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

This set of Standard Plans is effective beginning with the January 2021 bid opening.
MISSOURI HIGHWAYS AND TRANSPORATION COMMISSION

EFFECTIVE: 01/01/2021

MISSOURI STANDARD PLANS FOR HIGHWAY CONSTRUCTION
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UNDERGRADING – TYPICAL DETAILS
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MIDWEST GUARDRAIL SYSTEM (MGS) – MEDIAN PIER PROTECTION

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01/01/2019
04/01/2018

STANDARD
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606.80C
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DRAWING TITLE
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MIDWEST GUARDRAIL SYSTEM (MGS) – THRIE BEAM RAIL ON BRIDGE
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WOVEN WIRE FENCE
PAVED APPROACHES
CONCRETE SIDEWALK
CONCRETE STAIRS
CONCRETE MEDIAN STRIP
HANDRAILING
CURB RAMPS
CONCRETE CURB, CURB AND GUTTER AND GUTTER
PAVED DITCHES
DRAIN BASIN, SHOULDER PAVING AND FILL SLOPES AT BRIDGE ENDS
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CONCRETE SLOPE PROTECTION
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GRATES AND BEARING PLATES
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MANHOLE AND FRAME COVERS
TEMPORARY TRAFFIC CONTROL DEVICES
PERMANENT CONCRETE TRAFFIC BARRIER
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PAVEMENT EDGE TREATMENT
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HOLE PATTERN FOR PAVEMENT SLAB STABILIZATION
RUMBLE STRIPS

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SHEET 1 OF 2


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**EXCAVATION PAY LIMITS**

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

**EMBANKMENT LIMITS**

- **SOLID AREA INDICATES ADDITIONAL EMBANKMENT WHERE FULL WIDTH BASE IS USED.**

**INTERCEPTION DITCH AND/OR LEVEE**

- **LEVEE AND DITCH** may be located back of backslope when conditions require. Use ditch only where indicated or where required for drainage.

**BACKSLOPES IN STABLE AND SEMI-STABLE MATERIAL**

- Normal roadway slope:
  - Semi-stable material (slope as shown on plans or as directed)

- **10' Rounding**:
  - Stake at toe of roadway fill slope
  - Stake at top of roadway backslopes

**PARABOLIC Rounding**

**GENERAL NOTES:**

Subsurface logs of materials obtained during the soil survey for the purpose of cut classification may be acquired from the district office upon request.

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

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

**DATE EFFECTIVE:** 08/01/1998
**DATE PREPARED:** 8/23/2009

**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

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

IN ROCK OVER PARTIAL WIDTH OF ROADBED

SLOPE SAME AS ABOVE
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
1-888-454-MODOT (1-888-466-6636)

DATE EFFECTIVE: 01/01/2004
DATE PREPARED: 8/23/2009
SHET NO. 2 OF 2

203.02F
Spiraled Curve and Widening Transitions

Maximum Radius for Use of a Spiral Curve Transition

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

General Notes:

A practical control for the length of spiral "L2" is considered to be the super-elevation runoff "L".
See standard plans 203.22 sheet 1 of 2.

"W" the widening for surfacing at inside shoulders, see standard plans 203.22 sheet 2 of 2.

Widening transition varies in direct proportion to distance.

Spiral curves are used on all roadways that have design traffic greater than 400 vehicles per day.
And have a radius less than the values listed in the "Maximum Radius for Use of a Spiral Curve Transition" table.
NOTE: SHORT VERTICAL CURVES MAY BE
NEGLECTED AT POINTS "C" BY THE
REQUIREMENTS OF STYLES OR FORMS
IN THE FIELD.

SUPERELEVATION ELEVON = L/4

PLAN OF ALIGNMENT
FOR CASE NUMBER 2

OUTSIDE EDGE
INSIDE EDGE

SECTION F-F

OUTSIDE EDGE OF PAVEMENT (REF. TO HOWZ. CURVE)
WIDTH OF PAVEMENT
PLANE SURFACE

OUTSIDE EDGE OF PAVEMENT (REF. TO HOWZ. CURVE)
WIDTH OF PAVEMENT
PLANE SURFACE

OUTSIDE EDGE OF PAVEMENT (REF. TO HOWZ. CURVE)
WIDTH OF PAVEMENT
PLANE SURFACE

SECTION E-E

SUPERELEVATION
PROFILE OF INSIDE EDGE OF PAVEMENT
PROFILE OF OUTSIDE EDGE OF PAVEMENT

PROFILE OF邊 SIDE EDGE OF PAVEMENT
PROFILE OF INSIDE EDGE OF PAVEMENT

CASE NUMBER 2

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

STRAIGHT LINE METHODS OF ATTAINING SUPERELEVATION
NOTE: SHORT VERTICAL CURVES MAY BE
PLACED AT POINTS TO ENSURE
DEPARTMENTS OF STATES OR ORGANIZATION
IN THE FIELD.

SUPERELEVATION RISE = L - X

SECTION G-G

OUTSIDE EDGE OF PAVEMENT FREE TO WORK, CURVE

SECTION H-H

OUTSIDE EDGE OF PAVEMENT FREE TO WORK, CURVE

CASE NUMBER 3

WHERE TRAVELER SLIDE ON TANGENT SECTION IS SAME DIRECTION AS SLIDE OF SUPERELEVATION.
NOTE: PAVEMENT REFERENCE WITH ITS OUTSIDE EDGE WITH REFERENCE TO THE HORIZONTAL CURVE WHICH IS BEING APPROACHED.

STRAIGHT LINE METHOD OF ATTAINING SUPERELEVATION
### Minimum Radii for Design Super-elevation Rates, Design Speeds, and $\rho_{max} = 8\%$

#### Design Speed (MPH)

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</table>

#### TABLE NOTES:
- "NC" denotes below normal cross slope.
- "AC" denotes adverse cross slope.
- "SU" denotes super-elevation at normal cross slope.
- "DP" denotes the super-elevation in percent (%).

#### THE L1 COLUMN IS FOR 1-LANE ROUTE.
THE L2 COLUMN IS FOR 2-LANE ROUTES.

1 LANE ROUTED IS TYPICALLY FOR A 2-LANE HIGHWAY.
2 LANE ROUTED IS TYPICALLY FOR A 4-LANE HIGHWAY.

WHEN USING ONE OF THE TABLES FOR A GIVEN RADIUS INTERPOLATION IS NOT NECESSARY AS THE SUPER-ELEVATION RATE SHOULD BE DETERMINED FROM A RADIO EQUAL TO, OR SLIGHTLY SMALLER THAN, THE RADIUS PROVIDED IN THE TABLE. THE RESULT IS A SUPER-ELEVATION RATE THAT IS REDUCED UP TO THE NEAREST 0.2 OF A PERCENT.

**EXAMPLE:** A 50 MPH CURVE WITH A MINIMUM SUPER-ELEVATION RATE OF 6 PERCENT, AND A RADIUS OF 1,300 FT. SHOULDN'T USE THE RADIUS OF 1,300 FT TO OBTAIN A SUPER-ELEVATION RATE OF 5.4 PERCENT.

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

**SPECIAL EFFECTS:**

**DATE PREPARED:** 3/18/2023

**SHEET NO.:** 1 OF 2

**203.22**

**SUPER-ELEVATION, SPIRALS AND WIDENING**
### Calculated and Design Values for Traveled Way Widening on Open Highway Curves (Twolane Highways, One-Way or Two-Way) [WE-67 Adjustment]

<table>
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<tr>
<th>Curve</th>
<th>24' Roadway #28</th>
<th>22' Roadway #28</th>
<th>20' Roadway Width</th>
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<tr>
<td>Radius (FT)</td>
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**Table Notes:**

- 1' = 1 foot, 1 foot of widening for surfacing at inside shoulders.
- Values shown are for WE-67 design vehicle.
- Values less than 2 feet may be disregarded.
- For 3-lane roadways, multiply above values by 1.5.
- For 4-lane roadways, multiply above values by 2.0.

---

**MoDOT Highway and Transportation Commission**

105 West Capital
Jefferson City, MO 65105
1-888-435-MoDOT (1-888-435-6636)

**Superelevation, Spirals and Widening**

Date Effective: 03/25/2011
Date Prepared: 03/25/2011
Sheet No.: 2 of 2
GENERAL NOTES:

In no case will "W" be less than shoulder width. "W" will be 8' unless otherwise noted on the plans.

When entrances are adjacent to mailbox turnouts, the area and surfacing of the entrance may be used for a portion of the mailbox turnout.

Mailbox Turnouts
**TYPICAL DETAILS ON AND OFF RAMPS**

**DIAMOND INTERCHANGES AND OUTER RAMPS OF CLOVERLEAF INTERCHANGES**

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

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

**DATE EFFECTIVE:** 10/01/2007
**DATE PREPARED:** 8/25/2009

**SHEET NO.** 203.40G
**1 OF 2**

---

**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.

**NOTES:**

1. For ramp shoulder width, see typical sections.
2. See roadway plans.

---

**SECTION D-D**

- **RAMP BASE LINE**
- **RAMP SHOULDER**
- **PROFILE GRADE (RAMP)**
- **VARIABLE SLOPE (S.E. TRANS.**

**SECTION C-C**

- **RAMP BASE LINE**
- **RAMP SHOULDER**
- **PROFILE GRADE (RAMP)**
- **VARIABLE SLOPE (S.E. TRANS.**

**SECTION B-B**

- **RAMP BASE LINE**
- **RAMP SHOULDER**
- **PROFILE GRADE (RAMP)**
- **VARIABLE SLOPE (S.E. TRANS.**

**SECTION A-A**

- **RAMP BASE LINE**
- **RAMP SHOULDER**
- **PROFILE GRADE (RAMP)**
- **VARIABLE SLOPE (S.E. TRANS.**

---

**RAMP WIDTH**

- **ONE LANE, ONE WAY OPERATION**
- **NO PROVISION FOR PASSING STALLED VEHICLES. DESIGN TRUCK VOLUMES**

- **14' S.E. SLOPE**
- **5.5%**

- **12' S.E. SLOPE**
- **5.5%**
**PLAN VIEW "OFF" RAMPS**

**SECTION H-H**

**SECTION G-G**

**SECTION F-F**

**SECTION E-E**

**NOTES:**

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

DATE EFFECTIVE: 01/01/1995
DATE PREPARED: 08/21/2009

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

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

SECTION A-A

SECTION G-G

SECTION F-F

SECTION E-E
BREAK POINT - SHOULDER WIDTH PLUS 4' (MIN. 10') FROM E.F.

SLOPE 4" MIN. FROM EDGE OF TRAVELLED WAY TO BREAK POINT

DESIRABLE GRADE 5% OR LESS (SEE PLANS)

FINISHED ROADWAY TEMPLATE BEYOND LIMITS OF STREET OR ROAD

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

IN CUTS

BREAK POINT - SHOULDER WIDTH PLUS 4' (MIN. 10') FROM E.F.

SLOPE 4" MIN. FROM EDGE OF TRAVELLED WAY TO BREAK POINT

DESIRABLE GRADE 5% OR LESS (SEE PLANS)

FINISHED ROADWAY TEMPLATE BEYOND LIMITS OF STREET OR ROAD

IN CUTS

PROFILE

IN CUTS

PIPE 400 - 600' SEE PLANS

3.12% SL.

SEE NOTE BELOW

15" MINIMUM PIPE DIAMETER

WITH CURB

WITHOUT CURB

DRIVEWAY TYPICAL SECTION

SECTION THRU 4" ASPHALT CURB

SECTION THRU CONCRETE CURB AND GUTTER

CURB TERMINUS DETAIL

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-800-392-MODOT (6636)

DRIVEWAY

TYPE II

NOVEMBER 30, 2000

SHEET NO.

203.62E

2 OF 2
PROFILE VIEW

DRIVEWAY TYPICAL SECTION

1 TO 1700 VEHICLES PER DAY ON STATE ROUTE USE 5% SLOPE OR 6% Where Practicable.
OVER 1700 VEHICLES PER DAY ON STATE ROUTE USE 6% SLOPE OR FLATTER WHERE PRACTICABLE.

IN FILLS

SECTION THRU 4" ASPHALT CURB

SECTION THROUGH CONCRETE CURB AND GUTTER

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-800-255-MODOT 1-800-255-6636

DRIVEWAY

TYPE III

SHEET NO. 2 OF 2

07/01/2002 203.63C
NOTE:
SEE STANDARD PLAN 203.50 FOR DETAILS OF LOW PROFILE ISLAND.

WHERE MINIMUM ISLAND CANNOT BE OBTAINED, USE ISLAND.

MINIMUM ISLAND DETAILS

<table>
<thead>
<tr>
<th>VOLUME PRODUCT</th>
<th>N</th>
<th>R</th>
<th>TAPER</th>
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</thead>
<tbody>
<tr>
<td>24'</td>
<td>90</td>
<td>22</td>
<td>511</td>
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<tr>
<td>TRUCK-SINGLE APPROACH</td>
<td>50</td>
<td>95</td>
<td>24</td>
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NOTES:

THIS DRAWING SHALL BE USED IN CONJUNCTION WITH TYPES II AND III DRIVeways WHEN TRAFFIC VOLUMES REQUIRE A VOLUME PRODUCT INTERSECTION AND TYPE IV WHEN A SINGLE APPROACH TRUCK DRIVeway IS DESIRED.

ALL CONTROLS PERTAINING TO GRADES, DRAINAGE, BASE, CEMENTING, ETC. SHALL BE AS SHOWN OR OTHER RESPECTIVE TYPE DRIVeway STANDARD PlanS.

THE "N" DIMENSIONS ARE RECOMMENDED WIDTH. OTHER ALLOWED WIDTHS MAY BE USED WITHIN TOLERANCES OF THE RESPECTIVE TYPE DRIVeway STANDARD PlanS.

GENERAL NOTES:

DETAILS SHOWN ON THIS SHEET ARE FOR RIGHT ANGLE APPROACHES.

TAPER LENGTHS ARE NOT APPLICABLE WHEN DECELERATION LANES ARE PROVIDED.

SIGNALLIZED INTERSECTIONS AND INTERSECTIONS IN MEDIAN AREAS MAY BE MODIFIED TO MEET EXISTING CONDITIONS.

THIS DRAWING ILLUSTRATES DRIVeway DETAILS FOR VARIOUS SITUATIONS. TRAFFIC VOLUMES, SAFETY CONSIDERATIONS, GRADE, DRAINAGE, CONSTRUCTION, LOCAL REQUIREMENTS, ETC. MAY REQUIRE MORE EXTENSIVE IMPROVEMENTS THAN ILLUSTRATED.

MISSOURI HIGHWAYS AND TRANSPORTATION
COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-800-251-HWY (4999)

DRIVeway
TYPE V

PLAN VIEW

EDGE OF TRAVELLED WAY
EMBANKMENT CONTROL STAKE

2' GRADUATED SCALE

2" x 4" SOUND LUMBER

2" x 4" SPlice IF REQUIRED

GROUND LINE

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

3" PORTLAND CEMENT MORTAR LEVELING COURSE

3/4" DIA. COVER PIPE

1 1/2" DIA. RISER PIPE

ORDINARY BACKFILL

STEEL SETTLEMENT PLATE

1/4" CONTINUOUS WELD

SETTLEMENT GAUGE

18" +

3" GRADUATED SCALE

GROUND SURFACE

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-635-MO DOT (635-6636)

EMBANKMENT CONTROL MEASURING DEVICES

DATE EFFECTIVE: 04/01/1983
DATE PREPARED: 08/23/2009

SHEET NO. 1 OF 1
**GENERAL NOTE:**

The final finish on concrete shoulders may be obtained by the use of a broom consisting of a seamless strip of horsehair, cotton tape, plastic, turf, or other suitable material capable of producing a uniform surface or density thereof.

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

Inclined 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 12" BF-1 over 4" PCC unless otherwise specified on the plans.

**PAVEMENT ON ROCK BASE**

**TYPE A2 SHOULDERS**
GENERAL NOTES:

THE SAFETY EDGE™ SHALL BE CONSTRUCTED AT A SLIDE OF 30° FROM THE HORIZONTAL. THE LENGTH AS MEASURED ALONG THE SLIDE SHALL BE APPROXIMATELY 2 TIMES THE DEPTH, UP TO A MAXIMUM LENGTH OF 6'.

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

THE SAFETY EDGE™ SHALL BE BACKFILLED AS SHOWN.

REGARDLESS OF PAVEMENT TYPE, WHEN PAINT IS USED FOR PAVEMENT OR SHOULDER, MATERIAL IS MADE PER SOURCE VISE, THE MATERIAL NEEDED TO CONSTRUCT THE SAFETY EDGE™ IS CONSIDERED INCIDENTAL TO THE PAINT ON SHOULDER. NO MEASUREMENT WILL BE MADE FOR THE MATERIAL USED IN THE SAFETY EDGE™ EXCEPT WHEN PAINT FOR PADIENT OR SHOULDER IS MADE IN VOLUME OR WEIGHT.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITAL
JEFFERSON CITY, MO 65102
1-888-689-WAYV (1-888-689-9298)

SAFETY EDGE™

RCC (ROLLER COMPACTED CONCRETE) OR PCC (PORTLAND CEMENT CONCRETE)
HMA (HOT MIX ASPHALT)
BASE MATERIAL (IF APPLICABLE)
SCRUB SEAL BROOM CONFIGURATION

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

STREET BROOMS WITH NYLON BRISTLES

1'-0" CHAIN WITH HOOKS
IF NECESSARY TO PLACE A CONSTRUCTION JOINT OVER A PORTION OF THE PAVEMENT, A CONTRACTION JOINT SHOULD BE PLACED AS SHOWN IN THE REMAINING PORTION.

INTERCHANGE

PCC SHOULDER

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

THEORETICAL TAPER CONCRETE MAY BE OMITTED

TAPER TREATMENT

PREMOLDED FILLER MATERIAL

CONCRETE PAVEMENT AND BASE APPURTENANCES FOR 15' JOINT SPACING

DATE EFFECTIVE: 01/01/2020
DATE PREPARED: 10/17/2019

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

502.05P SHEET NO. 1 OF 4
CONSTRUCTION JOINT C

THE HEADER PLANKS SHALL BE EXTRUDED TO PREVENT EROSION FROM THE TREATED SECTION AND SOLUTION 2 STRAIGHT LINE FROM PAVEMENT EDGE TO PAINT EDGE.

THE EXPANSION JOINT MAY BE SAWED WITH A GAUGE HOLE IF A TREATMENT PLANK SHALL BE SAWED AFTER THE CONCRETE BUT ENOUGH TO PREVENT CURE.

CONCRETE PLANKS SHALL BE SAWED WITH A GAUGE HOLE DIMENSION TO THE REQUIRED LENGTH BUT ENOUGH TO PREVENT EROSION.

THE THICKNESS OF THE PLANK EXCEPT THE HOLE SHALL BE COATED WITH AN APPROVED WATERPROOF.

CONCRETE PAVEMENT AND BASE APPURTENANCES FOR 15" JOINT SPACING

GAGE TYPE:
DATE EFFECTIVE:
DATE PREPARED:
MODOT 502.05P
**SECTION A-A**

* FOR PAVEMENTS HAVING THICKNESS IN 1/8 INCREMENTS, DOWEL BASKETS SHALL BE half THE PAVEMENT THICKNESS MINUS 1/8".

**GENERAL NOTES:**

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

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

WIRE SIZES SHOWN ARE MINIMUM REQUIRED.

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

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

SPACER WIRE MAY BE CUT OR LEFT INTACT.

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

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

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

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

**DOEAL SUPPORTING UNITS**

**APPROVED FOR USE WITH TRANSVERSE JOINTS**

**DATE EFFECTIVE:** 06/01/2010

**DATE PREPARED:** 10/30/2015

**502.10K**

**SHEET NO.: 1 OF 2**
* FOR PAVEMENTS HAVING THICKNESS IN 1/4" INCREMENTS, DOWEL SHALL BE PLACED HALF THE PAVEMENT THICKNESS MINUS 1/4".

SECTION C-C

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

DATE EFFECTIVE: 06/01/2010
DATE PREPARED: 05/29/2015

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-451-MODOT (1-888-275-6636)
SECTION A-A

SECTION B-B

SECTION C-C

4" PERFORATED PIPE DRAIN ON HIGHER SIDE OF SILL. SLOPE THE PIPE TO DRAIN. IF LOCATION 1 IS THE HIGHER SIDE IF SILL, CONSTRUCT PERFORATED PIPE AT 1.

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

GENERAL NOTES:

SEE STANDARD DRAWING 605.10 FOR PIPE OUTLET DETAIL FROM SHOULDER POINT TO INLET.

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

CONCRETE APPROACH PAVEMENT
(MAJOR ROAD)

SHEET NO. 3 OF 3

504.00K
LOCATION SURVEY RIGHT-OF-WAY MARKER

2" DIA. FLAT ALUMINUM CAP

1/2" X 24" REBAR

GROUNDED CAP

PUNCH MARK (NOT NECESSARILY CENTERED)

STAMP 3/4" LETTERING INTO CAP FOR "MODOT R/W".
L.S. NUMBER AND LETTERING SHALL BE 1/2" OR LARGER

TOP VIEW

GROUND LINE

SIDE VIEW

OFFSET POST LATERALLY FROM PIPE OUTLET

IN EARTH

DRAIN MARKER

IN ROCK

DRAIN PIPE

OFFSET POST LATERALLY FROM PIPE OUTLET

GENERAL NOTES:

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

EXISTING

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 MONUMENT.

TYPICAL LOCATIONS
PIPE CULVERT HEADWALLS
TYPE S
12" TO 24" DIAMETERS - 1:16:1 SLOPES

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 1:16:1 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.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-800-46K-MODOT (1-800-465-6636)

DATE PREPARED: 9/3/2009

DATE EFFECTIVE: 8/15/2009

604.05D
1 OF 2
GENERAL NOTES:

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

MINIMUM CLEARANCE TO REINFORCING STEEL
SHALL BE 1½ UNLESS SHOWN OTHERWISE.

DIMENSIONS
DRAWINGS ARE NOT TO SCALE. FOLLOW DIMENSIONS.

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

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

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

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

DATE PREPARED: 9/3/2009
DATE EFFECTIVE: 9/3/2009
SHEET NO. 1 OF 1
GENERAL NOTES:

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

MINIMUM CLEARANCE TO REINFORCING STEEL
SHALL BE 1.5 UNLESS SHOWN OTHERWISE.

DIMENSIONS ARE NOT TO SCALE. FOLLOW DIMENSIONS.

ESTIMATED QUANTITIES

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<td>9.5 cu. YD.</td>
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<tr>
<td>REINFORCING STEEL</td>
<td>620</td>
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</table>

COMPLETE BILL OF REINFORCING STEEL

<table>
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<tr>
<th>LENGTH</th>
<th>SHAPE</th>
<th>NUMBER OF BARS</th>
</tr>
</thead>
<tbody>
<tr>
<td>10' 6&quot;</td>
<td>D1</td>
<td>3</td>
</tr>
<tr>
<td>12' 0&quot;</td>
<td>A1</td>
<td>2</td>
</tr>
<tr>
<td>18' 0&quot;</td>
<td>B1</td>
<td>1</td>
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</tbody>
</table>

BENDING DIAGRAMS

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

NOTE: BEND OR CUTOFF BARS IN FIELD TO CLEAR PIPE.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

JEFFERSON CITY, MO 65102

PIECE CULVERT HEADWALL

ENERGY DISSIPATOR (IMPACT TYPE)

FOR 24" CONCRETE PIPE

DATE EFFECTIVE: 03/01/2001
DATE PREPARED: 03/01/2001

604.11E
1 OF 1
NOTE: BEND OR CURT AT 12" CTS. AND 11 BARS IN FIELD TO CLEAR PIPE.

SECTION A-A

SECTION B-B

ESTIMATED QUANTITIES

ITEM TOTAL

REINFORCING STEEL

DIMENSIONS

DRAWINGS NOT TO SCALE. FOLLOW Dimensions.

MISSOURI HIGHWAYS AND TRANSPORTATION
COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-800-457-MDOT 11-866-2775-6635

PIPE CULVERT HEADWALL
ENERGY DISSIPATOR (IMPACT TYPE)
FOR 42" CONCRETE PIPE

Jefferson City, MO 65102

DATE EFFECTIVE: 03/01/2000
DATE PREPARED: 03/01/2000
SHEET NO. 604.14E
1 OF 1
MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

DATE EFFECTIVE:
DATE PREPARED:

07/10/2001
9/30/2009

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

DESIGN UNIT STRESSES
CLASS B CONCRETE
REINFORCING STEEL (GRADE 60)
$\sigma = 3.000 \text{ psi}$
$\f_y = 60.000 \text{ psi}$

DIMENSIONS

GENERAL NOTES:

- FOLLOW DIMENSIONS.

NOTE: BEND OR CUT AT
AND 72 BARS IN FIELD
TO CLEAR PIPE.

MINIMUM CLEARANCE TO REINFORCING STEEL
SHALL BE 3/16" UNLESS SHOWN OTHERWISE.

REINFORCING STEEL

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

DIMENSIONS

COMPLETE BILL OF REINFORCING STEEL
DIMENSIONS

CLASS B CONCRETE
REINFORCING STEEL

TOTAL

CU. YD. LBS.

BENDING DIAGRAMS

CLASS B CONCRETE
REINFORCING STEEL

NOTE: DIMENSIONS SHOWN ON THIS LINE ARE FOR BARS USED TO CLEAR PIPE.

NOTES:

- ALL STANDARD HOOKS AND BENDS OTHER THAN 180 DEG. TO BE
SENT WITH SAME PRODUCTION AS FOR 8' DEE STEEL HOOKS.
- ALL STANDARD HOOKS AND BENDS SHALL BE IN ACCORDANCE WITH THE
PRODUCTION AS SHOWN IN THIS SHEET.
- NORMAL, LENGTHS ARE BASED ON OUT TO OUT DIMENSIONS SHOWN
IN BENDING DIAGRAMS AND ARE USED FOR FABRICATORS USE.
- PAYMENTS ARE BASED ON ACTUAL LENGTHS.
- LENGTHS = TOTAL LENGTHS ARE MEASURED ALONG CENTERLINE
BAR TO THE NEAREST INCH.
- $y = 4 / 49$ dimensions vary in equal Increments between
DIMENSIONS SHOWN IN THIS LINE AND THE FOLLOWING LINE.
- NO. EA. = NUMBER OF BARS OF EACH LENGTH.

DATE EFFECTIVE:
07/10/2001
DATE PREPARED:
9/30/2009

SHEET NO.
604.15E
1 OF 1

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

PIPE CULVERT HEADWALL
ENERGY DISSIPATOR (IMPACT TYPE)
FOR 48" CONCRETE PIPE
MANHOLE FRAME AND COVER IN PAVES AREAS USE TYPE 1. IN UNPAVED AREAS USE TYPE 1A OR 1B. NO CHANGE IN QUANTITIES REQUIRED FOR FRAME AND COVER DETAILS. SEE OTHER DRAWINGS.

SECTION A-A

GENERAL NOTES:

THE MAXIMUM DEPTH OF MANHOLE USING #4 HORIZONTAL BARS AT 12" CENTERS IS 20".

OVER 20" DEPTH, HORIZONTAL BARS SHALL BE INCREASED TO A #6 BAR AT 10" CENTERS TO A MAXIMUM DEPTH OF 30".

OVER 30" DEPTH WILL REQUIRE A SPECIAL DESIGN.

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

VARIABLE DIMENSIONS

<table>
<thead>
<tr>
<th>SIZE OF PIPE</th>
<th>#4 0-6&quot;</th>
<th>0-6&quot;</th>
<th>4-9&quot;</th>
<th>7&quot;</th>
<th>M</th>
<th>N</th>
</tr>
</thead>
</table>
| 24"          | 2"      | 2"   | 3"   | 6" | 1" | 1"
| 30"          | 3"      | 3"   | 4"   | 7" | 1" | 1"
| 36"          | 4"      | 4"   | 5"   | 8" | 1" | 1"
| 42"          | 5"      | 5"   | 6"   | 9" | 1" | 1"
| 48"          | 6"      | 6"   | 7"   | 10"| 1" | 1"

NOTES:

MINIMUM "M" SHALL BE THE OUTSIDE DIAMETER OF LARGEST PIPE ENTERING MANHOLE PLUS 16" CARRIED TO THE NEAREST 1/16"

HORIZONTAL AND VERTICAL BARE HORIZONTAL AND VERTICAL BARS AROUND PIPES.
### PIPE OPENINGS

**PIPE SIZES**

<table>
<thead>
<tr>
<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>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>Width of Wall Required for Pipe</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>Length of #6 Bar Required</td>
<td>4'-0&quot;</td>
<td>4'-6&quot;</td>
<td>5'-0&quot;</td>
<td>5'-6&quot;</td>
<td>6'-0&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight of Bar Lbs.</td>
<td>6.0</td>
<td>6.8</td>
<td>7.5</td>
<td>8.3</td>
<td>9.0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Weight of Steel Required**

- 2.76 steel
- 2.28 208.6 steel
- 0.70 42.6 steel
- 0.18 255.8 steel
- 3.16 255.8 steel

**Concrete Steel**

- From Table 4'-3" OD
- Add 12 X Quantities from 1-Foot
- Add 15" = 2 X 3" (2 x Quantities for 3")
- Use 2.80 280.0 steel

### ADDITIONAL STEEL OVER 3'-0" X 4'-0" MANHOLE

- 0.40 19.5 steel
- Total 2.76 275.3 steel
- Use 2.80 280.0 steel

**Concrete Manholes**

- Less than 20-foot TD and including 30-foot depth
- First, Compute Quantities for 30-foot depth from the Table 30" OD and 39.56 steel
- Add 0.40 19.5 steel
- Total 7.40 554.5 steel

**Concrete Steel**

- 2.28 208.6 steel
- 0.70 42.6 steel
- 0.18 255.8 steel
- 3.16 255.8 steel

**Concrete Steel**

- From Table 4'-3" OD
- Add 12 X Quantities from 1-Foot
- Add 15" = 2 X 3" (2 x Quantities for 3")
- Use 2.80 280.0 steel

### FOR DEPTHS ("D") NOT SHOWN, REFER TO TABLE FOR THE SIZE OF MANHOLE REQUIRED. ADD OR SUBTRACT THE "D" VALUE FROM THE TABLE AND THE "D" VALUE FROM THE PLANS. MULTIPLY THE VALUES SHOWN IN THE 4'-0" FOOT COLUMNS FROM THE TABLE WITH THE FULL SIZE DEPT. INCREDENTS FROM THE DIFFERENCE BETWEEN THE 0" AND 4'-0" FROM THE TABLES AND THE "D" FROM THE TABLES. MULTIPLY THE VALUES SHOWN IN THE 3'-0" 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:

**EXAMPLE:** Quantities for 3'-0" X 4'-0" manhole with 6'-9" OD: Having one 18" X 24" and one 36" pipe openings are determined as follows:

- OD Required = 6'-9"
- OD Given in Table = 4'-3"
- OD Additional = 2'-6"

**Concrete Steel**

- From Table 4'-3" OD
- Add 12 X Quantities for 4'-0"
- Add 15" = 2 X 3" (2 x Quantities for 3")
- Use 2.80 280.0 steel

**CONCRETE MANHOLES**

- Date Effective: 02-01-2009
- Date Prepared: 02/28/2009
- SHEET NO: 2 OF 2

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-452-MODOT (6636)
www.modot.mo.gov
**TYPE C COLLAR**

**SECTION B-B**

**TYPE A COLLAR**

**SECTION A-A**

**ELEVATION**

(FOR BOX CULVERT TO PIPE)

**BENDING DIAGRAM FOR B-BARS**

**C-BARS**

**D-BARS**

**A-BARS**

**B-BARS**

**FLOW LINE**

ONE LAYER COMMERCIAL AVAILABLE
55-POUND ROLL ROOFING.
### Table of Dimensions

<table>
<thead>
<tr>
<th>Size of Pipe (IN.)</th>
<th>Dimensions (IN.)</th>
<th>Length of Bars (FT.-IN.)</th>
<th>Quantities</th>
</tr>
</thead>
<tbody>
<tr>
<td>LARGE (IN.)</td>
<td>SMALL (IN.)</td>
<td>A &amp; B (FT.-IN.) C (FT.-IN.)</td>
<td>A (#5) REQUIRED (FT.-IN.)</td>
</tr>
<tr>
<td>12</td>
<td>12</td>
<td>2-8</td>
<td>1-0</td>
</tr>
<tr>
<td>15</td>
<td>15</td>
<td>3-0</td>
<td>1-0</td>
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<tr>
<td>18</td>
<td>15</td>
<td>3-3</td>
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<tr>
<td>66</td>
<td>54</td>
<td>8-10</td>
<td>2-0</td>
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</table>

**Table of Dimensions**

<table>
<thead>
<tr>
<th>Box Size (IN.)</th>
<th>Dimensions (IN.)</th>
<th>Length of Bars (FT.-IN.)</th>
<th>Quantities</th>
</tr>
</thead>
<tbody>
<tr>
<td>LARGE (IN.)</td>
<td>SMALL (IN.)</td>
<td>A &amp; B (FT.-IN.) C (FT.-IN.)</td>
<td>A (#5) REQUIRED (FT.-IN.)</td>
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<tr>
<td>12</td>
<td>12</td>
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<td>66</td>
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<td>8-10</td>
<td>2-0</td>
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</table>

**Type B Collar**

(For Concrete Pipe to Corrugated Metal Pipe)

![Pipe Placement Diagram](image_url)
**SLOTTED DRain**

**SECTION 8-8**

**604.70**

**SLOTTED DRAIN**

**TYPE A**

**PLAN**

**LOCKING PLATE DETAIL**

**ISOMETRIC DETAIL**

**JOINT CONNECTION SECTION**

**STeEL WALL**

**CARRIAGE BOLT 1/2" 2"**

**TYPE "A"**

**JOINT CONNECTION SECTION**

**SLOT OPENING CORRUGATED METAL PIPE**

**TYPE "B"**

**SLOTTED PIPE DETAIL**

**DIMENSION CHART**

<table>
<thead>
<tr>
<th>PIPE DIAMETER</th>
<th>A</th>
<th>B</th>
<th>D</th>
<th>E</th>
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<tbody>
<tr>
<td>12&quot;</td>
<td>31&quot;</td>
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<td>31&quot;</td>
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<tr>
<td>36&quot;</td>
<td>94&quot;</td>
<td>86&quot;</td>
<td>84&quot;</td>
<td>81&quot;</td>
</tr>
</tbody>
</table>

**PORTION OF END COVER PLATE IS NOT SHOWN FOR CLARITY ONLY**

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

**8" FOR STANDARD 10 FT. Ø 12" DIA. PIPE, "C" = 0. FOR ALL OTHER PIPE SIZES "C" IS IN MULTIPLES OF "A".**

**LOCKING PLATE TO BE INSTALLED AT:**

A. EACH END OF DRAIN GUIDE.
B. EACH SEAM.
C. EACH MID-POINT OF OPEN SLOT. (TYPICAL FOR JOINT (3) IN 20 FT. SECTION FOR TWO PIECE CONNECTION SECTION DRAIN GUIDE. INCREASE NUMBER OF TYPE "A" AND TYPE "8")

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

**105 WEST CAPITOL**

**JEFFERSON CITY, MO 65102**

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

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

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

**SHEET NO.: 1 OF 2**
STRUCTURAL STEEL SLOTTED DRAIN
(TYPE B)

SECTION A-A

SECTION F-F

SECTION G-G

BEARING BAR

SOLID WELD SPACER

FILLET WELD

COUPLING BAND

PIPE

2 1/2" X 1 1/2" X 2" X 2"

LONG BAND ANGLE

2 1/2" X 1 1/2" X 2" X 2"

LONG BAND ANGLE

3" DIA. CARRIAGE BOLT

1 1/2" LEG

SPOT WELDS (EACH SIDE OF BAND ANGLE)

COUPLING BAND

GRATE

5" DIA. CARRIAGE BOLT

3" DIA. CARRIAGE BOLT

COUPLING BAND

GRATE

5" DIA. CARRIAGE BOLT

SECTION D-D

TOP VIEW

SIDE VIEW

TYPICAL COUPLING BAND

TYPICAL PIPE SECTION

GRATE WELDING DETAIL

GRATE WELDING DETAIL

SIDE VIEW

TYPICAL COUPLING BAND

TYPICAL PIPE SECTION

GRATE WELDING DETAIL

STRUCTURAL STEEL SLOTTED DRAIN
(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. 604.70
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. 604.70
2 OF 2

SLOTTED DRAIN
TYPE B AND TYPE C
**SECTION A-A**

**SECTION B-B**

**SECTION C-C**

**SECTION D-D**

**SECTION D-D**

**ITEM 2: 13: 1 LI: 16: 1 5.48' 6.19' 6.95' 8.58'**

**ITEM 2: 13: 1 LI: 16: 1 2.70' 3.07' 3.116' 4.28'**

**ITEM 2: 13: 1 LI: 16: 1 0.78' 1.12' 1.19' 2.30'**

**ITEM 2: 13: 1 LI: 16: 1 2.00' 2.00' 2.00' 2.00'**

**ITEM 2: 13: 1 LI: 16: 1 2.00' 2.00' 2.00' 2.00'**

**ITEM 2: 13: 1 LI: 16: 1 0.46' 0.61' 0.78' 1.18'**

**ITEM 2: 13: 1 LI: 16: 1 0.71' 1.07' 1.16' 2.27'**

**ITEM 2: 13: 1 LI: 16: 1 2.31' 2.51' 2.71' 3.13'**

**CONC. 0.15 C.Y. 0.17 C.Y. 0.20 C.Y. 0.25 C.Y.**

**GENERAL NOTES:**

PRECAST CONCRETE SPLASH PADS MAY BE INSTALLED AS APPROVED BY THE ENGINEER.

TOP OF SPLASH PAD SHALL MATCH EXISTING CROSS SLOPE.

CONSTRUCT BEND IN SPLASH PAD WHERE CROSS SLOPE CHANGES.

DIMENSIONS ARE APPROXIMATE AND CAN BE ADJUSTED AS DIRECTED BY THE ENGINEER.

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

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

PAVEMENT UNDERDRAINAGE CROSS DRAINS

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

PAVEMENT UNDERDRAINAGE CROSS DRAINS

**DATE** 06/01/2013
**SHEET NO.** 605.101
**3 OF 4**
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)

PAVEMENT UNDERDRAINAGE
AGGREGATE UNDERDRAINS

PLAN

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

PAVEMENT UNDERDRAINAGE
AGGREGATE UNDERDRAINS

DATE EFFECTIVE: 06/01/2013
DATE PREPARED: 06/11/2013
SHEET NO.: 605.101
4 OF 4
STEEL POST & WOOD OR PLASTIC BLOCK

ELEVATION

TYPE A GUARDRAIL

PLAN

ELEVATION

STEEL POST & WOOD OR PLASTIC BLOCK

ELEVATION

TYPE B GUARDRAIL

GENERAL NOTES:

See Sheet No. 5 of 7 for foot and block details.

Contractor may furnish equivalent sections fabricated from material meeting specifications per Section 1040.
PART SECTION SHOWING TYPE E TO TYPE A GUARDRAIL TRANSITION

The overall nominal dimensions shown shall be net. Although the size of the plastic block may vary from the shape shown, except the 2 3/8" flange and the overall width dimensions may be varied if approved by project operations.

SECTION B-B

SECTION C-C

GENERAL NOTES:

The Type E guardrail shall use 6x8 1/2" foot spacing unless 3-1/2" foot is specified.

The single thire beam rail for the Type E guardrail and the transition section shall be made of steel and shall be 10 gauge.

For protective coating and material requirements, see Sec 1056 of the Standard Specifications.

See Sheet 7 of 7 for requirements for special installations.

All dimensions are subject to manufacturer tolerances except where allowable tolerances are shown.

For details not shown, see other sheets of this drawing.

