**SHOP DRAWING NO.** [blank]

**MFR. PART NUMBER** [blank]

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**IDENTIFICATION TAG**

*Tag shall be aluminum or stainless steel and attached to pole using two rivets or stainless steel fasteners. A tag hole shall be drilled prior to galvanizing.*

*Including Revision*

---

**GENERAL NOTES**

The correct mounting height will be obtained by adjusting headroom from the minimum clearance between the pole cap and the top of the bracket arm.

Holes shall be finished only for specified bolt circle.

Transformer base shall be certified as meeting the breakaway criteria and structural requirements as set by the current edition of the Specifications for Structural Supports for Highway Signs, Lighting, and Traffic Signals and meet the breakaway requirements of Section 22.

Material shall be 0.062 in. x 6 in. x 6 in. material frame shall be reinforced so that the pole strength is not reduced.

Transformer bases for all mounting shall be furnished with one drilled and two formed pin holes and grounding lug for grounding equipment.

All function holes shall conform to Section 22 of the Standard Specifications.

Type 316 poles shall be equipped with the grounding lug inside the transformer base, Type B and MB poles shall be equipped with one grounding lug inside the pole.

Pole shall be furnished from ground lug in feet 45 ft.

Concrete pole base to concrete system ground lug shall be 125 or 175 ft. from ground.

The pole entrance at the bracket arm shall be a field drilled 1-1/4 in. dia. hole.

---

**HIGHWAY LIGHTING POLES, FOUNDATIONS AND APPURTENANCES FOR 45'-0" MOUNTING HEIGHT**

**DATE EFFECTIVE:** 06/01/2014

**DATE PREPARED:** 06/20/2016

**SHEET NO.:** 2 OF 6

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**M-ODOT HIGHWAY AND TRANSPORTATION COMMISSION**

105 WEST CAPITOL

JEFFERSON CITY, MO 65102

1-888-438-WDOR (9367) 1-888-438-WDOR (9367)
**LED LUMINAIRES**

| POLE TYPE | DESIGNATION | MAX. WATT | EXTENSION TUBE | BOLTED LIGHT-HEIGHT | schematic of a pole and led luminaires

**GENERAL NOTES:**

- The lowest operating weight will be obtained by selecting luminaire from the 30° minimum clearance between the pole cap and the top of the bracket and
- The world shall be provided for the specified bolt circle.

- Transformer base shall be certified as meeting the 30° minimum clearance requirements set by the 30° minimum clearance specifications for transformers. The transformer shall be certified with the 30° minimum clearance requirements of NEMA 30B.

- The world shall be provided for a 30° minimum clearance to the transformer as per the specified bolt circle.

- All junction boxes shall conform to Section 1002 of the standard specifications.

- Type B poles shall be equipped with a grounding lug. Inside the transformer base, type B and V1 poles shall be equipped with a grounding lug inside the pole.

- The transformer shall be grounded from ground lug in the ground. Any bare copper wire to conduit system. Ground lug shall be bolted to the pole.

- The cable entrance at the bracket arm shall be a field filled 1/4 in. hole.

**HIGHWAY LIGHTING**

POLES, FOUNDATIONS, AND APPURTENANCES FOR 45' MOUNTING HEIGHT
3. AT THE OPTION OF THE CONTRACTOR THE CONCRETE PROJECTIONS MAY BE PRECAST. IF PRESENT, THEY SHALL BE SET IN DRILLED HOLES 5 FEET IN DIAMETER AND 1.5 FEET DEEPEST THAN THE BOTTOM OF THE CONCRETE FOUNDATIONS. THE BOTTOM 6 INCHES OF THE HOLE ARE THE RESULTING SPACE SHOWN. THE PROJECTIONS SHALL BE BACKFILLED WITH NET TAMPERED LIGHTWEIGHT CEMENT IN LAYERS NOT EXCEEDING 12 INCHES.

GENERAL NOTES:

4. ALL CLASSIFICATIONS ARE ASTM UNLESS OTHERWISE NOTED. SEE STANDARD SPECIFICATIONS FOR CLASSIFICATIONS NOT SHOWN.

4. ALL BOLT CIRCLES FOR 45' MOUNTING HEIGHT SHALL BE 174 IN.

4. ALL CONCRETE PLATE AND CEMENT PLATE THICKNESSES SHOWN ARE AS SHOWN IN EXHISTNCE.

4. ALL ANCHOR BOLTS SHALL BE FULLY COUNTERTIGHTED.

4. ALL DIAMETER HIGH STRENGTH ANCHOR BOLTS.

4. ALL STEEL COMPONENTS SHALL BE HOT DIP GALVANIZED.

DETAILS OF CONCRETE FOUNDATION EMBEDMENT
COIL ENDS OF CABLE-CONDUIT DITCH LINE AND COVER WITH PLANKS. IF WIRING IS INSTALLED PRIOR TO POLE INSTALLATION.

CURB SAME LOCATION BARRIER OR CURB SAME LOCATION.

CABLE-CONDUIT OR RIGID CONDUIT WHICH SHOULD BE CLASSIFIED OTHER THAN CLASS A MATERIAL.

SELECT BACKFILL

SELECT BACKFILL

TRAVELLED WAY

EDGE OF TRAVELED WAY

CABLE-CONDUIT OR RIGID CONDUIT (AS SPECIFIED)

CABLE-CONDUIT OR RIGID CONDUIT (AS SPECIFIED)

CONCRETE PULL BOX

CONCRETE PULL BOX

POLE FOUNDATION

POLE FOUNDATION

OUTSIDE EDGE OF SHOULDER

OUTSIDE EDGE OF SHOULDER

PULL BOX

PULL BOX

2'' DRAIN PIPE RIGID CONDUIT (AS SPECIFIED)

2'' DRAIN PIPE RIGID CONDUIT (AS SPECIFIED)

POLE FOUNDATION

POLE FOUNDATION

FRP PULL BOX

FRP PULL BOX

BARRIER OR MOUNTABLE CURB

BARRIER OR MOUNTABLE CURB

6'' MIN.

6'' MIN.

EDGE OF TRAVELED WAY

EDGE OF TRAVELED WAY

INSIDE SHOULDER (ALL SHOULDER TYPES)

INSIDE SHOULDER (ALL SHOULDER TYPES)

OUTSIDE SHOULDER (ALL SHOULDER TYPES)

OUTSIDE SHOULDER (ALL SHOULDER TYPES)

BEHIND GUARD RAIL

BEHIND GUARD RAIL

NOTE:

1. SEE DRAWING 902.20 FOR PULL BOXES.

2. CONDUIT MAY BE REMOVED FROM CABLES IN RIGID CONDUIT. SPLICES SHALL NOT BE MADE UNLESS SHOWN ON PLANS.

3. BRAND AND MODEL OF FUSE HOLDER SHALL BE APPROVED BY THE ENGINEER.

4. CABLES SHALL BE CONTINUOUS TO THE FIRST LIGHT POLE. SPLICES SHALL NOT BE MADE FOR THE PURPOSE OF TERMINATING CABLE-CONDUIT.

GENERAL NOTES:

THE CONDUIT OF THE CABLE-CONDUIT SHALL BE CUT AWAY FROM THE CABLES WHERE THEY ENTER THE RIGID CONDUIT INSIDE A CONCRETE BARRIER OR STRUCTURE.
CABLE-CONDUIT 1 TO LIGHTS PULLBOX 2' MIN.

- Form air gap between filter (~ cut 2/1 dia. and inside cabinet as shown).
- Insert washers between filter and inside cabinet to form air gap.

LEXAN WINDOW 1" - 2"

- Catch with flush with cabinet.
- Base flush with cabinet.
- 4" x 4" x 4" concrete apron.
- Stainless steel piano hinge.
- Drip shield.
- Top view.
- Bottom view.

LIST OF MATERIALS

1. R2 COrIn aLOCK
2. RIGID CONDUIT 
3. CLASS B CONCRETE, 0.4 C.C.
4. NEMA 4: DUST-PROOF, WATERPROOF, CABINET
5. GROUND ROUDT, 2" DIA. X 8" MIN.
6. PHOTOELECTRIC SWITCH AND SOCKET: 105/275 V., 1000-WATTS
7. TRANSPARENT PLEXIGLASS FILTER 2" X 0.087", 4" THICK.
8. CLEAN LEXAN #903, WINDOW, 1" THICK MIN.
9. MOUNTING PAN, 3" X 12" X 2" ALUMINUM OR STAINLESS STEEL.
10. PLIABLE DUCT SEALANT
11. LIFETIME SILICONE CAULK
12. ANCHOR BOLTS, 5/8 X 11 X 14" LONG BOLTS, HOT DIP GALVANIZED, 4 REQUIRED USE BOLT HEAD OR TACK WELDED NUT ON EMBEDDED END.
13. WEATHERPROOF ADHESIVE LABEL: VINYL RAISED LETTERING (OR EQUIVALENT, SEE DETAIL)

GENERAL NOTES:
- ALTERNATE CABINET DIMENSIONS WILL BE ALLOWED AS APPROVED BY THE ENGINEER. INTERIOR CABINET VOLUME SHALL BE EQUAL TO OR GREATER THAN THAT SHOWN ON PLANS AND PROPER CLEARANCES SHALL BE PROVIDED FOR ALL EQUIPMENT. CONCRETE BASE DIMENSIONS SHALL BE MODIFIED TO FIT THE CABINET SUPPLIER.
- PLACEMENT OF ALL ITEMS SHALL BE APPROVED BY THE ENGINEER.
- CABINET SHALL BE LOCATED AWAY FROM TRAFFIC. TOP MOUNT PHOTO CONTROL SHALL FACE AN OPEN SKY. SIDE MOUNT PHOTO CONTROL SHALL FACE NORTH.
- SEE PLANS FOR CIRCUIT WIRING. MAXIMUM LOADING PER CIRCUIT IS 7,400 WATTS FOR 240 VOLT AND 11,000 WATTS FOR 480 VOLT.
- SCHEMATIC DIAGRAM SHALL BE MOUNTED ON INSIDE OF CABINET DOOR.
- THE UTILITY SHALL BE NOTIFIED IN WRITING 30 DAYS PRIOR TO DATE SERVICE WILL BE REQUIRED.
- ALL OPENINGS IN CABINET SHALL BE COVERED AND SEALED WITH LIFETIME SILICONE CAULK.
- ALL MATERIALS REQUIRED EXCLUDING REFERENCE ITEMS AS SHOWN ON DRAWING SHALL BE INCLUDED IN PRICE BID FOR CONTROL STATION.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-800-455-MODOT (1-800-455-6636)

