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

This set of Standard Plans is effective beginning with the October 2019 bid opening.

www.modot.org/business/standards_and_specs/standardplans.htm
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EXCAVATION PAY LIMITS

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

EMBANKMENT LIMITS

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

BACKSLOPES IN STABLE AND SEMI-STABLE MATERIAL

AT TOE OF ROADWAY FILL SLOPE

AT TOP OF ROADWAY BACKSLOPES

PARABOLIC ROUNING

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.
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

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 PARTIAL WIDTH OF ROADBED
GENERAL NOTES:

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

UNDERGRADING TYPICAL DETAILS

DATE EFFECTIVE: 01/01/2004
DATE PREPARED: 8/25/2009

SHEET NO. 2 OF 2
SPIRALED CURVE AND WIDENING TRANSITIONS

SUPERELEVATION RUNOFF AND WIDENING TRANSITIONS WITHOUT SPIRALS

MULTILANE FACTORS FOR "L"

1.0 LANE ROTATED (2 LANE ROADBED) = 1.00
1.1 LANE ROTATED (3 LANE ROADBED) = 1.25
2.0 LANE ROTATED (4 LANE ROADBED) = 1.50
2.2 LANE ROTATED (5 LANE ROADBED) = 1.75
3.0 LANE ROTATED (6 LANE ROADBED) = 2.00
3.5 LANE ROTATED (7 LANE ROADBED) = 2.25

MAXIMUM RADIUS FOR USE OF A SPIRAL CURVE TRANSITION

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TABLE NOTE: THE EFFECT OF SPIRAL CURVE TRANSITION ON LATERAL ACCELERATION IS LIKELY TO BE NEGLECTIBLE FOR LARGER RADII.

GENERAL NOTES:

A PRACTICAL CONTROL FOR THE LENGTH OF SPIRAL "L" IS CONSIDERED TO BE THE SUPERELEVATION RUNOFF "L", SEE STANDARDS PLANS 203.22 SHEET 1 OF 2.

"W" THE WIDENING FOR SURFACING AT INSIDE SHOULDER, SEE STANDARDS 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.
CASE NUMBER 1

(1) FULL S.E. FOR 1/2 PAVEMENT WIDTH
IF GREATER THAN CROWN SLOPE.

(2) FULL S.E. FOR 1/2 PAVEMENT WIDTH.

SUPERELEVATION SPIRALS AND WIDENING UNDIVIDED HIGHWAYS
Spiraled Curve and Widening Transitions

Section on Superelevated Curve Curve to Left (Illustrated)
SUPERELEVATION RUNOUT WITHOUT SPIRALS

SECTION ON SUPERELEVATED CURVE
CURVE TO LEFT (ILLUSTRATED)
CC: OUTSIDE EDGE OF PAVEMENT

SECTION A-A

SECTION C-C
(CURVE TO RIGHT)

SECTION B-B
(CURVE TO RIGHT)

SECTION D-D
(CURVE TO RIGHT)

NOTE:
- Vertical curves may be inserted at points of E.E. to the adjustments of states or County in the field.

SUPERELEVATION, SPURS AND WIDENING DIVIDED HIGHWAYS

Suplelevanion runoff = 1.0 (see standard plans 203.22, sheet 2 of 21)

DATE EFFECTIVE: 
DATE PREPARED:

203.21K SHEET NO. 3 OF 3
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<td>80</td>
</tr>
<tr>
<td>100</td>
<td>125</td>
<td>150</td>
<td>180</td>
</tr>
<tr>
<td>200</td>
<td>250</td>
<td>300</td>
<td>350</td>
</tr>
<tr>
<td>300</td>
<td>375</td>
<td>450</td>
<td>525</td>
</tr>
<tr>
<td>400</td>
<td>475</td>
<td>550</td>
<td>625</td>
</tr>
<tr>
<td>500</td>
<td>575</td>
<td>650</td>
<td>725</td>
</tr>
<tr>
<td>600</td>
<td>675</td>
<td>750</td>
<td>825</td>
</tr>
</tbody>
</table>

**TABLE NOTES:**

- W' is the widening in feet for surfacing at inside shoulders.
- Values shown are for 2-lane design vehicle.
- Values less than 2.0 feet may be disregarded.
- For 3-lane highways, multiply above values by 1.5.
- For 4-lane highways, multiply above values by 2.0.
Extend fill where pipe is required.

Ditch

Edge of surfacing

Normal shoulder line

Edge of traveled way

# PAVEMENT

PLAN

Section A-A

(Without pipe)

Section A-A

(With pipe)

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.

Mailbox Turnouts

Missouri Highways and Transportation Commission
105 West Capitol
Jefferson City, MO 65102
1-800-ASK-MODOT (1-888-275-6636)

Date Effective: 08/01/1981
Date Prepared: 8/23/2009

Sheet No. 203.35A
1 of 1
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.
TYPICAL DETAILS ON AND OFF RAMPS
DIAMOND INTERCHANGES AND OUTER RAMPS OF CLOVERLEAF INTERCHANGES

W RAMP WIDTH
ONE LANE, ONE WAY OPERATION WITH NO PROVISION FOR PASSING STALLED VEHICLES. DESIGN TRUCK VOLUMES > 5%

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

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

MISSOURI HIGHWAYS AND TRANSPORTATION
COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)
TYPICAL DETAILS ON AND OFF RAMPS
DIAMOND INTERCHANGES AND OUTER RAMPS OF CLOVERLEAF INTERCHANGES
(ROADWAYS WITH 6:1 FORESLOPES) 20 FOOT PAVEMENT STRUCTURE

DATE EFFECTIVE: 01/01/1995
DATE PREPARED: 8/21/2009

EDGE OF PAVEMENT STRUCTURE
2' TRAVELED WAY

MAINLINE PAVEMENT CONSTRUCTION BASE

SECTION A-A

RAMP BASE LINE
12' OR 24'
VARIABLE

SLOPE SAME AS B-B

PROFILE GRADE (RAMP)
S.E. SLOPE

SECTION F-F

RAMP BASE LINE
12' OR 24'
VARIABLE

SLOPE SAME AS B-B

PROFILE GRADE (RAMP)
S.E. SLOPE

MI ssouri highways and transportation commission
105 west capitol
jefferson city, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

PLAN VIEW "OFF" RAMPS

EDC EDGE OF PAVEMENT STRUCTURE
AND SHOULDER

MAINLINE PAVEMENT CONSTRUCTION BASE

SECTION G-G

RAMP BASE LINE
12' OR 24'
VARIABLE

SLOPE SAME AS B-B

PROFILE GRADE (RAMP)
S.E. SLOPE

SECTION E-E

RAMP BASE LINE
12' OR 24'
VARIABLE

SLOPE SAME AS B-B

PROFILE GRADE (RAMP)
S.E. SLOPE

2' TRAVELED WAY
FOR PRIVATE ENTRANCES, MINOR SIDE ROADS OR FIELD ENTRANCES

TYPE I MEDIAN OPENING

NOTES FOR TYPE I MEDIAN OPENINGS:

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

SHOULDER ADJACENT TO THE MEDIAN OPENING AND TAPERS SHALL BE AS SHOULDER FOR INTERSTATE AND MAJOR ROADS OR AS SHOULDER FOR LOW VOLUME MAJOR AND MINOR ROADS.

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

<table>
<thead>
<tr>
<th>DESIGN LENGTH</th>
<th>&quot;L&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥ 40 MPH</td>
<td>112.5'</td>
</tr>
<tr>
<td>&gt; 40 MPH</td>
<td>225'</td>
</tr>
</tbody>
</table>

FOR MAJOR SIDE ROADS, STATE ROUTES AND MAJOR COMMERCIAL ENTRANCES

TYPE II MEDIAN OPENING

NOTES FOR TYPE II MEDIAN OPENINGS:

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

SHOULDER ADJACENT TO THE MEDIAN OPENING AND TAPERS SHALL BE AS SHOULDER FOR INTERSTATE AND MAJOR ROADS OR AS SHOULDER FOR LOW VOLUME MAJOR AND MINOR ROADS.

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

<table>
<thead>
<tr>
<th>DESIGN LENGTH</th>
<th>&quot;L&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥ 40 MPH</td>
<td>125'</td>
</tr>
<tr>
<td>&gt; 40 MPH</td>
<td>250'</td>
</tr>
</tbody>
</table>
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.

NOTE: RECOMMENDED WIDTH OF DRIVEWAY - 20'

VARY GRADE AS REQUIRED TO MEET EXISTING GRADE OR GROUND LINE.

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

GENERAL NOTES:

IN CUTS

PROFILE VIEW

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

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

IN FILLS

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

FINISHED ROADWAY TEMPLATE BEYOND LIMITS OF DRIVEWAY

VARIABLE

(SEE PLANS)

NORMAL ROADWAY TEMPLATE

L (SEE PLANS)

(4' MINIMUM)

PIPE (SEE PLANS FOR SIZE AND LENGTH)

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: 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".
IN FILLS

PROFILE

IN CUTS

DRIVEWAY TYPICAL SECTION

CURB TERMINUS DETAIL

SECTION THRU CONCRETE CURB AND GUTTER

SECTION THRU 4" BARRIER CURB

DRIVEWAY SIZE SLOPES:

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

OVER 1700 VEHICLES PER DAY ON STATE ROUTE USE 6:1 SLOPE
FOR FLATTER SLOPE PRATICAL.

+ IN ORDER TO MINIMIZE THE USE OF SLOPE AND PIPE SECTIONS
ON NEW CONSTRUCTION OF DRAINAGE PIPE SHOULD BE ERE TO THE
CLEAR ZONE ENSLACE AS SHOWN IN TABLE 3.1 OF THE "ROUTESIDE
DESIGN COUNCIL".

MCDOT
WATERWAYS AND TRANSPORTATION
COMMISSION

DRIVEWAY TYPE IV

DATE EFFECTIVE: 06/01/2017
DATE CONFIRMED: 06/19/2017

STATE OF MISSOURI
DEPARTMENT OF HIGHWAYS AND TRANSPORTATION

203.64D   SHEET 2 OF 2
NOTE:

SEE STANDARD PLAN 203.50 FOR DETAILS OF LOW PROFILE ISLAND.

WHERE MINIMUM ISLAND CANNOT BE OBTAINED, OMIT ISLAND.

MINIMUM ISLAND DETAILS

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

MIN. W R TURN TAPER LANE

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.

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.

NOTE:

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.

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

DATE EFFECTIVE: 10/01/1998
DATE PREPARED: 8/21/2009

DRIVEWAY
TYPE V

PLAN VIEW

10'

EDGE OF TRAVELED WAY
**EMBANKMENT CONTROL STAKE**

2" X 4" SOUND LUMBER

2" X 4" SPLICE IF REQUIRED

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

GROUND LINE

2' GRADUATED SCALE

2" DIA. RISER PIPE

1 1/2" DIA. COVER PIPE

GROUND SURFACE

STANDARD PIPE

ORDINARY BACKFILL

CONTINUOUS WELD

ORDINARY BACKFILL

3" PORTLAND CEMENT MORTAR LEVELING COURSE

SETTLEMENT GAUGE

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: 08/25/2009

SHEET NO. 204.000

1 OF 1
GENERAL

ELEV. A

1 1/2" PVC PIPE WITH SOLVENT WELDED COUPLINGS

ELEV. B

12" PVC PIPE WITH 60-1/8" HOLES

GENERAL NOTES:

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

SEE DETAIL A-1 & B-1

3" IRON OR STEEL CASING

PLYWOOD PLATE 6" x 4" x 4 LAYERS
2" EXTERIOR OR MARINE WITH 3" DIA. HOLE

LEVELING COURSE OF SAND

GROUND SURFACE

THICK BENTONITE SLURRY

1 1/2" PVC PIPE WITH SOLVENT WELDED COUPLINGS

COMPACTED MOIST BENTONITE BALLS

SEE DETAIL A-2 & B-2

ELEVATION

24" PVC PIPE WITH 60-1/8" HOLES

PVC CAP

SAND CHAMBER

ELEVATION

24" PVC PIPE WITH 60-1/8" HOLES

PVC CAP

GENERAL

ELEVATION

1 1/2" PVC PIPE

JACKETED TUBING 6" TO 12" EPOXY SEAL

TRANSPLANT ASSEMBLY POROUS STONE BELOW 1 1/2" REDUCING COUPLING

2" PVC PIPE WITH 60-1/8" HOLES

PVC CAP

ELEVATION

6" TO 12" EPOXY SEAL

SOLVENT WELDED COUPLING

1 1/2" PVC PIPE WITH 60-1/8" HOLES DRILLED 1/2" EXTENSION BELOW PIPE COUPLING

PVC CAP

NEW EFFICIENT MACHINERY FOR THE CLASSICAL EMPIRE - II

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

DATE EFFECTIVE: 03/01/1996

DATE PREPARED: 8/23/2009

PORE PRESSURE MEASUREMENT DEVICES

SHEET NO. 1 OF 1

204.30
The final finish on concrete shoulders may be obtained by the use of a base consisting of a seamless strip of long durability concrete, plastic, turf, or other suitable material capable of providing a uniform surface or grout to the shoulder.

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

Incidental base shall consist of Type 1 or 5 aggregate for base or an alternate material that meets the approval of the Engineer.

Pavement on Rock Base

Base

RCC (Roller compacted concrete) or PCC (Portland cement concrete)

HMA (Hot mix asphalt)

4 in. use 16" BF-1 over 4" base unless otherwise specified on the plans.

Typo A2 Shoulders

Missouri Highways and Transportation Commission
105 West Capitol
Jefferson City, MO 65102
1-888-388-MODOT (1-888-388-6636)

Type A2 shoulders

Date Effective: 01/01/2006

Sheet No. 1 of 3
GENERAL NOTES:


THE SAFETY EDGE™ SHALL BE CONSTRUCTED MONOLITHICALLY 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 SAFETY EDGE OR SHOULDER IS MADE IN VOLUME OR WEIGHT.

MOVER HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-800-392-MODOT (663-6683)

SAFETY EDGE™

Missouri Department of Transportation

Sheet No. 3 OF 3

Date Effective: 08/01/2016
Date Printed: 03/01/2016

RCC (ROLLER COMPACTED CONCRETE) OR PCC (PORTLAND CEMENT CONCRETE)

HMA (HOT MIX ASPHALT)

BASE MATERIAL (IF APPLICABLE)
STREET BROOMS WITH NYLON BRISTLES

1/2" CHAIN WITH HOOKS

DATE EFFECTIVE: 07/01/2004
DATE PREPARED: 8/23/2009
TRANSVERSE JOINT SPACING 15'-0" (MAX.)

INTERCHANGE

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

GENERAL NOTES:

ALL TRANSVERSE JOINTS ON SHOULDERS SHALL BE □.
THE CONTRACTOR SHALL DETERMINE THE PAVING WIDTH.
□ SHALL BE USED BETWEEN PAVEMENT AND SHOULDER GREATER THAN 4'. THE INTERCHANGE WILL ALSO INCLUDE THE RAMPS UP TO THE BEGINNING OF THE RADIUS WITH THE ROAD INTERSECTING THE RAMP.

FOR JOINT DETAILS, SEE SHEETS NO. 3 & 4.

THE JOINT LAYOUT OF RAMPS IS TYPICAL FOR OUTER RAMPS OF CLOVERLEAF AND DIAMOND INTERCHANGES. SEE OTHER DRAWINGS FOR SPECIAL JOINT LAYOUTS.

SHOULDERS 4' OR LESS IN WIDTH CAST MONOLITHICALLY WITH THE ADJACENT LANE AND SHALL NOT HAVE A LONGITUDINAL JOINT OR TIE BARS.

CONCRETE PAVEMENT AND BASE APPURTEANCES FOR 15' JOINT SPACING

DATE EFFECTIVE: 07/23/2015
DATE PREPARED: 5/29/2015

15'-0" *

1' TO 4'

THEORETICAL TAPER CONCRETE MAY BE OMITTED

J JOINT FILLER

20'-0"

ON RAMP

OFF RAMP

BRIDGE Approach SLAB (SEE BRIDGE PLANS)

PCC SHLDR.

PREMOLDED FILLER MATERIAL

2" PREM. EXP. JT.

PCC SHOULDER

PCC SHOULDER

TAPER TREATMENT

DRAWING

SEEN TAPER TREATMENT DRAWING

BRIDGE APPROACH SLAB (SEE BRIDGE PLANS)

PCC SHLDR.

MONOLITHIC CONSTRUCTION

SEE TAPER TREATMENT DRAWING

PCC SHLDR.

PREMOLDED FILLER MATERIAL

2" prem. exp. JT.

PCC SHOULD

15'-0" OR LESS

END OF CONSTRUCTION

20'-0"

15'-0"

15'-0" (MAX.)

NON-INTERCHANGE

FOR SHORT Pavement CONNECTIONS TO FLEXIBLE SURFACED ROADS THE E-JOINTS MAY BE ELIMINATED

* Concrete Approach Pavement or N/R PCC Pavement (Roadway Plans)

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

502.05N SHEET No. 1 OF 4

DATE EFFECTIVE: 07/23/2015
DATE PREPARED: 5/29/2015

CONCRETE PAVEMENT AND BASE APPURTEANCES FOR 15' JOINT SPACING

DATE EFFECTIVE: 07/23/2015
DATE PREPARED: 5/29/2015

CONCRETE PAVEMENT AND BASE APPURTEANCES FOR 15' JOINT SPACING
**Concrete Pavement and Base Appurtenances for 15' Joint Spacing**

**General Notes:**

The final position of all dowels and tie bars shall be perpendicular to the plane of the joint and parallel to the surface of the pavement and parallel to each other.

**Joint Plan and Spacing for Contraction Joints:**

- Longitudinal joint not required at inside shoulder on divided highways or at inside shoulder of ramps. For 4' or less inside shoulders, dowels are required for the first two feet adjacent to the travel lane.

**Transverse Contraction Joint:**

- DOWEL BARS REQUIRED. FOR PERMISSIBLE TYPES OF DOWELS SUPPORTING UNITS, SEE OTHER DRAWINGS.
- TRANSVERSE CONTRACTION JOINTS FOR CONCRETE PAVEMENT OR BASE WIDENING SHALL MATCH EXISTING JOINTS.

**Tie Bar and Dowel Table:**

<table>
<thead>
<tr>
<th>Type</th>
<th>Dowel Size</th>
<th>Tie Bar Size</th>
<th>Dowel Spacing</th>
<th>Tie Bar Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCCP Thickness (P)</td>
<td>Less Than 7&quot;</td>
<td>None</td>
<td>30&quot; CTR.-CTR.</td>
<td>TIE BAR (SEE TABLE)</td>
</tr>
<tr>
<td></td>
<td>7&quot; to 10&quot;</td>
<td>1/2&quot;x18&quot;</td>
<td>12&quot; CTR.-CTR.</td>
<td>30&quot; CTR.-CTR.</td>
</tr>
<tr>
<td></td>
<td>Greater Than 10&quot;</td>
<td>1-1/2&quot;x18&quot;</td>
<td>12&quot; CTR.-CTR.</td>
<td>30&quot; CTR.-CTR.</td>
</tr>
</tbody>
</table>

**Longitudinal Construction Joint:**

S = Shoulder Thickness

**Transverse Construction Joint:**

O = Joint (Width Max. 1/4")
**CONSTRUCTION JOINT**

The header board shall be sufficiently rigid to prevent distortion from the typical section and maintain a straight line from pavement edge to pavement edge.

The construction joint may be sawed full depth, holes for dowel bars shall be drilled after the concrete has sufficient set to prevent damage.

Dowel bars shall be bonded into the holes. Bonding for dowel bars shall be epoxy or polyester bonding agents as specified in Section 1039.

The portion of the dowel outside the hole shall be coated with an approved lubricant.

**LONGITUDINAL CONSTRUCTION JOINT** (existing pavement)

Tie bars shall be epoxy coated, deformed reinforcing bars meeting the requirements of Sections 710 and 1073.

Bonding for tie bars shall be epoxy or polyester bonding agents as specified in Section 1039.

Tie bar size and length shall be based on the thickness of the thinner pavement or shoulder to be tied together.

**EXPANSION JOINTS**

(Contractor may select either expansion joint)

**ALTERNATE EXPANSION JOINTS**

(1) Length of cap

(2) Gap between end of cap and dowel.

*For expansion joints formed using a construction header, the expansion caps shall be installed on the exposed end of each bar once the header has been removed and the joint filler material has been installed.*
GENERAL NOTES:

- The dowel supporting units shall be factory assembled and capable of holding the dowels in their required positions. In the completed joint installation, dowels shall be positioned within 1/2" of the vertical and horizontal plane and in the longitudinal direction. The skew tolerance shall be 1/4".

- The free end of each epoxy coated dowel shall be marked with a spot of paint at least one inch in diameter and contrasting in color with the epoxy coating.

- Wire sizes shown are minimum required.

- Wires, bars or clips shall be used as necessary to strengthen the assemblies.

- The diameter of the spacer wire shall not exceed 0.200".

- Spacer wire may be cut or left intact.

- Staking pins shall be fabricated from 0.306" diameter wire minimum with a suitable hook. Staking pins shall have a minimum length of 12" for dowel assemblies unless otherwise directed by the engineer.

- Minor variations in the configuration of the support units will be allowed.

- Different leg shapes may be used provided the dowel bars are maintained at the proper position during concrete placement.

<table>
<thead>
<tr>
<th>PAVEMENT THICKNESS</th>
<th>BAR SIZE</th>
<th>LENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>10&quot; AND LESS</td>
<td>1/2&quot;</td>
<td>18&quot;</td>
</tr>
<tr>
<td>GREATER THAN 10&quot;</td>
<td>1 1/2&quot;</td>
<td>18&quot;</td>
</tr>
</tbody>
</table>

DATE EFFECTIVE: 06/01/2010
DATE PREPARED: 10/30/2015

APPROVED FOR USE WITH TRANSVERSE JOINTS

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-458-MODOT (1-888-275-6636)
FOR PAVEMENTS HAVING THICKNESS IN \( \frac{1}{4} \) INCREMENTS, DOWEL SHALL BE PLACED HALF THE PAVEMENT THICKNESS MINUS \( \frac{1}{4} \).

SECTION C-C

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

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-45X-MoDOT (1-888-275-6636)

DOWEL SUPPORTING UNITS
MECHANICAL PLACEMENT

DATE EFFECTIVE: 06/01/2010
DATE PREPARED: 03/29/2010

502.10K

SHEET NO. 2 OF 2
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 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 3" 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.
**USE** ⅜" JOINT FILLER BETWEEN TYPE A CURBS

**NOT REQUIRED WHEN ADJACENT PAVEMENT IS ASPHALT.**

"SECTION A-A, B-B AND C-C. SEE SHEET 3 OF 3."
**NORMAL SHOULDER LINE**

**SHOULDER**

**NORMAL PAVEMENT WIDTH**

**SHOULDER**

**SECTION A-A**

- **LIMITS OF CONCRETE APPROACH PAVEMENT**
- **4" TYPE 5 AGGREGATE BASE**
- **15'-0" (LIMITS OF CONCRETE APPROACH PAVEMENT) VARY WITH SKewed SLABS**
- **6 STANDARD 2" EXPANSION JOINT (NOT REQUIRED WHEN ADJACENT PAVEMENT IS ASPHALT)**

**SECTION B-B**

- **LIMITS OF CONCRETE APPROACH PAVEMENT**
- **4" TYPE 5 AGGREGATE BASE UNDER CONCRETE APPROACH PAVEMENT**
- **18"**
- **18"**

**SECTION C-C**

- **LIMITS OF CONCRETE APPROACH PAVEMENT**
- **TOP OF SLEEPER SLAB MAY BE FLAT OR CROWNED, SEE BRIDGE PLANS**

**FOR LOCATIONS OF SECTIONS A-A, B-B AND C-C, SEE SHEETS 1 AND 2.**

**GENERAL NOTES:**

SEE STANDARD DRAWING 605.10 FOR PIPE OUTLET DETAIL FROM SHOULDER POINT TO INSLOPE.
LOCATION SURVEY RIGHT-OF-WAY MARKER

STAMP 2" LETTERING INTO CAP FOR "MO DOT R/W".
L.S. NUMBER AND LETTERING SHALL BE ½" OR LARGER

TOP VIEW

SIDE VIEW

WITNESS POST

OFFSET POST LATERALLY FROM PIPE OUTLET

IN ROCK

DRAIN MARKER

IN EARTH

DRAIN PIPE

OFFSET POST LATERALLY

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.

GROUT INTO ROCK

DRAIN PIPE

6' WHITE CARBONITE WITNESS POST (FACING E)

OFFSET ON MO DOT R/W LINE

1' LOCATION SURVEY R/W MARKER

602.00D

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

DATE EFFECTIVE: 01/01/2003
DATE PREPARED: 08/23/2009
R/W LINE

SECTION A-A

POLYURETHANE FOAM OR POST MAY BE DRIVEN

IN EARTH

IN ROCK

POLYURETHANE FOAM (8" DIA.)

GROUT INTO ROCK

LEGEND

EXISTING

NEW

STEEL R/W MARKER

LOCATION SURVEY R/W MARKER

CONCRETE R/W MARKER

DRAIN MARKER

TYPICAL LOCATIONS

WITNESS POSTS, WHEN USED, ARE TO BE SET ON MODOT R/W LINE EITHER 1' IN FRONT OR BEHIND R/W MONUMENT.
TOTAL LENGTH = "L" + 5'-9"

CONSTRUCTION

SECTION A-A

B2 BARS

SECTION B-B

B2 BARS

B3 BARS

CONSTRUCTION

JOINT PERMITTED

SECTION C-C

C BARS

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 1Y TO 6A 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.

FLOOR LINE OF HEADWALL IS TO BE PLACED HORIZONTALLY.

PRECAST NOTES:

THE CONTRACTOR MAY, SUBJECT TO APPROVAL OF THE
ENGINEER, FURNISH PRECAST UNITS IN LIEU OF CAST-IN-PLACE.
IF A PRECAST UNIT IS FURNISHED, IT SHALL
CONFORM IN ALL RESPECTS TO THE REQUIREMENTS
FOR CAST-IN-PLACE UNITS INCLUDING DIMENSIONS AND
REINFORCEMENT, EXCEPT THAT THE FORMS MAY BE
PRECASTING FORMS.

MISSOURI HIGHWAYS AND TRANSPORTATION
COMMISSION

105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-438-MODOT 11-888-2667661

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

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

B2 BARS

B3 BARS

BENDING DETAILS

24" 1'-6" 15'-6" 3.0 110 2 3'-5" 2 2'-3" 2 2'-5" 2 2'-0" 3 15'-3" 2 1'-5" 5'-8" 7'-6" 4 1'-11" 5" 8'-11" 12'-0" 12 3'-3"
18" 1'-3" 12'-6" 2.2 90 2 2'-6" 2 2'-0" 2 1'-9" 3 12'-3" 2 1'-3" 5'-8" 7'-6" 4 1'-2" 5" 4'-5" 6'-9" 9 3'-3"
15" 1'-0" 9'-9" 1.5 70 2 2'-0" 2 1'-6" 2 1'-3" 2 1'-0" 3 9'-3" 2 1'-5" 5'-8" 7'-6" 4 11" 5" 2'-11" 5'-0" 8 3'-3"
12" 9" 3'-9" 9'-6" 1.5 70 2 2'-0" 2 1'-6" 2 1'-3" 2 1'-0" 3 9'-3" 2 1'-5" 5'-8" 7'-6" 4 11" 5" 2'-11" 5'-0" 8 3'-3"

END SECTION

PIECE NOTES:

FOR CAST-IN-PLACE UNITS INCLUDING DIMENSIONS AND
REINFORCEMENT, EXCEPT THAT THE FORMS MAY BE
PRECASTING FORMS.

SHOP DRAWINGS OF THE PREFORM UNIT SHALL BE
SUBMITTED FOR APPROVAL PRIOR TO FIRST USE OF
THE PRECAST FORMS.
**GENERAL NOTES:**

See General Notes on Sheet 1.

**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

**DATE EFFECTIVE:** 08/01/2006

**DATE PREPARED:** 9/3/2009

**604.05D SHEET NO. 1 OF 2**

---

### BENDING DETAILS

- **B2 BARS**
- **B3 BARS**

---

### PIPE SIZES AND DIMENSIONS

<table>
<thead>
<tr>
<th>PIPE SIZE</th>
<th>DIMENSIONS</th>
<th>QUANTITIES</th>
<th>REINFORCING</th>
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<tr>
<td></td>
<td>&quot;H&quot; &quot;L&quot; TOTAL LENGTH</td>
<td>&quot;L&quot;</td>
<td>LBS.</td>
</tr>
<tr>
<td>27&quot;</td>
<td>2'0&quot; 15&quot;</td>
<td>3'-0&quot;</td>
<td>2 3'-0&quot;</td>
</tr>
<tr>
<td>30&quot;</td>
<td>2'9&quot; 18&quot;</td>
<td>5'-3&quot;</td>
<td>2 3'-0&quot;</td>
</tr>
<tr>
<td>36&quot;</td>
<td>2'9&quot; 18&quot;</td>
<td>3'-6&quot;</td>
<td>2 3'-0&quot;</td>
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</tbody>
</table>

---

### CONSTRUCTION JOINT PERMITTED

- Section B-B
- Section C-C

---

**TOTAL LENGTH = "L" + 5'-9"**

---

**PLAN VIEW**

**SECTION A-A**

**SECTION B-B**

**SECTION C-C**

---

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-650-MODOT (1-888-650-6636)

**DATE EFFECTIVE:** 08/01/2006

**DATE PREPARED:** 9/3/2009

**604.05D SHEET NO. 1 OF 2**

---

**GENERAL NOTES:**

See General Notes on Sheet 1.

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-650-MODOT (1-888-650-6636)

**DATE EFFECTIVE:** 08/01/2006

**DATE PREPARED:** 9/3/2009

**604.05D SHEET NO. 1 OF 2**

---

**GENERAL NOTES:**

See General Notes on Sheet 1.

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-650-MODOT (1-888-650-6636)

**DATE EFFECTIVE:** 08/01/2006

**DATE PREPARED:** 9/3/2009

**604.05D SHEET NO. 1 OF 2**

---

**GENERAL NOTES:**

See General Notes on Sheet 1.

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-650-MODOT (1-888-650-6636)

**DATE EFFECTIVE:** 08/01/2006

**DATE PREPARED:** 9/3/2009

**604.05D SHEET NO. 1 OF 2**

---

**GENERAL NOTES:**

See General Notes on Sheet 1.
GENERAL NOTES:

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

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

- DIMENSIONS
  DRAWINGS ARE NOT TO SCALE. FOLLOW DIMENSIONS.

- DRAWINGS
  DIMENSIONS NOT TO SCALE. FOLLOW DIMENSIONS.

<table>
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<tr>
<th>ITEM</th>
<th>TOTAL</th>
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<tr>
<td>CLASS B CONCRETE</td>
<td>6.1</td>
</tr>
<tr>
<td>REINFORCING STEEL</td>
<td>480</td>
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<table>
<thead>
<tr>
<th>COMPLETE BILL OF REINFORCING STEEL</th>
</tr>
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<tbody>
<tr>
<td><strong>INCHES</strong></td>
</tr>
<tr>
<td><strong>ITEM</strong></td>
</tr>
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<td>6</td>
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<tr>
<td>2</td>
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<td>14</td>
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<table>
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<th>BENDING DIAGRAMS</th>
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<tbody>
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<td><strong>SHAPE</strong></td>
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<td>SHAPE 11</td>
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<tr>
<td>SHAPE 14</td>
</tr>
<tr>
<td>SHAPE 16</td>
</tr>
<tr>
<td>SHAPE 18</td>
</tr>
</tbody>
</table>

NOTE: BEND OR CUT AT BARS IN FIELD TO CLEAR PIPE.

NOTE: BEND OR CUT AT BARS IN FIELD TO CLEAR NOTCH IN BAFFLE WALL.

PIPE CULVERT HEADWALL
ENERGY DISSIPATOR (IMPACT TYPE)
FOR 18" CONCRETE PIPE

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-4ASK-MODOT (1-888-275-6636)

DATE PREPARED: 8/3/2009
DATE EFFECTIVE: 6/1/2009
SHEET NO.: 604.1OE 1 OF 1
GENERAL NOTES:

- **SECTION A - A**

**CLASS B CONCRETE**
**REINFORCING STEEL (GRADE 60)**

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

**DIMENSIONS:**
DRAWINGS ARE NOT TO SCALE. FOLLOW DIMENSIONS.

**COMPLETE BILL OF REINFORCING STEEL**

**REINFORCING DIAGRAMS**

**ESTIMATED QUANTITIES**

**ITEM** | **TOTAL**
--- | ---
CLASS B CONCRETE | 13.2
REINFORCING STEEL | 1.170

**UPSTREAM ELEVATION**
NOTE: BEND OR CUT AT BARS IN FIELD TO CLEAR PIPE.

**HALF SECTION B-B**
HALF ELEVATION OF LOWER BAFFLE AND WING

**NOTE:** BEND OR CUT AT 0.1 BARS IN FIELD TO CLEAR NOTCH IN BAFFLE WALL.
NOTE: BEND OR CUT #1 AND #3 BARS IN FIELD TO CLEAR PIPE.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1/8" UNLESS SHOWN OTHERWISE.

DIMENSIONS ARE NOT TO SCALE. FOLLOW DIMENSIONS.

COMPLETE BILL OF REINFORCING STEEL

<table>
<thead>
<tr>
<th>DIMENSIONS</th>
<th>MATERIAL</th>
<th>GROSS</th>
<th>NET</th>
<th>E</th>
<th>F</th>
<th>D</th>
<th>C</th>
<th>B</th>
<th>A</th>
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</thead>
<tbody>
<tr>
<td>12&quot;-#4-A3</td>
<td>63</td>
<td>35</td>
<td>18</td>
<td>11</td>
<td>7</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>12&quot;-#4-A4</td>
<td>63</td>
<td>35</td>
<td>18</td>
<td>11</td>
<td>7</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>12&quot;-#4-A5</td>
<td>63</td>
<td>35</td>
<td>18</td>
<td>11</td>
<td>7</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

ENERGY DISSIPATOR (IMPAKT TYPE) FOR 48" CONCRETE PIPE

DESIGN UNIT STRESSES

CLASS B CONCRETE

REINFORCING STEEL (GRADE 60)

Total

CU. YD. 4.940

LBS. 36.7

REINFORCING STEEL

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1/8" UNLESS SHOWN OTHERWISE.

DIMENSIONS ARE NOT TO SCALE. FOLLOW DIMENSIONS.

GENERAL NOTES:

CLASS B CONCRETE

REINFORCING STEEL (GRADE 60)  f_y = 60,000 psi

BENDING DIAGRAMS

CONTRACT: JOINT KEY 3 x 3

NOTE: BEND OR CUT #3 AND #3 BARS IN FIELD TO CLEAR PIPE.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1/8" UNLESS SHOWN OTHERWISE.

DIMENSIONS ARE NOT TO SCALE. FOLLOW DIMENSIONS.

ALL STANDARD HOOKS AND BENDS OTHER THAN 180 DEG. TO BE WELDED WITH SMALL CONDUIT AS TO BE ALLOWED IN TABLES AS SHOWN IN THIS SHEET.

NORMAL LENGTHS ARE BASED ON OUT TO OUT DIMENSIONS SHOWN IN BENDING DIAGRAMS AND ARE LISTED IN FABRICATORS GUARD DC.

PAYMENTS ARE BASED ON ACTUAL LENGTH.

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

NOTE: DIMENSIONS VARIED IN EQUAL INTERVALS BETWEEN DIMENSIONS SHOWN IN THIS LINE AND THE FOLLOWING LINE.

NOTE = NUMBER OF BARS OF EACH LENGTH.

DATE EFFECTIVE: 03/28/2011

DATE PREPARED: 03/28/2011

PIECE CULVERT HEADWALL

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

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

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

DATE EFFECTIVE: 03/28/2011

DATE PREPARED: 03/28/2011

PIPE CULVERT HEADWALL
1. See drawing 609.00 or special curb drawing for these dimensions.

2. Normal slope of gutter at this point:

3. Normal slope minus 1/2:

4. Construction joint:

5. Edge of concrete pavement structure:

6. Normal edge of curb:

7. Normal depth of gutter:

8. Transition:

9. CURB DRAWING FOR THESE DIMENSIONS:

10. TRANSITION SEE DETAILS ON LEFT:

11. NORMAL 2" DEPTH OF GUTTER AT THIS POINT:

12. DIRECTION OF FLOW:

13. 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 "H" CONCRETE. CONCRETE IN INSERTS 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 OR FOR CUTTING AND BENDING REINFORCING BARS.

14. MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION:

15. 105 WEST CAPITOL

16. JEFFERSON CITY, MO 65102

17. 1-888-ASK-MODOT (1-888-275-6636)

18. 604.29C SHEET NO.

19. 1 OF 2

20. DATE EFFECTIVE: 04/01/1983

GENERAL NOTES:

1. The maximum depth of manhole using No. 4 horizontal bars at 12" centers is 20".
Over 20" depth, horizontal bars shall be increased to a No. 6 bar at 10" centers to a maximum depth of 30".
Over 30" depth will require a special design.

2. Bottom steel at more than 20" depth to a maximum depth of 30" is increased to No. 6 bars at 7" centers.

VARIABLE DIMENSIONS

<table>
<thead>
<tr>
<th>SIZE OF PIPE</th>
<th>W</th>
<th>T-B</th>
<th>M</th>
<th>N</th>
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<tbody>
<tr>
<td>8&quot;-24&quot;</td>
<td>3&quot;-0&quot;</td>
<td>4'-0&quot;</td>
<td>7&quot;</td>
<td>23&quot;</td>
</tr>
<tr>
<td>30&quot;</td>
<td>3'-6&quot;</td>
<td>4'-6&quot;</td>
<td>7&quot;</td>
<td>54&quot;</td>
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<tr>
<td>36&quot;</td>
<td>4'-0&quot;</td>
<td>5'-2&quot;</td>
<td>7&quot;</td>
<td>88&quot;</td>
</tr>
<tr>
<td>42&quot;</td>
<td>4'-6&quot;</td>
<td>6'-0&quot;</td>
<td>8&quot;</td>
<td>93&quot;</td>
</tr>
<tr>
<td>48&quot;</td>
<td>5'-0&quot;</td>
<td>6'-2&quot;</td>
<td>8&quot;</td>
<td>103&quot;</td>
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</tbody>
</table>

NOTES:

- Minimum "W" shall be the outside diameter of largest pipe entering manhole plus 16" carriageway to the nearest 3".
- Horizontal and vertical bars horizontal and vertical bars around pipes.
### FOR PIPE OPENINGS

<table>
<thead>
<tr>
<th>PIPE SIZES</th>
<th>12&quot;</th>
<th>15&quot;</th>
<th>18&quot;</th>
<th>24&quot;</th>
<th>30&quot;</th>
<th>36&quot;</th>
<th>42&quot;</th>
<th>48&quot;</th>
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<tr>
<td>CUBIC YARDS</td>
<td>0.03</td>
<td>0.04</td>
<td>0.06</td>
<td>0.11</td>
<td>0.16</td>
<td>0.23</td>
<td>0.31</td>
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<tr>
<td>CONCRETE TO DEDUCT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>ADDITIONAL STEEL REQUIRED FOR PIPE OPENING</td>
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<td></td>
<td></td>
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</table>

#### WIDTH OF WALL REQUIRED FOR PIPE

- 3'-0" x 3'-0"
- 3'-6" x 4'-0"
- 4'-6" x 5'-0"
- 5'-0" x 6'-0"

#### LENGTH OF #6 BAR REQUIRED

- 4'-0" x 4'-6"
- 5'-0" x 5'-6"
- 6'-0" x 6'-0"

#### WEIGHT OF BAR LBS.

- 6.0
- 6.8
- 7.5
- 8.3
- 9.0

**NOTE:**

- 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 1 that for 1 foot of "D." So use quantity in 1 foot column for full feet and in 3" column for fractional feet.

### QUANTITIES

#### TO AND INCLUDING 20'-0" DEPTH

<table>
<thead>
<tr>
<th>SIZE (W)</th>
<th>D= 3'-3&quot;</th>
<th>D= 4'-3&quot;</th>
<th>ADD OR SUBTRACT FOR EACH</th>
<th>ADD OR SUBTRACT FOR EACH</th>
<th>ADDITIONAL STEEL IN BOTTOM DIFFERENCE IN #6 AND #8 BARS</th>
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<tr>
<td>3'-0&quot; x 3'-0&quot;</td>
<td>C 1.62</td>
<td>1.93</td>
<td>0.37</td>
<td>0.37</td>
<td>0.08</td>
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<td>3'-0&quot; x 3'-6&quot;</td>
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<td>0.08</td>
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<td>2.53</td>
<td>0.38</td>
<td>0.38</td>
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<td>6.15</td>
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<td>3'-0&quot; x 10'-0&quot;</td>
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<td>C 6.40</td>
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</table>

#### TO AND INCLUDING 20'-0" DEPTH

- Note: To compute the quantities for depths such as "D" not shown, refer to the table for the size of manhole required. Subtract the "D" value from the table and the "D" value from the plans. Multiply the values shown in the 1-foot column of the table with the full depth, fraction of the difference between the "D" from the plans and the "D" from the table, multiply the values shown in the 3" column of the table with the remaining fractional foot values per 3" increments. Follow this same procedure for the steel calculations. See the example below.

#### 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'-0"
  - D given in table = 4'-3"
  - D additional = 2'-3"

#### CONCRETE STEEL

- FROM TABLE FOR 4'-3" D: 2.28 208.6
- ADD 12 X QUANTITIES FOR 1-FOOT: 0.70 42.6
- ADD 15" = 2 X 3" (2 X QUANTITIES FOR 3") 0.18 255.6
- SUBTOTAL: 3.16 255.6
- ADJUST QUANTITIES FOR THE PIPE OPENINGS (DEDUCT CONCRETE AND ADD STEEL FOR TWO 3" AND ONE 4" WALL) -0.40 +19.5
- TOTAL: 2.76 275.3
- USE: 2.80 280.0

#### MORE THAN 20'-0" TO AND INCLUDING 30'-0" DEPTH

- First, compute quantities for 20'-0" depth from the table "TO AND INCLUDING 20'-0" DEPTH.
- For example:
  - Quantities for 3'-0" x 4'-0" manhole with 20'-0" D having one 18", one 24" and one 36" pipe openings are determined as follows:
    - D required = 20'-0"
    - D given in table = 4'-3"
    - D additional = 15'-9"

#### CONCRETE STEEL

- FROM TABLE FOR 4'-3" D: 2.28 208.6
- ADD 19 X QUANTITIES FOR 1-FOOT: 9.50 519.3
- ADD 19" = 3 X 3" (3 X QUANTITIES FOR 3") 0.27 6.7
- SUBTOTAL: 9.77 535.0
- ADJUST QUANTITIES FOR THE PIPE OPENINGS (DEDUCT CONCRETE AND ADD STEEL FOR TWO 3" AND ONE 4" WALL) -0.40 +19.5
- TOTAL: 7.40 554.5

#### SECOND, COMPUTE QUANTITIES FOR THE DEPTHS BEYOND 20 FEET TO A MAXIMUM OF 30 FEET USING THE TABLE "20'-0" TO AND INCLUDING 30'-0" DEPTH", AND ADD TO THE QUANTITIES FOR 20'-0" DEPTH. ALSO, ADD THE DIFFERENCE IN STEEL IN THE BOTTOM DUE TO INCREASE IN SIZE OF BARS FROM #4 TO #8 BARS IN 7-INCH CENTERS.

#### FOR EXAMPLES:

- D required = 30'-0"
- D computed = 20'-0"
- D additional = 10'-0"

#### CONCRETE STEEL

- ADD CONCRETE (10 X QUANTITIES FOR 1-FOOT): 3.50
- ADD STEEL (10 X QUANTITIES FOR 1-FOOT): 242.70
- ADD STEEL (ADDITIONAL STEEL IN BOTTOM): 39.56
- TOTAL (30'-0" DEPTH): 10.90 836.76
- USE: 10.9 840.0

---

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

**JEFFERSON CITY, MO 65102**

**1-888-459-MODOT 11-888-677-6631**

**CONCRETE MANHOLES**

**DATE EFFECTIVE:** 02-01-2009

**DATE PREPARED:** 02-28-2009

**SHEET NO. 2 OF 2**
BENDING DIAGRAM FOR B-BARS

SECTION B-B

TYPE C COLLAR

SECTION A-A

TYPE A COLLAR

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

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

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

PIPE COLLARS

SHEET NO. 604.40F 1 OF 2
TABLE OF DIMENSIONS

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TABLE OF DIMENSIONS

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TYPE B COLLAR
FOR CONCRETE PIPE TO CORRUGATED METAL PIPE
SLOTTED PIPE DETAIL

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<th>B₃</th>
<th>B₄</th>
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<td>21&quot;²</td>
<td>20&quot;²</td>
<td>11  21</td>
</tr>
</tbody>
</table>

LOCKING PLATES REQUIRED (3)

PORTION OF END COVER PLATE IS NOT SHOWN FOR CLARITY ONLY

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

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

11) FOR STANDARD 10 FT., 12" DIA. PIPE, "C" = 0. FOR ALL OTHER PIPE SIZES "C" IS IN MULTIPLES OF "A".
12) LOCKING PLATE TO BE INSTALLED AT:
A. EACH END OF DRAIN GUIDE.
B. EACH SEAM.
C. EACH MID-POINT OF OPEN SLOT.
13) IN 20 FT. SECTION FOR TWO PIECE DRAIN GUIDE, INCREASE NUMBER OF LOCKING PLATES BY TWO.

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

SLOTTED DRAIN TYPE A

DATE EFFECTIVE: 03/01/1994
DATE PREPARED: 08/25/2009

604.70 SHEET NO. 1 OF 2
SLOTTED DRAIN
TYPE B AND TYPE C

SECTION A-A
SECTION F-F
SECTION G-G

TOP VIEW
SIDE VIEW
TYPICAL COUPLING BAND

BEARING BAR
PIPE
COUPLING BAND WIDTH
SOLID WELD SPACER
DIAMETER CARRIAGE BOLT
GALVANIZED GRATE

LONG BAND ANGLE

SECTION D-D

TOP VIEW

BEARING BAR
COUPLING BAND WIDTH
SOLID WELD SPACER
DIAMETER CARRIAGE BOLT
GALVANIZED GRATE

LONG BAND ANGLE

GRATE WELDING DETAIL

20' NOMINAL LENGTH
GRATE SLOT WELDED TO PIPE.
SEE GRATE WELDING DETAIL.

TYPICAL PIPE SECTION

GRATE WELDING DETAIL

SIDE VIEW
TYPICAL COUPLING BAND

BEARING BAR
PIPE
COUPLING BAND WIDTH
SOLID WELD SPACER
DIAMETER CARRIAGE BOLT
GALVANIZED GRATE

LONG BAND ANGLE

TYPICAL PIPE SECTION

TYPICAL COUPLING BAND

BEARING BAR
PIPE
COUPLING BAND WIDTH
SOLID WELD SPACER
DIAMETER CARRIAGE BOLT
GALVANIZED GRATE

LONG BAND ANGLE

STRUCTURAL STEEL SLOTTED DRAIN
(TYPE B)

STRUCTURAL STEEL SLOTTED DRAIN
(TYPE C)
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.


MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)
PLAN
LENGTH OF W-BEAM RAIL = 13'-6.5"
6'-5"
ELEVATION
6'-5"

STEEL POST & WOOD OR PLASTIC BLOCK

ELEVATION

TYPE A GUARDRAIL

PLAN
LENGTH OF W-BEAM RAIL = 13'-6.5"
6'-5"

STEEL POST & WOOD OR PLASTIC BLOCK

ELEVATION

TYPE B GUARDRAIL

(1) THE CONTRACTOR MAY FURNISH EQUIVALENT SECTIONS, FABRICATED FROM MATERIAL VECTED TO MEET SECTION REQUIREMENTS.

GENERAL NOTES:
SEE SHEET NO. 5 FOR FABRICATION DETAILS.
Typical Section

1. Shoulder widening shall consist of embankment material compacted in accordance with Sec 203.4 of the Standards 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

Traffic

Type A Guardrail

Traffic

Transition

Detail for transitioning between Type A and Type B guardrail

Plan

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

Elevation

Guardsail at curbs (3)

Location other than & median lateral placement of guardrail for shoulder installation

Missouri Highways and Transportation Commission

Guardsail Layout

File A: 606.004A
Sheet No.: 3 of 7

Date Effective: 09/01/2021
Date Prepared: 09/17/2021
TYPE E
FOR STEEL POST & WOOD OR PLASTIC BLOCKS (1)

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

ALTERNATE DESIGN
FOR WOOD BLOCK

(1) THE OVERALL NOMINAL DIMENSIONS SHOWN SHALL BE NET. ALTHOUGH THE SHAPE OF THE PLASTIC BLOCK MAY VARY FROM THE SHAPE SHOWN, EXCEPT THE 2 1/8" FLANGE AND THE OVERALL WIDTH DIMENSIONS MAY BE NURDER IF APPROVED BY PROJECT OPERATIONS.

GENERAL NOTES:
FOR GUARDRAIL DELINEATION DETAILS SEE
SDT PLAN 903.03.
PIER AT & OF MEDIAN
PLAN VIEW

GENERAL NOTES:

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

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

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

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

MEDIAN PIER PROTECTION BULLNOSE GUARDRAIL SYSTEM

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

606.01F SHEET NO. 2 OF 9
POSTS 2 THROUGH 8
STANDARD BLOCKS

BLOCKS FOR POSTS 9 AND 10
STANDARD BLOCKS

THRIE BEAM ANCHOR POSTS

TAPERED BLOCK

THRIE BEAM CTR POSTS

DATE EFFECTIVE: 08/01/2012
DATE PREPARED: 7/27/2012

MEDIAN PIER PROTECTION
BULLNOSE GUARDRAIL SYSTEM
POST AND BLOCKS

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

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COMMISSION
105 WEST CAPITOL
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1-888-ASK-MODOT (1-888-275-6636)

MEDIAN PIER PROTECTION
BULLNOSE GUARDRAIL SYSTEM
POST AND BLOCKS

DATE EFFECTIVE: 08/01/2012
DATE PREPARED: 7/27/2012

606.01F
SHEET NO. 4 OF 9
RAIL SECTION 1 (NOSE SECTION)

6'-3" (SHOP BEND TO 34'-2" RADIUS)
12'-6" (TANGENT SECTION FOR 3.6:1 TO 6:1 TAPERS)

RAIL SECTION 2

6'-3" (SHOP BEND TO 34'-2" RADIUS)
12'-6" (TANGENT SECTION FOR 6:1 TO 13:1 TAPERS)

RAIL SECTION 3

12'-6"
(1) STUD, THREADED ENTIRE LENGTH.

STEEL PLATE, A306
12 1/2" x 5 1/2" x 3/4"

DETAIL OF CABLE ASSEMBLY

DETAIL OF STEEL BEARING PLATE
TOP VIEW, RAIL #1

62½" RADIUS

TOP VIEW, RAIL #2

409½" RADIUS

12'-6", 12 GAGE, TYPICAL THRIE BEAM SECTION

END SECTION

"COLD TUFF" BUTTON, S-409 SIZE NO. 12 SB 2½"
STOCK NO. 1040395 FOR 3/8 DIA. (6 x 25) WIRE ROPE
(OR ANY SIMILARLY Sized SWAGE-GRIP BUTTON FERRULES)

14'-4½" CABLE LENGTH

END SECTION

FRONT VIEW (UNBENT)

12'-6"
MEDIAN WIDTH LESS THAN 50’

SECTION C-C

AREA OF MEDIAN FILL (SEE SECTION C-C)

EDGE OF SHOULDER

EDGE OF TRAVELED WAY

SHOULDER WIDTH

SHOULDER WIDTH

SHOULDER SLOPE

MEDIAN FILL

EDGE OF SHOULDER

EDGE OF TRAVELED WAY

C MEDIAN

END TERMINAL (2)

LIMITS OF END TERMINAL (2)

LIMITS OF END TERMINAL (2)

SHOULDER SLOPE

10:1

10:1

10:1

50' MIN.

50' MIN.

50' MIN.

2' MIN.

2' MIN.

2' MIN.

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

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

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

GENERAL NOTES:

TYPE B CRASH WORTHY 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

1.2 The contractor may, at his option, furnish equivalent sections fabricated from material meeting and in accordance with the requirements of ASTM A633 Grade 36 or 40. The sections shall be galvanized after fabrication in accordance with requirements of ASTM A 857.

2.6 BEARING PLATE

SECTION THROUGH THREE BEAM RAIL

GENERAL NOTES:

DESIGN BASED ON NCHRP REPORT 350 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 GRADE AND VERTICALLY IN CROSS SECTION.

WASHERS SHALL BE USED AT ALL POST BOLTS.

STRUCTURAL TENSION BLOCK SHALL BE FABRICATED FROM ASTM A570 GRADE B STEEL AND GALVANIZED.

USE 4" BUTTON-HEAD DUAL SHOULDER BOLTS WITH HEX NUTS AT ALL SLOTS (THICKNESS OF HEX NUTS = 3/8"

THE BEARING PLATE SHALL BE FABRICATED FROM GRADE 350 STEEL AND GALVANIZED.

ALL LAP SPLICE, INCLUDING END SHADES, SHALL BE MADE IN THE DIRECTION OF TRAFFIC.

SEE STANDARD PLAN 606.00 FOR DETAILS NOT SHOWN.

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

COVER PLATE PANELS ARE 1/4" THICK.

ALL STIFFENERS ARE 3/8" 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".

WELDING INSTRUCTION

- ALL FILLET WELDS SHALL BE 1" LONG SPACED AT 2".

BRIDGE ANCHOR SECTION
 SAFETY BARRIER CURB ON BRIDGE (CONNECTOR PLATE DETAIL)
WELDING INSTRUCTION

1. STIFFENERS LOCATED AT THE OUTSIDE EDGES OF THE COVER PLATE SHALL BE WELDED AS FOLLOWS:
   - Single bevel groove weld on external sides and fillet weld by 1" long spaced at 2" on internal sides.

2. STIFFENERS LOCATED ON THE INSIDE OF THE COVER PLATE SHALL BE WELDED AS FOLLOWS:
   - Fillet weld by 1" long spaced at 2".

CONNECTOR PLATE DIMENSION
(PER ASSEMBLY)

<table>
<thead>
<tr>
<th>PLATE</th>
<th>SHAPE</th>
<th>SIZE (L x W x C x D)</th>
<th>THICKNESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>1</td>
<td>20&quot; x 20&quot;</td>
<td>1/8&quot;</td>
</tr>
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<td>P2</td>
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<td>P3</td>
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<td>16&quot; x 16&quot; x 16&quot;</td>
<td>1/8&quot;</td>
</tr>
<tr>
<td>P4</td>
<td>1</td>
<td>12&quot; x 12&quot; x 12&quot;</td>
<td>1/8&quot;</td>
</tr>
<tr>
<td>P5</td>
<td>1</td>
<td>8&quot; x 8&quot; x 8&quot;</td>
<td>1/8&quot;</td>
</tr>
</tbody>
</table>

GENERAL NOTES:
- COVER PLATE PANELS ARE 1/8" THICK.
- ALL STIFFENERS ARE 1/8" THICK.
- CONNECTOR PLATE SHALL BE FABRICATED FROM 45TH GRADE 4336 STEEL AND GALLACTIZED.
- FOR GALLACTIZED REQUIREMENTS, SEE SEC 1040 OF THE STANDARD SPECIFICATIONS.
- ALL HOLE DIAMETERS SHALL BE 1/2".

BRIDGE ANCHOR SECTION
SAFETY BARRIER CURB ON BRIDGE
(CONNECTOR PLATE DETAIL)
SINGLE SLOPE BARRIERS
BRIDGE ANCHOR SECTION (THREE BEAM RAIL)

PLAN

THREE BEAM RAIL

BRIDGE ANCHOR SECTION (THREE BEAM RAIL)

TYPE A

TRANSITION SECTION

TYPE A

COMBINATION

PART SECTION THROUGH SLAB AT END OF WING

1 - FIRST 6" X 20 FOOT OF BRIDGE WITH 6" X 15 STEEL BLOCK.

NOTES:

(1) AT CONTRACTOR'S OPTION, EQUIVALENT SECTIONS MAY BE FABRICATED FROM MATERIAL MEETING AND IN ACCORDANCE WITH THE REQUIREMENTS OF ASTM A572.

(2) VERIFY BY RAIL TRANSITION PROTECTION.

(3) TRANSITION FROM 21" TO 25" HEIGHT OVER NEXT TWO RIPSTREAM 12'-6" A-BEAM FAILS.

FOR GENERAL NOTES, SEE SHEET 2 OF 5.

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

1. DESIGN BASED ON NCHRP REPORT 350 TEST LEVEL 3 (L=3). 
2. THE THREE BEAM RAIL FOR THE BRIDGE ANCHOR SECTION SHALL BE FIXED OR SUPPORTED AT THE CONNECTION SECTION AND TRANSITION SECTION SHALL BE SIMILAR. 
3. THE TRANSPORTATION OF STRUCTURAL STEEL SHALL BE WITH 40,000 GRADE 30 FOR STEEL. 
4. FOR PROTECTION AND MATERIAL REQUIREMENTS, SEE SIDE 310 OF THE STANDARD SPECIFICATIONS. 
5. FOR THE PROJECT, COATING AND MATERIAL REQUIREMENTS, SEE SIDE 310 OF THE STANDARD SPECIFICATIONS. 
6. ALL RAIL POSTS SHALL BE SLIPPED IN A TIGHT AND VERTICALLY WITHIN THE CONNECTING BLOCKOUT. 
7. WASHERS SHALL BE USED AT ALL POST BOLTS. 
8. USE 4" X 4" X 1" TUBULAR STEEL FOR ALL BOLTS. 
9. THE LENGTH OF WEAR CAPS SHALL BE MADE IN THE DIRECTION OF TRAFFIC. 
10. THE COST OF INSTALLING TRANSITION SECTION COMPLETE-IN-PLACE SHALL BE PAID FOR AT THE CONTRACT UNIT PRICE PER FEET. 
11. THE COST OF INSTALLING TRANSITION SECTION COMPLETE-IN-PLACE SHALL BE PAID FOR AT THE CONTRACT UNIT PRICE PER FEET. 
12. FOR DETAILS NOT SHOWN, SEE BRIDGE THREE BEAM RAIL SHEET.
DETAIL C
ASSEMBLED VIEW
(ANCHOR PLATE)

1" HEX NUT AND LOCK WASHER
2" PLATE
3/4" DIA M. HOLE

2"
4"
4"
4"
2"
1/4"

(1) STAIN THREADED ENTIRE LENGTH.
(2) 6-32 HANGING FOR TYPE C OR E CULVERT; 3-1/2" HANGING FOR TYPE D CULVERT.
(3) 27° ANGULAR BIT LESS THAN 1/16 FOR TYPE C CULVERT;
4" MINIMUM FOR TYPE D CULVERT.

DETAIL B
(CABLE ASSEMBLY)

FLAT WASHER
LOCK WASHER
1" HEX NUT
STANDARD NIPPLE FITTING
AND NUT

END ANCHOR

B E N D 6-3/8" C U L V E R T

1/2" D I A M . H O L E

EDGE OF SHOULDER

LAP FILL OVER END SECTION

POST 1

POST 2

ELEVATION
END ANCHOR

FINISHED GRADE LINE

DETAIL A

LAP CABLE TO ENSURE駐LE LOCATION

FACE OF CULVERT

105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-605-MODOT 1-888-605-6636

GUARDRAIL
TERMINAL ANCHOR ENDS

DATE EFFECTIVE: 06/24/2017
DATE PREPARED: 07/20/2017
SHEET NO. 2 OF 7
606.30K
SECTION A-A
EXPANDED POLYSTYRENE FOAM
INSTALLATION DETAIL

CONCRETE FOUNDATION FOR END ANCHORS

SOIL PLATE

WOOD BREAKAWAY POST
SEE SECTION 1050

GENERAL NOTES:

1. 8-112" FOR CONCRETE FOUNDATION ALTERNATE.
2. 3-1/4" FOR CONCRETE FOUNDATION ALTERNATE.

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

INSTALLATION OF WOOD POST MAY BE NEEDED FOR CONCRETE FOUNDATION.

STEEL TUBE FOUNDATIONS SHALL BE FILLED AND BACK-
FILLED WITH A SUITABLE MATERIAL. WHEN THE SOIL PLATE IS FILLED AS SHOWN TO THE STEEL TUBE, STEEL TUBE
FOUNDATION MAY BE DRIVEN WHEN THE SOIL PLATE IS WELDED AS SHOWN TO THE STEEL TUBE.

GUARDRAIL TERMINAL ANCHOR ENDS

DATE EFFECTIVE: 06/01/2017
DATE REVISED: 07/05/2017
606.30K SHEET NO. 3 OF 7
ELEVATION
ANCHORED IN BACKSLOPE GUARDRAIL

GENERAL NOTES:
FOR THE ANCHOR DETAILS, SEE SHEET 4-3 OR 7.
EACH FOOT FOOT IS REQUIRED WITH RUBRAIL.
RUBRAIL DESIGN WHEN THE DISTANCE BETWEEN THE GUARDRAIL AND THE CUTOFF IS TO BE INCREASED.
THE GUARDRAIL ANCHOR SHALL BE PLUMB AND CONFORM TO THE ELEVATION SHOWN IN SHEET 5-7.
THE CONTRACTOR IS TO PROVIDE THE GUARDRAIL ANCHOR AND TERMINAL CONNECTOR.
THE ELEVATION OF SUCH GUARDRAIL ANCHOR IS TO MATCH THE ELEVATION SHOWN ON SHEET 5-7.
ELECTRICAL TERMINAL MUST BE USED FOR ANY GUARDRAIL ANCHOR.
THE GUARDRAIL ANCHOR SHALL CONFORM TO THE ELEVATION SHOWN ON SHEET 5-7.

FOR THE RUBRAIL DETAILS, SEE SHEET 4-3 OR 7.
RUBRAIL DESIGN WHEN THE DISTANCE BETWEEN THE GUARDRAIL AND THE CUTOFF IS TO BE INCREASED.
THE GUARDRAIL ANCHOR SHALL BE PLUMB AND CONFORM TO THE ELEVATION SHOWN IN SHEET 5-7.
THE CONTRACTOR IS TO PROVIDE THE GUARDRAIL ANCHOR AND TERMINAL CONNECTOR.
THE ELEVATION OF SUCH GUARDRAIL ANCHOR IS TO MATCH THE ELEVATION SHOWN ON SHEET 5-7.
ELECTRICAL TERMINAL MUST BE USED FOR ANY GUARDRAIL ANCHOR.
THE GUARDRAIL ANCHOR SHALL CONFORM TO THE ELEVATION SHOWN ON SHEET 5-7.

FOR THE ROCK FACE GUARDRAIL ANCHOR DETAILS, SEE SHEET 4-3 OR 7.
RUBRAIL DESIGN WHEN THE DISTANCE BETWEEN THE GUARDRAIL AND THE CUTOFF IS TO BE INCREASED.
THE GUARDRAIL ANCHOR SHALL BE PLUMB AND CONFORM TO THE ELEVATION SHOWN IN SHEET 5-7.
THE CONTRACTOR IS TO PROVIDE THE GUARDRAIL ANCHOR AND TERMINAL CONNECTOR.
THE ELEVATION OF SUCH GUARDRAIL ANCHOR IS TO MATCH THE ELEVATION SHOWN ON SHEET 5-7.
ELECTRICAL TERMINAL MUST BE USED FOR ANY GUARDRAIL ANCHOR.
THE GUARDRAIL ANCHOR SHALL CONFORM TO THE ELEVATION SHOWN ON SHEET 5-7.
3 - 1" holes to be field drilled in V-beam element and attached with:
- 1" hex head bolt
- 2.5" long each with one square washer and hex nut.

1" hole to be field drilled through V-beam and through post flange, attached to beam with:
- 1" hex head bolt
- 2.5" long with one square washer and hex nut.

4" fillet weld plate to post both sides of post.

EMBEDDED STEEL POST

SPECIAL RUBRAIL TO POST CONNECTION AT POST A
CONCRETE BLOCK ANCHOR
ANCHOR ASSEMBLY

END OF INSERT TO BE COVERED

THREADED INSERTS FOR 2" X 2"
CONCRETE BLOCKS ARE RECOMMENDED.
CAP SCREWS TO BE THREADED INTO MINIMUM 1/4" INSERTS THREADED VERTICAL OF 1/2".

TOP VIEW

TERMINAL CONNECTOR

ELEVATION

CONCRETE BLOCK ANCHOR
(24" X 24" X 36")

3 - 1/2" HOOPS
30" X 16"

ELEVATION OF 6' POST

ELEVATION 8' POST

STEEL POST AND BLOCK DETAIL

STEEL POST

PLAN

FOR ADDITIONAL DETAIL OF POST AND BLOCK
DETAILS SEE SHEET 606.30B.

GUARDRAIL
EMBEDDED TERMINAL ENDS
GENERAL DETAILS

606.30K
7 OF 7
GRADING LIMITS FOR FLARED CRASHWORTHY END TERMINALS

STANDARD GRADING LIMITS FOR CRASHWORTHY END TERMINALS

ALTERNATE GRADING LIMITS FOR CRASHWORTHY END TERMINALS

GENERAL NOTES:

1. STANDARD GRADING LIMITS SHALL BE WIDEN WHEN CONSTRUCTING A NEW ROADWAY. ALTERNATE GRADING LIMITS ARE ALLOWABLE ON EXISTING ROADSides EXCEPT WHEN STANDARD GRADING IS INDICATED ON THE PLANS.

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

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

EXPANDABLE OR SCREW TYPE ANCHOR

12'-6"

CABLE END

$\frac{3}{4}$" CABLE

ANCHOR ASSEMBLY

GROUND LINE OR SHOULDER ELEVATION

300' MAX. (BETWEEN ANCHORS)

END ANCHOR

LINE POST

ELEVATION

INTERMEDIATE ANCHOR

5'-0"

$\frac{1}{8}$" DIA.

NOT REQUIRED FOR LINE POST

$\frac{1}{4}$" BOLT AND WASHER

$\frac{1}{8}$" HOLE

1" X $\frac{3}{8}$" CLAMP

CABLE

CABLE END

CABLE

$\frac{1}{4}$" DIA.

NOT REQUIRED FOR LINE POST

$\frac{1}{4}$" X $\frac{3}{8}$" LAG SCREW

STEEL POST

WOOD POST

S3 X 5.7 STD. BEAM

4" X 4" SQUARE OR 4" ROUND

POST DETAILS

ONE-STRAND ACCESS RESTRAINT CABLE

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-456-MODOT (1-888-275-6636)

07/01/2004 DATE EFFECTIVE:
8/23/2009 DATE PREPARED:

606.40D SHEET NO.
1 OF 2
ACCESS-RESTRAINT CABLE GREATER THAN 500 FEET IN LENGTH REQUIRES AN INTERMEDlATE ANCHOR AS SHOWN.

splice detail

ANCHOR ROD ASSEMBLY

CABLE END

TYPICAL LOCATION
SHOULDER INSTALLATION

ONE-STRAND ACCESS RESTRAINT CABLE

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

DATE EFFECTIVE: 07/01/2004
DATE PREPARED: 08/21/2009

SHEET NO. 2 OF 2
GUARD CABLE TO GUARDRAIL TRANSITION AT MEDIAN OBSTACLE

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

GENERAL NOTES:

WHEN GUARD CABLE IS LOCATED ALONG THE MEDIAN CENTERLINE NEAR A BRIDGE END OR CONCRETE EMBANKMENT, IT SHALL BE DESIGNED BEHIND THE EMBANKMENT, EMBANKMENT OR HILLTOP CABLE SUPPORT ASSEMBLY TO BE CONSTRUCTED SO THAT IT IS PROTECTED BY THE GUARDRAIL.

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

SUITSABLE DRAINAGE MUST BE PROVIDED WHEN MEDIAN GRADING EXCEEDS NORMAL FLOOD LEVEL.

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 SPACING, IT SHALL BE SHOWN BEHIND THE GUARDRAIL ASSEMBLY WITH THE GUARD CABLE ASSEMBLY. THE GUARD CABLE ASSEMBLY SHALL BE DESIGNED SO THAT IT IS PROTECTED BY THE GUARDRAIL.

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

SUITEABLE GRADE MUST BE PROVIDED WHEN MEDIAN GUARD CABLE INTERFACE NORMAL FLOW.

TYPICAL GUARD CABLE TO GUARDRAIL TRANSITION ELEVATION
PLAN VIEW

1. 2'-0" minimum clearance to the face of obstacle with 6'-3" post spacing.
2. 3'-0" minimum clearance to the face of obstacle with 3'-14" post spacing.
3. 1'-0" minimum clearance to the face of obstacle with 1'-6" post spacing.

GENERAL NOTES:

FOR INITIAL INSTALLATION, CONSTRUCT THE GUARDRAIL WITHIN 1" OF THE STANDARD HEIGHT TO THE TOP OF THE BEAM. FOR SUBSEQUENT PROJECTS SUCH AS REPAIRS, THE HEIGHT OF EXISTING GUARDRAIL INSERTS IS NOT REQUIRED TO BE REPAIRED, IF THE FINISHED HEIGHT IS WITHIN 1" OF THE STANDARD HEIGHT.

THE STANDARD POST LENGTH IS 6'-0" (+1/4" - 0" TOLERANCE).

THE SUBSTITUTION OF 8 FOOT POSTS IN LIEU OF REQUIRED 6 FOOT POSTS TO CONSTRUCT LESS THAN THE DESIGNED TOTAL LENGTH MAY NOT BE ALLOWED.

REFER TO SECTION A-A FOR DIMENSIONAL DETAILS OF W-BEAM, ROLLER BAR RELIEF AND END SECTIONS. BEAM SPLEES, POST AND SPICE BOLTS, NUTS AND TYPICAL W-BEAM TO THREE BEAM TRANSITION SECTIONS.

BEAM NERNSERS ARE NOT TO BE USED. BOLTGRADE SHALL BE ASTM A325.

UNLESS OTHERWISE SPECIFIED, W-BEAM RAIL IS 12 GAUGE STEEL WITH AN EFFECTIVE LENGTH OF 10'-0" OR 25'-0".

FOR PROTECTION OF MATERIAI REQUIREMENTS, SEE SECTION 10 OF THE STANDARD SPECIFICATIONS.

TRANSITION BETWEEN RAILS OR BETWEEN A RAIL AND TERMINAL CONNECTORS IN THE DIRECTION OF TRAFFIC: USE THE FLANGED END SECTION IN THE DIRECTION OF TRAFFIC.
MGS GUARDRAIL AT CURB

MAX. DISTANCE FACE OF CURB CAN BE IN FRONT OF FACE OF GUARDRAIL

ALTERNATE MGS AT CURB

FOR STEEL POST AND NOTCHED WOOD OR PLASTIC BLOCK

HOLE PUNCHING DETAIL

MAX. TWO HOLES CAN BE PROVIDED ON EACH FLANGE OF POST. ONLY ONE IS REQUIRED FOR FLANGE OF POST THAT HAS A BLOCK ATTACHMENT.

RAIL ELEMENT SPLICE DETAIL

DELINERATORS ON GUARDRAIL

GENERAL NOTES:

FOR GUARDRAIL DELINERATION DETAILS SEE
STC PLAN 903.03.
MGS Guardrail with 3'-1\(\frac{1}{2}\)" Post Spacing

MGS Guardrail with 1'-6\(\frac{1}{2}\)" Post Spacing

General Notes:

- All notes cannot be used together:
  - Post Spacing is less than 6'-6"
  - Within Crashworthy End Terminals
  - Within Vertical Barrier Transitions (606.60)
  - Within Bridge Approach Transitions (606.70)

11: 25 FEET IF MGS 3'-14" POST SPACING GUARDRAIL IS REQUIRED ON APPROACH AND DEPARTURE ENDS OF 1'-6" 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. GAP DEPLOYMENT OF 8'-0" POSTS WILL ONLY BE ALLOWED IN ACCORDANCE WITH SPECIAL INSTALLATIONS AS SHOWN ON SHEET D OR E.
SETTING POST IN SOLID ROCK

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

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

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

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

GENERAL NOTES:
HOLE IN SOLID ROCK SHALL PROVIDE A DIAMETER OF NOT
LESS THAN 4 INCHES GREATER THAN THE MAXIMUM
TRANSVERSE DIMENSION OF THE POST SECTION.
POST MAY BE SHORTER WHERE PLACED IN 2 FEET OF SOLID
ROCK. STEEL POSTS MAY BE FLAGE OR SAW CUT. REPAIR
OF CUT SHALL BE IN ACCORDANCE WITH SECTION OF THE
STANDARD SPECIFICATIONS.

SETTING POST THROUGH ASPHALT ≤ 2" THICK
SECTION A-A
8' STEEL POST

ALTERNATE SECTION A-A
MAXIMUM LATERAL PLACEMENT OF 8' STEEL POSTS ADJACENT TO SLOPES

GENERAL NOTES:
SEE STD. PLAN 505.81 FOR SITE GRADING REQUIREMENTS FOR CRASHWORTHY END TERMINALS.

8 FOOT POSTS SHALL BE USED WHEN LESS THAN 2 FEET OF EMBANKMENT IS PRESENT BETWEEN THE BACK OF THE GUARDRAIL POST AND THE SLIP HINGE POINT. THE SUBSTITUTION OF 6 FOOT POSTS IN LIEU OF 8 FOOT POSTS AS TO CONSTRUCT LESS THAN THE DESIGNED TYPICAL SECTION, SHALL NOT BE ALLOWED.
MGS BLOCK AND HEIGHT TRANSITION FROM TYPE A GUARDRAIL TO MGS GUARDRAIL

NOTES:
1) WHERE FOOT OFFSET IS CONSTRUCTED, ANY PART OF THE EXISTING SHOULDER MUST BE MINIMUM OF 6 FEET LONG TO ACCELEATE THE 10 INCH BLOCKS OF THE MGS GUARDRAIL. WHERE SITE CONSTRUCTION PROHIBITS USE OF ENGAGEMENT CANNOT BE CONSTRUCTED TO PROVIDE A MINIMUM OF 2 FEET BETWEEN THE EDGE OF THE GUARDRAIL FOOT AND SLOPE ENGAGEMENT. 3 FOOT POSTS SHALL BE MINIMUM. SEE SHEET 8 OF 8. THE SUBSTITUTION OF 3 FOOT POSTS FOR REQUIRED ENGAGEMENT SHALL NOT BE ALLOWED.

2) MGS TRANSITION FROM TYPE A GUARDRAIL SHALL BE COMPLETED OUTSIDE THE 50 FT. MGS ENGAGEMENT LIMITS.

MIDWEST GUARDRAIL SYSTEM (MGS) BLOCK AND HEIGHT TRANSITION
PIER AT MEDIAN

1. 3'-0" MINIMUM CLEARANCE TO THE FACE OF OBSTACLE WITH 6'-0" FOOT SPACING IS PREFERRED
   2'-0" MINIMUM CLEARANCE FOR 3'-0" FOOT SPACING
   1'-0" MINIMUM CLEARANCE FOR 1'-0" FOOT SPACING
   SEE DETAIL PLANS 606.50 FOR FOOT SPACING DETAILS.

2. TRANSITION DANRE SLOPE (Pier to Guardrail Height) 1/1-2 1/2" at Pier for Type B Crashworthy End Terminal Per Manufacturer's Requirements. See DETAIL PLANS 606.50 FOR HEIGH TRANSITION DETAILS.

3. CONTINUE 1/34 SLOPE TO OBSTACLE OR A MINIMUM OF 2' FAST THE FACE OF THE GUARDRAIL FOOT.

4. 10'-0" FLIPE RATE OR AS RECOMMENDED BY TABLE 5-3 OF THE LATEST VERSION OF THE "ROADSIDE DESIGN GUIDES".

MEDIAN WIDTH LESS THAN 60'

EDGE OF TRAVELLED WAY

EDGE OF SHOULDER

L MEDIAN AND OBSTACLE

SECTION A-A

DETAI A

(GRADING LIMITS)

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

MGS GUARDRAIL

MEDIAN PIER PROTECTION

MEDIAN LESS THAN 60'
PIER AT MEDIAN

1. 36" MINIMUM CLEARANCE TO THE FACE OF GUARDRAIL WITH 6'-3" POST SPACING IS PREFERRED.

2. 30" MINIMUM CLEARANCE TO THE FACE OF GUARDRAIL WITH 7'-6" POST SPACING

3. FOR MEDIAN WIDTHS GREATER THAN 60', THE PIER OBSTACLES ARE BEYOND THE CLEAR-ZONE DO NOT REQUIRE MEDIAN PIER PROTECTION.

4. GENERAL NOTES:
   MEDIAN WIDTHS LESS THAN 60' THAT THE PIER OBSTACLES ARE BEYOND THE CLEAR-ZONE DO NOT REQUIRE MEDIAN PIER PROTECTION. FOR CLEAR-ZONE DISTANCES, SEE THE LATEST VERSION OF THE "FREEDOM DESIGN GUIDE 3.1 THE CLEAR-ZONE CONCEPT."

5. TYPE "A" NON-FLARED CRASHWORTHY END TERMINAL SHALL BE THE LATEST VERSION AND SHALL BE INSTALLED ACCORDING TO MANUFACTURER'S RECOMMENDATIONS.
PLATE AND STIFFENER IDENTIFICATION

1. COVER PLATE #1
2. COVER PLATE #2
3. STIFFENER #1: 1 EACH
4. STIFFENER #2: 1 EACH
5. STIFFENER #3: 1 EACH
6. STIFFENER #4: 1 EACH
7. STIFFENER #5: 1 EACH
8. STIFFENER #6: 1 EACH
9. STIFFENER #7: 1 EACH
10. STIFFENER #8: 1 EACH
11. STIFFENER #9: 1 EACH
12. STIFFENER #10: 1 EACH
13. STIFFENER #11: 1 EACH
14. STIFFENER #12: 1 EACH
15. STIFFENER #13: 1 EACH
16. STIFFENER #14: 1 EACH
WELDING INSTRUCTION

ALL FILLET WELDS SHALL BE 1/8" LONG SPACED AT 2".

GENERAL NOTES:

COVER PLATE PANELS ARE 3/8" THICK.
ALL STIFFENERS ARE 1" THICK.
CONNECTOR PLATE SHALL BE FABRICATED FROM 45# GRADE
2" THICK AND GALVANIZED.
FOR GALVANIZED REQUIREMENTS, SEE SECTION 1060 OF THE
STEEL 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 GROOVE WELD ON EXTERNAL SIDES ARE 1/2" FILLET WELD BY 1" LONG SPACED AT 2" ON INTERNAL SIDES.
2. STIFFENERS LOCATED ON THE INSIDE OF THE COVER PLATE SHALL BE WELDED AS FOLLOWS:
   - 1/2" FILLET WELD BY 1" LONG SPACED AT 2".

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

CONNECTOR PLATE DIMENSION
(PER ASSEMBLY)

<table>
<thead>
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<th>PLATE</th>
<th>QUANTITY</th>
<th>SHAPE</th>
<th>SIZE (A X B X C X D)</th>
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GENERAL NOTES:
- COVER PLATE PANELS ARE 1/2" THICK.
- ALL STIFFENERS ARE 1/2" THICK.
- CONNECTOR PLATE SHALL BE FABRICATED FROM 40400 SESS AND STEEL.
- FOR GALVANIZED REQUIREMENTS, SEE SECTION 10040 OF THE STANDARD SPECIFICATIONS.
- ALL MALLE DIAMETERS SHALL BE 1/2".
STEEL POST AND STEEL BLOCK (1)

STEEL POST AND WOOD BLOCK (2) THROUGH (5)

GENERAL NOTES:
- DESIGN BASED ON MAIN TEST LEVEL 3 (75-3).
- PREQUALIFIED STRUCTURAL STEEL SHALL BE ASTM A36 GRADE 30.
- FOR PROTECTIVE COATING AND MATERIAL REQUIREMENTS, SEE SECTION 12.0 OF THE STANDARD SPECIFICATIONS.
- RAIL POSTS SHALL BE SET PERPENDICULAR TO THE ROADWAY PROFILE GRDE AND VERTICALLY IN CROSS SECTION.
- USE 3/8" BOLT-HEADED CONICAL SHOULDER BOLTS WITH KEY NUTS. COMPLETE INSTALLATION OF BOLTS AND NUTS AT ALL BOLTS.
- ALL LIP SPLICES SHALL BE MIG IN THE DIRECTION OF TRAFFIC.
- THE COST OF FURNISHING, FABRICATING AND INSTALLING TRANSITION SECTIONS, COMPLETE BLOCKS, SHALL BE PAID FOR AT THE CONTRACT UNIT PRICE PER EACH.
- THE COST OF FURNISHING, FABRICATING AND INSTALLING BRIDGE ENDCAP SECTION THREE BEAMS COMPLETE BLOCKS, SHALL BE PAID FOR AT THE CONTRACT UNIT PRICE PER EACH.

FOR DETAILS NOT ShOWN, SEE BRIDGE THEORETICAL RAIL SHEET.
STEEL POST AND WOOD BLOCK

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

THRIE BEAM RAIL SPLICE AT POST

ASYMMETRICAL TRANSITION SECTION
TYPE 2 BREAKAWAY WOOD POST

STEEL GROUND FOUNDATION TUBE

STRUT AND YOKE ASSEMBLY
**PLAN VIEW**

**ELEVATION**

ANCHORED IN BACKSLOPE GUARDRAIL

- Height of guardrail is parallel to roadway.
- Cost of grooved face for placing of terminal connectors, drilling holes, furnishing and placing bolts, washers, cutting anchors, and the grade to be utilized in the face of guardrail anchor, rock face.

**SECTION A-A**

- 12.5:1 Min. for 340 VPH Design speed 91:1 for 600 VPH Measurable along the falls face.

**SECTION B-B**

- 25° Min. Top of Fill.

**SECTION C-C**

- Anchor in concrete block not flatter than 2:1, steel foot.

**SECTION D-D**

- 6" Min. Not flatter than 2:1.

**GENERAL NOTES**

- For end anchor details, see Sheet 1-3 of 7.
- Guardrail begins when the distance between the guardrail and the grade is 10' and increasing.
- End anchor foot 1 and 2 shall have foundation type as shown on Sheet 3 of 7.
- The contract unit price for embedded guardrail anchor shall include the concrete anchor, excavation and re-filling of terminal connector, and all incidental hardware and work necessary to complete the installation.
- The embedded anchor transition shall extend 1/2" below the ditch line and terminate a minimum of 12 inches below ground elevation of the back slope.
- Eclipsors will not be placed for any foot which will be completely being covered; the alignment of such foot shall be approved by the engineer.

**MIDWEST GUARDRAIL SYSTEM (MGS)**

TERMINAL ENDS

EMBEDDED AND ROCK FACE

(V-Ditch Steeper than 10:1, 4:1 Max. Foorslope)

**ROCK FACE GUARDRAIL ANCHOR**

- Height above ditch is equal to fall elevation at the ditch crossing.

**DITCH ELEVATION**

- 6" High-Med Machine bolts and washers.

**DITCH CROSSING**

- Anchor terminal connector to face of rock cut.

**FIELD EDGE**

- Detail A

**MIDWEST HIGHWAY AND TRANSPORTATION COMMISSION**

101 WEST CAPITAL
JEFFERSON CITY, MO 65102
1-888-443-MOHIKE (1-888-443-6645)
1-573-265-6000
1-888-443-MOHIKE (1-888-443-6645)
1-573-265-6000

**MIDWEST GUARDRAIL SYSTEM (MGS)**

TERMINAL ENDS

EMBEDDED AND ROCK FACE

(V-Ditch Steeper than 10:1, 4:1 Max. Foorslope)

**ROCK FACE GUARDRAIL ANCHOR**

- Height above ditch is equal to fall elevation at the ditch crossing.

**DITCH ELEVATION**

- 6" High-Med Machine bolts and washers.

**DITCH CROSSING**

- Anchor terminal connector to face of rock cut.

**FIELD EDGE**

- Detail A
EMBEDDED STEEL POST

3 - 1" O Holes to be field drilled in V-beam element and attached with 1/4" hex washer bolt. 1½" long each with one square washer and hex nut.

1" O Hole to be field drilled through V-beam element and attached with 1/4" hex washer bolt. 1½" long each with one square washer and hex nut.

1¼" x 1½" steel plate

4" Fillet weld plate to post both sides of post

5½" x 1½" steel plate

1½" O Vone or flange block

1½" Fillet weld plate to post both sides of post

SPECIAL RUBRAIL TO POST CONNECTION AT POST A
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 roadway. Alternate grading limits are allowable on existing roadways except when standard grading is indicated on the plans.

The contractor shall provide the engineer with approved shop drawings of the Mass Accelerated Safety Highway End Terminal.

End anchors shall be installed on ends of guardrail runs where crashworthy end terminals are not required.

Missouri Highways and Transportation Commission

Type A
Grading Limits

MoDOT

Crashworthy End Terminals

Sheet No. 1 of 1

606.81B

Date: 03/01/2020

State Highway Commission of the State of Missouri

105 West Capitol
Jefferson City, MO 65102
1-800-428-MODOT (663-6868)
WIRE SIZE AND HEIGHT OF FABRIC

SPECIFIED DIAMETER

FABRIC INCHES

GAGE MESH INCHES INCHES

0.120 11 2 36. 42
0.148 9 2 48. 60
0.192 6 2 72. 84

DATE EFFECTIVE: 02/10/2007

DATE PREPARED: 08/21/2009

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 Ø IN SOLID ROCK SHALL PROVIDE A DIAMETER OF NOT LESS THAN Ø GREATER THAN THE MAXIMUM TRANSVERSE DIMENSION OF THE POST SECTION.

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

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

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°.

PRIVATE FENCE

1:1 SLOPE

TYPICAL TRENCH DETAILS

TYPICAL LOCATION

POST TOPS

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

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

CHAIN-LINK FENCE

DATE EFFECTIVE: 08/01/2007

DATE PREPARED: 08/21/2009

SHEET NO. 1 OF 1

607.10V
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**

**Plan Of Floor Plate**

**Section A-A**

**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".

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**Missouri Highways and Transportation Commission**

105 West Capitol
Jefferson City, MO 65102

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

Date Prepared: 4/30/2009
Date Effective: 6/01/2009

607.11H Sheet No. 1 of 1
END POST ASSEMBLY

LINE POST

STEEL POST

CORNER OR PULL POST ASSEMBLY

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

POORLY DEFINED CHANNELS (SMALL DRAINAGE AREAS)

WELL DEFINED CHANNELS (LARGE DRAINAGE AREAS)

TYPICAL FENCING AT CHANNEL CROSSING
TRANSVERSE CONCRETE RAMPS

CURB RAMP

EXISTING PAVEMENT SHALL BE SHAPED TO PROVIDE A SMOOTH VERTICAL PLANE.

SHAPED TO PROVIDE A SMOOTH VERTICAL PLANE.

SECTION A-A

SECTION B-B

SECTION C-C

SECTION D-D

GENERAL NOTES:

WHERE PAVED APPROACH MEETS EXISTING CONCRETE PAVEMENT OR SIDEWALK, PLACE 1/2" PREFORMED FIBER EXPANSION JOINT, CUT TO TEMPLATE, THROUGH NEW CONCRETE AND 1" FROM JUNCTION WITH EXISTING CONCRETE, OR ALONG CURB AND GUTTER SECTIONS. GROUND COVER SHALL CONFORM TO FINISHED GRADING FOR CURB AND GUTTER SECTIONS

CONTINUE WHERE REQUIRED TO MEET EXISTING PAVEMENT.

EXTEND WHERE REQUIRED TO MEET EXISTING IMPROVEMENTS.

SEE STANDARD PLAN 502.05 FOR JOINT DETAILS.

SEE STANDARD PLAN 502.00 FOR TRANSVERSE EXPANSION JOINT DETAILS.

WHERE DRAINAGE IS NOT TO BE CARRIED ACROSS THE PAVED APPROACH, SEE STANDARD PLAN 608.10 FOR CONCRETE CURB RAMPS.

HAND FINISHING PERMITTED ON PAVED APPROACH.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
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PAVED APPROACHES
ADJOINING CURB AND GUTTER SECTIONS

DATE EFFECTIVE: 10/01/2009
DATE PREPARED: 8/30/2000
608.00H SHEET NO: 1 OF 2
EXISTING PAVEMENT SHALL BE SHAPED TO PROVIDE A SMOOTH VERTICAL PLANE.

SECTION F-F

SECTION G-G

SECTION H-H

SECTION J-J

SECTION K-K

SECTION L-L

SECTION M-M

SECTION N-N

SECTION O-O

SECTION P-P

SECTION Q-Q

SECTION R-R

SECTION S-S

SECTION T-T

SECTION U-U

SECTION V-V

SECTION W-W

SECTION X-X

SECTION Y-Y

SECTION Z-Z

GENERAL NOTES:

1. The number of joints shown in paved approach are for illustrative purposes only. Joints placed in paved approaches shall match the 400-10 expansion joint transverse mainline pavement joint location.

2. 6" - Except where varied to meet existing improvements.

3. 8" - NRCCP - for street, sideroad, alley or commercial approaches.

4. Extend where required to meet existing pavement.

5. Vary to meet existing improvements.

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. 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" OVER 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 GUTTER. GROUND COVER SHALL CONFORM TO FINISHED GRADING FOR CURB RAMP.

HAND FINISHING PERMITTED ON PAVED APPROACH.

MUL CHAINWALKS ARE PRESENT ADJACENT TO THE PAVED APPROACHES OF THE CLASSROOM BUILDINGS AND THE APPROACHES TO THE GRADE OF THE APPROACH BY WAY OF AN APPROPRIATE RAMP AS SHOWN ON THE PLANS. SEE 608.10 FOR RAMP DETAILS.

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

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

PLANNING OF STREET, SIDEROADS, ALLEYS OR COMMERCIAL APPROACHES

PLAN OF STREET, SIDEROAD, ALLEY OR COMMERCIAL APPROACHES

CROSS-HATCHED AREA TO BE MONOLITHIC WITH MAINLINE PAVEMENT

TONGUE AND GROOVE JOINT (NO TIE BARS) FOR PCC MAINLINE PAVEMENT ONLY

PREFORMED FIBER EXPANSION JOINT

TONGUE AND GROOVE JOINT (NO TIE BARS) FOR PCC MAINLINE PAVEMENT ONLY

PREFORMED FIBER EXPANSION JOINT

CROWN TO BE ESTABLISHED BY ENGINEER

SMOOTH VERTICAL PLANE

EXISTING PAVEMENT SHALL BE SHAPED TO PROVIDE A SMOOTH VERTICAL PLANE.

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.

SEE STANDARD PLAN 608.10 FOR CONCRETE CURB RAMPS.

SEE STANDARD PLAN 502.05 FOR JOINT DETAILS.

1. THE NUMBER OF JOINTS SHOWN IN PAVED APPROACH ARE FOR ILLUSTRATIVE PURPOSES ONLY. Joints placed in paved approaches shall match the expansion joint transverse mainline pavement joint location.

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HAND FINISHING PERMITTED ON PAVED APPROACH.

SIDEROADS AND PRIVATE ENSUES ARE PRESENT ADJACENT TO THE PAVED APPROACHES OF THE APPROACHES TO THE GRADE OF THE APPROACH BY WAY OF AN APPROPRIATE RAMP AS SHOWN ON THE PLANS. SEE 608.10 FOR RAMP DETAILS.

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

PLANNING OF PRIVATE APPROACHES

PLAN OF PRIVATE APPROACHES

CROSS-HATCHED AREA TO BE MONOLITHIC WITH MAINLINE PAVEMENT

TONGUE AND GROOVE JOINT (NO TIE BARS) FOR PCC MAINLINE PAVEMENT ONLY

PREFORMED FIBER EXPANSION JOINT

CROWN TO BE ESTABLISHED BY ENGINEER

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PLAN OF PRIVATE APPROACHES

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TONGUE AND GROOVE JOINT (NO TIE BARS) FOR PCC MAINLINE PAVEMENT ONLY

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SEE STANDARD PLAN 502.05 FOR JOINT DETAILS.

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PLAN OF PRIVATE APPROACHES

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TONGUE AND GROOVE JOINT (NO TIE BARS) FOR PCC MAINLINE PAVEMENT ONLY

PREFORMED FIBER EXPANSION JOINT

CROWN TO BE ESTABLISHED BY ENGINEER

SMOOTH VERTICAL PLANE

EXISTING PAVEMENT SHALL BE SHAPED TO PROVIDE A SMOOTH VERTICAL PLANE.
TYPICAL SIDEWALK WITH PARKWAY 2' OR MORE

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 MIDBLOCK PEDESTRIAN STREET CROSSINGS, THE CROSS SLOPE OF THE PEDESTRIAN ACCESS ROUTE SHALL BE PERMITTED TO EQUAL 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.

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

CONCRETE SIDEWALK

DATE EFFECTIVE: 04/01/2015
DATE PREPARED: 02/20/2015
608.10P SHEET NO. 1 OF 1
SAFETY RAIL DETAILS

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.

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.

STAIRWAY STEP DETAILS

SIDE ELEVATION

STAIRWAY STEP DETAILS

FRONT ELEVATION

WADE EFFECTIVE:

DATE PREPARED:

STAIRWAY STEP DETAILS

SIDE ELEVATION

STAIRWAY STEP DETAILS

FRONT ELEVATION

Wade EFFECTIVE:

DATE PREPARED:

CONCRETE STAIRS

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-456-MODOT (1-888-275-6636)
04/01/2015
212012015
OATE EFFECTIVE:

DATE PREPARED:

CONCRETE STAIRS

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-456-MODOT (1-888-275-6636)
04/01/2015
212012015
OATE EFFECTIVE:

DATE PREPARED:
## QUANTITIES FOR CONCRETE STEPS

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<td>0.48</td>
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<tr>
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<table>
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<th>6&quot; RISE</th>
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<td>3'</td>
<td>CONC.</td>
<td>0.25</td>
<td>0.35</td>
<td>0.45</td>
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<tr>
<td>4'</td>
<td>CONC.</td>
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<td>0.44</td>
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<tr>
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<td>0.81</td>
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<tr>
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<td>0.27</td>
<td>0.35</td>
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<td>0.37</td>
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<td>CONC.</td>
<td>0.33</td>
<td>0.47</td>
<td>0.61</td>
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<td>0.66</td>
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<td></td>
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<td>35</td>
<td>45</td>
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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 JOIN LOCATION

(1) WHEN THERE ARE NO VISIBLE JOINTS IN THE ADJACENT PAVEMENT, THE JOINT SPACING WILL BE EQUAL TO THE MEDIAN STRIP WIDTH, WITH A MINIMUM SPACING OF 10'.