MINNEAPOLIS HARRIS & TRANSPORTATION CO.
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-604-MODOT 1-888-604-6636

GUARDRAIL

MODOT

GUARDRAIL

TYPE E

DATE EFFECTIVE:
01/07/2017

606.00AY
2 OF 7
TYPICAL SECTION

1. SHOULDER WIDENING SHALL CONSIST OF ENHANCED MATERIAL COMPACTED IN ACCORDANCE WITH SEC 203.4 OF THE STANDARD SPECIFICATIONS.
2. POST SHALL BE SPACED AT 3'-0" ON CENTER.
3. WHEN GUARDRAIL IS CONSTRUCTED OVER CURBS, THE CURBS SHALL BE CONSTRUCTED AS SHOWN.

ALTERNATE TYPICAL SECTION AT SLOPE BREAKPOINT

DETAIL FOR TRANSITIONING BETWEEN TYPE A AND TYPE B GUARDRAIL

LOCATION OTHER THAN MEDIAN LATERAL PLACEMENT OF GUARDRAIL FOR SHOULDER INSTALLATION

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

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

ALTERNATE DESIGN
FOR WOOD BLOCK

NOTE:
(1) THE OVERALL NOMINAL DIMENSIONS SHOWN SHALL BE NET. ALTHOUGH THE SHAPE OF THE PLASTIC BLOCKS MAY VARY FROM THE SHAPE SHOWN; EXCEPT THE 2 IN FLANGE ARE THE OVERALL WIDTH DIMENSIONS MAY BE ALTERED IF APPROVED BY PROJECT OPERATIONS.
**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:**

Posts in solid rock shall provide a diameter of not less than 6 inches greater than the maximum transverse dimension of the post section.

Posts may be smaller where placed in a minimum 2 feet of solid rock. Steel posts may be placed in cavities if post shall be in accordance with Sec. 410 of the standard specifications.
**Guardrail Long-Span Nested W-Beam**

- **Section A-A:**
  - WS X 9 Steel Posts, 6' or 7' long with
  - 8" x 6" x 14" routed wood blockouts
  - Post 1 through 5 and 19 through 24.

- **Section B-B:**
  - Set wood posts, 6' or 7' long with
  - 8" x 6" x 14" wood blockouts
  - Post 6 through 18.

---

**Notes:**

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

MEDIAN PIER PROTECTION

BULLNOSE GUARDRAIL SYSTEM

DATE EFFECTIVE: 08/01/2012
DATE PREPARED: 07/27/2012
GENERAL NOTE:
RAILS NUMBERS 1, 2, 3 AND 4 ARE TYPE E GUARDRAIL.
RAIL NUMBER 4 IS A STANDARD THRIE BEAM, NOT SLOTTED.

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

MEDIAN PIER PROTECTION
BULLNOSE GUARDRAIL SYSTEM

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

THRIE BEAM CRT POSTS

POSTS 2 THROUGH 8
STANDARD BLOCKS

BLOCKS FOR POSTS 9 AND 10
STANDARD BLOCKS

TAPERED BLOCK

MEDIAN PIER PROTECTION
BULLNOSE GUARDRAIL SYSTEM
POST AND BLOCKS
RAIL SECTION 1 (NOSE SECTION)

RAIL SECTION 2

RAIL SECTION 3

MEDIAN PIER PROTECTION

BULLNOSE GUARDRAIL SYSTEM

RAIL SECTION 1, 2 AND 3

DATE EFFECTIVE: 08/01/2012
DATE PREPARED: 07/27/2012
606.01F SHEET NO. 5 OF 9
STEEL PLATE, A306
12\(\frac{1}{2}\)" x 5\(\frac{3}{8}\)" x \(\frac{3}{8}\)"

(1) STUD, THREADED ENTIRE LENGTH.

DETAIL OF CABLE ASSEMBLY

DETAIL OF STEEL BEARING PLATE
TOP VIEW, RAIL #1

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

END SECTION

TOP VIEW, RAIL #2

14' - 4" CABLE LENGTH

2 1/2"

13'-10"

62 1/2" RADIUS

"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 SNAKE-GRIP BUTTON FERRULES)

END SECTION

FRONT VIEW (UNBENT)

12'-6"
(1) TYPE E GUARDRAIL 12'-5" IN LENGTH AND FACTORY FORMED TO THE REQUIRED RADIUS.

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

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

GENERAL NOTES:

TYPE B CRASH WORTHY END TERMINAL SHALL BE LATEST VERSION AND SHALL BE INSTALLED ACCORDING TO MANUFACTURER'S RECOMMENDATIONS.
PIER AT $\xi$ OF MEDIAN

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

(2) TYPE A NON-FLARED CRASHWORTHY END TREATMENT.

GENERAL NOTES:

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

TYPE A NON-FLARED CRASHWORTHY END TERMINAL SHALL BE THE LATEST VERSION AND SHALL BE INSTALLED ACCORDING TO MANUFACTURER'S RECOMMENDATIONS.
THREE BEAM RAIL SPlice AT Post

[Diagram showing rail splice details]

1 ½" X 1 1/8" SPlice BOLT SLOTTED HOLES
2 ½" X 2" POST BOLT SLOTS

DIRECTION OF TRAFFIC

8' 8" X 6' 8" TYP.

2" BEARING PLATE

GENERAL NOTES:

DESIGN BASED ON NCWPI REPORT 550 TEST LEVEL 3.

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

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

RAIL POSTS SHALL BE SET PERPENDICULAR TO THE ROADWAY PROFILE 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" BUTTON-HEAD DUAL SHOULDER BOLTS WITH HEX NUTS AT ALL SLOTS (THICKNESS OF HEX NUTS = 3/4"

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

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

SEE STANDARD PLAN 606.00 FOR DETAILS NOT SHOWN.

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

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

BRIDGE ANCHOR SECTION
SAFETY BARRIER CURB ON BRIDGE
WELDING INSTRUCTION

1. STIFFENERS LOCATED AT THE OUTSIDE EDGES OF THE COVER PLATE SHALL BE RECYCLED AS FOLLOWS:
   - SINGLE BEVEL CORNER WELD 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 RECYCLED 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>CONNECTOR</th>
<th>SHAPE</th>
<th>SIZE (X X X X X)</th>
<th>THICKNESS</th>
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GENERAL NOTES:

COVER PLATE PANELS ARE 3/16" THICK.
ALL STIFFENERS ARE 1/4" THICK.
CONNECTOR PLATE SHALL BE FABRICATED FROM 45,000 MPY 410 STAINLESS STEEL AND GALLERIZED.
FOR GALLERIZATION REQUIREMENTS, SEE SEC. 1040 OF THE STANDARD SPECIFICATIONS.
ALLホール DIAMETERS SHALL BE 1".

BRIDGE ANCHOR SECTION
SAFETY BARRIER CURB ON BRIDGE (CONNECTOR PLATE DETAIL)
SINGLE SLOPE BARRIERS
GENERAL NOTES:

1. DESIGN BASED ON NEEDS REPORT AND TEST LEVEL 3 (V=45).  
2. THE THREE BEAM RAIL FOR THE BRIDGE ANCHOR SECTION SHALL BE 12 PIPE OR 12 GAGE STEEL. THE TRANSITION SECTION SHALL BE 12 BAR.  
3. FABRICATED STRUCTURAL STEEL SHALL BE ASTM 90 GRADE 50.  
4. FOR PROTECTIVE COATING AND MATERIAL REQUIREMENTS, SEE SECTION 10 OF THE STANDARD SPECIFICATIONS.  
5. RAIL POSTS SHALL BE SET PERPENDICULAR TO THE HORIZONTAL PLANE AT VERTICALLY IN EACH SECTION.  
6. WASHERS SHALL BE USED AT ALL POST BOLTS.  
7. USE 2" LUG-HUG Fastening Bolt with Hex Nut. Thread thickness of Hex Nuts = 2" Bolt at all bolts.  
8. ALL LUG SPECIES SHALL BE MADE IN THE DIRECTION OF TRAFFIC.  
9. THE COST OF FABRICATING, FABRICATING AND INSTALLING TRANSITION SECTION COMPLETE-IN-PLACE SHALL BE PAID FOR AT THE CONTRACT UNIT PRICE PER EA.  
10. THE COST OF FABRICATING, FABRICATING AND INSTALLING BRIDGE ANCHOR SECTION THREE BEAMS COMPLETE-IN-PLACE SHALL BE PAID FOR AT THE CONTRACT UNIT PRICE PER EA.  
11. FOR DETAILS NOT SHOWN, SEE BRIDGE THREE BEAM RAIL SHEET.
SECTION F-F
SIDE VIEW
STEEL POST AND WOOD BLOCKOUT

SECTION G-G
SIDE VIEW
STEEL POST AND WOOD BLOCKOUT

SECTION H-H
FRONT VIEW
THROUGH THRIE BEAM RAIL

THRIE BEAM RAIL SPLICED AT POST

ASYMMETRICAL TRANSITION SECTION

OPTIONAL 8" EAIL HOLE FOR HANDLING
COUNTERSINKING - PERMITTED

POST 7 - 121 VERTIGAS RAIL TRANSITION PRODUCER (SEE FRONT SHEET)
POST 8 - ONLY 1 HOLE REQUIRED
ALL HOLES 3/16" DIAMETER EXCEPT AS NOTED

HOLE PUNCHING DETAIL
FOR STEEL POST & WOOD BLOCKS (6" AND 8")
**Concrete Foundation for End Anchors**

**Steel Tube Foundation for End Anchors**

Bolts and nuts shall be galvanized in accordance with the requirements of ASTM A325, or they may be mechanically galvanized in accordance with ASTM A325 Class C.

**Expanded Polystyrene Foam Installation Detail**

Two sides of post shall be faced with one layer of two-thick expanded polystyrene foam sheets and one layer of lightweight building paper. The opening shall be filled with ballistic resistant grade or other approved water proof material.

**Soil Plate Connections**

**Wood Breakaway Post**

See Section 1050

1. 3' - 1/2" for concrete foundation alternate.
2. 3' - 3/8" for concrete foundation alternate.

**General Notes:**

The contractor has the option to install wood post 1 and 2 in steel tube or concrete foundation.

Trenching of wood post may be necessary for steel tube foundation.

Steel tube foundations shall be filled with and back-filled with a suitable material. When the soil plate is placed, it shall be aligned with the steel tube. Steel tube foundations may be driven when the soil plate is welded as shown to the steel tube.
SECTION A-A

SECTION B-B

SECTION C-C

SECTION D-D

ELEVATION
ANCHORED IN BACKSLOPE GUARDRAIL

44 THE FOOT BEHIND THE DITCH LINE MAY BE SHORTENED TO PROVIDE 78" WING ENGAGEMENT.

GENERAL NOTES:
FOR THE ANCHOR DETAILS, SEE SHEET 11-3 OF 7.
THE FOOT FOOT IS DESIGNED WITH EMBRACE.
HEADS, WHEN THE DISTANCE BETWEEN THE GUARDRAIL AND THE ROAD IS 60" AND INCREASED.
THE GUARDRAIL FOOT 1 AND 2 SHALL HAVE FLEXIBLE TYPE AS SHOWN ON SHEET 3 OF 7.
THE CONTRACTOR MUST STORE THE GUARDRAIL, FOOT, AND THE ROAD CONNECTION, AND ALL MEASUREMENTS AND DESIGNS FOR THE INSTALLATION.
AS SHOWN ON SHEET 7 OF 7.
ELECTRICAL WILL NOT BE REQUIRED FOR ANY FOOT WHICH WILL BE COMPLETELY BELOW GROUND ELEVATION OF THE GUARDRAIL.
SEE OTHER DRAWINGS AND SPECIFICATIONS FOR MATERIALS AND CONSTRUCTION REQUIREMENTS NOT SHOWN.

GUARDRAIL
TERMINAL ENDS
EMBEDDED AND ROCK FACE
(V-DITCH STEEPER THAN 01, 41:1 MAX, FORESLOPE)

ROCK FACE GUARDRAIL ANCHOR

FOUR 6" x 6" HEX-MACHINE BOLTS AND NUTS

HEIGHT ABOVE DITCH IS EQUAL TO ROAD ELEVATION AT THE DITCH CROSSING.
3 - 1" holes to be field drilled in V-beam element and attached with 1/2" hex head bolt 2 1/4" long each with one square washer and hex nut.

1/4" hole to be field drilled through V-beam element and attached with 1/2" hex head bolt 2 1/4" long each with one square washer and hex nut.

Embedded steel 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 ALTERNATE GRADING LIMITS ARE ALLOWABLE ON EXISTING ROADS EXCEPT WHEN STANDARD GRADING IS INDICATED ON THE PLANS.

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

END ANCHORS SHALL BE INSTALLED ON ENDS OF GUARDRAIL RUNS WHERE CRASHWORTHY END TERMINALS ARE NOT REQUIRED.
ACCESS-RESTRAINT CABLE GREATER THAN 300 FEET IN LENGTH REQUIRES AN INTER-
MEDIATE ANCHOR AS SHOWN.

SPICE DETAIL

ANCHOR ROD ASSEMBLY

CABLE END

TYPICAL LOCATION
SHOULDER INSTALLATION

ONE-STRAND ACCESS RESTRAINT CABLE
GUARD CABLE TO GUARDRAIL TRANSITION AT MEDIAN OBSTRUCTION

GENERAL NOTES:

4. Visually inspect to achieve 25° deflection to second post of S-4-1.50 or E-100.

4.4 If guard cable is used with E-100 guardrail system, or a Crashworthy End Terminal on a median less than 50' in width, the rail anchor shall be placed on the rail centerline 120' from the edge of the transition end terminal of the guardrail system.

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

DETAIL C

TYPICAL GUARD CABLE TO GUARDRAIL TRANSITION ELEVATION

DETAIL D
PLAN VIEW

11. 2' - 6" minimum clearance to the face of obstacle with 6' - 3" post spacings.
   3' - 6" minimum clearance to the face of obstacle with 3' - 14" post spacings.
   For 1' - 6" minimum clearance to the face of obstacle with 1' - 6" post spacings,
   see Sheet 4 if 3 for post spacing details.

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

GENERAL NOTES:

FOR INITIAL INSTALLATION, CONSTRUCT THE GUARDRAIL WITHIN 1" OF THE STANDARD 3" HEIGHT TO THE TOP OF K-BEAM RAIL. WHEN SIGNAL PROJECTS, SUCH AS

REFLECTIONS AFFECT THE HEIGHT OF EXISTING GUARDRAIL, ADJUSTMENT IS NOT REQUIRED IF FINISHED
HEIGHT IS WITHIN 3" OF THE STANDARD HEIGHT.

THE STANDARD POST LENGTH IS 6' - 2" (+/- 1") TOLERANCE.

THE SUBSTITUTION OF 8 FOOT POSTS IN LIEU OF REQUIRED 12 FOOT POSTS, TO ENSURE LESS THAN THE DESIGNED TYPICAL SECTION, SHALL NOT BE ALLOWED.

REFER TO SHEET 11 FOR DIMENSIONAL DETAILS OF K-BEAM, ROLLER BAR, AND END SECTIONS. BEAM

SPLEDES, POST AND SPLICE BOLTS, NUTS, AND TIE-1

K-BEAM TO THREE BEAM TRANSITION SECTIONS.

BEAM WASHERS ARE NOT TO BE USED. BOLT GRACE SHALL

BE ASTM A567.

UNLESS OTHERWISE SPECIFIED, K-BEAM RAIL IS 12 GAUGE STEEL WITH AN EFFECTIVE LENGTH OF 10' - 6" OR 25'-6".

WITH 1/4" X 1/2" SPLICE BOLT CLOTS AND 2 X 5" POST

BOLT CLOTS ON 4'-1" CENTERS REGARDLESS OF POST

SPACING.

FOR PROTECTIVE COATINGS AND MATERIAL REQUIREMENTS,

SEE BACK OF THE STANDARD SPECIFICATIONS.

LAF SPLEDGES BETWEEN TWO RAILS OR BETWEEN A RAIL AND

TERMINAL CONNECTOR IN THE DIRECTION OF TRAFFIC. LAF

THE PLACED EYE SECTIONS IN THE DIRECTION OF TRAFFIC.
MGS GUARDRAIL WITH 3'-1\frac{1}{2}"
POST SPACING

101: 25 FEET OF MGS 3'-1\frac{1}{2}" POST SPACING GUARDRAIL IS REQUIRED ON APPROACH AND DEPARTURE ENDS OF 1'-6\frac{1}{2}" POST SPACING MGS GUARDRAIL.

102: USE AS MANY SEGMENTS AS NECESSARY TO SHIELD THE AREA OF CONCERN.

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

GENERAL NOTES:
- GUARDRAILS CANNOT BE USED WHERE:
  - POST SPACING IS LESS THAN 6'-0"
  - WITHIN CRASHWORTHY END TERMINALS
  - WITHIN VERTICAL BARRIER TRANSITIONS (606.6D)
  - WITHIN BRIDGE APPROACH TRANSITIONS (606.7D)
SETTING POST IN SOLID ROCK

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

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

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

SECTION D-D
SETTING POST THROUGH PAVEMENT (CONCRETE OR ASPHALT 0 TO 2" THICK)

GENERAL NOTES:

HOLES IN SOLID ROCK SHALL PROVIDE A DIAMETER OF NOT LESS THAN 4 INCHES GREATER THAN THE MAXIMUM
TRANSVERSE DIAMETER OF THE POST SECTION.

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

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
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MIDWEST GUARDRAIL SYSTEM (MGS)
SPECIAL INSTALLATIONS

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

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

11. 3'-6" MINIMUM CLEARANCE TO THE FACE OF
OBSTACLE WITH 8' POSTS ADJACENT TO A 2:1 SLIME.

12. WHERE THERE IS NOT SUFFICIENT ENHANCEMENT
BEYOND THE SHOULDER TO PLACE THE BACKFILL MATERIAL
BEYOND THE FREE EDGE POST, THE POSTS MAY BE PLACED A MAXIMUM OF 12" BEYOND
THE FREE EDGE POST IF A 2:1 OR FLATTER SLIME.

GENERAL NOTES:
SEE STC PLAN 606.61 FOR SITE GRADING REQUIREMENTS FOR CRASHWORTHY END
TERMINALS.

8 FOOT POSTS SHALL BE USED WHEN LESS THAN 2 FEET OF ENHANCEMENT IS PRESENT
BETWEEN THE BACK OF THE GUARDRAIL POST AND THE SLIME FREE EDGE. THE
SUBSTITUTION OF 6 FOOT POSTS IN LIEU OF REQUIRED ENHANCEMENT LESS THAN THE DESIGNED TYPICAL SECTION SHALL NOT BE ALLOWED.
PLAN VIEW
FACE OF GUARDRAIL ALIGNED WITH EDGE OF SHOULDER (1)

TYPE A GUARDRAIL
MGS TRANSITION (2)
MGS GUARDRAIL

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 CONSTRUCTED, AND WHEN THE EXISTING SHOULDER IS WIDER THAN 2 FEET, THE EXISTING SHOULDER MAY BE REDUCED UP TO 4 INCHES TO ACCOMMODATE THE 2 INCH BLOCKS OF THE MGS GUARDRAIL.
WHERE SITE CONSTRAINTS PROHIBIT OR ENGAGEMENT CANNOT BE CONSTRUCTED TO PROVIDE A MINIMUM OF 2 FEET BETWEEN THE EDGE OF THE GUARDRAIL FOOT AND SLOPE BREA POINT, 2 FOOT PADS SHALL BE USED. (SEE SHEET B OF 8). THE SUBSTITUTION OF 2 FOOT PADS FOR REQUIRED GRADEING SHALL NOT BE ALLOWED.
(2) MGS TRANSITION FROM TYPE A GUARDRAIL SHALL BE COMPLETED INSIDE THE 50 FT ROADWAY TERMINAL LIMITS.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
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MIDWEST GUARDRAIL SYSTEM (MGS)
BLOCK AND HEIGHT TRANSITION

FILED EFFECTIVE: 08/02/2012
FILED ISSUE: 10/07/2012
SHEET NO: 606.50D 8 OF 8
PIER AT MEDIAN

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

(2) TRANSITION EMBANKMENT HEIGHT AND WIDTH OF MEDIAN FOR TYPE B CRASHWORTHY END TERMINAL PER MANUFACTURER'S REQUIREMENTS. SEE STP PLAN 606.80 FOR EMBANKMENT DESIGN DETAILS.

(3) CONTINUE 10'-0" SLOPE TO MEDIAN OR 2'-0" FAST THE EDGE OF THE MEDIAN IN FOOT.

(4) 10'-0" PLATE RATE OR AS RECOMMENDED BY TABLE 3-3 OF THE LATEST VERSION OF THE "ROADSIDE DESIGN GUIDE.”

MEDIAN WIDTH LESS THAN 60’

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

MGS GUARDRAIL MEDIAN PIER PROTECTION
MEDIAN LESS THAN 60’
PIER AT MEDIAN

1. 300' minimum clearance to the face of obstacle with 6'-3" post spacing is preferred.
   240' minimum clearance use 1'-6" post spacing
   180' minimum clearance use 1'-0" post spacing
   See Std. Pile 606.81 for post spacing details.
2. For length-of-tee, see the latest version of the "Pre-Hi" Design Guide.
3. See Section A-A for details.
4. Continue 10'1" slope to obstacle or a minimum of 3'-0" past the edge 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 "Pre-Hi" Design Guide 3.1, 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.
PLATE AND STIFFENER IDENTIFICATION

COVER PLATE #1

COVER PLATE #2

STIFFENER #: 4 EACH

STIFFENER #: 1 EACH

STIFFENER #: 1 EACH

STIFFENER #: 1 EACH

STIFFENER #: 1 EACH

STIFFENER #: 1 EACH

STIFFENER #: 1 EACH
WELDING INSTRUCTION

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

GENERAL NOTES:

COVER PLATE PANELS ARE 5/8" THICK.
ALL STIFFENERS ARE 3/4" THICK.
CONNECTOR PLATE SHALL BE FABRICATED FROM 50K GRADE 36 PLATE AND GALLREADED.
FOR GALVANIZE REQUIREMENTS, SEE SECTION 1040 OF THE STANDARD SPECIFICATIONS.
ALL HOLE DIAMETERS SHALL BE 1/2".

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:
A) TYPICAL GROOVE WELD ON EXTERNAL SIDES ARE ⅛" FILLET WELD BY 1" LONG SPACING AT 20° ON INTERNAL SIDES.
B) STIFFENERS LOCATED ON THE INSIDE OF THE COVER PLATE SHALL BE WELDED AS FOLLOWS:
A) ⅛" FILLET WELD BY 1" LONG SPACING AT 20°.

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

CONNECTOR PLATE DIMENSION
(PER ASSEMBLY)

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<thead>
<tr>
<th>PLATE</th>
<th>QUANTITY</th>
<th>SHAPE</th>
<th>SIZE (A x B x C x D)</th>
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GENERAL NOTES:
COVER PLATE PANELS ARE ⅛" THICK.
ALL STIFFENERS ARE ⅛" THICK.
CONNECTOR PLATE SHALL BE FABRICATED FROM 50S GRADE 300 STEEL MILL CALIBRATED.
FOR Galvanized requirement, see S9020 of the standard specifications.
ALL HOLE DIAMETERS SHALL BE ⅛".
GENERAL NOTES:

DESIGN BASED ON MAIN TEST LEVEL 3 (TL=3).

SPECIAL STEEL AND WOOD MAY BE 350,000 PSI OR GRADE 36.

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

PAI POSTS SHALL BE SET PERPENDICULAR TO THE ROADWAY PROFILE OR ROAD AND VERTICALLY IN CROSS SECTION.

STEEL BLOCKS SHALL BE HEAVY-DUTY SQUARE HOLE BOLTS WITH HEY/HOLE WITH THE HOLE ON THE 24" SIDE AT ALL BLOCKS.

ALL L 寸 SPACES SHALL BE COVERED IN THE DIRECTION OF TRAFFIC.

THE COST OF FURNISHING, DELIVERING AND INSTALLING TRANSITION SECTION COMPLETE-TO-PLACE SHALL BE PAID FOR AT THE CONTRACT UNIT PRICE FOR EACH.

THE COST OF FURNISHING, DELIVERING AND INSTALLING BRIDGE ENDS IN SECTION THREE BEAMS COMPLETE-TO-PLACE SHALL BE PAID FOR AT THE CONTRACT UNIT PRICE FOR EACH.

FOR DETAILS NOT SHOWN, SEE BRIDGE BEAM RAIL SHEET.
EMBEDDED STEEL 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 FENCE. 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 MASH APPROVED CRASHWORTHY END TERMINAL.

END ANCHORS SHALL BE INSTALLED ON ENDS OF CULVERT RAIN WHERE CRASHWORTHY END TERMINALS ARE NOT REQUIRED.
WIRE SIZE AND HEIGHT OF FABRIC SPECIFIED DIAMETER PRESENTATION

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

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

Pull posts shall be used at sharp breaks in vertical grade or at approximate 500' centers on straight runs or as directed by the engineer.

Drilled holes in solid rock shall provide a diameter of not less than 2" greater than the maximum transverse dimension of the post section.

All posts shall have provisions to securely hold the top tension wire in position and allow for removal and replacement of a post without damaging the top tension wire.

The mesh size shall be 2 inches ± 1/2 in. measured in either direction as the minimum clear distance between the wires forming the parallel sides of the mesh.

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

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

CHAIN-LINK FENCE

DATE EFFECTIVE: 08/01/2007
DATE PREPARED: 8/21/2009

607.10V SHEET NO. 1 OF 1
U-BOLT (TYP. DIAMETER 9"

PLACE EXPANSION SLEEVE AT ABOUT 30° CENTERS WITH AT LEAST ONE EXPANSION SLEEVE BETWEEN PULL POSTS.

PART ELEVATION (TYPICAL)

PLACE JOINT FILLER.

SEE PLANS FOR SLOPE DETAILS.

GENERAL NOTES:

PAYMENT FOR U-BOLTS WITH NUTS, WASHERS, AND #4 BARS WILL BE CONSIDERED COMPLETELY COVERED BY THE CONTRACT UNIT PRICE FOR CHAIN-LINK FENCE (RETAINING WALLS).

PULL POST SHALL BE USED AT SHARP BREAKS IN VERTICAL GRADE OR AT APPROXIMATE 100° CENTERS ON STRAIGHT RUNS.

THE CHAIN-LINK FENCE SHALL BE IN ACCORDANCE WITH APPLICABLE PARTS OF SEC. 607.

MAXIMUM POST SPACING IN HORIZONTAL DIRECTION SHALL BE 10'-0".

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL JEFFERSON CITY, MO 65102 1-888-655-MODOT (1-888-275-6636)

CHAIN-LINK FENCE FOR RETAINING WALLS

DATE EFFECTIVE: 06/01/2009
DATE PREPARED: 04/30/2009
607.11H SHEET NO. 1 OF 1
END POST ASSEMBLY

STEEL POST

CORNER OR PULL POST ASSEMBLY

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

POORLY DEFINED CHANNELS (SMALL DRAINAGE AREAS)

TYPICAL WATER CROSSING GATE

WELL DEFINED CHANNELS (LARGE DRAINAGE AREAS)

TYPICAL FENCING AT CHANNEL CROSSING
GENERAL NOTES:

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. X 5 FT. PASSING SPACES EVERY 200 FT. SHALL BE PROVIDED AND ARE PERMITTED TO OVERLAP PEDESTRIAN ACCESS ROUTES.

THE CROSS SLOPE OF THE CONTINUOUS PEDESTRIAN ACCESS ROUTE THROUGH ENTRANCES, ALLEYS, AND SIDEWALK CONNECTIONS SHALL BE 1.00% TO FACILITATE DRAINAGE (2.00% MAX.).

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

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

STORMWATER INLETS, SIGNS, POSTS, MANHOLE COVERS, PULL BOXES AND OTHER ACCESS LIDS SHOULD BE AVOIDED WITHIN THE SIDEWALK. IF SUCH A LOCATION IS NECESSARY, THE FEATURE MUST MEET ADA STANDARDS.

THE RUNNING GRADE OF A SIDEWALK SHALL NOT EXCEED 5.0% UNLESS IT IS MATCHING THE GRADE OF THE ADJACENT ROADWAY.

PEDESTRIAN ACCESS ROUTE SHALL CONTINUE ACROSS RESIDENTIAL AND COMMERCIAL ENTRANCES, ALLEYS, AND SIDEWALK CONNECTIONS.
SAFETY RAIL DETAILS

STAIRWAY STEP 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.

POST SPACING 5'-0" MAX.

1'-0" MIN.

POST LENGTH - HANDRAIL FOR STEPS

CENTER MIDDLE RAIL VERTICALLY BETWEEN TOP AND TOE RAILS

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### Quantities for Concrete Steps
#### Concrete & Steel

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TIE BAR LOCATIONS FOR CONCRETE MEDIAN STRIP

TIE BAR LOCATIONS FOR CONCRETE MEDIAN STRIP (ISLAND)

CONCRETE MEDIAN STRIP

PLACE JOINTS AT EACH EXISTING JOINT (1)

EXISTING PAVEMENT JOINTS (1)

(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'.

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'.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

DATE EFFECTIVE: 10/01/2020
DATE PREPARED: 7/21/2020

608.30A SHEET NO. 1 OF 1
GENERAL NOTES:

All areas of the pedestrian access route must be compliant with the Americans with Disabilities Act – Guidelines for Accessible Public Rights of Way. Exceptions must be approved by the engineer. All other areas of non-compliance shall be removed and corrected at the contractor's expense.

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

Sidewalk, ramp and landing cross slopes shall be 1.00% to facilitate drainage (2.00% max.).

The cross slope of the continuous pedestrian access route through entrances, alleys, and sideward connections with stop or yield control shall be 1.00% to facilitate drainage (2.00% max.).

Where pedestrian access routes are contained within pedestrian street crossings without yield or stop control, the cross slope of the pedestrian access route shall be 5.00% maximum.

Where pedestrian access routes are contained within midblock pedestrian street crossings, the cross slope of the pedestrian access route shall be permitted to equal the street or highway grade.

30" x 48" clear space shall be provided centered on the pedestrian push button.

Beyond the bottom grade break of a curb ramp, a clear space 4' minimum by 4' minimum shall be provided within the width of the pedestrian street crossing and wholly outside the parallel vehicle travel lane.

Side flares of curb ramps, in the path of pedestrian travel (traversable), shall not exceed a slope of 1:1.0:20. Side flares outside the pedestrian path (non-traversable) may be vertical.

Transition from sidewalk or curb ramp to gutter to roadway shall be flush.

Detectable warning surfaces (truncated domes) shall be preformed and installed as per manufacturer's recommendations. Stamped concrete will not be accepted.

The detectable warning surface shall contrast visually with adjoining surfaces. Either light-on-dark or dark-on-light. Truncated domes shall span the full width of the ramp or landing 24" deep.

Detectable warning surfaces shall be aligned perpendicular or radial to the break between the ramp, landing or blended transition, and the street.

Where the bottom grade break of a curb ramp is less than 5' from the back of curb, detectable warnings shall be located on the ramp surface at the back of the curb. Where the grade break is greater than 5' from the back of curb, the detectable warning shall be located on the lower landing.

* Some detectable warning products require a concrete border for proper installation. The concrete border shall not exceed 2 inch per side.

Sheet No. 1 of 4
5' WIDTH 6' WIDTH NEXT TO CURB OR 5' WIDTH W/ MIN. 2' LAWN SPACE

EXISTING GROUNDLINE

EXISTING PAVEMENT

VARIABLE HEIGHT TYPE A BARRIER CURB

VARIABLE HEIGHT CURB FLUSH WITH RAMP

5' MIN.

SECTION B-B

PEDESTRIAN PUSH BUTTON (6)

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

VARIABLE HEIGHT CURB TIE INTO EXISTING CURB FLUSH WITH RAMP

VARIABLE HEIGHT CURB TIE INTO EXISTING CURB FLUSH WITH RAMP

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

VARIABLE HEIGHT CURB TIE INTO EXISTING CURB FLUSH WITH RAMP

GENERAL NOTES:

1. 1% (2.0% MAX.) GRADE OR ROAD GRADE EXCEPTION.

2. Variable Height Vertical Curb - If traversable use a max. 1V:12H flare measured parallel to the curb line.

3. Ensure that the inside edge of curved ramps maintain an 8.3% (1V:12H) maximum slope.

4. Height varies to meet existing ground.

5. The counter slope of the gutter on street at the foot of curb ramp runs (blended transitions) and turning spaces shall be 5% maximum.

6. The face of pedestrian push buttons shall be 6" offset for front approach and 10" max. for side approach to the curb face.
GENERAL NOTES:

1) 1% OR MINIMAL, 2.0% MAXIMUM.

2) VERTICAL OR 1" FLARE. IF TRAVERSABLE USE A MAX. 1:10 FLARE MEASURED PARALLEL TO THE Curb LINE.

3) ENSURE THAT THE INSIDE EDGE OF CURVED RAMPS MAINTAIN AN 8.3% (1V:12H) MAXIMUM SLOPE.

4) HEIGHT VARIES TO MEET EXISTING GROUND.

5) THE COUNTER SLOPE OF THE GUTTER OR STREET AT THE FOOT OF CURB RAMP RUNS, BLENDED TRANSITIONS, AND TURNING SPACES SHALL BE 5% MAXIMUM.

6) BEYOND THE BOTTOM GRADE BREAK, A CLEAR SPACE 4'X 4' MINIMUM SHALL BE PROVIDED WITHIN THE WIDTH OF THE PEDESTRIAN STREET CROSSING AND MIDDLE OUTSIDE THE PARALLEL VEHICLE TRAVEL LANE.

7) THE FACE OF PEDESTRIAN PUSH BUTTONS SHALL BE 1" OFFSET FOR FRONT APPROACH AND 10" MAX. FOR SIDE APPROACH TO THE Curb FACE.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

105 West Capitol
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

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

150 West Capitol
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

CURB RAMPS

DATE EFFECTIVE: 04/01/2015
DATE PREPARED: 02/20/2015

SHEET NO. 3 OF 4

608.50
(1) DETECTABLE WARNING SURFACES SHALL BE OMITTED IF LENGTH IS < 6', BECAUSE REFUGE SPACE IS DEEMED TOO SMALL.

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

SECTION A-A
ISLAND CUT THROUGH TYPICAL
RAMP OR CUT-THROUGH DEPENDING ON ISLAND WIDTH. IF RAMPED, PROVIDE 4' MINIMUM LANDING AND SLOPE RAMPS AT 1:12H MAX.
RAMP MUST BE CONSTRUCTED TO DRAIN TO THE OUTSIDE.

DETECTABLE WARNING SURFACES SHALL BE PLACED AT THE EDGES OF THE PEDESTRIAN ISLAND AND SHALL BE SEPARATED BY 2' MIN. LENGTH OF SURFACE WITHOUT DETECTABLE WARNINGS.
GENERAL NOTES:

A minimum 4" type 1 or 5 aggregate base shall be placed beneath all curb and gutter sections and included within the mainline base pay limits.

When curbs are constructed directly beneath guardrail, curb height shall be 4" inch barrier curb, as shown on standard plan 601.00.

Curb, gutter, and curb and gutter constructed along and attached to concrete pavement or base shall have:

1. Joint C, one-quarter depth of curb and gutter thickness as a continuation of each contraction joint in the base or pavement.
2. Joint D as continuation of 2" expansion joint in the concrete base or pavement shall extend and continue through the curb, gutter, and curb and gutter.
3. Joint E through curb and curb and gutter at the beginning and end of each paved approach.

Curb, gutter and curb and gutter constructed apart or separated from concrete base or pavement or as a form for asphaltic concrete pavement shall have a joint entirely through the curb, curb and gutter and gutter. At the beginning and end of each "paved approach" and a joint to 1/2" depth of curb and gutter thickness at intervals of 30 feet between approaches.

Joints E1 and E2 through curb shall be filled with preformed filler material and sealed with hot poured filler for joints.

Joint E3 in gutter shall be filled with preformed filler and sealed with hot filler material.

Joint E4 in gutter shall be filled with preformed filler and sealed with filler or filled with hot poured filler.

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

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

Where a sidewalk intersects a curb, the sidewalk shall be ramped no steeper than 1:121 slope to 5% provided access for wheelchair across approaches.

When allowed by the engineer, types A and B gutter may be precast to conform to the dimensions shown. The precaster shall submit shop drawings indicating the section length, section connection, and proposed joint sealing system.

When precast sections cannot conform to any vertical or horizontal curve designated on the plans, the gutter shall be cast-in-place, a combination of cast-in-place and precast gutter may be permitted.
SECTION THROUGH DITCH
(SHOWING TOE WALL)

SECTION A-A

PLAN

OUTLET THE WALL

INTERMEDIATE THE WALL

GENERAL NOTES:

STEEL WELDED WIRE REINFORCEMENT SHALL BE IN ACCORDANCE WITH SDOT 501.3.5.

SIDE GROOVE FOR EROSION CONTROL MATT. SHALL BE REED ALONG THE SIDES IF SHOWN ON THE PLANS.

THE WALLS SHALL BE CONSTRUCTED AT INLET AND OUTLET "C" OF PIPE EXCEPT AS SHOWN OR AS DIRECTED BY THE ENGINEER.

PAVED DITCHES
SHOULDER, FINISHED GRADE, OR NATURAL GROUND

VARIABLE WIDTH

VARIABLE DEPTH

VARIABLE MIN. THICKNESS

EROSION CONTROL GEOTEXTILE FABRIC (IF REQUIRED) SEE SPECIAL PROVISIONS

FLAT BOTTOM DITCH WITHOUT BEDDING MATERIAL

FLAT BOTTOM DITCH WITH BEDDING MATERIAL

TYPICAL DITCH LINER DETAILS

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

ROCK DITCH LINER

DATE EFFECTIVE: 03/01/1993
DATE PREPARED: 08/23/2009
609.60C SHEET NO. 1 OF 1

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

<table>
<thead>
<tr>
<th>ROCK LINING FOR CULVERT OUTLETS</th>
</tr>
</thead>
<tbody>
<tr>
<td>CULVERT SIZE</td>
</tr>
<tr>
<td>---------------</td>
</tr>
<tr>
<td>18</td>
</tr>
<tr>
<td>24</td>
</tr>
<tr>
<td>30</td>
</tr>
<tr>
<td>36</td>
</tr>
<tr>
<td>42</td>
</tr>
<tr>
<td>48</td>
</tr>
<tr>
<td>54</td>
</tr>
<tr>
<td>60</td>
</tr>
<tr>
<td>66</td>
</tr>
<tr>
<td>72</td>
</tr>
<tr>
<td>84</td>
</tr>
<tr>
<td>108</td>
</tr>
</tbody>
</table>

GENERAL NOTES:

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

(USE ON STRUCTURES WITHOUT PASSIVE PRESSURE BERM)

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

(1) SLOPE 4" 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)

APRON (1)

LIMIT OF SLOPE PROTECTION (2)

APRON (1)

LIMIT OF SLOPE PROTECTION (1)

APRON (1)

GENERAL NOTES:
SLOPE PROTECTION SHALL BE MADE CONTINUOUS BETWEEN STRUCTURES WHEN METER IS 60' OR LESS.

