2019 Missouri Standard Plans for Highway Construction

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 January 2020 bid opening.

www.modot.org/business/standards_and Specs/standardplans.htm
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EXCAVATION PAY LIMITS

EMBANKMENT LIMITS

BACKSLOPES IN STABLE AND SEMI-STABLE MATERIAL

INTERCEPTION DITCH AND/OR LEVEE

GENERAL NOTES:

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)

EXCAVATION AND EMBANKMENT TYPICAL DETAILS

DATE EFFECTIVE: 08/01/1998
DATE PREPARED: 8/23/2009
203.00E SHEET NO. 1 OF 1
IN ROCK OVER ENTIRE WIDTH OF ROADBED WITH 18" ROCK BASE

SLOPE SAME AS SHOULDER EXCEPT FOR FLEXIBLE PAVEMENTS HAVING FULL WIDTH BITUMINOUS STABILIZED BASE COURSE WHERE THE SLOPE SHALL BE THE SAME AS BOTTOM OF BASE.

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

IN ROCK OVER PARTIAL WIDTH OF ROADBED
UNDERGRADING LIMITS
(FLEXIBLE OR RIGID PAVEMENTS)

SLOPE SAME AS ABOVE
UNDERGRADING LIMITS
IN UNSUITABLE MATERIAL

SLOPE SAME AS ABOVE
NO HEAVY RED PLASTIC CLAY, FIRECLAY OR OTHER UNSUITABLE SUBGRADE MATERIAL TO BE PLACED ABOVE THIS LINE.

UNDERGRADING LIMITS
(IN ROCK OR UNSUITABLE MATERIAL)

UNDERGRADING LIMITS
(EARTH OR AGGREGATE TYPE SURFACE)

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

DATE EFFECTIVE: 01/01/2004
DATE PREPARED: 8/25/2009
SHEET NO. 2 OF 2

203.02F
### Multilane Factors for "L"

<table>
<thead>
<tr>
<th>LANE ROTATED</th>
<th>LANE ROADED</th>
<th>FACTOR (&quot;)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>1.5</td>
<td>1.25</td>
<td></td>
</tr>
<tr>
<td>2.0</td>
<td>1.50</td>
<td></td>
</tr>
<tr>
<td>2.5</td>
<td>1.75</td>
<td></td>
</tr>
<tr>
<td>3.0</td>
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<td></td>
</tr>
<tr>
<td>3.5</td>
<td>2.25</td>
<td></td>
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### Maximum Radius for Use of a Spiral Curve Transition

<table>
<thead>
<tr>
<th>Design Speed</th>
<th>Maximum Radius (ft)</th>
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<tbody>
<tr>
<td>30</td>
<td>456</td>
</tr>
<tr>
<td>35</td>
<td>620</td>
</tr>
<tr>
<td>40</td>
<td>810</td>
</tr>
<tr>
<td>45</td>
<td>1025</td>
</tr>
<tr>
<td>50</td>
<td>1265</td>
</tr>
<tr>
<td>55</td>
<td>1531</td>
</tr>
<tr>
<td>60</td>
<td>1822</td>
</tr>
<tr>
<td>65</td>
<td>2138</td>
</tr>
<tr>
<td>70</td>
<td>2479</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 superelevation runoff "L". See Standard Plans 203.22 Sheet 1 of 2.

"W" - The 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.
SUPERELEVATION SPIRALS AND WIDENING UNDIVIDED HIGHWAYS

CASE NUMBER 1

NOTE:
SHEET VERTICAL CURVES MAY BE INCREASED AT POINTS OF KING CURVES TO PROVIDE SUFFICIENT SPACE FOR TRAFFIC TO STUDY.

SECTION A-A
SECTION B-B
SECTION C-C
SECTION D-D

(1) FULL S.E. FOR 1/2 PAVEMENT WIDTH IF GREATER THAN CROWN SLOPE.
(2) FULL S.E. FOR 1/2 PAVEMENT WIDTH.
NOTE:
Short vertical curves may be
 inserted at points "C" by eye
and adjusted by stakes or forms
in the field.

PLAN OF ALIGNMENT
FOR CASE NUMBER 2

CASE NUMBER 2

WHERE TRANSVERSE SLOPE ON TANGENT SECTION IS OPPOSITE TO SLOPE OF SUPERELEVATION
NOTE: PAVEMENT REVISED FROM ITS INSIDE EDGE WITH REFERENCE TO THE HORIZONTAL CURVE WHICH IS BEING APPROACHED.

STRAIGHT LINE METHODS OF ATTAINING SUPERELEVATION
L (SEE STANDARD PLANS 203.22 SHEET 1 OF 2)

PROFILE OF OUTSIDE EDGE OF PAVEMENT

PROFILE OF INSIDE EDGE OF PAVEMENT

NOTE:
SHORT VERTICAL CURVES MAY BE
IMPOSED AT POINTS TO EASE
DEPARTURES OF STAKE OR FOLDS
IN THE FIELD.

SUPERELEVATION RISE/HF = L - X

SECTION G-G

OUTSIDE EDGE OF PAVEMENT REF.
TO HORIZONTAL CURVE.

SECTION H-H

OUTSIDE EDGE OF PAVEMENT REF.
TO HORIZONTAL CURVE.

CASE NUMBER 3

STRAIGHT LINE METHOD OF ATTAINING SUPERELEVATION

SUPERELEVATION SPIRALS AND WIDENING
UNDIVIDED HIGHWAYS

NOTE:
PAVEMENT REFERRED TO IS OUTSIDE EDGE WITH REFERENCE TO THE HORIZONTAL CURVE WHICH IS BEING APPROACHED.
**Minimum Radii for Design Super-elevation Rates, Design Speeds, and $r_{max} = 6\%$**

<table>
<thead>
<tr>
<th>%</th>
<th>Radius (feet)</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>
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<tbody>
<tr>
<td>0</td>
<td>2,940.00</td>
<td>4,480.00</td>
<td>2,250.00</td>
<td>1,130.00</td>
<td>565.00</td>
<td>283.00</td>
<td>143.00</td>
<td>71.50</td>
<td>35.75</td>
<td>17.90</td>
<td>9.00</td>
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<tr>
<td>2.5</td>
<td>2,940.00</td>
<td>4,480.00</td>
<td>2,250.00</td>
<td>1,130.00</td>
<td>565.00</td>
<td>283.00</td>
<td>143.00</td>
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<td>17.90</td>
<td>9.00</td>
</tr>
<tr>
<td>5.0</td>
<td>2,940.00</td>
<td>4,480.00</td>
<td>2,250.00</td>
<td>1,130.00</td>
<td>565.00</td>
<td>283.00</td>
<td>143.00</td>
<td>71.50</td>
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<td>283.00</td>
<td>143.00</td>
<td>71.50</td>
<td>35.75</td>
<td>17.90</td>
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<tr>
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<td>4,480.00</td>
<td>2,250.00</td>
<td>1,130.00</td>
<td>565.00</td>
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<td>143.00</td>
<td>71.50</td>
<td>35.75</td>
<td>17.90</td>
<td>9.00</td>
</tr>
</tbody>
</table>

**Notes:**
- "NC" denotes normal cross slope.
- "AC" denotes adverse cross slope.
- "S" denotes the super-elevation in percent (%).
- "L" denotes the length of super-elevation roundoff and ending transition in feet for a 2.5 lane roadway.
- The L1 column is for 1 lane roundoff.
- The L2 column is for 2 lanes roundoff.
- When using one of the tables for a given radius, interpolation is not necessary as the super-elevation rate should be determined from a radius equal to, or slightly smaller than, the radius provided in the table. The result is a super-elevation rate that is reduced up to the nearest 0.2 of a percent. An example: a 5.0% curve with a maximum super-elevation rate of 6%, and a radius of 1,350 ft. should use the radius of 1,330 ft. to obtain a super-elevation rate of 5.4%.
<table>
<thead>
<tr>
<th>CURVE</th>
<th>2000</th>
<th>2050</th>
<th>2100</th>
<th>2150</th>
<th>2200</th>
<th>2250</th>
<th>2300</th>
<th>2350</th>
<th>2400</th>
<th>2450</th>
<th>2500</th>
<th>2550</th>
<th>2600</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>a + b</td>
<td>a + b</td>
<td>a + b</td>
<td>a + b</td>
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<td>F</td>
<td>F</td>
<td>F</td>
<td>F</td>
<td>F</td>
</tr>
</tbody>
</table>

**Table Notes:**
- The values in the table are for design purposes, with values rounded to the nearest 0.01.
- The table includes values for various curve radii (R) and corresponding factors (F).
- The table is used for calculating and designing highways, one-way, or two-way, and includes adjustments for spiral, widening, and superelevation.

**Superelevation Calculation:**
- Use the formula: $E = \frac{V^2}{R}$, where $E$ is the superelevation rate, $V$ is the design speed, and $R$ is the curve radius.

**Widening Calculation:**
- Use the formula: $W = \frac{V^2}{R}$, where $W$ is the widening rate, $V$ is the design speed, and $R$ is the curve radius.

**Spiral Adjustment:**
- Use the formula: $S = \frac{V^2}{R}$, where $S$ is the spiral adjustment rate, $V$ is the design speed, and $R$ is the curve radius.
**MAILBOX TURNOUTS**

**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.

**SECTION A-A (WITHOUT PIPE)**

**SECTION A-A (WITH PIPE)**

**PLAN**

**EXTEND FILL WHERE PIPE IS REQUIRED**

**MAILBOX LOCATION**

**PIPE (WHEN REQ'D)**

**DITCH**

**EDGE OF SURFACING**

**NORMAL SHOULDER LINE**

**EDGE OF TRAVELED WAY**

**EDGE OF TRAVELED WAY**

**NORMAL SHOULDER SLOPE**

**GENERAL NOTES:**

Add 2' for each additional mailbox.
**PLAN VIEW "ON" RAMPS**

**SECTION D-D**

**SECTION C-C**

**SECTION B-B**

**SECTION A-A**

**NOTES:**
1. FOR RAMP SHOULDER WIDTH, SEE TYPICAL SECTIONS.
2. SEE ROADWAY PLANS.

**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.

**W RAMP WIDTH**

ONE LANE, ONE WAY OPERATION WITH
14' NO PROVISION FOR PASSING STALLED VEHICLES. DESIGN TRUCK VOLUMES > 5%

ONE LANE, ONE WAY OPERATION WITH
12' NO PROVISION FOR PASSING STALLED VEHICLES. DESIGN TRUCK VOLUMES ≤ 5%
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)
28 FOOT PAVEMENT STRUCTURE

DATE EFFECTIVE: 01/01/1995
DATE PREPARED: 8/23/2009

STANDARD ROADWAY DITCH
EDGE OF PAVEMENT STRUCTURE

RAMP SHOULDERS WIDE SEE TYPICAL SECTION

STANDARD ROADWAY DITCH

2' TRAVELED WAY
EDGE OF PAVEMENT STRUCTURE

(1) FOR RAMP SHOULDER WIDTH, SEE TYPICAL SECTIONS.
(2) SEE ROADWAY PLANS.
PLAN VIEW "OFF" RAMPS

SECTION A-A

SECTION G-G

SECTION F-F

SECTION E-E
**For Private Entrances, Minor Side Roads or Field Entrances**

**Type I Median Opening**

**Taper Length**

<table>
<thead>
<tr>
<th>Design Speed</th>
<th>&quot;L&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-40 MPH</td>
<td>112.5'</td>
</tr>
<tr>
<td>&gt; 40 MPH</td>
<td>225'</td>
</tr>
</tbody>
</table>

**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 A2 shoulders for interstate and major roadways or A3 shoulders for low volume minors 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**

**Taper Length**

<table>
<thead>
<tr>
<th>Design Speed</th>
<th>&quot;L&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-40 MPH</td>
<td>125'</td>
</tr>
<tr>
<td>&gt; 40 MPH</td>
<td>250'</td>
</tr>
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</table>

**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 A2 shoulders for interstate and major roadways or A3 shoulders for low volume minors and minor roads.

In addition to the identified slopes, slopes adjacent to median opening shoulders shall not be steeper than 5:1.
SECTION ALONG MEDIAN OPENING &

THEORETICAL TAPER
CONCRETE MAY BE OMITTED

EDGE OF PAVEMENT
STRUCTURE

TAPER TREATMENT

SHOULDER TAPER
TREATMENT

DETAIL A

8' DIAM. SIGN HOLE
OMIT CONCRETE

ISLAND DETAIL
ISLAND WILL BE PAIRED FOR 35 CONCRETE MEDIAN STRIP.

LOW PROFILE ISLAND DETAIL

VARIABLE
2:1 SLOPE

3' CONCRETE
MEDIAN STRIP

TIE BARS

CONSTRUCTION JOINT

EXISTING PAVEMENT

DETAIL B
GENERAL NOTES:

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

SURFACING SHALL BE AS SHOWN ON THE PLANS OR PERMIT.

LENGTH OF PIPE SHALL BE DETERMINED BY DEPTH AND LOCATION OF DITCH. (MINIMUM 32' LENGTH OF MINIMUM 15" DIAMETER PIPE), SEE PLANS.

VARY GRADE AS REQUIRED TO MEET EXISTING GRADE OR GROUND LINE

DESIRABLE 10% OR LESS (SEE PLANS)

DESIRED GRADE 10% OR LESS (SEE PLANS)

BREAK POINT = SHOULDER WIDTH PLUS 4' (MIN. 10' FROM E.P.)

SLOPE 4' MIN. FROM EDGE OF TRAVELED WAY TO BREAK POINT

BREAK POINT = SHOULDER WIDTH PLUS 4' (MIN. 10' FROM E.P.)

SLOPE 4' MIN. FROM EDGE OF TRAVELED WAY TO BREAK POINT

IN CUTS

PLAN VIEW

BREAK POINT = SHOULDER WIDTH PLUS 4' (MIN. 10' FROM E.P.)

IN FILLS

PROFILE VIEW

IN CUTS

1 TO 1700 VEHICLES PER DAY ON STATE ROUTE USE 3:1 SLOPE (OR 6:1 SLOPE WHERE PRACTICAL).

OVER 1700 VEHICLES PER DAY ON STATE ROUTE USE 6:1 SLOPE (OR FLATTER WHERE PRACTICAL).

NOTE: RECOMMENDED WIDTH OF DRIVEWAY - 20'

* IN ORDER TO MINIMIZE THE USE OF 6:1 SLOPED END PIPE SECTIONS ON NEW CONSTRUCTION AND WHERE POSSIBLE ON EXISTING ROUTES, THE LOCATION OF DRAINAGE PIPE SHOULD BE BEYOND THE CLEAR ZONE DISTANCE AS SHOWN IN TABLE 3.1 OF THE 1988 EDITION OF "ROADSIDE DESIGN GUIDE".

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

3.1% MIN. "L" DRIVEWAY

SECTION THRU 4" ASPHALT CURB

SECTION THROUGH 4" BARRIER CURB

PROFILE VIEW

IN CUTS

CURB TERMINUS DETAIL

SECTION THROUGH CONCRETE CURB AND GUTTER

DRIVEWAY SIDE SLOPES:

1. TO 1000 VEHICLES PER DAY ON STATE ROUTE USE 3.1% SLOPE (OR 6"/1' WHERE PRACTICABLE).  
2. IF 1000 VEHICLES PER DAY ON STATE ROUTE USE 6"/1' SLOPE FOR FLATTER WHERE PRACTICABLE.

4. FOR DRIVeways, USE 6"/1' SLOPED DRAINAGE PIPE SECTIONS ON NEW CONSTRUCTION AND WHERE PRACTICABLE ON EXISTING PIPE. THE LOCATION OF THE DRAINAGE PIPE SHOULD BE BEYOND THE CLEAR ZONE DISTANCE AS SHOWN IN TABLE 3.1 OF THE "RIM" DESIGN GUIDE.
BREAK POINT - Should be centered between the traveled way plus 4' to 10' from E.P.

SLOPE 4% MIN. FROM EDGE OF TRAVELED WAY TO BREAK POINT

SHOULDER

DESIRABLE GRADE 5% OR LESS (SEE PLANS)

PIPE SIZE AND LOCATION TO BE DETERMINED BY GEOMETRY AND DRAINAGE CONDITIONS (SEE PLANS)

PROFILE

IN CUTS

IN FILLS

DRIVEWAY TYPICAL SECTION

CURB TERMINUS DETAIL

SECTION THRU CONCRETE CURB AND GUTTER

SECTION THRU 4" BARRIER CURB

COLORADO DOT

COLORADO HIGHWAYS AND TRANSPORTATION COMMISSION

101 WEST CAPITOL

JEFFERSON CITY, MO 65102

1-800-662-MDOT (1-800-662-6638)

DRIVEWAY

TYPE IV

DATE EFFECTIVE:

06/01/2017

203.64D

2 OF 2
### Minimum Island Details

<table>
<thead>
<tr>
<th>VOLUME PRODUCT</th>
<th>W</th>
<th>R</th>
<th>MIN. TURN LANE</th>
<th>TAPER</th>
</tr>
</thead>
<tbody>
<tr>
<td>24' 90' 22' 5:1</td>
<td>24'</td>
<td>90'</td>
<td>22' 5:1</td>
<td>511</td>
</tr>
<tr>
<td>TRUCK-SINGLE APPROACH</td>
<td>30'</td>
<td>95'</td>
<td>24' 5:1</td>
<td>511</td>
</tr>
</tbody>
</table>

**General Notes:**

This drawing shall be used in conjunction with Types II and III driveways when traffic volumes require a volume product intersection and Type IV when a single approach truck driveway is desired.

All controls pertaining to grades, drainage, curbing, etc. shall be as shown on other respective type driveway standard plans.

The "W" dimensions are recommended width. Other allowed widths may be used within tolerances of the respective type driveway standard plans.

All controls pertaining to grades, drainage, curbing, etc. shall be as shown on other respective type driveway standard plans.

This drawing illustrates driveway details for minimum situations. Traffic volumes, safety considerations, drainage considerations, local requirements, etc., may dictate more extensive improvements than illustrated.

---

**Diagram: PLAN VIEW**

- **Low Profile Island**
- **Taper**
- **Edge of Travelled Way**
- **State Route**
- **Minimum Island Details**

**Note:**

See Standard Plan 203.50 for details of low profile island. Where minimum island cannot be obtained, omit island.

**Missouri Highways and Transportation Commission**

105 West Capitol
Jefferson City, MO 65102
1-888-365-MODOT (1-888-275-6636)

**Date Effective:** 10/01/1998

**Date Prepared:** 8/21/2009

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**General Notes:**

Details shown on this sheet are for right angle approaches.

Taper lengths are not applicable when deceleration lanes are provided.

Signalized intersections and intersections in developed areas may be modified to meet existing conditions.

This drawing illustrates driveway details for minimum situations. Traffic volumes, safety considerations, drainage considerations, local requirements, etc., may dictate more extensive improvements than illustrated.

**Driveaway Type V**

---

**Diagram: PLAN VIEW**

- **Low Profile Island**
- **Taper**
- **Edge of Travelled Way**
- **State Route**
- **Minimum Island Details**

**Note:**

See Standard Plan 203.50 for details of low profile island. Where minimum island cannot be obtained, omit island.
EMBANKMENT CONTROL STAKE

2' GRADUATED SCALE

2" x 4" SOUND LUMBER

2" x 4" SPLICE IF REQUIRED

GROUND LINE

2" DIA. RISER PIPE

1 1/2" DIA. COVER PIPE

GROUND SURFACE

ORDINARY BACKFILL

STEELE SETTLEMENT PLATE

3" PORTLAND CEMENT MORTAR LEVELING COURSE

SETTLEMENT GAUGE

3" X 12" X 12"

ORDINARY

GRADUATED SCALE

2" X 4" SPLIT IF REQUIRED

2" X 4" SOUND LUMBER (OR 3" ROUND WOOD POST)

GROUND LINE

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

EMBANKMENT CONTROL MEASURING DEVICES

DATE EFFECTIVE: 04/01/1983
DATE PREPARED: 8/23/2009

SHEET NO. 204.00D 1 OF 1
SHEET NO. 1 OF 204.30

PORE PRESSURE MEASUREMENT DEVICES

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

DATE EFFECTIVE: 03/01/1996
DATE PREPARED: 08/23/2009

FOR ELEVATION A AND ELEVATION B STATION, LOCATIONS AND EMBANKMENT CONTROL LIMITS, SEE ROADWAY PLANS.
GENERAL NOTES:


- THE SAFETY EDGE™ SHALL BE CONSTRUCTED CONSISTENTLY WITH THE SHOULDER OR PAVEMENT.

- THE SAFETY EDGE™ SHALL BE BACKFILLED AS SHOWN.

- REGARDLESS OF PAVEMENT TYPE, WHEN PAYMENT FOR PAVEMENT OR SHOULDER IS MADE PER SQUARE YARD, THE MATERIAL NEEDED 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 PAVEMENT OR SHOULDER IS MADE IN VOLUME OR WEIGHT.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITAL
Jefferson City, MO 65102
1-888-636-MODOT (636-6668)

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'-0" CHAIN WITH HOOKS

9 BROOMS

DATE EFFECTIVE: 07/01/2004
DATE PREPARED: 08/23/2009
TIE BAR AND DOWEL TABLE

<table>
<thead>
<tr>
<th>DECK THICKNESS (F)</th>
<th>COWEL SIZE</th>
<th>TIE BAR SIZE</th>
<th>COWEL SPACING</th>
<th>TIE BAR SpACING</th>
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<tbody>
<tr>
<td>LESS THAN 1&quot;</td>
<td>3/32&quot;</td>
<td>3/32&quot;</td>
<td>3/32&quot;</td>
<td>3/32&quot;</td>
</tr>
<tr>
<td>1&quot; TO 2&quot;</td>
<td>1/16&quot;</td>
<td>3/32&quot;</td>
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</table>

LONGITUDINAL JOINT

TONGUE AND GROOVE JOINTS K AND M

TRANSVERSE CONTRACTION JOINT

LONGITUDINAL CONSTRUCTION JOINT FOR SHOULDER

GENERAL NOTES:

THE FINAL POSITION OF ALL DOWELS AND TIE BARS SHALL BE PARALLEL TO THE FLAT OF THE JOINT AND PERPENDICULAR TO THE SURFACE OF THE PAVEMENT AND PARALLEL TO EACH OTHER.
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.

WIRE, 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.
FOR PAVEMENTS HAVING THICKNESS IN 1/4" INCREMENTS, DOWEL SHALL BE PLACED HALF THE PAVEMENT THICKNESS MINUS 1/4".

OPTIONAL INSIDE OR OUTSIDE COAT WITH APPROVED LUBRICANT.

SECTION C-C

LENGTH DETERMINED BY PAVEMENT WIDTH 1/2" DOWEL BAR

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 SKREW TOLERANCE SHALL BE 1/4".
GENERAL NOTES:

TYPE A CURB IS TO BE CONSTRUCTED WITH CONCRETE APPROACH PAVEMENT ONLY WHEN DRAIN BASINS ARE REQUIRED. TYPE A CURBS WILL BE CONSIDERED AS INCIDENTAL, AND WILL BE INCLUDED IN THE PAYMENT FOR CONCRETE APPROACH PAVEMENT.

FOR SHOULDER PAVING AND DRAIN BASINS AT BRIDGE ENDS, SEE STANDARD DRAWING NUMBER 609.40.

FOR TYPE A BARRIER CURBS, STANDARD 2" EXPANSION JOINTS, LONGITUDINAL JOINTS AND TONGUE AND GROOVE JOINTS. SEE STANDARD DRAWINGS NO. 502.00 AND 609.00.

FOR BRIDGE APPROACH SLAB, SLEEPER SLAB, AND JOINT FILLER DETAILS, SEE BRIDGE PLANS.

A PRE-FORMED FIBER EXPANSION JOINT MATERIAL SHALL BE PLACED WITH CONCRETE APPROACH PAVEMENT AND MEET THE REQUIREMENTS OF SECTION 1057 OF THE STANDARD SPECIFICATION FOR HIGHWAY CONSTRUCTION.

COST OF FURNISHING AND PLACEMENT OF 4" TYPE 5 AGGREGATE BASE AND 2" JOINT FILLER IS INCLUDED IN CONTRACT UNIT BID PRICE FOR CONCRETE APPROACH PAVEMENT.

FOR SECTIONS A-A, B-B AND C-C, SEE SHEET 3 OF 3.

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

CONCRETE APPROACH PAVEMENT FOR TWO-LANE PAVEMENTS (MAJOR ROAD)

DATE EFFECTIVE: 07/01/2015
DATE PREPARED: 03/19/2015
504.00J SHEET NO. 1 OF 3
**NOT REQUIRED WHEN ADJACENT PAVEMENT IS ASPHALT.**

**USE 1/2" JOINT FILLER BETWEEN TYPE A CURBS**

**CONCRETE APPROACH PAVEMENT**

FOR MULTI-LANE PAVEMENTS
(MAJOR ROAD)

NOTE:
FOR SECTIONS A-A, B-B AND C-C.
SEE SHEET 3 OF 3.
LOCATION SURVEY RIGHT-OF-WAY MARKER

TOP VIEW

2" DIA. FLAT ALUMINUM CAP

GROUND LINE

PUNCH MARK (NOT NECESSARILY CENTERED)

SIDE VIEW

2" X 24" REBAR

LOCATION SURVEY RIGHT-OF-WAY MARKER

IN EARTH

DRAIN MARKER

IN ROCK

DRAIN PIPE

OFFSET POST LATERALLY FROM PIPE OUTLET

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

POLYURETHANE FOAM (8" DIA.)

GROUT INTO ROCK

WITNESS POSTS, WHEN USED, ARE TO BE SET ON MoDOT R/W LINE EITHER 1' IN FRONT OR BEHIND R/W MONUMENT.

TYPICAL LOCATIONS

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-455-MoDOT (1-888-275-6636)

RIGHT-OF-WAY AND DRAIN MARKERS

DATE EFFECTIVE: 01/01/2003
DATE PREPARED: 08/23/2009
SHEET NO. 202.00D 2 OF 2
**CONSTRUCTION JOINT PERMITTED**

**SECTION B-B**

- **GRATE AND BEARING PLATE**
  - C BARS AT APPROXIMATELY 16" CTRS.

**SECTION C-C**

**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 specifications 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.

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

_105 WEST CAPITOL_  
JEFFERSON CITY, MO 65102  
1-888-ASK-MODOT (1-888-275-6636)

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

**PIECE CULVERT HEADWALLS**  
**TYPE S**  
12" TO 24" DIAMETERS  
- 1V:6H SLOPES

**DATE PREPARED:** 9/3/2009  
**SHEET NO.:** 604.05D  
**1 OF 2**

**TAPERED TO FACILITATE REMOVAL OF THE UNIT FROM THE**

**IN-PLACE. IF A PRECAST UNIT IS FURNISHED. IT SHALL**

**CONFORM IN ALL RESPECTS TO THE REQUIREMENTS**

**BASED ON THE USE OF CONCRETE PIPE. QUANTITIES OF**

**USE RIGHT ANGLE HEADWALL FOR ALL INSTALLATIONS.**

**FOR CAST-IN-PLACE UNITS INCLUDING DIMENSIONS AND**

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

**REINFORCEMENT. EXCEPT THAT THE FORMS MAY BE**

** quantities necessary due to the use of**

**OF ANY OTHER TYPE PIPE SPECIFIED OR PERMITTED.**

** THIS DRAWING AND THE CONCRETE QUANTITIES SHOWN ARE**

**OF ANY QUANTITY CHANGES NECESSARY DUE TO THE USE**

**FLOW LINE OF HEADWALL IS TO BE PLACED HORIZONTALLY.**
**Plan View**

**Total Length = "L" + 5'-9"**

**Bending Details**

**Construction Joint Permitted**

- B2 Bar
- B3 Bar

**Section B-B**

**SECTION A-A**

**End Section**

**Concrete & Bearing Plate**

**General Notes:**

- See General Notes on Sheet 1.
- Date Effective: 08/01/2006
- Date Prepared: 9/3/2009

**Missouri Highways and Transportation Commission**

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

**Pipe Culvert Headwalls**

- Type S
- 27" to 36" diameters
- 1v:6h slopes

** reinforcing bars per approximately 12" ctrs.**
### General Notes:

- **Design Unit Stresses**
  - Class B Concrete:
  - Reinforcing Steel (Grade 60)
    - \( f_y = 60,000 \text{ psi} \)
- **Reinforcing Steel**
  - Minimum clearance to reinforcing steel shall be 1" unless shown otherwise.
- **Dimensions**
  - Drawings are not to scale. Follow dimensions.

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### Complete Bill of Reinforcing Steel

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### Bending Diagrams

- **Section A - A**
  - Downstream Elevation
  - Upstream Elevation

### Pipe Culvert Headwall

- **Energy Dissipator (Impact Type)**
- For 18" Concrete Pipe

**Note:** Bend or cut D1 bars in field to clear pipe and wing.
GENERAL NOTES:
- DESIGN UNIT STRESSES
- MINIMUM CLEARANCE TO REINFORCING STEEL
- DRAWINGS ARE NOT TO SCALE.
- ALL STANDARD HOOKS AND BARS OTHER THAN SHAPE 3 AND 82 MUST BE BENT OR CUT IN FIELD TO CLEAR PIPE.

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

DIMENSIONS
- DRAWINGS ARE NOT TO SCALE. FOLLOW DIMENSIONS.

SECTION A - A

UPSTREAM ELEVATION
- NOTE: BEND OR CUT AT #2 BARS IN FIELD TO CLEAR PIPE.
- TOTAL LENGTH = 120 FT.
- LENGTH OF BEND = 12 FT.

ENERGY DISSIPATOR (IMPACT TYPE)
- FOR 36" CONCRETE PIPE

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-800-458-MODOT 11-862-2961

PIECE 604.13E

DATE PREPARED: 2/2/2002
DATE REVIEWED: 9/3/2003
SHEET NO. 1 OF 1
NOTE: BEND OR CUT #1 AND #2 BARS IN FIELD TO CLEAR PIPE.

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

REINFORCING STEEL

MINIMUM "F" = 3,000 psi
"f" = 60,000 psi

DESIGN UNIT STRESSES

CLASS B CONCRETE

REINFORCING STEEL (GRADE 60)

TOTAL

CU. YD.

LBS.

DIAMETER I) / \
~ ~
\12-#4-B1 AT 12" CTS.
2-#4-B3
6-#4-B2 AT 12" CTS.

9" (STREAM FACE)

2-#4-B4

13-V

16-#4-A1 AT 12" CTS. (TOP)
16-#4-A3 AT 12" CTS.

16-#4-A5 AT 12" CTS.

16-#4-A7 AT 12" CTS.

16-#4-A9 AT 12" CTS.

16-#4-A11 AT 12" CTS.

16-#4-A13 AT 12" CTS.

16-#4-A15 AT 12" CTS.

16-#4-E2 AT 12" CTS. (UPSTREAM)

16-#4-E4 AT 12" CTS.

16-#4-E6 AT 12" CTS.

16-#4-E8 AT 12" CTS.

16-#4-E10 AT 12" CTS.

16-#4-E12 AT 12" CTS.

16-#4-G1 AT 12" CTS.

12-#4-G2 AT 12" CTS.

12-#4-G4 AT 12" CTS.

12-#4-G6 AT 12" CTS.

12-#4-G8 AT 12" CTS.

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12-#4-G18 AT 12" CTS.

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12-#4-G22 AT 12" CTS.

12-#4-G24 AT 12" CTS.

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12-#4-G28 AT 12" CTS.

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12-#4-G32 AT 12" CTS.

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12-#4-G90 AT 12" CTS.

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12-#4-G94 AT 12" CTS.

12-#4-G96 AT 12" CTS.

12-#4-G98 AT 12" CTS.

12-#4-G100 AT 12" CTS.

16-#4-A1 AT 12" CTS. (BOTTOM)

16-#4-A3 AT 12" CTS.

16-#4-A5 AT 12" CTS.

16-#4-A7 AT 12" CTS.

16-#4-A9 AT 12" CTS.

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16-#4-A107 AT 12" CTS.

16-#4-A109 AT 12" CTS.

16-#4-A111 AT 12" CTS.

16-#4-A113 AT 12" CTS.

16-#4-A115 AT 12" CTS.

16-#4-A117 AT 12" CTS.

16-#4-A119 AT 12" CTS.
NORMAL SLOPE OF 2' 3""
GUTTER AT THIS POINT

(1) SEE DRAWING 609.00 OR SPECIAL CURB DRAWING FOR THESE DIMENSIONS

PLAN

SECTION A-A
INTAKE BOX

SECTION C-C
EXTENSION

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.

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

DROP INLET
TYPE X

DATE EFFECTIVE: 06/03/1983
DATE PREPARED: 8/23/2009
SHR NO. 604.29C 1 OF 2
BASE PLAN

PLAN VIEW

SECTION A-A

VARIABLE DIMENSIONS

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NOTES:
- "W" SHALL BE THE OUTSIDE DIAMETER OF LARGE PIPE ENTERING MANHOLE PLUS 16" CARRIED TO THE NEAREST 2".
- "T" 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.

GENERAL NOTES:
- THE MAXIMUM DEPTH OF MANHOLE USING #4 HORIZONTAL BARS AT 12" CENTERS IS 20".
- OVER 20" DEPTH, HORIZONTAL BARS SHALL BE INCREASED TO A #6 BAR AT 10" 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.

CONCRETE MANHOLES

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-MO-DOIT (663-6448) 11-888-275-9823

DATE EFFECTIVE
03-01-2009

DATE PREPARED
08-24-2009

604.30G

SHEET NO.
1 OF 2
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<td>2.28 208.6</td>
<td>0.70 42.6</td>
</tr>
<tr>
<td>3'-0&quot; x 5'-0&quot;</td>
<td>2.32 0.83 0.37 0.61 0.37 0.08 0.37 0.08</td>
<td>49.97</td>
<td>C</td>
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<tr>
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<td>2.49 0.83 0.37 0.61 0.37 0.08 0.37 0.08</td>
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<tr>
<td>3'-0&quot; x 6'-0&quot;</td>
<td>2.65 0.83 0.37 0.61 0.37 0.08 0.37 0.08</td>
<td>61.39</td>
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<td>2.28 208.6</td>
<td>0.70 42.6</td>
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<tr>
<td>3'-0&quot; x 6'-6&quot;</td>
<td>2.81 0.83 0.37 0.61 0.37 0.08 0.37 0.08</td>
<td>67.10</td>
<td>C</td>
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<td>0.70 42.6</td>
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<tr>
<td>3'-0&quot; x 7'-0&quot;</td>
<td>2.98 0.83 0.37 0.61 0.37 0.08 0.37 0.08</td>
<td>72.81</td>
<td>C</td>
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<tr>
<td>3'-0&quot; x 7'-6&quot;</td>
<td>3.15 0.83 0.37 0.61 0.37 0.08 0.37 0.08</td>
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<tr>
<td>3'-0&quot; x 8'-0&quot;</td>
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<td>84.23</td>
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<tr>
<td>3'-0&quot; x 8'-6&quot;</td>
<td>3.49 0.83 0.37 0.61 0.37 0.08 0.37 0.08</td>
<td>90.94</td>
<td>C</td>
<td>2.28 208.6</td>
<td>0.70 42.6</td>
</tr>
</tbody>
</table>

### Notes

**Concrete Quantities in Table Include Invert. The Quantity of Steel for 3" of "D" is Not & of That for 1 Foot of "D". Neither Is the Quantity for 6" of "D" Equal to 3 That for 1 Foot of "D", So Use Quantity in 1 Foot Column for Full Feet and in 3" Column for Fractional Feet.**

For Example: Quantities for 3'-0" x 4'-0" Manhole with 6'-0" "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"

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

First, Compute Quantities for 20-Foot Depth from the Table "To and Including 20-Foot Depth" and for 30-Foot Depth, from the Table "To and Including 30-Foot Depth", and Add the Quantities in the Steel Column to Find the Quantity of Steel in the Bottom Due to Increase in Size of Bars From #6 to #8 Bars on 7-Inch Centers.
PIPE COLLARS

TYPE C COLLAR

SECTION B-B

SECTION A-A

TYPE A COLLAR

ELEVATION (FOR BOX CULVERT TO PIPE)

BENDING DIAGRAM FOR B-BARS

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

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105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-MODOT (663-6683)

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

604.4OF SHEET NO. 1 OF 2
### TABLE OF DIMENSIONS

<table>
<thead>
<tr>
<th>Size of Pipe</th>
<th>Dimensions</th>
<th>Length of Bars</th>
<th>Quantities</th>
</tr>
</thead>
<tbody>
<tr>
<td>LARGE (IN.)</td>
<td>SMALL (IN.)</td>
<td>A &amp; B (FT.-IN.)</td>
<td>C (FT.-IN.)</td>
</tr>
<tr>
<td>12</td>
<td>12</td>
<td>2-8</td>
<td>1-0</td>
</tr>
<tr>
<td>15</td>
<td>15</td>
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<td>18</td>
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<tr>
<td>21</td>
<td>21</td>
<td>3-5</td>
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</tr>
<tr>
<td>24</td>
<td>24</td>
<td>3-8</td>
<td>1-0</td>
</tr>
<tr>
<td>26</td>
<td>26</td>
<td>4-0</td>
<td>1-0</td>
</tr>
<tr>
<td>30</td>
<td>30</td>
<td>4-5</td>
<td>1-4</td>
</tr>
<tr>
<td>36</td>
<td>36</td>
<td>5-0</td>
<td>1-4</td>
</tr>
<tr>
<td>42</td>
<td>42</td>
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<tr>
<td>72</td>
<td>72</td>
<td>8-10</td>
<td>2-0</td>
</tr>
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</table>

**Table of Dimensions**

<table>
<thead>
<tr>
<th>BOX SIZE (IN.)</th>
<th>PIPE SIZE (IN.)</th>
<th>A (#5) (FT.-IN.)</th>
<th>B (#5) (FT.-IN.)</th>
<th>C (#4) (FT.-IN.)</th>
<th>CONCRETE (CU.YD.)</th>
<th>STEEL (LBS.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 x 1½</td>
<td>24</td>
<td>5-1</td>
<td>4-9</td>
<td>1-0</td>
<td>4-10</td>
<td>10-4</td>
</tr>
<tr>
<td>2 x 2</td>
<td>30</td>
<td>5-3</td>
<td>5-3</td>
<td>1-4</td>
<td>5-0</td>
<td>11-0</td>
</tr>
<tr>
<td>3 x 2</td>
<td>36</td>
<td>6-1</td>
<td>5-10</td>
<td>1-4</td>
<td>5-10</td>
<td>12-5</td>
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<tr>
<td>3 x 3</td>
<td>42</td>
<td>6-5</td>
<td>6-5</td>
<td>1-4</td>
<td>6-0</td>
<td>13-4</td>
</tr>
</tbody>
</table>

**Type B Collar**

For concrete pipe to corrugated metal pipe

**Pipe Placement**

2' x 1½' Box
Use 24'' Pipe

2' x 2' Box
Use 30'' Pipe

3' x 2' Box
Use 36'' Pipe

3' x 3' Box
Use 42'' Pipe

**Approximate Wall Thickness**

- Minimum wall thickness same as concrete pipe.
SLOTTED PIPE DETAIL

JOINT CONNECTION SECTION

DRAIN GUIDE PLAN

DRAIN GUIDE DETAIL

END COVER PLATE DETAIL

SECTION A-A

SIDE ELEVATION

TYPE A SLOTTED DRAIN

(FORMED SHEET)

SLOTTED DRAIN GUIDE DETAIL

PORTION OF END COVER PLATE IS NOT SHOWN FOR CLARITY ONLY

JOINT CONNECTION SECTION

(TYPICAL FOR JOINT CONNECTION SECTION TYPE "A" AND TYPE "B")

JOINT CONNECTION SECTION

(TYPICAL FOR JOINT CONNECTION SECTION TYPE "A" AND TYPE "B")

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
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1-888-ASK-MODOT (1-888-275-6636)

SLOTTED DRAIN

TYPE A

DATE EFFECTIVE: 03/01/1994
DATE PREPARED: 06/21/2009

PORTION OF END COVER PLATE IS NOT SHOWN FOR CLARITY ONLY

DRAIN GUIDE CAN BE USED WITH TYPICAL DRAIN GUIDE STEEL WALLS.

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DRAIN GUIDE CAN BE USED WITH TYPICAL DRAIN GUIDE STEEL WALLS.
**Structural Steel Slotted Drain**

**(Type B)**

**Structural Steel Slotted Drain**

**(Type C)**

---

**Typical Coupling Band**

---

**Pipe**

---

**Bearings Bar**

---

**Grating**

---

**Spot Welds**

---

**Fillet Welds**

---

**Direction of Flow**

---

**Pipe Welding Details**

---

**Typical Pipe Section**

---

**Grate Welding Details**

---

**Section A-A**

---

**Section F-F**

---

**Section G-G**

---

**Typical Coupling Band**

---

**Typical Pipe Section**

---

**Missouri Highways and Transportation Commission**

---

**Date Effective:** 03/01/1994

---

**Date Prepared:** 8/23/2009

---

**Sheet No.:** 604.70

---

**SLOTTED DRAIN**

---

**TYPE B AND TYPE C**

---

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

---

**105 WEST CAPITOL**

---

**JEFFERSON CITY, MO 65102**

---

**1-888-455-MODOT (1-888-275-6636)**

---

**1-888-455-MODOT (1-888-275-6636)**
RIGID PAVEMENT WITH TYPE 5 BASE

FLEXIBLE PAVEMENT WITH TYPE 5 BASE

GENERAL NOTES:

BASE MATERIAL (ASPHALT MILLINGS, RECYCLED CONCRETE, TYPE 1 BASE, ETC.) APPROVED BY THE ENGINEER.

PAVEMENT UNDERDRAINAGE

PIECE AGGREGATE PAVEMENT EDGE DRAINS FOR TYPE A2 SHOULDERS

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

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

**Without Permeable Base**

- **Type 5 Aggregate Base**: 6" Dia. Perforated Drain Pipe
- **Type 1 Aggregate Base**: 4" Dia. Perforated Drain Pipe
- **Porous Backfill (2)**: 18" DIA.

**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.

### Section D-D

**Without Permeable Base**

- **Type 5 Aggregate Base**: 6" Dia. Perforated Drain Pipe
- **Type 1 Aggregate Base**: 4" Dia. Perforated Drain Pipe
- **Porous Backfill (2)**: 18" DIA.

**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.

### Table: Dimensions

<table>
<thead>
<tr>
<th>Item</th>
<th>2&quot;</th>
<th>3&quot;</th>
<th>4&quot;</th>
<th>6&quot;</th>
</tr>
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<tbody>
<tr>
<td>A</td>
<td>5.48'</td>
<td>6.19'</td>
<td>6.95'</td>
<td>8.58'</td>
</tr>
<tr>
<td>B</td>
<td>2.70'</td>
<td>3.07'</td>
<td>3.46'</td>
<td>4.28'</td>
</tr>
<tr>
<td>C</td>
<td>0.78'</td>
<td>1.12'</td>
<td>1.49'</td>
<td>2.30'</td>
</tr>
<tr>
<td>D</td>
<td>2.00'</td>
<td>2.00'</td>
<td>2.00'</td>
<td>2.00'</td>
</tr>
<tr>
<td>E</td>
<td>0.46'</td>
<td>0.61'</td>
<td>0.78'</td>
<td>1.18'</td>
</tr>
<tr>
<td>F</td>
<td>0.71'</td>
<td>1.07'</td>
<td>1.46'</td>
<td>2.27'</td>
</tr>
<tr>
<td>G</td>
<td>2.31'</td>
<td>2.51'</td>
<td>2.71'</td>
<td>3.13'</td>
</tr>
</tbody>
</table>

**Conc.** | 0.15 C.Y. | 0.17 C.Y. | 0.20 C.Y. | 0.25 C.Y.

### 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.
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.


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PAVEMENT UNDERDRAINAGE
AGGREGATE UNDERDRAINS

DATE EFFECTIVE: 06/01/2013
DATE PREPARED: 4/1/2013
SHEET NO. 4 OF 4

605.101
PART SECTION SHOWING TYPE E TO TYPE A GUARDRAIL TRANSITION

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

SECTION B-B

SECTION C-C
Typical Section

1. Shoulder widening shall consist of embankment material compacted in accordance with Sec 205.4 of the standard specifications.
2. Post shall be spaced at 3'-0" on center.
3. When guardrail is constructed over curbs, the curbs shall be constructed as shown.

Alternate Typical Section at Slope Breakpoint

Detail for transitioning between Type A and Type B Guardrail

Plan

Length of V-beam rail = 15'-0"

Elevation

Guardrail at curbs (3)

Location other than & median lateral placement of guardrail for shoulder installation
**TYPE E**
FOR STEEL POST & WOOD OR PLASTIC BLOCKS (1)

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

(1) THE OVERALL NOMINAL DIMENSIONS ShOWN SHALL BE NET, ALTHOUGH THE SHAPE OF THE PLASTIC BLOCKS MAY VARY FROM THE SHAPE SHOWN. EXCEPT THE 3-1/2 INCH FLANGE AND THE OVERALL WIDTH dimension MAY BE ALTERED IF APPROVED BY PROJECT OPERATIONS.

**GENERAL NOTES:**
FOR GUARDRAIL DELINEATION DETAILS SEE
STD PLAN 903.03.

**GUARDRAIL POST AND BLOCK**

**DELINEATORS ON NEW GUARDRAIL**
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

MINIMUM POST DIAMETER IS EQUAL TO
FULL DEPTH POST EXCEEDS MINIMUM SOIL
DEPTH.