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

GENERAL NOTES:
TIE BARS SHALL BE EPOXY COATED, DEFERRRED REINFORCING BARS MEETING THE REQUIREMENTS OF SECTION 1050 AND 1057.
BONDING FOR TIE BARS SHALL BE EPOXY OF POLYESTER BONDING AGENTS AS SPECIFIED IN SECTION 1059.
The face of the median may be constructed without batter when constructed on a radius of 0' or less.
When concrete medians are constructed directly beneath guardrail, the median height shall be 4'.

<table>
<thead>
<tr>
<th>MEDIAN HEIGHT</th>
<th>BAR LENGTH</th>
</tr>
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<tbody>
<tr>
<td>3'</td>
<td>8'</td>
</tr>
<tr>
<td>4'</td>
<td>9'</td>
</tr>
<tr>
<td>6'</td>
<td>11'</td>
</tr>
<tr>
<td>8'</td>
<td>13'</td>
</tr>
</tbody>
</table>
SIDEWALK SAFETY RAIL WITH BALUSTERS AND HANDRAIL

SIDEWALK WITHOUT BUFFER STRIP
(SECTION A-A)

SIDEWALK WITH BUFFER STRIP
(SECTION A-A)

FOR GENERAL NOTES AND MATERIAL REQUIREMENTS ON PILL SHAPES SEE SHEET 3 OF 4.

HANDRAILING
HANDRAIL REQUIREMENTS

<table>
<thead>
<tr>
<th>Fill Slope</th>
<th>Fill Height</th>
<th>Handrail</th>
</tr>
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<tbody>
<tr>
<td>(1(v)H) or Flatter</td>
<td>&gt; 6 FT.</td>
<td>Required</td>
</tr>
<tr>
<td>(1(h)H) or Steeper</td>
<td>&gt; 4 FT.</td>
<td>Required</td>
</tr>
<tr>
<td>(1(v)H) or Steeper</td>
<td>&gt; 1 FT.</td>
<td>Required</td>
</tr>
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</table>

RAILING AND POST SPECIFICATION

<table>
<thead>
<tr>
<th>Description</th>
<th>Type</th>
<th>Size (Dia.)</th>
<th>Weight (LBS. / FT.)</th>
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<tbody>
<tr>
<td>Railing &amp; Post</td>
<td>Round</td>
<td>1 1/2&quot;</td>
<td>0.940</td>
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<tr>
<td></td>
<td>Square</td>
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<td>Baluster</td>
<td>Round</td>
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<td>0.2312</td>
</tr>
<tr>
<td></td>
<td>Rect.</td>
<td>3/8&quot; x 1/2&quot; STL.</td>
<td>0.6375</td>
</tr>
<tr>
<td></td>
<td>Square</td>
<td>1/2&quot; x 1/2&quot; ALUM.</td>
<td>0.2944</td>
</tr>
</tbody>
</table>
HANDRAIL AND EXTENSION CONNECTION

DETAIL A - HANDRAIL

HANDRAIL GRIPPING SURFACES

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 on walking surfaces with slopes not steeper than 1:20, the bottoms of handrail gripping surfaces shall be permitted to be obstructed along a parallel line that is not more than 4 inches beyond a line perpendicular to the edge of the walking surface.
- The distance between horizontal projections and the bottom of the gripping surface shall be permitted to be reduced by 1/4" for each 12" 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.

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: 02/19/2015
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.

SIDWALK, 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 SIDE ROAD 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 6.00% 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 1V: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.


* 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% MINIMUM, 2% MAXIMUM.
(2) VERTICAL OR 1" FLARE, IF TRAVERSABLE USE A MAX, 1"/10H FLARE MEASURED PARALLEL TO THE CURB LINE.
(3) ENSURE THAT THE INSIDE EDGE OF CURVED RAMPS MAINTAIN AN 8.3% (1V:12H) MAXIMUM SLOPE.
(4) 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'H X 4'H MINIMUM SHALL BE PROVIDED WITHIN THE WIDTH OF THE PEDESTRIAN STREET CROSSING AND MOLLY OUTSIDE THE PARALLEL VEHICLE TRAVEL LANE.
(7) THE FACE OF PEDESTRIAN PUSH BUTTONS SHALL BE 0" OFFSET FOR FRONT APPROACH AND 1" MAX. FOR SIDE APPROACH TO THE CURB FACE.

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

CURB RAMPS

DATE PREPARED: 2/20/2015
DATE EFFECTIVE: 3/1/2015
SHEET NO.: 5 of 4
608.50
ISLAND CUT THROUGH TYPICAL

DATE EFFECTIVE: 04/01/2015
DATE PREPARED: 2/20/2015

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

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

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

3. 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.

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

RAMP MUST BE CONSTRUCTED TO DRAIN TO THE OUTSIDE.

4" CONCRETE

6" CONCRETE ISLAND

SECTION A-A
ISLAND CUT THROUGH TYPICAL

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-456-MoDOT (1-888-275-6636)

CURB RAMPS

MIDBLOCK

MIDBLOCK

MIDBLOCK

ISLAND CUT THROUGH

CROSSWALK

CROSSWALK

CROSSWALK

ISLAND CUT THROUGH

LENGTH

MIDBLOCK

MIDBLOCK

MIDBLOCK

ISLAND CUT THROUGH

CROSSWALK

CROSSWALK

CROSSWALK

ISLAND CUT THROUGH

LENGTH
Plan of Measurement of Curb & Gutter and Joint Plan

Legend:
- 2" Maximum Width Transverse Contraction Joint (preformed or sawed)
- 2" Transverse Expansion Joint (preformed or sawed
- 1" Transverse Expansion Joint (preformed or sawed
- Tongue & Groove Joint with Tie Bar - See Detail
- Tongue & Groove Joint without Tie Bars - See Detail
- Not less than 1/4" or more than 30'
- Round to 1/4" Radius (except for sawed joints)

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, gutter and curb and gutter constructed along and attached to concrete pavement or base shall have:
  1. Joint 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 core or pavement, extend and continue through the curb, cutter, and curb and gutter.
  3. Joint through curb and curb and gutter at the beginning and end of each paved approach.
- Curb, gutter and curb and gutter constructed apart or separated from concrete base or pavement or as a form for asphaltic concrete pavement shall have a joint entirely through the curb, curb and gutter. At the beginning and end of each "paved approach" and a joint to a depth of curb and gutter thickness at intervals of 30 feet between approaches.

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

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

When allowed by the engineer, types A and B gutter may be precast to conform to the dimensions shown. The precaster shall submit shop drawings indicating the section length, section connection, and proposed joint sealing system. When precast sections cannot conform to any vertical or horizontal curve designated on the plans, the gutter shall be cast-in-place. A combination of cast-in-place and precast gutter may be permitted.

Missouri Highways and Transportation Commission
105 West Capitol
Jefferson City, MO 65102
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General Notes:

105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-800-ASK-MODOT (1-888-275-6636)

Concrete Curb, Curb and Gutter and Gutters

Date Effective: 08/01/2008
Date Prepared: 12/26/2011
Sheet No. 1 of 2
CONCRETE CURB, CURB AND GUTTER
AND GUTTER

GUTTERS

Curb & Gutter

Thru Tongue & Groove Joint

Legend
1. Tie bars - 3/8" x 4' @ 20" c.c.s.
2. Permissible construction joint. If constructed in this manner tie bars must be used.
3. Tie bar at 3/4" centers. Length of the tie bars equal thickness of pavement plus height of curb less 3 inches.
4. Tongue & groove joint with tie bar - see detail.
5. Top of pavement of concrete base.
6. Rounded to 1/2" radius. (except for sawed joints)
7. Rounded to 1/2" radius.
8. Construct to 1/2" radius
10. Pay limit for curb or curb & gutter.

Concrete Curtain Wall
Gutter

Concrete Pavement for Dimensions
See Typical Section Sheets

Curb & Gutter

Type A (Mountable)

Type B (Barrier)

Type A

Type B

Type C

Type D

Type E

Mountable Curbs

Type M

Type N

Type O

Low Profile Curb

Beginning and endings of introduced low profile curbs shall utilize curb height ranging from 0 inch to 3 inches in 1/2 feet. All lengths shall include tapers.

Depth may be reduced if keyed 6" in rock.

Missouri Highways and Transportation Commission

Sheet No. 609.00P

2 of 2
FLAT BOTTOM DITCH
WITHOUT BEDDING MATERIAL

FLAT BOTTOM DITCH
WITH BEDDING MATERIAL

TYPICAL DITCH LINER DETAILS

<table>
<thead>
<tr>
<th>TYPE</th>
<th>ROCK DITCH LINER MIN. THICKNESS</th>
<th>BEDDING MATERIAL MIN. THICKNESS</th>
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<td>1</td>
<td>8&quot;</td>
<td>--</td>
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<tr>
<td>2</td>
<td>12&quot;</td>
<td>--</td>
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<tr>
<td>3</td>
<td>22&quot;</td>
<td>8&quot;</td>
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<tr>
<td>4</td>
<td>30&quot;</td>
<td>12&quot;</td>
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</table>
CONSTRUCT LINING ON BACKSLOPE AT CULVERT OUTLET WHEN ROADWAY DITCH IS INTERCEPTED AND FLOW IS CARRIED IN ROADWAY DITCH FOR SOME DISTANCE.

ROCK LINING FOR CULVERT OUTLETS

<table>
<thead>
<tr>
<th>CULVERT SIZE</th>
<th>MIN. DIAMETER (IN.)</th>
<th>MINIMUM DEPTH AND WIDTH (FT.)</th>
<th>MINIMUM LENGTH (FT.)</th>
<th>ROCK LINING WIDTH (CU. YD.)</th>
<th>EQUIVALENT PIPE Arch CULVERT (APPROX.)</th>
<th>EQUIVALENT CONCRETE BOX CULVERT (APPROX.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>1 x 4</td>
<td>12</td>
<td>2</td>
<td></td>
<td>2' x 1½</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>1 x 6</td>
<td>14</td>
<td>3</td>
<td></td>
<td>2' x 2½</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>1 x 7</td>
<td>16</td>
<td>4</td>
<td></td>
<td>2' x 3</td>
<td></td>
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<tr>
<td>36</td>
<td>1.5 x 9</td>
<td>18</td>
<td>9</td>
<td></td>
<td>3' x 2½</td>
<td></td>
</tr>
<tr>
<td>42</td>
<td>2 x 12</td>
<td>20</td>
<td>15</td>
<td></td>
<td>3' x 3</td>
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<tr>
<td>48</td>
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<td>4' x 3</td>
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<td>54</td>
<td>2 x 13.5</td>
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<td>22</td>
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<td>4' x 4</td>
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</tr>
<tr>
<td>60</td>
<td>2 x 15</td>
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<td>28</td>
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<td>5' x 4½</td>
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</tr>
<tr>
<td>66</td>
<td>2 x 18</td>
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<td>33</td>
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<td>5½' x 5½</td>
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<td>72</td>
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<td>44</td>
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<td>84</td>
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</tr>
<tr>
<td>96</td>
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<td>111</td>
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<td>7' x 7½</td>
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<tr>
<td>108</td>
<td>3 x 32</td>
<td>40</td>
<td>142</td>
<td></td>
<td>8' x 8½</td>
<td></td>
</tr>
</tbody>
</table>

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

SLOPE PROTECTION SHALL BE MADE CONTINUOUS BETWEEN STRUCTURES WHEN MEDIAN IS 60' OR LESS.

CONCRETE SLOPE PROTECTION SHALL BE FORMED AROUND ANY UNDISTURBED ROCK THAT IS PERMITTED TO REMAIN WITHIN THE SLOPE PROTECTION AREA.

**NOTE:**

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

ELEVATION

<table>
<thead>
<tr>
<th>STRAIGHT SLOPE TYPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>A - SEE BRIDGE PLANS</td>
</tr>
<tr>
<td>B - BERM SHALL BE CONSTRUCTED TO ELEVATION SHOWN ON PLANS WITH A MINIMUM OF 4'-0&quot; BELOW BOTTOM OF SUPERSTRUCTURE.</td>
</tr>
<tr>
<td>C - DIMENSION OF BERM (SEE BRIDGE PLANS).</td>
</tr>
</tbody>
</table>

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

LIMIT OF SLOPE PROTECTION (3)

SLOPE PROTECTION SHALL BE PLACED IN CONTINUOUS PANELS FROM TOE OF THE SLOPE TO THE TOP OF THE SLOPE.

LIMIT OF SLOPE PROTECTION (TO BE SPECIFIED ON PLANS)

APRON (1): 1" PRE-FORMED FIBER EXPANSION JOINT MATERIAL (SECTION 1057)

1" PRE-FORMED FIBER EXPANSION JOINT MATERIAL (SECTION 1057)

SEE BRIDGE PLANS FOR TYPE OF CURB

CONCRETE SLOPE PROTECTION (ROADWAY ITEM)

APRON (1): 1" PRE-FORMED FIBER EXPANSION JOINT MATERIAL (SECTION 1057)

SEE BRIDGE PLANS FOR TYPE OF CURB

CONCRETE SLOPE PROTECTION (ROADWAY ITEM)

APRON (1): 1" PRE-FORMED FIBER EXPANSION JOINT MATERIAL (SECTION 1057)

ELEVATION

<table>
<thead>
<tr>
<th>USE ON STRUCTURES WITHOUT PASSIVE PRESSURE BERM</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) SLOPE 2&quot; PER FOOT MINIMUM.</td>
</tr>
<tr>
<td>(2) PROTECTION SHALL BE PLACED IN CONTINUOUS PANELS FROM TOE OF THE SLOPE TO THE TOP OF THE SLOPE.</td>
</tr>
<tr>
<td>(3) SLOPE PROTECTION SHALL FOLLOW THE CONTOUR OF THE FINAL ROADWAY FILL.</td>
</tr>
</tbody>
</table>

APRON (1): 1" PRE-FORMED FIBER EXPANSION JOINT MATERIAL (SECTION 1057)

SEE BRIDGE PLANS FOR TYPE OF CURB

CONCRETE SLOPE PROTECTION (ROADWAY ITEM)

APRON (1): 1" PRE-FORMED FIBER EXPANSION JOINT MATERIAL (SECTION 1057)

SEE BRIDGE PLANS FOR TYPE OF CURB

CONCRETE SLOPE PROTECTION (ROADWAY ITEM)
ATTENUATOR LAYOUT:
ALL SAND FILLED ATTENUATORS SHOULD MEET MANUFACTURER'S RECOMMENDATIONS FOR THE ARRAY AND SAND WEIGHT.

18" X 18" TYPE 3 OBJECT MARKER WITH MIDWAY TYPE 3 YELLOW SHEETING

TRAFFIC PASSING TO LEFT AND RIGHT

LOCATION OF OBJECT MARKER

18" X 18" TYPE 3 OBJECT MARKER WITH MIDWAY TYPE 3 YELLOW SHEETING

TRAFFIC PASSING TO LEFT
FLIP FOR TRAFFIC TO RIGHT

TYPE 3 OBJECT MARKER PLACEMENT FOR PERMANENT INSTALLATIONS

10" X 10" TYPE 1 OBJECT MARKER WITH MIDWAY FLUORESCENT ORANGE SHEETING

TYPE 1 OBJECT MARKER PLACEMENT FOR TEMPORARY INSTALLATIONS

GENERAL NOTES:
OBJECT MARKERS SHALL BE CENTERED VERTICALLY OR PLACED AS DIRECTED BY THE ENGINEER.
1. Remove all concrete to limits shown, to max. of 2.5
   the pavement depth or top of course by spalling,
   whichever is less.
2. Place compressible insert in joint or crack. Insert
   shall be thickened at joint or crack vertices, but
   not less than 2.
3. Chamfer repair edges at approximate 1:3 slope.
4. Place 2" width compressible insert adjacent to
   longitudinal lane of shoulder joint.
5. Exposed surface shall be sealed by hand setting
   shotcrete or high-pressure water blasting.
6. Exposed surface of course bars shall be coated with
   an approved bond breaker.

PLAN VIEW

SECTION A-A

SECTION B-B

SECTION C-C

SECTION D-D

SECTION E-E

 APES TO BE REMOVED
GENERAL NOTES:

1. AT EACH REPAIR LOCATION, HOLES SHALL BE DRILLED AT 90° ANGLES TO THE PAVEMENT SURFACE, PERPENDICULAR TO THE CRACK. THE DIAMETER OF THE HOLE SHALL NOT EXCEED 1/2 IN.

2. DRILL HOLES ALTERNATE BACK AND FORTH OR EITHER SIDE OF THE LONGITUDINAL JOINT FROM MILE TO MILE.

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

4. DRILLED HOLES SHALL BE CLEARED OF LOOSE DEBRIS AND DRIED. EPOXY OR POLYESTER RESINS FOR JOINTS MEET THE MATERIAL REQUIREMENTS OF SECTION 707. EPOXY RESINS SHALL BE DRIED IN EACH MILE PER MILE TO THE EPOXY MATERIAL TO ENSURE DRYNESS. EPOXY BARS SHALL BE SPACED 12 INCHES APART TO ALLOW 1/2-IN. COVER AS SHOWN IN THE PROFILE DETAIL.

5. THE SURFACE SHALL HAVE ALL EXCESS EPOXY REMOVED AND HAVE A PLAIN FINISH.

GENERAL NOTES:

6. PAVEMENT REPAIR
   CROSS STITCHING

SECTION A-A

<table>
<thead>
<tr>
<th>LAB THICKNESS (IN)</th>
<th>1/4</th>
<th>1/2</th>
<th>11/16</th>
<th>3/4</th>
<th>1</th>
<th>11/16</th>
</tr>
</thead>
<tbody>
<tr>
<td>A DISTANCE TO HOLE (IN)</td>
<td>1/4</td>
<td>1/2</td>
<td>3/4</td>
<td>1</td>
<td>11/16</td>
<td></td>
</tr>
</tbody>
</table>
1. 14" diameter dowel bar x 18" length.
2. Dowel bar slots shall be parallel to roadway.
3. Tip of compressible insert shall be flush with pavement surface.
4. Crack perimeter in slot shall be sealed with silicone.
5. Compressible insert shall be placed in middle of dowel bar.

PLAN VIEW

SECTION A-A

CONCRETE PAVEMENT

LENGTH MEASURE FOR DOWEL BAR RETROFIT

SECTION B-B

SECTION C-C

PAVEMENT REPAIR
DOWEL BAR RETROFIT

DATE EFFECTIVE: 04/21/2017
DATE REVISED: 03/20/2017
613.005
SHEET NO. 4 OF 4
**PLAN**

**BEARING PLATE**

**END VIEW OF BEARING BAR**

**SECTION A-A**

**SECTION B-B**

**SECTION C-C**

**DETAIL A**

**GRATES AND BEARING PLATES**

**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.

**WEIGHT AND DIMENSIONS DATA**

<table>
<thead>
<tr>
<th>OPENING</th>
<th>WEIGHT</th>
<th>BEARING BAR DIMENSIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1) Lbs</td>
<td>x</td>
</tr>
<tr>
<td>5' x 5'</td>
<td>190</td>
<td>3/4 X 3/4 X 3/4</td>
</tr>
<tr>
<td>5' x 5'</td>
<td>330</td>
<td>7/8 X 3/4 X 3/4</td>
</tr>
<tr>
<td>5' x 5'</td>
<td>190</td>
<td>1 X 3/4 X 3/4</td>
</tr>
<tr>
<td>5' x 5'</td>
<td>550</td>
<td>1 1/2 X 3/4 X 3/4</td>
</tr>
</tbody>
</table>

**NOTES:**

- Use with type S-1 inlets and type S headwalls.
- Use with type S-2 and type S-3 inlets only.
- 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.

**REMARKS:**

- This drawing is not to be used in the field without approval and provided 4 linear inches weight is maintained symmetrically around the plate and the nominal dimensions of the plate and slot are maintained.

**DATE EFFECTIVE:** 12/31/2009

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

**SHEET NO.** 1 OF 1

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

**105 WEST CAPITOL, JEFFERSON CITY, MO 65102**

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

**614.10T**
INSTALLATION INSTRUCTIONS:

DRILL AND TAP FRAME.
INSTALL ½" DIA. BOLTS WITHOUT WASHERS BEFORE CONCRETE POUR TO FORM ½" BOLT EXTENSION INTO CONCRETE BELOW FRAME. LUBRICATE EXPOSED THREADS.

AFTER CONCRETE HARDENS SUFFICIENTLY, FINAL INSTALLATION SHALL REMOVE AND REINSTALL ½" DIA. BOLTS AND LOCK WASHERS THROUGH GRATE AND FRAME. TORQUE ½" DIA. BOLTS TO 35-40 FT. LB. APPLY THREAD ADHESIVE TO ALL ½" DIA. STAINLESS STEEL BOLTS.

GENERAL NOTES:

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

MINIMUM CLEAR OPEN AREA: 2.10 SQUARE FEET.
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 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 160 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.
**PLAN**

**SECTION B-B**

**COVER**

**SECTION A-A**

**FRAME**

**ADJUSTING RING**

**INSTALLATION DETAILS**

**ADJUSTING RING**

**SOLID OR ADJUSTABLE**

**APPROXIMATE WEIGHT OF FRAME AND COVER 150 LBS.**

**ALTERNATE TYPE 4 COVER**
TABLE A
WORK ZONE SIGN MOUNTING REQUIREMENTS

<table>
<thead>
<tr>
<th>TYPE</th>
<th>SIGN SUPPORT</th>
<th>MINIMUM MOUNTING MEDIUM</th>
<th>HEIGHT LIMITATIONS</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>POST</td>
<td>PERFORATED GALV STEEL TUBE (CHANNEL) NOTE</td>
<td>RIGID</td>
<td>5' RURAL INDIVIDUAL HIGHWAYS 7' RURAL DIVIDED HIGHWAYS</td>
<td>NO LIMITATION</td>
</tr>
<tr>
<td>TYPE 1 PORTABLE</td>
<td>SINCE FOLD-UP STAND</td>
<td>RIGID</td>
<td>5' RURAL INDIVIDUAL HIGHWAYS 7' RURAL DIVIDED HIGHWAYS</td>
<td>PERMITTED ONLY WHERE POST MOUNTING IS NOT PRACTICAL.</td>
</tr>
<tr>
<td>TYPE 2 PORTABLE</td>
<td>SELF-DRIVING POST型1</td>
<td>FLEXIBLE</td>
<td>12' (4)</td>
<td>PERMITTED ONLY FOR INSTALLATION UP TO 9 X 10 FEET.</td>
</tr>
<tr>
<td>SIGN</td>
<td>CONCRETE TRAFFIC BARRIER</td>
<td>FLEXIBLE</td>
<td>5' RURAL INDIVIDUAL HIGHWAYS 7' RURAL DIVIDED HIGHWAYS</td>
<td>PERMITTED ONLY WHERE LONGITUDINAL BARRIER IS PRESENT.</td>
</tr>
<tr>
<td>VEHICLE</td>
<td>Pavement Marking Equipment</td>
<td>FLEXIBLE</td>
<td>48&quot; (6)</td>
<td>PERMITTED ONLY IN PILOT CAR OR MOVING OPERATIONS.</td>
</tr>
</tbody>
</table>

GENERAL NOTES:
1. LONGITUDINAL SPACING OF SIGNS SHOWN ON THE PLANS ARE PREFERRED SPACING, BUT MAY BE ADJUSTED TO MEET FIELD CONDITIONS WITH APPROVAL FROM THE ENGINEER.
2. SIGNS MAY NOT BE MOUNTED IN OR ON CHANNELIZERS.
3. ALL SIGNS MAY BE ADJUSTED TO MEET FIELD CONDITIONS WITH APPROVAL FROM THE ENGINEER.
4. CONSTRUCTION SIGNS MAY NOT BE LOCATED ON SIDEWALKS, CYCLE LINES, OR ARE DESIGNATED FOR PEDESTRIAN OR BICYCLE TRAFFIC.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
TEMPORARY TRAFFIC CONTROL DEVICES
SIGN MOUNTING REQUIREMENTS

GSP EFFECTIVE: 03/24/2005
616.10AV
Sheet 1 of 9
DIRECTION INDICATOR BARRICADE

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

DIIRECTION 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 FORCIBLE, CAPABLE OF REMOVING UPHILL AND ENTIRELY FREE STANDING.

ADVANCE WARNING RAIL SYSTEM

MAXIMUM WEIGHT OF SIGN SHALL NOT EXCEED 25 LBS.

THE SIGN AND RAIL SYSTEM MAY BE WOODED AS TWO SEPARATE GRASSEWORTHY DEVICES. THE RAIL SYSTEM SHALL BE LOCATED DIRECTLY IN FRONT OF THE SIGN WITH 1 TO 3 FEET SEPARATING THE TWO DEVICES.

WHERE MARKING IS NOT PROVIDED ON THE RAIL, STEPS OF 7 IN. HEIGHT TYPE IV ORANGE SHEETING MAY BE APPLIED TO THE EDGES OF EACH RAIL TO HELP DELIMIT THE DEVICE.

WHITE AND ORANGE REFLECTIVE SHEETING SHALL BE IN ACCORDANCE WITH Sec. 1042.1.7.4.

GENERAL NOTES:

WHITE, ORANGE, AND FLUORESCENT ORANGE REFLECTIVE SHEETING SHALL BE IN ACCORDANCE WITH Sec. 1042.1.7.4.

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

IF USED, THE WARNING LIGHT UNIT AND BATTERY COMPARTMENT SHALL BE FORWARDED TO THE MANUFACTURER OR OTHERWISE MEET THE MANUFACTURER'S RECOMMENDATIONS FOR FENCE COILS AND EARTH BOLTS FOR ALL DEVICES IN THE SERIES.

WARNING LIGHTS SHALL BE IN ACCORDANCE WITH Sec. 1042.1.5.

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

UPON APPROVAL OF THE ENGINEER, THE CONTRACTOR MAY, AT NO ADDITIONAL COST, USE TRIM-LINE CHANNELIZERS IN LIEU OF TRIM-LINE CHANNELIZERS TO PROVIDE LONGITUDINAL CHANNELIZING WITHIN THE ACTIVITY AREAS WHERE NO PAMS, INTERSECTIONS OR LIMITED CLEARANCE EXIST.

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

UPON APPROVAL OF THE ENGINEER, THE CONTRACTOR MAY, AT NO ADDITIONAL COST, USE VERTICAL PANELS IN LIEU OF TRIM-LINE CHANNELIZERS DURING DAYTIME OPERATIONS ON INTERSTATE HIGHWAYS.

CHANNELIZERS

WHITE, ORANGE, AND FLUORESCENT ORANGE REFLECTIVE SHEETING SHALL BE IN ACCORDANCE WITH Sec. 1042.1.7.4.

CHANNELIZERS SHALL BE SECURELY ATTACHED TO A SUPPORT THAT IS FORCIBLE, CAPABLE OF REMOVING UPHILL AND ENTIRELY FREE STANDING.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

TEMPORARY TRAFFIC CONTROL DEVICES

CHANNELIZERS AND DIRECTION INDICATOR BARRICADE

CHANNELIZERS

WHITE, ORANGE, AND FLUORESCENT ORANGE SHEETING SHALL BE IN ACCORDANCE WITH Sec. 1042.2.1.3.5.

CHANNELIZERS SHALL MAINTAIN THEIR SHAPE UNDER EXPOSURE TO NORMAL WEAR CONDITIONS.

CHANNELIZERS SHALL BE USED DURING DAYTIME OPERATIONS ONLY.

VERTICAL PANELS SHALL BE SECURELY ATTACHED TO A SUPPORT THAT IS FORCIBLE, CAPABLE OF REMOVING UPHILL AND ENTIRELY FREE STANDING.

MISSOURI DEPARTMENT OF TRANSPORTATION
**Example 1** - One Type 3 movable barricade will be required to completely close each lane of pavement.

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

**Example 3** - Where barricades extend entirely across a roadway, stripes should converge in the direction toward which vehicle traffic must turn.

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

**Example 5** - Where no turns are intended, stripes positioned to drive converge toward the center of the barricade.
### Temporary Traffic Control Devices

#### Warning Signs

<table>
<thead>
<tr>
<th>Sign</th>
<th>Date Effective</th>
<th>Date Expires</th>
<th>6 of 9</th>
<th>616.10AV</th>
</tr>
</thead>
</table>

**Sign Definitions:** Arrow, Banners, and Spacing shall be in accordance with the latest edition of Standard Highway Signs by the U.S. Department of Transportation - FHWA.

**Refer to the latest edition of NFPA 70A:C1.1 (2007)**. The U.S. Department of Transportation (DOT) and the State of Missouri adopted the latest edition of NFPA 70A:C1.1 (2007) as the standard for the design and placement of traffic control devices. This standard includes guidelines for the use of traffic control devices, including warning signs, and provides a comprehensive approach to traffic safety and management.

**Use of a Supplementary Plate for Line 1 is Acceptable:** This provision allows for the use of a supplementary plate to additional information that may be necessary to convey the complete message of the traffic control device, especially when the primary plate is insufficient to provide all required information.

**Flashing and Applicable Regulatory Signs shall be Illustrated:** This instruction encourages the use of illustrations to accompany flashing signs, ensuring that the traffic control devices are easily understood by motorists and other road users.

**SHF Refer to St. 900.03 Sheet 1 of 8:** This instruction directs the reader to refer to the specified sheet for additional details or illustrations related to the traffic control devices discussed in the document.

---

**General Notes:**

- **Sign Layouts:** shall be in accordance with the latest edition of Standard Highway Signs by the U.S. Department of Transportation - FHWA, unless specified otherwise.
- **Sign Dimensions:** shall be in accordance with the latest edition of Standard Highway Signs by the U.S. Department of Transportation - FHWA, unless specified otherwise.
- **Material:** shall be in accordance with the latest edition of Standard Highway Signs by the U.S. Department of Transportation - FHWA, unless specified otherwise.
- **Color:** shall be in accordance with the latest edition of Standard Highway Signs by the U.S. Department of Transportation - FHWA, unless specified otherwise.
- **Placement:** shall be in accordance with the latest edition of Standard Highway Signs by the U.S. Department of Transportation - FHWA, unless specified otherwise.
- **Spacing:** shall be in accordance with the latest edition of Standard Highway Signs by the U.S. Department of Transportation - FHWA, unless specified otherwise.
- **Operation:** shall be in accordance with the latest edition of Standard Highway Signs by the U.S. Department of Transportation - FHWA, unless specified otherwise.
- **Maintenance:** shall be in accordance with the latest edition of Standard Highway Signs by the U.S. Department of Transportation - FHWA, unless specified otherwise.
- **Installation:** shall be in accordance with the latest edition of Standard Highway Signs by the U.S. Department of Transportation - FHWA, unless specified otherwise.
- **Acceptance:** shall be in accordance with the latest edition of Standard Highway Signs by the U.S. Department of Transportation - FHWA, unless specified otherwise.

**Missouri Highways and Transportation Commission:**

**Temporary Traffic Control Devices Warning Signs:**

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

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

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

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

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

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

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

**Acceptance:** shall be in accordance with the latest edition of Standard Highway Signs by the U.S. Department of Transportation - FHWA, unless specified otherwise.
(1) SIGN LAYOUTS SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF "HIGHWAY SIGNS" BY THE U.S. DEPARTMENT OF TRANSPORTATION - FTA.

(2) REFER TO THE LATEST EDITION OF "HIGHWAY SIGNS" BY THE U.S. DEPARTMENT OF TRANSPORTATION - FTA FOR SIGN DEFINITIONS, SPECIFICATIONS, COLORS, AND SPACING. THIS SIGN IS PROPOSED FOR USE IN THE SHOWN CONFIGURATION FOR THE SPECIFIED FUNCTION.

(3) SIGN LAYOUTS SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF "STANDARD HIGHWAY SIGNS" BY THE U.S. DEPARTMENT OF TRANSPORTATION - FTA.

(4) USE OF A SUPPLEMENTAL PLATE FOR LINE 1 IS ACCEPTABLE.

(5) FLAME AND APPARATUS REGULATORY SIGNS MAY BE MANUFACTURED AS ONE SIGN.

GENERAL NOTES:
SIGN LAYOUTS SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF "STANDARD HIGHWAY SIGNS" BY THE U.S. DEPARTMENT OF TRANSPORTATION - FTA UNLESS SPECIFIED OTHERWISE.

SIGN DIMENSIONS SHOWN ARE MINIMUM. NO ADDITIONAL SPACE WILL BE MADE IF CONTRACTORS USE LARGER SPACE.

NO ADDITIONAL SPACE WILL BE MADE FOR PLATES.
ALL PLATES SHALL HAVE A BORDER. PLATES SHALL NOT HAVE A BORDER.

LETTER DIMENSIONS SHALL BE AS SHOWN.

TEMPORARY
TRAFFIC CONTROL DEVICES

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
1 MOU BH 11, 6TH FLOORS IN THE CAPITOL
JEFFERSON CITY, MO 65105
1-888-688-MODOT (6636) 1-888-688-MODOT (6636)

SHEET NO. 8 OF 9
DATE EFFECTIVE: 05/15/2020
DATE PREPARED: 05/16/2020
616.10AV
SECTION A-A

SEE SECTION C-C FOR DIMENSIONS

SECTION B-B

SECTION C-C

PLAN

TRANSITION DETAILS FOR PIER PROTECTION

1-1/2" JOINT FILLER (TYP.)

40:1 TRANSITION MAX. RATE

6"
TABLE A TRANSVERSE PAVEMENT REINFORCEMENT

<table>
<thead>
<tr>
<th>PAVEMENT THICKNESS</th>
<th>BAR SIZE</th>
<th>SPACING</th>
</tr>
</thead>
<tbody>
<tr>
<td>6&quot;</td>
<td>#6</td>
<td>0.5&quot;</td>
</tr>
<tr>
<td>9&quot;</td>
<td>#6</td>
<td>0.5&quot;</td>
</tr>
<tr>
<td>12&quot;</td>
<td>#6</td>
<td>0.5&quot;</td>
</tr>
<tr>
<td>18&quot;</td>
<td>#6</td>
<td>0.5&quot;</td>
</tr>
<tr>
<td>21&quot;</td>
<td>#6</td>
<td>0.5&quot;</td>
</tr>
</tbody>
</table>

NOTES:

All reinforcement shall be Grade 60.

No direct pavement will be made for reinforcing steel.

Minimum clearance to reinforcing steel shall be 1½" unless otherwise shown.

4\4 tilt transverse pavement reinforcement hooks from vertical alignment to maintain 1½" minimum clearance.

SEE HIGHWAY PAVEMENT DESIGN.

90° HOOKS

180° HOOKS

NOTES:

Type D shall be used only at locations shown on plans.

For concrete traffic barrier delineation details see Item Plan 903.01.

TYPE D (MSE WALL) TRAFFIC BARRIER ON TOP OF MSE WALL

PERMANENT CONCRETE TRAFFIC BARRIER

TYPE D ATOP MSE WALL
NOTES:

ALL REINFORCEMENT SHALL BE GRADE 60 EPOXY COATED.
BAR SPLICES SHALL BE A MINIMUM OF 24 TIMES THE
MINIMAL DIAMETER OF THE BAR.
MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1/2
UNLESS OTHERWISE SHOWN.

ANY METHOD RECOMMENDED BY THE CONTRACTOR AND APPROVED BY
THE ENGINEER THAT WILL ASSURE THE LATERAL
REINFORCING STEEL WILL BE PLACEMENT AS SHOWN WILL BE SATISFACTORY.

THE CONTRACTOR HAS THE OPTION TO APPLY EPOXY TO THE
BAR REINFORCEMENT. ADDITIONAL REINFORCEMENT MAY
BE TIED TO THE UPPER TWO-THIRDS OF THE REINFORCING
CAGE TO PROVIDE BONING.

THIS BARRIER SHALL NOT BE USED TO SUPPORT HIGHWAY
LIGHTING PILES.
THIS BARRIER SHALL NOT BE USED FOR BRIDGE PARAPET
APPLICATIONS.

SAWN JOINTS SHALL BE SPACED AT 15'-0". SEE STANDARD
PLANS FOR SAWN JOINT DETAIL.

TYPE E BARRIER SHALL BE USED ONLY AT LOCATIONS SHOWN
ON PLANS.

REINFORCING BARS WITH AN EPOXY ANCHOR SYSTEM MAY
BE SUBSTITUTED FOR SMOOTH 1" DIAMETER ROUND STEEL
DOWELS.

FOR CONCRETE TRAFFIC BARRIER DELINEATION DETAILS SEE
STEEL PLAN 903.03.

MISSOURI HIGHWAYS AND TRANSPORTATION
COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-MO-DOT-HOTLINE (1-888-663-6686)

PERMANENT CONCRETE
TRAFFIC BARRIER
TYPE D BESIDE MSE WALL

SIZE EFFECTIVE:
06/01/2010
617.10L
SHEET NO.
9 OF 11

DATE MODIFIED:
07/17/2010
CONCRETE BARRIER END ANCHORAGE ON GRADE

GENERAL NOTES:

ALL REINFORCEMENT SHALL BE GRADE 60 EPOXY COATED.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1/8" UNLESS OTHERWISE SHOWN.

A 1/16" BUFFER REQUIRED WITHIN THE LINES OF THE TRAFFIC BARRIER EXCLUDING THE END ANCHORAGE SECTIONS.

FOR CONCRETE TRAFFIC BARRIER ELEVATION DETAILS SEE SHEET PLAN 903.03.

PAVEMENT SURFACE DIFFERENTIAL SHALL NOT EXCEED 3/4".

BAR SPACER SHALL BE A MINIMUM OF 24 TIMES THE NOMINAL DIAMETER OF THE BAR.

TRAFFIC BARRIER ON TOP OF MSE WALL
PRECAST BARRIER HEIGHT TRANSITION
(Temporary installations only)

(1) Optional 4 inch diameter, 1/8" gauge steel round mechanical tubing sleeved for lift hole allows the location of the lift hole to accommodate the differing height distribution of transition sections.

(2) 3" x 4" slots for lifting - two per section, location to be determined by contractor.

GENERAL NOTES:
Reinforcing steel clearance to edge of concrete shall be 1" unless otherwise shown.

Height transitions shall not be used in interstate formulae or in locations where the posted speed prior to construction is greater than 35 MPH.

At no time shall the barriers be lifted or moved by use of the lift bars.

Retainer bar and nut must be used with transition barriers.

The option of the contractor, height transitions may be manufactured in one section. The flange for reinforcement across joint shall be approved by the Engineer prior to manufacture.
GENERAL NOTES:

DIMENSIONS ARE OUT TO OUT OF BARS UNLESS OTHERWISE NOTED.

TEMPORARY CONCRETE TRAFFIC BARRIER
TYPE F HEIGHT TRANSITIONS

NOTE: FOR DETAILS OF B BARS, SEE SHEET 2 OF 6.
BOLT THROUGH DECK AT THERMAL EXPANSION JOINTS

GENERAL NOTES:
ANCHOR BOLT SYSTEMS ARE ONLY APPLICABLE ON BRIDGE DECKS AND RIGID PAVEMENTS.
CONTRACTOR SHALL VERIFY ALL DIMENSIONS IN FIELD BEFORE ORDERING NEW MATERIAL.
SEE OTHER SHEETS FOR DETAILS NOT SHOWN.
AFTER REMOVAL OF ANCHOR BOLTS HOLES SHALL BE FILLED WITH QUALIFIED SPECIAL MORTAR IN ACCORDANCE WITH SEC 704.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

TEMPORARY CONCRETE TRAFFIC BARRIER
ANCHORED (BOLT SYSTEM)
ELEVATION OF BARRIER WITH ANCHOR PINS

GENERAL NOTES:

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

WHERE EXISTING FLEXIBLE PAVEMENT OR RIGID PAVEMENT IS NOT PRESENT A 3" THICK X 30" WIDE MINIMUM ASPHALT PAVING SHALL BE CONSTRUCTED.

COST OF FURNISHING AND INSTALLING THE ASPHALT PAVING COMPLETE-ON-PLACE WILL BE CONSIDERED INCIDENTAL TO OTHER PAY ITEMS.

SEE OTHER SHEETS FOR DETAILS NOT SHOWN.

AFTER REMOVAL OF ANCHOR PINS HOLES SHALL BE FILLED WITH QUALIFIED SPECIAL WOOLER IN ACCORDANCE WITH SECTION 1024.

NA
### CROSS SECTION

<table>
<thead>
<tr>
<th>CONDITION</th>
<th>DIFFERENTIAL</th>
<th>TIME</th>
<th>TREATMENT</th>
<th>SIGN</th>
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<td>SIDE ROAD (2)</td>
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<td>NON-WORKING HOURS</td>
<td>NEAR CLOSE TO VEHICLES OR FLATTER</td>
<td>NO SIGNS REQUIRED</td>
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<tr>
<td>PAVEMENT EDGE DIFFERENTIAL</td>
<td>&gt; 3&quot;</td>
<td>NON-WORKING HOURS</td>
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<td>NO SIGNS REQUIRED</td>
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<tr>
<td>PAVEMENT EDGE DIFFERENTIAL</td>
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<td>NO SIGNS REQUIRED</td>
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<td>WORKING HOURS</td>
<td>NEAR CLOSE TO VEHICLES OR FLATTER</td>
<td>NO SIGNS REQUIRED</td>
</tr>
</tbody>
</table>

- **Legend:**
  - F: Fixed Pavement
  - F: Flexible Pavement
  - A: 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 619-20.

---

**Note:**
- Signs shall be spaced at approximately one mile intervals and be located within 100 ft. of any state road. Signs placed at the ¾ mile interval fall within ½ mile of 2 signs placed after an intersection. The sign placed at the ¼ mile interval may be omitted when the shoulder pavement signs with the lane line are both specified. Alternating sign messages shall be used at 1½ mile spacings.

- On side roads, with posted speed of 45 mph or greater, signs shall be placed 100 ft. in advance of intersection with mainline.

- Signs shall be placed in a way so that they are visible from the side of the roadway where the pavement edge differential exists.

- Signs to remain visible until shoulder pavement is complete.

- Signs shall be located on front side of non-lane line medians and on right side of shoulder highways where a lane line differential exists.

- When the shoulder drop-off signs are in place for greater than three days, the shoulder drop-off shall be reset in addition to the shoulder drop-off sign.
TYPICAL STRIPING OFFSETS
WITHOUT RUMBLE STRIPES

TYPICAL STRIPING OFFSETS
FOR RUMBLE STRIPES
FOR SHOULDERS

EDGE LINE
AS SHOWN ON PLANS

EDGE OF TRAVELLED WAY

2 WAY 2 LANE
(SEE TYPICAL STRIPING FOR RUMBLESTRIPS)

= LATERAL DEVIATION SHALL NOT EXCEED ONE INCH IN 100 FEET.
1. STOP LINES SHALL BE PLACED 80 FT TO THE ROADSIDE.
2. 7-PILLAR SIGN IS PLACED THE STOP LINE SHALL BE 8 FT FROM CURT.

Symbol Detail

11. THE DISTANCE FROM THE RAILROAD CROSSING MARKING TO THE APPROACH SHALL VARY ACCORDING TO THE AFGHAIFE AND THE HEIGHT, ETC. OF THE VEHICLES TRAFFIC APPROACHING BUT SHALL BE NO LESS THAN 70 FEET.

6. THREE-LINE SIGNALS SHALL BE MARKED WITH 2 DARK-LINE FOR TWO-LINE APPROACH IN THE APPROACH TO THE CROSSING OR MULTI-LINE PROPOSED TO THE CROSSING SIGNALS SHALL EXTEND ACROSS ALL APPROACH LINES, AND INDIVIDUALLY IDENTIFIED SIGNALS SHALL BE PLACED IN EACH APPROACH LANE.

12. PLACEMENT OF YIELD TO SIGN BY OTHERS.

Railroad Grade Crossing

Letter Detail

White Midblock Crosswalk (Zebra)

PEDESTRIAN CROSSWALKS

Pavement Detail

13. 6" CROSSING LANE LINE SHALL ENTER TO THE ROAD AT THE LINE

a. VARIABLE BASE OF THE APPROACH WIDTH.

b. VARY BASE OF THE APPROACH WIDTH.

c. 24" WHITE CROSSING LINE WILL BE MARKED THE LANE OF THE ROAD, BUT SHALL NOT EXCEED 10".

d. If the finisher

h. LANE SHALL BE EXTENDED TO THE THREE LANE, ADDING ADDITIONAL BLOCKS TO COMPLETE.

Pavement Marking

White Yield Line Triangles

E = 3" TO 12"
TWO-WAY MARKING WITH DOUBLE YELLOW PROHIBITED PASSING MARKING SECTION

ELEVATION SIDE
TYPICAL TEMPORARY RAISED PAVEMENT MARKER DETAIL

GENERAL NOTES:

TEMPORARY PAVEMENT MARKING IS REQUIRED WHEN TWO CONSECUTIVE LINEAR FEET OR MORE OF PERMANENT PAVEMENT MARKING HAS BEEN ALTERED, REMOVED OR DIRECTION BY THE ENGINEER.

TEMPORARY RAISED PAVEMENT MARKERS (TECHNICAL) ARE THE OPTIONAL 4" X 4" SHORT TERM TYPE OF PAINT. THEY ARE TO BE MAINTAINED IN PLACE AND PERMANENT UNTIL THE PERMANENT PAVEMENT MARKINGS ARE INSTALLED. VARIOUS TYPES OF REFLECTIVE MATERIAL ARE SPECIFIED FOR INTERMEDIATE LIFTS OR MORE ARE RECOMMENDED WITHIN THE RANGE OF 4 TO 8 OR MORE CONSECUTIVE MARKINGS AND ARE RECOMMENDED.

FOR INTERMEDIATE LIFTS, 4" X 4" SHORT TERM TYPE OF TEMPORARY PAINT MAY BE USED IN LIEU OF MARKERS.

MARKERS USED ON INTERMEDIATE LIFTS SHALL BE REMOVED PRIOR TO PAVEMENT OF THE NEXT LIFT.

ALL TEMPORARY MARKINGS SHALL BE REMOVED BY THE CONTRACTOR AFTER INSTALLATION OF PERMANENT MARKINGS, EXCEPT WHEN PERMANENT MARKINGS ARE TO BE INSTALLED BY OTHERS.

TEMPORARY TYPE SHALL NOT BE USED FOR TEMPORARY MARKING ON THE FINAL SURFACE EXCEPT WHEN SPECIFIED IN THE PLANS.
* 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.

**HOLE PATTERN FOR PAVEMENT SLAB STABILIZATION**

**DATE EFFECTIVE:** 10/01/1998
**DATE PREPARED:** 8/25/2009

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

EXPRESSWAY DIVIDED

RUMBLE STRIPS

RESIDENTIAL, COMMERCIAL OR OUTER ROAD

EDGE OF TRAVELED WAY

14' PAVEMENT STRUCTURES, ALL SHOULDER TYPES

13' PAVEMENT STRUCTURES, ALL SHOULDER TYPES

PAVEMENT STRUCTURES ≤ 12' WITH A2 SHOULDER

PAVEMENT STRUCTURES ≤ 12' WITH A3 SHOULDER

PAVEMENT STRUCTURES ≤ 12' WITH EARTH OR AGGREGATE SHOULDERS

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

GENERAL NOTES:

SEE STANDARD PLAN 620.00 FOR PAVEMENT MARKING.