HIGHWAY LIGHTING
BASE MOUNTED CONTROL STATION
240 V OR 480 V - 4 CIRCUIT

DATE EFFECTIVE: 06/01/2005
DATE PREPARED: 06/01/2005
SHEET NO. 901.30F 1 OF 2
LIST OF MATERIALS

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Rigid conduit *</td>
</tr>
<tr>
<td>4</td>
<td>Nema 4, Dust-Tight, Watertight Cabinet</td>
</tr>
<tr>
<td>5</td>
<td>Ground Rod, 2&quot; Dia. x 8' Min.</td>
</tr>
<tr>
<td>6</td>
<td>Photocell Switch and socket, 105/285 V., 1000 Watt</td>
</tr>
<tr>
<td>7</td>
<td>Translucent, Plexiglass filter, #2067, 6&quot; Thick</td>
</tr>
<tr>
<td>8</td>
<td>Clear Lexan Window, 6&quot; Thick Min.</td>
</tr>
<tr>
<td>9</td>
<td>Mounting Pan, 315&quot; x 12&quot; x 2&quot; Aluminum or Stainless Steel</td>
</tr>
<tr>
<td>10</td>
<td>Pliable Sealant</td>
</tr>
<tr>
<td>11</td>
<td>Lifetime Silicone Caulk</td>
</tr>
<tr>
<td>12</td>
<td>Insulated Terminal Block, for greater than 4/0 cable</td>
</tr>
<tr>
<td>13</td>
<td>15/240 V, 2-Pole, 100 Amp, 120 V Coil Lighting Contactor</td>
</tr>
<tr>
<td>14</td>
<td>15/240 V, 2-Pole, 100 Amp, 240 V Coil Lighting Contactor</td>
</tr>
<tr>
<td>15</td>
<td>2-Pole, 650 Volt Lighting Arrester</td>
</tr>
<tr>
<td>16</td>
<td>1-Pole, 15 Amp, Type B Control Breaker</td>
</tr>
<tr>
<td>17</td>
<td>Insulated Ground Neutral, 100 Amp</td>
</tr>
<tr>
<td>18</td>
<td>2-Pole, 100 Amp, Type A Main Breaker</td>
</tr>
<tr>
<td>19</td>
<td>2-Pole, 15 Amp, Mini-Type A Lighting Breakers</td>
</tr>
<tr>
<td>20</td>
<td>#12 AWG Min., 600 V. Control Cable</td>
</tr>
<tr>
<td>21</td>
<td>#12 AWG Min., 600 V. Power Cable</td>
</tr>
<tr>
<td>22</td>
<td>#12 AWG Min., 600 V. Ground Cable</td>
</tr>
</tbody>
</table>

* See plans

NOTES

A Lighting system voltage as specified on plans.

B Photocell switch brackets may vary. Locate center of window over center of photocell switch.

C If for reasons of voltage drop a wire size is specified larger than the breaker lugs can accommodate, an insulated heavy duty terminal block shall be installed to terminate the larger wires and a smaller jumper connected to the breaker itself.

D Lighting circuit:

- 240 V Total
- 80 V Total

- Circuit Load (Watts)

<table>
<thead>
<tr>
<th>Size (Lamps)</th>
<th>240 V Total</th>
<th>480 V Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>0-2800</td>
<td>0-5500</td>
</tr>
<tr>
<td>20</td>
<td>2850-5100</td>
<td>5550-7400</td>
</tr>
<tr>
<td>25</td>
<td>5750-6500</td>
<td>7450-8000</td>
</tr>
<tr>
<td>30</td>
<td>6500-7400</td>
<td>8000-11000</td>
</tr>
<tr>
<td>35</td>
<td>11000</td>
<td></td>
</tr>
</tbody>
</table>

E Circuit load includes load due to line loss, lamp, and ballast load.

F All circuit breakers shall conform to section 901.4 of the standard specifications.
# LIST OF MATERIALS

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>SERVICE POLE 30' MIN. CLASS 4 MODOT CONTRACTOR PROVIDED MODOT OWNED</td>
</tr>
<tr>
<td>2</td>
<td>#2 AWG MIN. CABLE 600 VOLT</td>
</tr>
<tr>
<td>3</td>
<td>SERVICE ENTRANCE HEAD</td>
</tr>
<tr>
<td>4</td>
<td>GUY CABLE AS REQUIRED</td>
</tr>
<tr>
<td>5</td>
<td>RIGID CONDUIT 2&quot; MIN. WITH PREFORMED ELBOWS</td>
</tr>
<tr>
<td>6</td>
<td>LIGHTING ARRESTER VALVE TYPE 2 POLE 650 VOLT</td>
</tr>
<tr>
<td>7</td>
<td>METER SOCKET 200 AMP. FOR SIGNALS</td>
</tr>
<tr>
<td>8</td>
<td>METER SOCKET 200 AMP. FOR LIGHTING</td>
</tr>
<tr>
<td>9</td>
<td>LOCKING RAINLIGHT NEMA 4 SERVICE DISCONNECT BOX</td>
</tr>
<tr>
<td>10</td>
<td>THREADED CONDUIT HUB WITH SEALING WASHERS</td>
</tr>
<tr>
<td>11</td>
<td>GROUND ROD</td>
</tr>
<tr>
<td>12</td>
<td>1/2&quot; METAL CONDUIT</td>
</tr>
<tr>
<td>13</td>
<td>#2 AWG MIN. CABLE 600 VOLT</td>
</tr>
<tr>
<td>14</td>
<td>#2 AWG MIN. GROUND WIRE</td>
</tr>
<tr>
<td>15</td>
<td>GROUND ROD 3/4&quot; X 8&quot; MIN.</td>
</tr>
<tr>
<td>16</td>
<td>PB AWG MIN. CABLE 600 VOLT</td>
</tr>
<tr>
<td>17</td>
<td>CLASS B CONCRETE 0.92 C.Y.</td>
</tr>
<tr>
<td>18</td>
<td>THREADED CONDUIT HUB WITH SEALING WASHERS</td>
</tr>
<tr>
<td>19</td>
<td>WEATHERPROOF ADHESIVE LABEL LIGHTING VINYL RAISED LETTERING</td>
</tr>
<tr>
<td>20</td>
<td>WEATHERPROOF ADHESIVE LABEL SIGNALS VINYL RAISED LETTERING</td>
</tr>
<tr>
<td>21</td>
<td>#6 X 9 OR #6 X 15 GALVANIZED POST</td>
</tr>
<tr>
<td>22</td>
<td>#2 AWG MIN. CABLE 600 VOLT</td>
</tr>
<tr>
<td>23</td>
<td>RIGID CONDUIT 2&quot; MINIMUM</td>
</tr>
</tbody>
</table>

* SEE PLANS

### LIGHTING AND/OR SIGNALS

![Wiring Diagram](attachment:DIAGRAM.jpg)

**NOTES:**

- SERVICE POLE SHALL BE GUYED WHEN SPAN OF OVERHEAD SERVICE WIRE EXCEEDS 50 FEET.
- INCREASE 1 FOOT FOR EACH 5 FEET ABOVE 30 FEET.
- SERVICE DISCONNECT BOXES AND METER BOXES SHALL BE ALUMINUM OR STAINLESS STEEL. ALL HARDWARE, HINGES, Catches, etc. SHALL BE STAINLESS STEEL. METER SOCKET FOR SIGNALS OR LIGHTING AND OTHER EQUIPMENT AND MATERIALS SHALL BE U.L. APPROVED, AND CONFORM TO THE REQUIREMENTS OF THE UTILITY COMPANY OR MUNICIPALITY PROVIDING POWER.
- SCHEMATIC DIAGRAM SHALL BE MOUNTED ON Inside OF CABINET DOOR.
- UTILITY COMPANY SHALL DECIDE IF LIGHTNING ARRESTERS ARE TO BE CONNECTED ON THE LOAD OR LINE SIDE OF THE METER. THE UTILITY COMPANY SHALL ALSO DECIDE IF THE LIGHTNING ARRESTER IS TERMINATED IN THE METER OR DISCONNECT CABINET. IF TERMINATED IN THE DISCONNECT CABINET IT SHALL BE INSTALLED ON THE DISCONNECT CABINET.
- LIGHTING SYSTEM VOLTAGE OF 240 VOLTS OR 480 VOLTS AS SHOWN ON THE PLANS.
- BREAKERS SHALL CONFORM TO SEC. 901.4 OF THE STANDARD SPECIFICATIONS.
- IF SUBSURFACE CONDITIONS EXIST WHICH PROHIBIT THE PLACEMENT OF THE GROUND ROD IN A VERTICAL POSITION, THE ROD MAY BE DRIVEN AT AN OBLIQUE ANGLE NOT TO EXCEED 45 DEGREES FROM VERTICAL OR BURIED IN A TRENCH AT LEAST 30 IN. DEEP. CONNECTION TO GROUND ROD SHALL BE CAMELIZED.