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

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

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

TYPE 1 OBJECT MARKER PLACEMENT FOR TEMPORARY INSTALLATIONS

18" X 18" TYPE 1 OBJECT MARKER WITH MID-OFF FLUORESCENT ORANGE SHEETING

TYPE 3 OBJECT MARKER PLACEMENT FOR PERMANENT INSTALLATIONS

18" X 18" TYPE 3 OBJECT MARKER WITH MID-OFF TYPE 3 YELLOW SHEETING

LOCATION OF OBJECT MARKER

TRAFFIC PASSING TO BOTH LEFT AND RIGHT

TRAFFIC PASSING TO LEFT
FLIP FOR TRAFFIC TO RIGHT

GENERAL NOTES:

OBJECT MARKERS SHALL BE CENTERED VERTICALLY OR PLACED AS DIRECTED BY THE ENGINEER.
1. REMOVE ALL CONCRETE TO LIMITS SHOWN TO MAX. OF 1/2 THE EXISTING DEPTH OF TOP OF COWLES BY MILLING.
2. PLACE COMRESSIBLE INSERT IN JOINT OR CRACK. INSERT SHALL BE THICKNESS OF JOINT OR CRACK WIDTH, BUT NOT LESS THAN 1/2 INCH.
3. CHIP VERTICAL REPAIR EDGES AT APPROXIMATE 1:1 SLOPE.
4. PLACE 1/2 MIN. COMRESSIBLE INSERT ADJACENT TO LONGITUDINAL LANE OF SHOULDER JOINT.
5. EXPOSED SURFACE SHALL BE CLEANED BY SANDBLASTING OR SHOTBLASTING.
6. EXPOSED SURFACE OF COWELS BARS SHALL BE COATED WITH AN APPROVED BINDER.}

**PLAN VIEW**

**SECTION A-A**

**SECTION B-B**

**SECTION C-C**

**SECTION D-D**

**SECTION E-E**

---

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-686-MODOT (663-6683)

**PAVEMENT REPAIR**

**PARTIAL DEPTH**

**CLASS A**

**DRAWN BY:**

**CHECKED BY:**

**DATE ISSUED:** 08/10/2022

**DATE REVISED:** 10/07/2018

**SHEET NO.** 2 OF 4

**613.00T**
1. **1 1/4" Diameter Dowel Bar x 18" Length.**
2. **Dowel Bar Slots shall be parallel to roadways.**
3. **Tip of compressible insert shall be flush with pavement surface.**
4. **Crack perimeter in slot shall be sealed with silicone.**
5. **Compressible insert shall be placed at middle of dowel bar.**

**PLAN VIEW**

- 1 1/4" (min.) Compressible Insert
- Transverse Crack
- Dowel Bar Expansion Gap (Typ.)
- **Concrete Filler Material**
- **Existing Pavement Surface**

**DETAIL A**

- **Concrete Filler Material**
- **Existing Pavement Surface**
- **Point of Curvature**
- **Chair to Rest Parallel to Surface**

**SECTION A-A**

- **Concrete Pavement**
- **Longitudinal Joint**
- **Dowel Bar Retrofit**

**SECTION B-B**

- **Concrete Filler Material**
- **Existing Pavement Surface**
- **Radius Varies Depending on Saw Blade Diameter**

**SECTION C-C**

- **Concrete Filler Material**
- **Existing Pavement Surface**
- **Chair to Rest Parallel to Surface**
**WEIGHT AND DIMENSIONS DATA**

<table>
<thead>
<tr>
<th>OPENING</th>
<th>WEIGHT (lbs)</th>
<th>BEARING BARS</th>
<th>DIMENSIONS</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>5'-0&quot;</td>
<td>190 63.1</td>
<td>1 3&quot; 2'-5&quot;</td>
<td>11 4&quot; 2'-6&quot;</td>
<td>2'-6&quot;</td>
</tr>
<tr>
<td>5'-0&quot;</td>
<td>330 148.9</td>
<td>2 3&quot; 3'-5&quot;</td>
<td>10 1'-2&quot; 3'-5&quot;</td>
<td>3'-5&quot;</td>
</tr>
<tr>
<td>5'-0&quot;</td>
<td>300 135.9</td>
<td>3 3&quot; 2'-5&quot;</td>
<td>18 1'-2&quot; 2'-3&quot;</td>
<td>2'-3&quot;</td>
</tr>
<tr>
<td>5'-0&quot;</td>
<td>550 253.1</td>
<td>4 3&quot; 3'-5&quot;</td>
<td>17 1'-2&quot; 2'-3&quot;</td>
<td>2'-3&quot;</td>
</tr>
<tr>
<td>5'-0&quot;</td>
<td>200 90.9</td>
<td>1 3&quot; 2'-6&quot;</td>
<td>11 4&quot; 2'-6&quot;</td>
<td>2'-6&quot;</td>
</tr>
<tr>
<td>5'-0&quot;</td>
<td>340 153.7</td>
<td>2 3&quot; 3'-6&quot;</td>
<td>10 1'-2&quot; 3'-5&quot;</td>
<td>3'-5&quot;</td>
</tr>
<tr>
<td>5'-0&quot;</td>
<td>310 140.9</td>
<td>3 3&quot; 2'-6&quot;</td>
<td>18 1'-2&quot; 2'-3&quot;</td>
<td>2'-3&quot;</td>
</tr>
<tr>
<td>5'-0&quot;</td>
<td>560 258.9</td>
<td>4 3&quot; 3'-6&quot;</td>
<td>17 1'-2&quot; 2'-3&quot;</td>
<td>2'-3&quot;</td>
</tr>
</tbody>
</table>

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

* FULL DEPTH OF BAR SAME FOR ALL BARS

**GENERAL NOTES:**

- WHEN BOLTS ARE CUT IN THE FIELD, THREADS MUST BE CLEANED TO PERMIT THE FINAL NUT TO RUN FREELY ON THE BOLT.

- THE WELDING REQUIREMENTS SHOWN ON THIS DRAWING ARE FOR PAINTED GRATES AND BEARING PLATES. IF GALVANIZED, ALL TIGHTLY CONTACTING SURFACES SHALL BE COMPLETELY SEALED, ON ALL SIDES BY WELDING, PRIOR TO GALVANIZING.

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

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

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

**SHEET NO.** 1 OF 1

**GRATES AND BEARING PLATES**
INSTALLATION INSTRUCTIONS:

DRILL HOLE IN FRAME.

INSTALL 5/8" DIA. BOLTS WITH LOCK NUTS THROUGH CONCRETE FLOOR TO FORM 5/8" BOLT EXTENSION INTO CONCRETE BELOW FRAME. LUBRICATION EXCLUDED.

AFTER CONCRETE HARDENS SUFICIENTLY, FINAL INSTALLATION SHALL REMOVE AND RETORQUE 2 DIA. BOLTS ON LOCK NUTS THROUGH GRATE AND FRAME. TORQUE 2 DIA. BOLTS TO 25-40 FT. LB.

GENERAL NOTES:

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 "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.

GENERAL NOTES:

ELEVATION TYPE 1A AND 1B
APPROXIMATE WEIGHT OF FRAME AND COVER TYPE 1A 540 LBS.
TYPE 1B 570 LBS.
PLAN

SECTION B-B

ADJUSTING RING
SOLID OR ADJUSTABLE

COVER

FRAME

SECTION A-A

ELEVATION

APPROXIMATE WEIGHT OF FRAME AND COVER 150 LBS.

ALTERNATE
TYPE 4 COVER

INSTALLATION DETAILS
# TABLE A
## WORK ZONE SIGN MOUNTING REQUIREMENTS

<table>
<thead>
<tr>
<th>TYPE</th>
<th>SUPPORT</th>
<th>SIGN SUBSTRATE</th>
<th>MINIMUM MOUNTING HEIGHT(3)</th>
<th>USAGE LIMITATIONS</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>POST</td>
<td>PERFORATED SQUARE STEEL TUBE</td>
<td>RIGID</td>
<td>5'</td>
<td>RURAL UNDIVIDED HIGHWAYS</td>
<td>POSTS SHALL BE FREE OF ANY BRACING AND EXTEND NO FURTHER ABOVE THE SIGN EXCEPT AS NEEDED FOR WARNING LIGHT ATTACHMENT. FOR DETAILS OF POST INSTALLATION DETAILS SEE SHEET NO. 2 OF 8. GALVANIZATION OF POSTS WILL NOT BE REQUIRED.</td>
</tr>
<tr>
<td></td>
<td>U-CHANNEL</td>
<td></td>
<td>7'</td>
<td>RURAL DIVIDED HIGHWAYS</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>7'</td>
<td>URBAN HIGHWAYS</td>
<td></td>
</tr>
<tr>
<td>PORTABLE</td>
<td>FOLD-UP STAND</td>
<td>RIGID</td>
<td>5'</td>
<td>RURAL UNDIVIDED HIGHWAYS</td>
<td>SYSTEMS SHALL COMPLY WITH CRASH TEST REQUIREMENTS OF NCHRP 350 TEST LEVEL 3 AND MAY BE PLACED ADJACENT TO OR WITHIN THE ROADWAY PROVIDED A MINIMUM LATERAL CLEARANCE OF 3 FEET, MEASURED HORIZONTALLY FROM THE EDGE OF THE SIGN TO THE EDGE OF THE DESIGNATED TRAVELED WAY, IS MAINTAINED.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>7'</td>
<td>RURAL DIVIDED HIGHWAYS</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>7'</td>
<td>URBAN HIGHWAYS</td>
<td></td>
</tr>
<tr>
<td>TYPE 1 PORTABLE</td>
<td>SELF-DRIVING POST</td>
<td>FLEXIBLE</td>
<td>12&quot; (4)</td>
<td>PERMITTED ONLY FOR INSTALLATION UP TO 3 DAYS, WHERE SIGNS ARE OBSCURED BY OTHER OBJECTS (I.E., TRAFFIC CONTROL DEVICES, PARKED VEHICLES, BARRIER, VEGETATION, ETC.) OR INSTALLED ON MULTI-LANE UNDIVIDED FACILITIES OR MULTI-LANE DIVIDED FACILITIES WITH 3 OR MORE LANES IN ONE DIRECTION. MOUNTING HEIGHTS SHALL BE AS SPECIFIED FOR POST-MOUNTED SIGNS.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TYPE III MOBILE BARRICADE SKID</td>
<td>RIGID</td>
<td>5'</td>
<td>RURAL UNDIVIDED HIGHWAYS</td>
<td>SYSTEMS SHALL PROVIDE POSITIVE CONNECTION TO THE BARRIER AND MINIMIZE POTENTIAL FOR VEHICLE SNAGGING.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>7'</td>
<td>RURAL DIVIDED HIGHWAYS</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>7'</td>
<td>URBAN HIGHWAYS</td>
<td></td>
</tr>
<tr>
<td>BARRIER</td>
<td>CONCRETE TRAFFIC BARRIER GUARDRAIL</td>
<td>FLEXIBLE</td>
<td>5'</td>
<td>RURAL UNDIVIDED HIGHWAYS</td>
<td>SYSTEMS SHALL PROVIDE POSITIVE CONNECTION TO THE BARRIER AND MINIMIZE POTENTIAL FOR VEHICLE SNAGGING.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>7'</td>
<td>RURAL DIVIDED HIGHWAYS</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>7'</td>
<td>URBAN HIGHWAYS</td>
<td></td>
</tr>
<tr>
<td>VEHICLE</td>
<td>PAVEMENT MARKING EQUIPMENT</td>
<td>FLEXIBLE</td>
<td>48&quot; (6)</td>
<td>PERMITTED ONLY IN PILOT CAR OR MOVING OPERATIONS.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PILOT CAR</td>
<td>RIGID</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PROTECTIVE VEHICLE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**GENERAL NOTES:**

1. LONGITUDINAL SPACING OF SIGNS SHOWN IN THE PLANS ARE PREFERRED MINIMUMS, BUT MAY BE ADJUSTED TO MEET EXISTING FIELD CONDITIONS WITH APPROVAL FROM THE ENGINEER.
2. SIGNS SHALL NOT BE MOUNTED IN OR ON CHANNELIZERS.
3. ALL POSTS AND SIGNS SHALL BE INSTALLED AND MAINTAINED IN A PLUMB POSITION.
4. CONSTRUCTION SIGNS SHALL NOT BE LOCATED ON SIDEWALKS, BICYCLE LANES, OR AREAS DESIGNATED FOR PEDESTRIAN OR BICYCLE TRAFFIC.

---

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

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

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**TEMPORARY TRAFFIC CONTROL DEVICES**

**SIGN MOUNTING REQUIREMENTS**

**DATE EFFECTIVE:** 07/01/2020
**DATE PREPARED:** 4/29/2020
**SHEET NO.** 1 OF 9

---

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

1. **EDGE OF TRAVELED WAY WHERE THERE IS NO PAVED OR STABILIZED SHOULDER:**
   - MIN. 6' - MAX. 12'
   - SEE TABLE A

2. **HEIGHT AND LATERAL LOCATIONS FOR POST AND PORTABLE SIGN MOUNTING:**
   - MIN. 1' - MAX. 2'
   - SEE TABLE A
USE OF SPICE IS OPTIONAL.
SPICE OVERLAP SHALL BE POSITION ENTIRELY BETWEEN GROUND LINE AND 18 INCH GROUND LINE.

+ IF A PLACARD IS USED, NEITHER THE SIGN NOR THE SIGNS OF OVERLAP AREA.
ONLY ONE SPIECES WILL BE ALLOWED PER POST.

**U-CHANNEL POST DETAIL**

4" x 4" wood post - no slots or holes permitted
4" x 6" wood post - 1/4" x 4" slot on 6" side or 1/2" dia. hole on 6" side
6" x 6" wood post - 1/4" x 4" slot or 1/2" dia. hole
Slot across neutral axis formed by successive drilling with 1/2" bit.

**WOOD POST DETAIL**

**POST SPACING**

**PERFORATED SQUARE STEEL TUBE POST DETAIL**

**POST TYPE**

<table>
<thead>
<tr>
<th>SIGN AREA (SQ.FT.)</th>
<th>U-CHANNEL</th>
<th>WOOD</th>
<th>PERFORATED SQUARE STEEL TUBE</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 10</td>
<td>1 - 3.0 LB/FT.</td>
<td>1 - 4&quot; X 4&quot;</td>
<td>1 - 2&quot; 12 GA</td>
</tr>
<tr>
<td>&gt; 10 ≤ 16</td>
<td>2 - 5.0 LB/FT.</td>
<td>2 - 4&quot; X 4&quot;</td>
<td>2 - 2&quot; 12 GA</td>
</tr>
<tr>
<td>&gt; 16 ≤ 24</td>
<td>2 - 5.0 LB/FT.</td>
<td>2 - 4&quot; X 6&quot;</td>
<td>2 - 2&quot; 12 GA</td>
</tr>
<tr>
<td>&gt; 24 ≤ 72</td>
<td>3 - 5.0 LB/FT.</td>
<td>2 - 6&quot; X 6&quot;</td>
<td>N/A</td>
</tr>
<tr>
<td>&gt; 72</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

+ SIGNS GREATER THAN 2 FEET IN WIDTH, EXCEPT DIAMOND SHAPED SIGNS, REQUIRE THE POSTS.
++ REQUIRES SLIP BOLT PER MANUFACTURER'S RECOMMENDATION.

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

GENERAL NOTES:
ALL POSTS SHALL BE ERECTED A MINIMUM OF 3 FEET.
SIGN INSTALLATION DETAILS SHOWN SHALL APPLY TO ALL POSTS OF ANY MULTI-POST INSTALLATIONS.
AT THE ENGINEER'S DISCRETION, A FLUORESCENT PAINT SHALL BE APPLIED HEAVILY TO BOTH SIDES OF U-CHANNEL POST TOP FOR A LENGTH OF AT LEAST 6 INCHES BELOW THE TOP OF THE STUD.

TEMPORARY TRAFFIC CONTROL DEVICES POST INSTALLATION DETAILS

SIGN EFFECTIVE: 07/01/2022
SIGN DATE PREPARED: 04/24/2022

616.10AW SHEET NO. 2 OF 9

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

105 WEST CAPITAL
JEFFERSON CITY, MO 65101
1-888-MODOT-11 (1-888-663-6811)
DIRECTION INDICATOR BARRIACDE

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

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

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

ADVANCE WARNING RAIL SYSTEM

MAXIMUM WEIGHT OF SIGN SHALL NOT EXCEED 25 LBS.

THE SIGN AND RAIL SYSTEM MAY BE ILLUSTRATED AS TWO SEPARATE DURABLE DEVICES. THE RAIL SYSTEM SHALL BE LOCATED DIRECTLY IN FRONT OF THE SIGN WITH A 5 TO 10 FEET SEPARATION OF THE TWO DEVICES.

WHERE MOUNTING IS NOT PROVIDED ON THE BACKSIDE, STEPS OF 5" WIDE MAY BE USED TYPE IV ORANGE REFLECTIVE SHEETING MAY BE APPLIED TO THE EDGE OF EACH RAIL TO HELP DELINATE THE DEVICE.

WHITE AND ORANGE REFLECTIVE SHEETING SHALL BE IN ACCORDANCE WITH SEC. 106.2.7.4.

GENERAL NOTES:

WHITE, ORANGE, AND FLUORESCENT ORANGE REFLECTIVE SHEETING SHALL BE IN ACCORDANCE WITH SEC. 104.2.7.

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

IF USED, THE WARNING LIGHT UNIT AND BATTERY COMPARTMENT SHALL BE PURCHASED FROM THE MANUFACTURER OR OTHERWISE MEET THE MANUFACTURER'S RECOMMENDATIONS FOR DESIGN AND SHALL BE REPIEVED ON ALL DEVICES IN THE SERIES.

WARNING LIGHTS SHALL BE IN ACCORDANCE WITH SEC. 1063.5.

UPON APPROVAL OF THE ENGINEER, THE CONTRACTOR MAY, AT NO ADDED COST, USE TRIM-LINE CHANNELIZERS IN LIEU OF TRIM-LINE CHANNELIZERS TO PRODUCE LONGITUDINAL CHANNELIZING WITHIN THE ACTIVITY AREA WHERE NO ROADS, INTERSECTIONS OR LIMITED LATERAL CLEARANCE EXISTS.

UPON APPROVAL OF THE ENGINEER, THE CONTRACTOR MAY, AT NO ADDED COST, USE DIRECTION INDICATOR BARRIACDE IN LIEU OF TRIM-LINE CHANNELIZERS IN WORKING TAPERS.

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

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

CHANNELIZERS

WHITE, ORANGE, AND FLUORESCENT ORANGE REFLECTIVE SHEETING SHALL BE IN ACCORDANCE WITH SEC. 104.2.7.4.

CHANNELIZERS AND DIRECTION INDICATOR BARRIACDE

MISSOURI HIGHWAYS AND TRANSPORTATION
COMMISION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-800-449-MADOT (1-800-449-6236)

TEMPORARY
TRAFFIC CONTROL DEVICES
CHANNELIZERS AND DIRECTION
INDICATOR BARRIACDE

SHEET NO. 3 OF 9
Example 1 - One Type 3 movable barricade will be required to completely close each 8-ft. of pavement. Faded shoulders shall be included in the area to be closed.

Signs shall be light weight (roll-up or plastic) and should not exceed more than 50 percent of the top 2 rails or 33 percent of all three rails. Warning lights shall be light height 12.5 ft. or less, or have battery back mounted no higher than 12-inch and shall not cover any portion of the barricade face.

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

If signs or lights cannot meet the above requirements, they shall be mounted on separate message devices at heights specified for post mounted signs located in Table 6 on Sheet 1. The barricade shall be located in front of the sign or lights within 7 to 10 feet separating the devices.

Type 3 movable barricades shall be entirely free standing and portable. Warning shall only be applied to the front of each rail if it is not to be applied to both the front and the back of each rail provided the warning on the back does not conflict with intended opposing traffic movement.

White and orange reflective sheeting shall be in accordance with Section 104.2-74.

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

Example 3 - Where barricades extend entirely across a roadway, stripes slope forward in the direction toward which road users wish to turn.

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

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

IF RAISED PAVEMENT MARKERS ARE PRESENT, THE LEAVES
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
AJARAGE TO THE ROADWAY SURFACE.

REFLECTIVE SHEETING APPLIED TO TUBULAR DELINEATORS SHALL BE IN ACCORDANCE
WITH ANSI-Z56.2-2004.

CHANGEABLE MESSAGE SIGN

4' 5 CHANNELIZERS (INCIDENTAL) AT 20' INTERVALS.
CHANNELIZERS MAY BE OMITTED WHERE THE CHANGEABLE MESSAGE SIGN IS
LOCATED 15' OR MORE FROM THE EDGE OF THE ROAD.

EDGE OF PAVEMENT FOR SHOULDER WHERE APPLICABLE

CHANNELIZERS

TYPE 3 OBJECT MARKERS
FLUORESCENT ORANGE REFLECTIVE SHEETING SHALL BE
IN ACCORDANCE WITH ANSI-Z56.2-2004.
<table>
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<tr>
<th>SIGN</th>
<th>SIZE</th>
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</table>

**GENERAL NOTES:**

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

**SIGN DIMENSIONS SHOWN ARE MINIMUM. NO ADDITIONAL PAINT WILL BE USED IF CONTRACTORS USE LARGER SIGN, NO ADDITIONAL PAINT WILL BE MADE FOR SIGNS.**

**TEMPORARY TRAFFIC CONTROL DEVICES**

**WARNING SIGNS**

**NOTE:** Refer to the latest edition of "Standard Highway Signs" by the U.S. Department of Transportation-FHWA, for sign dimensions, colors, and symbols. Use of supplementary plates for lines 11 is acceptable.
NOTES:

1. ALL REINFORCEMENT SHALL BE GRADE 60 EPOXY COATED.
2. BAR SPLICES SHALL BE A MINIMUM OF 24 TIMES THE NOMINAL DIAMETER OF THE BAR.
3. ANY METHOD CONSIDERED BY THE CONTRACTOR AND APPROVED BY THE ENGINEER THAT WILL ASSURE THE LONGITUDINAL REINFORCING STEEL WILL BE FIREPROOF TO 4 1/2 INCH AS RECOMMENDED WILL BE SATISFACTORY.
4. THE CONTRACTOR WILL HAVE THE OPTION TO SLIP-Form THE BARRIER, IN WHICH CASE, ADDITIONAL REINFORCEMENT MAY BE TIED TO THE UPPER TWO-THIRDS OF THE REINFORCING BAR TO PROVIDE BRACING.
5. THIS BARRIER SHALL NOT BE USED TO SUPPORT HIGHWAY LIGHTING POLES.
6. THIS BARRIER SHALL NOT BE USED FOR BRIDGE RAILWAY APPLICATIONS.
7. SAME JOINTS SHALL BE LOCATED AT PAVEMENT TRANSVERSE JOINTS.
8. TYPE D SHALL BE USED ONLY AT LOCATIONS SHOWN ON PLAN.
9. REINFORCING BARS WITH AN EPOXY ANCHOR SYSTEM MAY BE SUBSTITUTED FOR SMOOTH 1" DIAMETER ROUND STEEL BARS.
10. FOR CONCRETE TRAFFIC BARRIER DELINEATION DETAILS SEE SITE PLAN 928-03.
1" E12A. ROUND STEEL

 limits of M1 - V1 SPACE AS SHOWN BELOW

 at terminal ends of barrier only

1" joint filler

DELINHEATOR

R1 BAR (#4)

shoulder

type d typical section

SECTION A-A

SECTION B-B

ELEVATION

REINFORCING DETAILS

V1 BAR (#4)

shoulder

limits of M1 - V1 SPACE AS SHOWN BELOW

at terminal ends of barrier only

1" E12A. ROUND STEEL

notes:

all reinforcement shall be grade 60 epoxy coated.

bar splice shall be a minimum of 24 times the

nominal diameter of the bar.

minimum clearance to reinforcing steel shall be 1/2

unless otherwise shown.

any method devised by the contractor and approved by

the engineer that will assure the longitudinal

reinforcing steel will be positioned 1/2 HUN AS

dimensioned will be satisfactory.

the contractor has the option to slip-form the

barrier in wall use. additional reinforcement may

be tied to the upper two-thirds of the reinforcing

cage to provide bracing.

this barrier shall not be used to support highway

lighting poles.

this barrier shall not be used for bridge roadway

applications.

save joints shall be spaced at 15'-0". see standard

plan for save joint detail.

type e barrier shall be used only at locations shown

on plans.

reinforcing bars with an epoxy anchor system may

be specified for smooth 1" diameter round steel

couplers.

for concrete traffic barrier delineation details see

std plan 903.03.

Missouri Highways and Transportation Commission

105 West Capitol

Jefferson City, MO 65102

1-888-657-MADOT (1-888-657-6263)

Permanent Concrete Traffic Barrier

Type d Beside MSE Wall

Sheet No.: 9

10/21/2020

617.10m
GENERAL NOTES:

CONCRETE SHALL BE CLASS B (0' - 4,000 PSI).
ALL REINFORCEMENT SHALL BE GRADE 60 EPOXY COATED.
ANGLE OF INTERNAL FRICTION: 2° 30' FOR BACKFILL MATERIAL.
MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1'-12" UNLESS OTHERWISE SHOWN.
BAR SPACING WILL BE A MINIMUM OF 24 TIMES THE MODULUS DIAMETER OF THE BAR.

ANY METHOD RECOMMENDED BY THE CONTRACTOR AND APPROVED BY THE ENGINEER THAT WILL ASSURE THE LONGITUDINAL REINFORCING STEEL WILL BE POSITIONED 4½ INCH AS DIMENSIONS WILL BE SATISFACTORY.

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

THE BARRIER SHALL NOT BE USED TO SUPPORT HIGHWAY LIGHTING POLES.

THE BARRIER SHALL NOT BE USED FOR BRIDGE RAILWAY APPLICATION.

SLEEVED JOINTS SHALL BE SPACED AT 15'-0". SEE MISSOURI STANDARD PLAN FOR SLEEVED JOINT DETAILED.

TYPE 6 BARRIER MODIFIED RETAINING WALL WITH NONREINFORCED SLAB SHALL BE USED ONLY AT LOCATIONS SHOWN IN PLAN.

FOR CONCRETE TRAFFIC BARRIER DELINEATION DETAILS SEE STE PLAN 353.05.

REINFORCING SYSTEM SHALL BE DRILLED IN THE PLANT.

WHEN BARRIER HEIGHT EXCEEDS 4'2" OR SLICE EXCEEDS 5'1" USE NC LG OR WIDER GUTTER CONTACT BRIDGE DIVISION FOR SPECIAL DESIGN.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 BEST CAPITAL
JEFFERSON CITY, ME 65102
1-888-801-MODOT (663-6868)

PERMANENT CONCRETE TRAFFIC BARRIER
TYPE D AS RETAINING WALL

5 CUBIC FEET OF FORMERS BACKFILL SHALL BE PLACED AT REINFORCING FORMERS. BACKFILL SHALL BE IN ACCORDANCE WITH SEC 206.

ELEVATION
REINFORCING DETAILS

SECTION A-A
(FOR SLOPING AND NONSLOPING BACKSLOPE)
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 TERMINATION DETAILS SEE STD PLAN 905.05.

PAVEMENT SURFACE DIFFERENTIAL SHALL NOT EXCEED 1/8 IN.

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

REFLECTIVE SHEETING APPLIED TO TRAFFIC BARRIER DELINEATORS SHALL BE IN ACCORDANCE WITH MINI 1042.2.7.5.

PRECAST BARRIER HEIGHT TRANSITION
(Temporary installations only)

1. **Optical 4" inch diameter, 1/16" gauge steel, round mechanical threading sleeve for lift hole allowed. The location of the hole will vary to accommodate the differing height distributions of transition sections.**

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

**General Notes:**
- Reinforcing steel clearance to edge of concrete shall be 1" unless otherwise shown.
- Height transitions shall not be used in interstate routes where the posted speed prior to construction is greater than 35 mph.
- At no time shall the barriers be lifted or moved by use of the lifting eye.
- Retainer bolt and nut must be used with transition barrier.
- At the option of the contractor, height transitions may be prefabricated in one section. The plans for reinforcement across joint shall be approved by the engineer prior to manufacture.

**Missouri Highways and Transportation Commission**

**Temporary Concrete Traffic Barrier**

**Type F Height Transitions**

**Design Effective:** 03/04/2021

**Sheet Number:** 3 of 8
GENERAL NOTES:
DIMENSIONS ARE OUT TO OUT OF BARS UNLESS OTHERWISE NOTED.

TEMPORARY CONCRETE
TRAFFIC BARRIER
TYPE F HEIGHT TRANSITIONS

DETAILS OF TYPE F TEMPORARY BARRIER TIE-DOWN STRAP

SIDE VIEW

TIE-DOWN STRAP ANCHOR SHALL BE ONE OF THE FOLLOWING:
1) DRAIN IN ANCHOR WITH A 3/8" EMBEDMENT AND 1/2" DIA. X 15" LONG GRADE 5 BOLT.
2) RED HELE LARGE DIAMETER TAPCON (HELT-8 X 45) LONG WITH A 3/8" EMBEDMENT.
3) SIMPSON TITE-BEL 1/2" DIA. X 5" LONG WITH A 4" EMBEDMENT.

GENERAL NOTES:
TIE-DOWN STRAP SYSTEMS ARE ONLY APPLICABLE ON Rigid Pavements.
CONTRACTOR SHALL VERIFY ALL DIMENSIONS IN FIELD BEFORE ORDERING MATERIAL.
SEE OTHER SHEETS FOR DETAILS NOT SHOWN.
<table>
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<tr>
<th>CROSS SECTION</th>
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<th>TIME</th>
<th>TREATMENT</th>
<th>SIGN</th>
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<td>SIDE ROAD (2)</td>
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</tbody>
</table>

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

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

For additional sign spacing and details see standard plan 619.10.

**Pavement Edge Treatment**

- **Lane line**
- **Uneven lanes**
- **Bump**

**Note:**
- Signs shall be spaced at approximately one mile intervals and located within 100 ft. before any change in the number of lanes.
- When a sign is placed at the 1/2 mile interval, a sign at the 1/2 mile interval may be omitted.
- Signs shall be placed at the 1/2 mile interval or at the 1/4 mile interval.
- When the shoulder drop-off is less than 3 ft., the shoulder drop-off slope shall be 1:3 in addition to the shoulder drop-off slope.
1. STOP LINES SHALL BE PLACED 90' TO THE ROADWAY.
2. IF RAILROAD CROSSING GATE IS PRESENT THE STOP LINE SHALL BE 9' FROM GATE.

**Symbol Detail**
- 2 Practice bands at point angles to pavement.
- 2' White bands
- Yellow NO passing line
- Solid yellow NO passing line

**Letter Detail**
- 6' 12'' STOP LINE
- 12'' STOP LINE

**Pavement Detail**
- The distance from the railroad crossing warning to the nearest traffic light shall vary according to the approach speed and the sight distance of the vehicles traffic approaching, but shall be no less than 50 feet.
- A three-line crossing shall be marked with a center line for two-line approaches (option of the approaches to a crossing on a multi-line roadway the transverse lines shall extend across all approach lanes). The individual crossing signs shall be free to each approach line.

**Placement of stop-to-sign by others.**

**Railroad Grade Crossing**
- Line of intersection of crossing
- Direction of travel
- White yield line triangles

**White Midblock Crosswalk (Zebra)**
- 6' WHITE STOP LINES
- 6' WHITE SIGN (15)

**Pedestrian Crosswalks**
- 6' WHITE STOP LINES
- 6' WHITE STOP LINES
- 6' WHITE STOP LINES

**Pavement Marking**
- 12'' STOP LINE
- 6'' WHITE STOP LINES
- 6'' WHITE STOP LINES
- 6'' WHITE STOP LINES

**Symbol Detail**
- X

**Letter Detail**
- R

**White Midblock Crosswalk (Zebra)**
- Line
- Line

**Pavement Marking**
- 12'' STOP LINE
- 6'' WHITE STOP LINES
- 6'' WHITE STOP LINES
- 6'' WHITE STOP LINES

**Symbol Detail**
- X
GENERAL NOTES:

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

LINES OF TEMPORARY GATE MARKING ARE THE SAME AS THE EXISTING GATE LINES.
GENERAL NOTES:
TEMPORARY PAVEMENT MARKING IS REQUIRED IN INTERSECTIONS, PART
CUT AND OTHER TRANSITION SPACES.

TEMPORARY PAVEMENT MARKING IS REQUIRED WHEN
EXISTING PAVEMENT MARKING IS NOT PAINTED.

YELLOW AND WHITE TEMPORARY MARKING IS REQUIRED WHEN THE ISLAND CURB IS NOT PAINTED.

6" WIDE DOUBLE YELLOW

PLAN VIEW

TEMPORARY STOP BAR DETAIL (WHITE)
TEMPORARY ARROW DETAIL (WHITE)
RAISED DIVISIONAL ISLAND
RAISED CHANNELIZING ISLAND

MEASURED FROM CURB EDGE
LIMITS OF TEMPORARY PAVEMENT MARKING

1 MILE INTERVAL 1 MILE INTERVAL 1 MILE INTERVAL 1 MILE INTERVAL

SIGN SPACING FOR DIVIDED OR MULTI-LANE HIGHWAY

SIGN SPACING AT STATE ROUTE INTERSECTIONS

SIGN SPACING AT RAMPS

GENERAL NOTES:
FOR DETAILS OF TEMPORARY PAVEMENT MARKING, SEE SHEET 3 OF 4.
ALL SIGNS SHALL BE POST MOUNTED AND IN ACCORDANCE WITH STANDARD PLANS 650.10 AND 650.03.
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.

TEMPORARY PAVEMENT MARKING
DIVIDED AND MULTI-LANE HIGHWAYS

DATE EFFECTIVE: 02/03/2017
DATE PREPARED: 07/08/2017
SHEET NO.: 620.10G
5 OF 5
THIS HOLE SHOULD ONLY BE USED ON PATCHES EXISTING PRIOR TO CONSTRUCTION. THE HOLE SHOULD BE LOCATED CLOSE TO THE CENTER OF THE PATCH. BY USING THIS HOLE, THE TWO HOLES LOCATED AT THE SHOULDER COULD BE ELIMINATED.

**PATCH**

**CRACK**

**JOINT**

*TRAVEL* LANE FOR MULTIPLE LANES OR BOTH LANES OF TWO LANE DIRECTIONAL ROADWAY.
RUMBLE STRIP LAYOUTS

INTERSECTIONS
ACCELERATION OR DECELERATION LANE

RUMBLE STRIP PLAN VIEW

RUMBLE STRIP CROSS SECTION VIEW

14' PAVEMENT STRUCTURES, ALL SHOULDER TYPES

13' PAVEMENT STRUCTURES, ALL SHOULDER TYPES

PAVEMENT STRUCTURES ≤ 12' WITH A2 SHOULDER

PAVEMENT STRUCTURES ≤ 12' WITH A3 SHOULDER

PAVEMENT STRUCTURES ≤ 12' WITH EARTH OR AGGREGATE SHOULDERS

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

GENERAL NOTES:

SEE STANDARD PLAN 620.00 FOR PAVEMENT MARKING.

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

ALL RUMBLE STRIPS SHALL BE MILLED.

RUMBLE STRIPS SHALL NOT BE MILLED INTO TRANSVERSE JOINTS.

RUMBLE STRIPS SHALL NOT BE PLACED ON BRIDGES.

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

RUMBLE STRIPS
SHOULDER

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

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

DETAILED B

EDGE OF TRAVELED WAY
EDGE OF TRAVELED WAY

SHOULDER

TWO-WAY ROAD

GENERAL NOTES:

SEE STANDARD PLAN 620.00 FOR PAVEMENT MARKING.

RUMBLE STRIPS SHALL NOT BE PLACED ON BRIDGES.

ALL RUMBLE STRIPS SHALL BE MILLLED.

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.

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

RUMBLE STRIPS
CENTERLINE

DATE EFFECTIVE: 04/01/2009
DATE PREPARED: 02/20/2009
Sheet No. 2 of 2
GENERAL ELEVATION A-A

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

EQUATIONS FOR COMPUTING A, B, C AND D:

\[ A = \text{angle of barrel slope with horizontal normal to roadway or median = arctan} \left( \frac{\text{elev.} 1 - \text{elev.} 2}{\text{barrel length}} \right) \]

\[ B = \text{angle of fill slope with horizontal normal to roadway or median = arctan} \left( \frac{\text{elev.} 1 - \text{elev.} 2}{\text{barrel length}} \right) \]

\[ C = \text{horizontal distance from upstream edge of shoulder to = roadway fill + acc} \left( \frac{\text{median}}{\text{barrel length}} \right) \]

\[ D = \text{horizontal distance from downstream edge of shoulder to = roadway fill + acc} \left( \frac{\text{median}}{\text{barrel length}} \right) \]

\[ D = \text{cross slope of each part of roadway including crown, lanes and shoulders. D is positive if rising and negative if falling away from roadway or median.} \]

\[ \text{The term "acc" is the difference in elevation between each roadway or median and the top of the fill slope normal to roadway or median. This term shall be adjusted for unsymmetrical and nonstandard roadways.} \]

TO ACCOUNT FOR A VARYING PROFILE Grade the roadway fill shall be based on stations that correspond to the corners of the inside face of the headwalls that produce maximum values for B and C.

SEE SHEET 3 OF 3 FOR DETAILS. FOR REINFORCEMENT DETAILS. SEEE SHEET 2 OF 3. FOR SECTION 703.17.

GENERAL NOTES:

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

DESIGN LOADINGS:
SPECIFIC = 793 WINGS LANE LOAD = 120 LB/FT
EQUIVALENT FLUID PRESSURE = 50 LB/FT (MIN. 60 LB/FT) (MAX. 120 LB/FT)

DESIGN UNIT STRESSES:
CLASS III CONCRETE BOX CULVERT: F' = 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 TYP. 3.

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.

WHEN ALTERNATE PRECAST BOX CULVERT SECTIONS ARE USED.
THE MINIMUM DISTANCE FROM INSIDE FACE OF HEADWALLS TO PRECAST CULVERTS IN EQUATIONS FOR COMPUTING A, B, C AND D.

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

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

JEFFERSON CITY, MO 65102

1-888-ASK-MODOT 1-888-275-6636)
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 1/2".
LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.
BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.
A. SAME SIZE AND SPACING AS B2 BARS
B. VARTIES. 12" MAXIMUM
C. J4 BAR SPACING
D. NOT SPECIFIED ON THIS SHEET
E. NOT SPECIFIED ON THIS SHEET
F. NOT SPECIFIED ON THIS SHEET
G. NOT SPECIFIED ON THIS SHEET
H. FOR DESIGN FILLS OVER 2'-0".
J4 BAR SPACING
A. SAME SIZE AND SPACING AS B2 BARS
B. VARTIES. 12" MAXIMUM
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.

ELEVATION A-A

PLAN OF LAYOUT DIMENSIONS

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<th>DIMENSION</th>
<th>VARIABLE</th>
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<td>b</td>
<td>(\text{TAN}) 20(\circ)</td>
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<tr>
<td>c</td>
<td>U</td>
<td>d</td>
<td>v (\text{H} + \text{T}S - 12)</td>
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<td>e</td>
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<td>g</td>
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</table>
GENERAL NOTES:

FOR SECTIONS THROUGH BARREL, WINGS AND HEADWALLS, SEE SHEET 7 OF 3. FOR BARS SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT EXCEPT 40 BARS, SEE T50-17. FOR 40 BARS, SEE T50-18.

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

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

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

LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.

BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

(a) SAME SIZE AND SPACING AS 82 BARS

(b) VARIES: 12" MAXIMUM

(c) J4 BAR SPACING

(d) SAME SIZE AND SPACING AS 82 BARS

(e) A2 BAR SPACING

(f) NOT SPECIFIED ON THIS SHEET

(g) NOT SPECIFIED ON THIS SHEET

(h) FOR DESIGN FILLS OVER 2'-6" OR LESS

LAYING OUT TRANVERSE JOINTS

USE A TRANVERSE JOINT WHEN BARREL LENGTH IS OVER 80 FEET. USE ADDITIONAL JOINTS TO LIMIT BARREL LENGTH AND SECTION LENGTH.

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' OR LESS THE FOLLOWING SHALL APPLY:

BARS AT BOTTOM (c) J5 BARS AT BOTTOM

WHEN BARREL AND END SECTION LENGTH RESTRICTIONS REQUIRE TRANVERSE JOINTS TO BE LOCATED UNDER A TRAVELED WAY WITH DESIGN FILLS 2' OR LESS, THE JOINTS SHALL BE LOCATED MINIMUM, THE LENGTH OF JOINT UNDER A TRAVELED WAY.

TRAVELED WAY IS THE ROADWAY WIDTH WITH WING SHOULDER WIDTHS.

FOR OUT SECTION DETAILS, SEE T05-16.

DATE EFFECTIVE: 07/27/2023
DATE PREPARED: 05/13/2023

703-11J SHEET NO. 2 OF 3
GENERAL ELEVATION A-A

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

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.

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

CONSTRUCTION JOINT KEY NOT SHOWN FOR EXCAVATION OF UNSUITABLE MATERIAL AND IF UNSUITABLE MATERIAL IS ENCOUNTERED.