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

ALL RUMBLE STRIPS SHALL BE MILLED.

RUMBLE STRIPS SHALL NOT BE MILLED INTO TRANSVERSE JOINTS.

RUMBLE STRIPS SHALL NOT BE PLACED ON BRIDGES.

DATE EFFECTIVE: 04/01/2009

JEFFERSON CITY, MO 65102

105 WEST CAPITOL COMMISSION

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

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

1 OF 2 SHEET NO.

626.00H 1 OF 2
SECTION C-C

DETAIL B

EDGE OF TRAVELED WAY

EDGE OF TRAVELED WAY

SHOULDER

TWO-WAY ROAD

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

GENERAL NOTES:

SEE STANDARD PLAN 620.00 FOR PAVEMENT MARKING.

RUMBLE STRIPS SHALL NOT BE PLACED ON BRIDGES.

ALL RUMBLE STRIPS SHALL BE MILLED.

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

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

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

EQUATIONS FOR COMPUTING α, β, B AND C

\[ \alpha = \text{ANGLE OF BARREL SLOPE WITH HORIZONTAL NORMAL TO E ROADWAY OR E MEDIAN} \]
\[ \beta = \text{ANGLE OF FILL SLOPE WITH HORIZONTAL NORMAL TO E ROADWAY OR E MEDIAN} \]
\[ B = \text{HORIZONTAL DISTANCE FROM UPSTREAM EDGE OF SHOULDER TO E ROADWAY OR E MEDIAN} \]
\[ C = \text{HORIZONTAL DISTANCE FROM DOWNSTREAM EDGE OF SHOULDER TO E ROADWAY OR E MEDIAN} \]
\[ D = \text{DISS SLOPE OF EACH PART OF ROADWAY INCLUDING CROWN LINES AND SHOULDERS. DS IS POSITIVE IF RISING AND NEGATIVE IF FALLING AWAY FROM E ROADWAY OR E MEDIAN. THIS TERM \text{SHALL BE ADJUSTED FOR UNSYMMETRICAL AND NONSTANDARD ROADWAYS.}} \]

TO ACCOUNT FOR A VARYING PROFILE GRAD. THE 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 FOR SLOPES, 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 NATURAL STREAM BOTTOM DUE TO ENVIRONMENTAL REQUIREMENTS.

LAYOUT DIMENSIONS

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>α</td>
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<td>#</td>
<td>2A + B + C + 2C</td>
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<tr>
<td>TW</td>
<td>W + A + C</td>
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GENERAL NOTES:

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

DESIGN LOADINGS:
SPECIFIC = 0.03 WINGS LANE LOAD, EARTH = 120 LB/FT
EQUIVALENT FLUID PRESSURE = 50 LB/FT (MIN) 60 LB/FT (MAX)

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

MISCELLANEOUS:
FOR REINFORCEMENT DETAILS, SEE SHEET 2 OF 3, FOR SECTION DETAILS, SEE SHEET 3 OF 3, SEE 703.17. DRAWING NOT SCALE, FOLLOW DIMENSIONS.

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.

WHEN ALTERNATE PRECAST CONCRETE BOX CULVERT SECTIONS ARE USED, THE MINIMUM DISTANCE FROM INSIDE FACE OF HEADWALLS TO PRECAST CONCRETE CULVERT SECTIONS SHALL BE IN ACCORDANCE WITH MISSOURI STANDARD PLANS.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

MISSISSIPPI HIGHWAYS AND TRANSPORTATION COMMISSION

CONCRETE SINGLE BOX CULVERT

SKEW: SQUARED
WINGS: STRAIGHT

PLANNED LAYOUT DIMENSIONS

A) AHEAD STATION WHERE STREAM FLOWS LEFT TO RIGHT.
B) AHEAD STATION WHERE STREAM FLOWS RIGHT TO LEFT.

DATE PREPARED: 07/10/2018
DATE EFFECTIVE: 07/01/2015

703-10J SHEET NO. 1 OF 3
GENERAL NOTES:

For sections thru barrel, wings and headwall, 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 clearances to reinforcing steel shall be 1".

Lap longitudinal bars a minimum of 23" at splices.

Beveled headwall shall be located at upstream end.

1a) Same size and spacing as J2 bars
1b) Varies; 12" maximum
1c) J4 bar spacing
1d) Not specified on this sheet
1e) Not specified on this sheet
1f) Not specified on this sheet
1g) Not specified on this sheet
1h) For design fills over 2'-0" (fl) Not specified on this sheet
1i) For design fills 2'-0" or less
1j) For design fills 2'-0" or less

Laying out transverse joints:

Use a transverse joint when barrel length is over 80 feet. Use additional joints to limit cut section length and end section length to 75 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 designed fills 2 feet or less, the joints shall be located to minimize the length of joint under the traveled way.

Traveled way is the road width minus wings shoulder widths.

Use a transverse joint when barrel length is over 80 feet. Use additional joints to limit cut section length and end section length to 75 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 road width minus wings shoulder widths.

For cut section details, see 703.16.
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 IN TOP SLAB AND SIDEWALLS WITH EDGES SEALED WITH MASTIC OR TWO SIDED TAPE. FILTER CLOTH SHALL BE TRANSVERSE JOINT THRU BARREL.

UPSTREAM AND DOWNSTREAM WINGS REINFORCEMENT

GRANULAR BACKFILL LIMITS AND MEMBER DIMENSIONS

TRANSVERSE JOINT THRU BARREL

PREFORMED FIBER EXPANSION JOINT MATERIAL WITH SEC 1057 SHALL BE STITCHED TO ONE FACE OF THE CONCRETE WITH 10 GAUGE COPPER WIRE OR 12 GAUGE SOFT DRAWN GALVANIZED STEEL NAIL.

FILTER CLOTH A FOOT IN WIDTH AND DOUBLE THICKNESS SHALL BE CENTERED ON TRANSVERSE JOINTS IN TOP SLAB AND SIDEWALLS WITH EDGES SEALED WITH MASTIC OR TWO SIDED TAPE. FILTER CLOTH SHALL BE SECURED WITH DRAINAGE GEOTEXTILE IN ACCORDANCE WITH SEC 1011. FUTURE INSTALLATION OF FILTER CLOTH WILL BE CONSIDERED COMPLETELY COVERED BY THE CONTRACT UNIT PRICE FOR OTHER ITEMS.

UPSTREAM HEADWALL REINFORCEMENT

DOWNSTREAM HEADWALL REINFORCEMENT

GENERAL NOTES:

FOR MEMBER THICKNESS AND BAR SIZES, SPACING AND DIMENSIONS OF BARREL AND WINGS SECTIONS ARE NORMAL TO LONG DIRECTION OF HEADWALL.

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 11".

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

CONCRETE SINGLE BOX CULVERT
SKEW: SQUARED WINGS: STRAIGHT

SECTIONS

DATE PREPARED: 07/01/2015 511312015

JEFFERSON CITY. MO 65102
105 WEST CAPITOL

COMMISSION

3 OF 3 SHEET NO.

703.10J
ELEV. 1

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 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 ELEVATION A-A

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

EQUATIONS FOR COMPUTING \( a, b, B \) AND \( C \)

\[
\begin{align*}
\alpha &= \text{angle of barrel slope with horizontal normal to the roadway or median} = \arctan(\frac{E_1 - E_2}{W}) \quad \text{(ELEV. 1 - ELEV. 2)} \\
\beta &= \text{angle of fill slope with horizontal normal to the roadway or median} = \arctan(\frac{V}{W}) \\
b &= \text{horizontal distance from upstream edge of shoulder to the road opening, fill equals -} a \text{ (ACROSS UPSTREAM MEDIAN NORMAL TO THE ROADWAY OR MEDIAN)} \\
c &= \text{horizontal distance from downstream edge of shoulder to the road opening, fill equals -} a \text{ (ACROSS DOWNSTREAM MEDIAN NORMAL TO THE ROADWAY OR MEDIAN)} \\
cs &= \text{cross slope of each part of roadway including crown, lanes and shoulders, cs is positive if rising and negative if falling away from the roadway or median.} \\
\text{The term "ACCS" is the difference in elevation between the roadway or median and the top of the fill slope normal to the roadway or median. This term should be adjusted for symmetrical and nonstandard roadways.} \\
\text{To account for a varying profile grade the roadway fill shall be based on stations that correspond to the corners of the inside face of the headwalls that produces maximum values for } b \text{ and } c.
\end{align*}
\]

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

LAYOUT DIMENSIONS

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<td>( P )</td>
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<td>( 3^\circ + \text{TAN } 10^\circ )</td>
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GENERAL NOTES:

DESIGN SPECIFICATIONS:

2010 AMEND LRFD BRIDGE DESIGN SPECIFICATIONS AND 2010 INTERIM REVISIONS

DESIGN LOADING:

PERMITTED 140PSF WING LOAD. EARTH = 120 LB/FT.

EQUIVALENT CREE K PRESSURE = 30 LB/FT. (MIN.) 60 LB/FT. (MAX.)

DESIGN UNIT STRESSES:

CLASS B-1 CONCRETE BOX CULVERT: F'c = 4000 PSI REINFORCING STEEL (GRADE 60) = 60000 PSI

MISCELLANEOUS:

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

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.

WHEN ALTERNATE PRECAST CONCRETE BOX CULVERT SECTIONS ARE USED, THE MINIMUM DISTANCE FROM INSIDE FACE OF HEADWALLS TO PRECAST CULVERT SIDES SHALL BE IN ACCORDANCE WITH MISSOURI STANDARD PLANS.

REINFORCEMENT AND DIMENSIONS FOR WINGS AND HEADWALLS SHALL BE IN ACCORDANCE WITH MISSOURI STANDARD PLANS.

CONCRETE SINGLE BOX CULVERT

SKEW: SQUARED

WINGS: FLARED

LAYOUT

DATE EFFECTIVE: 03/01/2008

DATE PREPARED: 03/10/2008

703.11J

SHEET NO. 1 OF 3
GENERAL NOTES:

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

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 J2 BARS
(e) J2 BAR SPACING
(f) NOT SPECIFIED ON THIS SHEET
(g) NOT SPECIFIED ON THIS SHEET
(h) FOR DESIGN FILLS OVER 2'-0".
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 THE GRANULAR BACKFILL IN ACCORDANCE WITH SEC 1011. COST OF FURNISHING AND INSTALLING FILTER CLOTH SHALL BE INCLUDED IN THE CONTRACT UNIT PRICE.

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

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

UPSTREAM FLARED WINGS REINFORCEMENT

DOWNSTREAM WINGS REINFORCEMENT

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

GENERAL NOTES:

FOR MEMBER THICKNESS AND BAR SIZES, SPACING AND DIMENSIONS OF REINFORCEMENT, SEE 703.117 FOR JS BARS. SEE 103.31.

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

DRAINING NOT TO SCALE, FOLLOW DIMENSIONS.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 12".

DATE EFFECTIVE: 07/01/2015
DATE PREPARED: 05/01/2015

703.11J SHEET NO. 3 OF 3
GENERAL NOTES:

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

DESIGN LOADING:

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

MISCELLANEOUS:

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.

REINFORCEMENT AND DIMENSIONS FOR WINGS AND HEADWALLS SHALL BE IN ACCORDANCE WITH MISSOURI STANDARD PLANS.

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

CONCRETE SINGLE BOX CULVERT
SKEW: LEFT ADVANCE WINGS: STRAIGHT

LAYOUT

DATE PREPARED: 03/01/2015
DATE EFFECTIVE: 05/13/2015
703.12J SHEET NO. 1 OF 3

EQUATIONS FOR COMPUTING A, B, C AND D

A = Angle of Barrel Slopewith Horizontal Normal to E Roadway or E Median = Arc tan ( ELEV. 1 - ELEV. 2 )
B = Angle of Fill Slopewith Horizontal Normal to E Roadway or E Median = Arc tan ( ELEV. 3 - ELEV. 4 )
C = Horizontal Distance from Upstream Edge of Shoulde r to E Roadway or E Median
D = Horizontal Distance from Downstream Edge of Shoulder to E Roadway or E Median

CS = Cross Slope of Each Part of the Roadway Including Crown, Lanes and Shoulders. CS is Positive If Risingand Negative If Falling Away from E Roadway or E Median.

The Term "A(CS)" Is the Difference in Elevation Between E Roadway or E Median and the Top of the Fill Slope to Account for a Varying Profile 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 for Slopes, Fill Elevations 1, 2 and E Elevations 1 and 2 Correspond to Upper and Lower Flow Line Elevations and May Be Below the Natural Stream Bottom Due to Environmental Requirements.

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.

渠道底端应按右侧方式调整以供过渡。渠道床面应按道路或中央分隔带的平面进行调整。渠道两侧应按道路或中央分隔带的平面进行调整。如果遇到非适宜材料，应进行开挖，并提供适宜材料。
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 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 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) AT BAR SPACING
(h) FOR DESIGN FILLS OVER 2'-0" OR LESS
(i) FOR DESIGN FILLS 2'-0" OR LESS

BOTTOM SLAB

TOP SLAB

ELEVATION

J1 BARS MAY BE BENT IN FIELD OR SHOP.

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) AT BAR SPACING
(h) FOR DESIGN FILLS OVER 2'-0" OR LESS
(i) FOR DESIGN FILLS 2'-0" OR LESS

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

THICKNESS SHALL BE CENTERED ON TRANSVERSE JOINTS

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

FILTER CLOTH 3 FEET IN WIDTH AND DOUBLE PREFORMED FIBER EXPANSION JOINT MATERIAL IN ACCORDANCE WITH SEC 1057 SHALL BE SECURELY ATTACHED TO THE GRANULAR BACKFILL IN ACCORDANCE WITH SEC 1011. COST OF FURNISHING AND INSTALLING THE EXPANSION JOINT MATERIAL IN THE TOP SLAB AND SIDEWALLS WITH EDGES SEALED WITH MASTIC OR TWO SIDED TAPE. FILTER CLOTH SHALL BE PLACED IN A TRANSVERSE JOINT THRU BARREL OR KEYED CONSTRUCTION JOINT ACCORDING TO THE CONTRACT UNIT PRICE FOR MATERIALS.

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 10GA COPPER WIRE OR 12GA 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 ATTACHED TO THE GRANULAR BACKFILL IN ACCORDANCE WITH SEC 1011. THE CONTRACT UNIT PRICE FOR FILTER CLOTH WILL BE CONSIDERED COMPLETELY COVERED BY THE CONTRACT UNIT PRICE FOR OTHER ITEMS.

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 REINFORCEMENT, SEE Tables 1053.14 THROUGH 1053.17, FOR 20" BARS, SEE 703.14. FOR 24" BARS, SEE 103.31. BARREL AND WINGS SECTIONS ARE SYMMETRICAL AND NORMAL TO THE LONG DIRECTION OF THE HEADWALL.

DRAWING NOT TO SCALE, FOLLOW DIMENSIONS.

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

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

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

JEFFERSON CITY, MO 65102

CONCRETE SINGLE BOX CULVERT SKEW: LEFT ADVANCE WINGS: STRAIGHT

SECTIONS

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

703.12J SHEET NO. 3 OF 3
GENERAL ELEVATION A-A

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

EQUATIONS FOR COMPUTING A, B, AND C

\[ A = \tan(D) + \tan(C) \]
\[ B = \tan(D) - \tan(C) \]
\[ C = \tan(D) \]

\[ D = \tan(\alpha) - \tan(\beta) \]

\[ E = \tan(\gamma) - \tan(\delta) \]

\[ F = \tan(\epsilon) - \tan(\zeta) \]

\[ G = \tan(\eta) - \tan(\theta) \]

\[ H = \tan(\iota) - \tan(\kappa) \]

\[ I = \tan(\lambda) - \tan(\mu) \]

\[ J = \tan(\nu) - \tan(\xi) \]

\[ K = \tan(\psi) - \tan(\chi) \]

\[ L = \tan(\omega) - \tan(\phi) \]

\[ M = \tan(\theta) \]

GENERAL NOTES:

DESIGN SPECIFICATIONS:
2010 AMEND UBD BRIDGE DESIGN SPECIFICATIONS AND 2010 INTERIM REVISIONS

DESIGN LOADINGS:
TACULVERT BOX LANE LOAD = 120 LB/FT
EQUIVALENT FLUID PRESSURE = 80 LB/FT (MIN. 1, 60 LB/FT (MAX.)

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

MISC.

PER FOR REINFORCEMENT DETAILS, SEE SHEET 2 OF 3, FOR SECTION DETAIL SEE SHEET 3 OF 3, FOR MEMBER THICKNESS SEE 703.17.
DRAWING NOT TO SCALE, FOLLOW DIMENSIONS.

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.

WHEN ALTERNATE PRECAST CONCRETE BOX CULVERT SECTIONS ARE USED, THE MINIMUM DISTANCE FROM INSIDE FACE OF HEADWALLS TO PRECAST CONCRETE BOX CULVERT IS TO BE DETERMINED BY THE CONTRACTOR AS PER MODOT LETTER 703.17. THE REINFORCEMENT AND DIMENSIONS FOR WINGS AND HEADWALLS SHALL BE IN ACCORDANCE WITH MISSOURI STATE STANDARDS.

PLAN OF LAYOUT DIMENSIONS

LAYOUT DIMENSIONS

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>DIMENSION</th>
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<tbody>
<tr>
<td>H</td>
<td>SEE EQUATIONS</td>
</tr>
<tr>
<td>D</td>
<td>I = YY</td>
</tr>
<tr>
<td>B</td>
<td>P [2\sec(20° + P)]</td>
</tr>
<tr>
<td>C</td>
<td>[\sec(20°)]</td>
</tr>
<tr>
<td>D</td>
<td>Z [2\cos(20° + P)]</td>
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<tr>
<td>E</td>
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<tr>
<td>M</td>
<td>Z [2\cos(20°)]</td>
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</tbody>
</table>

D = \[A + B + C + D + E + SS\] \[\sec(Z/2)\] 
E = \[A + B + C + D + E + SS\] \[\sec(Z/2)\] 
F = \[A + B + C + D + E + SS\] \[\sec(Z/2)\] 
G = \[A + B + C + D + E + SS\] \[\sec(Z/2)\] 
H = \[A + B + C + D + E + SS\] \[\sec(Z/2)\] 
I = \[A + B + C + D + E + SS\] \[\sec(Z/2)\] 
J = \[A + B + C + D + E + SS\] \[\sec(Z/2)\] 
K = \[A + B + C + D + E + SS\] \[\sec(Z/2)\] 
L = \[A + B + C + D + E + SS\] \[\sec(Z/2)\] 
M = \[A + B + C + D + E + SS\] \[\sec(Z/2)\] 

GENERAL EQUATIONS:

\[ A = \tan(D) + \tan(C) \]
\[ B = \tan(D) - \tan(C) \]
\[ C = \tan(D) \]

\[ D = \tan(\alpha) - \tan(\beta) \]
\[ E = \tan(\gamma) - \tan(\delta) \]
\[ F = \tan(\epsilon) - \tan(\zeta) \]
\[ G = \tan(\eta) - \tan(\theta) \]
\[ H = \tan(\iota) - \tan(\kappa) \]
\[ I = \tan(\lambda) - \tan(\mu) \]
\[ J = \tan(\nu) - \tan(\xi) \]
\[ K = \tan(\psi) - \tan(\chi) \]
\[ L = \tan(\omega) - \tan(\phi) \]
\[ M = \tan(\theta) \]

REFERENCES:

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

CONCRETE
SINGLE BOX CULVERT
SKEW: LEFT ADVANCE
WINGS: FLARED
LAYOUT

DATE EFFECTIVE: 07/01/2015
DATE PREPARED: 06/30/2015
703.13J SHEET NO. 1 OF 3
GENERAL NOTES:

1. FOR SECTIONS THRU BARREL, WINGS AND HEADWALLS, SEE SHEET 2 OF 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. MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 11/2".

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

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS. MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1 1/2".

BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END. SAME SIZE AND SPACING AS 82 BARS.

VARIES: 12" MAXIMUM. J4 BAR SPACING SAME SIZE AND SPACING AS A2 BARS.

A2 BAR SPACING.

IF SAME SIZE AND SPACING AS A1 BARS.

A1 BAR SPACING.

FOR DESIGN FILLS OVER 2' 0".

FOR DESIGN FILLS 2' 0" OR LESS.

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

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

DATE PREPARED: 5/13/2015
DATE EFFECTIVE: 5/13/2015

REINFORCEMENT

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT 1-888-275-6636
NO. 105 WEST CAPITOL
1-888-ASK-MODOT 1-888-275-6636

CONCRETE
SINGLE BOX CULVERT
SKEW: LEFT ADVANCE
WINGS: FLARED

DEVELOPED ELEVATION:

J1 AND J6 BARS MAY BE SENT 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 3 FEET IN WIDTH AND DOUBLE
PREFORMED FIBER EXPANSION JOINT MATERIAL IN ACCORDANCE WITH SEC 1057 SHALL BE SECURELY
A SUBSURFACE DRAINAGE GEOTEXTILE IN ACCORDANCE WITH SEC 1011. COST OF FURNISHING AND INSTALLING
IN TOP SLAB AND SIDEWALLS WITH EDGES SEALED WITH MASTIC OR TWO SIDED TAPE. FILTER CLOTH SHALL BE
TRANSVERSE JOINT THRU BARREL
(approximately one-third of wall
thickness)

EXPOSED TOP SLAB

GRANULAR BACKFILL

TRANVERSE JOINT THRU BARREL
PREFORMED FIBER EXPANSION JOINT MATERIAL IS IN ACCORDANCE WITH SEC 1057. SHALL BE SECURELY
STITCHED TO ONE FACE OF THE CONCRETE WITH 10GAGE COPPER WIRE OR 12 GAGE SOFT DRAWN
FILTER CLOTH 3 FEET IN WIDTH AND DOUBLE
PREFORMED FIBER EXPANSION JOINT MATERIAL IN ACCORDANCE WITH SEC 1057 SHALL BE SECURELY
A SUBSURFACE DRAINAGE GEOTEXTILE IN ACCORDANCE WITH SEC 1011. COST OF FURNISHING AND INSTALLING
IN TOP SLAB AND SIDEWALLS WITH EDGES SEALED WITH MASTIC OR TWO SIDED TAPE. FILTER CLOTH SHALL BE
TRANSVERSE JOINT THRU BARREL
(approximately one-third of wall
thickness)

BARREL REINFORCEMENT
FOR DESIGN FILLS OVER 2'-0"

Upstream flared wings reinforcement

Upstream headwall reinforcement

Downstream headwall reinforcement

Downstream wings reinforcement

General Notes:
For member thickness and for bar sizes, spacing, and dimensions of
reinforcement, see Sec. 703.17. For J5 bars, see Sec. 105.31.

Culvert and wings sections are
symmetrical about and normal to long direction of headwall.

Drawings not to scale. Follow dimensions.

Minimum clearance to reinforcing steel shall be 12".
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.

ELEVATION A-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.

PLAN OF LAYOUT DIMENSIONS

GENERAL NOTES:

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

DESIGN LOADS:
VEHICULAR:
CLASS B-93 LINES AND LANE LOAD, EARTH = 120 LB/FT
EQUIVALENT FLUID PRESSURE = 30 LB/FT (MIN. 1. 60 LB/FT (MAX. 1)

DESIGN UNIT STRESSES:
CLASS B-93 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. FOR SECTION DETAILS, SEE SHEET 3 OF 3. FOR MEMBER THICKNESS, SEE 703.17.
DRAWING NOT TO SCALE, FOLLOW DIMENSIONS.

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.

WHEN ALTERNATE PRECAST CONCRETE BOX CULVERT SECTIONS ARE USED, THE MINIMUM DISTANCE FROM INSIDE FACE OF HEADWALLS TO PRECAST CULVERT LIMITS SHALL BE IN ACCORDANCE WITH MISSOURI STANDARD PLAN.

REINFORCEMENT AND DIMENSIONS FOR WINGS AND HEADWALLS SHALL BE IN ACCORDANCE WITH MISSOURI STANDARD PLANS.

DRAWING SHEET NO. 1 OF 3

DATE EFFECTIVE: 07/01/2015
DATE PREPARED: 06/30/2015

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: RIGHT ADVANCE
WINGS: STRAIGHT

LAYOUT

DATE EFFECTIVE: 07/01/2015
DATE PREPARED: 06/30/2015
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 TABLES 1-17. 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.
- FOR CUT SECTION DETAILS, SEE 703.16.
- FOR DESIGN FILLS OVER 2'-0" SEE 703.17. FOR DESIGN FILLS OVER 2'-0" SEE 703.37.
- USE A TRANSVERSE JOINT WHEN BARREL LENGTH IS OVER 80 FEET. USE ADDITIONAL JOINTS TO LIMIT CUT SECTION LENGTH AND END SECTION LENGTH AS MEASURED ALONG CENTERLINE OF CULVERT TO 50 FEET.
- TO AVOID LOCATING TRANSVERSE JOINTS UNDER A TRAVELED WAY WITH DESIGN FILLS 2 FEET OR LESS, USE JOINTS 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 AS MEASURED ALONG CENTERLINE OF CULVERT TO 50 FEET.
- MINIMUM END SECTION LENGTH SHALL BE 3 FEET MEASURED ALONG THE SHORTEST WALL FROM THE OUTSIDE FACE OF HEADWALL TO THE TRANSVERSE JOINT.
- MINIMUM END SECTION LENGTH SHALL BE 3 FEET MEASURED ALONG THE SHORTEST WALL FROM THE OUTSIDE FACE OF HEADWALL TO THE TRANSVERSE JOINT.
- TRANSVERSE JOINTS TO BE LOCATED UNDER A TRAVELED WAY WITH DESIGN FILLS OVER 2'-0" OR LESS. USE JOINTS 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 AS MEASURED ALONG CENTERLINE OF CULVERT TO 50 FEET.
- USE A TRANSVERSE JOINT WHEN BARREL LENGTH IS OVER 80 FEET. USE ADDITIONAL JOINTS TO LIMIT CUT SECTION LENGTH AND END SECTION LENGTH AS MEASURED ALONG CENTERLINE OF CULVERT TO 50 FEET.

LAYERING OUT TRANVERSE JOINTS

- USE A TRANSVERSE JOINT WHEN BARREL LENGTH IS OVER 80 FEET. USE ADDITIONAL JOINTS TO LIMIT CUT SECTION LENGTH AND END SECTION LENGTH AS MEASURED ALONG CENTERLINE OF CULVERT TO 50 FEET.
- MINIMUM END SECTION LENGTH SHALL BE 3 FEET MEASURED ALONG THE SHORTEST WALL FROM THE OUTSIDE FACE OF HEADWALL TO THE TRANSVERSE JOINT.
- TO AVOID LOCATING TRANSVERSE JOINTS UNDER A TRAVELED WAY WITH DESIGN FILLS 2 FEET OR LESS, USE JOINTS 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 AS MEASURED ALONG CENTERLINE OF CULVERT TO 50 FEET.
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- USE A TRANSVERSE JOINT WHEN BARREL LENGTH IS OVER 80 FEET. USE ADDITIONAL JOINTS TO LIMIT CUT SECTION LENGTH AND END SECTION LENGTH AS MEASURED ALONG CENTERLINE OF CULVERT TO 50 FEET.
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 SUBSURFACE DRAINAGE GEOTEXTILE IN ACCORDANCE WITH SEC 1011. COST OF FURNISHING AND INSTALLING

UPSTREAM AND DOWNSTREAM WINGS REINFORCEMENT

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

GENERAL NOTES:
FOR MEMBER THICKNESS AND FOR BAR SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT EXCEPT J5 BARS, SEE 703.17. FOR J5 BARS, SEE 703.31.

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 11".

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: RIGHT ADVANCE
WINGS: STRAIGHT

SECTIONS

DATE EFFECTIVE: 07/01/2015
DATE PREPARED: 03/13/2015

703.14 J 3 OF 3 SHEET NO.
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

(1) Ahead station where stream flows left to right. (2) Ahead station where stream flows right to left.

EQUIATIONS FOR COMPUTING A, B, B AND C

A = ANGLE OF BARREL SLOPE WITH HORIZONTAL NORMAL TO E ROADWAY OR E MEDIAN = ARCTAN (Z) ELEV. Z + ELEV. 2
B = ANGLE OF FILL SLOPE WITH HORIZONTAL NORMAL TO E ROADWAY OR E MEDIAN = ARCTAN (Z)
C = HORIZONTAL DISTANCE FROM UPSTREAM EDGE OF SHOULDER TO = E ROADWAY FILL + C (AC - ALTANO)
D = HORIZONTAL DISTANCE FROM DOWNSTREAM EDGE OF SHOULDER TO = E ROADWAY FILL + C (AC - ALTANO)

CS = CROSS SLOPE OF EACH PART OF ROADWAY INCLUDING CROWN LINES AND SHOULDERS. CS IS POSITIVE IF RISING AND NEGATIVE IF FALLING AWAY FROM E ROADWAY OR E MEDIAN.

THE TERM "A(CS)" IS THE DIFFERENCE IN ELEVATION BETWEEN E ROADWAY OR E MEDIAN AND THE TOP OF THE FILL SLOPE NORMAL TO E ROADWAY OR E MEDIAN. THIS TERM SHALL BE ADJUSTED FOR UNSYMMETRICAL AND NONSTANDARD ROADWAYS.

TO ACCOUNT FOR A VARYING PROFILE GRADE THE E ROADWAY FILL SHALL BE BASED ON STATIONS THAT CORRESPOND TO THE CONSTRUCTION JOINT KEY NOT SHOWN FOR TO CULVERT OPENINGS. CHANNEL BANKS SHALL BE TAPERED TO MATCH CULVERT OPENINGS.

GENERAL NOTES:

DESIGN SPECIFICATIONS:
2010 AMEND URB BRIDGE DESIGN SPECIFICATIONS AND 2010 INTERIM REVISIONS

DESIGN LOADINGS:
VEHICULAR HL-93 MINUS LANE LOAD, GROSS = 120 LB/FT
EQUIVALENT FLUID PRESSURE = 50 LB/FT MIN. 50, 80, 120 (MAX. 1)

DESIGN UNIT STRESSES:
CLASS III CONCRETE BOX CULVERT (F') = 4,000 PSI
REINFORCING STEEL (GRADE 60) Ty = 60,000 PSI

MISCELLANEOUS:
FOR REINFORCEMENT DETAILS, SEE SHEET 3 OF 3, FOR MEMBER THICKNESS, SEE 703.15. DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
JEFFERSON CITY, MO 65102
1-888-656-MODOT (1-888-275-6636)

CONCRETE SINGLE BOX CULVERT
SKEW: RIGHT ADVANCE
WINGS: FLARED

LAYOUT

DATE EFFECTIVE: 07/12/2015
DATE PREPARED: 07/01/2015

703.15E SHEET NO. 1 OF 3
GENERAL NOTES:

- For sections thru barrel, wings and headwalls, see Sheet 9 of 3. For bar sizes, spacing and dimensions of all reinforcement, see 703.17. For J5 bars, see 703.37.
- Lap longitudinal bars a minimum of 23" at splices.
- Minimum clearance to reinforcing steel shall be 1/2".
- Construction joint key not shown for clarity in half plans and elevation. See Sheet 2 of 3 for details.
- Drawing not to scale, follow dimensions.
- Minimum clearance to reinforcing steel shall be 1/2".
- Reinforcement a minimum of 23" at splices.
- Beveled headwall shall be located at upstream end.
- A1 size and spacing as A2 bars.
- A2 bar spacing.
- A1 size and spacing as A2 bars.
- A2 bar spacing.
- For design fills over 2'-0".
- For design fills over 2'-0" or less.
- For design fills over 2'-0" or less.

LAYING OUT TRANVERSE JOINTS

- Use a transverse joint when barrel length is over 80 feet. Use additional joints to limit cut section length and end section barrel length measured along centerline of culvert to 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.
- Transverse way is the roadway width minus shoulder widths.

For cut section details, see 703.16.

DATE PREPARED: 5/13/2015
DATE EFFECTIVE: 5/13/2015
SHEET NO. 2 OF 3
STITCHED TO ONE FACE OF THE CONCRETE WITH 10GAGE COPPER WIRE OR 12 GAGE SOFT DRAWN GALVANIZED STEEL WIRE.

THICKNESS SHALL BE CENTERED ON TRANSVERSE JOINTS FILTER CLOTH WILL BE CONSIDERED COMPLETELY COVERED BY THE CONTRACT UNIT PRICE FOR OTHER ITEMS.

PREFORMED FIBER EXPANSION JOINT MATERIAL IN ACCORDANCE WITH SEC 1057 SHALL BE SECURELY 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 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 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 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.

BARREL REINFORCEMENT FOR DESIGN FILLS OVER 2'-0"
<table>
<thead>
<tr>
<th>Member Thickness</th>
<th>Top Slab Bars</th>
<th>Bottom Slab Bars</th>
<th>Wall Bars</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 FT</td>
<td>A1, B1, C1</td>
<td>A2, B2, C2</td>
<td>A3, B3</td>
</tr>
<tr>
<td>2 FT</td>
<td>A1, B1, C1</td>
<td>A2, B2, C2</td>
<td>A3, B3</td>
</tr>
<tr>
<td>3 FT</td>
<td>A1, B1, C1</td>
<td>A2, B2, C2</td>
<td>A3, B3</td>
</tr>
<tr>
<td>4 FT</td>
<td>A1, B1, C1</td>
<td>A2, B2, C2</td>
<td>A3, B3</td>
</tr>
<tr>
<td>5 FT</td>
<td>A1, B1, C1</td>
<td>A2, B2, C2</td>
<td>A3, B3</td>
</tr>
<tr>
<td>6 FT</td>
<td>A1, B1, C1</td>
<td>A2, B2, C2</td>
<td>A3, B3</td>
</tr>
<tr>
<td>7 FT</td>
<td>A1, B1, C1</td>
<td>A2, B2, C2</td>
<td>A3, B3</td>
</tr>
<tr>
<td>8 FT</td>
<td>A1, B1, C1</td>
<td>A2, B2, C2</td>
<td>A3, B3</td>
</tr>
<tr>
<td>9 FT</td>
<td>A1, B1, C1</td>
<td>A2, B2, C2</td>
<td>A3, B3</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 4 feet, use the greater member thickness, area of reinforcement, and bar dimensions from the 2 and 4 feet tabulated design fills.
- A design fill equal to or greater than 50 feet is not recommended.
- Dimensions are in inches unless otherwise specified.
- Fill is measured from the top of the top slab to the top of earth fill or roadway.
### Table: Design Thickness

<table>
<thead>
<tr>
<th>DESIGN</th>
<th>THICKNESS</th>
<th>A1 BARS</th>
<th>A2 BARS</th>
<th>J3 BARS</th>
<th>J4 BARS</th>
<th>B2 BARS</th>
<th>WALL BARS</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 B5 TX</td>
<td>SIZE SPA.</td>
<td>SIZE SPA.</td>
<td>SIZE SPA.</td>
<td>SIZE SPA.</td>
<td>SIZE SPA.</td>
<td>SIZE SPA.</td>
<td>SIZE SPA.</td>
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<tr>
<td>2 FT</td>
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<tr>
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<tr>
<td>4 FT</td>
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<tr>
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</tr>
<tr>
<td>8 FT</td>
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<tr>
<td>10 FT</td>
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<td>20 FT</td>
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<td>24 FT</td>
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<td>30 FT</td>
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### Table: Design Thickness (continued)

<table>
<thead>
<tr>
<th>DESIGN</th>
<th>THICKNESS</th>
<th>A1 BARS</th>
<th>A2 BARS</th>
<th>J3 BARS</th>
<th>J4 BARS</th>
<th>B2 BARS</th>
<th>WALL BARS</th>
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<tbody>
<tr>
<td>32 FT</td>
<td>10 8 8 5 4 4</td>
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<tr>
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<td>38.6</td>
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<tr>
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<td>10 8 8 5 4 4</td>
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<tr>
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<td>38.6</td>
<td>38.6</td>
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<tr>
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<td>38.6</td>
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<tr>
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<tr>
<td>46 FT</td>
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<td>50 FT</td>
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</tr>
</tbody>
</table>

### Diagram: Bar Dimensions Diagram

The diagram illustrates the bar dimensions, thickness, and spacing for the different member thicknesses. It is important to note the specific dimensions provided to ensure accurate construction.

### General Notes:

- If design fill is between tabulated design fills, use the next greater tabulated design fill.
- Use alternate J3 bars when the distance between the ends of J3 bars is less than 20 feet.
- For design fills between 2 and 5 feet, use the greater member thicknesses, area of reinforcement, and bar dimensions from the 2 and 5 foot tabulated design fills.
- Alternative J3 bars may be used to the extent that the area of foundation or crane required with alternate J3 bars on a length equal to J3 bars. No additional payment will be made for this substitution.

### Bar Dimensions Diagram

The bar dimensions diagram is designed to provide a visual representation of the bar sizes and placements. It shows the bars at different thicknesses, ensuring that the construction follows the specified guidelines.
### Design Thickness

<table>
<thead>
<tr>
<th>Member Thickness</th>
<th>Top slab bars</th>
<th>Bottom slab bars</th>
<th>Wall bars</th>
</tr>
</thead>
<tbody>
<tr>
<td>11 - 15</td>
<td>8</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>17</td>
<td>7</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>19</td>
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<tr>
<td>21</td>
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<td>31</td>
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<tr>
<td>49</td>
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<td>6</td>
<td>5</td>
</tr>
</tbody>
</table>

### Height (Ht) = 7 ft or 10 ft

<table>
<thead>
<tr>
<th>Member Thickness</th>
<th>Top slab bars</th>
<th>Bottom slab bars</th>
<th>Wall bars</th>
</tr>
</thead>
<tbody>
<tr>
<td>11 - 15</td>
<td>8</td>
<td>6</td>
<td>5</td>
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<tr>
<td>17</td>
<td>7</td>
<td>6</td>
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<tr>
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<tr>
<td>49</td>
<td>7</td>
<td>6</td>
<td>5</td>
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</tbody>
</table>

### General Notes:
- If design fill is between tabled design fills, use the next greatest tabled design fill. For design fills between 2 tabled design fills, use the greater thickness plus a use of the greater thickness, area of reinforcement, and bar dimensions from the 2 feet fill and a feet fill tabled 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.
- Members were 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 within the load zone winds the lane load.
- Members are not lis.
### Table 1: Design Thickness

<table>
<thead>
<tr>
<th>SPAN (S)</th>
<th>DESIGN THICKNESS</th>
<th>A1 BARS</th>
<th>B2 BARS</th>
<th>WALL BARS</th>
<th>SB WALL BARS</th>
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</thead>
<tbody>
<tr>
<td>35</td>
<td>12 11 8</td>
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<td>12 11 8</td>
<td>5 6</td>
<td>6 6</td>
<td>6 6</td>
<td>6 6</td>
</tr>
</tbody>
</table>

### Table 2: Fill TS BS

<table>
<thead>
<tr>
<th>SPAN (S)</th>
<th>DESIGN THICKNESS</th>
<th>A1 BARS</th>
<th>B2 BARS</th>
<th>WALL BARS</th>
<th>SB WALL BARS</th>
</tr>
</thead>
<tbody>
<tr>
<td>35</td>
<td>12 11 8</td>
<td>5 6</td>
<td>6 6</td>
<td>6 6</td>
<td>6 6</td>
</tr>
<tr>
<td>38</td>
<td>12 11 8</td>
<td>5 6</td>
<td>6 6</td>
<td>6 6</td>
<td>6 6</td>
</tr>
<tr>
<td>36</td>
<td>12 11 8</td>
<td>5 6</td>
<td>6 6</td>
<td>6 6</td>
<td>6 6</td>
</tr>
<tr>
<td>20</td>
<td>12 11 8</td>
<td>5 6</td>
<td>6 6</td>
<td>6 6</td>
<td>6 6</td>
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<tr>
<td>24</td>
<td>12 11 8</td>
<td>5 6</td>
<td>6 6</td>
<td>6 6</td>
<td>6 6</td>
</tr>
<tr>
<td>40</td>
<td>12 11 8</td>
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<td>6 6</td>
<td>6 6</td>
<td>6 6</td>
</tr>
<tr>
<td>42</td>
<td>12 11 8</td>
<td>5 6</td>
<td>6 6</td>
<td>6 6</td>
<td>6 6</td>
</tr>
</tbody>
</table>

### Table 3: General Notes

- If design fill is between tabulated design fills, use the next greater design fill.
- Design fills between 2 ft and 4 ft are limited to use the greater member thickness area of reinforcement and bar dimensioning from the 2 ft and 4 ft table.
- Area of reinforcement equals area per foot of footing.
- 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 fills were measured from the top of top slab to the top of earth fill or roadbed.
- Culverts meet strength and serviceability requirements for the design fill.

### Single Box Culvert

**Member Thickness**: 5 ft or 6 ft

**Bar Size**: SPAN (S): 9 FT

**Bar Size, Spacing & Dimensions**

- J3 Bar: 15" CL.
- J1 Bar: 13" CL.
- Culvert: 8" CL.

**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 J1 (foot 1 shall be used with alternate J3 bars. Additional payment will be made for alternate J3 bars required with alternate J3 bars with a length equal to 1 bar and spacing equal to J3 bars. No additional payment will be made for this substitution.
### DESIGN THICKNESS

<table>
<thead>
<tr>
<th>Member Thickness</th>
<th>A1 Bars</th>
<th>J3 Bars</th>
<th>A2 Bars</th>
<th>J4 Bars</th>
<th>Bottom Slab Bars</th>
<th>Top Slab Bars</th>
<th>Wall Bars</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 FT</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>12 FT</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>9</td>
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<td>9</td>
</tr>
<tr>
<td>15 FT</td>
<td>9</td>
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<td>9</td>
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<tr>
<td>18 FT</td>
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<td>9</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>9</td>
</tr>
</tbody>
</table>

### GENERAL NOTES:
- If design fill is between tabulated design fills, use the next greatest design fill.
- Use alternate J3 bars with a length greater than 16 feet.
- Use alternate J3 bars with a length greater than 16 feet.
- Dimensioning from the top of top slab to the top of culvert.

### MEMBERS:
- Members are required when the design fill is less than 1 foot or greater than 10 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 roadway.

### CONCRETE SINGLE BOX CULVERT

### DATE EFFECTIVE:
- 04/01/2001

### DATE PREPARED:
- 4/24/2011

### SHEET NO.:
- 8 of 14
### DESIGN THICKNESS

<table>
<thead>
<tr>
<th>SPAN (S)</th>
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</tr>
<tr>
<td>T1</td>
<td></td>
</tr>
<tr>
<td>T2</td>
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</tr>
<tr>
<td>T3</td>
<td></td>
</tr>
<tr>
<td>T4</td>
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### FILL TS BS TX SIZE SPA.

<table>
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<tbody>
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<td>BARS</td>
<td></td>
</tr>
<tr>
<td>T1</td>
<td></td>
</tr>
<tr>
<td>T2</td>
<td></td>
</tr>
<tr>
<td>T3</td>
<td></td>
</tr>
<tr>
<td>T4</td>
<td></td>
</tr>
</tbody>
</table>

### TOP SLAB BARS

<table>
<thead>
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<th>SPAN (S)</th>
<th>11 FT</th>
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</thead>
<tbody>
<tr>
<td>BARS</td>
<td></td>
</tr>
<tr>
<td>T1</td>
<td></td>
</tr>
<tr>
<td>T2</td>
<td></td>
</tr>
<tr>
<td>T3</td>
<td></td>
</tr>
<tr>
<td>T4</td>
<td></td>
</tr>
</tbody>
</table>

### BOTTOM SLAB BARS

<table>
<thead>
<tr>
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<th>11 FT</th>
</tr>
</thead>
<tbody>
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<td>BARS</td>
<td></td>
</tr>
<tr>
<td>T1</td>
<td></td>
</tr>
<tr>
<td>T2</td>
<td></td>
</tr>
<tr>
<td>T3</td>
<td></td>
</tr>
<tr>
<td>T4</td>
<td></td>
</tr>
</tbody>
</table>

### WALL BARS

<table>
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<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>BARS</td>
<td></td>
</tr>
<tr>
<td>T1</td>
<td></td>
</tr>
<tr>
<td>T2</td>
<td></td>
</tr>
<tr>
<td>T3</td>
<td></td>
</tr>
<tr>
<td>T4</td>
<td></td>
</tr>
</tbody>
</table>
### Table: Member Thickness

<table>
<thead>
<tr>
<th>Design</th>
<th>Member Thickness</th>
<th>Top Slab Bars</th>
<th>Bottom Slab Bars</th>
<th>Wall Bars</th>
</tr>
</thead>
<tbody>
<tr>
<td>12'</td>
<td>5 B5</td>
<td>12 12</td>
<td>12 12</td>
<td>12 12</td>
</tr>
<tr>
<td></td>
<td>4 B4</td>
<td>12 12</td>
<td>12 12</td>
<td>12 12</td>
</tr>
<tr>
<td></td>
<td>3 B3</td>
<td>12 12</td>
<td>12 12</td>
<td>12 12</td>
</tr>
<tr>
<td></td>
<td>2 B2</td>
<td>12 12</td>
<td>12 12</td>
<td>12 12</td>
</tr>
<tr>
<td></td>
<td>1 B1</td>
<td>12 12</td>
<td>12 12</td>
<td>12 12</td>
</tr>
</tbody>
</table>

### Table: Member Thickness

<table>
<thead>
<tr>
<th>Design</th>
<th>Member Thickness</th>
<th>Top Slab Bars</th>
<th>Bottom Slab Bars</th>
<th>Wall Bars</th>
</tr>
</thead>
<tbody>
<tr>
<td>12'</td>
<td>5 B5</td>
<td>12 12</td>
<td>12 12</td>
<td>12 12</td>
</tr>
<tr>
<td></td>
<td>4 B4</td>
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<td>12 12</td>
</tr>
<tr>
<td></td>
<td>3 B3</td>
<td>12 12</td>
<td>12 12</td>
<td>12 12</td>
</tr>
<tr>
<td></td>
<td>2 B2</td>
<td>12 12</td>
<td>12 12</td>
<td>12 12</td>
</tr>
<tr>
<td></td>
<td>1 B1</td>
<td>12 12</td>
<td>12 12</td>
<td>12 12</td>
</tr>
</tbody>
</table>

### Diagram: Bar Dimensions Diagram

**ALTERNATE J3 BAR**

**GENERAL NOTES:**

- If 4' or greater tabulated design fills, use the next greater tabulated design fill, except for design fills between 2'6" and 4'2", for which the greater member thickness area of reinforcement and bar spacing shall be from the 2' and 4' tabulated design fills. Area of reinforcement equals bar area plus space per foot spacing.

- Special designs are required when the design fill is less than is less than 10 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 with additional requirements for the design vehicular live load HL-93 while the lane load.