**GENERAL NOTES:**

- FOR CABLE TYPES AND INSTALLATION, SEE STANDARD SPECIFICATIONS.
- THE POWER SUPPLY ASSEMBLY TYPE IS SHOWN ON THE PLANS OR IS DESIGNATED IN THE CONTRACT.
- THE UTILITY COMPANY SHALL BE NOTIFIED IN WRITING 30 DAYS PRIOR TO DATE SERVICE WILL BE REQUIRED.
- WHERE SIGNAL OR LIGHTING POWER ONLY IS DESIGNATED OMIT ITEMS NOT REQUIRED.
- ALL OPENINGS IN ANY SERVICE BOX OR METER BOX SHALL BE COVERED AND SEALED WITH LIFETIME SILICONE CAULK.
- ALL MATERIALS REQUIRED AS SHOWN ON DRAWING INCLUDING CABLE AND CONDUIT FROM POWER SUPPLY ASSEMBLY TO UTILITY COMPANY FACILITIES SHALL BE INCLUDED IN UNIT BID PRICE FOR POWER SUPPLY ASSEMBLY.

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

**HIGHWAY LIGHTING POWER SUPPLY ASSEMBLY SECONDARY SERVICE**

**DATE EFFECTIVE:** 06/01/2002

**DATE PREPARED:** 4/12/2003

**SHEET NO.** 1 OF 2

**ENGINEERING NUMBER:** 901.800
PEDESTAL OR NEW STATE-OWNED POLE TO BE SET WITHIN 2' TO 4' OF RIGHT-OF-WAY LINE. ALL SERVICE POWER SUPPLY ASSEMBLIES ARE TO BE LOCATED ON STATE PROPERTY.

PRIVATE PROPERTY
STATE PROPERTY

TOP VIEW

IF FENCE BLOCKS ACCESS TO POWER SUPPLY A 3' MIN. LOCKING GATE IS TO BE INSTALLED. (NO DIRECT PAY)

UTILITY COMPANY POLE, PEDESTAL OR PAD MOUNT TRANSFORMER

COIL CABLE FOR UTILITY COMPANY HOOKUP (MIN. 35' FOR POLE, 15' FOR PED.)

POWER INPUT SHALL BE (MIN.) 2" RIGID STEEL CONDUIT WITH THREE 1C #2 AWG CABLES.

SEPARATE FEEDS FOR LIGHTING AND SIGNALS

TO LIGHTING CABINET

TO SIGNAL CABINET

TO SIGNAL CABINET

CONCRETE FOOTING 1/4

LOCATION OF FACILITIES SHALL COMPLY WITH UTILITY COMPANY CLEARANCE STANDARDS.

NOTE:
CABLE AND CONDUIT FROM POWER SUPPLY ASSEMBLY TO UTILITY COMPANY FACILITIES SHALL BE INCLUDED IN PRICE BID FOR POWER SUPPLY ASSEMBLY.
CONDUIT LOCATIONS

PLAN VIEW

PLAN VIEW

PLAN VIEW

PLAN VIEW

CONDUIT LOCATIONS

FOR CONTROLLER CABINETS WITH
HEIGHTS FROM 6'-1" TO 6'-8"
TYPE E

FOR CONTROLLER CABINETS WITH
HEIGHTS FROM 4'-4" TO 6'-0"
TYPE EV

DOUBLE FOR TYPE 170
CONTROLLER CABINETS
TYPE 332

FOR TYPE 170
CONTROLLER CABINETS
TYPE 336S

CONDUIT AS REQUIRED

NOTES:

1. DIMENSION VARIES ACCORDING TO CABINET TYPE AND HEIGHT.
2. GROUND ROD: 3/4" DIAM. x 8' MIN. IF
   SUBSURFACE CONDITIONS EXIST WHICH PROHIBIT
   THE PLACEMENT OF THE GROUND ROD IN A VERTICAL
   POSITION, THE ROD MAY BE DRIVE AT AN ANGLE NOT TO EXCEED 45 DEGREES FROM VERTICAL.
   OR BURIED IN A TRENCH AT LEAST 3 FEET IN DEEP.
3. CONNECTION TO GROUND ROD SHALL BE CEMENTED.
4. LIFETIME SILICONE SEAL BETWEEN CABINET AND WALL.
5. #2 CORBIN LOCK
6. ANCHOR BOLTS (USE BOLT HEAD DR TACK WELDED
   NUT ON EMBEDDED END AND SIZE AS SPECIFIED BY
   CABINET MANUFACTURER.)

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISION

TRAFFIC SIGNALS
CONTROLLERS
CONDUIT LOCATION

DATE EFFECTIVE:
DATE PREPARED:
902.100
1 OF 1

0.5% MINIMUM SLOPE
NON-PAVED SURFACE
PAVED SURFACE

CONCRETE (TYP.)
1.36 C.Y.
CONCRETE
1.93 C.Y.
CONCRETE MAX.
2.41 C.Y.

ANCHOR BOLTS
1.36 C.Y.
CONCRETE
1.36 C.Y.
CONCRETE MAX.
2.41 C.Y.

ANCHOR BOLTS
1.36 C.Y.
CONCRETE
**LIST OF MATERIALS**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SERVICE POLE 30' MIN., CLASS IV WOOD, CONTRACTOR PROVIDED, MODOT OWNED</td>
</tr>
<tr>
<td>2</td>
<td>#8 AWG MIN. CABLE, 600 VOLT</td>
</tr>
<tr>
<td>3</td>
<td>SERVICE ENTRANCE HEAD</td>
</tr>
<tr>
<td>4</td>
<td>GUY CABLE, AS REQUIRED</td>
</tr>
<tr>
<td>5</td>
<td>2&quot; MIN. RIGID CONDUIT WITH PREFORMED ELBOWS</td>
</tr>
<tr>
<td>6</td>
<td>LIGHTNING ARRESTER, VALVE TYPE, 2 POLE, 650 VOLT</td>
</tr>
<tr>
<td>7</td>
<td>METER SOCKET, 200 AMP, FOR SIGNALS</td>
</tr>
<tr>
<td>8</td>
<td>2&quot; MIN. RIGID CONDUIT</td>
</tr>
<tr>
<td>9</td>
<td>SERVICE DISCONNECT BOX, LOCKING, RAIN TIGHT, NEMA 4</td>
</tr>
<tr>
<td>10</td>
<td>INSULATED, GROUNDABLE NEUTRAL, 200 AMP MINIMUM</td>
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<tr>
<td>11</td>
<td>SIGNAL BREAKER, SINGLE POLE, 40A MIN., TYPE A OR B</td>
</tr>
<tr>
<td>12</td>
<td>LIGHTING BREAKER, SINGLE POLE, 40A, TYPE A OR B</td>
</tr>
<tr>
<td>13</td>
<td>METAL CONDUIT, 1/2&quot;</td>
</tr>
<tr>
<td>14</td>
<td>GROUND WIRE, #2 AWG MIN.</td>
</tr>
<tr>
<td>15</td>
<td>GROUND Rod, 3/4&quot; x 8' MIN.</td>
</tr>
<tr>
<td>16</td>
<td>#8 AWG MIN. CABLE, 600 VOLT</td>
</tr>
<tr>
<td>17</td>
<td>CLASS B CONCRETE, 0.92 C.Y.</td>
</tr>
<tr>
<td>18</td>
<td>THREADED CONDUIT HUB WITH SEALING WASHERS</td>
</tr>
<tr>
<td>19</td>
<td>LIGHTING CABLES</td>
</tr>
<tr>
<td>20</td>
<td>WEATHERPROOF ADEHSEVE LABEL (SIGNALS) VINYL RAISED LETTERING</td>
</tr>
<tr>
<td>21</td>
<td>TYPE B CONTROLLER AND SIGNAL BREAKER, AS SPECIFIED.</td>
</tr>
<tr>
<td>22</td>
<td>TYPE B AUXILIARY BREAKER, 15 AMP</td>
</tr>
<tr>
<td>23</td>
<td>W6 x 9 OR W6 x 15 GALVANIZED POST</td>
</tr>
<tr>
<td>24</td>
<td>LIGHTING CONTROL CABINET (SEE SHEET 2)</td>
</tr>
<tr>
<td>25</td>
<td>#2 AWG MIN. CABLE, 600 VOLT</td>
</tr>
</tbody>
</table>

**NOTES**

1. SERVICE POLE SHALL BE OVED WHEN SPAN OF OVERHEAD SERVICE WIRE EXCEEDS 50'.
2. INCREASE 1 FOOT FOR EACH 5 FEET ABOVE 50 FEET.
3. SERVICE DISCONNECT BOXES AND METER BOXES SHALL BE ALUMINUM OR STAINLESS STEEL. ALL HARDWARE, HINGES, CATCHES, ETC., SHALL BE STAIN-LESS STEEL.
4. SCHEMATIC DIAGRAM SHALL BE MOUNTED ON INSIDE OF DOOR.
5. UTILTITY COMPANY SHALL DECIDE IF LIGHTNING ARRERRERS ARE TO BE CONNECTED ON THE LOAD OR LINE SIDE OF THE METER. THE UTILITY COMPANY SHALL ALSO DECIDE IF THE LIGHTNING ARRESTER IS TERMINATED IN THE METER OR DISCONNECT CABINET. IF TERMINATED IN THE DISCONNECT CABINET, IT SHALL BE INSTALLED ON THE CONNECT CABINET.
6. IF LIGHTING IS SPECIFIED, INSTALL LIGHTING CONTROL ON POWER SUPPLY.
7. BREAKERS SHALL CONFORM TO SEC. 901.4 OF THE STANDARD SPECIFICATIONS.
8. IF SUBSURFACE CONDITIONS EXIST WHICH PROHIBIT THE PLACEMENT OF THE GROUND ROD IN VERTICAL POSITION, THE ROD MAY BE DRIVEN AT AN OBLIQUE ANGLE NOT TO EXCEED 45 DEGREES FROM VERTICAL OR BURIED IN A TRENCH AT LEAST 30 IN. DEEP. CONNECTION TO GROUND ROD SHALL BE CAY WELDED.