THE TERM "A(CS)" IS THE DIFFERENCE IN ELEVATION BETWEEN ROADWAY OR MEDIAN AND THE TOP OF THE FILL SLOPE TO ACCOUNT FOR A VARYING PROFILE GRADE THE ROADWAY FILL SHALL BE BASED ON STATIONS THAT CORRESPOND TO THE TOP OF THE FILL SLOPE NORMAL TO ROADWAY OR MEDIAN. THIS TERM SHALL BE ADJUSTED FOR UNSYMMETRIC 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 B AND C.

SEE ROADWAY PLANS FOR SLOPES, ROADWAY FILL AND ELEVATIONS 1 AND 2. ELEVATIONS 1 AND 2 CORRESPOND TO UPPER CORNERS OF THE INSIDE FACE OF THE HEADWALLS THAT PRODUCE MAXIMUM VALUES FOR B AND C.

THE MINIMUM DISTANCE FROM INSIDE FACE OF HEADWALLS TO PRECAST CONCRETE CULVERT SECTIONS MEASURED ALONG THE SHORTEST WALL SHALL BE 3 FEET.

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

EQUATIONS FOR COMPUTING A, B, B AND C

A = ANGLE OF BARREL SLOPE WITH HORIZONTAL NORMAL TO ROADWAY OR MEDIAN = ARC TAN (ELEV. 1 - ELEV. 2)

B = ANGLE OF FILL SLOPE WITH HORIZONTAL NORMAL TO ROADWAY OR MEDIAN = ARC TAN (ELEV. 2 - ELEV. 1)

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

THE TERM "ACC" IS THE DIFFERENCE IN ELEVATION BETWEEN ROADWAY OR MEDIAN AND THE TOP OF THE FILL SLOPE NORMAL TO ROADWAY OR MEDIAN. THIS TERM SHALL BE ADJUSTED FOR UNSYMMETRIC AND NONSTANDARD ROADWAYS.

HORIZONTAL DISTANCE FROM DOWNSTREAM EDGE OF SHOULDER TO ROADWAY FILL + A(CS) + B

HORIZONTAL DISTANCE FROM UPSTREAM EDGE OF SHOULDER TO ROADWAY FILL + A(CS) - B

ANGLE OF BARREL SLOPE WITH HORIZONTAL NORMAL TO ROADWAY OR MEDIAN

ANGLE OF FILL SLOPE WITH HORIZONTAL NORMAL TO ROADWAY OR MEDIAN

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

THE TERM "A(CS)" IS THE DIFFERENCE IN ELEVATION BETWEEN ROADWAY OR MEDIAN AND THE TOP OF THE FILL SLOPE TO ACCOUNT FOR A VARYING PROFILE GRADE THE ROADWAY FILL SHALL BE BASED ON STATIONS THAT CORRESPOND TO THE TOP OF THE FILL SLOPE NORMAL TO ROADWAY OR MEDIAN. THIS TERM SHALL BE ADJUSTED FOR UNSYMMETRIC 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 B AND C.

SEE ROADWAY PLANS FOR SLOPES, ROADWAY FILL AND ELEVATIONS 1 AND 2. ELEVATIONS 1 AND 2 CORRESPOND TO UPPER CORNER OF THE INSIDE FACE OF THE HEADWALLS.

EXPOSED ROADWAY FILL SHALL BE MINIMUM COVER.

BE WARPED TO PROVIDE 12 INCHES IF ANY PART OF THE BARREL IS EXPOSED. THE ROADWAY FILL SHALL PROVIDE 12 INCHES MINIMUM COVER.

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

703.12J SHEET NO. 1 OF 3

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-658-MODOT 1-888-275-6636
LAYING OUT TRANVERSE JOINTS

UNLESS SHOWN ON ROADWAY OR BRIDGE PLANS

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

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

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

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

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

TRAVELED WAY IS THE ROADWAY WIDTH MINUS SHOULDER WIDTHS.

FOR CUT SECTION DETAILS, SEE 703.16.

GENERAL NOTES:

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

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

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1".

LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.

BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

(i) SAME SIZE AND SPACING AS B2 BARS

( ii) SAME SIZE AND SPACING AS A2 BARS

(iii) SAME SIZE AND SPACING AS A1 BARS

(iv) SAME SIZE AND SPACING AS A2 BARS

(v) BAR SPACING

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

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-456-MODOT 1-888-275-6636
07/01/2015
DATE EFFECTIVE:
10/31/2015
DATE PREPARED:
511312015
GENERAL NOTES:

- For sections thru barrel, wings and headwalls, see Sheet 3 of 3 for details.
- For construction joint key, 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.

- One-time size and spacing as A2 bars
- 12" maximum
- J1 bar spacing
- Same size and spacing as A2 bars
- A2 bar spacing
- Same size and spacing as A1 bars
- At bar spacing
- For design fills over 2'-6" or less
- For design fills 2'-6" or less

FOR CUT SECTION DETAILS, SEE 703.16.

DATE PREPARED: 5/13/2015
DATE EFFECTIVE: 7/1/2015

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL CITY, MO 65202
1-888-ASK-MODOT 1-888-275-6636)

CONCRETE SINGLE BOX CULVERT
SKEW: LEFT ADVANCE
WINGS: FLARED

REINFORCEMENT

DATE PREPARED: 5/13/2015
DATE EFFECTIVE: 7/1/2015

703.13J SHEET NO. 2 OF 3
CONSTRUCTION JOINT KEY NOT SHOWN FOR CLARITY. SEE SHEET 3 OF 3 FOR DETAILS.

IF UNSUITABLE MATERIAL IS ENCOUNTERED, EXCAVATION OF UNSUITABLE MATERIAL AND FURNISHING AND PLACING OF GRANULAR BACKFILL SHALL BE IN ACCORDANCE WITH SEC 206.

GENERAL ELEVATION A-A

PLAN OF LAYOUT DIMENSIONS

CONCRETE SINGLE BOX CULVERT
SKEW: RIGHT ADVANCE
WINGS: STRAIGHT
LAYOUT

GENERAL NOTES:

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

DESIGN LOADINGS:
VEHICULAR
HL-93 MINUS LANE LOAD, EARTH = 120 LB/FT
EQUIVALENT FLUID PRESSURE = 30 LB/GF (MIN. 1, 60 LB/GF) MAX. 1

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

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

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED. WHEN ALTERNATE PRECAST CONCRETE BOX CULVERT SECTIONS ARE USED, THE MINIMUM DISTANCE FROM INSIDE FACE OF HEADWALLS TO PRECAST SECTION OVERWROUGHT MOLDING AND REINFORCEMENT AND DIMENSIONS FOR WINGS AND HEADWALLS SHALL BE IN ACCORDANCE WITH MISSOURI STANDARD PLANS.
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 703.17. FOR J5 BARS, SEE 703.37.

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

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

4. USE A TRANSVERSE JOINT WHEN BARREL LENGTH IS OVER 80 FEET. USE ADDITIONAL JOINTS TO LIMIT CUT SECTION LENGTH AND END SECTION LENGTH TO 3 FEET 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.

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

6. FOR DETAILS, SEE SHEET 3 OF 3.

7. DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

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

9. MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1".

10. BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

11. SAME SIZE AND SPACING AS B2 BARS

12. SAME SIZE AND SPACING AS A2 BARS

13. SAME SIZE AND SPACING AS B2 BARS

14. SAME SIZE AND SPACING AS A2 BARS

15. SAME SIZE AND SPACING AS B2 BARS

16. SAME SIZE AND SPACING AS A2 BARS

17. SAME SIZE AND SPACING AS B2 BARS

18. SAME SIZE AND SPACING AS A2 BARS

19. SAME SIZE AND SPACING AS B2 BARS

20. SAME SIZE AND SPACING AS A2 BARS

HALF PLANS
HALF PLANS ARE SYMMETRICAL ABOUT CULVERT.

ELEVATION
J1 BARS MAY BE BENT IN FIELD OR SHOP.

DATE EFFECTIVE: 07/01/2015
DATE PREPARED: 07/13/2015
SHEET NO: 2 OF 3

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

CONCRETE
SINGLE BOX CULVERT
SKEW: RIGHT ADVANCE
WINGS: STRAIGHT
REINFORCEMENT

LAYING OUT TRANVERSE JOINTS
UNLESS SHOWN ON ROADWAY OR BRIDGE PLANS

LAYING OUT TRANVERSE JOINTS

FOR CUT SECTION DETAILS, SEE 703.16.
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
10' = 1'-0"

EQUATIONS FOR COMPUTING m, b, b AND C

\[ m = \frac{20''}{(b + C)} \]

\[ b = \frac{20''}{C} \]

\[ C = \frac{20''}{b} \]

\[ b + C = \frac{20''}{b} \]

\[ b(C + C) = \frac{20''}{C} \]

\[ b(C + C)(\sec Z) \]

\[ Z = \arctan \left( \frac{\text{HOR}}{\text{VER}} \right) \]

\[ \theta = \arctan \left( \frac{\text{ELEV.1} - \text{ELEV.2}}{\text{A} + \text{C} + \text{E} + \text{LL}} \right) \]

\[ \text{VAR} = \text{SEE EQUATIONS} \]

\[ \text{DIMENSION} = \text{SEE DIMENSIONS} \]

\[ \text{VARIABLE} = \text{DIMENSION} \]

\[ \text{INDEX} = \text{DIMENSION} \]

\[ \text{VALUE} = \text{DIMENSION} \]

\[ \text{ITEM} = \text{DIMENSION} \]

\[ \text{TOTAL} = \text{DIMENSION} \]

\[ \text{LENGTH} = \text{DIMENSION} \]

\[ \text{WIDTH} = \text{DIMENSION} \]

\[ \text{HEIGHT} = \text{DIMENSION} \]

\[ \text{THICKNESS} = \text{DIMENSION} \]

\[ \text{WEIGHT} = \text{DIMENSION} \]

\[ \text{MATERIAL} = \text{DIMENSION} \]

\[ \text{SKEW} = \text{DIMENSION} \]

\[ \text{ANGLE} = \text{DIMENSION} \]

\[ \text{SLOPE} = \text{DIMENSION} \]

\[ \text{GRADE} = \text{DIMENSION} \]

\[ \text{EFFECTIVE} = \text{DIMENSION} \]

\[ \text{STRESS} = \text{DIMENSION} \]

\[ \text{LOAD} = \text{DIMENSION} \]

\[ \text{DESIGN} = \text{DIMENSION} \]

\[ \text{SPECIFICATIONS} = \text{DIMENSION} \]

\[ \text{REINFORCEMENT} = \text{DIMENSION} \]

\[ \text{CONCRETE} = \text{DIMENSION} \]

\[ \text{SINGLE BOX CULVERT} = \text{DIMENSION} \]

\[ \text{SKEW: RIGHT ADVANCE WINGS: FLARED} \]

\[ \text{LAYOUT} \]

\[ \text{DATE PREPARED: 07/01/2015} \]

\[ \text{DATE EFFECTIVE: 08/01/2015} \]

\[ \text{703.15E SHEET NO. 1 OF 3} \]

\[ \text{MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION} \]

\[ \text{JEFFERSON CITY, MO 65102} \]

\[ \text{1-888-656-MODOT \ 1-888-275-6636) \]

\[ \text{105 WEST CAPITOL \ MISSOURI STREETS AND HIGHWAYS DIVISION} \]

\[ \text{CONCRETE SINGLE BOX CULVERT} \]

\[ \text{SKEW: RIGHT ADVANCE WINGS: FLARED} \]

\[ \text{LAYOUT} \]

\[ \text{DATE EFFECTIVE: 07/01/2015} \]

\[ \text{DATE PREPARED: 08/01/2015} \]

\[ \text{703.15E SHEET NO. 1 OF 3} \]

\[ \text{MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION} \]

\[ \text{JEFFERSON CITY, MO 65102} \]

\[ \text{1-888-656-MODOT \ 1-888-275-6636) \]

\[ \text{105 WEST CAPITOL \ MISSOURI STREETS AND HIGHWAYS DIVISION} \]

\[ \text{CONCRETE SINGLE BOX CULVERT} \]

\[ \text{SKEW: RIGHT ADVANCE WINGS: FLARED} \]

\[ \text{LAYOUT} \]

\[ \text{DATE EFFECTIVE: 07/01/2015} \]

\[ \text{DATE PREPARED: 08/01/2015} \]

\[ \text{703.15E SHEET NO. 1 OF 3} \]

\[ \text{MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION} \]

\[ \text{JEFFERSON CITY, MO 65102} \]

\[ \text{1-888-656-MODOT \ 1-888-275-6636) \]

\[ \text{105 WEST CAPITOL \ MISSOURI STREETS AND HIGHWAYS DIVISION} \]
### Design Thickness

<table>
<thead>
<tr>
<th>Design</th>
<th>A1 Bars</th>
<th>J3 Bars</th>
<th>A2 Bars</th>
<th>J4 Bars</th>
<th>B2 Bars</th>
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<tbody>
<tr>
<td>T5</td>
<td>9</td>
<td>4</td>
<td>10</td>
<td>10</td>
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<tr>
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<td>9</td>
<td>4</td>
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<tr>
<td>T2</td>
<td>9</td>
<td>4</td>
<td>10</td>
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</tr>
</tbody>
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### Span (S) = 3 FT

#### Height (HT) = 2 FT OR 3 FT

<table>
<thead>
<tr>
<th>Member</th>
<th>Top Slab Bars</th>
<th>Bottom Slab Bars</th>
<th>Wall Bars</th>
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</thead>
<tbody>
<tr>
<td>C1</td>
<td>A1 Bar</td>
<td>A2 Bar</td>
<td>B2 Bar</td>
</tr>
<tr>
<td>C2</td>
<td>J3 Bar</td>
<td>J4 Bar</td>
<td></td>
</tr>
</tbody>
</table>

### Span (S) = 3 FT

#### Height (HT) = 4 FT OR 5 FT

<table>
<thead>
<tr>
<th>Member</th>
<th>Top Slab Bars</th>
<th>Bottom Slab Bars</th>
<th>Wall Bars</th>
</tr>
</thead>
<tbody>
<tr>
<td>C3</td>
<td>J3 Bar</td>
<td>J4 Bar</td>
<td></td>
</tr>
<tr>
<td>C4</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### General Notes:

If design fill is between tabulated design fills, use the next greater tabulated design fill. Exception: use the greater member thickness, area of reinforcement, and bar dimensions from the 2 FT or greater than 30 feet tabulated design fills, area of reinforcement equal to bar area per foot of spacing.

Special designs are required when the design fill is less than 1 foot or greater than 50 feet.

Members in inches unless otherwise specified.

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

Culverts meet strength and serviceability requirements for the design vechicular live load plus 15 ft. winds the lane load.

### Conclusions

**Missouri Highways and Transportation Commission**

**Jefferson City, MO 65102**

**105 West Capitol**

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

**Date Prepared:** 04/01/2010

**Date Effective:** 04/28/2011

**Sheet No:** 703.17

**1 of 14**

---

**Concrete Single Box Culvert**

**Bar Size, Spacing & Dimensions**

**Spans (S):** 3 Feet Height (HT): 2 Through 5 Feet

---

**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 C1 (not C) shall be used with alternate J3 bars. Additional payment will be made for this substitution.
**Design Thickness A1 Bars**

<table>
<thead>
<tr>
<th>SPAN (S) = 4 FT</th>
<th>HEIGHT (Ht) = 2 FT OR 3 FT</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEMBER THICKNESS</td>
<td>A1 BARS</td>
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<tr>
<td>15</td>
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<td>10</td>
</tr>
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</tbody>
</table>

**Design Thickness A2 Bars**

<table>
<thead>
<tr>
<th>SPAN (S) = 7 FT</th>
<th>HEIGHT (Ht) = 6 FT OR 7 FT</th>
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</thead>
<tbody>
<tr>
<td>MEMBER THICKNESS</td>
<td>A1 BARS</td>
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<tr>
<td>15</td>
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<td>10</td>
</tr>
<tr>
<td>5</td>
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</tbody>
</table>

**General Notes:**

- If design fill is between tabulated design fills, use the next greater tabulated design fill. For design fills between 2' and 4' thick, refer to the data sheet for added information. Use the greater member thickness area of reinforcement and bar dimensions from the chart and a 4 ft. tabulated design fill. Area of reinforcement equals bar area per foot spacing.

- Special designs are required when the design fill is less than 1 foot or greater than 50 feet.

- Dimensions are in inches unless otherwise specified.

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

**Missouri Highways and Transportation Commission**

105 West Capitol
Jefferson City, MO 65102
1-800-452-MODOT (6686)

**Concrete Single Box Culvert**

**Member Thickness**

**Bar Size, Spacing & Dimensions**

**Span (S): 4 Feet, Height (Ht): 2 thru 7 Feet**

**Sheet No.: 2 of 14**

**Date Effective:** 09/15/2006

**Date Prepared:** 09/16/2006

**703.17**

**Design Fill**

<table>
<thead>
<tr>
<th>DESIGN FILL</th>
<th>MEMBER THICKNESS</th>
<th>A1 BARS</th>
<th>J1 BARS</th>
<th>J2 BARS</th>
<th>J3 BARS</th>
<th>B2 BARS</th>
<th>WALL BARS</th>
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<tbody>
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<tr>
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<td>10</td>
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<td>10</td>
<td>10</td>
</tr>
<tr>
<td>5'</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
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</tr>
</tbody>
</table>

**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". In dimension 2, (footnote 1) shall be used with alternate J3 bar. Additional spacing if required with alternate J3 bars with a length equal to J3 bars. No additional payment will be made for this substitution.
<table>
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GENERAL NOTES:
1. IF DESIGN FILL IS BETWEEN TABULATED DESIGN FILLS, USE THE NEXT HIGHER TABULATED DESIGN FILL.
2. IF DESIGN FILL IS LESS THAN 2 FT, USE THE NEXT LOWER TABULATED DESIGN FILL.
3. EXCEPTION: USE THE HOME SIZED DESIGN FILL FOR DESIGN FILLS BETWEEN 2 ND 3 FT.
4. USE THE HOME SIZED DESIGN FILL FOR DESIGN FILLS BETWEEN 2 AND 3 FT.
5. USE THE HOME SIZED DESIGN FILL FOR DESIGN FILLS BETWEEN 2 AND 3 FT.
6. USE THE HOME SIZED DESIGN FILL FOR DESIGN FILLS BETWEEN 2 AND 3 FT.
7. USE THE HOME SIZED DESIGN FILL FOR DESIGN FILLS BETWEEN 2 AND 3 FT.
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32. USE THE HOME SIZED DESIGN FILL FOR DESIGN FILLS BETWEEN 2 AND 3 FT.
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48. USE THE HOME SIZED DESIGN FILL FOR DESIGN FILLS BETWEEN 2 AND 3 FT.
49. USE THE HOME SIZED DESIGN FILL FOR DESIGN FILLS BETWEEN 2 AND 3 FT.
50. USE THE HOME SIZED DESIGN FILL FOR DESIGN FILLS BETWEEN 2 AND 3 FT.

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

CONCRETE
SINGLE BOX CULVERT
MEMBER THICKNESS
BAR SIZE, SPACING & DIMENSIONS
SPAN (S) = 6 FT OR 7 FT
HEIGHT (HT) = 7 FT OR 8 FT
DATE PREPARED: 04/15/2011
DATE EFFECTIVE: 04/12/2012
SHEET NO. 703.17
3 OF 14
### General Notes:

- If design fill is between tabulated design fills, use the next greater tabulated design fill. 
- Except for design fills between 2 to 4 feet, use the greater member thickness area of reinforcement and bar dimensions from the 2 foot fill and a 4 foot tabulated design fill. 
- Area of reinforcement equals bar area per foot spacing.
- Special designs are required when the design fill is less than 1 foot or greater than 50 feet.

### Dimensions:

Dimensions are in inches unless otherwise specified.

Culverts meet strength and serviceability requirements for the design fill.

---

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

105 West Capitol
Jefferson City, MO 65102

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

**DATE EFFECTIVE:** 4/18/2011

**DATE PREPARED:** 3/18/2011

**CONCRETE SINGLE BOX CULVERT**

**MEMBER THICKNESS**

**BAR SIZE, SPACING & DIMENSIONS**

**SPAN (S): 7 FEET**

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<th>HEIGHT (H): 2 FT OR 4 FT</th>
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**SPAN (S): 8 FT**

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</table>

**GENERAL NOTES:**

If design fill is between tabulated design fills, use the next greater tabulated design fill. Except for design fills between 2 to 4 feet, use the greater member thickness area of reinforcement and bar dimensions from the 2 foot fill and a 4 foot tabulated design fill. Area of reinforcement equals bar area per foot spacing.

Special designs are required when the design fill is less than 1 foot or greater than 50 feet.

Dimensions are in inches unless otherwise specified.

Culverts meet strength and serviceability requirements for the design fill.

---

**BAR DIMENSIONS DIAGRAM**

**SYMMETRICAL ABOUT CULVERT**

---

**ALTERNATE J3 BAR**

At contractor’s option, alternate J3 bars may be used when the distance between the ends of J3 bars in the top slab is less than 2 ft. Dimension J3 (not C) shall be used with alternate J3 bars. 

Multiple J3 bars shall be used with alternate J3 bars. 

J3 bars are required with alternate J3 bars with a length equal to J3 bars. No additional payment will be made for this substitution.
**SYMMETRICAL ABOUT CULVERT.**

**BAR DIMENSIONS DIAGRAM SYMMETRICAL ABOUT CULVERT.**

**CONCRETE SINGLE BOX CULVERT**

**MEMBER THICKNESS**

**DATE PREPARED:** 4/18/2011

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

**JEFFERSON CITY, MO 65102 1-888-ASK-MODOT (1-888-275-6636)**

**CONCRETE**

**SINGLE BOX CULVERT**

**MEMBER THICKNESS**

**DATE EFFECTIVE:** 4/19/2011

**DATE PREPARED:** 4/12/2011

**SHEET NO:** 1

**7 OF 14**

**GENERAL NOTES:**

If design fill is between tabulated design fills, use the next greater tabulated design fill. To design fills between 2 feet and 4 feet, tabulated design fills may be used with alternate J3 bars and J4 bars. Where L1 is equal to 18", 22" and 28" for #4, alternate J3 bars and J4 bars may be used at contractor's option. Alternate J3 bars may be used in the top slab where dimension 4 (not C1) is equal to 2'-0". (Design fill is not less than 1 foot or greater than 50 feet. Dimensions are in inches unless otherwise specified. In fills, the design fill was measured from the top of top slab to the top of earth fill or roadway. Culverts meet strength and serviceability requirements for the design fill.)
<table>
<thead>
<tr>
<th>SPAN (S)</th>
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<th>MEMBER THICKNESS</th>
<th>TOP SLAB BARS</th>
<th>J3 BARS</th>
<th>BOTTOM SLAB BARS</th>
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GENERAL NOTES:
- If design fill is between tabulated design fills, use the next greater member. If design fill is less than 2 ft, use tabulated design fills between 2 ft and 6 ft. Tabulated design fills are based on the greater member thickness, area of reinforcement, and bar diameters from the top of top slab to the top of earth fill or roadway.
- Specific design fills are measured from the top of top slab to the top of earth fill or roadway.
- Culverts meet strength and serviceability requirements for the design fill unless the load exceeds the Design Fill Load.
### Design Thickness

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### Design Fills

- **Top Slab Bars**: Design fills are measured from the top of top slab for design fills between 2 feet and 4 feet. For use the next greater tabulated design fill. Except tabulated design fills, area of reinforcement and bar dimensions from the 2 feet and 4 feet.

### General Notes

- If design fills are less than or greater than 50 feet, special designs are required. Dimensions are in inches unless otherwise specified.

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

- Culvert wall thickness, spacing and splicing equals 2J bars. No additional payment will be made for this substitution.

### SINGLE BOX CULVERT

- **Member Thickness**: 3" Charcoal, 2" Charcoal

### Date Prepared: 04/01/2011

### Date Effective: 04/28/2011

### Sheet No.: 703.17

### Missouri Highways and Transportation Commission

105 West Capitol
Jefferson City, MO 65102
1-888-MO-ROAD (667-6233)

### Concretes

- **Design Fill**: Use the next greater tabulated design fill. Design fill between 2 feet and 4 feet. Excess earth fills, earth fills greater than 50 feet.

- **Member Thickness**: Area of reinforcement and bar dimensions from the 2 feet and 4 feet tabulated fills. Area of reinforcement equals 2J bars. Special designs are required when the design fill is less than or greater than 50 feet.

- **Dimensions**: Spacing and splicing equals 2J bars. No additional payment will be made for this substitution.

- **Design Fills**: Measured from the top of top slab to the top of earth fills or roadway.
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<th>SPAN (S)</th>
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**DESIGN THICKNESS A1 BARS**

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**GENERAL NOTES:**

- If design fill is less than the noted fill height, use the next smaller fill size.
- If the design fill is greater than the noted fill height, select the next larger fill size.
- Use the greater member thickness, area of reinforcement, and fill size in the design.
- Dimensions are in inches unless otherwise specified.
- Design fill was measured from the top of top slab to the top of earth fill or roadway.
- Culverts meet strength and serviceability requirements for the design with the quoted load resistance for live load.

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

**CONCRETE SINGLE BOX CULVERT**

**MEMBER THICKNESS**

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<th>BAR SIZE</th>
<th>SPACING &amp; DIMENSIONS</th>
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**DATE EFFECTIVE:** 08/07/2000

**DATE PREPARED:** 07/02/2001

**SHEET NO.:** 703.17

**13 OF 14**
### Design Thickness

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### General Notes:
- If Design Fill is between tabulated Design Fills, use the next greater tabulated Design Fill.
- The Greater Tabulated Design Fills Between 2 Dimensions are used to determine the Greater Member Thickness, and are used for Reinforcement and Bar Dimensions from the top and bottom Design Fills. Area of reinforcement equals bar area per foot spacing.
- Special design requirements when the Design Fill is less than 1 foot or greater than 50 feet.
- Dimensions are in inches unless otherwise specified.
- Design fill width was measured from the top of top slab to the top of earth fill or roadway.

### Missouri Highways and Transportation Commission

**Single Box Culvert**

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

**Concrete**

**Conventional Single Box Culvert**

**Member Thickness**

**Bar Size, Spacing & Dimensions**

**Date Effective:** 04/25/2011

**Date Prepared:** 04/12/2011

**Sheet No.:** 103.17

**14 of 14**
### AREA OF STEEL REQUIRED FOR J5 BARS IN WINGS (SQ. IN./FT.)

#### WALL HEIGHT VS. WALL THICKNESS

- **Sheetfill Slope = 3:1**

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**NOTE:**

- The wall height is equal to the barrel height, plus the top slab thickness. If the wall height is in return or outside tapered wall height, 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 J-4 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 J-4 bars is insufficient, increase the size of the J5 bars (3/8-in. max.) and/or decrease the spacing of the J5 bars (8-in. max.). Use smallest bar size possible based on window spacing.

- Minimum steel to be used in the wings for J5 bars is #6 bars at 14" centers (area of steel = 0.1683 sq. in./ft.).

- See Standard Plan 705.3TC, 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°.

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.

**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>
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**CONCRETE BOX CULVERT**

**EXTERIOR WING BACKFILL SLOPE TRANSITION**
GENERAL NOTES:

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

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

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

A CONTINUOUS V-GROOVE AT LEAST 1" IN DEPTH SHALL BE CUT ON THE FACE OF THE CONCRETE AS A GUIDE FOR THE LINE OF BREAK AND TO PREVENT SPALLING.

THE BOX EXTENSION OPENING SHALL BE BUILT TO MATCH THE EXISTING BOX OPENING. WHEN THE EXISTING OPENING DOES NOT MATCH A SIZE FROM THE TABLES, THE NEXT LARGER SIZE SHALL BE USED FOR DETERMINING THE MEMBER SIZES AND REINFORCEMENT.
GENERAL NOTES:
The hatched parts of these drawings indicate those portions of the existing culvert which are to be removed.

All reinforcing bars within areas shown to be removed, that are bonded in undisturbed old concrete, shall be cleanly stripped, straightened, and extended into new concrete.

See standard specifications for required bushhammering and treating of old concrete surfaces which are to receive new concrete.

A continuous V-groove at least 1" in depth shall be cut on the face of the concrete as a guide for the line of break and to prevent spalling.

The box extension opening shall be built to match the existing box opening. When the existing opening does not match a size from the tables, the next larger size shall be used for determining the member sizes and reinforcement.
GENERAL NOTES:

- For sections thru barrel, #4 bars and headwalls, see Sheet 3 of 3. For bar sizes, spacing, and dimensions of all reinforcement except #4 bars, see T03-41. For #5 bars, see T03-37.
- 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 1/2".
- 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.

LAYING OUT TRANVERSE JOINTS

- Use a transverse joint when barrel length is over 80 feet. Use additional joints to limit cut section length and end section barrel length measured along centerline of culvert to 50 feet.
- Minimum end section length shall be 3 feet measured along the shortest path 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 T03-46.

DATE PREPARED: 5/13/2015
DATE EFFECTIVE: 6/1/2015

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-456-MODOT (1-888-266-3638)

CONCRETE DOUBLE BOX CULVERT
SKEW: SQUARED
WINGS: STRAIGHT
REINFORCEMENT

DATE PREPARED: 5/13/2015
DATE EFFECTIVE: 6/1/2015

703.40H 1 OF 3
Laying Out Transverse Joints

Use a transverse joint when barrel length is over 80 feet. Use additional joints to limit cut section length and end section barrel length measured along centerline of culvert to 50 feet. Minimum end section length shall be 3 feet measured along the shortest wall from the inside face of headwall to the transverse joint.

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

Traveled way is the roadway width minus shoulder widths.

For cut section details, see 703.46.

General Notes:

For sections thru barrel, wings and headwalls, see Sheet 3 of 7, 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 7 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

Concrete Double Box Culvert

Skeleton: Squeared Wings: Flared

Reinforcement

Date Effective: __/__/20XX
Date Prepared: __/__/20XX

703.41H SHEET NO. 1 OF 3
GENERAL NOTES:
FOR SECTIONS THRU BARREL, WINGS AND HEADWALLS, SEE SHEET 3 OF 3, FOR BAR SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT EXCEPT J5 BARS, SEE 703.47, FOR J5 BARS, SEE 703.37.
CONSTRUCTION JOINT KEY NOT SHOWN FOR CLARITY IN PLAN AND SECTION, SEE SHEET 3 OF 3 FOR DETAILS.
DRAWING NOT TO SCALE, FOLLOW DIMENSIONS.
MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1/2".
LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.
BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.
(a) SAME SIZE AND SPACING AS ADJACENT B BARS
(b) VARIES, 12" MAXIMUM
(c) NOT SPECIFIED ON THIS SHEET
(d) SAME SIZE AND SPACING AS A2 BARS
(e) A2 BAR SPACING
(f) NOT SPECIFIED ON THIS SHEET
(g) NOT SPECIFIED ON THIS SHEET
(h) FOR DESIGN FILLS OVER 2'-0".
(i) FOR DESIGN FILLS 2'-0" OR LESS
(j) NOT REQUIRED FOR CLEAR SPANS > 10'-0"
(k) FOR CLEAR SPAN > 10'-0".
(l) FOR CLEAR SPAN > 13'-0"

IF REQUIRED, THE MINIMUM LENGTH EACH SIDE OF A WALL SHALL BE 6" TO REINFORCEMENT OVER ALL JOINTS.
THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

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

SECTION NEAR INTERIOR WALL
J1 BARS MAY BE BENT IN FIELD OR SHOP.
GENERAL NOTES:

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

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

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

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

LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPACES.

BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

(a) Same size and spacing as adjacent B bars
(b) Varies. 12" minimum
(c) J4 bar spacing

(b) SAME SIZE AND SPACING AS A1 BARS
(e) J4 BAR SPACING
(f) SAME SIZE AND SPACING AS A1 BARS
(g) AT BAR SPACING

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 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 LENGTH OF JOINT UNDER A TRAVELED WAY.

TRAVELED WAY IS THE ROADWAY WIDTH MINUS SHOULDER WIDTHS.

FOR CUT SECTION DETAILS, SEE 703.46.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

JEFFERSON CITY, MO 65102

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

JEFFERSON CITY, MO 65102

CONCRETE DOUBLE BOX CULVERT

SKEW: LEFT ADVANCE
WINGS: STRAIGHT

REINFORCEMENT

DATE PREPARED: 5/13/2015

DATE EFFECTIVE: 5/13/2015

105 WEST CAPITOL
1-888-ASK-MODOT 1-888-275-6636

1 OF 3

SHEET NO. 105

COMMISSION
GENERAL NOTES:

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

CONSTRUCTION JOINT KEY NOT SHOWN FOR CLARITY IN PLAN AND SECTION. SEE SHEET 5 OF 3 FOR DETAILS.

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

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

LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.

BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

(i) SAME SIZE AND SPACING AS A1 BARS

(k) SAME SIZE AND SPACING AS A2 BARS

(t) VARIES. 12" MAXIMUM

( w) A2 BAR SPACING

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

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

( h) THE CLEarest LENGTH EACH SIDE OF A REINFORCEMENT JOINT SHALL BE THE GREATER OF 48 BAR DIAMETERS OR 10'-0".

1.00 BAR SPACING

(h) For the clear span, the minimum length each side of a reinforcing joint shall be the greater of 48 bar diameters or 10'-0".

(j) Not required for clear spans > 13'-0".

(k) H2 bars as required. Quantity of bars varies with skew.

( k) H2 bars as required. Quantity of bars varies with skew.

PLAN OF TOP SLAB

VARIED A BARS AT EACH FACE

J5 BARS MAY BE SENT IN FIELD OR SHOP.

SECTION NEAR INTERIOR WALL

A1 BARS AT BOTTOM

A1 BARS AT BOTTOM

CONCRETE DOUBLE BOX CULVERT

SKEW: LEFT ADVANCE

WINGS: STRAIGHT

REINFORCEMENT

DATE EFFECTIVE: 3/13/2015

DATE PREPARED: 3/13/2015

1 OF 3
GENERAL NOTES:

1. For sections thru barrel, wings and headwalls, see Sheet 3 of 3. For bar sizes, spacing and dimensions of all reinforcement except J5 bars, see T03-4. For J5 bars, see T03-37.

2. Lap longitudinal bars a minimum of 23" at splices.

3. For cut section details, see T03-46.

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 of joint under a traveled way. A traveled way is the roadway width minus wings shoulder widths.

5. Beveled headwall shall be located at upstream end.

6. Joint may be bent in field or shop.

7. Minimum clearance to reinforcing steel shall be 1½".

8. Transverse joint key not shown for clarity in plan and elevation. See sheet 3 of 3 for details.


10. The joints shall be located to minimize the length of joint under the traveled way. The length of joint under a traveled way is the roadway width minus wings shoulder widths.

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 705.37.

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 1.5".

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) J4 BARS SPACING
(d) SAME SIZE AND SPACING AS J2 BARS
(e) J2 BAR SPACING

J5 BARS AT BOTTOM
J4 BARS AT BOTTOM
J2 BARS AT BOTTOM
J1 BARS AT BOTTOM
J3 BARS AT BOTTOM
G BARS AT BOTTOM
G BARS AT S.F.
G BARS AT S.F.
J5 BARS AT BOTTOM
J5 BARS AT BOTTOM
J5 BARS AT BOTTOM
G BARS AT S.F.
G BARS AT S.F.
G BARS AT S.F.
J5 BARS AT BOTTOM
J5 BARS AT BOTTOM
J5 BARS AT BOTTOM
G BARS AT S.F.
G BARS AT S.F.
G BARS AT S.F.
J5 BARS AT BOTTOM
J5 BARS AT BOTTOM
J5 BARS AT BOTTOM
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G BARS AT S.F.
G BARS AT S.F.
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G BARS AT S.F.
J5 BARS AT BOTTOM
J5 BARS AT BOTTOM
J5 BARS AT BOTTOM
G BARS AT S.F.
G BARS AT S.F.
G BARS AT S.F.
### General Notes:

If design fill is between tabulated design fills, use the next greater tabulated design fill. Except for design fills between 2 and 3 feet, use the next greater tabulated fill. To obtain the greater member thickness, area of reinforcement and bar dimensions from the 3 ft. and 4 ft. tabulated design fills, area of reinforcement equals bar area per foot of fill spacing.

Special designs are required when the design fill is less than 1 foot or greater than 50 feet.

Dimensions are in inches unless otherwise specified.

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

Culverts meet strength and serviceability requirements for the design vertical live load H-93-5 when the lane load.

### Culvert Design Information

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<th>Span (S)</th>
<th>Height (H)</th>
<th>Number of Slabs</th>
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<td>5 ft or 6 ft</td>
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<tr>
<td>6 ft</td>
<td>6 ft</td>
<td>8 slabs</td>
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</tbody>
</table>

### Culvert Member Details

- **Bar Size, Spacing & Dimensions**: Refer to the table for specific member details.

### Culvert Size & Spacing

- **Member Thickness**: Refer to the table for specific member thicknesses.

### Culvert Spans & Heights

- **3 ft Span**: Height (H) = 2 ft or 3 ft or 4 ft
- **5 ft Span**: Height (H) = 5 ft or 6 ft
- **6 ft Span**: Height (H) = 6 ft

### Date Prepared

- **Date Prepared**: 9/8/2011

### Missouri Highways and Transportation Commission

- **Office Location**: 105 West Capitol, Jefferson City, MO 65102
- **Phone Number**: 1-888-ASK-MODOT (1-888-275-6636)

### Concrete Double Box Culvert

- **Member Thickness**: Refer to the table for specific member thicknesses.

### Date Prepared

- **Date Prepared**: 9/8/2011
- **Sheet No.**: 1 of 27

### Additional Notes

- **EARTH FILL OR ROADWAY**: Used in different contexts as described.
- **FOOT OR GREATER THAN 50 FEET**: Indicates specific requirements or conditions.
- **JEFFERSON CITY. MO 65102**: Refers to the location.
GENERAL NOTES:

IF DESIGN FILL IS BETWEEN TABULATED DESIGN FILLS, USE THE NEXT GREATER TABULATED DESIGN FILL. EXCEPT FOR DESIGN FILLS BETWEEN 2 FEET AND 4 FEET, FOR DESIGN FILLS BETWEEN 2 FEET AND 4 FEET USE THE GREATER MEMBER THICKNESS, AREA OF REINFORCEMENT AND BAR DIMENSIONS FROM THE 2 FEET AND 4 FEET TABULATED DESIGN FILLS. AREA OF REINFORCEMENT EQUALS BAR AREA PER FOOT SPACING.

SPECIAL DESIGNS ARE REQUIRED WHEN THE DESIGN FILL IS LESS THAN 1 FOOT OR GREATER THAN 50 FEET.