**DATE EFFECTIVE:** 04/15/2023

**DATE PREPARED:** 04/17/2021

**SHEET NO.:** 073.17

**SPANN = 12 FT**

**HEIGHT (HT) = 6 FT OR 7 FT OR 8 FT**

- Top Slab Bars: A1 Bars, A2 Bars, J4 Bars
- Bottom Slab Bars: B2 Bars
- Wall Bars: J4 Bars

**SPANN = 12 FT**

**HEIGHT (HT) = 9 FT OR 10 FT OR 11 FT**

- Top Slab Bars: A2 Bars, J4 Bars
- Bottom Slab Bars: B2 Bars
- Wall Bars: B2 Bars

**MEMBER THICKNESS**

- 12' B5
- 11' B4
- 10' B3
- 9' B2
- 8' B1

**Top Slab Bars**

- A1 Bars
- A2 Bars
- J4 Bars

**Bottom Slab Bars**

- B2 Bars

**Wall Bars**

- J4 Bars

**GENERAL NOTES:**

- If design fill is between tabulated design fills, the next greater tabulated design fill shall be used. For design fills between 2'6" and 4'2", the greater member thickness area of reinforcement and bar spacing shall be from the 2' and 4' tabulated design fills. Area of reinforcement equals bar area plus space per foot spacing.

- Special designs are required when the design fill is less than 10 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 with additional requirements for the design vehicular live load HL-93 while the lane load.
<table>
<thead>
<tr>
<th>SPAN (S) = 13 FT</th>
<th>HEIGHT (HT) = 7 FT OR 8 FT OR 9 FT</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEMBER THICKNESS</td>
<td>WALL BARS</td>
</tr>
<tr>
<td>15</td>
<td>5</td>
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<tr>
<td>20</td>
<td>12</td>
</tr>
<tr>
<td>28</td>
<td>19</td>
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<tr>
<td>90</td>
<td>50</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>SPAN (S) = 13 FT</th>
<th>HEIGHT (HT) = 15 FT OR 16 FT</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEMBER THICKNESS</td>
<td>WALL BARS</td>
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<td>15</td>
<td>5</td>
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<td>20</td>
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<tr>
<td>80</td>
<td>40</td>
</tr>
<tr>
<td>90</td>
<td>44</td>
</tr>
</tbody>
</table>

GENERAL NOTES:
- If design fill is between tabulated design fills, use the next greater tabulated design fill. Except for design fill between 2 feet and 6 feet, fill should be at least 2 feet.
- Greater member thickness area of reinforcement and bar spacing requirements from the 3 feet and 4 feet tabulated fills area of reinforcement equals bars of the next greater spacing.
- Special designs are required when the design fill is less than 5 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 WITHIN THE CLEARANCE REQUIREMENTS FOR THE DESIGN VEHICULAR LIVE LOAD HL-93 WINS MEANS THE LANE LOAD.
### Table: Member Thickness

<table>
<thead>
<tr>
<th>Design</th>
<th>Top Slab Bars</th>
<th>Bottom Slab Bars</th>
<th>Wall Bars</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A1 Bars</td>
<td>A2 Bars</td>
<td>B2 Bars</td>
</tr>
<tr>
<td></td>
<td>J1 Bars</td>
<td>J2 Bars</td>
<td></td>
</tr>
</tbody>
</table>

### Notes:
- **General Notes:**
  - If design fills between tabulated design fills, use the next greater tabulated design fill, except for design fills between 2 feet and 4 feet. In this range, greater member thickness, area of reinforcement and bar spacing is used, since 3 feet and 4 feet tabulated design fills are more closely spaced.
  - Special designs are required when the design fill is less than 3 feet or greater than 10 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.

### Diagram: Single Box Culvert
- **Bar Dimensions Diagram:** Symmetrical about culvert centerline.
- **Alternate J3 Bar:** At contractor's option. Alternate J3 bars may be used when the distance between the ends of J3 bars in each direction is less than 2 feet. In this case, J3 bars shall be used with alternate J3 bars, when alternate J3 bars are required with alternate J3 bars having a length equal to the length of J3 bar, with bar spacing and bar size equivalent to J3 bars. No additional payment will be made for this substitution.

### Bar Dimensions

<table>
<thead>
<tr>
<th>Design</th>
<th>Top Slab Bars</th>
<th>Bottom Slab Bars</th>
<th>Wall Bars</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A1 Bars</td>
<td>A2 Bars</td>
<td>B2 Bars</td>
</tr>
<tr>
<td></td>
<td>J1 Bars</td>
<td>J2 Bars</td>
<td></td>
</tr>
</tbody>
</table>

### Specifications
- **Height (H1) = 15 FT or 16 FT**
- **Height (H2) = 7 FT or 8 FT or 9 FT**
- **Span (S) = 14 FT**
- **Span (S) = 14 FT**
- **Height (H1) = 15 FT or 16 FT**
- **Height (H2) = 10 FT or 11 FT or 12 FT**
- **Span (S) = 14 FT**

### Design Criteria
- **Span (S) = 14 FT**
- **Height (H2) = 10 FT or 11 FT or 12 FT**
- **Height (H1) = 7 FT or 8 FT or 9 FT**

---

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

**CONCRETE SINGLE BOX CULVERT**

**Member Thickness**

**Bar Size: Spacing & Dimensions**

**Span (S): 14 FEET**

**Height (H1): 7 THRU 16 FEET**

**Date Effective:** 04/05/2019

**Date Prepared:** 04/19/2011

**Sheet No.: 703.17**

12 OF 14
### Table: SPAN (S) = 16 FT

<table>
<thead>
<tr>
<th>SPAN (S)</th>
<th>HEIGHT (H)</th>
<th>WALL BARS</th>
<th>TRUSS BARS</th>
<th>CONCRETE SINGLE BOX CULVERT</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 5S 16</td>
<td>15 5S 16</td>
<td>15 5S 16</td>
<td>15 5S 16</td>
<td>15 5S 16</td>
</tr>
<tr>
<td>12 6S 18</td>
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<td>12 6S 18</td>
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<td>10 7S 20</td>
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<tr>
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<td>8 8S 22</td>
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<td>8 8S 22</td>
</tr>
<tr>
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<td>6 9S 24</td>
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<tr>
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### Table: SPAN (S) = 16 FT

<table>
<thead>
<tr>
<th>SPAN (S)</th>
<th>HEIGHT (H)</th>
<th>WALL BARS</th>
<th>TRUSS BARS</th>
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</tr>
</thead>
<tbody>
<tr>
<td>15 5S 16</td>
<td>15 5S 16</td>
<td>15 5S 16</td>
<td>15 5S 16</td>
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<tr>
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<td>10 7S 20</td>
<td>10 7S 20</td>
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<tr>
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<td>8 8S 22</td>
<td>8 8S 22</td>
<td>8 8S 22</td>
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</tr>
<tr>
<td>6 9S 24</td>
<td>6 9S 24</td>
<td>6 9S 24</td>
<td>6 9S 24</td>
<td>6 9S 24</td>
</tr>
<tr>
<td>4 10S 26</td>
<td>4 10S 26</td>
<td>4 10S 26</td>
<td>4 10S 26</td>
<td>4 10S 26</td>
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<td>2 12S 28</td>
<td>2 12S 28</td>
<td>2 12S 28</td>
<td>2 12S 28</td>
</tr>
</tbody>
</table>

### General Notes:
- If design fill is between tabulated design fills, use the next greater fill. 
- Tabulated design fills less than 2 ft and 4 ft are not shown. 
- 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. 

**Concrete Single Box Culvert**
- Member thickness
- Bar size, spacing & dimensions

**Conterminous Single Box Culvert**
- Member thickness
- Bar size, spacing & dimensions

**Date Effective:** 04/05/2011
**Date Prepared:** 04/16/2011
**Sheet No.:** 703.17
**Scale:** 1/4" = 1'-0"
<table>
<thead>
<tr>
<th>TX (in.)</th>
<th>AREA OF STEEL REQUIRED FOR J5 BARS IN WINGS (SQ. IN.)</th>
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<tbody>
<tr>
<td>5</td>
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<tr>
<td>6</td>
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**MINIMUM STEEL TO BE USED IN THE WINGS FOR J5 BARS IS #4 BARS AT BASE.**


**DATE PREPARED:** 703.37C

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

**CONCRETE BOX CULVERT EXTERIOR WING REINFORCEMENT**

**AREA OF STEEL REQUIRED FOR J5 BARS IN WINGS (SQ. IN.)**

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

**105 WEST CAPITOL COMMISSION**
NOTE: USE 65° FOR ANGLE E FOR ALL WINGS WHICH MAKE AN ANGLE D GREATER THAN 90°.

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<th>BACKFILL ANGLE (DEGREES)</th>
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WING BACKFILL TABLE

BACKFILL SLOPE (H:V)

DETAIL OF BOX CULVERT

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

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

CONCRETE BOX CULVERT

EXTERIOR WING BACKFILL SLOPE TRANSITION

DATE EFFECTIVE: 04/01/2011
DATE PREPARED: 04/18/2011

SHEET NO. 2 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:

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.
TRANVERSE JOINT THRU BARREL
PREFORMED FIBER EXPANSION JOINT MATERIAL IN ACCORDANCE WITH SECT. 1011. 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 AND MEMBER DIMENSIONS.

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

A SUBSURFACE DRAINAGE GEOTEXTILE IN ACCORDANCE WITH SEC 1011. COST OF FURNISHING AND INSTALLING IN TOP SLAB AND SIDEWALLS WITH EDGES SEALED WITH MASTIC OR TWO SIDED TAPE. FILTER CLOTH SHALL BE EXPOSED NEAR INTERIOR WALL AND MEMBER DIMENSIONS.

FOR DESIGN FILLS OR LESS.

BARS AT ABOUT 14" CENTERS

BARREL REINFORCEMENT FOR DESIGN FILLS OVER 2'-0"

UPSTREAM AND DOWNSTREAM WINGS REINFORCEMENT

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

GENERAL NOTES:
FOR MEMBER THICKNESS AND FOR BAR SIZES, SPACING AND DIMENSIONS OF BARS, SEE 703.37. FOR J5 BARS, SEE 703.30.

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".

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

CONCRETE DOUBLE BOX CULVERT
SKEW: SQUARED
WINGS: STRAIGHT

SECTIONS

DATE EFFECTIVE: 02/01/2011
DATE PREPARED: 11/18/2010

703.40H SHEET NO. 3 OF 3
STITCHED TO ONE FACE OF THE CONCRETE WITH 10GAGE COPPER WIRE OR 12 GAGE SOFT DRAWN GALVANIZED STEEL WIRE.

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 TRANSVERSE JOINT THRU BARREL

(a) APPROXIMATELY ONE-THIRD OF WALL

REINFORCEMENT

UPSTREAM HEADWALL REINFORCEMENT NEAR INTERIOR WALL

(b) #8 FOR CLEAR SPAN > 10'-0" OR LESS

#5 FOR CLEAR SPAN > 13'-0" OR LESS

IF 02 BARS ARE 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.

MINIMUM CLEARANCE TO REINFORCING HEADWALL.

GENERAL NOTES:

FOR MEMBER THICKNESS AND FOR BAR SIZES, SPACING, AND FINISH LENGTHS OF BARS, SEE 703.41H. SEE 703.37. FOR BAR SIZES, SEE 703.37. SEE 703.37. 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".

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 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 WAXIC OR TWO SIDED TAPE. FILTER CLOTH SHALL BE SUBSURFACE CHANNING, EXPOSED IN ACCORDANCE WITH CONTRACT RIGHTS. FILTER CLOTH WILL BE CONSIDERED COMPLETELY CENTERED BY THE CONTRACT UNIT PRICE FOR OTHER ITEMS.

UPSTREAM HEADWALL REINFORCEMENT NEAR MIDSPAN

UPPER FLARED WINGS REINFORCEMENT

FILTER CLOTH

BOTTOM SLAB

GRANULAR BACKFILL
GENERAL NOTES:

1. FOR BAR SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT EXCEPT J5 BARS, SEE 703.47. FOR J5 BARS, SEE 703.37.

2. J5 BARS MAY BE BENT IN FIELD OR SHOP.

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

4. FOR CUT SECTION DETAILS, SEE 703.46.

5. BEVELED HEADWALL SHALL BE LOCATED AT UPCOMING END. SAME SIZE AND SPACING AS ADJACENT B BARS.

6. J4 BAR SPACING VARIATION IS 12" MAXIMUM.

7. SAME SIZE AND SPACING AS A2 BARS.

8. SAME SIZE AND SPACING AS A1 BARS.

9. A1 BARS AT BARREL LENGTH UP TO 90 FEET WITHOUT A TRANSVERSE JOINT.

10. USE A TRANSVERSE JOINT WHEN BARREL LENGTH IS OVER 90 FEET.

11. 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.

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

TRAVELED WAY IS THE ROADWAY WIDTH MINUS SHOULDER WIDTHS.

FOR CUT SECTION DETAILS, SEE 703.46.

PLAN OF BOTTOM SLAB

ELEVATION OF EXTERIOR WALL

J1 BARS MAY BE BENT IN FILL OR SHOP.
GENERAL NOTES:

FOR SECTIONS THROUGH BARRELS, 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 11/2'.

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 AT BARS

(e) A2 BAR SPACING

(f) SAME SIZE AND SPACING AS AT BARS

(g) AT BAR SPACING

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

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

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

(k) FOR CLEAR SPAN 5'-0" OR LESS

(l) FOR CLEAR SPAN > 15'-0"

IF REQUIRED, THE MINIMUM LENGTH EACH SIDE OF E BAR SHALL BE THE SUM OF E BAR DIAMETERS OR 12" SPACING. THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

(m) J5 BARS AS REQUIRED. QUANTITY OF BARS VARIES WITH SKEW.

DATE PREPARED: 5/13/2015

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

105 WEST CAP ITAL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT 11-888-275-6631

CONCRETE
DOUBLE BOX CULVERT
SKEW: LEFT ADVANCE
WINGS: STRAIGHT
REINFORCEMENT

DATE EFFECTIVE: 6/1/2015

703.42H SHEET NO.

2 OF 3

MISSOURI HIGHWAY AND TRANSPORTATION COMMISSION

105 WEST CAP ITAL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT 11-888-275-6631

CONCRETE
DOUBLE BOX CULVERT
SKEW: LEFT ADVANCE
WINGS: STRAIGHT
REINFORCEMENT

DATE EFFECTIVE: 6/1/2015

703.42H SHEET NO.

2 OF 3

MISSOURI HIGHWAY AND TRANSPORTATION COMMISSION
Laying out Transverse Joints

Unless shown on bridge plans:

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 the traveled way. Traveled way is the roadway width minus wings shoulder widths.

For cut section details, see 703.46.

General Notes:

For Sections thru Barrel, Wings and Headwalls, see Sheet 3 of 3. For Bar Sizes, Spacing and Dimensions of All Reinforcement except J5 Bars, see 703.47. For J5 Bars, see 703.37.

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.

(a) Same size and spacing as adjacent # B Bars

(b) Varies, 12" maximum

(c) J4 Bar Spacing

(d) Same size and spacing as A2 Bars

(e) A2 Bar Spacing

(f) Same size and spacing as A1 Bars

(g) A1 Bar Spacing

DATE PREPARED: 5/13/2015
DATE EFFECTIVE: 5/13/2015

Missouri Highways and Transportation Commission
105 West Capitol
Jefferson City, MO 65102
1-888-ASK-MODOT 1-888-275-6636

Concrete Double Box Culvert
Skew: Left Advance
Wings: Flared

Reinforcement

Date Prepared: 5/13/2015
Sheet No.: 1 of 3

703.43H
GENERAL NOTES:

FOR SECTIONS THRU BARREL, WINGS AND HEADWALLS, SEE SHEET 3 OF 3.
FOR BARS SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT EXCEPT J5 BARS, SEE 703.47. FOR J5 BARS, SEE 703.43.

CONSTRUCTION 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 1/16".

LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.

BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

(c) SAME SIZE AND SPACING AS ADJACENT B BARS

(f) VARIES. 12" MAXIMUM

(h) VARIES. 12" MAXIMUM

(i) NOT SPECIFIED ON THIS SHEET

(k) SAME SIZE AND SPACING AS A2 BARS

(l) A2 BAR SPACING

(m) SAME SIZE AND SPACING AS AT BARS

(n) AT BAR SPACING

(p) FOR DESIGN FILLS OF 0-1'-0" OR LESS

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

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

(s) FOR CLEAR SPAN > 15'-0"

(T) IF REQUIRED. THE MINIMUM LENGTH EACH SIDE OF A BAR SHALL BE THE LARGER OF 36 DIAMETERS OR 4 CLEAR SPANS.

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

(u) VARIES. CAPS OF BARS VARY WITH SKEW.

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

CONCRETE DOUBLE BOX CULVERT
SKEW: LEFT ADVANCE
WINGS: FLARED

REINFORCEMENT

DATE EFFECTIVE: 3/13/2010
DATE PREPARED: 3/13/2010

703.43H SHEET NO. 2 OF 3
STITCHED TO ONE FACE OF THE CONCRETE WITH 10 GAUGE COPPER WIRE OR 12 GAUGE SOFT DRAWN.
THICKNESS SHALL BE CENTERED ON TRANSVERSE JOINTS.

PREFORMED FIBER EXPANSION JOINT MATERIAL IN ACCORDANCE WITH SEC 1057 SHALL BE SECURELY
A SUBSURFACE DRAINAGE GEOTEXTILE IN ACCORDANCE WITH SEC 1011.

COST OF FURNISHING AND INSTALLING IN TOP SLAB AND SIDEWALLS WITH EDGES SEALED WITH
MASTIC OR TWO SIDED TAPE. FILTER CLOTH SHALL BE
TRANSVERSE JOINT THRU BARREL
PREFORMED FIBER EXPANSION JOINT MATERIAL IN ACCORDANCE WITH SEC 1057.
FILTER CLOTH SHALL BE SECURELY STITCHED TO ONE FACE OF THE CONCRETE WITH 10 GAUGE COPPER WIRE.
THICKNESS SHALL BE CENTERED ON TRANSVERSE JOINTS.

GRANULAR BACKFILL LIMITS AND MEMBER DIMENSIONS

GENERAL NOTES:
FOR MEMBER THICKNESS AND FOR BAR SIZES, SPACING AND DIMENSIONS OF
CONCRETE DOUBLE BOX CULVERT.
BARRELS, SEE 103.37.

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

DRAWING NOT TO SCALE. FOLLOW
DIMENSIONS.

MINIMUM CLEARANCE TO REINFORCING
STEEL SHALL BE 1".

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-656-MODOT (1-888-676-6636)
703.43H SHEET NO. 3 OF 3

JUNE 30, 2001

CONCRETE
DOUBLE BOX CULVERT
SKEW: LEFT ADVANCE
WINGS: FLARED

SECCTIONS
GENERAL NOTES:

(0) SAME SIZE AND SPACING AS ADJACENT B BARS
(1) J4 BAR SPACING
(2) SAME SIZE AND SPACING AS A2 BARS
(3) A2 BAR SPACING
(4) SAME SIZE AND SPACING AS A1 BARS
(5) AT BAR SPACING

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

DATE PREPARED: 5/13/2015

CONCRETE DOUBLE BOX CULVERT
SKEW: RIGHT ADVANCE WINGS: STRAIGHT

LAYING OUT TRANVERSE JOINTS

USE A TRANSVERSE JOINT WHEN BARREL LENGTH IS OVER 80 FEET. USE ADDITIONAL JOINTS TO LIMIT CUT SECTION LENGTH AND SET 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 JOINTS UNDER THE TRAVELED WAY. THE TRAVELED WAY IS THE ROADWAY WIDTH WITH WINGS AND SHOULDERS.

FOR CUT SECTION DETAILS, SEE 703.46.

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

LONGITUDINAL BARS A MINIMUM OF 23" AT SPACES.

BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

(a) SAME SIZE AND SPACING AS ADJACENT B BARS
(b) VARIES, 12" MAXIMUM
(c) J4 BAR SPACING
(d) SAME SIZE AND SPACING AS A2 BARS
(e) A2 BAR SPACING
(f) SAME SIZE AND SPACING AS A1 BARS
(g) AT BAR SPACING

LAVING OUT TRANVERSE JOINTS

UNLESS SHOWN ON BRIDGE PLANS

1 OF 3

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

CONCRETE DOUBLE BOX CULVERT
SKEW: RIGHT ADVANCE WINGS: STRAIGHT

REINFORCEMENT

DATE PREPARED: 5/13/2015
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".
- (i) For design fills 2'-0" or less
- (j) Not required for clear spans ≤ 10'-0".
- #4 for clear span ≤ 10'-0".
- #4 for clear span > 10'-0".
- If required, the minimum length each side of B bars shall be the greater of 8B bar diameters or 1/4 clear span. The clear span is parallel to long direction of headwall.
- (k) H2 bars as required. Quantity of bars varies with skew.

DATE PREPARED:
3/13/2015

DATE EFFECTIVE:
3/30/2015
STITCHED TO ONE FACE OF THE CONCRETE WITH 10-GAGE COPPER WIRE OR 12-GAGE SOFT DRAWN.

THICKNESS SHALL BE CENTERED ON TRANSVERSE JOINTS.

PREFORMED FIBER EXPANSION JOINT MATERIAL IN ACCORDANCE WITH SEC 1057 SHALL BE SECURELY.

A SUBSURFACE DRAINAGE GEOTEXTILE IN ACCORDANCE WITH SEC 1011. COST OF FURNISHING AND INSTALLING.

IN TOP SLAB AND SIDEWALLS WITH EDGES SEALED WITH MASTIC OR TWO SIDED TAPE. FILTER CLOTH SHALL BE.

GENERAL NOTES:
STEEL SHALL BE 1/2 FER." SYMMETRICAL ABOUT AND NORMAL TO DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

FOR MEMBER THICKNESS AND FOR BARS SIZES, SPACING AND DIMENSIONS OF BARREL REINFORCEMENT.

See Sec. 103.31.

BARREL AND WING SECTIONS ARE NORMAL TO LONG DIRECTION OF HEADWALL. DRAWN NOT TO SCALE. FOLLOW DIMENSIONS.

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

UPSTREAM AND DOWNSTREAM WINGS REINFORCEMENT

UPSTREAM HEADWALL REINFORCEMENT NEAR INTERIOR WALL

DOWNSTREAM HEADWALL REINFORCEMENT NEAR INTERIOR WALL

UPSTREAM HEADWALL REINFORCEMENT NEAR MIDSPAN

DOWNSTREAM HEADWALL REINFORCEMENT NEAR MIDSPAN

(1) #6 FOR CLEAR SPAN > 10'-0"
(2) #6 FOR CLEAR SPAN > 13'-0"
#8 FOR CLEAR SPAN > 15'-0"
(3) #8 FOR CLEAR SPAN > 15'-0"
NOT REQUIRED FOR CLEAR SPAN < 10'-0"
THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.
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 ELEVATION. SEE SHEET 3 OF 3 FOR DETAILS.

3. DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

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

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

6. BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

7. SAME SIZE AND SPACING AS ADJACENT B BARS.

8. SAME SIZE AND SPACING AS ADJACENT B BARS.

9. SAME SIZE AND SPACING AS ADJACENT B BARS.

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. TRAVELED WAY IS THE ROADWAY WIDTH MINUS SHOULDER WIDTHS.

12. FOR CUT SECTION DETAILS. SEE 703.46.

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

14. FOR SECTION DETAILS. SEE TO 3-46.

15. LAYING OUT TRANVERSE JOINTS

16. USE A TRANSVERSE JOINT WHEN BARREL LENGTH IS OVER 80 FEET. USE ADDITIONAL JOINTS TO MINIMIZE SECTION LENGTH AND END SECTION LENGTH. LOCATION OF JOINTS IS SHOWN ON BRIDGE PLAN.

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

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

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

20. BARREL LENGTH OF 50 FEET OR LESS, THE JOINTS SHALL BE LOCATED TO MINIMIZE THE LENGTH OF JOINT UNDER THE TRAVELED WAY.

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

22. FOR OUT SECTION DETAILS. SEE TO 3-46.
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 703.45, FOR J5 BARS, SEE 703.47.

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 1/4".

LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.

BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

1) SAME SIZE AND SPACING AS ADJACENT BARS
2) VARIES, 12" MAXIMUM
3) NOT SPECIFIED ON THIS SHEET
4) SAME SIZE AND SPACING AS A2 BARS
5) A2 BAR SPACING
6) SAME SIZE AND SPACING AS A1 BARS
7) A1 BAR SPACING
8) FOR DESIGN FILLS OVER 2'-0" OR LESS
9) FOR DESIGN FILLS 2'-0" OR LESS
10) NOT REQUIRED FOR CLEAR SPANS < 10'-0"
11) FOR CLEAR SPAN < 10'-0"
12) FOR CLEAR SPAN > 10'-0"
13) FOR CLEAR SPAN > 15'-0"
14) THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

IF REQUIRED, THE MINIMUM LENGTH EACH SIDE OF R BARS SHALL BE THE GREATER OF 48 BAR DIAMETERS OR 12 TIMES THE CLEAR SPAN.

REINFORCEMENT QUANTITY OF BARS VARIES WITH SKEW.

DATE PREPARED: 5/13/2015

DATE EFFECTIVE: 4/27/2015

WINGS: FLARED

CONCRETE DOUBLE BOX CULVERT

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

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

CONCRETE DOUBLE BOX CULVERT

SKEW: RIGHT ADVANCE
WINGS: FLARED
REINFORCEMENT

DATE PREPARED: 5/13/2015

DATE EFFECTIVE: 4/27/2015

703.45C SHEET NO. 2 OF 3

5/13/2015 5/13/2015
STITCHED TO ONE FACE OF THE CONCRETE WITH 10GAGE COPPER WIRE OR 12 GAGE SOFT DRAWN GALVANIZED STEEL WIRE.

THICKNESS SHALL BE CENTERED ON TRANSVERSE JOINTS.

PREFORMED FIBER EXPANSION JOINT MATERIAL IN ACCORDANCE WITH SEC 1057 SHALL BE SECURELY (a) APPROXIMATELY ONE-THIRD OF WALL.

AND MEMBER DIMENSIONS:

EXPANDED SLOW LEAKAGE JOINT KEYED (TYP.)

UPSTREAM FLARED WINGS REINFORCEMENT

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

THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 3'-0".

GENERAL NOTES:

FOR MEMBER THICKNESS AND BAR SIZES, SPACING AND DIMENSIONS OF STEEL REINFORCEMENT, SEE TOL. 47 FOR 2'-0" SPANS.

BARS AT ABOUT 1'4" CENTERS

BARREL REINFORCEMENT

BARS AT ABOUT 1'-0"

FOOTNOTE:

FOR CLEAR SPAN > 1'-0", THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 3'-0".

PREPARATION DATE: 9/10/2010

CONFIRM DATE: 9/10/2010

703.45C SHEET NO. 3 OF 3

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

JEFFERSON CITY, MO 65102

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

CONCRETE DOUBLE BOX CULVERT

SKEW: RIGHT ADVANCE

WINGS: FLARED

SECTIONS
KEYED CONSTRUCTION JOINT
1.0 APPROXIMATELY ONE-THIRD OF WALL THICKNESS

GRANULAR BACKFILL LIMITS AND MEMBER DIMENSIONS

WITH MASTIC OR TWO SIDED TAPE. CONSIDERED COMPLETELY COVERED BY GAGE COPPER WIRE OR 1Z GAGE SOFT ONE FACE OF THE CONCRETE WITH 10 ON TRANSVERSE JOINTS IN TOP SLAB FILTER CLOTH SHALL BE A SUBSURFACE DRAINAGE GEOTEXTILE IN ACCORDANCE DOUBLE THICKNESS SHALL BE CENTERED DRAWN GALVANIZED STEEL WIRE. WITH SEC 1011. COST OF FURNISHING AND INSTALLING FILTER CLOTH WILL BE FOR DESIGN FILLS OVER 2'-0" SYMMETRICAL ABOUT AND NORMAL TO $CULVERT.

DESIGN SPECIFICATIONS: DOT AASHO-LFD BRIDGE DESIGN SPECIFICATIONS AND 2010 INTERIM REVISIONS

GENERAL NOTES

DESIGN LOADING:

VEHICULAR = HL-93 MINUS LANE LOAD. EARTH = 120 LOAD EQUIVALENT FLUID PRESSURE = 80 LB/CF (MIN.), 60 LB/CF (MAX.).

DESIGN UNIT STRESSES:

SLAB-1 CONCRETE (BOX CULVERT) $f'c$ = 4,000 PSI REINFORCING STEEL (GRADE 60) $fy$ = 60-000 PSI

MISCELLANEOUS:

FOR MEMBER THICKNESS AND FOR BAR SIZES, SPACING AND BAR PROBES. DRAWING NOT TO SCALE. FOLLOW DIMENSIONS. MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 11''.
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 a tabulated design fill only if the maximum fill is greater than 3 ft. Use the greater member thickness, area of reinforcement, and area of reinforcement equals bar area per foot spacing.

Special designs are required when the design fill is less than 1 ft or greater than 50 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.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 West Capitol
Jefferson City, MO 65102
1-888-ASK-MODOT (1-888-275-6686)

CONCRETE DOUBBLE BOX CULVERT
MEMBER THICKNESS
BAR SIZE, SPACING & DIMENSIONS
SPAN (S): 5 FEET
HEIGHT (HT): 3 THRU 6 FEET

SAMPLE BAR DIMENSIONS DIAGRAM SYMMETRICAL ABOUT CULVERT

BAR DIMENSIONS DIAGRAM SYMMETRICAL ABOUT CULVERT.

SPAN (S) = 5 FT
HEIGHT (HT) = 5 FT OR 6 FT

MEMBER TOP SLAB BARS
BOTTOM SLAB BARS
WALL BARS

SPAN (S) = 5 FT
HEIGHT (HT) = 3 FT OR 4 FT

MEMBER THICKNESS
AT BARS
C2 BARS
C3 BARS
C4 BARS
C5 BARS
C6 BARS
C7 BARS
B1 BARS
B2 BARS

DATA SHEET: 703.47 SHEET: 4 OF 27
MEMBER THICKNESS | A1 BARS | J1 BARS | H1 BARS | B1 BARS | B2 BARS
---|---|---|---|---|---
2' 11' | 6 | 6 | 5 | 3 | 1
5' 11' | 8 | 8 | 8 | 4 | 4
10' 9' | 10 | 9 | 8 | 4 | 6.5
15' 9' | 11 | 8 | 8 | 4 | 11.5
20' 8' | 10 | 7 | 7 | 4 | 1.5
24' 8' | 9 | 6 | 6 | 4 | 10.5
28' 8' | 9 | 6 | 6 | 4 | 7.5
32' 8' | 8 | 5 | 5 | 4 | 10.5
36' 8' | 8 | 5 | 5 | 4 | 7.5
40' 8' | 8 | 5 | 5 | 4 | 5.5
44' 8' | 7.5 | 5 | 5 | 4 | 7.5
48' 8' | 7.5 | 5 | 5 | 4 | 5.5
GENERAL NOTES:
- If design fill is less than 1 foot and the design fill is greater than the next greater tabulated design fill, use the next greater member thickness.
- If the design fill is between tabulated design fills, use the next greater member thickness, area of reinforcement and bar dimensions from the next greater tabulated design fill.

EARTH FILL OR ROADWAY.
SPECIAL DESIGNS ARE REQUIRED WHEN THE DESIGN FILL IS LESS THAN 1 FOOT OR GREATER THAN 50 FEET.

MEMBER THICKNESS
BAR SIZE, SPACING & DIMENSIONS
SPAN (S) = 5 FT
HEIGHT (HT) = 7 FT OR 8 FT

CULVERTS MEET STRENGTH AND SERVICEABILITY REQUIREMENTS FOR THE DESIGN WIND LOAD 60-MPH-WIND THE LOAD.
<table>
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**GENERAL NOTES:**

- If design fill is less than the greater tabulated design fill, use the next smaller tabulated design fill. For design fills between two tabulated design fills, use the greater member thickness, area of reinforcement, and bar dimensions from the smaller of the two tabulated design fills. The area of reinforcement equals bar area per foot spacing.
- 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. Cylinders meet strength and serviceability requirements for the design vertical live load at 93 mph winds the lane load.
- If design fill is less than 1 foot or greater than 50 feet, special designs are required.

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

**DATE EFFECTIVE:** 10/01/2019

**DATE PREPARED:** 9/8/2011

**7 OF 27**

**703.47**
<table>
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**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 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. For design fills less than 2 feet, use the tabulated design fills.

* Design fills are measured from the top of top slab to the top of member.

* Dimensions are in inches unless otherwise specified.

**DESIGN LIVE LOAD:** HL-93 minus the lane load.

**DATE EFFECTIVE:** 9/8/2011

**DATE PREPARED:** 9/8/2011

**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 8 FEET AND THE GREATER MEMBER THICKNESS, AREA OF REINFORCEMENT AND BAR DIMENSIONS FROM THE 8 FEET AND 10 FEET TABULATED DESIGN FILLS. AREA OF REINFORCEMENT EQUALS BAR AREA PER FOOT SPACING.

SPECIAL DESIGNS ARE REQUIRED WHEN THE DESIGN FILL IS LESS THAN 1 FOOT OR GREATER THAN 50 FEET.

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

DESIGN FILLS ARE MEASURED FROM THE TOP OF TOP SLAB TO THE TOP OF EARTH FILL OR ROADWAY.

CULVERTS MEET STRENGTH AND SERVICEABILITY REQUIREMENTS FOR THE DESIGNED VEHICULAR 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)

JEFFERSON CITY, MO 65102

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

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

GENERAL NOTES:

IF DESIGN FILL IS BETWEEN TABULATED DESIGN FILLS, USE THE NEXT GREATER TABULATED DESIGN FILL. EXCEPT FOR DESIGN FILLS BETWEEN 8 FEET AND THE GREATER MEMBER THICKNESS, AREA OF REINFORCEMENT AND BAR DIMENSIONS FROM THE 8 FEET AND 10 FEET TABULATED DESIGN FILLS. AREA OF REINFORCEMENT EQUALS BAR AREA PER FOOT SPACING.

SPECIAL DESIGNS ARE REQUIRED WHEN THE DESIGN FILL IS LESS THAN 1 FOOT OR GREATER THAN 50 FEET.

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

DESIGN FILLS ARE MEASURED FROM THE TOP OF TOP SLAB TO THE TOP OF EARTH FILL OR ROADWAY.

CULVERTS MEET STRENGTH AND SERVICEABILITY REQUIREMENTS FOR THE DESIGNED VEHICULAR 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)

CONCRETE DOUBLE BOX CULVERT

MEMBER THICKNESS

BAR SIZE, SPACING & DIMENSIONS

SPAN (S) = 8 FT

HEIGHT (HT) = 10 FT OR 11 FT

DATE EFFECTIVE: 10/23/2001

DATE PREPARED: 9/8/2001

703.47

SHED NO.

11 OF 27
<table>
<thead>
<tr>
<th>SPAN (S)</th>
<th>9 FT</th>
<th>HEIGHT (HT)</th>
<th>11 FT OR 12 FT</th>
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<tbody>
<tr>
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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 special designs and tabulated design fills. Use the greater member thickness, area of reinforcement and bar dimensions from the next greater tabulated design fill. Area of reinforcement equals bar area per foot spacing.

Special designs are required when the design fill is less than 1 foot or greater than 50 feet.

Dimensions are in inches unless otherwise specified.

Design fills are measured from the top of top slab to the top of earth fill or roadway.

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)

JEFFERSON CITY. MO 65102

**DATE PREPARED:** 9/8/2011

**DATE EFFECTIVE:** 9/8/2011

**SHEET NO.:** 703.47

**PAGE NO.:** 13 OF 27
MEMBER THICKNESS

HEIGHT (HT): 5 THRU 10 FEET

SPAN (S): 10 FEET

CONCRETE DOUBLE BOX CULVERT

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

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 4 Foot tabulated design filling, use a Design Fill of 0.5 Foot. 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.

Culverts meet strength and serviceability requirements for the design vertical live load H-20k with the lane load Q-15.

DATE PREPARED: 12/30/2002
DATE PRINTED: 8/8/2011

SPAN (S) = 10 FT
HEIGHT (HT) = 5 FT OR 6 FT OR 7 FT

MEMBER TOP SLAB BARS
B3 BARS
B2 BARS
B1 BARS

SPAN (S) = 10 FT
HEIGHT (HT) = 8 FT OR 9 FT OR 10 FT

MEMBER TOP SLAB BARS
B3 BARS
B2 BARS
B1 BARS

BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT I.C.U.

CONCRETE DOUBLE BOX CULVERT
MEMBER THICKNESS
BAR SIZE, SPACING & DIMENSIONS

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

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

MEMBER TOP SLAB BARS
B3 BARS
B2 BARS
B1 BARS

SPAN (S) = 10 FT
HEIGHT (HT) = 8 FT OR 9 FT OR 10 FT

MEMBER TOP SLAB BARS
B3 BARS
B2 BARS
B1 BARS

BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT I.C.U.

CONCRETE DOUBLE BOX CULVERT
MEMBER THICKNESS
BAR SIZE, SPACING & DIMENSIONS

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

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

MEMBER TOP SLAB BARS
B3 BARS
B2 BARS
B1 BARS

SPAN (S) = 10 FT
HEIGHT (HT) = 8 FT OR 9 FT OR 10 FT

MEMBER TOP SLAB BARS
B3 BARS
B2 BARS
B1 BARS

BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT I.C.U.

CONCRETE DOUBLE BOX CULVERT
MEMBER THICKNESS
BAR SIZE, SPACING & DIMENSIONS

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

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

MEMBER TOP SLAB BARS
B3 BARS
B2 BARS
B1 BARS

SPAN (S) = 10 FT
HEIGHT (HT) = 8 FT OR 9 FT OR 10 FT

MEMBER TOP SLAB BARS
B3 BARS
B2 BARS
B1 BARS

BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT I.C.U.

CONCRETE DOUBLE BOX CULVERT
MEMBER THICKNESS
BAR SIZE, SPACING & DIMENSIONS

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

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

MEMBER TOP SLAB BARS
B3 BARS
B2 BARS
B1 BARS

SPAN (S) = 10 FT
HEIGHT (HT) = 8 FT OR 9 FT OR 10 FT

MEMBER TOP SLAB BARS
B3 BARS
B2 BARS
B1 BARS

BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT I.C.U.
### General Notes:
- If design fill is between tabulated design fills, use the next greater tabulated design fill. Except for design fills between 2 and 4 feet, use the greater member thickness, area of reinforcement, and bar dimensions from the 2 foot or greater tabulated design fills. Area of reinforcement equals bar area per foot spacing.
- Special designs are required when the design fill is less than 1 foot or greater than 50 feet.
- Dimensions are in inches unless otherwise specified.
- Design fills are measured from the top of top slab to the top of earth fill or roadway.

### Culverts Meet Strength and Serviceability Requirements for the Design Vehicle Live Load H-93 with the Lane Load.

#### Missouri Highways and Transportation Commission
105 West Capitol
Jefferson City, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

**Date Prepared:** 9/8/2011
**Date Effective:** 7/10/2011

**Sheet No:** 15 of 27

---

### Table of Design Specifications

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<th>A1 Bars</th>
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<th>B2 Bars</th>
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### Diagram

- **Member Thickness Diagram**
- **Bar Dimensions Diagram**

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**GENERAL NOTES:**
- If design fill is between tabulated design fills, use the next greater tabulated design fill. Except for design fills between 2 and 4 feet, use the greater member thickness, area of reinforcement, and bar dimensions from the 2 foot or greater tabulated design fills. Area of reinforcement equals bar area per foot spacing.
- Special designs are required when the design fill is less than 1 foot or greater than 50 feet.
- Dimensions are in inches unless otherwise specified.
- Design fills are measured from the top of top slab to the top of earth fill or roadway.

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

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

**DATE PREPARED:** 9/8/2011
**DATE EFFECTIVE:** 7/10/2011

**SHEET NO:** 15 OF 27

---

**CONCRETE DOUBLE BOX CULVERT**

**MEMBER THICKNESS**

**BAR SIZE, SPACING & DIMENSIONS**

**SPAN (S): 10 FEET**

**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. If design fill is less than 2 feet, use the greater member thicknesses. Area of reinforcement is calculated based on the area of reinforcement equals area of reinforcement equals 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 and Serviceability Requirements
For the design vermiculite live load H-I-31C winds the lane load.

### Missouri Highways and Transportation Commission
Concrete Double Box Culvert
Member Thickness
Bar Size, Spacing 
Dimensions

#### Span (S): 11 FT

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### Conventional Dimensions Diagram

- **Bar Dimensions Diagram**: Symmetrical about culvert.
- **2" CL**: (H1, H2, J1, B1 & B2 Bars)
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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 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.

### Design Fill Dimensions:
- 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): 11 feet
- Height (HT): 12 thru 14 feet

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

CONCRETE DOUBLE BOX CULVERT
MEMBER THICKNESS
BAR SIZE, SPACING & DIMENSIONS
SPAN (S): 11 FEET
HEIGHT (HT): 12 THRU 14 FEET

DATE PREPARED: 9/8/2011
DATE EFFECTIVE: 9/8/2011

SHEET NO: 27
Sheet 17 of 27
<table>
<thead>
<tr>
<th>DESIGN</th>
<th>SPAN (S) = 12 FT</th>
<th>SPAN (S) = 12 FT OR 15 FT</th>
<th>HEIGHT (HT) = 12 FT OR 15 FT</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 footage and 4 foot fills, tabulated design fills are greater than or equal to the greater member thickness, area of reinforcement and bar dimensions from the 2 feet and 4 feet tabulated design fills. Area of reinforcement equals 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 the 3 foot fill or roadway.

**GENERAL DESIGN:**
- Culverts meet strength and serviceability requirements for the design vertical live load H-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)
- MISSOURI MEMBERS THICKNESS: 1-5 7/8"-8"
- DATE PREPARED: 9/8/2011
- SHEET NO: 703.47
- CONCRETE DOUBLE BOX CULVERT
- MEMBER THICKNESS
- BAR SIZE, SPACING & DIMENSIONS
- SPAN (S): 12 FEET
- HEIGHT (HT): 12 OR 15 FEET
- DATE EFFECTIVE: 10/1/2011
<table>
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<th>DESIGN</th>
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<tr>
<td>SPAN (S) = 13 FT</td>
<td>WOMEN</td>
<td>THICKNESS</td>
<td>A1 BARS</td>
<td>2 BARS</td>
<td>3 BARS</td>
<td>4 BARS</td>
<td>5 BARS</td>
<td>6 BARS</td>
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<td>SPAN</td>
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<td>A4 BARS</td>
<td>A5 BARS</td>
<td>A6 BARS</td>
<td>A7 BARS</td>
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</table>

GENERAL NOTES:
IF DESIGN FILL IS BETWEEN TABLED DESIGN FILLS, USE THE NEXT GREATER TABULATED DESIGN FILL. EXCEPT FOR DESIGN FILLS BETWEEN 2 & 3 FT, USE 3 FT DESIGN FILL. USE 8.6 FN FOR UNITED STATES DESIGN FILLS. USE THE GREATER MEMBER THICKNESS, AREA OF REINFORCEMENT AND BAR DIMENSIONS FROM THE FEET AND 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.
CONCRETE DESIGN FILLS ARE MEASURED FROM THE TOP OF TOP SLAB TO THE TOP OF EARTH FILL OR ROADWAY.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-800-MODOT-4U (1-800-663-6868)

CONCRETE DOUBBLE BOX CULVERT
MEMBER THICKNESS
BAR SIZE, SPACING & DIMENSIONS
SPAN (S) = 13 FT
HEIGHT (HT) = 13 FT OR 16 FT

DATE EFFECTIVE: 10/25/2000
DATE PREPARED: 9/8/2001
SHEET NO.: 703.47
21 OF 27

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-800-MODOT-4U (1-800-663-6868)

CONCRETE DOUBBLE BOX CULVERT
MEMBER THICKNESS
BAR SIZE, SPACING & DIMENSIONS
SPAN (S) = 13 FT
HEIGHT (HT) = 13 FT OR 16 FT

DATE EFFECTIVE: 10/25/2000
DATE PREPARED: 9/8/2001
SHEET NO.: 703.47
21 OF 27

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-800-MODOT-4U (1-800-663-6868)

CONCRETE DOUBBLE BOX CULVERT
MEMBER THICKNESS
BAR SIZE, SPACING & DIMENSIONS
SPAN (S) = 13 FT
HEIGHT (HT) = 13 FT OR 16 FT

DATE EFFECTIVE: 10/25/2000
DATE PREPARED: 9/8/2001
SHEET NO.: 703.47
21 OF 27

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-800-MODOT-4U (1-800-663-6868)

CONCRETE DOUBBLE BOX CULVERT
MEMBER THICKNESS
BAR SIZE, SPACING & DIMENSIONS
SPAN (S) = 13 FT
HEIGHT (HT) = 13 FT OR 16 FT

DATE EFFECTIVE: 10/25/2000
DATE PREPARED: 9/8/2001
SHEET NO.: 703.47
21 OF 27
### General Notes:
- If design fill is between tabulated design fills, use the next greater tabulated design fill. Except for design fills between 2 and 4 feet, use the next greater tabulated design fill. Use the greater member thicknesses, area of reinforcement, and bar dimensions from the 4-feet fill and 4-feet tabulated design fills. Area of reinforcement equals bar area per foot of footing 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.

### Petroleum Culvert
- Member thicknesses and bar sizes are not applicable for petroleum culverts.

### Missouri Highways and Transportation Commission

#### Date Prepared: 7/29/2011

---

### SPAN (S) = 15 FT

#### Height (H) = 8 FT OR 9 FT OR 10 FT

**Member Thickness**
- **Top Slab Bars** (A1 Bars)
- **Bottom Slab Bars** (A2 Bars)
- **Wall Bars** (A3 Bars)

<table>
<thead>
<tr>
<th>DESIGN FILL</th>
<th>MEMBER THICKNESS</th>
<th>A1 BARS</th>
<th>A2 BARS</th>
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<tbody>
<tr>
<td>1 FT</td>
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**Dimensions Are In Inches Unless Otherwise Specified.**

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### Double Box Culvert

#### Date Prepared: 7/29/2011

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### Conical Culvert

#### Date Prepared: 7/29/2011

---

### 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 tabulated design fill. Use the greater member thicknesses, area of reinforcement, and bar dimensions from the 4-feet fill and 4-feet tabulated design fills. Area of reinforcement equals bar area per foot of footing 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.

### Petroleum Culvert
- Member thicknesses and bar sizes are not applicable for petroleum culverts.
### SPAN (S) = 16 FT

**HEIGHT (Ht) = 8 FT OR 9 FT OR 10 FT**

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<th>MEMBER WIDTH (C)</th>
<th>B1 BARS</th>
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</table>

**DATE EFFECTIVE:**

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

JEFFERSON CITY, MO 65102

**DATE PREPARED:**

9/8/2011

**SHEET NO.:**

26 OF 27

### GENERAL NOTES:

If design fill is between tabulated design fills, use the next greater tabulated design fill except for design fills between 2 and 4 feet. Use special designs when the design fill is less than 1 foot. Use the greater member thickness, area of reinforcement and bar dimensions from the next larger tabulated 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 wind and live loads H-23. Wind the lane load.
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 LATERAL BARS NOT TO MINIMUM OF 3" AT SPICES.
BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.
(a) SAME SIZE AND SPACING AS ADJACENT BARS
(b) VARIES. 12" MAXIMUM
(c) NOT SPECIFIED ON THIS SHEET
(d) NOT SPECIFIED ON THIS SHEET
(e) NOT SPECIFIED ON THIS SHEET
(f) NOT SPECIFIED ON THIS SHEET
(g) NOT SPECIFIED ON THIS SHEET
(h) FOR DESIGN FILLS OVER 2'-0"
(i) FOR DESIGN FILLS 2'-0" OR LESS
(j) NOT REQUIRED FOR CLEAR SPANS < 10'-0"
(k) FOR CLEAR SPAN < 10'-0"
(l) FOR CLEAR SPAN > 10'-0"
(m) 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.