**GENERAL NOTES:**

FOR CABLE TYPES AND INSTALLATION, SEE STANDARD SPECIFICATIONS.

THE TYPE POWER SUPPLY ASSEMBLY IS SHOWN ON THE PLANS OR IS DESIGNATED IN THE CONTRACT.

THE UTILITY COMPANY SHALL BE NOTIFIED IN WRITING 30 DAYS PRIOR TO DATE SERVICE WILL BE REQUIRED.

WHERE SIGNAL OR LIGHTING POWER ONLY IS DESIGNATED, OMIT ITEMS NOT REQUIRED.

ALL OPENINGS IN ANY SERVICE BOX OR METER BOX SHALL BE COVERED AND SEALED WITH LIFETIME SILICONE CAULK.

ALL MATERIALS REQUIRED EXCLUDING REFERENCE ITEMS AS SHOWN ON DRAWING SHALL BE INCLUDED IN PRICE BID FOR POWER SUPPLY ASSEMBLY.

FOR WIRING DIAGRAM AND LABEL DETAIL SEE SHEET 2 OF 4.

---

**TRAFFIC SIGNALS**

**POWER SUPPLY ASSEMBLY**

240/120 VOLT SERVICE

DATE EFFECTIVE: 07/01/2004

DATE PREPARED: 8/12/2009

SHEET NO. 1 OF 3

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

105 WEST CAPITOL

JEFFERSON CITY, MO 65102

1-800-45K-MODOT (1-800-295-3668)

![Diagram of Type 2 (Pedestal) Underground Service](image-url)
TRAFFIC SIGNALS
POWER SUPPLY ASSEMBLY
240/120 VOLT SERVICE

MISSOURI HIGHWAYS AND TRANSPORTATION
COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

FOR CABLE TYPES AND INSTALLATION, SEE STANDARD SPECIFICATIONS.

THE TYPE POWER SUPPLY ASSEMBLY IS SHOWN ON THE PLANS OR IS DESIGNATED IN THE CONTRACT.

THE UTILITY COMPANY SHALL BE NOTIFIED IN WRITING 30 DAYS PRIOR TO DATE SERVICE WILL BE REQUIRED.

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ALL MATERIALS REQUIRED EXCLUDING REFERENCE ITEMS AS SHOWN ON DRAWING SHALL BE INCLUDED IN PRICE BID FOR POWER SUPPLY ASSEMBLY.

GENERAL NOTES:

SERVICE POLE SHALL BE GUYED WHEN SPAN OF OVERHEAD SERVICE WIRE EXCEEDS 50'.

INCREASE 1 FOOT FOR EACH 5 FEET ABOVE 50 FEET.

SERVICE DISCONNECT BOXES AND METER BOXES SHALL BE ALUMINUM OR STAINLESS STEEL. ALL HARDWARE, HINGES, CATCHES, ETC. SHALL BE STAIN-LESS STEEL.

METER SOCKET AND OTHER EQUIPMENT AND MATERIALS SHALL BE U.L. APPROVED, AND CONFORM TO THE REQUIREMENTS OF THE UTILITY COMPANY OR MUNICIPALITY PROVIDING POWER.

SCHEMATIC DIAGRAM SHALL BE MOUNTED ON INSIDE OF DOOR.

UTILITY COMPANY SHALL DECIDE IF LIGHTNING ARRESTERS ARE TO BE CONNECTED ON THE LOAD OR LINE SIDE OF THE METER. THE UTILITY COMPANY SHALL ALSO DECIDE IF THE LIGHTNING ARRESTER IS TERMINATED IN THE METER OR DISCONNECTING CABINET. IT SHALL BE INSTALLED ON THE CONNECTING CABINET.

IF LIGHTING IS SPECIFIED, INSTALL LIGHTING CONTROL ON POWER SUPPLY.

BREAKERS SHALL CONFORM TO SEC. 901.4 OF THE STANDARD SPECIFICATIONS.

IF SUBSURFACE CONDITIONS EXIST WHICH PROHIBIT THE PLACEMENT OF THE GROUND ROD IN VERTICAL POSITION, THE ROD MAY BE DRIVEN AT AN OBLIQUE ANGLE NOT TO EXCEED 45 DEGREES FROM VERTICAL OR BURIED IN A TRENCH AT LEAST 30 IN. DEEP. CONNECTION TO GROUND ROD SHALL BE CAD WELDED.

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SCHEMATIC DIAGRAM SHALL BE MOUNTED ON INSIDE OF DOOR.

UTILITY COMPANY SHALL DECIDE IF LIGHTNING ARRESTERS ARE TO BE CONNECTED ON THE LOAD OR LINE SIDE OF THE METER. THE UTILITY COMPANY SHALL ALSO DECIDE IF THE LIGHTNING ARRESTER IS TERMINATED IN THE METER OR DISCONNECTING CABINET. IT SHALL BE INSTALLED ON THE CONNECTING CABINET.

IF LIGHTING IS SPECIFIED, INSTALL LIGHTING CONTROL ON POWER SUPPLY.

BREAKERS SHALL CONFORM TO SEC. 901.4 OF THE STANDARD SPECIFICATIONS.

IF SUBSURFACE CONDITIONS EXIST WHICH PROHIBIT THE PLACEMENT OF THE GROUND ROD IN VERTICAL POSITION, THE ROD MAY BE DRIVEN AT AN OBLIQUE ANGLE NOT TO EXCEED 45 DEGREES FROM VERTICAL OR BURIED IN A TRENCH AT LEAST 30 IN. DEEP. CONNECTION TO GROUND ROD SHALL BE CAD WELDED.

NOTES

SERVICE POLE SHALL BE GUYED WHEN SPAN OF OVERHEAD SERVICE WIRE EXCEEDS 50'.

INCREASE 1 FOOT FOR EACH 5 FEET ABOVE 50 FEET.

SERVICE DISCONNECT BOXES AND METER BOXES SHALL BE ALUMINUM OR STAINLESS STEEL. ALL HARDWARE, HINGES, CATCHES, ETC. SHALL BE STAIN-LESS STEEL.

METER SOCKET AND OTHER EQUIPMENT AND MATERIALS SHALL BE U.L. APPROVED, AND CONFORM TO THE REQUIREMENTS OF THE UTILITY COMPANY OR MUNICIPALITY PROVIDING POWER.

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IF SUBSURFACE CONDITIONS EXIST WHICH PROHIBIT THE PLACEMENT OF THE GROUND ROD IN VERTICAL POSITION, THE ROD MAY BE DRIVEN AT AN OBLIQUE ANGLE NOT TO EXCEED 45 DEGREES FROM VERTICAL OR BURIED IN A TRENCH AT LEAST 30 IN. DEEP. CONNECTION TO GROUND ROD SHALL BE CAD WELDED.
To form air gap between filter hole in cabinet, insert seal between & around Lexan window.

Photoelectric switch and socket, 105/285 V, 1000 watt.

15 amp control breaker, single pole, type B.

15 amp auto-manual switch, single pole breaker, type B, with label.

Main breaker, single pole, type B.

Neutral terminal strip.

Lighting terminal block, insulated from back panel, 12 position.

Power, cable, #8 AWG min., 600 V.

Filter, translucent, plexiglass.

Power cable, #8 AWG min., 600 V.

Continuous stainless steel hinge.

Continuous stainless steel hing.

Neoprene gasket door.

3/8"-16 collar stud.

120 volt lighting control.

Photoelectric switch & socket.

105/285 V, 1000 watt.

15 amp control breaker, single pole, type B.

15 amp auto-manual switch, single pole breaker, type B, with label.

Main breaker, single pole, type B.

Neutral terminal strip.

Lighting terminal block, insulated from back panel, 12 position.

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Main breaker, single pole, type B.

Neutral terminal strip.

Lighting terminal block, insulated from back panel, 12 position.

Power, cable, #8 AWG min., 600 V.

Filter, translucent, plexiglass.

Power cable, #8 AWG min., 600 V.
2 PIECE INTERLOCKING COVER

BOLT (2 REQUIRED)

CLASS 1 OR 2

PREFORMED PULL BOX COVER

<table>
<thead>
<tr>
<th>NUMBER ENTERING CONDUCTORS</th>
<th>CLASS</th>
<th>PREFORMED PULL BOX MINIMUM DIMENSIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>4</td>
<td>23</td>
<td>17&quot; 30&quot; 22&quot;</td>
</tr>
<tr>
<td>23 - 68</td>
<td>2</td>
<td>24&quot; 36&quot; 24&quot;</td>
</tr>
<tr>
<td>&gt; 68</td>
<td>3</td>
<td>30&quot; 48&quot; 36&quot;</td>
</tr>
</tbody>
</table>

1. ALL METAL CONDUITS SHALL BE ELECTRICALLY BONDED BY A GROUND BUSHING AND #6 AND DARE COPPER WIRE. FOR PVC CONDUITS, ALL GROUND WIRES SHALL BE CONNECTED.
2. SIGNAL PULL BOXES SHALL BE EMBOSSED "STATE SIGNALS" AND LIGHTING PULL BOXES "STATE LIGHTING."
3. PULL BOX FRAMES AND COVERS SHALL BE CAST IRON AND THE FOLLOWING MINIMUM DIMENSIONS:

   | FRAME SIZE:      | 29" X 29" |
   | OPENING SIZE:    | 22" X 22" |
   | FRAME WEIGHT:    | 120 LBS.  |
   | COVER SIZE:      | 22" X 22" |
   | COVER THICKNESS: | 1/2"       |
   | COVER WEIGHT:    | 140 LBS.  |

GENERAL NOTES:

IF AN EXTENSION IS USED WITH A PREFORMED BOX, THE LIP OF THE EXTENSION MAY BE INTERIOR OR EXTERIOR. THE EXTENSION SHALL BE COMPATIBLE AND FROM THE SAME MANUFACTURER.

