Missouri Department of Transportation

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

This set of Standard Plans is effective beginning with the October 2023 bid opening.

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EXCAVATION PAY LIMITS

EMBANKMENT LIMITS

BACKSLOPES IN STABLE AND SEMI-STABLE MATERIAL

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

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-MODOT (1-888-663-6868)

EXCAVATION AND EMBANKMENT TYPICAL DETAILS

DATE EFFECTIVE: 08/01/1998
DATE PREPARED: 08/23/2009

SHEET NO. 1 OF 1
IN ROCK OVER ENTIRE WIDTH OF ROADBED WITH 18" ROCK BASE

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

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

TYPE 5 AGGREGATE BASE

SLOPE SAME AS ABOVE

IN ROCK OVER PARTIAL WIDTH OF ROADBED

ORIGINAL ROCK LINE

SLOPE SAME AS ABOVE
- ORIGINAL GROUND LINE
- SLOPE SAME AS ABOVE
- UNDERGRADING LIMITS

**CUT**

- SLOPE SAME AS ABOVE
- UNDERGRADING LIMITS

**FILL**

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

**IN UNSUITABLE MATERIAL**

**UNDERGRADING LIMITS**

(Flexible or Rigid Pavements)

**UNDERGRADING LIMITS**

(Earth or Aggregate Type Surface)

---

**GENERAL NOTES:**

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
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UNDERGRADING TYPICAL DETAILS

DATE EFFECTIVE: 01/01/2004
DATE PREPARED: 8/23/2009
SHEET NO.: 203.02F 2 OF 2
SPIRALED CURVE AND WIDENING TRANSITIONS

GENERAL NOTES:

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

"W" THE WIDENING FOR SURFACING AT INSIDE SHOULDERS, SEE STANDARD PLANS 203.22 SHEET 2 OF 2.

WIDENING TRANSITION VARIES IN DIRECT PROPORTION TO DISTANCE.

SPIRAL CURVES ARE USED ON ALL ROADS THAT HAVE DESIGN TRAFFIC GREATER THAN 400 VEHICLES PER DAY.

AND HAVE A RADIUS LESS THAN THE VALUES LISTED IN THE "MAXIMUM RADIUS FOR USE OF A SPIRAL CURVE TRANSITION" TABLE.

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

**MULTILANE FACTORS FOR L**

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<th>RADIUS OF CURVE</th>
<th>1.0 LANE ROTATED</th>
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MAXIMUM RADIUS FOR USE OF A SPIRAL CURVE TRANSITION

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SUPERELEVATION RUNOFF AND WIDENING TRANSITIONS WITHOUT SPIRALS
CASE NUMBER 1

PROFILE CROWN

SECTION A-A

SECTION B-B

SECTION C-C

SECTION D-D

1. Full S.E. for 1/2 pavement width if greater than crown slope.
2. Full S.E. for 1/2 pavement width.

NOTE:

VERTICAL CURVES MAY BE
INSERTED AT POINTS WHERE THE
DEPARTMENTS OF STREETS OR HIGHWAYS
IN THE FIELD.

NOTE:

THE TANGENT RUNOUT

X = L x ACOS1

FULL ELEVATION

SUPERELEVATION

SPIRALS AND WIDENING

UNDIVIDED HIGHWAYS

MO DOT HIGHWAY AND TRANSPORTATION

STATE OF MISSOURI

105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-MODOT-Help (1-888-663-6838)

SUPERELEVATION

PIECE-OF-OUTSIDE-EDGE

PERCENT OF TRAVELLED-WAY

FULL ELEVATION

SUPERELEVATION

PIECE-OF-INSIDE-EDGE

PERCENT OF TRAVELLED-WAY

FULL ELEVATION

SUPERELEVATION

P.C. OR F.T.

NOTE:

SUPERELEVATION SHORT = L

SEE STANDARD PLOU 203.22 SHEET 1 OF 2

FULL ELEVATION

SUPERELEVATION

PIECE-OF-OUTSIDE-EDGE

PERCENT OF TRAVELLED-WAY

FULL ELEVATION

SUPERELEVATION

PIECE-OF-INSIDE-EDGE

PERCENT OF TRAVELLED-WAY

FULL ELEVATION

SUPERELEVATION
NOTE: GROSS VERTICAL CURVES MAY BE DETERMINED AT POINTS "C" BY EYE

PROFILE OF OUTSIDE EDGE OF PAVEMENT
PROFILE OF INSIDE EDGE OF PAVEMENT
L/3
P.C. OR
E.T.
SUPERELEVATION PLOTTING = L 4 X

OUTSIDE EDGE

SECTION E-E

SECTION F-F

PLAN OF ALIGNMENT FOR CASE NUMBER 2

CASE NUMBER 2

OUTSIDE TRANSVERSE SLOPE ON TANGENT SECTION IS OPPOSITE TO SLOPE OF SUPERELEVATION
NOTE: PAVEMENT RISES ABOVE ITS EDGE WITH REFERENCE TO THE HORIZONTAL CURVE WHICH IS BEING APPROACHED

STRAIGHT LINE METHODS OF ATTAINING SUPERELEVATION
PROFILE OF OUTSIDE EDGE OF PAVEMENT

PROFILE OF INSIDE EDGE OF PAVEMENT

NOTE:
- Short vertical curves may be
- Assumed to correct side
- Elevation of sides or edges
- In the field.

SUPERELEVATION RISE = L - X

OUTSIDE EDGE OF PAVEMENT (REF.
TO HORIZ. CURVE)

SECTION G-G

INCLINE OF PAVEMENT

OUTSIDE EDGE OF PAVEMENT (REF.
TO HORIZ. CURVE)

SECTION H-H

INSIDE EDGE OF PAVEMENT (REF.
TO HORIZ. CURVE)

PLAN OF ALIGNMENT

FOR CASE NUMBER 3

CASE NUMBER 3

WHERE TRANSVERSE SMOKE OR TANGENT SECTION IS SAME DIRECTION AS SLOPE OF SUPERELEVATION.

NOTES:
- Pavement assumed to be rectilinear edge with reference to the horizontal curve which it is being approximated.

STRAIGHT LINE METHOD OF ATTAINING SUPERELEVATION
### Calculated and Design Values for Traveled Way Widening on Open Highway Curves (Two-Lane Highways, One-Way or Two-Way) (WE-67 Adjustment)

<table>
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<th>24' Roadway Width</th>
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**Table Notes:**

- "W" the widening in feet for surfacing at inside shoulders.
- Values shown are for AE-67 design vehicle.
- Values less than 2.0 feet may be disregarded.
- For single lane highways, multiply above values by 1.5.
- For 4-lane highways, multiply above values by 2.0.

---

**Superelevation, Spirals, and Widening**

[Diagram and additional text related to superelevation, spirals, and widening are present but not fully transcribed.]
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.

* ADD 2' FOR EACH ADDITIONAL MAILBOX
Typical Details on and Off Ramps

**Plan View "On" Ramps**

- **Section D-D**
  - Ramp Base Line
  - Ramp Shoulder
  - Traveled Way
  - Profile Grade (Ramp)
  - S.E. SLOPE
  - Variable Slope (S.E. Trans.)
  - Mainline Shoulder
  - Edge of Pavement Structure

- **Section C-C**
  - Ramp Base Line
  - Ramp Shoulder
  - Mainline Shoulder
  - Edge of Pavement Structure
  - Pavement X-Slope

- **Section B-B**
  - Ramp Base Line
  - Ramp Shoulder
  - Traveled Way
  - Profile Grade (Ramp)
  - S.E. SLOPE
  - Pavement X-Slope

- **Section A-A**
  - Ramp Base Line
  - Ramp Shoulder
  - S.E. SLOPE

**Notes:**

1. For Ramp Shoulder Width, see Typical Sections.
2. See roadway Plans.

**General Notes:**

See other drawings for joint layouts and striping details.

This drawing is for general information only; for actual construction details and pavement types, see other drawings.
PLAN VIEW "OFF" RAMPS

SECTION H-H

SECTION G-G

SECTION F-F

SECTION E-E

NOTES:

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

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

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-643-MODOT (1-888-275-6636)

STANDARD SLOPES

PLAN VIEW "OFF" RAMPS

SECTION A-A

SECTION G-G

SECTION F-F

SECTION E-E

MAINLINE PAVEMENT
CONSTRUCTION BASE

2' TRAVELED WAY

RAMP BASE LINE
12' OR 24'

PROFILE GRADE (RAMP)
SLOPE SAME AS B-B

RAMP SHOULDER WIDTH VARIABLE

RAMP CONSTRUCTION BASE

MAINLINE PAVEMENT
CONSTRUCTION BASE

EDGE OF PAVEMENT STRUCTURE

S.E. TRANSITION

MAINLINE PAVEMENT
AND SHOULDER

PROFILE GRADE (RAMP)
S.E. SLOPE

PROFILE GRADE (RAMP)
S.E. SLOPE

PROFILE GRADE (RAMP)
S.E. SLOPE

PROFILE GRADE (RAMP)
S.E. SLOPE

PROFILE GRADE (RAMP)
S.E. SLOPE

MAINLINE PAVEMENT
CONSTRUCTION BASE

STANDARD SLOPES

EDGES OF PAVEMENT STRUCTURE

2' TRAVELED WAY

6' VAR.

2' TRAVELED WAY

2' TRAVELED WAY

2' TRAVELED WAY

2' TRAVELED WAY

2' TRAVELED WAY

6' VAR.

2' TRAVELED WAY

6' VAR.

2' TRAVELED WAY
GENERAL NOTES:

FOR LIGHT DUTY PARKING (3500 ACT) DRIVEWAY BEGINS AT EDGE OF PAVEMENT.

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

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

SURFACING SHALL BE AS SHOWN ON THE PLANS OR EIGHTH.

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

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

IF A PAVED APPROACH IS REQUIRED, REFER TO STANDARD PLAN 7003-0 FOR CONSTRUCTION DETAILS AND CONSTRUCT CURB AS REQUIRED TO MEET CURB ON PAVED APPROACH. TRANSITION REQUIRED FROM 9' CURE TO 6' CURE.

CURE OR CURB AND GUTTER BETWEEN RIGHT-OFF-HAY LINE AND TYPE I MAY MEET LOCAL AGENCY STANDARDS.

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

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

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
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DRIVEWAY
TYPE III

SIZE EFFECTIVE: 07/16/2020
DATE PREPARED: 04/23/2020
203.63C  SHEET NO. 1 OF 2
PROTECTIVE STEEL BOX OR CONTAINER FOR STORAGE OF EXCESS TUBING AND TERMINALS. BOX TO BE DETACHABLE FOR CASING EXTENSIONS.

COUPLING WELDED TO STEEL BOX OR CONTAINER & SCREWED TIGHT TO CASING.

JACKETED TUBING OF SUFFICIENT LENGTH TO AVOID EXTENSIONS THROUGH EMBANKMENT.

LEVELING COURSE OF SAND.

THICK BENTONITE SLURRY.

1-1/2" PVC PIPE WITH SOLVENT WELDED COUPLINGS.

COMPACTED MOIST BENTONITE BALLS.

SEE DETAIL A-2 & B-2.

4'-0" MIN. VERTICAL

GROUNDSURFACE

ELEV. A

SEE DETAIL A-1 & B-1.

3" IRON OR STEEL CASING

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

LEVELING COURSE OF SAND

THICK BENTONITE SLURRY

1-1/2" PVC PIPE WITH SOLVENT WELDED COUPLINGS

COMPACTED MOIST BENTONITE BALLS

SEE DETAIL A-2 & B-2

4'-0" MIN. VERTICAL

GROUND SURFACE

ELEV. A

1-1/2" PVC PIPE

JACKETED TUBING

6" - 12" EPOXY SEAL

TRANSOCER ASSEMBLY

POROUS STONE BELOW 2" REDUCING COUPLING

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

PVC CAP

ELEV. B

GENERAL

4'-0" MIN. VERTICAL

GROUND SURFACE

ELEV. B

GENERAL

PVC PIPE

WITH SOLVENT WELDED COUPLINGS

SAND CHAMBER

ELEVATION A

1-1/2" PVC PIPE

JACKETED TUBING

6" - 12" EPOXY SEAL

TRANSOCER ASSEMBLY

POROUS STONE BELOW 2" REDUCING COUPLING

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

PVC CAP

ELEVATION B

1-1/2" PVC PIPE

6" TO 12" EPOXY SEAL

SOLVENT WELDED COUPLING

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

1-1/2" EXTENSION BELOW PIPE COUPLING

PVC CAP

GENERAL NOTES:

FOR ELEVATION A AND ELEVATION B STATION, LOCATIONS AND EMBANKMENT CONTROL LIMITS. SEE ROADWAY PLANS.
Option 1

Option 2

Option 3

PCC Pavement

HMA Pavement

General Note:
The final finish on concrete shoulders may be enhanced by the use of a base consisting of a seamless strip of asphalt, concrete, or a mixture of concrete, HMA, or other suitable material capable of producing a uniform surface or provide other related benefactor.

The quantity of additional base material resulting from the variable thickness material of construction methods in type A2 shoulders shall be considered incidental.

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

RCC (Roller Compacted Concrete) or PCC (Portland Cement Concrete) HMA (Hot Mix Asphalt)

4 Use 10' BF-1 over 4' PRC unless otherwise specified on the plans.

Pavement on Rock Base

Sheet No. 1 OF 3
GENERAL NOTE:

THE FINAL FINISH ON CONCRETE SHOULDERS MAY BE OBTAINED BY THE USE OF A DRY CONCRETE OR A SEAMLESS STRIP OF DEMP SHEET, COTTON FABRIC, PLASTIC TURF OR OTHER SUITABLE MATERIAL CAPABLE OF PRODUCING A UNIFORM SURFACE OF GUTTY TEXTURE.

THE QUANTITY FOR ADDITIONAL BASE MATERIAL RESULTING FROM THE VARIABLE THICKNESS MATERIAL OF CONSTRUCTION METHOD OF TYPE 23 SHOULDER WILL BE CONSTRUCTED INCIDENTAL.

INCIDENTAL BASE SHALL CONSIST OF TYPE 2 OR 3 AGGREGATE FOR BASE, OR AN ALTERNATE MATERIAL THAT MEETS THE APPROVAL OF THE ENGINEER.

RCB (ROLLER COMPACTED CONCRETE) OR PCC (PORTLAND CEMENT CONCRETE) OR HMA (HOT MIX ASPHALT) BASE

+ USE #5 IF NOT OTHERWISE SPECIFIED ON THE PLANS
++ JOINT DEPTH SHALL BE F/C AND MAY BE SAWN OR TOLLED.
GENERAL NOTES:

THE SAFETY EDGE™ SHALL BE CONSTRUCTED AT A SLOPE OF 60° FROM THE HORIZONTAL. THE LENGTH AS MEASURED ALONG THE SLOPE SHALL BE APPROXIMATELY 1.5 TIMES THE DEPTH, UP TO A MAXIMUM LENGTH OF 6".

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 PAVER OR SHOULDERS IS PAVER FOR PAVEMENT OR SHOULDERS IS MADE PER SQUARE YARD, THE MATERIAL NEEDED TO CONSTRUCT THE SAFETY EDGE™ IS CONSIDERED INCIDENTAL TO THE PAVER OR SHOULDERS. NO MEASUREMENTS WILL BE MADE FOR THE MATERIAL USED IN THE SAFETY EDGE™ EXCEPT WHEN PAVER FOR PAVEMENT OR SHOULDERS IS MADE IN VOLUME OR WEIGHT.

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105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-MO-DOT-Help (1-888-663-6854)

SAFETY EDGE™

MoDOT
STATE OF MISSOURI
DEPARTMENT OF TRANSPORTATION

DATE EFFECTIVE: 12/1/2010
DATE PRINTED: 9/3/2010
PAGE NO. 3 OF 3

401.00C

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

DATE EFFECTIVE: 07/01/2004
DATE PREPARED: 08/23/2009
GENERAL NOTES:

THE DOWEL SUPPORTING UNITS SHALL BE FACTORY ASSEMBLED AND CAPABLE OF HOLDING THE DOWELS IN THEIR REQUIRED POSITIONS. IN THE COMPLETE UNIT INSTALLATION, DOWELS SHALL BE FIXTURED WITHIN 3/4" OF THE VERTICAL AND HORIZONTAL PLANE ARE IN THE LATERAL DIRECTION. THE SKEW TOLERANCE SHALL BE 1/8".

THE FREE END OF EACH EPOXY COATED DOWEL SHALL BE MARKED WITH A SPOT OF PAINT AT LEAST 3/32" IN DIAMETER AND CONTRASTING IN COLOR WITH THE EPOXY COATING.

WIRE SIZES SHOWN ARE MINIMUM REQUIRED.

WIRE, BAR, 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.

STAINING FINS SHALL BE FABRICATED FROM 0.306" DIA. SPACER WIRE WITH A SUITABLE MADE SPACER FIN WHICH IS 0.255" FOR DOWEL ASSEMBLIES UNLESS OTHERWISE DIRECTED BY THE ENGINEER.

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

MOORE HIGHWAYS AND TRANSPORTATION
COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MOCDOT (1-888-275-6638)

DOWEL SUPPORTING UNITS
APPROVED FOR USE WITH TRANSVERSE JOINTS

DATE APPROVED: 5/1/2003
DATE PREPARED: 5/1/2003
SECTION B-B

GENERAL NOTES:

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

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
115 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT 1-888-275-6668

DOWEL SUPPORTING UNITS
MECHANICAL PLACEMENT

DATE ISSUED: 11/1/2013
DATE PREPARED: 11/6/2013
SHEET NO. 2 OF 2
LOCATION SURVEY RIGHT-OF-WAY MARKER

2" X 24" REBAR

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.
R/W LINE

POLYURETHANE FOAM OR POST MAY BE DRIVEN

IN EARTH

IN ROCK

STEEL RIGHT-OF-WAY MARKER

LEGEND

EXISTING

NEW

STEEL R/W MARKER

LOCATION SURVEY R/W MARKER

CONCRETE R/W MARKER

DRAIN MARKER

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

TYPICAL LOCATIONS

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

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

SHEET NO. 2 OF 2602.000

DATE EFFECTIVE: 01/01/2003
DATE PREPARED: 8/23/2009

RIGHT-OF-WAY AND DRAIN MARKERS
**TOTAL LENGTH = "L" + 5'-9"**

| PIPE SIZE | "H" | "L" | "5'-9" | 9'-6" | 1'-8" | 1'-6" | 1'-3" | 1'-0" | 2'-0" | 2'-3" | 2'-6" | 2'-9" | 3'-0" | 3'-3" | 3'-6" | 4'-0" | 4'-3" | 4'-6" | 4'-9" | 5'-0" | 5'-3" | 5'-6" | 5'-9" | 6'-0" | 6'-3" | 6'-6" | 6'-9" | 7'-0" | 7'-3" | 7'-6" | 7'-9" | 8'-0" | 8'-3" | 8'-6" | 8'-9" | 9'-0" | 9'-3" | 9'-6" | 9'-9" | 10'-0" | 10'-3" | 10'-6" | 10'-9" | 11'-0" | 11'-3" | 11'-6" | 11'-9" | 12'-0" | 12'-3" | 12'-6" | 12'-9" |
|-----------|-----|-----|--------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 12"       | 9'-0"| 3'-9"| 9'-6"  | 1'-8"  | 1'-6"  | 1'-3"  | 1'-0"  | 2'-0"  | 2'-3"  | 2'-6"  | 2'-9"  | 3'-0"  | 3'-3"  | 3'-6"  | 4'-0"  | 4'-3"  | 4'-6"  | 4'-9"  | 5'-0"  | 5'-3"  | 5'-6"  | 5'-9"  | 6'-0"  | 6'-3"  | 6'-6"  | 6'-9"  | 7'-0"  | 7'-3"  | 7'-6"  | 7'-9"  | 8'-0"  | 8'-3"  | 8'-6"  | 8'-9"  | 9'-0"  | 9'-3"  | 9'-6"  | 9'-9"  | 10'-0" | 10'-3" | 10'-6" | 10'-9" | 11'-0" | 11'-3" | 11'-6" | 11'-9" | 12'-0" | 12'-3" | 12'-6" | 12'-9" |

**PICTURES**

**END SECTION**

**SECTION A-A**

**SECTION B-B**

**SECTION C-C**

**GENERAL NOTES:**

* Use right angle headwall for all installations. Skew pipe by using a beveled end or elbow on pipe. In special cases, headwall may be turned to fit pipe skew and 1V:6H slope warped to fit headwall. All concrete shall be class "B".

* This drawing and the concrete quantities shown are based on the use of concrete pipe. Quantities of concrete shown will be used for payment regardless of any quantity changes necessary due to the use of any other type pipe specified or permitted.

* Flow line of headwall is to be placed horizontally.

**PRECAST NOTES:**

* The contractor may, subject to approval of the engineer, furnish precast units in lieu of cast-in-place. If a precast unit is furnished, it shall conform in all respects to the requirements for cast-in-place units including dimensions and reinforcement, except that the forms may be tapered to facilitate removal of the unit from the forms. Shop drawings of the precast unit shall be submitted for approval prior to first use of the precast forms.
GENERAL NOTES:

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

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

DIMENSIONS
DRAWINGS ARE NOT TO SCALE. FOLLOW DIMENSIONS.

COMPLETE BILL OF REINFORCING STEEL

<table>
<thead>
<tr>
<th>ITEM</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLASS B CONCRETE</td>
<td>CU. YS.</td>
</tr>
<tr>
<td>REINFORCING STEEL</td>
<td>LBS.</td>
</tr>
<tr>
<td>6-1</td>
<td>480</td>
</tr>
</tbody>
</table>

ECONOMICAL LENGTHS ARE BASED ON 3 X 3 (TYP.) CLASS B CONCRETE REINFORCING STEEL. NO. EA. NUMBERS OF BARS OF EACH LENGTH.

DIMENSIONS ARE TO SCALE.

DATE PREPARED: 9/2/2008

DATE EFFECTIVE: 9/2/2008

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

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

MISSOURI DEPARTMENT OF HIGHWAYS AND TRANSPORTATION
LEWIS W. RUNYON COMMISSIONER

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

- **SECTION A - A**
  - Design unit stresses:
    - Class B concrete:
      - Reinforcing steel (grade 60):
        - $f_y = 60,000$ psi
    - Minimum clearance to reinforcing steel shall be 1" unless shown otherwise.
  - Dimensions, drawings are not to scale. Follow dimensions.

**REINFORCING STEEL**

- Minimum clearance to reinforcing steel shall be 1" unless shown otherwise.

**SECTION B - B**

- Complete bill of reinforcing steel.
  - Dimensions:
    - All standard hooks and bends other than those shown on this sheet are based on actual lengths.
    - Full dimensions are shown in bending diagrams and are listed for fabrication use.
    - Anchors are based on actual lengths.

**UPSTREAM ELEVATION**

- Note: Bend or cut at D1 bars in field to clear pipe.

**ESTIMATED QUANTITIES**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLASS B CONCRETE</td>
<td>6,350</td>
</tr>
<tr>
<td>REINFORCING STEEL</td>
<td>13.2</td>
</tr>
<tr>
<td>LBS.</td>
<td>1,170</td>
</tr>
</tbody>
</table>

**CLASS B CONCRETE**

- Energy dissipator (impact type)
  - For 30" concrete pipe

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

**JOHN J. STONE CAPITOL, JEFFERSON CITY, MO 65102**

**PIECE CONSTRUCTION**

**DATE EFFECTIVE:**

**DATE PREPARED:**

**J. V. 13-2**

**JOEFERSON CITY, MO 65102**

**1-800-456-MODOT 1-1-562-276-6361**

**PIPE CULVERT HEADWALL**

- HALF ELEVATION OF LOWER BATTLE AND WING

- Note: Bend or cut at D1 bars in field to clear pipe.

**HALF SECTION B - B**

- Complete bill of reinforcing steel.
  - Dimensions:
    - All standard hooks and bends other than those shown on this sheet are based on actual lengths.
    - Full dimensions are shown in bending diagrams and are listed for fabrication use.
    - Anchors are based on actual lengths.
GUTTER AT THIS POINT

NOTE: SEE DRAWING 609.00 OR SPECIAL CURB DRAWING FOR THESE DIMENSIONS

2) 2 LAYERS OF TAR PAPER
1) SEE DRAWING 609.00 OR SPECIAL CURB DRAWING FOR THESE DIMENSIONS

PLAN

NORMAL SLOPE MINUS 1 1/4

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 "9" 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 NOR FOR CUTTING AND BENDING REINFORCING BARS.

DROP INLET

TYPE X

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

DATE EFFECTIVE: 06/01/1983
DATE PREPARED: 08/23/2009

604.29C SHEET NO. 1 OF 2
**MANHOLE FRAME AND COVER IN PAVES AREAS USE TYPE 1. IN UNPAVABLE AREAS USE TYPE 1A OR 1B. NO CHANGE IN QUANTITIES REQUIRED FOR FRAME AND COVER DETAILS. SEE OTHER DRAWINGS.**

**SECTION A-A**

**BASE PLAN**

**PLAN VIEW**

**VARIABLE DIMENSIONS**

<table>
<thead>
<tr>
<th>SIZE OF PIPE</th>
<th>W</th>
<th>T</th>
<th>B</th>
<th>M</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>24&quot;</td>
<td>3'-0&quot;</td>
<td>4'-3&quot;</td>
<td>7&quot;</td>
<td>21&quot;</td>
<td></td>
</tr>
<tr>
<td>30&quot;</td>
<td>3'-6&quot;</td>
<td>4'-8&quot;</td>
<td>7&quot;</td>
<td>54&quot;</td>
<td></td>
</tr>
<tr>
<td>36&quot;</td>
<td>4'-0&quot;</td>
<td>5'-2&quot;</td>
<td>7&quot;</td>
<td>84&quot;</td>
<td></td>
</tr>
<tr>
<td>42&quot;</td>
<td>4'-4&quot;</td>
<td>5'-4&quot;</td>
<td>8&quot;</td>
<td>108&quot;</td>
<td></td>
</tr>
<tr>
<td>48&quot;</td>
<td>5'-0&quot;</td>
<td>6'-2&quot;</td>
<td>9&quot;</td>
<td>144&quot;</td>
<td></td>
</tr>
</tbody>
</table>

**NOTES:**

- "W" shall be the outside diameter of largest pipe entering manhole plus 16" carried to the nearest 2".
- Horizontal and vertical bars horizontal and vertical bars around pipes.

**GENERAL NOTES:**

- The maximum depth of manhole using #4 horizontal bars at 12" centers is 20'.
- Over 20' depth, horizontal bars shall be increased to #5 bars at 10" centers to a maximum depth of 30'.
- Over 30' depth will require a special design.

**BOTTOM STEEL AT MORE THAN 20' DEPTH TO A MAXIMUM DEPTH OF 30' IS INCREASED TO #6 BARS AT 7" CENTERS.**
### FOR PIPE OPENINGS

**PIPE SIZES**

<table>
<thead>
<tr>
<th>Size (W)</th>
<th>12&quot;</th>
<th>15&quot;</th>
<th>18&quot;</th>
<th>24&quot;</th>
<th>30&quot;</th>
<th>36&quot;</th>
<th>42&quot;</th>
<th>48&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</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>
<td>0.40</td>
</tr>
</tbody>
</table>

**ADDITIONAL STEEL REQUIRED FOR PIPE OPENING**

<table>
<thead>
<tr>
<th>Size (W)</th>
<th>3' - 0&quot;</th>
<th>3' - 6&quot;</th>
<th>4' - 0&quot;</th>
<th>4' - 6&quot;</th>
<th>5' - 0&quot;</th>
<th>5' - 6&quot;</th>
<th>6' - 0&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>1.62</td>
<td>1.93</td>
<td>2.06</td>
<td>2.08</td>
<td>2.12</td>
<td>2.12</td>
<td>2.01</td>
</tr>
</tbody>
</table>

**LENGTH OF #6 BAR REQUIRED**

<table>
<thead>
<tr>
<th>Size (W)</th>
<th>4' - 0&quot;</th>
<th>4' - 6&quot;</th>
<th>5' - 0&quot;</th>
<th>5' - 6&quot;</th>
<th>6' - 0&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>6.0</td>
<td>6.0</td>
<td>6.8</td>
<td>7.5</td>
<td>8.3</td>
</tr>
</tbody>
</table>

**WGT OF #6 BAR LBS.**

| Size (W) | 6.0     | 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 to exceed that for 1 foot of "D", nor is the quantity for 6" of "D" equal to 2 for 1 foot of "D", so use quantity in 1 foot column for full feet and in 3" column for fractional feet.

### QUANTITIES

**Size (W)**

| Size (W) | 3' - 0" X 3' - 0" | 3' - 0" X 3' - 6" | 3' - 0" X 4' - 0" | 3' - 0" X 4' - 6" | 3' - 0" X 5' - 0" | 3' - 0" X 5' - 6" | 3' - 0" X 6' - 0" | 3' - 0" X 6' - 6" | 3' - 0" X 7' - 0" | 3' - 0" X 7' - 6" | 3' - 0" X 8' - 0" | 3' - 0" X 8' - 6" | 3' - 0" X 9' - 0" | 3' - 0" X 9' - 6" | 3' - 0" X 10' - 0" | 3' - 0" X 10' - 6" | 3' - 0" X 11' - 0" | 3' - 0" X 11' - 6" | 3' - 0" X 12' - 0" | 3' - 0" X 12' - 6" |
|----------|-----------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| C        | 1.62            | 1.93             | 2.06             | 2.08             | 2.12             | 2.12             | 2.01             | 2.05             | 2.10             | 2.14             | 2.18             | 2.22             | 2.25             | 2.28             | 2.31             | 2.34             | 2.38             | 2.41             | 2.44             | 2.47             |

**TO AND INCLUDING 20' DEPTH**

**20' TO AND INCLUDING 30' DEPTH**

**ADDITIONAL STEEL IN BOTTOM DIFFERENCE IN #6 AND #8 BARS**

<table>
<thead>
<tr>
<th>Size (W)</th>
<th>1 FT. X 3 IN.</th>
<th>1 FT. X 3 IN.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.08</td>
<td>0.08</td>
</tr>
</tbody>
</table>

**ADJUST QUANTITIES FOR THE PIPE OPENINGS**

**CONCRETE AND ADD STEEL FOR TWO 3' X 4' RAIL**

**ADJUST QUANTITIES FOR THE PIPE OPENINGS**

**CONCRETE AND ADD STEEL FOR TWO 3' X 4' RAIL**

**TO AND INCLUDING 20'-FOOT DEPTH**

**NOTE:**

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

**FOR EXAMPLE:**

**QUANTITIES FOR 3' - 0" X 4' - 0" MANHOLE WITH 6" - 9' "D" HAVING ONE 18", ONE 24", AND ONE 36" PIPE OPENINGS ARE DETERMINED AS FOLLOWS:**

**"D" REQUIRED**

**"D" REQUIRED**

**"D" GIVEN IN TABLE**

**"D" ADDITIONAL**

**CONCRETE STEEL**

<table>
<thead>
<tr>
<th>Size (W)</th>
<th>2.28</th>
<th>2.086</th>
</tr>
</thead>
</table>

**ADD 12 X QUANTITIES FOR 1'-FOOT**

**ADD 15" X 2 X 3'" (2X QUANTITIES FOR 3")**

**TOTAL**

<table>
<thead>
<tr>
<th>Size (W)</th>
<th>2.76</th>
<th>19.5</th>
</tr>
</thead>
</table>

**USE**

| Size (W) | 2.00 | 0.0 |

**MORE THAN 20'-FOOT TD AND INCLUDING 30'-FOOT DEPTH**

**FIRST, COMPUTE QUANTITIES FOR 20'-FOOT DEPTH FROM THE "TO" AND INCLUDING 20'-FOOT DEPTHS**

**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**

**"D" REQUIRED**

**"D" GIVEN IN TABLE**

**"D" ADDITIONAL**

**CONCRETE STEEL**

<table>
<thead>
<tr>
<th>Size (W)</th>
<th>2.28</th>
<th>2.086</th>
</tr>
</thead>
</table>

**ADD 12 X QUANTITIES FOR 1'-FOOT**

**ADD 15" X 3 X 3'" (3 X QUANTITIES FOR 3")**

**TOTAL**

<table>
<thead>
<tr>
<th>Size (W)</th>
<th>7.80</th>
<th>535.0</th>
</tr>
</thead>
</table>

**SUBTOTAL**

<table>
<thead>
<tr>
<th>Size (W)</th>
<th>7.40</th>
<th>544.5</th>
</tr>
</thead>
</table>

**ADJUST QUANTITIES FOR THE PIPE OPENINGS**

**CONCRETE AND ADD STEEL FOR TWO 3' X 4'-6" RAIL**

**SECOND, COMPUTE QUANTITIES FOR THE DEPTHS BETWEEN 20 FEET TO A MAXIMUM OF 30 FEET USING THE TABLE "TO AND INCLUDING 30'-FOOT DEPTHS" AND ADJUST THE QUANTITIES FOR 20'-FOOT DEPTH. ALSO, ADD THE DIFFERENCE IN STEEL IN THE BOTTOM DUE TO THE INCREASE IN SIZE OF BARS FROM 6" TO 8" BARS IN 7-INCH CENTERS.**

**FOR EXAMPLES:**

**"D" REQUIRED**

**"D" REQUIRED**

**"D" GIVEN IN TABLE**

**"D" ADDITIONAL**

**CONCRETE STEEL**

<table>
<thead>
<tr>
<th>Size (W)</th>
<th>3.50</th>
</tr>
</thead>
</table>

**ADD STEEL (10 X QUANTITIES FOR 1'-FOOT)**

**ADD STEEL (ADDITIONAL STEEL IN BOTTOM)**

**TOTAL (30'-FOOT DEPTHS)**

<table>
<thead>
<tr>
<th>Size (W)</th>
<th>10.90</th>
<th>836.76</th>
</tr>
</thead>
</table>

**USE**

| Size (W) | 10.9 | 840.0 |

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**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

**JEFFERSON CITY, MO 65102**

**1-888-ask-MoDOT 1-888-275-6661**

**CONCRETE MANHOLE**

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

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

**604.306**

**SHEET NO. 2 OF 2**
3.50" SLOTTED DRAIN TYPE A PLAN LOCKING PLATE DETAIL

"c" IS IN MULTIPLES OF "A".

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

LOCKING PLATE DETAIL

SLOTTED PIPE DETAIL

DIMENSION SCHEDULE LOCKING PLATES REQUIRED (5)

<table>
<thead>
<tr>
<th>PIPE DIAMETER</th>
<th>E</th>
<th>D</th>
<th>10 FT.</th>
<th>20 FT.</th>
</tr>
</thead>
<tbody>
<tr>
<td>12&quot;</td>
<td>27 1/2&quot;</td>
<td>27 5/16&quot;</td>
<td>17</td>
<td>19</td>
</tr>
<tr>
<td>15&quot;</td>
<td>23 1/2&quot;</td>
<td>23 5/16&quot;</td>
<td>19</td>
<td>21</td>
</tr>
<tr>
<td>18&quot;</td>
<td>21&quot;</td>
<td>21 5/16&quot;</td>
<td>21</td>
<td>23</td>
</tr>
<tr>
<td>24&quot;</td>
<td>21 5/16&quot;</td>
<td>21 5/16&quot;</td>
<td>23</td>
<td>25</td>
</tr>
<tr>
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<td>21 5/16&quot;</td>
<td>21 5/16&quot;</td>
<td>25</td>
<td>27</td>
</tr>
<tr>
<td>36&quot;</td>
<td>21 5/16&quot;</td>
<td>21 5/16&quot;</td>
<td>27</td>
<td>29</td>
</tr>
</tbody>
</table>

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

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

DATE EFFECTIVE: 03/01/1994
DATE PREPARED: 08/12/2009

SHEETH No. 1 OF 2

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

DATE EFFECTIVE: 03/01/1994
DATE PREPARED: 8/23/2009

SHEET NO. 2 OF 2

SLOTTED DRAIN
TYPE B AND TYPE C

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

DATE EFFECTIVE: 03/01/1994
DATE PREPARED: 8/23/2009

SHEET NO. 2 OF 2

SLOTTED DRAIN
TYPE B AND 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)
PART SECTION SHOWING TYPE E TO TYPE A GUARDRAIL TRANSITION

THE OVERALL NOMINAL DIMENSIONS SHOWN SHALL BE NET. ALTHOUGH THE SHAPE OF THE PLASTIC BLOCK MAY VARY FROM THE SHAPE SHOWN, EXCEPT THE 4" X 4" FLANGE AND THE OVERALL WIDTH DIMENSIONS MAY BE VARIED IF APPROVED BY PROJECT OPERATIONS.

SECTION B-B

SECTION C-C

GENERAL NOTES:

TYPE E GUARDRAIL SHALL USE 6X8.5 FOOT SPACING UNLESS 3-1/2 FOOT IS SPECIFIED.

THE TYRE BEAM RAIL FOR THE TYPE E GUARDRAIL AND THE TRANSITION SECTION SHALL BE MADE OF STEEL AND SHALL BE 19 INCHES.

FOR PROTECTIVE COATING AND MATERIAL REQUIREMENTS, SEE SECTION 10 OF THE STANDARD SPECIFICATIONS.

FOR DETAILS NOT SHOWN, SEE OTHER SHEETS OF THIS ENSIGN.
(1) Shoulder widenings shall consist of embankment material compacted in accordance with Sec 205.2 of the standard specifications.
(2) Post shall be spaced at 3'-8" on center.
(3) When guardrail is constructed over curbs, the curbs shall be constructed as shown.

**Typical Section**

**Alternate Typical Section at Slope Breakpoint**

**Detail for Transitioning Between Type A and Type B Guardrail**

**Plan**
- Length of H-beam rail = 15'-0".
- Lip in the direction of traffic.

**Elevation**
- 12 gauge H-beam rail
- 6" post (TIP)

**Guardrail Layout**

**Location Other Than & Median Lateral Placement of Guardrail for Shoulder Installation**
OPTIONAL 3" E-314 HOLE FOR HANDLING DURING BOLTING (ONE PERMITTED)

TYPE E
FOR STEEL POST & WOOD OR PLASTIC BLOCKS (1)

OPTIONAL 3" E-314 HOLE FOR HANDLING DURING BOLTING (ONE PERMITTED)

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

HOLE FOR TYPE B CHECKERED

(1) THE OVERALL NOMINAL DIMENSIONS SHOWN SHALL BE NET. ALTHOUGH THE SHAPE OF THE PLASTIC BLOCK MAY VARY FROM THE SHAPE SHOWN, EXCEPT THE 3" FLANGE ARE THE OVERALL WIDTH DIMENSIONS MAY BE VARY IF APPROVED BY PROJECT OPERATIONS.

 ALTERNATE DESIGN
FOR WOOD BLOCK

DELINERATORS ON NEW GUARDRAIL

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

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

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

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

**SETTING POST IN SOLID ROCK**

**SETTING POST THROUGH ASPHALT ≤ 2" THICK**

**GENERAL NOTES:**
- Holes in solid rock shall provide a diameter of not less than 6 inches greater than the maximum transverse dimension of the post section.
- Post may be shorter where placed in a minimum 2 feet of solid rock. Steel posts may be placed in saw cutters of cut shall be in accordance with the standard specifications.
PLAN

ELEVATION

1. If located within the clear zone of a two-way roadway, the minimum length is 87'-6".
2. Additional Considerations as Required, including end treatment.
3. The post may be shifted due to the presence of an obstacle such as a culvert.
4. Place end treatment no closer to the shifted post than posts 5 and 22.

SECTION A-A
WS 9 steel posts, 6' or 7' long with 8" x 6" x 14" routed wood blockouts, posts 5 through 12 and 19 through 24.

SECTION B-B
Set wood posts, 6' or 7' long with the 8" x 6" x 14" wood blockouts posts 13 through 16.
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.
RAIL SECTION 1 (NOSE SECTION)

DIA TYPICAL 12'-6"

SPlice overlAp Line

RAIL SECTION 2

DIA TYPICAL 2'-0"

tangent sectiOn for 13:1 or flatter tapers

6'-3'' (shop bend to 34'-2'' radius)

8'-11'' (tangent section for 6:1 to 13:1 tapers)

12'-6'' (tangent section for 3.6:1 to 6:1 tapers)

10'-6'' (shop bend to 34'-2'' radius)

6'' (shop bend to 34'-2'' radius)

RAIL SECTION 3

DIA TYPICAL 2''

splicing overlAp Line

12'-6''
STEEL PLATE, A306
12 1/4" x 5 1/8" x 3/8"

DETAIL OF STEEL BEARING PLATE

DETAIL OF CABLE ASSEMBLY

(1) STUD, THREADED ENTIRE LENGTH.
TOP VIEW, RAIL #1

62 1/2" RADIUS

TOP VIEW, RAIL #2

409 1/2" RADIUS

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

FRONT VIEW (UNBENT)

"COLD TUFF" BUTTON, S-409 SIZE NO. 12 SB 2 1/2" STOCK NO. 1040395 FOR 3/8" DIA (6 x 25) WIRE ROPE (OR ANY SIMILARLY SIZED SWAGE-GRIP BUTTON FERRULES)
(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 E MEDIANPIER PROTECTION 60' MEDIAN OR GREATER

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

= 0.01F
SHEET NO. 9 OF 9
STRUCTURAL STEEL TUBING BLOCK DETAIL

21\% WOOD BLOCK DETAIL

19\% WOOD BLOCK DETAIL

14\% WOOD BLOCK DETAIL

ALL HOLES DRILLED OR PUNCHED \% E.C.G.
THREE BEAM RAIL SPLICE AT POST

1. The contractor may, at his option, furnish equivalent sections fabricated from material meeting and in accordance with the requirements of ASTM A763 Grade 36 or 40. The sections shall be galvanized after fabrication in accordance with requirements of AASHTO M 111.

2 x 1/2" X 14" SPLOIT BOLT SLOTS

8 1/2" X 24" POST BOLT SLOTS

TERMINAL CONNECTOR

4 1/2" X 24" POST BOLT SLOTS

GENERAL NOTES:

DESIGN BASED ON NCHRP REPORT 550 TEST LEVEL 3.

THE THREE BEAM RAIL, TERMINAL CONNECTOR AND THE TRANSITION SECTION FOR THE BRIDGE ANCHOR SECTION SHALL BE MADE OF STEEL AND SHALL BE 12 GAGE.

FOR PROTECTIVE COATINGS 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 TIERING BLOCK SHALL BE FABRICATED FROM ASTM A36 GRADE B STEEL AND GALVANIZED.

USE 1/2 BOLT-HEAD OVAL SHOULDERS BOLTS WITH HECK NUTS AT ALL SLOTS (THICKNESS OF HECK NUTS = 1/2 MIN.).

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

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

SEE STANDARD PLAN 606.00 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 PER EACH.

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

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

GENERAL NOTES:

COVER PLATE PANELS ARE 4-1/4" THICK.
ALL STIFFENERS ARE 1-1/4" THICK.
CONNECTOR PLATE SHALL BE FABRICATED FROM ASTM GRADE A572 STEEL AND GALVANIZED.