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: SQUARED
WINGS: STRAIGHT
REINFORCEMENT
DATE EFFECTIVE: 02/01/2011
DATE PREPARED: 09/13/2010
703.80H SHEET NO. 2 OF 3
FILTER CLOTH WILL BE CONSIDERED COMPLETELY COVERED BY THE CONTRACT UNIT PRICE FOR OTHER ITEMS.

FILTER CLOTH 3 FEET IN WIDTH AND DOUBLE MASTIC OR TWO SIDED TAPE. FILTER CLOTH SHALL BE A SUBSURFACE DRAINAGE GEOTEXTILE IN ACCORDANCE WITH DRAINAGE SPECIFICATION.

GRANULAR BACKFILL--

JOINT MATERIAL

REINFORCEMENT

#8 FOR CLEAR SPAN > 10'-0"  
#9 FOR CLEAR SPAN > 13'-0"

WALL SHALL BE THE GREATER OF MEMBER THICKNESS AND FOR BARSIZES, SPACING AND DIMENSIONS OF CULVERT, HEADWALL SECTIONS ARE NORMAL TO LONG DIRECTION OF HEADWALL.

DRAWING NOT TO SCALE, FOLLOW DIMENSIONS.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1".

GENERAL NOTES:

CONCRETE TRIPLE BOX CULVERT

SKEW: SQUARED WINGS: STRAIGHT

SECTIONS

DATE EFFECTIVE: 12/01/2011
DATE PREPARED: 3/13/2011

703.80H SHEET NO. 3 OF 3

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

JEFFERSON CITY, MO 65102
1-888-456-MODOT 1-888-275-6636

109 WEST CAPITOL

CONCRETE TRIPLE BOX CULVERT

SKEW: SQUARED WINGS: STRAIGHT

SECTIONS

DATE EFFECTIVE: 12/01/2011
DATE PREPARED: 3/13/2011

703.80H SHEET NO. 3 OF 3

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

JEFFERSON CITY, MO 65102
1-888-456-MODOT 1-888-275-6636

109 WEST CAPITOL
GENERAL NOTES:

FOR SECTIONS THRU BARREL, WINGS AND HEADWALLS: SEE SHEET 3 OF 3 FOR BAR SPACING, 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 5 OF 5 FOR DETAILS.

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1".

LAP LONGITUDINAL BARS A MINIMUM OF 24" AT SPLICES.

BIEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

(a) SAME SIZE AND SPACING AS ADJACENT B BARS

(b) VARIES. 12" MAXIMUM

(c) J4 BAR SPACING

(d) SAME SIZE AND SPACING AS A2 BARS

(e) A2 BAR SPACING

DATE PREPARED: 3/2/2011

DATE ISSUED: 3/10/2011

703-81H

SHEET NO. 1 OF 3

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
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 703.37. FOR J5 BARS, SEE 703.37.

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

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1". LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.

BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

(a) SAME SIZE AND SPACING AS ADJACENT B BARS
(b) VARIES. 12" MAXIMUM
(c) NOT SPECIFIED ON THIS SHEET
(d) SAME SIZE AND SPACING AS A2 BARS
(e) A2 BAR SPACING
(f) NOT SPECIFIED ON THIS SHEET
(g) NOT SPECIFIED ON THIS SHEET
(h) FOR DESIGN FILLS OVER 2'-0" OR LESS
(i) FOR DESIGN FILLS 2'-0" OR LESS
(j) NOT REQUIRED FOR CLEAR SPANS > 10'-0"
(k) FOR CLEAR SPAN < 10'-0"
(l) FOR CLEAR SPAN < 13'-0"

IF REQUIRED, THE MINIMUM LENGTH EACH SIDE OF A WALL SHALL BE THE GREATER OF 48 BAR DIAMETERS OR 5' FOR CLEAR SPANS > 10'-0", THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

DATE PREPARED: 8/13/2015
DATE EFFECTIVE: 8/01/2015

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-455-MODOT 1-888-275-6631

CONCRETE
TRIPLE BOX CULVERT
SKEW: SQUARED
WINGS: FLARED
REINFORCEMENT

PLAN OF TOP SLAB
B BARS IN WALLS ARE NOT SHOWN FOR CLARITY. FOR PLACEMENT, SEE SHEET 1 OF 3.

J3 BARS AT TOP
A1 BARS AT BOTTOM
J3 BARS AT TOP

SECTION NEAR INTERIOR WALL
J1 BARS MAY BE BENT IN FIELD OR SHOP.

02 BAR (j)
02 BAR (j)
02 BAR (j)
02 BAR (j)
02 BAR (j)
02 BAR (j)
02 BAR (j)
02 BAR (j)
02 BAR (j)
02 BAR (j)
02 BAR (j)
02 BAR (j)
02 BAR (j)
02 BAR (j)
02 BAR (j)
02 BAR (j)
02 BAR (j)
02 BAR (j)
02 BAR (j)
02 BAR (j)
02 BAR (j)
02 BAR (j)
02 BAR (j)
02 BAR (b) - 'J (TYP. )

KEYED CONSTRUCTION JOINT

GRANULAR BACKFILL LIMITS

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 PREFORMED FIBER EXPANSION JOINT MATERIAL IN ACCORDANCE WITH SEC 1057 SHALL BE SECURELY SECURED TO THE CONCRETE WITH 10 CABER RING OF 1/2 IN. GAUGED SOFT WAX AND HAMMERED 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 WAXIC substance. FILTER CLOTH SHALL BE SECURELY STITCHED TO ONE FACE OF THE CONCRETE WITH 10 CABER RINGS OF 1/2 IN. GAUGED SOFT WAX AND HAMMERED STEEL NAILS.

UPSTREAM FLARED WINGS REINFORCEMENT

DOWNSTREAM WINGS REINFORCEMENT

BARREL REINFORCEMENT

FOR DESIGN FILLS OVER 2'-0''

BARREL REINFORCEMENT

FOR DESIGN FILLS OVER 2'-0'' OR LESS

GENERAL NOTES:

FOR MEMBER THICKNESS AND FOR BAR SIZES, SPACING AND DIMENSIONS OF BAR ELONGATION, SEE 703.87, FOR JS BARS.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1/8''.

BARREL AND WINGS ARE SECTIONS ARE SYMMETRICAL, BENDING NORMAL TO CULVERT. HEADWALL SECTIONS ARE NORMAL TO LONG DIRECTION OF HEADWALL.

DRAWING NOT TO SCALE, FOLLOW DIMENSIONS.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1/8''.
GENERAL NOTES:

1. FOR SECTIONS THRU BARREL, WINGS AND HEADWALLS, SEE SHEET 5 OF 703.87 FOR BAR SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT EXCEPT J5 BARS. SEE 703.87 FOR J5 BARS.

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

3. FOR SECTIONS THRU BARREL, WINGS AND HEADWALLS, SEE SHEET 3 OF 703.87 FOR BAR SIZES, SPACING AND DIMENSIONS.

4. DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

5. FOR SECTIONS THRU BARREL, WINGS AND HEADWALLS, SEE SHEET 3 OF 703.87 FOR BAR SIZES, SPACING AND DIMENSIONS.

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

7. MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1".

8. WHEN BARREL AND CUT SECTION LENGTH RESTRICTIONS REQUIRE TRANSVERSE JOINTS TO BE LOCATED UNDER A TRAVELED WAY WITH DESIGN FILLS 2 FEET OR LESS THE FOLLOWING SHALL APPLY:

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

10. BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

11. FOR CUT SECTION DETAILS, SEE 703.86.

12. CUT SECTION LENGTHS UP TO 60 FEET.

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

14. 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.

15. TRANSVERSE JOINTS MAY BE BENT IN FIELD OR SHOP.

16. REINFORCEMENT

17. 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 FOLLOWING SHALL APPLY:

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

19. BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

20. FOR CUT SECTION DETAILS, SEE 703.86.

21. CUT SECTION LENGTHS UP TO 60 FEET.

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

23. 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.

24. TRANSVERSE JOINTS MAY BE BENT IN FIELD OR SHOP.
GENERAL NOTES:

FOR SECTIONS THRU BARREL, WINGS AND HEADWALLS, SEE SHEET 3 OF 3. FOR BAR SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT EXCEPT J5 BARS, SEE 703.87. FOR J5 BARS, SEE 703.37.

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

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

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

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) AT BAR SPACING
(h) FOR DESIGN FILLS OVER 2'-0"^2
(i) FOR DESIGN FILLS OVER 2'-0" OR LESS
(j) NOT REQUIRED FOR CLEAR SPANS 5'-0"-0"
(k) FOR CLEAR SPANS 5'-0"-0"
(l) FOR CLEAR SPANS 5'-0"-0"

10' -0" #8 FOR CLEAR SPAN > 10'-0"
13' -0" #9 FOR CLEAR SPAN > 13'-0"
3'-0" AT BOTTOM

VARIATION A BARS

VARIED A BARS

J1 BARS MAY BE BENT IN FIELD OR SHOP.
02 BAR (b) 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 IN TOP SLAB AND SIDEWALLS WITH EDGES SEALED WITH FILTER CLOTH 3 FEET IN WIDTH AND DOUBLE MASTIC OR TWO SIDED TAPE. FILTER CLOTH SHALL BE A SUBSURFACE DRAINAGE GEOTEXTILE IN ACCORDANCE WITH SEC 1057 SHALL BE SECURELY APPROXIMATELY ONE-THIRD OF WALL THICKNESS AND MEMBER DIMENSIONS. 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-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 WASTIC ON TWO SIDED TAPE. FILTER CLOTH SHALL BE A SUBSURFACE DRAINAGE GEOTEXTILE IN ACCORDANCE WITH PREFORMED FIBER EXPANSION JOINT MATERIAL. FLOWING FILTER CLOTH WILL BE CONSIDERED COMPLETELY COVERED BY THE CONTRACT UNIT PRICE FOR OTHER ITEMS.

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

UPSTREAM AND DOWNSTREAM WINGS REINFORCEMENT

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

GENERAL NOTES:
FOR MEMBER THICKNESS AND FOR BAR SIZES, SPACING, AND DIMENSIONS OF JOINTS AND KEYED MATERIAL, SEE 703.87. FOR 15 BARS, SEE 703.37.
BARREL AND WINGS SECTIONS ARE SYMMETRIC, EXCEPT FOR BAR SIZES, SPACING, AND NORMAL JOINTS. BARREL, HEADWALL, SECTIONS ARE NORMAL TO LONG DIRECTION OF HEADWALL.
DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.
MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1/4".

D2 BAR (1) 12" AT 12" CENTERS.
D2 BAR (2) 12" AT 12" CENTERS.
D2 BAR (3) 12" AT 12" CENTERS.
D2 BAR (4) 12" AT 12" CENTERS.
D2 BAR (5) 12" AT 12" CENTERS.
D2 BAR (6) 12" AT 12" CENTERS.
D2 BAR (7) 12" AT 12" CENTERS.
D2 BAR (8) 12" AT 12" CENTERS.
D2 BAR (9) 12" AT 12" CENTERS.
D2 BAR (10) 12" AT 12" CENTERS.
D2 BAR (11) 12" AT 12" CENTERS.
D2 BAR (12) 12" AT 12" CENTERS.
D2 BAR (13) 12" AT 12" CENTERS.
D2 BAR (14) 12" AT 12" CENTERS.
D2 BAR (15) 12" AT 12" CENTERS.
D2 BAR (16) 12" AT 12" CENTERS.
D2 BAR (17) 12" AT 12" CENTERS.
D2 BAR (18) 12" AT 12" CENTERS.
D2 BAR (19) 12" AT 12" CENTERS.
D2 BAR (20) 12" AT 12" CENTERS.
D2 BAR (21) 12" AT 12" CENTERS.
D2 BAR (22) 12" AT 12" CENTERS.
D2 BAR (23) 12" AT 12" CENTERS.
D2 BAR (24) 12" AT 12" CENTERS.
D2 BAR (25) 12" AT 12" CENTERS.
D2 BAR (26) 12" AT 12" CENTERS.
D2 BAR (27) 12" AT 12" CENTERS.
D2 BAR (28) 12" AT 12" CENTERS.
D2 BAR (29) 12" AT 12" CENTERS.
D2 BAR (30) 12" AT 12" CENTERS.
D2 BAR (31) 12" AT 12" CENTERS.
D2 BAR (32) 12" AT 12" CENTERS.
D2 BAR (33) 12" AT 12" CENTERS.
D2 BAR (34) 12" AT 12" CENTERS.
D2 BAR (35) 12" AT 12" CENTERS.
D2 BAR (36) 12" AT 12" CENTERS.
D2 BAR (37) 12" AT 12" CENTERS.
D2 BAR (38) 12" AT 12" CENTERS.
D2 BAR (39) 12" AT 12" CENTERS.
D2 BAR (40) 12" AT 12" CENTERS.
02 BAR 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 IN TOP SLAB AND SIDEWALLS WITH EDGES SEALED WITH FILTER CLOTH 3 FEET IN WIDTH AND DOUBLE MASTIC OR TWO SIDED TAPE. FILTER CLOTH SHALL BE A SUBSURFACE DRAINAGE GEOTEXTILE IN ACCORDANCE WITH SEC 1057 SHALL BE SECURELY.

GRANULAR BACKFILL LIMITS AND MEMBER DIMENSIONS

TRANSVERSE JOINT THRU BARREL

PREFORMED FIBER EXPANSION JOINT MATERIAL IN ACCORDANCE WITH SEC 957 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 WASTIC ON TWO SIDED TAPE. FILTER CLOTH SHALL BE A SUBSURFACE DRAINAGE GEOTEXTILE IN ACCORDANCE WITH SEC 1057. BARREL REINFORCEMENT FOR DESIGN FILLS OVER 2'-0".

GENERAL NOTES:

FOR MEMBER THICKNESS AND FOR BAR SIZES, SPACING AND DIMENSIONS OF CONCRETE TRIPLE BOX CULVERTS, SEE 703.817. FOR JS BARS, SEE 703.871.

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

DRAWN NOT TO SCALE. FOLLOW DIMENSIONS.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 11-1/2".
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. CONSTRUCTION JOINT KEY NOT SHOWN FOR CLARITY IN PLAN AND ELEVATION. SEE SHEET 3 OF 3 FOR DETAILS.

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

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

5. BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

6. 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 UNDER THE TRAVELED WAY. TRAVELED WAY IS THE ROADWAY WIDTH MINUS SHOULDER Widths.

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 UNDER THE TRAVELED WAY. TRAVELED WAY IS THE ROADWAY WIDTH MINUS SHOULDER Widths.

8. WHEN BARREL AND CUT SECTION LENGTH RESTRICTIONS REQUIRE TRANSVERSE JOINTS TO BE LOCATED UNDER A TRAVELED WAY WITH DESIGN FILLS 2 FEET OR LESS, THE JOINTS SHALL BE LOCATED TO MINIMIZE THE LENGTH UNDER THE TRAVELED WAY. TRAVELED WAY IS THE ROADWAY WIDTH MINUS SHOULDER Widths.

9. 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 UNDER THE TRAVELED WAY. TRAVELED WAY IS THE ROADWAY WIDTH MINUS SHOULDER Widths.

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 UNDER THE TRAVELED WAY. TRAVELED WAY IS THE ROADWAY WIDTH MINUS SHOULDER Widths.

11. 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 UNDER THE TRAVELED WAY. TRAVELED WAY IS THE ROADWAY WIDTH MINUS SHOULDER Widths.

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 UNDER THE TRAVELED WAY. TRAVELED WAY IS THE ROADWAY WIDTH MINUS SHOULDER Widths.

13. 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 UNDER THE TRAVELED WAY. TRAVELED WAY IS THE ROADWAY WIDTH MINUS SHOULDER Widths.

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 UNDER THE TRAVELED WAY. TRAVELED WAY IS THE ROADWAY WIDTH MINUS SHOULDER Widths.

15. 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 UNDER THE TRAVELED WAY. TRAVELED WAY IS THE ROADWAY WIDTH MINUS SHOULDER Widths.

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 UNDER THE TRAVELED WAY. TRAVELED WAY IS THE ROADWAY WIDTH MINUS SHOULDER Widths.

17. 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 UNDER THE TRAVELED WAY. TRAVELED WAY IS THE ROADWAY WIDTH MINUS SHOULDER Widths.
STITCHED TO ONE FACE OF THE CONCRETE WITH 10 GAGE COPPER WIRE OR 12 GAGE SOFT DRAWN COPPER WIRE. THICKNESS SHALL BE CENTERED ON TRANSVERSE JOINTS IN TOP SLAB AND SIDEWALLS WITH EDGES SEALED WITH FILTER CLOTH 3 FEET IN WIDTH AND DOUBLE MASTIC OR TWO SIDED TAPE. FILTER CLOTH SHALL BE A SUBSURFACE DRAINAGE GEOTEXTILE IN ACCORDANCE WITH SEC 1011.

COST OF FURNISHING AND INSTALLING ACCORDANCE WITH SEC 1057 SHALL BE SECURELY TIED TO THE IN place CONCRETE WITH 10 GAGE COPPER WIRE OR 12 GAGE COPPER WIRE.

GRANULAR BACKFILL LIMITS AND MEMBER DIMENSIONS

TRANSVERSE 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 GAUGE COPPER WIRE OR 12 GAUGE COPPER WIRE. THICKNESS SHALL BE CENTERED ON TRANSVERSE JOINTS IN TOP SLAB AND SIDEWALLS WITH EDGES SEALED WITH FILTER CLOTH 3 FEET IN WIDTH AND DOUBLE MASTIC OR TWO SIDED TAPE. FILTER CLOTH SHALL BE A SUBSURFACE DRAINAGE GEOTEXTILE IN ACCORDANCE WITH SEC 1011.

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

UPSTREAM AND DOWNSTREAM WINGS REINFORCEMENT

GENERAL NOTES:
FOR MEMBER THICKNESS AND FOR BAR SIZE PREFERENCES AND DIMENSIONS OF REINFORCEMENT, SEE 703.17. FOR J5 BARS, SEE 1031.45.

BARREL AND WING SECTIONS ARE SKEWED, ARCHED AND NORMAL TO CULVERT, HEADWALL SECTIONS ARE NORMAL TO THE LONG DIRECTION OF HEADWALL.

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

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

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

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

CONCRETE
TRIPE BOX CULVERT
SKEW: RIGHT ADVANCE
WINGS: STRAIGHT

SECTIONS

DATE EFFECTIVE: 2/2/2011
DATE PREPARED: 3/10/2011

703.84H SHEET NO. 3 OF 3
GENERAL NOTES:

FOR SECTIONS THRU BARREL, WINGS AND HEADWALLS, SEE SHEET 3 OF 3. FOR BAR SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT EXCEPT J5 BARS, SEE 703.87. FOR J5 BARS, SEE 703.37.

CONSTRUCTION JOINT KEY NOT SHOWN FOR CLARITY IN PLAN AND 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.

(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 AZ BARS
(e) A2 BAR SPACING
(f) SAME SIZE AND SPACING AS A1 BARS
(g) AT BAR SPACING
(h) FOR DESIGN FILLS OVER 2'-0"
(i) FOR DESIGN FILLS 2'-0" OR LESS
(j) NOT REQUIRED FOR CLEAR SPANS < 10'-0"
(k) FOR CLEAR SPAN < 15'-0"
(l) FOR CLEAR SPAN < 20'-0"
(m) 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.

REINFORCEMENT

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

DATE EFFECTIVE: 12/01/2011
DATE PREPARED: 3/13/2011

703.85C SHEET NO. 2 OF 3
KEYED CONSTRUCTION JOINT
(a) APPROXIMATELY ONE-THIRD OF WALL THICKNESS
(b) NOT REQUIRED FOR CLEAR SPANS > 10'-0"
#2 AND #4 BARS ARE REQUIRED. THE MINIMUM WIDTH EACH SIDE OF A WALL SHALL BE THE GREATER OF 42 BAR DIAMETERS OR A CLEAR SPAN. THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

GRANULAR BACKFILL LIMITS AND MEMBER DIMENSIONS

TRANSVERSE JOINT THRU BARREL
PREFORMED FIBER EXPANSION JOINT MATERIAL IN ACCORDANCE WITH SECT. 9.154 SHALL BE SECURELY STITCHED TO ONE FACE OF THE CONCRETE WITH 10 IN. CONDOR RIE UP TO 50 CABLES 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 SEAL WITH WASTIC OR TWO SIDED TAP. FILTER CLOTH SHALL BE SECURITY STITCHED TO ONE FACE OF THE CONCRETE WITH 10 IN. CONDOR RIE UP TO 50 CABLES SOFT DRAWN GALVANIZED STEEL NAILS.

UPSTREAM HEADWALL REINFORCEMENT NEAR INTERIOR WALL
#2 BARS AT 12" CTS.

UPSTREAM HEADWALL REINFORCEMENT NEAR MIDSPAN
#2 BARS AT 12" CTS.

DOWNSTREAM HEADWALL REINFORCEMENT NEAR INTERIOR WALL
#4 Bars at 12" CTS.

DOWNSTREAM HEADWALL REINFORCEMENT NEAR MIDSPAN
#4 Bars at 12" CTS.

BARREL REINFORCEMENT FOR DESIGN FILLS OVER 2'-0"
#4 Bars at 12" CTS.

BARREL REINFORCEMENT FOR DESIGN FILLS 2'-0' OR LESS
#4 Bars at 12" CTS.

GENERAL NOTES:
FOR MEMBER THICKNESS AND FOR BAR SIZES, SPACING AND DIMENSIONS OF 45 BAR DIMENSIONS, SEE 703-85C BARS. SEE 703-18T FOR 42 BARS.

BARREL AND WINGS SECTIONS ARE SYMMETRICAL AND NORMAL TO LONG DIRECTION OF HEADWALL.
DRAWING NOT TO SCALE, FOLLOW DIMENSIONS.
MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1/2."
SPAN (S) = 3 FT  HEIGHT (H) = 2 FT OR 3 FT OR 4 FT

MEMBER TOP SLAB BARS  BOTTOM SLAB BARS  WALL BARS

SPANN (S) = 3 FT  HEIGHT (H) = 5 FT OR 6 FT

MEMBER TOP SLAB BARS  BOTTOM SLAB BARS  WALL BARS

GENERAL NOTES:
1. IF DESIGN FILL IS BETWEEN TABULATED DESIGN FILLS, USE THE NEXT GREATER 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.

2. AREA OF REINFORCEMENT EQUALS BAR AREA PER FOOT SPACING.

3. GENERAL DESIGN REQUIREMENTS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

4. DESIGN FILLS ARE MEASURED FROM THE TOP OF TOP SLAB TO THE TOP OF EARTH FILL OR ROADWAY.

5. CULVERTS MUST MEET STRENGTH AND SERVICEABILITY REQUIREMENTS FOR THE GREATER MEMBER THICKNESS, AREA OF REINFORCEMENT AND BAR DIMENSIONS.
**TABLE 1**

<table>
<thead>
<tr>
<th>Design</th>
<th>Height (Ht)</th>
<th>B1 Bars</th>
<th>B2 Bars</th>
<th>B3 Bars</th>
<th>B4 Bars</th>
<th>B5 Bars</th>
<th>B6 Bars</th>
<th>B7 Bars</th>
<th>B8 Bars</th>
</tr>
</thead>
<tbody>
<tr>
<td>60 FT</td>
<td>10 8 8 8 4</td>
<td>12 24 24 3</td>
<td>12 24 24 3</td>
<td>12 24 24 3</td>
<td>12 24 24 3</td>
<td>12 24 24 3</td>
<td>12 24 24 3</td>
<td>12 24 24 3</td>
<td>12 24 24 3</td>
</tr>
<tr>
<td>60 FT</td>
<td>9 10 8 8 4</td>
<td>12 24 24 3</td>
<td>12 24 24 3</td>
<td>12 24 24 3</td>
<td>12 24 24 3</td>
<td>12 24 24 3</td>
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<td>12 24 24 3</td>
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<tr>
<td>60 FT</td>
<td>8 9 10 8 4</td>
<td>12 24 24 3</td>
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<tr>
<td>60 FT</td>
<td>7 8 9 10 4</td>
<td>12 24 24 3</td>
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<td>12 24 24 3</td>
</tr>
<tr>
<td>60 FT</td>
<td>6 7 8 9 4</td>
<td>12 24 24 3</td>
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<tr>
<td>60 FT</td>
<td>5 6 7 8 4</td>
<td>12 24 24 3</td>
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<td>12 24 24 3</td>
<td>12 24 24 3</td>
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<td>12 24 24 3</td>
<td>12 24 24 3</td>
</tr>
</tbody>
</table>

**GENERAL NOTES:**

- If the design fill is between tabulated design fills, use the next greater tabulated design fill except for design fills between 2 and 2.5 feet. For design fills, use the greater member thickness area of reinforcement and bar dimensions from the 2 feet and 2.5 feet tabulated design fills. Area of reinforcement equals bar area per foot spacing.

- Special designs are recommended when the design fill is less than 1 foot or greater than 50 feet.

- Dimensions are in inches unless otherwise specified.

- Design fills are measured from the top of the top slab to the top of the fill (1 foot or less).

- Culverts meet strength and serviceability requirements for the design vehicle live load H-20 plus the lane load.
<table>
<thead>
<tr>
<th>SPAN (S) = 5 FT</th>
<th>HEIGHT (H) = 3 FT OR 4 FT</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1 BARS</td>
<td>A2 BARS</td>
</tr>
<tr>
<td>C1 BARS</td>
<td>C2 BARS</td>
</tr>
<tr>
<td>C5 BARS</td>
<td>C6 BARS</td>
</tr>
</tbody>
</table>

**GENERAL NOTES:**

1. If design fill is between tabulated design fills, use the next greater tabulated design fill. If design fills between 2 ft and 50 ft are required the designer shall use the greater member thickness, area of reinforcement and bars.
2. Dimensions from the top are 1 ft less than tabulated design fill. Area of reinforcement equals bar area per foot spacing.
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 earth fill or roadway.
6. Culverts meet strength and serviceability requirements for the design vehicle live load H-20-43 Munitas the lane load.

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

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

**CONCRETE TRIPLE BOX CULVERT**

MEMBER THICKNESS:

BAR SIZE: SPACING & DIMENSIONS

SPAN (S) = 5 FEET

HEIGHT (H) = 3 OR 4 FEET

**DATE EFFECTIVE:**

9/29/2011

**DATE PREPARED:**

9/29/2011

**SHEET NO.:**

4 OF 27

**703.87**
### General Notes:

If Design Fill is between tabled design fills, use the Next Greater Ungrounded Design Fill. Except for Design Fills Between 2 and 4, use the Greater Member Thickness, Area of Reinforcement and Bar Dimensions of the Fill Feets and 4 Feet Taller 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 the Slab Top to the Top of Earth Fill or Roadway.

### Member Thickness

<table>
<thead>
<tr>
<th>Height (ft)</th>
<th>3 FT</th>
<th>4 FT</th>
<th>5 FT</th>
<th>6 FT</th>
<th>7 FT</th>
<th>8 FT</th>
<th>9 FT</th>
<th>10 FT</th>
</tr>
</thead>
<tbody>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

### Span (S) = 6 FT

<table>
<thead>
<tr>
<th>Design</th>
<th>Span (S)</th>
<th>Height (H)</th>
<th>Top Slab Bars</th>
<th>Bottom Slab Bars</th>
<th>Wall Bars</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>A1 Bars</td>
<td>A2 Bars</td>
<td>H1 Bars</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>A3 Bars</td>
<td>A4 Bars</td>
<td>H3 Bars</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>C1 Bars</td>
<td>C2 Bars</td>
<td>C3 Bars</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>C4 Bars</td>
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<td>C6 Bars</td>
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<td>C7 Bars</td>
<td>C8 Bars</td>
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<td></td>
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<td>C10 Bars</td>
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</tbody>
</table>

### Span (S) = 7 FT

<table>
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<th>Span (S)</th>
<th>Height (H)</th>
<th>Top Slab Bars</th>
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<th>Wall Bars</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>A1 Bars</td>
<td>A2 Bars</td>
<td>H1 Bars</td>
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<tr>
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<td>A3 Bars</td>
<td>A4 Bars</td>
<td>H3 Bars</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>C1 Bars</td>
<td>C2 Bars</td>
<td>C3 Bars</td>
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<tr>
<td></td>
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</tr>
</tbody>
</table>

### Diagram

Concrete Triple Box Culvert

Member Thickness

Bar Size, Spacing & Dimensions

Span (S) = 6 FEET

Height (H): 3 THRU 7 FEET

Date Effective: 9/29/2011

Date Prepared: 9/29/2011

Sheet No. 703.87

6 OF 27
**Concrete Triple Box Culvert**

**Member Thickness**

<table>
<thead>
<tr>
<th>T</th>
<th>B1</th>
<th>T1</th>
<th>T2</th>
<th>T3</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
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<th>6</th>
<th>7</th>
<th>8</th>
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<tbody>
<tr>
<td>12</td>
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<td>8</td>
<td>8</td>
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<td>17</td>
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<td>14</td>
<td>32</td>
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<tr>
<td>14</td>
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<td>8</td>
<td>8</td>
<td>7</td>
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<td>32</td>
<td>30</td>
<td>30</td>
<td>5</td>
<td>14</td>
<td>32</td>
</tr>
</tbody>
</table>

**Span (s) = 7 FT**

| Design | Member Thickness | A1 Bars | A2 Bars | B1 Bars | B2 Bars | C1 Bars | C2 Bars | D1 Bars | D2 Bars | E1 Bars | E2 Bars | F1 Bars | F2 Bars | G1 Bars | G2 Bars |
|--------|------------------|--------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 1 | 4 8 8 8 8 | 5 16 25 | 30 31 32 33 | 5 16 25 | 30 31 32 33 | 5 16 25 | 30 31 32 33 | 5 16 25 | 30 31 32 33 | 5 16 25 | 30 31 32 33 | 5 16 25 | 30 31 32 33 | 5 16 25 | 30 31 32 33 |
| 2 | 5 12 20 | 30 31 32 33 | 5 16 25 | 30 31 32 33 | 5 16 25 | 30 31 32 33 | 5 16 25 | 30 31 32 33 | 5 16 25 | 30 31 32 33 | 5 16 25 | 30 31 32 33 | 5 16 25 | 30 31 32 33 |
| 3 | 6 18 24 | 30 31 32 33 | 5 16 25 | 30 31 32 33 | 5 16 25 | 30 31 32 33 | 5 16 25 | 30 31 32 33 | 5 16 25 | 30 31 32 33 | 5 16 25 | 30 31 32 33 | 5 16 25 | 30 31 32 33 |
| 4 | 7 24 30 | 30 31 32 33 | 5 16 25 | 30 31 32 33 | 5 16 25 | 30 31 32 33 | 5 16 25 | 30 31 32 33 | 5 16 25 | 30 31 32 33 | 5 16 25 | 30 31 32 33 | 5 16 25 | 30 31 32 33 |

**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 tabulated value that uses the greater member thickness, area of reinforcement, and bar area of reinforcement equals bar area per foot spacing.
- Special designs are required when the design fill is less than 1 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.

**Concave Triple Box Culvert**

*Missouri Highways and Transportation Commission*

**Date Prepared:** 9/29/2011

**Sheet No.:** 8 of 27

**Date Effective:** 3/15/2011

**703.87**
### General Notes:
- If design fill is between tabulated design fills, use the next greater tabulated design fill. Exempt for design fills between 2 and 4 feet, use the greater member thickness. Area of reinforcement and bar dimensions from the 2 feet and 4 feet tabulated design fills. Area of reinforcement equals bar area per foot spacing.
- Special 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.

#### General Notes:
- For design fill between tabulated design fills, use the next greater tabulated design fill. For design fills between 2 and 4 feet, use the greater member thickness. Area of reinforcement and bar dimensions from the 2 feet and 4 feet tabulated design fills. Area of reinforcement equals bar area per foot spacing.
- Special 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.
### General Notes:

If design fill is between tabulated design fills, use the next greater tabulated fill. Except for design fills between 2 and 3 feet, use the larger member thickness, area of reinforcement, and bar dimensions from the tabular fill. If 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:

Dimensions are in inches unless otherwise specified.

### Concrete Triple Box Culvert

<table>
<thead>
<tr>
<th>Design Span (s)</th>
<th>Height (h)</th>
<th>Size Spa C1</th>
<th>Size Spa C2</th>
<th>Size Spa C3</th>
<th>Size Spa C4</th>
<th>Size Spa C5</th>
<th>Size Spa C6</th>
<th>Size Spa C7</th>
<th>Size Spa C8</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 ft</td>
<td>8 ft</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>6 ft</td>
<td>8 ft</td>
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<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>7 ft</td>
<td>8 ft</td>
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<tr>
<td>9 ft</td>
<td>8 ft</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Bar Dimensions Diagram

The bar dimensions are symmetrical about the culvert.
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 5 feet. When using design fills between 2 and 5 feet, use the greater member thickness, area of reinforcement and bar dimensions from the 2 or 3 foot 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 earth fill or roadway.

CONCRETE TRIPLE BOX CULVERT
MEMBER THICKNESS
BAR SIZE, SPACING & DIMENSIONS
SPAN (S) 8 FEET
HEIGHT (H1) 10 TO 11 FEET

DATE EFFECTIVE: 12/10/12011
DATE PREPARED: 9/28/2011
703.87 SHEET NO. 11 OF 27
### Table: Span (s) = 9 FT

<table>
<thead>
<tr>
<th>Width (ft)</th>
<th>Spacing (ft)</th>
<th>Top Slab Bars</th>
<th>Bottom Slab Bars</th>
<th>Wall Bars</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>6.5</td>
<td>5, 6</td>
<td>4</td>
<td>5, 6, 7</td>
</tr>
<tr>
<td>3</td>
<td>6.5</td>
<td>5, 6</td>
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<td>5, 6, 7</td>
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<td>6.5</td>
<td>5, 6</td>
<td>4</td>
<td>5, 6, 7</td>
</tr>
</tbody>
</table>

### General Notes:
- **Design Fill:**
  - If design fill is between tabulated design fills, use the next greater tabulated design fill.
  - If design fill is less than 1 foot or greater than 50 feet, special designs are required.
  - If design fill is between 2 feet and 4 feet, use tabulated design fills for the greater member thickness, area of reinforcement, and bar dimensions.
  - If design fill is between 2 feet and 4 feet tabulated design fills, use the next greater tabulated design fill.
  - Area of reinforcement equals bar area per foot of spacing.

- **Special Descriptions:**
  - Descriptions are required when the design fill is less than 1 foot or greater than 50 feet.
  - Dimensions are in inches unless otherwise specified.

- **Concrete Culvert:**
  - Culverts meet strength and serviceability requirements for the design vehicle live load H-20.
  - Culverts are constructed using concrete.
### Design

**Member Thickness**

<table>
<thead>
<tr>
<th>Size</th>
<th>B1 Bars</th>
<th>B2 Bars</th>
<th>B3 Bars</th>
<th>C1 Bars</th>
<th>C2 Bars</th>
<th>C3 Bars</th>
<th>D1 Bars</th>
<th>D2 Bars</th>
<th>D3 Bars</th>
<th>E1 Bars</th>
<th>E2 Bars</th>
<th>E3 Bars</th>
<th>F1 Bars</th>
<th>F2 Bars</th>
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<tbody>
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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 and 3 feet. In these cases, use the greater member thickness, area of reinforcement, and bar 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.
- Dimensions are in inches unless otherwise specified.

### Concretes
- Triple Box Culvert
- Member Thickness: Bar Size, Spacing & Dimensions
- Span (s) = 10 Feet
- Height (h) = 5 Feet, 6 Feet, 7 Feet, 8 Feet, 9 Feet, 10 Feet

---

**Date Effective:** 12/10/2011

**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 Prepared:** 9/28/2011

**703.87**

**Sheet No.** 14 of 27
<table>
<thead>
<tr>
<th>HEIGHT (HT)</th>
<th>DESIGN VEHICULAR LIVE LOAD HL-93 MINUS THE LANE LOAD.</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 FT</td>
<td>DESIGN FILLS ARE MEASURED FROM THE TOP OF TOP SLAB TO THE TOP OF CULVERT.</td>
</tr>
<tr>
<td>11 FT OR 12 FT OR 13 FT</td>
<td>DIMENSIONS FROM THE 2 FEET AND 4 FEET TABULATED DESIGN FILLS. AREA OF REINFORCEMENT EQUALS BAR AREA PER FOOT SPACING.</td>
</tr>
<tr>
<td>10 FT</td>
<td>SPECIAL DESIGNS ARE REQUIRED WHEN THE DESIGN FILL IS LESS THAN 1 FOOT OR GREATER THAN 25 FEET.</td>
</tr>
<tr>
<td>11 FT OR 12 FT OR 13 FT</td>
<td>DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.</td>
</tr>
</tbody>
</table>

**BAR DIMENSIONS DIAGRAM**

**GENERAL NOTES:**
- If design fill is between tabulated design fills, use the next greater tabulated design fill. Except for design fills between 2 feet and 4 feet tabulated design fills, use the greater member thickness, area of reinforcement, and bar design.

**DATE PREPARED:**
- 12/01/2010

**DATE EFFECTIVE:**
- 3/1/2011

**CONCRETE TRIPLE BOX CULVERT**

**MEMBER THICKNESS BAR SIZE, SPACING & DIMENSIONS**

**SPAN (S) = 10 FEET**

**HEIGHT (HT) = 11 FT OR 12 FT OR 13 FT**

**DATE EFFECTIVE:**
- 3/1/2011

**DATE PREPARED:**
- 12/01/2010

**SHEET NO.:**
- 15 OF 27
<table>
<thead>
<tr>
<th>DESIGN</th>
<th>MEMBER THICKNESS</th>
<th>AT BARS</th>
<th>TOP SLAB BARS</th>
<th>JT BARS</th>
<th>TOP SLAB BARS</th>
<th>HT BARS</th>
<th>BOTTOM SLAB BARS</th>
<th>JT BARS</th>
<th>BOTTOM SLAB BARS</th>
<th>WALL BARS</th>
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<tr>
<td>1 FT</td>
<td>5</td>
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</tr>
</tbody>
</table>

**GENERAL NOTES:**
- If design fill is between tabulated design fills, use the next greater tabulated design fill except for design fills between 2 and 4 feet. For design fills less than 2 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.

**CONCRETE TRIPLE BOX CULVERT**

**MEMBER THICKNESS**

**BAR SIZE, SPACING & DIMENSIONS**

**DATE EFFECTIVE:** 12/9/2011

**DATE PREPARED:** 9/29/2011

**SHEET NO:** 703.87

**OF 27**
### General Notes:

1. If design fill is between tabulated design fills, use the next greater tabulated fill fill, except for design fills between 2 and 3 ft. Use the greater member thickness, area of reinforcement, and bar dimensions from the next tabulated fill.
2. Design fills are measured from the top of top slab to the bottom of earth fill or drainage culvert.
3. Culverts meet strength and serviceability requirements for the design vertical live load H-93 winds the lane layout.

### Table 1: Member Thickness, Bar Size, Spacing & Dimensions

<table>
<thead>
<tr>
<th>Member Thickness</th>
<th>Bar Size</th>
<th>Spacing &amp; Dimensions</th>
</tr>
</thead>
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<td>12 ft</td>
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### Table 2: Design Fills

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<tr>
<td>14 ft</td>
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</table>

### Diagram

- **Concrete Double Box Culvert**
- **Member Thickness**
- **Bar Size**
- **Spacing & Dimensions**
- **Fill Dimensions**

### Date Effective:
- 12/01/2011

### Date Prepared:
- 9/28/2011

### Sheet No.:
- 18 of 27
GENERAL NOTES:
If the design fill is between tabulated design fills, use the next greater tabulated design fill, except for design fills between 2 feet and 4 feet. For design fills between 2 feet and 4 feet, use the greater member thickness, area of reinforcement, and bar dimensions from the 2 feet and 4 feet tabulated design fills. The area of reinforcement equals the 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 vehicle live load H-20 or H-44, whichever is less.
### Table 1: Design Information

<table>
<thead>
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<th>Design</th>
<th>Member Thickness</th>
<th>B1 Bars</th>
<th>B2 Bars</th>
<th>A1 Bars</th>
<th>A2 Bars</th>
<th>H1 Bars</th>
<th>H2 Bars</th>
<th>B3 Bars</th>
<th>Bottom Slab Bars</th>
<th>Overall Bars</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 FT</td>
<td>15 12 12 13</td>
<td>6 8 6 8</td>
<td>73 76 35</td>
<td>5 5 6 5</td>
<td>6 8 8 6</td>
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</table>

### Table 2: Design Information

<table>
<thead>
<tr>
<th>Design</th>
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<th>B1 Bars</th>
<th>B2 Bars</th>
<th>A1 Bars</th>
<th>A2 Bars</th>
<th>H1 Bars</th>
<th>H2 Bars</th>
<th>B3 Bars</th>
<th>Bottom Slab Bars</th>
<th>Overall Bars</th>
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</thead>
<tbody>
<tr>
<td>2 FT</td>
<td>15 12 12 13</td>
<td>6 8 6 8</td>
<td>73 76 35</td>
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<td>6 8 8 5</td>
<td>6 8 8 5</td>
</tr>
</tbody>
</table>

### Diagram

**Concrete Triple Box Culvert**

**Member Thickness**

**Bar Size, Spacing & Dimensions**

**Date Effective:** 9/29/2011

**Sheet No.:** 23 of 27

**Missouri Highways and Transportation Commission**

**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 vertical live load.
- Culverts are symmetrical about culvert.

**Concretes Used:**
- Culvert:
  - 15 ft or 16 ft
  - Member thickness:
    - B1 15 ft or 16 ft
    - B2 15 ft or 16 ft
  - Overall:
    - A1 15 ft or 16 ft
    - A2 15 ft or 16 ft
    - H1 15 ft or 16 ft
    - H2 15 ft or 16 ft
    - B3 15 ft or 16 ft
    - Bottom Slab:
      - B1 15 ft or 16 ft
      - B2 15 ft or 16 ft
    - Overall:
      - J1 15 ft or 16 ft
      - J2 15 ft or 16 ft
      - J3 15 ft or 16 ft
      - J4 15 ft or 16 ft

**Date Prepared:** 9/29/2011

**Sheet No.:** 23 of 27

**Scale:**
- 1/12 ft

**Note:**
- 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.
GENERAL NOTES:

1. DESIGN FILL IS BETWEEN TABLED DESIGN FILLS. USE THE NEXT GREATER TABLED DESIGN FILL EXCEPT FOR DESIGN FILLS BETWEEN 2 AND 3 FT. USE THE TABLED DESIGN FILL. USE THE FOLLOWING DESIGN FILLS EXCEPT FOR DESIGN FILLS BETWEEN 4 AND 6 FT. USE THE GREATER MEMBER THICKNESS. AREA OF REINFORCEMENT AND BAR DIMENSIONS FROM 1 FT, AND 1 FEET TABLED DESIGN FILLS. AREA OF REINFORCEMENT EQUALS BAR AREA PER FOOT SPACING.

2. BASE FILLS ARE MEASURED FROM THE TOP OF TOP SLAB TO THE TOP OF EARTH FILL OR ROADWAY.

3. CONCRETE MEETS STRENGTH AND SERVICEABILITY REQUIREMENTS FOR THE VEHICLE. MAXIMUM LOAD H-83 WINDS THE LANE LOAD.

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

Date Prepared: 9/29/2011
Date Effective: 11/20/2011

DATE EFFECTIVE: 10/23/2011
DATE PREPARED: 9/29/2011

SHEET NO. 703.87
24 OF 27
### General Notes:

1. **Design Fill Is Between Tabulated Design Fills. Use the Next Greater Tabulated Design Fill Except for Design Fills Between 2 Feet Where the Greater Fill for Each Location Shall Be Used.**
2. **Use the Greater Member Thickness, Area of Reinforcement and Bar Spacing from the 15 and 16 Feet Tabulated Design Fill Areas of Reinforcement Equals Area Per Foot Spacing.**
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 Earth Fill or Reading.**

---

**Missouri Highways and Transportation Commission**

**Jefferson City**

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

**Triple Box Culvert**

**Member Thickness**

**Bar Size, Spacing & Dimensions**

**Span (S):** 15 Feet

**Height (H):** 14 Feet or 15 Feet or 16 Feet

---

**Bar Dimensions Diagram**

-Symmetrical About Culvert-

-**General** Notes:

1. **Design Fill Is Between Tabulated Design Fills. Use the Next Greater Tabulated Design Fill Except for Design Fills Between 2 Feet Where the Greater Fill for Each Location Shall Be Used.**
2. **Use the Greater Member Thickness, Area of Reinforcement and Bar Spacing from the 15 and 16 Feet Tabulated Design Fill Areas of Reinforcement Equals Area Per Foot Spacing.**
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 Earth Fill or Reading.**

**Concrete Triple Box Culvert**

**Member Thickness**

**Bar Size, Spacing & Dimensions**

**Span (S):** 15 Feet

**Height (H):** 14 Feet or 15 Feet or 16 Feet

---

**Bar Dimensions Diagram**

-Symmetrical About Culvert-

---

**General Notes:**

-JF Design Fill Is Between Tabulated Design Fills. Use the Next Greater Tabulated Design Fill Except for Design Fills Between 2 Feet Where the Greater Fill for Each Location Shall Be Used. Use the Greater Member Thickness, Area of Reinforcement and Bar Spacing from the 15 and 16 Feet Tabulated Design Fill Areas of Reinforcement Equals 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 Reading.

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**Concrete Triple Box Culvert**

**Member Thickness**

**Bar Size, Spacing & Dimensions**

**Span (S):** 15 Feet

**Height (H):** 14 Feet or 15 Feet or 16 Feet

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**Bar Dimensions Diagram**

-Symmetrical About Culvert-

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**General Notes:**

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**Concrete Triple Box Culvert**

**Member Thickness**

**Bar Size, Spacing & Dimensions**

**Span (S):** 15 Feet

**Height (H):** 14 Feet or 15 Feet or 16 Feet

---

**Bar Dimensions Diagram**

-Symmetrical About Culvert-
### Bar Size, Spacing & Dimensions

#### Design

<table>
<thead>
<tr>
<th>Design</th>
<th>Member Thickness</th>
<th>A1 Bars</th>
<th>A2 Bars</th>
<th>A3 Bars</th>
<th>A4 Bars</th>
<th>A5 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>
<th>C8 Bars</th>
<th>C9 Bars</th>
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<tbody>
<tr>
<td>P5 = 16 FT</td>
<td>H1 = 8 FT or 9 FT or 10 FT</td>
<td>Size SPA</td>
<td>Size SPA</td>
<td>Size SPA</td>
<td>Size SPA</td>
<td>Size SPA</td>
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<td>29</td>
</tr>
</tbody>
</table>

#### General Notes:
- If Design Fill is between Tabulated Design Fills, use the NEXT GREATER Tabulated Fill. If Design Fill is Smaller than Tabulated Fill, use the Tabulated Fill. If Design Fill is Greater than Tabulated Fill, use the Greater Member Thickness, Area of Reinforcement and Bar Dimensions from the Tabulated Fill. Area of reinforcement equals Bar Area x Foot Spacing.
- Special Designs are Required when the Design Fill is LESS than 1 Foot or GREATER Than 30 Feet.