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 SHORTER AND PLACED IN A MINIMUM 2 FEET
OF SOLID ROCK. STEEL POSTS MAY BE PLACED IN CAVITIES
OF SOIL SHALL BE IN ACCORDANCE WITH THE STANDARD
SPECIFICATIONS.

GUARDRAIL SPECIAL INSTALLATIONS
ELEVATION

1. IF LOCATED WITHIN THE CLEAR ZONE OF A TWO-WAY ROADWAY, THE MINIMUM LENGTH IS 67'-6".
2. ADDITIONAL GUARDRIL AS REQUIRED, INCLUDING END TREATMENT.
3. THE POST MAY BE SLOTTED DUE TO THE PRESENCE OF AN OBSTACLE SUCH AS A CURB.
4. PLACE END TREATMENT NO CLOSER TO THE SLOTTED POST THAN POSTS 5 AND 22.

SECTION A-A
W6 X 9 STEEL POSTS, 6' OR 7' LONG WITH 8" X 6" X 14" ROUTED WOOD BLOCKOUTS.
POSTS 3 THROUGH 12 AND 18 THROUGH 24.

SECTION B-B
SET WOOD POSTS, 6' OR 7' LONG WITH THE 8" X 6" X 14" WOOD BLOCKOUTS.
POSTS 13 THROUGH 17.

GUARDRAIL
LONG-SPAN NESTED W-BEAM
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.
RAILS NUMBERS 1, 2, 3 AND 4 ARE TYPE E GUARDRAIL. RAIL NUMBER 4 IS A STANDARD THRIE BEAM, NOT SLOTTED.

POST DETAILS

POST 1 DETAIL

GENERAL NOTE:

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105 WEST CAPITOL
JEFFERSON CITY, MO 65102
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MEDIAN PIER PROTECTION
BULLNOSE GUARDRAIL SYSTEM

DATE EFFECTIVE: 08/01/2012
DATE PREPARED: 07/31/2012
606.01F SHEET NO. 2 OF 9
THRIE BEAM ANCHOR POSTS

POSTS 2 THROUGH 8
STANDARD BLOCKS

BLOCKS FOR POSTS 9 AND 10
STANDARD BLOCKS

TAPERED BLOCK

THRIE BEAM CRT POSTS

POST AND BLOCKS

DATE EFFECTIVE: 08/01/2012
DATE PREPARED: 07/27/2012
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)

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 1/8" x 5 1/4" x 3/8"

STEEL PLATE

1 1/2" x 1 1/2" SLOT

(1) STUD, THREADED ENTIRE LENGTH.

DETAIL OF CABLE ASSEMBLY

DETAIL OF STEEL BEARING PLATE

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1-888-658-MODOT (1-888-275-6636)

MEDIAN PIER PROTECTION
BULLNOSE GUARDRAILS SYSTEM
PLATES AND CABLE ASSEMBLY

DATE EFFECTIVE: 08/01/2012
DATE PREPARED: 7/27/2012
SHEET NO. 606.01F 6 OF 9
"COLD TUFF" BUTTON, S-409 SIZE NO. 12 SB 2 ½" STOCK NO. 1040395 FOR 3⁄8" O/1 (6 x 25) WIRE ROPE (OR ANY SIMILARLY SIZED SLAVE-GRIP BUTTON FERRULES)
SECTION C-C

AREA OF MEDIAN FILL (SEE SECTION C-C)

EDGE OF SHOULDER

EXISTING SLOPES

EDGE OF SHOULDER

2' MIN. LIMITS OF END TERMINAL (2)

50' MIN.

2' MIN. TYP.

(1) TYP. ~ 15:1 OR FLATTER SLOPE (TYP.)

(1) TYP. ~ 20' MIN.

LIMITS OF END TERMINAL (2)

10:1

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 CRASHWORTHY END TERMINAL.

TYPE B CRASHWORTHY END TERMINAL SHALL BE LATEST VERSION AND SHALL BE INSTALLED ACCORDING TO MANUFACTURER'S RECOMMENDATIONS.
PIER AT 60' 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.
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 GRACE 36 OR 40. THE SECTIONS SHALL BE GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH REQUIREMENTS OF ASTM A 111.

SECTION THROUGH THREE BEAM RAIL

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 12 GAUGE.

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

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

WASHERS SHALL BE USED AT ALL POST BOLTS.

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

USE 3/4" BUTTON-HEAD DUAL SHOULDER BOLTS WITH HEX NUTS AT ALL SLOTS (THICKNESS OF HEX NUT = 3/4" MIN.).

THE BEARING PLATE SHALL BE FABRICATED FROM GRADE 436 STEEL AND GALVANIZED.

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

SEE STANDARD PLAN 606.00 FOR DETAILS NOT SHOWN.

THE COST OF FURNISHING, FABRICATING AND INSTALLING TRANSPORTATION, 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.

MoDOT

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JEFFERSON CITY, MO 65102
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STATE OF MISSOURI
HIGHWAY DEPARTMENT

BRIDGE ANCHOR SECTION
SAFETY BARRIER CURB ON BRIDGE
WELDING INSTRUCTION

ALL FILLETS MUST BE 1" LONG SPACED AT 2".

GENERAL NOTES:

COVER PLATE PANELS ARE 4-1/4" THICK.

ALL STIFFENER ARE 1/8" THICK.

CONNECTOR PLATE SHALL BE FABRICATED FROM ASTM GRADE A36 STEEL AND GALVANIZED.

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

ALL HOLE DIAMETERS SHALL BE 1".

BRIDGE ANCHOR SECTION
SAFETY BARRIER CURB ON BRIDGE (CONNECTOR PLATE DETAIL)
PART SECTION THROUGH SLAB AT END OF WING

(1) AT CONTRACTOR'S OPTION, EQUIVALENT SECTIONS MAY BE FABRICATED FROM MATERIAL MEETING AND IN ACCORDANCE WITH THE REQUIREMENTS OF ASTM A690.

NOTES:

FOR GENERAL NOTES, SEE SHEET 2 OF 5.

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

(2) VERIFY BY RAIL TRANSITION PROCEDURE.

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

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JEFFERSON CITY, MO 65102
1-888-MO-DOT-Help (1-888-663-6835)
GENERAL NOTES:

1. DESIGN BASED ON IBC REPORT AND TEST LEVEL 3 (V=3).


3. FABRICATED STRUCTURAL STEEL SHALL BE 5014 WITH GRADE 50.

4. FOR PROPER JOINTING AND MATERIAL REQUIREMENTS, SEE SECTION 10 OF THE STANDARD SPECIFICATIONS.

5. ALL RAW POSTS SHALL BE SET PERPENDICULARLY TO THE FINISHED GRADE AND VERTICALLY IN CROSS SECTION.

6. WASHERS SHALL BE USED AT ALL POST BOLTS.

7. USE 5014 WITHE JOINTED NUTS WITH HEX NUTS. THICKNESS OF NUTS = 1/2 V1/4 IN. AT ALL BOLTS.

8. ALL LIP SPECIES SHALL BE MADE IN THE DIRECTION OF TRAFFIC.

9. THE COST OF INSTALLING, FABRICATING AND INSTALLING TRANSITION SECTION COMPLETE IS FIXED. SHALL BE PRODUCED FOR THE CONTRACT UNIT PRICE PER EA.

10. THE COST OF INSTALLING, FABRICATING AND INSTALLING BRIDGE ANCHOR SECTION THREE BEAM, COMPLETE Sec. SHALL BE PRODUCED FOR THE CONTRACT UNIT PRICE PER EA.

11. FOR DETAILS NOT SHOWN, SEE BRIDGE THREE BEAM RAIL SHEET.
SECTION F-F
STEEL POST AND WOOD BLOCKOUT

SECTION G-G
STEEL POST AND WOOD BLOCKOUT

POST BLOCKOUT
SIDE VIEW

POST BLOCKOUT
FRONT VIEW

POST BLOCKOUT
SIDE VIEW

POST BLOCKOUT
FRONT VIEW

THRIE BEAM RAIL SPLICE AT POST

ASYMMETRICAL TRANSITION SECTION

SECTION H-H
THROUGH THRIE BEAM RAIL

OPTIONAL 3" ELB. HOLE FOR HANDLING,
CURING ALLOWANCE, OR PERMITS

POST 12 - (2) VERT TRIP RAIL TRANSITION PROVISION (SEE FRONT SHEET)
POST 20 - ONLY 1 HOLE REQUIRED
ALL HOLES 1/4" DIAMETER EXCEPT AS NOTED

HOLE PUNCHING DETAIL
FOR STEEL POST & WOOD BLOCKS (6" AND 8")
**Plan View**

- **Section A-A**
  - **Fill/Fill Transition**
  - **Shoulder**
  - **Steel Foot**

- **Section B-B**
  - **Fill/Shoulder with Rub Rail**
  - **Steel Foot**

- **Section C-C**
  - **Fill/Shoulder with Rub Rail**
  - **Steel Foot**

- **Section D-D**
  - **Fill/Shoulder with Rub Rail**
  - **Steel Foot**

**Elevation - Anchored in Backslope Guardrail**

- **Conduit Line**
- **Rub Rail**
- **Rock Face Guardrail Anchor**

**General Notes:**

- For anchor details, see Sheet 3-1 or 3.
- Right foot point is required with guardrail.
- Rub rail begins when the distance between the guardrail and the slope is 50 ft. This makes the guardrail proper.
- The guardrail foot 1 and 2 shall have stand-off type as shown on Sheet 3-1.
- The guardrail shall extend 10 feet beyond the ditch line and terminate a minimum of 10 feet beyond the guardrail foot of the slope.
- Elevation will not be required for any foot which will be completely below grade. The alignment of such foot shall be approved by the engineer.

**Guardsrail**

- **Terminal Ends**
  - Elevation: 401.1 (max. foreslope)

**Sheet Information:**

- **M&DOT**
  - **Sheet No. 4 of 7**
  - **Date Effective:** 04/25/2017
  - **Date Revised:** 03/25/2017
  - **Scale:** 1/64 = 1'-0"
  - **Drawing Type:** T
d 606.30K
SECTION B-B

SECTION C-C

SECTION D-D

1. Max. cross slope shall not exceed 6%. Emphasis is required when cross slope exceeds 1% or when the existence of either concrete or steel guardrail is increasing.

PLAN VIEW

ELEVATION

ANCHORED IN BACKSLOPE GUARDRAIL

G U A R D R A I L  
E M B E D D E D T E R M I N A L 
E N D S ( F L A T D I T C H )
3 - 1" Ø holes to be field-filled in A-Beam element and attached with 1" Ø hex head bolts 1/2" long each with one square washer and hex nut.

1" Ø hole to be field-filled through A-Beam element and attached with 1" Ø hex head bolt 2" long with one square washer and hex nut.

2" x 14" x 14" steel plate

4" fillet weld plate to post both sides of post

Embedded steel post

Special rubrail to post connection at post A
Concrete Block Anchor Assembly

Concrete block anchor assembly for threaded inserts to be used with cap screws and minimum 12" threaded rod.

Concrete Block Anchor (24" x 24" x 36"")

Top View

End of insert to be closed.

Steel Post and Block Detail

Plan

Elevation of 6' Post

Elevation of 8' Post

For additional post and block details, see sheet plans 606.300.

Steel post and block detail.
GRADING LIMITS FOR FLARED CRASHWORTHY END TERMINALS

STANDARD GRADING LIMITS FOR CRASHWORTHY END TERMINALS

ALTERNATE GRADING LIMITS FOR CRASHWORTHY END TERMINALS

(1) APPROVED CRASHWORTHY END TERMINAL

GENERAL NOTES:

STANDARD GRADING LIMITS SHALL BE USED WHEN CONSTRUCTING A NEW PAVED ALTERNATE GRADING LIMITS ARE ALLOWABLE ON EXISTING ROADS EXCEPT WHEN STANDARD GRADING IS INDICATED ON THE PLANS.

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.

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CRASHWORTHY END TERMINALS
TYPE A
GRADING LIMITS

SHEET NO. 1 OF 1
ANCHOR ASSEMBLY

EXPANDABLE OR SCREW TYPE ANCHOR

END ANCHOR

LINE POST

INTERMEDIATE ANCHOR

CABLE END

5/8" CABLE

300' MAX. (BETWEEN ANCHORS)

GROUND LINE OR SHOULDER ELEVATION

POST DETAILS

STEEL POST

(53 X 5.7 STD. BEAM)

1 1/2" DIAMETER BOLT AND WASHER

1" X 1/2" CLAMP

1 1/2" DIAMETER

NOT REQUIRED FOR LINE POST

CABLE

WOOD POST

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

1" X 1/2" CLAMP

1 1/2" DIAMETER

NOT REQUIRED FOR LINE POST

CABLE

LAG SCREW
ACCESS-RESTRAINT CABLE GREATER THAN 300 FEET IN LENGTH Requires an intermediate anchor as shown.

**SPLICE DETAIL**

**ANCHOR ROD ASSEMBLY**

**CABLE END**

**TYPICAL LOCATION**

**SHOULDER INSTALLATION**
GUARD CABLE TO GUARDRAIL TRANSITION AT MEDIAN OBSTACLE

PROFILE OF TRANSITION
AT MEDIAN OBSTACLE WITH BULLNOSE
OR IN A MEDIAN NARROWER THAN 60'

DETAIL C

DETAIL D

TYPICAL GUARD CABLE TO GUARDRAIL TRANSITION ELEVATION
GUARD CABLE TO GUARDRAIL TRANSITION AT MEDIAN BRIDGE END

GENERAL NOTES:

WHEN GUARD CABLE IS LOCATED ALONG THE MEDIAN CENTER-LINE NEAR A BRIDGE END OR COMPLETE SUPPLIER, IT SHALL BE SHOWN BEHIND THE GUARDRAIL ASSEMBLY WITH THE GUARD CABLE GUARDRAIL ASSEMBLY. THE GUARD CABLE ASSEMBLY SHALL BE CONSTRUCTED SO THAT IT IS PROTECTED BY THE GUARDRAIL.

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

SUITEABLE GUARDRAIL MUST BE PROVIDED WHEN MEDIAN GUARDRAIL INSTALLS NORMAL FLOW.

TYPICAL GUARD CABLE TO GUARDRAIL TRANSITION ELEVATION
MGS GUARDRAIL WITH 3'-1 1/2"
POST SPACING

MGS GUARDRAIL WITH 1'-6 2/3"
POST SPACING

GENERAL NOTES:
- NO GUARDRAIL CAN BE USED UNLESS:
  - POST SPACING IS LESS THAN 6'-1"
  - WITHIN GRASSWORTH END TERMINALS
  - WITHIN VERTICAL BARRIER TRANSITIONS (606.60)
  - WITHIN BRIDGE APPROACH TRANSITIONS (606.70)

11: 25 FEET IF MGS 3'-1 1/2" POST SPACING GUARDRAIL IS REQUIRED ON APPROACH OR DEPARTURE ENDS OF 1'-6 2/3" POST SPACING MGS GUARDRAIL.
12: USE AS MANY SEGMENTS AS NECESSARY TO SHIELD THE AREA OF CONCERN.
13: REDUCED POST SPACING SHALL USE 6'-0" POSTS.
MAX. ANY DEVIATION OF 8'-0" POSTS WILL ONLY BE ALLOWED IN ACCORDANCE WITH SPECIAL INSTALLATIONS AS SHOWN ON SHEET 5 OF 3.
SETTING POST IN SOLID ROCK

SECTION A-A
ROCK ENCOUNTERED UP TO 6" BEHIND SURFACE

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

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

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

GENERAL NOTES:

HOLES IN SOLID ROCK SHALL PROVIDE A DIAMETER OF NOT LESS THAN 2 INCHES GREATER THAN THE MAXIMUM TRANSVERSE DIAMETER OF THE POST SECTION.

POST MAY BE SHORTER WHERE PLACED IN 2 FEET OF SOLID ROCK. STEEL POSTS MAY BE FLANGE OR SIA CUT. REPAIR OF CUT SHALL BE IN ACCORDANCE WITH SECTION OF THE STANDARD SPECIFICATIONS.

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MIDWEST GUARDRAIL SYSTEM (MCS)
SPECIAL INSTALLATIONS

SETTING POST THROUGH ASPHALT ≤ 2" THICK
NORMAL ROADWAY GRADING
SEE PLANS

STANDARD MGS BLKOUT (TYP.)

CULVERT BLKOUT (TYP.)

OFFSET FROM
MGS BLKOUT (TYP.)

TYPE 1 BREAKAWAY
FOOT (TYP.)

STANDARD MGS
FOOT (TYP.)

PLAN VIEW

MIN. 15'-0" STANDARD MGS OR
MASH RAIL TERMINAL REQUIRED

MIN. 57'-0" STANDARD MGS OR
MASH RAIL TERMINAL REQUIRED

ELEVATION VIEW

NOTES:
A MINIMUM LENGTH OF STANDARD MGS GUARDRAIL OR
AN END TERMINAL IS REQUIRED BEFORE THE 111'-0"-
OF MGS LONG SPAN GUARDRAIL. AFTER TO MAINTAIN STABILITY
IN THE SYSTEM, A FOOT MAY BE USED OUTSIDE THE
GRADE LIMITS SHOWN.

USE TYPE 1 BREAKAWAY WOOD POST NO. 1-6.
ALL OTHER POSTS SHALL BE REBAR OR WROUGHT STEEL POSTS.

WHEN THE GUARDRAIL IS FLUSH WITH THE GRADE,
THE END OF THE POST CAN BE ALIGNED WITH THE NEAR
SIDE OF THE GUARDRAIL. BUT IF THE GUARDRAIL
CONTINUES ALONG GUARDRAIL, THE SYSTEM SHOULD BE OFFSET
8' FROM THE FLUSH OBJECT.

FOR LOCATIONS WHERE A GUARDRAIL FLARE IS DESIRED,
THE SYSTEM SHOULD REMAIN UNALTERED FOR 30'-0" BEFORE
FOOT 1 OR AFTER POST 6. AT WHICH POINT THE
GUARDRAIL MAY FLARE AT A MAXIMUM TAPER RATE OF 7:1.

ALL POSTS, BLOCKS, GUARDRAIL, AND MASH RAIL SHALL
COMPLY WITH THE MGS GUARDRAIL AND AS DETAINED
ON THIS SHEET.

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MIDWEST GUARDRAIL SYSTEM
(MGS)
LONG SPAN GUARDRAIL

SHEET NO.
7 OF 8

DATE REVIEWED:
03/21/2019
606.50D
PLAN VIEW

FACE OF GUARDRAIL ALIGNED WITH EDGE OF SHOULDER (1)

MGS BLOCK AND HEIGHT TRANSITION FROM
TYPE A GUARDRAIL TO MGS GUARDRAIL

NOTES:

1) WHERE FOOT OFFSET IS CONSTRUCTED, AND WHEN THE EXISTING SHOULDER IS WIDER THAN 2 FEET, THE EXISTING SHOULDER MAY BE REINED UP TO 4 INCHES TO ACCOMMODATE THE 10 INCH BLOCKS OF THE MGS GUARDRAIL. WHERE SITE CONSTRAINTS PROHIBIT OR ENCROachment CANNOT BE CONSTRUCTED TO PROVIDE A MINIMUM OF 2 FEET BETWEEN THE EDGE OF THE GUARDRAIL FOOT AND SLOPE BREAST PLATE, A FOOT PLATE SHALL BE USED (SEE SHEET 8 OF 8). THE SUBSTITUTION OF A FOOT PLATE FOR REQUIRED OR ENCROachment SHALL NOT BE ALLOWED.

2) MGS TRANSITION FROM TYPE A GUARDRAIL SHALL BE COMPLETED PRIOR TO THE 50 MGS EDGE TERMINAL LIMITS.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

MIDWEST GUARDRAIL SYSTEM (MGS)
BLOCK AND HEIGHT TRANSITION

ALTERNATE PLAN VIEW - ALIGNMENT TAPER
SEE NOTE (1)
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 12'-0" FOOT SPACING.
SEE STP. PLANS 606.50 FOR FOOT SPACING DETAILS.

(2) TRANSITION CABLE RECEIVES IMPACT ENERGY AND WIDTH OF HOEHEAD FOR TYPE B CRASHWORTHY END TERMINAL PER MANUFACTURER'S REQUIREMENTS. SEE STP. PLANS 606.50 FOR HEIGHT TRANSITION DETAILS.

(3) CONTINUE 10'-0" SLOPE TO OBSTACLE OR A MINIMUM OF 2'-0" PAST THE END OF THE GUARDRAIL FOOT.

(4) 10'-0" FLARE RATE OR AS RECOMMENDED BY TABLE 5-10 OF THE LATEST VERSION OF THE "PAVEMENT DESIGN GUIDE".

GENERAL NOTE:
TYPE B CRASHWORTHY END TERMINAL SHALL BE MGS COMPATIBLE, LATEST VERSION AND SHALL BE INSTALLED ACCORDING TO MANUFACTURER'S RECOMMENDATIONS.
PIER AT MEDIAN

1. For post spacing of 6'-3" foot spacing, 1'-11" foot spacing, and 6'-6.6" foot spacing, see the latest version of the "Fusselie Design Guide." See the latest version of the "Fusselie Design Guide."

2. The minimum clearance between the edge of the guardrail and the edge of the traveled way is 1'-6.6" foot spacing. See the latest version of the "Fusselie Design Guide."

3. Continue to the slope to the edge of the traveled way. The edge of the traveled way is 1'-6.6" foot spacing. See the latest version of the "Fusselie Design Guide."

4. The minimum clearance between the edge of the guardrail and the edge of the traveled way is 1'-6.6" foot spacing. See the latest version of the "Fusselie Design Guide."

5. The minimum clearance between the edge of the guardrail and the edge of the traveled way is 1'-6.6" foot spacing. See the latest version of the "Fusselie Design Guide."

GENERAL NOTE:


- TYPE A NON-FLARED CRASHWORTHY END TERMINAL SHALL BE THE LATEST VERSION AND SHALL BE INSTALLED ACCORDING TO MANUFACTURER'S RECOMMENDATIONS.
GENERAL NOTES:
1. MIDWEST GUARDRAIL SHALL BE TANGENTIAL WITH BRIDGE APPROACH TRANSITION FOR 1/8" BEFORE THE TWO MILLER V-BEAM STIFFNESS TRANSITION AND 25'-40" BEFORE THE BEAM TRANSITION SECTION.
2. AT THE CONTRACTOR OPTION, A SINGLE 10'-9" PIECE OF THE BEAM MAY BE SUBSTITUTED FOR ONE OF THE 12'-6" PANELS AND THE 7'-7" SECTION 25 SHOWN.
3. FOR PROTECTIVE COATING AND MATERIAL REQUIREMENTS, SEE SECTION 6 OF THE STANDARD SPECIFICATIONS.
4. RAIL POSTS SHALL BE SET PERPENDICULAR TO THE ROADWAY PROFILE ORANGE AND VERTICALLY IN CROSS SECTION.
5. THE 2" BOLT HOLE MAY BE SHOULDER BOLTED WITH HEX NUTS AT ALL SLOTS LENGTHS OF HE RAILS = 2.5" VERTICAL.
6. THE RAILING PLATE SHALL BE FABRICATED FROM GRACIE AND STEEL AND GALvanized.
7. ALL LIP PLATES INCLUDING END PLATES SHALL BE MAND IN THE DIRECTION OF TRAFFIC.
8. THE COST OF PURCHASING FABRICATING AND INSTALLING BRIDGE APPROACH TRANSITION (EXTENDED CURB) COMPLETE IN PLACE, WILL BE PAG FOR AT THE CONTRACT UNIT PRICE PER EACH.
WELDING INSTRUCTION

4. All fillet welds shall be 1/8" long spaced at 2".

GENERAL NOTES:

Cover plate flanges are 5/8" thick.
All stiffeners are 3" thick.
Connector plate shall be fabricated from ASTM Grade 36 steel and galvanized.

For galvanizing requirements, see Section 1040 of the Standard Specifications.
All hole diameters shall be 1".
WELDING INSTRUCTION
(VIEWED FROM BACK SIDE OF PLATE)

(1) STIFFENERS LOCATED AT THE OUTER EDGES OF THE COVER PLATE SHALL BE WELDED AS FOLLOWS:
- SINGLE BEVEL FILLET WELD ON EXTERNAL SIDES ARE 3/8" FILLET WELD BY 1/4" LONG SPACED AT 24" ON INTERNAL SIDES.

(2) STIFFENERS LOCATED ON THE INSIDE OF THE COVER PLATE SHALL BE WELDED AS FOLLOWS:
- 3/8" FILLET WELD BY 1/4" LONG SPACED AT 24".

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

CONNECTOR PLATE DIMENSION
(PER ASSEMBLY)

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<tr>
<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>D</td>
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<tr>
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<tr>
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GENERAL NOTES:
- COVER PLATE PANELS ARE 3/8" THICK.
- ALL STIFFENERS ARE 3/8" THICK.
- CONNECTOR PLATE SHALL BE FABRICATED FROM ASTM A36 STEEL AND GALVINIZED.
- FOR GALVANIZED REQUIREMENTS SEE SECTION 1010 OF THE STANDARD SPECIFICATIONS.
- ALL HOLE DIAMETERS SHALL BE 1/4".

MIDWEST GUARDRAIL SYSTEM
(MGS)
VERTICAL BARRIER TRANSITIONS
(CONNECTOR PLATE DETAIL)
SINGLE SLOPE BARRIERS

STATE EFFECTIVE: 07/01/2027
DATE ISSUED: 07/01/2027
INSTITUTE OF TRANSPORTATION ENGINEERS
606.60B 6 OF 6
Steel Post and Steel Block

Steel Post and Wood Block

General Notes:
- Design based on Main Test Level 3 (TL-3).
- Corroded structural steel shall be ASTM A572 Grade 50.
- For protective coating and material requirements, see Section of the Standard Specifications.
- Pile posts shall be set perpendicular to the roadway profile grade and vertically in cross-section.
- Use 3/4" diameter, 1-1/4" long, with 4 3/8" diameter, 1-1/4" long, for all bolts.
- All roof splices shall be seen in the direction of traffic.
- The cost of furnishing, fabricating, and installing transition sections, complete with pile, shall be paid for at the contract unit price per each.
- The cost of furnishing, fabricating, and installing bridge approach section, three beams, complete, shall be paid for at the contract unit price per each.

For details not shown, see bridge and rail sheet.

Midwest Guardrail System (MGS)
Bridge Approach Transition (Three Beam on Bridge)
STEELE POST AND WOOD BLOCK

THREE BEAM RAIL SPLICE AT POST

ASYMMETRICAL TRANSITION SECTION

MIDWEST GUARDRAIL SYSTEM
(MGS)
BRIDGE APPROACH
TRANSITION
(THREE BEAM ON BRIDGE)
TYPE 2 BREAKAWAY
WOOD POST

STEEL GROUND
FOUNDATION TUBE

STRUT AND YOKE ASSEMBLY

MIDWEST GUARDRAIL SYSTEM
(MGS)
TERMINAL ANCHOR ENDS
EMBEDDED STEEL POST

- 3 1\(\frac{2}{16}\)" holes to be field drilled in V-beam element and attached with 3\(\frac{1}{2}\)" hex head bolts. 12\(\frac{1}{2}\)" long each with one square washer and hex nut.
- 1\" hole to be field drilled through V-beam element and attached with 2\(\frac{1}{2}\)" hex head bolts. 12\(\frac{1}{2}\)" long each with one square washer and hex nut.
- 2\" fillet weld plate to post both sides of post.

SPECIAL RUBRAIL TO POST CONNECTION AT POST A
ELEVATION OF 6' STEEL POST AND BLOCK

TOP VIEW

CONCRETE BLOCK ANCHOR ANCHOR ASSEMBLY

END OF JIGS TO BE CLOSED

SECTION A-A

ELEVATION 8' STEEL POST AND BLOCK

THREADED JIGS: FOR 6" X 2"
CALCULATED NECESSARY 6-3/4" SCREWS.
CAP SCREWS TO BE THREADED 1-1/2", INSERTS THREADED VERTICAL 1.25".

ANCHOR ASSEMBLY FOR THREADED INSERTS (SEE DETAIL ON THIS SHEET).
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 PAVED ALTERNATE GRADING LIMITS
ARE ALLOWABLE ON EXISTING ROADS UNLESS THE
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 GUARDERS.

ENDS WHERE CRASHWORTHY END TERMINALS ARE NOT REQUIRED.

MISSOURI HIGHWAYS AND TRANSPORTATION
COMMISSION
105 West Capitol
Jefferson City, MO 65102
1-888-800-MODOT (1-888-800-6663)

MASH CRASHWORTHY END TERMINALS
TYPE A
GRADING LIMITS

FILE EFFECTIVE: 5/30/2020
DATE ISSUED: 7/8/2020

606.81B
1 OF 1
**Wire Size and Height of Fabric**

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**Date Effective:** 02/10/2007

**Date Prepared:** 8/21/2009

**General Notes:**

- 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 ± 1/2 inch measured in either direction as the minimum clear distance between the wires forming the parallel sides of the mesh.

**Post Ties:**

- 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'.

**Post Anchorage (Driven):**

- Alternate line post anchorage (driven)

**Typical Trench Details:**

- Typical trench details

**Typical Location:**

- Typical location
U-BOlT (TYP.)
DIAMETER
TERMINAL POST
PLACE EXPANSION SLEEVE AT ABOUT 30° CENTERS WITH AT LEAST ONE EXPANSION SLEEVE BETWEEN PULL POSTS.

PART ELEVATION (TYPICAL)

ALTERNATE SECTION A-A 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° 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
FENCE CONNECTION FOR MSE WALLS

COLONEL OF MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

DATE PREPARED: 4/30/2009
DATE EFFECTIVE: 6/01/2009
SHEET NO: 607.11H
1 OF 1
END POST ASSEMBLY

STEEL POST

CORNER OR PULL POST ASSEMBLY

ROADWAY DITCHES OR SMALL SHALLOW CHANNELS
(SPAWN WITH NORMAL LINE POST SPACING)

POORLY DEFINED CHANNELS (SMALL DRAINAGE AREAS)

WELL DEFINED CHANNELS (LARGE DRAINAGE AREAS)

TYPICAL FENCING AT CHANNEL CROSSING
Existing pavement shall be shaped to provide a smooth vertical plane.

**SECTION F-F**
- Extend where required to meet existing pavement.
- SEE PLANS FOR RADIUS.
- 1' CURB HEIGHT TRANSITION

**SECTION G-G**
- Width shown on plans
- SEE PLANS FOR RADIUS.

**SECTION H-H**
- 1' CURB HEIGHT TRANSITION
- VARIABLE

**SECTION J-J**
- SEE PLANS FOR RADIUS.

**SECTION K-K**
- The number of joints shown in paved approach are for illustrative purposes only. Joints placed in paved approaches shall match the expansion transverse mainline pavement joint location.
- 3" - Except where varied to meet existing improvements.
- 2" NRCP - For street, sideway, alley or commercial approaches.
- 1" NRCP - For private approaches.

**GENERAL NOTES**
- Where paved approach meets existing PCC pavement or sidewalk, place 1' preformed fiber expansion joint, cut to template, through new concrete and 1' from junction with existing concrete or along inside edge of sidewalk. Where paved approach meets existing bituminous construction, omit joint.
- See standard plan 608.10 for concrete curb ramps.
- See standard plan 502.05 for joint details.

**SECTION F-F**
- Elevation of center of paved approach. At a point 6' from edge of normal pavement shall not vary more than 2" from elevation of mainline pavement at centerline of paved approach.
- If sidewalks are not included in construction or paved approach, place ground cover, as shown on plans, behind curb through radius. Ground cover shall conform to finished grading for curb ramp.
- Hand finishing permitted on paved approach.

**DETAIL A**
- Cross-hatched area to be monolithic with mainline pavement.
- 1' preformed fiber expansion joint.

**PLAN OF STREET, SIDERoad, ALLEY OR COMMERCIAL APPROACHES**
- Full curb height to 6'
- Transition from full curb height to 6'

**PLAN OF PRIVATE APPROACHES**
- Cross-hatched area to be monolithic with mainline pavement.

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**NOT ADJOINING CURB AND GUTTER SECTIONS**

DATE EFFECTIVE: 10/01/2009
DATE PREPARED: 8/29/2009

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-454-MODOT (1-888-266-6368)
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.

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 SIDEWALK 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 PEDESTRIAN ACCESS ROUTE SHALL BE 5.0% MAXIMUM.

WHERE PEDESTRIAN ACCESS ROUTES ARE CONTAINED WITHIN MIDD BLOCK PEDESTRIAN STREET CROSSINGS, THE CROSS SLOPE OF THE PEDESTRIAN ACCESS ROUTE MUST BE EQUAL TO 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 SIDEWALK CONNECTIONS.
**STAIRWAY STEP DETAILS**

**SAFETY RAIL DETAILS**

**RAILING & POST SPECIFICATIONS**

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**STEP DIMENSIONS**

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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 AASHTo M111.
- 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

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</table>
 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

(2) SEE STANDARD PLAN 203.50 FOR DETAILS OF LOW PROFILE ISOLINE

GENERAL NOTES:
TIE BARS SHALL BE EPOXY COATED, DEFORMED REINFORCING BARS MEETING THE REQUIREMENTS OF SECTION 1050 AND 1057.

BONDING FOR TIE BARS SHALL BE EPOXY OR POLYESTER BONDING AGENTS AS SPECIFIED IN SECTION 1059.

THE FACE OF THE MEDIAN MAY BE CONSTRUCTED WITHOUT BATTERY WHEN CONSTRUCTED ON A RADIUS OF 5' OR LESS.

WHEN CONCRETE MEDIANS ARE CONSTRUCTED DIRECTLY BENEATH GUARDRAIL, THE MEDIAN HEIGHT WILL BE 4'.

CONCRETE MEDIAN STRIP

MODIFIED DATE: 9/30/2016
SHEET: 1 OF 1

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-MODOT-INFO 1-888-663-6846

CONCRETE MEDIAN STRIP
SIDEWALK HANDRAILING WITHOUT BALUSTERS

4 CROSS SLIDES: 1.0% MIN. - 2.0% MAX.

SIDEWALK WITHOUT BUFFER STRIP
(SECTION A-A)

SIDEWALK WITH BUFFER STRIP
(SECTION A-A)

FOR GENERAL NOTES AND HANDRAILING REQUIREMENTS ON PILL SETS SEE SHEET 3 OR 4
HANDRAIL REQUIREMENTS

<table>
<thead>
<tr>
<th>Fill Slope</th>
<th>Fill Height</th>
<th>Handrail</th>
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<tr>
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<tr>
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<td>≥ 4 ft.</td>
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<td>(1/2:3H) or Steeper</td>
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RAILING AND POST SPECIFICATION

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GENERAL NOTES:

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
1-888-650-MODOT (1-888-265-6636)
HANDRAIL AND EXTENSION CONNECTION

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 entire length where they are integral to crash rails or bumper guards.

The distance between horizontal projections and the bottom of the gripping surface shall be permitted to be reduced by 4" for each 6" of additional handrail perimeter dimension that exceeds 4".

Handrail surfaces and any surfaces adjacent to them shall be free of sharp or abrasive elements and shall have rounded edges.

Handrails shall not rotate within their fittings.

HANDRAIL GRIPPING SURFACES

DETAIL A - HANDRAIL

HANDRAILING

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: 02/28/2013

SHEET NO. 4 OF 4
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 YIELD 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” x 48” CLEAR SPACE SHALL BE PROVIDED CENTERED ON THE PEDESTRIAN PUSH BUTTON.

BEYOND 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 1/10H. SIDE FLARES OUTSIDE THE PEDESTRIAN PATH (NONTRAVERSABLE) MAY BE VERTICAL.

TRANSITION FROM SIDEWALK OR CURB RAMP TO GUTTER TO ROADWAY 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.
GENERAL NOTES:

1. 1% OR MINIMUM, 2% 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% (1:12H) MAXIMUM SLOPE.
4. HEIGHT VARIES TO MEET EXISTING GROUND.
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 15° MAX. FOR SIDE APPROACH TO THE CURB FACE.
(1) 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.

(2) PEDESTRIAN PUSH BUTTONS SHALL BE 10' OFFSET FOR FRONT APPROACH AND 10' MAX. FOR SIDE APPROACH TO THE CURB FACE.

DETECTABLE WARNING SURFACES SHALL BE OMITTED IF LENGTH IS < 6', BECAUSE REFUGE SPACE IS DEEMED TOO SMALL.

RAMP OR CUT-THROUGH DEPENDING ON ISLAND WIDTH. IF RAMPED, PROVIDE 4' MINIMUM LANDING AND SLOPE RAMPS AT 1:12 MAX.

RAMP MUST BE CONSTRUCTED TO DRAIN TO THE OUTSIDE.

SECTION A-A
ISLAND CUT THROUGH TYPICAL

CROSSWALK

RAMP MUST BE CONSTRUCTED TO DRAIN TO THE OUTSIDE.
CONCRETE CURB, CURB AND GUTTER AND GUTTER

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 4 INCH BARRIER CURB, AS SHOWN ON STANDARD PLAN 609.00.
CURB, CURB AND GUTTER CONSTRUCTED ALONG AND ATTACHED TO CONCRETE PAVEMENT OR BASE SHALL HAVE:
1. JOINT OF 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, CURB AND GUTTER AND CURB AND GUTTER.
3. JOINT THROUGH CURB AND CURB AND GUTTER AT THE BEGINNING AND END OF EACH PAVED APPROACH.
CURB, 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 CURB AND GUTTER, AT THE BEGINNING AND END OF EACH "PAVED APPROACH" AND A JOINT TO DEPTH OF CURB AND GUTTER THICKNESS AT INTERVALS OF 30 FEET BETWEEN APPROACHES.
JOINTS AND THROUGH CURB SHALL BE FILLED WITH PREFERED FILLER MATERIAL AND SEALED WITH HOT POURED FILLER FOR JOINTS.
JOINT IN GUTTER SHALL BE FILLED WITH PREFERED FILLER AND SEALED WITH HOT FILLER MATERIAL.
PREFERED 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 WILL BE REQUIRED.
WHERE A SIDEWALK INTERSECTS A CURB, THE SIDEWALK SHALL BE RAMPED NO STEEPER THAN 12:1 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

FLAT BOTTOM DITCH
WITH BEDDING MATERIAL

TYPICAL DITCH LINER DETAILS

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<th>BEDDING MATERIAL MIN. THICKNESS</th>
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<td>8&quot;</td>
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<td>4</td>
<td>30&quot;</td>
<td>12&quot;</td>
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SHOULDER, FINISHED GRADE, OR NATURAL GROUND

VARIABLE

WIDTH

VARIABLE

MIN. DEPTH

Erosion Control
Geotextile Fabric (if required) see Special Provisions

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)
**ROCK LINING FOR CULVERT OUTLETS**

<table>
<thead>
<tr>
<th>CULVERT SIZE, DIA (IN.)</th>
<th>MIN/MIN. DEPTH AND WIDTH (FT.), MINIMUM LENCING Lining (CU.YD.), Equivalent Pipe Arch (APP.), Equivalent Concrete Box (APPROX.)</th>
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<td>24</td>
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<tr>
<td>108</td>
<td>3 x 32 40 142 8’ x 8’</td>
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</tbody>
</table>

**GENERAL NOTES:**

The dimensions shown in the Table can be applied to box or arch culverts of equivalent waterway area.

**STATE OF MISSOURI**

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-455-MODOT (1-888-275-6636)

**SHEET NO.** 609.70C

**DATE EFFECTIVE:** 1/1/1981

**DATE PREPARED:** 8/23/2009

**END VIEW**

(ALTERNATE METHOD)
**GENERAL NOTES:**

**SLOPE PROTECTION SHEET NO. 1 OF 1**

**Slope Protection**

Slope Protection shall be made continuous between structures when median is 60' or less. Concretes shall be formed around any undisturbed rock that is permitted to remain within the slope protection area.

**Concrete Slope Protection**

Concrete slope protection shall be formed around any undisturbed rock that is permitted to remain within the slope protection area.

**Concrete Slope Protection (Roadway Item)**

- **Raise Edge 3" in 2'-0" to 12" ± from finished ground line (Typ.).**
- **Limit of Slope Protection to be specified on plans.**

**Pre-Formed Fiber Expansion Joint Material**

1" Pre-Formed Fiber Expansion Joint Material (Section 1057)

**Detail A**

See Bridge Plans for Type of Curb

**Elevation (Straight Slope Type)**

- **Elevation (Use on Structures Without Passive Pressure Berm)**
- **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).**

**Elevation (Use on Structures With Passive Pressure Berm)**

- **Raise Edge 3" in 2'-0" to 12" ± from finished ground line (Typ.).**
- **Limit of Slope Protection.**

**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.

**DATE EFFECTIVE:** 07/01/2015

**DATE PREPARED:** 5/29/2015

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

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

**CONCRETE SLOPE PROTECTION**

**SHEET NO. 1 OF 1**
ATTENUATOR LAYOUT:

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

10" x 10" TYPE 1 OBJECT MARKER WITH MID-OFF FLUORESCENT ORANGE SHEETING

TYPE I OBJECT MARKER PLACEMENT FOR TEMPORARY INSTALLATIONS

TRAFFIC PASSING TO LEFT AND RIGHT

LOCATION OF OBJECT MARKER

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

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.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-800-427-MODOT (1-800-427-6636)

SAND FILLED IMPACT ATTENUATORS
1) REMOVE ALL CONCRETE TO LIMITS SHOWN TO MAX. OF 1/2 THE PAVEMENT DEPTH ON TOP OF CURB BY MILLING.

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

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

4) PLACE 2" MIN. COMPRESSIBLE INSERT ADJACENT TO LONGITUDINAL LINE OF SHOULDER JOINT.

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

6) EXPOSED SURFACE OF CURB BARS SHALL BE COATED WITH AN APPROVED BINDER SEALER.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL JEFFERSON CITY, MO 65102
1-888-MODOT-HELP 1-888-663-6853

PAVEMENT REPAIR
PARTIAL DEPTH
CLASS A

DATE: 05/14/2019 SHEET: 2 OF 4

613.00T
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 BE ALTERNATE EACH ONE FOOT ON EITHER SIDE OF THE LONGITUDINAL JOINT FROM HOLE TO HOLE. DRILLED HOLES SHALL NOT PENETRATE THROUGH THE SLAB BOTTOM.

3. DRILLED HOLES SHALL BE CLEARED OF LOOSE DEBRIS AND DUST. EPOXY OR POLYESTER BONDING AGENTS FOR BARS, MEETING THE MATERIAL REQUIREMENTS OF SECTION 1027, SHALL BE INJECTED OR PUMPED INTO EACH HOLE. A CROSS-STITCH BAR SHALL BE INSERTED IN EACH HOLE SUCH THAT THE EPOXY MATERIAL IS EVENLY DISTRIBUTED AROUND THE BAR AND EXTRUDED FROM THE SURFACE (PRESSURE). EACH BAR SHALL BE INSERTED FLUSH ENOUGH TO ALLOW 1/4" OF COVER AS SHOWN IN THE PROFILE DETAIL.

4. THE SURFACE SHALL HAVE ALL EXCESS EPOXY REMOVED AND HAVE A FLUSH FINISH.

GENERAL NOTES:

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITAL
JEFFERSON CITY, MO 65102
1-800-MO-DOT-MO (1-800-663-6686)

PAVEMENT REPAIR
CROSS STITCHING

SECTION A-A

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<th>E (IN)</th>
<th>L (IN)</th>
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<td>18</td>
</tr>
<tr>
<td>22</td>
<td>22</td>
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</tr>
</tbody>
</table>
1. 1 1/2" DIAMETER DOWEL BAR X 10" LENGTH.
2. DOWEL BAR SLOTS SHALL BE PARALLEL TO ROADWAY.
3. TIP OF COMPRRESSIBLE INSERT SHALL BE flush with Pavement surface.
4. CRACK PERIMETER IN SLOT SHALL BE SEULED WITH SILICONE.
5. COMPRESSIBLE INSERT SHALL BE PLACED AT MIDDLE OF DOWEL BAR.

PLAN VIEW

LONGITUDINAL JOINT

TRANSVERSE CRACK

DETAIL A

EXISTING CONCRETE PAVEMENT

DOWEL BAR RETROFIT (TIP.)

CONCRETE PAVEMENT

SECTION A-A

MESSAGE

PAVEMENT REPAIR

DOWEL BAR RETROFIT

SECTION B-B

SECTION C-C

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-467-MODOT (6636) 1-800-292-4682

DATE EFFECTIVE: 03/04/2019
613.001 SHEET NO. 4 OF 4
**Plan**

**Bearin Plate**

**Section A-A**

**Section B-B**

**Section C-C**

**Grate**

**Table - WEIGHT AND DIMENSIONS DATA**

<table>
<thead>
<tr>
<th>OPENING</th>
<th>WEIGHT (lbs)</th>
<th>BEARING BARS</th>
<th>DIMENSIONS</th>
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<td>2'-5 1/2&quot;</td>
<td>11</td>
</tr>
<tr>
<td>5'-0&quot; x 3'-0&quot;</td>
<td>330</td>
<td>1/4&quot;</td>
<td>3'-5 1/2&quot;</td>
<td>10</td>
</tr>
<tr>
<td>5'-0&quot; x 2'-0&quot;</td>
<td>300</td>
<td>1/4&quot;</td>
<td>2'-5 1/2&quot;</td>
<td>18</td>
</tr>
<tr>
<td>5'-0&quot; x 3'-0&quot;</td>
<td>550</td>
<td>1/4&quot;</td>
<td>3'-5 1/2&quot;</td>
<td>17</td>
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<tr>
<td>5'-0&quot; x 2'-1 1/2&quot;</td>
<td>200</td>
<td>1/4&quot;</td>
<td>2'-6 1/2&quot;</td>
<td>11</td>
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<tr>
<td>5'-0&quot; x 3'-1 1/2&quot;</td>
<td>340</td>
<td>1/4&quot;</td>
<td>3'-6 1/2&quot;</td>
<td>10</td>
</tr>
<tr>
<td>5'-0&quot; x 2'-1 1/2&quot;</td>
<td>310</td>
<td>1/4&quot;</td>
<td>2'-6 1/2&quot;</td>
<td>18</td>
</tr>
<tr>
<td>5'-0&quot; x 3'-1 1/2&quot;</td>
<td>560</td>
<td>1/4&quot;</td>
<td>3'-6 1/2&quot;</td>
<td>17</td>
</tr>
</tbody>
</table>

1) THE WEIGHT OF THE GRATE AND BEARING PLATE INCLUDES THE BOLTS, NUTS, AND WASHERS AND SHALL BE AS SHOWN WITH A TOLERANCE OF 5 PERCENT.

