Missouri Department of Transportation

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

This set of Standard Plans is effective beginning with the January 2024 bid opening.

www.modot.org/business/standards_and_specs/standardplans.htm
EFFECTIVE: 01/01/2024

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
MISSOURI STANDARD PLANS FOR HIGHWAY CONSTRUCTION
TABLE OF CONTENTS

STANDARD
NO.
203.00E
203.02F
203.10D
203.20G
203.21K
203.22
203.35A
203.40G
203.41F
203.50N
203.61B
203.62E
203.63C
203.64E
203.65B
204.00D
204.30
401.00C
413.20
502.05S
502.10L
504.00L
506.20
602.00D
604.05D
604.10E
604.11E
604.12E
604.13E
604.14E
604.15E
604.29C
604.30G
604.40G
604.70
605.10I
606.00AY
606.01F
606.22U
606.23J
606.30L
606.31B

DRAWING TITLE
EXCAVATION AND EMBANKMENT – TYPICAL DETAILS
UNDERGRADING – TYPICAL DETAILS
TABULATED EARTHWORK AND SECTION DATA
SUPERELEVATION, SPIRALS AND WIDENING (UNDIVIDED HIGHWAY)
SUPERELEVATION, SPIRALS AND WIDENING (DIVIDED HIGHWAY)
SUPERELEVATION, SPIRALS AND WIDENING
MAILBOX TURNOUTS
TYPICAL DETAILS ON AND OFF RAMP
TYPICAL DETAILS ON AND OFF RAMPS (ROADWAY WITH 6:1 FORESLOPE)
TYPICAL MEDIAN OPENINGS (DIVIDED HIGHWAYS)
DRIVEWAY – TYPE I
DRIVEWAY – TYPE II
DRIVEWAY – TYPE III
DRIVEWAY – TYPE IV
DRIVEWAY – TYPE V
EMBANKMENT CONTROL – MEASURING DEVICES
PORE PRESSURE MEASUREMENT DEVICES
TYPE A2 AND A3 SHOULDERS, SAFETY EDGE SM
SCRUB SEAL BROOM CONFIGURATION
CONCRETE PAVEMENT AND BASE APPURTENANCES FOR 15 FT. JOINT SPACING
DOWEL SUPPORTING UNITS
CONCRETE APPROACH PAVEMENT
BIG BLOCK UNBONDED CONCRETE OVERLAY
RIGHT-OF-WAY AND DRAIN MARKERS
PIPE CULVERT HEADWALLS – TYPE S
PIPE CULVERT HEADWALLS – ENERGY DISSIPATOR FOR 18” CONCRETE PIPE
PIPE CULVERT HEADWALLS – ENERGY DISSIPATOR FOR 24” CONCRETE PIPE
PIPE CULVERT HEADWALLS – ENERGY DISSIPATOR FOR 30” CONCRETE PIPE
PIPE CULVERT HEADWALLS – ENERGY DISSIPATOR FOR 36” CONCRETE PIPE
PIPE CULVERT HEADWALLS – ENERGY DISSIPATOR FOR 42” CONCRETE PIPE
PIPE CULVERT HEADWALLS - ENERGY DISSIPATOR FOR 48" CONCRETE PIPE
DROP INLET - TYPE X
CONCRETE MANHOLES
PIPE COLLARS
SLOTTED DRAIN
PAVEMENT UNDERDRAINAGE
GUARDRAIL
MEDIAN PIER PROTECTION
BRIDGE ANCHOR SECTION - SAFETY BARRIER CURB ON BRIDGE
BRIDGE ANCHOR SECTION - THRIE BEAM RAIL ON BRIDGE
GUARDRAIL - TERMINAL ANCHOR ENDS
CRASHWORTHY END TERMINALS - TYPE A - GRADING LIMITS

NO. OF
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1
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07/01/2018
07/01/2004
04/01/2023
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04/01/2021
10/01/2019

STANDARD
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606.40D
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606.50E
606.51
606.60B
606.70B
606.80C
606.81B
607.10V
607.11H
607.20G
608.00K
608.10P
608.20E
608.30A
608.40A
608.50A
609.00Q
609.15D
609.40U
609.60D
609.70C
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616.20A
617.10M
617.20F
619.10J
620.00N
620.10G
625.00
626.00H