#### Concretes Meet Strength and Serviceability Requirements for the Design Volume. The Load H:Y:Z winds the Lane Load.

### Member Thickness

#### Bar Size, Spacing & Dimensions

<table>
<thead>
<tr>
<th>Design</th>
<th>Member Thickness</th>
<th>A1 Bars</th>
<th>A2 Bars</th>
<th>A3 Bars</th>
<th>A4 Bars</th>
<th>A5 Bars</th>
<th>B1 Bars</th>
<th>B2 Bars</th>
<th>C1 Bars</th>
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<th>C4 Bars</th>
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<th>C7 Bars</th>
<th>C8 Bars</th>
<th>C9 Bars</th>
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</thead>
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<td>Size SPA</td>
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- Special Designs are Required when the Design Fill is LESS than 1 Foot or GREATER Than 30 Feet.

#### Concretes Meet Strength and Serviceability Requirements for the Design Volume. The Load H:Y:Z winds the Lane Load.
TYPE A - FINGER TYPE EXPANSION DEVICES

PART SECTION THRU EXPANSION DEVICE

EXPERIENCE Gap to be at least 1/2" measured parallel to a roadway
for low asphalt in excess of the 2% of vertical rise not more than
5/32" per foot of horizontal length or 1/12" in a minimum space of
2 ft. 3/4".

The channel shall be at least 6" for hearing surfaces above 1.5 ft and
channel height shall be 1.5 ft for hearing surfaces greater than 1.5
ft. Any elevation to which is required. Hearing surface changes
and angular plane change necessary shall be shown with a

ELEVATION OF CHANNEL SPLICE

PART PLAN AT EXPANSION DEVICE

PLAN OF CHANNEL SPLICE

GENERAL NOTES:

- OUTLINE OF PROJECT IS INDICATED BY LIGHT DASHED LINES: HEAVY
  LINES INDICATE NEW WORK.
- THE NEW EXPANSION DEVICES SHALL BE SUPERSEDED FOR
  LATERAL PLATES AND FASTENERS BEFORE THE NEW EXPANSION
  DEVICES ARE INSTALLED.
- STRUCTURAL STEEL SHALL BE IN ACCORDANCE WITH ADO
  CODE NO.
- QUALIFICATION OF WELDING OPERATIONS WILL BE REQUIRED.
- STEEL OR ECONOMY STEEL SHALL BE USED.
- THE STEEL CHAMBER SHALL BE EXTENDED PROPERLY WITH ECONOMY
  STEEL OR ECONOMY STEEL AS INDICATED. STEEL CHAMBERS
  INDICATED FOR STEEL CHANNELS SHALL BE IN ACCORDANCE WITH
  STEEL CHAMBER IN ACCORDANCE WITH ADO CODE NO.
- THE CHAMBER SHALL BE EXTENDED PROVIDING ANY ENCLOSE TO
  EXTEND THE CHAMBER OF TIMES OR SIMILAR.
- STEEL CHANNELS OF BOTH SIDES OF EXPANSION JUNCTURE, FOR
  STEEL CHANNELS OF TIMES, SHALL BE PROVIDED WITH ESTIMATES
  STRENGTH SIMILAR TO STEEL CHANNELS.
- THE LENGTH OF STEEL DAMS WILL BE REQUIRED FOR STEEL DAMS.

MISSOURI HIGHWAYS AND TRANSPORTATION
COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65101
1-888-MISSOURI (1-888-647-7684)

STEEL DAMS
AT EXPANSION DEVICES
FOR RESURFACING BRIDGE FLOORS

DATE EFFECTIVE: 2/12/2022
712.40L
SHEET NO.: 1
# 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:

<table>
<thead>
<tr>
<th>Depth of Corrugation</th>
<th>Min. Bedding Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>1&quot;</td>
<td>1&quot;</td>
</tr>
<tr>
<td>2&quot;</td>
<td>2&quot;</td>
</tr>
</tbody>
</table>

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.

## PIPE-ARCH TRENCH DETAIL

**Bedding and Corner Trench Zone Treatment for Pipe Arch Structures**

### PIPE-ARCHES

<table>
<thead>
<tr>
<th>Pipe Diameter</th>
<th>Space S ((1/2) pipe dia)</th>
<th>Up to 24&quot;</th>
<th>24&quot; to 72&quot;</th>
<th>Over 72&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>72&quot; and over</td>
<td>36&quot;</td>
<td>12&quot;</td>
<td>12&quot;</td>
<td>12&quot;</td>
</tr>
<tr>
<td>Up to 36&quot;</td>
<td>12&quot;</td>
<td>12&quot;</td>
<td>12&quot;</td>
<td>12&quot;</td>
</tr>
</tbody>
</table>

### 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 Metal-Coated Steel Circular Pipe Lock Seam

**Maximum Allowable Overfill Heights (1)**

<table>
<thead>
<tr>
<th>Specified Diameter of Pipe</th>
<th>0.064</th>
<th>0.070</th>
<th>0.098</th>
<th>0.158</th>
<th>0.168</th>
</tr>
</thead>
<tbody>
<tr>
<td>In. FT.</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>A</td>
</tr>
<tr>
<td>A</td>
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</tbody>
</table>

**Minimum Cover**

**Spiral Rib**

**Specified Thickness of Coated Sheet (In.)**

**Maximum Allowable Overfill Heights (1)**

<table>
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<tr>
<th>Specified Diameter of Pipe</th>
<th>0.064</th>
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</table>

Note: For trench installation only.

---

**Corrugated Metal-Coated Steel Circular Pipe Riveted Seam**

**Maximum Allowable Overfill Heights (1)**

<table>
<thead>
<tr>
<th>Specified Diameter of Pipe</th>
<th>0.064</th>
<th>0.070</th>
<th>0.098</th>
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<th>0.168</th>
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<td>C</td>
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**Specified Thickness of Coated Sheet (In.)**

**Maximum Allowable Overfill Heights (1)**

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Note: For trench installation only.
### CORRUGATED H32 ALUMINUM CIRCULAR PIPE LOCK SEAM

#### MAXIMUM ALLOWABLE OVERFILL HEIGHTS (1)

<table>
<thead>
<tr>
<th>SPECIFIED DIAMETER OF PIPE</th>
<th>MINIMUM COVER</th>
<th>CORRUGATED SPIRAL</th>
<th>SPECIFIED THICKNESS OF COATED SHEET (IN.)</th>
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<th>0.075</th>
<th>0.125</th>
<th>0.155</th>
<th>0.164</th>
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<tbody>
<tr>
<td>IN. FT. FT.</td>
<td>FT. FT. FT. FT.</td>
<td>FT. FT. FT. FT. FT. FT. FT. FT. FT. FT. FT. FT. FT. FT. FT.</td>
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### CORRUGATED H32 ALUMINUM CIRCULAR PIPE RIVETED SEAM

#### MAXIMUM ALLOWABLE OVERFILL HEIGHTS (1)

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A = \( \frac{2}{3} \times \frac{2}{3} \text{ CORRUGATIONS}\). B = \( 3 \times 1 \text{ CORRUGATIONS}\). C = \( 5 \times 1 \text{ CORRUGATIONS}\). D = \( \frac{3}{4} \times \frac{3}{4} \times 1 \) \( \frac{1}{2} \text{ SPIRAL RIB}\). 111 MAXIMUM OVERFILL MEASURED FROM THE TOP OF PIPE TO SURFACE.
### SPECIFIED DIAMETER OF PIPE

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### MAXIMUM ALLOWABLE OVERFILL HEIGHTS

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### CORRUGATED H34 ALUMINUM CIRCULAR PIPE RIVETED SEAM

### MAXIMUM ALLOWABLE OVERFILL HEIGHTS

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### CORRUGATED H34 ALUMINUM CIRCULAR PIPE LOCK SEAM

### MAXIMUM ALLOWABLE OVERFILL HEIGHTS

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### MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

JEFFERSON CITY, MO 65102

DATE EFFECTIVE: 06/21/2011
DATE PREPARED: 04/12/2013

**FOR TRENCH INSTALLATION ONLY**

A = 2-2/3" X 1/2" CORRUGATIONS.
B = 3" X 1" CORRUGATIONS.
C = 5" X 1" CORRUGATIONS.
D = 3/4" X 3/4" X 1-1/2" SPIRAL RIB

111 MAXIMUM OVERFILL MEASURED FROM THE TOP OF PIPE TO SURFACE.
### Minimum Cover for Construction Loads (Round and Pipe-Arch)

#### Pipe-Arch Requirements 2-2/3" X 1/2" Corrugations

<table>
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<th>Diameter or Pipe Span</th>
<th>Minimum Cover (ft.) for Indicated Axle Loads (12)</th>
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<td>18k lbs.</td>
<td>50k lbs.</td>
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<tr>
<td>50k lbs.</td>
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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

#### Type

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<tr>
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<th>Span (3)</th>
<th>Rise (3)</th>
<th>Galvanized Sheet Thickness (in.)</th>
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(2) Minimum cover measured from top of pipe to bottom of flexible pavement or top of rigid pavement.

(3) A tolerance of plus or minus one inch or 2 percent of equivalent circular diameter, whichever is greater, will be permissible in span and rise.

(4) Tolerances in parentheses. No tolerance in opposite direction.

---

**Missouri Highways and Transportation Commission**

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

Corrugated Metal Pipe Installation Methods

**Date Effective:** 04/01/2011

**Date Prepared:** 06/01/2011

**Sheet No.:** 5 OF 5

**Missouri Highways and Transportation Commission**

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

Corrugated Metal Pipe Installation Methods

**Date Effective:** 04/01/2011

**Date Prepared:** 06/01/2011

**Sheet No.:** 5 OF 5
FABRICATE CURTAIN WALL WITH CORRUGATIONS VERTICAL

G.D. PIPE

1/8" DIA. ROD (SHOP COAT WITH ASPHALT BASE ALUMINUM PAINT)

BAND SHALL BE SHAPED TO FIT PIPE (ROUND OR ARCH)

CONTINUOUS WELD

12" MIN. BAND WIDTH

G.0.138 INCH THICK GALVANIZED PLATE WELDED TO BOTTOM

NON-RODDED END

15" OR 18"

SECTION A-A

GENERAL NOTES:

FOR PIPE ARCH

TABLE FOR METAL CURTAIN WALL

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METAL CURTAIN WALL

PLAN METAL INLETS

METAL INLETS

FOR ROUND OR ELLIPTICAL PIPE

BAND SHALL BE SAME THICKNESS AS CURTAIN WALL MATERIAL

WELD STUB TO RISER

5 CORRUGATION STUBS

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-800-455-MODOT (1-800-455-6636)

METAL CURTAIN WALL AND METAL INLETS

DATE EFFECTIVE: 07/01/2004
DATE PREPARED: 8/21/2009
725.31C SHEET NO. 1 OF 1
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.

- LEGEND -
D = normal inside diameter of pipe.
D = outside diameter of pipe.
H = fill cover height over pipe (feet).
MIN = minimum.
= undisturbed soil.

MAXIMUM DIAMETER AND MAXIMUM FILL HEIGHT

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<thead>
<tr>
<th>CLASS OF PIPE</th>
<th>INSTALLATION TYPE</th>
<th>MAXIMUM DIAMETER (INCHES)</th>
<th>MAXIMUM FILL HEIGHT IN FEET</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLASS I</td>
<td>I</td>
<td>108</td>
<td>108</td>
</tr>
<tr>
<td></td>
<td>II</td>
<td>108</td>
<td>84</td>
</tr>
<tr>
<td></td>
<td>III</td>
<td>108</td>
<td>72</td>
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<tr>
<td></td>
<td>IV</td>
<td>108</td>
<td>51</td>
</tr>
<tr>
<td></td>
<td>V</td>
<td>108</td>
<td>40</td>
</tr>
</tbody>
</table>

- TRENCH INSTALLATION -
- MULTIPLE PIPE CULVERTS SHALL BE INSTALLED WITH A MINIMUM CLEARANCE BETWEEN PIPES OF 3 Dp OR 12", WHICHEVER IS GREATER, BUT NOT TO EXCEED 36".

- GENERAL NOTES -
MULTIPLE PIPE CULVERTS SHALL BE INSTALLED WITH A MINIMUM CLEARANCE BETWEEN PIPES OF 3 Dp OR 12", WHICHEVER IS GREATER, BUT NOT TO EXCEED 36".

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.
HEIGHT OF FILL OVER V.C. PIPE CULVERTS

<table>
<thead>
<tr>
<th>NOMINAL PIPE DIAMETER (INCH)</th>
<th>STANDARD STRENGTH</th>
<th>EXTRA STRENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TRENCH WIDTH AT ONE FOOT ABOVE TOP OF PIPE (FEET)</td>
<td>MINIMUM FILL HEIGHT (FEET)</td>
</tr>
<tr>
<td>6</td>
<td>2.0</td>
<td>1.0</td>
</tr>
<tr>
<td>8</td>
<td>2.0</td>
<td>1.0</td>
</tr>
<tr>
<td>10</td>
<td>2.5</td>
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<tr>
<td>30</td>
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<td>1.0</td>
</tr>
<tr>
<td>36</td>
<td>5.0</td>
<td>1.0</td>
</tr>
</tbody>
</table>

EXTRA STRENGTH

STANDARD STRENGTH

See Table II (Sec. 726) for width of trench.

Embankment shall be placed to this line before cutting trench.

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.

See Table I (Sec. 726) for width of trench.

Legend:
- Compacted roadway embankment
- Suitable backfill
- Loose dry material
- Compacted sand
**Trench Installation**

- **Legend**
  - **NOTE:** Multiple pipe shall be installed with a minimum clearance between pipes of D0/3 or 12", whichever is greater, but not to exceed 36".
  - **OUTSIDE DIAMETER OF PIPE:** (D0 + 6") (MIN.)
  - **INSIDE DIAMETER OF PIPE:**

**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.

**Fill Height Limits**

**Typical Cambered Flow Line**

- **Note:**
  - **SPD** = Standard Proctor Density.
  - Fill height measured from the top of pipe to surface.
  - Fill height accounts 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.

**Table:**

<table>
<thead>
<tr>
<th>Pipe Diameter</th>
<th>POLYETHYLENE</th>
<th>STEEL REINFORCED POLYETHYLENE</th>
<th>POLYVINYL</th>
<th>DOUBLE WALL POLYPROPYLENE</th>
<th>TRIPLE WALL POLYPROPYLENE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>COMPACTION/COMPACITION 90% SPD 93% SPD</td>
<td>COMPACTION 90% SPD</td>
<td>COMPACTION/COMPACITION 90% SPD 93% SPD</td>
<td>COMPACTION 90% SPD</td>
<td>COMPACTION/COMPACITION 90% SPD 93% SPD</td>
</tr>
<tr>
<td></td>
<td>MIN.</td>
<td>MAX.</td>
<td>MIN.</td>
<td>MAX.</td>
<td>MIN.</td>
</tr>
<tr>
<td>12</td>
<td>2.0</td>
<td>2.5</td>
<td>2.5</td>
<td>3.0</td>
<td>3.0</td>
</tr>
<tr>
<td>15</td>
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<td>2.5</td>
<td>2.5</td>
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<td>3.0</td>
</tr>
<tr>
<td>18</td>
<td>2.0</td>
<td>2.5</td>
<td>2.5</td>
<td>3.0</td>
<td>3.0</td>
</tr>
<tr>
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<td>2.5</td>
<td>2.5</td>
<td>3.0</td>
<td>3.0</td>
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<tr>
<td>30</td>
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<td>2.5</td>
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<td>3.0</td>
</tr>
<tr>
<td>48</td>
<td>2.0</td>
<td>2.5</td>
<td>2.5</td>
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</tr>
<tr>
<td>60</td>
<td>2.0</td>
<td>2.5</td>
<td>2.5</td>
<td>3.0</td>
<td>3.0</td>
</tr>
</tbody>
</table>

**Notes:**

- Minimum cover for construction loads are not sufficient for silty sand or silty gravel structural backfill compacted to 90% standard proctor density. 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.

**Date Prepared:** 2/27/2015

**Date Effective:** 04/01/2015

**730.00E 1 1 OF 1**
TYPE S-1

SECTION A-A

SECTION B-B

SECTION C-C

SECTION D-D

SECTION E-E

SECTION F-F

TYPE S-2

GENERAL NOTES:
The concrete for inverts shall be placed after completion of the drop inlet box. No direct finishing will be made for finishing or placing invert concrete.

TYPE S-3

TYPICAL INVERTS

<table>
<thead>
<tr>
<th>WIDTH</th>
<th>LENGTH</th>
<th>TYPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>2</td>
<td>A-B-C</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>E</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>E-S-1</td>
</tr>
<tr>
<td>5</td>
<td>2</td>
<td>S-2-S-3</td>
</tr>
</tbody>
</table>

NOTE: SEE STANDARD PLAN 6104.10 FOR GRATES AND BEARING PLATES. TYPICAL LOCATION DETAILS ARE ShOWN ON SHEET Y AND Z OF D. THE SECTIONS MAY BE CAST MANUFACTURED WITH BASE SECTION.
LID FOR ADJACENT SECTIONS

SECTION 0-0
OPTIONAL PRECAST CURB INLET
5'-0" OPENING

GENERAL NOTES:

NOTE: FOR EXHIBIT ONLY

THE LENGTH AND WIDTH OF THE INLET SHALL BE AS SHOWN
ON THE PLANS.

SIZES BETWEEN THE ADJACENT SECTIONS SHALL BE INSURED
BY AGREEMENT WITH SECTION 405.3.1 OF THE STANDARD
SPECIFICATIONS.

IF DEPTH OF INLET EXCEEDS 8 FEET THE PRECAST UNITS
MAY BE FURNISHED IN TWO OR MORE SECTIONS.

IF TWO OR MORE SECTIONS ARE USED THE TYPE S MANHOLE
FRAME AND COVER SHALL BE IN THE DOWNSTREAM SECTION
ONLY.

IF A 5 FOOT OPENING IS REQUIRED THE 27'-6" OPENING
SECTIONS OF ONE 5 FOOT OPENING SECTION MAY BE FURNISHED
AT THE CONTRACTOR'S OPTION.

SEE SHEET 1 FOR DEPTH DETAILS AND SHEET 4 FOR GENERAL
NOTES.
DETAILED FOR ROADWAY DITCH INLETS
LOCATED WITHIN THE CLEAR ZONE
<table>
<thead>
<tr>
<th>TYPE</th>
<th>DIAMETER OF ROUND PIPE (IN.)</th>
<th>CALCULATED SHEET THICKNESS (IN.)</th>
<th>DIMENSIONS (IN.)</th>
<th>APPROXIMATE SLOPE OF PLATE (1/16)</th>
<th>THE PLATE IF SPECIFIED P. (IN.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>B1</td>
<td>12</td>
<td>0.064</td>
<td>5'L X 3'B X 3'L X 3'H</td>
<td>1/4 TOL. L X 1/4 TOL. W</td>
<td>3/32</td>
</tr>
<tr>
<td>B2</td>
<td>18</td>
<td>0.064</td>
<td>7'L X 5'B X 5'L X 5'H</td>
<td>1/4 TOL. L X 1/4 TOL. W</td>
<td>3/32</td>
</tr>
<tr>
<td>B3</td>
<td>21</td>
<td>0.064</td>
<td>10'L X 7'B X 7'L X 7'H</td>
<td>1/4 TOL. L X 1/4 TOL. W</td>
<td>3/32</td>
</tr>
<tr>
<td>B4</td>
<td>24</td>
<td>0.064</td>
<td>13'L X 10'B X 10'L X 10'H</td>
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<td>3/32</td>
</tr>
<tr>
<td>B5</td>
<td>27</td>
<td>0.064</td>
<td>16'L X 13'B X 13'L X 13'H</td>
<td>1/4 TOL. L X 1/4 TOL. W</td>
<td>3/32</td>
</tr>
<tr>
<td>B6</td>
<td>30</td>
<td>0.075</td>
<td>19'L X 16'B X 16'L X 16'H</td>
<td>1/4 TOL. L X 1/4 TOL. W</td>
<td>3/32</td>
</tr>
<tr>
<td>B7</td>
<td>33</td>
<td>0.075</td>
<td>22'L X 19'B X 19'L X 19'H</td>
<td>1/4 TOL. L X 1/4 TOL. W</td>
<td>3/32</td>
</tr>
<tr>
<td>B8</td>
<td>36</td>
<td>0.075</td>
<td>25'L X 22'B X 22'L X 22'H</td>
<td>1/4 TOL. L X 1/4 TOL. W</td>
<td>3/32</td>
</tr>
<tr>
<td>B9</td>
<td>39</td>
<td>0.075</td>
<td>28'L X 25'B X 25'L X 25'H</td>
<td>1/4 TOL. L X 1/4 TOL. W</td>
<td>3/32</td>
</tr>
<tr>
<td>B10</td>
<td>42</td>
<td>0.075</td>
<td>31'L X 28'B X 28'L X 28'H</td>
<td>1/4 TOL. L X 1/4 TOL. W</td>
<td>3/32</td>
</tr>
<tr>
<td>B11</td>
<td>45</td>
<td>0.075</td>
<td>34'L X 31'B X 31'L X 31'H</td>
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<td>3/32</td>
</tr>
<tr>
<td>B12</td>
<td>48</td>
<td>0.075</td>
<td>37'L X 34'B X 34'L X 34'H</td>
<td>1/4 TOL. L X 1/4 TOL. W</td>
<td>3/32</td>
</tr>
</tbody>
</table>

**End Sections for Arch Pipe**

**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 3/8" diameter and galvanized, unless otherwise shown.

The plate extension, if specified, shall have holes to match holes in the plate.

The plate extension shall be flanged portion of the end section including side and bottom (center) panels and apron.

For 12" through 24" pipes, all parts of the extension shall be made in one piece.

The pipe shall be joined by riveting or bolting on centerline.

The pipe shall be joined by riveting or bolting equal distance from centerline.

All 3 piece and 4 piece skirts for 60" or larger pipes 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 connector sections. Corner plates and toe plates shall be galvanized and of the same or greater thickness as the skirt.

**See Sheet 3 of 3 for connection details.
**BEVELED PIPE ENCASEMENT DETAILS**

<table>
<thead>
<tr>
<th>PIPE DIAMETER</th>
<th>PIPE SLOPE</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
</tr>
</thead>
<tbody>
<tr>
<td>15”</td>
<td>41”</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>18”</td>
<td>41”</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>21”</td>
<td>41”</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>24”</td>
<td>41”</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
</tbody>
</table>

**PLAN VIEW FOR HIGHWAYS**

**SECTION A-A**

**SECTION B-B**

**SECTION C-C**

**GENERAL NOTES:**

CONCRETE USED IN CONSTRUCTION OF THE BEVELED PIPE ENCASEMENT SHALL BE CLASS B CONCRETE OR AN APPROVED COMMERCIAL MIX MEETING REQUIREMENTS OF SECTION 501 OF THE STANDARD SPECIFICATIONS.

REINFORCING STEEL USED IN CONSTRUCTION OF THE BEVELED PIPE ENCASEMENT SHALL MEET THE REQUIREMENTS OF SECTION 1036 OF THE STANDARD SPECIFICATIONS.

BEVELED PIPE ENCASEMENT MAY BE USED WITH EITHER POLYETHYLENE OR CORRUGATED METALLIC COATED STEEL PIPE.

THE PRICE BID PER EACH FOR "BEVELED PIPE END TREATMENT" SHALL BE CONSIDERED FULL COMPENSATION FOR FURNISHING ALL MATERIALS AND INSTALLATION OF THE BEVELED PIPE SECTION AND BEVELED PIPE ENCASEMENT AS SHOWN OR AS DIRECTED BY THE ENGINEER.

THE 3" x 6" BOLT AND NUTS SHALL BE GALVANIZED IN ACCORDANCE WITH AASHTO M33 (ASTM A153) SPECIFICATIONS. LOW CARBON STEEL ANCHOR BOLTS SHALL MEET ASTM A577.

BEVELED PIPE SHALL BE DRILLED AT LOCATIONS SHOWN ON PLANS FOR PLACEMENT OF "BEVELED PIPE ENCASEMENT" AS SHOWN AND PLACED IN THE VALLEY OF PIPE CORRUGATIONS.
PIPE END DETAILS FOR PARALLEL DRAINAGE STRUCTURES FOR DRIVeways

(SINGLE PIPE INSTALLATION)

NOTE:

FOR MULTIPLE PIPE INSTALLATIONS, END SECTIONS WITH SAFETY BARS SYSTEM OR OPTIONAL BAR GATE SYSTEM SHALL BE PROVIDED. SEE STANDARD PLAN 732.10.

SEE DRIVEWAY STANDARD PLANS FOR BEVELED END SECTION REQUIREMENTS.

GENERAL NOTES:

CONCRETE USED IN CONSTRUCTION OF THE BEVELED PIPE ENCASEMENT SHALL BE CLASS B CONCRETE OR AN APPROVED COMMERCIAL MIX MEETING REQUIREMENTS OF SECTION 501 OF THE STANDARD SPECIFICATIONS.

REINFORCING STEEL USED IN CONSTRUCTION OF THE BEVELED PIPE ENCASEMENT SHALL MEET THE REQUIREMENTS OF SECTION 1036 OF THE STANDARD SPECIFICATIONS.

BEVELED PIPE ENCASEMENT MAY BE USED WITH EITHER POLYETHYLENE OR CORRUGATED METALLIC COATED STEEL PIPE.

THE PRICE BID PER EACH FOR "BEVELED PIPE END TREATMENT" SHALL BE CONSIDERED FULL COMPENSATION FOR FURNISHING ALL MATERIALS AND INSTALLATION OF THE BEVELED PIPE SECTION AND BEVELED PIPE ENCASEMENT AS SHOWN OR AS DIRECTED BY THE ENGINEER.

THE 1/2" x 6" BOLT AND NUTS SHALL BE GALVANIZED IN ACCORDANCE WITH AASHTO M32 (ASTM A123) SPECIFICATIONS. LOW CARBON STEEL ANCHOR BOLTS SHALL MET 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 TIGHTLY TOGETHER TO HOLD THE SURFACES.

HOLES FOR HEX HEAD BOLTS

1" X

STEEL ROD OR NO. 4 GALVANIZED REINFORCED BAR

~ MINIMUM

~ SLOTTED

t"

DIAMETER GALVANIZED

4" LONGITUDINAL BAR DETAIL

DETAIL OF SAFETY BAR

1" X 1/2" SLOTTED HOLES FOR 1" HEX HEAD BOLTS

SIDE ELEVATION CIRCULAR SECTION

END SECTIONS, INCLUDING ALL BOLTS, NUTS, RODS AND STRAPS, SHALL BE FABRICATED FROM GALVANIZED STEEL MEETING THE REQUIREMENTS OF SECTION 1020.

ASSIGNED SHEET NO.

GENERAL NOTES:

END SECTIONS FABRICATED FROM THICKER METAL THAN INDICATED WILL BE ACCEPTED.

ALL BOLTS SHALL BE 3/4" DIAMETER AND GALVANIZED.

UNLESS OTHERWISE SHOWN.

SKIRT SECTION IS DEFINED AS THE FLARED PORTION OF THE END SECTION INCLUDING SIDE AND BOTTOM (CENTER) PANELS AND APRON.

SKIRT SECTION FOR 12" THROUGH 24" PIPES SHALL BE MADE IN ONE PIECE.

SKIRT SECTIONS FOR 30" AND LARGER PIPES MAY BE MADE FROM UP TO 3 SHEETS JOINED BY RIVETING OR BOLTING ON CENTERLINE.

SKIRT SECTIONS FROM 48" AND LARGER PIPES MAY BE MADE FROM UP TO 3 SHEETS JOINED BY RIVETING OR BOLTING EQUAL DISTANCE FROM CENTERLINE.

ALL 3 PIECE SKIRTS FOR 60" PIPES SHALL HAVE 0.109" THICK SIDES AND 0.158" THICK BOTTOM (CENTER) PANELS.

WIDTH OF BOTTOM PANELS SHALL BE GREATER THAN 20% OF THE PIPE PERIPHERY CONNECTOR SECTION WIDE.

CORRUGATION SIZED TO FIT PIPE

END SECTION

EDGE OF SIDEWALL SHEET SHALL BE ROLLED SNUGLY AGAINST STEEL ROD OR BAR.

LONGITUDINAL BAR DETAIL

MINIMUM 3/4" DIAMETER GALVANIZED STEEL ROD OR NO. 4 GALVANIZED REINFORCED BAR

3/4" threaded rod

END SECTION

LONGITUDINAL BAR DETAIL

FABRICATION.

THE USE OF A MANUFACTURER'S STANDARD METHODS OF FABRICATION.

MINOR VARIATIONS OF DETAIL WILL BE ACCEPTED TO PERMIT THE USE OF A MANUFACTURER'S STANDARD METHODS OF FABRICATION.

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CORRUGATION SIZED TO FIT PIPE

END SECTION

EDGE OF SIDEWALL SHEET SHALL BE ROLLED SNUGLY AGAINST STEEL ROD OR BAR.

LONGITUDINAL BAR DETAIL

MINIMUM 3/4" DIAMETER GALVANIZED STEEL ROD OR NO. 4 GALVANIZED REINFORCED BAR

3/4" threaded rod

END SECTION

LONGITUDINAL BAR DETAIL

FABRICATION.

THE USE OF A MANUFACTURER'S STANDARD METHODS OF FABRICATION.

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UNLESS OTHERWISE SHOWN.

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SKIRT SECTION FOR 12" THROUGH 24" PIPES SHALL BE MADE IN ONE PIECE.

SKIRT SECTIONS FOR 30" AND LARGER PIPES MAY BE MADE FROM UP TO 3 SHEETS JOINED BY RIVETING OR BOLTING ON CENTERLINE.

SKIRT SECTIONS FROM 48" AND LARGER PIPES MAY BE MADE FROM UP TO 3 SHEETS JOINED BY RIVETING OR BOLTING EQUAL DISTANCE FROM CENTERLINE.

ALL 3 PIECE SKIRTS FOR 60" PIPES SHALL HAVE 0.109" THICK SIDES AND 0.158" THICK BOTTOM (CENTER) PANELS.

WIDTH OF BOTTOM PANELS SHALL BE GREATER THAN 20% OF THE PIPE PERIPHERY CONNECTOR SECTION WIDE.

CORRUGATION SIZED TO FIT PIPE

END SECTION

EDGE OF SIDEWALL SHEET SHALL BE ROLLED SNUGLY AGAINST STEEL ROD OR BAR.

LONGITUDINAL BAR DETAIL

MINIMUM 3/4" DIAMETER GALVANIZED STEEL ROD OR NO. 4 GALVANIZED REINFORCED BAR

3/4" threaded rod

END SECTION

LONGITUDINAL BAR DETAIL

FABRICATION.

THE USE OF A MANUFACTURER'S STANDARD METHODS OF FABRICATION.

MINOR VARIATIONS OF DETAIL WILL BE ACCEPTED TO PERMIT THE USE OF A MANUFACTURER'S STANDARD METHODS OF FABRICATION.

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SKIRT SECTIONS FROM 48" AND LARGER PIPES MAY BE MADE FROM UP TO 3 SHEETS JOINED BY RIVETING OR BOLTING EQUAL DISTANCE FROM CENTERLINE.

ALL 3 PIECE SKIRTS FOR 60" PIPES SHALL HAVE 0.109" THICK SIDES AND 0.158" THICK BOTTOM (CENTER) PANELS.

WIDTH OF BOTTOM PANELS SHALL BE GREATER THAN 20% OF THE PIPE PERIPHERY CONNECTOR SECTION WIDE.

CORRUGATION SIZED TO FIT PIPE

END SECTION

EDGE OF SIDEWALL SHEET SHALL BE ROLLED SNUGLY AGAINST STEEL ROD OR BAR.

LONGITUDINAL BAR DETAIL

MINIMUM 3/4" DIAMETER GALVANIZED STEEL ROD OR NO. 4 GALVANIZED REINFORCED BAR

3/4" threaded rod

END SECTION

LONGITUDINAL BAR DETAIL

FABRICATION.

THE USE OF A MANUFACTURER'S STANDARD METHODS OF FABRICATION.

MINOR VARIATIONS OF DETAIL WILL BE ACCEPTED TO PERMIT THE USE OF A MANUFACTURER'S STANDARD METHODS OF FABRICATION.
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

<table>
<thead>
<tr>
<th>PIPE DIA. (IN.)</th>
<th>MIN. GAUGE ENDS (IN.)</th>
<th>MIN. GAUGE ENDS (IN.)</th>
<th>OVERALL WIDTH</th>
<th>SLOPE LENGTH</th>
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SAFETY SLOPE END SECTION

DATE EFFECTIVE: 06/01/2013
DATE PREPARED: 11/11/2013

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

SAFETY SLOPE END SECTION

SHEET NO. 2 OF 3
**BAR GRATE SYSTEM DATA**

**DRAIN PIPE SIZE** | **3:1 SLOPE** | **4:1 SLOPE** | **6:1 SLOPE**
---|---|---|---
| A | B | C | D | E | F | G | H | J | A | B | C | D | E | F | G | H | J | A | B | C | D | E | F | G | H | J
**15°** | 24 | 0 | 4 | 2"-0" | 6" | 15" | 3" | 8" | 3'/3" | 18.4" | 0 | 4 | 2"-0" | 15" | 15" | 12" | 3'/3" | 14" | 2 | 4 | 2"-0" | 13" | 15" | 15" | 12" | 3'/3" | 9.5" | 9" | 9" | 9" | 9" | 9" | 9" | 9" | 9" | 9" |
| 30° | 0 | 5 | 2'/6" | 15" | 15" | 15" | 12" | 3'/3" | 18.4" | 1 | 5 | 2'/6" | 18" | 18" | 12" | 3'/3" | 14" | 3 | 5 | 2'/6" | 19" | 18" | 12" | 3'/3" | 9.5" | 9" | 9" | 9" | 9" | 9" | 9" | 9" | 9" | 9" |
| 45° | 1 | 6 | 3'/0" | 16" | 18" | 18" | 12" | 4'/3" | 18.4" | 2 | 6 | 3'/0" | 18" | 18" | 12" | 4'/3" | 14" | 5 | 6 | 3'/0" | 20" | 18" | 12" | 4'/3" | 9.5" | 9" | 9" | 9" | 9" | 9" | 9" | 9" | 9" | 9" |
| 60° | 2 | 7 | 3'/6" | 17" | 18" | 18" | 12" | 4'/3" | 18.4" | 4 | 7 | 3'/6" | 12" | 18" | 12" | 4'/3" | 14" | 7 | 7 | 3'/6" | 17" | 18" | 12" | 4'/3" | 9.5" | 9" | 9" | 9" | 9" | 9" | 9" | 9" | 9" | 9" |
| 75° | 3 | 8 | 4'/0" | 18" | 18" | 18" | 12" | 5'/3" | 18.4" | 5 | 8 | 4'/0" | 18" | 18" | 12" | 5'/3" | 14" | 7 | 8 | 4'/0" | 13" | 18" | 12" | 5'/3" | 9.5" | 9" | 9" | 9" | 9" | 9" | 9" | 9" | 9" | 9" |
| 90° | 4 | 9 | 4'/6" | 18" | 18" | 18" | 12" | 5'/3" | 18.4" | 6 | 9 | 4'/6" | 18" | 18" | 12" | 5'/3" | 14" | 7 | 9 | 4'/6" | 14" | 18" | 12" | 5'/3" | 9.5" | 9" | 9" | 9" | 9" | 9" | 9" | 9" | 9" | 9" |

**NOTE:** BAR GRATE SYSTEM IS NOT REQUIRED FOR DRAIN PIPE DIAMETER OF 21" OR LESS, FOR SINGLE PIPE INSTALLATIONS.

**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).

---

**OPTIONAL BAR GRATE SYSTEM FOR SAFETY SLOPE END SECTION**

**DATE EFFECTIVE:** 06/01/2013
**DATE PREPARED:** 11/12/2013
**SHEET NO:** 732.10H 3 OF 3
**ROCK DITCH CHECK**

*Geotextile lining may be installed as required by the Engineer.*

**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.

**EXEMPLARY DITCH CHECK SPACING**

<table>
<thead>
<tr>
<th>Ditch Height (FT)</th>
<th>Spacing for 9&quot; Eff. Height (FT)</th>
<th>Spacing for 12&quot; Eff. Height (FT)</th>
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</table>

**MINIMUM DITCH CHECK SPACING**

*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.*
SHEET NO. 2 OF 6

2 X 4 BOARD SPACERS
LOG/SOCK 806.10J
DETAIL C

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

INLETS BALLAST
6" TO 8" GAP
INLET OPENING MANHOLE
FOR SEDIMENT CONTROL SPACING SEE SHEET 1 OF 6.

GENERAL NOTES:
OTHER PROPERIETARY INLET PROTECTION MAY BE
SUBSTITUTED IN ACCORDANCE WITH SEC 806 OR
AS DIRECTED BY THE ENGINEER.

CURB
DATE EFFECTIVE: 04/01/2015
DATE PREPARED: 02/20/2015

SECTION INLET PROTECTION DROP CONTAINMENT

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.

ELEVATION DETAIL
NOTES:
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.

PLAN
NOTES:
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

ROCK/MESH SEDIMENT CONTROL FENCE

END VIEW

SEDIMENT TRAP
NOTE:
SEDIMENT TRAP IN THE CLEAR ZONE SHALL BE REMOVED OR
LEVELLED (IF ALLOWABLE) AFTER THE VEGETATION HAS
SUFFICIENTLY MATURED TO PROTECT THE DITCH OR SWALE.

WITH BOTTOM OF DITCH

FLOW

SECTION A-A

DROP INLET CHECK
SEE SHEET 1 OF 6 FOR DETAILS OF ROCK DITCH CHECK.

FLOW FLOW... BALLAST

FLOW... INLET OPENING 6" TO 8" GAP AT 2 X 4 BOARD SPACERS.

DETAIl C

WIRE MESH

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.
**EFFECTIVE DEPTH**

\[ u_B u = \text{MIN. 2', MAX. 6'} \text{ DEPENDENT UPON CONFIGURATION REQUIRED BY LOCATION AND ESTIMATED VOLUME.} \]

**SECTION C-C**

**PLAN VIEW**

**SECTION D-D**

**SECTION A-A**

**INLET**

\[ D = 1.0' = \text{DESIGN FLOW DEPTH-MIN.} \]

\[ \text{VARIES FROM WIDTH OF STREAM AT INLET TO ONE-HALF WIDTH OF POND AT OUTLET.} \]

**SECTION B-B**

**OUTLET**

**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 BASIN.

IF SEDIMENT BASIN IS TO BE PERMANENT ITS SLOPES SHALL BE STABILIZED WITH ROCK RIPRAP OR EQUIVALENT.

THE MATERIALS FOR ROCK RIPRAP SHALL MEET THE REQUIREMENTS OF SEC 611.30 FOR TYPE 2 ROCK BLANKET.

SEE PLANS FOR LENGTH, DEPTH AND WIDTH OF BASIN.

SEE PLANS FOR ESTIMATED QUANTITIES OF ROCK RIPRAP – CUBIC YARDS.
SECTION B-B
TYPE B BERM

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.

NOTE:
MAXIMUM LENGTH BETWEEN SLOPE DRAINS SHALL BE APPROXIMATELY 500 FEET.
Flow Detail A

Typical B-B

Normal INSlope

Flow

Post

Filter Fabric

Ground Line

Elevation Detail

Fabric Silt Fence

Plan View

Detail A

Perimeter Silt Fence

For Transverse Flow

Perimeter Silt Fence

For Angular Flow

General Notes:

Use Silt Fence for fill heights greater or equal to 10 feet. On all fills greater than 10 feet high, mid-slope runs of Silt Fence should be considered.

For fabric Silt Fence:

Minimum longitudinal splice overlap shall be 2' with a post at each end.

Secure Fabric to posts.

Instead of Silt Fence across drainage ditches and drains, ditch checks shall be used as shown on plans or as directed by engineer.

At culverts, place sediment barriers over the top of the culverts (not in the stream channel).
SECTION A-A
TYPE C BERM

1. TYPE C BERM SHALL BE PLACED ABOVE THE DESIGN HIGH WATER MARK OR AT THE ELEVATION AS DIRECTED BY THE ENGINEER.

VEGETATIVE MULCH COMPACTED TO 3" OR EQUIVALENT EROSION CONTROL BLANKET OR SEED/TILE FABRIC IF REQUIRED BY THE ENGINEER.

SECTION B-B

GENERAL NOTES:

TYPE C BERM SHALL BE BUILT TO HANDLE SIGNIFICANT RAINFALL EVENTS AND SHALL BE INSTALLED PRIOR TO SOIL DISTURBANCE OF FLUVIAL OR FILL IN THE DRAINAGE AREA OF THE BERM.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-MO-DOT-411 (1-888-663-6868)

TEMPORARY EROSION CONTROL MEASURES
BRIDGES AND BOX CULVERTS AT STREAM CROSSINGS

FILE DATE: 06/24/2020
FILE REV: 06/25/2018

806.10J SHEET NO. 6 OF 6
METHOD OF SUPPORTING DECIDUOUS TREES
3" CALIBER OR LARGER

SIX LAYERS OF BURLAP TO BE INSTALLED BEFORE BRACE BLOCKS

METHOD OF SUPPORTING EVERGREEN TREES
3' OR MORE IN HEIGHT

BRACE BLOCK MAY BE NAILED TO TREE

ROOT BALL TO BE INSTALLED BEFORE BRACE BLOCKS

TWIST WIRE TO TIGHTEN

HOLE

NO. 12-WIRE

5 FT. "T" STEEL COMMERCIAL FENCE POST

NOTES:

TREE WRAP SHALL BE INSTALLED BEFORE BRACING.

BRACE SHALL BE NAILED SECURELY TO POST AND BRACE BLOCK.

BANDING SHALL BE DONE WITH A COMMERCIAL BANDING MACHINE.

GENERAL NOTE:

ALL NUMBER MEASUREMENTS ARE NOMINAL.

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

DATE EFFECTIVE: 07/01/2004
DATE PREPARED: 08/28/2003

TYPICAL PLANTING ILLUSTRATIONS
METHOD OF SUPPORT

SHEET NO. 1 OF 3
**Measurement of Small Trees**

- **Measure Caliber for Trees 4" or less.**
- **Measure Caliber for Trees more than 4".**

**Measurement of Large Trees**

- Base width measured not more than 10" above the ground line.

**Measurement of Evergreen Trees**

**Measurement of Deciduous Shrubs**

**Pruning Cuts**

- Thinning cut
- Heading cut

**Typical Planting Illustrations**

Missouri Highways and Transportation Commission
105 West Capitol
Jefferson City, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

Date Effective: 07/01/2004
Date Prepared: 08/28/2009
EVERGREEN AND DECIDUOUS TREES

SHOULDER

MINIMUM CLEAR DISTANCE AS SPECIFIED IN THE PLANS

PAVEMENT

MEDIAN

MINIMUM DISTANCE FOR PLANTING ON TYPICAL CROSS SECTION

LOCATION OF SHRUBS IN A TYPICAL PLANT BED

GROUNDCOVER

PAVEMENT

SHRUBS

GROUND COVER

SHOULDER

DITCH

MINIMUM DISTANCE FOR PLANTING ON TYPICAL CROSS SECTION

LOCATION OF SHRUBS IN A TYPICAL PLANT BED

EVERGREEN SHRUB SLOPE PLANTING

DECIDUOUS SHRUB SLOPE PLANTING

VINES AND SEEDLINGS

SPREAD MEASURED NO MORE THAN 10" ABOVE THE GROUND LINE.

4" MULCH

BACKFILL MATERIAL

SPREAD

ROOT SPREAD

6" 6"

DATE EFFECTIVE: 07/01/2004
DATE PREPARED: 08/28/2009
**Identification Tag**

**General Notes:**

- Holes shall be punched only for specified bolt circles.
- Type A poles shall be equipped with the grounding lug inside the transformer base. Type B poles shall be equipped with 1 grounding lug inside the pole.
- Transformer base shall be certified as meeting the Greenbook criteria and structural requirements as set by the Greenbook. Standards and regulations for structural steel supports and fire protection shall meet the requirements of ASME 350.
- Bolts used are for the pole base. The bolt holes shall be reinforced to prevent theft and damage.
- All holes shall be conform to Section 10.1 of the Transformer Specifications.
- The number of bolts is specified. Cables shall be wired in pairs and attached to the pole.
- The cable entrance at the pole shall be a 30° mounting height.

**LED Luminaire Table**

| Luminaire | Max. Watt | Distribution | Lifespan | Model
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<td>105</td>
<td>310</td>
<td>BLM-00-02</td>
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**Wall Brackets**

1. 2 standard galvanized steel pipe: Install joint box at each bracket. Wire shall be slitted in junction box with fixed connections.

2. Wire entrance hole: Clean out hole edges to prevent wire damage.

3. Hole and 4 bolts.

**Face Plate Details**

1. 2 holes and 4 bolts.

---

**Manufacturer Fabrication Date**

- Shop Drawing No. MFR. PART NUMBER
- INCH LINES
- REV.
- DATE
- SCALE
- 1:100

---

**Highway Lighting Poles, Foundations and Appurtenances for 30' Mounting Height**

- Date Effective: 09/01/2004
- Sheet No.: 2 of 4

---

**Notes**

- The holes shall be slotted in the pole and attached to the pole using the two bolts or stainless steel plate screws.
- Including Revision.
GENERAL NOTES:

1. ALL CLASSIFICATIONS ARE WITH UNLESS OTHERWISE NOTED.
2. SEE STANDARD SPECIFICATIONS FOR CLASSIFICATIONS NOT SHOWN.
3. ALL CONNECTOR PLATE AND CLOSURE PLATE THICKNESSES SHOWN ARE NOMINAL THICKNESSES.
4. ALL ANCHOR BOLTS SHALL BE FULLY GALVANIZED 1/2 IN DIAMETER STAINLESS STEEL BOLTS.
5. ALL STEEL COMPONENTS SHALL BE FULLY COATED OR GALVANIZED.

ELEVATION
DETAILS OF CIRCULAR
STEEL PILE FOUNDATION

DETAILS OF STEEL "H" PILE FOUNDATION

NOTES:

1. COUNTERSINK spurred to clear bolt head.
2. CONNECTOR PLATES ARE LEVEL PERPENDICULAR TO THE BOLTS AND PLUGGED FOR BOLT EYES PARALLEL TO THE PILE AXIAL.
3. PLUGS ARE REQUIRED AS NEEDED TO CLEAR HOLE EDGE.

M.O.D.O.T.
HIGHWAY LIGHTING
POLES, FOUNDATIONS AND
APPARATUSES FOR
30’ MOUNTING HEIGHT

DATE EFFECTIVE: 10/1/2014
DATE PREPARED: 2/2/2016
SHEET NO.: 901.00AB
3 OF 4
ANCHOR BOLTS SHALL BE PLACED ONLY FOR 15" DIAM. BOLT CIRCLE.