**General Notes:**

- When bolts are cut in the field, threads must be cleaned to permit the final nut to run freely on the bolt.

- The welding requirements shown on this drawing are for painted grates and bearing plates. If galvanized, all tightly contacting surfaces shall be completely sealed on all sides by welding prior to galvanizing.

---

**Missouri Highways and Transportation Commission**

105 West Capitol
Jefferson City, MO 65102
1-888-4ASK-MODOT (1-888-275-6636)

**Grates and Bearing Plates**

Date Effective: 12/21/2009
Date Prepared: 8/23/2009

614.10T Sheet No. 1 of 1
INSTALLATION INSTRUCTIONS:
DRILL AND TAP FRAME.
INSTALL 3/4" DIA. BOLTS WITHOUT WASHERS BEFORE CONCRETE POUR TO FORM 3/4" BOLT EXTENSION INTO CONCRETE BELOW FRAME. LUBRICATE EXPOSED THREADS.

AFTER CONCRETE HARDENS SUFFICIENTLY, FINAL INSTALLATION SHALL REMOVE AND REINSTALL 3/4" DIA. BOLTS AND LOCK WASHERS THROUGH GRATE AND FRAME. TORQUE 3/4" DIA. BOLTS TO 35-40 FT. LB.
APPLY THREAD ADHESIVE TO ALL 3/4" DIA. STAINLESS STEEL BOLTS.

NOTE: TWO 2' X 2' GRATES MAY BE USED IN LIEU OF SINGLE 4' X 2' GRATES.

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.

PLAN

SECTION A-A

SECTION B-B
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.

GENERAL NOTES:

TYPE 1A:
WHEN "p" (PAVEMENT THICKNESS) IS 8" USE MANHOLE FRAME WITH 9" HEIGHT (F) APPROXIMATE WEIGHT OF FRAME AND COVER. 540 LBS., CLASS 35 CASTING.

TYPE 1B:
WHEN "p" (PAVEMENT THICKNESS) IS 9" OR 10", USE MANHOLE FRAME WITH 10" HEIGHT (F) APPROXIMATE WEIGHT OF FRAME AND COVER. 570 LBS., CLASS 35 CASTING.

TYPE 1C:
TYPE 1C MANHOLE FRAME AND COVER WILL BE ACCEPTED AS AN ALTERNATE TO TYPE 1A OR TYPE 1B. APPROXIMATE WEIGHT OF FRAME AND COVER. 290 LBS.

FOR "p" GREATER THAN 10" ADJUSTING RINGS COMBINED WITH MANHOLE FRAMES WITH "F" EQUAL TO 9" OR 10" SHALL BE USED TO MATCH THE PAVEMENT THICKNESS.

THE PRICE BID FOR MANHOLE FRAME AND COVER SHALL INCLUDE THE NUMBER OF ADJUSTING RINGS REQUIRED TO MATCH PAVEMENT THICKNESS.

WHEN SPECIFIED, USE A LOCK TYPE FRAME AND COVER WITH A MINIMUM OF 3 LOCK BLOCKS AND BOLTS.

MANHOLE ADJUSTING RINGS SHALL BE SECURED TO EITHER THE FRAME OR PAVEMENT TO PREVENT MOVEMENT UNDER TRAFFIC.

APPROXIMATE WEIGHT OF FRAME AND COVER 290 LBS.

APPROXIMATE WEIGHT OF FRAME AND COVER 250 LBS.

APPROXIMATE WEIGHT OF FRAME AND COVER 115 LBS.

APPROXIMATE WEIGHT OF FRAME AND COVER 160 LBS.
SECTION A-A

APPROXIMATE WEIGHT OF FRAME AND COVER 150 LBS.

ALTERNATE TYPE 4 COVER

SECTION B-B

ADJUSTING RING

ELEVATION

INSTALLATION DETAILS

FRAME

ADJUSTING RING

COVER
### Table A: Work Zone Sign Mounting Requirements

<table>
<thead>
<tr>
<th>Type</th>
<th>Support Description</th>
<th>Minimum Mounting Height</th>
<th>Usable Limitations</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post</td>
<td>Perforated Round Steel Tube D-Channel Hinge</td>
<td>5'</td>
<td>Rural, Undivided Highways</td>
<td>None</td>
</tr>
<tr>
<td>Type 1 Portable</td>
<td>Round Pole-Off Stand</td>
<td>5'</td>
<td>Rural, Undivided Highways</td>
<td>Permitted only where post mounting is not feasible.</td>
</tr>
<tr>
<td>Type 2 Portable</td>
<td>Self-Driving Post Type 131 Portable Barriere-Safe</td>
<td>Flexible Round</td>
<td>Rural, Undivided Highways</td>
<td>Permitted only for installation up to 5' vertically, where signs are required by other objects. Systems shall comply with crash test requirements of NCHRP Report 411. Sections 3, 4, 5, and 6, if used. If used, a minimum lateral clearance of 5 feet is required. Horizontal clearances shall be maintained from the edge of the sign to the edge of the designated traveled way.</td>
</tr>
<tr>
<td>Barrier</td>
<td>Concrete Traffic Barrier</td>
<td>Flexible Round</td>
<td>Rural, Undivided Highways</td>
<td>Permitted only where longitudinal barrier is present.</td>
</tr>
<tr>
<td>Vehicle</td>
<td>Pavement Marking Equipment</td>
<td>Flexible Round</td>
<td>Rural, Undivided Highways</td>
<td>Permitted only in pilot car or moving operations.</td>
</tr>
</tbody>
</table>

#### General Notes:

- **Height and Lateral Locations for Post and Portable Sign Mounting**

- **Special Traffic Control Devices Sign Mounting Requirements**

- **Temporary Traffic Control Devices Sign Mounting Requirements**

---

**Table Notes:**

- Minimum heights must be maintained from the edge of the traveled way.

**Diagram Notes:**

- Heights and lateral locations for post and portable sign mounting are shown in the diagram.

**Engineer's Note:**

- All signs shall be mounted in or on channelizers.
- All signs shall be installed and maintained in a firm position.
- Construction signs shall not be located on sidewalks, shoulders, or areas designated for protection or bicycle traffic.

**Missouri Highways and Transportation Commission**

[Logo]

**Temporary Traffic Control Devices Sign Mounting Requirements**

**Size:** 8.5" x 11" **Date:** May 2009 **Sheet No.:** 1 of 9
U-CHANNEL POST DETAIL

FOUR #8 GALVANIZED ASTM A 449 BOLTS, NUTS AND WASHERS MAY BE INSTALLED IN EITHER DIRECTION.

DIRECTION OF TRAFFIC
MOUNT SIGN ON THIS FACE OF POST

WOOD POST DETAIL

4" X 4" WOOD POST - NO SLOTS OR HOLES REQUIRED.
6" X 6" WOOD POST - 1 3/4" X 4" SLOT ON 6" SIDE OR 1 1/2" DIAM. HOLES ON 6" SIDE.
6" X 6" WOOD POST - 2" X 4" SLOTTED 2" DIAM. HOLE SPLIT ACROSS NEUTRAL AXIS FORMED BY SUCCESSIVE DRILLING WITH 4" BIT.

OPTIONAL U-CHANNEL POST DETAIL

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

PERFORATED SQUARE STEEL TUBE POST DETAIL

THE SIGN POST IS TO BE MOUNTED ON THE FACE OF POST.

POST TYPE

<table>
<thead>
<tr>
<th>SIGN AREA (SQ. FT)</th>
<th>U-CHANNEL</th>
<th>WOOD</th>
<th>PERFORATED SQUARE STEEL TUBE</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 10</td>
<td>1 - 3.0 LB/FT²</td>
<td>1 - 4&quot; X 4&quot;</td>
<td>1 - 2&quot; X 2&quot; GA</td>
</tr>
<tr>
<td>&gt; 10 ≤ 16</td>
<td>2 - 5.0 LB/FT²</td>
<td>2 - 4&quot; X 4&quot;</td>
<td>2 - 2&quot; X 2&quot; GA</td>
</tr>
<tr>
<td>&gt; 16 ≤ 24</td>
<td>2 - 3.0 LB/FT²</td>
<td>2 - 4&quot; X 6&quot;</td>
<td>2 - 2&quot; X 2&quot; GA</td>
</tr>
<tr>
<td>&gt; 24 ≤ 30</td>
<td>3 - 5.0 LB/FT²</td>
<td>2 - 4&quot; X 6&quot;</td>
<td>N/A</td>
</tr>
<tr>
<td>&gt; 30 ≥ 50</td>
<td>N/A</td>
<td>2 - 6&quot; X 6&quot;</td>
<td>N/A</td>
</tr>
</tbody>
</table>

* SIGNS GREATER THAN 6 FEET IN HEIGHT, EXCEPT DIAMOND SHAPED SIGNS, REQUIRE TWO POSTS.

** REQUIRES SLIP BASE PER MANUFACTURER'S RECOMMENDATION.

USE OF SPLICE IS OPTIONAL.

SPICE OVERLAP SHALL BE POSITIONED ENTIRELY BETWEEN GROUND LINE AND 18" ABOVE GROUND LINE OR BETWEEN 18" AND 18" ABOVE GROUND LINE.

IF A SPLICE IS USED, NEITHER THE SIGN NOR THE FRAME SHALL BE POSITIONED WITHIN THE SPLICE OVERLAP SPECIFIED.

ONLY ONE SPLICE WILL BE ALLOWED PER POST.

GENERAL NOTES:

ALL POSTS SHALL BE EMBEDDED A MINIMUM OF 3 FEET.

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

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-409-MODOT (1-888-409-6636)

TEMPORARY TRAFFIC CONTROL DEVICES POST INSTALLATION DETAILS

SIZE EFFECTIVE: 09/04/2021
SIZE EFFECTIVE: 09/07/2020
616.10AV SHEET NO: 2 OF 9
DIRECTION INDICATOR BARRICADE

VERTICAL DIMENSIONS DO NOT INCLUDE PROJECTIONS DESIGNED FOR EASE OF MANEUVERING.

DIRECTION INDICATOR BARRICADES SHALL NOT BE USED IN SHIFTING TAPERS UNLESS SHOWN ON THE PLANS.

THE PANELS SHALL BE SECURELY ATTACHED TO A SUPPORT THAT IS PORTABLE, COMPATIBLE WITH EXISTING UPHOLSTERY AND ENTIRELY FREE STANDING.

ADVANCE WARNING RAIL SYSTEM

MAXIMUM WEIGHT OF SIGN SHALL NOT EXCEED 25 LBS.

THE SIGN AND RAIL SYSTEM MAY BE V Varied AS TWO SEPARATE GRASHPICHERS. THE RAIL SYSTEM SHALL BE LOCATED DIRECTLY IN FRONT OF THE SIGN A WITH 1 TO 10 FEET SEPARATING THE TWO DEVICES.

WHERE MARKING IS NOT PROVIDER ON THE RAILSIDE, STEPS OF 3" VICE MARK TYPE 7 ORANGE SHEETING MAY BE APPLIED TO THE ENDS OF EACH RAIL TO HELP DELIMITER THE DEVICE.

WHITE AND ORANGE REFLECTIVE SHEETING SHALL BE IN ACCORDANCE WITH SEC 10452.7.4.

CHANNELIZERS

WHITE, ORANGE, AND FLUORESCENT ORANGE REFLECTIVE SHEETING SHALL BE IN ACCORDANCE WITH SEC 10452.7.4.

GENERAL NOTES:

WHITE, ORANGE, AND FLUORESCENT ORANGE REFLECTIVE SHEETING SHALL BE IN ACCORDANCE WITH SEC 10452.7.4.

BALLAST FOR TRAFFIC CONTROL DEVICES SHALL CONFORM TO MANUFACTURER S RECOMMENDATION FOR FIELD CONDITIONS WHEN APPLICABLE.

IF USED, THE WARNING LIGHT UNIT AND BATTERY COMPARTMENT SHALL BE FURNISHED BY THE TRAFFIC CONTROL DEVICES MANUFACTURER OR OTHERWISE MEET THE MANUFACTURER S RECOMMENDATIONS FOR DESIGN AND WILL BE REQUIRED ON ALL DEVICES IN THE SERIES.

WARNING LIGHTS SHALL BE IN ACCORDANCE WITH SEC 1065.5.

ON APPROVAL OF THE ENGINEER, THE CONTRACTOR MAY, AT NO ADDITIONAL COST, USE TRIM-LINE CHANNELIZERS IN LIEU OF TRIM-LINE CHANNELIZERS TO PROVIDE LONGITUDINAL CHANNELIZING WITHIN THE ACTIVITY AREA, WHERE ALL NURSERY, INTERSECTIONS OR LIMITED CLEARANCE EXISTS.

ON APPROVAL OF THE ENGINEER, THE CONTRACTOR MAY, AT NO ADDITIONAL COST, USE TRIM-LINE CHANNELIZERS IN LIEU OF TRIM-LINE CHANNELIZERS IN VERTICALLY TAPERS.

ON APPROVAL OF THE ENGINEER, THE CONTRACTOR MAY, AT NO ADDITIONAL COST, USE TRIM-LINE CHANNELIZERS IN LIEU OF TRIM-LINE CHANNELIZERS TO PROVIDE LONGITUDINAL CHANNELIZING WITHIN THE ACTIVITY AREA.

ON APPROVAL OF THE ENGINEER, THE CONTRACTOR MAY, AT NO ADDITIONAL COST, USE TRIM-LINE CHANNELIZERS DURING DAYTIME OPERATIONS ON MAJOR ROUTES.

CHANNELIZERS AND DIRECTION INDICATOR BARRICADE

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

CHANNELIZERS AND DIRECTION INDICATOR BARRICADE

TEMPORARY TRAFFIC CONTROL DEVICES

DATE EFFECTIVE: 07/01/2021

SHEET NO. 3 OF 9

CHANNELIZERS

WHITE, ORANGE, AND FLUORESCENT ORANGE REFLECTIVE SHEETING SHALL BE IN ACCORDANCE WITH SEC 10452.7.4.

CHANNELIZERS SHALL BE SECURELY ATTACHED TO A SUPPORT THAT IS PORTABLE, COMPATIBLE WITH EXISTING UPHOLSTERY AND ENTIRELY FREE STANDING.

VERTICAL PANEL SHEET NO. 3 OF 9

CHANNELIZERS

WHITE, ORANGE, AND FLUORESCENT ORANGE REFLECTIVE SHEETING SHALL BE IN ACCORDANCE WITH SEC 10452.7.4.

CHANNELIZERS SHALL BE SECURELY ATTACHED TO A SUPPORT THAT IS PORTABLE, COMPATIBLE WITH EXISTING UPHOLSTERY AND ENTIRELY FREE STANDING.
Type 3 movable barricades shall be on both sides of each rail and direct traffic movement appropriately to allow vehicles to pass through.

Example 1 - One Type 3 movable barricade will be required to completely close each 8' of pavement. Fixed shoulders 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 33 percent of all three rails.

Warning lights shall be lightweight (3.3 lbs. or less) or have battery packs mounted no higher than 12" and shall not cover any portion of the barricade face.

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

If signs or lights cannot meet the above requirements, they shall be mounted on separate crashworthiness devices at heights specified for post mounted signs. Located in Table 6 on Sheet 1, the barricade shall be located in front of the signs or lights with 1'-6" 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 or may be applied to both the front and the back of each rail provided the warning on the back does not conflict with intended opposing traffic movement.

White and orange reflective sheeting shall be in accordance with Sec. 400.27-04.

Example 2 - For paved roadways with a width of 25 feet or less and without fixed shoulders, two barricades are acceptable.

Example 3 - Where barricades extend entirely across a roadway, stripes should be placed in the direction toward which the user must turn.

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

Example 5 - Where no turns are intended, stripes positioned to slope downward toward the center of the barricade of barricades.

Missouri Highways and Transportation Commission

Temporary Traffic Control Devices

Type 3 Movable Barricade

Date Effective: 03/30/2005

Sheet No.: 4

616.10AV
TWO LANE / TWO WAY TRAFFIC DELINEATION PLAN FOR DIVIDED HIGHWAY

IF RAISED PAVEMENT MARKERS ARE PRESENT, THE LEDGES 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 PAVEMENT SURFACE. THE ADHESIVE SHALL PERMIT EASY REMOVAL OF THE TUBULAR DelineATOR WITHOUT DAMAGE TO THE PAVEMENT SURFACE.

REFLECTIVE SHEETING APPLIED TO TUBULAR DelineATORS SHALL BE IN ACCORDANCE WITH Sec 1042.7.7.6.

CHANGEABLE MESSAGE SIGN

4 5 CHANNELIZERS (INCIDENTAL) AT 20' INTERVALS; CHANNELIZERS MAY BE OMITTED WHERE THE VARIABLE MESSAGE SIGN IS LOCATED 15' OR MORE FROM THE EDGE OF ANY SHOULDER. EDGE OF PAVEMENT SHOULD BE NO SHOULDER BEYOND THE 6' MIN. LINE, OR BEHIND A CURVE OR PHYSICAL EARRIER.

STRIPES SHALL SLOPE DOWNWARD TOWARD THE SIDE WITH TRAFFIC 35 TO PASS.

TYPE 3 OBJECT MARKERS
FLUORESCENT ORANGE REFLECTIVE SHEETING SHALL BE IN ACCORDANCE WITH Sec 1042.7.7.6.
### WARNING SIGNS

<table>
<thead>
<tr>
<th>SIGN</th>
<th>SITE DESCRIPTION</th>
<th>AREA</th>
<th>MILE MARKER</th>
<th>DATE</th>
<th>SHEETING</th>
<th>COLOR</th>
<th>BACKGROUND DESIGNATION</th>
<th>DESCRIPTION</th>
</tr>
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<tbody>
<tr>
<td>W01</td>
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<td>W03</td>
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</table>

**GENERAL NOTES:**

SIGN LAYOUTS SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF "STANDARD HIGHWAY SIGNS" BY THE U.S. DEPARTMENT OF TRANSPORTATION - FED. EXCEPT WHERE 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 PLATES. ALL SIGNS MUST BE MOUNTED WITH A BOLTER. PLATES SHALL NOT BE BURIED.

---

**TEMPORARY TRAFFIC CONTROL DEVICES**

**WARNING SIGNS**

<table>
<thead>
<tr>
<th>SIGN</th>
<th>SITE DESCRIPTION</th>
<th>AREA</th>
<th>MILE MARKER</th>
<th>DATE</th>
<th>SHEETING</th>
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<th>BACKGROUND DESIGNATION</th>
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**SHEET EFFECTIVE DATE:** 01/01/2001

**SHEET 6 OF 9**

**SITE 616.10AV**

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**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISION**

**105 WEST CAPITOL,JEFFERSON CITY, MO 65101**

**1-888-638-MDOT (638-6368)**

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**TEMPORARY TRAFFIC CONTROL DEVICES**

**WARNING SIGNS**

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<th>SIGN</th>
<th>SITE DESCRIPTION</th>
<th>AREA</th>
<th>MILE MARKER</th>
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<th>BACKGROUND DESIGNATION</th>
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**SHEET EFFECTIVE DATE:** 01/01/2001

**SHEET 6 OF 9**

**SITE 616.10AV**

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**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISION**

**105 WEST CAPITOL,JEFFERSON CITY, MO 65101**

**1-888-638-MDOT (638-6368)**

---

**TEMPORARY TRAFFIC CONTROL DEVICES**

**WARNING SIGNS**

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<th>AREA</th>
<th>MILE MARKER</th>
<th>DATE</th>
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<th>BACKGROUND DESIGNATION</th>
<th>DESCRIPTION</th>
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<tbody>
<tr>
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</tbody>
</table>
### Type B (Modified) TYPICAL SECTION

#### PART SECTION THROUGH UPPER BARRIER

<table>
<thead>
<tr>
<th>Transverse Pavement Reinforcement</th>
<th>Bar Size</th>
<th>Bar Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pavement Thickness</td>
<td>Ø 0.95&quot;</td>
<td>12&quot;</td>
</tr>
<tr>
<td>10&quot;</td>
<td>Ø 0.95&quot;</td>
<td></td>
</tr>
<tr>
<td>11&quot;</td>
<td>Ø 0.95&quot;</td>
<td></td>
</tr>
</tbody>
</table>

#### PART SECTION THROUGH LOWER BARRIER

**NOTES:**
- ALL REINFORCEMENT SHALL BE GRAY 60 EPOXY COATED.
- NO DIRECT PAVEMENT WILL BE USED FOR REINFORCING STEEL.
- MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1/8" UNLESS OTHERWISE SHOWN.

**Type B (Modified) shall be used only at locations shown in plans.**

**For concrete traffic barrier delineation details see Std. Plan 903-D.**

1. **REINFORCING BARS WITH AN EPOXY ALUMINUM SYSTEM MAY BE SUBSTITUTED FOR 1/8" DIAMETER ROUND STEEL DIAMETERS.**

2. **TILT TRANSVERSE PAVEMENT REINFORCEMENT HOOKS FROM VERTICAL ALIGNMENT TO MAINTAIN 1/8" MINIMUM CLEARANCE.**

3. **SEE ROADWAY PAVEMENT DESIGN.**

**Notes (80%):**
- All reinforcement shall be gray 60 epoxy coated.
- No direct pavement will be used for reinforcing steel.
- Minimum clearance to reinforcing steel shall be 1/8" unless otherwise shown.

**Type B (Modified) shall be used only at locations shown in plans.**

**For concrete traffic barrier delineation details see Std. Plan 903-D.**

1. Reinforcing bars with an epoxy aluminum system may be substituted for 1/8" diameter round steel diameters.

2. Tilt transverse pavement reinforcement hooks from vertical alignment to maintain 1/8" minimum clearance.

3. See roadway pavement design.

**R.F.DOT.**

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

**PERMANENT CONCRETE TRAFFIC BARRIER AT MSE WALL TYPE B MODIFIED**

**Sheet No.:** 3 OF 11

**Date Effective:** 01/01/2021

**Date Prepared:** 12/17/2016

617.10L
SECTI ON A-A

SECTI ON B-B

SECTI ON C-C

PLAN

TRANSITION DETAILS FOR PIER PROTECTION

1 1/2" JOINT FILLER (TYP.)

40:1 TRANSITION MAX. RATE

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITAL
JEFFERSON CITY, MO 65102
1-800-257-MIDT (6438) 1-800-257-6438

PERMANENT CONCRETE TRAFFIC BARRIER
TYPE C

GIVE EFFECTIVE:
6/14/2010
GIVE PENDING:
6/24/2010
SHEET NO.
617.110L
5 OF 11
### Table 4: Transverse Pavement Reinforcement

<table>
<thead>
<tr>
<th>Pavement Thickness</th>
<th>Bar Size</th>
<th>Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5 ft</td>
<td>#4</td>
<td>0.5 ft</td>
</tr>
<tr>
<td>0.6 ft</td>
<td>#4</td>
<td>0.6 ft</td>
</tr>
<tr>
<td>0.7 ft</td>
<td>#4</td>
<td>0.7 ft</td>
</tr>
<tr>
<td>0.8 ft</td>
<td>#4</td>
<td>0.8 ft</td>
</tr>
<tr>
<td>0.9 ft</td>
<td>#4</td>
<td>0.9 ft</td>
</tr>
</tbody>
</table>

**NOTES:**

- All reinforcement shall be Grade 60 high-strength steel.
- No expect pavement will be made for reinforcing steel.
- Minimum clearances to reinforcing steel shall be 1.5" unless otherwise shown.
- 4° tilt transverse pavement reinforcement hooks from vertical alignment to maintain 1.5" minimum clearance.
- See roadway pavement design.

#### Detailing Dimension

**90° Hooks**

- Hook A
  - 3/4" or 24" min.

**180° Hooks**

- Hook B
- Hook C

**Eve Hook Dimensions**

<table>
<thead>
<tr>
<th>End Hooks</th>
<th>Soft Hooks</th>
</tr>
</thead>
<tbody>
<tr>
<td>#4</td>
<td>#4</td>
</tr>
<tr>
<td>#4</td>
<td>#4</td>
</tr>
<tr>
<td>#4</td>
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</tbody>
</table>

All standard hooks and bend other than 180° to be bent with the same procedure as for 90° standard hooks.

---

**Part Section Through Barrier**

- Type D (MSE Wall) Traffic Barrier on Top of MSE Wall

---

**Permanent Concrete Traffic Barrier**

**Type D Atop MSE Wall**
GENERAL NOTES:

CONCRETE SHALL BE CLASS B 4" - 4,000 PSI.

ALL REINFORCEMENT SHALL BE GRAY 60 EPOXY COATED.

ANGLE OF INTERNAL FRICTION = 25° FOR BACKFILL MATERIAL.

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

ELEVATION DETAILS SHALL BE A MINIMUM OF 24 TIMES THE NOBLE DIAMETER OF THE BAR.

ANY METHOD RECOMMENDED BY THE CONTRACTOR AND APPROVED BY THE ENGINEER SHALL BE USED. THE CONDITIONAL REINFORCING STEEL WILL BE PLACED 1"-6" IN PLACE AS REQUIRED.

THE CONTRACTOR IS TO SLIP-FIT THE BAR-UPTO THE WIDTH OF THE REINFORCING ELEVATION. THE ELEVATION GAGES ARE TO BE PROVIDED BY THE CONTRACTOR.

THE BARRIER SHALL NOT BE USED TO SUPPORT HIGHWAY LANDING FENCES.

THE BARRIER SHALL NOT BE USED FOR BRIDGE ROADWAY APPLICATION.

SPEED LIMITS SHALL BE PROMINENT AT 15"-60". SEE MISSOURI STANDARD PLANS FOR SPEED LIMIT DETAIL.

TYPE E BARriers MODIFY RETAINING WALL WITH NONREINFORCEMENT. THE BARRIER SHALL BE USED ONLY AT LOCATIONS SHOWN ON PLANS.

FOR CONCRETE TRAFFIC BARRIER DETAILS SEE DETAIL SHEET 303.03.

REINFORCEMENT SYSTEM SHALL BE DRILLED AND COATED.

WHEN BARRIER HEIGHT EXCEEDS 42" OR SLOPE EXCEEDS 1:1, NO LIVE LOAD IS APPLIED. 6"-0" CONTACT BARRIER DESIGN FOR SPECIAL DESIGN.

MISCELLANEOUS:

**PERMANENT CONCRETE TRAFFIC BARRIER**

**TYPE D AS RETAINING WALL**

**SHEET NO.** 10 OF 11
CONCRETE BARRIER END ANCHORAGE ON GRADE

TRAFFIC BARRIER ON TOP OF MSE WALL

GENERAL NOTES:

ALL REINFORCEMENT SHALL BE GRADE 60 EPOXY COATED.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1 3/4" UNLESS OTHERWISE SHOWN.

4 1/2" BUFFER REQUIRED WITHIN THE LIMITS OF THE TRAFFIC BARRIER EXCLUDING THE MSE ANCHORAGE SECTIONS.

FOR CONCRETE TRAFFIC BARRIER ELEVATION DETAILS SEE STD PLAN 903.03.

PAVEMENT SURFACE DIFFERENTIAL SHALL NOT EXCEED 1/8".

BAR SPACINGS SHALL BE A MINIMUM OF 24 TIMES THE MINIMUM DIAMETER OF THE BAR.
PRECAST BARRIER HEIGHT TRANSITION
(Temporary installations only)

1. Optional 4 inch diameter, 11 gauge steel frame mechanical tubing sleeve for lift hole allowed. The location of the hole necessary to accommodate the differing height distribution of transition sections.

2. 3" x 1/2" slots for lifting - two per section, location to be determined by contractor.

SECTION A-A
NOTE: Sections to be connected with two 1" E14 bars or reinforcing bars 3/8" long in lift hole as shown.

SECTION B-B

SECTION C-C

GENERAL NOTES:

REINFORCING STEEL CLEARANCE TO EDGE OF CONCRETE SHALL BE 14" UNLESS OTHERWISE SHOWN.

HEIGHT TRANSITIONS SHALL NOT BE USED ON INTERSTATE FREEWAYS OR IN LOCATIONS WHERE THE FESTER SPEED PRIOR TO CONSTRUCTION IS GREATER THAN 35 MPH.

NO TIME SHALL THE BARRIERS BE LIFTED OR MOVED BY RISE OF THE LIFT EAS.

REINFORCING BOLT AND NUT MUST BE USED WITH TRANSITION BARRIERS.

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.
TEMPORARY CONCRETE TRAFFIC BARRIER
TYPE F HEIGHT TRANSITIONS

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

NOTE: FOR DETAILS OF C BARS, SEE SHEET 2 OF 6.

#4 A1 BAR
#4 A2 BAR
#4 A3 BAR
#4 A4 BAR
#4 A5 BAR
#4 A6 BAR
#4 A7 BAR
#4 A8 BAR
#4 A9 BAR
#4 A10 BAR
#4 A11 BAR

#5 J BAR
1. Tie-down strap anchor shall be one of the following:
   - 2" pipe in anchor with a 3/4" thread and 1/2" bolt.
   - Red Head large diameter tapcon (8") long with a 1/4" reamed.
   - Simpson Titen RF 2" dia. x 5" long with a 1/4" reamed.

2. Details of Type F temporary barrier tie-down strap

3. 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.
ELEVATION OF BARRIER WITH ANCHOR PINS

GENERAL NOTES:

CONTRACTOR SHALL VERIFY ALL DIMENSIONS IN FIELD BEFORE MEETING NEW MATERIAL.

WHERE EXISTING FLEXIBLE PAVEMENT OR RIGID PAVEMENT DO NOT PRESENT A 3" THICK X 30" WIDE MINIMUM ASPHALT RAP WILL BE CONSTRUCTED.

COST OF PREREMOVAL AND INSTALLING THE ASPHALT RAP 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-MO-ROAD (667-6263)

TEMPORARY CONCRETE TRAFFIC BARRIER
ANCHORED (PIN SYSTEM)

DATE EFFECTIVE: 7/3/2018 SHEET NO. 7 OF 8

DRIVEN ANCHOR PIN (A36)
### Differential: Lane Line Differential < 2"

- **NON-WORKING HOURS**: NEDE EDGE TO SIDE OF FLATTER
- **WORKING HOURS**: NO EDGE TREATMENT REQUIRED

**No signs required.**

### Differential: Lane Line Differential 2" to 3"

- **NON-WORKING HOURS**: NEDE EDGE TO SIDE OF FLATTER
- **WORKING HOURS**: NO EDGE TREATMENT REQUIRED

**No signs required.**

### Differential: Lane Line Differential > 3"

- **NON-WORKING HOURS**: NEDE EDGE TO SIDE OF FLATTER
- **WORKING HOURS**: NO EDGE TREATMENT REQUIRED

**No signs required.**

### Mainline (1) Side Road (2)

1. Signs shall be spaced at approximately one mile intervals and located within 100 ft. of the exit ramp. When a sign placed at the 0.5 mile interval fails within 0.1 mile of a sign placed after at an intersection, the sign placed at the 0.1 mile interval may be omitted. When shoulder pavement signs with dotted lines are both specified, alternating sign positions shall be used at 0.1 mile spacings.
2. On side roads with posted speed of 45 mph or greater, signs shall be placed 500 ft. in advance of intersection with mainline.
3. Signs shall be located on the side of the roadway where the pavement edge differential exists.
4. Signs to remain visible until shoulder paving is complete.
5. Signs shall be located on the right side of non-divided highways on both sides of divided highways where a lane line differential exists.
6. When the shoulder drop-off signs are in place for greater than three days, the shoulder edge pavement shall be placed in addition with the shoulder drop-off sign.

**Legend:**
- **-** Fixed pavement
- **-** Flexible pavement
- **-** All pavement types

**General Notes:**
Signs shall be visible to traffic only when and where conditions exist.

For additional sign spacing and details see standard plan 619.10.
DIVIDED PAVEMENT

TWO-LANE TWO-WAY
TYPICAL STRIPING OFFSETS
WITHOUT RUMBLE STRIPES

INTERMITTENT LINE

DOUBLE LINE
LINE DETAIL

TWO-LANE TWO-WAY
TYPICAL STRIPING OFFSETS
FOR RUMBLE STRIPES
EDGE LINE

AS SHOWN ON PLANS

EDGE OF TRAVELER WAY

FOR SHOULDERS

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

= LATERAL DEVIATION SHALL NOT EXCEED ONE INCH IN 100 FEET.
1. STOP LINES SHALL BE PLACED 100' TO THE REAR OF A STOP SIGN.
2. STOP LINE DISTANCE IS 60' FROM CG.

Symbol Detail

11. THE DISTANCE FROM THE RAILROAD CROSSING WARNING TO THE DEPARTURE TRAFFIC WILL VARY ACCORDING TO THE APPROACH ROAD USE THE SIGHT DISTANCE OF THE VEHICLE TRAFFIC APPROACHING BUT SHALL NOT BE LESS THAN 50 FEET.
12. A THREE-LINE WARNING SHALL BE MARKED WITH A CENTERLINE FOR TWO-LINE APPROACH OR TWO-LINE ROADWAY THE TRANSVERSE BANDS SHALL EXTEND ACROSS THE APPROACH LANE ON INDIVIDUAL THE REFLECTORS SHALL BE PLACED 6 FEET FROM THE APPROACH LANE.
13. THE LOCATION OF THE 10'-10' SIGN IS TO BE DETERMINED BY OTHERS.

Railroad Grade Crossing

14. THE DISTANCE FROM THE RAILROAD CROSSING WARNING TO THE DEPARTURE TRAFFIC WILL VARY ACCORDING TO THE APPROACH ROAD USE THE SIGHT DISTANCE OF THE VEHICLE TRAFFIC APPROACHING BUT SHALL NOT BE LESS THAN 50 FEET.
15. A THREE-LINE WARNING SHALL BE MARKED WITH A CENTERLINE FOR TWO-LINE APPROACH OR TWO-LINE ROADWAY THE TRANSVERSE BANDS SHALL EXTEND ACROSS THE APPROACH LANE ON INDIVIDUAL THE REFLECTORS SHALL BE PLACED 6 FEET FROM THE APPROACH LANE.
16. THE LOCATION OF THE 10'-10' SIGN IS TO BE DETERMINED BY OTHERS.

Pedestrian Crosswalks

17. THE DISTANCE FROM THE RAILROAD CROSSING WARNING TO THE DEPARTURE TRAFFIC WILL VARY ACCORDING TO THE APPROACH ROAD USE THE SIGHT DISTANCE OF THE VEHICLE TRAFFIC APPROACHING BUT SHALL NOT BE LESS THAN 50 FEET.
18. A THREE-LINE WARNING SHALL BE MARKED WITH A CENTERLINE FOR TWO-LINE APPROACH OR TWO-LINE ROADWAY THE TRANSVERSE BANDS SHALL EXTEND ACROSS THE APPROACH LANE ON INDIVIDUAL THE REFLECTORS SHALL BE PLACED 6 FEET FROM THE APPROACH LANE.
19. THE LOCATION OF THE 10'-10' SIGN IS TO BE DETERMINED BY OTHERS.
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

OPTIONAL HOLE

PASSING LANE

LONGITUDINAL JOINT

OPTIONAL HOLE

"TRAVEL" LANE FOR MULTIPLE LANES OR BOTH LANES OF TWO LANE DIRECTIONAL ROADWAY.

JOINT

EDGEOFP AVEMENT

LANE WIDTH

EDGEOFP AVEMENT

LANE WIDTH

EDGEOFP AVEMENT

LANE WIDTH

EDGEOFP AVEMENT

LANE WIDTH

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LANE WIDTH
RUMBLE STRIP LAYOUTS

INTERSECTIONS ACCELERATION OR DECELERATION LANE

ACCELERATION LANE SHOWN

RUMBLE STRIP PLAN VIEW

RUMBLE STRIP CROSS SECTION VIEW

GENERAL NOTES:

SEE STANDARD PLAN 620.00 FOR PAVEMENT MARKING.

RUMBLE STRIPS SHALL NOT BE PLACED ON BRIDGES.

RUMBLE STRIPS SHALL NOT BE OMITTED IF SHOULDERS ARE LESS THAN 2' WIDE.

ALL RUMBLE STRIPS SHALL BE MILLED.

RUMBLE STRIPS SHALL NOT BE MILLED ONTO TRANSVERSE JOINTS.

RUMBLE STRIPS SHALL NOT BE PLACED ON BRIDGES.
SECTION C-C

DETAIL B

EDGE OF TRAVELED WAY

EDGE OF TRAVELED WAY

SHOULDER

C

C

TWO-WAY ROAD

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.

RUMBLE STRIPS
CENTERLINE

DATE EFFECTIVE: 04/01/2009
DATE PREPARED: 02/20/2009
GENERAL NOTES:

FOR SECTIONS THRU BARREL, WINGS AND HEADWALLS, SEE SHEET 1 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.

1) SAME SIZE AND SPACING AS B2 BARS
2) VARIETY: 12" MAXIMUM
3) J4 BAR SPACING
4) NOT SPECIFIED ON THIS SHEET
5) NOT SPECIFIED ON THIS SHEET
6) FOR DESIGN FILLS OVER 2 L O" 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.

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 MINUS SHOULDER WIDTHS.

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.

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

WHEN BARREL AND END 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 JOINT LENGTH UNDER A TRAVELED WAY.

REINFORCEMENT

DATE EFFECTIVE: 07/01/2015
DATE PREPARED: 06/11/2015

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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: 06/11/2015

703.10 J SHEET NO. 2 OF 3
STITCHED TO ONE FACE OF THE CONCRETE WITH 10 GAUGE COPPER WIRE OR 12 GAUGE 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 SECURELY A SUBSURFACE DRAINAGE GEOTEXTILE IN ACCORDANCE WITH SEC 1011.

COST OF FURNISHING AND INSTALLING (a) APPROXIMATELY ONE-THIRD OF WALL KEYED CONSTRUCTION JOINT GRANULAR BACKFILL LIMITS AND MEMBER DIMENSIONS

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 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.

A SUBSURFACE DRAINAGE GEOTEXTILE IN ACCORDANCE WITH SEC 1011.

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 703.37.

BARREL AND WINGS SECTIONS ARE SYMMETRICAL ABOUT AND NORMAL TO DRAWING NOT TO SCALE, FOLLOW MINIMUM CLEARANCE TO REINFORCING MEMBER THICKNESS AND FOR BARSIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT EXCEPT J5 BARS. SEE 703.17. FOR J5 BARS, SEE 703.37.

BARREL AND WINGS SECTIONS ARE SYMMETRICAL ABOUT AND NORMAL TO DRAWING NOT TO SCALE, FOLLOW MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1½".

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

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION 105 WEST CAPITOL JEFFERSON CITY, MO 65102 1-888-ASK-MODOT 11-888-275-6636

JEFFERSON CITY, MO 65102 105 WEST CAPITOL

CONCRETE SINGLE BOX CULVERT WINGS: SQUARED STRAIGHT

SECTIONS

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

703.10J 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.

ELEV. 1 ~ CULVERT

EXCAVATION OF UNSUITABLE MATERIAL AND BACKFILL SHALL BE IN ACCORDANCE WITH FURNISHING AND PLACING OF GRANULAR CLARITY. SEE SHEET 3 OF 3 FOR DETAILS.

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 CLARITY SHALL BE IN ACCORDANCE WITH SEC. 20G.

PLAN OF LAYOUT DIMENSIONS

(1) AHEAD STATION WHERE STREAM FLOWS LEFT TO RIGHT. (2) AHEAD STATION WHERE STREAM FLOWS RIGHT TO LEFT.

GENERAL NOTES:

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

DESIGN LOADINGS:

DESIGN UNIT STRESSES: CLASS B-1 CONCRETE SINGLE BOX CULVERT: f'c = 4,000 PSI REINFORCING STEEL (GRADE 60) fy = 60,000 PSI

REINFORCEMENT AND DIMENSIONS FOR WINGS AND HEADWALLS SHALL BE IN ACCORDANCE WITH MISSOURI HIGHWAY DESIGN STANDARDS.

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.

EQUATIONS FOR COMPUTING A, B, C AND D

A = ANGLE OF BARREL SLOPE WITH HORIZONTAL NORMAL TO E ROADWAY OR E M E D I A N = ARCTAN ( ELEV. 1 - ELEV. 2 )

B = ANGLE OF FILL SLOPE WITH HORIZONTAL NORMAL TO E ROADWAY OR E M E D I A N = ARCTAN ( A )

C = HORIZONTAL DISTANCE FROM UPSTREAM EDGE OF SHOULDER TO E ROADWAY OR E M E D I A N

D = HORIZONTAL DISTANCE FROM DOWNSTREAM EDGE OF SHOULDER TO E ROADWAY OR E M E D I A N

CS = CROSS SLOPE OF EACH PART OF ROADWAY INCLUDING CROWN, LANES AND SHOULDERS. CS IS POSITIVE IF RISING AND NEGATIVE IF FALLING AWAY FROM E ROADWAY OR E M E D I A N.

THE TERM "BS" IS THE DIFFERENCE IN ELEVATION BETWEEN E ROADWAY OR E M E D I A N AND THE TOP OF THE FILL SLOPE NORMAL TO E ROADWAY OR E M E D I A N. THIS TERM SHALL BE ADJUSTED FOR UNIFORMITIC AND NONSTANDARD ROADWAYS.

TO ACCOUNT FOR A VARYING PROFILE GRADE, THE E ROADWAY FILL SHALL BE BASED ON STATIONS THAT CORRESPOND TO THE CORNERS OF THE INSIDE FACE OF THE HEADWALLS THAT PRODUCE MAXIMUM VALUES FOR B AND C.

SEE ROADWAY PLANS, E ROADWAY FILL AND ELEVATIONS 1 AND 2, ELEVATIONS 1 AND 2 CORRESPOND TO UPPER AND LOWER FLOW LINE ELEVATIONS AND MAY BE BELOW THE E ROADWAY STREAM BOTTOM DUE TO ENVIRONMENTAL REQUIREMENTS.
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 3 FEET IN WIDTH AND DOUBLE PREFORMED FIBER EXPANSION JOINT MATERIAL IN ACCORDANCE WITH SEC 1057 SHALL BE SECURELY PLACED IN 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 CENTERED OVER THE TRANSVERSE JOINT THRU BARREL KEYED CONSTRUCTION JOINT

GRANULAR BACKFILL LIMITS AND MEMBER DIMENSIONS

TRANSVERSE JOINT THRU BARREL

PREFORMED FIBER EXPANSION JOINT MATERIAL IN TOP SLAB AND SIDEWALLS WITH EDGES SEALED WITH MASTIC OR TWO SIDED TAPE. FILTER CLOTH SHALL BE CENTERED ON TRANSVERSE JOINTS IN TOP SLAB AND SIDEWALLS WITH EDGES SEALED WITH MASTIC OR TWO SIDED TAPE. FILTER CLOTH SHALL BE CENTERED OVER THE TRANSVERSE JOINT THRU BARREL KEYED CONSTRUCTION JOINT

FILTER CLOTH A FEET IN WIDTH AND DOUBLE THICKNESS SHALL BE CENTERED ON TRANSVERSE JOINTS IN TOP SLAB AND SIDEWALLS. FILTER CLOTH MUST BE SECURELY STITCHED TO ONE FACE OF THE CONCRETE WITH 10 GAGE COPPER WIRE OR 12 GAGE SOFT DRAWN GALVANIZED STEEL WIRE.

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GRANULAR BACKFILL LIMITS AND MEMBER DIMENSIONS

FILTER CLOTH A FEET IN WIDTH AND DOUBLE THICKNESS SHALL BE CENTERED ON TRANSVERSE JOINTS IN TOP SLAB AND SIDEWALLS. FILTER CLOTH MUST BE SECURELY STITCHED TO ONE FACE OF THE CONCRETE WITH 10 GAGE COPPER WIRE OR 12 GAGE SOFT DRAWN GALVANIZED STEEL WIRE.
ELEV. 1
@ Ii. CULVERT
SEC 206.
CHANNEL BOTTOM SHALL BE GRADED WITHIN RIGHT OF WAY FOR TRANSITION OF CHANNEL BED
BACKFILL SHALL BE IN ACCORDANCE WITH
FURNISHING AND PLACING OF GRANULAR
CLARITY. SEE SHEET 3 OF 3 FOR DETAILS.
CONSTRUCTION JOINT KEY NOT SHOWN FOR
TO CULVERT OPENINGS. CHANNEL BANKS SHALL BE TAPERED TO MATCH CULVERT OPENINGS.
EXCAVATION OF UNSUITABLE MATERIAL AND
IF UNSUITABLE MATERIAL IS ENCOUNTERED.