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

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

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

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

DATE EFFECTIVE: 10/10/2011
DATE PREPARED: 9/8/2011
SHEET NO. 3 OF 27

CONCRETE DOUBLE BOX CULVERT

MEMBER THICKNESS
BAR SIZE, SPACING & DIMENSIONS

SPAN (S): 4 FT
HEIGHT (HT): 6 FT OR 7 FT

<table>
<thead>
<tr>
<th>SPAN (S)</th>
<th>HEIGHT (HT)</th>
<th>BAR DIMENSIONS DIAGRAM</th>
<th>SYMMETRICAL ABOUT CULVERT</th>
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<tbody>
<tr>
<td>4 FT</td>
<td>6 FT OR 7 FT</td>
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**SPAN (S): 4 FT**
HEIGHT (HT): 6 FT OR 7 FT

**DESIGN FILLS**
MEMBER TOP SLAB BARS
BOTTOM SLAB BARS
WALL BARS

**Bar Dimensions Diagram**
SYMMETRICAL ABOUT CULVERT.
### Table: Dimensions and Spans

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<tr>
<th>Design</th>
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<tr>
<td>1 FT</td>
<td>1/8</td>
<td>6x6 9.5</td>
<td>4</td>
<td>20</td>
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<td>20</td>
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</tr>
<tr>
<td>2 FT</td>
<td>1/8</td>
<td>6x6 9.5</td>
<td>4</td>
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</tr>
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<td>3 FT</td>
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<td>6x6 9.5</td>
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</table>

### General Notes:
- If design fill is between tabulated design fills, use the next greater tabulated design fill. Except for design fills between 2 and 4 feet, use the greater member thicknesses, area of reinforcement, and bar dimensions from the 4 feet fill. If 4 feet tabulated design fills, area of reinforcement equals bar area per foot of spacing.
- Special designs 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 H2-93 minus the lane load.
<table>
<thead>
<tr>
<th>SPAN (S) = 5 FT</th>
<th>HEIGHT (HT) = 7 FT OR 8 FT</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>DESIGN VEHICULAR LIVE LOAD</th>
<th>HL-93 MINUS THE LANE LOAD</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>SPAN (S) = 5 FT</th>
<th>TOP SLAB BARS</th>
<th>BOTTOM SLAB BARS</th>
<th>WALL BARS</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 FT</td>
<td>50.0</td>
<td>50.0</td>
<td>50.0</td>
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<tr>
<td>45 FT</td>
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<tr>
<td>5 FT</td>
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**GENERAL NOTES:**

- If design fill is between tabulated design fills, use the next greater tabulated design fill; except for design fills between 2 feet and 4 feet, use the next smaller tabulated design fill.
- Use the greater member thickness, area of reinforcement, and bar dimensions from the 7 feet and 8 feet tabulated design fills. Area of reinforcement equals bar area per foot spacing.
- Special designs are required when the design fill is less than 1 foot or greater than 50 feet.
- Dimensions are in inches unless otherwise specified.
- Design fills are measured from the top of top slab to the top of earth fill or roadway.

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

**JEFFERSON CITY, MO 65102**

**1-888-275-6636**

**LEAVE NO STONE UNTURNED!**

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

**JEFFERSON CITY, MO 65102**

**1-888-275-6636**

**LEAVE NO STONE UNTURNED!**

**DATE PREPARED:** 9/8/2011

**DATE EFFECTIVE:** 10/1/2011

**CONCRETE DOUBLE BOX CULVERT**

**MEMBER THICKNESS**

**BAR SIZE, SPACING & DIMENSIONS**

**SPAN (S) = 5 FEET**

**HEIGHT (HT) = 7 THRU 8 FEET**

**SHEET NO.** 5 OF 27
### Table: Member Thickness

<table>
<thead>
<tr>
<th>Span (S)</th>
<th>Height (H)</th>
<th>Design Fill</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 FT</td>
<td>2 FT</td>
<td>3 FT</td>
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<tr>
<td>1 FT</td>
<td>2 FT</td>
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<td>3 FT</td>
</tr>
<tr>
<td>1 FT</td>
<td>2 FT</td>
<td>3 FT</td>
</tr>
</tbody>
</table>

### Diagram: Bar Dimensions

**General Notes:**

- If design fill is between tabulated design fills, use the next greater tabulated design fill. Except for design fills between 2 feet and 4 feet, use the next greater tabulated design fill except for design fills between 2 feet and 4 feet. For design fills between 2 feet and 4 feet, use the next greater tabulated design fill.
- Use the greater member thickness, area of reinforcement, and bar dimensions from the fills and 4 feet tabulated design fills. Area of reinforcement equals bar area per foot spacing.
- Special designs are required when the design fill is less than 1 foot or greater than 50 feet.
- Dimensions are in inches unless otherwise specified.
- Design fills are measured from the top of the slab to the top of earth fill or roadway.

**Concrete Double Box Culvert**

**Member Thickness**

- Bar size, spacing, and dimensions
- Design fill
- Section
- Culvert meets strength and serviceability requirements for the design
- U/S loads due to the lane load

**Missouri Highways and Transportation Commission**

**Date Effective:** 10/23/2011

**Date Prepared:** 9/8/2011

**Sheet Number:** 8 of 27

**Conform to MWDOT Bar Dimensions Diagram**

**Symmetrical about E axis.**
<table>
<thead>
<tr>
<th>SPAN (S)</th>
<th>HEIGHT (H)</th>
<th>MEMBER THICKNESS (T)</th>
<th>BAR SIZE, SPACING &amp; DIMENSIONS</th>
<th>CONCRETE DOUBLE BOX CULVERT</th>
<th>GENERAL NOTES</th>
</tr>
</thead>
</table>
| 8 FT     | 4 FT OR 5 FT | 6 FT | | | If design fill is between tabulated design fills, use the next greater tabulated design fill. For design fills between 2 and 3 ft, use the smaller of these two tabulated design fills. Use the greater member thickness, area of reinforcement, and bar dimensions from the 4 ft and 6 ft tabulated design fills. Area of reinforcement equals bar area per foot spacing.

Special designs are required when the design fill is less than 1 foot or greater than 50 feet.

Dimensions are in inches unless otherwise specified.

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

Culverts meet strength and serviceability requirements for the design vehicular live load H-20. The live load H-20 is the lane load.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

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

Concrete Double Box Culvert

Member Thickness

Bar Size, Spacing & Dimensions

<table>
<thead>
<tr>
<th>SPAN (S)</th>
<th>HEIGHT (H)</th>
<th>Member Thickness</th>
<th>Bar Size, Spacing &amp; Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 FT</td>
<td>4 FT OR 5 FT</td>
<td>6 FT</td>
<td></td>
</tr>
</tbody>
</table>
GENERAL NOTES:

IF DESIGN FILL IS BETWEEN TABULATED DESIGN FILLS, USE THE NEXT GREATER TABULATED DESIGN FILL. EXCEPT FOR DESIGN FILLS BETWEEN 2 FEET AND 4 FEET, USE THE GREATER MEMBER THICKNESS, AREA OF REINFORCEMENT AND BAR DIMENSIONS FROM THE 4 FEET AND 8 FEET TABULATED DESIGN FILL. AREA OF REINFORCEMENT EQUALS BAR AREA PER FOOT SPACING.

SPECIAL DESIGNS ARE REQUIRED WHEN THE DESIGN FILL IS LESS THAN 1 FOOT OR GREATER THAN 50 FEET.

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

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

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

If design fill is between tabulated design fills, use the next greater tabulated design fill. Except for design fills between 2 feet and 4 feet, use the tabulated design fill. For design fills greater than 50 feet, use the greater member thickness, area of reinforcement, and bar dimensions from the 2 feet and 4 feet tabulated design fills. Area of reinforcement equals bar area per foot of spacing.

Special designs are required when the design fill is less than 1 foot or greater than 50 feet.

Bar dimensions are in inches unless otherwise specified.

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

Concrete meet strength and serviceability requirements for the Design Section 9.3-2:0 REINS, MINS. THE LANE LOAD IHE 63-64.
### GENERAL NOTES:

- If design fill is between tabulated design fills, use the next greater tabulated design fill; except for design fills between 2 and 4 feet, use the next greater fill. Use the greater member thickness, area of reinforcement, and bar dimensions from the fill and 4 feet tabulated design fills. Area of reinforcement equals bar area per foot spacing.

- Special designs are required when the design fill is less than 1 foot or greater than 50 feet.

- Dimensions are in inches unless otherwise specified.

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

### CULVERTS MEET STRENGTH AND SERVICEABILITY REQUIREMENTS FOR THE DESIGN VEHICLE LOAD HL-93 MINUS THE LANE LOAD.

### MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

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

### SHEET NO.

15 OF 27

### DATE PREPARED:

09/20/2011

### DATE EFFECTIVE:

09/20/2011

### CONCRETE DOUBLE BOX CULVERT

### MEMBER THICKNESS BAR SIZE, SPACING & DIMENSIONS

<table>
<thead>
<tr>
<th>SPAN (S)</th>
<th>10 FT</th>
<th>HEIGHT (HT)</th>
<th>11 FT OR 12 FT OR 13 FT</th>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 FT</td>
<td>11'</td>
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<tr>
<td>12 FT</td>
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<td>16 FT</td>
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<td>20 FT</td>
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<td>22 FT</td>
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<td>48 FT</td>
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</tr>
<tr>
<td>50 FT</td>
<td>31'</td>
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</tbody>
</table>

### MEMBERS/THICKNESS

- TOP SLAB BARS
- BOTTOM SLAB BARS
- WALL BARS

### BAR DIMENSIONS DIAGRAM

- SYMMETRICAL ABOUT CULVERT
### General Notes:

If Design Fill is between tabulated Design fills, use the next greater tabulated Design Fill. Except for Design fills between 2 and 3 feet, Special Designs are required when the Design Fill is less than 1 foot.

Use the Greater Member Thickness, Area of Reinforcement and Bar Dimensions from the 2 foot tabulated Design fill. Area of reinforcement equals bar area per foot spacing.

Special Designs are required when the Design Fill is less than 1 foot or greater than 50 feet.

Dimensions are in inches unless otherwise specified.

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

Culverts meet strength and serviceability requirements for the design vehicle live load when 93 feet spacing.

### Missouri Highways and Transportation Commission

105 West Capitol
Jefferson City, MO 65102
1-888-88-HWY-MO (1-888-884-9966)

### Concretes

**Double Box Culvert**

<table>
<thead>
<tr>
<th>Member Thickness</th>
<th>Bar Size, Spacing &amp; Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Span (S): 11 FT</strong></td>
<td><strong>Height (H): 9 FT or 10 FT or 11 FT</strong></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Design Fill</th>
<th>Top Slab</th>
<th>Bottom Slab</th>
<th>Wall Slab</th>
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<tbody>
<tr>
<td>T1</td>
<td>B1</td>
<td>B2</td>
<td>B3</td>
</tr>
<tr>
<td>1</td>
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<tr>
<td>6</td>
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<td>11</td>
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</tbody>
</table>

**Design Fill**:
- T1: 11 to 14 feet
- T2: 14 to 17 feet
- T3: 17 to 20 feet
- T4: 20 to 23 feet
- T5: 23 to 26 feet

**Area of Reinforcement**:
- C1: 0.06 square feet per linear foot

**Bar Dimensions Diagram**:
- Symmetrical about culvert.
<table>
<thead>
<tr>
<th>Design</th>
<th>Member Thickness</th>
<th>Span (S)</th>
<th>Height (H)</th>
<th>Top slab bars</th>
<th>HT bars</th>
<th>H2 bars</th>
<th>AZ bars</th>
<th>Bottom slab bars</th>
<th>HT bars</th>
<th>H3 bars</th>
<th>B1 bars</th>
<th>B2 bars</th>
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<tbody>
<tr>
<td>5 FT</td>
<td>14</td>
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</table>

**General Notes:**
- If design fill is between tabulated design fills, use the next greater tabulated design fill. Except for design fills between 2 and 4 feet, use the next greater member thickness, area of reinforcement, and bar dimensions from the next greater tabulated design fill. Area of reinforcement equals bar area per foot spacing.
- Special designs are required when the design fill is less than 1 foot or greater than 50 feet.
- Dimensions are in inches unless otherwise specified. Design fills are measured from the top of top slab to the top of earth fill or roadway.

**Concrete Double Box Culvert:**
- Member thickness, bar size, spacing & dimensions
- Span (S) = 11 feet
- Height (H) = 12 or 13 feet or 14 feet

**Details:**
- Concreting double box culvert
- Member thickness
- Bar size, spacing & dimensions
- Span (S) = 11 feet
- Height (H) = 12 thru 14 feet

**Date Prepared:** 9/8/2011

**Contact:**
- 1-800-ASK-MODOT (1-888-275-6636)
- Missouri Highways and Transportation Commission
- 105 West Capitol, Jefferson City, MO 65102
<table>
<thead>
<tr>
<th>Design</th>
<th>Fill</th>
<th>Member</th>
<th>Thickness</th>
<th>T5</th>
<th>B5</th>
<th>T6</th>
<th>B6</th>
<th>T7</th>
<th>B7</th>
<th>T8</th>
<th>B8</th>
<th>T9</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>A1</td>
<td>B1</td>
<td>C1</td>
<td>D1</td>
<td>E1</td>
<td>F1</td>
<td>A2</td>
<td>B2</td>
<td>C2</td>
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| Date Effective: | 9/8/2011 |

**General Notes:**
- If design fill is between tabulated design fills, use the next greater tabulated design fill. Except for design fills between 12 and 13 feet, you may use the greater member thicknesses of reinforcement and bar dimensions from the 12 foot and 13 foot tabulated design fills. Any reinforcement equals bar area per foot spacing.
- Special designs are required when the design fill is less than 1 foot or greater than 50 feet.
- Dimensions are in inches unless otherwise specified.
- Design fills are measured from the top of the slab to the top of the earth fill or roadway.

**Concrete Double Box Culvert Bar Size, Spacing & Dimensions**

**Span (S): 12 Feet**
- **Height (H): 12 Feet or 15 Feet**

**Design Fill:**
- **Height (HT): 12 Feet or 15 Feet**
- **Span (S): 12 Feet**

**Bar Dimensions Diagram:**
- Symmetrical about Culvert.
### MEMBERS THICKNESS

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</table>

### GENERAL NOTES:

- If design fill is between tabulated design fills, use the next greater tabulated design fill. For design fills between 2 feet and 4 feet, use the greater member thickness, area of reinforcement, and bar dimensions from the 2 feet and 4 feet tabulated design fills. Area of reinforcement equals bar area per foot spacing.
- Special design fills are measured from the top of top slab to the top of earth fill or roadway.
- Culverts meet strength and serviceability requirements for the design wind load. H-83 winds the lane load.

### MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

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**Concrete Double Box Culvert**

**Member Thickness**

**Bar Size, Spacing & Dimensions**

**Span (S): 15 Feet**

**Height (H): 7 Feet or 8 Feet or 9 Feet**

---

**Sheet No:** 20 OF 27
### Design Information

**Member Thickness**

<table>
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<tr>
<th>DESIGN</th>
<th>SPAN (S)</th>
<th>HEIGHT (HT)</th>
<th>Top Slab Bars</th>
<th>Bottom Slab Bars</th>
<th>Wall Bars</th>
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**Columns**

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</table>

**General Notes**

- If design fill is between tabulated design fills, use the next greater tabulated design fill. If design fill is between 2 and 3.5 feet, use the next greater design fill. If design fill is less than 3.5 feet, use the greater member thickness, area of reinforcement and bar area of reinforcement equals bar area per foot spacing.

**Special Designs**

- Designs are measured from the top of top slab to the top of earth fill or roadway.

**Concrete Double Box Culvert**

- Member thickness, bar size, spacing & dimensions

**Date Prepared:**

October 10, 2011

**Missouri Highways and Transportation Commission**

**Jefferson City, MO 65102**

1-800-527-MODOT (1-800-527-6636)
<table>
<thead>
<tr>
<th>DESIGN</th>
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<th>HEIGHT (HT) = 15 FT OR 16 FT</th>
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### Table 1: Design Parameters

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<td>03</td>
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</table>

**GENERAL NOTES:**
- If design fill is between tabulated design fills, use the next greater tabulated design fill. Except for design fills between 2 feet and 4 feet, for each foot of fill less than 2 feet, reduce the member thickness, area of reinforcement, and bar area of reinforcement by 10%.
- If the design fill is less than 1 foot, use the greater member thickness, area of reinforcement, and bar area of reinforcement.
- If the design fill is less than 2 feet, reduce the member thickness, area of reinforcement, and bar area of reinforcement by 10%.
- If the design fill is less than 3 feet, reduce the member thickness, area of reinforcement, and bar area of reinforcement by 20%.

**DATE PREPARED:**
- MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
- 105 WEST CAPITOL
- JEFFERSON CITY, MO 65102
- 1-800-344-MODOT 1-888-272-6631

**DATE EFFECTIVE:**
- MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
- 105 WEST CAPITOL
- JEFFERSON CITY, MO 65102
- 1-800-344-MODOT 1-888-272-6631

**SPANN (S): 14 FEET**

**CONCRETE DOUBLE BOX CULVERT**

MEMBER THICKNESS

BAR SIZE, SPACING & DIMENSIONS

**SPANN (S): 14 FEET**

**HEIGHT (HT): 15 FT OR 16 FT**

**SPAN (S): 14 FT**

**HEIGHT (HT): 15 FT OR 16 FT**

**MEMBER THICKNESS**

**BAR SIZE, SPACING & DIMENSIONS**

**DATE PREPARED:**
- MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
- 105 WEST CAPITOL
- JEFFERSON CITY, MO 65102
- 1-800-344-MODOT 1-888-272-6631

**DATE EFFECTIVE:**
- MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
- 105 WEST CAPITOL
- JEFFERSON CITY, MO 65102
- 1-800-344-MODOT 1-888-272-6631

**SHEET NO:**
- 23 OF 27
### Table of Concrete Box Culvert Design Details

<table>
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<td>DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.</td>
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<tr>
<td>IF DESIGN FILL IS BETWEEN TABULATED DESIGN FILLS, USE THE NEXT GREATER TABULATED DESIGN FILL. EXCEPT FOR DESIGN FILLS BETWEEN 2 AND 3 FEET USE THE NEXT SMALLER TABULATED DESIGN FILL. IF DESIGN FILL IS MORE THAN 50 FEET USE THE GREATER MEMBER THICKNESS. AREA OF REINFORCEMENT IS AREA PER FOOT SPACING. DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED. BAR DIMENSIONS 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 VERSUS LYE LOAD HS-83 WINDS THE LANE LOAD.</td>
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<th>Size SPA</th>
<th>C4 Bars</th>
<th>Bottom Slab Bars</th>
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### General Notes:
- If design fill is between tabulated design fills, use the next greater tabulated design fill. Except for design fills between 2 feet and 4 feet, use the greater member thickness, area of reinforcement, and bar dimensions from the 2 foot and 4 foot tabulated design fills. Use the greater member thickness, area of reinforcement equals bar area per foot spacing. Special designs are required when the design fill is less than 1 foot or greater than 50 feet.
- Dimensions are in inches unless otherwise specified.
- Design fills are measured from the top of top slab to the top of earth fill or roadway.

**Concretes Meet Strength and Serviceability Requirements for the Design.**
**Concrete Type: 40 psi.**
**Compression Strength:**
- 7 days: 4000 psi
- 28 days: 5500 psi

### Jefferys City, MO 65102

**Date Prepared:** 9/8/2011

**Date Effective:** 10/1/2011

**Sheet No.:** 703.47

**25 of 27**
### General Notes:

If design fill is between tabulated design fills, use the next greater tabulated design fill. Except for design fills between 2 feet and 4 feet, use the next greater tabulated design fill. Use the greater member thickness, area of reinforcement, and bar dimensions from the 2 feet and 4 feet tabulated design fills. Area of reinforcement equals bar area per foot spacing.

Special designs are required when the design fill is less than 1 foot or greater than 50 feet.

Dimensions are in inches unless otherwise specified.

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

Culverts meet strength and serviceability requirements for the design vertiual live load H-20 grading the lane loads.

**Concrete Double Box Culvert**

<table>
<thead>
<tr>
<th>Member Thickness</th>
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**Concrete Double Box Culvert**

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**General Information:**

- **Dimensions are in inches unless otherwise specified.**
- **Design fills are measured from the top of top slab to the top of earth fill or roadway.**
- **Culverts meet strength and serviceability requirements for the design vertical live load H-20 grading the lane loads.**

**Concrete Double Box Culvert**

- **Member Thickness:**
  - **A4 BARS**
  - **A9 EARS**
  - **A2 EARS**
  - **A1 ZEARS**
  - **C1**
  - **T2**
  - **T3**
  - **T4**
  - **T5**
  - **T6**
  - **T7**
  - **T8**
  - **T9**
  - **H1 BAMS**
  - **H2 BAMS**
  - **H3 BAMS**
  - **B1 BAMS**
  - **B2 BAMS**

**Design Fill:**

- **SPAN (S): 16 FT**
- **HEIGHT (H): 8 FT OR 9 FT OR 10 FT**

**Date Prepared:**

10/09/2011

**Date Effective:**

10/10/2011

**Missouri Highways and Transportation Commission**

JEFFERSON CITY, MO 65102

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

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

105 WEST CAPITOL

JEFFERSON CITY. MO 65102

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

**Concrete Double Box Culvert**

**Member Thickness**

- **Bar Size**
- **Spacing & Dimensions**

**Date Prepared:**

10/09/2011

**Date Effective:**

10/10/2011

**Sheet No.:**

703.47

**26 OF 27**
MEMBER TOP SLAB BARS BOTTOM SLAB BARS WALL BARS

J3 BARS

A2 BARS

H1 BARS

H2 BARS

A1 BARS

H3 BARS

B1 BARS

B2 BARS

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

DESIGN VEHICULAR LIVE LOAD HL-93 MINUS THE LANE LOAD.

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

GENERAL NOTES:

IF DESIGN FILL IS BETWEEN TABULATED DESIGN FILLS, USE THE NEXT GREATER TABULATED DESIGN FILL. EXCEPT FOR DESIGN FILLS BETWEEN 2 FEET AND 4 FEET USE THE GREATER MEMBER THICKNESS. AREA OF REINFORCEMENT AND BAR DIMENSIONS FROM THE 2 FEET AND 4 FEET TABULATED DESIGN FILLS. AREA OF REINFORCEMENT EQUALS BAR AREA PER FOOT SPACING.

SPECIAL DESIGNS ARE REQUIRED WHEN THE DESIGN FILL IS LESS THAN 1 FOOT OR GREATER THAN 50 FEET.

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.

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

CULVERT MEET STRENGTH AND SERVICEABILITY REQUIREMENTS FOR THE DESIGN VERTICAL LIVE LOAD HL-93 MINUS THE LANE LOAD.
GENERAL NOTES:

- FOR SECTIONS THROUGH BARREL, WINGS AND HEADWALLS, SEE SHEET 3 OF 3 FOR BARS, SPACING AND DIMENSIONS OF ALL REINFORCEMENT EXCEPT J5 BARS. SEE 703.07. FOR J5 BARS, SEE 703.37.

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

- DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

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

- LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPICES.

- 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) NOT SPECIFIED ON THIS SHEET

- (e) NOT SPECIFIED ON THIS SHEET

- (f) NOT SPECIFIED ON THIS SHEET

- (g) NOT SPECIFIED ON THIS SHEET

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

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

- (j) NOT REQUIRED FOR CLEAR SPANS < 10'-0"

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

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

- IF REQUIRED, THE MINIMUM LENGTH EACH SIDE OF WALL SHALL BE THE GREATER OF 48 BAR DIAMETERS OR A CLEAR SPAN. THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

DATE PREPARED: 3/10/2009
DATE EFFECTIVE: 3/10/2009
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.
- DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.
- MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1/2".
- LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.
- BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.
- (a) SAME SIZE AND SPACING AS ADJACENT BARS
- (b) VARIES. 12" MAXIMUM
- (c) NOT SPECIFIED ON THIS SHEET
- (d) SAME SIZE AND SPACING AS A2 BARS
- (e) A2 BAR SPACING
- (f) NOT SPECIFIED ON THIS SHEET
- (g) NOT SPECIFIED ON THIS SHEET
- (h) FOR DESIGN FILLS OVER 2'-0" OR LESS
- (i) FOR DESIGN FILLS 2'-0" OR LESS
- (j) FOR CLEAR SPANS > 10'-0"
- (k) FOR CLEAR SPAN 3'-0" - 10'-0"
- (l) 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 IS PARALLEL TO LONG DIRECTION OF HEADWALL.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

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

CONCRETE TRIPLE BOX CULVERT
SKEW: SQUARED
WINGS: FLARED

REINFORCEMENT

DATE EFFECTIVE: 02/01/2011
DATE PREPARED: 02/01/2011

511312015

NOT SPECIFIED ON THIS SHEET

(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) NOT SPECIFIED ON THIS SHEET
(g) NOT SPECIFIED ON THIS SHEET
(h) FOR DESIGN FILLS OVER 2'-0" OR LESS
(i) FOR DESIGN FILLS 2'-0" OR LESS
(j) NOT REQUIRED FOR CLEAR SPANS > 10'-0"
(k) FOR CLEAR SPAN 3'-0" - 10'-0"
(l) FOR CLEAR SPAN > 10'-0"

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

CONCRETE TRIPLE BOX CULVERT
SKEW: SQUARED
WINGS: FLARED

REINFORCEMENT

DATE EFFECTIVE: 02/01/2011
DATE PREPARED: 02/01/2011

511312015

NOT SPECIFIED ON THIS SHEET

(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) NOT SPECIFIED ON THIS SHEET
(g) NOT SPECIFIED ON THIS SHEET
(h) FOR DESIGN FILLS OVER 2'-0" OR LESS
(i) FOR DESIGN FILLS 2'-0" OR LESS
(j) NOT REQUIRED FOR CLEAR SPANS > 10'-0"
(k) FOR CLEAR SPAN 3'-0" - 10'-0"
(l) FOR CLEAR SPAN > 10'-0"

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

CONCRETE TRIPLE BOX CULVERT
SKEW: SQUARED
WINGS: FLARED

REINFORCEMENT

DATE EFFECTIVE: 02/01/2011
DATE PREPARED: 02/01/2011

511312015

NOT SPECIFIED ON THIS SHEET

(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) NOT SPECIFIED ON THIS SHEET
(g) NOT SPECIFIED ON THIS SHEET
(h) FOR DESIGN FILLS OVER 2'-0" OR LESS
(i) FOR DESIGN FILLS 2'-0" OR LESS
(j) NOT REQUIRED FOR CLEAR SPANS > 10'-0"
(k) FOR CLEAR SPAN 3'-0" - 10'-0"
(l) FOR CLEAR SPAN > 10'-0"

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

CONCRETE TRIPLE BOX CULVERT
SKEW: SQUARED
WINGS: FLARED

REINFORCEMENT

DATE EFFECTIVE: 02/01/2011
DATE PREPARED: 02/01/2011

511312015

NOT SPECIFIED ON THIS SHEET

(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) NOT SPECIFIED ON THIS SHEET
(g) NOT SPECIFIED ON THIS SHEET
(h) FOR DESIGN FILLS OVER 2'-0" OR LESS
(i) FOR DESIGN FILLS 2'-0" OR LESS
(j) NOT REQUIRED FOR CLEAR SPANS > 10'-0"
(k) FOR CLEAR SPAN 3'-0" - 10'-0"
(l) FOR CLEAR SPAN > 10'-0"
GENERAL NOTES:

1. FOR BAR SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT EXCEPT J5 BARS, SEE 703.87. FOR J5 BARS, SEE 703.37.

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

3. BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

4. FOR CUT SECTION DETAILS, SEE 703.86.

5. USE ADDITIONAL JOINTS TO LIMIT CUT SECTION LENGTH AND END SECTION BARREL LENGTH MEASURED ALONG CENTERLINE OF CULVERT TO 90 FEET.

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 LOCATION OF TRANVERSE JOINTS UNDER A TRAVELED WAY WITH DESIGN FILL 3 FEET OR LESS, THE JOINTS SHALL BE LOCATED TO MINIMIZE THE LENGTH OF JOINT UNDER THE TRAVELED WAY.

TRAVELED WAY IS THE ROADSIDE WIDTH MINUS SHOULDER RIDS.

FOR CUT SECTION DETAILS, SEE 703.86.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-652-MODOT 1-888-275-6638

CONCRETE TRIPLE BOX CULVERT

SKEW: LEFT ADVANCE
WINGS: STRAIGHT

REINFORCEMENT

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

703.82H SHEET No. 1 OF 3
GENERAL NOTES:

FOR SECTIONS THRU BARREL, WINGS AND HEADWALLS, SEE SHEET 3 OF 3. FOR BAR SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT EXCEPT J5 BARS, SEE 703.87. FOR J5 BARS, SEE 703.37.

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

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

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

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) MINIMUM LENGTH EACH SIDE OF WALL SHALL BE THE GREATER OF 48 BAR DIAMETERS OR CLEAR SPAN. THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

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

SHEET NO. 2 OF 3

REINFORCEMENT

MISSOURI CONCRETE TRIPLE BOX CULVERT
SKEW: LEFT ADVANCE WINGS: STRAIGHT

DATE EFFECTIVE: 12/01/2011
DATE PREPARED: 10/13/2011

703.82H SHEET NO. 2 OF 3
Laying Out Transverse Joints

Use a transverse joint when barrel length is over 80 feet. Use additional joints to limit cut section length and end section barrel length measured along centerline of culvert to 18 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 of 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 of 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 703.66.

Plan of Bottom Slab

1. Variable bars at about 14" centers at top.
2. G bars at bottom.
3. B1 bar pairs at bottom.
4. J4 bars at bottom.
5. B2 bars at bottom.
6. J5 bars at bottom.
7. J3 bars at fill face.
8. J1 and J6 bars may be bent in field or shop.

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 5. For bar sizes, spacing and dimensions of all reinforcement except J5 bars, see 703.87. For J5 bars, see 703.57.

Construction joint key not shown for clarity in plan and elevation, see Sheet 5 of 5 for details.

Draining 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 adjacent B bars
2. SAME size and spacing as adjacent A1 bars
3. J4 bar spacing
4. A2 bar spacing
5. SAME size and spacing as A1 bars
6. A1 bar spacing

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

Concrete Triple Box Culvert

Wings: Flared

Reinforcement

Date Prepared: 2/11/2015
Date Effective: 5/20/2015

703.83H SHEET NO. 1 OF 3
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 1½".

LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.

BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

(a) SAME SIZE AND SPACING AS ADJACENT B BARS
(b) VARIES. 12" MAXIMUM
(c) NOT SPECIFIED ON THIS SHEET
(d) SAME SIZE AND SPACING AS AZ BARS
(e) AZ BAR SPACING
(f) SAME SIZE AND SPACING AS A1 BARS
(g) A1 BAR SPACING
(h) FOR DESIGN FILLS OVER 3'-0"
(i) FOR DESIGN FILLS 3'-0" OR LESS
(j) NOT REQUIRED FOR CLEAR SPANS 5'-0"-0"
# FOR CLEAR SPAN 5'-0"-0"
# FOR CLEAR SPAN 8'-0"-0"

IF REQUIRED, THE MINIMUM LENGTH EACH SIDE OF HEADWALL SHALL BE THE GREATER OF 48 BAR DIAMETERS OR 1 CLEAR SPAN. THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

(k) A1 BAR SPACING

REINFORCEMENT

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

CONCRETE TRIPLE BOX CULVERT
SKEW: LEFT ADVANCE
WINGS: FLARED

DATE EFFECTIVE: 
DATE PREPARED:

703.83H SHEET NO.
2 OF 3
GENERAL NOTES:

FOR SECTIONS THRU BARREL, WINGS AND HEADWALLS, SEE SHEET 3 OF 3. FOR BAR SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT EXCEPT J5 BARS, SEE 703.87. FOR J5 BARS, SEE 703.37.

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

LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1½".

BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

(a) SAME SIZE AND SPACING AS ADJACENT B BARS
(b) Varies. 12" maximum
(c) J4 BAR SPACING
(d) SAME SIZE AND SPACING AS A2 BARS
(e) A2 BAR SPACING
(f) SAME SIZE AND SPACING AS A1 BARS
(g) AT BAR SPACING

ELEVATION OF EXTERIOR WALL
J1 BARS MAY BE BENT IN FIELD OR SHOP.

PLAN OF BOTTOM SLAB

FLOW

4-W-E1 BARS (SIMILAR BAR AT ENDS OF ALL WALLS)

G BARS (a) J4 BARS AT BOTTOM

G BARS (a) J5 BARS AT BOTTOM

VARIED A BARS AT TOP (d)

VARIED A BARS AT BOTTOM (d)

TRANSVERSE JOINT

G BARS (a) J5 BARS AT BOTTOM

G BARS (a) J4 BARS AT BOTTOM

A2 BARS AT TOP

A2 BARS AT BOTTOM

J4 BARS AT FILL FACE

J5 BARS AT FILL FACE

ELEVATION OF EXTERIOR WALL
J1 BARS MAY BE BENT IN FIELD OR SHOP.

PLAN OF BOTTOM SLAB

FLOW

4-W-E1 BARS (SIMILAR BAR AT ENDS OF ALL WALLS)

G BARS (a) J4 BARS AT BOTTOM

G BARS (a) J5 BARS AT BOTTOM

VARIED A BARS AT TOP (d)

VARIED A BARS AT BOTTOM (d)

TRANSVERSE JOINT

G BARS (a) J5 BARS AT BOTTOM

G BARS (a) J4 BARS AT BOTTOM

A2 BARS AT TOP

A2 BARS AT BOTTOM

J4 BARS AT FILL FACE

J5 BARS AT FILL FACE

ELEVATION OF EXTERIOR WALL
J1 BARS MAY BE BENT IN FIELD OR SHOP.

4-W-E1 BARS (SIMILAR BAR AT ENDS OF ALL WALLS)

G BARS (a) J4 BARS AT BOTTOM

G BARS (a) J5 BARS AT BOTTOM

VARIED A BARS AT TOP (d)

VARIED A BARS AT BOTTOM (d)

TRANSVERSE JOINT

G BARS (a) J5 BARS AT BOTTOM

G BARS (a) J4 BARS AT BOTTOM

A2 BARS AT TOP

A2 BARS AT BOTTOM

J4 BARS AT FILL FACE

J5 BARS AT FILL FACE

ELEVATION OF EXTERIOR WALL
J1 BARS MAY BE BENT IN FIELD OR SHOP.

PLAN OF BOTTOM SLAB

FLOW

4-W-E1 BARS (SIMILAR BAR AT ENDS OF ALL WALLS)

G BARS (a) J4 BARS AT BOTTOM

G BARS (a) J5 BARS AT BOTTOM

VARIED A BARS AT TOP (d)

VARIED A BARS AT BOTTOM (d)

TRANSVERSE JOINT

G BARS (a) J5 BARS AT BOTTOM

G BARS (a) J4 BARS AT BOTTOM

A2 BARS AT TOP

A2 BARS AT BOTTOM

J4 BARS AT FILL FACE

J5 BARS AT FILL FACE

ELEVATION OF EXTERIOR WALL
J1 BARS MAY BE BENT IN FIELD OR SHOP.
GENERAL NOTES:

1. 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.

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

3. 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 BARS

(b) VARIES, 12" MAXIMUM

(c) NOT SPECIFIED ON THIS SHEET

(d) SAME SIZE AND SPACING AS A2 BARS

(e) A2 BAR SPACING

(f) SAME SIZE AND SPACING AS A1 BARS

(g) A1 BAR SPACING

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

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

(j) NOT REQUIRED FOR CLEAR SPANS 5'-0"-0"

(k) FOR CLEAR SPANS 5'-0"-0"

(l) FOR CLEAR SPANS 5'-0"-0"

(m) IF REQUIRED, THE MINIMUM LENGTH EACH SIDE OF A WALL SHALL BE THE GREATER OF 48 BAR DIAMETERS OR A CLEAR SPAN. THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

(n) J5 BARS AS REQUIRED. QUANTITY OF BARS VARIES WITH SKEW.

4. FOR DESIGN FILLS Z'-0" OR LESS

5. SAME SIZE AND SPACING AS A1 BARS

6. SAME SIZE AND SPACING AS ADJACENT BARS

7. SAME SIZE AND SPACING AS A2 BARS

8. #8 FOR CLEAR SPAN > 13'-0"

9. #9 FOR CLEAR SPAN > 13'-0"

10. BE THE GREATER OF 48 BAR DIAMETERS OR 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.

11. J5 BARS AS REQUIRED. QUANTITY OF BARS VARIES WITH SKEW.

CONCRETE TRIPLE BOX CULVERT

SKEW: RIGHT ADVANCE
WINGS: STRAIGHT

REINFORCEMENT

DATE EFFECTIVE: 12/01/2011
DATE PREPARED: 6/13/2009

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
JEFFERSON CITY, MO 65102
1-888-652-MODOT (1-888-275-6636)
GENERAL NOTES:

- For Sections thru Barrels, 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 1/2".
- 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 AZ BARS
- (e) AZ Bar Spacing
- (f) Same size and spacing as A1 Bars
- (g) A1 Bar Spacing
- (h) For Design Fills over 2'-0".
- (i) For Design Fills 2'-0" or Less
- (j) Not Required for Clear Spans 5'-0"-0"
- # For Clear Span 7'-0"-0"  
- # For Clear Span 9'-0"-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.
- (k) H2 Bars as Required. Quantity of Bars Varies with Skew.

CONCRETE TRIPLE BOX CULVERT

SKEW: RIGHT ADVANCE
WINGS: FLARED
REINFORCEMENT

DATE EFFECTIVE: 12/01/2011
DATE PREPARED: 9/13/2009
703.85C SHEET NO. 2 OF 3
### General Notes:

If design fill is between tabulated design fills, use the next greater tabulated fill. Except for design fills between 2 feet and 3 feet, use the greater member thickness area of reinforcement and bar dimensions. From 3 feet and 4 feet tabulated fills, use the next greater tabulated fill area of reinforcement equals bar area per foot spacing. Special designs are required when the design fill is less than 1 foot or greater than 50 feet.

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

Concrete triple box culvert member thickness, bar size, spacing, and dimensions.

**General Notes:**
- If design fill is between tabulated design fills, use the next greater tabulated fill. Except for design fills between 2 feet and 3 feet, use the greater member thickness area of reinforcement and bar dimensions. From 3 feet and 4 feet tabulated fills, use the next greater tabulated fill area of reinforcement equals bar area per foot spacing.
- Special designs are required when the design fill is less than 1 foot or greater than 50 feet.
- Design fills are measured from the top of the top slab to the top of earth fill or roadway.

**Concrete Triple Box Culvert**

**Member Thickness**

<table>
<thead>
<tr>
<th>Design Fill</th>
<th>Bar Size</th>
<th>Spacing</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 ft</td>
<td>5/8 in</td>
<td>6 in</td>
<td></td>
</tr>
<tr>
<td>3 ft</td>
<td>3/4 in</td>
<td>6 in</td>
<td></td>
</tr>
<tr>
<td>4 ft</td>
<td>1 in</td>
<td>6 in</td>
<td></td>
</tr>
</tbody>
</table>

**Member Top Slab Bars**

<table>
<thead>
<tr>
<th>Design Fill</th>
<th>Top Slab Bars</th>
<th>Bottom Slab Bars</th>
<th>Wall Bars</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 ft</td>
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</table>

**Member Wall Bars**

<table>
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**Concrete Triple Box Culvert**

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</table>

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<table>
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</tr>
</tbody>
</table>
### Design Conditions

<table>
<thead>
<tr>
<th>Span (ft)</th>
<th>Height (ft)</th>
<th>Top Slab Bars</th>
<th>Bottom Slab Bars</th>
<th>Wall Bars</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>2</td>
<td>A1, A2</td>
<td>A1, A2</td>
<td>A1, A2</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>A1, A2</td>
<td>A1, A2</td>
<td>A1, A2</td>
</tr>
<tr>
<td>5</td>
<td>2</td>
<td>A1, A2</td>
<td>A1, A2</td>
<td>A1, A2</td>
</tr>
<tr>
<td>6</td>
<td>2</td>
<td>A1, A2</td>
<td>A1, A2</td>
<td>A1, A2</td>
</tr>
<tr>
<td>10</td>
<td>2</td>
<td>A1, A2</td>
<td>A1, A2</td>
<td>A1, A2</td>
</tr>
<tr>
<td>18</td>
<td>2</td>
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<td>A1, A2</td>
<td>A1, A2</td>
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<td>A1, A2</td>
<td>A1, A2</td>
</tr>
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<td>A1, A2</td>
<td>A1, A2</td>
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<td>2</td>
<td>A1, A2</td>
<td>A1, A2</td>
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</tr>
</tbody>
</table>

**Notes:**
- If design fill is between tabulated design fills, use the next greater tabulated design fill except for design fills between 2 ft and 3 ft. For these fills, use the greater member thickness, area of reinforcement, and bar dimensions from the 2 ft and 3 ft tabulated design fills. Area of reinforcement equals bar area per foot spacing.
- Special designs are required when the design fill is less than 1 foot or greater than 50 feet.
- Dimensions are in inches unless otherwise specified.
- Design fills are measured from the top of top slab to the top of earth fill or roadway.
<table>
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<tr>
<th>Design</th>
<th>Member Thickness</th>
<th>A1 Bars</th>
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<th>H1 Bars</th>
<th>H2 Bars</th>
<th>Bottom Slab Bars</th>
<th>Wall Bars</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 ft</td>
<td>1 ft 11 in</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>7</td>
</tr>
<tr>
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<td>8</td>
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<td>8</td>
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</table>

**General Notes:**

- If design fill is between tabulated design fills, use the next greater tabulated design fill. Except for design fills between 2 feet and 4 feet, use the greater member thickness, area of reinforcement, and bar dimensions from the 2 feet and 4 feet tabulated design fills. If design fill equals bar area per foot spacing.