DRAWING TITLE
ONE-STRAND ACCESS RESTRAINT CABLE
THREE-STRAND GUARD CABLE
MIDWEST GUARDRAIL SYSTEM (MGS)
MIDWEST GUARDRAIL SYSTEM (MGS) - MEDIAN PIER PROTECTION
MIDWEST GUARDRAIL SYSTEM (MGS) - VERTICAL BARRIER TRANSITIONS
MIDWEST GUARDRAIL SYSTEM (MGS) - THRIE BEAM RAIL ON BRIDGE
MIDWEST GUARDRAIL SYSTEM (MGS) - TERMINAL ANCHOR ENDS
MASH - CRASHWORTHY END TERMINALS - TYPE A - GRADING LIMITS
CHAIN-LINK FENCE
CHAIN-LINK FENCE FOR RETAINING WALLS
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
ROCK DITCH LINER
ROCK LINING FOR CULVERT OUTLET
CONCRETE SLOPE PROTECTION
SAND FILLED IMPACT ATTENUATORS
PAVEMENT REPAIR
GRATES AND BEARING PLATES
CURVED VANE GRATE AND FRAME
MANHOLE AND FRAME COVERS
TEMPORARY TRAFFIC CONTROL DEVICES
TEMPORARY TRAFFIC CONTROL PLANS - TWO-LANE ROADWAYS
PERMANENT CONCRETE TRAFFIC BARRIER
TEMPORARY CONCRETE TRAFFIC BARRIER
PAVEMENT EDGE TREATMENT
PAVEMENT MARKING
TEMPORARY PAVEMENT MARKING
HOLE PATTERN FOR PAVEMENT SLAB STABILIZATION
RUMBLE STRIPS

* REVISED OR ADDED SINCE JULY 2023

*

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*

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10/01/2020
01/01/2021
10/01/2017
10/01/2022
07/01/2017
10/01/1998
07/01/2022