DETAIL A

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 LOADING:
VEHICULAR
MISSOURI HIGHWAYS AND TRANSPORTATION
COMMISSION
CONCRETE SINGLE BOX CULVERT
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JEFFERSON CITY, MO 65102
1-888-ASK-MODOT 1-888-275-6636

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

EQUATIONS FOR COMPUTING W, B, A AND C
W = ANGLE OF BARREL SLOPE WITH HORIZONTAL NORMAL TO Ii. ROADWAY OR Ii. MEDIAN = ARCTAN(W/12")
B = ANGLE OF FILL SLOPE WITH HORIZONTAL NORMAL TO Ii. ROADWAY OR Ii. MEDIAN = ARCTAN(B/12")
HORIZONTAL DISTANCE FROM UPSTREAM EDGE OF SHOULDER TO = L. RDWY. FILL + A(CS) - ALTANA
C = ANGLE OF BARREL SLOPE WITH HORIZONTAL NORMAL TO Ii. ROADWAY OR Ii. MEDIAN
D = CROSS SLOPE OF EACH PART OF ROADWAY INCLUDING CROWN, LANES AND SHOULDERS. CS IS POSITIVE IF RISING AND
NEGATIVE IF FALLING AWAY FROM Ii. ROADWAY OR Ii. MEDIAN.
THE TERM "A(CS)" IS THE DIFFERENCE IN ELEVATION BETWEEN Ii. ROADWAY OR Ii. MEDIAN AND THE TOP OF THE FILL SLOPE
NORMAL TO Ii. ROADWAY OR Ii. MEDIAN. THIS TERM SHALL BE ADJUSTED FOR UNSYMMETRICAL AND NONSTANDARD ROADWAYS.
SEE ROADWAY PLANS FOR SLOPES. Ii. ROADWAY FILL AND ELEVATIONS 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.
NORMAL TO THE ROADWAY OR MEDIAN.
NORMAL TO THE ROADWAY OR MEDIAN.
NORMAL TO THE ROADWAY OR MEDIAN.

LAYOUT DIMENSIONS

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LAYOUT

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

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

703-12J
SHEET NO. 1 OF 3
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 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 1/2".

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" OR LESS
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 ATTACHED TO 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 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 WIRCING OR TWO SIDED TAPE. FILTER CLOTH SHALL BE SECURELY STITCHED TO ONE FACE OF THE CONCRETE WITH 10 GAGE COPPER WIRE OR 12 GAGE SOFT DRAWN GALVANIZED STEEL WIRE.

UPSTREAM AND DOWNSTREAM WINGS REINFORCEMENT

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

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 GAGE COPPER WIRE OR 12 GAGE SOFT DRAWN GALVANIZED STEEL WIRE.

GENERAL NOTES:

FOR MEMBER THICKNESS AND BAR SIZES, SPACING AND DIMENSIONS OF REINFORCEMENT, SEE 703.17. FOR JS BARS, SEE 703.31.

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

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.

LAYOUT DIMENSIONS

EQUATIONS FOR COMPUTING A, B, AND C

\[
A = \angle \text{OF BARREL SLOPE WITH HORIZONTAL TO } E \text{ ROADWAY OR } E \text{ MEDIAN = ARCH IT}\n\]

\[
B = \angle \text{OF FILL SLOPE WITH HORIZONTAL TO } E \text{ ROADWAY OR } E \text{ MEDIAN = ARCH IT}
\]

\[
C = \angle \text{OF DOWNSLOPE FROM DOWNSLOPE EDGE OF SHOULDER TO } E \text{ ROADWAY OR } E \text{ MEDIAN}
\]

\[
D = \angle \text{OF UPSLOPE FROM UPSLOPE EDGE OF SHOULDER TO } E \text{ ROADWAY OR } E \text{ MEDIAN}
\]

\[
E = \angle \text{OF BARREL SLOPE WITH HORIZONTAL NORMAL TO } E \text{ ROADWAY OR } E \text{ MEDIAN}
\]

\[
F = \angle \text{OF FILL SLOPE WITH HORIZONTAL NORMAL TO } E \text{ ROADWAY OR } E \text{ MEDIAN}
\]

\[
G = \angle \text{OF DOWNSLOPE FROM DOWNSLOPE EDGE OF SHOULDER TO } E \text{ ROADWAY OR } E \text{ MEDIAN}
\]

\[
H = \angle \text{OF UPSLOPE FROM UPSLOPE EDGE OF SHOULDER TO } E \text{ ROADWAY OR } E \text{ MEDIAN}
\]

\[
I = \angle \text{OF BARREL SLOPE WITH HORIZONTAL NORMAL TO } E \text{ ROADWAY OR } E \text{ MEDIAN}
\]

\[
J = \angle \text{OF FILL SLOPE WITH HORIZONTAL NORMAL TO } E \text{ ROADWAY OR } E \text{ MEDIAN}
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\[
K = \angle \text{OF DOWNSLOPE FROM DOWNSLOPE EDGE OF SHOULDER TO } E \text{ ROADWAY OR } E \text{ MEDIAN}
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L = \angle \text{OF UPSLOPE FROM UPSLOPE EDGE OF SHOULDER TO } E \text{ ROADWAY OR } E \text{ MEDIAN}
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M = \text{NIRCOS } Z
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PLATE CONTENTS:

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

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

105 WEST CAPITOL JEFFERSON CITY, MO 65102

1-888-456-MODOT 1-888-275-6636)

CONCRETE SINGLE BOX CULVERT

SKEW: LEFT ADVANCE WINGS: FLARED

LAYOUT

DATE PREPARED: 07/01/2016

DATE EFFECTIVE: 07/01/2016

703.13J SHEET NO. 1 OF 3
GENERAL NOTES:

- For sections thru-1 barrel, wings and headwalls, see Sheet 3 of 3, for bar sizes, spacing and dimensions of all reinforcement except J5 bars. See T01-17 for J5 bars. See 703.17.
- Lap longitudinal bars a minimum of 23" at splices.
- Beveled headwall shall be located at upstream end.
- For design fills 2 feet or less, the joints shall be located to minimize the length of joint under a traveled way.
- 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 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.
- Transverse way is the roadway width minus wings shoulder widths.
- For cut section details, see T03-16.

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".
- Bars at top (g) same size and spacing as A1 bars.
- Bars at top (h) same size and spacing as A2 bars.
- J5 bars at top (i) same size and spacing as A1 bars.
- J5 bars at top (j) same size and spacing as A2 bars.
- J5 bars at Fill Face (k) for design fills 2 feet or less.
- J5 bars at Fill Face (l) for design fills over 2 feet.
- J6 bars at Fill Face (m) for design fills 2 feet or less.
- J6 bars at Fill Face (n) for design fills over 2 feet.
- J1 and J4 bars may be bent in field or shop.
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 ATTACHED TO A SUBSURFACE DRAINAGE GEOTEXTILE IN ACCORDANCE WITH SEC 1011. COST OF FURNISHING AND INSTALLING JOINTS.

GRANULAR BACKFILL LIMITS AND MEMBER DIMENSIONS

TRANVERSE JOINT THRU BARREL PREFORMED FIBER EXPANSION JOINT MATERIAL IN ACCORDANCE WITH SEC 1011 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 SHALL BE 1" THICK IN WIDTH AND DOUBLE THICKNESS SHALL BE CENTERED ON TRANVERSE JOINTS IN TOP SLAB AND SIDEWALLS WITH EDGES SEALED WITH WAXIC OR TWO SIDED TAPE. FILTER CLOTH SHALL BE A SUBSURFACE DRAINAGE GEOTEXTILE IN ACCORDANCE WITH SEC 1057. FILTER CLOTH WILL BE CONSIDERED COMPLETELY COVERED BY THE CONTRACT UNIT PRICE FOR OTHER ITEMS.

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

UPSTREAM HEADWALL REINFORCEMENT

DOWNSTREAM HEADWALL REINFORCEMENT

UPSTREAM FLARED WINGS REINFORCEMENT

DOWNSTREAM WINGS REINFORCEMENT

GENERAL NOTES:

FOR MEMBER THICKNESS AND FOR BAR SIZES, SPACING AND DIAMETERS OF REINFORCING BARS, SEE 703.17. FOR JOINTS, SEE 703.31.

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

UPSTREAM HEADWALL REINFORCEMENT

DOWNSTREAM HEADWALL REINFORCEMENT

WINGS: FLARED

SECTIONS

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

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

703.13J SHEET NO. 3 OF 3
CONSTRUCTION JOINT KEY NOT SHOWN FOR CLARITY. SEE SHEET 3 OF 3 FOR DETAILS.

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

TOP SLAB

112 " G BARS AT S.F.

12" ::...- OJ

#4-F BARS AT STREAM FACE----.I CTS. AT STREAM FACE 14" CTS. AT S.F. AT STREAM FACE

VARIED A BARS

5 BARS AT FILL FACE

L#4-F BARS L#4-F BARS TRANSVERSE

J5 BARS AT BOTTOM

G BARS (a)

3'-0 BARS

2-#7-J 1 IL-KEYED t#4-F BAR AT IL-KEYED t#4-F BAR 2-#7-J1 BARS

( a) (b)

CONSTR. JT. FILL FACE CONSTR. JT. AT F.F.

4-#g-H BARS

M: :::u: 0«

V1R. A BARS (f)

11

VARIED A BARS

AT BOTTOM (f)

A1 BARS AT BOTTOM

HALF PLANS ARE SYMMETRICAL ABOUT

B2 BARS AT BOTTOM

4-#g-H BARS .,.BARS AT 14" CTS. AT 14" CTS.

A2 BARS AT TOP

VARIED A BARS (e)

3'-0 BARS

AT TOP (d)

HALF PLANS

GENERAL NOTES:

3. FOR BAR SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT EXCEPT J5 BARS. SEE 703.17. FOR J5 BARS. SEE 703.37.

LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.

BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1" FOR SECTIONS THRU BARREL, WINGS AND HEADWALLS. SEE SHEET 3 OF

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 THE TRAVELED WAY.

FOR SECTIONS THRU BARREL. WINGS AND HEADWALLS. SEE SHEET 3 OF

USE A TRANSVERSE JOINT WHEN BARREL LENGTH IS OVER 80 FEET. USE

LAYING OUT TRANSVERSE JOINTS UNLESS SHOWN ON ROADWAY OR BRIDGE PLANS

RIGHT ADVANCE STRAIGHT

JEFFERSON CITY, MO 65102

COMMISSION

105 WEST CAPITOL

CONSULTING ENGINEERS OF INDIANA, INC.

MISSOURI HIGHWAYS AND TRANSPORTATION

703.14J CONCRETE SINGLE BOX CULVERT

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

RIGHT ADVANCE STRAIGHT

REINFORCEMENT

SHEET NO.

DATE PREPARED: 07/01/2015

DATE EFFECTIVE: 01/01/2015
STITCHED TO ONE FACE OF THE CONCRETE WITH 10GAUGE COPPER WIRE OR 12GAUGE SOFT DRAWN GALVANIZED STEEL WIRE.

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
PREFORMED FIBER EXPANSION JOINT MATERIAL IN ACCORDANCE WITH SEC 607. SMALL Piece SECURED STITCHED TO ONE FACE OF THE CONCRETE WITH 10GAUGE COPPER WIRE OR 12GAUGE SOFT DRAWN GALVANIZED STEEL WIRE.

FILTER CLOTH A FEET IN LENGTH AND DOUBLE THICKNESS SHALL BE CENTERED ON TRANSVERSE JOINTS IN TOP SLAB AND SIDEWALLS WITH EDGES SEALED WITH WAXIC OR TWO SIDED TAPE. FILTER CLOTH SHALL BE A SUBSURFACE DRAINAGE GEOTEXTILE IN ACCORDANCE WITH SEC 607. LARGE PIECE OF FILTER CLOTH WILL BE CONSIDERED COMPLETELY COVERED BY THE CONTRACT UNIT PRICE FOR OTHER ITEMS.

GENERAL NOTES:
FOR MEMBER THICKNESS AND FOR BAR AND JOINT SIZES SPACING AND DIMENSIONS OF GIRDER, SEE SHEET 205.57 OF CATALOG FOR GIRDER SIZES 40 TO 65. FOR J5 BARS, SEE 103.31. FOR BAR AND WINGS SECTIONS ARE SYMMETRIC ABOUT AND NORMAL TO LONG DIRECTION OF HEADDWALL. DRAWING NOT TO SCALE, FOLLOW DIMENSIONS.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1½".

BARREL REINFORCEMENT FOR DESIGN FILLS 2½" OR LESS

UPSTREAM HEADWALL REINFORCEMENT

DOWNSTREAM HEADWALL REINFORCEMENT

UPSTREAM AND DOWNSTREAM WINGS REINFORCEMENT

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

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

GRANULAR BACKFILL LIMITS AND MEMBER DIMENSIONS

TOP SLAB

BOTTOM SLAB

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

GRANULAR BACKFILL LIMITS AND MEMBER DIMENSIONS

TOP SLAB

BOTTOM SLAB

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

TRANVERSE JOINT THRU BARREL
PREFORMED FIBER EXPANSION JOINT MATERIAL IN ACCORDANCE WITH SEC 607. SMALL PIECE SECURED 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 LENGTH AND DOUBLE THICKNESS SHALL BE CENTERED ON TRANSVERSE JOINTS IN TOP SLAB AND SIDEWALLS WITH EDGES SEALED WITH WAXIC OR TWO SIDED TAPE. FILTER CLOTH SHALL BE A SUBSURFACE DRAINAGE GEOTEXTILE IN ACCORDANCE WITH SEC 607. LARGE PIECE OF FILTER CLOTH WILL BE CONSIDERED COMPLETELY COVERED BY THE CONTRACT UNIT PRICE FOR OTHER ITEMS.
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.

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.

GENERAL NOTES:

- DESIGN SPECIFICATIONS: 2010 AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS AND 2010 INTERIM REVISIONS
- DESIGN LOADINGS: REQUIRING CONCRETE BOX CULVERT F'c = 4,000 PSI REINFORCING STEEL (GRADE 60) fy = 60,000 PSI
- MISCELLANEOUS: FOR REINFORCEMENT DETAILS, SEE SHEET 2 OF 3.

DATE PREPARED: 07/01/2013
DATE EFFECTIVE: 07/01/2013

EQUATIONS FOR COMPUTING \( \alpha, \beta, \gamma, \) AND \( \delta \)

\[
\begin{align*}
\alpha & = \text{ANGLE OF BARREL SLOPE WITH HORIZONTAL NORMAL TO \( \epsilon \) ROADWAY OR \( \epsilon \) MEDIAN} \\
\beta & = \text{ANGLE OF FILL SLOPE WITH HORIZONTAL NORMAL TO \( \epsilon \) ROADWAY OR \( \epsilon \) MEDIAN} \\
\gamma & = \text{HORIZONTAL DISTANCE FROM UPSTREAM EDGE OF SHOULDER TO \( = \) ROCKY FILL, \( + = \) ALTARROW UPSTREAM HEADWALL NORMAL TO \( \epsilon \) ROADWAY OR \( \epsilon \) MEDIAN} \\
\delta & = \text{HORIZONTAL DISTANCE FROM DOWNSRAME HEADWALL NORMAL TO \( \epsilon \) ROADWAY OR \( \epsilon \) MEDIAN} \\
\end{align*}
\]

CS = CROSS SLOPE OF EACH PART OF ROADWAY INCLUDING CROWN, LANES AND SHOULDERS.

THE TERM \( A(CS) \) IS THE DIFFERENCE IN ELEVATION BETWEEN \( \epsilon \) ROADWAY OR \( \epsilon \) MEDIAN AND THE TOP OF THE FILL SLOPE NORMAL TO \( \epsilon \) ROADWAY OR \( \epsilon \) MEDIAN.

TO ACCOUNT FOR A VARYING PROFILE GRADE THE \( \epsilon \) ROADWAY FILL SHALL BE BASED ON STATIONS THAT CORRESPOND TO THE CORNERS OF THE INSIDE FACE OF THE HEADWALLS THAT PRODUCE MAXIMUM VALUES FOR \( \beta \) AND \( \gamma \).

SEE ROADWAY PLANS FOR SLOPES, & ROADWAY FILL ELEVATIONS 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.

THE TERM "A(CS)" IS THE DIFFERENCE IN ELEVATION BETWEEN THE TERMS "\( \frac{1}{2} \)E\( \alpha(CS) \)" AND "\( \frac{1}{2} \)E\( \beta(CS) \)" TO ACCOUNT FOR A VARYING PROFILE GRADE THE \( \epsilon \) ROADWAY FILL SHALL BE BASED ON STATIONS THAT CORRESPOND TO THE CORNERS OF THE INSIDE FACE OF THE HEADWALLS THAT PRODUCE MAXIMUM VALUES FOR \( \beta \) AND \( \gamma \).

SEE EQUATIONS:

\[
\begin{align*}
\alpha & = \text{ANGLE OF BARREL SLOPE WITH HORIZONTAL NORMAL TO \( \epsilon \) ROADWAY OR \( \epsilon \) MEDIAN} \\
\beta & = \text{ANGLE OF FILL SLOPE WITH HORIZONTAL NORMAL TO \( \epsilon \) ROADWAY OR \( \epsilon \) MEDIAN} \\
\gamma & = \text{HORIZONTAL DISTANCE FROM UPSTREAM EDGE OF SHOULDER TO \( = \) ROCKY FILL, \( + = \) ALTARROW UPSTREAM HEADWALL NORMAL TO \( \epsilon \) ROADWAY OR \( \epsilon \) MEDIAN} \\
\delta & = \text{HORIZONTAL DISTANCE FROM DOWNSRAME HEADWALL NORMAL TO \( \epsilon \) ROADWAY OR \( \epsilon \) MEDIAN} \\
\end{align*}
\]

MASSIVE "A(CS)" IS THE DIFFERENCE IN ELEVATION BETWEEN THE TERMS "\( \frac{1}{2} \)E\( \alpha(CS) \)" AND "\( \frac{1}{2} \)E\( \beta(CS) \)" TO ACCOUNT FOR A VARYING PROFILE GRADE THE \( \epsilon \) ROADWAY FILL SHALL BE BASED ON STATIONS THAT CORRESPOND TO THE CORNERS OF THE INSIDE FACE OF THE HEADWALLS THAT PRODUCE MAXIMUM VALUES FOR \( \beta \) AND \( \gamma \).

SEE EQUATIONS:

\[
\begin{align*}
\alpha & = \text{ANGLE OF BARREL SLOPE WITH HORIZONTAL NORMAL TO \( \epsilon \) ROADWAY OR \( \epsilon \) MEDIAN} \\
\beta & = \text{ANGLE OF FILL SLOPE WITH HORIZONTAL NORMAL TO \( \epsilon \) ROADWAY OR \( \epsilon \) MEDIAN} \\
\gamma & = \text{HORIZONTAL DISTANCE FROM UPSTREAM EDGE OF SHOULDER TO \( = \) ROCKY FILL, \( + = \) ALTARROW UPSTREAM HEADWALL NORMAL TO \( \epsilon \) ROADWAY OR \( \epsilon \) MEDIAN} \\
\delta & = \text{HORIZONTAL DISTANCE FROM DOWNSRAME HEADWALL NORMAL TO \( \epsilon \) ROADWAY OR \( \epsilon \) MEDIAN} \\
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MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL JEFFERSON CITY, MO 65102 (314) 572-1300 1-888-652-MODOT (1-888-275-6636)

CONCRETE SINGLE BOX CULVERT

SKEW: RIGHT ADVANCE
WINGS: FLARED

LAYOUT

DATE EFFECTIVE: 07/01/2013
DATE PREPARED: 07/01/2013

703.15E SHEET NO. 1 OF 3
HALF PLANS
HALF PLANS ARE SYMMETRICAL ABOUT E CULVERT.

DEVELOPED ELEVATION
J1 AND J6 BARS MAY BE SENT IN FIELD OR SHOP.
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 TRANSVERSE JOINT THRU BARREL APPROXIMATELY ONE-THIRD OF WALL KEYED CONSTRUCTION JOINT.

OVERLAP OF MEMBERS AT JOINTS IN LENGTH AND FOR MEMBER DIMENSIONS.

PLAN VIEW

UPSTREAM FLARED WINGS REINFORCEMENT

DOWNSTREAM WINGS REINFORCEMENT

UPSTREAM HEADWALL REINFORCEMENT

DOWNSTREAM HEADWALL REINFORCEMENT

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

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

GENERAL NOTES:

1. STEEL SHALL BE 11".

2. MINIMUM CLEARANCE TO REINFORCING BARREL AND WINGS SECTIONS ARE SYMMETRICAL ABOUT AND NORMAL TO LONG DIRECTION OF HEADWALL.

3. DRAWN NOT TO SCALE. FOLLOW DIMENSIONS.

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

GRANULAR BACKFILL LIMITS AND MEMBER DIMENSIONS

TRANSVERSE JOINT THRU BARREL PREFORMED FIBER EXPANSION JOINT MATERIAL IN TOP SLAB AND SIDWALLS WITH EDGES SEAMED WITH MASTIC OR TWIN SIDED TAPE. FILTER CLOTH SHALL BE A SUBSURFACE DRAINING BACKFILL IN ACCORDANCE WITH Sec. 1057. PREFORMED FILTER CLOTH WILL BE CONSIDERED COMPLETELY COVERED BY THE CONTRACT UNIT PRICE FOR OTHER ITEMS.

REINFORCEMENT SKEW: RIGHT ADVANCE WINGS: FLARED SECTIONS

DATE EFFECTIVE: 07/01/2015

DATE PREPARED: 05/13/2015

703.15E 3 OF 3
KEYED CONSTRUCTION JOINT
1. APPROXIMATELY ONE-THIRD OF WALL THICKNESS

GRANULAR BACKFILL LIMITS AND MEMBER DIMENSIONS

CONSIDERED COMPLETELY COVERED BY GAGE COPPER WIRE OR 12-GAGE SOFT ONE FACE OF THE CONCRETE WITH 10 DRAWN GALVANIZED STEEL WIRE.

WITH SEC 1011. COST OF FURNISHING THE CONTRACT UNIT PRICE FOR OTHER 1057 SHALL BE SECURELY STITCHED TO (a) APPROXIMATELY ONE-THIRD OF WALL THICKNESS

PREFORMED FIBER EXPANSION JOINT MATERIAL. IN ACCORDANCE WITH SEC 703.17. MINIMAL CLEARANCE TO REINFORCING STEEL SHALL BE 1".

ELEVATION OF WALL REINFORCEMENT

GENERAL NOTES

DESIGN SPECIFICATIONS:

2010 MISSOURI DOT BRIDGE DESIGN SPECIFICATIONS AND 2010 INTERIM REVISIONS

DESIGN LOADING:
VEHICULAR = HL-93 MINUS LANE LOAD, EARTH = 120 LBS/FT
EQUIVALENT FLUID PRESSURE = 80 LBS/FT (MIN. 40 LBS/FT) (MAX. 120 LBS/FT)

DESIGN UNIT STRESSES:
CLASS IV CONCRETE (BOX CULVERT) f'c = 4,000 PSI
REINFORCING STEEL (GRADE 60) f_y = 60,000 PSI

MISCELLANEOUS:
FOR MEMBER THICKNESS AND FOR BAR SIZES, SPACING AND DIMENSIONS. SEE 703.17.
CONSTRUCTION JOINT KEY NOT SHOWN FOR CLARITY IN PART PLANS AND ELEVATIONS.
DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.
MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1/2.

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

SINGLE BOX CULVERT
CUT SECTION

DATE EFFECTIVE: 08/20/2013
DATE PREPARED: 09/10/2012
703.16 SHEET NO. 1 OF 1
**Design Thickness**

- **A1 Bars:** 32.5, 29.5, 26.5
- **J3 Bars:** 32.5, 29.5, 26.5
- **A2 Bars:** 28, 26, 24
- **J4 Bars:** 28, 26, 24
- **B2 Bars:** 22

**Design Spans:**

- **50 ft:** 8, 10, 8, 4, 6, 4, 6.5, 22.0, 24.0, 31.9
- **40 ft:** 8, 10, 8, 4, 6, 5, 6.5, 30.8, 24.3, 29.1
- **38 ft:** 8, 10, 8, 4, 6.5, 4, 6, 30.8, 24.3, 29.1
- **36 ft:** 8, 10, 8, 4, 7, 4, 8, 30.8, 24.3, 29.1
- **34 ft:** 8, 10, 8, 4, 7.5, 4, 9.5, 30.8, 24.3, 29.1
- **32 ft:** 8, 10, 8, 4, 8, 4, 12, 30.8, 24.3, 29.1
- **30 ft:** 8, 10, 8, 4, 8.5, 4, 8, 30.8, 24.3, 29.1
- **28 ft:** 8, 10, 8, 4, 9, 4, 10.5, 30.8, 24.3, 29.1
- **26 ft:** 8, 10, 8, 4, 9.5, 4, 10.5, 30.8, 24.3, 29.1
- **24 ft:** 8, 10, 8, 4, 10, 4, 11, 30.8, 24.3, 29.1
- **22 ft:** 8, 10, 8, 4, 11, 4, 12, 30.8, 24.3, 29.1
- **20 ft:** 8, 10, 8, 4, 12, 4, 12, 30.8, 24.3, 29.1
- **18 ft:** 8, 10, 8, 4, 12, 4, 12, 30.8, 24.3, 29.1
- **16 ft:** 8, 10, 8, 4, 12, 4, 12, 30.8, 24.3, 29.1
- **14 ft:** 8, 10, 8, 4, 12, 4, 12, 30.8, 24.3, 29.1
- **12 ft:** 8, 10, 8, 4, 12, 4, 12, 30.8, 24.3, 29.1
- **10 ft:** 8, 10, 8, 4, 12, 4, 12, 30.8, 24.3, 29.1
- **8 ft:** 8, 10, 8, 4, 12, 4, 12, 30.8, 24.3, 29.1
- **6 ft:** 8, 10, 8, 4, 12, 4, 12, 30.8, 24.3, 29.1
- **2 ft:** 8, 10, 8, 4, 12, 4, 12, 30.8, 24.3, 29.1

**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 4-foot and 6-foot 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 Vehicle Load (HL-93) minus the lane load.**

**Concrete Single Box Culvert**

- **Member Thickness:**
  - **Bar Size, Spacing & Dimensions**
  - **Span (S):** 3 Feet, Height (H): 2 thru 5 Feet

**Design Parameters:**

- **Member Thickness:**
  - **A1 Bars:**
    - **J3 Bars:**
      - **A2 Bars:**
        - **J4 Bars:**
          - **B2 Bars:**

**Bar Dimensions Diagram:**

- **Symmetrical About Culvert:**
- **Column (C):**
  - **Row (R):**
    - **Alternate J3 Bar:**

**Alternate J3 Bar Note:**
- 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'-0". Dimension L1 (not C1) shall be used with alternate J3 bars.

**Substitution Note:**
- Additional bars shall be used with alternate J3 bars with a length equal to 41 bars and size and spacing equal to J3 bars. No additional payment will be made for this substitution.
### DESIGN THICKNESS A1 BARS

<table>
<thead>
<tr>
<th>SPAN (S)</th>
<th>HEIGHT (H)</th>
<th>2 FT</th>
<th>3 FT</th>
<th>4 FT</th>
<th>5 FT</th>
<th>6 FT</th>
<th>7 FT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 T, 8 B, 10 T, 12 B</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
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<td>2 T, 8 B, 10 T, 12 B</td>
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<td>4 T, 8 B, 10 T, 12 B</td>
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### FILL THICKNESS

<table>
<thead>
<tr>
<th>SPAN (S)</th>
<th>HEIGHT (H)</th>
<th>2 FT</th>
<th>3 FT</th>
<th>4 FT</th>
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<th>7 FT</th>
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<tr>
<td>1 T, 8 B, 10 T, 12 B</td>
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### GENERAL NOTES:
- IF DESIGN FILLS BETWEEN TABULATED DESIGN FILLS, USE THE NEXT GREATER TABULATED DESIGN FILL. FOR DESIGN FILLS BETWEEN 2 AND 4 FEET, USE THE 2-FT FILLS. FOR DESIGN FILLS BEHIND 4 FEET, USE THE GREATER MEMBER THICKNESS, AREA OF REINFORCEMENT AND BAR DIMENSIONS FROM THE 4-FT FILLS OR A FT TABULATED DESIGN FILL. AREA OF REINFORCEMENT EQUALS BAR AREA PER FOOT SPACING.
- Specification is in inches unless otherwise specified.
- DESIGN FILLS ARE MEASURED FROM THE TOP OF THE TOP SLAB TO THE TOP OF EARTH FILM OR HIGHWAY.
- CULVERTS MEET STRENGTH AND SERVICEABILITY REQUIREMENTS FOR THE DESIGN FILL PER LOAD-30 WS HIGHWAY.
### DESIGN THICKNESS A1 BARS

<table>
<thead>
<tr>
<th>Span</th>
<th>Top Slab Bars</th>
<th>Bottom Slab Bars</th>
<th>Wall Bars</th>
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<tbody>
<tr>
<td>5 ft</td>
<td>JC-1</td>
<td>1-20</td>
<td>28</td>
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<tr>
<td>6 ft</td>
<td>JC-1</td>
<td>2-20</td>
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<tr>
<td>7 ft</td>
<td>JC-1</td>
<td>3-20</td>
<td>48</td>
</tr>
<tr>
<td>8 ft</td>
<td>JC-1</td>
<td>4-20</td>
<td>58</td>
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</table>

### DESIGN FILLS ARE MEASURED FROM THE TOP OF TOP SLAB TO THE TOP OF CONCRETE SINGLE BOX CULVERT.

### GENERAL NOTES:

- If design fill is between tabulated design fills, use the next greater tabulated design fill.
- If design fills between 2 ft and 4 ft tabulated design fills, use the greater member thickness and the reinforcement and bar area of reinforcement equal to bar area per foot spacing.

### DATE EFFECTIVE:

- April 1, 2011

### MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

**CONCRETE SINGLE BOX CULVERT**

**MEMBER THICKNESS**

**BAR SIZE, SPACING & DIMENSIONS**

**SPAN (S) = 8 FT**

<table>
<thead>
<tr>
<th>Design Fill</th>
<th>Top Slab Bars</th>
<th>Bottom Slab Bars</th>
<th>Wall Bars</th>
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<tbody>
<tr>
<td>5 ft</td>
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<td>8 ft</td>
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<td>4-20</td>
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**ALTERNATE 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 L in Figure 1 shall be used with alternate J3 bars.

Members shall be designed with alternate J3 bars required with alternate J3 bars with a length equal to J3 bars and size and spacing equaling J3 bars. No additional payment will be made for this substitution.
### Design Thickness

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<tr>
<th>SPAN (ft)</th>
<th>Fill</th>
<th>SPAN 2040</th>
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</table>

**GENERAL NOTES:**

- **If Design Fill is Between Tabulated Design Fills:** Use the Next Greater Tabulated Design Fill. For Design Fills Between 2 Tabulated Design Fills, Use the Tabulated Design Fill Between Them. Use the Greater Member Thickness and Use Reinforcement and Bar Dimensions from the 1st Fill and 4 ft Tabular Data. The Area of Reinforcement Equals the Area per Foot Spacing, except for 2 ft Spacings. Special Design Fill Requirements. Design Fills Were Measured From the Top of Top Slab to the Top of Earth Fill or Roadway.

**Concrete Single Box Culvert**

**Member Thickness**

<table>
<thead>
<tr>
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<th>Fill 2040</th>
<th>Fill 2040</th>
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</table>
**DESIGN THICKNESS**

| SPAN (S) | DESIGN VEHICULAR LIVE LOAD HL-93 MINUS THE LANE LOAD. | DIMENSIONS FROM THE 2 FEET AND 4 FEET TABULATED DESIGN FILLS. | CULVERTS MEET STRENGTH AND SERVICEABILITY REQUIREMENTS FOR THE SPECIAL DESIGNS ARE REQUIRED WHEN THE DESIGN FILL IS LESS THAN 1 FOOT. AREAS OF REINFORCEMENT EQUALS BAR AREA PER FOOT SPACING.

**GENERAL NOTES:**
- If design fill is between tabulated design fills, use the greater member thicknesses and/or reinforce and bar dimensions from the 2 feet and 4 feet tabulated design fills.
- Use the greater member thicknesses and/or reinforce and bar dimensions from the 2 feet and 4 feet tabulated design fills. AREA OF REINFORCEMENT EQUALS BAR AREA PER FOOT SPACING.
- Specific 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 fill was measured from the top of top slab to the top of earth fill or roadbed.
- Cylinders meet strength and serviceability requirements for the design loadings without assisting wind and live loads.

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

**CONCRETE SINGLE BOX CULVERT**

**MEMBER THICKNESS**

| SPAN (S) | DESIGN VEHICULAR LIVE LOAD HL-93 MINUS THE LANE LOAD. | DIMENSIONS FROM THE 2 FEET AND 4 FEET TABULATED DESIGN FILLS. | CULVERTS MEET STRENGTH AND SERVICEABILITY REQUIREMENTS FOR THE SPECIAL DESIGNS ARE REQUIRED WHEN THE DESIGN FILL IS LESS THAN 1 FOOT. AREAS OF REINFORCEMENT EQUALS BAR AREA PER FOOT SPACING.

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- Cylinders meet strength and serviceability requirements for the design loadings without assisting wind and live loads.

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

**CONCRETE SINGLE BOX CULVERT**

**MEMBER THICKNESS**

| SPAN (S) | DESIGN VEHICULAR LIVE LOAD HL-93 MINUS THE LANE LOAD. | DIMENSIONS FROM THE 2 FEET AND 4 FEET TABULATED DESIGN FILLS. | CULVERTS MEET STRENGTH AND SERVICEABILITY REQUIREMENTS FOR THE SPECIAL DESIGNS ARE REQUIRED WHEN THE DESIGN FILL IS LESS THAN 1 FOOT. AREAS OF REINFORCEMENT EQUALS BAR AREA PER FOOT SPACING.

**GENERAL NOTES:**
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- Cylinders meet strength and serviceability requirements for the design loadings without assisting wind and live loads.

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

**CONCRETE SINGLE BOX CULVERT**

**MEMBER THICKNESS**

| SPAN (S) | DESIGN VEHICULAR LIVE LOAD HL-93 MINUS THE LANE LOAD. | DIMENSIONS FROM THE 2 FEET AND 4 FEET TABULATED DESIGN FILLS. | CULVERTS MEET STRENGTH AND SERVICEABILITY REQUIREMENTS FOR THE SPECIAL DESIGNS ARE REQUIRED WHEN THE DESIGN FILL IS LESS THAN 1 FOOT. AREAS OF REINFORCEMENT EQUALS BAR AREA PER FOOT SPACING.

**GENERAL NOTES:**
- If design fill is between tabulated design fills, use the greater member thicknesses and/or reinforce and bar dimensions from the 2 feet and 4 feet tabulated design fills.
- Use the greater member thicknesses and/or reinforce and bar dimensions from the 2 feet and 4 feet tabulated design fills. AREA OF REINFORCEMENT EQUALS BAR AREA PER FOOT SPACING.
- Specific 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 fill was measured from the top of top slab to the top of earth fill or roadbed.
- Cylinders meet strength and serviceability requirements for the design loadings without assisting wind and live loads.
### CONCRETE SINGLE BOX CULVERT

**Member Thickness**

<table>
<thead>
<tr>
<th>Bar Size</th>
<th>A1 Bars</th>
<th>A2 Bars</th>
<th>A3 Bars</th>
<th>B1 Bars</th>
<th>B2 Bars</th>
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<tbody>
<tr>
<td>6 6</td>
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**Dimensions**

<table>
<thead>
<tr>
<th>Design Span</th>
<th>Height (Ht)</th>
<th>Top Slab Bars</th>
<th>Bottom Slab Bars</th>
<th>Wall Bars</th>
</tr>
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<tr>
<td>12 FT</td>
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</tbody>
</table>

**Bar Dimensions Diagram**

- **2" Cl.** (A1, B2)
- **3" Cl.** (A1, B2)
- **4" Cl.** (A1, B2)

**General Notes:**
- If design is based on tabulated design fills, use the next greater tabulated design fill, except for design fills between 2 ft and 4 ft. Use the next greater member thickness, area of reinforcement, and bar spacing from the 3 ft and 4 ft tabulated design fills. Area of reinforcement equals bar area per foot spacing.
- Specific designs are required when the design fill is less than 3 ft or greater than 20 ft. 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 with a width of 2 feet or more require the following live load requirements for the design vehicular live load.

**Date Effective:** 04/09/2005

**Date Prepared:** 04/10/2001
**Design Thickness**

<table>
<thead>
<tr>
<th>Span (S)</th>
<th>Height (H)</th>
<th>Ft</th>
<th>D</th>
<th>Ft</th>
<th>D</th>
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<th>D</th>
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</thead>
<tbody>
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<td>6</td>
<td>4</td>
<td>10</td>
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<td>10 FT</td>
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<td>2</td>
<td>4</td>
<td>6</td>
<td>4</td>
<td>10</td>
</tr>
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<td>28 FT</td>
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<td>1</td>
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<td>4</td>
<td>6</td>
<td>4</td>
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<td>2</td>
<td>4</td>
<td>6</td>
<td>4</td>
<td>10</td>
</tr>
</tbody>
</table>

**General Notes:**

- If design fill is less than tabulated design fill, use the next greater tabulated design fill.  
- Use the next greater tabulated fill for fill greater than 50 ft.
- Fill from the 3 ft and 4 ft tabulated fill areas for design fill greater than 50 ft.
- Fill from the 3 ft tabulated fill areas for design fill less than 50 ft.
- Use alternate J3 bars with a length equal to the top slab or bottom slab.  
- Use alternate J3 bars with a length equal to the top slab or bottom slab.  
- No additional fill will be made for this substitution.
### Design Fill (S = 15 FT)

<table>
<thead>
<tr>
<th>SPAN (S)</th>
<th>HEIGHT (H)</th>
<th>MEMBER THICKNESS</th>
<th>BOTTOM SLAB BARS</th>
<th>SOFT SLAB BARS</th>
<th>J3 BARS</th>
<th>WALL BARS</th>
<th>BE BARS</th>
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### Overall Notes:
- If Design Fill is between tabulated Design Fills, use the next greater Design Fill. (Unstable Design Fills between 2 FT and 4 FT are shown in blue. Use the greater Member Thickness area of reinforcement and bar dimensions from the 2 FT and 4 FT 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 Fill even when the load height is less than 20 ft.
- Concretes Single Box Culvert Member Thickness Bar Size, Spacing & Dimensions.

**Single Box Culvert**

**Member Thickness Bar Size, Spacing & Dimensions**

**Date Effective:**

**Date Prepared:**

**Sheet No.:**

**Missouri Highways and Transportation Commission**

105 West Capitol

Jefferson City, MO 65102

1-888-MO-HWY2

660-266-4391

**Concrete Single Box Culvert**

**Member Thickness Bar Size, Spacing & Dimensions**

**Design Fill (S = 15 FT)**

**Height (H) = 15 FT OR 12 FT OR 15 FT**

**Member Thickness**

**Bottom Slab Bars**

**Soft Slab Bars**

**J3 Bars**

**Wall Bars**

**BE Bars**

**Alternate J3 Bar**

At Contractor's option, Alternate J3 Bars may be used when the distance between the ends of J3 Bars is less than 2 FT. Dimension 1 (foot) shall be used with Alternate J3 Bars.

Alternate J3 Bars require the same number of Alternate J3 Bars to have a length equal to J3 Bars. No additional payment will be made for this substitution.
## SPAN (S) = 16 FT

<table>
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<th>DESIGN</th>
<th>MEMBER THICKNESS</th>
<th>T BAR SLAB</th>
<th>J BAR SLAB</th>
<th>BOTTOM SLAB</th>
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</tbody>
</table>

### GENERAL NOTES:
- If design fill is between tabulated design fills, use the next greater member thickness on the lower side. Design fills between 2 feet and 4 feet tabulated design fills are measured from the top of top slab to the top of earth fill.
- 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.
**AREA OF STEEL REQUIRED FOR J5 BARS IN WINGS (SQ. IN./FT.)**

**WALL HEIGHT VS. WALL THICKNESS**

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<th>18</th>
<th>24</th>
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<th>36</th>
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<th>90</th>
<th>96</th>
<th>102</th>
<th>108</th>
<th>114</th>
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<td>0.168</td>
<td>0.168</td>
<td>0.197</td>
<td>0.291</td>
<td>0.414</td>
<td>0.578</td>
<td>0.766</td>
<td>1.003</td>
<td>1.280</td>
<td>1.594</td>
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<td>2.806</td>
<td>3.308</td>
<td>3.855</td>
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<tr>
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<td>0.168</td>
<td>0.168</td>
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<td>0.766</td>
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<td>2.806</td>
<td>3.308</td>
<td>3.855</td>
<td>4.453</td>
</tr>
</tbody>
</table>

**NOTE:**

The wall height is equal to the barrel height (+) plus the top slab thickness (S1). When wall height 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 is greater than that indicated in the table, use the same size and spacing for the J4 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 J4 bars (MB max.) and/or decrease the spacing of the J4 bars (6" min.). Use smallest bar size possible based on minimum spacing.

Minimum steel to be used in the wings for J4 bars is #4 bars at 14" centers (area of steel = 0.1683 SQ. IN./FT.)

© See Standard Plan 703.37C, Sheet 2 of 2 for backfill slope to be used based on skew.
PLAN OF WINGS AND SLOPE TRANSITION LINES

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>
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NOTE: USE 65° FOR ANGLE E FOR ALL WINGS WHICH MAKE AN ANGLE D GREATER THAN 90°.

NOTE: BACKFILL TRANSITION ANGLE AND BACKFILL SLOPE SHALL APPLY TO ALL BOX CULVERTS REGARDLESS OF TYPE - SINGLE, DOUBLE, OR TRIPLE.
GENERAL NOTES:

1. THE HATCHED PARTS OF THESE DRAWINGS INDICATE THOSE PORTIONS OF THE EXISTING CULVERT WHICH ARE TO BE REMOVED.

2. ALL REINFORCING BARS WITHIN AREAS SHOWN TO BE REMOVED, THAT ARE BONED IN UNDISTURBED OLD CONCRETE, SHALL BE CLEANLY STRIPPED, STRAIGHTENED, AND EXTENDED INTO NEW CONCRETE.

3. SEE STANDARD SPECIFICATIONS FOR REQUIRED BUSHHAMMERING AND TREATING OF OLD CONCRETE SURFACES WHICH ARE TO RECEIVE NEW CONCRETE.

4. 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 SPALLING.

5. 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.

LIMIT OF WALL REMOVAL

NOT LESS THAN 32 X STA. OF TRANSVERSE STEEL + 2"

PLAN

CUTTING LINE (TOP AND BOTTOM SLABS)

CUT IN TOP AND BOTTOM SLABS ALWAYS TO BEGIN AT THIS POINT

SIDE ELEVATION

SKEW OF 20° OR MORE

NOTE: CUTTING LINE IN OPPOSITE SIDEWALL IS TO MEET CUT IN BOTTOM SLAB.

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

CONCRETE BOX CULVERTS
CUTTING DETAIL EXTENSION TO STRAIGHT WINGS

DATE EFFECTIVE: 10-01-2009
DATE PREPARED: 8/18/2009

703.38A 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 1" 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:**

1. FOR SECTIONS THRU BARREL, #4 BARS AND HEADWALLS, SEE SHEET 3 OF 3. FOR BAR SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT EXCEPT #4 BARS, SEE 703.42. FOR #4 BARS, SEE 703.47.

2. CONSTRUCTION JOINT KEY NOT SHOWN FOR CLARITY IN PLAN AND ELEVATION. SEE SHEET 3 FOR 3 FOR DETAILS.

3. DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

4. MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1½".

5. LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPlices.

6. BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

7. (a) SAME SIZE AND SPACING AS ADJACENT B BARS

8. (b) VARIES, 12" MAXIMUM

9. (c) #4 BARS SPACING

---

**LAYING OUT TRANVERSE JOINTS**

**UNLESS SHOWN ON 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 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 THE TRAVELED WAY.

- TRAVELED WAY IS THE ROADWAY WIDTH MINUS SHOULDER WIDTHS.

- FOR CUT SECTION DETAILS, SEE 703.46.

- FOR SKEW: SQUARED

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**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

**JEFFERSON CITY, MO 65102**

**1-888-ASK-MODOT 1-888-275-6636**

**JEFFERSON CITY, MO 65102**

**105 WEST CAPITOL**

**COMMISSION**

**703.40H**

**DATE EFFECTIVE:**

**DATE PREPARED:**

**1 OF 3**
STITCHED TO ONE FACE OF THE CONCRETE WITH 10 GAUGE COPPER WIRE OR 12 GAUGE SOFT DRAWN.

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

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

GRANULAR BACKFILL LIMITS AND MEMBER DIMENSIONS

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 GAUGE COPPER WIRE OR 12 GAUGE SOFT DRAWN GALVANIZED STEEL NAIL.

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

UPSTREAM HEADWALL REINFORCEMENT NEAR INTERIOR WALL

UPSTREAM HEADWALL REINFORCEMENT NEAR MIDSPAN

DOWNSTREAM HEADWALL REINFORCEMENT NEAR INTERIOR WALL

DOWNSTREAM HEADWALL REINFORCEMENT NEAR MIDSPAN

UPSTREAM AND DOWNSTREAM WINGS REINFORCEMENT

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

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

GENERAL NOTES:
FOR MEMBER THICKNESS AND FOR BAR SIZE, SPACING AND DIMENSIONS OF BARS, SEE 103.417. FOR J5 BARS, SEE 103.31.
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".

GENERAL NOTES:
FOR MEMBER THICKNESS AND FOR BAR SIZE, SPACING AND DIMENSIONS OF BARS, SEE 103.417. FOR J5 BARS, SEE 103.31.
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".