FOR GALVANIZED REQUIREMENTS, SEE SECTION 1040 OF THE STANDARD SPECIFICATIONS.
ALL HOLE DIAMETERS SHALL BE 1".

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

(1) STIFFENERS LOCATED AT THE OUTSIDE EDGES OF THE COVER PLATE SHALL BE WELDED AS FOLLOWS:

SINGLE BEVEL CROWN FROE ON EXTERNAL SIDES AND 6" 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:

6" FILLET WELD BY 1" LONG SPACED AT 2".

PLATE AND STIFFENER IDENTIFICATION

CONNECTOR PLATE DIMENSION
(PER ASSEMBLY)

<table>
<thead>
<tr>
<th>PLATE</th>
<th>ORIENTATION</th>
<th>SIZE (A x B x C x D)</th>
<th>THICKNESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1</td>
<td>1</td>
<td>20&quot; x 20&quot;</td>
<td>ε</td>
</tr>
<tr>
<td>F2</td>
<td>1</td>
<td>20&quot; x 20&quot; x 28&quot;x 6&quot;</td>
<td>ε</td>
</tr>
<tr>
<td>F3</td>
<td>1</td>
<td>35&quot; x 35&quot; x 20&quot; x 15&quot;</td>
<td>ε</td>
</tr>
<tr>
<td>S1</td>
<td>4</td>
<td>16&quot; x 16&quot; x 8&quot;</td>
<td>ε</td>
</tr>
<tr>
<td>S2</td>
<td>1</td>
<td>16&quot; x 16&quot; x 6&quot;</td>
<td>ε</td>
</tr>
<tr>
<td>S3</td>
<td>1</td>
<td>3&quot; x 6&quot; x 3&quot;</td>
<td>ε</td>
</tr>
<tr>
<td>S4</td>
<td>1</td>
<td>6&quot; x 6&quot;</td>
<td>ε</td>
</tr>
<tr>
<td>S5</td>
<td>1</td>
<td>6&quot; x 12&quot;</td>
<td>ε</td>
</tr>
<tr>
<td>S6</td>
<td>1</td>
<td>12&quot; x 12&quot;</td>
<td>ε</td>
</tr>
<tr>
<td>S7</td>
<td>1</td>
<td>24&quot; x 6&quot; x 3&quot;</td>
<td>ε</td>
</tr>
<tr>
<td>S8</td>
<td>1</td>
<td>1&quot; x 7&quot; x 2&quot;</td>
<td>ε</td>
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<tr>
<td>S9</td>
<td>1</td>
<td>6&quot; x 6&quot; x 1&quot;</td>
<td>ε</td>
</tr>
<tr>
<td>S10</td>
<td>1</td>
<td>6&quot; x 6&quot; x 1&quot;</td>
<td>ε</td>
</tr>
<tr>
<td>S11</td>
<td>1</td>
<td>8&quot; x 8&quot; x 1&quot;</td>
<td>ε</td>
</tr>
</tbody>
</table>

GENERAL NOTES:

- COVER PLATE PANELS ARE ε THICK.
- ALL STIFFENERS ARE 6" THICK.
- CONNECTOR PLATE SHALL BE FABRICATED FROM 45TH GRADE 436 STEEL AND GALVANIZED.
- FOR GALLERIZED REQUIREMENTS, SEE SEC 1004 OF THE STANDARD SPECIFICATIONS.
- ALL HOLE DIAMETERS SHALL BE 1".

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

(1) AS CONTRACTOR'S OPTION, EQUIVALENT SECTIONS MAY BE FABRICATED FROM MATERIAL MEETING AND IN ACCORDANCE WITH THE REQUIREMENTS OF ASTM A479.

NOTES:

(2) VERIFY BY RAIL TRANSITION PROCEDURE.

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

FOR GENERAL NOTES, SEE SHEET 2 OF 5.

FOR FOOT DETAILS AND SECTION VIEWS, SEE SHEET 2 AND 3 OF 5.
### Section F-F
- **View:** Side View
- **Objects:** Post, Blockout

### Section G-G
- **View:** Side View
- **Objects:** Post, Blockout

### Section H-H
- **View:** Front View
- **Objects:** Through Thrie Beam Rail

### Notes:
- **Wood Block Size:** 6" x 9" (for both sections)
- **Hole Punching Detail:** For Steel Post & Wood Blocks (6" and 8")
- **Thrie Beam Rail Splice at Post**
- **Asymmetrical Transition Section**
- **1/6" to 1" Tolerance**
- **Neutral Axis**

### Additional Information:
- **Neutral Axis:** Symm, Vert.
- **Dimensions:** Various dimensions are marked for precise measurements.
- **Hole Size:** 1/16" Diameter except as noted.

---

**Bridge Anchor Section**
- **Thrie Beam Rail on Bridge**
- **Use:** For structural support and alignment.
DETAIL C
ASSEMBLED VIEW
(ANCHOR PLATE)

(1) STICK THREE-EIGHT ENTIRE LENGTH.
(2) 6'-3" SPACING FOR TYPE D & E CABLES; 3'-15" SPACING FOR TYPE E CABLES.
(3) 27" ADJUNCT BIT LESS THAN 4" FOR TYPE D CABLES;
4" MINIMUM FOR TYPE E CABLES.

DETAIL B
(CABLE ASSEMBLY)

GUARDRAIL
TERMINAL ANCHOR ENDS
POST 1

STEEL TUBE FOUNDATION FOR END ANCHORS

BOLTS AND NUTS SHALL BE TAPPED IN ACCORDANCE WITH SECTION 1007 OF THE MISSOURI STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION.

GENERAL NOTES:

1. THE CONTRACTOR HAS THE OPTION TO INSTALL POST 1 AS A STEEL TUBE OR CONCRETE FOUNDATION.

2. THE BREAKAWAY POST MAY BE NEEDED FOR STEEL TUBE FOUNDATION.
ELEVATION
ANCHORED IN BACKSLOPE GUARDRAIL

GENERAL NOTES:
for end anchor details, see sheet 1-3 or 7.
eight foot post is required with guardrail.
post(s) being when the distance between the guardrail and the channel is 20 feet increasing.
end anchor posts 1 and 2 shall have foundation type as shown on sheet 3 of 7.
the contract unit price for excavated guardrail anchor shall include the concrete anchor, excavation
and backfilling of terminal connector, and all incidental measures are necessary to complete
the installation.
the guardrail shall extend 5 feet beyond the ditch line at the terminals a minimum of 15 inches
below ground elevation of the backslope.
electrical will not be required for any post which will be completely below ground. the alignment of
such posts shall be approved by the engineer.

GUARDRAIL
TERMINAL ENDS
EMBEDDED AND ROCK FACE
(V-ITCH STEEPER THAN 101:1
4:1 MAX, FOESEMPLER)

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-800-243-MOARD 1-800-243-6673

ROCK FACE GUARDRAIL ANCHOR

FOUR 2" X 6" HEAD-HEX MACHINE BOLTS AND WASHERS

ANCHOR TERMINAL CONNECTOR TO FACE OF ROCK CUT

HEIGHT ABOVE DITCH IS EQUAL TO RAIL ELEVATION AT THE DITCH CROSSING.

FOR END-anchor DETAILS, SEE SHEET 1-3 OR 7.
EIGHT FOOT POST IS REQUIRED WITH GUARDRAIL.
POST(S) BEING WHEN THE DISTANCE BETWEEN THE GUARDRAIL AND THE CHANNEL IS TO BE INCREASING.
END ANCHOR POSTS 1 AND 2 SHALL HAVE FOUNDATION TYPE AS SHOWN ON SHEET 3 OF 7.
THE CONTRACT UNIT PRICE FOR EXCAVATED GUARDRAIL ANCHOR SHALL INCLUDE THE CONCRETE ANCHOR, EXCAVATION
AND BACKFILLING OF TERMINAL CONNECTOR, AND ALL INCIDENTAL MEASURES ARE NEEDED TO COMPLETE THE INSTALLATION.
THE GUARDRAIL SHALL EXTEND 5 FEET BEYOND THE DITCH LINE AT THE TERMINALS A MINIMUM OF 15 INCHES BELOW
GROUND ELEVATION OF THE BACKSLOPE.
ELECTRICAL WILL NOT BE REQUIRED FOR ANY POST WHICH WILL BE COMPLETELY BELOW GROUND. THE ALIGNMENT OF
SUCH POSTS SHALL BE APPROVED BY THE ENGINEER.
SEE OTHER DRAWINGS AND SPECIFICATIONS FOR MATERIAL AND CONSTRUCTION REQUIREMENTS NOT ShOWN.
3 - 1" Ø holes to be field drilled through H-beam element and attached with 1/2" hex head bolt 1/2" long each with one square washer and hex nut.

1" Ø hole to be field drilled through H-beam element and attached with 1/2" hex head bolt 1/2" long each with one square washer and hex nut.

4" 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 paved road. Alternate grading limits are allowable on existing roadsides except when standard grading is indicated on the plans.

- The contractor shall provide the engineer with approved shop drawings of the approved crashworthiness end terminals.

- End anchors shall be installed on ends of guardrail runs where crashworthiness end terminals are not required.
ANCHOR ASSEMBLY

EXPANDABLE OR SCREW TYPE ANCHOR

END ANCHOR

LINE POST

INTERMEDIATE ANCHOR

CABLE END

4" CABLE

GROUND LINE OR SHOULDER ELEVATION

300' MAX. (BETWEEN ANCHORS)

ELEVATION

ANCHOR ASSEMBLY

ANCHOR ASSEMBLY

ANCHOR ASSEMBLY

PLAN

STEEL POST

WOOD POST

POST DETAILS

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

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

1" X 1/2" CLAMP

1" X 1/2" CLAMP

1" X 1/2" CLAMP

1" X 1/2" CLAMP

CABLE

CABLE

CABLE

CABLE

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

5'-0"

5'-0"

5'-0"

5'-0"

1" X 1/2" CLAMP

1" X 1/2" CLAMP

1" X 1/2" CLAMP

1" X 1/2" CLAMP

LAG SCREW

LAG SCREW

LAG SCREW

LAG SCREW

5'-0"

5'-0"

5'-0"

5'-0"

1" X 1/2" CLAMP

1" X 1/2" CLAMP

1" X 1/2" CLAMP

1" X 1/2" CLAMP

LAG SCREW

LAG SCREW

LAG SCREW

LAG SCREW

5'-0"

5'-0"

5'-0"

5'-0"

1" X 1/2" CLAMP

1" X 1/2" CLAMP

1" X 1/2" CLAMP

1" X 1/2" CLAMP

LAG SCREW

LAG SCREW

LAG SCREW

LAG SCREW

5'-0"

5'-0"

5'-0"

5'-0"
SPICE DETAIL

ANCHOR ROD ASSEMBLY

CABLE END

ACCESS-RESTRAINT CABLE GREATER THAN 300 FEET IN LENGTH REQUIRES AN INTERMEDIATE ANCHOR AS SHOWN.

TYPICAL LOCATION
SHOULDER INSTALLATION

ONE-STRAND ACCESS RESTRAINT CABLE

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

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-MODOT-8277 (1-888-663-6868)

SHEET NO. 2 OF 2

PLATE WASHER & HEX NUT

6'-6" ROD
ATTACH TO ANCHOR

1" DIA.

8"

6"

1' DIA.

STANDARD TURNBUCKLE

3 CLIPS REQUIRED

5"

1" EYE BOLT

6"

1" DIA.

THIMBLE

STANDARD TURNBUCKLE

PLATE WASHER & HEX NUT

6"

1" DIA.

CABLE END
GUARD CABLE TO GUARDRAIL TRANSITION AT MEDIAN OBSTACLE

GENERAL NOTES:

WHEN GUARD CABLE IS LOCATED ALONG THE MEDIAN CENTRELINE NEAR A BRIDGE END OR CONCRETE BARRIER, IT SHALL BE ANCHORED BEHIND THE GUARDRAIL ASSEMBLY WITH THE GUARD CABLE ANCHOR ASSEMBLY. THE GUARD CABLE ANCHOR SHALL BE CONSTRUCTED 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 RUNS OF CABLE ARE REQUIRED.

SUITE DRAINAGE MUST BE PROVIDED WHEN MEDIAN GRADING IMPHES NORMAL FLOW.

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

TYPICAL GUARD CABLE TO GUARDRAIL TRANSITION ELEVATION

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

TWO-STRAND GUARD CABLE

105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-605-MOARDER 1-888-605-6673

SHEET NO. 2 OF 7

DATE EFFECTIVE: 06/24/2021
DATE REVISED: 06/27/2021
606.41M
GUARD CABLE TO GUARDRAIL TRANSITION AT MEDIAN BRIDGE END

GENERAL NOTES:

WHEN GUARD CABLE IS LOCATED ALONG THE MEDIAN CENTERLINE NEAR A BRIDGE END OR CONCRETE FILLER, IT SHALL BE SHOWN BEHIND THE GUARDRAIL ASSEMBLY WITH THE GUARD CABLE AND GUARDRAIL ASSEMBLY. THE GUARD CABLE ANCHOR SHALL BE CONSTRUCTED SO THAT IT IS PROJECTED 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 DRAINAGE MUST BE PROVIDED WHEN MEDIAN GRADING INCREASES NORMAL FLOW.

TYPICAL GUARD CABLE TO GUARDRAIL TRANSITION ELEVATION
PLAN VIEW

11. 2'-6" minimum clearance to the face of obstacle with 6'-3" post spacing.
    3'-0" minimum clearance to the face of obstacle with 3'-14" post spacing.
    See Sheet 4 for post spacing details.

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

ELEVATION VIEW

GENERAL NOTES:

For initial installation, construct the guardrail within 1' of the standard 3' height to the tip of
N-beam rail. When interchange projects, such as
bridges, adjacent guardrail is not required. If finished
height is within 3' of the standard height,

The standard post length is 6'-2" [45' - 5" TOLERANCE].

The substitution of 8' posts in lieu of required
spacing, to construct less than the designed typical
section, shall not be allowed.

Refer to section 9.16 for dimensional details of
N-beam, helical driven and end sections. Beam
splices, post and splice bolts, nuts, and type I
N-beam to truss beam transition sections.

Beam washers are not to be used. Bolt shall be
ASTM A307.

Unless otherwise specified, N-beam rail is 12 gauge
steel with an effective length of 13'-6" or 25'-6".
With 12" x 1/2" splice bolt slots, and 1 1/2" x 5" post
bolt slots on 3'-14" centers regardless of post
spacing.

For protective coating and material requirements,
see section 9.16 of the standard specifications.

LSP splices between two rails or between rail and
terminal connector in the direction of traffic. LSP
the flipped end sections in the direction of traffic.
MGS GUARDRAIL AT CURB

FACE OF GUARDRAIL FLUSH WITH FACE OF CURB

31" 4" 12"

MGS8.5 OR MGS9

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

12" 2" 2"

MGS8.5 OR MGS9

ALTERNATE MGS AT CURB

FOR STEEL POST AND NOTCHED WOOD OR PLASTIC BLOCK

HOLE PUNCHING DETAIL

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

FOR GUARDRAIL DELINEATION DETAILS SEE
STC PLAN 903.05.

GREAT LAKES TRANSPORTATION COMMISSION

GENERAL NOTES:

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

105 WEST CAPITAL
JEFFERSON CITY, MO 65103
1-888-MO-DOT-WEB (1-888-663-6832)

MIDWEST GUARDRAIL SYSTEM (MGS) POST AND BLOCK

DELINEATORS ON GUARDRAIL

606.50E SHEET NO. 3 OF 8
MGS GUARDRAIL WITH 3'-1 1/2" POST SPACING

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

GENERAL NOTES:
- MGS CANNOT BE USED WHERE:
  - POST SPACING IS LESS THAN 6'-3"
  - WITHIN CRASHWORTHY END TERMINALS
  - WITHIN VERTICAL GUARDRAIL TRANSITIONS (606.60)
  - WITHIN BRIDGE APPROACH TRANSITIONS (606.70)
SETTING POST IN SOLID ROCK

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

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

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

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

GENERAL NOTES:

HOLES IN SOLID ROCK SHALL PROVIDE A DIAMETER OF NOT LESS THAN 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 FLANGE OR RAN OUT. REPAIR OR CUT SHALL BE IN ACCORDANCE WITH SECTION OF THE STANDARD SPECIFICATIONS.

NO ADDITIONAL PAYMENT WILL BE MADE FOR CUTTING THE OVERSIZED HOLES OR PLACING AGGREGATE IN THE HOLES AS INDICATED IN THIS PLAN.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITAL
JEFFERSON CITY, MO 65101
1-888-637-MODOT (1-888-637-6636)

MIDWEST GUARDRAIL SYSTEM
(MGS)
SPECIAL INSTALLATIONS

DATA EFFECTIVE: 04/04/2023
DATA MODIFIED: 07/27/2023
606.50E SHEET NO. 5 OF 8
**ARIA AREA OF CONCERN OBSTACLE**

**SLOPE HINGE POINT**

**USE 8' POSTS**

**PLAN VIEW**

**SECTION A-A**

**8' STEEL POST**

**ELEVATION VIEW**

111 3'-6" MINIMUM CLEARANCE TO THE FACE OF OBSTACLE WITH 8' POSTS ADJACENT TO A 2:1 SLOPE.

121 WHERE THERE IS NOT SUFFICIENT EMBANKMENT BEHIND THE SHOULDER TO PLACE THE GUARDRAIL POST, THE POSTS MAY BE PLACED A MAXIMUM OF 12" BEYOND THE SLOPE BREAK POINT IN A 2:1 OR FLATTER SLOPE.

**ALTERNATE SECTION A-A**

**MAXIMUM LATERAL PLACEMENT OF 8' STEEL POSTS ADJACENT TO SLOPES**

**GENERAL NOTES:**

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

8 FOOT POSTS SHALL BE USED WHEN LESS THAN 2 FEET OF EMBANKMENT IS PRESENT BETWEEN THE BACK OF THE GUARDRAIL POST AND THE SLOPE BREAK POINT. THE SUBSTITUTION OF 6 FOOT POSTS IN LIEU OF BEING ALLOWED TO CONSTRUCT LESS THAN THE DESIGNED TYPICAL SECTION, SHALL NOT BE ALLOWED.
PLAN VIEW

FACE OF GUARDRAIL ALIGNED WITH EDGE OF SHOULDER

MGS Block and Height Transition from Type A Guardrail to MGS Guardrail

ALTERNATE PLAN VIEW - ALIGNMENT TAPER

SEE NOTE (1)

NOTES:

1. Where foot offset is constrained, and when the existing shoulder is wider than 6 feet, the existing shoulder may be reduced up to 4 inches to accommodate the 10 inch blocks of the MGS guardrail.

2. MGS transition from type A guardrail shall be completed outside the 50. MGS E/W design limits.

3. With site constraints, the height of guardrail cannot be constructed to provide a minimum of 2 feet between the edge of the guardrail and slope.

4. HiLo foot form shall be used to meet the sheet 6 of 8.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

MIDWEST GUARDRAIL SYSTEM (MGS)

BLOCK AND HEIGHT TRANSITION

SHEET NO.

606.50E

8 OF 8

DATE PRINTED: 06/26/2023

DATE PRINTED: 07/27/2023
PIER AT © MEDIAN

1. 2'-6" MINIMUM CLEARANCE TO THE FACE OF OBSTACLE WITH 6'-3" POST SPACING IS PREFERRED
2'-0" MINIMUM CLEARANCE FOR 1'-5" POST SPACING
SEE STP. PLANS 606.50 FOR POST SPACING DETAILS.

2. TRANSITION CURVE FACES CRASHWORTHY HEIGHT & WIDTH IF NEEDED FOR TYPE B CRASHWORTHY END TERMINAL PER MANUFACTURER'S REQUIREMENTS. SEE STP. PLANS 606.50 FOR HEIGHT TRANSITION DETAILS.

3. CONTINUE 10% SLOPE TO OBSTACLE OR A MINIMUM OF 2' PAST THE EDGE OF THE CRASHWORTHY FOOT.

4. 10% FLARE RATE OR AS RECOMMENDED BY TABLE 5-3 OF THE LATEST VERSION OF THE "ROADSIDE DESIGN GUIDE".

MEDIAN WIDTH LESS THAN 60'

EDGE OF TRAVELED WAY

EDGE OF SHOULDER

EDGE OF SHOULDER

SHOULDER

SHOULDER

EDGE OF SHOULDER

MGS GUARDRAIL

MGS GUARDRAIL

EDGE OF SHOULDER

EDGE OF TRAVELED WAY

SECTION A-A

EDGE OF SHOULDER

EDGE OF SHOULDER

10% 10% SLOPE

GENERAL NOTE:

TYPE B CRASHWORTHY END TERMINAL SHALL BE MGS COMPATIBLE, LATEST VERSION AND SHALL BE INSTALLED ACCORDING TO MANUFACTURER'S RECOMMENDATIONS.
PIER AT 6' MEDIAN

(1) 24" minimum clearance to the face of obstacle with 6'-3" post spacing is preferred.

24" minimum clearance using 1'-6" post spacing.

(2) See STD. PLANS 608.81 for post spacing details.

(3) For length-of-need, see the latest version of the "M.G.S. Design Guide v9.4.5" for length-of-need.

(4) Continue 10% slope to obstacle or a minimum of 2' past the back of the guardrail post.

GENERAL NOTE:
- Median widths greater 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 M.G.S. Design Guide v9.4.5 the clear zone concept.
- Type A non-flared crashworthy end terminal shall be the latest version and shall be installed according to manufacturer's recommendations.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITAL
JEFFERSON CITY, MO 65102
1-800-392-MDOT (6368)
1-888-PASS-MDOT (7277-MDOT)

MGS GUARDRAIL
MEDIAN PIER PROTECTION
60' MEDIAN OR GREATER

DATE EFFECTIVE: 09/30/2011
DATE REVISED: 09/30/2011
SHEET NO: 606-51
GENERAL NOTES:

SEE SHEET 1 FOR ADDITIONAL NOTES NOT INCLUDED ON THIS SHEET.

THE COST OF FURNISHING, FABRICATING AND INSTALLING
BRIDGE APPROACH TRANSITION (REGULAR LENGTH CURB OR NO CURB), COMPLETE
IN PLACE, WILL BE FOB FOR AT THE CONTRACT UNIT
PRICE PER EACH.

(1) IF CURB EXTENDS UPTREAM OF POST NO. 11 FOR DRAGGING PURPOSES,
A STIFFNESS TRANSITION CONSISTING OF AN EXTRA 12'-6" BEAM OF 12
GAUGE X-BEAM MUST BE INSTALLED PRIOR TO THE TRANSITION SECTION
UPSTREAM OF POST NO. 15. THE CURB SHALL BE EXTENDED TO THE END
OF THE 12'-6" 12 GAUGE X-BEAM STIFFNESS TRANSITION SEE DET. PLAN
SHEET 606.60B FOR DETAILS. IF CURB EXTENDS BEYOND POST NO. 15, PAY FOR
A BRIDGE APPROACH TRANSITION (EXTENDED CURB).
WELDING INSTRUCTION

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

GENERAL NOTES:
COVER PLATE PAGES ARE 1/8" THICK.
ALL STIFFENERS ARE 1/4" THICK.
CONNECTOR PLATE SHALL BE FABRICATED FROM 45TH GRADE 20G STEEL AND FULL-ION.
FOR GAUGING REQUIREMENTS, SEE SECTION 1040 OF THE STANDARD SPECIFICATIONS.
ALL HOLE DIAMETERS SHALL BE 1".

MIDWEST GUARDRAIL SYSTEM
(MGS)
VERTICAL BARRIER
TRANSITIONS
(CONNECTOR PLATE DETAIL)
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 Ф1/2 IN DEEP WELD ON EXTERNAL SIDES AND 1/8" FILLER 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:
   1/8" FILLER WELD BY 1" LONG SPACED AT 2".

CONNECTOR PLATE DIMENSION
(PER ASSEMBLY)

<table>
<thead>
<tr>
<th>PLATE</th>
<th>QUANTITY</th>
<th>SHAPE</th>
<th>SIZE (A X B X C X D)</th>
<th>THICKNESS</th>
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<td>1</td>
<td>H</td>
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<tr>
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<td>3</td>
<td></td>
<td>20&quot; x 20&quot;</td>
<td>1/8&quot;</td>
</tr>
<tr>
<td>F3</td>
<td>1</td>
<td>H</td>
<td>30&quot; x 30&quot; x 20&quot; x 1&quot;</td>
<td>1/8&quot;</td>
</tr>
<tr>
<td>S1</td>
<td>4</td>
<td></td>
<td>10&quot; x 10&quot; x 10&quot;</td>
<td>1/8&quot;</td>
</tr>
<tr>
<td>S2</td>
<td>1</td>
<td>House</td>
<td>10&quot; x 10&quot; x 10&quot;</td>
<td>1/8&quot;</td>
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<td>1/8&quot;</td>
</tr>
<tr>
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<tr>
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<tr>
<td>S8</td>
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<tr>
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<td>S10</td>
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<td>House</td>
<td>1&quot; x 14&quot; x 14&quot;</td>
<td>1/8&quot;</td>
</tr>
<tr>
<td>S11</td>
<td>1</td>
<td>House</td>
<td>6&quot; x 6&quot; x 12&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 300 SERIES STAINLESS STEEL.
FOR GALVANIZED REQUIREMENTS, SEE SECTION 20 OF THE STANDARD SPECIFICATIONS.
ALL HOLE DIAMETERS SHALL BE 1/4".

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

DATE EFFECTIVE: 09/12/2007 SHEET NO: 606.60B SHEET: 6 OF 6
FABRICATION DETAIL

ASSEMBLED VIEW
ANCHOR BRACKET

END VIEW

CABLE ASSEMBLY

STEEL BEARING PLATE

DETAIL A
(END POST DETAIL)

FOR LOCATION OF DETAIL A SEE SHEET 1 OF 7.
EMBEDDED STEEL POST

SPECIAL RUBRAIL TO POST CONNECTION AT POST A
**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

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

**CHAIN-LINK FENCE**

**SPECIFIED DIAMETER**

- **Height of Fabric:**
  - **Inches Gage Mesh:**
    - 120: 11 2 36.42
    - 148: 9 2 48.60
    - 192: 6 2 72.84

**DATE EFFECTIVE:** 02/10/2007

**DATE PREPARED:** 8/21/2009

**GENERAL NOTES:**

- **Weights of Materials Shown in Table are for ASTM F 1043 Group IA. Sizes shown are for Steel and Aluminum. Equivalent ASTM F 1043 Alternatives may be used.**
- **Pull Posts shall be used at sharp breaks in vertical grade or at approximate 500’ centers on straight runs or as directed by the Engineer.**
- **Drilled holes in solid rock shall provide a diameter of not less than 2” greater than the maximum transverse dimension of the post section.**
- **All posts shall have provisions to securely hold the top tension wire in position and allow for removal and replacement of a post without damaging the top tension wire.**
- **The mesh size shall be 2 inches ± 1/2 inch measured in either direction as the minimum clear distance between the wires forming the parallel sides of the mesh.**

**LEGEND)**

- **Fabric**
- **End Corner or Pull Post**
- **Line Post**
- **Gate Post**
- **Brace**
- **Truss Rod**
- **Gate Frame**
- **Stretcher Bar**
- **Stretcher Bar Band**
- **End or Corner Clamp**
- **Post Ties (Other than Line Posts)**
- **Fabric Ties**
- **Line Post Ties With or Without Top Rails**
- **One-Half Fabric Height or as Recommended by Manufacturer**

**MINIMUM DEPTH FOR SETTING POSTS**

<table>
<thead>
<tr>
<th>Description</th>
<th>Height of Fence</th>
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<tbody>
<tr>
<td></td>
<td>48”</td>
</tr>
<tr>
<td></td>
<td>60”</td>
</tr>
<tr>
<td></td>
<td>72”</td>
</tr>
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</table>

**MINIMUM SIZE FOR FENCE HARDWARE**

<table>
<thead>
<tr>
<th>Description</th>
<th>Size (in.)</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>2” dia.</td>
</tr>
<tr>
<td></td>
<td>3” dia.</td>
</tr>
<tr>
<td></td>
<td>4” dia.</td>
</tr>
<tr>
<td></td>
<td>6” dia.</td>
</tr>
<tr>
<td></td>
<td>8” dia.</td>
</tr>
</tbody>
</table>

**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”.**

**TYPICAL TRENCH DETAILS**

**TYPICAL LOCATION**

**WIRE SIZE AND HEIGHT OF FABRIC**

<table>
<thead>
<tr>
<th>Wire Size</th>
<th>Height of Fabric</th>
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</thead>
<tbody>
<tr>
<td>0.120</td>
<td>11” 2 36.42</td>
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<tr>
<td>0.148</td>
<td>9” 2 48.60</td>
</tr>
<tr>
<td>0.192</td>
<td>6” 2 72.84</td>
</tr>
</tbody>
</table>

**PRIVATE FENCE**

**TYPICAL LOCATION**

**POST TOPS**

**NOTE:** If posts cannot be driven to depths indicated because of rocky soils or other conditions, they shall be removed and replaced in footings. Post tops shall be protected against damage and all posts which are damaged during installation shall be removed and replaced.
**PART ELEVATION (TYPICAL)**

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

**LINE POST**
- Fabric tie at abt. 12 centers (TYP.)
- 3⁄8" Dia. U-bolts (TYP.)
- 2" Dia. Fence post

**PULL POST**
- Expansion sleeve between pull posts.
- 3⁄8" or 2½" Diameter pipe

**ALTERNATE SECTION A-A FOR MSE WALLS**
- 2½" or 2½" Diameter pipe
- Three ⅞" bars at equal spaces
- 3'–6"

**GENERAL NOTES:**
- Payment for U-bolts with nuts, washers, and ¾ 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".

**FENCE CONNECTION FOR MSE WALLS**
- Modified type A gutter
- Modified type B gutter

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

**DATE EFFECTIVE:** 06/01/2009
**DATE PREPARED:** 4/30/2009
**SHEET NO.** 607.11H

**57**
END POST ASSEMBLY

STEEL POST

CORNER OR PULL POST ASSEMBLY

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

POORLY DEFINED CHANNELS (SMALL DRAINAGE AREAS)

WELL DEFINED CHANNELS (LARGE DRAINAGE AREAS)

TYPICAL FENCING AT CHANNEL CROSSING

TYPICAL WATER CROSSING GATE

WOVEN WIRE FENCE
CONCRETE SIDEWALK

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

CURB AND GUTTER

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 SIDEROAD 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 ALLOWED 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 SIDEROAD CONNECTIONS.

CONCRETE SIDEWALK JOINTS

- SEE PLANS FOR WIDTH
- SEE STANDARD 608.00
- CURB TO BE MONOLITHIC WITH PCC MAINLINE PAVEMENT. CURB TO BE TYPE S WITH ASPHALT CONCRETE MAINLINE PAVEMENT. SEE STANDARD PLAN 609.00.
- MIN. 1/2" DEPTH JOINT.
- SEE TYPICAL PAVEMENT SECTION
- SLOPE 1.0% (2.0% MAX.)
- SPACING EQUAL TO WIDTH OF WALK
SAFETY RAIL DETAILS

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

#4 B-BARS AT 18" ± CTRS.
#4 A-BARS AT 13" ± CTRS.

TREAD

NUMBER OF STEPS

11 - 13 - 24

FRONT ELEVATION

2" VARIABLE STEP WIDTH "W"

2"

VARIABLE HEIGHT

2"

2"

2"

2"

4"

4"

4"

4"

POST SPACING 5'-0" MAX.

TOP RAIL

RAIL LENGTH - HANDBRACE FOR STEPS

CENTER MIDDLE RAIL VERTICALLY BETWEEN TOP AND TOE RAILS

TOE RAIL

ONE TREAD DEPTH MIN.

2" MIN.

SIDEWALK

SIDEWALK

SIDEWALK

SIDEWALK

SIDEWALK
## Quantities for Concrete Steps

### Concrete C.Y. - Steel Lb.

<table>
<thead>
<tr>
<th>Tread</th>
<th>1:1.5 Slope</th>
<th>Rise</th>
<th>N</th>
<th>No. of Steps</th>
<th>Conc.</th>
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<td></td>
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<th>N</th>
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</table>
CONCRETE MEDIAN STRIP

SECTION A-A

CONCRETE MEDIAN STRIP

TIE BAR LOCATIONS FOR CONCRETE MEDIAN STRIP

TIE BAR LOCATIONS FOR CONCRETE MEDIAN STRIP (ISLAND)

CONCRETE MEDIAN STRIP JOINT LOCATION

(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 ISLAND

GENERAL NOTES:

TIE BARS SHALL BE EPOXY COATED, DEFORMED REINFORCING BARS MEETING THE REQUIREMENTS OF SECTION 710 AND 1057.

BONDING FOR TIE BARS SHALL BE EPOXY OR POLYESTER BONDING AGENTS AS SPECIFIED IN SECTION 1039.

THE FACE OF THE MEDIAN MAY BE CONSTRUCTED WITHOUT BATTER WHEN CONSTRUCTED ON A RADIUS OF 6' OR LESS.

WHEN CONCRETE MEDIANS ARE CONSTRUCTED DIRECTLY BENEATH GUARDRAIL, THE MEDIAN HEIGHT WILL BE 4'.
SIDEWALK HANDRAILING WITHOUT BALUSTERS

4 CROSS SLABS: 1.0 % MIN. - 2.5 % MAX.

SIDEWALK WITHOUT BUFFER STRIP
(SECTION A-A)

1/8" x 6" MIN. x 4" MIN. STEEL PLATE

GROUNDLINE

SIDEWALK WITH BUFFER STRIP
(SECTION A-A)

1/2" x 4" MIN. x 6" MIN. STEEL PLATE
SIDEWALK SAFETY RAIL WITH BALUSTERS AND HANDRAIL

4 CROSS-SLICE: 1.0% MIN. - 3.0% MAX.

SAFETY RAIL WITH HANDRAIL

CONCRETE CURB ON CURB AND CURTAIN
CONCRETE SIDEWALK
CONCRETE SIDEWALK
CONCRETE SIDEWALK
CONCRETE SIDEWALK
GRANITE LINE
GRANITE LINE
GRANITE LINE
GRANITE LINE

4" CONCRETE SHEATH

STEEL OR ALUMINUM ALLOY PIPE "A" PIPE
STEEL OR ALUMINUM ALLOY PIPE "A" PIPE
STEEL OR ALUMINUM ALLOY PIPE "A" PIPE
STEEL OR ALUMINUM ALLOY PIPE "A" PIPE

SIDEWALK WITH BUFFER STRIP (SECTION A-A)

SIDEWALK WITHOUT BUFFER STRIP (SECTION A-A)

FOR GENERAL NOTES AND MATERIAL REQUIREMENTS ON RAIL CONFIGS SEE SHEET 3 OF 4.
GENERAL NOTES:

ALL PEDESTRIAN ACCESS ROUTE MUST BE COMPLIANT WITH THE AMERICAN WITH DISABILITIES ACT - GUIDELINES FOR ACCESSIBLE PUBLIC PLACES AND TRANSPORTATION. ALL PEDESTRIAN ACCESS ROUTE MUST BE APPROVED BY THE ENGINEER. ALL OTHER ASPECTS OF NON-COMPLIANCE SHALL BE REMOVED AND REPAIRED AT THE CONTRACTOR'S EXPENSE.

THE SURFACES OF PEDESTRIAN ACCESS ROUTE ELEMENTS AND SPACES REQUIRED TO CONNECT TO PEDESTRIAN ACCESS ROUTE, SHALL BE LONG, SLIP RESISTANT, AND SHALL NOT HAVE RAVES.

SCHOOL, RAMP AND LANDING CROSS SLOPES SHALL BE 1.00% TO FACILITATE DRAINAGE 0.20% MAX.

THE CROSS SLOPE OF THE CONTINUOUS PEDESTRIAN ACCESS ROUTE THROUGH ENTRANCES, ISLANDS, AND SIDE ROAD CONNECTIONS WITH STOP OR YIELD CONTROL SHALL BE 1.00% TO FACILITATE DRAINAGE 0.20% MAX.

WHERE PEDESTRIAN ACCESS ROUTE ARE CONTAINED WITHIN PEDESTRIAN SIDEroach TRAVEL WITHOUT STOP OR YIELD CONTROL, THE CROSS SLOPE OF THE PEDESTRIAN ACCESS ROUTE SHALL BE 5.00% MAXIMUM.

WHERE PEDESTRIAN ACCESS ROUTE ARE CONTAINED WITHIN WHEEL-LOCK PEDESTRIAN STREET CROSSING, THE CROSS SLOPE OF THE PEDESTRIAN ACCESS ROUTE SHALL BE PERMITTED TO EQUAL THE STREET OR HORIZONTAL FLOOR.

50'-60' CLEAR SPACE SHALL BE PROVIDED CENTERED ON THE PEDESTRIAN PUSH BUTTON.

BEFORE THE BOTTOM GAP BEHIND A CURB RAMP, A CLEAR SPACE 0.50' MINIMUM IN BREADTH SHALL BE PROVIDED WITHIN THE WIDTH OF THE PEDESTRIAN STREET CROSSING AND SHALL OUTSIDE THE PARALLEL TRAVEL LANE.


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

DETECTABLE WARNING SURFACES (TRUNCATED DOMES) SHALL BE PREPAINTED AND INSTALLED IN PER CONTRACTOR'S RECOMMENDATIONS. STAINED CONCRETE WILL NOT BE ACCEPTED.

THE DETECTABLE WARNING SURFACE WILL HANG VISIBLE TO PEDESTRIANS. FLAT TOP-OF-CURB WARNING SURFACE SHALL OPEN THE FULL WIDTH OF THE RAMP OR LANDING 24 DEEP.

DETECTABLE WARNING SURFACES SHALL BE ALLOWED PERPENDICULAR TO THE PATH, LANDING OR ELEVATION TRANSITION, AND THE STREET.

WHERE THE BOTTOM GAP BEHIND A CURB RAMP IS LESS THAN 0.50' FROM THE END OF CURB, DETECTABLE WARNING SURFACE SHALL BE LOCATED ON THE RAMP SURFACE AT THE END OF THE CURB, WHERE THE GAP IS GREATER THAN 0.50' FROM THE END OF CURB, THE DETECTABLE WARNING SURFACE MUST BE LOCATED ON THE LOWER LANDING.

MISSOURI HIGHWAYS AND TRANSPORTATION
COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-800-392-MODOT 1-800-392-6636
CURB RAMPS
DATE EFFECTIVE: 09/25/2003
DATE REVISED: 10/13/2003
608.50A
1 of 4
SMALL RADIUS PERPENDICULAR

LARGE RADIUS PERPENDICULAR

ISOMETRIC VIEW

LARGE RADIUS PERPENDICULAR

GENERAL NOTES:

11. 1.0% MINIMUM, 2.0% MAXIMUM CROSS SLOPE.

12. VARIABLE HEIGHT VERTICAL CURVE. IF TRANSVERSE RAMP MOUNTING FLANGE REQUIRED, PARALLEL TO THE CURVE LINE.

13. HEIGHT VARIES TO MEET EXISTING GROUND.

14. THE CURVATURE SLOPE OF THE OUTER CURB OF STREET AT THE POINT OF CURVE RAMP ARMS, BLIND STREETS TRANSITIONS, AND TYPING SPACE SHALL BE 5% MAXIMUM.

15. THE RISE OF PEDESTRIAN PLAN BUTTONS SHALL BE OFFSET 0" FOR FROM APPROXIMATE 10 MAX. FOR ICE APPROACH TO THE CURVE EDGE.

16. BEYOND THE OUTER CURB, A CLEAR SPACE 4" X 4" MINIMUM SHALL BE PROVIDED WITHIN THE WIDTH OF THE PEDESTRIAN STREET CROSSING AND WHOLLY OUTSIDE THE PARALLEL VEHICLE TRAVEL LANE.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

MODOT

CURB RAMPS

DATE EFFECTIVE: 03/24/2023
DATE REVISED: 10/06/2022

608.50A SHEET NO. 3 OF 4
Construct lining on backslope at culvert outlet when roadway ditch is intercepted and flow is carried in roadway ditch for some distance.

General Notes:
The dimensions shown in the table can be applied to box or arch culverts of equivalent waterway area.

### Rock Lining for Culvert Outlets

<table>
<thead>
<tr>
<th>Culvert Diameter (Dia. In.)</th>
<th>Minimum Depth and Width (Ft. X Ft.)</th>
<th>Minimum Line Length (Ft.)</th>
<th>Equivalent Pipe Arch Culvert (Approx.)</th>
<th>Equivalent Concrete Box Culvert (Approx.)</th>
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<tbody>
<tr>
<td>18</td>
<td>1 x 4</td>
<td>12</td>
<td>2 x 1 1/2</td>
<td></td>
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<td>24</td>
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</table>

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

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

(1) SLOPE 2" PER FOOT MINIMUM.
(2) PROTECTION SHALL BE PLACED IN CONTINUOUS PANELS FROM TOE OF THE SLOPE TO THE TOP OF THE SLOPE.
(3) SLOPE PROTECTION SHALL FOLLOW THE CONTOUR OF THE FINAL ROADWAY FILL.

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

LIMIT OF SLOPE PROTECTION (3)

LONG ROADWAY PROTECTION

APRON (3)

SQUARE

APRON (3)

PART PLAN

SKewed

LIMIT OF SLOPE PROTECTION (3)

LIMIT OF SLOPE PROTECTION TO BE SPECIFIED ON PLANS

LIMIT OF SLOPE PROTECTION TO BE SPECIFIED ON PLANS

GENERAL NOTES:

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

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

3. ONE LAYER OF 50# ROOFING FELT SHALL BE PLACED BETWEEN CONTACT SURFACES OF FOOTINGS.

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.

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

CONCRETE SLOPE PROTECTION

DATE EFFECTIVE: 07/01/2015
DATE PREPARED: 05/29/2015

611.60R SHEET NO. 1 OF 1
ATTENUATOR LAYOUT:

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

TRAFFIC PASSING TO BOTH LEFT AND RIGHT

TRAFFIC PASSING TO LEFT
FLIP FOR TRAFFIC TO RIGHT

TYPE 3 OBJECT MARKER PLACEMENT
FOR PERMANENT INSTALLATIONS

TYPE 1 OBJECT MARKER PLACEMENT
FOR TEMPORARY INSTALLATIONS

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

MISSOURI HIGHWAYS AND TRANSPORTATION
COMMISSION
105 N 10TH STREET
JEFFERSON CITY, MO 65102
1-800-527-MODOT (1-800-527-6638)
1) REMOVE ALL CONCRETE TO LIMITS ShOWN TO MAX. OF 1/2 THE PAVEMENT DEPTH ON TOP OF PANELS BY MILLING.
2) PLACE COMPRESSIBLE INSERT IN JOINT OR CRACK. INSERT SHALL BE THREE TIMES OR JOINT OR CRACK WIDTH, BUT NOT LESS THAN 1/2 INCH.
3) CROWN VERTICAL REPAIR EDGES AT APPROXIMATE 1:1 SLOPE.
4) PLACE 2" MIN. COMPRESSIBLE INSERT ADJACENT TO LONGITUDINAL LINE OF SHOULDER JOINT.
5) EXPOSED SURFACE SHALL BE CLEANED BY SANDBLASTING OR SHOTBLASTING.
6) EXPOSED SURFACE OF CONCRETE SHALL BE COATED WITH AN APPROVED BINDER SEALER.
CROSS STITCHING PLAN

GENERAL NOTES:

1. AT EACH REPAIR LOCATION, HOLES SHALL BE DRILLED AT 30° ANGLES TO THE PAVEMENT SURFACE, PERPENDICULAR TO THE CRACK. THE DRILL BIT DIAMETER SHALL NOT EXCEED 1/4".