IF PREFORMED PULL BOXES ARE SPECIFIED, THE CONTRACTOR MAY USE THE STANDARD CONCRETE PULL BOX IN LIEU OF THE CLASS 1 OR 2 PREFORMED PULL BOX OR THE DOUBLE CONCRETE PULL BOX, TYPE A, IN LIEU OF THE CLASS 3 PREFORMED PULL BOXES.
GENERAL NOTES:

A minimum of nine hooks, installed in three levels, shall be included with each pull box.

If subsurface conditions exist which prohibit the placement of the ground rod in a vertical position, the rod may be driven at an oblique angle not to exceed 45 degrees from vertical or buried in a trench at least 30 in. deep. Connection to ground rod shall be cadwelded.

The circular pull box cover should be sized to fit a box with a clear opening of 25".

AGGREGATE SHALL BE TYPE I CONFORMING TO SEC 1007.

BOX SHALL BE OF A FLARE DESIGN AND HAVE A LIP FOR STABILIZATION.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

TRAFFIC SIGNALS
CONCRETE AND PREFORMED PULL BOXES

DATE EFFECTIVE: 11/01/2010
DATE PREPARED: 9/3/2010
SHEET NO. 3 OF 3

SHEET NO. 3 OF 3

TRAFFIC SIGNALS
CONCRETE AND PREFORMED PULL BOXES

DATE EFFECTIVE: 11/01/2010
DATE PREPARED: 9/3/2010
SHEET NO. 3 OF 3
MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

TRAFFIC SIGNALS POST BASES

NOTE:
ALL ANCHOR BOLTS SHALL BE FULLY GALVANIZED.

OPTIONAL STEEL PLATE FOR ANCHOR BOLTS

SIDE VIEW
END VIEW

TWO BOLTS PER PLATE
HEX NUT OR 3/8" FILLET WELD ALL AROUND BOTH SIDES

SIDE VIEW
END VIEW

FOUR BOLTS PER PLATE
HEX NUT OR 3/8" FILLET WELD ALL AROUND BOTH SIDES

DETAIL A

STAINLESS STEEL BOLT & NUT
GROUND LUG
WEATHER-PROOF DOOR
GALVANIZED HEX NUT & WASHER
ANCHOR BOLT

BOI_ T VERT. THREAD DIA. LENGTH HT. A LEN. B C INCHES INCHES INCHES INCHES
19 17 1.50 0.625
57 51 7.00 1.250
79 73 7.50 1.500
94 88 8.00 1.750
121 115 8.50 2.000
120 114 9.00 2.250
146 140 9.50 2.500

DATE EFFECTIVE: 02/01/2008
DATE PREPARED: 08/26/2009

TRAFFIC SIGNALS
POST BASES

OPTIONAL STEEL PLATE FOR ANCHOR BOLTS

SIDE VIEW
END VIEW

TWO BOLTS PER PLATE
HEX NUT OR 3/8" FILLET WELD ALL AROUND BOTH SIDES

SIDE VIEW
END VIEW

FOUR BOLTS PER PLATE
HEX NUT OR 3/8" FILLET WELD ALL AROUND BOTH SIDES

ANCHOR BOLT

NOTE:
ALL ANCHOR BOLTS SHALL BE FULLY GALVANIZED.
TYPICAL TOP VIEW

TYPICAL POST LOADING

MAST ARM LOADING

MINIMUM DESIGN LOADING FOR POST AND MAST ARM ATTACHMENTS

TRAFFIC SIGNALS
TUBULAR STEEL POSTS
DESIGN LOADING REQUIREMENTS
LOOP SHALL BE #16 AWG STRENGTH WIRE IN PDF DEP'ED UP OF 2 NON-TWISTED TIPS IN SINGLE SLOT OR AS RECOMMENDED BY MANUFACTURER OF DETECTOR AMPLIFIER. LOOP SHALL BE PLACED IN SAWED SLOTS IN A FIGURE EIGHT MANNER.

IF EXISTING LOOPS ARE TO BE ABANDONED AND NEW LOOP INSTALLED, ABANDONED LOOP WIRES SHALL BE REMOVED OR CUT COMPLETELY THROUGH.

VEHICLE FLOW

LOOP CONFIGURATION

ABANDONED LOOPS
STEEL POST DETAILS

1. 6" IF LOCATED WITHIN 6" OF CONCRETE MEDIAN.
2. DOUBLE GALVANIZED 3/4" MIN. STEEL MESSANGER WIRE - 7 STRAND HIGH STRENGTH STEEL.
3. 3/4" AUTOMATIC JAW TYPE CABLE FITTING WITH SHORT BAIL: 15,800 LBS. MINIMUM HOLDING STRENGTH.
4. 1-1/4" X 6" MIN. COPPER GROUND ROD, ONE POLE SHALL BE GROUNDED BY CONNECTING NO. 6 AND CAGE COPPER WIRE FROM CABLE TO GROUND ROD. EACH END OF A GROUNDED CABLE CLAMP LOCATED INSIDE OF POLE. GROUND LUG SHALL BE OBTAINED NOT TO EXCEED 1/2" IN DIAMETER. GROUNDING DEVICE CONSISTS OF WIRE FROM GROUND ROD IN A VERTICAL PLANE. THE GROUND ROD IS TO BE PLANTED AT 28 INCH DEEP. CONNECTION TO GROUND ROD SHALL BE OBTAINED.
5. GALVANIZED 1 1/2" STEEL CLEVIS CLAMP TO FASTEN TO THE POLE WITH 1 1/2" GALVANIZED CARRIAGE BOLTS.
6. RAKE AS NECESSARY, TO MAXIMUM.
7. NON-CORRODIBLE MEDIUM CARBON STEEL NON-CONDUCTING RODS.
8. MULTI-CONDUCTOR CABLE (AS REQUIRED).
9. 3/4" AUTOMATIC JAW TYPE CABLE FITTING WITH SHORT BAIL: 5500 LBS. MINIMUM HOLDING STRENGTH.
10. 1-1/4" X 6" WAZERHEAD AND COVER WITH REINFORCED FRAME RIBBED TO POLE.
11. ONE-PIECE OR TWO-PIECE METAL BASE COVER OR ДиВЕРСИОН НУТ LOADERS.
12. FULLY GALVANIZED ANCHOR BOLT WITH BOLT HEAD OF THIS REEDED ROD IN EXPOSED END.
13. FIRE ENTRANCE WITH INSULATED REBAR/REBAR BRUSHING (AS REQUIRED).
14. DOUBLE GALVANIZED 3/4" STEEL - 7 STRAND HIGH STRENGTH STEEL TENDER WIRE ONE CLAMP TO POLE WITH SMALL RELEASE INTERNALS. INSTALL MOUNTING OR EMBIL MOUNTING.
15. TYPE 4-10 BASE. SEE STANDARD 809 FOR DETAILS.
16. LUMINAL RING BRACKET AS SPECIFIED IN DETAILS. SEE STANDARD 809 FOR MOUNTING DETAILS.
17. HINGE LUGS (AS REQUIRED).
18. STEEL PLATE (AS REQUIRED).
19. CONCRETE BASE (AS SPECIFIED).
20. CONCRETE FINISH (AS SPECIFIED).

GENERAL NOTES:
- DETAILS OF STRUCTURAL SUPPORTS SHALL COMPLY WITH ADOPTED STANDARD SPECIFICATIONS FOR STRUCTURAL SUPPORTS FOR MEDIUM VOLUME LUMINALS AND TRAFFIC SIGNALS.
- MAXIMUM SPAN LENGTHS:
  - MIN. 6'-0" FOR ONE OR TWO SPANS OFF POST WITH NO WIRE.
  - MIN. 9'-0" FOR TWO SPANS OFF POST WITH WIRE.
  - MIN. 14'-0" FOR THREE SPANS OFF POST WITH WIRE.
  - MIN. 20'-0" FOR FOUR SPANS OFF POST.

CONCRETE POST EXEMPT TO BE CONCRETE.

TRAFFIC SIGNALS:
RIGID SPAN WIRE DETAILS

DATE EFFECTIVE: 06/12/2003
DATE REVISED: 06/06/2003
902.7OP SHEET NO. 2 OF 2
### Structural Sign Data

<table>
<thead>
<tr>
<th>DESIGNATION</th>
<th>COLOR SCHEME</th>
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<tbody>
<tr>
<td></td>
<td>LEGEND</td>
<td>BACKGROUND</td>
</tr>
<tr>
<td>Structural (ST)</td>
<td>BLK</td>
<td>WHT</td>
</tr>
<tr>
<td>Structural Fluorescent (STF)</td>
<td>BLK</td>
<td>Fl Yellow</td>
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</tbody>
</table>

Note: White legend is direct applied unless specified otherwise.

### Flat Sheet Sign Data

<table>
<thead>
<tr>
<th>DESIGNATION</th>
<th>COLOR SCHEME</th>
<th>SHEETING</th>
</tr>
</thead>
<tbody>
<tr>
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<td>LEGEND</td>
<td>BACKGROUND</td>
</tr>
<tr>
<td>Flat Sheet (SH)</td>
<td>BLK</td>
<td>WHT</td>
</tr>
<tr>
<td>Flat Sheet Fluorescent (SHF)</td>
<td>BLK</td>
<td>Fl Yellow</td>
</tr>
</tbody>
</table>

Note: Legend and background colors are achieved through transmittant tints and films.