CONCRETE DOUBLE BOX CULVERT
SKEW: SQUARED WINGS: STRAIGHT

SECTIONS

DATE PREPARED: 3-10-2001
DATE EFFECTIVE: 3-10-2001

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

3 OF 3 SHEET NO.
703.40H
LAYING OUT TRANVERSE JOINTS

UNLESS SHOWN ON BRIDGE PLAN

USE A TRANVERSE JOINT WHEN BARREL LENGTH IS 50 FEET OR LESS. USE ADDITIONAL JOINTS TO LIMIT CURT SECTION LENGTH AND END SECTION BARREL LENGTH 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 JOINTS SHALL BE LOCATED TO MINIMIZE THE LENGTH OF JOINT UNDER A TRAVELED WAY.

TRANVERSE WAY IS THE ROADWAY WIDTH WITH 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 703.41. 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 IS NOT TO SCALE. FLOW DIMENSIONS.

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

LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPACERS.

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

(e) SAME SIZE AND SPACING AS J2 BARS

(a) J2 BAR SPACING

CONCRETE DOUBLE BOX CULVERT

SKEW: SQUARED
WINGS: FLARED

REINFORCEMENT

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

DATE PREPARED:
DATE EFFECTIVE:

703.41H SHEET NO.
1 OF 3
GENERAL NOTES:

1. 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.

2. DIMENSIONS 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.

(a) SAME SIZE AND SPACING AS ADJACENT A 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" OR LESS

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

(j) NOT REQUIRED FOR CLEAR SPAN > 10'-0"

(k) FOR CLEAR SPAN > 10'-0"

(l) FOR CLEAR SPAN > 13'-0"

(m) IF REQUIRED, THE MINIMUM LENGTH EACH SIDE OF J WALL SHALL BE THE GREATER OF 48 BAR DIAMETERS OR 2'-0"

(n) THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

DATE PREPARED: 5/13/2021

DATE EFFECTIVE: 6/1/2021

SKEW: SQUARED

WINGS: FLARED

CONCRETE

DOUBLE BOX CULVERT

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

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

REINFORCEMENT

CONCRETED DOUBLE BOX CULVERT

SKEW: SQUARED

WINGS: FLARED

CONCRETE

DOUBLE BOX CULVERT

SKEW: SQUARED

WINGS: FLARED

CONCRETE

DOUBLE BOX CULVERT
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 TRANSVERSE JOINT THRU BARREL

(a) APPROXIMATELY ONE-THIRD OF WALL GRANULAR BACKFILL LIMITS AND MEMBER DIMENSIONS

TRANVERSE JOINT THRU BARREL

PREFORMED FIBER EXPANSION JOINT MATERIAL IN ACCORDANCE WITH CONTRACT SHALL BE SECURELY STITCHED TO ONE FACE OF THE CONCRETE WITH 10 GAGE COPPER WIRE OR YES 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 WAXIC OR TAN SIDES TAPE. FILTER CLOTH SHALL BE SUBSUMED UNDER EXPOSED FILTER CLOTH. FILTER CLOTH WILL BE CONSIDERED COMPLETELY COVERED BY THE CONTRACT UNIT PRICE FOR OTHER ITEMS.

UPSTREAM HEADWALL REINFORCEMENT NEAR MIDSPAN

(a) #6 FOR CLEAR SPAN > 10'-0" OR LESS
(b) #8 FOR CLEAR SPAN > 13'-0"
(c) #8 FOR CLEAR SPAN > 13'-0"
(d) #5 FOR CLEAR SPAN > 13'-0"

BARREL REINFORCEMENT FOR DESIGN FILLS OVER 2'-0"

UPSTREAM FLARED WINGS REINFORCEMENT

UPSTREAM HEADWALL REINFORCEMENT NEAR INTERIOR WALL

(a) #6 FOR CLEAR SPAN > 10'-0"
(b) #8 FOR CLEAR SPAN > 13'-0"

GENERAL NOTES:

FOR MEMBER THICKNESS AND FOR BAR SIZES, SPACING AND DIMENSIONS OF REINFORCEMENT, SEE 703.47. FOR J5 BARS, SEE 703.37.

BARREL AND WINGS ARE AS SYMMETRICAL AND NORMAL TO MEMBER THICKNESS.

DRAWING NOT TO SCALE, FOLLOW DIMENSIONS.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 11/".

SECTIONS

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

305 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-453-MDOT (1-888-273-6638)

CONCRETE DOUBLE BOX CULVERT

SKEW: SQUARED

WINGS: FLARED

DATE PREPARED: 3/13/2001
DATE EFFECTIVE: 3/30/2001

703.41H 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 J1 bars, see 703.41. For J1 bars, see 703.17.
- Construction joint key not shown for clarity in plan and section. See sheet 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 A1 bars
- (g) A1 bar spacing
- (h) For design fills over 2'-0" or less
- (i) Not required for clear spans < 10'-0"
- (j) For clear span 5'-10"-0"
- (k) If required, the minimum length each side of J1 bar shall be the greater of 48 bar diameters or 1/2 clear span.
- The clear span is parallel to long direction of headwall.
- (l) J1 bars as required, quantity of bars varies with skew.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1/2".
LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPICLES.
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 A1 BARS
(g) A1 BAR SPACING
(h) FOR DESIGN FILLS OVER 2'-0" OR LESS
(i) NOT REQUIRED FOR CLEAR SPANS < 10'-0"
(j) FOR CLEAR SPAN 5'-10"-0"
(k) IF REQUIRED, THE MINIMUM LENGTH EACH SIDE OF J1 BAR SHALL BE THE GREATER OF 48 BAR DIAMETERS OR 1/2 CLEAR SPAN.
(l) J1 BARS AS REQUIRED, QUANTITY OF BARS VARIES WITH SKEW.
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
PREFORMED FIBER EXPANSION JOINT MATERIAL IN
IN TOP SLAB AND SIDEWALLS WITH EDGES SEALED WITH
MASTIC OR TWO SIDED TAPE. FILTER CLOTH SHALL BE

GRANULAR BACKFILL LIMITS
AND MEMBER DIMENSIONS

TRANSVERSE JOINT THRU BARREL
PREFORMED FIBER EXPANSION JOINT MATERIAL IN
ACCORDANCE WITH SEC 1057 SHALL BE SECURELY
IN TOP SLAB AND SIDEWALLS WITH EDGES SEALED WITH
Mastic OR TWO Sided Tape. FILTER CLOTH SHALL BE

UPSTREAM AND DOWNSTREAM WINGS REINFORCEMENT
BARREL REINFORCEMENT
FOR DESIGN FILLS OVER 2'-0".
GENERAL NOTES:
FOR MEMBER THICKNESS AND FOR BARSIZES, SPACING AND DIMENSIONS OF
ALL REINFORCEMENT EXCEPT J5 BARS. SEE 703.47. FOR J5 BARS.
CONCRETE DOUBLE BOX CULVERT
SKEW: LEFT ADVANCE
WINGS: STRAIGHT
SECTIONS
DATE PREPARED: 8/13/2001
DATE EFFECTIVE: 8/13/2001
3 OF 3

THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.
MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 11".
GENERAL NOTES:

1. 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 703.47. FOR J5 BARS, SEE 703.37.

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

3. MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1½".

4. BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

5. Cuts Section Lengths Up To 60 Feet

6. Barrel Length Up To 90 Feet Without A Transverse Joint

7. 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.

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

9. 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 THE TRAVELED WAY. TRAVELED WAY IS THE ROADWAY WIDTH MINUS SHOULDER WIDTHS.

10. FOR CUT SECTION DETAILS, SEE 703.46.

11. 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.

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, THE JOINTS SHALL BE LOCATED TO MINIMIZE THE LENGTH OF JOINT UNDER THE TRAVELED WAY. TRAVELED WAY IS THE ROADWAY WIDTH MINUS SHOULDER WIDTHS.

14. FOR CUT SECTION DETAILS, SEE 703.46.

15. 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.

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

17. 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 THE TRAVELED WAY. TRAVELED WAY IS THE ROADWAY WIDTH MINUS SHOULDER WIDTHS.

18. 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 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" BE THE GREATER OF 48 BAR DIAMETERS OR IF REQUIRED, THE MINIMUM LENGTH EACH SIDE OF A CLEAR SPAN.

(i) NOT REQUIRED FOR CLEAR SPANS > 13'-0" " FOR CLEAR SPAN > 10'-0"

(j) H2 BARS AS REQUIRED. QUANTITY OF BARS VARIES WITH SKEW.

(k) H2 BAR SPACING

(l) SAME SIZE AND SPACING AS A1 BARS

(m) SAME SIZE AND SPACING AS A2 BARS

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

(o) NOT REQUIRED FOR CLEAR SPANS > 13'-0"

FIELD OR SHOP.

4-#8-H BARS

5/13/2012

SHEET NO.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

JEFFERSON CITY, MO 65102

1-888-ASK-MODOT 1-888-275-6636

CONCRETE DOUBLE BOX CULVERT

SKEW: LEFT ADVANCE

WINGS: FLARED

REINFORCEMENT

DATE EFFECTIVE: 10/30/2011

DATE PREPARED: 8/13/2009

703.43H 2 OF 3

REINFORCEMENT

SECTION NEAR INTERIOR WALL

J1 BARS MAY BE BENT IN FIELD OR SHOP.
STITCHED TO ONE FACE OF THE CONCRETE WITH 10GAGE COPPER WIRE OR 12 GAGE SOFT DRAWN 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

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 NAIL.

FILTER CLOTH SHALL BE IN WIDTH AND DOUBLE THICKNESS SHALL BE CENTERED ON TRANSVERSE JOINTS IN TOP SLAB AND SIDEWALLS WITH EDGES SEALED WITH WAXIC ON TWO SIDES TAPE. FILTER CLOTH SHALL BE SECURED TO CONCRETE WITH GALVANIZED NAILS, IN ACCORDANCE WITH SEC 1057. FILTER CLOTH WILL BE CONSIDERED COMPLETELY COVERED BY THE CONTRACT UNIT PRICE FOR OTHER ITEMS.

UPSTREAM FLARED WINGS REINFORCEMENT
BARREL REINFORCEMENT FOR DESIGN FILLS OVER 2'-0".

UPSTREAM HEADWALL REINFORCEMENT NEAR MIDSPAN
UPSTREAM HEADWALL REINFORCEMENT NEAR INTERIOR WALL

DOWNSTREAM HEADWALL REINFORCEMENT NEAR MIDSPAN
DOWNSTREAM HEADWALL REINFORCEMENT NEAR INTERIOR WALL

GENERAL NOTES:
FOR MEMBER THICKNESS AND BARS SIZES, SPACING AND DIMENSIONS OF BAR TOP, SEE 703.47 FOR 2'-0" BARS.
BARREL AND WINGS SECTIONS ARE SYMMETRICAL, BAR Diameters & CULVERT, HEADWALL SECTIONS ARE NORMAL TO LONG DIRECTION OF HEADWALL.
DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.
MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1/2".

DATE PREPARED: 3/13/2009
DATE PREPARED: 3/13/2009

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
JEFFERSON CITY, MO 65102
1-800-453-MODOT (663-6683)

CONCRETE DOUBLE BOX CULVERT
SKEW: LEFT ADVANCE
WINGS: FLARED
SECTIONS

703.43H SHEET NO. 3 OF 3
GENERAL NOTES:

1. 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 703.47.

2. MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1½".

3. BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

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

5. 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.

6. USE A TRANSVERSE JOINT UNDER A TRAVELED WAY WITH DESIGN FILLS 2 FEET OR LESS.

7. 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.

8. THE JOINTS SHALL BE LOCATED TO MINIMIZE THE LENGTH OF JOINT UNDER THE TRAVELED WAY.

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.

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.

13. FOR CUT SECTION DETAILS, SEE 703.46.

14. 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.

15. FOR CUT SECTION DETAILS, SEE 703.46.

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 THE TRAVELED WAY.

17. FOR CUT SECTION DETAILS, SEE 703.46.
GENERAL NOTES:

1. 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.
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 1/4".
5. Lap longitudinal bars a minimum of 23" at splices.
6. Beveled headwall shall be located at upstream end.
7. Same size and spacing as adjacent G bars.
8. J5 bar varies. 12" maximum.
9. Not specified on this sheet.
11. For design fills over 2'-0".
12. For design fills 2'-0" or less.
13. For clear span > 10'-0".
14. For clear span > 15'-0".
15. If required, the minimum length each side of J bars shall be the greater of 4 bar diameters or 1 clear span. The clear span is parallel to long direction of headwall.
16. H2 bars as required. Quantity of bars varies with skew.

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

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 FIXED TO THE SUBSURFACE DRAINAGE GEOTEXTILE IN ACCORDANCE WITH SEC 1011. COST OF FURNISHING AND INSTALLING IS INCLUDED.

UPSTREAM HEADWALL REINFORCEMENT
NEAR INTERIOR WALL

UPSTREAM HEADWALL REINFORCEMENT
NEAR MIDSPAN

DOWNSTREAM HEADWALL REINFORCEMENT
NEAR INTERIOR WALL

DOWNSTREAM HEADWALL REINFORCEMENT
NEAR MIDSPAN

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

GENERAL NOTES:
FOR MEMBER THICKNESS AND FOR BAR SIZES, SPACING, AND DIMENSIONS OF WALLS ONLY, SEE 703.47. FOR J5 BARS, SEE 703.31.

BARREL AND WINGS SECTIONS ARE SYMMETRICAL, AND HORIZONTAL MEMBER DIMENSIONS ARE NORMAL TO LONG DIRECTION OF HEADWALL.

DRAWING NOT TO SCALE, FOLLOW SPECIFICATIONS.

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

DATE EFFECTIVE: 5/13/2015
DATE PREPARED: 1/13/2015
703.44H SHEET 3 OF 3
GENERAL NOTES:

1. 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 703.45. FOR J5 BARS, SEE 703.37.

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 3/4".

5. LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPlices.

6. 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

7. SAME SIZE AND SPACING AS J2 BARS

8. 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 TRANSVERSE JOINT.

9. 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 LENGTH OR 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.

10. TRAVELED WAY IS THE ROADWAY WIDTH PLUS 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 A TRAVELED WAY.

13. FOR SECTION THRU BARREL, WINGS AND HEADWALLS, SEE SHEET 3 OF 3. FOR BAR SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT EXCEPT J5 BARS, SEE 703.45. FOR J5 BARS, SEE 703.37.

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

15. DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

16. MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1 3/4".

17. LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPlices.

18. 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

19. SAME SIZE AND SPACING AS J2 BARS

20. 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 TRANSVERSE JOINT.

21. 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 LENGTH OR 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.

22. TRAVELED WAY IS THE ROADWAY WIDTH PLUS SHOULDER WIDTHS.

23. FOR CUT SECTION DETAILS, SEE 703.46.

24. 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.

25. FOR SECTION THRU BARREL, WINGS AND HEADWALLS, SEE SHEET 3 OF 3. FOR BAR SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT EXCEPT J5 BARS, SEE 703.45. FOR J5 BARS, SEE 703.37.

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

27. DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

28. MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1 3/4".

29. LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPlices.

30. 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

31. SAME SIZE AND SPACING AS J2 BARS

32. 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 TRANSVERSE JOINT.

33. 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 LENGTH OR 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.

34. TRAVELED WAY IS THE ROADWAY WIDTH PLUS SHOULDER WIDTHS.

35. FOR CUT SECTION DETAILS, SEE 703.46.

36. 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.
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 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 APPROXIMATELY ONE-THIRD OF WALL KEYED CONSTRUCTION JOINT

PREFORMED FIBER EXPANSION JOINT MATERIAL. PREFORMED FIBER EXPANSION JOINT MATERIAL IN ACCORDANCE WITH SEC 1012 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 SHALL BE 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 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 INTERIOR WALL

(2) #8 FOR CLEAR SPAN > 10'-0" OR #5 FOR CLEAR SPAN > 13'-0" IF D2 AND D4 BARS ARE REQUIRED, THE MINIMUM LENGTH EACH SIDE OF 1 WALL SHALL BE THE GREATER OF 48 BAR DIAMETERS OR CLEAR SPAN. THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

GENERAL NOTES:

FOR MEMBER THICKNESS AND FOR BAR SIZES, SPACING AND DIMENSIONS OF REINFORCEMENT, SEE 703.47 FOR J5 BARS.

BARRELS 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".

CONCRETE DOUBLE BOX CULVERT

SKEW: RIGHT ADVANCE WINGS: FLARED

SECTIONS

DATE PREPARED: 3/14/2001
DATE EFFECTIVE: 3/01/2001
703.45C SHEET NO. 3 OF 3

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
1105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-455-MODOT (1-888-266-6368)
GENERAL NOTES:

If design fill is between tabulated design fill, use the next greater tabulated design fill. Except for design fills between 2 and 3 feet, use fill of 3 feet.

Use the greater member thickness, area of reinforcement and bar dimensions from the next greater 4 feet 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.

Culverts meet strength and serviceability requirements for the design vehicle live load H-93 minus the lane load.
### General Notes:
- If design fill is between tabulated design fills, use the next greater tabulated design fill. If Design fills between 2' and 4', use earth fill or roadway.
- Use the greater member thickness, area of reinforcement, and bar area per foot for feet greater than 50 feet.
- Dimensions 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 vertical live load H-25-43 when the lane load.

### Conventional Box Culvert
- **Member Thickness**
- **Bar Size**, **Spacing & Dimensions**
- **span** (s) = 4 ft, **height** (ht) = 3 ft

#### Conventional Box Culvert Size & Dimensions

<table>
<thead>
<tr>
<th>Size</th>
<th>Top Slab Bars</th>
<th>Bottom Slab Bars</th>
<th>Wall Bars</th>
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<tbody>
<tr>
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<td>10 8 8 8 4 8 4 4 12 4 12 24 36</td>
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### Design Fill
- **MEMBER TOP SLAB BARS**
- **MEMBER BOTTOM SLAB BARS**
- **MEMBER WALL BARS**

#### Design Fill

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</tbody>
</table>

### Characteristics:
- **Bar Size**, **Spacing & Dimensions**
- **span** (s) = 4 ft, **height** (ht) = 3 ft

#### Characteristics

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</table>
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 tabulated design fill of the next greater thickness. Area of reinforcement and bar dimensions from the 2 and 4 foot 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.

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 drain roadway.

CULVERTS MEET STRENGTH AND SERVICEABILITY REQUIREMENTS FOR THE DESIGN VEHICULAR LIVE LOAD HL-93 MINUS THE LANE LOAD.
### GENERAL NOTES:

If design fill is between tabulated design fills, use the nearest greater tabulated design fill. Except for design fills between 2 and 3 ft or greater than 50 ft, use the greater member thickness, area of reinforcement, and bar diameters from the 2 ft fill and 3 ft fill tabulated design fills. Area of reinforcement equals bar area per foot spacing.

For special design cases where the design fill is less than 1 ft or greater than 50 ft, 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 vehicle live load and reduce the lane load. Culverts are designed for Earth fill or roadway.

### SPAN (S): 6 FT

<table>
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<th>DESIGN FILL</th>
<th>TOP SLAB BARS</th>
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<tr>
<td>10 FT</td>
<td>D1 BARS</td>
<td>D2 BARS</td>
<td>D3 BARS</td>
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<tr>
<td>12 FT</td>
<td>E1 BARS</td>
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<td>14 FT</td>
<td>F1 BARS</td>
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<td>16 FT</td>
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### SPAN (S): 6 FT OR 7 FT

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<td>F1 BARS</td>
<td>F2 BARS</td>
<td>F3 BARS</td>
</tr>
<tr>
<td>17 FT</td>
<td>G1 BARS</td>
<td>G2 BARS</td>
<td>G3 BARS</td>
</tr>
</tbody>
</table>

### SPAN (S): 6 FT OR 7 FT

<table>
<thead>
<tr>
<th>DESIGN FILL</th>
<th>TOP SLAB BARS</th>
<th>BOTTOM SLAB BARS</th>
<th>WALL BARS</th>
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</thead>
<tbody>
<tr>
<td>6 FT</td>
<td>A1 BARS</td>
<td>A2 BARS</td>
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<td>7 FT</td>
<td>B1 BARS</td>
<td>B2 BARS</td>
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<td>9 FT</td>
<td>C1 BARS</td>
<td>C2 BARS</td>
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<td>11 FT</td>
<td>D1 BARS</td>
<td>D2 BARS</td>
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<tr>
<td>13 FT</td>
<td>E1 BARS</td>
<td>E2 BARS</td>
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<td>17 FT</td>
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**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-800-4ASK-MODOT (1-888-275-6636)

**CONCRETE DOUBLE BOX CULVERT**

**MEMBER THICKNESS**

<table>
<thead>
<tr>
<th>BAR SIZE, SPACING &amp; DIMENSIONS</th>
<th>SPAN (S): 6 FEET</th>
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</thead>
<tbody>
<tr>
<td><strong>HEIGHT (HT)</strong>: 6 FT OR 7 FT</td>
<td></td>
</tr>
<tr>
<td><strong>DATE EFFECTIVE:</strong> 10/31/2011</td>
<td></td>
</tr>
<tr>
<td><strong>DATE PREPARED:</strong> 9/8/2011</td>
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**MEMBER TOP SLAB BARS**

- **WIDTH (#)**: 11
- **OFFSET (#)**: 8
- **THICKNESS (#)**: 5
- **SLAB (#)**: 4
- **LINE (#)**: 1
- **SPAN (#)**: 9
- **DATE PREPARED:** 9/8/2011

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-800-4ASK-MODOT (1-888-275-6636)
<table>
<thead>
<tr>
<th>SPAN (S)</th>
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<th>HEIGHT (H): 4 FT OR 5 FT OR 6 FT</th>
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<td><strong>MEMBER DIMENSIONS</strong></td>
<td><strong>A1 BARS</strong></td>
</tr>
<tr>
<td><strong>T1</strong></td>
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<td>10</td>
<td>12</td>
</tr>
<tr>
<td><strong>T5</strong></td>
<td>11</td>
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</tr>
<tr>
<td><strong>T6</strong></td>
<td>12</td>
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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 2 feet and 4 feet, use the next greater member thickness, area of reinforcement and bar dimensions. If design fill is less than 2 feet, use the special designs are required when the design fill is less than 1 foot or greater than 50 feet.
- The greater member thickness, area of reinforcement and bar dimensions are from the top slab to the top of earth fill or roadway.

**Concrete Double Box Culvert**

**Member Thickness, Bar Size, Spacing & Dimensions**

**SPAN (S) = 7 FT**

**HEIGHT (H): 7 FT OR 8 FT**

**A1 BARS** | **A2 BARS** | **A3 BARS** | **A4 BARS** | **A5 BARS** | **A6 BARS** | **A7 BARS** | **A8 BARS** | **B1 BARS** | **B2 BARS** |
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<thead>
<tr>
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</thead>
<tbody>
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<td><strong>T2</strong></td>
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<td><strong>T4</strong></td>
<td><strong>T5</strong></td>
<td><strong>T6</strong></td>
<td><strong>T7</strong></td>
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**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

**JEFFERSON CITY, MO 65102**

**105 WEST CAPITOL**

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

**JEFFERSON CITY, MO 65102**

**DATE EFFECTIVE:**

**DATE PREPARED:**

**SHEET NO.**

**8 OF 27**

**703.47**

**8 OF 27**
### Table: Design Thickness

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<th>Span (ft)</th>
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<tr>
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<tr>
<td>22</td>
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<td></td>
</tr>
<tr>
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<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 feet and 4 feet, use the greater member thickness, area of reinforcement, and bar dimensions from the next closest fill. Use the 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.

### Missouri Highways and Transportation Commission

- Date Prepared: 9/8/2011
- Date Effective: 10/1/2011
- Sheet No.: 703.47
- Scale: 1 of 27

**Concrete Double Box Culvert**

- Bar Size, Spacing, and Dimensions

**General Notes:**

- Earth Fill Dr Roadway.
- Plates 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 Next Closest 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.
The document contains a worksheet for designing a double box culvert. The worksheet lists various member thicknesses, bar sizes, and spacings for different spans and heights. The worksheet includes columns for top slab bars, bottom slab bars, wall bars, and member thicknesses. It also includes a diagram of the top slab with bar dimensions.

**General Notes:**
- If design fill is between tabulated design fills, use the next greater tabulated design fill except for design fills between 2 foot and 5 foot. Use the next 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.

**Concrete Double Box Culvert**

**Member Thickness, Bar Size, Spacing & Dimensions**

<table>
<thead>
<tr>
<th>SPAN (S)</th>
<th>HEIGHT (H)</th>
<th>Width 1</th>
<th>Width 2</th>
<th>Width 3</th>
<th>Width 4</th>
<th>Width 5</th>
<th>Width 6</th>
<th>Width 7</th>
<th>Width 8</th>
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<tbody>
<tr>
<td>8 FT</td>
<td>4 FT</td>
<td>12</td>
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</tbody>
</table>

**Dates:**
- Date Effective: 10/10/91
- Date Prepared: 9/8/91

**Commission:**
- MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
- MISSOURI DEPARTMENT OF TRANSPORTATION

**Address:**
- 105 WEST CAPITOL
- JEFFERSON CITY, MO 65102
- 1-888-ASK-MODOT 1-888-357-6668
### Design Data

#### Member Thickness Bar Size, Spacing & Dimensions

<table>
<thead>
<tr>
<th>Span (s) = 9 FT</th>
<th>Height (h) = 5 FT OR 6 FT OR 7 FT</th>
<th>Height (h) = 8 FT OR 9 FT OR 10 FT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Member Thickness</strong></td>
<td><strong>Top Slab Bars</strong></td>
<td><strong>Bottom Slab Bars</strong></td>
</tr>
<tr>
<td><strong>Design</strong></td>
<td><strong>A1 Bars</strong></td>
<td><strong>A2 Bars</strong></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, use the lesser member thickness. Area of reinforcement and bar dimensions from the top and 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.

**Concrete Double Box Culvert**

**Member Thickness**

- **Bar Size:**
- **Spacing & Dimensions:**

**Span (s):** 9 FEET

**Height (h):** 5 FEET THRU 10 FEET

**Missouri Highways and Transportation Commission**

105 West Capitol
Jefferson City, MO 65102
1-888-MODOT-11 or 1-888-663-6831

**DATE EFFECTIVE:**

**DATE PREPARED:**

**DATE APPROVED:**

**SHEET NO.:**

**703.47**

**12 OF 27**
<table>
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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 2 and 4 feet, use the greater member thickness, area of reinforcement, and bar dimensions from the next tabulated design fill. If design fill is equal to 1 foot or greater than 50 feet, special designs are required. If design fills are measured from the top of top slab to the top of earth fill or roadway.

Special designs and special requirements for the design vertical live load HL-93 minus the lane load. Design fills are measured from the top of bottom slab to the top of earth fill or roadway.

Culverts meet strength and serviceability requirements for the design vertical live load HL-93 minus the lane load.

**MEMBER THICKNESS**

- Top slab bars
- Bottom slab bars
- Wall bars
- Symmetrical about culvert

**Bar Dimensions Diagram**

Bar 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.

**General Notes:**

- 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 vertical live load HL-93 minus the lane load.

**Notes:**

- Bar sizes, spacing, and dimensions
- Span (S) = 9 FT
- Height (HT) = 11 FT OR 12 FT

**Date Prepared:** 8/18/2011
**Date Effective:** 10/21/2011
**Missouri Highways and Transportation Commission**

**Concrete Double Box Culvert**

**Member Thickness**

- Bar size
- Spacing
- Dimensions

**Span (S):** 9 FEET

**Height (HT):** 11 OR 12 FEET

**Date:** 10/21/2011

**Sheet No.:** 703.47

**13 OF 27**
### Design Data

#### Span (S) = 10 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 greater tabulated design fill. All other design fills use the greater member thickness area of reinforcement and bar dimensions from the 10 ft and 8 ft tabulated design fills. Area of reinforcement equals bar area per foot spacing.
- Special designs are reviewed 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.

*Concretes meet strength and serviceability requirements for the design. Vertical live load Hz-93 winds the lane load.*
<table>
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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. For design fills between 2 and 4 feet, use the greater member thickness, area of reinforcement, and bar dimensions from the 4-foot fill 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 serviceability requirements for the design vertical live load H-25.**
### Design for 11 ft Span

**Member Thickness**

- **A1 Bars**
- **A2 Bars**
- **B1 Bars**
- **B2 Bars**

**Slab Bar Designations**

- **Top Slab Bars**
- **Bottom Slab Bars**
- **Wall Bars**

**Design Details**

- **Span (S) = 11 ft**
- **Height (H1) = 9 ft or 10 ft or 11 ft**

**Bar Dimensions Diagram**

- **Symmetrical About Culvert**

**General Notes**

- If design fill is between tabulated design fills, use the next greater tabulated design fill. Except for design fills between 0 ft and 9 ft, fill side area ratios are: top area of reinforcement equals bar area per foot spacing.

**Concrete Double Box Culvert**

- **Member Thickness**
- **Bar Size, Spacing & Dimensions**

**Missouri Highways and Transportation Commission**

- **Jefferson City, MO 65102**

**Date Effected:** 10/01/2009

**Date Prepared:** 8/18/2009

**Sheet No:** 16 of 27

**Design Fill Table**

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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 0 ft and 9 ft, fill side area ratios are: top 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.

- Culverts meet strength and serviceability requirements for the design ventiper live load H-165 wind the lane load L-160.
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 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.

2. SPECIAL DESIGNS 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 FIELDS ARE MEASURED FROM THE TOP OF TOP SLAB TO THE TOP OF EARTH FILL OR ROADWAY.

5. CULVERTS MEET STRENGTH AND SERVICEABILITY REQUIREMENTS FOR THE DESIGN VEHICULAR LIVE LOAD HL-93 MINUS THE LANE LOAD.

6. DESIGN FILLS ARE MEASURED FROM THE TOP OF TOP SLAB TO THE BASE OF CONCRETE DOUBLE BOX CULVERT.

7. GENERAL NOTES:

8. EARTH FILL OR ROADWAY.


10. SPECIAL DESIGNS ARE REQUIRED WHEN THE DESIGN FILL IS LESS THAN 1 FOOT OR GREATER THAN 50 FEET.

11. DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

12. DESIGN FIELDS ARE MEASURED FROM THE TOP OF TOP SLAB TO THE TOP OF EARTH FILL OR ROADWAY.

13. CULVERTS MEET STRENGTH AND SERVICEABILITY REQUIREMENTS FOR THE DESIGN VEHICULAR LIVE LOAD HL-93 MINUS THE LANE LOAD.

14. DATE PREPARED:

15. DATE EFFECTIVE:

16. MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

17. 105 WEST CAPITOL

18. JEFFERSON CITY, MO 65102

19. 1-888-ASK-MODOT (1-888-275-6636)

20. CONCRETE DOUBLE BOX CULVERT

21. MEMBER THICKNESS

22. BAR SIZE, SPACING & DIMENSIONS

23. SPAN (S): 11 FT

24. HEIGHT (HT): 12 FT OR 13 FT OR 14 FT

25. MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

26. 105 WEST CAPITOL

27. JEFFERSON CITY, MO 65102

28. 1-888-ASK-MODOT (1-888-275-6636)

29. CONCRETE DOUBLE BOX CULVERT

30. MEMBER THICKNESS

31. 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, in feet and 4 feet tabulated design fills, special designs are required when the design fill is less than 1 foot or greater than 50 feet. Dimensions in inches unless otherwise specified.

Design fills are measured from the top of top slab to the top of earth fill or roadway.

Concrete meet strength and serviceability requirements for the design vehicle live load H-20 minus the lane load.
BAR SIZE: SPACING & DIMENSIONS
DOUBLE BOX CULVERT

CONCRETE

MISSOURI HIGHWAY & TRANSPORTATION COMMISSION

GENERAL NOTES:

SPAN (5)

101011201105 WEST CAPITOL

SHEET NO.
### Top Slab Bars

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<tr>
<td>7 FT</td>
<td>20'</td>
<td>13' or 14'</td>
<td>A7 BARS</td>
<td>5</td>
<td>6.5</td>
<td>32.0</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 and 3 feet, use the next greater tabulated design fill if the design fill is 0.5 feet or less below the tabulated design fill.
- For design fills of 4 or more feet, use the greater member thickness area if reinforcement and bar doubling is not required.
- Use the greater member thickness area if reinforcement is required.
- For design fills between 2 and 3 feet, use the next greater member thickness area if reinforcement and bar doubling is required.
- Use the next greater member thickness area if reinforcement and bar doubling is not required.

### Culvert Strength and Serviceability Requirements:
- For the design, consult the Missouri DOT's Live Load H-93.1 and the Load Chart.

---

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

**Concrete Double Box Culvert**

**Member Thickness**

**Bar Size, Spacing & Dimensions**

**Sheet No.** 23 of 27

**Date Prepared** 9/6/2017

**Date Effective** 10/3/2017

**Jefferson City, MO 65102**

**1-800-ASK-MODOT 1-800-275-6687**

**Jefferson City, MO 65102**

**1-800-ASK-MODOT 1-800-275-6687**
### CONCRETE DOUBLE BOX CULVERT

<table>
<thead>
<tr>
<th>SPAN (S) = 15 FT</th>
<th>HEIGHT (H) = 8 FT OR 9 FT OR 10 FT</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEMBER THICKNESS</td>
<td>AT BARS</td>
</tr>
<tr>
<td>T5 B5 T1</td>
<td>T5 B5 T1</td>
</tr>
<tr>
<td>1 FT</td>
<td>1 FT</td>
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<td>2 FT</td>
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<td>14 FT</td>
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<td>15 FT</td>
<td>15 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.
- 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 vehicle live load H-20-5200 lbs along the lane load.

### MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-800-448-MODOT (1-800-448-6636)

CONCRETE DOUBLE BOX CULVERT
MEMBER THICKNESS
BAR SIZE, SPACING & DIMENSIONS

**SPAN (S): 15 FEET**
**HEIGHT (H): 8 FT OR 9 FT OR 10 FT**
<table>
<thead>
<tr>
<th>SPAN (S) = 15 FT</th>
<th>HEIGHT (HT) = 14 FT OR 15 FT OR 16 FT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DESIGN THICKNESS</strong></td>
<td><strong>A1 BARS</strong></td>
</tr>
<tr>
<td><strong>TOP SLAB BARS</strong></td>
<td><strong>HT BARS</strong></td>
</tr>
<tr>
<td><strong>BOTTOM SLAB BARS</strong></td>
<td><strong>J1 BARS</strong></td>
</tr>
<tr>
<td><strong>WALL BARS</strong></td>
<td><strong>K1 BARS</strong></td>
</tr>
</tbody>
</table>

### Sample Values

- For **15 FT** span:
  - **Top Slab Bars:** 4, 3, 2, 1
  - **Bottom Slab Bars:** 4, 3, 2, 1
  - **Wall Bars:** 1, 2, 3, 4, 5

- For **14 FT** span:
  - **Top Slab Bars:** 4, 3, 2, 1
  - **Bottom Slab Bars:** 4, 3, 2, 1
  - **Wall Bars:** 1, 2, 3, 4

- For **13 FT** span:
  - **Top Slab Bars:** 4, 3, 2, 1
  - **Bottom Slab Bars:** 4, 3, 2, 1
  - **Wall Bars:** 1, 2

---

**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 next greater member thickness, area of reinforcement, and bar dimensions from the next smaller design fill. Use the greater member thickness, area of reinforcement and bar dimensions from the next smaller 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.**

---

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

**105 WEST CAPITOL**

**JEFFERSON CITY, MO 65102**

**CONCRETE DOUBLE BOX CULVERT**

**MEMBER THICKNESS**

**BAR SIZE, SPACING & DIMENSIONS**

**SPAN (S): 15 FEET**

**HEIGHT (HT): 14 THRU 16 FEET**

---

**DATE EFFECTIVE:**

**DATE PREPARED:**

**703.47**

**SHEET NO.**

25 OF 27
### Design Notes

**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 tabulated fill thickness. For design fills between 2 and 4 feet use the greater member thickness, area of reinforcement, and bar dimensions from the next greater fill thickness. 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.

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) = 16 FT**

- **Height (Ht) = 8 FT OR 9 FT OR 10 FT**

<table>
<thead>
<tr>
<th>Member Thickness</th>
<th>A1 Bars</th>
<th>A2 Bars</th>
<th>A3 Bars</th>
<th>B1 Bars</th>
<th>B2 Bars</th>
<th>C1 Bars</th>
<th>C2 Bars</th>
<th>C3 Bars</th>
<th>C4 Bars</th>
<th>C5 Bars</th>
<th>C6 Bars</th>
<th>C7 Bars</th>
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</thead>
<tbody>
<tr>
<td><strong>Top Slab Bars</strong></td>
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<td><strong>Bottom Slab Bars</strong></td>
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<td><strong>Wall Bars</strong></td>
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<tr>
<td><strong>Design Fills</strong></td>
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- **SPAN (S) = 18 FT**

- **HEIGHT (Ht) = 11 FT OR 12 FT OR 13 FT**

<table>
<thead>
<tr>
<th>Member Thickness</th>
<th>A1 Bars</th>
<th>A2 Bars</th>
<th>A3 Bars</th>
<th>B1 Bars</th>
<th>B2 Bars</th>
<th>C1 Bars</th>
<th>C2 Bars</th>
<th>C3 Bars</th>
<th>C4 Bars</th>
<th>C5 Bars</th>
<th>C6 Bars</th>
<th>C7 Bars</th>
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<td><strong>Top Slab Bars</strong></td>
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<td><strong>Bottom Slab Bars</strong></td>
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<td><strong>Wall Bars</strong></td>
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<td><strong>Design Fills</strong></td>
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</tbody>
</table>

**Missouri Highways and Transportation Commission**

**Concrete Double Box Culvert**

**Member Thickness**

**Bar Size, Spacing, and Dimensions**

**Span (S) = 16 FT**

- **Height (Ht) = 8 FT OR 9 FT OR 10 FT**

**Span (S) = 18 FT**

- **Height (Ht) = 11 FT OR 12 FT OR 13 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 feet, use the greater tabulated fill thickness.
- For design fills between 2 and 4 feet, use the greater member thickness, area of reinforcement, and bar dimensions from the next greater fill thickness.
- 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.

**Concrete Double Box Culvert**

**Member Thickness**

**Bar Size, Spacing, and Dimensions**

**Date Effective:**

**Date Prepared:**

**Sheet No.:** 703.47

**Sheet 26 of 27**
NOTE: DASHED BARS REPRESENT PLAN REINFORCEMENT.
SOLID BARS INDICATE ADDITIONAL REINFORCING.
BAR COVER FROM FACE OF CONCRETE 1-1/2" CLEWR.
SEE ROAD PLANS FOR LOCATION, SIZE AND TYPE OF PIPE.
PLACE 5/16" JOINT FILLER AROUND REINFORCED CONCRETE BARS AND EMBOSS ASHALT AROUND CORRUGATED METAL PIPE AT PIPE INLET.
THE BLOCK-OUT MAY BE ELIMINATED AT CONTRACTORS ELECTION. 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.
GENERAL NOTES:

1. FOR BAR SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT EXCEPT J5 BARS, SEE 703.87. FOR J5 BARS, SEE 703.37.

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

3. LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPlices.

4. FOR CUT SECTION DETAILS, SEE 703.86. 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.

5. USE ADDITIONAL JOINTS TO LIMIT CUT SECTION LENGTH AND END SECTIONS TO BARREL LENGTH MEASURED ALONG CENTERLINE OF CULVERT TO AVOID LOCATING TRANSVERSE JOINTS UNDER A TRAVELED WAY WITH DESIGN FILLS 2 FEET OR LESS.

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

DATE PREPARED: 3/10/2015

DATE EFFECTIVE: 3/2/2015

703.80H SHEET NO. 1 OF 3
D2 BAR (b) -N (TYP.)

GALVANIZED STEEL WIRE.
THICKNESS SHALL BE CENTERED ON TRANSVERSE JOINTS IN TOP SLAB AND SIDEWALLS WITH EDGES SEALED WITH 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 SECT 1011 SHALL BE SECURELY STITCHED TO ONE FACE OF THE CONCRETE WITH 10 EAGLE HEADER W/ 12 EAGLE SOFT DRAWN GALVANIZED STEEL NAILS.

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. COST OF FURNISHING AND INSTALLING FILTER CLOTH WILL BE CONSIDERED COMPLETELY COVERED BY THE CONTRACT UNIT PRICE FOR OTHER ITEMS.

KEYED CONSTRUCTION JOINT
1/2 APPROXIMATELY ONE-THIRD OF WALL THICKNESS

GRANULAR BACKFILL

TOP SLAB

BOTTOM SLAB

UPSTREAM HEADWALL REINFORCEMENT
NEAR INTERIOR WALL

(b) NOT REQUIRED FOR CLEAR SPANS ≤ 10'-0"  
(b) NOT REQUIRED FOR CLEAR SPANS > 13'-0"

UPSTREAM HEADWALL REINFORCEMENT
NEAR MIDSPAN

DOWNSTREAM HEADWALL REINFORCEMENT
NEAR INTERIOR WALL

DOWNSTREAM HEADWALL REINFORCEMENT
NEAR MIDSPAN

UPSTREAM AND DOWNSTREAM WINGS REINFORCEMENT

BARREL REINFORCEMENT
FOR DESIGN FILLS OVER 2'-0"

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

GENERAL NOTES:
FOR MEMBER THICKNESS AND FOR BAR SIZES, SPACING AND DIMENSIONS OF JOINTS: SEE 703.80H. FOR A2 BARS: SEE 703.81.

BARREL AND WINGS SECTIONS ARE SYMMETRIC, ARCHED AND NORMAL TO & COULVERT, HEADWALL SECTIONS ARE 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 TRANVERSE JOINT WHEN BARREL LENGTH IS OVER 80 FEET.**
**USE ADDITIONAL JOINTS TO LIMIT CUT SECTION LENGTH AND END SECTIONS. BARREL LENGTH MEASURED ALONG CENTERLINE OF CULVERT TO TRANSVERSE JOINT.**

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

**TO AVOID LOCALLING TRANSVERSE JOINTS UNDER A TRAVELED WAY WITH DESIGN FILLS 9 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 9 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 703.66.**

---

**GENERAL NOTES:**

- FOR SECTIONS THRU BARREL, WINGS AND HEADWALLS, SEE SHEET 3 OF 11.
- FOR BAR SPACING AND DIMENSIONS OF ALL REINFORCEMENT EXCEPT BARS, SEE 703.07 FOR 25 BARS, SEE 703.37.

**CONSTRUCTION JOINT KEY NOT SHOWN FOR CLARITY IN PLAN AND ELEVATION. SEE SHEET 3 OF 5 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.**

- **SAME SIZE AND SPACING AS ADJACENT B BARS**
- **VARIES 12" MAXIMUM**
- **J4 BAR SPACING**
- **SAME SIZE AND SPACING AS A2 BARS**
- **A2 BAR SPACING**

---

**CONCRETE TRIPLE BOX CULVERT**

**SKN: SQUARED WINGS: FLARED**

**DATE EFFECTIVE: 12/31/2015**

**DATE PREPARED: 12/01/2011**

**MODOT**

**105 WEST CAPITOL**

**JEFFERSON CITY, MO 65102**

**1-888-ASK-MODOT 1-888-275-6636**

**REINFORCEMENT**

**DATE EFFECTIVE: 12/31/2015**

**DATE PREPARED: 12/01/2011**

**703.8IH**

**SHEET NO. 1 OF 3**
GALVANIZED STEEL WIRE. THICKNESS SHALL BE CENTERED ON TRANSVERSE JOINTS IN TOP SLAB AND SIDEWALLS WITH EDGES SEALED WITH PREFORMED FIBER EXPANSION JOINT MATERIAL IN...

TRANSVERSE JOINT THRU BARREL

PREFORMED FIBER EXPANSION JOINT MATERIAL IN ACCORDANCE WITH SECTION 703.81H, SEC. 703.81H, BE SECURELY STITCHED TO ONE FACE OF THE CONCRETE WITH 10 EAGLE CORNER RING UP TO 1/2 IN DIAMETER GALVANIZED STEEL NAILS.

FILTER CLOTH A FEET IN WIDTH AND DOUBLE THICKNESS SHALL BE CENTERED ON TRANSVERSE JOINTS IN TOP SLAB AND SIDEWALLS WITH EDGES SEALED WITH WAXICED PROFOLDED TAPE. FILTER CLOTH SHALL BE SUBMERGED IN A 1" DEEP TRENCH IN ACCORDANCE WITH 703.81H, SEC. 703.81H, WITH A 1" DEEP TRENCH IN THE TRENCH WILL BE CONSIDERED COMPLETELY.

UPSTREAM FLARED WINGS REINFORCEMENT

REINFORCEMENT FOR DESIGN FILLS OVER 2'-0"'

MINIMUM CLEARANCE TO REINFORCING BARREL AND WINGS SECTIONS ARE SYMMETRICAL ABOUT AND NORMAL TO HEADWALL.

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

BARREL JOINTS (TYP.)

KEYED JOINTS (TYP.)

PERM. JOINTS (TYP.)

GRANULAR BACKFILL LIMITS AND MEMBER DIMENSIONS

UPSTREAM HEADWALL REINFORCEMENT NEAR INTERIOR WALL

DOWNSTREAM HEADWALL REINFORCEMENT NEAR MIDSPAN

UPSTREAM HEADWALL REINFORCEMENT NEAR MIDSPAN

GENERAL NOTES:

FOR MEMBER THICKNESS AND FOR BAR SIZES, SPACING AND DIMENSIONS OF CONCRETE TRIPLE BOX CULVERTS, SEE 703.81H, FOR JB BARS, SEE 703.81H, FOR JB BARS, SEE 703.81H.

BARREL AND WING SECTIONS ARE SYMMETRICAL AROUND HORIZONTAL AXIS AND NORMAL TO LONG DIRECTION OF HEADWALL.