2. DRILLING SHALL ALTERNATE EACH 1/4 FT IN OR ON EITHER SIDE OF THE LONGITUDINAL JOINT FROM HOLE TO HOLE.

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

4. DRILLED HOLES SHALL BE CLEANED OF LOOSE DEBRIS AND DIRT. EPOXY OR POLYESTER BONDING AGENTS FOR BARS, MEETING THE MATERIAL REQUIREMENTS OF SECTION 102.3, SHALL BE INJECTED OR PUMPED INTO EACH HOLE. A CROSS-STITCH BAR SHALL BE INSETTED IN EACH HOLE SUCH THAT THE EPOXY MATERIAL IS EVENLY DISTRIBUTED AROUND THE BAR AND EXTRUDING FROM THE SURFACE. EACH BAR SHALL BE INSERTED FAR ENOUGH TO ALLOW 1/2 OF 5/16" SHOWN IN THE PROFILE DETAIL.

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

GENERAL NOTES:

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

PAVEMENT REPAIR
CROSS STITCHING

SHEET NO. 613.00T 3 OF 4

1-888-637-MODOT 1-888-637-6636
1. 1/2" DIA DOWEL BAR X 18" LENGTH.
2. DOWEL BAR SLOTS SHALL BE PARALLEL TO ROLLWAY.
3. TIP OF COMPRRESSIBLE INSERT SHALL BE FLUSH WITH PAVEMENT SURFACE.
4. CRACK PERIMETER IN SLOT SHALL BE SEALED W/ SILICONE.
5. COMPRRESSIBLE INSERT SHALL BE PLACED AT MIDDLE OF DOWEL BAR.

PLAN VIEW

SECTION A-A

SECTION B-B

SECTION C-C
INSTALLATION INSTRUCTIONS:

DRILL THE HOLE:

Install 2 1/4" dia. bolts without washers before concrete pour to form 4 1/2" bolt extension into concrete below frame. Lubricate extended thread.

AFTER CONCRETE HARDENS SUFICIENTLY, FINAL INSTALLATION SHALL BE MADE AND REINSTALL 2 1/4" dia. bolts and lock washers through grate and frame. Torque 2 1/4" dia. bolts to 35-40 ft.-lbs. Apply thread adhesive to all 2 1/4" stainless steel bolts.

GENERAL NOTES:

Grates to be constructed of cast gray iron and meet requirements of ASME A126. Minor variations in grate shape to meet manufacturer's standard practice are permitted.

MINIMUM CLEAR OPEN AREA: 2.10 SQUARE FEET.

614.11D

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-MODOT-5411 / 1-573-526-5411
WHEN "p" (PAVEMENT THICKNESS) IS 8" USE MANHOLE FRAME WITH 9" HEIGHT (F) APPROXIMATE WEIGHT OF FRAME AND COVER. 540 LBS., CLASS 35 CASTING.

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

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

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

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

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

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

A CHECKERED DESIGN TOP SHALL BE FURNISHED.
PLAN

SECTION B-B
ELEVATION
ADJUSTING RING
SOLID OR ADJUSTABLE

COVER
ADJUSTING RING
FRAME
INSTALLATION DETAILS

SECTION A-A
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>SIGN SUBSTRATE</th>
<th>MINIMUM MOUNTING HEIGHT (Ft)</th>
<th>USAGE LIMITATIONS</th>
<th>COMMENTS</th>
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</thead>
<tbody>
<tr>
<td>POST</td>
<td>PERFORATED SQUARE STEEL TIME MARKER HOOD</td>
<td>RIGID</td>
<td>5'</td>
<td>FINAL UNDIVIDED HIGHWAYS</td>
<td>NONE</td>
</tr>
<tr>
<td>TYPE 1 POST</td>
<td>STEEL FILE UP STAKE</td>
<td>RIGID</td>
<td>5'</td>
<td>FINAL UNDIVIDED HIGHWAYS</td>
<td>PERMITTED ONLY WHERE POST MOUNTING IS NOT POSSIBLE.</td>
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<tr>
<td>TYPE 2 POST</td>
<td>EXCEL FILE UP STAKE</td>
<td>FLEXIBLE</td>
<td>12' (6)</td>
<td>FINAL UNDIVIDED HIGHWAYS</td>
<td>PERMITTED FOR PROGRESSIVE WORK SUCH AS ASPHALT REPAIRES, PERMITTED FOR STATIONARY WORK EXPECTED TO BE COMPLETED IN 3 DAYS OR LESS, PERMITTED FOR INTERMITTENT STATIONARY WORK THAT EXCEEDS 3 DAYS IN TOTAL AS APPROVED BY THE ENGINEER. WHERE SIGNS ARE INFRAS BY OTHER OBJECTS (I.E., TRAFFIC CONTROL DEVICES, EARTHWORK, VEHICLES, ETC.) OR INSTALLED ON MULTI-LANE UNDIVIDED FACILITIES OR MULTIPLE LANE DIVIDED FACILITIES WITH 2 OR MORE LANES IN ONE DIRECTION MOUNTING HEIGHTS SHALL BE 12 FT SPECIFIED FOR POST-MOUNTED SIGNS.</td>
</tr>
<tr>
<td>BARRIER</td>
<td>CONCRETE TRAFFIC BARRIER</td>
<td>FLEXIBLE</td>
<td>30'</td>
<td>FINAL UNDIVIDED HIGHWAYS</td>
<td>PERMITTED ONLY WHERE LONGITUDINAL BARRIER IS PRESENT.</td>
</tr>
<tr>
<td>VEHICLE</td>
<td>PAYMENT MARKING EQUIPMENT, FOLDING PAPER SIGN, PROTECTIVE VEHICLE</td>
<td>FLEXIBLE</td>
<td>30'</td>
<td>FINAL UNDIVIDED HIGHWAYS</td>
<td>PERMITTED ONLY IN PILOT CAR OR MOVING OPERATIONS.</td>
</tr>
</tbody>
</table>

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

1. (1) Edge of traveled way where there is no paved or unpaved shoulder.
2. (2) 250-foot less than mounting height (note in Table A).

**GENERAL NOTES:**
- Longitudinal spacing of signs shown in the plans are preferred minimums, but may be adjusted to meet existing field conditions with approval of the Engineer.
- Signs shall not be mounted in or on channelizers.
- All signs and signs shall be installed and maintained in a plane position.
- Construction signs shall not be located on sidewalks, pedestrian lanes, or areas designated for stopping or bicycle traffic.
USE OF SPLICE IS OPTIONAL.
SPLICE OVERLAP SHALL BE POSITION ENTIRELY BETWEEN GROUND LINE AND 18" ABOVE GROUND LINE.
ONLY ONE SPLICE WILL BE ALLOWED PER POST.

POST TYPE

<table>
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<tr>
<th>SIGN AREA (SQ. FT.)</th>
<th>U-CHANNEL</th>
<th>WOOD</th>
<th>PERFORATED SQUARE STEEL TUBE</th>
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<tr>
<td>≤ 10</td>
<td>1 - 3.0 LBF/FT²</td>
<td>1 - 4&quot; x 4&quot;</td>
<td>1 - 2.0&quot; 12 GA</td>
</tr>
<tr>
<td>&gt; 10 ≤ 16</td>
<td>2 - 3.0 LBF/FT²</td>
<td>2 - 4&quot; x 4&quot;</td>
<td>2 - 2.0&quot; 12 GA</td>
</tr>
<tr>
<td>&gt; 16 ≤ 24</td>
<td>2 - 3.0 LBF/FT²</td>
<td>2 - 4&quot; x 4&quot;</td>
<td>3 - 2.0&quot; 12 GA</td>
</tr>
<tr>
<td>&gt; 24 ≤ 32</td>
<td>3 - 3.0 LBF/FT²</td>
<td>2 - 4&quot; x 6&quot;</td>
<td>N/A</td>
</tr>
<tr>
<td>&gt; 32 ≤ 50</td>
<td>N/A</td>
<td>2 - 6&quot; x 6&quot;</td>
<td>N/A</td>
</tr>
</tbody>
</table>

+ SIGNS GREATER THAN 4 FEET IN DIAMETER, EXCEPT DIAMOND SHAPE SIGNS REQUIRE THE POSTS
++ REQUIRED IN ANCHOR BASE PER MANUFACTURER'S RECOMMENDATION.

GENERAL NOTES:
ALL POSTS SHALL BE EMBEDDED A MINIMUM OF 3 FEET.
SIGN INSTALLATION DETAILS SHOWN SHALL APPLY TO ALL SIGNS IN A MULTI-PER POST INSTALLATION.

THE ENGINEER'S ENGINEERING & FLUORESCENT PAINT SHALL BE APPLIED HEAVILY TO BOTH SIDES OF U-CLEAN POST UP TO THE LENGTH OF AT LEAST 3 INCHES BELOW THE TOP OF THE SIGN.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
115 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-456-MODOT (1-888-456-6636)

TEMPORARY TRAFFIC CONTROL DEVICES
POST INSTALLATION DETAILS

DATE REQUESTED: 12/11/2023
DATE PREPARED: 11/4/2023
SHEET NO.: 616.10BC 2 OF 9
DIRECTION INDICATOR BARRICADE

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

Direction indicator barricades shall not be used in swinging tapers unless shown on the plans.

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

Advance warning rail system

Maximum weight of sign shall not exceed 25 lbs.

The sign and rail system may be mounted as two separate crashworthy devices. The rail system shall be located directly in front of the sign with 1 to 10 feet separating the two devices.

Where grading is not provided on the backside, strips of 3' wide Type IV orange reflective sheeting may be applied to the ends of each rail to help delineate the device.

White and orange reflective sheeting shall be in accordance with Sec. 1042.6.7.4.

General notes:

White, orange, and fluorescent orange reflective sheeting shall be in accordance with Sec. 1042.2.7.4.

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

Sequential flashing warning lights shall be in accordance with Sec. 1065.5.

Upon approval of the engineer, the contractor may, at no additional cost, use direction indicator barricades in lieu of two-line channelizers in merging tapers.

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

Upon approval of the engineer, the contractor may, at no additional cost, use direction indicator barricades in lieu of merging tapers.

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

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

Panel and rail markings for traffic delineation shall be painted toward the intended direction of travel. Illustrations shown are for instances where traffic moves to the left. All other configurations shall be used for traffic movements to the right. Markings shall only be applied to the front of each rail or panel of may be applied to both the front and back projecting the marking on the back does not conflict with intended opposing traffic movement.

MoDOT
Missouri Highways and Transportation Commission

Temporary Traffic Control Devices
Channelizers and Direction Indicator Barricade

Date Prepared: 7/24/2022
616.10BC SHEET NO. 3 OF 9
**TYPE 3 MOVEABLE BARRICADE**

**SOFT CLOSURE PLAN VIEW**

**EXAMPLE 1** - ONE TYPE 3 MOVEABLE BARRICADE WILL BE REQUIRED TO COMPLETELY CLOSE EACH 8'-0" OF CLOSED. PAIRED SHOULDERS SHALL BE INCLUDED IN THE AREA TO BE CLOSED.

**EXAMPLE 2** - SIGNS SHALL BE LITHT WEIGHT (ARMS) OR PLASTIC AND SHOULD NOT EXCEED MORE THAN 50 PERCENT OF THE TOP 2 PANELS OR LESS THAN 33 PERCENT OF ALL THREE PANELS.

**EXAMPLE 3** - IF SIGNS CANNOT MEET THE ABOVE REQUIREMENTS, THEY SHALL BE MOUNTED ON SEPARATE PLASTIC ARMED PANELS SPECIFIED FOR POST MOUNTED SIGNS LOCATED IN TABLE 5 ON SHEET 1. THE BARRICADE SHALL BE LOCATED IN FRONT OF THE SIGNS WITH 7 TO 10 FEET SEPARATING THE DEVICES.

**EXAMPLE 4** - TYPE 3 MOVEABLE BARRICADES SHALL BE EXACTLY FEET STANDING AND PORTABLE. MOUNTING SHALL ONLY BE APPLIED TO THE FRONT OF EACH BARRIER OR MAY BE APPLIED TO BOTH THE FRONT AND THE BACK OF EACH BARRIER PROVIDING THE MOUNTING ON THE BACK DOES NOT CONFLICT WITH INGRESS/EGRESS TRAFFIC MOVEMENT.

**EXAMPLE 5** - WHITE AND ORANGE REFLECTIVE SHEETING SHALL BE IN ACCORDANCE WITH SEC 100.2.5.3

**EXAMPLE 6** - FOR PAIRED BARRIERS WITH A WIDTH OF 20'-0" OR LESS AND WITHOUT PAIRED SHOULDERS, TWO BARRICADES ARE ACCEPTABLE.

**EXAMPLE 7** - FOR BARRIERS EXTENDING TOWARDS A ROADWAY, STRIPES SLOPE HORIZONTAL IN THE DIRECTION TOWARDS WHICH TRAFFIC MOVES MOSTLY.

**EXAMPLE 8** - FOR BOTH RIGHT AND LEFT LANE ARE PROVIDED, STRIPES SLOPE HORIZONTAL IN EACH DIRECTION FROM THE CENTER OF THE BARRIERS OR BARRIERS.

**EXAMPLE 9** - FOR NO TURNS ARE INTERCEPTED, STRIPES POSITIONED TO SLOPE HORIZONTAL TO THE CENTER OF THE BARRIERS OR BARRIERS.
TWO LANE / TWO WAY TRAFFIC DELINEATION PLAN
FOR DIVIDED HIGHWAY

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

SECTION A-A
TUBULAR DELINEATOR DETAIL

AN ADHESIVE, IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS,
SHALL BE USED TO APPLY THE TUBULAR DELINEATOR TO THE ROADWAY SURFACE.
THE ADHESIVE SHALL PERMIT EASY REMOVAL OF THE TUBULAR DELINEATOR WITHOUT
CAUSING DAMAGE TO THE ROADWAY SURFACE.

REFLECTIVE SHEETING APPLIED TO TUBULAR DELINEATORS SHALL BE IN ACCORDANCE
WITH SEC 1042.7.7.5.

CHANGEABLE MESSAGE SIGN

TYPE 3 OBJECT MARKERS
FLUORESCENT ORANGE REFLECTIVE SHEETING SHALL BE IN ACCORDANCE WITH SEC 1042.5.1.
11. Sign designations, arrow, borders, and spacing shall be in accordance with the latest edition of "Standard Highway Signs" by the U.S. Department of Transportation - Final.

12. Refer to the latest edition of Article Part 64 by the U.S. Department of Transportation - Final for sign designations. Arrow, borders, and spacing shall conform to the guidelines set forth in the latest edition of "Standard Highway Signs" by the U.S. Department of Transportation - Final.

13. Use of a supplemental plate for line 1 is acceptable.

14. All signs and applicable regulatory sign shall be manufactured as one sign.

- Shall only be used at private and commercial entrances to ensure the proper install and spacing she will not be permitted for use in intersecting state, county, or city signs. Interior shall be designed only for commercial use and supported with a 10-feet galvanized steel H-frame to match. Copy of the test shall be in accordance with other traffic control items.

GENERAL NOTES:

1. Sign layouts shall be in accordance with the latest edition of "Standard Highway Signs" by the U.S. Department of Transportation - Final. Unless specified otherwise.

2. Sign dimensions shown are nominal. No additional payment shall be made if contractors use larger signs.

3. No additional payment shall be made for plates.

4. All plates shall have a border. Plates shall not have a border.

5. Letter dimensions shall be as shown.

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JEFFERSON CITY, MO 65102
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TEMPORARY TRAFFIC CONTROL DEVICES

DATE PREPARED: 3/6/2023
616.10BC SHEET NO. 8 OF 9
NOT TO SCALE

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-800-392-MODOT 1-800-392-6636

TEMPORARY TRAFFIC CONTROL PLANS
PAVEMENT TREATMENTS FOR TWO-LANE ROADWAYS

DATE EFFECTIVE: 02/03/2021
DATE PRINTED: 4/29/2021
SHEET NO.: 1 OF 5

THIS TEMPORARY TRAFFIC CONTROL IS FOR USE ON THE FOLLOWING PAVEMENT TREATMENT PROJECTS AND IS NOT INTENDED FOR USE WHEN ADDITIONAL CONSTRUCTION ITEMS SUCH AS SHOULDER WIDENING, PIPE REPLACEMENT OR EXTENSIONS, GUARDRAIL CONSTRUCTION OR REPAIR, AND/OR SIGN INSTALLATIONS ARE PART OF THE PROJECT:
- ASPHALTIC RESURFACING SECTIONS 4071 AND 4021
- SEAL COAT
- SCRUB SEAL/SAND SEAL

NOTES:
- SIGNS 1 AND 2 ARE ONLY USED ON PROJECT LENGTHS 2 MILES OR GREATER.
- PREVIEW STAGE IS 25 MPH DIRECTION ON TWO-LANE HIGHWAY.
- DISTANCE MAY BE ADJUSTED ACCORDING TO FIELD CONDITIONS.
NOT TO SCALE

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
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TEMPORARY TRAFFIC CONTROL PLANS
PAVEMENT TREATMENTS FOR TWO-LANE ROADWAYS

DATE EFFECTIVE: 03/14/2021
DATE ISSUED: 03/14/2021
616.20 SHEET NO. 2 OF 5

NOTES:
- ENGINEERS
- FLAGGER

PERMANENT POSTED SPEED LIMIT (MPH) | BUFFER SPACE LENGTH (FT)
--- | ---
0 - 15 | 250
16 - 25 | 500
26 - 35 | 750
36 - 40 | 1000

NOTES:
- Spacing between signs: between last sign and flagger, beginning of taper or signed conditions
- Spacing may be adjusted as necessary to meet field conditions.
SIGN SPACING AND TEMPORARY STRIPING FOR MAINLINE

SIGN SPACING AT STATE ROUTE INTERSECTIONS SHOWING TEMPORARY STRIPING FOR MAINLINE

NOT TO SCALE

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65103
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TEMPORARY TRAFFIC CONTROL PLANS
PAVEMENT TREATMENTS FOR TWO-LANE ROADWAYS

DATE effective: 02/03/2021
DATE prepared: 4/20/2021
SHEET NO. 4 OF 5

PILOT CAR IN USE
WAIT & FOLLOW

NO CENTER LINE
UNEVEN LANES

NOTES:
SIGN IN USE.

STATE ROUTE INTERSECTION SIGNING

STATE ROUTE INTERSECTION SIGNING FOR MAINLINE

STATE ROUTE INTERSECTION SIGNING FOR MAINLINE
NOT TO SCALE

Sheet 616.20

Temporary Traffic Control Plans
Pavement Treatments for Two-Lane Roadways

Missouri Highways and Transportation Commission
105 West Capitol
Jefferson City, MO 65102
1-888-4MODOT (663-6683)

Sheet 5 of 5
TYPICAL VIEW
TYPE A - TWO TRAFFIC FACES

TYPICAL VIEW
TYPE B - ONE TRAFFIC FACE

GENERAL NOTES:
HEIGHT TRANSITIONS SHALL NOT BE USED IN LOCATIONS WHERE THE POSTED SPEED IS GREATER THAN 55 MPH.
ALL TOP AND END EDGES SHALL BE CHAMFERED 1/16 IN.
EXPANSION JOINTS SHALL BE PROVIDED IN THE BARRIER TO MATCH EXPANSION JOINTS IN PAVEMENT.
FOR CONCRETE TRAFFIC BARRIER CEMEMENT DETAILS SEE STD PLAN 905-085.
REINFORCING BARS WITH AN EPOXY ANCHOR SYSTEM MAY BE SUBSTITUTED FOR SMOOTH 1 1/4" DIAMETER ROUND STEEL
DOVETAILS.

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1-888-663-6682

PERMANENT CONCRETE TRAFFIC BARRIER
TYPE A AND B

SHEET NO. 1 OF 10
SECTION A-A

SECTION C-C

SECTION B-B

PLAN

TRANSITION DETAILS FOR PIER PROTECTION

1 IN. JOINT WITH JOINT FILLER AND SEALER

10:1 TRANSITION
MAX. RATE

40:1 TRANSITION
MAX. RATE

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-687-MODOT (1-888-687-6636)

PERMANENT CONCRETE TRAFFIC BARRIER
TYPE C
NOTES:
ALL Reinforcement shall be Grade 60 Epoxy Coated.
Bar Splices shall be a minimum of 24 times the nominal diameter of the bar.

Any method devised by the contractor and approved by the engineer that will assure the longitudinal reinforcing steel will be figured at 25% of the bar material will be satisfactory.

The contractor has the option to slip-form the barrier, in such case, additional reinforcement may be tied to the upper two-thirds of the reinforcing cage to prevent flexing.

This barrier shall not be used to support highway lighting poles.
This barrier shall not be used for bridge parapet applications.
Same joints shall be located at pavement transverse joints.
Type C shall be used only at locations shown on plan.

Reinforcing bars with an epoxy anchor system shall be substituted for smooth 1" diameter round steel dowels.

For concrete traffic barrier delineator details see Std. Plan 935.05.
LIMITS OF V1 SPACES AS SHOWN BELOW AT TERMINAL ENDS OF BARRIER ONLY

NOTE:
ALL REINFORCEMENT SHALL BE GRADE 60 EPOXY COATED.
B V1 SPACES SHALL BE A MINIMUM OF 24 TIMES THE
MINIMUM 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 LONGITUDINAL
REINFORCING STEEL WILL BE POSITIONED 1/2 INCH AS
DISHED WILL BE SATISFACTORY.

THE CONTRACTOR HAS THE OPTION TO SLIP-TIGHTEN THE
BAR IN WHICH CASE ADDITIONAL REINFORCEMENT MAY
BE TIED TO THE OUTER TWO-THIRDS OF THE REINFORCING
CAGE TO PROVIDE BANDING.

THIS BARRIER SHALL NOT BE USED TO SUPPORT HIGHWAY
LIGHTING FIXTURES.

THIS BARRIER SHALL NOT BE USED FOR BRIDGE ROADWAY
APPLICATIONS.

SIX JOINTS SHALL BE SPACED AT 15'-0". SEE STANDARD
PLAN FOR SIXJOINT DETAIL

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

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

FOR CONCRETE TRAFFIC BARRIER DELINEATOR DETAILS SEE
STD PLAN 903.03.
CONCRETE BARRIER END ANCHORAGE ON GRADE

TRAFFIC BARRIER ON TOP OF MSE WALL

GENERAL NOTES:
ALL REINFORCEMENT SHALL BE GRADE 60 EPOXY COATED.
MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1/2", UNLESS OTHERWISE SHOWN.
A 1/2" BUFFER REQUIRED WITHIN THE LIMITS OF THE TRAFFIC BARRIER EXCLUDING THE END ANCHORAGE SECTIONS.
FOR CONCRETE TRAFFIC BARRIER DETAIL SEE DETAIL 903-05.
PAVEMENT SURFACE DIFFERENTIAL SHALL NOT EXCEED 1/2".
BAR SPLICES SHALL BE A MINIMUM OF 24 TIMES THE MINIMAL DIAMETER OF THE BAR.

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COMMISSION
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JEFFERSON CITY, MO 65102
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PERMANENT CONCRETE TRAFFIC BARRIER
TYPE E AT TOP MSE WALL

DATE EFFECTIVE: 5/24/2020
DATE PREPARED: 7/2/2020
SHEET NO.: 11011
617.10M
**TEMPORARY CONCRETE TRAFFIC BARRIER TYPE F**

**GENERAL NOTES:**

All reinforcing shall meet requirements of ORS except where shown on plans.

Reinforcing steel clearance to edge of concrete shall be 1½ unless otherwise shown.

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

The section furnished shall comply with dimensions shown as approved by the engineer.

See Sheet 2 for delineator details.

---

**ELEVATION VIEW**

- **Barrier Loop Connection**
- **Connection Rod Assembly**
- **Details of Barrier Connection**
- **Section B-B**
- **Section A-A**
- **Plan View**

---

**ALTERNATING END VIEWS FOR BARRIER LOOP CONNECTION**

- **Elevation View**
- **Plan View**
- **Details of Barrier Connection**
- **Section B-B**
- **Section A-A**
- **Plan View**

---

**PART SECTION C-C**

**LIFTING SLOT DETAIL**

- **4 FLANGE EDGE TO PREVENT FALLING**
- **ELEVATION VIEW**
- **Plan View**
- **Details of Barrier Connection**
- **Section B-B**
- **Section A-A**
- **Plan View**

---

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

**950 WEST CAPITOL**

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**TEMPORARY CONCRETE TRAFFIC BARRIER TYPE F**

**DATE ISSUED: 03/04/2021**

**SHEET NO.: 1 OF 8**

---
DETAILS OF TYPE F TEMPORARY BARRIER TIE-DOWN STRAP

TIE-DOWN STRAP ANCHOR SHALL BE ONE OF THE FOLLOWING:

- 2″ DIA. ANCHOR WITH A 3/4″ EMBEDMENT AND 1/2″ DIA. X 13″ LONG GRADE 5 BOLT.
- RED HEI LARGE DIAMETER TAPCON SHEET: 3/4″ X 13″ LONG WITH 4″ EMBEDMENT.
- SIMPSON TITE-BE 3/4″ DIA. X 5″ LONG WITH 4″ EMBEDMENT.

GENERAL NOTES:

- TIE-DOWN STRAP SYSTEMS ARE ONLY APPLICABLE ON RIGID PAVEMENTS.
- CONTRACTOR SHALL VERIFY ALL DIMENSIONS IN FIELD BEFORE ORDERING NEW MATERIAL.
- SEE OTHER SHEETS FOR DETAILS NOT SHOWN.
ELEVATION OF BARRIER WITH ANCHOR PINS

GENERAL NOTES:
CONTRACTOR SHALL VERIFY ALL DIMENSIONS IN FIELD BEFORE PROCEEDING WITH MATERIAL.
WHERE EXISTING FLEXIBLE PAVEMENT OR RIGID PAVEMENT IS NOT PRESENT A 3" THICK X 30" WIDE MINIMUM ASPHALT RAP SHAPE MUST CONFORM.
COST OF FURNISHING AND INSTALLING THE ASPHALT RAP CONCRETE IN-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 MATERIAL IN ACCORDANCE WITH SECTION 704.
### CROSS SECTION

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<th>SIGN</th>
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<td>NEAR EDGE OF FLATTER</td>
<td>NO SIGNS REQUIRED</td>
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<td>NEAR EDGE OF FLATTER</td>
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**LEGEND**

- - FIXED PAVEMENT
- - FLEXIBLE PAVEMENT
- - ALL PAVEMENT TYPES

**GENERAL NOTES**

- SIGNS WILL BE VISIBLE TO TRAFFIC ONLY WHEN AND WHERE CONDITIONS EXIST.
- FOR ADDITIONAL SIGN SPACING AND DETAILS SEE STANDARD PLAN 690.10.
(1) 50' (typ.) SPACE BETWEEN BARS. A MINIMUM OF 3 BARS ARE REQUIRED.
IF NECESSARY, THE DISTANCE BETWEEN THE BARS SHALL BE DECREASED TO INSTALL 5 BARS.

L = \( S \times V \) WHEN POSTED SPEED 45 MPH OR GREATER OR 65 MPH WHEN POSTED
SPEED IS 45 MPH OR LESS.
EFFECT DISTANCE L AS REQUIRED BY
SIGHT DISTANCE CONDITIONS.

L = LENGTH OF TAPE IN FEET.
S = POSTED OR 85 PERCENTILE SPEED IN MPH.
V = OFFSET DISTANCE IN FEET.
D = WARNING SIGN SPACING MEASURED FROM BEGINNING OF THE TAPE TO WARNING
SIGN " Lane Ends Merge Right "

GENERAL NOTES:
INTERMITTENT LINES SHALL BE 10 FEET IN LENGTH
SEPARATED BY 50 FOOT GAPS.

RIGHT LANE EDGELINES SHALL BE SOLID WHITE.
EDGELINES SHALL BE CONTINUOUS ACROSS INTERSECTIONS
AND OTHER INTERSECTING ROADS.

CENTERLINE RATTLE STRIPS ON PASSING LANEWAYS SHALL
FULFILL RATTLE STRIPING THROUGH TRANSITIONS. SEE
CONTRACT PLAN FOR STRIPING DETAILS.

RATTLE STRIPS SHALL NOT BE PLACED ON BRIDGES.
ALL RATTLE STRIPS SHALL BE MILLED.
CENTERLINE RATTLE STRIPS SHALL BE CONTINUOUS THROUGH
CONNECTING OR SPUR LANE ENDS WITH ALL LEFT TURN LANE-
DISCONTINUE CENTERLINE RATTLE STRIPS THROUGH
THE LIMIT OF ALL LEFT TURN LANE, INCLUDING ANY LANE
TAPE SECTION.

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PAVEMENT MARKING
ALTERNATE PASSING LANE

DRAWN / REVIEWED / ISSUED: 04/01/2003
640.00N 00002 2 OF 6
DIVIDED PAVEMENT

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

INTERMITTENT LINE
LINE DETAIL

LEGEND
WHITE LINE
YELLOW LINE

(1) OFFSET FROM EDGE OF TRAVELED WAY (TYP.)
(2) OFFSET FROM JOINT (TYP.)
(3) OFFSET FROM CENTERLINE (TYP.)

PAVEMENT MARKING
620.00N
3 OF 6
FOR SHOULDERS

AS SHOWN ON PLANS

EDGE OF TRAVELED WAY

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

= LATERAL DEVIATION SHALL NOT EXCEED ONE INCH IN 100 FEET.
ARROW MARKINGS
This lane use control arrows for first 200 feet with one additional arrow every 400 feet of
mandatory movement lane. First arrow 75 feet from stop line.

FISH-HOOK ARROW
ROUNDABOUT APPROACH MARKINGS

WORD MARKING
ELONGATED WORD & SYMBOL

WORD MARKING
BICYCLE SYMBOL

ELONGATED WORD & SYMBOL

WORD MARKING
ELONGATED WORD & SYMBOL

Signalized Grade
Intersection Marking

Pavement Marking
4" RISE WHITE
EDGE LINE
8" RISE YELLOW

ENTRANCE RAMP

4" RISE WHITE
EDGE LINE
8" RISE YELLOW

EXIT RAMP

4" RISE WHITE
EDGE LINE
8" RISE YELLOW

LANE TRANSITION

GENERAL NOTES:

TEMPORARY PAVEMENT MARKING IN INTERSECTIONS, RAMPS, CORRIDORS AND OTHER TRANSITION AREAS USE AN INTERMITTENT MARKING OF 3 FEET LONG, AT A CYCLE OF 20 FEET.

LINES OF TEMPERARY CORE MARKING ARE THE SAME AS THE EXISTING CORE LINES.
SIGN SPACING FOR DIVIDED OR MULTI-LANE HIGHWAY

SIGN SPACING AT STATE ROUTE INTERSECTIONS

SIGN SPACING AT RAMPS

GENERAL NOTES:

ALL SIGNS SHALL BE POST MOUNTED AND IN ACCORDANCE WITH STANDARD PLANS 66.10 AND 825.03.

WHEN SHOULDER DROP-OFF SIGNS ARE IN PLACE FOR GREATER THAN THREE DAYS, THE SHOULDER DROP-OFF PLACARD SHALL BE USED IN ADDITION WITH THE SHOULDER DROP-OFF SIGN.
*This hole should only be used on patches existing prior to construction. The hole should be located close to the center of the patch. By using this hole, the two holes located at the shoulder could be eliminated.

**Patch**

**Crack**

**Joint**

"Travel" lane for multiple lanes or both lanes of two lane directional roadway.
EXPRESSWAY DIVIDED

RUMBLE STRIP LAYOUTS

RUMBLE STRIP PLAN VIEW

RUMBLE STRIP CROSS SECTION VIEW

GENERAL NOTES:

SEE STANDARD PLAN 620.00 FOR PAVEMENT MARKING.

RUMBLE STRIPS SHALL NOT BE PLACED ON BRIDGES.

RUMBLE STRIPS SHALL NOT BE MILEED.

RUMBLE STRIPS SHALL NOT BE MILEED ON TRANSVERSE JOINTS.

FOR CONCRETE PAVEMENT WITH 15" JOINT SPACING, AT LEAST TWELVE RUMBLE STRIPS SHALL BE MILEED PER PANEL.

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

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

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RUMBLE STRIPS
SHOULDER

DATE EXPIRES: 07/01/2023
DATE PREPARED: 3/18/2022

626.00H SHEET NO. 1 OF 2
SECTION C-C

= 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.

GENERAL NOTES:

- DESIGN SPECIFICATIONS: 2010 MISSOURI LRFD BRIDGE DESIGN SPECIFICATIONS AND 2010 INTERIM REVISIONS

- DESIGN LOADING:
  - CLASS B-1 CONCRETE (BOX CULVERT) f'c = 2010 AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS AND 2010 INTERIM REVISIONS
  - FOR REINFORCEMENT DETAILS, SEE SHEET 2 OF 3. FOR SECTION DETAILS, SEE SHEET 3 OF 3.

- MISCELLANEOUS:
  - 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.

- DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

EQUATIONS FOR COMPUTING m, β, B, C AND T

m = ANGLE OF BARREL SLOPE WITH HORIZONTAL NORMAL TO E ROADWAY OR E MEDIUM = ARCTAN(1 - ELEV. 1 - ELEV. 2)
β = ANGLE OF FILL SLOPE WITH HORIZONTAL NORMAL TO E ROADWAY OR E MEDIUM = ARCTAN(B)
B = HORIZONTAL DISTANCE FROM UPSTREAM EDGE OF SHOULDER TO = E ROADWAY FILL + ACSEL - ALTANK
C = HORIZONTAL DISTANCE FROM DOWNSTREAM EDGE OF SHOULDER TO = E ROADWAY FILL + ACSEL - ALTANK

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 MEDIUM.

THE TERM "ACSEL" IS THE DIFFERENCE IN ELEVATION BETWEEN E ROADWAY OR E MEDIUM AND THE TOP OF THE FILL SLOPE NORMAL TO E ROADWAY OR E MEDIUM. THIS TERM SHALL BE ADJUSTED FOR UNSYMMETRICAL AND NONSTANDARD ROADWAYS.

TO ACCOUNT FOR A VARYING PROFILE GRADE, THE ROADWAY FILL SHALL BE BASED ON STATIONS THAT CORRESPOND TO THE CORNERS OF THE INSIDE FACE OF THE HEADWALLS THAT PRODUCE MAXIMUM VALUES FOR β 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>
<th>VARIABLE</th>
<th>DIMENSION</th>
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<tbody>
<tr>
<td>m</td>
<td>SEE EQUATIONS</td>
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<td>C</td>
<td>SEE EQUATIONS</td>
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<td>G</td>
<td>G = 23&quot;</td>
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<tr>
<td>F</td>
<td>F = 2TX</td>
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<tr>
<td>V</td>
<td>V = HT + TS - 12&quot;</td>
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<tr>
<td>Z</td>
<td>Z = 2A + B + C + 2E</td>
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<tr>
<td>TW</td>
<td>TW = MAX(14&quot; OR (BS - 12&quot;&quot;)</td>
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</tbody>
</table>

CONCRETE SINGLE BOX CULVERT
SKEW: SQUARED WINGS: STRAIGHT

PLAN OF LAYOUT DIMENSIONS

(01) AHEAD STATION WHERE STREAM FLOWS LEFT TO RIGHT.  (02) AHEAD STATION WHERE STREAM FLOWS RIGHT TO LEFT.
GENERAL NOTES:

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.

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 1/8".

LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.

BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

A1 BARS AT BOTTOM
A2 BARS AT TOP
12" (i)

A2 BARS AT TOP
J3 BARS AT FILL FACE
J4 BARS AT FILL FACE
J5 BARS AT BOTTOM
3'-0"
3'-0"

HALF PLANS
HALF PLANS ARE SYMMETRICAL ABOUT & CULVERT.

ELEVATION
J1 BARS MAY BE BENT IN FIELD OR SHOP.

TRANSVERSE JOINT
J5 BARS AT BOTTOM
J3 BARS AT TOP
J4 BARS AT BOTTOM
2-#5-E1 BARS
2-#7-J1 BARS
G BARS AT F.S.
M-01 BAR
M-01 BAR
M-01 BAR
G BARS AT F.S.
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G BARS AT F.S.
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M-01 BAR
M-01 BAR
G BARS AT F.S.
GENERAL ELEVATION A-A

ELEV. 1 CULVERT SEC 206.
CHANNEL BOTTOM SHALL BE GRADED WITHIN RIGHT OF WAY FOR TRANSITION OF CHANNEL BED TO CULVERT OPENINGS. CHANNEL BANKS SHALL BE TAPERED TO MATCH CULVERT OPENINGS.

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

PLAN OF LAYOUT DIMENSIONS

A ROADWAY OR E MEDIUM

GENERAL NOTES:

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

DESIGN LOADINGS:
- 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.

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.
Laying Out Tranverse Joints

Use a Tranverse Joint when barrel length is over 800 feet. Use additional joints to limit Cut Section Length and End Section Length measured along centerline of culvert to 50 feet. Minimum End Section Length shall be 3 feet measured along the shortest wall from the inside face of headwall to the Tranverse Joint.

To avoid locating Tranverse Joints under a traveled way with design fills 2 feet or less, the joints shall be located to minimize the length of joint under a traveled way.

Traveled Way is the roadway width with shoulder widths.

For Cut Section Details, see T05-16.

General Notes:

For Sections thru barrel, wings and headwalls, see Sheet 3 of 3. For bar sizes, spacing and dimensions of all reinforcement except 40 bars, see T03-77. For 40 bars, see T05-37.

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 1½”.

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 B2 bars

(e) A2 bar spacing

(f) Not specified on this sheet

(g) Not specified on this sheet

(h) For design fills over 2’0”

(i) For design fills 2’0” or less

Missouri Highways and Transportation Commission
105 West Capitol
Jefferson City, MO 65102
1-888-ASK-MODOT 1-888-275-6638

Jefferson City, MO 65102

Concrete Single Box Culvert

SKEW: Squared

WINGS: Flared

Reinforcement

Date Effective: 07/01/2015
Date Prepared: 07/13/2015

703-11J Sheet No. 2 of 3
LAYING OUT TRANVERSE JOINTS

UNLESS SHOWN ON ROADWAY OR BRIDGE PLANS

USE A TRANSVERSE JOINT WHEN BARREL LENGTH IS OVER 80 FEET. USE ADDITIONAL JOINTS TO LIMIT CUT SECTION LENGTH AND END SECTION 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.
- CONSTRUCTION JOINT KEY NOT SHOWN FOR CLARITY IN HALF PLANS AND ELEVATION. SEE SHEET 3 OF 3 FOR DETAILS.
- DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.
- MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1/4".
- LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.
- BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.
- (a) SAME SIZE AND SPACING AS B2 BARS
- (b) VARIES. 12" MAXIMUM
- (c) J4 BAR SPACING
- (d) SAME SIZE AND SPACING AS A2 BARS
- (e) A2 BAR SPACING
- (f) SAME SIZE AND SPACING AS A1 BARS
- (g) A1 BAR SPACING
- (h) FOR DESIGN FILLS OVER 2'-0" OR LESS
- (i) FOR DESIGN FILLS 2'-0" OR LESS

CONCRETE SINGLE BOX CULVERT

SKEW: LEFT ADVANCE
WINGS: STRAIGHT

REINFORCEMENT
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.

PLANT OF LAYOUT DIMENSIONS

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

GENERAL NOTES:

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

DESIGN LOADINGS:
MISSOURI HIGHWAY 93 LANE LOAD, CTR = 120 LB/CFT EQUIVALENT FLUID PRESSURE = 50 LB/GF (MIN. 1) 60 LB/GF (MAX)

DESIGN UNIT STRESSES:
CLASS III: CONCRETE 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 703.13.

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 SECTIONS OR BETWEEN WINDOWS SHALL BE IN ACCORDANCE WITH MISSOURI STANDARD PLANS.

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

CONCRETE SINGLE BOX CULVERT

SKEW: LEFT ADVANCE
WINGS: FLARED

LAYOUT

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

703.13J SHEET NO. 1 OF 3
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 UNDER THE TRAVELED WAY.

LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.

BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

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

LAYING OUT TRANVERSE JOINTS

GENERAL NOTES:

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.

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

FLAT 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 A2 BARS
B) VARIES - 12" MAXIMUM
C) J5 BAR SPACING
D) SAME SIZE AND SPACING AS A2 BARS
E) A2 BAR SPACING
F) SAME SIZE AND SPACING AS A1 BARS
G) A1 BAR SPACING
H) FOR DESIGN FILLS OVER 2 1/2" I) FOR DESIGN FILLS 2 1/2" OR LESS

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-458-MDOT (1-888-458-6368)
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

If any part of the barrier is exposed, the roadway fill shall provide 12 inches minimum cover.

EQUATIONS FOR COMPUTING A, B, C AND D

A = Angle of barrel slope with horizontal normal to & roadway or & median = ArcTan (ELEV. 1 + ELEV. 2)
B = Angle of fill slope with horizontal normal to & roadway or & median = ArcTan (HD - 93 Minus Lane Load, Earth 120 lb/ft)
C = Horizontal distance from upstream edge of shoulder to & roadway or & median
D = Horizontal distance from downstream edge of shoulder to & roadway or & median

HD = Horizontal Distance

General Notes:

Design specifications: 2010 AASHTO LRFD Bridge Design Specifications and 2010 Interim Revisions
Design loading:

Class B1 Concrete Box Culvert: F'c = 4000 psi

Missouri Highways and Transportation Commission

Concrete Single Box Culvert

Skew: Right Advance
Wings: Straight

Layout

Date Effective:

07/01/2015

Date Prepared:

07/01/2015

703.14J

Sheet No.

1 of 3
GENERAL NOTES:

1. FOR BAR SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT CONSTRUCTION JOINT KEY NOT SHOWN FOR CLARITY IN HALF PLANS AND EXCEPT J5 BARS. SEE 703.17. FOR J5 BARS. SEE 703.37.

LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.

BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE FOR SECTIONS THRU BARREL, WINGS AND HEADWALLS. SEE SHEET 3 OF 3 FOR DESIGN FILLS 2'-0" OR LESS.

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

GENERAL NOTES:

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

LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.

BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

(a) SAME SIZE AND SPACING AS B2 BARS

(b) VARIES, 12" MAXIMUM

(c) J4 BAR SPACING

(d) SAME SIZE AND SPACING AS A2 BARS

(e) A2 BAR SPACING

(f) SAME SIZE AND SPACING AS A1 BARS

(g) A1 BAR SPACING

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

(i) FOR DESIGN FILLS 2'-0" OR LESS
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 MISSOURI LRFD BRIDGE DESIGN SPECIFICATIONS AND 2010 INTERIM REVISIONS
- DESIGN LOADING: CLASS C1: CONCRETE BOX CULVERT, F'c = 4,000 PSI
- DESIGN UNIT STRESSES: CLASS C1: CONCRETE BOX CULVERT, F'c = 4,000 PSI
- MISCELLANEOUS: WHEN ALTERNATE PRECAST CONCRETE BOX CULVERT SECTIONS ARE USED, THE MINIMUM DISTANCE FROM INSIDE FACE OF HEADWALLS TO PRECAST CONCRETE BOX CULVERT OPENINGS. DIMENSIONS FOR WINGS AND HEADWALLS SHALL BE IN ACCORDANCE WITH MISSOURI STANDARD PLANS.

CONCRETE SINGLE BOX CULVERT
SKEW: RIGHT ADVANCE
WINGS: FLARED

LAYOUT

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

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.

ELEVATIONS 1 AND 2 CORRESPOND TO UPPER CORNERS OF THE INSIDE FACE OF THE HEADWALLS THAT PRODUCE MAXIMUM VALUES FOR BAND C.

THE TERM "A(CS)" IS THE DIFFERENCE IN ELEVATION BETWEEN TO ACCOUNT FOR A VARYING PROFILE GRADE THE ROADWAY FILL SHALL BE BASED ON STATIONS THAT CORRESPOND TO THE CORNERS OF THE INSIDE FACE OF THE HEADWALLS THAT PRODUCE MAXIMUM VALUES FOR B AND C.

THE TERMS "A(CS)" AND LOWER FLOW LINE ELEVATIONS AND MAY BE BELOW THE NATURAL STREAM BOTTOM DUE TO ENVIRONMENTAL REQUIREMENTS.

COORDINATE BACKFILL SURFACES

EQUATIONS FOR COMPUTING A, B, AND C

\[ A = \text{ANGLE OF BARREL SLOPE WITH HORIZONTAL NORMAL TO E ROADWAY OR E MEdIAN} \]
\[ B = \text{ANGLE OF FILL SLOPE WITH HORIZONTAL NORMAL TO E ROADWAY OR E MEdIAN} \]
\[ C = \text{HORIZONTAL DISTANCE FROM UPSTREAM EDGE OF SHOULDER TO = E RDWY. FILL - A(CS) - ALTAN} \]

SECTION 1: CONCRETE SINGLE BOX CULVERT

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

703.15E SHEET NO. 1 OF 3
GENERAL NOTES:

FOR SECTIONS THRU BARREL, WINGS AND HEADWALLS, SEE SHEET 7 OF 3 FOR BAR SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT. Bundle bars at a minimum of 23" at splices.

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".

LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPlices.

BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

1) SAME SIZE AND SPACING AS B2 BARS
2) VARY: 12" MAXIMUM
3) J5 BAR SPACING
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"
9) FOR DESIGN FILLS 2'-0" OR LESS
10) FOR DESIGN FILLS 2'-0" OR LESS

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 MALL 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 MINIMUM LENGTH OF JOINT UNDER A TRAVELED WAY.

TRAVELED WAY IS THE ROADWAY WIDTH MINUS WING SHOULDER WIDTHS.

FOR CUT SECTION DETAILS, SEE TO5-16.

LAYING OUT TRANVERSE JOINTS

UNLESS SHOWN ON ROADWAY OR BRIDGE PLANS

USE A TRANSVERSE JOINT WHEN BARREL LENGTH IS OVER 80 FEET. USE ADDITIONAL JOINTS TO LIMIT 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 MALL 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 MINIMUM LENGTH OF JOINT UNDER A TRAVELED WAY.

TRAVELED WAY IS THE ROADWAY WIDTH MINUS WING SHOULDER WIDTHS.

FOR CUT SECTION DETAILS, SEE TO5-16.

DATE EFFECTIVE: 07/01/2015
DATE PREPARED: 07/13/2015
### General Notes:

If design fill is between tabulated design fills, use the next higher design fill. If design fill is less than 0.5 feet, use 0.5 feet. For design fills between 2 feet and 4 feet, use the member thickness area of reinforcement and bar dimensions from the 2'-4" tabulated design fill. Special designs are required when the design fill is less than 2 feet or greater than 3 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 agency culverts meet strength and serviceability requirements for the design vertical level. Long fills shall include the level load.

### Concreto Single Box Culvert

**Member Thickness**

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<th>Bar Size</th>
<th>Diameter</th>
<th>Bar Dimensions</th>
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### Design Spans

#### 3' Span

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<td>5/8&quot;</td>
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### Plan Details

**Alternate 13 Bar**

At contractor's option, alternate 13 bars may be used when the distance between the ends of 14 bars is less than 2'-4". Dimension 1. Where L is equal to or less than 2'-4", dimension 1. Where L is greater than 2'-4", dimension 2. Dimension 1 and dimension 2 are required with alternate 13 bars with a length equal to 13 bars and size and spacing equal to 13 bars. Additional payment will be made for this substitution.

**Culvert Dimensions**

<table>
<thead>
<tr>
<th>Bar Size</th>
<th>Diameter</th>
<th>Bar Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>3&quot;</td>
<td>0.75</td>
<td></td>
</tr>
<tr>
<td>4&quot;</td>
<td>1.00</td>
<td></td>
</tr>
</tbody>
</table>

### Missouri Highways and Transportation Commission

185 West Capitol
Jefferson City, MO 65102
1-888-4S>M>ODOT 1-888-873-6665

Sheet No: 703.17A

Date: 2/22/2023

1 of 14
## General Notes:
- All dimensions are in inches unless otherwise specified.
- Design fills are measured from the top of the top slab to the top of the earth fill or adjacent ground.
- Culverts meet strength and serviceability requirements for the design vertical loads and live loads.

### CONCRETE SINGLE BOX CULVERT
- **Member Thickness**
- **Bar Size, Spacing & Dimensions**
- **Spans (S): 4 Feet Height (H): 2 Through 7 Feet**

### Material Specifications:
- Use reinforcing bar sizes as specified in the chart.
- Concrete cover shall be at least 2 inches at all locations.
- Splices shall be made in accordance with AASHTO specifications.

### Bar Dimensions Diagram
- Symmetrical about 4-culvert centerline.
- Bars are arranged in a 3-4-3 pattern.

### 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. Dimensions shall be as specified in the chart.

### Diagram Legends:
- D4: Design fill
- C1: Culvert 1
- C2: Culvert 2
- C3: Culvert 3
- C4: Culvert 4

---

### Table Content

<table>
<thead>
<tr>
<th>Span</th>
<th>Design Fill</th>
<th>Member Thickness</th>
<th>Bar Size</th>
<th>Spacing</th>
<th>Dimension</th>
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</tbody>
</table>

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### Diagram Description
- The diagram shows the arrangement of reinforcing bars for a single box culvert with dimensions and spacing as specified in the table.
- The bars are arranged in a 3-4-3 pattern to ensure proper reinforcement.

---

### Additional Notes
- For spans greater than 7 feet, consult the MoDOT Engineering Manual for detailed specifications.
- Use the MoDOT Bridge Design Manual for further guidance on culvert design and construction.
## CONCRETE SINGLE BOX CULVERT

### MEMBER THICKNESS

<table>
<thead>
<tr>
<th>Span (s)</th>
<th>Bar Size</th>
<th>Spacing &amp; Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 ft</td>
<td>3 in</td>
<td>3 ft or 4 ft</td>
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<tr>
<td></td>
<td></td>
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<tr>
<td>5 ft</td>
<td>4 in</td>
<td>4 ft</td>
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</tbody>
</table>

### BAR SIZE, SPACING & DIMENSIONS

- **Span (s):** 5 ft
- **Height (H):** 3 ft through 8 ft
- **Members:**
  - 13 bars
  - Top slab bars
  - Bottom slab bars
  - Wall bars

### GENERAL NOTES:
- Dimensions are in inches.
- Special design details are provided for specific cases.
- Culverts are designed for specific load conditions.

### ALTERNATE 13 BAR

- At contractor's option, alternate 13 bars may be used when the distance between the ends of 13 bars in the top slab is less than 2.1 feet. Dimensions 1 are to be used with the alternate 13 bars.

---

**For detailed specifications and design details, refer to the original source material.**

---

**Missouri Highways and Transportation Commission**

**1155 West Capitol**

**Jefferson City, MO 65102**

**1-888-MO-ROAD (1-888-667-6263)**

**DATE ISSUED:** 2/3/92

**DATE PREPARED:** 2/22/92

**FILE #:** 703.17A

**SHEET #:** 3 of 14
### Concrete Single Box Culvert

**Member Thickness**

- **Bar Size:** 6 FEET (FT)
- **Height (HT):** 3 FT THRU 9 FT

**Span (S): 6 FT**

<table>
<thead>
<tr>
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<th>T12</th>
<th>T14</th>
<th>T16</th>
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</table>

**Design Section**

- **Wall Bars:** 1 A1
- **Bottom Slab Bars:** 2 A2
- **Top Slab Bars:** 2 A1

**General Notes:**

If design fill is between tabulated design fills, use the next smaller fill. Except when design fill between 2 ft and 4 ft, use the smaller fill. Area of reinforcement and design fill from the 2”-4” tabulated design fill.

**Dimension Notes:**

- Dimensions are in inches unless otherwise specified.
- Design fills are measured from the top of top slab to the top of earth fill or embankment.

**Culverts Meet Strength and Serviceability Requirements for the Design Vehicle Level of Live Load as Defined in the AASHTO LRFD Bridge Design Specifications.”

**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’-0”. Dimension J3 (C) shall be used with alternate J3 bars. Alternate J3 bars are required with alternate J3 bars with a length equal to A1, A2 and A3 and the plating for J3 shall be increased. A supplemental payment will be made for this substitution.
### TABLE 5: 7 FT

| SPAN (S) | 7 FT
| --- | ---
| HEIGHT (H) | 4 FT OR 5 FT OR 6 FT
<table>
<thead>
<tr>
<th>DESIGN THICKNESS</th>
<th>A1</th>
<th>A2</th>
<th>A3</th>
<th>B1</th>
<th>B2</th>
<th>B3</th>
<th>C1</th>
<th>C2</th>
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<tbody>
<tr>
<td>T5</td>
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<td>T6</td>
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</table>

### TABLE 4: 5 FT

| SPAN (S) | 5 FT
| --- | ---
| HEIGHT (H) | 4 FT OR 6 FT
<table>
<thead>
<tr>
<th>DESIGN THICKNESS</th>
<th>A1</th>
<th>A2</th>
<th>B1</th>
<th>B2</th>
<th>B3</th>
<th>C1</th>
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</table>

### CONCRETE SINGLE BOX CULVERT

**MEMBER THICKNESS**

**BAR SIZE, SPACING & DIMENSIONS**

**SPAN (S): 7 FEET**

**HEIGHT (H): 4 THRU 10 FEET**

**GENERAL NOTES:**

- If design fill is between tabulated design fills, use the next higher fill increment. For design fills between 2 feet and 4 feet, use the member thickness, bar size, and reinforcement bar dimensions from the 2'-4" tabulated design fill.

- Specific designs are shown when the design fill is less than 3 feet or greater than 5 feet.

**BAR DIMENSIONS DIAGRAM**

Symmetrical about θ Culvert.

**ALTERNATE J3 BAR**

At contractor's option, alternate J3 bars may be used when 1-2 design fills less than 12" in the top slab is less than 2'-2". Dimensions 3 unit (C1) shall be used with alternate J3 bars. Member shall remain centered. For J3 bars, a minimum of 0.5 ft is required with alternate J3 bars with a length equal to the total and size and spacing equal to J3 bars. Additional payment will be made for this substitution.
### SPAN (S) = 10 FT

<table>
<thead>
<tr>
<th>SPAN (S) = 10 FT</th>
<th>HEIGHT (H) = 5 FT OR 6 FT OR 7 FT</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>WALL BARS</td>
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</table>

### SPAN 151 = 10 FT

<table>
<thead>
<tr>
<th>SPAN 151 = 10 FT</th>
<th>HEIGHT (H) = 13 FT OR 12 FT OR 13 FT</th>
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<tbody>
<tr>
<td></td>
<td>WALL BARS</td>
</tr>
<tr>
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</tbody>
</table>

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**GENERAL NOTES:**
- If design fill is between tabulated design fills, use the next larger design fill. Design fills between 2 ft and 4 ft deep are between the member thickness, area of reinforcement, and bar dimensions from the 2 ft to 4 ft tabulated design fill.
- Special designs are required when the design fill is less than 3 feet or greater than 50 feet.
- Design fills are measured from the top of the top slab to the top of the earth fill or bottom of culvert.
- Culverts meet strength and serviceability requirements for the design fills listed.
- Member thicknesses and bend reinforcement are required with alternate J3 bars with a length.
- For alternate J3 bars, the size and spacing or J3 bars may be used when the distance between the ends of J3 bars in the top slab is less than 2 ft.

---

**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.

---

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**
- 1155 WEST CAPITOL
- JEFFERSON CITY, MO 65102
- 1-888-ASK-MODOT (1-888-275-6636)

---

**CONCRETE SINGLE BOX CULVERT**
- MEMBER THICKNESS
- BAR SIZE, SPACING & DIMENSIONS

---

**SPAN (S): 10 FT**
- HEIGHT (H): 5 THRU 13 FT
### Table 1

<table>
<thead>
<tr>
<th>Design</th>
<th>Member Thickness</th>
<th>Top Slab Bars</th>
<th>J2 Bars</th>
<th>J4 Bars</th>
<th>Wall Bars</th>
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<tr>
<td></td>
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<td>A1 Bars</td>
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<th>J2 Bars</th>
<th>J4 Bars</th>
<th>Wall Bars</th>
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<th>Member Thickness</th>
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<th>J2 Bars</th>
<th>J4 Bars</th>
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### Table 4

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### Diagram

- **Alternate 3 Bar**: As contractor's option, alternate 3 bars may be used when the distance between the ends of 3 bars is greater than 3 feet. Each 3 bar shall be used with alternate 3 bars. Where it is less than 3 feet, 2 and 4 bars, respectively, alternate 3 bars shall be used. No additional pay will be made for this substitution.

### General Notes

- If design fill is between undulated design fills, care shall be taken to ensure that design fills are not less than 3 feet apart.
- Special designs are required when dimension 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 slabs to the top of the wall fill or runway.
- Culverts, slabs, and loads are required for the design vehicle load per-80 percent the lane load.
2" Cl. (13, 82)

ALTERNATE 13 BAR
AS CONTRACTOR'S OPTION. ALTERNATE 13 BARS MAY BE USED WHEN THE DISTANCE BETWEEN THE ENDS OF 13 BARS IS LESS THAN 8 FEET, BUT NOT LESS THAN 6 FEET. THE 13TH BAR SHALL BE USED WITH ALTERNATE 13 BARS.

OUTER 4 BARS: 5/8" X .515 SLP.
CENTRAL 10 BARS: 5/8" X .438 SLP.

BAR DIMENSIONS DIAGRAM
SYMBOLS ARE ABOUT 1 CULVERT.

GENERAL NOTES:
1. IF DESIGN FILL IS BETWEEN VARIED DESIGN FILLS, USE THE LARGER DESIGN FILL. USE THE SMALLER DESIGN FILL FOR DESIGN FILLS BETWEEN 2 FEET AND 2 FEET. USE THE TABLES FOR DESIGN FILLS 2 FEET OR LESS. ENSURE THESE ARE IN ACCORDANCE WITH THE MEMBER THICKNESS, AREA OF REINFORCEMENT AND BAR SPACING FROM THE 1ST, 2ND, AND 3RD FEET OF THE DESIGN FILL. SIX BARS OR LESS ARE ALLOWED IN THESE DESIGN FILL AREAS.
2. SPECIAL DESIGNS ARE REQUIRED WHEN THE DESIGN FILL IS LESS THAN 1 FEET OR GREATER THAN 10 FEET. DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.
3. DESIGN FILLS ARE MEASURED FROM THE TOP OF THE MEMBER TO THE TOP OF THE MEMBER PLUS THE FILL OR HARDWAY.

CONCRETE SINGLE BOX CULVERT
MEMBER THICKNESS BAR SIZE, SPACING & DIMENSIONS
SPAN (S) = 13 FEET
HEIGHT (H) = 7 THRU 16 FEET

DATE ISSUED: 7/23/2023
DATE PREPARED: 7/22/2023
703.17A
11 OF 14
### Table: Bar Dimensions Diagram

#### Symmetrical Culvert

<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>3 bars</td>
<td>8, 6, 6</td>
<td>8, 6, 6</td>
<td>6, 8</td>
<td>6, 8</td>
</tr>
<tr>
<td>4 bars</td>
<td>6, 6, 6, 6</td>
<td>6, 6, 6, 6</td>
<td>6, 6, 6, 6</td>
<td>6, 6, 6, 6</td>
</tr>
<tr>
<td>5 bars</td>
<td>6, 6, 6, 6, 6</td>
<td>6, 6, 6, 6, 6</td>
<td>6, 6, 6, 6, 6</td>
<td>6, 6, 6, 6, 6</td>
</tr>
</tbody>
</table>

#### ALTERNATE 3 BAR

**As Contractor's Option**: Alternate 3 bars may be used when the distance between the ends of 3 bars is 6 ft or greater. The number of bars shall be used with alternate 3 bars. Where 12, 14, 15, 16, 17, and 18 ft, respectively. Additional P1 bars are required with alternate 3 bars with a length of 3 ft or greater. No additional payment will be made for this substitution.

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**General Notes**:

- Design fill is between 2 feet and 4 feet. All special design fills are required. Special design fills 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 is measured from the top of the top slab to the top of earth fill or runway.

**Concrete Single Box Culvert**

**Bar Size, Spacing & Dimensions**

#### Span (S): 14 ft

**Height (H): 14 ft**

<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>3 bars</td>
<td>8, 6, 6</td>
<td>8, 6, 6</td>
<td>6, 8</td>
<td>6, 8</td>
</tr>
<tr>
<td>4 bars</td>
<td>6, 6, 6, 6</td>
<td>6, 6, 6, 6</td>
<td>6, 6, 6, 6</td>
<td>6, 6, 6, 6</td>
</tr>
<tr>
<td>5 bars</td>
<td>6, 6, 6, 6, 6</td>
<td>6, 6, 6, 6, 6</td>
<td>6, 6, 6, 6, 6</td>
<td>6, 6, 6, 6, 6</td>
</tr>
</tbody>
</table>

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**Missouri Highways and Transportation Commission**

115 West Capitol
Jefferson City, MO 65102
1-888-454-MDOT (1-888-426-6368)

**Concrete**

**Single Box Culvert**

**Member Thickness**

**Bar Size, Spacing & Dimensions**

**Span (S): 14 ft**

**Height (H): 14 ft**

**Design**: 14 bars

---

**Data Captured**: 12/23/2023

**Sheet No.**: 103.17A

**Date Prepared**: 7/22/2023

**Page 12 of 14**
### SPAN (S) = 15 FT
#### HEIGHT (H) = 8 FT OR 9 FT OR 10 FT

<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></td>
<td>AL BARS</td>
<td>A2 BARS</td>
<td>A3 BARS</td>
<td>A4 BARS</td>
</tr>
<tr>
<td></td>
<td>Size/SPA, Size/SPA</td>
<td>Size/SPA, Size/SPA</td>
<td>Size/SPA, Size/SPA</td>
<td>Size/SPA, Size/SPA</td>
</tr>
<tr>
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</tr>
</tbody>
</table>

### SPAN (S) = 15 FT
#### HEIGHT (H) = 11 FT OR 12 FT OR 13 FT

<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>
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<tr>
<td></td>
<td>AL BARS</td>
<td>A2 BARS</td>
<td>A3 BARS</td>
<td>A4 BARS</td>
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</tr>
</tbody>
</table>

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### GENERAL NOTES:
If design fills are between tabulated design fills, use the next largest tabulated fill. Design fills between 2 ft and 4 ft are assumed to be 5 ft. Design fills greater than 9 ft are assumed to be 8 ft. Design fills greater than 11 ft are assumed to be 10 ft.

**Special Design Notes:**
- Design fits are measured from the top of top slab to the top of earth fill or grade.
- Dimensions are in inches unless otherwise specified.
- Members are made to be on grade.
- Culverts meet strength and serviceability requirements for the design vehicle level. 50% of the load shall be assumed to be dead load. Additional payment will be made for this substitution.

---

### CONCRETE SINGLE BOX CULVERT
#### Member Thickness:
- Bar Size, Spacing & Dimensions
- SPAN (S): 15 FT
- HEIGHT (H): 8 THRU 16 FT

---

**Date Review:** 2/22/2022
**Date Prepared:** 2/22/2022
**Sheet No.:** 13 of 14
### AREA OF STEEL REQUIRED FOR J5 BARS IN WINGS (SQ. IN./FT.)

<table>
<thead>
<tr>
<th>Wall Height (in.)</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
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<th>14</th>
<th>15</th>
<th>16</th>
<th>17</th>
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<td>0.436</td>
<td>0.479</td>
<td>0.576</td>
<td>0.614</td>
<td>0.773</td>
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<td>0.168</td>
<td>0.168</td>
<td>0.168</td>
</tr>
</tbody>
</table>

**NOTE:**

- The wall height is equal to the barrel height (HT) plus the top slab thickness (TS). When wall height is in between or outside tabulated wall heights, the area of steel required should be interpolated between or extrapolated from adjacent areas of steel using the actual wall height.

- If area of steel in the wall of the culvert (J4 bars) is greater than that indicated in the table, use the same size and spacing for the J5 bars in the wings. However, if the area of steel provided by matching size and spacing of the J4 bars is insufficient, increase the size of the J5 bars (4#8 max.) and/or decrease the spacing of the J5 bars (6" min.). Use smallest bar size possible based on minimum spacing.

- Minimum steel to be used in the wings for J5 bars is #4 bars at 14" centers (area of steel = 0.1683 SQ. IN./FT.)

**See Standard Plan 703.37C, Sheet 2 of 2 for Backfill Slope to be used based on skew.**
NOTE: USE 65° FOR ANGLE E FOR ALL WINGS WHICH MAKE AN ANGLE D GREATER THAN 90°.

EDGE OF "SHOULDER"

WING BACKFILL TABLE

<table>
<thead>
<tr>
<th>WING SKEW (DEGREES)</th>
<th>A (DEGREES)</th>
<th>B TRANSITION ANGLE (DEGREES)</th>
<th>C BACKFILL SLOPE (H:V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;0</td>
<td>&gt;90</td>
<td>65</td>
<td>3:1</td>
</tr>
<tr>
<td>0</td>
<td>90</td>
<td>65</td>
<td>3:1</td>
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<td>65</td>
<td>58</td>
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</tr>
<tr>
<td>60</td>
<td>30</td>
<td>10</td>
<td>2:1</td>
</tr>
</tbody>
</table>

PLAN OF WINGS AND SLOPE TRANSITION LINES

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

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

SIDE ELEVATION

SKEW OF 20° OR MORE

NOT LESS THAN 20° X STA. OP TRANSVERSE STEEL + 2°
GENERAL NOTES:

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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.

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THE BOX EXTENSION OPENING SHALL BE BUILT TO MATCH THE EXISTING BOX OPENING. WHEN THE EXISTING OPENING DOES NOT MATCH A SIZE FROM THE TABLES, THE NEXT LARGER SIZE SHALL BE USED FOR DETERMINING THE MEMBER SIZES AND REINFORCEMENT.
GENERAL NOTES:

1. FOR SECTIONS THROUGH BARREL, #6 BARS AND HEADWALLS, SEE SHEET 3 OF 3. FOR BAR SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT EXCEPT #5 BARS, SEE 703-41. FOR #5 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 1.5".

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

6. BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

(a) SAME SIZE AND SPACING AS ADJACENT B BARS

(b) VARIES. 12" MAXIMUM

(c) J4 BAR SPACING

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

CONCRETE DOUBLE BOX CULVERT

SKREW: SQUARED
WINGS: STRAIGHT

REINFORCEMENT

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

LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.

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

TRAVELED WAY IS THE ROADWAY WIDTH MINUS SHOULDER WIDTHS.

FOR CUT SECTION DETAILS, SEE 703-46.
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 JS BARS, SEE 703.40. FOR JS BARS, SEE 703.37.

2. CONSTRUCTION JOINT KEY NOT SHOWN FOR CLARITY IN PLAN AND SECTION. 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 SPLICES.

6. BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

7a) SAME SIZE AND SPACING AS ADJACENT B BARS

7b) VARY, 12" MAXIMUM

7c) NOT SPECIFIED ON THIS SHEET

7d) NOT SPECIFIED ON THIS SHEET

7e) NOT SPECIFIED ON THIS SHEET

7f) NOT SPECIFIED ON THIS SHEET

7g) NOT SPECIFIED ON THIS SHEET

7h) FOR DESIGN FILLS OVER 2'-0"

7i) FOR DESIGN FILLS 2'-0" OR LESS

7j) NOT REQUIRED FOR CLEAR SPANS > 10'-0"

7k) FOR CLEAR SPAN > 10'-0"

7l) FOR CLEAR SPAN > 13'-0"

8. IF REQUIRED, THE MINIMUM LENGTH EACH SIDE OF E WALL SHALL BE THE GREATER OF 48" BAR STÄMPERS OR A CLEAR SPAN.

THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

CONCRETE DOUBLE BOX CULVERT

SKEW: SQUARED WINGS: STRAIGHT

REINFORCEMENT

DATE EFFECTIVE: 5/13/2015

DATE PREPARED: 10/01/2011

J3 BARS AT TOP

B BARS IN WALLS ARE NOT SHOWN FOR CLARITY. FOR PLACEMENT, SEE SHEET 1 OF 3.

FLOW

3'-0"

H1 BARS ALTERNATED WITH H2 BARS

A1 BARS AT BOTTOM

PLAN OF TOP SLAB

H1 BARS ALTERNATED WITH H2 BARS

A1 BARS

SECTION NEAR INTERIOR WALL

J1 BARS MAY BE BENT IN FIELD OR SHOP.
LAYING OUT TRANVERSE JOINTS

UNLESS SHOWN ON BRIDGE PLANS

USE A TRANVERSE JOINT WHEN BARREL LENGTH IS OVER 30 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 INCLINE FACE OF HEADWALL TO THE TRANVERSE JOINT.

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

TRAVELED WAY IS THE ROADWAY WIDTH MINUS SHOULDER WIDTHS.

FOR CUT SECTION DETAILS, SEE 703.46.

GENERAL NOTES:

FOR SECTIONS THRU BARREL, WINGS AND HEADWALLS, SEE SHEET 3 OF 3 FOR BAR SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT EXCEPT J5 BARS. SEE 703.47. FOR J5 BARS, SEE 703.37.

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

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

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

LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPICES.

BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

(a) SAME SIZE AND SPACING AS ADJACENT BARS
(b) VARIES. 12" MAXIMUM
(c) 14 BAR SPACING
(d) SAME SIZE AND SPACING AS 2 BARS
(e) A2 BAR SPACING

DATE EFFECTIVE: 03/01/2011
DATE PREPARED: 03/23/2011

703.41H SHEET NO. 1 OF 3
GENERAL NOTES:

1. FOR DESIGN FILLS OVER 2'-0" NOT SPECIFIED ON THIS SHEET.
2. SAME SIZE AND SPACING AS A2 BARS.
3. FOR CLEAR SPANS > 10'-0" #9 IF REQUIRED.
4. THE MINIMUM LENGTH EACH SIDE OF A WALL SHALL BE THE GREATER OF 48 BAR DIAMETERS OR THE CLEAR SPAN PARALLEL TO THE DIAGONAL OF THE WALL.
5. FOR CLEAR SPAN > 13'-0".

LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.

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

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

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

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.

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 1-1/4".

Lap longitudinal bars a minimum of 23" at splices.

Beveled headwall shall be located at upstream end.

(a) Same size and spacing as adjacent B bars.
(b) Varies, 12" maximum.
(c) Not specified on this sheet.
(d) Same size and spacing as A2 bars.
(e) A2 bar spacing.
(f) Not specified on this sheet.
(g) Not specified on this sheet.
(h) For design fills over 2'-0".
(i) For design fills 2'-0" or less.
(j) Not required for clear spans ≤ 10'-0".
(k) For clear span > 10'-0".

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 parallel to long dimension of headwall.
GENERAL NOTES:

(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

WAHL ENGINEERING

1010112011

5/13/2015

WINGS:

STRAIGHT

LEFT ADVANCE

JEFFERSON CITY, MO 65102

CITY, MO 65102

JEFFERSON COMMISSION

1 OF 3

105 WEST CAPITOL

JEFFERSON CITY, MO 65102

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

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

CONCRETE DOUBLE BOX CULVERT

SKEW: LEFT ADVANCE

WINGS: STRAIGHT

REINFORCEMENT

DATE PREPARED: 5/13/2015

703-42H SHEET NO: 1 OF 3

LAYING OUT TRANVERSE JOINTS

UNLESS SHOWN ON BRIDGE PLAN

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

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

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

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

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

TRAVELED WAY IS THE ROADWAY WIDTH MINUS SHOULDER WIDTHS.

FOR CUT SECTION DETAILS, SEE 703.46.

FOR BAR SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT CONSTRUCTION JOINT KEY NOT SHOWN FOR CLARITY IN PLAN AND ELEVATION. SEE SHEET 3 OF 3 FOR DETAILS.

EXCEPT J5 BARS. SEE 703.47. FOR J5 BARS. SEE 703.37.

LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.

BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

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

LONGITUDINAL BARS A MINIMUM OF 23" AT SPACES.

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

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

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

TRAVELED WAY IS THE ROADWAY WIDTH MINUS SHOULDER WIDTHS.

FOR CUT SECTION DETAILS, SEE 703.46.

GENERAL NOTES:

(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

WAHL ENGINEERING

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5/13/2015

WINGS:

STRAIGHT

LEFT ADVANCE

JEFFERSON CITY, MO 65102

CITY, MO 65102

JEFFERSON COMMISSION

1 OF 3

105 WEST CAPITOL

JEFFERSON CITY, MO 65102

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MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

CONCRETE DOUBLE BOX CULVERT

SKEW: LEFT ADVANCE

WINGS: STRAIGHT

REINFORCEMENT

DATE PREPARED: 5/13/2015

703-42H SHEET NO: 1 OF 3

LAYING OUT TRANVERSE JOINTS

UNLESS SHOWN ON BRIDGE PLAN

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

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

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

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

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

TRAVELED WAY IS THE ROADWAY WIDTH MINUS SHOULDER WIDTHS.

FOR CUT SECTION DETAILS, SEE 703.46.

FOR BAR SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT CONSTRUCTION JOINT KEY NOT SHOWN FOR CLARITY IN PLAN AND ELEVATION. SEE SHEET 3 OF 3 FOR DETAILS.

EXCEPT J5 BARS. SEE 703.47. FOR J5 BARS. SEE 703.37.

LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.

BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

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

LONGITUDINAL BARS A MINIMUM OF 23" AT SPACES.

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

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

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

TRAVELED WAY IS THE ROADWAY WIDTH MINUS SHOULDER WIDTHS.

FOR CUT SECTION DETAILS, SEE 703.46.

GENERAL NOTES:

(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

WAHL ENGINEERING

1010112011

5/13/2015

WINGS:

STRAIGHT

LEFT ADVANCE

JEFFERSON CITY, MO 65102

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JEFFERSON COMMISSION

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MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

CONCRETE DOUBLE BOX CULVERT

SKEW: LEFT ADVANCE

WINGS: STRAIGHT

REINFORCEMENT

DATE PREPARED: 5/13/2015

703-42H SHEET NO: 1 OF 3

LAYING OUT TRANVERSE JOINTS

UNLESS SHOWN ON BRIDGE PLAN

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

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

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

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

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

TRAVELED WAY IS THE ROADWAY WIDTH MINUS SHOULDER WIDTHS.

FOR CUT SECTION DETAILS, SEE 703.46.

GENERAL NOTES:

(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
PLAN OF TOP SLAB
BARS IN WALLS ARE NOT SHOWN FOR CLARITY. FOR PLACEMENT, SEE SHEET 1 OF 3.

SECTION NEAR INTERIOR WALL
J1 BARS MAY BE SUNK 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 703.47. FOR J5 BARS, SEE 703.37.
CONSTRUCTION JOINT KEY NOT SHOWN FOR CLARITY IN PLAN AND SECTION. SEE SHEET 5 OF 3 FOR DETAILS.

1. DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.
2. MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1/4".
3. LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.
4. 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) SAME SIZE AND SPACING AS A2 BARS
   e) A2 BAR SPACING
   f) SAME SIZE AND SPACING AS AT BARS
   g) AT BAR SPACING
   h) FOR DESIGN FILLS OVER 2'-0" OR LESS
   i) FOR DESIGN FILLS 2'-0" OR LESS
   j) NOT REQUIRED FOR CLEAR SPANS < 10'-0"
   k) FOR CLEAR SPAN > 10'-0"
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. MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1 1/2".

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

4. BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

5. FOR CUT SECTION DETAILS, SEE 703.46.

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 OF JOINT UNDER THE TRAVELED WAY.

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

8. 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.

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

10. FOR CUT SECTION DETAILS, SEE 703.46.

11. 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.

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

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

14. BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

15. FOR CUT SECTION DETAILS, SEE 703.46.

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

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

18. 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.

19. TRAVELED WAY IS THE ROADWAY WIDTH MINUS WING SHOULDER WIDTHS.

20. FOR CUT SECTION DETAILS, SEE 703.46.

21. 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.

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

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

24. BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

25. FOR CUT SECTION DETAILS, SEE 703.46.

26. 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.

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

28. 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.

29. TRAVELED WAY IS THE ROADWAY WIDTH MINUS WING SHOULDER WIDTHS.

30. FOR CUT SECTION DETAILS, SEE 703.46.

31. 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.

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

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

34. BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

35. FOR CUT SECTION DETAILS, SEE 703.46.

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

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

38. 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.

39. TRAVELED WAY IS THE ROADWAY WIDTH MINUS WING SHOULDER WIDTHS.

40. FOR CUT SECTION DETAILS, SEE 703.46.

41. 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.

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

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

44. BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

45. FOR CUT SECTION DETAILS, SEE 703.46.

46. 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.

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

48. 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.

49. TRAVELED WAY IS THE ROADWAY WIDTH MINUS WING SHOULDER WIDTHS.

50. FOR CUT SECTION DETAILS, SEE 703.46.

51. 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.

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

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

54. BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

55. FOR CUT SECTION DETAILS, SEE 703.46.

56. 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.

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

58. 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.

59. TRAVELED WAY IS THE ROADWAY WIDTH MINUS WING SHOULDER WIDTHS.

60. FOR CUT SECTION DETAILS, SEE 703.46.
Laying Out Transverse Joints

Use a transverse joint when barrel length is over 90 feet. Use additional joints to limit cut section length and end section barrel length measured along centerline of culvert to 50 feet. Minimum end section length shall be 3 feet measured along the shortest wall from the inside face of headwall to the transverse joint. To avoid locating transverse joints under a traveled way with design fills 2 feet or less, the joints shall be located to minimize the length of joint under a traveled way. Transverse way is the roadway width minus wing shoulder widths. For cut section details, see 703.46.

General Notes:

For sections through barrel, wings and headwalls, see Sheet 3 of 3. For bar sizes, spacing and dimensions of all reinforcement except J5 bars, see 703.44. For J5 bars, see 703.37.

Drawing not to scale. Follow dimensions. Minimum clearance to reinforcing steel shall be 1 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" max
(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

Plan of Bottom Slab

Elevation of exterior wall: J5 bars may be bent in field or shop.

General Notes:

For sections through barrel, wings and headwalls, see Sheet 3 of 3. For bar sizes, spacing and dimensions of all reinforcement except J5 bars, see 703.44. For J5 bars, see 703.37.

Drawing not to scale. Follow dimensions. Minimum clearance to reinforcing steel shall be 1 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" max
(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

Plan of Bottom Slab

Elevation of exterior wall: J5 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 703.47. FOR J5 BARS, SEE 703.37.
- BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.
- SAME SIZE AND SPACING AS ADJACENT B BARS
- SAME SIZE AND SPACING AS A2 BARS
- SAME SIZE AND SPACING AS A1 BARS
- MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1'.
- VARIETIES: 12" MAXIMUM
- NOT SPECIFIED ON THIS SHEET
- VARIES. 12" MAXIMUM
- H2 BARS AS REQUIRED. QUANTITY OF BARS VARIES WITH SKEW.
- H2 BARS AT TOP
- BE THE GREATER OF 4B BAR DIAMETERS OR IF REQUIRED. THE MINIMUM LENGTH EACH SIDE OF
- THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.
- NOT REQUIRED FOR CLEAR SPANS > 13'-0".
- IF REQUIRED, THE MINIMUM LENGTH EACH SIDE OF BAR SHALL BE THE GREATER OF 4B BAR DIAMETERS OR IF CLEAR SPAN > 10'-0".
- IF CLEAR SPAN > 15'-0"
- J5 BARS MAY BE BENT IN FIELD OR SHOP.
- J3 BARS AT TOP
- J3 BARS AT TOP
- A1 BARS AT BOTTOM
- A1 BARS AT BOTTOM
- VARIED A BARS AT BOTTOM
- VARIED A BARS AT BOTTOM

PLAN OF TOP SLAB

G BARS IN WALLS ARE NOT SHOWN FOR CLARITY. FOR PLACEMENT, SEE SHEET 1 OF 3.

PLAN OF TOP SLAB

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.
- BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.
- SAME SIZE AND SPACING AS ADJACENT B BARS
- SAME SIZE AND SPACING AS A2 BARS
- SAME SIZE AND SPACING AS A1 BARS
- MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1'.
- VARIETIES: 12" MAXIMUM
- NOT SPECIFIED ON THIS SHEET
- VARIES. 12" MAXIMUM
- H2 BARS AS REQUIRED. QUANTITY OF BARS VARIES WITH SKEW.
- H2 BARS AT TOP
- BE THE GREATER OF 4B BAR DIAMETERS OR IF REQUIRED. THE MINIMUM LENGTH EACH SIDE OF
- THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.
- NOT REQUIRED FOR CLEAR SPANS > 13'-0".
- IF REQUIRED, THE MINIMUM LENGTH EACH SIDE OF BAR SHALL BE THE GREATER OF 4B BAR DIAMETERS OR IF CLEAR SPAN > 10'-0".
- IF CLEAR SPAN > 15'-0"
- J5 BARS MAY BE BENT IN FIELD OR SHOP.
- J3 BARS AT TOP
- J3 BARS AT TOP
- A1 BARS AT BOTTOM
- A1 BARS AT BOTTOM
- VARIED A BARS AT BOTTOM
- VARIED A BARS AT BOTTOM

PLAN OF TOP SLAB

G BARS IN WALLS ARE NOT SHOWN FOR CLARITY. FOR PLACEMENT, SEE SHEET 1 OF 3.

PLAN OF TOP SLAB

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.
- BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.
- SAME SIZE AND SPACING AS ADJACENT B BARS
- SAME SIZE AND SPACING AS A2 BARS
- SAME SIZE AND SPACING AS A1 BARS
- MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1'.
- VARIETIES: 12" MAXIMUM
- NOT SPECIFIED ON THIS SHEET
- VARIES. 12" MAXIMUM
- H2 BARS AS REQUIRED. QUANTITY OF BARS VARIES WITH SKEW.
- H2 BARS AT TOP
- BE THE GREATER OF 4B BAR DIAMETERS OR IF REQUIRED. THE MINIMUM LENGTH EACH SIDE OF
- THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.
- NOT REQUIRED FOR CLEAR SPANS > 13'-0".
- IF REQUIRED, THE MINIMUM LENGTH EACH SIDE OF BAR SHALL BE THE GREATER OF 4B BAR DIAMETERS OR IF CLEAR SPAN > 10'-0".
- IF CLEAR SPAN > 15'-0"
- J5 BARS MAY BE BENT IN FIELD OR SHOP.
- J3 BARS AT TOP
- J3 BARS AT TOP
- A1 BARS AT BOTTOM
- A1 BARS AT BOTTOM
- VARIED A BARS AT BOTTOM
- VARIED A BARS AT BOTTOM

PLAN OF TOP SLAB

G BARS IN WALLS ARE NOT SHOWN FOR CLARITY. FOR PLACEMENT, SEE SHEET 1 OF 3.

PLAN OF TOP SLAB

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.
- BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.
- SAME SIZE AND SPACING AS ADJACENT B BARS
- SAME SIZE AND SPACING AS A2 BARS
- SAME SIZE AND SPACING AS A1 BARS
- MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1'.
- VARIETIES: 12" MAXIMUM
- NOT SPECIFIED ON THIS SHEET
- VARIES. 12" MAXIMUM
- H2 BARS AS REQUIRED. QUANTITY OF BARS VARIES WITH SKEW.
- H2 BARS AT TOP
- BE THE GREATER OF 4B BAR DIAMETERS OR IF REQUIRED. THE MINIMUM LENGTH EACH SIDE OF
- THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.
- NOT REQUIRED FOR CLEAR SPANS > 13'-0".
- IF REQUIRED, THE MINIMUM LENGTH EACH SIDE OF BAR SHALL BE THE GREATER OF 4B BAR DIAMETERS OR IF CLEAR SPAN > 10'-0".
- IF CLEAR SPAN > 15'-0"
- J5 BARS MAY BE BENT IN FIELD OR SHOP.
- J3 BARS AT TOP
- J3 BARS AT TOP
- A1 BARS AT BOTTOM
- A1 BARS AT BOTTOM
- VARIED A BARS AT BOTTOM
- VARIED A BARS AT BOTTOM

PLAN OF TOP SLAB

G BARS IN WALLS ARE NOT SHOWN FOR CLARITY. FOR PLACEMENT, SEE SHEET 1 OF 3.

PLAN OF TOP SLAB

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.
- BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.
- SAME SIZE AND SPACING AS ADJACENT B BARS
- SAME SIZE AND SPACING AS A2 BARS
- SAME SIZE AND SPACING AS A1 BARS
- MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1'.
- VARIETIES: 12" MAXIMUM
- NOT SPECIFIED ON THIS SHEET
- VARIES. 12" MAXIMUM
- H2 BARS AS REQUIRED. QUANTITY OF BARS VARIES WITH SKEW.
- H2 BARS AT TOP
- BE THE GREATER OF 4B BAR DIAMETERS OR IF REQUIRED. THE MINIMUM LENGTH EACH SIDE OF
- THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.
- NOT REQUIRED FOR CLEAR SPANS > 13'-0".
- IF REQUIRED, THE MINIMUM LENGTH EACH SIDE OF BAR SHALL BE THE GREATER OF 4B BAR DIAMETERS OR IF CLEAR SPAN > 10'-0".
- IF CLEAR SPAN > 15'-0"
- J5 BARS MAY BE BENT IN FIELD OR SHOP.
- J3 BARS AT TOP
- J3 BARS AT TOP
- A1 BARS AT BOTTOM
- A1 BARS AT BOTTOM
- VARIED A BARS AT BOTTOM
- VARIED A BARS AT BOTTOM
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 1/2".
- Lap longitudinal bars a minimum of 23" at splices. Beveled headwall shall be located at upstream end.
- (a) Same size and spacing as adjacent B bars
- (b) Varies. 12" maximum
- (c) Not specified on this sheet
- (d) Same size and spacing as A2 bars
- (e) A2 bar spacing
- (f) Same size and spacing as A1 bars
- (g) A1 bar spacing
- (h) For design fills over 2'-0".
- (i) For design fills 2'-0" or less.
- (j) Not required for clear spans 5'-10"-0".
- #1 for clear span 5'-10"-0"
- #2 for clear span 5'-15"-0"
- If required: The minimum length each side of J5 bars shall be the greater of 8" diameters or 1/2 clear span. The clear span is parallel to long direction of headwall.
- (k) H2 bars as required. Quantity of bars varies with skew.