### Flat Sheet Thickness

<table>
<thead>
<tr>
<th>SIGN SIZE</th>
<th>THICKNESS</th>
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<tbody>
<tr>
<td>14&quot; WIDE</td>
<td>0.060 IN.</td>
</tr>
<tr>
<td>20&quot; WIDE</td>
<td>0.100 IN.</td>
</tr>
<tr>
<td>36&quot; WIDE</td>
<td>0.125 IN.</td>
</tr>
</tbody>
</table>
**MODOT ID LABEL DETAILS**

Placed on the sign face

**Vendor ID Label Details**

Placed on the back of the sign

**Example Vendor ID Label**

**Acme Sign Company**

Midwest, US 55555

800-555-5555

Sign Fabrication Date: June 8, 2016

**General Notes**

All details shall be full screen printed with matte compound on the sheeting materials
to provide a label that has an equal life expectancy as the sign face.

MOJO ID Labels shall be printed on clear electrostatic film background with black ink or it
may be incorporated into the full screen detail and printed along with the sign face.

Sticker ID Labels shall be located on the back of the sign in the lower right corner of a
returning sign of rectangular shape or at the lower right corner of a stop sign in close
proximity to the sign border. Avoid bolt hole locations.

**Vendor ID Label shall contain the company contact information, including full name, city,
state, phone number, and the sign fabrication date.**

**Vendor ID Label shall be located on the back of the sign in the lower right corner of a
typical shape or at the lower right corner of a stop sign or yield signs.**

**Stop**

**Yield**

**Destination**

**← Destination →**

**← Destination →**
ONE POST ASSEMBLY
USE TO SUPPORT UP TO 4 ROUTE MARKERS

TWO POST ASSEMBLY
USE TO SUPPORT 5 OR 6 ROUTE MARKERS

STANDARD BACKING BAR LAYOUT

OPTIMAL BACKING BAR LAYOUT

DETAILED A
SEE GENERAL NOTES

DETAILED B
SEE GENERAL NOTES

GENERAL NOTES:

ALL BACKING BARS SHALL BE 2" X 4" STEEL, GALVANIZED, AFTER FINISHING. WEIGHT = 0.55 LB. PER FOOT. HOLES IN BARS SHALL BE #14 AND SHALL BE FINISHED AS SHOWN ON THIS DRAWING.

DETAIL A - THE END OF THE HORIZONTAL BACKING BARS SHALL EXTEND MAXIMUM OF 3 1/2" IN PAST THE SIGN BOLT, BUT SHALL NOT EXCEED THE EDGE OF THE SIGN.

DETAIL B - FOR SIGNS INSTALLED ON THE PARALLEL HORIZONTAL BACKING BARS, ONE ADDITIONAL BOLT SHALL BE ADDED TO THE LEFT SIGN TO KEEP ASSEMBLY SQUARE.

WHEN USING OPTIONAL BACKING BAR LAYOUT, VERTICAL BARS SHALL BE MOUNTED CENTERED HORIZONTAL BARS.

BACKING BARS SHALL MEET MISSOURI STANDARD PLANS OR APPROVED PRODUCTS LIST.

BACKING BARS MADE OF STRUCTURAL STEEL. PER FUTURE.

ALL SIGNS TO BE INSTALLED ALONG VERTICAL CENTERLINES.

FOR POST AND FOOTING DATA SEE DETAILS OF SIGNS AND MARKERS. SEE OTHER DRAWINGS.

MINIMAL VERTICAL SPACING INTERIEUR BETWEEN SIGNS TO BE ACHIEVED BY USING THE CLOSEST AVAILABLE HOLES WHEN USING POST.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-457-MODOT (463-6868)

HIGHWAY SIGNING
BACKING BARS
SHEET 4 OF 8
ROUTE SHIELD AND MARKER ASSEMBLIES

MOOD: 403.02AP

DATE FIRST PRINTED: 7/6/2006

DATE MODIFIED: 3/1/2007

DATE RETURNED: 8/1/2007
GENERAL NOTES:

SIGNS WITH FOUR OR MORE HOLES REQUIRE BACKING BARS OR MULTIPLE POSTS.

HOLES IN SIGNS SHALL BE 1/8" AND PUNCHED AS SHOWN ON THIS DRAWING.

FLAT SHEET FOR SIGNS SHALL BE THE FOLLOWING THICKNESS:

- 9 SQUARE FEET OR LESS - .080 IN.
- OVER 9 SQUARE FEET BUT LESS THAN 16 SQUARE FEET - .100 IN.
- 16 SQUARE FEET OR LARGER - .125 IN.

FOR MOUNTING DETAILS, SEE OTHER DRAWINGS.

BACKING BARS MAY BE REQUIRED FOR FOUR HOLE PUNCH INSTALLATION.
Wide Flange Structural Steel Posts Design Data

Perforated Fuse Plate Data Table

Splice Plate Data Table

The weight of structural steel posts shown in the contract has been computed using the weights shown.

Direction of Traffic

Cut Post

Splice Plate

Perforated Fuse Plate and Splice Plate Detail

Notes:

For general notes, see Sheet 1 of 16.

For locations where traffic may strike the backside of the post, perforated fuse plates shall be installed on both sides of the post.

Missouri Highways and Transportation Commission

Post Installation Details

Hinge Details

Wide Flange (WF) Posts

Elevation D-D

Splice Plate Thickness = 0

Perforated Fuse Plate Thickness = f

All holes shall be filled; all plate cuts shall preferably be arc cuts. Moreover, flange cutting shall be permitted provided all edges are ground.

Perforated Fuse Plate and Splice Plate shall be fabricated from ASTM A 50 Structural Steel.
DITCH SECTION

BARRIER CURB SECTIONS

FILL SECTION

POST SPACING

GENERAL NOTES:

FOR GENERAL NOTES, SEE SHEET 1 OF 16.

VERTICAL CLEARANCE FROM THE ROADWAY SHALL BE 7.5 FT AND INCREASED ONLY TO MEET THE 7.75 FT MINIMUM VERTICAL CLEARANCE FROM THE ROADWAY.

POST SIZE IS DETERMINED USING SIGN WEIGHT, SIGN WIDTH AND CLEAR HEIGHT. THE CLEAR HEIGHT IS EQUAL TO THE LENGTH OF THE LOWEST POST MEASURED FROM THE GROUND TO THE BOTTOM OF THE SIGN.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

POST INSTALLATION DETAILS

TYPICAL SECTION: MOUNTING HEIGHT AND POST SPACING WIDE FLANGE (WF) POSTS

NOTE: SEE SHEET 2 FOR FINE FLUTE DETAILS.
**NOTES:**

For general notes, see Sheet 1 of 16.

For extruded aluminum panel and post clip details, see Standard Plans 903.02 Sheet 4 of 7.

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

**SIGN MOUNTING DETAILS**

WIDE FLANGE (WF) POSTS

**SIGN POSTS**

- 3 signs shall be field attached to posts with post clips and bolts. See Post Clip Detail. The shear of the Post Clip Bolt shall fit tightly against the Post Flange after the Locknut is torqued. Locknuts on the Post Clip Bolts shall be torqued to 225 inch-feet when using 250 clean, un lubricated washers.

**FOR EXTRUDED ALUMINUM PANEL AND POST CLIP DETAILS,** see Standard Plans 903.02 Sheet 4 of 7.

**FOR GENERAL NOTES,** see Sheet 1 of 16.
CLAMP TYPE SIGN SUPPORT FOR PIPE POST

WIDTH OF PIPE POST CLAMP

<table>
<thead>
<tr>
<th>SIGN TYPE</th>
<th>MINIMUM &quot;</th>
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</thead>
<tbody>
<tr>
<td>FLAT</td>
<td>1 1/2&quot;</td>
</tr>
<tr>
<td>STRUCTURAL</td>
<td>3&quot;</td>
</tr>
</tbody>
</table>

MOUNTING DETAILS FOR FLAT SHEET SIGNS ON PIPE POST

NOTES:
FOR GENERAL NOTES, see SHEET 1 OF 16.
FOR MOUNTING WEIGHT AND OFFSET DETAILS, see SHEET 10 OF 16.
FOR DETAILS OF EXTRUDED ALUMINUM PANEL AND POST CLIP DETAILS, see STANDARD PLANS 903.02 SHEET 3 OF 7.

MOUNTING DETAILS FOR FLAT SHEET ON PIPE POST

MISSOURI HIGHWAYS AND TRANSPORTATION
COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-MO-DOT-HD (1-888-663-6683)

SIGN MOUNTING DETAILS
Pipe Post

SIGN MOUNTING DETAILS
Pipe Post
**Extruded Panel Mounting Detail**

**T-Bolt Detail**

**Notes:**
- Aluminum bolts shall be ASTM E 291, 2017-14 or 601-16.
- Aluminum flat washers shall be ASTM E 209, A325 2017-14 or 2016-16.
- Aluminum lock nuts (nylon insert) shall be ASTM E 291 or 2017-14.

For the general notes, see Sheet 1 of 16.
For mounting height and offset details, see Sheet 10 of 16.
For post clip details, see standard plans 903-02 SHEET 6 OF 7.
Alternate post mounting hardware use shall be on approved list.

**TABLE:**

<table>
<thead>
<tr>
<th>Sign Height</th>
<th>No. of Bolts Per Post Foot Hole</th>
</tr>
</thead>
<tbody>
<tr>
<td>1'</td>
<td>2</td>
</tr>
<tr>
<td>2'</td>
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</tr>
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<td>4'</td>
<td>5</td>
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<td>5'</td>
<td>6</td>
</tr>
<tr>
<td>6'</td>
<td>7</td>
</tr>
<tr>
<td>7'</td>
<td>8</td>
</tr>
</tbody>
</table>
ONE POST - SINGLE SIGN

EDGE OF TRAVEL LANE
OR SHOULDER

MIN. 12" FROM TRAVEL LINE
MIN. 12" FROM SHOULDER

FOOTPRINT

GROUND

ONE POST - SINGLE SIGN WITH SUPPLEMENTAL PLAQUE

EDGE OF TRAVEL LANE
OR SHOULDER

MIN. 12" FROM TRAVEL LINE
MIN. 12" FROM SHOULDER

FOOTPRINT

GROUND

TWO POST

EDGE OF TRAVEL LANE
OR SHOULDER

MIN. 12" FROM TRAVEL LINE
MIN. 12" FROM SHOULDER

FOOTPRINT

GROUND

+ BASED ON PLANS AND FIELD CONDITIONS

2" TO 8" +

EDGE OF TRAVEL LANE
OR SHOULDER

CHEVRON SIGN

EDGE OF SIGN TO LINE UP WITH THE EDGE OF OBJECT

OBJECT

GROUND

TYPE III OBJECT MARKER

EDGE OF TRAVEL LANE
OR SHOULDER

MIN. 12" FROM TRAVEL LINE

FOOTPRINT

GROUND

ADJACENT TO CURB

GROUND

GENERAL NOTES:

SIGN MOUNTING BOLTS SHALL BE INSTALLED WITH A NYLON WASHER AGAINST THE SIGN FACE WITH A STEEL WASHER BETWEEN THE NYLON WASHER AND BOLT HEAD.