SHEET 1 OF 2

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# MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
## MISSOURI STANDARD PLANS FOR HIGHWAY CONSTRUCTION
### TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>STANDARD NO.</th>
<th>DRAWING TITLE</th>
<th>NO. OF SHEETS</th>
<th>EFFECTIVE DATE</th>
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<tr>
<td>703.10J</td>
<td>CONCRETE SINGLE BOX CULVERT – STRAIGHT WINGS (SQUARED)</td>
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<td>CONCRETE SINGLE BOX CULVERT – STRAIGHT WINGS (LEFT ADVANCE)</td>
<td>3</td>
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<td>CONCRETE SINGLE BOX CULVERT – FLARED WINGS (LEFT ADVANCE)</td>
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<td>703.14J</td>
<td>CONCRETE SINGLE BOX CULVERT – STRAIGHT WINGS (RIGHT ADVANCE)</td>
<td>3</td>
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<tr>
<td>703.15E</td>
<td>CONCRETE SINGLE BOX CULVERT – FLARED WINGS (RIGHT ADVANCE)</td>
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<td>CONCRETE SINGLE BOX CULVERT – CUT SECTIONS</td>
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<td>CONCRETE SINGLE BOX CULVERT – MEMBER SIZES AND REINFORCEMENT</td>
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<td>07/01/2021</td>
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<td>703.37C</td>
<td>CONCRETE BOX CULVERT – EXTERIOR WING REINFORCEMENT</td>
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<td>04/01/2011</td>
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<td>703.38A</td>
<td>CONCRETE BOX CULVERT – CUTTING DETAILS</td>
<td>2</td>
<td>10/01/2009</td>
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<td>703.40H</td>
<td>CONCRETE DOUBLE BOX CULVERT – STRAIGHT WINGS (SQUARE)</td>
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<td>CONCRETE DOUBLE BOX CULVERT – FLARED WINGS (SQUARE)</td>
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<td>703.42H</td>
<td>CONCRETE DOUBLE BOX CULVERT – STRAIGHT WINGS (LEFT ADVANCE)</td>
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<td>703.43H</td>
<td>CONCRETE DOUBLE BOX CULVERT – FLARED WINGS (LEFT ADVANCE)</td>
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<td>CONCRETE DOUBLE BOX CULVERT – STRAIGHT WINGS (RIGHT ADVANCE)</td>
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<td>CONCRETE DOUBLE BOX CULVERT – FLARED WINGS (RIGHT ADVANCE)</td>
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<td>CONCRETE DOUBLE BOX CULVERT – CUT SECTION</td>
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<tr>
<td>703.47A</td>
<td>CONCRETE DOUBLE BOX CULVERT – MEMBER SIZES AND REINFORCEMENT</td>
<td>27</td>
<td>07/01/2023</td>
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<tr>
<td>703.60E</td>
<td>CONCRETE BOX STRUCTURE – PIPE INLET</td>
<td>1</td>
<td>07/01/2001</td>
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<tr>
<td>703.60H</td>
<td>CONCRETE TRIPLE BOX CULVERT – STRAIGHT WINGS (SQUARE)</td>
<td>3</td>
<td>01/01/2021</td>
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<tr>
<td>703.81H</td>
<td>CONCRETE TRIPLE BOX CULVERT – FLARED WINGS (SQUARE)</td>
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<td>01/01/2021</td>
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<tr>
<td>703.82H</td>
<td>CONCRETE TRIPLE BOX CULVERT – STRAIGHT WINGS (LEFT ADVANCE)</td>
<td>3</td>
<td>01/01/2021</td>
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<tr>
<td>703.84H</td>
<td>CONCRETE TRIPLE BOX CULVERT – STRAIGHT WINGS (RIGHT ADVANCE)</td>
<td>3</td>
<td>01/01/2021</td>
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<td>703.85C</td>
<td>CONCRETE TRIPLE BOX CULVERT – FLARED WINGS (RIGHT ADVANCE)</td>
<td>3</td>
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<td>703.86</td>
<td>CONCRETE TRIPLE BOX CULVERT – CUT SECTIONS</td>
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<td>01/01/2021</td>
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<tr>
<td>703.86A</td>
<td>CONCRETE TRIPLE BOX CULVERT – MEMBER SIZES AND REINFORCEMENT</td>
<td>27</td>
<td>07/01/2023</td>
</tr>
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<td>706.35H</td>
<td>BAR SUPPORTS FOR CONCRETE REINFORCEMENT</td>
<td>1</td>
<td>07/01/2004</td>
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<td>712.40L</td>
<td>STEEL DAMS AT EXPANSION JOINTS</td>
<td>1</td>
<td>10/01/2019</td>
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<tr>
<td>725.06C</td>
<td>CORRUGATED METAL PIPE INSTALLATION METHODS</td>
<td>5</td>
<td>04/01/2011</td>
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<tr>
<td>725.31C</td>
<td>METAL CURTAIN WALL AND METAL INLETS</td>
<td>1</td>
<td>07/01/2004</td>
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<tr>
<td>726.35J</td>
<td>RIGID CULVERT INSTALLATION METHODS</td>
<td>2</td>
<td>04/01/2015</td>
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<td>730.90J</td>
<td>THERMOPLASTIC PIPE INSTALLATION METHODS</td>
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<td>04/01/2015</td>
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<td>731.00J</td>
<td>PRECAST MANHOLE</td>
<td>2</td>
<td>07/01/2016</td>
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<td>731.10S</td>
<td>PRECAST DROP INLET</td>
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<td>01/01/2022</td>
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<td>732.00S</td>
<td>FLARED END SECTION</td>
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<td>07/01/2021</td>
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<td>732.05D</td>
<td>BEVELED PIPE END TREATMENT</td>
<td>2</td>
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<td>SAFETY SLOPES END SECTION</td>
<td>3</td>
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<td>733.00L</td>
<td>PRECAST CONCRETE BOX CULVERT TIES</td>
<td>1</td>
<td>07/01/2021</td>
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<td>805.00</td>
<td>SEEDING</td>
<td>1</td>
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<tr>
<td>806.10K</td>
<td>TEMPORARY EROSION CONTROL MEASURES</td>
<td>6</td>
<td>01/01/2023</td>
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<tr>
<td>808.00</td>
<td>TYPICAL PLANTING ILLUSTRATIONS</td>
<td>3</td>
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*REVISED OR ADDED SINCE JULY 2023*
EXCAVATION PAY LIMITS

EMBANKMENT LIMITS

BACKSLOPES IN STABLE AND SEMI-STABLE MATERIAL

PARABOLIC Rounding

INTERCEPTION DITCH AND/OR LEVEE

GENERAL NOTES:

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

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

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

SHEET NO. 1 OF 1

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

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

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

SOLID AREA INDICATES ADDITIONAL EMBANKMENT WHERE FULL WIDTH BASE IS NOT USED.
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 18" rock base

Slope same as shoulder except for flexible pavements having full width bituminous stabilized base course where the slope shall be the same as bottom of base.