REINFORCEMENT

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.
SPAN (S) = 3 FT
HEIGHT (H T) = 5 FT OR 6 FT

<table>
<thead>
<tr>
<th>DESIGN FILL</th>
<th>A1 BARS</th>
<th>A2 BARS</th>
<th>A3 BARS</th>
<th>A4 BARS</th>
<th>WALL BARS</th>
</tr>
</thead>
<tbody>
<tr>
<td>T5 B5 T5 T5</td>
<td>14-5</td>
<td>12-5</td>
<td>10-5</td>
<td>8-5</td>
<td>C</td>
</tr>
<tr>
<td>T5 B5 T5 T5</td>
<td>10-5</td>
<td>12-5</td>
<td>14-5</td>
<td>16-5</td>
<td>C</td>
</tr>
<tr>
<td>T5 B5 T5 T5</td>
<td>8-5</td>
<td>10-5</td>
<td>12-5</td>
<td>14-5</td>
<td>C</td>
</tr>
<tr>
<td>T5 B5 T5 T5</td>
<td>6-5</td>
<td>8-5</td>
<td>10-5</td>
<td>12-5</td>
<td>C</td>
</tr>
<tr>
<td>T5 B5 T5 T5</td>
<td>4-5</td>
<td>6-5</td>
<td>8-5</td>
<td>10-5</td>
<td>C</td>
</tr>
<tr>
<td>T5 B5 T5 T5</td>
<td>2-5</td>
<td>4-5</td>
<td>6-5</td>
<td>8-5</td>
<td>C</td>
</tr>
<tr>
<td>T5 B5 T5 T5</td>
<td>0-5</td>
<td>2-5</td>
<td>4-5</td>
<td>6-5</td>
<td>C</td>
</tr>
</tbody>
</table>

GENERAL NOTES:
If design fill is between tabulated design fills, use the next smaller fill size. If design fill is between 2 and 4 feet, use the next smaller fill size. If design fill is greater than 4 feet, use the next larger fill size. If design fill is greater than 8 feet, use the next larger fill size. If design fill is greater than 12 feet, use the next larger fill size.

Special considerations should be made when the design fill is less than 3 feet or greater than 4 feet.

Dimensions are in inches unless otherwise specified.

Design fills are measured from the top of the top slab to the top of the earth fill or roadway.

Culverts must be long enough to accommodate the design flow rate, the bed and bank slopes, and the required drain length.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

CONCRETE DOUBLE BOX TUBE
MEMBER THICKNESS
BAR SIZE, SPACING & DIMENSIONS
SPAN (S): 3 FEET
HEIGHT (H T): 2 TO 6 FEET

DATE ISSUED: 2/22/2021
DATE PREPARED: 1/22/2023
703.47A 1 OF 27
### SPAN (S) = 4 FT

#### HEIGHT (H) = 2 FT OR 3 FT

<table>
<thead>
<tr>
<th>DESIGN FILL</th>
<th>A1 BARS</th>
<th>A3 BARS</th>
<th>C1 BARS</th>
<th>C3 BARS</th>
<th>B1 BARS</th>
<th>B3 BARS</th>
</tr>
</thead>
<tbody>
<tr>
<td>T5 B5 T1 T6</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>
</tr>
<tr>
<td>T7</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>
</tr>
<tr>
<td>T8</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>
</tr>
<tr>
<td>T9</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>
</tr>
<tr>
<td>T10</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>
</tr>
</tbody>
</table>

#### SPAN (S) = 4 FT

#### HEIGHT (H) = 4 FT OR 5 FT

<table>
<thead>
<tr>
<th>DESIGN FILL</th>
<th>A1 BARS</th>
<th>A3 BARS</th>
<th>C1 BARS</th>
<th>C3 BARS</th>
<th>B1 BARS</th>
<th>B3 BARS</th>
</tr>
</thead>
<tbody>
<tr>
<td>T5 B5 T1 T6</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>
</tr>
<tr>
<td>T7</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>
</tr>
<tr>
<td>T8</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>
</tr>
<tr>
<td>T9</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>
</tr>
<tr>
<td>T10</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>
</tr>
</tbody>
</table>

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**GENERAL NOTES:**

If design fill is between tabulated design fill, use the next larger fills. Except for design fills between 2 ft and 3 ft, for design fills between 2 ft and 4 ft use the member thickness, area of reinforcement and bar dimensions from the 2 ft "tabulated design fill." Special designs are required when the design fill is less than 1 foot or greater than 3 feet.

Dimensions are in inches unless otherwise specified. Design bars 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 load, live load, and dead load.

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

115 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-856-MODOT (1-888-263-6636)

**CONCRETE DOUBLE BOX CULVERT**

**MEMBER THICKNESS**

**BAR SIZE, SPACING & DIMENSIONS**

**SPAN (S): 4 FEET**

**HEIGHT (H): 2 THRU 5 FEET**

**DATE APPROVED:** 2/15/2003

**DATE PREPARED:** 3/22/2003

**SHEET NO.:** 703.47A

**2 OF 27**
### Design Fill

**Design Fill Table**

GENERAL NOTES:

1. DESIGN FILL IS BETWEEN TABULATED DESIGN FILLS. USE THE NEXT LARGE DESIGN FILL FOR DESIGN FILL BETWEEN 2 FEET AND 4 FEET. FOR DESIGN FILLS BETWEEN 2 FEET AND 4 FEET USE THE MEMBER THICKNESS AND BAR DIMENSIONS FROM THE 2'-4' TABULATED DESIGN FILL.

2. SPECIAL DESIGNS ARE NOT DESIGNED WHEN THE DESIGN FILL IS LESS THAN 2 FEET OR GREATER THAN 32 FEET.

3. DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

4. DESIGN FILLS ARE MEASURED FROM THE TOP OF THE TOP SLAB TO THE TOP OF THE EARTH FILL OR GRAVEL.

5. CULVERTS MEET STRENGTH AND SERVICEABILITY REQUIREMENTS FOR THE DESIGN VERTICAL LOAD, LIVE LOAD, 93 PMHS THE LAST LOAD.

MISSOURI HIGHWAYS AND TRANSPORTATION
COMMISSION

CONCRETE
DOUBLE BOX CULVERT

MEMBER THICKNESS
BAR SIZE, SPACING & DIMENSIONS

SPAN (S): 5 FEET
HEIGHT (H): 7 FEET TO 8 FEET

DATE APPROVED: 2/21/2023
DATE PREPARED: 3/22/2023

703.47A
5 OF 27
GENERAL NOTES:

1. IF DESIGN FILL IS BETWEEN TABULATED DESIGN FILL, USE THE NEXT
   LOWER TABULATED DESIGN FILL.
2. DESIGN FILL IS DESIGNED TO WITHSTAND 12 INCH OF WET
   SOIL AND A FEET OF WATER. FOR DESIGN FILL BETWEEN 2 FEET AND 4 FEET OF
   WATER, USE THE MEMBER THICKNESS, AREA OF REINFORCEMENT AND BAR
   DIMENSIONS FROM THE 2' - 4' TABULATED DESIGN FILL.
3. SPECIAL DESIGNS ARE REQUIRED WHEN THE DESIGN FILL IS LESS THAN 1
   FOOT OR GREATER THAN 3 FOOT.
4. DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.
5. DESIGN FILL IS MEASURED FROM THE TOP OF THE TOP SLAB TO THE TOP
   OF EARTH FILL OR GRAVITY.

CULVERTS MEET STRENGTH AND SERVICEABILITY REQUIREMENTS FOR THE
DESIGN VERTICALLY LOAD, LOAD HLD, B3 MINUS THE LIVE LOAD.

CONCRETE DOUBLE BOX CULVERT
MEMBER THICKNESS
BAR SIZE, SPACING & DIMENSIONS
SPAN (S): 7 FEET
HEIGHT (H): 9' THRU 10 FEET
### CONCRETE DOUBLE BOX CULVERT

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

- **Span (S):** 8 ft
- **Height (H):** 4 ft or 5 ft or 6 ft

#### Design Fill

<table>
<thead>
<tr>
<th>Design Fill</th>
<th>Men's Figures</th>
<th>Top Slab Bar</th>
<th>Sub Slab Bar</th>
<th>Bottom Slab Bar</th>
<th>Wall Bar</th>
</tr>
</thead>
<tbody>
<tr>
<td>T5 B5 T0</td>
<td>A1 B5 A3 B5 C1</td>
<td>A2 B5 A4 B5 C2</td>
<td>A4 B5 A6 B5 C4</td>
<td>A6 B5 A8 B5 C6</td>
<td>A8 B5 A10 B5 C8</td>
</tr>
<tr>
<td>T6 B6 T1</td>
<td>A1 B6 A3 B6 C1</td>
<td>A2 B6 A4 B6 C2</td>
<td>A4 B6 A6 B6 C4</td>
<td>A6 B6 A8 B6 C6</td>
<td>A8 B6 A10 B6 C8</td>
</tr>
<tr>
<td>T7 B7 T2</td>
<td>A1 B7 A3 B7 C1</td>
<td>A2 B7 A4 B7 C2</td>
<td>A4 B7 A6 B7 C4</td>
<td>A6 B7 A8 B7 C6</td>
<td>A8 B7 A10 B7 C8</td>
</tr>
</tbody>
</table>

#### General Notes:

- If design fill is between tabulated design fills, use the next higher fill. Design fills are between 2 feet and 4 feet. For design fills between 2 feet and 4 feet, use the member thickness, area of reinforcement, and bar dimensions from the 2' x 4' tabulated design fill.

- Special designs are reviewed when the design fill is less than 1 foot or greater than 30 feet.

- Dimensions are in inches unless otherwise specified.

- Design fills are measured from the top of concrete slab to the top of earth fill or roadway.

- Culverts meet strength and durability requirements for the design vertical level, flood filling, and vehicular loading.

---

**Symmetrical about culvert center.**

- **Bar Dimensions Diagram:**
  - A1 Bar
  - A2 Bar
  - A3 Bar
  - A4 Bar
  - A5 Bar
  - A6 Bar
  - A7 Bar
  - A8 Bar
  - A9 Bar
  - A10 Bar
  - A11 Bar
  - A12 Bar
  - A13 Bar
  - A14 Bar
  - A15 Bar
  - A16 Bar
  - A17 Bar
  - A18 Bar
  - A19 Bar
  - A20 Bar
  - A21 Bar
  - A22 Bar
  - A23 Bar
  - A24 Bar
  - A25 Bar
  - A26 Bar
  - A27 Bar
  - A28 Bar
  - A29 Bar
  - A30 Bar
  - A31 Bar
  - A32 Bar
  - A33 Bar
  - A34 Bar
  - A35 Bar
  - A36 Bar
  - A37 Bar
  - A38 Bar
  - A39 Bar
  - A40 Bar

---

**Missouri Highways and Transportation Commission**

**DATE APPROVED:** 2/13/2023
**DATE PREPARED:** 3/22/2023
**SHEET NO.:** 10 of 27

**703.47A**
## Concrete Double Box Culvert

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

**Span (S): 9 Feet**
**Height (Ht): 5 Feet or 6 Feet or 7 Feet**

### General Notes:
- If design fill is between tabulated design fills, use the next lower fill.
- Design fills between 2 feet and 4 feet of the member thickness, area of reinforcement and bar dimensions from the 2'- 4' tabulated design fill.
- Special designs are modified when the design fill is less than 1 foot or greater than 6 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 only.
- Culverts are designed for maximum design loads.

### Bar Dimensions Diagram

The diagram shows the placement of bars in the culvert sections, indicating the positions of H1, H2, H1 & H2 bars.

### Table: Bar Dimensions

<table>
<thead>
<tr>
<th>Bar</th>
<th>Top Bar</th>
<th>Bottom Bar</th>
<th>Top Bar</th>
<th>Bottom Bar</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1</td>
<td>C1</td>
<td>C3</td>
<td>C6</td>
<td>C4</td>
</tr>
<tr>
<td>H2</td>
<td>C3</td>
<td>C6</td>
<td>C4</td>
<td>C1</td>
</tr>
</tbody>
</table>

### Table: Bar Sizes

<table>
<thead>
<tr>
<th>Design Fill</th>
<th>Top Bar</th>
<th>Bottom Bar</th>
<th>Top Bar</th>
<th>Bottom Bar</th>
</tr>
</thead>
<tbody>
<tr>
<td>2'-4'</td>
<td>C1</td>
<td>C3</td>
<td>C6</td>
<td>C4</td>
</tr>
<tr>
<td>5'-6'</td>
<td>C1</td>
<td>C3</td>
<td>C6</td>
<td>C4</td>
</tr>
</tbody>
</table>

### Material Specifications

- **Missouri Highways and Transportation Commission**
- **115 West Capitol**
- **Jefferson City, MO 65102**
- **1-888-456-MODOT (1-888-456-6636)**

**Data Approved by:**
**Date Prepared:**
**Sheet No.:**

703.47A
12 of 27
### SPAN (S) = 10 FT

<table>
<thead>
<tr>
<th>DESIGN</th>
<th>MONEY THICKNESS</th>
<th>A1 BARS</th>
<th>A2 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>D1 BARS</th>
<th>D2 BARS</th>
<th>D3 BARS</th>
<th>D4 BARS</th>
<th>D5 BARS</th>
<th>D6 BARS</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 upheld</td>
<td>28-09</td>
<td>5 0.5</td>
<td>3 0.5</td>
<td>2 0.5</td>
<td>1 0.5</td>
<td>1 0.5</td>
<td>0.5</td>
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<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>3 up</td>
<td>28-09</td>
<td>5 0.5</td>
<td>3 0.5</td>
<td>2 0.5</td>
<td>1 0.5</td>
<td>1 0.5</td>
<td>0.5</td>
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<td>0.5</td>
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<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>4 up</td>
<td>28-09</td>
<td>5 0.5</td>
<td>3 0.5</td>
<td>2 0.5</td>
<td>1 0.5</td>
<td>1 0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
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<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>5 up</td>
<td>28-09</td>
<td>5 0.5</td>
<td>3 0.5</td>
<td>2 0.5</td>
<td>1 0.5</td>
<td>1 0.5</td>
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<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
</tr>
</tbody>
</table>

### BAR DIMENSIONS DIAGRAM

**SYMmetrical about Culvert**

**C1**
- 13 BAR
- 12 BAR
- 11 BAR
- 10 BAR
- 9 BAR
- 8 BAR
- 7 BAR
- 6 BAR
- 5 BAR
- 4 BAR
- 3 BAR

**C2**
- 2 BAR
- 1 BAR
- 0 BAR

**C3**
- Culvert

**C4**
- 14 BAR
- 13 BAR
- 12 BAR
- 11 BAR
- 10 BAR
- 9 BAR
- 8 BAR
- 7 BAR
- 6 BAR
- 5 BAR
- 4 BAR
- 3 BAR

**C5**
- Culvert

**C6**
- Culvert

---

**GENERAL NOTES:**
- If Design Fill is between tabulated Design Fill, use the next smaller Design Fill, except for Design Fill between 2 feet and 4 feet use the Money Thickness Area of Reinforcement and Bar Dimensions from the 2 3/4 tabulated Design Fill.
- Special designs are required when the Design Fill is less than 2 feet or greater than 10 feet.
- Dimensions are in inches unless otherwise specified.
- Design Fill is measured from the top of top slab to the top of earth fill or roadway.

**CULVERTS:** Meet strength and serviceability requirements for the Design Vertical Load Fill on Culverts using the Culvert load tables.

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**
- Jefferson City, MO 65102
- 1-888-ASK-MODOT (1-888-275-6636)

**DATE APPLIED:** 1/21/2003
**DATE PREPARED:** 3/22/2023
**SHEET NO.:** 703.47A
**PAGE:** 14 OF 27
GENERAL NOTES:

If design fill is between tabulated design fills, use the next lower fill. If fill is less than 2 feet, use the intermediate fill between 2 feet and 4 feet. Design fills between 3 feet and 5 feet use the member thickness, area of reinforcement and bar dimensions from the 2.5" tabulated design fill.

Special designs are avoided when the design fill is less than 1 foot or greater than 3 feet.

Dimensions are in inches unless otherwise specified.

Design fills are measured from the top of the top slab to the top of earth fill or roadway.

Culverts meet strength and serviceability requirements for the design vertical load, live load, bridge loads.

Missouri Highways and Transportation Commission

CONCRETE DOUBLE BOX CULVERT

Member Thickness, Bar Size, Spacing & Dimensions

Span (S): 11 Feet
Height (Ht): 12 Thru 14 Feet

Data Approved: 6/13/2003
Sheet No.: 703.47A
Date Prepared: 3/22/2003

17 of 27
### Concrete Double Box Culvert

**Member Thickness**

<table>
<thead>
<tr>
<th>BAR SIZE</th>
<th>SPAN (S) = 14 FT</th>
<th>SPAN (S) = 14 FT OR 16 FT</th>
</tr>
</thead>
<tbody>
<tr>
<td>14 BARS</td>
<td>13 FT OR 15 FT</td>
<td>15 FT OR 16 FT</td>
</tr>
</tbody>
</table>

**Design Fill**

<table>
<thead>
<tr>
<th>DESIGN FILL</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1 BARS</td>
</tr>
<tr>
<td>A2 BARS</td>
</tr>
<tr>
<td>A3 BARS</td>
</tr>
<tr>
<td>A4 BARS</td>
</tr>
<tr>
<td>D1 BARS</td>
</tr>
<tr>
<td>D2 BARS</td>
</tr>
<tr>
<td>B1 BARS</td>
</tr>
</tbody>
</table>

**General Notes**

- If design fill is between tabulated design fill, use the next larger listed fill. Design fill limits between 1 and 2 feet. For design fills between 2 and 4 feet, use design fill limits and bar dimensions from the 2' - 4' tabulated design fill.
- Special designs are provided when the design fill is less than 92 inches or greater than 52 inches.
- Design fills are measured from the top of the fill slab to the top of fill earth for roadways.
- Culverts meet strength and serviceability requirements for the design vertical load, load limit, and live loads.

**Concrete Thickness Diagram**

- Symmetrical about culvert centerline.
# Concrete Double Box Culvert

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

**SPAN (S) = 15 FT**  
**HEIGHT (H) = 8 FT OR 9 FT OR 10 FT**

### Design Fill

<table>
<thead>
<tr>
<th>Design of Culvert</th>
<th>MODEN THICKN</th>
<th>SW</th>
<th>SIZE SPA</th>
<th>SIZE SPA</th>
<th>C1</th>
<th>SW</th>
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### Bottom Bars

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<th>Design of Culvert</th>
<th>SW</th>
<th>SIZE SPA</th>
<th>SIZE SPA</th>
<th>C1</th>
<th>SW</th>
<th>SIZE SPA</th>
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### General Notes:

1. If design fill is between tabulated design fills, use the next smaller design fill. Keep the modulus between 2 and 4 feet. For design fills between 2 and 4 feet, use the member thickness, area of reinforcement and bar dimensions from the 2' 4" tabulated design fill.

2. Special designs are required when the design fill is less than 1 foot or greater than 10 feet.

3. Members are spaced 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, live load plus the local dead load, and the external static load.**

---

**Missouri Highways and Transportation Commission**

105 West Capitol
Jefferson City, MO 65102
1-888-MODOT (1-888-663-6868)

**Data Prepared:** 3/22/2023
**Sheet No.:** 703.47A
**Page No.:** 24 of 27
### General Notes:

- If design fill is between tabulated design fills, use the next smaller design fill. If design fill is greater than 3 feet and a fourth, use the member thickness and area of reinforcement and bar dimensions from the 4" tabulated design fill.
- Special designs are modified when the design fill is less than 3 feet or greater than 12 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 levee load fills in these conditions.

### Concrete Double Box Culvert

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

**Span (S): 15 ft**

**Height (H): 14 ft OR 15 ft OR 16 ft**

<table>
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**Bar Dimensions Diagram**

**Symmetrical About E Culvert**

**Concrete Missouri Highways and Transportation Commission**

**Sheet No.: 203 47A**

**Date Prepared: 3/22/2023**
CONCRETE
DOUBLE BOX Culvert
MEMBER THICKNESS, BAR SIZE, SPACING & DIMENSIONS
SPAN (S): 16 FEET
HEIGHT (H): 8 FT OR 9 FT OR 10 FT

GENERAL NOTES:

If design fill is between tabulated design fills, use the next
higher design fill. Enter tabulated elevations between 2
feet and a foot. For design fills between 2 feet and a foot use
the member thickness, area of reinforcement and bar dimensions
from the 2", 4" tabulated design fill.

Special designs are provided when the design fill is less than 1
foot or greater than 20 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.

CURVATURES MEET STRENGTH AND SERVICEABILITY REQUIREMENTS FOR
THE DESIGN VERTICAL CURVE. LOAD FIELDS ARE THE CURVATURE.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

1155 WEST CAPITO

CONTRACTOR: MOSS, INC.

DATE: 3/22/2022

703.47A

26 OF 27
<table>
<thead>
<tr>
<th>SPAN (S)</th>
<th>16 FT</th>
<th>HEIGHT (H)</th>
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**GENERAL NOTES:**
- If design fill is between tabulated design fills, use the next smaller fill. If design fill is between 14 feet and 16 feet,设计 fill is between 14 feet and 16 feet, use the member thickness, area of reinforcement and bar dimensions from the 14' 16' tabulated design fill.
- Special designs are modified when the design fill is less than 1 foot or greater than 30 feet.
- Dimensions are in inches unless otherwise specified.
- Design fills are measured from the top of the top slab to the top of the earth fill or grade.

**CULVERTS MEET STRENGTH AND SERVICEABILITY REQUIREMENTS FOR THE DESIGN VERTICAL LAYOUT. LONG SECTIONS MEET THE LAYOUT LONG.
PART ELEVATION OF EXTERIOR WALL
(PIPE DIAMETER = 24" OR MORE)
(WALL THICKNESS = 8" TO 12")

PART ELEVATION OF EXTERIOR WALL
(PIPE DIAMETER = 24" OR MORE)
(WALL THICKNESS = 12" OR MORE)

PART ELEVATION OF EXTERIOR WALL
(PIPE DIAMETER = 24" OR MORE)
(WALL THICKNESS = LESS THAN 24")

NOTE: DASHED BARS REPRESENT PLAN REINFORCEMENT.
SOLID BARS INDICATE ADDITIONAL Mn BARS.
BAR COVER FROM FACE OF CONCRETE = 1-1/2".
SEE ROAD PLANS FOR LOCATION, SIZE AND TYPE OF PIPE.
PLACE 5/16" JOINT FILLER AROUND REINFORCED CONCRETE PIPE AND EMULSIFIED ASPHALT AROUND CORRUGATED METAL PIPE AT PIPE INLET.
THE BLOCK-OUT MAY BE ELIMINATED AT CONTRACTOR'S OPTION. BLOCK-OUT IS ELIMINATED. REINFORCEMENT SHALL BE AS SHOWN EXCEPT PLAN REINFORCEMENT MAY BE BENT TO CLEAR PIPE.
ADDITIONAL REINFORCEMENT REQUIRED FOR BLOCK-OUT IS NOT INCLUDED IN ESTIMATED QUANTITIES. NO SEPARATE PAYMENT WILL BE MADE FOR ADDITIONAL REINFORCING REQUIRED.

NOTE: KEYED JOINT FOR ADJACENT WALLS.
NOTE: PLAN REINFORCING BARS TO CLEAR PIPE BLOCK-OUT AS SHOWN.
NOTE: Mn BARS TO CLEAR PIPE BLOCK-OUT AS SHOWN.

NOTE: Mn BARS TO CLEAR PIPE BLOCK-OUT AS SHOWN.
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 THIS SHEET FOR DETAILS.

3. DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

4. FOR SECTIONS THRU BARREL, WINGS AND HEADWALLS, SEE SHEET 3 OF THIS SHEET FOR DIMENSIONS OF ALL REINFORCEMENT EXCEPT J5 BARS. SEE 703.87 FOR J5 BARS. SEE 703.37.

5. SHORTEST WALL FROM THE INSIDE FACE OF HEADWALL TO THE TRANSVERSE JOINT.

6. USE A TRANSVERSE JOINT WHEN BARREL LENGTH IS OVER 80 FEET. USE ADDITIONAL JOINTS TO LIMIT CUT SECTION LENGTH AND END SECTIONS. BARREL LENGTH MEASURED ALONG CENTERLINE OF CULVERT TO TRANSVERSE JOINT.

7. MINIMUM END SECTION LENGTH SHALL BE 5 FEET MEASURED ALONG THE SHORTEST WALL FROM THE INSIDE FACE OF HEADWALL TO THE TRANSVERSE JOINT.

8. TO AVOID LOCATING TRANSVERSE JOINTS UNDER A TRAVELED WAY, DESCRIBED 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 WIDTH.

9. FOR CUT SECTION DETAILS, SEE 703.86.

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 WIDTH.

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

13. USE A TRANSVERSE JOINT WHEN BARREL LENGTH IS OVER 80 FEET. USE ADDITIONAL JOINTS TO LIMIT CUT SECTION LENGTH AND END SECTIONS. BARREL LENGTH MEASURED ALONG CENTERLINE OF CULVERT TO TRANSVERSE JOINT.

14. MINIMUM END SECTION LENGTH SHALL BE 5 FEET MEASURED ALONG THE SHORTEST WALL FROM THE INSIDE FACE OF HEADWALL TO THE TRANSVERSE JOINT.

15. TO AVOID LOCATING TRANSVERSE JOINTS UNDER A TRAVELED WAY, DESCRIBED 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 WIDTH.

16. FOR CUT SECTION DETAILS, SEE 703.86.

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 OF JOINT UNDER THE TRAVELED WAY.

18. TRAVELED WAY IS THE ROADWAY WIDTH MINUS SHOULDER WIDTH.

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

20. USE A TRANSVERSE JOINT WHEN BARREL LENGTH IS OVER 80 FEET. USE ADDITIONAL JOINTS TO LIMIT CUT SECTION LENGTH AND END SECTIONS. BARREL LENGTH MEASURED ALONG CENTERLINE OF CULVERT TO TRANSVERSE JOINT.

21. MINIMUM END SECTION LENGTH SHALL BE 5 FEET MEASURED ALONG THE SHORTEST WALL FROM THE INSIDE FACE OF HEADWALL TO THE TRANSVERSE JOINT.

22. TO AVOID LOCATING TRANSVERSE JOINTS UNDER A TRAVELED WAY, DESCRIBED 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 WIDTH.

23. FOR CUT SECTION DETAILS, SEE 703.86.

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

25. TRAVELED WAY IS THE ROADWAY WIDTH MINUS SHOULDER WIDTH.

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

27. USE A TRANSVERSE JOINT WHEN BARREL LENGTH IS OVER 80 FEET. USE ADDITIONAL JOINTS TO LIMIT CUT SECTION LENGTH AND END SECTIONS. BARREL LENGTH MEASURED ALONG CENTERLINE OF CULVERT TO TRANSVERSE JOINT.

28. MINIMUM END SECTION LENGTH SHALL BE 5 FEET MEASURED ALONG THE SHORTEST WALL FROM THE INSIDE FACE OF HEADWALL TO THE TRANSVERSE JOINT.

29. TO AVOID LOCATING TRANSVERSE JOINTS UNDER A TRAVELED WAY, DESCRIBED 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 WIDTH.

30. FOR CUT SECTION DETAILS, SEE 703.86.

31. 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.

32. TRAVELED WAY IS THE ROADWAY WIDTH MINUS SHOULDER WIDTH.

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

34. USE A TRANSVERSE JOINT WHEN BARREL LENGTH IS OVER 80 FEET. USE ADDITIONAL JOINTS TO LIMIT CUT SECTION LENGTH AND END SECTIONS. BARREL LENGTH MEASURED ALONG CENTERLINE OF CULVERT TO TRANSVERSE JOINT.

35. MINIMUM END SECTION LENGTH SHALL BE 5 FEET MEASURED ALONG THE SHORTEST WALL FROM THE INSIDE FACE OF HEADWALL TO THE TRANSVERSE JOINT.

36. TO AVOID LOCATING TRANSVERSE JOINTS UNDER A TRAVELED WAY, DESCRIBED 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 WIDTH.

37. FOR CUT SECTION DETAILS, SEE 703.86.

38. 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.

39. TRAVELED WAY IS THE ROADWAY WIDTH MINUS SHOULDER WIDTH.

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

41. USE A TRANSVERSE JOINT WHEN BARREL LENGTH IS OVER 80 FEET. USE ADDITIONAL JOINTS TO LIMIT CUT SECTION LENGTH AND END SECTIONS. BARREL LENGTH MEASURED ALONG CENTERLINE OF CULVERT TO TRANSVERSE JOINT.

42. MINIMUM END SECTION LENGTH SHALL BE 5 FEET MEASURED ALONG THE SHORTEST WALL FROM THE INSIDE FACE OF HEADWALL TO THE TRANSVERSE JOINT.

43. TO AVOID LOCATING TRANSVERSE JOINTS UNDER A TRAVELED WAY, DESCRIBED 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 WIDTH.

44. FOR CUT SECTION DETAILS, SEE 703.86.

45. 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.

46. TRAVELED WAY IS THE ROADWAY WIDTH MINUS SHOULDER WIDTH.

47. WHEN BARREL LENGTH IS OVER 80 FEET, USE A TRANSVERSE JOINT.
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 1/8".

LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.

BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

(a) SAME SIZE AND SPACING AS ADJACENT 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 > 13'-0"

IF REQUIRED, THE MINIMUM LENGTH EACH SIDE OF A WALL SHALL BE THE GREATER OF 40 BARS DIAMETERS OR A CLEAR SPAN. THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

PLAN OF TOP SLAB

B BARS IN WALLS ARE NOT SHOWN FOR CLARITY. FOR PLACEMENT, SEE SHEET 1 OF 3.
LAYING OUT TRANVERSE JOINTS

UNLESS SHOWN ON BRIDGE PLAN

USE A TRANSVERSE JOINT WHEN BARREL LENGTH IS OVER 60 FEET.
USE ADDITIONAL JOINTS TO LIMIT CUT SECTION LENGTH AND END A
SECTOR BARREL LENGTH MEASUREMENT ALONG CENTERLINE OF CULVERT TO
THE TRANSVERSE JOINT.

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 OUT SECTION DETAILS, SEE 703.66.

GENERAL NOTES:

FOR SECTIONS THRU BARREL, WINGS AND HEADWALLS, SEE SHEET 3 OF
3. FOR BAR SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT
EXCEPT J5 BARS, SEE 703.87. FOR J5 BARS, SEE 703.37.

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

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1 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) J4 BAR SPACING
(d) SAME SIZE AND SPACING AS A2 BARS
(e) A2 BAR SPACING.
GENERAL NOTES:

FOR SECTIONS THRU BARREL, WINGS AND HEADWALLS, SEE SHEET 3 OF 3. FOR BAR SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT EXCEPT J5 BARS, SEE 703.87. FOR J5 BARS, SEE 703.37.

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

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1".

LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.

BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

(a) SAME SIZE AND SPACING AS ADJACENT B BARS
(b) VARIES, 12" MAXIMUM
(c) NOT SPECIFIED ON THIS SHEET
(d) SAME SIZE AND SPACING AS A2 BARS
(e) A2 BAR SPACING
(f) NOT SPECIFIED ON THIS SHEET
(g) NOT SPECIFIED ON THIS SHEET
(h) FOR DESIGN FILLS OVER 2'-0"
(i) FOR DESIGN FILLS 2'-0" OR LESS
(j) NOT REQUIRED FOR CLEAR SPAN > 13'-0"

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.

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

DATE EFFECTIVE: 12/1/2011
DATE PREPARED: 12/1/2011

703-81H SHEET NO. 2 OF 3

REINFORCEMENT

CONCRETE
TRIPLE BOX CULVERT
SKEW: SQUARED
WINGS: FLARED
GENERAL NOTES:

For sections thru barrel, wings and headwalls, see sheet 5 of 703.87. For details of reinforcement except J5 bars, see 703.4. For J5 bars, see 703.37.

Construction Joint Key Not Shown for clarity in plan and elevation. See Sheet 3 of 3 for details.

Drawing Not To Scale. Follow Dimensions.

Minimum Clearance to reinforcing steel shall be 1¾" lap. Longitudinal bars a minimum of 23" at splices.

Bevel headwall shall be located at upstream end.

J1 Bars may be bent in field or shop.

Laying Out Transverse Joints

Use a transverse joint when barrel length is over 80 feet. Use additional joints to limit cut section length and end section barrel length measured along centerline of culvert to transverse joint.

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 3 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 3 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 703.86.

PLAN OF BOTTOM SLAB

ELEVATION OF EXTERIOR WALL

J1 Bars may be bent in field or shop.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

CONCRETE TRIPLE BOX CULVERT

SKEW: LEFT ADVANCE

WINGS: STRAIGHT

REINFORCEMENT

DATE EFFECTIVE: 12/01/2011

DATE PREPARED: 5/13/2009

703-82H SHEET NO. 1 OF 3
FLOW 2-#7-J1 BARS AT TOP

PLANT OF TOP SLAB
B BARS IN WALLS ARE NOT SHOWN FOR CLARITY.
FOR PLACEMENT. SEE SHEET 1 OF 3.

PLAN OF TOP SLAB
B BARS IN WALLS ARE NOT SHOWN FOR CLARITY.
FOR PLACEMENT, SEE SHEET 1 OF 3.

GENERAL NOTES:
FOR SECTIONS THRU BARREL, RINGS AND HEADWALLS, SEE SHEET 2 OF 3. FOR BAR SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT EXCEPT J5 BARS, SEE 703.87. FOR J5 BARS, SEE 703.87.
CONSTRUCTION joint KEY NOT SHOWN FOR clarity IN PLAN AND SECTION, SEE SHEET 2 OF 3 FOR DETAILS.
DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.
MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 11/".
AP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.
BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.
(i) SAME SIZE AND SPACING AS ADJACENT B BARS
(ii) VARIES. 12" MAXIMUM
(iii) NOT SPECIFIED ON THIS SHEET
(iv) SAME SIZE AND SPACING AS J2 BARS
(v) J2 BAR SPACING
(vi) SAME SIZE AND SPACING AS H1 BARS
(vii) AT BAR SPACING
(viii) FOR DESIGN FILLS OVER 2'-0"
(ix) FOR DESIGN FILLS 2'-0" OR LESS
(x) NOT REQUIRED FOR CLEAR SPAN< 10'-0"
(xi) #8 FOR CLEAR SPAN< 10'-0"
(xii) #9 FOR CLEAR SPAN> 10'-0"
(xiii) IF REQUIRED, THE MINIMUM LENGTH EACH SIDE OF W WALL SHALL BE THE GREATER OF 48 BAR DIAMETERS OR 3'-0".
(xiv) THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.
(xv) J0 BARS AS REQUIRED. QUANTITY OF BARS VARIES WITH SKEW.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
(504) 275-2761 (FAX) 275-2768
MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT 1-888-275-6636

SHEET NO.
2 OF 3

CONCRETE
TRIPLE BOX CULVERT
SKEW: LEFT ADVANCE
WINGS: STRAIGHT
REINFORCEMENT

DATE EFFECTIVE:
3/01/2011
DATE PREPARED:
9/13/2010

703-82H
SHEET NO. 2 OF 3
Laying Out Tranverse Joints

Use a tranverse 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 80 feet. Minimum end section length shall be 3 feet measured along the shortest wall from the inside face of headwall to the tranverse joint.

To avoid locating tranverse joints under a traveled way with design fills 3 feet or less, the following shall apply:

- Barrel length up to 90 feet without a tranverse joint. Cut section lengths up to 60 feet.
- When barrel and cut section length restrictions require tranverse joints to be located under a traveled way with design fills 3 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 703.66.

Plan of Bottom Slab

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>J4 bars at bottom</td>
<td>G bars (a)</td>
<td>B1 bar pairs at bottom</td>
<td>G bar pairs (a)</td>
</tr>
<tr>
<td>J5 bars at bottom</td>
<td>G bars (a)</td>
<td>B1 bar pairs at bottom</td>
<td>G bar pairs (a)</td>
</tr>
<tr>
<td>J4 bars at bottom</td>
<td>G bars (a)</td>
<td>B1 bar pairs at bottom</td>
<td>G bar pairs (a)</td>
</tr>
</tbody>
</table>

Developed Elevation of Exterior Wall

J1 and J6 bars may be bent in field or shop.

General Notes:

- For sections thru barrel, wings and headwalls, see Sheet 5 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 shown for clarity in plan and elevation. See Sheet 3 of 3 for details.
- Drawing not to scale. Follow dimensions. Minimum clearance to reinforcing steel shall be 1\%.
- Lap longitudinal bars a minimum of 23\% at splices. Beveled headwall shall be located at upstream end.

Reinforcement:

- A1 bar spacing (g) varies. 12" maximum
- J4 bar spacing (b) same size and spacing as adjacent B bars
- J5 bar spacing (a) same size and spacing as A1 bars
- A2 bar spacing (f) same size and spacing as A1 bars
- A3 bar spacing (d) same size and spacing as A1 bars

Concrete Triple Box Culvert

Skew: Left Advance
Wings: Flared

Missouri Highways and Transportation Commission

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

Reinforcement

1/20/2011
1/30/2011
703.83H
1 of 3

Date Prepared: 1/30/2011
Date Effective: 1/20/2011

Missouri Department of Transportation

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

- For sections thru barrel, rings and headwalls, see Sheet 3 of 3. For bar sizes, spacing and dimensions of all reinforcement except J5 bars, see 703.87. For J5 bars, see 703.37.
- Construction joint key not shown for clarity in plan and section. See sheet 3 of 3 for details.
- Drawing not to scale. Follow dimensions.
- Minimum clearance to reinforcing steel shall be 1 1/2".
- Lap longitudinal bars a minimum of 23" at splices.
- Beveled headwall shall be located at upstream end.
- Joint size and spacing as adjacent B bars
- Varies. 12" maximum
- Not specified on this sheet
- Joint size and spacing as A2 bars
- A1 bar spacing
- Joint size and spacing as A1 bars
- A1 bar spacing
- Joint size and filling over 2'-0".
- Joint size and filling 2'-0" or less
- Joint not required for clean spans 5'-0" - 10'-0"
- Joint for clean span 5'-0" - 15'-0"
- If required, the minimum length each side of an wall shall be the greater of 48 bar diameters or a clean span. The clean span is parallel to long direction of headwall.
- Joint in bars as required. Quantity of bars varies with skew.

PLAN OF TOP SLAB

B bars in walls are not shown for clarity.
For placement, see sheet 1 of 3.

J1 bars may be bent in field or shop.

J1 bars may be bent in field or shop.

REINFORCEMENT

DATE EFFECTIVE: 12/01/2011
DATE PREPARED: 10/13/2009

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

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

CONCRETE TRIPLE BOX CULVERT
SKEW: LEFT ADVANCE
WINGS: FLARED

REINFORCEMENT
GENERAL NOTES:

1. FOR BAR SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT EXCEPT J5 BARS, SEE 703.87. FOR J5 BARS, SEE 703.37.

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

3. BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

4. 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.

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

6. FOR CUT SECTION DETAILS, SEE 703.86.

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

8. CUT SECTION LENGTHS UP TO 60 FEET

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

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

   a) J4 BAR SPACING
   b) SAME SIZE AND SPACING AS A2 BARS
   c) SAME SIZE AND SPACING AS A1 BARS
   d) SAME SIZE AND SPACING AS A1 BARS
   e) SAME SIZE AND SPACING AS A1 BARS
   f) SAME SIZE AND SPACING AS A1 BARS
   g) SAME SIZE AND SPACING AS A1 BARS

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 60 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:

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

2. CUT SECTION LENGTHS UP TO 60 FEET

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

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

   a) SAME SIZE AND SPACING AS A1 BARS
   b) SAME SIZE AND SPACING AS A2 BARS
   c) SAME SIZE AND SPACING AS A1 BARS
   d) SAME SIZE AND SPACING AS A1 BARS
   e) SAME SIZE AND SPACING AS A1 BARS
   f) SAME SIZE AND SPACING AS A1 BARS
   g) SAME SIZE AND SPACING AS A1 BARS

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

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS. MINIMUM END SECTION LENGTH SHALL BE 3 FEET MEASURED ALONG THE SHORTEST WALL FROM THE INSIDE FACE OF HEADWALL TO THE TRANSVERSE JOINT.

J4 BARS AT FILL FACE

<table>
<thead>
<tr>
<th>PLAN OF BOTTOM SLAB</th>
</tr>
</thead>
<tbody>
<tr>
<td>J5 BARS AT BOTTOM (a)</td>
</tr>
<tr>
<td>G BARS (a)</td>
</tr>
<tr>
<td>G BARS (a)</td>
</tr>
<tr>
<td>G BARS (a)</td>
</tr>
<tr>
<td>G BARS (a)</td>
</tr>
<tr>
<td>J5 BARS AT BOTTOM (a)</td>
</tr>
<tr>
<td>J4 BARS AT BOTTOM</td>
</tr>
<tr>
<td>B2 BARS AT BOTTOM</td>
</tr>
<tr>
<td>VARIOUS AT TOP (b)</td>
</tr>
<tr>
<td>J5 BARS AT BOTTOM</td>
</tr>
<tr>
<td>J4 BARS AT BOTTOM</td>
</tr>
<tr>
<td>J5 BARS AT BOTTOM</td>
</tr>
<tr>
<td>J4 BARS AT BOTTOM</td>
</tr>
<tr>
<td>B2 BARS AT BOTTOM</td>
</tr>
<tr>
<td>VARIOUS AT TOP (b)</td>
</tr>
<tr>
<td>J5 BARS AT BOTTOM</td>
</tr>
</tbody>
</table>

ELEVATION OF EXTERIOR WALL

J1 BARS MAY BE BENT IN FIELD OR SHOP.
GENERAL NOTES:

FOR SECTIONS THRU BARREL, RINGS AND HEADWALLS, SEE SHEET 5 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 2 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.

(i) Same size and spacing as adjacent B bars

(ii) Varies, 12" maximum

(iii) Not specified on this sheet

(iv) Same size and spacing as A2 bars

(v) A1 bar spacing

(vi) Same size and spacing as A1 bars

(vii) A1 bar spacing

(i) For design fills over 2'-0"

(ii) For design fills 2'-0" or less

(j) Not required for clean spans 5'-0" - 0".