- Special designs are required when the design fill is less than 1 foot or greater than 50 feet.

- Dimensions are in inches unless otherwise specified.

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

**Concrete Triple Box Culvert**

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

**Span (S): 5 Feet**

**Height (H): 3 Feet or 4 Feet**

**Top Slab Bars**

<table>
<thead>
<tr>
<th>Design</th>
<th>Member Thickness</th>
<th>A1 Bars</th>
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</tr>
</tbody>
</table>

**Concrete Triple Box Culvert**

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

**Span (S): 5 Feet**

**Height (H): 5 Feet or 6 Feet**

**Top Slab Bars**

<table>
<thead>
<tr>
<th>Design</th>
<th>Member Thickness</th>
<th>A1 Bars</th>
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</table>

**Concrete Triple Box Culvert**

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

**Span (S): 6 Feet**

**Height (H): 5 Feet or 6 Feet**

**Top Slab Bars**

<table>
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<tr>
<th>Design</th>
<th>Member Thickness</th>
<th>A1 Bars</th>
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</tr>
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### Design Table

<table>
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<tr>
<th>Span (S)</th>
<th>Height (Ht)</th>
<th>Top Slab Bars</th>
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<tbody>
<tr>
<td>5 ft</td>
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<td>A1 Bars</td>
<td>A2 Bars</td>
<td>A3 Bars</td>
<td>H1 Bars</td>
</tr>
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<td>6 ft</td>
<td>6 ft</td>
<td>B1 Bars</td>
<td>B2 Bars</td>
<td>B3 Bars</td>
<td>H2 Bars</td>
</tr>
<tr>
<td>7 ft</td>
<td>6 ft</td>
<td>C1 Bars</td>
<td>C2 Bars</td>
<td>C3 Bars</td>
<td>H3 Bars</td>
</tr>
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<td>8 ft</td>
<td>6 ft</td>
<td>D1 Bars</td>
<td>D2 Bars</td>
<td>D3 Bars</td>
<td>H4 Bars</td>
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<td>E1 Bars</td>
<td>E2 Bars</td>
<td>E3 Bars</td>
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<td>10 ft</td>
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<td>F1 Bars</td>
<td>F2 Bars</td>
<td>F3 Bars</td>
<td>H6 Bars</td>
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<td>G1 Bars</td>
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<td>H1 Bars</td>
<td>H2 Bars</td>
<td>H3 Bars</td>
<td>H8 Bars</td>
</tr>
</tbody>
</table>

**General Notes:**
- If design fill is between tabulated design fills, use the next greater tabulated design fill, except for design fills between 2 and 3 ft. For these design fills, use the smaller member thickness area of reinforcement and bar dimensions from the 3 ft and 4 ft tabulated design fills. The area of reinforcement equals bar area per foot spacing.
- Special designs are required when the design fill is less than 1 foot or greater than 50 feet.
- Dimensions are in inches unless otherwise specified.
- Design fills are measured from the top of the slab to the top of earth fill or roadway.

**Concrete Triple Box Culvert**

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

**SPAN (S): 6 FT, HEIGHT (Ht): 3 FT OR 4 FT OR 5 FT**

**DATE EFFECTIVE:**
- DATE PREPARED: 10/25/2011
- SHEET NO.: 703.87
- PAGE NO.: 6 OF 27

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

**JEFFERSON**
105 WEST CAPITOL, 1-888-ASK-MODOT (1-888-275-6636)

**SYMMETRICAL ABOUT BAR DIMENSIONS DIAGRAM**

**BAR DIMENSIONS DIAGRAM**

**CONCRETE TRIPLE BOX CULVERT**

**MEMBER THICKNESS, BAR SIZE, SPACING & DIMENSIONS**

**DATE EFFECTIVE:**
- DATE PREPARED: 9/28/2011
- SHEET NO.: 703.87
- PAGE NO.: 6 OF 27

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

**JEFFERSON**
105 WEST CAPITOL, 1-888-ASK-MODOT (1-888-275-6636)
## GENERAL NOTES:

If design fill is between tabulated design fills, use the next greater tabulated design fill. Except for design fills between 2 and 3 ft in height, use the greater member thickness, area of reinforcement and bar dimensions from the 3 ft fill and design fill.

Dimensions, in inches unless otherwise specified.

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

Culverts meet strength and serviceability requirements for the design load (14 kip-Hx-3) working the lane load.

### CONCRETE TRIPLE BOX CULVERT

<table>
<thead>
<tr>
<th>MEMBER THICKNESS</th>
<th>SPAN (S)</th>
<th>HEIGHT (H)</th>
<th>BAR SIZE, SPACING &amp; DIMENSIONS</th>
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<tbody>
<tr>
<td>TOP SLAB BARS</td>
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<td></td>
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<td>B1 BARS</td>
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<tr>
<td>B2 BARS</td>
<td></td>
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</table>

### GENERAL NOTES:

If design fill is between tabulated design fills, use the next greater tabulated design fill. Except for design fills between 2 and 3 ft in height, use the greater member thickness, area of reinforcement and bar dimensions from the 3 ft fill and design fill.

Dimensions, in inches unless otherwise specified.

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

Culverts meet strength and serviceability requirements for the design load (14 kip-Hx-3) working the lane load.

### CONCRETE TRIPLE BOX CULVERT

<table>
<thead>
<tr>
<th>MEMBER THICKNESS</th>
<th>SPAN (S)</th>
<th>HEIGHT (H)</th>
<th>BAR SIZE, SPACING &amp; DIMENSIONS</th>
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<td></td>
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<td>B2 BARS</td>
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<td>--------</td>
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</tr>
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<td>50 FT</td>
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</table>

**GENERAL NOTES:**

1. If design fill is between tabulated design fills, use the next greater tabulated design fill. Except for design fills between 2 feet and 4 feet, design fills are measured from the top of top slab to the top of fill.
2. Design fills are measured from the top of top slab to the top of fill. However, for design fills between 2 feet and 4 feet, fill area is considered equal to bar area per foot spacing.
3. Special designs are required when the design fill is less than 1 foot or greater than 50 feet.
4. Dimensions are in inches unless otherwise specified.
5. Culverts meet strength and serviceability requirements for the design vehicle live load HL-93 minus the lane load.

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

**CONCRETE TRIPLE BOX CULVERT**

**MEMBER THICKNESS**

**BAR SIZE, SPACING & DIMENSIONS**

**SPAN (S) = 7 FT**

**HEIGHT (H) = 9 FT OR 10 FT**

**DATE EFFECTIVE:**
10/01/2007

**DATE PREPARED:**
9/29/2011

**SHEET NO.:**
9 OF 27

**DATE PREPARED:**
9/29/2011

**SHEET NO.:**
9 OF 27

**CONCRETE TRIPLE BOX CULVERT**

**MEMBER THICKNESS**

**BAR SIZE, SPACING & DIMENSIONS**

**SPAN (S) = 7 FT**

**HEIGHT (H) = 9 FT OR 10 FT**

**DATE EFFECTIVE:**
10/01/2007

**DATE PREPARED:**
9/29/2011

**SHEET NO.:**
9 OF 27
### Table for FEET AND 4 FEET

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<td>B5, T4, 8</td>
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<td>B1, B2, B3, B4</td>
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<td>B1, B2, B3, B4</td>
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<td>B1, B2, B3, B4</td>
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### Table for 6 FEET

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<td>B1, B2, B3, B4</td>
</tr>
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<td>14 FT</td>
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<td>B1, B2, B3, B4</td>
<td>B1, B2, B3, B4</td>
</tr>
<tr>
<td>6 FT</td>
<td>15 FT</td>
<td>B5, T4, 8</td>
<td>B1, B2, B3, B4</td>
<td>B1, B2, B3, B4</td>
</tr>
<tr>
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<td>B1, B2, B3, B4</td>
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<tr>
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<td>B1, B2, B3, B4</td>
<td>B1, B2, B3, B4</td>
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<td>B1, B2, B3, B4</td>
</tr>
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<td>B1, B2, B3, B4</td>
</tr>
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<td>B1, B2, B3, B4</td>
<td>B1, B2, B3, B4</td>
</tr>
<tr>
<td>4 FT</td>
<td>16 FT</td>
<td>B5, T4, 8</td>
<td>B1, B2, B3, B4</td>
<td>B1, B2, B3, B4</td>
</tr>
<tr>
<td>4 FT</td>
<td>18 FT</td>
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<td>B1, B2, B3, B4</td>
<td>B1, B2, B3, B4</td>
</tr>
<tr>
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<td>20 FT</td>
<td>B5, T4, 8</td>
<td>B1, B2, B3, B4</td>
<td>B1, B2, B3, B4</td>
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### Table for 2 FEET

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</thead>
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<td>B5, T4, 8</td>
<td>B1, B2, B3, B4</td>
<td>B1, B2, B3, B4</td>
</tr>
<tr>
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<td>14 FT</td>
<td>B5, T4, 8</td>
<td>B1, B2, B3, B4</td>
<td>B1, B2, B3, B4</td>
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<td>15 FT</td>
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<td>B1, B2, B3, B4</td>
<td>B1, B2, B3, B4</td>
</tr>
<tr>
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<td>B5, T4, 8</td>
<td>B1, B2, B3, B4</td>
<td>B1, B2, B3, B4</td>
</tr>
<tr>
<td>2 FT</td>
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<td>B5, T4, 8</td>
<td>B1, B2, B3, B4</td>
<td>B1, B2, B3, B4</td>
</tr>
<tr>
<td>2 FT</td>
<td>20 FT</td>
<td>B5, T4, 8</td>
<td>B1, B2, B3, B4</td>
<td>B1, B2, B3, B4</td>
</tr>
</tbody>
</table>

### General Notes

1. **Plan Fill**: Plan fill is between tabulated design fills. Use the next greater tabulated design fill except for design fills between 2 and 3. Use fill of 3 ft if the fill is not tabulated. Use the greater member thickness, area of reinforcement, and bar dimensions from the above foot and 4-foot design fills. Area reinforcement equals bar area per foot spacing.
2. **Design Requirements for Design Fills**: Design requirements are met when the design fill is less than 1 foot or greater than 50 feet.
3. **Bar Spacing**: Bar spacing is in inches unless otherwise specified.

---

**Sheet No. 9/29/2011**

**Prepared:** 10/5/2011

**Date Effective:** 10/5/2011

**Jefferson City**: 1-888-452-MODOT (1-888-275-6636)

**Jefferson City**: 1-888-452-MODOT (1-888-275-6636)

**Jefferson City**: 1-888-452-MODOT (1-888-275-6636)
### General Notes:

- **Design Fill is between tabulated design fills**, use the next greater tabulated design fill. **Except for design fills between 2 and 3 feet use the next greater tabulated design fill.**
- **Use the greater member thickness, area of reinforcement and bar dimensions from the 2 feet and 3 feet tabulated design fills.**
- **Area of reinforcement equals bar area per foot spacing.**
- **Special designs are required when the design fill is less than 1 foot or greater than 50 feet.**
- **Dimensions are in inches unless otherwise specified.**
- **Design fills are measured from the top of top slab to the top of wall slab or headwall.**

---

**Concrete Triple Box Culvert**

**Member Diameter**

<table>
<thead>
<tr>
<th>Bar Size</th>
<th>Spacing</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>B1</td>
<td></td>
</tr>
<tr>
<td>A2</td>
<td>B2</td>
<td></td>
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<tr>
<td>A3</td>
<td>B3</td>
<td></td>
</tr>
<tr>
<td>A4</td>
<td>B4</td>
<td></td>
</tr>
</tbody>
</table>

**Bar Dimensions**

- **A1 Bar:** Diameter 6.5 in, Spacing 36 in
- **A2 Bar:** Diameter 6.5 in, Spacing 36 in
- **A3 Bar:** Diameter 6.5 in, Spacing 48 in
- **A4 Bar:** Diameter 6.5 in, Spacing 48 in

**Bar Dimensions Diagram**

- Bar A1: Diameter 6.5 in, Spacing 36 in
- Bar A2: Diameter 6.5 in, Spacing 36 in
- Bar A3: Diameter 6.5 in, Spacing 48 in
- Bar A4: Diameter 6.5 in, Spacing 48 in

---

**General Notes:**

- **If Design Fill is between tabulated design fills, use the next greater tabulated design fill.**
- **Except for design fills between 2 and 3 feet use the next greater tabulated design fill.**
- **Use the greater member thickness, area of reinforcement and bar dimensions from the 2 feet and 3 feet tabulated design fills.**
- **Area of reinforcement equals bar area per foot spacing.**
- **Special designs are required when the design fill is less than 1 foot or greater than 50 feet.**
- **Dimensions are in inches unless otherwise specified.**
- **Design fills are measured from the top of top slab to the top of wall slab or headwall.**
### MEMBERS

<table>
<thead>
<tr>
<th>DESIGN</th>
<th>MEMBER THICKNESS</th>
<th>A1 BARS</th>
<th>B1 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>
<th>F1 BARS</th>
<th>F2 BARS</th>
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### SPAN (S) = 10 FT

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### GENERAL NOTES:

1. If design fill is between tabulated design fills, use the next greater不限制设计填充，使用下一个较大的设计填充。All other design fills between the two tabulated design fills should be proportionally increased or decreased to use the greater member thickness, area of reinforcement, and bar spacing. These dimensions are in inches unless otherwise specified.

### SHEET NO.

1. If design fill is between the two tabulated design fills, use the next greater不限制设计填充，使用下一个较大的设计填充。All other design fills between the two tabulated design fills should be proportionally increased or decreased to use the greater member thickness, area of reinforcement, and bar spacing. These dimensions are in inches unless otherwise specified.

### DATE EFFECTIVE:

1. If design fill is between the two tabulated design fills, use the next greater不限制设计填充，使用下一个较大的设计填充。All other design fills between the two tabulated design fills should be proportionally increased or decreased to use the greater member thickness, area of reinforcement, and bar spacing. These dimensions are in inches unless otherwise specified.
<table>
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<th>SPAN (S)</th>
<th>HEIGHT (HT)</th>
<th>MEMBER THICKNESS</th>
<th>10 FT</th>
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**GENERAL NOTES:**
1. If design fill is not between tabulated design fills, use the next greater tabulated design fill except for design fills between 2 and 4 feet. For design fills between 2 and 4 feet, use the greater member thickness, area of reinforcement, and bar dimensions from the 2 and 4 feet tabulated design fills. Area of reinforcement equals bar area per foot spacing.

2. Special designs are required when the design fill is less than 1 foot or greater than 50 feet.

3. Dimensions are in inches unless otherwise specified.

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

**CULVERTS MEET STRENGTH AND SERVICEABILITY REQUIREMENTS FOR THE DESIGN VEHICULAR LIVE LOAD HL-93 MINUS THE LANE LOAD.**
### Design

#### $\text{SPAN (S)} = 11 \text{ FT}$

| DESIGN | MEMBER THICKNESS | A1 | BARS | A2 | BARS | A3 | BARS | A4 | BARS | B1 | BARS | B2 | BARS | H | BARS | V | BARS | J1 | BAR | J2 | BAR | J3 | BAR | J4 | BAR |
|--------|------------------|----|------|----|------|----|------|----|------|----|------|----|------|---|------|---|------|---|------|---|------|---|------|---|------|---|------|---|------|---|
| 1 FT   | 5 6 8 10 | 5 6 8 10 | 5 6 8 10 | 5 6 8 10 | 5 6 8 10 | 5 6 8 10 | 5 6 8 10 | 5 6 8 10 | 5 6 8 10 | 5 6 8 10 | 5 6 8 10 | 5 6 8 10 | 5 6 8 10 | 5 6 8 10 | 5 6 8 10 | 5 6 8 10 | 5 6 8 10 | 5 6 8 10 | 5 6 8 10 | 5 6 8 10 | 5 6 8 10 | 5 6 8 10 |
| 2 FT   | 4 6 8 10 | 4 6 8 10 | 4 6 8 10 | 4 6 8 10 | 4 6 8 10 | 4 6 8 10 | 4 6 8 10 | 4 6 8 10 | 4 6 8 10 | 4 6 8 10 | 4 6 8 10 | 4 6 8 10 | 4 6 8 10 | 4 6 8 10 | 4 6 8 10 | 4 6 8 10 | 4 6 8 10 | 4 6 8 10 | 4 6 8 10 | 4 6 8 10 | 4 6 8 10 | 4 6 8 10 |
| 3 FT   | 3 5 7 9 | 3 5 7 9 | 3 5 7 9 | 3 5 7 9 | 3 5 7 9 | 3 5 7 9 | 3 5 7 9 | 3 5 7 9 | 3 5 7 9 | 3 5 7 9 | 3 5 7 9 | 3 5 7 9 | 3 5 7 9 | 3 5 7 9 | 3 5 7 9 | 3 5 7 9 | 3 5 7 9 | 3 5 7 9 | 3 5 7 9 | 3 5 7 9 | 3 5 7 9 | 3 5 7 9 | 3 5 7 9 |
| 4 FT   | 2 4 6 8 | 2 4 6 8 | 2 4 6 8 | 2 4 6 8 | 2 4 6 8 | 2 4 6 8 | 2 4 6 8 | 2 4 6 8 | 2 4 6 8 | 2 4 6 8 | 2 4 6 8 | 2 4 6 8 | 2 4 6 8 | 2 4 6 8 | 2 4 6 8 | 2 4 6 8 | 2 4 6 8 | 2 4 6 8 | 2 4 6 8 | 2 4 6 8 | 2 4 6 8 | 2 4 6 8 | 2 4 6 8 |
| 5 FT   | 1 3 5 7 | 1 3 5 7 | 1 3 5 7 | 1 3 5 7 | 1 3 5 7 | 1 3 5 7 | 1 3 5 7 | 1 3 5 7 | 1 3 5 7 | 1 3 5 7 | 1 3 5 7 | 1 3 5 7 | 1 3 5 7 | 1 3 5 7 | 1 3 5 7 | 1 3 5 7 | 1 3 5 7 | 1 3 5 7 | 1 3 5 7 | 1 3 5 7 | 1 3 5 7 | 1 3 5 7 | 1 3 5 7 |

#### $\text{HEIGHT (H)} = 6 \text{ FT OR 7 FT OR 8 FT}$

| DESIGN | MEMBER THICKNESS | A1 | BARS | A2 | BARS | A3 | BARS | A4 | BARS | B1 | BARS | B2 | BARS | H | BARS | V | BARS | J1 | BAR | J2 | BAR | J3 | BAR | J4 | BAR |
|--------|------------------|----|------|----|------|----|------|----|------|----|------|----|------|---|------|---|------|---|------|---|------|---|------|---|------|---|------|---|
| 1 FT   | 5 6 8 10 | 5 6 8 10 | 5 6 8 10 | 5 6 8 10 | 5 6 8 10 | 5 6 8 10 | 5 6 8 10 | 5 6 8 10 | 5 6 8 10 | 5 6 8 10 | 5 6 8 10 | 5 6 8 10 | 5 6 8 10 | 5 6 8 10 | 5 6 8 10 | 5 6 8 10 | 5 6 8 10 | 5 6 8 10 | 5 6 8 10 | 5 6 8 10 | 5 6 8 10 |
| 2 FT   | 4 6 8 10 | 4 6 8 10 | 4 6 8 10 | 4 6 8 10 | 4 6 8 10 | 4 6 8 10 | 4 6 8 10 | 4 6 8 10 | 4 6 8 10 | 4 6 8 10 | 4 6 8 10 | 4 6 8 10 | 4 6 8 10 | 4 6 8 10 | 4 6 8 10 | 4 6 8 10 | 4 6 8 10 | 4 6 8 10 | 4 6 8 10 | 4 6 8 10 | 4 6 8 10 |
| 3 FT   | 3 5 7 9 | 3 5 7 9 | 3 5 7 9 | 3 5 7 9 | 3 5 7 9 | 3 5 7 9 | 3 5 7 9 | 3 5 7 9 | 3 5 7 9 | 3 5 7 9 | 3 5 7 9 | 3 5 7 9 | 3 5 7 9 | 3 5 7 9 | 3 5 7 9 | 3 5 7 9 | 3 5 7 9 | 3 5 7 9 | 3 5 7 9 | 3 5 7 9 | 3 5 7 9 | 3 5 7 9 | 3 5 7 9 |
| 4 FT   | 2 4 6 8 | 2 4 6 8 | 2 4 6 8 | 2 4 6 8 | 2 4 6 8 | 2 4 6 8 | 2 4 6 8 | 2 4 6 8 | 2 4 6 8 | 2 4 6 8 | 2 4 6 8 | 2 4 6 8 | 2 4 6 8 | 2 4 6 8 | 2 4 6 8 | 2 4 6 8 | 2 4 6 8 | 2 4 6 8 | 2 4 6 8 | 2 4 6 8 | 2 4 6 8 | 2 4 6 8 | 2 4 6 8 |
| 5 FT   | 1 3 5 7 | 1 3 5 7 | 1 3 5 7 | 1 3 5 7 | 1 3 5 7 | 1 3 5 7 | 1 3 5 7 | 1 3 5 7 | 1 3 5 7 | 1 3 5 7 | 1 3 5 7 | 1 3 5 7 | 1 3 5 7 | 1 3 5 7 | 1 3 5 7 | 1 3 5 7 | 1 3 5 7 | 1 3 5 7 | 1 3 5 7 | 1 3 5 7 | 1 3 5 7 | 1 3 5 7 | 1 3 5 7 |

### General Notes:
- If design fills are not tabulated, use the next greater unfilled design fill. 
- If design fills do not exceed design fill values, use the greater member thickness, area of reinforcement, and bar diameters from the 7 feet and 8 feet tabulated design fills. 
- Dimensions are shown in inches unless otherwise specified. 
- Design fills are measured from the top of top slab to the top of earth fill or roadway. 

### Missouri Highways and Transportation Commission

**Concrete Triple Box Culvert**

| SHEET NO. 16 OF 27 | DATE EFFECTIVE: 12/19/1981 | DATE PREPARED: 9/27/1981 | SHEET NO. 703.87 |

**Date:**
- **105 West Capitol**
- **Jefferson City**
- **1-888-454-MDOT (1-888-454-6636)**
- **Missouri Highways and Transportation Commission**
- **Concrete Triple Box Culvert**
- **Member Thickness, Bar Size, Spacing & Dimensions**
- **Span (S) = 11 Feet**
- **Height (H) = 6 Feet Through 11 Feet**
### General Notes:

If design fill is between tabulated design fills, use the next greater tabulated design fill. Except for design fills between 2 and 4 feet, use a culvert that meets strength and serviceability requirements for the greater member thickness. Area of reinforcement and bar dimensions from 2 to 4 feet tabulated design fills. Area of reinforcement equals bar area per foot spacing.

Special designs are required when the design fill is less than 1 foot or greater than 10 feet.

Dimensions are in inches unless otherwise specified.

Design fills are measured from the top of top slab to the top of culvert.

Culverts meet strength and serviceability requirements for the design vehicle live load. HL-93 minus the lane load.

### Culvert Dimensions and Diagram

**Symmetrical About B1 & B2 Bars**

#### Bar Dimensions Diagram

- **Bar Dimensions Diagram**
- **Symmetrical About B1 & B2 Bars**

#### Design Member Thickness

- **A1 Bars**
- **B1 Bars**
- **H1 Bars**
- **J1 Bars**

#### Design Spans

- **Design Spans (S)**
- **Height (H)**

### Culvert Options:

- **Span (S)**: 11 FT
- **Height (H)**: 12, 13, or 14 FT

### Culvert Specifications:

- **Design Spans (S)**: 11 FT
- **Height (H)**: 12, 13, or 14 FT

### Culvert Member Thickness

- **A1 Bars**
- **B1 Bars**
- **H1 Bars**
- **J1 Bars**
### General Notes:
- Member fills are measured from the top of top slab to the top of earth fill or roadway.
- Concrete Meets Strength and Serviceability Requirements for the Design Vehicle Live Load H-20-40."

### Design Spans (s) = 12 FT, Height (Ht) = 6 Ft or 7 Ft or 8 Ft

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### Design 12 FT Height (HT)

- 12 FT Height (HT)
- 703.87 SHEET No. 18 OF 27

**Date Prepared:** 9/28/2011

**Date Effective:** 10/1/2011

**Missouri Highways and Transportation Commission**

**Jefferson City** 1-800-453-MADOT (626-6631)
### General Notes:
- **Design Fill is between Tabulated Design Fills. Use the Next Greater Unlisted Design Fill Except for Design Fills between 27 and 30 Feet. Use the Greater Member Thickness, Area of Reinforcement and Bar Dimensions from the 27 Feet Fill Tabulated Design Fill.**
- **Area of reinforcement equals bar area per foot spacing. Special Design Fills are removed when the Design Fill is less than 1 foot or greater than 50 feet.**
- **Dimensions are in inches unless otherwise specified. Design Fills are measured from the top of top slab to the top of earth fill or roadway.**
- **Culverts meet strength and serviceability requirements for the design vehicle load H-23 winds the lane load.**

### Design:
- **Member Thickness:**
  - **Bar Size:**
  - **Spacing & Dimensions:**
  - **Span:** 12 Feet
  - **Height:** 12 to 15 Feet

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</tbody>
</table>

### Diagram:
- **Bar Dimensions Diagram:**
- **Symmetrical About Center Culvert:**

---

**Missouri Highways and Transportation Commission**

**JEFFERSON CITY, MO 65101**

**1-800-45A-MODOT 1-888-275-6661**

**Concrete Triple Box Culvert**

**Member Thickness**

**Bar Size**

**Spacing & Dimensions**

**Span:** 12 Feet

**Height:** 12 to 15 Feet

**Date Effective:** 9/28/2011

**Sheet No:** 703.87

**19 of 27**
### Table: Design Specifications

<table>
<thead>
<tr>
<th>SPAN (S)</th>
<th>15 FT</th>
<th>17 FT</th>
<th>19 FT</th>
<th>21 FT</th>
<th>23 FT</th>
<th>25 FT</th>
<th>27 FT</th>
<th>29 FT</th>
<th>31 FT</th>
<th>33 FT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SPAN (S)</strong></td>
<td>15</td>
<td>17</td>
<td>19</td>
<td>21</td>
<td>23</td>
<td>25</td>
<td>27</td>
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</tr>
<tr>
<td><strong>HEIGHT (H)</strong></td>
<td>7</td>
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</tr>
<tr>
<td><strong>TOP SLAB BARS</strong></td>
<td>A1</td>
<td>A2</td>
<td>A3</td>
<td>A4</td>
<td>A5</td>
<td>A6</td>
<td>A7</td>
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</tr>
<tr>
<td><strong>SIZE</strong> (in)</td>
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<tr>
<td><strong>SPACING</strong> (in)</td>
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<tr>
<td><strong>SHELL BARS</strong></td>
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<tr>
<td><strong>BONNET SLABS</strong></td>
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<td><strong>SIZE</strong> (in)</td>
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</tbody>
</table>

#### General Notes:
- Design fill is between tabulated design fills. Use the next greater tabulated design fill except for design fills between 2 ft and 4 ft. Use the greater member thickness, area of reinforcement and bar dimensions from the 2 ft fill and 4 ft tabulated design fill. Area of reinforcement equals bar area per foot spacing.
- Critical design is required when the design fill is less than 1 ft or greater than 50 ft.

**Copies meet strength and serviceability requirements for the design variable and load H=3 when the lane load.**

---

**Concrete Triple Box Culvert**

**Member Thickness**

**Bar Size. Spacing & Dimensions**

---

**Date Prepared:** 9/29/2011

**Date Effective:** 9/29/2011

**Date Prepared:** 9/29/2011

**Sheet No.:** 703.87

---

**Missouri Highways and Transportation Commission**

105 West Capitol
1-888-ASK-MODOT (1-888-275-6636)

**Concrete Triple Box Culvert**

**Member Thickness**

**Bar Size. Spacing & Dimensions**

---

**Date Effective:** 9/29/2011

**Date Prepared:** 9/29/2011

**Sheet No.:** 20 of 27
### Table

<table>
<thead>
<tr>
<th>SPAN (S)</th>
<th>13 FT Height (Ht) = 13 FT or 14 FT</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 FT</td>
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<tr>
<td>12 FT</td>
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<td>14 FT</td>
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<td>48 FT</td>
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</table>

### Diagram

**Legend:**
- **MEMBER TOP SLAB BARS**
- **BOTTOM SLAB BARS**
- **WALL BARS**

**General Notes:**
- If design fill is between tabulated design fills, use the next greater tabulated design fill. If design fill is between 2 and 4 feet, use the next smaller tabulated design fill. If the fill is greater than 4 feet, use the next greater fill. If the fill is less than 1 foot, use the next smaller fill. Use the greater member thickness, area of reinforcement, and bar dimensions from the 2 feet and 4 feet tabulated design fills.
- Special designs are required when the design fill is less than 1 foot or greater than 50 feet.
- Dimensions are in inches unless otherwise specified.

**Culvert Requirements:**
- For culverts with a live load, use 13 feet for the 13 feet or 14 feet height.
- Culverts meet strength and serviceability requirements for the 13 feet or 14 feet height when used to carry the specified live load.

**Design Fill:**
- Design fills are measured from the top of the top slab to the top of the culvert.

**Concretes:**
- Use the appropriate member thickness for the specified height.

**Dates:**
- Date Effective: [Date]
- Date Prepared: [Date]
### Design Table

<table>
<thead>
<tr>
<th>SPAN (S)</th>
<th>Design Height (H)</th>
<th>Table 1</th>
<th>Table 2</th>
<th>Table 3</th>
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<tbody>
<tr>
<td>10 FT</td>
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<td>38 FT</td>
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</tbody>
</table>

### Diagram

- **Design Layout**
- **Bar Dimensions Diagram**
- **Concrete Triple Box Culvert**
- **Member Thickness**
- **Size, Spacing & Dimensions**
- **Span (S) = 14 FT**
- **Height (H) = 7 FT OR 8 FT OR 9 FT**
- **Top Slab Bars**
- **Bottom Slab Bars**
- **General Notes**
- **Date Prepared:** 2/28/2011
- **Date Effective:** 3/10/2012
- **Sheet No.:** 22 of 27
### Table 1: Design Span (5) = 15 FT

<table>
<thead>
<tr>
<th>Member Thickness (in.)</th>
<th>A1 Bars</th>
<th>A2 Bars</th>
<th>B3 Bars</th>
<th>B4 Bars</th>
<th>B5 Bars</th>
<th>A2 Bars</th>
<th>A3 Bars</th>
<th>A4 Bars</th>
<th>C1 Bars</th>
<th>C2 Bars</th>
<th>C3 Bars</th>
<th>C4 Bars</th>
<th>C5 Bars</th>
<th>C6 Bars</th>
<th>C7 Bars</th>
<th>C8 Bars</th>
<th>C9 Bars</th>
<th>C10 Bars</th>
<th>C11 Bars</th>
<th>C12 Bars</th>
<th>C13 Bars</th>
<th>C14 Bars</th>
<th>C15 Bars</th>
<th>C16 Bars</th>
<th>C17 Bars</th>
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</thead>
<tbody>
<tr>
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<tr>
<td>HT = 9 FT</td>
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<tr>
<td>HT = 10 FT</td>
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<td>1.5</td>
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</tbody>
</table>

**General Notes:**
- If Design Fill is between tabulated design fills, use the next greater tabulated design fill. Excerpt from Table 2.
- Use the greater member thickness, area of reinforcement and bar area if reinforcement equals bar area per foot spacing.
- Special Designs are required when the Design Fill is less than 1 Foot or greater than 50 Feet.
- Dimensions are in inches unless otherwise specified.
- Design fills are measured from the top of top slab to the top of earth fill or roadbed.

**Concrete Triple Box Culvert**

**Design:**
- Number of spans: 2
- Culvert Type: Symmetrical about H1.

**Member Size:**
- Bar size: Spacing & Dimensions

**Date Prepared:** 9/29/2011

**Missouri Highways and Transportation Commission**

**Date Effective:** 8/8/2011

**Missouri Department of Transportation**

**Date Prepared:** 9/28/2011

**Sheet No.:** 703.87

**24 of 27**
**DIMENSIONS AND BAR DIMENSIONS DIAGRAM**

**GENERAL NOTES:**
- If design fill is between tabulated design fills, use the next greater tabulated design fill. Except for design fills between 2 feet and 4 feet, use the greater member thickness, area of reinforcement and bar dimensions from the 2 feet and 4 feet tabulated design fills.
- Special designs are required when the design fill is less than 1 foot or greater than 50 feet.
- Dimensions are in inches unless otherwise specified.
- Design fills are measured from the top of top slab to the top of culvert.

**DESIGN FILL SPECIFICATIONS:**
- Fill K2
- Fill K3
- Fill K4

**SPANN (S) = 15 FT**

**HEIGHT (HT) = 14 FT OR 15 FT OR 16 FT**

**Sheet No.: 25 of 27**

**DATE PREPARED:** 9/29/2011

**DATE EFFECTIVE:** 9/29/2011

**CONCRETE TRIPLE BOX CULVERT**

**MEMBER THICKNESS**

<table>
<thead>
<tr>
<th>DESIGN</th>
<th>MATERIAL</th>
<th>MEMBER THICKNESS</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>

**BAR SIZE, SPACING & DIMENSIONS**

<table>
<thead>
<tr>
<th>DESIGN</th>
<th>MATERIAL</th>
<th>BAR SIZE</th>
<th>BAR SPACING</th>
</tr>
</thead>
<tbody>
<tr>
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**Symmetrical About Bar Dimensions Diagram**

**Member Thickness Diagram**

**Bar Dimensions Diagram**

**Note:**
- Culverts meet strength and serviceability requirements for the design vehicle live load HL-93 minus the lane load.
### GENERAL NOTES:

1. If design fill is between tabulated design fills, use the next greater tabulated design fill except for design fills between 2 and 3 feet. Use the greater member thickness, area of reinforcement, and bar design vehicular live load HL-93 minus the lane load.

2. Dimensions from the 2 feet and 4 feet tabulated design fills.

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

#### CONCRETE TRIPLE BOX CULVERT

**DIMENSION DIAGRAM**

**SYMMETRICAL ABOUT**

**MEMBER THICKNESS**

**BAR SIZE, SPACING & DIMENSIONS**

**SPAN (S) = 16 FT**

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<th>SPA.</th>
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<tr>
<td>C1 CULVERT</td>
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**SPANN (S) = 14 FT OR 15 FT OR 16 FT**

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**DATE PREPARED:**

9/29/2011

**CONCRETE TRIPLE BOX CULVERT**

**MEMBER THICKNESS**

**BAR SIZE, SPACING & DIMENSIONS**

**SPAN (S) = 16 FT**

**HEIGHT (H) = 14 FT OR 15 FT OR 16 FT**

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MAX. SPACING

(1) CLEAR DISTANCE AS SPECIFIED ON PLAN.

PART CROSS SECTION

W BEAM SPANS
PLATE GIRDER SPANS
PRESSED GIRDER SPANS
DECK GIRDER SPANS
BOX GIRDER SPANS (TOP SLAB ONLY)

SLABS ON STRINGERS AND GIRDERS

(1) CLEAR DISTANCE AS SPECIFIED ON PLAN.

PART CROSS SECTION

PART SECTION A-A

SLABS ON PRECAST PRESTRESSED PANELS

SLABS ON STRINGERS AS SPECIFIED ON PLANS.

PART CROSS SECTION

PART SECTION C-C

SLAB SPANS - NO Voids (SOLID)
TRUSSES - NO LONGITUDINAL STRINGERS

PART CROSS SECTION

PART SECTION D-D

SLAB SPANS - WITH Voids

PART CROSS SECTION

PART SECTION H-H

SLABS ON P/S DOUBLE-TEE GIRDER

NOTE: VARY DIE HEIGHT AS REQUIRED FOR BOX GIRDERS.

MAX. SPACING

(1) CLEAR DISTANCE AS SPECIFIED ON PLAN.

PART CROSS SECTION

MAX. SPACING

(1) CLEAR DISTANCE AS SPECIFIED ON PLAN.

PART CROSS SECTION

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MAX. SPACING

(1) CLEAR DISTANCE AS SPECIFIED ON PLAN.

PART CROSS SECTION

MAX. SPACING

(1) CLEAR DISTANCE AS SPECIFIED ON PLAN.
TYPICAL TRENCH DETAIL

PIPE INSTALLATION AND BEDDING

NOTE:
A) MINIMUM STRUCTURAL BACKFILL OVER TOP OF PIPE SHALL BE ONE-EIGHTH DIAMETER OR SPAN OF PIPE OR ONE FOOT WHICHEVER IS GREATER.
B) BEDDING BLANKET OF LOOSE FILL SHALL BE ROUGHLY SHAPED TO FIT BOTTOM OF PIPE. MINIMUM THICKNESS BEFORE PLACING PIPE SHALL BE AS FOLLOWS:

<table>
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<tr>
<th>DEPTH OF CORRUGATION</th>
<th>MIN. BEDDING THICKNESS</th>
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</table>
C) TRENCH INSTALLATIONS - 2 FEET MINIMUM EACH SIDE OF CULVERT. THIS RECOMMENDED LIMIT SHOULD BE MODIFIED AS NECESSARY TO ACCOUNT FOR VARIABLES SUCH AS POOR IN-SITU SOILS. EMBANKMENT INSTALLATIONS - ONE DIAMETER OR SPAN EACH SIDE OF CULVERT.

DEPRESSIONS - 2 FEET MINIMUM EACH SIDE OF CULVERT.

ALTERNATIVE-SHAPED BEDDING

PIECE-ARCH TRENCH DETAIL

BEDDING AND CORNER ZONE TREATMENT FOR PIPE ARCH STRUCTURES

MULTIPLE STRUCTURE SPACING

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.
## Specified Minimum 0.105 Cover 0.06 0.075 0.135 0.164

<table>
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<tr>
<th>Specified Diameter of Pipe</th>
<th>D-125</th>
<th>D-126</th>
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### Maximum Allowable Overfill Heights (1)

**A = 2-2/3" x 1/2" Corrugations.**
**B = 3" x 1" Corrugations.**
**C = 5" x 1" Corrugations.**
**D = 3/4" x 3/4" x 1-1/2" Spiral Rib**

111 Maximum overfill measured from the top of pipe to surface.

---

**Corrugated H32 Aluminum Circular Pipe Riveted Seam**

### Maximum Allowable Overfill Heights (1)

<table>
<thead>
<tr>
<th>Specified Diameter of Pipe</th>
<th>D-125</th>
<th>D-126</th>
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<th>D-0.075</th>
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**Corrugated Metal Pipe Installation Methods**

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

**Corrugated H32 Aluminum Circular Pipe Lock Seam**

**Corrugated H32 Aluminum Circular Pipe Riveted Seam**

*FOR TRENCH INSTALLATION ONLY*
**CORRUGATED H34 ALUMINUM CIRCULAR PIPE LOCK SEAM**

**SPECIFIED MINIMUM DIAMETER OF PIPE**

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**MAXIMUM ALLOWABLE OVERFILL HEIGHTS (1)**

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**CORRUGATED H34 ALUMINUM CIRCULAR PIPE RIVETED SEAM**

**SPECIFIED MINIMUM DIAMETER OF PIPE**

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**MAXIMUM ALLOWABLE OVERFILL HEIGHTS (1)**

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
<th>J</th>
<th>K</th>
<th>L</th>
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<tr>
<td>MAXIMUM</td>
<td>0.06</td>
<td>0.075</td>
<td>0.105</td>
<td>0.135</td>
<td>0.164</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
<td>F</td>
<td>G</td>
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<td></td>
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</tr>
</tbody>
</table>

**NOTES:**

- For trench installation only.
- 111 Maximum overfill measured from the top of pipe to surface.