In rock over entire width of roadbed with Type 5 aggregate base

In rock over partial width of roadbed
UNDERGRADING LIMITS
(FLEXIBLE OR RIGID PAVEMENTS)

UNDERGRADING LIMITS
(EARTH OR AGGREGATE TYPE SURFACE)
Spiraled Curve and Widening Transitions

Super-elevation runoff and widening transitions without spirals

Multilane factors for "L"

1.0 Lane Rotated (12 Lane Roadbed) = 1.00
1.5 Lane Rotated (13 Lane Roadbed) = 1.29
2.0 Lane Rotated (14 Lane Roadbed) = 1.50
2.5 Lane Rotated (15 Lane Roadbed) = 1.70
3.0 Lane Rotated (16 Lane Roadbed) = 2.00
3.5 Lane Rotated (17 Lane Roadbed) = 2.25

Maximum radius for use of a spiral curve transition

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<th>Maximum Radius (ft)</th>
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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 "L" 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.
SUPERELEVATION
SPIRALS AND WIDENING
UNDIVIDED HIGHWAYS

CASE NUMBER 2

TRANVERSE SLOPE ON TANGENT SECTION IS OPPOSITE TO SLOPE OF SUPERELEVATION.
NOTE: PAVEMENT PROFILE DEPENDING UPON ITS OUTSIDE EDGE WITH REFERENCE TO THE HORIZONTAL CURVE WHICH IS BEING APPROACHED.

STRAIGHT LINE METHODS OF ATTAINING SUPERELEVATION
CASE NUMBER 3

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

NOTES: PAVEMENT PROJECTED ALONG ITS INSIDE EDGE WITH REFERENCE TO THE HORIZONTAL CURVE WHEN IT IS BEING APPROACHED.

STRAIGHT LINE METHOD OF ATTAINING SUPERELEVATION
Spiraled Curve and Widening Transitions

SECTION ON SUPERELEVATED CURVE CURVE TO LEFT (ILLUSTRATED)

MULTI-LANE FACTORS FOR "L"

- 1.0 Lane Routed (2 Lane Routed) = 1.00
- 1.5 Lane Routed (3 Lane Routed) = 1.50
- 2.0 Lane Routed (4 Lane Routed) = 2.00
- 2.5 Lane Routed (5 Lane Routed) = 2.50
- 3.0 Lane Routed (6 Lane Routed) = 3.00
- 3.5 Lane Routed (7 Lane Routed) = 3.25

EXAMPLE: 3.0 Lane Routed Highway = 3 Lanes in each direction routed separately about 3 times. Hence, when the lane separation table A is used (3) lane divided highway routed about the centerline.

Both cases would use the 3 lane routed adjustment value or 2 times the value of one lane routed.

MAXIMUM RADIUS FOR USE OF A SPIRAL CURVE TRANSITION

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<th>DESIGN SPEED</th>
<th>MAXIMUM RADIUS (FT)</th>
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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 "L" is considered to be the super-elevation ratio "L". See SHR4-002S SHEET 1 of 2.

- At the widening for surfacing at inside shoulder, see SHR4-002S SHEET 2 of 2.

- Widening transition varies in effect proportion to distance.

- Spiral curves are used in all roadways that have design traffic greater than 400 vehicles per day. One have a radius less than the values listed in the maximum radius for use of a spiral curve transition table.

SUPERELEVATION, SPIRAL AND WIDENING DIVIDED HIGHWAYS

SHEET NO. 1 OF 3

DATE: 07/09/2007
DATE: 07/09/2007

203.21K

MO DOT HIGHWAYS AND TRANSPORTATION COMMISSION
101 WEST CAPITOL JEFFERSON CITY, MO 65102 1-888-368-MO DOT (668-6688)
SUPERELEVATION, SPIRALS AND WIDENING
DIVIDED HIGHWAYS

NOTE:
- Vertical curves may be inserted at points where the alignment changes.
- Profiles should be verified in the field.

Superelevation runoff = L [see standard plans 203.22, sheet 2 of 2]
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TABLE NOTES:
- "NC" DENOTES NORMAL CROSS SLOPE.
- "AD" DENOTES AVERSE CROSS SLOPE.
- "AD" DENOTES THE SLOPE IN PERCENT (1%).
- "Lh" THE LENGTH OF SLOPE PERMIT AND DEVIATION TRANSITION IN FEET FOR A 2 LANE HIGHWAY.

THE 1 COLUMN IS FOR 1 LANE ROUTES.
THE 2 COLUMN IS FOR 2 LANE ROUTES.