(k) For clean span 5'-0" - 0"

(l) For clean span 5'-0" -

If required, the minimum length each side of E wall shall be the greater of 4B bar diameters or a clean span. The clean span is parallel to long direction of headwall.

(m) A2 bars as required. Quantity of bars varies with skew.

DATE PREPARED: 5/13/2015

DATE EFFECTIVE: 5/13/2015

1-888-ASK-MODOT 11-888-275-6636

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

JEFFERSON CITY, MO 65102

105 WEST CAPITOL

CONCRETE TRIPLE BOX CULVERT

WINGS: RIGHT ADVANCE

REINFORCEMENT

SECTION NEAR INTERIOR WALL

J1 bars may be bent in field or shop.

PLAN OF TOP SLAB

B bars in walls are not shown for clarity.

FOR PLACEMENT, SEE SHEET 1 OF 3.
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
SECTIONS. BARREL LENGTH MEASURED ALONG CENTERLINE OF CULVERT TO
MINIMUM END SECTION LENGTH SHALL BE 5 FEET MEASURED ALONG THE
SHORTEST WALL FROM THE INSIDE FACE OF HEADWALL TO THE
TRANSVERSE JOINT.

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

FOR CUT SECTION DETAILS, SEE 703.86.
FOR OUT DETAIL, SEE 703.86.

DATE EFFECTIVE: 5/1/2015
DATE PREPARED: 3/8/2015

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1".
BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

FOR SECTIONS THRU BARREL, WINGS AND HEADWALLS, SEE SHEET 3 OF
703.87. FOR 25 BARS, SEE 703.37.
CONSTRUCTION JOINT KEY NOT SHOWN FOR CLARITY IN PLAN AND
ELEVATION. SEE SHEET 3 OF 3 FOR DETAILS.
DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

REINFORCEMENT:
FOR SECTIONS THRU BARREL, WINGS AND HEADWALLS, SEE SHEET 3 OF
703.86.
WHEN BARREL AND CUT SECTION LENGTH RESTRICTIONS REQUIRE
TRANSVERSE JOINTS TO BE LOCATED UNDER A TRAVELED WAY WITH
DESIGN FILLS 2 FEET OR LESS, THE JOINTS SHALL BE LOCATED TO
MINIMIZE THE LENGTH OF JOINT UNDER THE TRAVELED WAY.
TRANSVERSE JOINTS TO BE LOCATED UNDER A TRAVELED WAY WITH

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

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

FOR CUT SECTION DETAILS, SEE 703.86.
FOR OUT DETAIL, SEE 703.86.

DATE EFFECTIVE: 5/1/2015
DATE PREPARED: 3/8/2015

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1".
BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

FOR SECTIONS THRU BARREL, WINGS AND HEADWALLS, SEE SHEET 3 OF
703.87. FOR 25 BARS, SEE 703.37.
CONSTRUCTION JOINT KEY NOT SHOWN FOR CLARITY IN PLAN AND
ELEVATION. SEE SHEET 3 OF 3 FOR DETAILS.
DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

REINFORCEMENT:
FOR SECTIONS THRU BARREL, WINGS AND HEADWALLS, SEE SHEET 3 OF
703.86.
WHEN BARREL AND CUT SECTION LENGTH RESTRICTIONS REQUIRE
TRANSVERSE JOINTS TO BE LOCATED UNDER A TRAVELED WAY WITH
DESIGN FILLS 2 FEET OR LESS, THE JOINTS SHALL BE LOCATED TO
MINIMIZE THE LENGTH OF JOINT UNDER THE TRAVELED WAY.
TRANSVERSE JOINTS TO BE LOCATED UNDER A TRAVELED WAY WITH

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

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

FOR CUT SECTION DETAILS, SEE 703.86.
FOR OUT DETAIL, SEE 703.86.

DATE EFFECTIVE: 5/1/2015
DATE PREPARED: 3/8/2015

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1".
BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

FOR SECTIONS THRU BARREL, WINGS AND HEADWALLS, SEE SHEET 3 OF
703.87. FOR 25 BARS, SEE 703.37.
CONSTRUCTION JOINT KEY NOT SHOWN FOR CLARITY IN PLAN AND
ELEVATION. SEE SHEET 3 OF 3 FOR DETAILS.
DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

REINFORCEMENT:
FOR SECTIONS THRU BARREL, WINGS AND HEADWALLS, SEE SHEET 3 OF
703.86.
WHEN BARREL AND CUT SECTION LENGTH RESTRICTIONS REQUIRE
TRANSVERSE JOINTS TO BE LOCATED UNDER A TRAVELED WAY WITH
DESIGN FILLS 2 FEET OR LESS, THE JOINTS SHALL BE LOCATED TO
MINIMIZE THE LENGTH OF JOINT UNDER THE TRAVELED WAY.
TRANSVERSE JOINTS TO BE LOCATED UNDER A TRAVELED WAY WITH

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

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

FOR CUT SECTION DETAILS, SEE 703.86.
FOR OUT DETAIL, SEE 703.86.

DATE EFFECTIVE: 5/1/2015
DATE PREPARED: 3/8/2015

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1".
BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

FOR SECTIONS THRU BARREL, WINGS AND HEADWALLS, SEE SHEET 3 OF
703.87. FOR 25 BARS, SEE 703.37.
CONSTRUCTION JOINT KEY NOT SHOWN FOR CLARITY IN PLAN AND
ELEVATION. SEE SHEET 3 OF 3 FOR DETAILS.
DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

REINFORCEMENT:
FOR SECTIONS THRU BARREL, WINGS AND HEADWALLS, SEE SHEET 3 OF
703.86.
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TRANSVERSE JOINTS TO BE LOCATED UNDER A TRAVELED WAY WITH
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MINIMIZE THE LENGTH OF JOINT UNDER THE TRAVELED WAY.
TRANSVERSE JOINTS TO BE LOCATED UNDER A TRAVELED WAY WITH

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

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

FOR CUT SECTION DETAILS, SEE 703.86.
FOR OUT DETAIL, SEE 703.86.
CONCRETE TRIPLE BOX CULVERT
SKEW: RIGHT ADVANCE
WINGS: FLARED
REINFORCEMENT

GENERAL NOTES:
FOR SECTIONS THRU BARREL, WINGS AND HEADWALLS. SEE SHEET 3 OF 3. FOR BAR SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT EXCEPT J5 BARS. SEE 703.87. 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 1/4".
LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.
BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.
(a) SAME SIZE AND SPACING AS ADJACENT B BARS
(b) VARY. 12" MAXIMUM
(c) NOT SPECIFIED ON THIS SHEET
(d) SAME SIZE AND SPACING AS A2 BARS
(e) A2 BAR SPACING
(f) SAME SIZE AND SPACING AS A1 BARS
(g) A1 BAR SPACING
(h) FOR DESIGN FILLS OVER 2'-0"
(i) FOR DESIGN FILLS 2'-0" OR LESS
(j) NOT REQUIRED FOR CLEAR SPANS 5'-10"-0"
(k) FOR CLEAR SPAN 5'-10"-0"
(l) FOR CLEAR SPAN 6'-15"-0"

IF REQUIRED, THE MINIMUM LENGTH EACH SIDE OF E WALL SHALL BE THE GREATER OF 48 BAR DIAMETERS OR A CLEAR SPAN. THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

(k) H2 BARS ALTERNATED WITH H1 BARS.

Missouri Highways and Transportation Commission
105 West Capitol
Jefferson City, MO 65102
1-888-656-MODOT (6636)
1-888-275-6636

FLOW

PLAN OF TOP SLAB
B BARS IN WALLS ARE NOT SHOWN FOR CLARITY.
FOR PLACEMENT, SEE SHEET 1 OF 3.
## Concrete Triple Box Culvert

**Member Thickness**

<table>
<thead>
<tr>
<th>Span (S)</th>
<th>3 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>
<tr>
<td>Height (H)</td>
<td>2 ft</td>
<td>3 ft</td>
<td>4 ft</td>
<td>5 ft</td>
<td>6 ft</td>
<td>7 ft</td>
<td>8 ft</td>
</tr>
</tbody>
</table>

**Design Fill**

<table>
<thead>
<tr>
<th>Design Fill</th>
<th>A1 Bars</th>
<th>A2 Bars</th>
<th>B1 Bars</th>
<th>B2 Bars</th>
<th>C1 Bars</th>
<th>C2 Bars</th>
<th>D1 Bars</th>
<th>D2 Bars</th>
<th>E1 Bars</th>
<th>E2 Bars</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-10</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
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<td>15</td>
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<tr>
<td>11-20</td>
<td>15</td>
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</tr>
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<td>21-30</td>
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<td>15</td>
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</tr>
<tr>
<td>31-40</td>
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<td>15</td>
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<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
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</tr>
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<td>41-50</td>
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<td>51-60</td>
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<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
</tr>
</tbody>
</table>

**General Notes:**

- If design fill is between tabulated design fills, use the next larger fill.
- Design fills are given in cubic feet per linear foot.
- Design fills are given in cubic yards per linear foot.
- Members are in inches unless otherwise specified.
- Design fills are measured from the top of the top slab to the top of the culvert.
- Culverts meet strength and serviceability requirements for the design vehicular load.

---

**Missouri Highways and Transportation Commission**

155 West Capitol
Jefferson City, MO 65102
1-888-ASK-MODOT (1-888-275-6638)

**Concrete Triple Box Culvert**

**Member Thickness**

- Bar size
- Spacing & Dimensions

**Span (S): 3 Feet**

**Height (H): 2 to 6 Feet**

---

**Date Approved:** 3/1/2023

**Date Prepared:** 3/22/2023

**DTP:** 703.87A

**SHEET NO.:** 1 OF 27
<table>
<thead>
<tr>
<th>Bar Size</th>
<th>R</th>
<th>S</th>
<th>T</th>
<th>U</th>
<th>V</th>
<th>W</th>
<th>X</th>
<th>Y</th>
<th>Z</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/8&quot;</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
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<td>10</td>
<td>11</td>
<td>12</td>
<td>13</td>
<td>14</td>
<td>15</td>
<td>16</td>
<td>17</td>
<td>18</td>
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<tr>
<td>3/8&quot;</td>
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<td>20</td>
<td>21</td>
<td>22</td>
<td>23</td>
<td>24</td>
<td>25</td>
<td>26</td>
<td>27</td>
</tr>
<tr>
<td>1/2&quot;</td>
<td>28</td>
<td>29</td>
<td>30</td>
<td>31</td>
<td>32</td>
<td>33</td>
<td>34</td>
<td>35</td>
<td>36</td>
</tr>
<tr>
<td>5/8&quot;</td>
<td>37</td>
<td>38</td>
<td>39</td>
<td>40</td>
<td>41</td>
<td>42</td>
<td>43</td>
<td>44</td>
<td>45</td>
</tr>
</tbody>
</table>

**CONCRETE CULVERT**

**BAR DIRECTIONS**

**BAR SIZE, SPACING & DIMENSIONS**

**TRIPLE BOX CULVERT**

**GENERAL NOTES**

1. Bars are M1 steel unless otherwise specified.
2. All dimensions are in inches unless otherwise noted.
3. Bar sizes shown on drawings are nominal sizes.
4. Bar sizes in tables are actual sizes.
5. Tolerances for bar size are ±0.0625 inches.
6. Bar size for all sections is determined from the upper surface of the header at the point of maximum loading.
7. All bar sizes are placed concentrically with an 8" minimum center-to-center spacing.
8. Bar sizes are placed in accordance with the bar size tables in Section 06100-11.1 General.
GENERAL NOTES:

1. If design fill is between tabulated design fills, use the next higher design fill. Design fill is kept for design fill between 4 feet and 6 feet. For design fills between 2 feet and 4 feet, use the member thickness, area of reinforcement, and bar dimensions from the 2' 4" tabulated design fill.

2. Special designs are reviewed when the design fill is less than 1 foot or greater than 3 feet.

3. Dimensions are in inches unless otherwise specified.

4. Design fills are measured from the top of the top slab to the top of the culvert.

5. Culverts meet strength and serviceability requirements for the design vertical live load fills, 93 minus the live load.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

CONCRETE TRIPLE BOX CULVERT

MEMBER THICKNESS
BAR SIZE, SPACING & DIMENSIONS

SPAN (S): 6 FEET
HEIGHT (H): 6 FEET OR 7 FEET

SPANNING (S): 4 FEET
HEIGHT (H): 5 FEET OR 7 FEET

BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT 1/2 CULVERT.
### General Notes:

If design fill is between tabulated design fills, use the next larger tabulated fill. Heavy top and bottom fills between 4 feet and 6 feet for design fills between 2 feet and 4 feet for the member thickness, area of reinforcement, and bar dimensions from the 2' - 4' tabulated design fill.

Special designs are reviewed when the design fill is less than 2 feet or greater than 6 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 level. Long fills, 90 degrees, 180 degrees, 270 degrees, and 360 degrees.

---

**Table:**

<table>
<thead>
<tr>
<th>Span (S)</th>
<th>Height (H)</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>A6 Bars</th>
<th>A7 Bars</th>
<th>A8 Bars</th>
<th>A9 Bars</th>
<th>A10 Bars</th>
<th>A11 Bars</th>
<th>A12 Bars</th>
<th>A13 Bars</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 ft</td>
<td>3 ft</td>
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<td>1</td>
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<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>5 ft</td>
<td>4 ft</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
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<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

---

**Diagram:**

- **Bar Dimensions Diagram:** Symmetrical about 4 culvert.
- **Culvert:** Concrete triple box culvert.
- **Member Thickness:** Bar size, spacing & dimensions.
- **Span (S):** 5 feet.
- **Height (H):** 3 thru 6 feet.

---

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

116 WEST CAPITOL

JEFFERSON CITY, MO 65102

1-888-458-MDOT (1-888-458-6638)

**CONCRETE TRIPLE BOX CULVERT**

**DATE APPROVED:** 2/11/2023

**DATE PREPARED:** 3/22/2023

** SHEET NO.: 703.87A 4 OF 27**
GENERAL NOTES:

1. DESIGN FILL IS BETWEEN TABULATED DESIGN FILLS, USE THE NEXT INCREMENT.
2. DESIGN FILL IS BETWEEN 0 FEET AND A FOOT FOR DESIGN FILLS BETWEEN 0 FEET AND 1 FOOT. USE THE MEMBER THICKNESS, AREA OF REINFORCEMENT AND BAR DIMENSIONS FROM THE 0' - 1' TABULATED DESIGN FILL.

3. SPECIAL DESIGNS ARE RECOMMENDED FOR MEMBERS WHEN THE DESIGN FILL IS LESS THAN 2 FEET OR GREATER THAN 10 FEET.

4. DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

5. DESIGN FILL ARE MEASURED FROM THE TOPOGRAPHIC TO THE TOP OF THE EARTH FILL OR ROADWAY.

CIVIL RIGHTS MEET STRENGTH AND SERVICES REQUIREMENTS FOR THE DESIGN VERTICAL ELEVATION FOR LOW FILL AT 0 FEET THE LOWEST.
GENERAL NOTES:
1. DESIGN FILL IS BETWEEN TABULATED DESIGN FILLS. USE THE NEXT HIGHER DESIGN FILL. KEEP THE MINIMUM DESIGN FILL BETWEEN 3 FEET AND 4 FEET. FOR DESIGN FILLS BETWEEN 2 FEET AND 4 FEET USE THE MEMBER THICKNESS, AREA OF REINFORCEMENT AND BAR DIMENSIONS FROM THE "2'-4' TABULATED DESIGN FILL." SPECIAL DESIGNS ARE ADOPTED WHEN THE DESIGN FILL IS LESS THAN 2 FEET OR GREATER THAN 5 FEET.
2. D-MENSURATIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.
3. DESIGN FILLS ARE MEASURED FROM THE TOP OF TOP SLAB TO THE TOP OF GROUND FILL OR ROADING.
4. CULVERTS MEET STRENGTH AND SERVICEABILITY REQUIREMENTS FOR THE DESIGN VERTICAL LIVE LOAD RINGS LESS THE LIVE LOAD.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

115 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-5EX-MODOT (1-888-539-6638)

CONCRETE TRIPLE BOX CULVERT
MEMBER THICKNESS
BAR SIZE, SPACING & DIMENSIONS
SPAN (S): 8 FEET
HEIGHT (HT): 4 THRU 9 FEET

DATE APPROVED: 2/3/2023
DATE PREPARED: 1/22/2023
703.87A
10 OF 27
<table>
<thead>
<tr>
<th>SPAN (S)</th>
<th>8 FT</th>
<th>HEIGHT (H)</th>
<th>10 FT OR 11 FT</th>
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</thead>
<tbody>
<tr>
<td>A1 BARS</td>
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<td>A2 BARS</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>A3 BARS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A4 BARS</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>A5 BARS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B1 BARS</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>B2 BARS</td>
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<tr>
<td>B3 BARS</td>
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</tr>
<tr>
<td>B4 BARS</td>
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<tr>
<td>B5 BARS</td>
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<td>C1 BARS</td>
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<td>C3 BARS</td>
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<td>C4 BARS</td>
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<td>C5 BARS</td>
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<td>E1 BARS</td>
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<td>E2 BARS</td>
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<tr>
<td>E4 BARS</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>E5 BARS</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**GENERAL NOTES:**

1. Design fill is between tabulated design fills. Use the next greater tabulated design fill, except for design fills between the 2" culvert. Culvert design fill is shown for the 2" culvert dimension and design fill and culvert design fill and culvert dimension from the 2", 4" tabulated design fill.

2. Design fill is shown for the top of the culvert. Culvert fill is shown for the top of the culvert.
### Table: Design Fill

<table>
<thead>
<tr>
<th>SPAN (S)</th>
<th>9 FT</th>
<th>HEIGHT (H)</th>
<th>5 FT OR 6 FT OR 7 FT</th>
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<tr>
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<table>
<thead>
<tr>
<th>T1</th>
<th>B5</th>
<th>T3</th>
<th>B12</th>
<th>T12</th>
<th>B12</th>
<th>C1</th>
<th>T12</th>
<th>B12</th>
<th>C1</th>
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<tbody>
<tr>
<td>1</td>
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<td>3</td>
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<td>5</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### General Notes:
- A DESIGN FILL IS BETWEEN TABULATED DESIGN FILLS. USE THE NEXT LOWER DESIGN FILL. KEEP THE OUTFLOW FILL BETWEEN 2 FEET AND 4 FEET. FOR DESIGN FILLS BETWEEN 2 FEET AND 4 FEET USE THE MEMBER THICKNESS, AREA OF REINFORCEMENT AND BAR DIMENSIONS FROM THE 2' - 4' TABULATED DESIGN FILL.
- SPECIAL DESIGNS ARE RECOMMENDED WHEN THE DESIGN FILL IS LESS THAN 1 FOOT OR GREATER THAN 2 FEET.
- BAR DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.
- CULVERTS MEET STRENGTH AND SERVICABILITY REQUIREMENTS FOR THE DESIGN VERTICAL LOAD AND LONG DOMINANT L. STRENGTH.

---

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

**CONCRETE TRIPLE BOX CULVERT**

**MEMBER THICKNESS**

**BAR SIZE, SPACING & DIMENSIONS**

**SPAN (S): 9 FEET**

**HEIGHT (H): 5 THRU 10 FEET**

**DATE APPRORVED:** 2/11/2023

**DATE PREPARED:** 3/22/2023

**703.87A**

**12 OF 27**
### General Notes:

- If design fill is between tabulated design fills, use the next higher tabulated design fill. Except for design fills between 3 feet and 4 feet, use the member thickness, area of reinforcement, and bar dimensions from the 2.4 ft. tabulated design fill.
- Special designs are required when the design fill is less than 1 foot or greater than 15 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, live load plus the dead load.

### Missouri Highways and Transportation Commission

#### Concreme Triple Box Culvert

- **Bar Size, Spacing & Dimensions**
- **Span (S): 9 Feet**
- **Height (Ht): 11 ft to 12 ft**

---

### Table

<table>
<thead>
<tr>
<th>Design Fill</th>
<th>Member Thickness</th>
<th>Bar 1</th>
<th>Bar 2</th>
<th>Bar 3</th>
<th>Bar 4</th>
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<td>Size</td>
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<td>CS</td>
<td>CS</td>
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</tr>
</tbody>
</table>

### Diagram

- **Bar Dimensions Diagram**
  - Symmetrical about Culvert.
  - **1st CS (N1, N2, J1, B1 & B2 Bars)**
  - **2nd CS (H1, H2 Bars)**
  - **A1 Bar**
  - **A2 Bar**
  - **B1 Bar**
  - **B2 Bar**
  - **C1 Bar**
  - **C2 Bar**

---

**Sheet No.:** 703.87A **Date Prepared:** 3/22/2023 **Page No.:** 13 of 27
**Concrete Triple Box Culvert**

**Member Thickness**

<table>
<thead>
<tr>
<th>Size of Slab</th>
<th>A1 Bars</th>
<th>A2 Bars</th>
<th>B1 Bars</th>
<th>B2 Bars</th>
<th>C Bars</th>
<th>D Bars</th>
<th>E Bars</th>
<th>F Bars</th>
<th>G Bars</th>
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</thead>
<tbody>
<tr>
<td>12 ft</td>
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</tbody>
</table>

**Design Fill**

<table>
<thead>
<tr>
<th>Size of Slab</th>
<th>A1 Bars</th>
<th>A2 Bars</th>
<th>B1 Bars</th>
<th>B2 Bars</th>
<th>C Bars</th>
<th>D Bars</th>
<th>E Bars</th>
<th>F Bars</th>
<th>G Bars</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 ft</td>
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</tbody>
</table>

**General Notes:**
- Design Fill is between tabulated design fills. Use the next larger design fill for pipe larger than 12 feet and 3 feet. For design fills between 2 feet and 4 feet use the member thickness, area of reinforcement, and bar dimensions from the 2"-4" tabulated design fill.
- Special designs are reviewed when the design fill is less than 2 feet or greater than 30 feet.
- Design Fill is measured from the top of the top slab to the top of the earth fill or roadbed.
- Culverts meet strength and serviceability requirements for the design vertical load, longitudinal loads, and live loads.

**Missouri Highways and Transportation Commission**

JEFFERSON CITY, MO 65102
1-888-654-MODOT (1-888-654-6636)

**Concrete Triple Box Culvert**

**Member Thickness**

<table>
<thead>
<tr>
<th>Size of Slab</th>
<th>A1 Bars</th>
<th>A2 Bars</th>
<th>B1 Bars</th>
<th>B2 Bars</th>
<th>C Bars</th>
<th>D Bars</th>
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**Missouri Highways and Transportation Commission**

JEFFERSON CITY, MO 65102
1-888-654-MODOT (1-888-654-6636)

**Concrete Triple Box Culvert**

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<table>
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<tr>
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**Missouri Highways and Transportation Commission**

JEFFERSON CITY, MO 65102
1-888-654-MODOT (1-888-654-6636)
### Design Fills

#### Design Thickness

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<tr>
<th>Design Thickness</th>
<th>A1 Bars</th>
<th>A2 Bars</th>
<th>A3 Bars</th>
<th>A4 Bars</th>
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<th>B2 Bars</th>
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### Concretes

#### Tri-Cone Box Culvert

- **Member Thickness**: 3"14, 3"16, 3"18, 3"20, 3"22, 3"24, 3"26, 3"28, 3"30

**General Notes**

- Design fills 12’ x 14’ x 18’.
- Bar sizes and spacing are determined by the culvert size and design loads.
- Special design considerations are applied for spans between 20’ and 26’.
- Culvert dimensions must meet the strength and serviceability requirements specified by the construction standards.

**Culvert Diagrams**

- **Bar Dimensions Diagram**: Symmetry about the culvert.

---

**Missouri Highways and Transportation Commission**

- **Engineer**: Jefferson City, MO 65102
- **Phone**: 1-888-456-MDOT (636-899)

**Concrete Tri-Cone Box Culvert**

- **Member Thickness**: 3'-14", 3'-16", 3'-18", 3'-20", 3'-22", 3'-24", 3'-26", 3'-28", 3'-30"
- **Span**: 12’
- **Height**: 12’

**Sheet No.:** 703.87A

**Date Prepared:** 3/22/2023

**Scale:** 19 of 27
### Design Fill

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<thead>
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### CONCRETE TRIPLE BOX CULVERT

<table>
<thead>
<tr>
<th>SPAN (S)</th>
<th>13 FT</th>
</tr>
</thead>
<tbody>
<tr>
<td>HEIGHT (H)</td>
<td>7 FT OR 11 FT OR 12 FT</td>
</tr>
</tbody>
</table>

GENERAL NOTES:
- Design fill is between tabulated design fills. Use the next largest design fill. Keep top fill thickness between 2 feet and 4 feet. For design fills between 2 feet and 4 feet use the member thickness, area of reinforcement, and bar dimensions from the 2’ or 4’ tabulated design fill.
- Special designs are reviewed when the design fill is less than 1 foot or greater than 20 feet.
- D-Mensions are in inches unless otherwise specified.
- Culverts 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 loads, long loads, and live loads.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
115 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-454-MODOT (1-888-454-6636)

CONCRETE TRIPLE BOX CULVERT
MEMBER THICKNESS
BAR SIZE, SPACING & DIMENSIONS
SPAN (S): 13 FEET
HEIGHT (H): 7 THROUGH 12 FEET

DATE PREPARED: 3/22/2023
WEIGHT NO: 703.87A
20 OF 27
PIPE INSTALLATION AND BEDDING

TYPICAL TRENCH DETAIL

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>
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<tbody>
<tr>
<td>3&quot;</td>
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C) TRENCH INSTALLATIONS - 2 FEET MINIMUM EACH SIDE OF CULVERT. THIS RECOMMENDED LIMIT SHOULD BE MODIFIED AS NECESSARY TO ACCOUNT FOR VARIABLES SUCH AS POOR IN-SITU SOILS. EMBANKMENT INSTALLATIONS - ONE DIAMETER OR SPAN EACH SIDE OF CULVERT.

PIECE-ARCH INSTALLATION METHODS

MULTIPLE STRUCTURE SPACING

PIECE-ARCHES

<table>
<thead>
<tr>
<th>DIAMETER</th>
<th>SPACE</th>
<th>SPAN</th>
<th>SPACE X</th>
</tr>
</thead>
<tbody>
<tr>
<td>UP TO 24&quot;</td>
<td>12&quot;</td>
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<td>3 1/2 PIPE DIA</td>
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<td>72&quot; AND OVER</td>
<td>36&quot;</td>
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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 Metallic-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>0.078</th>
<th>0.100</th>
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### Corrugated Metallic-Coated Steel Circular Pipe Riveted Seam

**Maximum Allowable Overfill Heights (1)**

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(1) Maximum overfill required from the top of pipe to surface.
## Corrugated H32 Aluminum Circular Pipe Lock Seam

### Maximum Allowable Overfill Heights (1)

<table>
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<tr>
<th>Specified Diameter of Pipe</th>
<th>Minimum Overfill (In.)</th>
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<th>0.075</th>
<th>0.100</th>
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### Corrugated H32 Aluminum Circular Pipe Riveted Seam

### Maximum Allowable Overfill Heights (1)

<table>
<thead>
<tr>
<th>Specified Diameter of Pipe</th>
<th>Minimum Overfill (In.)</th>
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<th>0.075</th>
<th>0.100</th>
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Missouri Highways and Transportation Commission

105 West Jefferson
Jefferson City, MO 65101
1-800-392-MOT (668)-MISSOURI

**Corrugated Metal Pipe Installation Methods**

| Size Application | 08/2021 | 725.00C | 03/23/2022 | 3 of 5 |
### CORRUGATED H34 ALUMINUM CIRCULAR PIPE LOCK SEAM

**MAXIMUM ALLOWABLE OVERFILL HEIGHTS (1)**

<table>
<thead>
<tr>
<th>SPECIFIED DIAMETER OF PIPE</th>
<th>MINIMUM OVERFILL (IN.)</th>
<th>MAXIMUM OVERFILL (IN.)</th>
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<tbody>
<tr>
<td></td>
<td>0.025</td>
<td>0.05</td>
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<tr>
<td>12</td>
<td>1 1</td>
<td>159 139</td>
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<td>1 1</td>
<td>127 106</td>
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<td>18</td>
<td>1 1</td>
<td>106 87</td>
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<td>21</td>
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<td>81 66</td>
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<td>24</td>
<td>1 1</td>
<td>54 44</td>
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<td>30</td>
<td>1 1</td>
<td>34 27</td>
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<td>36</td>
<td>1 1</td>
<td>24 19</td>
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<td>42</td>
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<td>25 50</td>
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<td>1 1</td>
<td>32 66</td>
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<td>72</td>
<td>1 1</td>
<td>45 70</td>
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<td>100</td>
<td>1 1</td>
<td>55 90</td>
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<tr>
<td>114</td>
<td>1 1</td>
<td>64 114</td>
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<tr>
<td>120</td>
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<td>72 120</td>
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</table>

### CORRUGATED H34 ALUMINUM CIRCULAR PIPE RIVETED SEAM

**MAXIMUM ALLOWABLE OVERFILL HEIGHTS (1)**

<table>
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<th>SPECIFIED DIAMETER OF PIPE</th>
<th>MINIMUM OVERFILL (IN.)</th>
<th>MAXIMUM OVERFILL (IN.)</th>
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</thead>
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<td>12</td>
<td>1 1</td>
<td>177 157</td>
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<td>15</td>
<td>1 1</td>
<td>146 126</td>
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<tr>
<td>18</td>
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<td>114 94</td>
</tr>
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<td>21</td>
<td>1 1</td>
<td>88 72</td>
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<td>61 49</td>
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<td>40 27</td>
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<td>1 1</td>
<td>29 22</td>
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<td>42</td>
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<td>35 60</td>
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<td>48 70</td>
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<td>57 90</td>
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<td>120</td>
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<td>74 120</td>
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(1) Maximum overfill required from the top of pipe to surface.
### MINIMUM COVER FOR CONSTRUCTION LOADS (ROUND AND PIPE-ARCH)

<table>
<thead>
<tr>
<th>DIAMETER PIPE SPAN</th>
<th>MINIMUM COVER (FT.) FOR INDICATED AXLE LOADS (2)</th>
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<td>18K LBS.</td>
<td>50K LBS.</td>
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<td>50K LBS.</td>
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<td>100K LBS.</td>
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<td>4.0</td>
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<td>4.5</td>
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</table>

The contractor shall provide minimum cover plus any additional cover required to avoid damage to the pipe. In unpaved situations, the surface must be maintained to a level and non-rutted condition.

### PIPE-ARCH REQUIREMENTS

#### 2-2/3" X 1/2" CORRUGATIONS

<table>
<thead>
<tr>
<th>TYPE</th>
<th>SPAN (3)</th>
<th>RISE (3)</th>
<th>THICKNESS (IN.)</th>
<th>GAUGE</th>
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#### PIPE-ARCH REQUIREMENTS

<table>
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<th>THICKNESS (IN.)</th>
<th>GAUGE</th>
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<td>46 (2.2)</td>
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<td>14</td>
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<td>14</td>
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<td>B1A</td>
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<td>55 (3.3)</td>
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<td>59 (3.6)</td>
<td>0.079</td>
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<td>B1A</td>
<td>87 (4.4)</td>
<td>63 (4.4)</td>
<td>0.079</td>
<td>14</td>
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<td>B1A</td>
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<td>0.079</td>
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<td>B1A</td>
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#### CORRUGATED METAL PIPE INSTALLATION METHODS

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<th>DATE PREPARED:</th>
<th>SHEET NO.</th>
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<td>06/21/2011</td>
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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.
**Metal Curtain Wall**

**Continuous Weld**

**Band Shall Be Same Thickness as Curtain Wall Material**

**Plan**

**Table for Metal Curtain Wall**

<table>
<thead>
<tr>
<th>Dia (In)</th>
<th>Galv. Sh. Thick (In)</th>
<th>W (In)</th>
<th>H (In)</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>0.064</td>
<td>12</td>
<td>35</td>
</tr>
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**General Notes:**

- **Table for Metal Curtain Wall**
- **Plan:** Metal Inlets

**Metal Curtain Wall and Metal Inlets**

**Date Effective:** 07/01/2004

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

**Missouri Highways and Transportation Commission**

105 West Capitol
Jefferson City, MO 65102
1-888-656-MODOT (1-888-275-6636)

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.

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<tr>
<th>INSTALLATION TYPE</th>
<th>BEDDING THICKNESS</th>
<th>HAUNCH AND OUTER BEDDING</th>
<th>LOWER SIDE BEDDING</th>
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EMBANKMENT INSTALLATIONS

MIDDLE BEDDING LOOSELY PLACED UNCOMPACTED.

MAXIMUM DIAMETER AND MAXIMUM FILL HEIGHT

<table>
<thead>
<tr>
<th>CLASS OF PIPE</th>
<th>INSTALLATION TYPE</th>
<th>MAXIMUM DIAMETER (INCHES)</th>
<th>MAXIMUM FILL HEIGHT IN FEET</th>
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<tr>
<td>CLASS I</td>
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TRENCH INSTALLATION

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<tr>
<td>D₀ = NORMAL INSIDE DIAMETER OF PIPE.</td>
</tr>
<tr>
<td>D₀₀ = OUTSIDE DIAMETER OF PIPE.</td>
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<tr>
<td>H = FILL COVER HEIGHT OVER PIPE (FEET)</td>
</tr>
<tr>
<td>MIN = MINIMUM</td>
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<tr>
<td>= UNDISTURBED SOIL</td>
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</table>

GENERAL NOTES:
MULTIPLE PIPE CULVERTS SHALL BE INSTALLED WITH A MINIMUM CLEARANCE BETWEEN PIPES OF 3 D₀ OR 12", WHICHEVER IS GREATER, BUT NOT TO EXCEED 36".
CLASS I AND CLASS II REINFORCED CONCRETE PIPE SHALL ONLY BE USED FOR SEWERS IN TRENCHES OUTSIDE ROADBED AND STREET LIMITS.

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.

TYPICAL CAMBERED FLOW LINE
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>
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<tr>
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<td>MINIMUM FILL HEIGHT (FEET)</td>
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<td>2.0</td>
<td>1.0</td>
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<tr>
<td>8</td>
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</tr>
<tr>
<td>36</td>
<td>5.0</td>
<td>1.0</td>
</tr>
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</table>
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.
See standard plan 610.10 for grates and bearing plates. Typical location details are indicated on Sheet 7 and 8 of 8. The sections may be cast monolithic with base section.

**General Notes:**

The concrete for inverts shall be placed after completion of the drop inlet box. No direct placement will be made for finishing or placing invert concrete.

**Typical Inverts**

<table>
<thead>
<tr>
<th>Width (in.)</th>
<th>Length (ft.)</th>
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**Section A-A**
**Section B-B**
**Section C-C**
**Section D-D**
**Section E-E**
**Section F-F**
**Section G-G**
**Section H-H**
### GENERAL NOTES:

The size of the drop inlet and type of cover will be shown on the plans.

The configuration details shown are descriptive only and may be varied to conform with established manufacturing practices.

- Top of drop inlet shall be constructed to the elevation of top of slab at the edge of pavement or edge of curb and gutter at drop inlet.
- Where the drop inlet is located on an inclined area, the top of the drop inlet walls shall be set to the elevation shown on the plans.

All concrete above the top surface of the drop inlet shall be constructed using placing operations in one course and gutter construction, and will be paid for as square yards of concrete pavement or linear feet of curb and gutter.

- For each cut-out opening shall be provided where pipe inlets and outlets are shown on the plans.
- Reinforcing bars in pavement shall be evenly coated and securely tied together and fastened to avoid any possibility of displacement during the placing of concrete. Reinforcement shown in addition to any reinforcement shown for concrete pavement or curb and gutter.

Joints shall be sealed in accordance with Section 726-3-1 of the Standard Specifications.

The contractor shall be permitted to cast in place the drop inlet cover for the pavement to the dimensions required for precast drop inlets.

- Unless otherwise specified, the reinforcement shall not be less than 25 square inches per linear foot both horizontally and vertically.
- No direct payment will be made for reinforcing steel.
- No direct payment will be made for cutting pipe nor for cutting or bending reinforcing steel.
- The top of the outlet pipes shall not be set below the top of the drop inlet.
- No direct payment will be made for forming for curved valve grates and frames.
- The reinforcement shown is the minimum required. At the contractor's option, additional reinforcement may be used.
- Reinforcing steel edge distance will be 1/2 unless otherwise specified.

Not more than two lift holes of lifting devices may be provided.

- Class B excavation will be paid within vertical planes 10" outside of the outer walls of the base section of the drop inlets. Class B excavation will not be paid for outside the footing limits.
Details for Roadway Ditch Inlets
Located Within the Clear Zone
### Dimensions

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<th>Wall</th>
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<th>B Min.</th>
<th>C Min.</th>
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<td>Area of Transverse Steel (In. Sq.)/Lin. Ft.</td>
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<td>0.072</td>
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### General Notes:

- Slight variations in both shape and dimensions from those shown may be accepted if approved by the Engineer.
- Not more than three lift holes may be drilled or cast in the end section for handling and listing.
- Lift lugs or bars will be permitted in precast toe walls.
- Toe walls may be cast-in-place or precast.
- Steel fibers may be used in lieu of repair or cold-drawn steel wire as per Section 1032.3.4.

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**Memorandum:**

- Date Distributed: 06/21/2016
- Date Effective: 07/01/2016
- Issued by: MCDOT
- Page No.: 1 DF 3
- Sheet No.: 732-005
### End Sections for Arch Pipe

| Type | Dimensions | Diameter of Equivalent Sheet Thick | Dimensions (In.) | Approximate Slope V|p| (In.) | The Plate if Specified P. (In.) |
|------|------------|-----------------------------------|------------------|-------------------|-------|-------------------------|
| B1   | 15         | .064                              | 6                | 6                 | 19    | 30                      | 2 1/2 | 40                            |
| B2   | 18         | .064                              | 7                | 11                | 23    | 36                      | 2 1/2 | 46                            |
| B3   | 21         | .064                              | 8                | 12                | 28    | 42                      | 2 1/2 | 52                            |
| B4   | 24         | .064                              | 8                | 16                | 32    | 48                      | 2 1/2 | 58                            |
| B5   | 30         | .075                              | 10               | 16                | 39    | 50                      | 2 1/2 | 70                            |
| BE OR BA | .075    | 12                               | 12               | 15                | 46    | 65                      | 2 1/2 | 85                            |
| B7 OR B7A | .109 | 13                              | 16               | 19                | 44    | 78                      | 1 1/4 | 107                           |
| B8 OR BA | .109 | 18                               | 26               | 30                | 53    | 85                      | 1 1/4 | 112                           |
| B9 OR BA | .109 | 18                               | 30               | 12                | 70    | 102                     | 1 1/4 | 124                           |
| B10 OR B10A | .109 | 18                             | 33               | 12                | 77    | 114                     | 1 1/4 | 136                           |
| B11 OR B11A | .109  | 18                            | 26               | 12                | 77    | 126                     | 1 1/4 | 148                           |
| B12 OR B12A | .109 | 18                            | 19               | 12                | 77    | 138                     | 1 1/4 | 160                           |

### End Sections for Round Pipe

| Pipe Diameter (In.) | Galvanized Sheet Thick (In.) | 1/2 Tol. | 1/4 Tol. | 1/4 Tol. | 1/4 Tol. | Approximate Slope V|p| (In.) | The Plate if Specified P. (In.) |
|---------------------|-----------------------------|----------|----------|----------|----------|-------------------|-------|-------------------------|
| 12                  | .064                        | 6        | 6        | 6        | 21       | 24                | 2 1/4 | 34                      |
| 15                  | .064                        | 7        | 6        | 6        | 26       | 30                | 2 1/4 | 40                      |
| 18                  | .064                        | 8        | 6        | 6        | 31       | 36                | 2 1/4 | 46                      |
| 21                  | .064                        | 9        | 12       | 6        | 36       | 42                | 2 1/4 | 52                      |
| 24                  | .064                        | 10       | 13       | 6        | 41       | 48                | 2 1/4 | 58                      |
| 30                  | .075                        | 12       | 16       | 8        | 51       | 60                | 2 1/4 | 70                      |
| 36                  | .075                        | 14       | 19       | 9        | 60       | 72                | 2 1/4 | 80                      |
| 42                  | .109                        | 16       | 22       | 11       | 69       | 84                | 2 1/4 | 106                     |
| 48                  | .109                        | 18       | 27       | 12       | 78       | 90                | 2 1/4 | 112                     |
| 54                  | .109                        | 18       | 30       | 12       | 84       | 102               | 2     | 124                     |
| 60                  | .109                        | 18       | 33       | 12       | 91       | 114               | 2     | 136                     |
| 66                  | .109                        | 18       | 36       | 12       | 102      | 120               | 2     | 144                     |
| 72                  | .109                        | 18       | 39       | 12       | 112      | 126               | 2     | 148                     |
| 78                  | .109                        | 18       | 42       | 12       | 122      | 132               | 2     | 154                     |
| 84                  | .109                        | 19       | 45       | 12       | 133      | 144               | 2     | 160                     |

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**General Notes:**

Minor variations of detail and dimensions will be acceptable to permit the use of a manufacturer's standard methods of fabrication.

End sections fabricated from thicker metal than indicated will be accepted.

All bolts shall be 3/4 diameter and galvanized, unless otherwise shown.

The plate extensions, if specified, shall have holes to match holes in the plate.

Sight section is defined as the flared portion of the end section including side and bottom (center) panels and apron.

Sight section for 12" through 24" pipes shall be made in one piece.

Sight sections for 36" and larger pipes and 85 and larger pipe arches may be made from up to 2 sheets joined by riveting or bolting on centerline.

Sight sections from 48" and larger pipes and 88 or larger pipe arches may be made from up to 3 sheets joined by riveting or bolting equal distance from centerline.

Sight sections for 72" and larger pipes may be made from up to 4 sheets joined by riveting and bolting. The bottom panel shall be 2 equal width sheets joined on centerline.

All 3 piece and 4 piece skirts for 60" or larger pipes are 10 and larger pipe arches shall have 0.109" thick sides and 0.138" thick bottom (center) panels. Width of bottom panels shall be greater than 20% of the pipe periphery connector sections. Corner plates and toe plates shall be galvanized and of the same or greater thickness as the skirt.

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**Typical Cross-Section**

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**End Section for Pipe and Pipe Arch**

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**FLARED END SECTION**

**Metal**

---

**Date Effective**

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**373.005 SHEET NO. 2 OF 3**
**Connection Requirements**

<table>
<thead>
<tr>
<th>Type</th>
<th>Connection Type</th>
<th>Size Range</th>
<th>CMP</th>
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<td>Y</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td></td>
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<td>Metal Flared End Section</td>
<td>5</td>
<td>ALL</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td></td>
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</tbody>
</table>

**Tapered Sleeve Connection for Concrete and Thermoplastic Pipe**

Tapered sleeve shall be firmly wedged into pipe end before backfilling pipe pay length.