ELEVATION
DETAILS OF CONCRETE FOUNDATION

PLAN

ANCOR BOLTS (36"

0.75"

15"

BOLT CIRCLE

DIAMETER OF CABLE ENTRANCE

DIAMETER OF CABLE ENTRANCE

3"

1 1/2"

15" x 15" x 1"

CONNECTOR PLATE

INJECTOR

INJECTOR

MATERIAL INDICATOR OF CABLE ENTRANCE

MATERIAL INDICATOR OF CABLE ENTRANCE

1/2" CABLE HOLE FOR 1 (E.G., HIGH STRENGTH BOLTS, ETC.)

NOTES:

1. USE WELD AS NECESSARY TO CLEAR BOLT HEAD.

2. FOUNDATIONS SHALL BE INSTALLED SO THAT CONNECTOR PLATES ARE LEVEL AND PARALLEL TO THE BUCKET AXES, AND LOCATED FOR EASE OF INSTALLATION PARALLEL TO THE BUCKET AXES.


GENERAL NOTES:

ALL FOUNDATIONS ARE WITH HOLES OF SIMILAR OR SIMILAR HOLE SIZES.

ALL CONNECTOR PLATE ARE SHOT-PLATED FOR HOLE STRENGTH.

ALL ANCHOR BOLTS SHALL BE FULLY GASTWELDED 1" DIAM. DIAM. STRENGTH ANCHOR BOLTS.

ALL STEEL COMPONENTS SHALL BE HOT DIP GALVANIZED.

CONCRETE FOUNDATION EMBEDMENT

CONCRETE FOUNDATION EMBEDMENT

SCREW ANCHOR EMBEDMENT

SCREW ANCHOR EMBEDMENT

HIGHWAY LIGHTING
POLES, FOUNDATIONS AND APPURTENANCES FOR 30' MOUNTING HEIGHT

901.00AB  4 OF 4
### LED LUMINAIRES

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<th>DESIGNATION</th>
<th>MAX. WATT</th>
<th>DISTRIBUTION</th>
<th>VOLT</th>
<th>E-SENSITIVE-MOUNTING-HEIGHT</th>
<th>E-BRACKET-MOUNTING-HEIGHT</th>
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<td>111</td>
<td>E-MD-02</td>
<td>E-MD-03</td>
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</table>

**LUMINAIRES PER CHART, UNLESS OTHERWISE SPECIFIED ON PLANS.**

**GENERAL NOTES:**

The correct mounting height will be obtained by selecting luminaires from the 8" minimum clearance between the pole cap and the top of the bracket and mounting points shall be determined only for specified bolt circle.

Transformer base shall be certified as meeting the test requirements and test shall be set to the correct mounting specifications for transformer. Holes for mounting shall meet the test requirements for transformer. Mounting bolt shall be 3" to 6".

Lighting shall be provided with a grounding lug for grounding equipment. All junction boxes shall comply with the standards of the standard specifications.

**TYPE A POLE:**

The pole shall be equipped with the grounding lug. Inside the transformer base, type E and VB pole shall be equipped with a grounding lug inside the pole.

Foot shall be grounded from ground lug in foot with 4 AWG bare copper wire to conduct system: ground lug shall be 1/2" or 3/4" from hole. The cable entrance at the socket arm shall be a 4" field fitted 1/2" E3A hole.

---

### TYPE B POLE

<table>
<thead>
<tr>
<th>BRACKET SPEC</th>
<th>6' x 15'</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAX. LUMINAIRES</td>
<td>60 LB 240V</td>
</tr>
<tr>
<td>MAX. PROTECTED</td>
<td>3.3 SQ. FT</td>
</tr>
</tbody>
</table>

**SINGLE BRACKET ARM**

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>BRACKET SPEC</th>
<th>E</th>
<th>NON.</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENCLOSED BARRIER CAST</td>
<td>6'</td>
<td>10&quot;</td>
<td>1-1/4&quot;</td>
</tr>
</tbody>
</table>

**TWO BRACKET ARM**

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>BRACKET SPEC</th>
<th>E</th>
<th>NON.</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENCLOSED BARRIER CAST</td>
<td>15'</td>
<td>10&quot;</td>
<td>1-1/4&quot;</td>
</tr>
</tbody>
</table>

---

### TYPE MB POLE

<table>
<thead>
<tr>
<th>BRACKET SPEC</th>
<th>6' x 15'</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAX. LUMINAIRES</td>
<td>60 LB 240V</td>
</tr>
<tr>
<td>MAX. PROTECTED</td>
<td>3.3 SQ. FT</td>
</tr>
</tbody>
</table>

**DOUBLE BRACKET ARM**

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>BRACKET SPEC</th>
<th>E</th>
<th>NON.</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENCLOSED BARRIER CAST</td>
<td>6'</td>
<td>10&quot;</td>
<td>1-1/4&quot;</td>
</tr>
</tbody>
</table>

**DOUBLE TWO BRACKET ARM**

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>BRACKET SPEC</th>
<th>E</th>
<th>NON.</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENCLOSED BARRIER CAST</td>
<td>15'</td>
<td>10&quot;</td>
<td>1-1/4&quot;</td>
</tr>
</tbody>
</table>
NOTE:
ANCHOR BOLTS SHALL BE PLACED ONLY FOR 1/2" BOLT CIRCLE

PLAN
ANCHOR BOLTS

ELEVATION
DETAILS OF CONCRETE FOUNDATION

CONCRETE FOUNDATION EMBEDMENT

CONCRETE REINFORCED COLUMN

GENERAL NOTES:

1. ALL CLASSIFICATIONS ARE ASTM UNLESS OTHERWISE NOTED.

2. ALL BOLT CIRCLES FOR 45' MOUNTING HEIGHT SHALL BE 1/2".

3. ALL CONCRETE PLATE AND CLOSURE PLATE THICKNESSES SHOWN ARE VARIATION EXHIBITIONS.

4. ALL ANCHOR BOLTS SHALL BE FULLY PRESTRESSED 1/2" DIAMETER HIGH STRENGTH ANCHOR BOLTS.

5. ALL STEEL COMPONENTS SHALL BE HOT DIP GALVANIZED.

ANCHOR BOLTS:

<table>
<thead>
<tr>
<th>QUANTITY</th>
<th>CONC.</th>
<th>reinforcements</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 - 1/2&quot;</td>
<td>90</td>
<td>60</td>
</tr>
<tr>
<td>7 - 1/2&quot;</td>
<td>90</td>
<td>90</td>
</tr>
<tr>
<td>8 - 1/2&quot;</td>
<td>94</td>
<td>104</td>
</tr>
<tr>
<td>9 - 1/2&quot;</td>
<td>102</td>
<td>120</td>
</tr>
</tbody>
</table>

SLOPE

ANCHOR BOLTS

RIGID CONDUIT (3/4" MILD STEEL)

G E N E R A L  C O N T R A C T O R

HIGHWAY LIGHTING
POLES, FOUNDATIONS
AND APPURTENANCES
FOR 45' MOUNTING HEIGHT

DATE EFFECTIVE: 3/28/2013
DATE PREPARED: 2/27/2013
901.01AJ SHEET NO. 6 OF 6
COIL ENDS OF CABLE-CONDUIT DITCH LINE AND COVER WITH PLANKS.

IF WIRING IS INSTALLED PRIOR TO POLE INSTALLATION.

PLAN INSIDE SHOULDER (ALL SHOULDER TYPES)

EDGE OF TRAVELED WAY
POLE FOUNDATION
CABLE-CONDUIT
RIGID CONDUIT

CONCRETE PULL BOX

RIGID CONDUIT UNDER PAVEMENT AND SHOULDER, TERMINATE RIGID CONDUIT IN PULL BOX.

OUTSIDE EDGE OF SHOULDER

PLAN OUTSIDE SHOULDER (ALL SHOULDER TYPES)

EDGE OF TRAVELED WAY
POLE FOUNDATION
CABLE-CONDUIT OR RIGID CONDUIT

CONCRETE PULL BOX

RIGID CONDUIT OR RIGID CONDUIT UNDER PAVEMENT (AS SPECIFIED)

PLAN BEHIND GUARD RAIL

EDGE OF TRAVELED WAY
SHOULDER
GUARD RAIL END TREATMENT (ANY TYPE)

OUTSIDE EDGE OF SHOULDER

GENERAL NOTES:

1. SEE DRAWING 902.20 FOR FULL BOXES.
2. CONDUIT MAY BE REMOVED FROM CABLES IN RIGID CONDUIT. SPLICES SHALL NOT BE MADE UNLESS SHOWN ON PLANS.
3. BRAND AND MODEL OF FUSE HOLDER SHALL BE APPROVED BY THE ENGINEER.
4. CABLES SHALL BE CONTINUOUS TO THE FIRST LIGHT POLE. SPLICES SHALL NOT BE REMOVED FOR THE PURPOSE OF TERMINATING CABLE-CONDUIT.
LIST OF MATERIALS

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>P2 CORBIN LOCK</td>
</tr>
<tr>
<td>2</td>
<td>RIGID CONDUIT</td>
</tr>
<tr>
<td>3</td>
<td>CLASS B CONCRETE, D.A.C.C.</td>
</tr>
<tr>
<td>4</td>
<td>NEMA 4 DUST-PROOF, WATERPROOF, CABINET</td>
</tr>
<tr>
<td>5</td>
<td>GROUND ROD, 3/4&quot; DIA., X 6' MIN.</td>
</tr>
<tr>
<td>6</td>
<td>PHOTOELECTRIC SWITCH AND SOCKET, 105/285 V., 1000-WATT</td>
</tr>
<tr>
<td>7</td>
<td>TRANSPARENT PLEXIGLASS WINDOW, #903, 3/8&quot; THICK</td>
</tr>
<tr>
<td>8</td>
<td>CLEAN, LEXAN #903 WINDOW, 1/2&quot; THICK MIN.</td>
</tr>
<tr>
<td>9</td>
<td>MOUNTING PAN, 3 1/2&quot; x 12&quot; x 2&quot; ALUMINUM OR STAINLESS STEEL</td>
</tr>
<tr>
<td>10</td>
<td>PLASTIC DUCT SEALANT</td>
</tr>
<tr>
<td>11</td>
<td>LIFETIME SILICONE CAULK</td>
</tr>
<tr>
<td>12</td>
<td>ANCHOR BOLTS, 5/8-11 x 14&quot; LONG BOLTS, HOT DIP GALVANIZED, 4 REQUIRED. USE BOLT HEAD OR TACK NUT ON EMBEDDED END</td>
</tr>
<tr>
<td>13</td>
<td>WEATHERPROOF ADHESIVE LABEL, VINYL RAISED LETTERING (OR EQUIVALENT, SEE PLANS)</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 EQUIMENT. 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 1,400 WATS FOR 240 VOLT AND 11,000 WATS FOR 480 VOLT.

- SCHEMATIC DIAGRAM SHALL BE MOUNTED ON INSIDE OF CABINET DOOR.

- THE UTILTY 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 CALK.

- ALL MATERIALS REQUIRED EXCLUDING REFERENCE ITEMS AS SHOWN ON DRAWING SHALL BE INCLUDED IN PRICE BID FOR CONTROL STATION.

DATE EFFECTIVE: 04/01/2005

JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)
105 WEST CAPITOL
MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
HIGHWAY LIGHTING BASE MOUNTED CONTROL STATION 240 V OR 480 V - 4 CIRCUIT
401.30F 901.30F SHEET NO. 1 OF 2
**NOTES**

- Lighting system voltage as specified on plans.
- Photocell switch brackets may vary. Locate center of window over center of photocell switch.
- 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.

**LIGHTING BREAKER SIZING:**

<table>
<thead>
<tr>
<th>Size (Lamps)</th>
<th>Circuit Load (Watts)</th>
<th>240V Total</th>
<th>480V Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>0-2800</td>
<td>2850-3700</td>
<td>5550-7400</td>
</tr>
<tr>
<td>20</td>
<td>2850-3700</td>
<td>5550-7400</td>
<td>9250-11000</td>
</tr>
<tr>
<td>25</td>
<td>3750-4600</td>
<td>7400-9200</td>
<td>11000-13000</td>
</tr>
<tr>
<td>30</td>
<td>4600-5500</td>
<td>9250-11000</td>
<td>13000-15000</td>
</tr>
<tr>
<td>35</td>
<td>5500-6500</td>
<td>11000-13000</td>
<td>15000-17000</td>
</tr>
<tr>
<td>40</td>
<td>6500-7400</td>
<td>13000-15000</td>
<td>17000-19000</td>
</tr>
</tbody>
</table>

Circuit load includes load due to line loss, lamp, and ballast load.

**ALL CIRCUIT BREAKERS SHALL CONFORM TO SECTION 901.4 OF THE STANDARD SPECIFICATIONS.**
## List of Materials

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</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>Lighting arrester, valve type, 2 pole, 650 volt</td>
</tr>
<tr>
<td>7</td>
<td>Meter socket, 200 amp., for signals</td>
</tr>
<tr>
<td>8</td>
<td>Meter socket, 200 amp., for lighting</td>
</tr>
<tr>
<td>9</td>
<td>Locking, 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>Signal breakers, single pole, 40A min., Type A or B *</td>
</tr>
<tr>
<td>12</td>
<td>Lighting breaker, 2 pole, 240 volt, 100A, Type A or B *</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>Weatherproof adhesive label (lighting), vinyl raised lettering (or equivalent, see detail)</td>
</tr>
<tr>
<td>19</td>
<td>Weatherproof adhesive label (signals), vinyl raised lettering (or equivalent, see detail)</td>
</tr>
<tr>
<td>20</td>
<td>#2 AWG min. cable, 600 volt</td>
</tr>
<tr>
<td>21</td>
<td>Rigid conduit, 2&quot; minimum</td>
</tr>
<tr>
<td>22</td>
<td>Rigid conduit, 2&quot; minimum</td>
</tr>
</tbody>
</table>

* See plans

## Wiring Diagram

**Lighting and/or Signals**

### Notes:

A. Service pole shall be guyed 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 decide if lightning arresters are to be connected on the load or line side of the meter. The utility company shall also decide if the lightning arrester is terminated in the meter or disconnect cabinet. If terminated in the disconnect cabinet, it shall be installed on the disconnect cabinet.
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.
PEDESTAL OR NEW STATE-OWNED POLE TO BE SET WITHIN 2' TO 4' OF RIGHT-OF-WAY LINE.
ALL SERVICE POWER SUPPLY ASSEMBLIES ARE TO BE LOCATED ON STATE PROPERTY.

PRIVATE PROPERTY
STATE PROPERTY

TOP VIEW
IF FENCE BLOCKS ACCESS TO POWER SUPPLY A 3' MIN. LOCKING GATE IS TO BE INSTALLED. (NO DIRECT PAY)

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.

SECTION A-A

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-454-MODOT (1-888-275-6636)

MEASUREMENTS IN INCHES

DATE EFFECTIVE: 04/01/2002
DATE PREPARED: 03/18/2002
901.80D SHEET NO. 2 OF 2

HIGHWAY LIGHTING
POWER SUPPLY ASSEMBLY
SECONDARY SERVICE
CONDUIT LOCATIONS

IN PROPOSED CONCRETE MEDIAN ON EXISTING PAVEMENT

0.5% MINIMUM SLOPE

NON-PAVED SURFACED

PAVED SURFACE

TYPE E

FOR CONTROLLER CABINETS WITH HEIGHTS FROM 6'-1" TO 6'-6"

TYPE EV

CONDUIT AS REQUIRED

TYPE 332

FOR TYPE 170 CONTROLLER CABINETS

TYPE 336S

CONDUIT AS REQUIRED

CONTROLLER CABINS AND BASE TYPES

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

TRAFFIC SIGNALS
CONTROLLERS
CONDUIT LOCATION

DATE EFFECTIVE: 04/01/2005
DATE PREPARED: 08/26/2005

SHEET NO. 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'.

SERVICE DISCONNECT BOXES AND METER BOXES SHALL BE ALUMINUM OR STAINLESS STEEL. ALL HARDWARE, HINGES, CATCHES, ETC. SHALL BE STAIN-LESS STEEL.

SERVICE DISCONNECT BOX, LOCKING, RAINTIGHT, NEMA 4.

GUARD, GROUNDABLE NEUTRAL, 200 AMP MINIMUM.

INSULATED, GROUNDABLE NEUTRAL, 200 AMP MINIMUM.

SERVICE ENTRANCE HEAD, SINGLE POLE, 40A MIN, TYPE A OR B.

LIGHTNING BREAKER, SINGLE POLE, 40A, TYPE A OR B.

METAL CONDUIT, 1/2".

GROUND WIRE, #2 AWG MIN.

GROUND ROD, 3/4" x 8' MIN.

CLASS B CONCRETE, 0.92 C.Y.

THREADED CONDUIT HUB WITH SEALING WASHERS

LIGHTING CABLES

WEATHERPROOF ADHESIVE LABEL (SIGNS) VINYL RAISED LETTERING

TYPE 2 CONTROLLER AND SIGNAL BREAKER, AS SPECIFIED.

TYPE B AUXILIARY BREAKER, 15 AMP

W6 x 9 OR W6 x 15 GALVANIZED POST

LIGHTING CONTROL CABINET (SEE SHEET 2)

UTILITY COMPANY POLE.

POLE OR PADMOUNT TRANSFORMER

NOTE:
CABLE AND CONDUIT FROM POWER SUPPLY ASSEMBLY TO UTILITY COMPANY FACILITIES 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.

FOR WIRING DIAGRAM AND LABEL DETAIL SEE SHEET 2 OF 4.
LIST OF MATERIALS

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SERVICE POLE 30' MIN., CLASS IV WOOD, CONTRACTOR PROVIDED, MODOT OWNED</td>
</tr>
<tr>
<td>2</td>
<td>#8 AWG MIN. CABLE, 600 VOLT</td>
</tr>
<tr>
<td>3</td>
<td>SERVICE ENTRANCE HEAD</td>
</tr>
<tr>
<td>4</td>
<td>GUY CABLE, AS REQUIRED</td>
</tr>
<tr>
<td>5</td>
<td>2&quot; MIN. RIGID CONDUIT WITH PREFORMED ELBOWS</td>
</tr>
<tr>
<td>6</td>
<td>LIGHTNING ARRESTER, VALVE TYPE, 2 POLE, 650 VOLT</td>
</tr>
<tr>
<td>7</td>
<td>METER SOCKET, 200 AMP, FOR SIGNALS</td>
</tr>
<tr>
<td>8</td>
<td>2&quot; MIN. RIGID CONDUIT</td>
</tr>
<tr>
<td>9</td>
<td>SERVICE DISCONNECT BOX, LOCKING, RAINTIGHT, NEMA 4</td>
</tr>
<tr>
<td>10</td>
<td>INSULATED, GROUNDBALE 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>
</tr>
<tr>
<td>14</td>
<td>GROUND WIRE, #2 AWG MIN.</td>
</tr>
<tr>
<td>15</td>
<td>GROUND ROD, 3/4&quot; x 8' MIN.</td>
</tr>
<tr>
<td>16</td>
<td>#8 AWG MIN. CABLE, 600 VOLT</td>
</tr>
<tr>
<td>17</td>
<td>CLASS B CONCRETE, 0.92 C.Y.</td>
</tr>
<tr>
<td>18</td>
<td>THREADED CONDUIT HUB WITH SEALING WASHERS</td>
</tr>
<tr>
<td>19</td>
<td>LIGHTING CABLES</td>
</tr>
<tr>
<td>20</td>
<td>WEATHERPROOF ADEHESIVE 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 VOLT</td>
</tr>
</tbody>
</table>

* SEE PLANS

NOTES
1. SERVICE POLE SHALL BE QUITED WHEN SPAN OF OVERHEAD SERVICE WIRE EXCEEDS 50'.
2. INCREASE 1 FOOT FOR EACH 5 FEET ABOVE 50 FEET.
3. SERVICE DISCONNECT BOXES AND METER BOXES SHALL BE ALUMINUM OR STAINLESS STEEL. ALL HARDWARE, HINGES, CATCHES, ETC. SHALL BE STAIN-LESS STEEL.
4. 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.
5. SCHEMATIC DIAGRAM SHALL BE MOUNTED ON INSIDE OF DOOR.
6. 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.
7. IF LIGHTING IS SPECIFIED, INSTALL LIGHTING CONTROL ON POWER SUPPLY.
8. BREAKERS SHALL CONFORM TO SEC. 901.4 OF THE STANDARD SPECIFICATIONS.
9. 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.
- 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: 8/28/2009
SHEET NO. 2 OF 3
TO FORM AIR GAP BETWEEN FILTER HOPE IN CABINET AND INSIDE CABINET

INSERT WASHERS BETWEEN FILTER AND INSIDE CABINET TO FORM AIR GAP

SEAL BETWEEN LEXAN WINDOW AND CABINET WITH NUTS AND BOLTS

CUT 2" DIAM HOLE IN CABINET

FILL BETWEEN HOLE IN CABINET AND INSIDE CABINET

SEAL BETWEEN & AROUND LEXAN WINDOW

BOLTS 16

PHOTOELECTRIC SWITCH AND SOCKET. 105/285 V., 1000 WATT

MAIN BREAKER. SINGLE POLE, TYPE B

PHOTOELECTRIC SWITCH BARCKETS MAY VARY. LOCATE CENTER OF WINDOW OVER CENTER OF PHOTOELECTRIC SWITCH.

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
EXCLUDING BALLAST LOAD

WIRE SIZE (AMPS)
12 GA MINIMUM THICKNESS. ALUMINUM OR STAINLESS STEEL

CONTINUOUS STAINLESS STEEL HINGE

NEOPRENE GASKET DOOR

FILTER, TRANSLUCENT, PLEXIGLASS

POWER, CABLE, #8 AWG MIN., 600 V.

CABINET. WATERTIGHT. NEMA 4. 14 GA MINIMUM THICKNESS

PLASMA DUCT SEALANT

LIGHTING TERMINAL BLOCK. INSULATED FROM BACK PANEL. 12 POSITION

PLIABLE DUCT SEALANT

PHOTOELECTRIC SWITCH AND SOCKET. 105/285 V., 1000 WATT

PHOTOELECTRIC WITCH BARCKETS MAY VARY. LOCATE CENTER OF WINDOW OVER CENTER OF PHOTOELECTRIC SWITCH.

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FILTER, TRANSLUCENT, PLEXIGLASS

POWER, CABLE, #8 AWG MIN., 600 V.

CABINET. WATERTIGHT. NEMA 4. 14 GA MINIMUM THICKNESS

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PLASMA DUCT SEALANT

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PLASMA DUCT SEALANT

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FILTER, TRANSLUCENT, PLEXIGLASS

POWER, CABLE, #8 AWG MIN., 600 V.
**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

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

**DATE EFFECTIVE:** 11/01/2010
**DATE PREPARED:** 9/3/2010

**TRAFFIC SIGNALS**

**CONCRETE AND PREFORMED PULL BOXES**

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

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

**DATE EFFECTIVE:** 11/01/2010
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**TRAFFIC SIGNALS**

**CONCRETE AND PREFORMED PULL BOXES**

1. **ALL METAL CONDUITS SHALL BE ELECTRICALLY BONDED BY A GROUND BUSHING AND #8 AWG BARE COPPER WIRE. FOR PVC CONDUITS, 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:**

   - **FRAME SIZE:** 29" x 29"
   - **FRAME HEIGHT:** 4"
   - **OPENING SIZE:** 22" x 22.5"
   - **FRAME WEIGHT:** 120 LBS.
   - **COVER SIZE:** 22" x 22.5"
   - **COVER THICKNESS:** 1.5"
   - **COVER WEIGHT:** 140 LBS.

4. **GENERAL NOTES:**
   - IF AN EXTENSION IS USED WITH A PREFORMED BOX, THE LIP OF THE EXTENSION MAY BE INTERIOR OR EXTERIOR.
   - THE EXTENSION SHALL BE COMPATIBLE AND FROM THE SAME MANUFACTURER.

5. **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.**

**SECTION A-A**

**SECTION B-B**

**SECTION C-C**

**Typical Bolt Cleanout**

**Double Concrete Pull Box, Type B**

**Preformed Pull Box**

**Class 1 or 2**

**Class 3**

**Preformed Pull Box Cover**

<table>
<thead>
<tr>
<th>Number of Entering Conductors</th>
<th>Class</th>
<th>Preformed Pull Box Minimum Dimensions</th>
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<tr>
<td></td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>4-20</td>
<td>2.5&quot;</td>
<td>2.5&quot;</td>
</tr>
<tr>
<td>23-60</td>
<td>2&quot;</td>
<td>2.5&quot;</td>
</tr>
<tr>
<td>68</td>
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<td>30&quot;</td>
</tr>
<tr>
<td></td>
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<td>30&quot;</td>
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**SECTION D-D**

**Typical Bolt Cleanout**

**Type I Drain Type**

**Type II Drain Type**

(See Drain Outlet Details)

(Section Above Break Applicable to Type I Drain.)

**Double Concrete Pull Box, Type B**

**Preformed Pull Box**

**Class 1 or 2**

**Class 3**

**Preformed Pull Box Cover**

---

**GENERAL NOTES:**

- IF AN EXTENSION IS USED WITH A PREFORMED BOX, THE LIP OF THE EXTENSION MAY BE INTERIOR OR EXTERIOR.
- THE EXTENSION SHALL BE COMPATIBLE AND FROM THE SAME MANUFACTURER.

- IF PREFORMED PULL BOXES ARE SPECIFIED, THE CONTRACTOR MAY USE THE STANDARD CONCRETE PULL BOX IN LIEU OF THE CLASS 1 OR 2 PREFORMED PULL BOX OR THE DOUBLE CONCRETE PULL BOX TYPE A IN LIEU OF THE CLASS 3 PREFORMED PULL BOXES.
GENERAL NOTES:
A minimum of nine hooks, installed in three levels, shall be included with each pull box.

If subsurface conditions exist which prohibit the placement of the ground rod in a vertical position, the rod may be driven at an oblique angle not to exceed 45 degrees from vertical or buried in a trench at least 30 in. deep. Connection to ground rod shall be cadwelded.

The circular pull box cover should be sized to fit a box with a clear opening of 25".

---

SECTION A-A

TYPE I DRAIN TYPE

(SEE DRAIN OUTLET DETAILS)

(CIRCULAR PULL BOX CLASS 5)

2" CONDUIT DRAIN TO INSLAPE OR AS SPECIFIED PREMOLDED BIT JOINT

1/8" PER FOOT MIN. SLOPE

SECTION B-B

FIBER OPTIC TERMINATION CABLE

3 CABLE HOOKS PER LEVEL (TYP.)

SOLID WALL SMOOTH/RIBBED FLEXIBLE CONDUIT BLACK = POWER

ORANGE = FIBER OPTIC CABLE

LOCATOR CABLE WIRE (TYP.)

STONE DRAIN MATERIAL

GROUND ROD (OPTIONAL)

PLAN

LIFT HOLE

COVER

CIRCUULAR PULL BOX

POLYMER CONCRETE RING

BOLT HOLES

SECTION A-A

TYPE II DRAIN TYPE

(SEE DRAIN OUTLET DETAILS)

(SOLID WALL SMOOTH/RIBBED FLEXIBLE CONDUIT)

BLACK = POWER

ORANGE = FIBER OPTIC CABLE

GROUND ROD (OPTIONAL)

COVER

41" DIA. NOMINAL CLEAR OPENING

36" NOMINAL CLEAR OPENING

25" NOMINAL CLEAR OPENING

LOCATOR CABLE WIRE (TYP.)
**TRAFFIC SIGNALS**

**POST BASES**

**DATE EFFECTIVE:** 02/01/2008

**DATE PREPARED:** 08/26/2009

**NOTE:**

- All anchor bolts shall be fully galvanized.

**OPTIONAL STEEL PLATE FOR ANCHOR BOLTS**

**CAST BASE**

- **SIDE VIEW END VIEW**
  - Two bolts per plate
  - Hex nut or \( \frac{3}{8} \)" fillet weld all around both sides

- **SIDE VIEW END VIEW**
  - Four bolts per plate
  - Hex nut or \( \frac{3}{8} \)" fillet weld all around both sides

**BOLT CIRCLE**

- **DETAIL A**
  - Stainless steel bolt & nut
  - Weather-proof door
  - Ground lug
  - Galvanized hex nut & washer
  - Anchor bolt

**THREADS**

<table>
<thead>
<tr>
<th>Bolt Length (Inches)</th>
<th>Vertical (Inches)</th>
<th>Thread Length (Inches)</th>
<th>Diameter (Inches)</th>
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<td>146</td>
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<td>2.500</td>
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**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

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

ALTERNATE SECTION D-D

SEAL CONDUIT OPENING AND DRILLED HOLE WITH PLIABLE SEALANT PRIOR TO APPLICATION OF LOOP SEALANT (TYPICAL ALL INSTALLATIONS)

SECTION D-D

CUT LOOP SLOT TO CURB LINE. CONDUIT SHALL NOT EXTEND PAST CURB LINE.

GENERAL NOTES:

SENSOR UNIT SHALL BE HOUSED IN CONTROLLER CABINET UNLESS SPECIFIED OTHERWISE.

LOOPS TO BE INSTALLED. WHEN EXISTING PORTLAND CEMENT CONCRETE OR ASPHALTIC CONCRETE PAVEMENT IS BEING RESURFACED. LOOPS SHALL NOT BE PLACED IN SURFACE COURSE OF THE ASPHALTIC CONCRETE.

THE CONDUIT SLOT MAY BE POWER OR MANUALLY CONSTRUCTED. ANY FORMING NEEDED TO SECURE CONDUIT IN SLOT SHALL BE REMOVED.


AFTER CABLE INSTALLATION, THE CONDUIT OPENING AT THE LOOP LEAD ENTRANCE SHALL BE SEALED.

AVOID "E" JOINTS OR OTHER FULL DEPTH JOINTS. MINOR ADJUSTMENTS TO LOOP LOCATION MAY BE MADE.

USE TYPICAL DIMENSIONS UNLESS OTHERWISE SHOWN ON PLANS.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

TRAFFIC SIGNALS INDUCTION LOOP DETECTORS

DATE EFFECTIVE: 06/01/2009
DATE PREPARED: 4/14/2009

902.50L SHEET NO. 1 OF 2

USE TYPICAL DIMENSIONS UNLESS OTHERWISE SHOWN ON PLANS.
LOOP SHALL BE #14 AWG STRANDED WIRE IN PVC DUCT MADE UP OF 2 NON-TWISTED TURNS IN SINGLE SLOT OR AS RECOMMENDED BY MANUFACTURER OF THE DETECTOR AMPLIFIER. LOOP SHALL BE PLACED IN SAWED SLOTS IN A FIGURE EIGHT MANNER.

IF EXISTING LOOPS ARE TO BE ABANDONED AND NEW LOOP INSTALLED, ABANDONED LOOP WIRES SHALL BE REMOVED OR CUT COMPLETELY THROUGH.

ABANDONED LOOPS

ABANDONED LOOPS
# Structural Sign Data

## Designation

<table>
<thead>
<tr>
<th>Color Scheme</th>
<th>Sheeting</th>
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<td>Legend</td>
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<tr>
<td>White</td>
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<tr>
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</table>

Note: White legend is direct applied unless specified otherwise.

## Flat Sheet Sign Data

### Designation

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<th>Color Scheme</th>
<th>Sheeting</th>
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### Flat Sheet Fluorescent

<table>
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<tr>
<th>Color Scheme</th>
<th>Sheeting</th>
</tr>
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</table>

Note: Legend and background colors are achieved through transmissive film and film.

### Flat Sheet Thickness

<table>
<thead>
<tr>
<th>Sign Size</th>
<th>Thickness</th>
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<tr>
<td>Top or Leg</td>
<td>0.080 IN.</td>
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<tr>
<td>Over 800 TO 1000</td>
<td>0.040 IN.</td>
</tr>
<tr>
<td>Over 1000</td>
<td>0.050 IN.</td>
</tr>
</tbody>
</table>
**General Notes:**

- All backing bars shall be 2-1/2" x 6" steel, galvanized after forming. Weight = 0.35 lb. per foot. Holes in bars shall be #1 and shall be finished as shown on this drawing.

- **Detail A:** The end of the horizontal backing bars shall extend maximum of 9 inches past the sign bolt, but shall not extend past the edge of the sign.

- **Detail B:** For signs installed on the parallel horizontal backing bars, the additional bolt shall be added to the left sign to keep assembly square.

- When using optional backing bar layout, vertical bars shall be mounted centerline horizontal bars.

- Backing bars shall meet Missouri Standard Plans or Approved Products List.

- Backing bars are 6" x 6" structural steel, per form. All signs to be installed along vertical centerlines.

- For post and footing data and details of shields and flanges, see other drawings.

- Minimum vertical spacing indicated between signs to be achieved by using the closest available holes when using post.

---

**Missouri Highways and Transportation Commission**

105 West Capitol
Jefferson City, MO 65102
1-888-667-MoDOT (667-6636)

**Highway Signing**

*Back to Sign Mounting Route Shield and Marker Assemblies*

*Effective Date:* 4/5/06
*Date Modified:* 3/6/07

MoDOT 903.02AP 4 of 8
12" EXTRUDED ALUMINUM PANEL
MINIMUM WT. = 2.40 LBS./FT.

NOTE: MINIMUM WEIGHT AND THICKNESS DIMENSIONS SHOWN. MEASURED PANELS MAY BE HEAVIER.

6" EXTRUDED ALUMINUM PANEL
MINIMUM WT. = 2.40 LBS./FT.

POST CLIP BOLT WITH FLAT WASHER AND LOCKNUT

NOTE: COARSE BOLT HEAD SHANK, RECTANGULAR BOLT HEAD WITH LENGTH DIMENSION OF 0.641 MAY BE USED.

BOLT = 3/8 X 1 ALUMINUM HEX LOCKNUT = 3/8 ALUMINUM WASHER = ALUMINUM

POST CLIPS SHALL BE LSTB-108, 356-T6 ALUMINUM ALLOY.

DETAIL A
ENLARGED VIEW OF SECTIONS

DETAIL B
ENLARGED DETAIL OF SECTIONS

ELEVATION VIEW

DETAIL C

PLAN VIEW
END VIEW

2\1/4 = 16 U.N.C. 2A THD.

\(\frac{25}{64\ 1/8} \times 1\times D.D. \times 0.281\)

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-800-558-MODOT (663-6688)

HIGHWAY SIGNING
EXTRUDED ALUMINUM PANEL DETAILS

DATE EFFECTIVE: 3/24/2020
DATE MODIFIED: 7/28/2020
903.02AP SHEET NO. 5 OF 8
GENERAL NOTES:

SEE STANDARD PLAN 903.03 FOR WIDE FLANGE INSTALLATION.

SIGN BARRICADE SHALL BE CONSTRUCTED AS A STRUCTURAL 1ST RANK SIGN.

DIRECTIONAL ARROWS SHALL BE SHAPED AND CONSIDERED INCIDENTAL TO THE SIGN.

ALL REFLECTIVE SURFACES SHALL BE RETROREFLECTIVE SHEETING IN ACCORDANCE WITH SEE 1032.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-800-392-MODOT 1-800-392-6636

HIGHWAY SIGNING
SIGN BARRICADE
### Structural Steel Post for Ground Mounted Signs

**Post and Footing Data Table**

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**General Notes:**
- **Post Installation Details**
- **Post and Footing Details**
- **Wide Flange (WF) Posts**

**Bolt Retainer**

**Section A-A**

**Section B-B**

**Section C-C**

**Stiffener Plate**

**Detail A**

**Elevation**

**Footing Detail**

**General Notes:**
- **Post Installation Details**
- **Post and Footing Details**
- **Wide Flange (WF) Posts**

**Sheet Metal Bolt Retainer Cut from 30 Ga. Galvanized Sheet Metal.**

**Consider Taper Plate Side Gages to Fit Plate.**

**Bolt Holes to Be a Larger than Reamied Bolt Side.**

**12"**

**SHIM**

**Stiffener Plate**

**Detail A**

**Elevation**

**Footing Detail**

**General Notes:**
- **Post Installation Details**
- **Post and Footing Details**
- **Wide Flange (WF) Posts**

**Missouri Highways and Transportation Commission**

**Sheet No.:** 1

**Date Modified:** 02/22/2005

**Location:** Jefferson City, MO 65102

**Telephone:** 1-888-442-MADOT (6236) / 1-800-558-MADOT (6236)

**Post and Footing Details**

**Wide Flange (WF) Posts**

**Sheet No.:** 903.03BM

**Date Effective:** 02/22/2005
CLAMP TYPE SIGN SUPPORT FOR PIPE POST

WIDTH OF PIPE POST CLAMP

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<th>SIGN TYPE</th>
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MOUNTING DETAILS FOR FLAT SHEET SIGNS ON ROUND STRUCTURES >4" PIPE POST

- 3/16" X 2" HEAVY DUTY FULL THREADED STAINLESS STEEL HARDWARE
- CLAMP ASTM B 308, 6061-T6 OR 6063-T6 ALUMINUM ALLOY EXTENSIONS
- 1/4" PIPE POST CLAMP ALUMINUM FLAT SHEET
- GALVANIZED ROUND POST
- PROFILE VIEW
- PLAN VIEW

MOUNTING DETAILS FOR EXTRUDED PANELS ON PIPE POST

- SIGN MOUNTING DETAILS PIPE POST

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 West Capitol
Jefferson City, MO 65102
1-888-MOTO-MOD 1-888-666-6663

SIGN MOUNTING DETAILS PIPE POST

- FLARED LEG SIGN BRACKET
- STRAP SEAL

NOTES:
- FOR GENERAL NOTES, SHEET 1 OF 16.
- FOR MOUNTING HEIGHT AND OFFSET DETAILS, SEE SHEET 10 OF 16.
- FOR DETAILS OF EXTRUDED ALUMINUM PANEL AND POST CLIP DETAILS, SEE MISC. PAGES 903/02 SHEET 91/107.

MO DOT
DELINEATORS ON GUARDRAIL

FOR GUARDRAIL DETAILS, SEE SHEETS 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 VIABLE BY USING VEHICLE TRAFFIC.
LEGEND
- WHITE DELINERATOR
- YELLOW DELINERATOR
- WHITE DOUBLE STRIPED DELINERATOR
- RED DELINERATOR

DELINERATOR SPACING ON HORIZONTAL CURVES

<table>
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<tr>
<th>RADIUS OF CURVE (FEET)</th>
<th>SPACING ON CURVE (FEET)</th>
<th>SPACING IN ADVANCE &amp; BEHIND CURVE (FEET)</th>
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7'5" SPACING ON CURVE = 3/4 X 6G OR MAY BE INTERPOLATED FROM TABLE. MINIMUM SPACING = 20 FEET.

SPACING OF FIRST DELINERATOR IN ADVANCE OF AND BEYOND CURVE = 2 X 5.
THE SECOND = 5 X 5 AND THE THIRD = 5 X 5 BUT NOT TO EXCEED 100 FEET. MAXIMUM SPACING = 100 FEET.

DELINERATORS SHALL BE INSTALLED FACING APPROACHING TRAFFIC. YELLOW DELINERATORS SHALL BEGIN AT CURVE END WITH THE WHITE EXIT SIGN AND END 60 FEET FROM THE CURVE END. WHITE DELINERATORS SHOULD EXTEND BEYOND THE FIRST YELLOW DELINERATOR. RED DELINERATORS SHOULD BE PLACED ON THE BACK SIDE OF EITHER THE WHITE OR YELLOW DELINERATOR FOR SMALLEST VEHICLES TO INDICATE THE EXIT ROAD END AND ISOLATE VEHICLES FACING AWAY FROM NORMAL TRAFFIC FLOW.

CHANNEL PARTY DELINERATORS SHALL BE INSTALLED ON SECTIONS WHERE DUPLINERATOR IS PRESENT. THESE PARTITIONS SHALL BE DELINERATED UTILIZING THE QUADRUPLE DELINERATOR. IN AREAS WHERE RED DELINERATORS ARE DELINERATED, REFLECTIVE SHEETING WILL BE PLACED ON THE BACK SIDE OF THE QUADRUPLE DELINERATOR.

REFLECTIVE SHEETING SHALL BE IN ACCORDANCE WITH SEC 1042.2.7.3.

NOTES:

(1) USE YELLOW DOUBLE STRIPED DELINERATOR FOR LEFT HAND ACCESS DECK LANE.
(2) DELETE IF EMERGENCY REFERENCE MARKERS ARE USED.
(3) EXTENT OF DELINERATOR ON ROUTES WITH EMERGENCY REFERENCE MARKERS.
(4) ON ROUTES WITHOUT EMERGENCY REFERENCE MARKERS DELINERATORS SHALL BE INSTALLED BETWEEN INTERCHANGES EVERY 500'.

THE CONTRACT UNIT PRICE FOR EACH CHANNEL POST DELINERATOR SHALL INCLUDE THE REFLECTORS AND FASTENERS ARE POSTED.

SIGN MOUNTING DETAILS INTERCHANGE DELINERATION
TYPE D GUARDRAIL

TYPE 4 OBJECT MARKER INSTALLATION

TYPICAL ROAD CLOSURE

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

105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-657-MODOT (6636) 745-5030

SIGN MOUNTING DETAILS
OBJECT MARKERS FOR ROAD CLOSURE

TYPE D GUARDRAIL

(1) THE CONTRACTOR MAY FURNISH EQUIVALENT SECTIONS FABRICATED FROM MATERIAL MEETING ONE IN ACCORDANCE WITH SEC 1040.
**BARRIER WALL INSTALLATION**

1. **Perforated Steel Tube**
   - 2" x 2" (4-3/16" OD x 1/2" ID)
   - Perforated steel tube shall extend at least 5" below the top of the perforated tube.

2. **Cable**
   - 2" x 2" (10-1/2" OD x 1"
   - Perforated steel tube shall extend at least 5" below the top of the perforated tube.

3. **Concrete Mix**
   - Mix concrete such that concrete has a minimum of 5,600 psi strength per cubic yard and a maximum slump of 4".

4. **Resin Anchors**
   - 5/8" diameter resin anchors shall be installed in accordance with manufacturer's specifications.
   - Resin anchors may be used if the device is used or exceed the full test requirements of Sec. 1059.

5. **Clean Anchor Holes**
   - Anchor holes shall be cleaned after installation.

6. **Rigid Surface**
   - Rigid surface shall be installed to provide added stability.

---

**SNAP MOUNTING DETAILS**

**EMERGENCY REFERENCE MARKERS**

**NOTES:**

- See sheet 1 of 16 for general notes.
- Perforated steel tube shall be secured to foundation tube or barrier wall mounting plate with a 1/2" diameter shoulder bolt per manufacturer's specifications.

---

**SIGN MOUNTING DETAILS**

**EMERGENCY REFERENCE MARKERS**

**NOTES:**

- See sheet 1 of 16 for general notes.
- Perforated steel tube shall be secured to foundation tube or barrier wall mounting plate with a 1/2" diameter shoulder bolt per manufacturer's specifications.
**MODIFIED FOOTING IN SOLID ROCK**

**GALVANIZED SIGN BRACKET ASSEMBLY**

---

**FOR POLE DIAMETER UNDER 12" ARM ATTACHMENT**

---

**GENERAL NOTES:**

- All bolts will be centered vertically above the horizontal line of the sign.
- All plates will be centered vertically above the horizontal line of the sign.

---

**HIGHWAY SIGNING**

**TUBULAR SUPPORT STEEL**

**TYPE C**

---

**DATE EFFECTIVE:** 09/01/2014

**DATE REVISED:** 9/7/2015

**903.07J**

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**SHEET NO.** 1 OF 2
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### Notes:
- **Base Plates:** Feet at end of beam. Longer sizes shall be normal to axis of sign.
- **Pedestals:** Feet at end of sign. Longer sizes shall be normal to axis of sign.
SECTION A-A
(TYPICAL SECTION SHOWING
REINFORCING STEEL)
4½" CLEAR FOR RE 2½" RE
6½" CLEAR FOR RE 3½" RE
VERTICAL LEGS OF CS SHALL BE PLACED
INSIDE SHAFT CS BARS.

SECTION B-B
(MIN. 24" WIDE, 27" DEEP)
TYPICAL SECTION SHOWING
REINFORCING STEEL
4½" CLEAR FOR RE 2½" RE
6½" CLEAR FOR RE 3½" RE
VERTICAL LEGS OF CS SHALL BE PLACED
INSIDE SHAFT CS BARS.

PART ELEVATION
(TYPE C CONCRETE TRAFFIC BARRIER)

ELEVATION

PART ELEVATION
(TYPE A CONCRETE TRAFFIC BARRIER)

DETAILS OF ALTERNATE PEDESTAL
12" MIN. TO 24" MAX.
12" CONDUIT IN THE CONCRETE PEDESTAL
SHALL BE PVC SCHEDULE 40 AND SHALL
BE PLACED WITH A MINIMUM BEND RADIUS
OF 90°.

GENERAL NOTES:
SHFT AND COLLAR SHALL BE CLASS B (275°F CCR).
MINIMUM CLEARANCE TO REINFORCEMENT IS 3½" EXCEPT AS SHOWN.
ANCHOR HOOKS ENCOUNTERED AT A DEPTH NOT EXCEEDING
2½" FOR RE > 3½" OR 3½" FOR RE < 3½".
THE LOCATION OF THE ANCHOR HOOK MAY BE ADJUSTED TO A MINIMUM OF
3½" RE.
CONTACT THE ENGINEER IF WATER TABLE IS ENCOUNTERED
DURING EXCAVATION.

FIVE COLUMN BASE PLATE ANCHOR BOLTS AND NUTS
PERTAINING TO THESE ITEMS HAVE BEEN OMITTED FOR
SLIGHTY. REFER TO SHEET 8 OF 7 FOR DETAILS OF
THESE ITEMS.

MODOT
MISSOURI DEPARTMENT OF HIGHWAYS AND TRANSPORTATION
ST. LOUIS, MISSOURI

OVERHEAD SIGN TRUSSES
DRILLED SHAFT OPTION

DATE EFFECTIVE: 8-10-98
DATE ISSUED: 8-13-98
903.12Z SHEET No. 5 OF 7
SECTION A-A
(TYPICAL SECTION SHOWING REINFORCING STEEL)

PART ELEVATION
(TYPE A CONCRETE TRAFFIC BARRIER)

SECTION B-B
(TYPICAL SECTION SHOWING REINFORCING STEEL)

DETAILS OF ALTERNATE PEDESTAL

ELEVATION

GENERAL NOTES:

PEDESTAL AND FOOTING SHALL BE CLASS B (RCA). MINIMUM CLEARANCE TO REINFORCEMENT IS 3" EXCEPT AS SHOWN.

CONTACT THE ENGINEER IF NEEDED TO ENCOUNTERS MOWING ENCROACHMENT.

TYPE Column, Base Plate, Anchor Bolts, the Notes referring to these items have been omitted for clarity. Refer to Sheet 5 for details of these items.

OVERHEAD SIGN TRUSSES
SPREAD FOOTING

DATE EFFECTIVE: 06/04/2016
DATE UPDATED: 08/12/2016

903.12Z SHEET 6 OF 7
OVERHEAD SIGN TRUSSES
STRUCTURAL STEEL

SECTION A-A

SECTION B-B

DETAIL OF FIELD SPLICES
(IF ANY)

DETAIL C

SECTION E-E
(FIELD SPLICE ONLY)

NOTE:

1. ALL TRUSSES SHALL BE ALTERED FOR APPROVAL OF ENGINEER.

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