EXAMPLE: A 50 MPH CURVE WITH A MAXIMUM SLOPE OF 3.0 PERCENT, 2 RADIUS OF 1,000 FT. SHOULD USE THE RADIUS OF 1,530 FT TO OBTAIN A SLOPE RATING OF 3.4 PERCENT.
<table>
<thead>
<tr>
<th>Curve Length (Ft)</th>
<th>24' Roadway Width</th>
<th>26' Roadway Width</th>
<th>30' Roadway Width</th>
<th>Design Speed (MPH)</th>
<th>Design Speed (MPH)</th>
<th>Design Speed (MPH)</th>
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<td>30</td>
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</table>

**Table Notes:**

- "W" is the widening in feet for superelevation at inside shoulders.
- Values shown are for 3-lane design vehicle.
- Values are effective widening in feet.
- Values less than 2.0 feet may be disregarded.
- For 3-lane highways, multiply above values by 1.5.
- For 4-lane highways, multiply above values by 2.0.

---

**MoDOT Highways and Transportation Commission**

100 West Capitol
Jefferson City, MO 65102
1-888-418-MODOT (6636) 1-660-275-6325

SUPERELEVATION, SPIRALS AND WIDENING

**Date Effective:** 07/03/2007

**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.

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

- **EDGE OF TRAVELED WAY:** 8' MIN.
- **NORMAL SHOULDER SLOPE:**
- **MAILBOX LOCATION:**
- **PIPE WHEN REQ'D:**

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

- **EDGE OF TRAVELED WAY:** 8' MIN.
- **NORMAL SHOULDER SLOPE:**
- **MAILBOX LOCATION:**
- **PIPE WHEN REQ'D:**

**PLAN**

*ADD 2' FOR EACH ADDITIONAL MAILBOX*
**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:** 8/23/2009

**GENERAL NOTES:**

SEE OTHER DRAWINGS FOR JOINT LAYOUTS AND STRIPING DETAILS.

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

**W RAMP WIDTH**

ONE LANE, ONE WAY OPERATION WITH

- **12' NO PROVISION FOR PASSING STALLED VEHICLES. DESIGN TRUCK VOLUMES
  - 6.5%**

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

**NOTES:**

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

SECTION H-H

SECTION G-G

SECTION F-F

SECTION E-E

NOTES:
(1) FOR RAMP SHOULDER WIDTH. SEE TYPICAL SECTIONS.
(2) SEE ROADWAY PLANS.
**Plan View "On" Ramps**

- **SECTION A-A**
  - Mainline Pavement Construction Base
  - Section A-A: View showing the alignment and details of the ramp base line.
  - Edge of Pavement Structure
  - 2' Traveled Way

- **SECTION B-B**
  - Mainline Pavement Construction Base
  - Section B-B: View showing the alignment and details of the ramp base line.
  - Edge of Pavement Structure
  - 2' Traveled Way

- **SECTION C-C**
  - Mainline Pavement Construction Base
  - Section C-C: View showing the alignment and details of the ramp base line.
  - Edge of Pavement Structure
  - 2' Traveled Way

- **SECTION D-D**
  - Mainline Pavement Construction Base
  - Section D-D: View showing the alignment and details of the ramp base line.
  - Edge of Pavement Structure
  - 2' Traveled Way

**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 shoulder width, see typical sections.
2. See roadway plans.
### Type I Median Opening

**Private Entrances, Minor Side Roads or Field Entrances**

<table>
<thead>
<tr>
<th>Design Speed</th>
<th>L'</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.40 mph</td>
<td>112.5'</td>
</tr>
<tr>
<td>7.40 mph</td>
<td>225'</td>
</tr>
</tbody>
</table>

**Notes for Type I Median Openings:**

Median openings and tapers shall be constructed of the same material and thickness as the traveled way. Shoulders adjacent to the median opening and tapers shall be A2 shoulders for interstate and major roadways or A3 shoulders for low volume majors and minor roads.

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

### Taper Length

**Full Deceleration Length**

<table>
<thead>
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<th>Design Speed</th>
<th>Minimum Length</th>
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<tbody>
<tr>
<td>45 mph</td>
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<tr>
<td>50 mph</td>
<td>435 ft.</td>
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<tr>
<td>55 mph</td>
<td>480 ft.</td>
</tr>
<tr>
<td>60 mph</td>
<td>530 ft.</td>
</tr>
<tr>
<td>65 mph</td>
<td>570 ft.</td>
</tr>
<tr>
<td>70 mph</td>
<td>615 ft.</td>
</tr>
</tbody>
</table>

For major side roads, state routes and major commercial entrances, the full deceleration length is recommended.