DRAWING NOT TO SCALE, FOLLOW DIMENSIONS.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1".

DATE EFFECTIVE: 02/01/2011

DATE PREPARED: 03/10/2011

JEFFERSON CITY, MO 65102

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

105 WEST CAPITOL

1-888-456-MODOT 1-888-275-6631

CONCRETE TRIPLE BOX CULVERT

SKEW: SQUARED

WINGS: FLARED

SECTIONS

703.81H SHEET NO.

3 OF 3
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 ELEVATION. SEE SHEET 3 OF 3 FOR DETAILS.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1".

BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

FOR CUT SECTION DETAILS, SEE 703.86.

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.

IF BARREL LENGTH IS OVER 80 FEET, 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 JOINTS SHALL BE LOCATED TO MINIMIZE THE LENGTH OF JOINT UNDER THE TRAVELED WAY.

TRAVELED WAY IS THE ROADWAY WIDTH MINUS SHOULDER WIDTHS.

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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 THE TRAVELED WAY.

TRAVELED WAY IS THE ROADWAY WIDTH MINUS SHOULDER WIDTHS.

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 ELEVATION. SEE SHEET 3 OF 3 FOR DETAILS.

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.

1a) SAME SIZE AND SPACING AS ADJACENT B BARS

1b) SAME SIZE AND SPACING AS A1 BARS

1c) SAME SIZE AND SPACING AS A2 BARS
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 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 B BARS

(ii) VARIIES. 12" MAXIMUM

(iii) NOT SPECIFIED ON THIS SHEET

(iv) SAME SIZE AND SPACING AS A2 BARS

(v) AT BAR SPACING

(vi) SAME SIZE AND SPACING AS A1 BARS

(vii) AT BAR SPACING

(viii) IF REQUIRED, THE MINIMUM LENGTH EACH SIDE OF WALL SHALL BE THE GREATER OF 48 BAR DIAMETERS OR A CLEAR SPAN. THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

(ix) H2 BARS AS REQUIRED. QUANTITY OF BARS VARIES WITH SKEW.

(x) 12" FOR CLEAR SPAN > 10'-0".

(xi) 15" FOR CLEAR SPAN > 13'-0".

(xii) 3'-0" AT BOTTOM

(xiii) H3 BARS

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-456-MODOT 1-888-275-6636

SHEET NO. 2 OF 3

DATE EFFECTIVE: 12/01/2011
5/13/2015

DATE PREPARED:

REINFORCEMENT

CONCRETE TRIPLE BOX CULVERT

SKEW: LEFT ADVANCE
WINGS: STRAIGHT

703.82H 2 OF 3
02 BAR (b) -"
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.
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.

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 10 CAGE COPPER WIRE OR 12 CAGE 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 WASTIC ON TWO SIDED TAPE. FILTER CLOTH SHALI BE A SUBSTRATE OF DRAGILE, GEOMETRIC, AND ACCORDING TO HIGHWAY DEPARTMENT SPECIFICATIONS. FILTER CLOTH WILL BE CONSIDERED COMPLETELY COVERED BY THE CONTRACT UNIT PRICE FOR OTHER ITEMS.

UPSTREAM AND DOWNSTREAM WINGS REINFORCEMENT

BARREL REINFORCEMENT
FOR DESIGN FILLS OVER 2'-0''

GENERAL NOTES:
FOR MEMBER THICKNESS AND FOR BAR SIZES, SPACING AND DIMENSIONS OF STEEL, SEE 703.87. FOR JS BARS, SEE 703.87. FOR JS BARS, SEE 703.87.
BARREL AND WINGS SECTIONS ARE SYMMETRICAL, AS ARE THE WIDTH AND LENGTH OF THE CULVERT.
DRAWING NOT TO SCALE, FOLLOW DIMENSIONS.
MINIMUM CLEARANCE TO REINFORCING GALVANIZED STEEL SHALL BE 10''.
KEYED CONSTRUCTION JOINT

GRANULAR BACKFILL LIMITS AND MEMBER DIMENSIONS

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

GENERAL NOTES:
- FOR MEMBER THICKNESS AND FOR BARS SIZES, SPACING AND DIMENSIONS OF KEYED JOINT CONCRETE, SEE, 703.877, FOR BAR JOINTS.
- SEE, 1011, FOR JOINTS.
- BARREL PLAYTIME:
- WINGS: FLARED

BARREL REINFORCEMENT FOR DESIGN FILLS OVER 2'-0"
GENERAL NOTES:

- For sections thru barrel, rings 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.
- Beveled headwall shall be located at upstream end.

1a) Same size and spacing as adjacent B bars
1b) Varies, 12" maximum
1c) Not specified on this sheet
1d) Same size and spacing as A2 bars
1e) A2 bar spacing
1f) Same size and spacing as A1 bars
1g) A1 bar spacing
1h) For design fills over 2" - 0"
1i) For design fills 2" - 0" or less
1j) Not required for clear spans 5 10" - 0"
1k) For clear span 3 10" - 0"
1l) For clear span 5 15" - 0"
1m) 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.

1n) H2 bars as required. Quantity of bars varies with skew.

Missouri Highways and Transportation Commission
105 West Capitol
Jefferson City, MO 65102
1-888-ASK-MODOT 1-888-275-6636

Concrete Triple Box Culvert
Skew: Right Advance
Wings: Straight
Reinforcement

Date Prepar ed: 12/01/2011
Date Effective: 02/01/2012
Sheet No: 703.84H 2 of 3
STITCHED TO ONE FACE OF THE CONCRETE WITH 10 GAGE COPPER WIRE OR 12 GAGE SOFT DRAWN PREFORMED FIBER EXPANSION JOINT MATERIAL IN 02 BAR (b)

GRANULAR BACKFILL—

TRANVERSE JOINT THRU BARREL
PREFORMED FIBER EXPANSION JOINT MATERIAL IN ACCORDANCE WITH SECTION SHALL BE SECURELY STITCHED TO ONE FACE OF THE CONCRETE WITH 10 GAGE COPPER WIRE OR GALVANIZED STEEL NAIL.

FILTER CLOTH A FEET IN WIDTH AND DOUBLE THICKNESS SHALL BE CENTERED ON TRANVERSE JOINTS ON TOP SLAB AND SIDWALLS WITH EDGES SEALING WITH VAPOR AND TWO SIDED TAPE. FILTER CLOTH SHALL BE SUBURBAN DRAINING, DESIRED IN ACCORDANCE WITH THE NOSE OF THE REINFORCING FILTER CLOTH WILL BE CONSIDERED COMPLETELY COVERED BY THE CONTRACT UNIT PRICE FOR OTHER ITEMS.

D2 BAR (b)

BARREL REINFORCEMENT
FOR DESIGN FILLS OVER 2'-0"

UPSTREAM HEADWALL REINFORCEMENT NEAR MidSPAN
NEAR MIDSPAN

D2 BAR (d)

DOWNSTREAM HEADWALL REINFORCEMENT NEAR MIDSPAN
NEAR MIDSPAN

F BARS AT 12" CTS.

GENERAL NOTES:
FOR MEMBER THICKNESS AND FOR BAR SIZES, SPACING AND DIMENSIONS OF INTERIOR HEADWALL BAR, SEE 703.67. FOR JS BAR, SEE 703.21.

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

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

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

- For sections thru barrel, rings 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.

Construciton 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) Knives, 12" maximum
(c) Not specified on this sheet
(d) Same size and spacing as A7 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
(j) Not required for clear spans 5'-0" or less
(k) For clear span 3'-0" or less
(l) For clear span 1'-0" or less

If required, the minimum length each side of e wall shall be the greater of 4B bar diameters or a clean span. The clean span is parallel to long direction of headwall.

(h) H2 bars as required. Quantity of bars varies with skew.

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

DATE EFFECTIVE: 12/01/2011
DATE PREPARED: 9/13/2011

CONCRETE TRIPLE BOX CULVERT
SKEW: RIGHT ADVANCE WINGS: FLARED
REINFORCEMENT

703.85C 2 OF 3
02 BAR STITCHED TO ONE FACE OF THE CONCRETE WITH 10GAGE COPPER WIRE OR 12 GAGE SOFT DRAWN. THICKNESS SHALL BE CENTERED ON TRANSVERSE JOINTS IN TOP SLAB AND SIDEWALLS WITH EDGES SEALED WITH FILTER CLOTH WILL BE CONSIDERED COMPLETELY COVERED BY THE CONTRACT UNIT PRICE FOR OTHER ITEMS.

FILTER CLOTH 3 FEET IN WIDTH AND DOUBLE WITH SEC 1011. COST OF FURNISHING AND INSTALLING.

TOP SLAB

UPSTREAM FLARED WINGS REINFORCEMENT

DOWNSTREAM WINGS REINFORCEMENT

UPSTREAM HEADWALL REINFORCEMENT NEAR INTERIOR WALL

DOWNSTREAM HEADWALL REINFORCEMENT NEAR MIDSPAN

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

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

KEYED CONSTRUCTION JOINT

PREFORMED FIBER EXPANSION JOINT MATERIAL IN ACCORDANCE WITH SEC 2012. BAR WILL BE SECURELY STITCHED TO ONE FACE OF THE CONCRETE WITH 10 GAGE COPPER WIRE OR 12 GAGE SOFT DRAWN.

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 MATERIAL IN ACCORDANCE WITH SEC 2010. IF THE MATERIAL IS A FIBER-MESH-TYPE FILTER CLOTH WILL BE CONSIDERED COMPLETELY COVERED BY THE CONTRACT UNIT PRICE FOR OTHER ITEMS.

CONCRETE TRIPLE BOX CULVERT

SKEW: RIGHT ADVANCE

WINGS: FLARED

GENERAL NOTES:

FOR MEMBER THICKNESSES AND FOR BARS OVER 1" IN SIZE, SPACING AND DIMENSIONS OF THE REINFORCEMENT SHALL BE IN ACCORDANCE WITH SEC 2010. SEE 703.17 FOR #5 BARS.

BARREL AND WINGS SECTIONS ARE SYMMETRICAL, ARCHED AND HORIZONTAL, AND COULVERT, HEADWALL, AND SECTIONS ARE NORMAL TO THE LONG DIRECTION OF HEADWALL.

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS. MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1".

ARCHER FOR CLEAR SPANS ≤ 10'-0" IF #2 AND #4 BARS ARE REQUIRED, THE MINIMUM LENGTH EACH SIDE OF PANEL SHALL BE THE GREATER OF 4X BAR SPAN DISTANCE BY A CLEAN SPAN. THE CLEAN SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.
### Design

<table>
<thead>
<tr>
<th>SPAN (S)</th>
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<td>HEIGHT (H)</td>
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**Member Thickness**

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**Top Slab Bars**

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**Bottom Slab Bars**

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**Wall Bars**

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**General Notes:**

- If design fill is between tabled design fills, use the next greater unlisted design fill. If design fill is between 2 listed design fills, use the next greater bar size. Use the greater member thickness. Area of reinforcement and bar dimensions from this chart is not available for design fills less than 2 feet.
- Design fills are measured from the top of top slab to the top of earth fill or roadway.

**Missouri Highways and Transportation Commission**

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

JEFFERSON CITY, MO 65102

**Concrete Triple Box Culvert**

- Member Thickness
- Bar Size, Spacing & Dimensions

**SPAN (S): 3 FEET**

**HEIGHT (H): 5 FT OR 6 FT**

**Member Thickness**

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<th>T</th>
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**Top Slab Bars**

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**Bottom Slab Bars**

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**Wall Bars**

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**General Notes:**

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- 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): 5 FT OR 6 FT**

**Member Thickness**

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<tr>
<th>T</th>
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**Top Slab Bars**

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**Bottom Slab Bars**

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**Wall Bars**

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**General Notes:**

- If design fill is between tabled design fills, use the next greater unlisted design fill. If design fill is between 2 listed design fills, use the next greater bar size. Use the greater member thickness. Area of reinforcement and bar dimensions from this chart is not available for design fills less than 2 feet.
- Design fills are measured from the top of top slab to the top of earth fill or roadway.
### 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 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 or roadway.

### Culvert Strength:
- Culverts meet strength and serviceability requirements for the design vertical live load H-30 winds the lane load.

### Date Effective:
- Date Prepared: 9/28/2011
- Sheet No.: 2 of 27
- SPAN (S) = 4 FEET
- HEIGHT (HT) = 2 OR 3 FT
- SPAN (S) = 4 FEET
- HEIGHT (HT) = 4 OR 5 FT

### Table:

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<th>Design</th>
<th>Member Thickness</th>
<th>A1 Bars</th>
<th>J1 Bars</th>
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<th>J2 Bars</th>
<th>Bottom Slab Bars</th>
<th>J4 Bars</th>
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### DESIGN THICKNESS

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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 and 4 feet, use special designs.
- The greater member thickness, area of reinforcement, and bar dimensions are required when the design fill is less than 1 foot or greater than 50 feet.
- Designs are specified for the top of the top slab to the top of the culvert.

### CONCRETE TRIPLE BOX CULVERT
- **Member Thickness**
- **Bar Size, Spacing & Dimensions**
- **Span (S): 4 Feet**
- **Height (H): 6 to 7 Feet**

### CENTER LINE OF REFERENCED DRAWING

- **Date Prepared:** 9/29/2011
- **Date Effective:** 10/1/2011
- **Sheet No.:** 3 of 27

---

**MEMBER TOP SLAB BARS: A1, A2, A3, A4, J1, J2, J3, J4, H1, H2, H3, H4, B1, B2, B3, B4.**

**BOTTOM SLAB BARS: C1, C2, C3, C4, G1, G2, G3, G4.**

**WALL BARS: C5, C6, C7, C8.**

**Design Fill:**
- **FT HEIGHT (HT): 6 thru 7 FEET**
- **SPAN (S): 4 FT**
- **Design Vehicular Live Load:** HL-93 Minus the Lane Load.

**Other Notes:**
- Earth fill or roadway.
- Dimensions from the top of top slab to the top of the culvert.
- 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 the culvert fill or roadway.

**General Notes:**
- If design fill is between tabulated design fills, use the next greater tabulated design fill. For design fills between 2 and 4 feet, use special designs.
- The greater member thickness, area of reinforcement, and bar dimensions 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 the culvert fill or roadway.

**Culverts Meet Strength and Serviceability Requirements for the Design Vehicle Live Load HL-93 Minus the Lane Load.**

**Missouri Highways and Transportation Commission**

**105 West Capitol**

**Jefferson City, MO 65102**

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

**30703.87**
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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 3 ft, use the greater member thickness, area of reinforcement, and 1 ft of fill.
- For fills greater than 1 ft and between 2 and 3 ft, use the greater member thickness, area of reinforcement, and 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 30 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): 5 feet, height (ht): 3 to 6 feet

**Missouri Highways and Transportation Commission**
- 105 West Capitol
- 1-888-452-MODOT (1-888-275-6636)
### Design Span (S) = 6 FT

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### General Notes:
- If design fill is between tabulated design fills, use the next greater tabulated design fill. If design fills between 2 are tabulated design fills, use the design fill between 2 values. If design fill exceeds 2 values, use the greater member thickness, area of reinforcement, and bar dimensions. From the top 2 feet and above, use the greater member thickness, area of reinforcement, and bar dimensions. The 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.

### Missouri Highways and Transportation Commission
1-888-ASK-MODOT (1-888-275-6636)

**Date Effective:** 12/10/2011
**Date Prepared:** 9/29/2011

**Sheet No.** 703.87

**6 Of 27**
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## Table: Design Thickness

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<th>Member Thickness</th>
<th>A1 Bars</th>
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<th>A2 Bars</th>
<th>H1 Bars</th>
<th>C1</th>
<th>H2 Bars</th>
<th>C2</th>
<th>J1 Bars</th>
<th>J2 Bars</th>
<th>C3</th>
<th>B1 Bars</th>
<th>B2 Bars</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. For design fills between 2 and 4 feet, use the greater member thickness, area of reinforcement, and bar dimensions from the 2 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.

---

**Concrete Triple Box Culvert**

**Member Thickness**

**Bar Size, Spacing & Dimensions**

<table>
<thead>
<tr>
<th>Span (s)</th>
<th>7 Feet</th>
<th>Height (Ht)</th>
<th>9 thru 10 Feet</th>
</tr>
</thead>
</table>

**Date Effective:** 12/06/2011

**Date Prepared:** 9/28/2011

**Sheet No:** 9 of 27

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

**JEFFERSON CITY, MO 65102**

**1-800-454-MODOT 1-888-270-6693**

**CONCRETE**

**TRIPLE BOX CULVERT**

**Member Thickness**

**Bar Size, Spacing & Dimensions**

**Date Effective:** 12/06/2011

**Date Prepared:** 9/28/2011

**Sheet No:** 9 of 27
### General Notes:

If design fill is between tabulated design fills, use the next greater tabulated design fill. Except for design fills between 3 and 4 ft, use the greater member thickness. Area of reinforcement and bar area of reinforcement equals bar area per foot spacing.

### Sheet Notes:

- 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 Design Vehicle Only. Live Load HL-93 Winds the Lane.

### Dimensions:
- In inches unless otherwise specified.
- Design fills are measured from the top of top slab to the top of earth fill or roadway.

#### Sheet No.

- 10 of 27

#### Date Prepared:
- 9/28/2011

#### Date Effective:
- 10/8/2011

#### MODOT

**Missouri Highways and Transportation Commission**

**105 West Capitol**

**1-888-458-MODOT (1-888-275-6636)**

![Concrete Triple Box Culvert Design](image_url)
### Table: Design Thickness

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### Notes:
- **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 greater member thickness, area of reinforcement and bar diameters from the 2 feet and 4 feet tabulated design fills.
  - Bar dimensions from the 2 feet and 4 feet tabulated design fills.
  - 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.

### Abbreviations:
- **HN:** Height
- **CN:** Span
- **MT:** Member thickness
- **AR:** Area of reinforcement
- **BT:** Bar thickness
- **SP:** Spacing

### Special Requirements:
- Design fills are measured from the top of top slab to the top of earth fill or roadways.

### Concretes:
- Triple Box Culvert

---

**Missouri Highways and Transportation Commission**

**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 greater member thickness, area of reinforcement and bar diameters from the 2 feet and 4 feet tabulated design fills.
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**Concretes:**
- Triple Box Culvert

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**Concretes:**
- Triple Box Culvert

---

**Sheet No.:**

**Date Prepared:**

**Date Effective:**

**Design Vehicular Live Load:** HL-93 minus the lane load.

**Date Prepared:** 9/29/2011

**Date Effective:** 10/1/2011

**Sheet No.:** 11 of 27
### Design Thickness

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<th>A1</th>
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### Notes:
- If design fill is between tabulated design fills, use the next smaller tabulated design fill. Excect for design fills between 2 and 5 feet, use the next larger tabulated design fill. Volumes from 2 to 5 feet are prorated.
- The UTB = 0.75 for design fills less than 2 feet.
- A culvert with a load 0-25% less than the specified load shall be used if the fill is less than 2 feet.
- Design fill is measured from the top of top slab to the top of fill area.

### Culvert Dimensions:
- Culverts meet strength and serviceability requirements for the design vehicle load.
- Culvert sizes are in inches unless otherwise specified.
- Design fills are measured from the top of top slab to the top of fill area or fill.
- Culverts meet strength and serviceability requirements for the design vehicle load.

### General Notes:
- Culverts meet strength and serviceability requirements for the design vehicle load.
- Culvert sizes are in inches unless otherwise specified.
- Design fills are measured from the top of top slab to the top of fill area or fill.
- Culverts meet strength and serviceability requirements for the design vehicle load.
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**GENERAL NOTES:**
1. If design fill is between tabulated design fills, use the next greater tabulated design fill. For design fills between tabulated design fills, use the greater member thickness, area of reinforcement, and area of reinforcement equals bar area per foot spacing.
2. Design fills are measured from the top of top slab to the top of earth fill or roadway.
3. Concretes meet strength and serviceability requirements for the design vehicle live load. HL-93 winds the lane load.

**DIMENSIONS FROM THE TABLES:**
- Span: 10 feet
- Height: 5 feet
- Size: 2 feet and 4 feet
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**GENERAL NOTES:**

- JF DESIGN FILLS ARE BETWEEN TABULATED DESIGN FILLS. USE THE NEXT GREATER TABULATED DESIGN FILL, EXCEPT FOR DESIGN FILLS BETWEEN 2 AND 3 FEET IN WHICH CASE USE THE LOWER FILLED CULVERTS MEET STRENGTH AND SERVICEABILITY REQUIREMENTS FOR THE DESIGN FILL AREAS OF REINFORCEMENT. USE THE GREATER MEMBER THICKNESS, AREA OF REINFORCEMENT AND BAR DIMENSIONS FOR THE 3 FEET HIGH AND 4 FEET TABULATED DESIGN FILL AREAS. IF DESIGN FILL IS BETWEEN TABULATED DESIGN FILLS, USE THE NEXT GREATER DESIGN FILM. USE THE GREATER MEMBER THICKNESS, AREA OF REINFORCEMENT, AND REINFORCEMENT FOR THE 3 FEET HIGH AND 4 FEET TABULATED DESIGN FILL AREAS. 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 READAY.

- MAINE WAYWAYS AND TRANSPORTATION COMMISSION:

  105 WEST CAPITOL
  JEFFERSON CITY, MO 65101
  1-888-ASK-MODOT (1-888-275-6636)

- CONCRETE TRIPLE BOX CULVERT:

  MEMBER THICKNESS

  BAR SIZE, SPACING & DIMENSIONS

  SPAN (S) 10 FEET

  HEIGHT (HT): 11 THRU 13 FEET

  SHEET NO. 15 OF 27

  DATE EFFECTIVE: 12/10/11
  DATE PREPARED: 9/28/11

  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 OR 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. AREA OF REINFORCEMENT EQUALS BAR AREA PER FOOT SPACING.
2. SPECIAL DESIGNS 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 WALL.

CULVERTS MEET STRENGTH AND SERVICEABILITY REQUIREMENTS FOR THE DESIGN VEHICULAR LIVE LOAD HL-93 MINUS THE LANE LOAD.

CULVERTS MEET STRENGTH AND SERVICEABILITY REQUIREMENTS FOR THE DESIGN VEHICULAR LIVE LOAD HL-93 MINUS THE LANE LOAD.
### Bar Dimension Diagram

**Panel Dimensions**: 3 ft 3 in (90 cm) x 3 ft 3 in (90 cm) x 2 in (5.1 cm)

**Member Thickness**: 1.5 in (3.8 cm)

**Bar Details**:
- **Top Slab Bars**: 4 bars in the middle, 2 bars at the ends
- **Bottom Slab Bars**: 2 bars in the middle, 1 bar at each end
- **Wall Bars**: 1 bar at each end

**Member Positions**
- **Center**: A, B, C
- **Left End**: D
- **Right End**: E

**Bar Spacing**
- **Top Slab**: 3 in (7.6 cm) centers
- **Bottom Slab**: 3 in (7.6 cm) centers
- **Wall**: 3 in (7.6 cm) centers

**Diagonal Bars**
- **Top Slab**: 2 bars at 45° angles
- **Bottom Slab**: 2 bars at 45° angles
- **Wall**: 1 bar at 45° angle

**Concrete Details**
- **Concrete Column**: 1 ft (0.3 m)
- **Concrete Slab**: 1.5 ft (0.45 m)
- **Concrete Wall**: 1.5 ft (0.45 m)

**General Notes**
- Bars are placed in accordance with the member thickness and spacing requirements.
- The diagram provides a visual guide for the placement of the bars in the concrete structure.
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<th>SPAN (S) = 14 FT OR 15 FT</th>
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<td>50 FT</td>
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<tr>
<td>GENERAL NOTES:</td>
<td></td>
</tr>
<tr>
<td>1. IF DESIGN FILL IS LESS THAN 1 FT, USE THE NEXT SMALLER DESIGN FILL.</td>
<td></td>
</tr>
<tr>
<td>2. IF DESIGN FILL IS BETWEEN TABULATED DESIGN FILLS, USE THE NEXT SMALLER DESIGN FILL.</td>
<td></td>
</tr>
<tr>
<td>3. SPAN (S) IS THE DISTANCE BETWEEN TOP SLABS.</td>
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</tr>
<tr>
<td>4. MEMBERS ARE OF THE TYPICAL DESIGN AND ARE NOT TO BE CHANGED.</td>
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</tr>
<tr>
<td>5. MEMBERS ARE IDENTIFIED AS TOP SLAB MEMBERS OR WALL MEMBERS.</td>
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<td>6. MEMBERS ARE IDENTIFIED AS TOP SLAB BARS OR WALL BARS.</td>
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<td>33. MEMBERS ARE IDENTIFIED AS TOP SLAB BARS OR WALL BARS.</td>
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<tr>
<td>34. MEMBERS ARE IDENTIFIED AS TOP SLAB BARS OR WALL BARS.</td>
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</tbody>
</table>
### Span (S) = 15 FT

#### General Notes:
- If design fill is between tabulated design fills, use the next greater tabulated design fill. If design fill is between 2 tabulated design fills, use the greater member thickness, area of reinforcement, and area of reinforcement equals bar area per foot spacing.
- Special designs may be required when the design fill is less than 1 foot or greater than 25 feet.

#### Culvert Details:
- Culverts meet strength and serviceability requirements for the design vehicle. Use load H-83 when the lane load is applicable.

#### Design Members:
- Member thickness, bar size, spacing & dimensions.

#### Tabulated Design Fills:
- Design fills are measured from the top of top slab to the top of earth fill or roadway.

#### Table:

<table>
<thead>
<tr>
<th>Design</th>
<th>Height (Ht)</th>
<th>Top Slab Bars</th>
<th>Bottom Slab Bars</th>
<th>Side Bars</th>
<th>Val. Bars</th>
</tr>
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<tbody>
<tr>
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<td>6.50</td>
<td>7.00</td>
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<td>9</td>
<td>8.50</td>
<td>9.50</td>
<td>10.50</td>
<td>11.00</td>
</tr>
</tbody>
</table>

#### Diagram:
- Diagram showing culvert details, including:
  - Culvert
  - Bar dimensions
  - Symmetrical about culvert.

#### Notice:
- For design fill is between tabulated design fills, use the next greater tabulated design fill. Exception for design fills between 2 tabulated design fills, use the greater member thickness, area of reinforcement, and area of reinforcement equals bar area per foot spacing.
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 greater tabulated design fill. Use the greater tabulated design fill except for design fills between 2 and 4 feet. Use the greater tabulated design fill. Examine fill is greater than tabulated design fill. Except for design fills between 2 and 4 feet, use the greater tabulated design fill.

2. Design fills are measured from the top of top slab to the top of fill.

3. Special designs are required when the design fill is less than 1 foot or greater than 50 feet.

4. Dimensions are in inches unless otherwise specified.

5. Design fills are measured from the top of top slab to the top of fill or roadway.

6. Culverts meet strength and serviceability requirements for the design vehicle live load. The load has three lanes.

CONCRETE TRIPLE BOX CULVERT

MEMBER THICKNESS

BAR SIZE, SPACING & DIMENSIONS

SPANN (S) = 13 FT

HEIGHT (HT) = 13 FT OR 16 FT

MEMBER THICKNESS

BAR LENGTH

AREA OF REINFORCEMENT EQUALS BAR AREA PER FOOT SPACING.

HEIGHT (HT): 13 THRU 16 FEET

DATE EFFECTIVE: 10/30/1998

DATE PREPARED: 9/28/2011

SHEET NO: 703.87

1 OF 27
### General Notes:

- The table shows design fill dimensions and reinforcement requirements.
- Design fill dimensions may vary depending on the specific project requirements.
- Special considerations should be made for projects with unique design fill requirements.

### Design Fill Dimensions

**Table 1:**

<table>
<thead>
<tr>
<th>Height (H)</th>
<th>10 FT</th>
<th>11 FT</th>
<th>12 FT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fill (F)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slope (S)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Bar Size</td>
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<td>Spacing</td>
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<td></td>
<td></td>
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<tr>
<td>Dimensions</td>
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<td></td>
</tr>
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</table>

**Table 2:**

<table>
<thead>
<tr>
<th>Height (H)</th>
<th>10 FT</th>
<th>11 FT</th>
<th>12 FT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fill (F)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slope (S)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bar Size</td>
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<td></td>
<td></td>
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<tr>
<td>Spacing</td>
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<tr>
<td>Dimensions</td>
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</table>

**Table 3:**

<table>
<thead>
<tr>
<th>Height (H)</th>
<th>10 FT</th>
<th>11 FT</th>
<th>12 FT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fill (F)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slope (S)</td>
<td></td>
<td></td>
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<tr>
<td>Bar Size</td>
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<tr>
<td>Spacing</td>
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</tr>
<tr>
<td>Dimensions</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

**Concrete Triple Box Culvert**

**Member Thickness Bar Size, Spacing & Dimensions**

**Design Fill:**

- **Span:** 14 FT
- **Height:** 7 THRU 12 FEET
- **Spans:** 14 FT

**Reinforcement Requirements:**

- The table provides reinforcement details for various member thicknesses and bar sizes.
- Special considerations should be made for projects with unique design fill requirements.

**General Notes:**

- The table shows design fill dimensions and reinforcement requirements.
- Design fill dimensions may vary depending on the specific project requirements.
- Special considerations should be made for projects with unique design fill requirements.

---

**Missouri Highways and Transportation Commission**

**Concrete Triple Box Culvert**

**Member Thickness Bar Size, Spacing & Dimensions**

**Design Fill:**

- **Span:** 14 FT
- **Height:** 7 THRU 12 FEET
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**Design Fill:**

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---

**Concrete Triple Box Culvert**

**Member Thickness Bar Size, Spacing & Dimensions**

**Design Fill:**

- **Span:** 14 FT
- **Height:** 7 THRU 12 FEET
- **Spans:** 14 FT

**Reinforcement Requirements:**

- The table provides reinforcement details for various member thicknesses and bar sizes.
- Special considerations should be made for projects with unique design fill requirements.
### SPAN (S) = 14 FT

#### HEIGHT (H) = 15 FT OR 16 FT

<table>
<thead>
<tr>
<th><strong>Design</strong></th>
<th><strong>Member Thickness</strong></th>
<th><strong>A1 Bars</strong></th>
<th><strong>A2 Bars</strong></th>
<th><strong>H1 Bars</strong></th>
<th><strong>H2 Bars</strong></th>
<th><strong>Bottom Slab Bars</strong></th>
<th><strong>Wall Bars</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>105 110 115 120</td>
<td>5 6 7 8</td>
<td>5 6 7 8</td>
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</table>

**General Notes:**
- If design fill is between tabulated design fills, use the next greater tabulated design fill. If design fills between 2 tabulated designs, use the design fill between the tabulated designs. If design fills are 1 foot or greater, use the greater member thickness. Area of reinforcement and bar dimensions from the top slab to the bottom slab area of reinforcement equals bar area per foot spacing.
- Special designs are subject to reinforcement requirements for the design vertical. The load Hx3 winds the lane load.
- Minimum required design fills are measured from the top of top slab to the top of earth fill or roadway.
## General Notes:
- If Design Fill is between tabulated Design Fills, use the next greater tabulated design fill. If design fills between 2 spans, use the greater member thickness, area of reinforcement, and bar dimensions from the two spans and select the fill area 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.

### Concrete Triple Box Culvert

<table>
<thead>
<tr>
<th>Member Thickness</th>
<th>B1 Bars</th>
<th>B2 Bars</th>
</tr>
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<tbody>
<tr>
<td>Size SPA.</td>
<td>C4</td>
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<tr>
<td>Size SPA.</td>
<td>C5</td>
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</table>

### Date Prepared:
11-16-16

**J.</****
### Table 1: Member Thickness

<table>
<thead>
<tr>
<th>Span (ft)</th>
<th>Height (ft)</th>
<th>Size SPA.</th>
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<td>13</td>
<td>6</td>
<td>13</td>
<td>6</td>
<td>13</td>
</tr>
</tbody>
</table>

### Diagram

**Concrete Triple Box Culvert Design**

- **Member Thickness**: The design includes three box sections for different spans and heights.
- **Bar Size and Spacing**: Bars are placed at certain intervals to provide reinforcement.
- **Symmetrical About Culvert**: The design is symmetrical to accommodate the culvert's structural requirements.

**General Notes**
- **Design Fill**: Between tabulated design fills, use the next greater tabulated design fill, except for design fills between 2 and 4 feet where use the greater member thickness.
- **Design Fills**: Area of reinforcement and bar dimensions from the top slab to the top of the greater member.
- **Design Fills**: Measured from the top of the slab to the top of the greater member.

**Concrete Triple Box Culvert**

**Member Thickness**: The design includes different member thicknesses for various spans and heights.

**Bar Size and Spacing**: Bars are placed at specific intervals to ensure structural integrity.

**Symmetrical About Culvert**: The design is symmetrical to accommodate the structural requirements of the culvert.

**General Notes**
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- **Design Fills**: Measured from the top of the slab to the top of the greater member.
### 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 and 4 and 5 ft, use the greater minimum thickness of area of reinforcement and 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.
- Culverts meet strength and serviceability requirements for the design scour velocity with a load H=3 winds the lane loads.

### Table 1: Design Fill, Height (Ht), and Bar Size

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### Culvert Design

- **16 FT HEIGHT (HT):**
  - Design Fill (DF): 16 ft
  - Culvert Design (CD): 16 ft
  - Slab Size (SS): 16 ft
  - Slab Dimension (SD): 16 ft
  - Bar Size (BS): 16 ft
  - Culvert Bar (CB): 16 ft
- **16 FT DESIGN:**
  - Design Fill (DF): 16 ft
  - Culvert Design (CD): 16 ft
  - Slab Size (SS): 16 ft
  - Slab Dimension (SD): 16 ft
  - Bar Size (BS): 16 ft
  - Culvert Bar (CB): 16 ft

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*Image and textual content are consistent with the provided specifications. For more detailed information, refer to the original source.*
NOTE: VARY DIE HEIGHT AS REQUIRED FOR BOX GIRDER.

PART CROSS SECTION

(1) DISTANCE TO BOTTOM OF TRANSVERSE BAR AS SPECIFIED ON PLANS.

PART C-D

PART D-D

PART E-E

SLAB SPANS - WITH VOIDS

(1) CLEAR DISTANCE AS SPECIFIED ON PLANS.

PART H-H

SLABS ON P/S DOUBLE-TEE GIRDER

PART CROSS SECTION

PART SECTION "A"

CONTINUOUS HIGH CHAIR - CHC

ALL CONTACT POINTS ON WIRE BAR SUPPORTS SHALL BE SECURELY WELDED.
A TURNED-UP, CAPPED OR DIPPED FOOT SHALL BE ON ALL BAR SUPPORTS BEARING ON FORMS. WHERE BAR SUPPORTS ARE USED ON EARTH OR AGGREGATE SUBGRADES, SUITABLE PLATES, CONTINUOUS BARS OR PRECAST CONCRETE BAR SUPPORTS SHALL BE PROVIDED TO PREVENT DISPLACEMENT OF THE SUPPORT FOOT.

ALL DIMENSIONS TO REINFORCING STEEL ARE TO BAR EXCEPT WHERE CLEAR DISTANCE FROM FACE OF CONCRETE IS INDICATED. ALL BAR SUPPORTS TO BE REQUIRED TO SUPPORT BARS IN EXACT POSITIONS SHOWN ON PLANS.

SPINAL MORTARMIXING SHALL BE SUPPORTED BY USE OF ADJACENT SPIRAL SPACING AT MORE THAN 3" CENTERS. PAYMENT FOR SPACING AND ALL OTHER BAR SUPPORTS WILL BE CONSIDERED COMPLETELY COVERED BY SPECIAL 1" UPPER BEAM BOLSTER SUPPORT AS SHOWN.

ELEVATION

WHEN BARS OF DIFFERENT SIZES ARE USED IN THE SAME MEMBERS, THE SELECTION OF BAR SUPPORTS SHALL BE BASED ON THE LARGER SIZE.

SUPPORTS FOR THE UPPER LAYERS NEED NOT BE DIRECTLY OVER THE SUPPORTS BELOW.

ALL BAR SUPPORTS SHALL BE IN ACCORDANCE WITH C.R.S. - I. MANUAL OF STANDARD PRACTICE. EXCEPT AS SHOWN.

ALL UNSPLICED WIRE BAR SUPPORTS SHALL HAVE CAPPED OR DIPPED FEET FOR THOSE APPLICATIONS WHERE MINIMIZING RUST SPOTS AND SURFACE BLEMISHES ARE EXPECTED TO BECOME VISIBLE. COLOR SHALL MATCH CONCRETE.

INDIVIDUAL HIGH CHAIRS AND SPACING WILL BE DETERMINED BY THE ENGINEER. INDIVIDUAL HIGH CHAIRS SHALL BE USED IN VARIOUS SPACING AS SHOWN.

PLASTIC BAR SUPPORTS SHALL BE PROVIDED ON THE SAME SPACING AS STEEL WIRE BAR SUPPORTS AS SHOWN.
TYPE A - FINGER TYPE EXPANSION DEVICES

GENERAL NOTES:
- OLIGO of the work is indicated by light dashed lines; heavy
  lines indicate new work.
- The existing expansion devices plates shall be checked for
  encrusted rust and replaced when necessary.
- Structural steel shall be in accordance with AASHTO
  Grade 50.
- Qualification of welding operations shall be required.
- Inspect or false steel plates shall be removed.
- The steel caps shall be installed according with the
  indicated dimensions and tolerances. The expansion
cap shall be placed in the expansion joint. The steel cap
shall be capped with the new plate. The new plate shall
be checked by welding surface.

TYPE B - PLATE TYPE EXPANSION DEVICES

STEEL DAMS
AT EXPANSION DEVICES
FOR RESURFACING BRIDGE FLOORS

MISSOURI HIGHWAYS AND TRANSPORTATION
COMMISSION
109 N EIGHTH STREET
JEFFERSON CITY, MO 65102
1-888-327-MODOT (1-888-327-6636)

STEEL DAMS
AT EXPANSION DEVICES
FOR RESURFACING BRIDGE FLOORS

STEEL DAMS
AT EXPANSION DEVICES
FOR RESURFACING BRIDGE FLOORS

STEEL DAMS
AT EXPANSION DEVICES
FOR RESURFACING BRIDGE FLOORS

712.40L
TYPICAL TRENCH DETAIL

PIPE INSTALLATION AND BEDDING

NOTE:

A) MINIMUM STRUCTURAL BACKFILL OVER TOP OF PIPE SHALL BE ONE-EIGHTH DIAMETER OR 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.

MULTIPLE STRUCTURE SPACING

PIECE - ARCHES

UP TO 24" - 12" PIPE DIA

24" TO 72" - 1/3 ARCH SPAN

72" AND OVER - 36"

PIPE

UP TO 36" - 12"

36" TO 108" - 1/3 ARCH SPAN

108" TO 189" - 36"

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

**SPECIFIED THICKNESS OF COATED SHEET (IN.)**

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### CORRUGATED METALIC-COATED STEEL CIRCULAR PIPE RIVETED SEAM

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</table>

**NOTES:**
- 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

**FOR TRENCH INSTALLATION ONLY**

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

105 WEST CAPITOL JEFFERSON CITY, MO 65102 1-888-458-WOOTH (1-888-968-9668)

**CORRUGATED METAL PIPE INSTALLATION METHODS**

**DATE EFFECTIVE:** 06/01/2011

**DATE PREPARED:** 03/26/2011

**SHEET NO:** 2 OF 5

**725.00C**
### Corrugated H32 Aluminum Circular Pipe Lock Seam

**Maximum Allowable Overfill Heights (1)**

<table>
<thead>
<tr>
<th>Specified Diameter of Pipe</th>
<th>Specified Thickness of Coated Sheet (In.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.06</td>
</tr>
<tr>
<td></td>
<td>A B C D</td>
</tr>
<tr>
<td>ft.</td>
<td>ft. ft. ft. ft.</td>
</tr>
<tr>
<td>12</td>
<td>1 1</td>
</tr>
<tr>
<td>15</td>
<td>1 1</td>
</tr>
<tr>
<td>18</td>
<td>1 1</td>
</tr>
<tr>
<td>21</td>
<td>1 1</td>
</tr>
<tr>
<td>24</td>
<td>1 1</td>
</tr>
<tr>
<td>30</td>
<td>1 2</td>
</tr>
<tr>
<td>36</td>
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<tr>
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</tr>
<tr>
<td>48</td>
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</tr>
<tr>
<td>54</td>
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<tr>
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<tr>
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<tr>
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<td>1 3</td>
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<tr>
<td>84</td>
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</tr>
<tr>
<td>92</td>
<td>1 3</td>
</tr>
<tr>
<td>96</td>
<td>1 3</td>
</tr>
<tr>
<td>102</td>
<td>2 4</td>
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<tr>
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<tr>
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</tr>
<tr>
<td>120</td>
<td>2 4</td>
</tr>
<tr>
<td>126</td>
<td>2 4</td>
</tr>
</tbody>
</table>

### Corrugated H32 Aluminum Circular Pipe Riveted Seam

**Maximum Allowable Overfill Heights (1)**

<table>
<thead>
<tr>
<th>Specified Diameter of Pipe</th>
<th>Specified Thickness of Coated Sheet (In.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.06</td>
</tr>
<tr>
<td>ft.</td>
<td>ft. ft. ft. ft.</td>
</tr>
<tr>
<td>12</td>
<td>1 1</td>
</tr>
<tr>
<td>15</td>
<td>1 1</td>
</tr>
<tr>
<td>18</td>
<td>1 1</td>
</tr>
<tr>
<td>21</td>
<td>1 1</td>
</tr>
<tr>
<td>24</td>
<td>1 1</td>
</tr>
<tr>
<td>30</td>
<td>1 2</td>
</tr>
<tr>
<td>36</td>
<td>1 2</td>
</tr>
<tr>
<td>42</td>
<td>1 2</td>
</tr>
<tr>
<td>48</td>
<td>1 2</td>
</tr>
<tr>
<td>54</td>
<td>1 2</td>
</tr>
<tr>
<td>60</td>
<td>1 2</td>
</tr>
<tr>
<td>66</td>
<td>1 2</td>
</tr>
<tr>
<td>72</td>
<td>1 3</td>
</tr>
<tr>
<td>78</td>
<td>1 3</td>
</tr>
<tr>
<td>84</td>
<td>1 3</td>
</tr>
<tr>
<td>90</td>
<td>1 3</td>
</tr>
<tr>
<td>96</td>
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<tr>
<td>102</td>
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<tr>
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<td>2 4</td>
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<tr>
<td>114</td>
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</tr>
<tr>
<td>120</td>
<td>2 4</td>
</tr>
<tr>
<td>126</td>
<td>2 4</td>
</tr>
</tbody>
</table>
### CORRUGATED H34 ALUMINUM CIRCULAR PIPE RIVETED SEAM

**MAXIMUM ALLOWABLE OVERFILL HEIGHTS (1)**

| SPECIFIED DIAMETER OF PIPE | MINIMUM COVER | CORRUGATED SPIRAL RIB | A | B | C | D | A | B | C | D | A | B | C | D |
|-----------------------------|---------------|-----------------------|---|---|---|---|---|---|---|---|---|---|---|---|---|
| [IN., FT., FT.]             | [A | B | C | D  | A | B | C | D | A | B | C | D | A | B | C | D] | [IN., FT., FT.] | [A | B | C | D  | A | B | C | D | A | B | C | D | A | B | C | D] |
| 12                          | 1             | 1                      | 159 | 135 | 85  | 199 | 229 | 117 | 278 | 320 | 187 | 358 | 428 | 260 | 437 | 504 |
| 15                          | 1             | 1                      | 137 | 146 | 68  | 159 | 183 | 93  | 223 | 256 | 150 | 286 | 343 | 212 | 350 | 403 |
| 18                          | 1             | 1                      | 106 | 122 | 57  | 132 | 153 | 78  | 185 | 213 | 125 | 259 | 286 | 176 | 293 | 356 |
| 21                          | 1             | 1                      | 91  | 104 | 49  | 113 | 131 | 67  | 159 | 183 | 107 | 205 | 245 | 151 | 250 | 288 |
| 24                          | 1             | 1                      | 79  | 91  | 43  | 99  | 115 | 58  | 139 | 160 | 94  | 179 | 214 | 132 | 218 | 252 |
| 30                          | 1             | 2                      | 73  | 74  | 92  | 47  | 111 | 128 | 73  | 143 | 117 | 106 | 175 | 202 | 212 | 243 |
| 36                          | 1             | 2                      | 61  | 204 | 66  | 76  | 38  | 93  | 107 | 62  | 119 | 143 | 88  | 146 | 168 | 202 |
| 42                          | 1             | 2                      | 52  | 66  | 33* | 78  | 91  | 54  | 102 | 122 | 76  | 125 | 144 | 202 | 243 | 304 |
| 48                          | 1             | 2                      | 46  | 57  | 68  | 80  | 47  | 89  | 107 | 66  | 109 | 126 |
| 54                          | 1             | 2                      | 41  | 51  | 56  | 71  | 42  | 73  | 95  | 59  | 70  | 92  | 202 | 243 | 304 |
| 60                          | 1             | 2                      | 37  | 46  | 64  | 105 | 37* | 69  | 86  | 53  | 73  | 101 | 202 | 243 | 304 |
| 66                          | 1             | 2                      | 33  | 42  | 58  | 78  | 48  | 59  | 92  |
| 72                          | 1             | 3                      | 30  | 38  | 53  | 71  | 42* | 47  | 84  |
| 78                          | 1             | 3                      | 35  | 49  | 66  | 78  |
| 84                          | 1             | 3                      | 35  | 46  | 61  | 72  |
| 90                          | 1             | 3                      | 39  | 57  | 67  |
| 96                          | 1             | 3                      | 39  | 55  | 62  |
| 102                         | 2             | 4                      | 48  | 56  | 51  |
| 108                         | 2             | 4                      | 43  | 51  |
| 114                         | 2             | 4                      | 46  |
| 120                         | 2             | 4                      | 41  |
| 126                         | 2             | 4                      | 41  |

### CORRUGATED H34 ALUMINUM CIRCULAR PIPE LOCK SEAM

**MAXIMUM ALLOWABLE OVERFILL HEIGHTS (1)**

<table>
<thead>
<tr>
<th>SPECIFIED DIAMETER OF PIPE</th>
<th>MINIMUM COVER</th>
</tr>
</thead>
<tbody>
<tr>
<td>[IN., FT., FT.]</td>
<td>[A</td>
</tr>
<tr>
<td>12</td>
<td>1</td>
</tr>
<tr>
<td>15</td>
<td>1</td>
</tr>
<tr>
<td>18</td>
<td>1</td>
</tr>
<tr>
<td>21</td>
<td>1</td>
</tr>
<tr>
<td>24</td>
<td>1</td>
</tr>
<tr>
<td>30</td>
<td>1</td>
</tr>
<tr>
<td>36</td>
<td>1</td>
</tr>
<tr>
<td>42</td>
<td>1</td>
</tr>
<tr>
<td>48</td>
<td>1</td>
</tr>
<tr>
<td>54</td>
<td>1</td>
</tr>
<tr>
<td>60</td>
<td>1</td>
</tr>
<tr>
<td>66</td>
<td>1</td>
</tr>
<tr>
<td>72</td>
<td>1</td>
</tr>
<tr>
<td>78</td>
<td>1</td>
</tr>
<tr>
<td>84</td>
<td>1</td>
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<tr>
<td>90</td>
<td>1</td>
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<tr>
<td>96</td>
<td>1</td>
</tr>
<tr>
<td>102</td>
<td>2</td>
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<tr>
<td>108</td>
<td>2</td>
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<tr>
<td>114</td>
<td>2</td>
</tr>
<tr>
<td>120</td>
<td>2</td>
</tr>
<tr>
<td>126</td>
<td>2</td>
</tr>
</tbody>
</table>
### Minimum Cover for Construction Loads (Round and Pipe-Arch)

<table>
<thead>
<tr>
<th>Diameter or Pipe Span</th>
<th>Minimum Cover (ft.) for Indicated Axle Loads (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>18k lbs.</td>
</tr>
<tr>
<td>ft.</td>
<td>ft.</td>
</tr>
<tr>
<td>12-42</td>
<td>2.0</td>
</tr>
<tr>
<td>48-72</td>
<td>3.0</td>
</tr>
<tr>
<td>78-120</td>
<td>3.5</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.