A LOCKNUT SHALL BE USED TO FASTEN THE SIGN TO THE POST.

VERTICAL CLEARANCE FROM THE PAVEMENT SHALL BE NET AND INCREDIBLE PAVEMENT TO MEET THE MINIMUM VERTICAL CLEARANCE FROM THE GROUND.

HORIZONTAL OFFSET MAY BE ADJUSTED BASED ON FIELD CONDITIONS.

MISSOURI HIGHWAYS AND TRANSPORTATION
COMMISSION

SIGN MOUNTING DETAILS
MOUNTING HEIGHT & OFFSET
PIPE POSTS, PSST, WOOD & U-CHANNEL POSTS

MISSOURI DEPARTMENT OF TRANSPORTATION

903.03BM
10 OF 16
CHANNEL POST DELINEATOR AND FASTENER DETAILS

GROUND MOUNT U-CHANNEL

CHANNEL POST DELINEATOR AND FASTENER DETAILS

36 INCH SURFACE-MOUNT DELINEATOR POST
TUBULAR DELINEATOR DETAIL
COLOR OF TUBULAR DELINEATOR AND REFLECTIVE SHEETING SHALL MATCH THE COLOR OF THE LOWEST MOUNTING OR CURB WARNING.
TUBULAR DELINEATOR SHAPE MAY BE ROUND OR SQUARE. TUBULAR DELINEATOR SHALL BE PERMANENTLY MOUNTED TO THE LOWEST MOUNTING OR CURB WARNING. THE MANUFACTURER'S RECOMMENDATIONS.

DELIMITER PLACEMENT FOR MEDIAN STRIPS

DELIMITER PLACEMENT FOR ISLANDS

DELIMITER PLACEMENT LOCATED AT THE CURB POINTS

RETROREFLECTIVE SHEETING TYPE II
WHITE OR YELLOW

NOTES:
RETROREFLECTIVE WHITE OR RED SHEETING IS REFERENCED TO RETRO REFLECTIVE SHEETING OF THE CURB WARNING. THE COLOR OF THE SHEETING SHALL MATCH THE COLOR OF THE LOWEST MOUNTING WARNING.
3" X 6" DELINEATOR BOLTS SHALL BE MADE FROM 0.800 INCH STEEL.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-MODOT-Help (1-888-663-6835)

SIGN MOUNTING DETAILS
DELINERATORS

DATE EFFECTIVE: 06/24/2013
DATE MODIFIED: 05/02/2014
SHEET NO.: 11 OF 16
DELINEATORS ON CONCRETE TRAFFIC BARRIER
FOR CONCRETE BARRIER DETAILS,
SEE STN PLANS 817-10 OR BRIDGE PLANS.

NOTE:
- FOR GENERAL NOTES, SEE SHEET 1 OF 16.
- REFLECTIVE YELLOW, WHITE OR RED SHEETING IN
  ACCORDANCE WITH 8TH EDITION OF FCHS TYPICAL
  RECOMMENDED PRACTICES WILL BE APPLIED TO ONLY
  ONE SIDE OF THE Delineator REFLECTOR BODY.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-800-941-MODOT (6636)

SIGN MOUNTING DETAILS CONCRETE BARRIER DELINEATORS
DATE EFFECTIVE: 06/04/2010
DATE REVISED: 03/08/2006
903.03BM SHEET NO. 12 OF 16

ROADWAY OR BRIDGE CONCRETE TRAFFIC BARRIER DELINEATION

NOTE:
- SECONDARY Delineator ON BACK SIDE NOT REQUIRED IF ROADWAY 4" HAS MORE THAN 2 LANES
DELINEATORS ON GUARDRAIL
FOR GUARDRAIL DETAILS, SEE SHEET PLANS 606.00 AND 606.50.
(1) A SECONDARY DELINEATOR WITH REFLECTIVE SHEETING SHALL BE ATTACHED TO THE BACK SIDE OF THE GUARDRAIL WHEN THE DELINEATION IS PLACED ALONG A DIVERSIONARY ROAD AND SHALL BE VISIBLE BY DRIVING (NOT TRAFFIC).

DELINEATORS ON THREE-STRAND MEDIAN GUARD CABLE
FOR THREE-STRAND GUARD CABLE DETAILS, SEE SHEET PLANS 606.41.

NOTES:
FOR GENERAL NOTES, SEE SHEET 1 OF 16.

RETROREFLECTIVE YELLOW, WHITE OR RED SHEETING IN CONFORMANCE WITH RP1-69095 TYPE S OR R SHALL BE APPLIED TO ONLY ONE SIDE OF THE GUARDRAIL POST DELINEATOR MOUNTED TOWARDS THE CHANNEL POST.

RETROREFLECTIVE SHEETING SHALL FOLLOW GUIDELINES OUTLINED IN RP1-10102-22 FOR CORRECT APPLICATION OF SHEETING TO DELINEATOR BODY. THE COLOR OF THE SHEETING SHALL MATCH THE CLOSEST ADJACENT PAINTED MARKING.
LEGEND

- WHITE DELINER
- YELLOW DELINER
- WHITE DOUBLE STATED DELINER
- RED DELINER

DELINER SPACING ON HORIZONTAL CURVES

<table>
<thead>
<tr>
<th>RADIUS OF CURVE (FEET)</th>
<th>SPACING ON CURVE (FEET)</th>
<th>SPACING IN ADVANCE &amp; BEHIND CURVE (FEET)</th>
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<tbody>
<tr>
<td>50</td>
<td>30</td>
<td>60, 90, 100</td>
</tr>
<tr>
<td>100</td>
<td>35</td>
<td>70, 100, 100</td>
</tr>
<tr>
<td>150</td>
<td>40</td>
<td>85, 100, 100</td>
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<td>200</td>
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<tr>
<td>250</td>
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<td>300</td>
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<tr>
<td>400</td>
<td>70</td>
<td>100, 100, 100</td>
</tr>
<tr>
<td>450</td>
<td>75</td>
<td>100, 100, 100</td>
</tr>
<tr>
<td>500</td>
<td>80</td>
<td>100, 100, 100</td>
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<td>550</td>
<td>85</td>
<td>100, 100, 100</td>
</tr>
<tr>
<td>600</td>
<td>90</td>
<td>100, 100, 100</td>
</tr>
</tbody>
</table>

5' SPACING ON CURVE = 5/V2 = 42.5 OR MAY BE INTERPOLATED FROM TABLE.
MINIMUM SPACING = 20 FEET.

SPACING OF FIRST DELINER IN ADVANCE OF AND BEYOND CURVE = 3 x 5.
THE SECOND = 5 x 5 AND THE THIRD = 6 x 5 BUT NOT TO EXCEED 100 FEET.
MAXIMUM SPACING = 100 FEET.

DELINERs SHALL BE INSTALLED FACING Approach TRAFFIC. YELLOW DELINERs SHOULD BEGIN EVEN WITH THE SAME EXIT SIGNS AND ENd
60 FEET FROM THE CURVE POINT. WHITE DELINERs SHOULD EXTEND
BEYOND THE FIRST YELLOW DELINER. RED DELINERs SHOULD BE
PLACED ON THE BACKSIDE OF EITHER THE WHITE OR YELLOW DELINER
FIRST. WHEN APPLICABLE, RED DELINERs ARE TYPICALLY INSTALLED
WHERE VEHICLES MAY ACCIDENTALLY CROSS THE ROAD ENCOUNTERS
AND MOUNTED FACING AWAY FROM NORMAL TRAFFIC FLOW.

CHANNEL POST DELINERs SHALL BE INSTALLED ON SECTIONS WHERE QUARREL IS PRESENT. THESE PORTIONS WILL BE DELINERED UTILIZING THE
QUARREL DELINERs. IN AREAS WHERE RED DELINERs ARE DELINERED,
REFLECTIVE SHEETING WILL BE PLACED ON THE BACK SIDE OF THE
QUARREL DELINER.

REFLECTIVE SHEETING SHALL BE IN ACCORDANCE WITH SEC 1042.2.7.3.

NOTES:

FOR GENERAL NOTES: SEE SHEET 1 OF 16.

THE CONTRACT UNIT PRICE FOR EACH CHANNEL POST DELINER SHALL INCLUDE THE REFLECTIVE FASTENERS ARE POST.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65101
1-888-621-MO DOT (1-888-621-6636)

SIGN MOUNTING DETAILS
INTERCHANGE DELINERATION

DATE EFFECTIVE: 03/04/2010
DATE UPDATED: 07/16/2010
903.03BM SHEET NO. 14 OF 16
WEIGH STATION

WEIGH STATION
RIGHT LANE

1 MILE

120'

108'

120'

108'

ARROW SIZE
14 3/4" x 17 1/4"

6" DIA. HOLE

4" X 6" POST

3 1/2" D.D. STD. PIPE

STEEL PIN

A

1 3/8"

MACH. BOLT

8" X 12" ST. PLATE

STEEL POST

1 1/2"

ASSEMBLY SHALL BE GALVANIZED AFTER FABRICATION

PLAN VIEW

ISOMETRIC VIEW

LICENSE FUEL
MoDOT PERMITS AVAILABLE HERE

SIGN
A
B
C
D
E
F
G
H
J
K
L
M
N
P

R1-154 6" 6" 6" 6" 1 3 3

45-

45-

108."