### Type II Median Opening

<table>
<thead>
<tr>
<th>Design Speed</th>
<th>L'</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.40 mph</td>
<td>125'</td>
</tr>
<tr>
<td>7.40 mph</td>
<td>250'</td>
</tr>
</tbody>
</table>

**Notes for Type II Median Openings:**

Median openings and tapers shall be constructed of the same material and thickness as the traveled way. Shoulders adjacent to the median opening and tapers shall be A2 shoulders for interstate and major roadways or A3 shoulders for low volume majors and minor roads.

In addition to the identified slopes, slopes adjacent to median opening shoulders shall not be steeper than 5:1.
Plan View

Types 1 or 5 Base

See Note Below

Pipe

Driveway Typical Section

Break Points Shoulder Width
Plus 4' Min. To E.P.

Slope 4% Min. From Edge of Traveled Way to Break Point

Finished roadway template beyond limits of driveway

In Fills

Profile View

Driveway Size Slopes:

1 to 1.50 Vehicles per day on State Route use 3:1 slope (or 6:1 slope where practicable).

Over 1.50 Vehicles per day on State Route use 6:1 slope (or flatter where practicable).

NOTE: Recommended width of driveway = 20'

In order to minimize use of 6:1 slopes the pipe sections on new construction and where possible on existing routes the location of drainage pipe should be beyond the clear zone distance as shown in Table 3.1 of the 1988 Edition of "Roadside Design Guide".

General Notes:

No part of the driveway excluding tapers shall be constructed beyond the property frontage.

Surfacing shall be as shown on the plans or pavement.

4 inches of Type 1 or 5 Base shall be placed on compacted base beneath the pavement surface of concrete and asphalt driveways.

Length of Type 1 shall be determined by depth site location of ditch. Minimum 72" length of minimum 10" diameter pipe, see plans.

This drawing illustrates driveway details for minimum situations. Traffic volume, safety considerations, local requirements, etc., may dictate more extensive improvements than illustrated.
GENERAL NOTES:
RECOMMENDED WIDTH OF ROADWAY - 24' WITHOUT PARKING
ON PAVED AND 52' WITH PARKING ON PAVED.
SURFACING SHALL BE AS SHOWN ON THE PLANS OR PERMIT.
4 INCHES OF TYPE 1 OR 2 BASE SHALL BE PLACED AND
COMPACTED BELOW THE APEX SURFACE OF ASPHALT
AND CONCRETE DRIVEWAYS.
LENGTH OF PIPE SHALL BE DETERMINED BY DEPTH AND
LOCATION OF DITCH, SEE PLANS.
IF A PAVED APPROACH IS REQUIRED, REFER TO STANDARD
PLAN 605.00 FOR CONSTRUCTION DETAILS AND CONSTRUCT
CUBE OF CUBE OR PAVED APPROACH. TRANSITION REQUIRED FROM 4" CUBE TO 6" CUBE.
CUBE OF CUBE OR GUTTER BETWEEN RIGHT-OFF LANE
AND PIPE MAY MEET LOCAL AGENCY STANDARDS.
THIS DRAWING ILLUSTRATES DETAILS FOR MUNICIPAL
SITUATIONS. TRAFFIC VOLUMES, SAFETY CONSIDERATIONS,
DRAINAGE CONSIDERATIONS, LOCAL REQUIREMENTS, ETC.,
MAY REQUIRE MORE EXTENSIVE IMPROVEMENTS THAN
ILLUSTRATED.
PIPE SIZE AND LOCATION TO BE DETERMINED BY
GEOMETRICS AND TRAFFIC CONDITIONS (SEE PLANS).
A MINIMUM 4'-FOOT RIGHT DISTANCE TRIANGLE MEASURED
ALONG THE CENTERLINE OF THE INTERSECTING ROADWAY
SHOULD BE PROVIDED.

MISSOURI HIGHWAYS AND TRANSPORTATION
COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-661-MDOT (636-8468)

DRIVEWAY
TYPE II

DERRICK BROWN, P.E.
DESIGNER

SIGN EXPIRES:
DATE ISSUED:
4/29/2020
203.62E
SUMMARY SHEET:
1 OF 2
NOTE:
SEE STANDARD PLAN 203.50 FOR DETAILS OF LOW PROFILE ISLAND.
WHERE MINIMUM ISLAND CANNOT BE
DETERMINED, OMIT ISLAND.

MINIMUM ISLAND DETAILS

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>R</th>
<th>TOTAL</th>
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<td>10</td>
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<td>TRUCK-ONLY</td>
<td>50</td>
<td>25</td>
<td>24</td>
<td>511</td>
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</table>

NOTES:

THIS DRAWING SHALL BE USED IN CONJUNCTION WITH TYPES II AND III DRIVES AND
TRAFFIC VOLUMES REQUIRE A VOLUNTEER PRODUCT
INTERSECTION ARE TYPE IV WHEN A SINGLE
APPROACH TRUCK DRIVEWAY IS DESIRED.