### Pipe-Arch Requirements

#### 2-2/3" x 1/2" Corrugations

| Type | Span (3) | Rise (3) | Galvanized Sheet
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(in.)</td>
<td>(in.)</td>
<td>Thickness (gaUGE)</td>
</tr>
<tr>
<td>B1</td>
<td>17</td>
<td>13</td>
<td>0.064 16</td>
</tr>
<tr>
<td>B2</td>
<td>21</td>
<td>15</td>
<td>0.064 16</td>
</tr>
<tr>
<td>B3</td>
<td>24</td>
<td>18</td>
<td>0.064 16</td>
</tr>
<tr>
<td>B4</td>
<td>28</td>
<td>20</td>
<td>0.064 16</td>
</tr>
<tr>
<td>B5</td>
<td>35</td>
<td>24</td>
<td>0.064 16</td>
</tr>
<tr>
<td>B6</td>
<td>42</td>
<td>29</td>
<td>0.079 14</td>
</tr>
<tr>
<td>B7</td>
<td>49</td>
<td>33</td>
<td>0.109 12</td>
</tr>
<tr>
<td>B8</td>
<td>57</td>
<td>38</td>
<td>0.109 12</td>
</tr>
<tr>
<td>B9</td>
<td>64</td>
<td>43</td>
<td>0.109 12</td>
</tr>
<tr>
<td>B10</td>
<td>71</td>
<td>47</td>
<td>0.138 10</td>
</tr>
<tr>
<td>B11</td>
<td>77</td>
<td>52</td>
<td>0.168 8</td>
</tr>
<tr>
<td>B12</td>
<td>83</td>
<td>57</td>
<td>0.168 8</td>
</tr>
</tbody>
</table>

#### 3" x 1" Corrugations

| Type   | Span (4) | Rise (4) | Galvanized Sheet
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(in.)</td>
<td>(in.)</td>
<td>Thickness (gaUGE)</td>
</tr>
<tr>
<td>B8A</td>
<td>53</td>
<td>41</td>
<td>0.079 14</td>
</tr>
<tr>
<td>B9A</td>
<td>60</td>
<td>46</td>
<td>0.079 14</td>
</tr>
<tr>
<td>B10A</td>
<td>66</td>
<td>51</td>
<td>0.079 14</td>
</tr>
<tr>
<td>B11A</td>
<td>73</td>
<td>55</td>
<td>0.079 14</td>
</tr>
<tr>
<td>B12A</td>
<td>81</td>
<td>59</td>
<td>0.079 14</td>
</tr>
<tr>
<td>B13A</td>
<td>87</td>
<td>63</td>
<td>0.079 14</td>
</tr>
<tr>
<td>B14A</td>
<td>95</td>
<td>67</td>
<td>0.079 14</td>
</tr>
<tr>
<td>B15A</td>
<td>103</td>
<td>71</td>
<td>0.079 14</td>
</tr>
<tr>
<td>B16A</td>
<td>112</td>
<td>75</td>
<td>0.079 14</td>
</tr>
<tr>
<td>B17A</td>
<td>117</td>
<td>79</td>
<td>0.079 14</td>
</tr>
<tr>
<td>B18A</td>
<td>128</td>
<td>83</td>
<td>0.079 14</td>
</tr>
<tr>
<td>B19A</td>
<td>137</td>
<td>87</td>
<td>0.079 14</td>
</tr>
<tr>
<td>B20A</td>
<td>142</td>
<td>91</td>
<td>0.079 14</td>
</tr>
</tbody>
</table>

#### 5" x 1" Corrugations

| Type   | Span (5) | Rise (5) | Galvanized Sheet
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(in.)</td>
<td>(in.)</td>
<td>Thickness (gaUGE)</td>
</tr>
<tr>
<td>B19A</td>
<td>137</td>
<td>87</td>
<td>0.079 14</td>
</tr>
<tr>
<td>B20A</td>
<td>142</td>
<td>91</td>
<td>0.079 14</td>
</tr>
</tbody>
</table>

### Notes

1. Minimum cover measured from top of pipe to bottom of flexible pavement or top of rigid pavement.
2. A tolerance of plus one inch or 2 percent of equivalent circular diameter, whichever is greater, will be permissible in span and rise.
3. Tolerances in parentheses. No tolerance in opposite direction.
4. The surface must be maintained to a level and non-rutted condition.

---

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

DATE EFFECTIVE: 04/01/2011
DATE PREPARED: 08/24/2010

CORRUGATED METAL PIPE INSTALLATION METHODS

SHEET NO. 5 OF 5

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-455-MODOT (1-888-275-6636)
**General Notes:**

- Metal curtain wall and metal inlets
- Date Effective: 07/01/2004
- Date Prepared: 08/21/2009

**Table for Metal Curtain Wall**

<table>
<thead>
<tr>
<th>Dia.</th>
<th>Galv. Sh.</th>
<th>W</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>0.064</td>
<td>12</td>
<td>35</td>
</tr>
<tr>
<td>21</td>
<td>0.064</td>
<td>12</td>
<td>35</td>
</tr>
<tr>
<td>24</td>
<td>0.064</td>
<td>12</td>
<td>40</td>
</tr>
<tr>
<td>30</td>
<td>0.064</td>
<td>12</td>
<td>49</td>
</tr>
<tr>
<td>36</td>
<td>0.079</td>
<td>84</td>
<td>49</td>
</tr>
<tr>
<td>42</td>
<td>0.079</td>
<td>84</td>
<td>49</td>
</tr>
<tr>
<td>48</td>
<td>0.079</td>
<td>84</td>
<td>49</td>
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<tr>
<td>54</td>
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<td>58-1/2</td>
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<tr>
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<td>0.073</td>
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<td>58-1/2</td>
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<tr>
<td>66</td>
<td>0.073</td>
<td>132</td>
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<tr>
<td>72</td>
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<td>132</td>
<td>68-1/2</td>
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<tr>
<td>78</td>
<td>0.099</td>
<td>132</td>
<td>68-1/2</td>
</tr>
<tr>
<td>84</td>
<td>0.099</td>
<td>132</td>
<td>68-1/2</td>
</tr>
</tbody>
</table>

**Continuous Weld**

- Band shall be same thickness as curtain wall material

- Weld stub to riser

- 5 corrugation stubs

- Non-rodded end

- 15" or 18"

**Section A-A**

- Plan metal inlets

**Section B-B**

- 12" min.

- Band width

**For Round or Elliptical Pipe**

- Band shall be same thickness as curtain wall material

**For Pipe Arch**

- Fabricate curtain wall with corrugations vertical

**FOR PIPE ARCH**

- 9-2 0.064 72 30
- 9-3 0.064 72 30
- 9-4 0.079 84 30
- 9-5 0.079 84 30
- 9-6 0.109 96 35
- 9-7 0.109 96 35
- 9-8 0.109 100 35
- 9-9 0.109 100 35
- 9-10 0.156 120 40
- 9-11 0.168 125 50
- 9-12 0.168 131 54

**Missouri Highways and Transportation Commission**

105 West Capitol
Jefferson City, MO 65102
1-888-4MO-MODOT (1-888-275-6636)
CONSTRUCTION SEQUENCE
1. PLACE BEDDING MATERIAL TO GRADE. DO NOT COMPACT.
2. INSTALL PIPE TO GRADE.
3. COMPACT BEDDING OUTSIDE THE MIDDLE THIRD OF THE PIPE.
4. PLACE AND COMPACT THE HAUNCH AREA UP TO THE SPRINGLINE.
5. COMPLETE BACKFILL ACCORDING TO SPECIFICATIONS.

MAXIMUM DIAMETER AND MAXIMUM FILL HEIGHT

<table>
<thead>
<tr>
<th>CLASS OF PIPE</th>
<th>INSTALLATION TYPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLASS I</td>
<td>CLASS II</td>
</tr>
<tr>
<td>CLASS III</td>
<td>CLASS IV</td>
</tr>
<tr>
<td>CLASS V</td>
<td></td>
</tr>
<tr>
<td>MAXIMUM DIAMETER (INCHES)</td>
<td>MAXIMUM FILL HEIGHT (IN FEET)</td>
</tr>
<tr>
<td>D0/6 (12&quot;) MIN.</td>
<td>108</td>
</tr>
<tr>
<td>D0/12 (18&quot;) MIN.</td>
<td>108</td>
</tr>
<tr>
<td>D0/18 (24&quot;) MIN.</td>
<td>108</td>
</tr>
<tr>
<td>D0/24 (30&quot;) MIN.</td>
<td>84</td>
</tr>
<tr>
<td>D0/30 (36&quot;) MIN.</td>
<td>72</td>
</tr>
</tbody>
</table>

| TYPE 1 | 12 | 15 | 21 | 33 | 51 |
| TYPE 2 | 9  | 12 | 17 | 26 | 39 |
| TYPE 3 | 7  | 9  | 13 | 20 | 30 |
| TYPE 4 | 4  | 6  | 9  | 13 | 20 |

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.

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 CONDITION AND SHALL BE SPECIFIED ON THE DESIGN PLANS.

MULTIPLE PIPE CULVERTS SHALL BE INSTALLED WITH A MINIMUM CLEARANCE BETWEEN PIPES OF D0 OR 12", WHICHEVER IS GREATER, BUT NOT TO EXCEED 36".

CLASS I AND CLASS II REINFORCED CONCRETE PIPE SHALL ONLY BE USED FOR SEWERS IN TRENCHES OUTSIDE ROADBED AND STREET LIMITS.

GENERAL NOTES:

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

RIGID CULVERT INSTALLATION METHODS
REINFORCED CONCRETE PIPE CULVERTS

DATE EFFECTIVE: 06/23/2015
DATE PREPARED: 3/28/2017
 SHEET NO. 726.30J 1 OF 2
SEE TABLE II (SEC. 726) FOR WIDTH OF TRENCH

EXTRA 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.

STANDARD STRENGTH

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>
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TRENCH INSTALLATION

NOTE:
- **MULTIPLE PIPE SHALL BE INSTALLED WITH A MINIMUM CLEARANCE BETWEEN PIPES OF 6", OR 12", WHICHEVER IS GREATER, BUT NOT TO EXCEED 36".**

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.

Embankment Installation

**Legend**
- Embankment Installation
- Trench Installation

**Legend Notes:**
- Multiple pipe shall be installed with a minimum clearance between pipes of 6", or 12", whichever is greater, but not to exceed 36".

**Minimum Cover for Construction Loads**

<table>
<thead>
<tr>
<th>Nominal Pipe Dia. (In.)</th>
<th>Minimum Cover (ft) for Indicated Axle Loads (Thousands of Pounds)</th>
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<tr>
<td>42-60</td>
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**Note:**
- SPD = Standard Proctor Density.
- **Fill Height** measured from the top of pipe to surface.
- **Fill 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 Limits**

- **Outflow Diameter of Pipe (D.o /"1") + 6" (MIN.)**
- **Complete Structural Backfill According to Specifications.**
- **Compact Bedding Outside the Middle Third of the Pipe.**
- **Place Bedding Material to Grade.**

**Typical Cambered Flow Line**

- **Flow Line as Laid**
- **Flow Line after Expected Settlement**
- **Flow Height**
- **Inlet**
- **Camber**
- **Roadbed**

**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.
TYPE S-1

TYPE S-2

TYPE S-3

SECTION A-A

SECTION B-B

SECTION C-C

SECTION D-D

SECTION E-E

SECTION F-F

GENERAL NOTES:
The concrete for inlets shall be placed after completion of the drop inlet box. No direct payment will be made for finishing or placing invert concrete.

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<th>LENGTH FT.</th>
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PRECAST DROP INLET
CURB INLET - TYPE T
LID FOR ADJACENT SECTIONS

SECTION 0-0
OPTIONAL PRECAST CURB INLET
5'-0" OPENING

OTHER DETAILS SPECIFIED AS
FOR THE 3'-0" OPENING
DROP INLET ON THIS SHEET.
DETAILS FOR ROADWAY DITCH INLETS
LOCATED WITHIN THE CLEAR ZONE
### Reinforcement

**Barrel Section**

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<th>D</th>
<th>E</th>
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**Flare Section**

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<th>E</th>
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</table>

**General Notes:**

- Slight variations in both shape and dimensions from those shown may be accepted if approved by the Engineer.
- Not more than three lift holes may be drilled or cast in the end section for handling and lifting.
- Bars will be permitted in Precast Toe Walls.
- The Walls may be cast-in-place or Precast.
- Steel fibers may be used in lieu of rebar or cold drawn steel wire as per Section 1032.3.4.

**Installation Details:**

- Finish Earth Slope as Required
- Lintel of Pavement for Pipe Culvert Location
- Steel Tube Backfill
- Alternate Shape
- Bell or Spigot as Required
- Toe Wall Constructed at Outlet End Only
- Section A-A
- Flared End Section

**Layer of Grout Between End Section and Toe Wall**

**Notes:**

- Date Effective: 02/01/2016
- Sheet No: 1 DF 3

**Precast Concrete**
## End Sections for Arch Pipe

<table>
<thead>
<tr>
<th>Type</th>
<th>Diameter</th>
<th>Galvanized Sheet Thickness (In.)</th>
<th>Dimensions (In.)</th>
<th>Approximate Slope (1%Perft)</th>
<th>The Plate If Specified P. (In.)</th>
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### See Standard Plan T25.00

## End Sections for Round Pipe

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<th>Galvanized Sheet Thickness (In.)</th>
<th>Dimensions (In.)</th>
<th>Approximate Slope (1%Perft)</th>
<th>The Plate If Specified P. (In.)</th>
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### General Notes:
- Minor variations of detail and dimensions 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 3/4 diameter and galvanized, unless otherwise shown.
- The plate extensions, if specified, shall have holes to match holes in the plate.
- The section defined as the flared portion of the end section including side and bottom (center) panels and apron.

The skirt section for 12" through 24" pipes shall be made in one piece.

Skirts sections for 30" and larger pipes and 85 and larger pipe arches may be made from up to 2 sheets joined by riveting or bolting on centerline.

Skirt sections for 48" and larger pipes and 85 or larger pipe arches may be made from up to 3 sheets joined by riveting or bolting equal distance from centerline.

Skirt sections for 72" and larger pipes may be made from up to 4 sheets joined by riveting and bolting. The bottom panel shall be 2 equal width sheets joined on centerline.

All 3 piece and 4 piece skirts for 65" or larger pipes and 180 and larger pipe arches shall have 0.109" thick sides and 0.138" thick bottom (center) panels. Width of bottom panels shall be greater than 20% of the pipe periphery connecting sections. Corner plates and top plates shall be galvanized and of the same or greater thickness as the skirt.

See sheet 3 of 3 for connection details.
### Connection Requirements

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**Tapered Sleeve Connection for Concrete and Thermoplastic Pipe**

A tapered sleeve shall be firmly wedged into pipe end before backfilling pipe pay length.

**Threaded Rod**

For 12" thru 24" round pipe only

**Permissible for all sizes**

**Type 1 Connection**

Pipe

- Threaded rod

Connector rod

**Type 2 Connection**

Pipe

- Threaded rod

Connector rod

**Type 3 Connection**

Pipe

- Connector strap

**Type 4 Connection**

Pipe

- Dimpled 10" wide. 0.062" thick adapter band.

- Riveted or bolted

**Type 5 Connection**

Pipe

- 12" wide corrugated adapter band

- Riveted or bolted

**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 ASTM A-250.

- 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.

- Any rod or strap used for making a connection shall be securely sealed into a valley of the pipe corrugation. The valley chosen to hold the rod or strap shall leave at least one full intact steel pipe corrugation before the end of the pipe. The female portion of a bell end shall not count as a full intact corrugation.
BEVELED PIPE ENCASEMENT DETAILS

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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.

BEVELED PIPE ENCASEMENT MAY BE USED WITH EITHER POLYETHYLENE OR CORRUGATED METAL 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.

THE "1½" 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 "1½" x 6" GALVANIZED BOLTS. THE "1½" x 6" GALVANIZED BOLTS SHALL BE "DOUBLE NUTTED" AS SHOWN AND PLACED IN THE VALLEY OF PIPE CORRUGATIONS.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

DATE EFFECTIVE: 07/01/2004
DATE PREPARED: 12/18/2008

732.05C SHEET NO. 1

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.

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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.

THE 1/2" x 6" BOLT AND NUTS SHALL BE GALVANIZED IN ACCORDANCE WITH AASHTO MS2 (ASTM A123) SPECIFICATIONS. LOW CARBON STEEL ANCHOR BOLTS SHALL MEET ASTM A307.

BEVELED PIPE SHALL BE DRILLED AT LOCATIONS SHOWN ON PLANS FOR PLACEMENT OF 1/2" x 6" GALVANIZED BOLTS. THE 1/2" x 6" GALVANIZED BOLTS SHALL BE "DOUBLE NUTTED" AS SHOWN AND PLACED IN THE VALLEY OF PIPE CORRUGATIONS.
BOLTS SHALL BE USED TO HOLD THE SURFACES TIGHTLY TOGETHER.

HOLES FOR HEX HEAD BOLTS 1" X STEEL ROD OR NO. 4 GALVANIZED REINFORCED BAR ~" MINIMUM ~" SLOTTED t"

DIAMETER GALVANIZED I" LONGITUDINAL BAR DETAIL

3" GALVANIZED PIPE WITH BOTH ENDS FLATTENED AND THE OUTSIDE 4" BENT TO MATCH END SECTION SIDES.

MINIMUM 4" DIAMETER GALVANIZED STEEL ROD OR NO. 4 GALVANIZED REINFORCED BAR

EDGE OF SIDEWALL SHEET SHALL BE ROLLED SNUGLY AGAINST STEEL ROD OR BAR.

LONGITUDINAL BAR DETAIL

LONGITUDINAL BAR, WHEN REQUIRED, SHALL BE WELDED TO SAFETY BARS TO FORM SINGLE GRADE STRUCTURE. LONGITUDINAL BAR IS NOT TO BE USED FOR PARALLEL DRAINAGE STRUCTURES.

NOTES:
(1) FOR CROSS ROAD DRAINAGE STRUCTURES ONLY.
(2) FOR PARALLEL DRAINAGE STRUCTURES ONLY.
(3) 4" TO 6" MINIMUM
(4) SAFETY BARS SHALL BE PROVIDED UNTIL THE LATERAL SPAN OF THE OPENING IS LESS THAN OR EQUAL TO 300.

SIDE ELEVATION CIRCULAR SECTION

LONGITUDINAL BAR (1)

3/4" DIA. HEX HEAD BOLTS (TYPICAL)

LONGITUDINAL BAR DETAIL

TOP VIEW CIRCULAR SECTION

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 TOP PLATE EXTENSION SHALL BE THE 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 80 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.

SLOTTED HOLES FOR SAFETY BAR ATTACHMENT SHALL BE PROVIDED FOR ALL END SECTIONS.

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 3/4" DIAMETER AND GALVANIZED. UNLESS OTHERWISE SHOWN.

SAFETY BARS AND LONGITUDINAL BARS SHALL BE FABRICATED FROM STEEL PIPE MEETING THE REQUIREMENTS OF ASTM A-53 SCHEDULE 80 SPECIFICATIONS. SAFETY BARS AND LONGITUDINAL BARS SHALL BE HOT DIPPED GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH SECTION 1020 OF STANDARD SPECIFICATIONS.

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INSTALLATION SHALL BE PERFORMED IN ACCORDANCE WITH SECTION 725 AND 732 OF THE STANDARD SPECIFICATIONS.

SLOTTED HOLES FOR SAFETY BAR ATTACHMENT SHALL BE PROVIDED FOR ALL END SECTIONS.
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.

Metal End Sections for Circular Pipes

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<th>Min. Gauge Ends (In.)</th>
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Missouri Highways and Transportation Commission
105 West Capitol
Jefferson City, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

Safety Slope End Section

Date Effective: 06/01/2013
Date Prepared: 4/12/2013
Sheets: 3 of 3
**BAR GRATE SYSTEM DATA**

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**OPTIONAL BAR GRATE SYSTEM FOR SAFETY SLOPE END SECTION**

**GENERAL NOTES:**
- 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

**732.10H SHEET NO. 3 OF 3**
GENERAL NOTES:

THE SHEET SHALL NOT BE USED FOR OTHER THAN THE SPECIFIED PURPOSE.
THE SHEET SHALL BE EMPLOYED FOR THE SPECIFIED PURPOSE.
THE SHEET SHALL BE EMPLOYED FOR THE SPECIFIED PURPOSE.
THE SHEET SHALL BE EMPLOYED FOR THE SPECIFIED PURPOSE.

EXTRA STRENGTH CONNECTION DETAILS

REGULAR STRENGTH CONNECTION DETAILS

PRECAST CONCRETE BOX CULVERT TIES

M-3010100
STATE OF MISSOURI
DEPARTMENT OF TRANSPORTATION
BRIDGE HANDBOOK AND TRANSPORTATION

105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-800-462-MODOT (6636) 1-800-276-6678

DATE EFFECTIVE: 2/2/2018
DATE REVISION: 733.00
SHEET NO. 1 OF 1
Typical Section

Rock Ditch Check

* Geotextile lining may be installed as required by the engineer.

NOTE:

Rock ditch check in the clear zone shall be removed or leveled (if allowable) after the vegetation has sufficiently matured to protect the ditch or swale.

Example

Ditch Check Spacing for Standard Heights (Feet)

<table>
<thead>
<tr>
<th>Ditch % Slope</th>
<th>9&quot; Eff. Height</th>
<th>18&quot; Eff. Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td>150</td>
<td>300</td>
</tr>
<tr>
<td>1.0</td>
<td>75</td>
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<td>2.0</td>
<td>37</td>
<td>75</td>
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<tr>
<td>2.5</td>
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<td>60</td>
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<td>3.5</td>
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<td>4.0</td>
<td>19</td>
<td>38</td>
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<tr>
<td>4.5</td>
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<td>33</td>
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<td>5.0</td>
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<td>30</td>
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<td>5.5</td>
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<td>25</td>
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<tr>
<td>6.5</td>
<td>11</td>
<td>23</td>
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<tr>
<td>7.0</td>
<td>10</td>
<td>21</td>
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<td>7.5</td>
<td>10</td>
<td>20</td>
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<tr>
<td>8.0</td>
<td>9</td>
<td>18</td>
</tr>
<tr>
<td>8.5</td>
<td>9</td>
<td>18</td>
</tr>
<tr>
<td>9.0</td>
<td>8</td>
<td>17</td>
</tr>
<tr>
<td>9.5</td>
<td>8</td>
<td>16</td>
</tr>
<tr>
<td>10.0</td>
<td>7</td>
<td>15</td>
</tr>
</tbody>
</table>

Minimum Ditch Check Spacing

Section B-B

Alternate Ditch Check

Typical Section

Trapezoidal Ditch

Notes:

Use minimum 12 in. diameter log/sock.

Use 2 ft. wooden stakes with a 2 in. by 2 in. nominal cross section.

Install log/sock to a height in ditch so flow will not wash around log/sock and scour ditch slopes or as directed by engineer.

Install a minimum of 2 upslope stakes and 4 downslope stakes at an angle to wedge log/sock to bottom of ditch.

Erosion control blanket shall be anchored according to the manufacturer's recommendations.

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.
**Sediment Trap**

**Note:** Sediment trap in the clear zone shall be removed or leveled (if allowable) after the vegetation has sufficiently matured to protect the ditch or swale.

**End View**

**Section A-A**

**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 1 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.

**Section B-B**

**Plan**

**Notes:**
- Prior to placement all debris, rock, large clods and wood vegetation shall be cleared.
- Log/sock placed on pavement shall be weighted down with gravel/sand ballast.

**Drop Inlet Check**

**See Sheet 1 of 6 for details of rock ditch check.**

**Optional to Reduce Sediment Build-up at Drain Inlet**

**Inlet Opening**

- 6" to 8" gap
- 2' x 4' board

**General Notes:**
- Other proprietary inlet protection may be substituted in accordance with Sec 806 or as directed by the engineer.

**For Sediment Control Spacing See Sheet 1 of 6.**

---

**Temporary Erosion Control Measures**

**Date Effective:** 04/01/2015
**Date Prepared:** 03/20/2015
**EFFECTIVE DEPTH**

\[ u_B \leq \text{MIN.} \ 2', \ \text{MAX.} \ 6' \text{ DEPENDENT UPON CONFIGURATION REQUIRED BY LOCATION AND ESTIMATED VOLUME.} \]

**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 RIPRAPP OR EQUIVALENT. THE MATERIALS FOR ROCK RIPRAPP 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 RIPRAPP – CUBIC YARDS.

**DATE EFFECTIVE:** 04/01/2015

**DATE PREPARED:** 02/20/2015
TEMPORARY SLOPE DRAIN INLET TREATMENT

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.

SECTION B-B
TYPE B BERM
**PERIMETER SILT FENCE**

**FOR TRANSVERSE FLOW**

- Use silt fence for fill heights greater than 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).

**GENERAL NOTES:**

- Mid-Slope runs of silt fence should be considered for fill heights greater than or equal to 10 feet.
- Use silt fence for all fills greater than 10 feet high.
- 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).

**TEMPORARY EROSION CONTROL MEASURES**

**SILT FENCE**

**DATE EFFECTIVE:** 04/01/2015

**DATE PREPARED:** 02/01/2015

**SHEET NO.:** 5 OF 6
SECTION A-A
TYPE C BERM

11. Type C berm shall be placed above the design high water level or 2 ft. of elevation as directed by the engineer.

Rocks line, rock blanket or an approved alternate if sediment basin not an option.

WE TYPE B TEMPORARY BERM WITH TEMPORARY SLOPE CTRL FOR DRAINAGE CONDITIONS.

+10% OR WHERE THE SLOPE SLOPE IS LESS THAN 10% ANGLE IS GREATER.

PLAN VIEW

SECTION B-B

GENERAL NOTES:

Type C berm shall be built to handle significant run-off events and shall be installed prior to soil disturbance or fill in the drainage area of the berm.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-800-392-MODOT (663-6683)

TEMPORARY EROSION CONTROL MEASURES
BRIDGES AND BOX CULVERTS AT STREAM CROSSINGS

DATE EFFECTIVE: 06/21/2020
DATE REVISED: 06/15/2018

806.10J SHEET NO.
6 OF 6
ROOT BALLSTEEL BANDS

SIX LAYERS OF BURLAP TO BE INSTALLED BEFORE BRACE BLOCKS

BRACE BLOCK MAY BE NAILED TO TREE

TWIST WIRE TO TIGHTEN

METHOD OF SUPPORTING DECIDUOUS TREES
3" CALIBER OR LARGER

METHOD OF SUPPORTING EVERGREEN TREES
3' OR MORE IN HEIGHT

HOLE WIRE BEFORE TWISTING

SECTION A-A

SECTION B-B

BRACE BLOCK MAY BE NAILED TO TREE

HOSE

NOTE:

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.
MEASUREMENT OF SMALL TREES

- 24" branches on any stem may be counted
- Measure caliber

MULTI-STEM TREES
- Acceptable if one stem is the caliber specified

WRAP ALL STEMS

MEASUREMENT OF LARGE TREES

- Measure caliber for trees 4" or less.
- Measure caliber for trees more than 4".

TREE WRAP

BASE WIDTH MEASURED NOT MORE THAN 10" ABOVE THE GROUND LINE

MEASUREMENT OF EVERGREEN TREES

MEASUREMENT OF DECIDUOUS SHRUBS

- Measure tip to tip

MEASUREMENT AND PRUNING CUTS

HEADING CUT

THINNING CUT

PRUNING CUTS
EVERGREEN AND DECIDUOUS TREES

MINIMUM DISTANCE FOR PLANTING
ON TYPICAL CROSS SECTION

LOCATION OF SHRUBS
IN A TYPICAL PLANT BED

VINES AND SEEDLINGS

DECIDUOUS SHRUB SLOPE PLANTING

EVERGREEN SHRUB SLOPE PLANTING

SPREAD MEASURED NO MORE THAN 10" ABOVE THE GROUND LINE.
NO HOLE WILL BE FITTED PROVING THAT THEY DO NOT INTERACT WITH OR COMPROMISE THE STRUCTURAL INTEGRITY OR THE FRAME BETWEEN THE PLATE AND SHAFT OF THE BOLT HOLE.

NOTES:

1. IF NEEDED AS NECESSARY TO CLEAR BOLT HEAD.

2. FOUNDATIONS SHALL BE INSTALLED SO THAT CONNECTOR PLATE ARE LEVEL APPROPRIATELY TO THE BRACKET AND ADJUSTED FOR FUSE LIFTS PARALLEL TO THE BRACKET ARM.


GENERAL NOTES:

ALL CLASSIFICATIONS ARE BOTH HOLES OTHERWISE NOTED. SEE SPECIFICATION FOR CLASSIFICATIONS NOT SHOWN.

ALL CONNECTOR PLATE ARE ADJUSTABLE PLATE THICKNESSES SHOWN ARE 30 INCH DEVIATIONS.

ALL BOLT ANCHOR BOLTS SHALL BE FULLY GALVANIZED 1-3/4 INCH STRENGTH ANCHOR BOLTS.

ALL STEEL COMPONENTS SHALL BE NOT ENEL GALVANIZED.

HIGHWAY LIGHTING
POLES, FOUNDATIONS AND APPURTENANCES FOR 30' MOUNTING HEIGHT

DATE EFFECTIVE: 3/23/2017
DATE PREPARED: 2/23/2016
901.00AB
SHEET NO. 4 OF 4
### TYPE AT POLE

<table>
<thead>
<tr>
<th>Bracket Size</th>
<th>6' OR 15'</th>
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</thead>
<tbody>
<tr>
<td>Max. Luminaire Weight</td>
<td>60 lb</td>
</tr>
<tr>
<td>Max. Projected Spec</td>
<td>3.3 SQ. FT.</td>
</tr>
</tbody>
</table>

**Other:**
- X: 10° MIN.
- L: 10°
- E: 10°

**Note:** The minimum alternate diameter shall be 107 for a 15' pole, 13 for a 15' pole, 15 for a 60' pole, 8 for a 60' pole, 8 for a 60' pole, 8 for a 60' pole, 8 for a 60' pole, 8 for a 60' pole.

### LED LUMINAIRES

<table>
<thead>
<tr>
<th>Pole Rating</th>
<th>Designation</th>
<th>Max. Watt</th>
<th>Elevation Code</th>
<th>Equal Height-Line Base Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 A</td>
<td>LEE-3</td>
<td>112</td>
<td>111</td>
<td>E-140-22</td>
</tr>
<tr>
<td>3 A</td>
<td>LEE-3</td>
<td>112</td>
<td>111</td>
<td>E-140-33</td>
</tr>
<tr>
<td>7 A</td>
<td>LEE-7</td>
<td>275</td>
<td>111</td>
<td>E-140-22</td>
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<tr>
<td>7 A</td>
<td>LEE-7</td>
<td>275</td>
<td>111</td>
<td>E-140-33</td>
</tr>
</tbody>
</table>

**Luminaire Per Group Unless Otherwise Specified:**

### TYPE B POLE

<table>
<thead>
<tr>
<th>Bracket Size</th>
<th>6' OR 15'</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. Luminaire Weight</td>
<td>60 lb</td>
</tr>
<tr>
<td>Max. Projected Spec</td>
<td>3.3 SQ. FT.</td>
</tr>
</tbody>
</table>

**Single Bracket Arm:**
- Location: Bracket Spread
- E: 10° MIN.
- Anchor Bolt Dia.: 1-1/4"

**Double Bracket Arm:**
- Location: Bracket Spread
- E: 10° MIN.
- Anchor Bolt Dia.: 1-1/4"

### TYPE MB POLE

<table>
<thead>
<tr>
<th>Bracket Size</th>
<th>6' OR 15'</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. Luminaire Weight</td>
<td>60 lb</td>
</tr>
<tr>
<td>Max. Projected Spec</td>
<td>3.3 SQ. FT.</td>
</tr>
</tbody>
</table>

**Single Bracket Arm:**
- Location: Bracket Spread
- E: 10° MIN.
- Anchor Bolt Dia.: 1-1/4"

**Double Bracket Arm:**
- Location: Bracket Spread
- E: 10° MIN.
- Anchor Bolt Dia.: 1-1/4"

**General Notes:**
- The socket mounting height will be obtained by placing luminaires from the junction base between the pole top and the top of the bracket arm halfway.
- Holes shall be punched only for specified bolt circle.
- Transformer bases shall be certified as meeting the requirements and installation requirements set in the current ANSI standards for minimum clearance for above ground installations. Luminaires are parked in such that they meet the minimum requirements of ANSI A13.3.
- Transformer shall be 6' x 6'. Maximum form shall be 15' and shall be reinforced so that the full strength of the pole is not required.
- Transformer bases for 45' mounting height shall be furnished with two drilled and tapped holes for the bracket arm.
- All junction boxes shall conform to section 2152 of the standard specifications.
- Type A poles shall be equipped with the grounding lug. Inside the transformer base, Type B and Type MB poles shall be equipped with a grounding lug inside the pole.
- Foot shall be grounded from ground lug in pole with 6 AWG copper wire to conduit system. Ground lug shall be on or very near the pole.
- The cable entrance at the bracket arm shall be a field drilled 1" hole.

---

**HIGHWAY LIGHTING POLES, FOUNDATIONS AND APPURTENANCES FOR 45' MOUNTING HEIGHT**

**Date Effective:** 04/01/2018
**Date Prepared:** 02/18/2018
**Sheet No.:** 3 OF 6
NOTE:
ANCHOR BOLTS SHALL BE PLACED ONLY FOR 17" WOOL CIRCLE

PLAN
ANCHOR BOLTS

ANCHOR BOLTS BOLT CIRCLE

CONCRETE CIRCULAR (S" MACHINED)

CONCRETE FOUNDATION EMBEDMENT

ELEVATION
DETAILS OF CONCRETE FOUNDATION

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 17".

4. ALL CONCRETE PLATE AND SCREW PLATE THICKNESSES SHOWN ARE UNFINISHED EXISTENCES.

4. ALL ANCHOR BOLTS SHALL BE FULLY EMBEDDED 17" DIAMETER HIGH STRENGTH ANCHOR BOLTS.

4. ALL STEEL COMPONENTS SHALL BE HOT DIP GALVANIZED.

COIL ENDS OF CABLE-CONDUIT DITCH LINE AND COVER WITH PLANKS.

IF WIRING IS INSTALLED PRIOR TO POLE INSTALLATION.

CURB SAME LOCATION BARRIER OR CABLE-CONDUIT OR RIGID CONDUIT TRAVELED WAY EDGE OF SHOULDER (ALL SHOULDER TYPES)

TRENCH LOCATION - INSIDE SHOULDER TRENCH LOCATION - OUTSIDE SHOULDER

MIN. 6" CABLE-CONDUIT OR RIGID CONDUIT TRAVELED WAY EDGE OF SHOULDER

MIN. 4' 6" TRENCH STAB. OR EARTH SHOULDER - SAME LOCATION

PLAN INSIDE SHOULDER (ALL SHOULDER TYPES)

MIN. 4' 6" EDGE OF TRAVELED WAY

MIN. 6" MIN.

OUTSIDE EDGE OF SHOULDER

RIGID CONDUIT UNDER PAVEMENT AND SHOULDER, TERMINATE RIGID CONDUIT IN PULL BOX.

CONCRETE PULL BOX

RIGID CONDUIT (AS SPECIFIED)

Pole Foundation

2" DRAIN PIPE

RIGID CONDUIT (AS SPECIFIED)

Pole Foundation

2" DRAIN PIPE

RIGID CONDUIT

Pole Foundation

RIGID CONDUIT UNDER PAVEMENT

PLAN OUTSIDE SHOULDER (ALL SHOULDER TYPES)

MIN. 4' 6" EDGE OF TRAVELED WAY

MIN. 6" MIN.

OUTSIDE EDGE OF SHOULDER

RIGID CONDUIT UNDER PAVEMENT AND SHOULDER, TERMINATE RIGID CONDUIT IN PULL BOX.

CONCRETE PULL BOX

RIGID CONDUIT (AS SPECIFIED)

Pole Foundation

2" DRAIN PIPE

RIGID CONDUIT (AS SPECIFIED)

Pole Foundation

2" DRAIN PIPE

RIGID CONDUIT

Pole Foundation

MIN. 6" CABLE-CONDUIT OR RIGID CONDUIT TRAVELED WAY EDGE OF SHOULDER

MIN. 4' 6" TRENCH STAB. OR EARTH SHOULDER - SAME LOCATION

PLAN BEHIND GUARD RAIL

MIN. 6" CABLE-CONDUIT OR RIGID CONDUIT TRAVELED WAY EDGE OF SHOULDER

MIN. 4' 6" TRENCH STAB. OR EARTH SHOULDER - SAME LOCATION

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 OR RIGID CONDUIT TO LIGHTS PULLBOX 2' MIN.

- ASHER INSERT
- LEXAN WINDOW AND CROWN 1/16 X 1/16 X 1/16 WITH 3 FLAT WASHERS CHAMFER SIDE VIEW
- CATCH WITH:
- DRIP SHIELD
- CONCRETE APRON
- PIA AND HINGE
- PHOTOELECTRIC SWITCH

- BOLTS ON 3" CENTERS
- FOUR STAINLESS 8-20 BOLTS 2" LONG WITH 3 FLAT WASHERS AND 2 NUTS EACH
- INSERT WASHERS BETWEEN FILTER AND INSIDE CABINET TO FORM AIR GAP
- CUT 2" DIA. HOLE IN CABINET

SIDE VIEW
- BASE FLUSH WITH CABINET ON BACK AND SIDES
- BOLTS 3/4" long AND CABINET '1/16 X '1/16 X 1/16
- PULLBOX 2' MIN.

FRONT VIEW
- POWER SUPPLY (REF.)
- CATCH WITH COMPRESSION SPRINGS
- PADLOCK HASP
- TOP VIEW
- DRIP SHIELD
- STAINLESS STEEL PLAIN HINGE
- STAINLESS STEEL PLAIN HINGE
- 3/4" CONCRETE APRON
- 16" MIN.
- 5' MIN.
- 5' MIN.
- 6' MIN.
- 2' MIN.
- R=24" MIN.
- 4" x 4" x 4" CONCRETE APRON
- 4" x 4" x 4"

DETAIL A
- WINDOW DETAIL
- DETAIL A
- DETAIL A
- DETAIL A
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- DETAIL A
- DETAIL A

LIST OF MATERIALS

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION</th>
<th>NOTES</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>PZ CORIN LOCK</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>RIGID CONDUIT</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>CLASS B CONCRETE, O.D., C.C.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>NEMA 4, DUST-PROOF, WATER-PROOF, CABINET</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>GROUND ROD, 2&quot; DIA. X 8' MIN.</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>PHOTOELECTRIC SWITCH AND SOCKET, 105/285 V - 1000-WATTS</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>TRANSLUCENT, PLEXIGLASS FILTER, #903, 1/8&quot; THICK</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>CLEAR LEXAN #903 WINDOW, 1/8&quot; THICK MIN.</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>MOUNTING PAN, 3 1/2&quot; x 12&quot; x 1/2&quot; ALUMINUM OR STAINLESS STEEL</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>PLIABLE DUCT SEALANT</td>
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<tr>
<td>11</td>
<td>LIFETIME SILICONE CAULK</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>ANCHOR BOLTS, 5/8-11 x 14&quot; LONG BOLTS</td>
<td></td>
</tr>
<tr>
<td></td>
<td>HOT DIP</td>
<td></td>
</tr>
<tr>
<td></td>
<td>GALVANIZED, 4 REQUIRED USE BOLT HEAD OR TACK WELD</td>
<td></td>
</tr>
<tr>
<td></td>
<td>NUT ON EMBEDDED END</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>WEATHERPROOF ADHESIVE LABEL, VINYL RAISED LETTERING</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(OR EQUIVALENT, SEE DETAIL)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-- SEE PLANS</td>
<td></td>
</tr>
</tbody>
</table>

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 7,000 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.