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

**JEFFERSON CITY, MO 65102**

**105 WEST CAPITOL**

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

**DATE EFFECTIVE:** 06/23/2011

**DATE PREPARED:** 04/20/2003

**725.00C SHEET NO. 4 OF 5**
### Minimum Cover for Construction Loads (Round and Pipe-Arch)

<table>
<thead>
<tr>
<th>Diameter or Pipe Span</th>
<th>Minimum Cover (ft.) for Indicated Axle Loads (1)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>18k lbs.-50k lbs.-100k lbs.-150k lbs.</td>
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<tr>
<td></td>
<td>50k lbs.-75k lbs.-110k lbs.-150k lbs.</td>
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<tr>
<td>FT.</td>
<td>FT.</td>
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<tr>
<td>12-42</td>
<td>2.0</td>
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<td>40-72</td>
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<td>78-120</td>
<td>3.5</td>
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<tr>
<td>126-144</td>
<td>4.0</td>
</tr>
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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.

(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.
CONSTRUCTION SEQUENCE
1. PLACE BEDDING MATERIAL TO GRADE.
   DO NOT COMPACT.
2. INSTALL PIPE TO GRADE.
3. COMPACT BEDDING OUTSIDE THE MIDDLE
   THIRD OF THE PIPE.
4. PLACE AND COMPACT THE HAUNCH AREA
   UP TO THE SPRINGLINE.
5. COMPLETE BACKFILL ACCORDING TO
   SPECIFICATIONS.

MAXIMUM DIAMETER AND
MAXIMUM FILL HEIGHT

<table>
<thead>
<tr>
<th>CLASS OF PIPE</th>
<th>INSTALLATION TYPE</th>
<th>CLASS I</th>
<th>CLASS II</th>
<th>CLASS III</th>
<th>CLASS IV</th>
<th>CLASS V</th>
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<tr>
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<td>108</td>
<td>108</td>
<td>84</td>
<td>72</td>
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<tr>
<td></td>
<td>MAXIMUM FILL HEIGHT IN FEET</td>
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<td>49</td>
<td>47</td>
<td>45</td>
<td>43</td>
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<td>33</td>
<td>51</td>
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<td>TYPE 2</td>
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<td>26</td>
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<td>TYPE 3</td>
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<td>9</td>
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<td>20</td>
<td>30</td>
<td></td>
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<tr>
<td>TYPE 4</td>
<td>4</td>
<td>6</td>
<td>9</td>
<td>13</td>
<td>20</td>
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</table>

IF FILL HEIGHT EXCEEDS 51 FEET AND PIPE DIAMETER IS 36 INCHES OR LESS A SPECIAL PIPE DESIGN AND INSTALLATION PROCEDURE SHALL BE REQUIRED. IF FILL HEIGHT EXCEEDS 51 FEET AND PIPE DIAMETER IS GREATER THAN 36 INCHES A SPECIAL DESIGN PIPE IS NOT ALLOWED.

BEDDING AND COMPACTION REQUIREMENTS

<table>
<thead>
<tr>
<th>INSTALLATION TYPE</th>
<th>BEDDING THICKNESS</th>
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<tr>
<td></td>
<td>HAUNCH AND OUTER BEDDING</td>
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<td>CATEGORY 1</td>
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<td>SOIL (A)</td>
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<tr>
<td>1</td>
<td>D6/24 MINIMUM, NOT LESS THAN 3&quot;, IF ROCK FOUNDATION, USE D6/12 MINIMUM, NOT LESS THAN 6&quot;.</td>
</tr>
<tr>
<td>2</td>
<td>D6/24 MINIMUM, NOT LESS THAN 3&quot;, IF ROCK FOUNDATION, USE D6/12 MINIMUM, NOT LESS THAN 6&quot;.</td>
</tr>
<tr>
<td>3</td>
<td>D6/24 MINIMUM, NOT LESS THAN 3&quot;, IF ROCK FOUNDATION, USE D6/12 MINIMUM, NOT LESS THAN 6&quot;.</td>
</tr>
<tr>
<td>4</td>
<td>D6/24 MINIMUM, NOT LESS THAN 3&quot;, IF ROCK FOUNDATION, USE D6/12 MINIMUM, NOT LESS THAN 6&quot;.</td>
</tr>
</tbody>
</table>

GENERAL NOTES:

MULTIPLE PIPE CULVERTS SHALL BE INSTALLED WITH A MINIMUM CLEARANCE BETWEEN PIPES OF 3 D6 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.

TYPICAL CAMBERED FLOW LINE

NOTE:

ON YIELDING SOIL, PIPE CULVERTS SHALL BE PLACED ON A CAMBERED FLOW LINE. THE AMOUNT OF CAMBER WILL VARY WITH SOIL CONDITION AND SHALL BE SPECIFIED ON THE DESIGN PLANS.
SEE TABLE II (SEC. 726) FOR WIDTH OF TRENCH

EXTRA STRENGTH

STANDARD STRENGTH

HEIGHT OF FILL OVER V.C. PIPE CULVERTS

<table>
<thead>
<tr>
<th>NOMINAL PIPE DIAMETER (INCH)</th>
<th>STANDARD STRENGTH</th>
<th>EXTRA STRENGTH</th>
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<tr>
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<td>MINIMUM FILL HEIGHT (FEET)</td>
<td>MAXIMUM FILL HEIGHT (FEET)</td>
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<tr>
<td></td>
<td>TRENCH WIDTH AT ONE FOOT ABOVE TOP OF PIPE</td>
<td>TRENCH WIDTH AT ONE FOOT ABOVE TOP OF PIPE</td>
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<tr>
<td>6</td>
<td>2.0</td>
<td>2.0</td>
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<tr>
<td>36</td>
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</tr>
</tbody>
</table>

CLASS 3 EXCAVATION LIMITS MEASURED FROM ORIGINAL GROUND LINE TO BOTTOM OF PIPE FOR GROUP I PIPE.

CLASS 3 EXCAVATION LIMITS MEASURED FROM ORIGINAL GROUND LINE TO BOTTOM OF TRENCH WHEN VITRIFIED CLAY PIPE IS SPECIFIED.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION 105 WEST CAPITOL JEFFERSON CITY, MO 65102 1-888-ASK-MODOT (1-888-275-6636) RIGID CULVERT INSTALLATION METHODS VITRIFIED CLAY PIPE CULVERTS
**OUTSIDE DIAMETER OF PIPE. (D o /'1") +6" (MIN.)**

**INSIDE DIAMETER OF PIPE.**

1. COMPLETE STRUCTURAL BACKFILL ACCORDING TO SPECIFICATIONS.

2. COMPACT BEDDING OUTSIDE THE MIDDLE THIRD OF THE PIPE.

3. PLACE BEDDING MATERIAL TO GRADE.

**NOTE:**
- MULTIPLE PIPE SHALL BE INSTALLED WITH A MINIMUM CLEARANCE BETWEEN PIPES OF \(\frac{D_{o}}{10}\) OR 12", WHICHEVER IS GREATER, BUT NOT TO EXCEED 36".
- MULTIPLE PIPE SHALL BE INSTALLED WITH A MINIMUM CLEARANCE BETWEEN PIPES OF \(\frac{D_{o}}{10}\) OR 12", WHICHEVER IS GREATER, BUT NOT TO EXCEED 36".

**NOTE:**
- WHEN ROCK, UNYIELDING, SOFT, OR OTHERWISE UNSUITABLE MATERIAL IS ENCOUNTERED.

**FILL HEIGHT LIMITS**

**MINIMUM COVER FOR CONSTRUCTION LOADS**

<table>
<thead>
<tr>
<th>PIPE DIA. (IN.)</th>
<th>POLYETHYLENE</th>
<th>STEEL REINFORCED POLYETHYLENE</th>
<th>POLYVINYL</th>
<th>DOUBLE WALL POLYPROPYLENE</th>
<th>TRIPLE WALL POLYPROPYLENE</th>
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<tr>
<td></td>
<td>MIN.</td>
<td>MAX.</td>
<td>MIN.</td>
<td>MAX.</td>
<td>MIN.</td>
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<td>1.5</td>
<td>1.8</td>
<td>35</td>
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<td>38</td>
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<td>18</td>
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<td>1.9</td>
<td>2.3</td>
<td>42</td>
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<td>60</td>
<td>60</td>
<td>2.6</td>
<td>3.0</td>
<td>50</td>
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**THERMOPLASTIC PIPE INSTALLATION METHODS**

**NOTE:**
- SPD = STANDARD PROCTOR DENSITY.
- FILL HEIGHT MEASURED FROM THE TOP OF PIPE TO SURFACE.
- LIMITS ACCOUNT FOR SHORT-TERM TEMPORARY WATER TABLE DEPTHS OF FIVE FEET ABOVE SPRINGLINE.
- TABLES ARE NOT APPLICABLE FOR PERMANENT WATER TABLE DEPTHS ABOVE SPRINGLINE.
- WHEN PIPES ARE USED AS GROUP A, FILL HEIGHTS ARE LIMITED TO SHARED VALUES.

**NOTE:**
- ON YIELDING SOIL, PIPE CULVERTS SHALL BE PLACED ON A CAMBERED FLOW LINE. THE AMOUNT OF CAMBER WILL VARY WITH SOIL CONDITION AND WILL BE SPECIFIED ON THE DESIGN PLANS.
GENERAL NOTES:

- The contractor will be permitted to cast in place the manholes, in accordance with the concrete manhole standards.
- If the contractor elects to cast in place the manholes, payment will be at the contract unit price for precast manholes.
- The configuration details shown are descriptive only and may be varied to conform with established manufacturing procedures.
- Figure or cut out openings shall be provided where pipe inlets and outlets are shown on the plans.
- The top of the outlet pipe shall not be set below the top of the outlet pipe.
- Reinforcement shall be cut at pipe openings.
- No direct payment will be made for cutting pipe, nor for cutting and bending reinforcing steel.
- Where the width of the base section is greater than 42", an eccentric sleeper section may be used to allow the use of 42" sleeper sections.
- The lower transition section as shown in Section 4-4 is optional.
- Foil water drops are required when specified in the plans; no direct payment will be made for the foil water drop or its equivalent.
- See standard plans for manhole frames and covers.
- Where pipes do not enter or exit partially, the next larger size manholes, class 1 elevation will be used with each pipe within the linear limits and outside walls of the base section of the manhole; class 1 elevation will not be used for outside the footing limits.
- All pipe connected with a manhole will be measured and paid for to the inside wall of the manhole.
- Ornamental reinforcement size and placement shall be in accordance with the standard specifications to a maximum depth of 24 feet.  Over 24 foot depth ornamental reinforcement is increased to 0.75" concrete; check with local authorities to determine for footing, to a maximum depth of 30 feet.
- For flexible connections, a rubber gasket in accordance with ASTM rubber gasket specifications C-434 or comparable is to be used in the manhole.  A layer of neoprene may be used as an alternate to expansible mortar.
SECTION A-A

SECTION B-B

SECTION C-C

INLET PLAN

BENDING DIAGRAM

STEEL STEP BAR
TYPE S-1

TYPE S-2

TYPE S-3

SECTION A-A

SECTION B-B

SECTION C-C

SECTION D-D

SECTION E-E

SECTION F-F

SECTION G-G

SECTION H-H

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 finishing invert concrete.

TYPICAL INVERTS

<table>
<thead>
<tr>
<th>WIDTH</th>
<th>LENGTH</th>
<th>TYPE</th>
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<td>2</td>
<td>A-B-C</td>
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<tr>
<td>2</td>
<td>2</td>
<td>E</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>E-5-1</td>
</tr>
<tr>
<td>5</td>
<td>2</td>
<td>5+2, 5+3</td>
</tr>
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</table>
Half-Plan
Concrete Vane Gate and Frame

Section E-E

Half-Section F-F
Type A
Inlet Adjacent to Curb

Half-Section H-H
Type B
Distance between Barrier and Pavement Edge Greater Than Inlet Width

Section J-J
Half-Section J-J
Type C
Distance between Barrier and Pavement Edge Equal to Inlet Width

DETAIL A

BENDING DIAGRAM

SEE STANDARD PLAN 614.11 FOR CHROVED VANE GATE

PRECAST DROP INLET COVERS

DATE REVISED: 07/08/2016
DATE PREPARED: 07/08/2016

731.10S 3 OF 8
SECTION 0-0
OPTIONAL PRECAST CURB INLET
5'-0" OPENING

OTHER DETAILS SPECIFIED AS FOR THE 2'-6" OPENING DROP INLET THIS SHEET.
DETAILS FOR ROADWAY DITCH INLETS
LOCATED WITHIN THE CLEAR ZONE
## Reinforcement

<table>
<thead>
<tr>
<th>DIMENSIONS</th>
<th>BELL OR SPIGOT AS REQUIRED</th>
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<tbody>
<tr>
<td></td>
<td>TOE WALL CONSTRUCTED AT OUTLET END ONLY</td>
</tr>
<tr>
<td></td>
<td>SECTION A-A</td>
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</tbody>
</table>

### Flared End Section

- **Installation Details**
- **Plan View**
- **Fabricated Pipe**
- **Layer of Grout Between End Section and Toe Wall**

### Barrel Section Reinforcement

#### Circular
<table>
<thead>
<tr>
<th>Pipe Dia.</th>
<th>A</th>
<th>B min.</th>
<th>C</th>
<th>D</th>
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#### Elliptical
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<td>0.46</td>
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</table>

### General Notes:
- Slight variations in both shape and dimensions from those shown may be accepted if approved by the engineer.
- Not more than three lift holes may be drilled or cast in the end section for handling and lashing.
- Toe walls may be cast-in-place or precast.
- Steel fibers may be used in lieu of rebar or cold drawn steel wire as per Section 1032.3.4.
**CONNECTION REQUIREMENTS**

<table>
<thead>
<tr>
<th>TYPE</th>
<th>CONNECTOR TYPE</th>
<th>ALLOWABLE SIZE RANGE (IN.)</th>
<th>CMP</th>
<th>RCP</th>
<th>PVC</th>
<th>PP</th>
<th>PE</th>
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<tr>
<td>SAFETY END SECTION</td>
<td>2</td>
<td>ALL</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>12-24</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>METAL FLARED END SECTION</td>
<td>1</td>
<td>12-24</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>N</td>
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<td></td>
<td>2</td>
<td>ALL</td>
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<td>Y</td>
<td>N</td>
<td>Y</td>
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<td>3</td>
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<td>Y</td>
<td>N</td>
<td>N</td>
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<td>N</td>
<td>N</td>
<td>N</td>
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<td>N</td>
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<td>6</td>
<td>12-24</td>
<td>N</td>
<td>Y</td>
<td>N</td>
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<td>N</td>
</tr>
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</table>

**TAPERED SLEEVE CONNECTION FOR CONCRETE AND THERMOPLASTIC PIPE**

Tapered sleeve shall be firmly wedged into pipe end before backfilling pipe pay length.

**GENERAL NOTES:**

Minor variations of detail and dimensions will be accepted to permit the use of a manufacturer's standard methods of fabrication.

Tapered sleeves shall be fabricated from smooth 12 gauge steel coated in accordance with ASHTO M-231.

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 cost of the tapered sleeve, hardware, and installation shall be included in the cost of the pipe.

Tapered sleeves shall have at a minimum a half coring up of the pipe designed to provide a secure connection with the end section.

Any rod or strap used for making a connection shall be securely sleeved into a valley of the pipe corrugation. The valley chosen to hold the rod or strap shall leave at least one full height of steel pipe diameter before the end of the pipe. The female portion of a bell end shall not extend as a full height of corrugation.

**END SECTION FOR PIPE AND PIPE ARCH**

**FLARED END SECTION**
### Beveled Pipe Encasement Details

<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>
</tr>
</thead>
<tbody>
<tr>
<td>15°</td>
<td>3'11'</td>
<td>5'4&quot;</td>
<td>2'7&quot;</td>
<td>6'1&quot;</td>
<td>1'12&quot;</td>
<td>1'</td>
<td>3'4&quot;</td>
<td>18°</td>
</tr>
<tr>
<td>31°</td>
<td>3'11'</td>
<td>5'4&quot;</td>
<td>2'7&quot;</td>
<td>6'1&quot;</td>
<td>1'12&quot;</td>
<td>1'</td>
<td>3'4&quot;</td>
<td>18°</td>
</tr>
<tr>
<td>36°</td>
<td>3'11'</td>
<td>5'4&quot;</td>
<td>2'7&quot;</td>
<td>6'1&quot;</td>
<td>1'12&quot;</td>
<td>1'</td>
<td>3'4&quot;</td>
<td>18°</td>
</tr>
<tr>
<td>41°</td>
<td>3'11'</td>
<td>5'4&quot;</td>
<td>2'7&quot;</td>
<td>6'1&quot;</td>
<td>1'12&quot;</td>
<td>1'</td>
<td>3'4&quot;</td>
<td>18°</td>
</tr>
<tr>
<td>46°</td>
<td>3'11'</td>
<td>5'4&quot;</td>
<td>2'7&quot;</td>
<td>6'1&quot;</td>
<td>1'12&quot;</td>
<td>1'</td>
<td>3'4&quot;</td>
<td>18°</td>
</tr>
</tbody>
</table>

#### Plan View for Highways

**General Notes:**
- Concrete used in construction of the beveled pipe encasement shall be Class B concrete or an approved commercial mix meeting requirements of Section 501 of the Standard Specifications.
- Reinforcing steel used in construction of the beveled pipe encasement shall meet the requirements of Section 1036 of the Standard Specifications.
- Beveled pipe encasement may be used with either pre-stressed or corrugated metallic coated steel pipe.

**Beveled Pipe Encasement:**
- The pipe is to be encased with a beveled angle of 15°.
- The 2" x 6" bolt and nuts shall be galvanized in accordance with Section 1034 of the Standard Specifications. Low carbon steel backing bolts shall be ASTM Grade 3B.
- Beveled pipe shall be filled at locations shown on plans for placement of 2" x 6" galvanized bolts.

**Section 1-1**
- Galvanized 2" x 6" bolt (typical) 4 bolts required

**Section C-C**
- Galvanized 2" x 6" bolt (typical) 8 bolts required

**Section B-B**
- Galvanized 1" x 6" bolt (typical) 12 bolts required
PIPE END DETAILS FOR PARALLEL DRAINAGE STRUCTURES FOR DRIVEWAYS
(SINGLE PIPE INSTALLATION)

NOTE:

FOR MULTIPLE PIPE INSTALLATIONS, END SECTIONS WITH SAFETY RISE SYSTEM OR OPTIONAL BAR RISE SYSTEM SHALL BE PROVIDED. SEE STANDARD PLAN 532-100.

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 501 OF THE STANDARD SPECIFICATIONS.

REINFORCING STEEL USED IN CONSTRUCTION OF THE BEVELED PIPE ENCASMENT SHALL MEET THE REQUIREMENTS OF SECTION 1038 OF THE STANDARD SPECIFICATIONS.

BEVELED PIPE ENCASMENT MAY BE COVERED WITH EITHER POLYVINYLCHLORIDE OR CORRUGATED METALIC COATED STEEL PIPE.

THE PRICE BID FOR 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.


GENERAL NOTES:

END SECTIONS, INCLUDING ALL BOLTS, NUTS, RODS AND STRAPS, SHALL BE FABRICATED FROM GAUGED STEEL MEETING THE REQUIREMENTS OF SECTION 1020.

ALL BOLTS UNLESS OTHERWISE SHOWN SHALL BE ASTM A490 BOLTS.

WHEN REQUIRED, OPTIMUM PLATE EXTENSION SHALL BE FURNISHED OR ADDED TO THE END SECTION. THE PLATE, STEEL FOR THE PLATE EXTENSION SHALL BE SAME GAUGE AS THE END SECTION. DIMENSIONS SHALL BE IN LENGTH NOT LESS THAN 6" BY 8" HIGH.

ATTACHMENT TO CIRCULAR PIPES 12" THROUGH 24" DIAMETER SHALL BE MADE WITH TYPE MI STRAPS. ALL OTHER SIZES SHALL BE ATTACHED WITH TYPE NO CONNECTORS.

SAFETY BARS AND LONGITUDINAL BARS SHALL BE FABRICATED FROM STEEL PIPE MEETING THE REQUIREMENTS OF ASTM A-530 SPECIFICATIONS. SAFETY BARS AND LONGITUDINAL BARS SHALL BE MADE IMPERIAL GAUGED AFTER FABRICATION IN ACCORDANCE WITH SECTION 1020 OF STANDARD SPECIFICATIONS.

INSTALLATION SHALL BE PERFORMED IN ACCORDANCE WITH SECTION 725.2 OF THE STANDARD SPECIFICATIONS.

SLOTTED HOLES FOR THE FABRICATED END SECTIONS SHALL BE PROVIDED FOR ALL END SECTIONS.

MAJOR VARIATIONS OF DETAIL WILL BE ACCEPTED TO PERMIT THE USE OF A MANUFACTURER’S STANDARD METHODS OF FABRICATION.

END SECTIONS FABRICATED FROM THICKER METAL THAN INDICATED WILL BE ACCEPTED.

ALL BOLTS SHALL BE 3" DIAMETER AND GALVANIZED, UNLESS OTHERWISE SHOWN.

SECTIONS ARE DEFINED AS THE PLATE PORTION OF THE END SECTION INCLUDING SIDE AND BOTTOM CENTER PANELS AND ARMS.

SECTIONS FOR 12" THROUGH 24" PIPES SHALL BE MADE IN ONE PIECE.

SECTIONS FOR 18" AND LARGER PIPES MAY BE MADE FROM UP TO 3 SECTIONS JOINED BY FABRICATION OR EATING ON CENTERLINE.

SECTIONS FOR 24" AND LARGER PIPES MAY BE MADE FROM UP TO 3 SECTIONS JOINED BY FABRICATION OR EATING ON CENTERLINE.

ALL 3 PIECE SHIFTS FOR 60" PIPES SHALL HAVE 0.125" THICKNESS AND 0.125" THICK CENTER PANELS. CENTER PANELS SHALL BE GREATER THAN 8" OR THE PIPE PERIMETER CONNECTOR SECTIONS. COPPER PLATES AND THE PLATE SHALL BE GALVANIZED ONE SIDE AND ONE THICKNESS AS THE SHAPED.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

MO DOT CAMPAIGN
JEFFERSON CITY, MO 65102
1-800-296-MOARD (66273) 1-660-296-7627 1-660-296-7628

SAFETY SLOPE
END SECTION

SHEET NO. 1 OF 3
**SAFETY SLOPE END SECTION**

For details of optional bar grate, see Sheet 3 of 3.

**NOTE:**
See driveway standard plans for beveled end section requirement.

For connection details, see 732.00 Sheet 3 of 3.

---

### Metal End Sections for Circular Pipes

<table>
<thead>
<tr>
<th>Pipe Dia. (in.)</th>
<th>Min. Gauge Ends (in.)</th>
<th>Min. Gauge Ends (in.)</th>
<th>Dimensions in Inches</th>
<th>Dimensions</th>
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</thead>
<tbody>
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<td></td>
<td>4 1/16 &amp; 6 1/11</td>
<td>4 1/16 &amp; 6 1/11</td>
<td>Overall Length (in.)</td>
<td>Slope (in.)</td>
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<tr>
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<td>1&quot; Tol.</td>
<td>1&quot; Tol.</td>
</tr>
<tr>
<td>16</td>
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<td>16</td>
<td>8</td>
<td>6</td>
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<tr>
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<td>60</td>
<td>12</td>
<td>12</td>
<td>16</td>
<td>12</td>
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</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**

**DATE EFFECTIVE:** 06/01/2013

**DATE PREPARED:** 11/12/2013

**SHEET NO.:** 3 OF 3

**DATE PREPARED:** 4/1/2013

**SHEET NO.:** 732.10H

**SELECTION D-D**

**SECTION D-D**

**PLAN**

**ELEVATION**

**DETAIL A**

**BENT PLATE ANCHOR**

**DETAIL B**

**U-BOLT ANCHOR**

**DETAIL C**

**U-BOLT ANCHOR**

**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).
ROCK DITCH CHECK

WEST SHALL MATCH BOTTOM OF DITCH

END VIEW

FLOW

VARIABLE 2'-0" MIN.

SECTION A-A

* GEOTEXTILE LINING MAY BE INSTALLED AS REQUIRED BY THE ENGINEER.

NOTE:
ROCK DITCH CHECK IN THE CLEAR ZONE SHALL BE REMOVED OR LEVELLED IF ALLOWABLE AFTER THE VEGETATION HAS SUFFICIENTLY MATURER TO PROTECT THE DITCH OR SWALE.

EXAMPLE

DITCH CHECK SPACING FOR STANDARD HEIGHTS

<table>
<thead>
<tr>
<th>Ditch % Slope</th>
<th>9' Eff. Height</th>
<th>18' Eff. Height</th>
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<tr>
<td>8.5</td>
<td>7</td>
<td>15</td>
</tr>
</tbody>
</table>

MINIMUM DITCH CHECK SPACING
**Sediment Trap**

Note:
- Sediment trap in the clear zone shall be removed or leveled (if allowable) after the vegetation has sufficiently matured to protect the ditch or swale.

**Elevation Detail**

Notes:
- Aggregate for drainage shall be in accordance with Sec 1009, Grade 4 or Grade 5.
- Use hardware cloth 24 gauge wire mesh with 1 inch mesh openings.
- Install 5 ft. T-post with a 2 foot embedment depth (min.).
- Attach hardware cloth to post with wire staple or other acceptable methods.
- Space post a maximum of 3 ft.
- For installation between sections of Silt fence, extend aggregate for drainage a minimum of 12 inches on each side of special Sediment control fence section.
- Installation shall be for area inlets and perimeter protection BMP's.

**Section A-A**

**Drop Inlet Check**

See Sheet 1 of 6 for details of Rock Ditch Check.

**Plan**

Notes:
- Optional to reduce sediment build-up at drain inlet.
- Excess log/sock to be drawn in and tied off to wood stake or ballasted.

**Section B-B**

Notes:
- Prior to placement all debris, rock, large clods and wood vegetation shall be cleared.
- Log/sock placed on pavement shall be weighted down with gravel/sand ballast.
- Aggregate for drainage shall be in accordance with Sec 1009, Grade 4 or Grade 5.
- Use hardware cloth 24 gauge wire mesh with 1 inch mesh openings.
- Install 5 ft. T-post with a 2 foot embedment depth (min.).
- Attach hardware cloth to post with wire staple or other acceptable methods.
- Space post a maximum of 3 ft.
- For installation between sections of Silt fence, extend aggregate for drainage a minimum of 12 inches on each side of special Sediment control fence section.
- Installation shall be for area inlets and perimeter protection BMP's.

**General Notes**

- OTHER PROPERIETY INLET PROTECTION MAY BE SUBSTITUTED IN ACCORDANCE WITH SEC 806 OR AS DIRECTED BY THE ENGINEER.

**Temporary Erosion Control Measures**

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-454-MODOT (1-888-275-6636)

DATE EFFECTIVE: 04/01/2015
DATE PREPARED: 06/01/2015

Sheet No.: 806.10J

For Sediment Control Spacing see Sheet 1 of 6.
**EFFECTIVE DEPTH**

\[ u_B = \min. \ 2', \ max. \ 6' \] dependent upon configuration required by location and estimated volume.

**SECTION C-C**

**SECTION D-D**

**SECTION A-A**

**INLET**

\[ D = 1.0' = \text{design flow depth-min.} \]

*Varies from width of stream at inlet to one-half width of pond at outlet.*

**SECTION B-B**

**OUTLET**

**GENERAL NOTES:**

Sediment basins are to be included in the BMP system when the geometry of right-of-way allows. Where included, sediment basins are to be designed and constructed to provide storage volume for the local 2-yr, 24-hour storm for disturbed acreage draining to them. If the design storm volume has not been calculated, basins are to be designed and constructed to provide a storage volume of at least 3,600 cubic feet per disturbed acre draining to the basins.

If sediment basin is to be permanent its slopes shall be stabilized with rock riprap or equivalent.

The materials for rock riprap shall meet the requirements of Sec 611.30 for Type 2 Rock Blanket.

See plans for length, depth and width of basin.

See plans for estimated quantities of rock riprap - cubic yards.
NOTE:

IN SOME CASES IT MAY BE NECESSARY TO EMBED METAL OR PLASTIC PIPE INTO THE FILL SLOPE TO SECURE PROPER ANCHORAGE.

SECTION A-A

TEMPORARY BERM

(METAL, FLEXIBLE RUBBER OR PLASTIC PIPE)

NOTE:

MAXIMUM LENGTH BETWEEN SLOPE DRAINS SHALL BE APPROXIMATELY 500 FEET.
TEMPORARY EROSION CONTROL MEASURES
SILT FENCE

GENERAL NOTES:

USE SILT FENCE FOR FILL HEIGHTS GREATER OR EQUAL TO 10 FEET. ON ALL FILLS GREATER THAN 10 FEET HIGH, MID-SLOPE RUNS OF SILT FENCE SHOULD BE CONSIDERED.

FOR FABRIC SILT FENCE:

- MINIMUM LONGITUDINAL SPLICE OVERLAP SHALL BE 2' WITH A POST AT EACH END.
- SECURE FABRIC TO POSTS.
- INSTEAD OF SILT FENCE ACROSS DRAINAGE DITCHES AND DRAINS, DITCH CHECKS SHALL BE USED AS SHOWN ON PLANS OR AS DIRECTED BY ENGINEER.
- AT CULVERTS, PLACE SEDIMENT BARRIERS OVER THE TOP OF THE CULVERTS (NOT IN THE STREAM CHANNEL).

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105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-352-MODOT (1-888-352-6636)

TEMPORARY EROSION CONTROL MEASURES
SILT FENCE

DATE EFFECTIVE: 06/21/2015
DATE PREPARED: 03/20/2015
SHEET NO.: 506.10J

806.10J SHEET NO. 5 OF 6
VEGETATIVE MULCH CONFINED TO 3" OR EQUIVALENT EROSION CONTROL BLANKET OR CONTRUCTION FABRIC IF REQUIRED BY THE ENGINEER.

SECTION A-A
TYPE C BERM

1) TYPE C BERM SHALL BE PLACED ABOVE THE DESIGN HIGH WATER MARK OR AT AN ELEVATION AS DIRECTED BY THE ENGINEER.

TYPE C BERM

SLOPE LINE

FILL-EKE

SLOPE LINE

FLAT BOTTOM DITCH

FLAT BOTTOM DITCH

PLAN VIEW

GENERAL NOTES:

TYPE C BERM SHALL BE BUILT TO HANDLE SIGNIFICANT RAINFALL EVENTS AND SHALL BE INSTALLED PRIOR TO SOIL EROSION OF FLOODFLAKE OR FILL IN THE DRAINAGE AREA OF THE BERM.

TEMPORARY EROSION CONTROL MEASURES
BRIDGES AND BOX CULVERTS
AT STREAM CROSSINGS

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-MO-PASS (667-7277)
METHOD OF SUPPORTING DECIDUOUS TREES
3" CALIBER OR LARGER

SIX LAYERS OF BURLAP TO BE INSTALLED BEFORE BRACE BLOCKS

BRACE BLOCK MAY BE NAILED TO TREE

BRACE MAY BE NAILED TO POST

ROOT BALL DIAMETER 9"

STEEL BAND

HOLE

TREE

SECTION A-A

METHOD OF SUPPORTING EVERGREEN TREES
3' OR MORE IN HEIGHT

TWIST WIRE TO TIGHTEN

WIRE BEFORE TWISTING

ROOT BALL

HOLE

TREE

HOLE

SECTION B-B

NOTES:

TREE WRAP SHALL BE INSTALLED BEFORE BRACING.

BRACE SHALL BE NAILED SECURELY TO POST AND BRACE BLOCK.

BANDING SHALL BE DONE WITH A COMMERCIAL BANDING MACHINE.

GENERAL NOTE:

ALL NUMBER MEASUREMENTS ARE NOMINAL.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

TYPICAL PLANTING ILLUSTRATIONS

METHOD OF SUPPORT

DATE EFFECTIVE: 03/01/2004
DATE PREPARED: 08/28/2003
808.00 SHEET NO. 1 OF 3
MEASUREMENT OF SMALL TREES

MEASURE CALIBER

MEASUREMENT OF LARGE TREES

MEASURE CALIBER FOR TREES 4" OR LESS.

MEASURE CALIBER FOR TREES MORE THAN 4".

MEASUREMENT OF EVERGREEN TREES

BASE WIDTH MEASURED NOT MORE THAN 10" ABOVE THE GROUND LINE

MEASUREMENT OF DECIDUOUS SHRUBS

MEASURE TIP TO TIP

MEASURE CALIBER

24" BRANCHES ON ANY STEM MAY BE COUNTED

MULTI-STEM TREES ACCEPTABLE IF ONE STEM IS THE CALIBER SPECIFIED

WRAP ALL STEMS

TREE WRAP

THINNING CUT

HEADING CUT

PRUNING CUTS

TYPICAL PLANTING ILLUSTRATIONS
MEASUREMENT AND PRUNING CUTS

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

DATE EFFECTIVE: 07/01/2004
DATE PREPARED: 08/28/2009
808.00 SHEET NO. 2 OF 3
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.

DATE EFFECTIVE: 07/01/2004
DATE PREPARED: 08/28/2009
NOTES:

1. Grind weld as necessary to clear bolt head.

2. Connections shall be installed so that connector plate is level perpendicular to the bracket arm and sloped for pole raising parallel to the bracket arm.

DETAILS OF CIRCULAR STEEL PILE FOUNDATION

ELEVATION

DETAILS OF STEEL "H" PILE FOUNDATION

ELEVATION

GENERAL NOTES:

- All classifications are ASTM unless otherwise noted. See standard specifications for classifications not shown.
- All connector plate and closure plate thicknesses shown are minimum thicknesses.
- All anchor bolts shall be fully galvanized 1" dia. high strength anchor bolts.
- All steel components shall be hot dip galvanized.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

HIGHWAY LIGHTING
POLES, FOUNDATIONS AND APPURTENANCES FOR 30' MOUNTING HEIGHT
GENERAL NOTES:


POLES SHALL BE FINISHED ONLY FOR SPECIFIED BOLT CLEVIS.

TRANSFORMER BASES SHALL BE CERTIFIED AS MEETING THE MICHIGAN CODES AND STANDARDS REQUIREMENTS AS SET BY THE MICHIGAN STANDARDS SPECIFICATIONS FOR ENERGIZED SYSTEMS FOR HIGHWAY SIGNS, LUMINARIES, AND OTHER EQUIPMENT AND MEET THE MICHIGAN REQUIREMENTS OF MSHA 3500.

MACHINE MOUNTS SHALL BE ADJUSTABLE 4" X 6" X 1/2" MACHINES SHALL NOT BE FORGED SO THAT THE PIECE LENGTH IS NOT REQUIRES.

TRANSFORMER BASE IS FOR MOUNTING HEIGHTS SHALL BE FINISHED WITH THE TRANSFORMER AND TRANSFORMER FOR MACHINES SHALL BE FORGED TO MEET THE MICHIGAN REQUIREMENTS.

ALL MACHINE MOUNTS SHALL CONFORM TO SECTION 9902 OF THE MICHIGAN SPECIFICATIONS.

TRANSFORMER BASE MOUNTS SHALL BE FORGED WITH THE MACHINES SHOWN IN THE TRANSFORMER BASE, TYPE A OR B MACHINES SHALL BE FORGED WITH MACHINES SHOWN IN THE TRANSFORMER BASE.

POLE MOUNTS SHALL BE FORGED FROM GROUND MOUNTS IN FLEX SLAB 3" X 6" X 1/2" MACHINES TO MEET MICHIGAN SYSTEM MACHINES SHALL BE 36" OR TALLER FROM MACHINES.

THE CABLE ENTRANCE AT THE BRACKET ARM MOUNTING SHALL BE 1" SQUARE 1-1/2" DIAMETER.

DESIGN OF STRUCTURAL SUPPORTS SHALL CONFORM WITH MICHIGAN CODES SPECIFICATIONS FOR STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINARIES, AND OTHER EQUIPMENT.

SIGNS SHALL NOT BE MOUNTED ON LOCATION POLES.
### LED Luminaires

<table>
<thead>
<tr>
<th>POLE HEIGHT</th>
<th>DESIGNATION</th>
<th>MAX. WATT</th>
<th>DISTRIBUTION TILT</th>
<th>ELECTRICAL HEIGHT LIFE EXPECTANCY</th>
</tr>
</thead>
<tbody>
<tr>
<td>34</td>
<td>LEE-6</td>
<td>110</td>
<td>111</td>
<td>E=60-M-D</td>
</tr>
<tr>
<td>34</td>
<td>LEE-7</td>
<td>110</td>
<td>111</td>
<td>E=60-M-D</td>
</tr>
<tr>
<td>34</td>
<td>LEE-8</td>
<td>275</td>
<td>111</td>
<td>E=60-M-D</td>
</tr>
</tbody>
</table>

LUMINARIES PER CIRCUIT UNLESS OTHERWISE SPECIFIED ON PLANS.

**General Notes:**

The socket mounting height will be obtained by subtracting 1.5 feet from the 8-foot clearance between the pole cap and the top of the bracket arm support.

Wires shall be run for 20 feet only for specified bolt circle.

Transformer base shall be certified as meeting the requirements of the transformer manufacturers and shall be set in the correct mounting base specifications to meet the transformer requirements of the transformer manufacturer.

Lightning arresters shall be installed and meet the lightning requirements of the transformer manufacturer.

Necessary shall be 4" x 4". Minimum flange shall be reinforced so that the flange strength is not reduced.

Transformer bases for 45' mounting height shall be furnished with a poured-in-place trowel and a grounding lug for grounding equipment.

All junction boxes shall conform to section 902.2 of the National Electrical Code.

Type B poles shall be equipped with a grounding lug. Inside the transformer base, type 8 and 9 poles shall be equipped with a bonding lug inside the pole.

Foot shall be poured from ground level in foot with 6" of base. Copper wire to conduct ground wire shall be run from ground level.

The cable entrance at the bracket arm shall be a field installed 1/4" E34, hole.
NOTE: ANCHOR BOLTS SHALL BE PLACED ONLY FOR 17" BOLT CIRCLE

AT THE OPTION OF THE CONTRACTOR THE CONCRETE FOUNDATION MAY BE PRECAST. IF PRESENT, THEY SHALL BE SET IN DRIED HOLE S 5 FEET IN DIAMETER AND 6 INCHES DEEPER THAN THE BOTTOM OF THE CONCRETE FOUNDATION. THE BOTTOM 6 INCHES OF THE HOLE ARE THE RESULTING SPACE ABOVE THE FOUNDATION SHALL BE BACKFILLED WITH DIRT TAMPED LEVEL WITH SCREENINGS IN LAYERS NOT EXCEEDING 12 INCHES.

GENERAL NOTES:

4 ALL BOLT CIRCLES FOR 45' MOUNTING HEIGHT SHALL BE 17".

4 ALL STEEL COMPONENTS SHALL BE HOT DIP GALvanized.

ELEVATION

DETAILS OF CONCRETE FOUNDATION

<table>
<thead>
<tr>
<th>QUANTITIES</th>
<th>CONC.</th>
<th>REINF.</th>
</tr>
</thead>
<tbody>
<tr>
<td>WEIGHT (LB)</td>
<td>(GR)</td>
<td>(LB)</td>
</tr>
<tr>
<td>6 - 1/2&quot;</td>
<td>60</td>
<td>80</td>
</tr>
<tr>
<td>7 - 1/2&quot;</td>
<td>81</td>
<td>90</td>
</tr>
<tr>
<td>8 - 1/2&quot;</td>
<td>93</td>
<td>104</td>
</tr>
<tr>
<td>9 - 1/2&quot;</td>
<td>105</td>
<td>120</td>
</tr>
</tbody>
</table>
COIL ENDS OF CABLE-CONDUIT DITCH LINE AND COVER WITH PLANKS. IF WIRING IS INSTALLED PRIOR TO POLE INSTALLATION.