ALL CONTROLS PERTAINING TO GRASSES, DRAINAGE,
BASE, CURBING, ETC., SHALL BE AS SHOWN ON
OTHER RESPECTIVE TYPE DRIVEWAY STANDARDS.

THE "K" DIMENSIONS ARE RECOMMENDED WIDTH.
OTHER ALLOWED WIDTHS MAY BE USED WITHIN
TOLERANCES OF THE RESPECTIVE TYPE DRIVEWAY
STANDARDS.

GENERAL NOTES:

DETAILS SHOWN ON THIS SHEET ARE FOR RECTANGLE
APPROACHES.

TAPER LENGTHS ARE NOT APPLICABLE WHEN DECELERATION
LANES ARE PROVIDED.

SIGNALIZED INTERSECTIONS AND INTERSECTIONS IN
SCHOOL ZONE ARE MANDATORY TO MEET EXISTING
CONDITION.

THIS DRAWING ILLUSTRATES DRIVEWAY DETAILS FOR MINIMUM
SITUATIONS. TRAFFIC VOLUMES, SAFETY CONSIDER-
ATIONS, DRAINAGE CONSIDERATIONS, LOCAL REQUIRE-
MENTS, ETC., MAY REQUIRE MORE EXTENSIVE IMPROVEMENTS
THAN ILLUSTRATED.

MISSOURI HIGHWAYS AND TRANSPORTATION
COMMISSION
105 WEST CAPITAL
JEFFERSON CITY, MO 65102
1-888-657-MODOT (1-888-657-6636)

DRIVeway TYPE V

PLAN VIEW
EMBANKMENT CONTROL STAKE

GROUND SURFACE
3" ± PORTLAND CEMENT MORTAR LEVELING COURSE

STEEL SETTLEMENT PLATE
3" PORTLAND CEMENT MORTAR LEVELING COURSE

ORDINARY BACKFILL

2" X 4" SPLICE IF REQUIRED

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

GROUND LINE

2' GRADUATED SCALE

1/2" DIA. COVER PIPE

3/8" DIA. RISER PIPE

3" CONTINUOUS WELD

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

EMBANKMENT CONTROL MEASURING DEVICES

DATE EFFECTIVE: 04/01/1983
DATE PREPARED: 06/23/1983

SHEET NO. 1 OF 1

204.000
GENERAL NOTES:

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

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

DATE EFFECTIVE: 03/01/1996
DATE PREPARED: 8/23/2009

SHEET NO. 1 OF 1

PORE PRESSURE MEASUREMENT DEVICES
OPTION 1

MAINLINE BASE
INCIDENTAL
BASE (NO DIRECT
PAY)

PAY LIMIT FOR MAINLINE BASE

OPTION 2

MAINLINE BASE
INCIDENTAL
BASE (NO DIRECT
PAY)

PAY LIMIT FOR MAINLINE BASE

OPTION 3

PCC PAVEMENT

MAINLINE BASE
INCIDENTAL
BASE (NO DIRECT
PAY)

PAY LIMIT FOR MAINLINE BASE

GENERAL NOTE:

THE FINAL FINISH ON CONCRETE SHOULDERs MAY BE
OBTAINED BY THE USE OF A ROLL CONSISTING OF A
SEAMLESS SHEET OF (Lamb LEAF - COTTON FABRIC),
PLASTIC, TURF, OR OTHER SUITABLE MATERIAL CAPABLE
OF PRODUCING A UNIFORM SURFACE OR SMOOTh TECb.
THE QUALITY FOR ADDITIONAL BASE MATERIAL RESULTING
FROM THE VARIABLE THICKNESS MATERIAL OF CONSTRUCTION
WHERE THE TYPE 2 SHOULDER WILL BE CONSIDERED
INCIDENTAL.

INCIDENTAL BASE SHALL CONSIST OF TYPE 1 OR 2
AGGREGATE FOR BASE. OR AN ALTERNATE MATERIAL THAT
MEETS THE APPROVAL OF THE ENGINEER.

PAVEMENT ON ROCK BASE

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

BASE

4 USE 12" BF-1 OVER 4" PBW UNLESS
OTHERWISE SPECIFIED ON THE PLANS.
**Option 1**

Mainline aggregate base, pay limit for mainline base, incidental base.

**Option 2**

Mainline aggregate base, pay limit for mainline base, incidental base.