1. **Type 1 Connection**
   - For 12" thru 24" round pipe only
   - 2" x 2" x 2" angles
   - 3" long with two 3" diameter bolts or bar and strap with two 3" diameter bolts.
   - This end of base grooved to match angular corrugation in end section.

2. **Type 2 Connection**
   - For 30" thru 48" pipe and equivalent pipe arch
   - Angles or bar and strap shall be riveted, bolted or resistance spot welded to the adapter band. Heels shall be painted as per standard specification 1020-19.5.
   - Dimpled 1/2" wide, 0.064" thick, adapter band.
   - Riveted or bolted.

3. **Type 3 Connection**
   - For all sizes
   - Angles riveted, bolted or resistance spot welded to the adapter band. Heels shall be painted as per standard specification 1020-19.5.

4. **Type 4 Connection**
   - For 12" thru 42" pipe and equivalent pipe arch
   - 2" x 2" x 2" angles
   - 3" long with three 3" diameter bolts.

5. **Type 5 Connection**
   - For all sizes through 84" pipe and 6-12" or 6-14" pipe arch
   - 12" wide corrugated adapter band.
   - Riveted or bolted.

**General Notes**

- Minor variations of detail and dimensions will be accepted to permit the use of a manufacturer's standard methods of fabrication.
- Tapered sleeves shall be fabricated from smooth 12 gauge steel coated in accordance with ASTM A525.
- Tapered sleeves shall be firmly wedged into the pipe end before backfilling pipe pay length.
- The length of tapered sleeve shall be sized to protect the sensitive pipe materials from sunlight. The entire length of the tapered sleeve, hardware, and installation shall be included in the cost of the pipe.
- Tapered sleeves shall have at a minimum a half corrugation or lip designed to provide a secure connection with the end section.

Any rod or strap used for making a connection shall be securely seated into a valley of the pipe corrugation. The valley chosen to hold the rod or strap shall leave at least the full intact corrugation before the end of the pipe. The female portion of a bell end shall not contact a full intact corrugation.
<table>
<thead>
<tr>
<th>Pipe Diameter</th>
<th>Slope</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
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<tbody>
<tr>
<td>3&quot;</td>
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<td>3&quot;</td>
<td>6&quot;</td>
<td>1</td>
<td>1/2</td>
<td>1/2</td>
<td>1</td>
<td>1/2</td>
</tr>
<tr>
<td>4&quot;</td>
<td>15°</td>
<td>3/4</td>
<td>6</td>
<td>1/2</td>
<td>1</td>
<td>2/3</td>
<td>1/2</td>
<td>1</td>
</tr>
<tr>
<td>6&quot;</td>
<td>10°</td>
<td>6</td>
<td>6</td>
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<td>3/4</td>
<td>2</td>
<td>1/2</td>
<td>3/4</td>
</tr>
<tr>
<td>8&quot;</td>
<td>10°</td>
<td>6</td>
<td>6</td>
<td>1/2</td>
<td>3/4</td>
<td>2</td>
<td>1/2</td>
<td>3/4</td>
</tr>
<tr>
<td>12&quot;</td>
<td>5°</td>
<td>8</td>
<td>8</td>
<td>1/2</td>
<td>3/4</td>
<td>2</td>
<td>1/2</td>
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<td>10</td>
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<td>1/2</td>
<td>3/4</td>
</tr>
</tbody>
</table>

**PLAN VIEW FOR HIGHWAYS**

**SECTION A-A**

**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 1036 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 pipe size for each beveled pipe encasement shall be decided following the guidelines for determining all materials and installation of the beveled pipe section and beveled pipe encasement as shown and as directed by the engineer.
- The 3/4" x 6" bolts and nuts shall be galvanized in accordance with ASTM A490 Grade 5.
- Beveled pipe shall be fielded at locations shown on plan for placement of 3/4" x 6" galvanized bolts. The 3/4" x 6" galvanized bolts shall be doubled as shown and placed in the valley of pipe corrugations.

**BEVELED PIPE END TREATMENT FOR HIGHWAYS**

**DATE EFFECTIVE:** 08/04/2021

**DATE REVISED:** 10/14/2021

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

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

1-888-561-MODOT (663-6868)

**732.05D SHEET 1 OF 2**
PIPE END DETAILS FOR PARALLEL DRAINAGE STRUCTURES FOR DRIVEWAYS
(SINGLE PIPE INSTALLATION)

NOTE:

FOR MULTIPLE PIPE INSTALLATIONS, END SECTIONS WITH SAFETY BAR SYSTEM OR OPTIONAL BAR SYSTEM SHALL BE PROVIDED. SEE STANDARD PLANS 332-100.

SEE DRIVEWAY STANDARD PLANS FOR BEVELED END SECTION REQUIREMENTS.

GENERAL NOTES:

CONCRETE USED IN CONSTRUCTION OF THE BEVELED PIPE ENCASMENT SHALL BE CLASS B CONCRETE OR AN APPROVED COMMERCIAL MIX MEETING REQUIREMENTS OF SECTION 503 OF THE STANDARD SPECIFICATIONS.

REINFORCING STEEL USED IN CONSTRUCTION OF THE BEVELED PIPE ENCASMENT SHALL MEET THE REQUIREMENTS OF SECTION 503 OF THE STANDARD SPECIFICATIONS.

BEVELED PIPE ENCASMENT MAY BE LINED WITH EITHER POLYETHYLENE OR CORROSION-RESISTANT 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 ENCASMENT AS SHOWN OR AS DIRECTED BY THE ENGINEER.

THE 3/4" X 6" BOLT AND NUTS SHALL BE GALVANIZED IN ACCORDANCE WITH ASME/ASTM A532 (ASTM A532), CLASS 2 SPECIFICATIONS. LOW CARBON STEEL ANCHOR BOLTS SHALL BE ASTM F554, GRADE 2.

BEVELED PIPE SHALL BE DRILLED AT LOCATIONS SHOWN ON PLANS FOR PLACEMENT OF 3/4" X 6" GALVANIZED BOLTS. THE 3/4" X 6" GALVANIZED BOLTS SHALL BE "DRIVE NUTTED" AS SHOWN AND PLACED IN THE VALLEY OF PIPE CORRUGATIONS.
NOTE:
SEE DRIVEWAY STANDARD PLANS FOR
BEVELED END SECTION REQUIREMENT.
FOR CONNECTION DETAILS, SEE 732.00
SHEET 3 OF 3.

FOR DETAILS OF OPTIONAL
BAR GRATE SEE SHEET 3 OF 3

PIPE END DETAILS FOR DRAINAGE STRUCTURES
(SINGLE PIPE INSTALLATION)

<table>
<thead>
<tr>
<th>PIPE SIZE</th>
<th>MIN. GAUGE (IN.)</th>
<th>GAUGE</th>
<th>MIN. GAUGE (IN.)</th>
<th>1&quot; TOL.</th>
<th>1&quot; TOL.</th>
<th>2&quot; TOL.</th>
<th>OVERALL LENGTH (IN.)</th>
<th>SLOPE (1:4)</th>
<th>SLOPE (1:6)</th>
<th>SLOPE (1:10)</th>
<th>DIMENSIONS IN INCHES</th>
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<td>101</td>
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<td>61</td>
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**BAR GRATE SYSTEM DATA**

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<th>6:1 SLOPE</th>
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<tr>
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<td>F&quot; BARS</td>
<td>G H J</td>
<td>A B C D E</td>
</tr>
<tr>
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<td>0 0 0 0 0</td>
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<tr>
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<td>0 0 0 0 0</td>
</tr>
<tr>
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<td>0 0 0 0 0</td>
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</tr>
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</tr>
<tr>
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<td>0 0 0 0 0</td>
<td>0 0 0 0 0</td>
<td>0 0 0 0 0</td>
</tr>
</tbody>
</table>

**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**

**SLOPE DIMENSIONS**
- 24" diameter pipe (all slopes)
- 30" - 54" diameter pipes, all slopes

**SLOPE END SECTION**

**PLAN**
- Plan view of bar grate system

**ELEVATION**
- Elevation view of bar grate system

**DETAIL A**
- Bent plate anchor

**DETAIL B**
- U-bolt anchor

**DETAIL C**
- Plate

**GENERAL NOTES:**
- Bar grate system is not required for drain pipe diameter of 21" or less, for single pipe installations.

**DATE EFFECTIVE:**
06/01/2013

**DATE PREPARED:**
01/11/2013

**732.10H** SHEET NO. 3 OF 3
GENERAL NOTES:

ALL PARTS OF THE TIE ASSEMBLY EXCEPT FOR HOOKS, SHALL BE LOCATED IN THE MILL FACE. GUARANTEE THAT 3 DIFFERENT MILL FACES SHALL BE USED.

|. EYE BOLT TIE OPTION

THE HOLE, SHALL BE CUT OR DRILLED AT INCLINE FROM CENTER OF HOLE TO MILL FACE. HOLES MOUNTED ARE SET IN FOR 1/4-20 CASING AND FROM ORIGIN OF HOLES.

| TAPPED HOLES ARE PERMITTED WHEN REASONABLE.

| REGULAR STRENGTH CONNECTIONS

| REGULAR STRENGTH CONCRETE SHALL BE 1/2 THREADED RODS.

| THE RODS FOR REGULAR STRENGTH CONNECTIONS SHALL BE OUGHT TO COMPLY WITH SEC. 408.

| EXTRA STRENGTH CONNECTIONS

| THREADED RODS FOR EXTRA STRENGTH CONNECTIONS SHALL BE STAINLESS STEEL, 1 1/4 THREADED RODS.

| HOLE FOR EXTRA STRENGTH CONNECTIONS SHALL BE STAINLESS STEEL TO MILL FACE.

| REGULAR STRENGTH TO MILL FACE.
**ROCK DITCH CHECK**

A rock ditch check may be installed as required by the engineer. 

**EXAMPLE**

**Ditch Check Spacing for Standard Heights**

<table>
<thead>
<tr>
<th>Ditch Elevation</th>
<th>Spacing for 2&quot; Eff. Height</th>
<th>Spacing for 3&quot; Eff. Height</th>
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</thead>
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<tr>
<td>9.0</td>
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<td>15</td>
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</tbody>
</table>

**MINIMUM DITCH CHECK SPACING**

**GENERAL NOTES**

- Use minimum 12 in. diameter loose rock.
- Use 2 ft. wooden stakes with a 2.5% by 2 in. nominal cross section.
- Install log/sod so height in ditch do flow will not wash away loose rock and keep ditch slope or as directed by the engineer.
- Install a minimum of 2 upslope stakes and 4 downslope stakes at an angle to wedge log/sod to bottom of ditch.
- Erosion control blanket shall be anchored according to the manufacturer's recommendations.

**ALTERNATE DITCH CHECK**

- Use 2 ft. wooden stakes with a 2 in. nominal cross section.
- Install log/sod so height in ditch do flow will not wash away loose rock and keep ditch slope or as directed by the engineer.
- Install a minimum of 2 upslope stakes and 4 downslope stakes at an angle to wedge log/sod to bottom of ditch.
- Erosion control blanket shall be anchored according to the manufacturer's recommendations.

**TYPICAL SECTION**

- Vee Ditch
- Trapezoidal Ditch
TEMPORARY SLOPE DRAIN INLET TREATMENT

SECTION A-A

TEMPORARY BERM

NOTE: M E T A L - F L E X I B L E P I P E O R P L A S T I C P I P E

PERIMETER SILT FENCE
FOR TRANSVERSE FLOW

GENERAL NOTES:
USE SILT FENCE FOR FILL HEIGHTS GREATER OR EQUAL TO 10 FEET. ON ALL FILLS GREATER THAN 10 FEET HIGH,
MINIMUM RISE OF SILT FENCE SHOULD BE CONSIDERED.

FOR FABRIC SILT FENCE:
MINIMUM LONGITUDINAL SPlice OVERLAP SHALL BE 2"
WITH A FOOT AT EACH END.
SECURE FABRIC TO POSTS.

INLINE OF SILT FENCE ACROSS DRAINAGE DITCHES AND
DRAINS. DRAIN BARS SHALL BE USED AS SHOWN ON
PLANS OR AS DIRECTED BY ENGINEER.
AS SHOWN.

SILT FENCE

MINIMUM J-HOOK SPACING
METHOD OF SUPPORTING DECIDUOUS TREES
3" CALIBER OR LARGER

SIX LAYERS OF BURLAP TO BE INSTALLED BEFORE BRACE BLOCKS

ROOT BALL

BRACE BLOCK MAY BE NAILED TO TREE

HOLE

SECTION A-A

STEEL BANDS

METHOD OF SUPPORTING EVERGREEN TREES
3' OR MORE IN HEIGHT

ROOT BALL DIAMETER 9"

2 STEEL BANDS

2" X 2" X 6" BRACE BLOCK

STEEL BAND

7'

5 FT. "T" STEEL COMMERCIAL FENCE POST

NO. 12-WIRE

5" MULCH

BACKFILL MATERIAL

ROOT BALL DIAMETER 9"

4" MULCH

HOLE

SECTION B-B

WIRE BEFORE TWISTING

ROOT BALL

TWIST WIRE TO TIGHTEN

HOLE

TREE

HOSE

METHOD OF SUPPORTING DECIDUOUS TREES
3" CALIBER OR LARGER

SIX LAYERS OF BURLAP TO BE INSTALLED BEFORE BRACE BLOCKS

ROOT BALL

BRACE BLOCK MAY BE NAILED TO TREE

HOLE

SECTION A-A

STEEL BANDS

METHOD OF SUPPORTING EVERGREEN TREES
3' OR MORE IN HEIGHT

ROOT BALL DIAMETER 9"

2 STEEL BANDS

2" X 2" X 6" BRACE BLOCK

STEEL BAND

7'

5 FT. "T" STEEL COMMERCIAL FENCE POST

NO. 12-WIRE

5" MULCH

BACKFILL MATERIAL

ROOT BALL DIAMETER 9"

4" MULCH

HOLE

SECTION B-B

WIRE BEFORE TWISTING

ROOT BALL

TWIST WIRE TO TIGHTEN

HOLE

TREE

HOSE

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.
**Measurement of Small Trees**

- Multi-stem trees acceptable if one stem is the caliber specified.
- 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**

- Measure tip to tip.

**Pruning Cuts**

- Heading cut
- Thinning cut

---

*MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION*

TYPICAL PLANTING ILLUSTRATIONS

MEASUREMENT AND PRUNING CUTS
MINIMUM DISTANCE FOR PLANTING ON TYPICAL CROSS SECTION

LOCATION OF SHRUBS IN A TYPICAL PLANT BED

VINES AND SEEDLINGS

DECIDUOUS SHRUB SLOPE PLANTING

EVERGREEN SHRUB SLOPE PLANTING

SPREAD MEASURED NO MORE THAN 10" ABOVE THE GROUND LINE.

EVERGREEN SHRUB SLOPE PLANTING

DATE EFFECTIVE: 07/01/2004
DATE PREPARED: 8/28/2009
808.00 SHEET NO. 3 OF 3
NOTE:
ANCHOR BOLTS SHALL BE PLACED ONLY FOR 11" BOLT CIRCLE

PLAN
ANCHOR BOLTS

ELEVATION
DETAILS OF CONCRETE FOUNDATION

CONCRETE FOUNDATION EMBEDMENT

CONCRETE MIXTURE (3" MALLEABLE)

BOLT HEAD OR TACK WELDED NUT

SLOPE

GENERAL NOTES:
4. ALL CLASSIFICATIONS ARE ASTM UNLESS OTHERWISE NOTED. SEE STANDARD SPECIFICATIONS FOR CLASSIFICATIONS NOT SHOWN.
4. ALL BOLT CIRCLES FOR 45' MOUNTING HEIGHT SHALL BE 11'.
4. ALL CONNECTOR PLATE AND CLOSURE PLATE THICKNESSES SHOWN ARE VARIATION EXAMINATIONS.
4. ALL ANCHOR BOLTS SHALL BE FULLY EXAMINED T1 DIAMETER HIGH STRENGTH ANCHOR BOLTS.
4. ALL STEEL COMPONENTS SHALL BE HOT DIP GALVANIZED.

QUANTITIES

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<td>8-1&quot;</td>
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<td>9-1&quot;</td>
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</tbody>
</table>

GENERAL SPECIFICATIONS FOR COLUMN:
1-48" CONCRETE COLUMN, DIAMETER 24"
INSERT SPACER BETWEEN 3/1 CENTERS FOUR STAINLESS STEEL LEAN WINDOW 1-"
ON BACK AND SIDES :: BASE FLUSH WITH CABINET-.

DETAIL A

SECTION A-A WINDOW DETAIL

TOP VIEW

SIDE VIEW

BASE Flush WITH CABINET ON BACK AND SIDES

CABLE-CONDUIT OR RIGID CONDUIT TO LIGHTS

PULLBOX

DETAIL A

LIST OF MATERIALS

ITEM \n1 P2 CORBIN LOCK
2 RIGID CONDUIT
3 CLASS B CONCRETE, O.A.C.E.
4 NEMA 4, DUST-PROOF, WATERPROOF, CABINET
5 GROUND ROD, 2" DIA, X 8' MIN.
6 PHOTOELECTRIC SWITCH AND SOCKET, 105/265 V, 1000-WATT
7 TRANSLUCENT PLEXIGLASS FILTER #903, 1" THICK
8 CLEAR, LEXAN #903 WINDOW, 1" THICK MIN.
9 MOUNTING PAN, 31/2" x 12" x 2" ALUMINUM OR STAINLESS STEEL
10 PLIABLE DUCT SEALANT
11 LIFETIME SILICONE CAULK
12 ANCHOR BOLTS, 5/8-11 x 14/1 LONG BOLTS. HOT DIP GALVANIZED, 4 REQUIRED. USE BOLT HEAD OR TACK WELD, NUT ON EMBEDDED END
13 WEATHERPROOF ADHESIVE LABEL. VINYL RAISED LETTERING (OR EQUIVALENT, SEE DETAIL)

- - SEE PLANS

GENERAL NOTES:
ALTERNATE CABINET DIMENSIONS WILL BE ALLOWED AS APPROVED BY THE ENGINEER. INTERIOR CABINET VOLUME SHALL BE EQUAL TO OR GREATER THAN THAT SHOWN ON PLANS AND PROPER CLEARANCES SHALL BE PROVIDED FOR ALL EQUIPMENT. CONCRETE BASE DIMENSIONS SHALL BE MODIFIED TO FIT THE CABINET SUPPLIER.

PLACEMENT OF ALL ITEMS SHALL BE APPROVED BY THE ENGINEER.

CABINET SHALL BE LOCATED AWAY FROM TRAFFIC. TOP MOUNT PHOTO CONTROL SHALL FACE AN OPEN SKY. SIDE MOUNT PHOTO CONTROL SHALL FACE NORTH.

SEE PLANS FOR CIRCUIT WIRING: MAXIMUM LOADING PER CIRCUIT IS 7100 WATTS FOR 240 VOLT AND 11000 WATTS FOR 480 VOLT.

SCHEMATIC DIAGRAM SHALL BE MOUNTED ON INSIDE OF CABINET DOOR.

THE UTILITY SHALL BE NOTIFIED IN WRITING 30 DAYS PRIOR TO DATE SERVICE WILL BE REQUIRED.

ALL OPENINGS IN CABINET SHALL BE COVERED AND SEALED WITH LIFETIME SILICONE CAULK.

ALL MATERIALS REQUIRED EXCLUDING REFERENCE ITEMS AS SHOWN ON DRAWING SHALL BE INCLUDED IN PRICE BID FOR CONTROL STATION.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-MODOT (1-888-266-368)
JEFFERSON CITY, MO 65102
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-MODOT (1-888-266-368)

DATE EFFECTIVE: 06/01/2007
DATE PREPARED: 06/01/2007
901.30F SHEET NO. 1 OF 2
EQUIPMENT LAYOUT

WIRING DIAGRAM

LIST OF MATERIALS

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>RIGID CONDUIT *</td>
</tr>
<tr>
<td>2</td>
<td>NEMA 4, DUST-TIGHT, WATER-TIGHT CABINET</td>
</tr>
<tr>
<td>3</td>
<td>GROUND ROD, 3/8&quot; DIA. X 8&quot; MIN.</td>
</tr>
<tr>
<td>4</td>
<td>PHOTOELECTRIC SWITCH AND SOCKET. 105/285 V. ± 1000 WATT</td>
</tr>
<tr>
<td>5</td>
<td>TRANSLUCENT, PLEXIGLASS FILTER W2067, 1/2&quot; THICK</td>
</tr>
<tr>
<td>6</td>
<td>CLEAR, LEXAN #034 WINDOW, 1/2&quot; THICK MIN.</td>
</tr>
<tr>
<td>7</td>
<td>MOUNTING PAN, 315&quot; x 12&quot; x 3/4&quot; ALUMINUM OR STAINLESS STEEL</td>
</tr>
<tr>
<td>8</td>
<td>PLIABLE SEALANT</td>
</tr>
<tr>
<td>9</td>
<td>LIFETIME SILICONE CAULK</td>
</tr>
<tr>
<td>10</td>
<td>INSULATED TERMINAL BLOCK, FOR GREATER THAN 4/0 CABLE</td>
</tr>
</tbody>
</table>

15/240V | 2-POLE, 100 AMP, 120V COIL LIGHTING CONTACTOR |
15/480V | 2-POLE, 100 AMP, 240V COIL LIGHTING CONTACTOR |
16    | 2-POLE, 650 VOLT LIGHTING ARRESTER |
17    | 1-POLE, 15 AMP, TYPE B CONTROL BREAKER |
18    | 1-POLE, 15 AMP, TYPE B CONTROL BREAKER |
19    | INSULATED GROUNDABLE NEUTRAL, 100 AMP |
20    | 2-POLE, 100 AMP, TYPE A MAIN BREAKER |
21    | 2-POLE, 15 AMP MINI, TYPE A LIGHTING BREAKERS |
22    | #12 AWG MIN., 600 V. CONTROL CABLE |
23    | #2 AWG MIN., 600 V. POWER CABLE |
24    | #2 AWG MIN., 600 V. GROUND CABLE |

NOTES

B LIGHTING SYSTEM VOLTAGE AS SPECIFIED ON PLANS.
C PHOTOELECTRIC SWITCH BRACKETS MAY VARY. LOCATE CENTER OF WINDOW OVER CENTER OF PHOTOELECTRIC SWITCH.
D IF FOR REASONS OF VOLTAGE DROP A WIRE SIZE IS SPECIFIED LARGER THAN THE BREAKER LUGS CAN ACCOMMODATE, AN INSULATED HEAVY DUTY TERMINAL BLOCK SHALL BE INSTALLED TO TERMINATE THE LARGER WIRES AND A SMALLER JUMPER CONNECTED TO THE BREAKER ITSELF.
E LIGHTING BREAKER SIZING:

<table>
<thead>
<tr>
<th>SIZE (AMPS)</th>
<th>240V TOTAL</th>
<th>480V TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>0-2800</td>
<td>0-5500</td>
</tr>
<tr>
<td>20</td>
<td>2850-5700</td>
<td>5550-7400</td>
</tr>
<tr>
<td>25</td>
<td>5750-4600</td>
<td>7450-9200</td>
</tr>
<tr>
<td>30</td>
<td>4690-6550</td>
<td>9250-11,000</td>
</tr>
<tr>
<td>35</td>
<td>6550-6500</td>
<td></td>
</tr>
</tbody>
</table>

CIRCUIT LOAD INCLUDES LOAD DUE TO LINE LOSS, LAMP, AND BALLAST LOAD.

F ALL CIRCUIT BREAKERS SHALL CONFORM TO SECTION 901.4 OF THE STANDARD SPECIFICATIONS.
LIST OF MATERIALS

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<tr>
<th>ITEM</th>
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<td>SERVICE POLE 30' MIN., CLASS 4 MOD. CONTRACTOR PROVIDED, MODOT OWNED*</td>
</tr>
</tbody>
</table>
| 2    | #2 AWG MIN. CABLE, 600 VOLT *
| 3    | SERVICE ENTRANCE HEAD
| 4    | GUY CABLE, AS REQUIRED
| 5    | RIGID CONDUIT, 2" MIN., WITH PREFORMED ELBOWS
| 6    | LIGHTING ARRESTER, VALVE TYPE, 2 POLE, 650 VOLT
| 7    | METER SOCKET, 200 AMP, FOR SIGNALS
| 8    | METER SOCKET, 200 AMP, FOR LIGHTING
| 9    | LOCKING, RAINTIGHT, NEMA 4 SERVICE DISCONNECT BOX
| 10   | THREADED CONDUIT HUB WITH SEALING WASHERS
| 11   | 1/2" METAL CONDUIT
| 12   | 1/2" METAL CONDUIT
| 13   | #2 AWG MIN. GROUND WIRE
| 14   | GROUND ROD, 3/4" X 8' MIN.
| 15   | #8 AWG MIN. CABLE, 600 VOLT *
| 16   | CLASS B CONCRETE, 0.92 C.Y.
| 17   | THREADED CONDUIT HUB WITH SEALING WASHERS
| 18   | WEATHERPROOF ADHESIVE LABEL (LIGHTING), VINYL RAISED LETTERING (OR EQUIVALENT, SEE DETAIL)
| 19   | WEATHERPROOF ADHESIVE LABEL (SIGNS), VINYL RAISED LETTERING (OR EQUIVALENT, SEE DETAIL)
| 20   | WEATHER PROOF ADHESIVE LABEL DETAIL (SIGNALS), VINYL RAISED LETTERING (OR EQUIVALENT, SEE DETAIL)
| 21   | 2" X 9 OR 6" X 15 GALVANIZED POST
| 22   | #2 AWG MIN. CABLE, 600 VOLT *
| 23   | RIGID CONDUIT, 2" MINIMUM * SEE PLANS

NOTES:

A. SERVICE POLE SHALL BE GUDED 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.
H. IF SUBSURFACE CONDITIONS EXIST WHICH PROHIBIT THE PLACEMENT OF THE GROUND ROD IN A VERTICAL POSITION, THE ROD MAY BE DRIVEN AT AN OBLIQUE ANGLE NOT TO EXCEED 45 DEGREES FROM VERTICAL OR BURIED IN A TRENCH AT LEAST 30 IN. DEEP. CONNECTION TO GROUND ROD SHALL BE CAMELIZED.

GENERAL NOTES:

FOR CABLE TYPES AND INSTALLATION, SEE STANDARD SPECIFICATIONS.

THE POWER SUPPLY ASSEMBLY TYPE IS SHOWN ON THE PLANS OR IS DESIGNATED IN THE CONTRACT.

THE UTILITY COMPANY SHALL BE NOTIFIED IN WRITING 30 DAYS PRIOR TO DATE SERVICE WILL BE REQUIRED.

WHERE SIGNAL OR LIGHTING POWER ONLY IS DESIGNATED, OMIT ITEMS NOT REQUIRED.

ALL OPENINGS IN ANY SERVICE POLE OR METER BOX SHALL BE COVERED AND SEALED WITH LIFETIME SILICONE CAULK.

ALL MATERIALS REQUIRED AS SHOWN ON DRAWING, INCLUDING CABLE AND CONDUIT FROM POWER SUPPLY ASSEMBLY TO UTILITY COMPANY FACILITIES, SHALL BE INCLUDED IN UNIT BID PRICE FOR POWER SUPPLY ASSEMBLY.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

HIGHWAY LIGHTING
POWER SUPPLY ASSEMBLY
SECONDARY SERVICE

DATE EFFECTIVE: 04/01/2002
DATE PREPARED: 06/01/2002
901.800  SHEET NO. 1 OF 2
PEDESTAL OR NEW STATE-OWNED POLE TO BE SET WITHIN 2' TO 4' OF RIGHT-OF-WAY LINE.

ALL SERVICE POWER SUPPLY ASSEMBLIES ARE TO BE LOCATED ON STATE PROPERTY.

UTILITY COMPANY POLE, PEDESTAL OR PAD MOUNT TRANSFORMER

POWER INPUT SHALL BE (MIN.) 2" RIGID STEEL CONDUIT WITH THREE #2 AWG CABLES.

SEPARATE FEEDS FOR LIGHTING AND SIGNALS

LOCATION OF FACILITIES SHALL COMPLY WITH UTILITY COMPANY CLEARANCE STANDARDS.

RISER OR TRIPLEX SECONDARY DROP BY UTILITY COMPANY.

UTILITY COMPANY POLE, PEDESTAL OR NEW STATE-OWNED POLE TO BE SET WITHIN 2' TO 4' OF RIGHT-OF-WAY LINE.

PRIVATE PROPERTY STATE PROPERTY

NOTE:
CABLE AND CONDUIT FROM POWER SUPPLY ASSEMBLY TO UTILITY COMPANY FACILITIES SHALL BE INCLUDED IN PRICE BID FOR POWER SUPPLY ASSEMBLY.
GENERAL NOTES:

ACCESSIBLE PEDESTRIAN SIGNAL ASSEMBLY MAY BE MONOLITHIC OR A SEPARATE ACTUATOR AND SIGN.

SIGNS FOR SIGNAL INSTALLATIONS, INCLUDING ALL MATERIAL REQUIRED FOR SIGN MOUNTING, SHALL BE FURNISHED BY THE CONTRACTOR. SIGNS SHALL BE MANUFACTURED IN ACCORDANCE WITH SEC. 903, AND MOUNTED AS SHOWN ON THE PLANS.

ACCESSIBLE PEDESTRIAN SIGNAL ASSEMBLY CAN BE MOUNTED TO SIGNAL POLE, PEDESTRIAN POLE, OR PEDESTRIAN PUSHBUTTON POLE.

INCLUDE A 9" X 15" FIG. 3E SIGN WITH EACH ASSEMBLY.

REQUIRES PEDESTRIAN PUSHBUTTON AND MOUNTING IN UNITS ON THE SAME PEDESTRIAN POLE. ADDITIONAL MOUNTING EXTENSION BRACKET SHALL BE PROVIDED IF A 3' MOUNTING DEPTH FROM THE PEDESTRIAN PUSHBUTTON INACCESSIBLE SIDEWALK CANNOT BE ACHIEVED.

IF THE CURB RAMP IS NOT ALIGNED WITH THE CROSSWALK, THE ACCESSIBLE PEDESTRIAN SIGNAL ASSEMBLY SHALL POINT IN THE DIRECTION OF TRAVEL, NOT IN THE DIRECTION OF THE CURB RAMP ORIENTATION.
FOR CONTROLLER CABINETS WITH HEIGHTS FROM 4'-0" TO 6'-0"

### DOUBLE

**TYPE E**
- **PLAN VIEW**
- **PLAN VIEW**
- **PLAN VIEW**
- **PLAN VIEW**
- **PLAN VIEW**
- **PLAN VIEW**

**TYPE EV**
- **PLAN VIEW**
- **PLAN VIEW**
- **PLAN VIEW**
- **PLAN VIEW**
- **PLAN VIEW**
- **PLAN VIEW**

### NOTES:
1. **D**imension varies according to cabinet height.
2. **G**round rod: 3/4" dia. x 8' min. If subsurface conditions exist which prohibit the placement of the ground rod in a vertical position, the rod may be driven at an angle not to exceed 45 degrees from vertical or buried in a trench at least 30 in. deep, with the top of the ground rod being at least 5 ft. below grade.
3. **L**ifetime silicone caulk between cabinet and base.
4. **R**# Corbin lock
5. Anchor bolts (use bolt head or tack welded nut on embedded end) and size as specified by cabinet manufacturer.

**CONDUIT LOCATIONS**

- **SCREENED LOUVERS WITH GUARD PLATES (TYPE)**
- **SCREENED LOUVERS WITH GUARD PLATES (TYPE)**
- **SCREENED LOUVERS WITH GUARD PLATES (TYPE)**
- **SCREENED LOUVERS WITH GUARD PLATES (TYPE)**
- **SCREENED LOUVERS WITH GUARD PLATES (TYPE)**
- **SCREENED LOUVERS WITH GUARD PLATES (TYPE)**

**CONDUIT AS REQUIRED**

- **0.5% MINIMUM SLOPE**
- **PAVED SURFACE**
- **NON-PAVED SURFACED**

**MISSOURI HIGHWAYS AND TRANSPORTATION**

**COMMISSION**

**TRAFFIC SIGNALS**

**CONTROLLERS**

**CONDUIT LOCATION**

**JEFFERSON CITY, MO 65102**

**DATE PREPARED:**

**DATE EFFECTIVE:**

**DATE PREPARED:**

**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 STAINLESS STEEL.

SERVICE DISCONNECT BOXES AND METER BOXES SHALL BE UL APPROVED, AND CONFORM TO THE REQUIREMENTS OF THE UTILITY COMPANY OR MUNICIPALITY PROVIDING POWER.

SCHEMATIC DIAGRAM SHALL BE MOUNTED ON INSIDE OF DOOR.

UTILITY COMPANY SHALL DECIDE IF LIGHTNING ARRESTERS ARE TO BE CONNECTED ON THE LOAD OR LINE SIDE OF THE METER. THE UTILITY COMPANY SHALL ALSO DECIDE IF THE LIGHTNING ARRESTER IS TERMINATED IN THE METER OR DISCONNECT CABINET. IF TERMINATED IN THE DISCONNECT CABINET, IT SHALL BE INSTALLED ON THE CONNECT CABINET.

IF LIGHTING IS SPECIFIED, INSTALL LIGHTING CONTROL ON POWER SUPPLY.

BREAKERS SHALL CONFORM TO SEC. 901.4 OF THE STANDARD SPECIFICATIONS.

IF SUBSURFACE CONDITIONS EXIST WHICH PROHIBIT THE PLACEMENT OF THE GROUND ROD IN VERTICAL POSITION, THE ROD MAY BE DRIVEN AT AN OBLIQUE ANGLE NOT TO EXCEED 45 DEGREES FROM VERTICAL OR BURIED IN A TRENCH AT LEAST 30 IN. DEEP. CONNECTION TO GROUND ROD SHALL BE CADD 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.

NOTE:
CABLE AND CONDUIT FROM POWER SUPPLY ASSEMBLY TO UTILITY COMPANY FACILITIES SHALL BE INCLUDED IN PRICE BID FOR POWER SUPPLY ASSEMBLY.

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. MO DOT 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‘ MIN. RIGID CONDUIT 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>2‘ MIN. RIGID CONDUIT</td>
</tr>
<tr>
<td>9</td>
<td>SERVICE DISCONNECT BOX, LOCKING, RAIN TIGHT, NEMA 4</td>
</tr>
<tr>
<td>10</td>
<td>INSULATED, GROUND WIRE, 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‘</td>
</tr>
<tr>
<td>14</td>
<td>GROUND WIRE, #2 AWG MIN.</td>
</tr>
<tr>
<td>15</td>
<td>GROUND ROD, 3/4‘ 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 CY.</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 ADHESIVE LABEL (SIGNALS) VINYL RAISED LETTERING</td>
</tr>
<tr>
<td>21</td>
<td>TYPE B CONTROLLER AND SIGNAL BREAKER, AS SPECIFIED</td>
</tr>
<tr>
<td>22</td>
<td>TYPE B AUXILIARY BREAKER, 15 AMP</td>
</tr>
<tr>
<td>23</td>
<td>6 X 9 OR 6 X 15 GALVANIZED POST</td>
</tr>
<tr>
<td>24</td>
<td>LIGHTING CONTROL CABINET (SEE SHEET 2)</td>
</tr>
<tr>
<td>25</td>
<td>#2 AWG MIN. CABLE, 600 VOLT</td>
</tr>
</tbody>
</table>

* SEE PLANS

** NOTES **
1. SERVICE POLE SHALL BE DUG 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 STAINLESS STEEL.
4. METER SOCKET AND OTHER EQUIPMENT AND MATERIALS SHALL BE UL 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 CADD WELDED.

FOR WIRING DIAGRAM AND LABEL DETAIL SEE SHEET 2 OF 4.
TRAFFIC SIGNALS
POWER SUPPLY ASSEMBLY
240/120 VOLT SERVICE

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

FOR CABLE TYPES AND INSTALLATION, SEE STANDARD SPECIFICATIONS.
THE TYPE POWER SUPPLY ASSEMBLY IS SHOWN ON THE PLANS OR IS DESIGNATED IN THE CONTRACT.
THE UTILITY COMPANY SHALL BE NOTIFIED IN WRITING 30 DAYS PRIOR TO DATE SERVICE WILL BE REQUIRED.
WHERE SIGNAL OR LIGHTING POWER ONLY IS DESIGNATED, OMIT ITEMS NOT REQUIRED.
ALL OPENINGS IN ANY SERVICE BOX OR METER BOX SHALL BE COVERED AND SEALED WITH LIFETIME SILICONE CAULK.
ALL MATERIALS REQUIRED EXCLUDING REFERENCE ITEMS AS SHOWN ON DRAWING SHALL BE INCLUDED IN PRICE BID FOR POWER SUPPLY ASSEMBLY.

GENERAL NOTES:
1. SERVICE POLES SHALL BE GUYED WHEN SPAN OF OVERHEAD SERVICE WIRE EXCEEDS 50'.
2. INCREASE 1 FOOT FOR EACH 5 FEET ABOVE 50 FEET.
3. SERVICE DISCONNECT BOXES AND METER BOXES SHALL BE ALUMINUM OR STAINLESS STEEL. ALL HARDWARE, HINGES, CATCHES, ETC. SHALL BE STAINLESS STEEL.
4. METER SOCKET AND OTHER EQUIPMENT AND MATERIALS SHALL BE U.L. APPROVED.
5. LOCATIONS OF FACILITIES SHALL COMPLY WITH UTILITY COMPANY CLEARANCE STANDARDS.
6. SERVICE POLES SHALL BE GUYED WHEN SPAN OF OVERHEAD SERVICE WIRE EXCEEDS 50'.
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<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 ADHESIVE LABEL (SIGNS) 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>56 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>

NOTES
1. SERVICE POLE SHALL BE GUYED WHEN SPAN OF OVERHEAD SERVICE WIRE EXCEEDS 50'.
2. INCREASE 1 FOOT FOR EACH 5 FEET ABOVE 50 FEET.
3. SERVICE DISCONNECT BOXES AND METER BOXES SHALL BE ALUMINUM OR STAINLESS STEEL. ALL HARDWARE, HINGES, CATCHES, ETC. SHALL BE STAINLESS STEEL.
4. METER SOCKET AND OTHER EQUIPMENT AND MATERIALS SHALL BE U.L. APPROVED.
5. LOCATIONS OF FACILITIES SHALL COMPLY WITH UTILITY COMPANY CLEARANCE STANDARDS.
6. SERVICE POLES SHALL BE GUYED WHEN SPAN OF OVERHEAD SERVICE WIRE EXCEEDS 50'.
7. INCREASE 1 FOOT FOR EACH 5 FEET ABOVE 50 FEET.
8. SERVICE DISCONNECT BOXES AND METER BOXES SHALL BE ALUMINUM OR STAINLESS STEEL. ALL HARDWARE, HINGES, CATCHES, ETC. SHALL BE STAINLESS STEEL.
9. METER SOCKET AND OTHER EQUIPMENT AND MATERIALS SHALL BE U.L. APPROVED.
10. UTILITY COMPANY SHALL BE NOTIFIED IN WRITING 30 DAYS PRIOR TO DATE SERVICE WILL BE REQUIRED.
11. WHERE SIGNAL OR LIGHTING POWER ONLY IS DESIGNATED, OMIT ITEMS NOT REQUIRED.
12. ALL OPENINGS IN ANY SERVICE BOX OR METER BOX SHALL BE COVERED AND SEALED WITH LIFETIME SILICONE CAULK.
13. ALL MATERIALS REQUIRED EXCLUDING REFERENCE ITEMS AS SHOWN ON DRAWING SHALL BE INCLUDED IN PRICE BID FOR POWER SUPPLY ASSEMBLY.

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

TRAFFIC SIGNALS
POWER SUPPLY ASSEMBLY
240/120 VOLT SERVICE

DATE EFFECTIVE: 07/01/2004
DATE PREPARED: 8/26/2009
902.15K
2 OF 3
TO FORM AIR GAP BETWEEN FILTER HOLE IN CABINET AND INSIDE CABINET
INSERT SEAL BETWEEN & AROUND LEXAN WINDOW
BOLTS 16 AND CABINET

FRONT VIEW

WINDOW DETAIL

SECTION A-A

PHOTOELECTRIC SWITCH

LIGHTING CONTROL 120 VOLTS

LABEL DETAIL

EQUIPMENT LAYOUT

WIRING DIAGRAM

LIST OF MATERIALS

1 CABINET, WATER-TIGHT, NEMA 4, 14 GA MINIMUM THICKNESS
2 PANEL, 12 OR MINIMUM THICKNESS, ALUMINUM OR STAINLESS STEEL
3 CONTINUOUS STAINLESS STEEL HINGE
4 NEOPRENE Gasket Door
5 3/8” x 1 1/4 COLLAR STU
6 PHOTOELECTRIC SWITCH AND SOCKET, 105/285 V., 1000 WATT
7 15 AMP CONTROL BREAKER, SINGLE POLE, TYPE B
8 15 AMP AUTO-MANUAL SWITCH, SINGLE POLE BREAKER, TYPE B, WITH LABEL
9 MAIN BREAKER, SINGLE POLE, TYPE B
10 NEUTRAL TERMINAL STRIP
11 LIGHTING TERMINAL BLOCK, INSULATED FROM BACK PANEL, 12 POSITION
12 POWER CABLE, #8 AWG, MIN. 600 V.
13 FILTER, TRANSLUCENT, PLEXIGLASS #9034 WINDOW, 1/4” THICK MIN. EXCEPT FOR 15A BREAKER MIN. WIDTH x 10 AMPS
14 CABLE, LIGHTING, MIN. 16 LIFETIME SILICONE CAULK
15 CABLE, LIGHTING, MIN. 16 LIFETIME SILICONE CAULK
16 LIFETIME SILICONE CAULK
17 PLIABLE DUCT SEALANT
18 LABEL, WEATHERPROOF ADHESIVE-VINYL, RAISED LETTERING (OR EQUIV.)
19 CONDUIT, RIGID, 2” MIN.
20 CONDUIT, RIGID, 1” MIN.
21 LIGHTING CONTACTOR, 2 POLE, 30 AMP, 600 VOLT, 120 VOLT COIL
22 #2 CORBIN LOCK
23 #2 THREADED CONDUIT HUB WITH SEALING WASHERS

NOTES:

A SCHEMATIC DIAGRAM SHALL BE MOUNTED ON INSIDE OF CABINET DOOR.
B PHOTOELECTRIC SWITCH BRACKET MAY VARY. LOCATE CENTER OF WINDOW OVER CENTER OF PHOTOELECTRIC SWITCH.
C MAIN BREAKER SIZE:
   TOTAL LUMINARIES BREAKER SIZE MIN. AWG
   0-920 15 10
   930-1260 20 8
   1270-1600 25 8
   1610-1930 30 8
   EXCLUDING BALLAST LOAD
   TERMINAL BLOCK SHALL BE RATED AT 600V. SHALL ACCEPT WIRES UP TO 8 AWG AND SHALL HAVE A BARREL BETWEEN EACH TERMINAL AND ON EACH END.