CURB SAME LOCATION BARRIER OR RIGID CONDUIT OR GUARD RAIL END TREATMENT (ANY TYPE)

TRAVELLED WAY EDGE OF TRAVELLED WAY

INSIDE SHOULDER (ALL SHOULDER TYPES)

CABLE-CONDUIT OR RIGID CONDUIT (AS SPECIFIED)

OUTSIDE SHOULDER (ALL SHOULDER TYPES)

CABLE-CONDUIT OR RIGID CONDUIT (AS SPECIFIED)

RIGID CONDUIT UNDER PAVEMENT

NOTES:

1. SEE DRAWING 902.20 FOR FULL BOXES.

2. CONDUIT MAY BE REMOVED FROM CABLES IN RIGID CONDUIT. SPLICES SHALL NOT BE MADE UNLESS SHOWN ON PLANS.

3. BRAND AND MODEL OF FUSE HOLDER SHALL BE APPROVED BY THE ENGINEER.

4. CABLES SHALL BE CONTINUOUS TO THE FIRST LIGHT POLE. SPLICES SHALL NOT BE MADE FOR THE PURPOSE OF TERMINATING CABLE-CONDUIT.

GENERAL NOTES:

THE CONDUIT OF THE CABLE-CONDUIT SHALL BE CUT AWAY FROM THE CABLES WHERE THEY ENTER THE RIGID CONDUIT INSIDE A CONCRETE BARRIER OR STRUCTURE.
CABLE-CONDUIT OR RIGID CONDUIT BETWEEN FILTER CUT 2/1 DIAM. INSERT SEAL BETWEEN 3/1 CENTERS.

FOUR STAINLESS 8"-20 BOLTS 2" LONG WITH 3 FLAT WASHERS AND 2 NUTS EACH.

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 SCHEMATIC DIAGRAM SHALL BE MOUNTED ON INSIDE OF CABINET SHALL BE LOCATED AWAY FROM TRAFFIC.

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 CEMENTED.

ALL MATERIALS REQUIRED EXCLUDING REFERENCE ITEMS AS SHOWN ON DRAWING SHALL BE INCLUDED IN PRICE BID FOR CONTROL STATION.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

HIGHWAY LIGHTING
BASE MOUNTED CONTROL STATION
240 V OR 480 V - 4 CIRCUIT

DATE EFFECTIVE: 04/01/2005
DATE PREPARED: 04/15/2005
SHEET NO. 1 OF 2

901-30F

911-412-010

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

ENGINEER BRIGHT RED 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 SCHEMATIC DIAGRAM SHALL BE MOUNTED ON INSIDE OF CABINET SHALL BE LOCATED AWAY FROM TRAFFIC.

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.

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CABINET SHALL BE LOCATED AWAY FROM TRAFFIC. TOP MOUNT PHOTO CONTROL SHALL FACE AN OPEN SKY. SIDE MOUNT PHOTO CONTROL SHALL FACE NORTH.
ON BRACKET

EQUIPMENT LAYOUT  WIRING DIAGRAM

SEE WINDOW DETAIL, SHEET 1 OF 2.

14 INSULATED TERMINAL BLOCK, FOR GREATER THAN 4/0 CABLE
15 240V 2-POLE, 100 AMP, 120V 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 MANUAL-LIGHTING 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 #10 AWG MIN. 600 V. POWER CABLE
24 #8 AWG MIN. 600 V. GROUND CABLE

NOTES

A LIGHTING SYSTEM VOLTAGE AS SPECIFIED ON PLANS.
B PHOTOELECTRIC SWITCH BRACKETS MAY VARY. LOCATE CENTER OF WINDOW OVER CENTER OF PHOTOELECTRIC SWITCH.
C IF FOR REASONS OF VOLTAGE DROP A WIRE SIZE IS SPECIFIED LARGER THAN THE BREAKER LUGS CAN ACCOMMODATE, AN INSULATED HEAVY DUTY TERMINAL BLOCK SHALL BE INSTALLED TO TERMINATE THE LARGER WIRES AND A SMALLER JUMPER CONNECTED TO THE BREAKER ITSELF.
D LIGHTING BREAKER SIZING:

<table>
<thead>
<tr>
<th>SIZE (LAMPS)</th>
<th>240V TOTAL CIRCUIT LOAD (WATTS)</th>
<th>480V TOTAL CIRCUIT LOAD (WATTS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>0-2800</td>
<td>5550 - 7400</td>
</tr>
<tr>
<td>20</td>
<td>2850-3700</td>
<td>5550 - 7400</td>
</tr>
<tr>
<td>25</td>
<td>3750-4600</td>
<td>7400 - 9500</td>
</tr>
<tr>
<td>30</td>
<td>4600-5500</td>
<td>9500 - 11,000</td>
</tr>
<tr>
<td>35</td>
<td>5500-6500</td>
<td>11,000 - 13,000</td>
</tr>
<tr>
<td>40</td>
<td>6500-7400</td>
<td></td>
</tr>
</tbody>
</table>

E CIRCUIT LOAD INCLUDES LOAD DUE TO LINE LOSS, LAMP, AND BALLAST LOAD.
F ALL CIRCUIT BREAKERS SHALL CONFORM TO SECTION 901.4 OF THE STANDARD SPECIFICATIONS.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

HIGHWAY LIGHTING
BASE MOUNTED CONTROL STATION
240 V OR 480 V - 4 CIRCUIT

DATE EFFECTIVE: 06/03/2009
DATE PREPARED: 08/28/2009
<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SERVICE POLE 30' MIN. CLASS 4 MODOT. CONTRACTOR PROVIDED. MODOT OWNED</td>
</tr>
<tr>
<td>2</td>
<td>#2 AWG MIN. CABLE. 600 VOLT</td>
</tr>
<tr>
<td>3</td>
<td>SERVICE ENTRANCE HEAD</td>
</tr>
<tr>
<td>4</td>
<td>GUY CABLE. AS REQUIRED</td>
</tr>
<tr>
<td>5</td>
<td>RIGID CONDUIT. 2&quot; MIN. WITH PREFORMED ELBOWS</td>
</tr>
<tr>
<td>6</td>
<td>LIGHTNING ARRESTER. VALVE TYPE. 2 POLE. 650 VOLT</td>
</tr>
<tr>
<td>7</td>
<td>METER SOCKET. 200 AMP. FOR SIGNALS</td>
</tr>
<tr>
<td>8</td>
<td>METER SOCKET. 200 AMP. FOR LIGHTING</td>
</tr>
<tr>
<td>9</td>
<td>LOCKING. RAINTIGHT. NEMA 4 SERVICE DISCONNECT BOX</td>
</tr>
<tr>
<td>10</td>
<td>THREADRED CONDUIT HUB WITH SEALING WASHERS</td>
</tr>
<tr>
<td>11</td>
<td>GROUND ROD.</td>
</tr>
<tr>
<td>12</td>
<td>CLASS B CONCRETE. 0.92 C.Y.</td>
</tr>
<tr>
<td>13</td>
<td>#2 AWG MIN. GROUND WIRE</td>
</tr>
<tr>
<td>14</td>
<td>#2 AWG MIN. GROUND WIRE</td>
</tr>
<tr>
<td>15</td>
<td>GROUND ROD. 3/4&quot; X 8' MIN.</td>
</tr>
<tr>
<td>16</td>
<td>CABINET (AS REQ'D.) TO SIGNALS</td>
</tr>
<tr>
<td>17</td>
<td>CLASS B CONCRETE. 0.92 C.Y.</td>
</tr>
<tr>
<td>18</td>
<td>THREADRED CONDUIT HUB WITH SEALING WASHERS</td>
</tr>
<tr>
<td>19</td>
<td>WEATHERPROOF ADHESIVE LABEL (LIGHTING). VINYL RAISED LETTERING (OR EQUIVALENT. SEE DETAIL)</td>
</tr>
<tr>
<td>20</td>
<td>WEATHERPROOF ADHESIVE LABEL (SIGNALS). VINYL RAISED LETTERING (OR EQUIVALENT. SEE DETAIL)</td>
</tr>
<tr>
<td>21</td>
<td>#6 X 9 OR #6 X 15 GALVANIZED POST</td>
</tr>
<tr>
<td>22</td>
<td>#2 AWG MIN. CABLE. 600 VOLT</td>
</tr>
<tr>
<td>23</td>
<td>RIGID CONDUIT. 2&quot; MINIMUM</td>
</tr>
</tbody>
</table>

* SEE PLANS

**NOTES:**
- SERVICE POLE SHALL BE GUYED WHEN SPAN OF OVERHEAD SERVICE WIRE EXCEEDS 50 FEET.
- INCREASE 1 FOOT FOR EACH 5 FEET ABOVE 30 FEET.
- SERVICE DISCONNECT BOXES AND METER BOXES SHALL BE ALUMINUM OR STAINLESS STEEL. ALL HARDWARE. HINGES. CATCHES, ETC. SHALL BE STAINLESS STEEL. METER SOCKET FOR SIGNALS OR LIGHTING AND OTHER EQUIPMENT AND MATERIALS SHALL BE U.L. APPROVED. AND CONFORM TO THE REQUIREMENTS OF THE UTILITY COMPANY OR MUNICIPALITY PROVIDING POWER.
- SCHEMATIC DIAGRAM SHALL BE MOUNTED ON INSIDE OF CABINET DOOR.
- UTILITY COMPANY SHALL DECIDE IF LIGHTNING ARRESTERS ARE TO BE CONNECTED ON THE LOAD OR LINE SIDE OF THE METER. THE UTILITY COMPANY SHALL ALSO DECIDE IF THE LIGHTNING ARRESTER IS TERMINATED IN THE METER OR DISCONNECT CABINET. IF TERMINATED IN THE DISCONNECT CABINET, IT SHALL BE INSTALLED ON THE DISCONNECT CABINET.
- LIGHTING SYSTEM VOLTAGE OF 240 VOLTS OR 480 VOLTS AS SHOWN ON THE PLANS.
- BREAKERS SHALL CONFORM TO SEC. 901.4 OF THE STANDARD SPECIFICATIONS.
- IF SUBSURFACE CONDITIONS EXIST WHICH PROHIBIT THE PLACEMENT OF THE GROUND ROD IN A VERTICAL POSITION, THE ROD MAY BE DRIVEN AT AN OBLIQUE ANGLE NOT TO EXCEED 45 DEGREES FROM VERTICAL OR BURIED IN A TRENCH AT LEAST 30 IN. DEEP. CONNECTION TO GROUND ROD SHALL BE CAMOLED.

**GENERAL NOTES:**
- FOR CABLE TYPES AND INSTALLATION. SEE STANDARD SPECIFICATIONS.
- THE POWER SUPPLY ASSEMBLY TYPE IS SHOWN ON THE PLANS OR IS DESIGNATED IN THE CONTRACT.
- THE UTILITY COMPANY SHALL BE NOTIFIED IN WRITING 30 DAYS PRIOR TO DATE SERVICE WILL BE REQUIRED.
- WHERE SIGNAL OR LIGHTING POWER ONLY IS DESIGNATED. OMIT ITEMS NOT REQUIRED.
- ALL OPENINGS IN ANY SERVICE BOX OR METER BOX SHALL BE COVERED AND SEALED WITH LIFETIME SILICONE CAULK.
- ALL MATERIALS REQUIRED AS SHOWN ON DRAWING. INCLUDING CABLE AND CONDUIT FROM POWER SUPPLY ASSEMBLY TO UTILITY COMPANY FACILITIES. SHALL BE INCLUDED IN UNIT BID PRICE FOR POWER SUPPLY ASSEMBLY.

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

**HIGWAY LIGHTING POWER SUPPLY ASSEMBLY SECONDARY SERVICE**

**DATE EFFECTIVE:** 04/01/2002
**DATE PREPARED:** 04/01/2002
**SHEET NO:** 1

**POWER SUPPLY ASSEMBLY**

**HIGHWAY LIGHTING**

**SECONDARY SERVICE**

**1 OF 2 SHEETS**

**JEFFERSON CITY, MO 65102**

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

**105 WEST CAPITOL COMMISSION**
PEDESTAL OR NEW STATE-OWNED POLE TO BE SET WITHIN 2' TO 4' OF RIGHT-OF-WAY LINE. ALL SERVICE POWER SUPPLY ASSEMBLIES ARE TO BE LOCATED ON STATE PROPERTY.

PRIVATE PROPERTY
STATE PROPERTY

TOP VIEW

IF FENCE BLOCKS ACCESS TO POWER SUPPLY A 3' MIN. LOCKING GATE IS TO BE INSTALLED. (NO DIRECT PAY)

5' MIN.

UTILITY COMPANY POLE, PEDESTAL OR PAD MOUNT TRANSFORMER

COIL CABLE FOR UTILITY COMPANY HOOKUP (MIN. 35') FOR POLE; 6' FOR PED.

POWER INPUT SHALL BE (MIN.) 2" RIGID STEEL CONDUIT WITH THREE #2 AWG CABLES.

SEPARATE FEEDS FOR LIGHTING AND SIGNALS

NOTE:
CABLE AND CONDUIT FROM POWER SUPPLY ASSEMBLY TO UTILITY COMPANY FACILITIES SHALL BE INCLUDED IN PRICE BID FOR POWER SUPPLY ASSEMBLY.
Controller Cabinets and Base Types

Controller cabinets and base types are designed to accommodate traffic signals and controllers. The dimensions and materials vary according to the specific requirements and height levels of the cabinets.

**Dimensions Varies According to Cabinet Height:**

1. **Ground Rod:** 3/4" Dia. x 8" Min. IF subsurface conditions exist which prohibit the placement of the ground rod in a vertical position, the rod may be driven at an oblique angle if not to exceed 90 degrees from vertical OR buried in a trench at least 30 in. deep. CONNECTION TO GROUND ROD WILL BE CEMENTED.
2. **Lifetime Silicone Caulk Between Cabinet and Base:**
3. **#2 Corbin Lock:**
4. **Anchor Bolts:** Use bolt head or tack welded nut on embedded end and size as specified by cabinet manufacturer.

**Conduit Locations:**

Conduit locations are marked for controller cabinets with heights from 6'-1" to 6'-6". Conduit is required for controller cabinets with heights from 4'-4" to 6'-0".

**Notes:**

- Type E
- Type EV
- Type 332
- Type 336S

**Plan View:**

Plan views illustrate the arrangement of cabinets, conduits, and other fixtures. These views are essential for understanding the layout and spatial relationship between different components of the traffic signal and controller system.
LIST OF MATERIALS

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SERVICE POLE 30' MIN. CLASS IV WOOD, CONTRACTOR PROVIDED, MODOT OWNED</td>
</tr>
<tr>
<td>2</td>
<td>#8 AWG MIN. CABLE, 600 VOLT</td>
</tr>
<tr>
<td>3</td>
<td>SERVICE ENTRANCE HEAD</td>
</tr>
<tr>
<td>4</td>
<td>GUY CABLE, AS REQUIRED</td>
</tr>
<tr>
<td>5</td>
<td>#2 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, Raintight, NEMA 4</td>
</tr>
<tr>
<td>10</td>
<td>INSULATED, GROUNDABLE NEUTRAL, 200 AMP MINIMUM</td>
</tr>
<tr>
<td>11</td>
<td>SIGNAL BREAKER, SINGLE POLE, 40A MIN. TYPE A OR B</td>
</tr>
<tr>
<td>12</td>
<td>LIGHTING BREAKER, SINGLE POLE, 40A, TYPE A OR B</td>
</tr>
<tr>
<td>13</td>
<td>METAL CONDUIT, 1/2</td>
</tr>
<tr>
<td>14</td>
<td>GROUND WIRE, #2 AWG MIN.</td>
</tr>
<tr>
<td>15</td>
<td>GROUND ROD, 5/8&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>W6 x 9 OR W6 x 15 GALVANIZED POST</td>
</tr>
<tr>
<td>24</td>
<td>LIGHTING CONTROL CABINET (SEE SHEET 2)</td>
</tr>
<tr>
<td>25</td>
<td>#2 AWG MIN. CABLE, 600 VOLT</td>
</tr>
</tbody>
</table>

* SEE PLANS

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. METER SOCKET AND OTHER EQUIPMENT AND MATERIALS SHALL BE U.L. APPROVED AND CONFORM TO THE REQUIREMENTS OF THE UTILITY COMPANY OR MUNICIPALITY PROVIDING POWER.
4. SCHEMATIC DIAGRAM SHALL BE MOUNTED ON INSIDE OF DOOR.
5. UTILITY COMPANY SHALL DECIDE IF LIGHTNING ARRESTERS ARE TO BE CONNECTED ON THE LOAD OR LINE SIDE OF THE METER. THE UTILITY COMPANY SHALL ALSO DECIDE IF THE LIGHTNING ARRESTER IS TERMINATED IN THE METER OR DISCONNECT CABINET. IF TERMINATED IN THE DISCONNECT CABINET, IT SHALL BE INSTALLED ON THE CONNECT CABINET.
6. IF LIGHTING IS SPECIFIED, INSTALL LIGHTING CONTROL ON POWER SUPPLY.
7. BREAKERS SHALL CONFORM TO SEC. 901.4 OF THE STANDARD SPECIFICATIONS.
8. IF SUBSURFACE CONDITIONS EXIST WHICH PROHIBIT THE PLACEMENT OF THE GROUND ROD IN VERTICAL POSITION, THE ROD MAY BE DRIVEN AT AN OBLIQUE ANGLE NOT TO EXCEED 45 DEGREES FROM VERTICAL OR BURIED IN A TRENCH AT LEAST 30 IN. DEEP. CONNECTION TO GROUND ROD SHALL BE CAD WELDED.

GENERAL NOTES:

FOR CABLE TYPES AND INSTALLATION, SEE STANDARD SPECIFICATIONS.

THE TYPE POWER SUPPLY ASSEMBLY IS SHOWN ON THE PLANS OR IS DESIGNATED IN THE CONTRACT.

THE UTILITY COMPANY SHALL BE NOTIFIED IN WRITING 30 DAYS PRIOR TO DATE SERVICE WILL BE REQUIRED.

WHERE SIGNAL OR LIGHTING POWER ONLY IS DESIGNATED, Omit ITEMS NOT REQUIRED.

ALL OPENINGS IN ANY SERVICE BOX OR METER BOX SHALL BE COVERED AND SEALED WITH LIFETIME SILICONE CAULK.

ALL MATERIALS REQUIRED EXCLUDING REFERENCE ITEMS AS SHOWN ON DRAWING SHALL BE INCLUDED IN PRICE BID FOR POWER SUPPLY ASSEMBLY.

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 NOTIFY 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.
**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 1</th>
<th>CLASS 2</th>
<th>CLASS 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>17&quot;</td>
<td>30&quot;</td>
<td>22&quot;</td>
</tr>
<tr>
<td>23 - 68</td>
<td>24&quot;</td>
<td>36&quot;</td>
<td>24&quot;</td>
</tr>
<tr>
<td>&gt; 68</td>
<td>30&quot;</td>
<td>48&quot;</td>
<td>36&quot;</td>
</tr>
</tbody>
</table>

1. ALL METAL CONDUITS SHALL BE ELECTRICALLY BONDED BY A GROUND BUSHING
2. BRAKE AND COVER (3)
3. BOLT LIFT HOLE (3"

**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.

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

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

**TRAFFIC SIGNALS CONCRETE AND PREFORMED PULL BOXES**

DATE EFFECTIVE: 11/01/2010
DATE PREPARED: 9/13/2010

902.20G SHEET NO. 2 OF 3
GENERAL NOTES:

1. AGGREGATE SHALL BE TYPE 1 CONFORMING TO SEC 1007.
2. BOX SHALL BE OF A FLARE DESIGN AND HAVE A LIP FOR STABILIZATION.

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 CADDWELDED.

THE CIRCULAR PULL BOX COVER SHOULD BE SIZED TO FIT A BOX WITH A CLEAR OPENING OF 25".

CIRCULAR PULL BOX CLASS 5

SECTION A-A

2" CONDUIT DRAIN TO INSLOPE OR AS SPECIFIED
PREMOLDED BIT JOINT
1/8" PER FOOT MIN. SLOPE

GROUND ROD (OPTIONAL)

SECTION B-B

3 CABLE HOOKS PER LEVEL (TYP.)

34" NOMINAL CLEAR OPENING

FIBER OPTIC TERMINATION CABLE

LOCATOR CABLE WIRE (TYP.)

SOLID WALL SMOOTH/RIBBED FLEXIBLE CONDUIT
BLACK = POWER
ORANGE = FIBER OPTIC CABLE

STONE MATERIAL

SECTION A-A

TYPE 1 DRAIN TYPE

(SEE DRAIN OUTLET DETAILS)

(SECTION ABOVE BREAK APPLICABLE TO TYPE I DRAIN.)

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-655-MODOT 1-888-655-6636

TRAFFIC SIGNALS
CONCRETE AND PREFORMED PULL BOXES

DATE EFFECTIVE: 11/01/2010
DATE PREPARED: 9/2/2010
902.20G SHEET NO. 3 OF 3
MODOT ARROWS

GENERAL NOTES:
ARROWS FOR REFERENCE ONLY.
ARROW DETAILS AVAILABLE FROM TRAFFIC AND HIGHWAY SAFETY DIVISION.

MUTCD ARROWS
### Structural Sign Data

<table>
<thead>
<tr>
<th>Designation</th>
<th>Color Scheme</th>
<th>Sheeting</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Legend</strong></td>
<td><strong>Background</strong></td>
<td><strong>Legend</strong></td>
</tr>
<tr>
<td>White</td>
<td>White</td>
<td>Type III - White Film</td>
</tr>
<tr>
<td>Red</td>
<td>Red</td>
<td>Type III - White Film</td>
</tr>
<tr>
<td>Black</td>
<td>Black</td>
<td>Type III - Black Film</td>
</tr>
<tr>
<td>Fluorescent Yellow</td>
<td>Fluorescent Yellow</td>
<td>Type III - Black Film</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><strong>Legend</strong></td>
<td><strong>Background</strong></td>
<td><strong>Legend</strong></td>
</tr>
<tr>
<td>White</td>
<td>White</td>
<td>Type III - White Film</td>
</tr>
<tr>
<td>Red</td>
<td>Red</td>
<td>Type III - White Film</td>
</tr>
<tr>
<td>Black</td>
<td>Black</td>
<td>Type III - Black Film</td>
</tr>
<tr>
<td>Fluorescent Yellow</td>
<td>Fluorescent Yellow</td>
<td>Type III - Black Film</td>
</tr>
</tbody>
</table>

**Note:** Legend and background colors are achieved through transference onto film.

---

**Flat Sheet Thickness**

<table>
<thead>
<tr>
<th>Sign Size</th>
<th>Thickness</th>
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</thead>
<tbody>
<tr>
<td>7' High or less</td>
<td>0.080 in.</td>
</tr>
<tr>
<td>Over 7' to 10'</td>
<td>0.125 in.</td>
</tr>
<tr>
<td>11' or larger</td>
<td>0.125 in.</td>
</tr>
</tbody>
</table>

---

**General Notes:**

Ground mounted signs greater than 5 feet wide or signs greater than 70 square feet shall be structural.

All non-standard signs not found in the Manual shall be detailed by the Traffic and Highway Safety Division Office.

Refer to Standard Specifications for details on sheeting, substrate, and fabrication details.

For mounting details, see Standard Plans 903.07.
MODOT ID LABEL DETAILS
PLACED ON THE SIGN FACE

WARNING
UP TO $1000 FINE AND
1 YEAR IMPRISONMENT
FOR REMOVING OR
TAMPERING WITH THIS SIGN

ACME SIGN COMPANY
MIDWEST, US 55555
800-555-5555
SIGN FABRICATION
DATE: JUNE 8, 2016

VENDOR ID LABEL DETAILS
PLACED ON THE BACK OF THE SIGN

ACME SIGN COMPANY
MIDWEST, US 55555
800-555-5555
SIGN FABRICATION
DATE: JUNE 8, 2016

GENERAL NOTES:
ALL DECALS SHALL BE SILK SCREEN PRINTED WITH
MATTE COMPOSITION FOR THE SHEETING MATERIALS
TO PROVIDE A LABEL THAT HAS AN EQUAL LITE
EFFECTIVITY AS THE SIGN FACE.

MODOT ID LABELS SHALL BE PRINTED ON CLEAR
ELECTRONIC FIBER BACKGROUND WITH BLACK INK OR IT
MAY BE INCORPORATED INTO THE SILK SCREEN DETAIL
AND PRINTED ALONG WITH THE SIGN FACE.

IF THE LABEL IS APPLIED TO A BARRIER THE LEGEND
OF THE LABEL SHALL MATCH THE COLOR OF THE SIGN
LEGEND. IT IS BEING APPLIED TO THE LABEL SHALL
NOT HAVE ANY BACKGROUND COLOR OR BORDER.

VENDOR ID LABEL SHALL CONTAIN THE COMPANY
CONTACT INFORMATION INCLUDING FULL NAME, CITY,
STATE, PHONE NUMBER, AND THE SIGN FABRICATION DATE.

VENDOR ID LABEL SHALL BE PRINTED ON A WHITE
BACKGROUND WITH BLACK INK AND THE LEGEND SHALL BE
A MINIMUM OF 3/4".

MISSOURI HIGHWAYS AND TRANSPORTATION
COMMISSION
106 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-658-MOHWY (1-888-658-6699)

HIGHWAY SIGNING
GENERAL SIGN DATA

DATE EFFECTIVE: 10/1/2003
ORIGINAL 903.02AP SHEET NO. 2 OF 8
This page contains diagrams of state route shields and general notes on their specifications. The diagrams illustrate the dimensions and text for independent and guide signs.

**General Notes**

Refer to standard specifications for sheet size and substrate details.

For noble punching and mounting details, see other drawings.

For general sign data details, see other drawings.

The Missouri shape detail may be obtained from the traffic and highway safety division office.

Guide sign use shall be direct applied. Post mounted use shall be applied to aluminum substrate.

For numbered routes with more than 1 digit, the legend font may need to be reduced to C or D font.

See notes for details on US and interstate route shields.

Non-standard shield sizes may be obtained from the traffic and highway safety division office.
12" EXTRUDED ALUMINUM PANEL

MINIMUM WT. = 2.40 LBS./FT.

NOTE: MINIMUM WEIGHT AND THICKNESS DIMENSIONS SHOWN. HOLLOW PANELS MAY BE USED.

PLAN VIEW

END VIEW

ELEVATION VIEW

POST CLIP

POST CLIPS SHALL BE ASTM B 108, 356-T6 ALUMINUM ALLOY.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

HIGHWAY SIGNING
EXTRUDED ALUMINUM PANEL DETAILS

MODOT
HIGHWAY OF LIVING
**Structural Steel Post for Ground Mounted Signs**

**Post and Footing Data Table**

<table>
<thead>
<tr>
<th>Post</th>
<th>BOLT</th>
<th>WASHER</th>
<th>Post Connection Data Table (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>12 G</td>
</tr>
<tr>
<td>1</td>
<td>M6</td>
<td>1</td>
<td>4.0</td>
</tr>
<tr>
<td>2</td>
<td>M8</td>
<td>2</td>
<td>5.0</td>
</tr>
<tr>
<td>3</td>
<td>M10</td>
<td>3</td>
<td>6.0</td>
</tr>
<tr>
<td>4</td>
<td>M12</td>
<td>4</td>
<td>9.0</td>
</tr>
<tr>
<td>5</td>
<td>M16</td>
<td>5</td>
<td>12.0</td>
</tr>
<tr>
<td>6</td>
<td>M20</td>
<td>6</td>
<td>15.0</td>
</tr>
</tbody>
</table>

**Footings**

- Post and footing details for wide flange (WF) posts.
- Post installation details.

**General Notes**

- All structural steel stifferener plates and base plates for ground mounted signs shall meet the requirements of ASTM A-36 and ASTM A-242 grade 50 minimum yield 50,000 psi.
- In the event the distance between the top of the footing and the bottom of the post is less than 24", the column weight and foot length is to be increased sufficiently to accommodate this minimum spacing.
- Footing and base plates shall be tightened to the required design bolt tension values shown in Table 1 Sec. 10.10 of the Standard Specifications.
- The nut shall be free turning if the nut will not 270° of rotation because of finalizing characteristics. A lubricant shall be applied.
- Each breakaway assembly bolt shall be tightened to the required torque at the same time as the initial tightening.
- The holes shall be backed up at the nut using a center punch to prevent bit from loosening.

**Missouri Highways and Transportation Commission**

**Post and Footing Details Wide Flange (WF) Posts**

**Site Location:**

- Site Number: 903.03BN
- Effective Date: 01/04/2023
- Date Reviewed: 10/04/2020

**Sheet No.:** 1 of 16
**Ditch Section**

**Fill Section**

**Barrier Curb Sections**

**Post Spacing**

**Sign Orientation**

For post designs numbers 3, 4, 5, and 6, having heights greater than 10 ft., posts shall be spaced at least 10 ft. apart.

For post designs numbers 1 and 2, posts may be spaced less than 7 ft. apart.

Do not use three number 1 or 2 posts for 1 less than 11 ft.

For 1 greater than 11' and less than 17', 3-5 posts may be used depending on soil conditions.

For 1 of 6' to 17' typically use 2 posts.

For 1 greater than 17' typically use 3 posts.

**General Notes:**

For general notes, see sheet 1 of 16.

Vertical clearance from the roadway shall be maintained and increased only to meet the 9 ft. minimum vertical clearance from the guardrail.

Post size is determined using sign height, sign width, and clear height. The clear height is equal to the length of the lowest post measured from the ground to the bottom of the sign.

**Modot**

Missouri Highways and Transportation Commission

105 West Capitol
Jefferson City, MO 65102

1-888-4MODOT (1-888-466-3682)

POST INSTALLATION DETAILS

TYPICAL SECTION: MOUNTING HEIGHT AND POST SPACING

WIDE FLANGE (WF) POSTS

Sign Effective: 01/01/2023

Sheet Number: 903.03BN

Page: 3 of 16
**CLAMP TYPE SIGN SUPPORT FOR PIPE POST**

**WIDTH OF PIPE POST CLAMP**

<table>
<thead>
<tr>
<th>SIGN TYPE</th>
<th>MINIMUM WIDTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>FLAT</td>
<td>1 1/4&quot;</td>
</tr>
<tr>
<td>STRUCTURAL</td>
<td>3&quot;</td>
</tr>
</tbody>
</table>

**MOUNTING DETAILS FOR FLAT SHEET SIGNS ON ROUND STRUCTURES >4" PIPE POST**

**STRAP SEAL**

**FLARED LEG SIGN BRACKET**

**NOTES:**

- FOR GENERAL NOTES, SEE SHEET 1 OF 16.
- FOR MOUNTING HEIGHT AND OFFSET DETAILS, SEE SHEET 10 OF 16.
- FOR DETAILS OF EXTRUDED ALUMINUM PANELS AND POST CLIP DETAILS, SEE STANDARD PLANS 903.02 SHEET 5 OF 7.
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 PSST 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>5'</td>
<td>6</td>
</tr>
<tr>
<td>6'</td>
<td>7</td>
</tr>
<tr>
<td>7'</td>
<td>8</td>
</tr>
</tbody>
</table>

**T-BOLT DETAIL**

- Aluminum bolts shall be ASTM B 211, 2004-T6 or 6061-T6
- Aluminum flat washers shall be ASTM B 209, AASHTO M274-24 or 2004-T6
- Aluminum lock nuts (nylon insert) shall be ASTM B 211 or B 217-T6

**NOTES:**

- 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 905.02 Sheet 6 of 7.
- Alternate post mounting hardware use shall be on approved list.
ONE POST - SINGLE SIGN

ONE POST - SINGLE SIGN WITH SUPPLEMENTAL PLAQUE

TWO POST

GENERAL NOTES:
- Sign mounting bolts shall be installed with a nylon washer against the sign face with a steel washer between the nylon washer and bolt head.
- A locknut shall be used to fasten the sign to the post.
- Vertical clearance from the roadway shall be met and increased only to meet the minimum vertical clearance from the ground.
- Horizontal offset may be adjusted based on field conditions.

CHEVRON SIGN

TYPE III OBJECT MARKER

ADJACENT TO CURB

MOUNTING HEIGHT DETAILS

SIGN MOUNTING DETAILS
MOUNTING HEIGHT & OFFSET PIPE POSTS, FSST, WOOD & U-CANAL POSTS
DELINEATORS ON CONCRETE TRAFFIC BARRIER
FOR CONCRETE BARRIER DETAILS,
SEE SHEET PLAN 617.10 OF BRIDGE PLANS.

ONE WAY TRAFFIC

TWO WAY TRAFFIC

LEGEND

- WHITE DELINEATOR
  - YELLOW DELINEATOR
  - RED DELINEATOR

NOTE:

SECONDARY DELINEATOR ON BACK SIDE IS NOT REQUIRED IF ROADWAY "A" HAS MORE THAN 2 LINES

ROADWAY OR BRIDGE CONCRETE TRAFFIC BARRIER DELINEATION
DELINEATORS ON GUARDRAIL

FOR GUARDRAIL DETAILS, SEE SHEET PLANS 606.00 AND 606.50.

(1) A SECONDARY DELINEATOR WITH REFLECTIVE SHEETING SHALL BE ATTACHED TO THE BACK SIDE OF THE CHANNEL WING WHEN THE DELINEATION IS PLACED ALONG AN INTERCHANGE PAVE AND SHALL BE VISIBLE BY USING WEB TRAFFIC.

DELINEATORS ON THREE-STRAND MEDIAN GUARD CABLE

FOR THREE-STRAND GUARD CABLE DETAILS
SEE SHEET PLANS 606.41.

NOTES:

FOR GENERAL NOTES, SEE SHEET 1 OF 16.

RETROREFLECTIVE YELLOW, WHITE OR RED SHEETING IN ACCORDANCE WITH HIGHWAY 1-4955 TYPE A OR B SHALL BE APPLIED TO ONLY ONE SIDE OF THE GUARD CABLE POST DELINEATOR MOUNTED TOWARDS THE CHANNEL POST.

RETROREFLECTIVE SHEETING SHALL FOLLOW GUIDELINES OUTLINED IN SE 105.12.7 FOR CORRECT APPLICATION OF SHEETING TO DELINEATOR BODY. THE COLOR OF THE SHEETING SHALL MATCH THE CLOSEST ADJACENT PAINTING MARKING.
LEGEND
- WHITE DELINEATOR
- YELLOW DELINEATOR
- WHITE DOUBLE STACKED DELINEATOR
- RED DELINEATOR

DELINERATOR 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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<td>100</td>
</tr>
<tr>
<td>900</td>
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</tbody>
</table>

NOTES:
- DELINEATORS SHALL BE INSTALLED FACING APPROACHING TRAFFIC. YELLOW DELINEATORS SHOULD BE INSTALLED EVEN IF THE CURVE EXIT 325 AND END 60 FEET FROM THE CURVE POINT. WHITE DELINEATORS SHOULD BE PLACED ON THE BACK SIDE OF EITHER THE WHITE OR YELLOW DELINEATOR POSTS.
- DELINEATORS SHOULD BE PLACED WHERE VEHICLES MAY ACCIDENTALLY TRAVEL BEYOND THE RAMP ENDS AND HAVEN'T FACED AWAY FROM NORMAL TRAFFIC FLOW.

REFLECTIVE SHEETING SHALL BE IN ACCORDANCE WITH Sec 1042.2.7.3.
TYPE 4 OBJECT MARKER INSTALLATION

TYPICAL ROAD CLOSURE

NOTES:

FOR GENERAL NOTES, SEE SHEET 1 OF 16.

TYPE D GUARDRAIL IS ACCESS RESTRAINT AND VISUAL TARGET VALUE ONLY. IT HAS NO REFLECTIVE CAPABILITY.
**NOTE:** CHANGEABLE "OPEN/CLOSE" AND "BUSES WEIGH" SIGNS MOUNTED BELOW THIS SIGN. SEE DETAILS THIS SHEET.

**PERMIT SIGN DETAIL**

**MATERIAL LIST**

<table>
<thead>
<tr>
<th>NO.</th>
<th>DESCRIPTION</th>
<th>LB.</th>
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<tbody>
<tr>
<td>2</td>
<td>STEEL PLATE</td>
<td>2.26</td>
</tr>
<tr>
<td>1</td>
<td>3&quot; STANDARD PIPE</td>
<td>32.44</td>
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<tr>
<td>2</td>
<td>2-1/2&quot; STANDARD PIPE</td>
<td>5.49</td>
</tr>
<tr>
<td>8</td>
<td>1 1/2&quot; GALV. MACH. BOLT</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>GALV. WASHER</td>
<td></td>
</tr>
</tbody>
</table>

**GENERAL NOTES:**

- **DESIGN SPEC:** AASHTO STANDARD SPECIFICATIONS FOR STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINARIES, 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**

1105 WEST CAPITOL
JOPLIN, MO 64801-5294

**HIGHWAY SIGNING**

**WEIGH STATION**

**DATE EFFECTIVE:** 03/01/2012

**DATE PREPARED:** 02/01/2012

**903.04F SHEET NO. 1 OF 1**
PART ELEVATION
(TYPE A CONCRETE TRAFFIC BARRIER)

NOTE:
The 2" CONCRETE IN THE CONCRETE PEDESTAL SHALL BE PVC SCHEDULE 40 AND SHALL BE PLACED WITH A MIN. RADIUS BEND OF 90°.

SECTION C-C
TYPICAL SECTION SHOWING REINFORCING STEEL

DETAILS OF ALTERNATE PEDESTAL
(to be used adjacent to Type "A" or "C" median barrier)
TYPICAL ELEVATION OF SIGN COMPONENTS

TYPICAL HALF PLAN OF SIGN COMPONENTS

SECTION A-A
TYPICAL SECTION OF SIGN SUPPORT

DETAIL 1

DETAIL 2

SECTION F-F

DETAIL 2

SECTION C-C

GENERAL NOTES:

EXIT NO. PANELS SHALL BE MOUNTED flush with the exit side of the dike sign.

ALL SIGNS SHALL BE CENTERED VERTICALLY ABOUT THE HORIZONTAL C. OF THE TRUSS.

SEE DETAIL 303.09 FOR LIGHTING DETAILS IF LIGHTING THE SIGN IS NECESSARY.

SEE DETAIL PLAN 903.03 FOR SIGN MOUNTING DETAILS.

ALL MATERIAL ALUMINUM EXCEPT AS NOTED.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-MO-ROAD (667-6633)

OVERHEAD SIGN TRUSSES
SIGN MOUNTING DETAIL

DETAIL 1

DETAIL 2

2 - 3/4" E110 Stainless steel bolts with self-locking nuts and aluminum washers

LOCATE THE INTERIOR DIAGONAL AS CLOSE AS POSSIBLE TO THE CENTERLINE OF THE PANEL POINT WITHOUT OVERLAPPING WELDS.

MI 903.10BD 6 OF 6 SHEET
## Drilled Shaft Option

<table>
<thead>
<tr>
<th>Post Type</th>
<th>Drill Diameter</th>
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<th>Split</th>
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## Alternate Pedestals

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## Spread Footing Option with Alternate Pedestals

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*Warning: Base plates, pedestal size footings, larger sizes shall be normal to axis of sign.*

**Warning: Base plates, pedestal size footings, larger sizes shall be normal to axis of sign.**

---

**Missouri Highways and Transportation Commission**

**OVERHEAD SIGN TRUSSES**

**SUBSTRUCTURE DATA**

**SITE EFFECTIVE:** 06-04-2021

**DATE REVIEWED:** 10-14-2020

**903.12AA**

**SHEET NO. 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:**
PEDESTAL AND FOOTING SHALL BE CLASS B (R.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.
REMARKS REFER TO SHEET 3 OF 7 FOR DETAILS OF THESE ITEMS.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

OVERHEAD SIGN TRUSSES
SPREAD FOOTING
NOTE:

THE 2" CONDUIT IN THE CONCRETE FEDERAL
SHALL BE PVC SCHEDULE 40 AND SHALL
BE PLACED WITH A MIN. RADIUS BEND OF 90°.

PART ELEVATION
(TYPE A CONCRETE TRAFFIC BARRIER)

SECTION C-C
TYPICAL SECTION SHOWING REINFORCING STEEL

DETAILS OF ALTERNATE PEDESTAL
(TO BE USED INDEPENDENT TO THE "A" OR "C" MEDIAN BARRIER)