108."

GENERAL SIGN DATA

SHR1L-3 TYPE REFLECTIVE SHEETING TYPE COLOR LETTER SERIES

BACKGROUND 3 WHITE B

LEGEND 4 WHITE E

SYMBOLS 4 WHITE D

BORDER 4 WHITE E

SUBSTRATE SHEET BLACK

PERMIT SIGN DETAIL

MATERIAL LIST

<table>
<thead>
<tr>
<th>NO.</th>
<th>DESCRIPTION</th>
<th>LB.</th>
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<tbody>
<tr>
<td>2</td>
<td>STEEL PLATE</td>
<td>2.26</td>
</tr>
<tr>
<td>1</td>
<td>3&quot; STANDARD PIPE</td>
<td>32.44</td>
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<tr>
<td>2</td>
<td>2-1/2&quot; STANDARD PIPE</td>
<td>5.49</td>
</tr>
<tr>
<td>8</td>
<td>GALV. MACH. BOLT</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>GALV. WASHER</td>
<td></td>
</tr>
</tbody>
</table>

GENERAL NOTES:

DESIGN SPECI: AASHTO STANDARD SPECIFICATIONS FOR STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINARES, AND TRAFFIC SIGNALS - 1975.

MATERIALS AND FABRICATION SHALL CONFORM TO THE REQUIREMENTS OF THE STATE HIGHWAY AND TRANSPORTATION COMMISSION STANDARD SPECIFICATIONS AND PROVISIONS.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

JEFFERSON CITY, MO 65102
105 WEST CAPITOL

HIGHWAY SIGNING
WEIGH STATION

DATE EFFECTIVE: 02/23/2012
DATE PREPARED: 12/19/2011

903.04F SHEET NO. 1 OF 1

GENERAL SIGN DATA

SHR1L-3 TYPE REFLECTIVE SHEETING TYPE COLOR LETTER SERIES

BACKGROUND 3 WHITE B

LEGEND 4 WHITE E

SYMBOLS 4 WHITE D

BORDER 4 WHITE E

SUBSTRATE SHEET BLACK

CHANGEABLE SIGN DETAIL

SUBSTRATE LEGEND, SYMBOLS, & BORDER
2 SH SHEET L-1 SCREEN PRINT

LEGEND 4 WHITE E

SYMBOLS 4 WHITE D

BORDER 4 WHITE E

SUBSTRATE STRUCTURAL.

REFLECTIVE SHEETING
R1 ENGINEERING GRADE IN ACCORDANCE WITH SEC 1042.2.7.1
R4 PRISMATIC IN ACCORDANCE WITH SEC 1042.2.7.3

GUIDE SIGN DETAIL

NOTE: CHANGEABLE "OPEN/CLOSE" AND "BUSES WEIGH" SIGNS MOUNTED BELOW THIS SIGN. SEE DETAILS THIS SHEET.

EXCEED BORDER FROM 5' TO 7'

CHANGEABLE "OPEN/CLOSE" AND "BUSES WEIGH" SIGNS MOUNTED BELOW THIS SIGN. SEE DETAILS THIS SHEET.

PERMIT SIGN DETAIL

MATERIAL LIST

<table>
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<td>8</td>
<td>GALV. WASHER</td>
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GENERAL NOTES:

DESIGN SPEC: AASHTO STANDARD SPECIFICATIONS FOR STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINARES, AND TRAFFIC SIGNALS - 1975.

MATERIALS AND FABRICATION SHALL CONFORM TO THE REQUIREMENTS OF THE STATE HIGHWAY AND TRANSPORTATION COMMISSION STANDARD SPECIFICATIONS AND PROVISIONS.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

JEFFERSON CITY, MO 65102
105 WEST CAPITOL

HIGHWAY SIGNING
WEIGH STATION

DATE EFFECTIVE: 02/23/2012
DATE PREPARED: 12/19/2011

903.04F SHEET NO. 1 OF 1

GENERAL SIGN DATA

SHR1L-3 TYPE REFLECTIVE SHEETING TYPE COLOR LETTER SERIES

BACKGROUND 3 WHITE B

LEGEND 4 WHITE E

SYMBOLS 4 WHITE D

BORDER 4 WHITE E

SUBSTRATE SHEET BLACK

CHANGEABLE SIGN DETAIL

SUBSTRATE LEGEND, SYMBOLS, & BORDER
2 SH SHEET L-1 SCREEN PRINT

LEGEND 4 WHITE E

SYMBOLS 4 WHITE D

BORDER 4 WHITE E

SUBSTRATE STRUCTURAL.

REFLECTIVE SHEETING
R1 ENGINEERING GRADE IN ACCORDANCE WITH SEC 1042.2.7.1
R4 PRISMATIC IN ACCORDANCE WITH SEC 1042.2.7.3

GUIDE SIGN DETAIL

NOTE: CHANGEABLE "OPEN/CLOSE" AND "BUSES WEIGH" SIGNS MOUNTED BELOW THIS SIGN. SEE DETAILS THIS SHEET.

EXCEED BORDER FROM 5' TO 7'

CHANGEABLE "OPEN/CLOSE" AND "BUSES WEIGH" SIGNS MOUNTED BELOW THIS SIGN. SEE DETAILS THIS SHEET.
TUBE DIAMETER EQUAL TO OR LESS THAN 10½" AT CENTER OF SPAN
CONTINUOUS HOLE
14½" PIN AND COTTER

TUBE DIAMETER GREATER THAN 10½" AT CENTER OF SPAN
CONTINUOUS HOLE
14½" RIVET HOLE WITH 3/8" COTTER

DETAILED BEAM CLAMP

GALVANIZED SIGN BRACKET ASSEMBLY

NOTE:
MINIMUM OF TWO BRACKETS ARE RECOMMENDED FOR SIGNS OVER 42" IN LENGTH.

SECTION A-A
SECTION B-B

TUBE DIAMETER 9½" AND UNDER
TUBE DIAMETER OVER 9½"

DETAIL C
BEAM SPLICE

ELEVATION
DETAIL B
POST BASE

PLAN

ANCHOR BOLT AS SPECIFIED:
THREE HOLE PLATE, P

A GALVANIZED SCREEN SHALL BE USED BETWEEN THE POST BASE PLATE AND CONCRETE BASE. SCREENS SHALL BE PRESSURE-CHASED OR MACHINED WITH GEAR OR HEADED STAINLESS STEEL OR COPPER TYPE 55 OR 46-4 TUBE SUPPORT STEEL. THE SCREEN SHALL BE APPROVED BY THE DIVISION.

14½" X 2" SLOTTED
HOLE IN MOUNTING ANGLES
1 2 HEX HEAD BOLTS, NUTS
AND LOCK WASHERS
2½" L + LENGTH AS REQUIRED BY BOLT
1 2-1/2" X 3" CLAMP HIGH STRENGTH LOW ALLOY
1 2-1/2" X 3" SIGN MOUNTING ANGLES

SIGN WEIGHT
MAXIMUM LOAD FT
FT/BRACKET
15
6
6

HIGHWAY SIGNING
TUBULAR SUPPORT STEEL
TYPE S
ONE TUBE

DATE EFFECTIVE: 10/01/2014
DATE PREPARED: 10/14/2014
903.05J SHEET NO. 2 OF 2
### Drilled Shaft Option

<table>
<thead>
<tr>
<th>POST TYPE</th>
<th>FIRE</th>
<th>COLOR</th>
<th>G</th>
<th>FLAT</th>
<th>BASE PLATE</th>
<th>STEEL</th>
<th>THREAD</th>
<th>BOLT</th>
<th>DIA</th>
<th>E</th>
<th>G</th>
<th>F4</th>
<th>F6</th>
<th>F8</th>
<th>PH</th>
<th>COLLE</th>
<th>STAR</th>
<th>SHAPED</th>
<th>CONVEY</th>
<th>FEEL</th>
<th>TOTAL</th>
<th>FEEL</th>
<th>CONCRETE</th>
<th>CONCRETE</th>
</tr>
</thead>
</table>
| 31       | 53.45 | 2     | 3-5/8" x 2-5/8" | 14 | 10 | 2-10 | 10 | 10-1/2" | 9-1/2" | 13-1/2" | 6" | 6" | 6" | 6" | 6" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12" | 12”
SECTION A-A
(TYPICAL SECTION SHOWING REINFORCING STEEL)

PART ELEVATION
(TYPE A CONCRETE TRAFFIC BARRIER)

PART ELEVATION
(TYPE C CONCRETE TRAFFIC BARRIER)

SECTION B-B
TYPICAL SECTION SHOWING REINFORCING STEEL
DETAILS OF ALTERNATE PEDESTAL

GENERAL NOTES:
1. PEDESTAL AND FOOTING SHALL BE CLASS B (R.C.C.).
2. MINIMUM CLEARANCE TO REINFORCEMENT IS 5" EXCEPT AS SHOWN.
3. CONTACT THE ENGINEER OF WATER TABLE TO ENCLOSE PEDESTALS.
4. TYPE COLUMN BASE PLATE, SLOTTED BOLTS AS SHOWN. NOTES
SPECIAL tentative TO THESE ITEMS HAVE BEEN OMITTED FOR CLARITY. REFER TO SHEET 2 OF 7 FOR DETAILS OF THESE ITEMS.

M O D O T
MISSOURI HIGHWAYS AND TRANSPORTATION

OVERHEAD SIGN TRUSSES
SPREAD FOOTING

DATE EFFECTIVE: 5/17/2004
DATE PREPARED: 7/8/2004