GENERAL NOTES:

ALL OPENINGS IN CABINET SHALL BE COVERED AND SEALED WITH LIFETIME SILICONE CAULK.

ALL CIRCUIT BREAKERS SHALL CONFORM TO SECTION 901.4 OF THE STANDARD SPECIFICATIONS.

PLACEMENT OF ALL ITEMS SHALL BE APPROVED BY THE ENGINEER.

CABINET SHALL BE LOCATED AWAY FROM TRAFFIC. TOP MOUNT PHOTO CONTROL SHALL FACE AN OPEN SKY. SIDE MOUNT PHOTO CONTROL SHALL FACE NORTH.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-800-ASK-MODOT (1-888-275-6636)

TRAFFIC SIGNALS
POWER SUPPLY ASSEMBLY
240/120 VOLT SERVICE

DATE EFFECTIVE: 07/01/2004
DATE PREPARED: 08/28/2003
902.15K SHEET NO. 3 OF 3
SECTION A-A
TYPE I DRAIN TYPE
GROUNDING BUSHING (TYP)

SECTION A-A
TYPE II DRAIN TYPE
SEE DRAIN OUTLET DETAIL
(SECTION ABOVE APPLICABLE TO TYPE I DRAIN)

SECTION B-B
TYPE I DRAIN TYPE
STONE (DRAIN MATERIAL)
STAIN (DRAIN MATERIAL)

SECTION B-B
TYPE II DRAIN TYPE
SEE DRAIN OUTLET DETAIL
(SECTION ABOVE APPLICABLE TO TYPE I DRAIN)

SECTION C-C

STANDARD CONCRETE PULL BOX

DOUBLE CONCRETE PULL BOX, TYPE A

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 MEDICAL CENTER
JEFFERSON CITY, MO 65102
1-888-399-MODOT (1-888-399-6636)

TRAFFIC SIGNALS
CONCRETE PULL BOXES

SIZE EFFECTIVE:
04/01/2003
902.20G
SHEET NO:
1/03/2003
1 OF 3
**2 PIECE INTERLOCKING COVER**

**BOLT (2 REQUIRED)**

**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>0</td>
<td>1</td>
<td>17&quot; x 30&quot;</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>24&quot; x 36&quot;</td>
</tr>
<tr>
<td>&gt; 68</td>
<td>3</td>
<td>30&quot; x 48&quot;</td>
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1. ALL METAL CONDUITS SHALL BE ELECTRICALLY BONDED BY A GROUND BUSHING AND #6 AWG DARE COPPER WIRE. FOR PVC CONDUITS, ALL GROUND WIRES SHALL BE CONNECTED.
2. SIGNAL PULL BOXES SHALL BE EMBOSSED "STATE SIGNALS" AND LIGHTING PULL BOXES "STATE LIGHTING."
3. PULL BOX FRAMES AND COVERS SHALL BE CAST IRON AND THE FOLLOWING MINIMUM DIMENSIONS:

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<th>FRAME SIZE:</th>
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</thead>
<tbody>
<tr>
<td>OPENING SIZE:</td>
<td>22&quot; x 22&quot;</td>
</tr>
<tr>
<td>FRAME WEIGHT:</td>
<td>120 LBS.</td>
</tr>
<tr>
<td>COVER SIZE:</td>
<td>22&quot; x 22&quot;</td>
</tr>
<tr>
<td>COVER THICKNESS:</td>
<td>1&quot;</td>
</tr>
<tr>
<td>COVER WEIGHT:</td>
<td>140 LBS.</td>
</tr>
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</table>

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.
AGGREGATE SHALL BE TYPE 1 CONFORMING TO SEC 1007.

BOX SHALL BE OF A FLARE DESIGN AND HAVE A LIP FOR STABILIZATION.

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".

TYPE II DRAIN TYPE
(SEE DRAIN OUTLET DETAILS)
(SECTION ABOVE BREAK APPLICABLE TO TYPE 1 DRAIN.)

SECTION A-A
TYPE 1 DRAIN TYPE

SECTION B-B

PLAN

CIRCULAR PULL BOX
CLASS 5

2" CONDUIT DRAIN TO INSLOPE OR AS SPECIFIED PREMOLDED BIT JOINT
4" PER FOOT MIN. SLOPE

POLYMER CONCRETE RING
BOLT HOLES

41" DIA. NOMINAL CLEAR OPENING

SOLID WALL SMOOTH/RIBBED FLEXIBLE CONDUIT
BLACK = POWER
ORANGE = FIBER OPTIC CABLE

FIBER OPTIC TERMINATION CABLE
LOCATOR CABLE WIRE (TYP.)

STONE DRAIN MATERIAL

GROUND ROD (OPTIONAL)

3 CABLE HOOKS PER LEVEL (TYP.)

25" NOMINAL CLEAR OPENING

36" NOMINAL CLEAR OPENING

30""
TRAFFIC SIGNALS
POST BASES

BOLT CIRCLE

THREADED OR LEADED (TYP. OCTAGONAL BASE)

STAINLESS STEEL BOLT & NUT

GALVANIZED HEX NUT & WASHER

ANCHOR BOLT

CAST BASE

SQUARE

OCTAGONAL

DETAIL A

ANCHOR BOLT

SIDE VIEW

END VIEW

TWO BOLTS PER PLATE
HEX NUT OR ¼" FILLET WELD ALL AROUND BOTH SIDES

SIDE VIEW

END VIEW

FOUR BOLTS PER PLATE
HEX NUT OR ¼" FILLET WELD ALL AROUND BOTH SIDES

NOTE:
ALL ANCHOR BOLTS SHALL BE FULLY GALVANIZED.

OPTIONAL STEEL PLATE FOR ANCHOR BOLTS

DATE EFFECTIVE:
02/01/2008

DATE PREPARED:
08/26/2009
TYPICAL TOP VIEW

TYPICAL POST LOADING

MINIMUM DESIGN LOADING FOR POST AND MAST ARM ATTACHMENTS

TRAFFIC SIGNALS
TUBULAR STEEL POSTS
DESIGN LOADING REQUIREMENTS

ITEM NO: DESCRIPTION | HEIGHT (FT.) | PROD. (lbs.) | SUBGRADE (lbs.)
--- | --- | --- | ---
1 | 3'-SECTION 6' HEI | 96.0 | 6.0 | 16.0
2 | 5'-SECTION 6' HEI | 120.0 | 10.0 | 24.0
3 | 3'-SECTION 4' FPE HEI | 96.0 | 6.0 | 16.0
4 | 5'-SECTION 4' FPE HEI | 120.0 | 10.0 | 24.0
5 | 5'-SECTION 6' LUMINOSE | 120.0 | 10.0 | 24.0
6 | 5'-SECTION 6' LUMINOSE | 120.0 | 10.0 | 24.0
7 | 32' X 3' SIGN | 32.0 | 24.0 | 64.0
8 | 48' X 18' SIGN | 48.0 | 36.0 | 72.0
9 | 60' X 18' SIGN | 60.0 | 48.0 | 96.0

**OIL-SPILLSLYMENDED**

4 MOUNTING WIRE REQUIRED

**STRUCTURAL DESIGN REQUIREMENTS**

All structural supports shall be designed and fabricated to withstand their own loading and the attachment loading shown on this drawing or on the plans, whichever is greater.

**DESIGN OF STRUCTURAL SUPPORTS** shall be based on ASST.

Specifications, Federal Highway Administration, Federal Highway Administration, Federal Highway Administration, Federal Highway Administration, Federal Highway Administration.

**Minimum Design Wind Speed** of 90 MPH at 30 Feet Above Grade.

**GROUP LOADING**:

**PERCENT OF ALLOWABLE STRESS**

**GROWTH**:

- **GROUP 1** - 75%
- **GROUP 2** - 60%
- **GROUP 3** - 40%
- **GROUP 4** - 30%
- **GROUP 5** - 25%

**For Type B and EL Posts**:

**General Notes**

- **ATTACHMENT LOCATIONS ARE FOR DESIGN LOADS ONLY.** Actual locations are shown on the plans.
- **LUMINOSE LAMINATE** adheres to MoDOT's Standards and Specifications unless otherwise noted on plans.
GENERAL NOTES:

- SENSOR UNIT SHALL BE HOUSED IN CONTROLLER CABINET UNLESS SPECIFIED OTHERWISE.
- LOOP SLT TO BE INSTALLED. WHEN USING EXISTING PORTLAND CEMENT CONCRETE OR ASPHALTIC CONCRETE PAVED ROADWAY BEING RESURFACED. LOOPS SHALL NOT BE PLACED IN SURFACE Course OF THE ASPHALTIC CONCRETE.
- THE CONDUIT SLOTS MAY BE BORED OR VIBRALLY 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 SEALER.
- LOOP "E" JOINTS OR OTHER FULL DEPTH JOINTS. MINOR ADJUSTMENTS TO LOOP LOCATION MAY BE MADE.
- USE TYPICAL DIMENSIONS UNLESS OTHERWISE SHOWN ON PLANS.

SECTION C-C

LOOP SLOT DETAIL

DETAIL A

SECTION A-A LOOP SLOT

DETAIL OF AN "E" JOINT OR OTHER FULL DEPTH JOINT CROSSING

CAUTION: WIRE SHALL BE PLACED IN SAVED SLOT WITH DEVICE WHICH WILL NOT DAMAGE THE WIRE INSULATION.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-777-MOidot (668-4688)

TRAFFIC SIGNALS
INDUCTION LOOP DETECTORS

SIZE EFFECTIVE: 08/01/2002
DATE PREPARED: 06/05/2003
902.50M SHEET NO. 1 OF 2
LOOP SHOULD BE #16 STRANDED WIRE IN PVC

DON'T MAKE UP OF 2 NON-TWISTED THROWS IN SINGLE
SLOT OR AS RECOMMENDED BY MANUFACTURER OF THE
DETECTOR AMPLIFIER. LOOP SHALL BE PLACED IN
SPLAY SLOTS IN A FIGURE EIGHT MANNER.

TO FILL BOX

3 WIRES

TO FILL BOX

CUTS

CUTS

IF EXISTING LOOPS ARE TO BE ABANDONED AND NEW
LOOP INSTALLED, ABANDONED LOOP WIRES SHALL BE
REMOVED OR CUT COMPLETELY THROUGH.

LOOP CONFIGURATION

ABANDONED LOOPS
WOOD POLE SPAN WIRE SIGNALS

1" EXPANDING ROCK ANCHOR (SAME APPLIES TO STAND OFF GUY)

MULTI-CONDUCTOR CABLE (SEE PLANS).
METER SOCKET AND CABINET.
CONTROLLER CABINET. ALL CONDUITS SHALL ENTER THE BOTTOM OF THE CABINET. NO HOLES SHALL BE MADE IN THE TOP, BACK OR SIDES OF THE CABINET.
JUNCTION BOX (NEMA 4).
DISCONNECT HANGER (NOT REQUIRED IF TEMPORARY).
CIRCUIT BREAKER. SEE STANDARD 902.15 FOR DETAILS.
¾" GALVANIZED STRAIGHT THIMBLEYE BOLT WITH GALVANIZED NUT AND 2½" GALVANIZED CURVE BOLT.
3" GALVANIZED ANGLE THIMBLEYE.
TETHER WIRE AND CLAMP WITH QUICK RELEASE PROVISIONS. SEE DETAIL FOR MOUNTING TO POLE AND SIGNAL. OPTIONAL ATTACHMENT PERMITTED WITH APPROVAL OF ENGINEER.
2½" GALVANIZED POST PLATE FASTENED TO POLE WITH ONE ¾" x 4" GALVANIZED LAG SCREWS.
2½" GALVANIZED CONNECTOR END FITTING.
ALL LOCATIONS REQUIRE GUY WIRE PROTECTOR. 17" MIN.
¾" x 8' GALVANIZED THIMBLEYE ANCHOR ROD. (30" MIN. LENGTH IN ROCK).
#6 AWG BARE COPPER WIRE IN ½" CONDUIT.
4" AUTOMATIC JAW-TYPE CABLE FITTING WITH SHORT BAIL. 5900 LBS. MINIMUM HOLDING STRENGTH.
LIGHTING CIRCUIT BREAKER CABINET (IF LUMINARIES ARE SPECIFIED SEE STANDARD 902.15 FOR DETAILS).

GENERAL NOTES:
DESIGN OF STRUCTURAL SUPPORTS SHALL COMPLY WITH AASHTO STANDARD SPECIFICATIONS FOR STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINARIES AND TRAFFIC SIGNALS 2001 AND CURRENT INTERIM.
MAXIMUM SPAN LENGTH: 100' FOR ONE OR TWO SPANS OFF POST, WITH ONE 5-SECTION HEAD SIGNAL, TWO 3-SECTION HEAD SIGNALS AND TWO SIGNS PER SPAN.
ALL APPURTENANCES TO BE MOUNTED ON POLE SHALL BE FASTENED TO POLE AS RECOMMENDED BY THE MANUFACTURER.
SCHEDULE 40 POLYETHYLENE OR POLYVINYL CHLORIDE CONDUIT AND WEATHER HEAD SHALL BE USED ON UTILITY COMPANY POLES IN LIEU OF RIGID STEEL CONDUIT.
NO DIRECT PAYMENT WILL BE MADE FOR GUYS, CONDUIT AND JUNCTION BOXES ON POLES, HARDWARE, LIGHTING BRACKETS, ARMS OR ANY OTHER ITEMS FOR WHICH SEPARATE PAYMENT IS NOT PROVIDED.
ALL GUY WIRES SHALL BE GROUNDED.

TRAFFIC SIGNALS
RIGID SPAN WIRE DETAILS

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

DATE EFFECTIVE: 04/01/2021
DATE PREPARED: 01/27/2021
SIGNED, SEALED AND DATED
902.700 SHEET NO. 1 OF 3
**Steel Post Details**

1. **6" IF LOCATED WITHIN 4' OF CONCRETE MEDIAN.**
2. **Double Galvanized ⅛" (MIN.) Steel Messenger Wire - T Strand High Strength Grade.**
3. **⅛" Automatic Jaw Type Cable Fitting with Short Bail. 13,860 lbs. Minimum Holding Strength.**
4. **1" x 8' Min. Copper Ground Rod. One pole shall be grounded by connecting no. 6 AWG bare copper wire from grounding lug inside pole to ground rod by means of a galvanized wire clamp located inside of pole. Ground lug shall be oriented 90° or 270° to handle.**
5. **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° from vertical or buried in a trench at least 30" in depth. Connection to ground rod shall be cadwelded.**
6. **Galvanized ⅛" Steel Clevis Clamp to fasten to the pole with ⅛" Galvanized Carriage Bolts.**
7. **Rake as necessary. 10° Maximum.**
8. **Non-Corrosive Metal Cable Hangers at 12" Centers.**
9. **Multi-Conductor Cable (AS Required).**
10. **⅛" Automatic Jaw Type Cable Fitting with Short Bail. 5990 lbs. Minimum Holding Strength.**
11. **4" x 6½" Handhole and cover with reinforced frame welded to pole.**
12. **One-Piece or Two-Piece Metal Base Cover or Individual Nut Covers.**
13. **Fully Galvanized Anchor Bolt with bolt head or tack welded nut on embedded end.**
14. **Wire Entrance with Insulated Weatherproof Bushing (AS Required).**
15. **Double Galvanized ½" Steel - T Strand High Strength Grade Tether Wire and Clamp with Quick Release Provisions. Install horizontal or below horizontal.**

**General Notes:**
- Maximum span length:
  - 160' for one one or two spans off post, with guy wire, one 5-section head signal, two 3-section head signals and two signs per span.
  - 100' for one span off post, without guy wire, with three 3-section head signals and two signs per span.
  - 100' for two spans off post, without guy wire, with two 3-section head signals and one sign per span.
- Concrete pole embedment shall be Class B Concrete.
- See sheet 1 for down guy information when down guy is specified on plans.
- Expansive grout shall be used between the pole base plate and the concrete base when individual nut covers are used. See Standard 902.40 for screen details.
SPAN WIRE SIGNING

DETAIL A

DETAIL B

BACKING BAR PLACEMENT

GENERAL NOTES:
SIGNS UP TO 20' IN WIDTH SHALL BE INSTALLED ON ONE VERTICAL BACKING BAR. SIGNS 20' TO 40' IN WIDTH SHALL BE INSTALLED ON TWO VERTICAL BACKING BARS. SIGNS WIDER THAN 40' SHALL BE INSTALLED ON THREE VERTICAL BACKING BARS.

 street name

4. As close as practical to minimum distance.
**Type A**

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<th>B</th>
<th>C</th>
<th>E</th>
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**Type D**

**General Notes:**

* Arrows for reference only.
* Arrow details available from Traffic and Highway Safety Division.

**Type D Arrow Details**

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<td>14 1/2&quot;</td>
<td>16&quot;</td>
<td>10 1/2&quot;</td>
</tr>
</tbody>
</table>

**Type C Overhead Arrow Details**

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>E</th>
<th>F</th>
<th>M1</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 1/2&quot; H.C.</td>
<td>27&quot;</td>
<td>16&quot;</td>
<td>10&quot;</td>
<td>5 1/2&quot;</td>
<td>6&quot;</td>
</tr>
</tbody>
</table>

**General Notes:**

* Arrows for reference only.
* Arrow details available from Traffic and Highway Safety Division.
### Structural Sign Data

<table>
<thead>
<tr>
<th>DESIGNATION</th>
<th>COLOR SCHEME</th>
<th>SHEETING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structural</td>
<td>Legend</td>
<td>Background</td>
</tr>
<tr>
<td>White</td>
<td>White</td>
<td>2.75 type 3</td>
</tr>
<tr>
<td>Black</td>
<td>Black</td>
<td>2.75 type 3</td>
</tr>
<tr>
<td>Red</td>
<td>Red</td>
<td>2.75 type 1</td>
</tr>
<tr>
<td>Green</td>
<td>Green</td>
<td>2.75 type 1</td>
</tr>
<tr>
<td>Orange</td>
<td>Orange</td>
<td>2.75 type 1</td>
</tr>
<tr>
<td>Structural Fluorescent</td>
<td>Legend</td>
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</tr>
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<td>Black</td>
<td>2.75 type 3</td>
</tr>
<tr>
<td>White</td>
<td>White</td>
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<td>2.75 type 1</td>
</tr>
<tr>
<td>Green</td>
<td>Green</td>
<td>2.75 type 1</td>
</tr>
<tr>
<td>Orange</td>
<td>Orange</td>
<td>2.75 type 1</td>
</tr>
</tbody>
</table>

**NOTE:** White Legend is direct applied unless specified otherwise.

### Flat Sheet Sign Data

<table>
<thead>
<tr>
<th>DESIGNATION</th>
<th>COLOR SCHEME</th>
<th>SHEETING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flat Sheet (SH)</td>
<td>Legend</td>
<td>Background</td>
</tr>
<tr>
<td>Black</td>
<td>Black</td>
<td>2.75 type 3</td>
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<tr>
<td>White</td>
<td>White</td>
<td>2.75 type 3</td>
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<tr>
<td>Red</td>
<td>Red</td>
<td>2.75 type 1</td>
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<tr>
<td>Green</td>
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<td>2.75 type 1</td>
</tr>
<tr>
<td>Flat Sheet Fluorescent (SH)</td>
<td>Legend</td>
<td>Background</td>
</tr>
<tr>
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<td>Black</td>
<td>2.75 type 3</td>
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<tr>
<td>White</td>
<td>White</td>
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<td>2.75 type 1</td>
</tr>
<tr>
<td>Green</td>
<td>Green</td>
<td>2.75 type 1</td>
</tr>
<tr>
<td>Orange</td>
<td>Orange</td>
<td>2.75 type 1</td>
</tr>
</tbody>
</table>

**NOTE:** Legend and Background colors are achieved through transference onto and film.

### Flat Sheet Thickness

<table>
<thead>
<tr>
<th>SIGN SIZE</th>
<th>THICKNESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 IN. OR LESS</td>
<td>0.060 IN.</td>
</tr>
<tr>
<td>OVER 10 IN. TO 20 IN.</td>
<td>0.100 IN.</td>
</tr>
<tr>
<td>OVER 20 IN.</td>
<td>0.125 IN.</td>
</tr>
</tbody>
</table>

### General Notes

GROUND MOUNTED SIGNS GREATER THAN 8 FEET WIDE OR SIGNS GREATER THAN 30 SQUARE FEET SHALL BE STRUCTURAL.

ALL NON STANDARD SIGNS NOT FOUND IN THE MANUAL AND MANUAL SHALL BE DETAINED BY THE TRAFFIC AND HIGHWAY SAFETY DIVISION OFFICE.

REFER TO STANDARD SPECIFICATION 1042 FOR SHEETING, SUBSTRATE AND FABRICATION DETAILS.

FOR MOUNTING DETAILS, SEE STANDARD PLANS 903.07.

---

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

**Highway Sign Data**

<table>
<thead>
<tr>
<th>SHEET NO.</th>
<th>SHEET REV.</th>
<th>DATE PRINTED</th>
</tr>
</thead>
<tbody>
<tr>
<td>903.02AP</td>
<td>1 OF 8</td>
<td></td>
</tr>
</tbody>
</table>
**MODOT ID LABEL DETAILS**
Placed on the back of the sign

**VENDOR ID LABEL DETAILS**
Placed on the sign face

<table>
<thead>
<tr>
<th>Vendor ID Details</th>
<th>Vendor ID Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ACME SIGN COMPANY</strong></td>
<td><strong>ACME SIGN COMPANY</strong></td>
</tr>
<tr>
<td>MIDWEST, US 55555</td>
<td>MIDWEST, US 55555</td>
</tr>
<tr>
<td>800-555-5555</td>
<td>800-555-5555</td>
</tr>
<tr>
<td><strong>DATE: JUNE 8, 2016</strong></td>
<td><strong>DATE: JUNE 8, 2016</strong></td>
</tr>
</tbody>
</table>

**GENERAL NOTES:**
All details shall be silk screen printed with water-base components or sheeting materials to provide a label that has an equal life expectancy as the sign face.

**MODOT ID LABELS** shall be printed or clear electron film background with black ink. OR IT MAY BE INCORPORATED INTO THE SILK SCREEN DETAIL AND PRINTED ALONG WITH THE SIGN FACE.

**VENDOR ID LABELS** shall contain the company contact information, including full name, city, state, phone number, and the sign fabrication date.

**VENDOR ID LABELS** shall be printed on a white or black background with block ink and the legend shall be a minimum of 1/4".
ONE POST ASSEMBLY
USE TO SUPPORT UP TO 4 ROUTE MARKERS

TWO POST ASSEMBLY
USE TO SUPPORT 5 OR 6 ROUTE MARKERS

STANDARD BACKING BAR LAYOUT

OPTIMAL BACKING BAR LAYOUT

GENERAL NOTES:
ALL BACKING BARS SHALL BE 1-5/8" STEEL, GALVANIZED AFTER FINISHING. WEIGHT = 0.62 LBS. PER FOOT. HOLES IN BARS SHALL BE 5/16" AND SHALL BE FINISHED AS SHOWN ON THIS DRAWING.


DETAIL B - FOR SIGNS INSTALLED ON TWO PARALLEL, HORIZONTAL SUPPORT BARS, ONE ADDITIONAL BOLT SHALL BE ADDED TO THE LEFT SIGN TO KEEP ASSEMBLY SQUARE.

WHEN USING OPTIONAL BACKING BAR LAYOUT, VERTICAL BARS SHALL BE MOUNTED BETWEEN HORIZONTAL BARS.

BACKING BARS SHALL MEET MISSOURI STANDARD PLANS OR APPROVED PRODUCTS LIST.

BACKING BARS MADE OF 5/8" STRUCTURAL STEEL, PER FORM.

ALL SIGNS TO BE INSTALLED ALONG VERTICAL CENTERLINES.
FOR POST AND FOOTING DATA SEE DETAILS OF SHEELS AND FLANGES, SEE OTHER DRAWINGS.

MINIMUM VERTICAL SPACING INDICATED BETWEEN SIGNS TO BE ACHIEVED BY USING THE CLOSEST AVAILABLE HOLES IN THE POST.

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

HIGHWAY SIGNING
BACKING BARS
SHEET 4: SIGN MOUNTING, ROUTE SHIELD AND MARKER ASSEMBLIES

DATE EFFECTIVE: 06/01/2006
DATE UPDATED: 07/01/2006
903.02AP
4 OF 8
12" EXTRUDED ALUMINUM PANEL
MINIMUM WT. = 2.40 LBS./FT.

NOTE: MINIMUM WT. AND THICKNESS DIMENSIONS SHOWN.
MENTS PANEL CAN BE HED.

6" EXTRUDED ALUMINUM PANEL
MINIMUM WT. = 2.40 LBS./FT.

POST CLIP BOLT
WITH FLAT WASHER AND LOCKNUT

NOTE: CORE BOLT HEAD SHANK. RECTANGULAR BOLT HEAD WITH
LEAD DIMENSION OF .641 MAY
BE USED.

BOLT - 1/2 X 1 ALUMINUM
HEX LOCKNUT - 5/16 ALUMINUM
WASHER - ALUMINUM

POST CLIP
POST CLIPS SHALL BE ASTM B 108, 356-T6 ALUMINUM ALLOY.
SEE STANDARD PLAN 903.03 FOR MOUNTING HEIGHT ON UNEVEN GROUND.

GENERAL NOTES:
- SEE STANDARD PLAN 903.03 FOR WIDE FLANGE INSTALLATION.
- SIGN BARRIERS SHALL BE CONSTRUCTED AS A STRUCTURAL SUPPORT.
- DIRECTIONAL ARROWS SHALL BE SHARP AND CONSIDERED INCIDENTAL TO THE SIGN.
- ALL REFLECTIVE SURFACES SHALL BE RETROREFLECTIVE SHEETING IN ACCORDANCE WITH MO 1032.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-888-9909 | www.MoDOT.com | 51200-6852

HIGHWAY SIGNING
SIGN BARRICADE
**Wide Flange Structural Steel Posts Design Data**

<table>
<thead>
<tr>
<th>Post Design No.</th>
<th>Nom. #</th>
<th>Height (in.)</th>
<th>Depth (in.)</th>
<th>Width (in.)</th>
<th>Flange</th>
<th>Web Thick (in.)</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>V6</td>
<td>9</td>
<td>0.75</td>
<td>5.7</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>V6</td>
<td>15</td>
<td>1.25</td>
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<td>6</td>
</tr>
<tr>
<td>3</td>
<td>V8</td>
<td>18</td>
<td>1.50</td>
<td>6.4</td>
<td>5</td>
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<td>4</td>
<td>810</td>
<td>22</td>
<td>1.83</td>
<td>10.4</td>
<td>5.6</td>
<td>5</td>
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<tr>
<td>5</td>
<td>810</td>
<td>26</td>
<td>2.17</td>
<td>10.4</td>
<td>5.6</td>
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<tr>
<td>6</td>
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<td>2.92</td>
<td>12.4</td>
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</tbody>
</table>

The weight of structural steel posts shown in the contract has been computed using the weights shown.

---

**Perforated Fuse Plate Data Table**

<table>
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<th>Post Design No.</th>
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<th>G</th>
<th>H</th>
<th>I</th>
<th>L</th>
<th>M</th>
<th>N</th>
<th>P</th>
<th>Q</th>
<th>R</th>
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</tbody>
</table>

**splice Plate Data Table**

<table>
<thead>
<tr>
<th>Post Design No.</th>
<th>J</th>
<th>L</th>
<th>N</th>
<th>U</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
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<tbody>
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<td>1</td>
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<td>4</td>
<td>4</td>
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<td>6</td>
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</tr>
</tbody>
</table>

The weight of structural steel posts shown in the contract has been computed using the weights shown.

---

**Notes:**

For general notes, see Sheet 1 of 16.

For roadways where traffic may strike the backside of the post, perforated fuse plates shall be installed on both sides of the post.

---

**Missouri Highways and Transportation Commission**

1115 West Capitol
Jefferson City, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

**Post Installation Details**

**Hinge Details**

**Wide Flange (WF) Posts**

**Elevation D-D**

<table>
<thead>
<tr>
<th>J</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Perforated Fuse Plate and Splice Plate Detail**

All holes shall be drilled. All plate cuts shall preferably be gas cuts. However, flute cutting will be permitted provided all edges are ground.

Perforated fuse plate and splice plate shall be fabricated from ASTM A 36 structural steel.
PLAN
POST CLIP METHOD

T-BOLT METHOD

EXTRUDED PANEL MOUNTING DETAIL

NUMBER OF BOLTS TO ATTACH STEEL CHANNEL TO PSST POST

<table>
<thead>
<tr>
<th>SIGN HEIGHT</th>
<th>NO. OF BOLTS PER POST POST HOLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1'</td>
<td>2</td>
</tr>
<tr>
<td>2'</td>
<td>3</td>
</tr>
<tr>
<td>3'</td>
<td>4</td>
</tr>
<tr>
<td>4'</td>
<td>5</td>
</tr>
<tr>
<td>6'</td>
<td>6</td>
</tr>
<tr>
<td>7'</td>
<td>8</td>
</tr>
</tbody>
</table>

T-BOLT DETAIL

NOTES:
- ALUMINUM BOLTS SHALL BE ASTM F 1121, 2024-T4 OR 6061-T6
- ALUMINUM PLAST WASHERS SHALL BE ASTM B 209, ALCLAD 2024-T4 OR 2024-T6
- ALUMINUM LOCK NUTS (NYLON INSERT) SHALL BE ASTM B 211 OR 2017-T6

POST CLIP METHOD

PROFILE

PROFILE

NOTE:
SQUARE BOLT HEAD SHOWN MAY BE REPLACED WITH RECTANGULAR BOLT HEAD WITH THE NARROW DIMENSION EQUAL TO 0.617".

T-BOLT METHOD

NOTE:
FOR THE GENERAL NOTES, SEE SHEET 1 OF 16.
FOR MOUNTING HEIGHT AND OFFSET DETAILS, SEE SHEET 10 OF 16.
FOR POST CLIP DETAILS, SEE STANDARD PLANS 903.02 SHEET 6 OF 17.
ALTERNATE POST MOUNTING HARDWARE USE SHALL BE ON APPROVED LIST.
DELINEATORS ON CONCRETE TRAFFIC BARRIER
FOR CONCRETE BARRIER DETAILS, SEE SHEET PLAN 017-10 OF BRIDGE PLANS.

EDGE BARRIER (TYP.)

LEGEND
- WHITE DELINEATOR
△ YELLOW DELINEATOR
○ RED DELINEATOR

111) SECONDARY DELINEATOR ON BACK SIDE NOT REQUIRED IF ROADWAY "A" HAS MORE THAN 2 LANES

ROADWAY OR BRIDGE CONCRETE TRAFFIC BARRIER DELINEATION

DELINEATOR CONNECTION ON CONCRETE TRAFFIC BARRIER DETAIL

NOTES:
FOR GENERAL NOTES, SEE SHEET 1 OF 16.
RETROREFLECTIVE YELLOW, WHITE OR RED SHEETING IS REQUIRED FOR THE REFLECTIVE DELINEATOR BODY. SHEETING SHALL BE APPLIED TO THE OUTER SIDE OF THE DELINEATOR REFLECTOR BODY.
THE COLOR OF THE SHEETING SHALL CORRESPOND TO THE COLOR OF THE CONCRETE MEDIAN THERMAL PAVEMENT MARKING.
DELINEATORS ON GUARDRAIL

FOR GUARDRAIL DETAILS, SEE SHEET 606.00 AND 606.50.

1. A SECONDARY DELINEATOR WITH REFLECTIVE SHEETING SHALL BE ATTACHED TO THE BACK SIDE OF THE CHANNEL WHEN THE DELINEATION IS PLACED ALONG AN INTERCHANGE RAMPS AND SHALL BE VIEWED BY MOTORIST TRAFFIC.
DELIMITER SPACING ON HORIZONTAL CURVES

<table>
<thead>
<tr>
<th>RADIUS OF CURVE (FEET)</th>
<th>SPACING ON CURVE (FEET)</th>
<th>SPACING IN ADVANCE &amp; BEHIND CURVE (FEET)</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>20</td>
<td>60</td>
</tr>
<tr>
<td>100</td>
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</tr>
<tr>
<td>300</td>
<td>75</td>
<td>60</td>
</tr>
<tr>
<td>350</td>
<td>85</td>
<td>60</td>
</tr>
</tbody>
</table>

5° SPACING ON CURVE = 5/360 OR MAY BE INTERPOLATED FROM TABLE.
MINIMUM SPACING = 20 FEET.

SPACING OF FIRST DELIMITER IN ADVANCE OF AND BEYOND CURVE = 3 x 5.
The spacing = 3 x 51, and the third = 5 x 6.5, but not to exceed 100
feet. Maximum spacing = 100 feet.

DELIMITERS SHALL BE INSTALLED FACING APPROACHING TRAFFIC. YELLOW DELIMITERS SHOULD AGAINST THE CORE EXIT Ramp AND ON
60 FEET FROM THE CORE POINT. WHITE DELIMITERS SHOULD EXTEND
BEYOND THE FIRST YELLOW DELIMITER. RED DELIMITERS SHOULD BE
PLACED ON THE BACK SIDE OR EITHER THE WHITE OR YELLOW DELIMITER.
(1) USE YELLOW DOUBLE STACKED DELIMITERS FOR LEFT HAND ACCESS/ENTRY LINES.
(2) DELETE IF EMERGENCY REFERENCE MARKERS ARE USED.
(3) EXTEND OF DELIMITERS ON ROUTES WITHOUT EMERGENCY REFERENCE MARKERS.
(4) ON ROUTES WITHOUT EMERGENCY REFERENCE MARKERS DELIMITERS SHALL BE INSTALLED
BETWEEN INTERCHANGES EVERY 500 FT.

NOTE:
FOR GENERAL NOTES, SEE SHEET 1 OF 16.
THE CONTRACT UNIT PRICE FOR EACH CHANNEL POST DELIMITER SHALL INCLUDE THE REFLECTORS, FASTENERS
AND POLES.

SIGN MOUNTING DETAILS
INTERCHANGE DELIMITATION

MISSOURI HIGHWAYS AND TRANSPORTATION
COMMISSION

903.03BR
SHEET NO. 14 OF 16
**Mounting Plate Detail**

- **Fall Arrest Cable Detail**
- **Detail B Shoulder Bolt**
- **Perforated Square Steel Timning**
- **Ground Installation**

**Barrier Wall Installation**

- **Perforated Square Steel Tube** (2" x 2" (O.D. 1 1/4"
- **Wire** shall extend a minimum of 6" below the top of the foundation tube.
- **Bolts** used to retain fall arrest cable shall be A 3/A319 grade 8 and pass through both sides of wire.
- **Holes for Anchoring System** shall be drilled to avoid reinforcing steel.
- **Top of Foundation, Flat with Finished Grade**
- **Rust Surface**

**Notes:**

For general notes, see Sheet 1 of 16.

Perforated square steel tube shall be secured to foundation tube or barrier wall mounting plate with a smaller bolt per perforated square steel tube manufacturer's specification.

Contact: Missouri Highways and Transportation Commission
115 West Capitol
Jefferson City, MO 65102
1-800-ASK-MODOT (1-800-275-6638)

Sign Mounting Details
Emergency Reference Markers

Sheet No. 16 of 16
NOTE: CHANGEABLE "OPEN/CLOSE" AND "BUSES WEIGH" SIGNS MOUNTED BELOW THIS SIGN. SEE DETAILS THIS SHEET.

GUIDE SIGN DETAIL

ISOMETRIC VIEW

BUSES WEIGH MOUNTING ASSEMBLY

OPEN CLOSED

FOR OPEN AND CLOSED SIGN SEE SPECIAL PROVISIONS

MAXIMUM HEIGHT FROM BOTTOM OF BUSES WEIGH SIGN TO GROUND SHALL BE 60".

GENERAL SIGN DATA

SHR1L-1 TYPE REFLECTIVE SHEETING TYPE COLOR LETTER SERIES
BACKGROUND 1 WHITE
LEGEND L-1 BLACK C
SYMBOLS L-1 BLACK
BORDER L-1 BLACK
SUBSTRATE SHEET

CHANGEABLE SIGN DETAIL

SUBSTRATE LEGEND, SYMBOLS, & BORDER
STRUCTURAL L-1 SCREEN PRINT
5H SHEET L-3 (DIRECT APPLIED (CUT FROM MATERIAL SHOWN ON PLANS.)
REFLECTIVE SHEETING R4 PRISMATIC IN ACCORDANCE WITH SEC 1042.2.7.3
R4 ENGINEERING GRADE IN ACCORDANCE WITH SEC 1042.2.7.1

PERMIT SIGN DETAIL

MATERIAL LIST

<table>
<thead>
<tr>
<th>NO.</th>
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<th>LB.</th>
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<td>STEEL PLATE</td>
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<td>1</td>
<td>3&quot; STANDARD PIPE</td>
<td>32.44</td>
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<tr>
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<td>2-1/2&quot; STANDARD PIPE</td>
<td>3.89</td>
</tr>
<tr>
<td>8</td>
<td>GALV. WASHER</td>
<td></td>
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</table>

GENERAL NOTES:

DESIGN SPEC: AASHTO STANDARD SPECIFICATIONS FOR STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINAIRES, AND TRAFFIC SIGNALS - 1975.

MATERIALS AND FABRICATION SHALL CONFORM TO THE REQUIREMENTS OF THE STATE HIGHWAY AND TRANSPORTATION COMMISSION STANDARD SPECIFICATIONS AND PROVISIONS.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

HIGHWAY SIGNING WEIGH STATION

DATE EFFECTIVE: | 03/01/2012 | 903.04F SHEET NO. 1 OF 1
MODIFIED FOOTING IN SOLID ROCK

<table>
<thead>
<tr>
<th>TYPE</th>
<th>FE</th>
<th>REINFORCING STEEL</th>
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<tbody>
<tr>
<td>S-110</td>
<td>0.63</td>
<td>0.35</td>
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</table>

REINFORCING PLATED SAME AS STANDARD FOOTING, CONCRETE TO BE PLACED TO EXHIBIT TRUE FACE OF ROCK.

ANCHOR BOLT PLATED 6" X 6" X 6".
HEAVY METAL OR BULT VEL.
ARM ATTACHMENT DETAIL

ANCHOR BOLTS AS SPECIFIED. THREAD Extension FURNishes GALVANIZED ENTIRE LENGTH OF BOLT AND ALL NUTS AND WASHERS.

HEAVY HEX NUT AND WASHER

HEAVY HEX OR HEAVY HEX NUT AND WASHER

ELEVATION

A GALVANIZED SCREEN SHALL BE FITTED BETWEEN THE POST BASE PLATE AND CONCRETE BASE. SCREENS SHALL BE PRE-FORMED OF 3 OR 4 MESH, STAINLESS STEEL OR UN-COATED GALVANIZED STEEL SCREENS OR APPROVED EQUIVALENT, THAT WILL PROVIDE A FRICTION-TIGHT FIT WHEN INSTALLED.

PLAN

DETAIL A

POST BASE DETAIL

<table>
<thead>
<tr>
<th>TYPE</th>
<th>E</th>
<th>C</th>
<th>F</th>
<th>H</th>
<th>S</th>
<th>R</th>
<th>F</th>
<th>T</th>
<th>E</th>
<th>ANCHOR</th>
<th>FOOTING</th>
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<tbody>
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<td>B-200</td>
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<td>7</td>
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<td>24</td>
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<td>24 x 36</td>
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<tr>
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<tr>
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<td>7</td>
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</table>

4 MINIMUM OF TWO BRACKETS REQUIRED ON SIGNS OVER 42" IN LENGTH
TYPICAL ELEVATION OF SIGN COMPONENTS

TYPICAL HALF PLAN OF SIGN COMPONENTS

SECTION A-A
TYPICAL SECTION OF SIGN SUPPORT

DETAIL 1

GENERAL NOTES:
- EXIT NO. PANELS SHALL BE MOUNTED FLUSH WITH THE EXIT SIDE OF THE RIDGE SIGN.
- ALL SIGNS SHALL BE CENTERED VERTICALLY ABOUT THE VERTICAL C/T OF THE TRUSS.

SEE STP PLAN 903.02 FOR SIGN MOUNTING DETAILS.

OVERHEAD SIGN TRUSSES
SIGN MOUNTING DETAIL
### Drilled Shaft Option

<table>
<thead>
<tr>
<th>Post Type</th>
<th>Pipe Color</th>
<th>E¹</th>
<th>Split</th>
<th>Base Plate Size</th>
<th>Anchor Bolt</th>
<th>Footing Size</th>
<th>Collar Reinforcement</th>
<th>Shaft Reinforcement</th>
<th>Pedestal Total (lbs.)</th>
<th>Concrete (cubic yards)</th>
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</thead>
<tbody>
<tr>
<td>33</td>
<td>100413</td>
<td>8º</td>
<td>0º</td>
<td>3-6 x 2-10 x 2</td>
<td>24</td>
<td>2-4 x 4-2</td>
<td>10 x 14</td>
<td>10 x 14</td>
<td>24</td>
<td>14</td>
</tr>
<tr>
<td>23</td>
<td>100413</td>
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<td>10 x 14</td>
<td>24</td>
<td>14</td>
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### Alternate Pedestals

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<td>24</td>
<td>14</td>
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</table>

### Spread Footing Option

<table>
<thead>
<tr>
<th>Post Type</th>
<th>Pipe Color</th>
<th>E¹</th>
<th>Split</th>
<th>Base Plate Size</th>
<th>Anchor Bolt</th>
<th>Footing Size</th>
<th>Longitudinal Footing Reinforcement</th>
<th>Pedestal Total (lbs.)</th>
<th>Concrete (cubic yards)</th>
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</thead>
<tbody>
<tr>
<td>33</td>
<td>100413</td>
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<td>0º</td>
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### Spread Footing Option with Alternate Pedestals

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<td>10 x 14</td>
<td>24</td>
</tr>
</tbody>
</table>

**Notes:**
- Base plates, pedestal, and footings shall be normal to axis of sign.
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---

**Missouri Highways and Transportation Commission**

**Statewide Sign Truss Substructure Data**

**Effective Date:** 03/04/2021

**Sheet No.:** 903.12AA

**Sheet 4 of 7**
SECTION A-A
(TYPICAL SECTION SHOWING REINFORCING STEEL)

PART ELEVATION
(TYPE A CONCRETE TRAFFIC BARRIER)

PART ELEVATION
(TYPE C CONCRETE TRAFFIC BARRIER)

SECTION B-B
TYPICAL SECTION SHOWING REINFORCING STEEL
DETAILS OF ALTERNATE PEDESTAL

GENERAL NOTES:
FEET AND FOOTING SHALL BE CLASS B (P.C.C.),
MINIMUM CLEARANCE TO REINFORCEMENT IS 3" EXCEPT AS SHOWN.

CONTACT THE ENGINEER IF WATER TABLE IS ENCOUNTERED
DURING EXCAVATION.

TYPE COLUMN BASE PLATE ANCHOR BOLTS ARE NOTED
REPLACING TO THESE ITEMS HAVE BEEN OMITTED FOR CLARITY. REFER TO SHEET 5 OF 7 FOR DETAILS OF THESE ITEMS.