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

HIGHWAY LIGHTING
BASE MOUNTED CONTROL STATION
240 V OR 480 V - 4 CIRCUIT

DATE EFFECTIVE: 06/01/2009
DATE PREPARED: 03/14/2010
SHEET NO. 1 OF 2

1001-30F
MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

HIGHWAY LIGHTING
BASE MOUNTED
CONTROL STATION
240 V OR 480 V - 4 CIRCUIT

DATE EFFECTIVE: 04/01/2005
DATE PREPARED: 08/28/2005

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, WATERPROOF CABINET</td>
</tr>
<tr>
<td>5</td>
<td>GROUND ROD, 1/2&quot; DIA. X 8' MIN.</td>
</tr>
<tr>
<td>6</td>
<td>PHOTOELECTRIC SWITCH AND SOCKET, 105/255 V., 1000 WATT</td>
</tr>
<tr>
<td>7</td>
<td>TRANSLUCENT, PLEXIGLASS FILTER, #2067, 1/8&quot; THICK</td>
</tr>
<tr>
<td>8</td>
<td>CLEAR, LEXAN #1034 WINDOW, 1/16&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>15 AMP MIN., TYPE B CONTROL BREAKER</td>
</tr>
<tr>
<td>13</td>
<td>2-POLE, 200 AMP, TYPE B MAIN BREAKER</td>
</tr>
<tr>
<td>14</td>
<td>1-Pole, 15 AMP, TYPE B CONTROL BREAKER</td>
</tr>
<tr>
<td>15</td>
<td>1-Pole, 15 AMP, TYPE B CONTROL BREAKER</td>
</tr>
<tr>
<td>16</td>
<td>2-POLE, 600 VOLT LIGHTING ARRESTER</td>
</tr>
<tr>
<td>17</td>
<td>1-Pole, 15 AMP, TYPE B CONTROL BREAKER</td>
</tr>
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<td>18</td>
<td>1-Pole, 15 AMP, TYPE B CONTROL BREAKER</td>
</tr>
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<td>19</td>
<td>1-Pole, 15 AMP, TYPE B CONTROL BREAKER</td>
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<td>20</td>
<td>2-POLE, 100 AMP, TYPE A MAIN BREAKER</td>
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<tr>
<td>21</td>
<td>2-POLE, 15 AMP MIN., TYPE A MAIN BREAKER</td>
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<tr>
<td>22</td>
<td>#12 AWG MIN., 600 V. CONTROL CABLE</td>
</tr>
<tr>
<td>23</td>
<td>#12 AWG MIN., 600 V., POWER CABLE</td>
</tr>
<tr>
<td>24</td>
<td>#12 AWG MIN., 600 V. GROUND CABLE</td>
</tr>
</tbody>
</table>

* SEE PLANS

NOTES

B. LIGHTING SYSTEM VOLTAGE AS SPECIFIED ON PLANS.

C. PHOTOELECTRIC SWITCH BRACKETS MAY VARY. LOCATE CENTER OF WINDOW OVER CENTER OF PHOTOELECTRIC SWITCH.

D. 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.

E. LIGHTING BREAKER SIZING:

<table>
<thead>
<tr>
<th>SIZE (AMPS)</th>
<th>CIRCUIT LOAD (WATTS)</th>
<th>CIRCUIT LOAD (WATTS)</th>
</tr>
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<tbody>
<tr>
<td>15</td>
<td>0-2500</td>
<td>0 - 5500</td>
</tr>
<tr>
<td>20</td>
<td>2650-3700</td>
<td>5550 - 7400</td>
</tr>
<tr>
<td>25</td>
<td>3750-4600</td>
<td>7450 - 9200</td>
</tr>
<tr>
<td>30</td>
<td>4600-5500</td>
<td>9250 - 11,000</td>
</tr>
<tr>
<td>35</td>
<td>5500-6500</td>
<td>11,000 - 13,000</td>
</tr>
<tr>
<td>40</td>
<td>6500-7400</td>
<td>13,000 - 15,000</td>
</tr>
</tbody>
</table>

F. CIRCUIT LOAD INCLUDES LOAD FOR LINE LOSS, LAMP, AND BALLAST LOAD.

G. ALL CIRCUIT BREAKERS SHALL CONFORM TO SECTION 901.4 OF THE STANDARD SPECIFICATIONS.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-656-MODOT (1-888-275-6636)

HIGHWAY LIGHTING
BASE MOUNTED
CONTROL STATION
240 V OR 480 V - 4 CIRCUIT

DATE EFFECTIVE: 04/01/2005
DATE PREPARED: 08/28/2005
SHEET NO. 2 OF 2
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 4 MOD., 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>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>METER SOCKET, 200 AMP., FOR LIGHTING</td>
</tr>
<tr>
<td>9</td>
<td>LOCKING, RAINTIGHT, 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>1/2&quot; METAL CONDUIT</td>
</tr>
<tr>
<td>12</td>
<td>DB MIN. GROUND WIRE</td>
</tr>
<tr>
<td>13</td>
<td>1/2&quot; METAL CONDUIT</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' MIN.</td>
</tr>
<tr>
<td>16</td>
<td>#2 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 (OR EQUIVALENT, SEE DETAIL)</td>
</tr>
<tr>
<td>20</td>
<td>WEATHERPROOF ADHESIVE LABEL (SIGNS), VINYL RAISED LETTERING (OR EQUIVALENT, SEE DETAIL)</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

NOTES:

A. SERVICE POLE SHALL BE GUTTED WHEN SPAN OF OVERHEAD SERVICE WIRE EXCEEDS 50 FEET.
B. INCREASE 1 FOOT FOR EACH 5 FEET ABOVE 30 FEET.
C. 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.
D. SCHEMATIC DIAGRAM SHALL BE MOUNTED ON INSIDE OF CABINET DOOR.
E. UTILITY COMPANY SHALL PROVIDE THE ENTIRE LIGHTING SYSTEM, INCLUDING ALL MATERIALS SHOWN ON DRAWING. SERVICE ENTRANCE HEAD?
F. LIGHTING SYSTEM VOLTAGE OF 240 VOLTS OR 480 VOLTS AS SHOWN ON THE PLANS.
G. BREAKERS SHALL CONFORM TO SEC. 901.4 OF THE STANDARD SPECIFICATIONS.
H. IF SUBSURFACE CONDITIONS EXIST WHICH PROHIBIT THE PLACEMENT OF THE GROUND ROD IN A VERTICAL POSITION, THE ROD MAY BE DRIVE 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 MADE USING CONNECTION MATERIAL SHOWN ON DRAWING.

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

HIGHEY LIGHTING POWER SUPPLY ASSEMBLY SECONDARY SERVICE

DATE EFFECTIVE: 04/01/2002
DATE PREPARED: 05/11/2002

901.800 SHEET NO. 1 OF 2
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

RAW LINE

VARIABLE

TOP VIEW

IF FENCE BLOCKS ACCESS TO POWER SUPPLY A 3' MIN. LOOKING GATE IS TO BE INSTALLED. (NO DIRECT PAY)

UTILITY COMPANY POLE,
POLE-13' MIN.
PED. POLE
PAD MOUNT TRANSFORMER

COIL CABLE FOR UTILITY COMPANY HOOKUP 1MIN. 55' FOR PULL- 6' FOR PED.

POWER INPUT SHALL BE (MIN.) 2" RIGID STEEL CONDUIT WITH THREE 1C #2 AWG CABLES.

SEPARATE FEEDS FOR LIGHTING AND SIGNALS

NOTE:
CABLE AND CONDUIT FROM POWER SUPPLY ASSEMBLY TO UTILITY COMPANY FACILITIES SHALL BE INCLUDED IN PRICE BID FOR POWER SUPPLY ASSEMBLY.

TO LIGHTING CABINET

TO SIGNAL CABINET

CONCRETE FOOTING

SECTION A-A

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.

TYPE 2 (PEDESTAL)
UNDERGROUND SERVICE

TYPE 1 (POLE)
OVERHEAD SERVICE

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-455-MODOT (1-888-275-6636)

HIGHWAY LIGHTING
POWER SUPPLY ASSEMBLY
SECONDARY SERVICE

DATE EFFECTIVE: 04/01/2002
DATE PREPARED: 03/18/2010
901.80D SHEET NO. 2 OF 2
FOR CONTROLLER CABINETS WITH HEIGHTS FROM 4'-4" TO 6'-0"

CABINET (TYP.)
SCREENED LOUVERS WITH GUARD PLATES (TYP.)

3" MIN. (TYP.)

FOR TYPE 170 CONTROLLER CABINETS
TYPE 332

NOTES:
1. DIMENSION VARY ACCORDING TO CABINET HEIGHT.
2. GROUND ROD, 3/4" DIA. X 8" MIN. 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
   CONNECTION TO GROUND ROD SHALL BE CADDWELDED.
   ANCHOR BOLTS (USE BOLT HEAD OR TACK WELDED
   NUT ON EMBEDDED END AND SIZE AS SPECIFIED BY
   CABLE MANUFACTURER).

TRAFFIC SIGNALS
CONTROLLERS CONDUIT LOCATION

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

DATE EFFECTIVE: 06/01/2005
DATE PREPARED: 08/26/2009
902-100 1 OF 1
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.

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 DISCONNECT CABINET. IF TERMINATED IN THE DISCONNECT CABINET, IT SHALL BE INSTALLED ON THE CONNECT 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.

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.

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.

NOTE:
CABLE AND CONDUIT FROM POWER SUPPLY ASSEMBLY TO UTILITY COMPANY FACILITIES SHALL BE INCLUDED IN PRICE BID FOR POWER SUPPLY ASSEMBLY.

TYPE 2 (PEDESTAL) UNDERGROUND 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.

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.

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.

TRAFFIC SIGNALS
POWER SUPPLY ASSEMBLY
240/120 VOLT SERVICE

DATE EFFECTIVE: 07/01/2004
DATE PREPARED: 08/28/2009
902.15K
2 OF 3

LIST OF MATERIALS

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<tr>
<th>ITEM</th>
<th>DESCRIPTION</th>
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</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 VOLTS</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 VOLTS</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, RAINTIGHT, NEMA 4</td>
</tr>
<tr>
<td>10</td>
<td>INSULATED, GROUNDABLE NEUTRAL, 200 AMP MINIMUM</td>
</tr>
<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>
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<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 VOLTS</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>WATERPROOF ADHESIVE 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>#6 x 9 OR #6 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 VOLTS</td>
</tr>
</tbody>
</table>

NOTES:
1. SERVICE POLE SHALL BE GUYED 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. 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.
4. SCHEMATIC DIAGRAM SHALL BE MOUNTED ON INSIDE OF DOOR.
5. 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. 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 CADD WELDED.

DATE EFFECTIVE: 07/01/2004
DATE PREPARED: 08/28/2009
902.15K
2 OF 3
To form air gap between filter hole in cabinet and inside cabinet was inserted seal between & around Lexan window bolts 16 and cabinet.

Section A-A Window Detail

Top View

Lighting Control 120 Volts

Label Detail

Equipment Layout

Wiring Diagram

List of Materials

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>Cabinet, Watertight, NEMA 4, 14 GA minimum thickness</td>
</tr>
<tr>
<td>2</td>
<td>Panel, 12 or minimum thickness, Aluminum or Stainless steel</td>
</tr>
<tr>
<td>3</td>
<td>Continuous Stainless Steel hinge</td>
</tr>
<tr>
<td>4</td>
<td>Neoprene gasket door</td>
</tr>
<tr>
<td>5</td>
<td>3/8&quot; - 16 collar stud</td>
</tr>
<tr>
<td>6</td>
<td>Photoelectric switch and socket, 120/285 V., 1000 watt</td>
</tr>
<tr>
<td>7</td>
<td>15 Amp control breaker, single pole, Type B</td>
</tr>
<tr>
<td>8</td>
<td>15 Amp auto-manual switch, single pole breaker, type B, with label</td>
</tr>
<tr>
<td>9</td>
<td>Main breaker, single pole, Type B</td>
</tr>
<tr>
<td>10</td>
<td>Neutral terminal strip</td>
</tr>
<tr>
<td>11</td>
<td>Lighting terminal block, insulated from back panel. 12 position</td>
</tr>
<tr>
<td>12</td>
<td>Power, cable, #6 AWG, 600 V.</td>
</tr>
<tr>
<td>13</td>
<td>Filter, translucent, Lexan #9034, 1/8&quot; thick</td>
</tr>
<tr>
<td>14</td>
<td>Clear Lexan #9034 window, 1/4&quot; thick min. except for 15A breaker, min. wire size 10 AWG</td>
</tr>
<tr>
<td>15</td>
<td>Cable, lighting</td>
</tr>
<tr>
<td>16</td>
<td>Lifetime Silicone caulk</td>
</tr>
<tr>
<td>17</td>
<td>Pliable duct sealant</td>
</tr>
<tr>
<td>18</td>
<td>Label, weatherproof adhesive-vinyl raised lettering (or equiv.)</td>
</tr>
<tr>
<td>19</td>
<td>Conduit, rigid, 2&quot; min.</td>
</tr>
<tr>
<td>20</td>
<td>Conduit, rigid, 1&quot; min.</td>
</tr>
<tr>
<td>21</td>
<td>Lighting contactor, 2 pole, 30 Amp, 600 Volt, 120 Volt coil</td>
</tr>
<tr>
<td>22</td>
<td>#2 Corbin lock</td>
</tr>
<tr>
<td>23</td>
<td>threaded conduit hub with sealing washers</td>
</tr>
</tbody>
</table>

Notes:

- A. Schematic diagram shall be mounted on inside of cabinet door.
- B. Photoelectric switch brackets may vary, locate center of window over center of photoelectric switch.
- C. Main breaker size: total luminaire breaker size min. AWG load (Watts) (amps)
  - 0-920 15 10
  - 930-1260 20 8
  - 1270-1600 25 8
  - 1610-1930 30 8

General Notes:

- All openings in cabinet shall be covered and sealed with lifetime silicone caulk.

All circuit breakers shall conform to section 901.4 of the standard specifications.

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.
GENERAL NOTES:

1. All metal conduits shall be electrically bonded by a ground bushing and #6 and bare copper wire. For PVC conduit, all wire 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:

<table>
<thead>
<tr>
<th>Number of Conduits</th>
<th>Class</th>
<th>Prefomed Pull Box Minimum Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>A</td>
<td>3&quot; x 3&quot; x 3&quot; 30&quot; x 30&quot; 4&quot; x 4&quot;</td>
</tr>
<tr>
<td>6</td>
<td>B</td>
<td>3&quot; x 3&quot; x 3&quot; 30&quot; x 30&quot; 4&quot; x 4&quot;</td>
</tr>
<tr>
<td>8</td>
<td>C</td>
<td>3&quot; x 3&quot; x 3&quot; 30&quot; x 30&quot; 4&quot; x 4&quot;</td>
</tr>
</tbody>
</table>

**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 1 conforming to Sec 1007.
Box shall be of a flare design and have a lip for stabilization.

Type II Drain Type
(See Drain Outlet Details)
(Section above Break Applicable to Type I Drain.)
FROM METER TO SIGNAL CABINET

TYPE 902.10-U
USE ON EXISTING ONLY

TELEPHONE OR UTILITY COMPANY POLE

TYPE TPA
USE ON NEW OR EXISTING

BY TELEPHONE COMPANY

TO SIGNAL CABINET

TO SIGNAL CABINET

1c #12 AWG
1-2c #12 AWG
CONDUIT SIZE AS SHOWN ON PLANS

FLEXIBLE STEEL CONDUIT TO BE GROUNDED TO THE GROUND ROD AND POWER COMPANY GROUNDED.

NOTE: MINIMUM FLEXIBLE CONDUIT CONTAINING 1-2c #12 AWG AND 1c #12 AWG.

ALL ITEMS CONTRACTOR FURNISHED AND INSTALLED.
POST BASES

<table>
<thead>
<tr>
<th>POST BASES</th>
<th>BASE LENGTH</th>
<th>BASE TYPE</th>
<th>STEEL BAR</th>
<th>COVER</th>
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<tbody>
<tr>
<td>TYPE A</td>
<td>9&quot;-90&quot;</td>
<td>10&quot;-40&quot;</td>
<td>320</td>
<td>2.88</td>
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<td>320</td>
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1. SURFACE OF BASE TO BE CONSTRUCTED SQUARE FOR A DEPTH OF 12".

STEEL AND CONCRETE REQUIREMENTS FOR POST BASES

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<td>8&quot;-50&quot;</td>
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1. SURFACE OF BASE TO BE CONSTRUCTED SQUARE FOR A DEPTH OF 12".

BASE EMBEDMENT IN SOLID ROCK

<table>
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<th>TYPE</th>
<th>SOLID ROCK</th>
<th>REQUIRED EMBEDMENT FOR BASE TYPE</th>
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<tr>
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<td>F-11</td>
<td>11&quot;-90&quot;</td>
<td>12&quot;-12&quot;</td>
</tr>
<tr>
<td>F-12</td>
<td>12&quot;-60&quot;</td>
<td>13&quot;-13&quot;</td>
</tr>
</tbody>
</table>

1. REQUIRED EMBEDMENT DEPTH CAN BE INTERPOLATED BETWEEN ENCOUNTER POINTS FOR OTHER SOLID ROCK ENCOUNTER DEPTHS.
2. NORMAL LENGTH FOR ANCHOR BOLTS AND REINFORCING STEEL WILL BE REQUIRED.
3. CORE DRILL HOLES FOR ANCHOR BOLTS AND REINFORCING STEEL IN SOLID ROCK SHALL BE PROVIDED. CORE DRILL HOLES SHALL BE TWICE THE DIAMETER OF THE ANCHOR BOLT AND REINFORCING STEEL DIAMETER AND TO WITHIN 3 INCHES OF THE NARROW BASE DIAMETER. IF SOIL, SMALLEO OR LOOSE MATERIALS ARE ENCOUNTERED DURING CORE DRILLING, THE ROCK SHAPE ALSO SHALL BE REMOVED TO THE POINT OF ENCOUNTER.
4. ANCHOR BOLTS ARE REINFORCING STEEL SHALL BE GROUNDED IN THE CORE DRILL HOLES WITH NON-METAL GROUND HAVING A MINSUMTURE LENGTH OF 1,000 FEET IN 24 HOURS.
5. STEEL AND CONCRETE REQUIREMENTS FOR POST BASES

MISOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 EAST CAPITAL
JEFFERSON CITY, MO 65101
1-800-424-WATCH (1-800-424-9284)

TRAFFIC SIGNALS
POST BASES

GIVE EFFECTIVE: 02/28/2007
DATE FILED: 02/28/2007
902.30P SHEET NO. 1 OF 2
### Traffic Signal Post Bases

#### Detail A

<table>
<thead>
<tr>
<th>Bolt Length</th>
<th>Vertical Thread Length</th>
<th>Diameter</th>
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<tbody>
<tr>
<td>19</td>
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<tr>
<td>57</td>
<td>51</td>
<td>1.00</td>
</tr>
<tr>
<td>79</td>
<td>73</td>
<td>1.50</td>
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<td>94</td>
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<td>121</td>
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<tr>
<td>120</td>
<td>114</td>
<td>2.25</td>
</tr>
<tr>
<td>146</td>
<td>140</td>
<td>2.50</td>
</tr>
</tbody>
</table>

**NOTE:**
- All anchor bolts shall be fully galvanized.

**Diagram Details:**
- Octagonal
- Square
- Cast Base
- Bolt Circle
- Threaded or Leaded (Typ. Octagonal Base)
- Stainless Steel Bolt & Nut
- Anchor Bolt
- Ground Lug
- Weather-Proof Door
- 2 Weep Holes

**Optional Steel Plate for Anchor Bolts**
- Side View
- End View

**Options:**
- Two Bolts per Plate
  - Hex Nut or 3/8" Fillet Weld All Around Both Sides
- Four Bolts per Plate
  - Hex Nut or 3/8" Fillet Weld All Around Both Sides
GENERAL NOTES:

Sensor unit shall be housed in controller cabinet unless specified otherwise.

Loops to be installed, when existing fortland cement concrete or asphaltic concrete pavement is being repaved. Loops shall not be placed in surface course of asphaltic concrete.

The conduit slot may be either by manually or hydraulically excavated. Any forming used to secure conduit in slot shall be removed.

A separate conduit shall be installed between the paved loop slot and the first slot box for each loop. The conduit opening at the end of the lead-in loop shall be at the bottom of the same slot.

After cable installation, the conduit opening at the loop lead entrance shall be sealed.

200' E joints or other full depth joints. Minor adjustments to loop location may be made.

Use typical dimensions unless otherwise shown on plans.
LOOP SHALL BE #4 200 STRANDED WIRE IN PROPER SIZE WIRE ... IN SLEEVE SLOTS IN FIGURE EIGHT MANNER.

3 WIRES

TO FILL BOX

TO FILL BOX

LOOP CONFIGURATION

ABANDONED LOOPS

IF EXISTING LOOPS ARE TO BE ABANDONED AND NEW LOOP INSTALLED, ABANDONED LOOP WIRES SHALL BE REMOVED OR CUT COMPLETELY THROUGH.
STEEL POST DETAILS

1. 6" of located within 6" of concrete median.
2. Double galvanized 1/4" tin messenger wire - 7 strand high strength grade.
3. 1/4" automatic tray type cable fitting with short bail: 15,000 lbs. minimum holding strength.
4. 2" x 8" min. copper ground rod; one pole shall be grounded by connecting No. 6 and bare copper wire from messenger line. Ground rod shall be driven into ground at least 1/2 of ground level, 1/2 of ground level, and driven 1/2 of ground level to ground. If surface conditions exist within 30" of the ground rod, the pipe shall be driven at an oblique angle not to exceed 45° from vertical. The pipe shall be driven to a depth of 42" at least 30" in-ground. Connection to ground rod shall be concealed.
5. Fully galvanized steel clevis (to fasten to the pole with 1/2 galvanized carriage bolts).
6. Rake as necessary: 1/14 maximum.
7. Non-corroding rigid metal cable hangers at 12" centers.
8. Multi-conductor cable (as required).
9. 1/4" automatic tray type cable fitting with short bail: 5,000 lbs. minimum holding strength.
10. 4" x 6" metal pipe and cover with reinforced frame sealed to pole.
11. One-piece or two-piece metal base cover or detachable nut covers.
12. Fully galvanized anchor bolt with bolt head of this type, or any equivalent.
13. Wire entrance with insulated weatherproof bushing (as required).
14. Double galvanized 3/4" steel - 7 strand high strength grade steel tenter wire and an all with self-releasing provision. Install horizontal or below horizontal.
15. Type A-10 base: See standard 802.33 for details.

GENERAL NOTES:
1. Design of structural supports shall comply with standard specifications for structural supports. See standard 802.33 for more details.
2. Section of the drawing shall be concealed by standard installations.
3. Traffic signals shall be used when required. See standard 802.40 for more details.

TRAFFIC SIGNALS
RIGID SPAN WIRE DETAILS

DATE EFFECTIVE: 04/03/2014
DATE REVISED: 07/08/2016
SHEET NO.: 2 OF 2
MODOT ARROWS

GENERAL NOTES:
ARROWS FOR REFERENCE ONLY.
ARROW DETAILS AVAILABLE FROM TRAFFIC AND HIGHWAY SAFETY DIVISION.

MUTCD ARROWS
### Structural Sign Data

<table>
<thead>
<tr>
<th>DESIGNATION</th>
<th>COLOR SCHEME</th>
<th>SHEETING</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LEGEND</strong></td>
<td><strong>BACKGROUND</strong></td>
<td><strong>LEGEND</strong></td>
</tr>
<tr>
<td>Structural (STF)</td>
<td>BLACK</td>
<td>7111 BLACK FILM</td>
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<td>7111 BLACK FILM</td>
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<tr>
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<tr>
<td>White</td>
<td>BLACK</td>
<td>7111 BLACK FILM</td>
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<tr>
<td>Structural Fluorescent (STF)</td>
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<tr>
<td>Black</td>
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<td>FLUORESCENT FILM</td>
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</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>
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<tr>
<td><strong>LEGEND</strong></td>
<td><strong>BACKGROUND</strong></td>
<td><strong>LEGEND</strong></td>
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<tr>
<td>Flat Sheet (SH)</td>
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<td>7111 TYPE 2 OR 11 WHITE</td>
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<td>Red</td>
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<td>FLUORESCENT</td>
<td>FLUORESCENT FILM</td>
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<td>FLUORESCENT FILM</td>
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*NOTES: LEGEND AND BACKGROUND COLORS ARE ACHIEVED THROUGH TRANSLUCENT FILM AND FILM.*

---

### Flat Sheet Thickness

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<thead>
<tr>
<th><strong>SIGN SIZE</strong></th>
<th><strong>THICKNESS</strong></th>
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<tbody>
<tr>
<td>1/16 in.</td>
<td>0.063 in.</td>
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<tr>
<td>1/8 in.</td>
<td>0.125 in.</td>
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<tr>
<td>1/4 in.</td>
<td>0.250 in.</td>
</tr>
<tr>
<td>1/2 in.</td>
<td>0.500 in.</td>
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</tbody>
</table>

---

**General Notes:**
- Ground mounted signs greater than 5 feet wide or signs greater than 50 square feet shall be structural.
- All new signs not found in the manual shall be detailed by the Traffic and Highway Safety Division Office.
- Refer to standard specifications for 706/2 for sheeting, substrate, and fabrication details.

For mounting details, see standard plans 903.07.
ONE POST ASSEMBLY
USE TO SUPPORT UP TO 6 ROUTE MARKERS

TWO POST ASSEMBLY
USE TO SUPPORT 5 OR 6 ROUTE MARKERS

STANDARD BACKING BAR LAYOUT

OPTIONAL BACKING BAR LAYOUT

GENERAL NOTES:
ALL BACKING BARS SHALL BE 2-1/2" x 4" STEEL, GALVANIZED.
ATTACHING NUTS AND BOLTS SHALL BE 3/8"-16 X 1".
BEGIN BOLTS ARE TO BE THE FULL HEIGHT OF THE SIGN.

DETAIL A - THE END OF THE HORIZONTAL BACKING BARS SHALL TERMINATE IN 8 IN. FROM THE EDGE OF THE SIGN.
THE BOLTS SHALL NOT EXCEED THE EDGE OF THE SIGN.

DETAIL B - FOR SIGNS INSTALLED IN PARALLEL, THE HORIZONTAL BAR ALIGNMENT SHOULDN'T BE ALIGNED WITH THE END OF THE SIGN TO AVOID ASSEMBLY DEFORMATIONS.

WHEN USING OPTIONAL BACKING BAR LAYOUT, VERTICAL BARS SHALL BE MOUNTED ALONG THE HORIZONTAL BARS.

BACKING BARS SHALL MEET MISSOURI SPECIFICATION OR APPROVED PRODUCTS LIST.
BACKING BARS FABRICATED FROM STRUCTURAL STEEL - PEER FOR PEER.
ALL SIGNS TO BE INSTALLED ALONG VERTICAL CENTERLINE.
CHECK YOUR SUMMER DATA FOR DETAILS OF SHIELD DEFORMATIONS. SEE OTHER DRAWINGS.

MINIMUM VERTICAL SPACING BETWEEN SIGNS TO BE ACHIEVED USING THE CLOSEST AVAILABLE HOLES WHEN USING THE POST.

MOORE COUNTY HIGHWAY AND TRANSPORTATION DISTRICT
105 WEST CENTER STREET, ST. LOUIS, MO 63020
1-800-543-1197

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITAL STREET, FENTON, MO 63501
1-800-543-MO DOT (322-8729)

HIGHWAY SIGNING
BACKING BARS
SHEET 1 OF 2 MOUNTING ROUTE SHIELD AND MARKER ASSEMBLIES

DATE EFFECTIVE: 06/01/2009
903.02AP SHEET 4 OF 8
12" EXTRUDED ALUMINUM PANEL
MINIMUM WT. = 2.40 LBS./FT.

NOTE: MINIMUM WEIGHT AND THICKNESS DIMENSIONS SHOWN.
HEATER PANELS CAN BE WELD.

PLAN VIEW
END VIEW

POST CLIP BOLT WITH FLAT WASHER AND LOCKNUT

NOTE:
COARSE BOLT HEAD SHANK.
RECTANGULAR BOLT HEAD WITH LEAD DIMENSION OF 0.651 MAY BE USED.

DETAIL C

6" EXTRUDED ALUMINUM PANEL
MINIMUM WT. = 2.40 LBS./FT.

NOTE: MINIMUM WEIGHT AND THICKNESS DIMENSIONS SHOWN.
HEATER PANELS CAN BE WELD.

ELEVATION VIEW

POST CLIP
POST CLIPS SHALL BE ASTM B 198, 356-T6 ALUMINUM ALLOY.
### Wide Flange Structural Steel Posts Design Data

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<th>LB/IN</th>
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### Splice Plate Data Table

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<tr>
<th>POST DESIGN NO.</th>
<th>J (lbs)</th>
<th>L (lbs)</th>
<th>U (lbs)</th>
<th>D (lbs)</th>
<th>F (lbs)</th>
<th>BOLT E12 (lbs)</th>
<th>ST. E12 (lbs)</th>
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<td>3 4</td>
</tr>
</tbody>
</table>

The weight of structural steel posts shown in the contract has been computed using the weights shown.

### 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

Date Effective: 10/24/2004
Date Modified: 7/11/2006

903.03BM 2 of 16
### ROUND PIPE POST FOR GROUND MOUNTED SIGNS

<table>
<thead>
<tr>
<th>POST DIA. (IN)</th>
<th>BOLT SIZE</th>
<th>VESSEL</th>
<th>BASE CONNECTION DATA TABLE (IN.)</th>
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<tbody>
<tr>
<td>Nom. Size</td>
<td>D</td>
<td>E</td>
<td>F</td>
</tr>
<tr>
<td>2</td>
<td>1/2</td>
<td>3/4</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>1/2</td>
<td>3/4</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>5/16</td>
<td>3/4</td>
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### ROUND PIPE POST AND FOOTING DATA TABLE

<table>
<thead>
<tr>
<th>NOM. SIZE</th>
<th>HEEL</th>
<th>STEM LENGTH</th>
<th>FOOTING CONCRETE</th>
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<tr>
<td>POST DIA.</td>
<td>2&quot;</td>
<td>3/4&quot;</td>
<td>1/2&quot;</td>
</tr>
<tr>
<td>Feet &amp; Inches</td>
<td>Feet &amp; Inches</td>
<td>Feet &amp; Inches</td>
<td>Feet &amp; Inches</td>
</tr>
<tr>
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<td>1/2</td>
<td>3/4</td>
<td>1</td>
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<tr>
<td>3</td>
<td>1/2</td>
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</tr>
<tr>
<td>4</td>
<td>5/16</td>
<td>3/4</td>
<td>1</td>
</tr>
</tbody>
</table>

### BOLT RETAINER

Sheet metal bolt retainer cut from 1/4" gauge galvanized sheet metal. Place between base plates. The retainer goes to fit plate. Bolt holes shall be sized larger than required bolt size.

### PLAN VIEW

Rolled stop to engage pipe O.D.

### MULTI-DIRECTION SLIP BASE

- Elevation (steel pipe post base connection)
- Footing detail
- Pipe 3" O.D. and under:
  - 2' maximum in post.
  - Pipe over 3" O.D.:
  - 3' maximum in post.

### Friction Cap

NOTE:

For general notes, see Sheet 1 of 16.
For mounting weight and offset details, see standard plans Sheet 15 of 16.

---

Missouri Highways and Transportation Commission

Post Installation Details

Pipe Post

Pipe Effective Date: 08/01/2021

Sheet No. 5 of 16
4" x 4" wood post - no slots or holes required. 
4" x 6" wood post - 1 1/2" dia. hole on 6" side or 1 1/4" dia. hole on 6" side. 
6" x 6" wood post - 2" x 4" slot or 2" dia. hole. 
Slot across neutral axis formed by successive drilling with 1/2" bit.

In lieu of a through bolt, a 5/8" lag screw equal in length to three quarters of the max. post thickness may be used.

**NUMBER OF BOLTS TO ATTACH STEEL CHANNEL TO WOOD POST**

<table>
<thead>
<tr>
<th>SIGN HEIGHT</th>
<th>NO. OF BOLTS PER WOOD POST SIDE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1&quot;</td>
<td>2</td>
</tr>
<tr>
<td>2&quot;</td>
<td>3</td>
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<tr>
<td>6&quot;</td>
<td>7</td>
</tr>
<tr>
<td>7&quot;</td>
<td>8</td>
</tr>
</tbody>
</table>

**PLAN VIEW**

MOUNTING DETAILS FOR EXTRUDED PANELS ON WOOD POST

**NOTES:**

FOR GENERAL NOTES, SEE SHEET 1 OF 16.

ALL POSTS SHALL BE EMBEDDED A MINIMUM OF 3 FEET INTO THE GROUND.

U-CHANNEL POST-STUB OVERLAP SHALL BE POSITIONED ENTIRELY BETWEEN GROUND LINE AND 10' ABOVE GROUND LINE.

FOR POST SIZING SEE ENGINEERING POLICY GUIDE.

FOR POST CLIP DETAILS, SEE STANDARDS PLAN 903.01 SHEET 4 OF 7.

FOR MOUNTING WEIGHT AND OFFSET DETAILS, SEE SHEET 10 OF 16.

**POST TYPE**

<table>
<thead>
<tr>
<th>SIGN AREA (SQ. FT.)</th>
<th>U-CHANNEL</th>
<th>WOOD</th>
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<tbody>
<tr>
<td>≤ 10</td>
<td>1 - 30 LB./FT. +</td>
<td>1 - 4&quot; x 4&quot; +</td>
</tr>
<tr>
<td>&gt; 10 ≤ 16</td>
<td>2 - 30 LB./FT. +</td>
<td>2 - 4&quot; x 4&quot; +</td>
</tr>
<tr>
<td>&gt; 16 ≤ 30</td>
<td>2 - 30 LB./FT. +</td>
<td>2 - 4&quot; x 6&quot; +</td>
</tr>
<tr>
<td>&gt; 30 ≤ 50</td>
<td>3 - 30 LB./FT. +</td>
<td>2 - 4&quot; x 6&quot; +</td>
</tr>
<tr>
<td>&gt; 50</td>
<td>N/A</td>
<td>2 - 6&quot; x 6&quot; +</td>
</tr>
</tbody>
</table>

* Signs greater than 4 feet in height require two posts, except standard shape, warning signs, yield signs, and one way signs.

**POST SIZE REQUIREMENTS**

**U-CHANNEL POST**

SIGN MOUNTING DETAILS 
WOOD AND U-CHANNEL POST
TUBULAR DELINEATOR DETAIL

36 INCH SURFACE-MOUNT DELINEATOR POST

TUBULAR DELINEATOR DETAIL

COLOR OF TUBULAR DELINEATOR AND REFLECTIVE SHEETING SHALL MATCH THE COLOR OF THE LOWEST PAVEMENT MARKING OR LINE WARNING.

TUBULAR DELINEATOR SHAPE MAY BE ROUND OR T-SHAPED. TUBULAR DELINEATOR SHALL BE PERMANENTLY MOUNTED TO THE PAVEMENT SURFACE IN COMPLIANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.

CHANNEL POST DELINEATOR AND FASTENER DETAILS

LIMITS

CHANNEL POST DELINEATOR

LENGTH 121

DIMENSIONS = INCHES

NORMAL 1.22

+ 4 6 8 8 4 1

TOLERANCES .05

+ 1 2 3 4 5 6 7 8

NOTE:

THE CHANNEL POST FOR DELINEATORS SHALL BE MANUFACTURED FROM STEEL WITH A 36 IN. BIT AND A BOLT OR PIN.

GROUND MOUNT U-CHANNEL

DIRECTIONS - INCHES

4 6 8 8 4 1

CHANNEL POST DELINEATOR MOUNTING DETAILS

SHOULDER MOUNTED

OUTSIDE CURB

NARROW PAVED MEDIAN

CHANNEL POST DELINEATOR MOUNTING DETAILS

SINGLE

DOUBLE STACKED

NOTE:

RETROREFLECTIVE SHEETING MUST BE APPLIED TO ONLY ONE SIDE OF THE DELINEATOR REFLECTOR BAY.

RETROREFLECTIVE SHEETING SHALL FOLLOW GUIDELINES OUTLINED IN SPECIFICATION 1905-10 FOR MOUNTING APPLICATION OF SHEETING TO DELINEATOR BAY. THE COLOR OF THE SHEETING SHALL MATCH THE LOWEST PAVEMENT MARKING.

3" X 6" DELINEATOR BAY SHALL BE MADE FROM 0.080 INCH SHEETMETAL.
DELINEATORS ON CONCRETE TRAFFIC BARRIER
FOR CONCRETE BARRIER DETAILS, SEE SHEET PLANS 617-10 OF BRIDGE PLANS.

ONE WAY TRAFFIC
(SEE SHEET 14 OF 16)

LEGEND
- WHITE DELINEATOR
△ YELLOW DELINEATOR
◆ RED DELINEATOR

NOTE:
(1) SECONDARY DELINEATOR ON BACK SIDE NOT REQUIRED IF ROADWAY "A" HAS MORE THAN 2 LANES

ROADWAY OR BRIDGE CONCRETE TRAFFIC BARRIER DELINEATION

DELINEATOR CONNECTION ON CONCRETE TRAFFIC BARRIER DETAIL

NOTES:
FOR GENERAL NOTES, SEE SHEET 1 OF 16.

RETROREFLECTIVE YELLOW, WHITE OR RED SHEETING IN CONFORMITY WITH AASHTO TYPE B OR C SHALL BE APPLIED TO ONLY ONE SIDE OF THE DELINEATOR REFLECTOR BODY.

RETROREFLECTIVE SHEETING SHALL FOLLOW GUIDELINES OUTLINED IN 23 CRC 1069.2.7 FOR CORRECT APPLICATION OF SHEETING TO DELINEATOR BODY. THE COLOR OF THE SHEETING SHALL MATCH THE CLOSEST ADJACENT PAINTED MARKING.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-606-MODOT 1-888-606-6636

SIGN MOUNTING DETAILS CONCRETE BARRIER DELINEATORS

DATE EFFECTIVE/DATE REVISED: 9/24/2020/7/16/2020
SHEET NO.: 903.03BM 12 OF 16
DELINEATORS ON GUARDRAIL

FOR GUARDRAIL DETAILS, SEE STIE 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 AN INTERCHANGE RAMPS AND SHALL BE VISIBLE TO VEHICLE TRAFFIC.
Legend:
- White Delineator
- Yellow Delineator
- White Double Stacked Delineator
- Red Delineator

Delineator Spacing on Horizontal Curves

<table>
<thead>
<tr>
<th>Radius of Curve (Feet)</th>
<th>Spacing on Curve (Feet)</th>
<th>Spacing in Advance &amp; Before Curve (Feet)</th>
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<td>20</td>
<td>40</td>
</tr>
<tr>
<td>150</td>
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<tr>
<td>1050</td>
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Spacing of first delineator in advance of and beyond curve = 2 x 5.
The second = 2 x 5 and the third = 5 x 5. But not to exceed 100 feet. Maximum spacing = 100 feet.

Delineators shall be installed facing approaching traffic. Yellow delineators shall be installed on the inside exit 50' and end 60' feet from the curve point. White delineators shall extend beyond the first yellow delineator. Red delineators shall be placed on the back side of either the white or yellow delineator first. If applicable, red delineators are typically installed where vehicles may accidentally travel down the ramp entrances and mounted facing away from normal traffic flow.

Channel post delineators shall be installed on sections where guardrail is present. These portions shall be delineated utilizing the guardrail delineators. In areas where red delineators are delineated, red retroreflective sheeting shall be placed on the backside of the guardrail delineator.

Reflective sheeting shall be in accordance with Sec. 1042.2.1.3.

Notes:
- For general notes, see Sheet 1 of 16.
- The contract unit price for each channel post delineator shall include the reflectors, fasteners, and post.

Missouri Highways and Transportation Commission
105 West Capitol
Jefferson City, MO 65102
1-800-447-MTDC (6832) 1-888-275-6686

SIGN MOUNTING DETAILS
INTERCHANGE DELINEATION

DATE EFFECTIVE: 03/14/03
DATE REVISED: 03/22/03
903.03BM SHEET NO. 14 OF 16
TYPE D GUARDRAIL

TYPE 4 OBJECT MARKER INSTALLATION

STEEL OBJECT MARKER POST

<table>
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<th>LIMITS</th>
<th>LENGTH (FT)</th>
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<tr>
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<tr>
<td>MAX.</td>
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(2) WEIGHT BEFORE GALVANIZING OF RINGING RAILS SHOWN ARE ABSOLUTE. NO FURTHER WEIGHT. DEVIATIONS OF COMMERCIAL TOLERANCE WILL BE ACCEPTABLE.

DIEC THREADS OF BOLT AS APPROVED BY THE ENGINEER.

HOLE PUNCHING TO ERAD 2" DIAMETER HOLES, THE HOLE CENTER TO CENTER, BEGINNING ONE-HALF INCH FROM THE END AND CONTINUING THE ENTIRE LENGTH OF THE POST.

OBJECT MARKER POST AND FASTENER DETAILS

NOTES:

FOR GENERAL NOTES, SEE SHEET 1 OF 16.

TYPE D GUARDRAIL IS ACCESS RESTRAINT AND VISUAL TARGET VALUE ONLY. IT HAS NO REACTIVE CAPABILITY.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

MO DOT

SIGN MOUNTING DETAILS

OBJECT MARKERS FOR ROAD CLOSURE

SIGN MOUNTING DETAILS

DATE EFFECTIVE: 3/1/2012

SHEET NO.: 903.03BM

15 OF 16
BARRIER WALL INSTALLATION

1. PERFORATED SQUARE STEEL TUBE 2" x 2" x 1/2" (1.312"")
   - Tube shall extend a minimum of 6" below the top of the formations edge.

2. TIME TO EXTEND SHEAR REINFORCEMENT ONLY ENOUGH TO ALLOW BOLT TO BE INSERTED 2'-8" MAXIMUM.

3. CONCRETE MIX TO HOLD FORMATION TUBE FLUSH WITHOUT SPACING SHALL HAVE A MINIMUM OF 5" SIDES OF CEMENT PER CUBIC YARD AND A MAXIMUM slump of 2'-8".

4. 2" x 2" x 1/2" (1.312"") SQUARE STEEL GALVANIZED STEEL TUBE 1/2" with 1/4" diameter holes in each face 2'-8" below top of tube.

5. 2" x 5' LONG STAINLESS STEEL CABLE (ASTM A 492 TYPE 304 MINIMUM BREAKING STRENGTH 200 LBS.) WITH A 1-1/4" LIP AT EACH END LOOPS FABRICATED MECHANICAL GRIP TYPE CONNECTION FOR MANUFACTURER’S SPECIFICATION. CABLE IS TO BE FIXED TO PERFORATED SQUARE STEEL TUBE CABLE TO BE USED ONLY WHEN SIGN MOUNTING LOCATION IS OVER ANOTHER TRAVELWAY.

6. 1/2" DIAMETER RESIN ANCHORS SHALL BE INSTALLED IN ACCORDANCE WITH STANDARD SPECIFICATIONS (SEC 10281). AN APPROVED MECHANICAL TYPE ANCHOR MAY BE USED IF THE DECK HULLS OF EXCEED THE FULL TEST REQUIREMENTS OF SEC. 1059.

7. FALL ARREST CABLE TO BE SECURED TO NEXT FULL HOLE BELOW CABLE.

NOTES:

FOR GENERAL NOTES: SEE SHEET 1 OF 16.

PERFORATED SQUARE STEEL TUBE SHALL BE SECURED TO FORMATION TUBE OR BARRIER WALL MOUNTING PLATE WITH A SMARTEK BOLT FOR PERFORATED SQUARE STEEL TUBE MANUFACTURER’S SPECIFICATION.

MISOURI HIGHWAYS AND TRANSPORTATION COMMISSION

903 BM EMERGENCY REFERENCE MARKERS

SIGN MOUNTING DETAILS

SPEC EFFECTIVE: 07/01/2016

DRAWN: 06/01/2016

903.03BM

SHEET NO. 16 OF 16
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<td>24</td>
<td>24</td>
<td>12</td>
</tr>
</tbody>
</table>

**Beam Clamp Detail**

- **Heavy Square Nuts and Washers for Placing**
- **Elevation**
- **Plan**

**Beam Splice Detail**

- **14" Hex Head Bolts, Nuts, and Lock Washers**
- **Spans 76' to 90'**
- **Spans up to 76'**

**Galvanized Sign Bracket Assembly**

**Tubular Support Steel**

- **Type S**
- **Two Tubes**
OVERHEAD SIGN TRUSSES
ALUMINUM

FOR ADDITIONAL INFORMATION SEE DATA SHEET.

TOOL VARIABLES

SPAN | "W" | MEMBER | MEMBER 2 | MEMBER 3 | MEMBER 4 | MEMBER 5 | MEMBER 6 | MEMBER 7 | MEMBER 8 | MEMBER 9 | MEMBER 10 | MEMBER 11 | MEMBER 12
--- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | ---
UP TO 30'-0" | 6'-0" | 6'-0" | 6'-0" | 6'-0" | 6'-0" | 6'-0" | 6'-0" | 6'-0" | 6'-0" | 6'-0" | 6'-0" | 6'-0"
7'-0" | 6'-0" | 6'-0" | 6'-0" | 6'-0" | 6'-0" | 6'-0" | 6'-0" | 6'-0" | 6'-0" | 6'-0" | 6'-0" | 6'-0"
10'-0" | 6'-0" | 6'-0" | 6'-0" | 6'-0" | 6'-0" | 6'-0" | 6'-0" | 6'-0" | 6'-0" | 6'-0" | 6'-0" | 6'-0"
15'-0" | 6'-0" | 6'-0" | 6'-0" | 6'-0" | 6'-0" | 6'-0" | 6'-0" | 6'-0" | 6'-0" | 6'-0" | 6'-0" | 6'-0"
20'-0" | 6'-0" | 6'-0" | 6'-0" | 6'-0" | 6'-0" | 6'-0" | 6'-0" | 6'-0" | 6'-0" | 6'-0" | 6'-0" | 6'-0"
25'-0" | 6'-0" | 6'-0" | 6'-0" | 6'-0" | 6'-0" | 6'-0" | 6'-0" | 6'-0" | 6'-0" | 6'-0" | 6'-0" | 6'-0"
30'-0" | 6'-0" | 6'-0" | 6'-0" | 6'-0" | 6'-0" | 6'-0" | 6'-0" | 6'-0" | 6'-0" | 6'-0" | 6'-0" | 6'-0"

NOTE:
1. FOR ALL VALUES OF SPANS LESS THAN 36 FEET AND 20 FT. FOR ALL OTHERS.

SIMULATED WIND-SHOP TEST LOADING

GENERAL NOTES:
1. ALL STRUCTURAL STEEL AND COLUMN BASE PLATES ASTM A36.
2. ALL NUTS AND BOLTS ASTM A578.
3. PROFILING FIELD SPACER SHALT BE SHOWN ON SHOP DRAWINGS FOR APPROVAL OF THE ENGINEER.
4. TRUSSES SHALL BE FABRICATED WITH A MINIMUM OF 11/2" SPACING ON TRUSS CHORDS.
5. FIELD SPACING WILL NOT BE PERMITTED WITHIN THE WEBCORE OR WIND-RESISTANT PANELS.

FOR ADDITIONAL INFORMATION SEE DATA SHEET.

OVERHEAD SIGN TRUSSES
ALUMINUM

MISCELLANEOUS HOLLOW REFERENCE
1-800-638-MISCELLANEOUS (647-3357)

OVERHEAD SIGN TRUSSES
ALUMINUM

MISCELLANEOUS HOLLOW REFERENCE
1-800-638-MISCELLANEOUS (647-3357)
### Drilled Shaft Option

<table>
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<tr>
<th>POST TYPE</th>
<th>PIPE COLOR</th>
<th>O.D. (in)</th>
<th>D (in)</th>
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### Spread Footing Option with Alternate Pedestals

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+ Base plates, pedestal she footings. Larger sizes shall be normal to axis of sign.
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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:
PEDESTAL AND FOOTING SHALL BE CLASS B SPECIFICALLY.
MINIMUM CLEARANCE TO REINFORCEMENT IS 1" (EXCEPT AS SHOWN).
CONTACT THE ENGINEER IF NEEDED FOR ENCROACHMENT.

TYPE Column, Base Plate, Anchor Bolts and Notches
REFERRING TO THESE ITEMS HAVE BEEN OMITTED FOR CLARITY. REFER TO SHEET 5 OF 7 FOR DETAILS OF THESE ITEMS.

OVERHEAD SIGN TRUSSES
SPREAD FOOTING

MO DOT
HIGHWAY AND TRANSPORTATION
COMMISSION
101 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-365-MODOT (6636) 1-888-276-6571