**Option 3**

Mainline aggregate base, pay limit for mainline base, incidental base.

**PCC Pavement**

Mainline aggregate base, pay limit for mainline base, incidental base.

**HMA Pavement**

Mainline aggregate base, pay limit for mainline base, incidental base.

**General Note:**

The final finish on concrete shoulders may be obtained by the use of a wear course consisting of a seamless strip of damp emulsion, cotton fabric, plastic turf or other suitable material capable of producing a uniform surface of spotty texture.

The quantity for additional base material resulting from the variable thickness material of construction method of Type 3 shoulder will be considered incidental.

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

**Tool Joint**

Joint depth shall be 3" and may be sawed or tooled.

**RCC (Roller Compacted Concrete) or PCC (Portland Cement Concrete)**

HMA (Hot Mix Asphalt) base.

**PAY LIMIT FOR ROCK BASE**

Type A3 Shoulders
GENERAL NOTES:

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

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

THE SAFETY EDGE™ SHALL BE BACKFILLED AS SHOWN.

RECEIVED OF PAVEMENT TYPE. WHEN PAYMENT OF SHOULDER IS MADE PER SOURCE USE, THE MATERIAL NEEDED TO CONSTRUCT THE SAFETY EDGE™ IS CONSIDERED INCIDENTAL TO THE PAYMENT OF SHOULDER. NO MEASUREMENTS WILL BE MADE FOR THE MATERIAL USED IN THE SAFETY EDGE™ EXCEPT WHEN PAYMENT FOR PAVEMENT OR SHOULDER IS MADE IN VOLUME OR WEIGHT.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITAL
JEFFERSON CITY, MO 65102
1-888-MODOT-Help (1-888-663-6838)

SAFETY EDGE™

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

1/" CHAIN WITH HOOKS

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

**GENERAL NOTES:**

1. ALL TRANSVERSE JOINTS ON SHOULDERS SHALL BE 4".
2. THE CONTRACTOR SHALL DETERMINE THE PAVING WIDTH.

**TAPER TREATMENT**

**NON-INTERCHANGE**
CONSTRUCTION JOINT C

THE HEATER PLANK SHALL BE SUFFICIENTLY RIGID TO PREVENT EYEBROWING FROM THE TYPICAL SECTION AND ADDITION. STRAIGHT LINE FROM PAVEMENT EDGE TO PAVEMENT EDGE.

THE CONSTRUCTION JOINT MAY BE SAWED FULL DEPTH. HOLES FOR EYELET BARS SHALL BE DRILLED AFTER THE CONCRETE HAS SUFFICIENT SET TO PREVENT CRACKING. EYELET BARS SHALL BE BENT INTO THE HOLES.

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

THE PORTION OF THE EYELET INSIDE THE HOLE SHALL BE COATED WITH AN APPROVED EYEBROW.

LONGITUDINAL CONSTRUCTION JOINT L

(EXISTING PAVEMENT)

LONGITUDINAL BASE APPURTEENANCES FOR 15' JOINT SPACING

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

CONCRETE PAVEMENT AND BASE APPURTEENANCES FOR 15' JOINT SPACING

DATA PREPARED: 03/31/2005  502.05S  SHEET NO. 4 OF 4
4. NOT REQUIRED WHEN ADJACENT PAVEMENT IS DIFFERENT.

GENERAL NOTES:
TYPE A CURB IS TO BE CONSTRUCTED WITH CONCRETE APPROACH PAVEMENT ONLY WHEN DESIGN STANDARDS REQUIRE TYPE A CURB WILL BE CONSIDERED AS INFILL AND WILL NOT BE INCLUDED IN THE PAYMENT FOR CONCRETE APPROACH PAVEMENT.

- SHOULDER PAVING AND FACE BASING AT BRIDGE ENDS, SEE STANDARD PLAN 609-90.0
- FOR TYPE A CURB CORNER, STANDARD 2" EXPANSION JOINTS, AND JOINT FILLER DETAILS, SEE BRIDGE PLANS.
- A PRECURED EXPANSION JOINT MATERIAL SHALL BE FLEXIBLE WITH CONCRETE APPROACH PAVEMENT AND MEET THE REQUIREMENTS OF SECTION 404 OF THE STANDARD SPECIFICATION FOR HIGHWAY CONSTRUCTION.

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

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

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

SHEET NO. 1 OF 3
EXISTING PCC PAVEMENT

EXISTING ASPHALT PAVEMENT
MINIMUM 3" THICK

JOINT LAYOUT

GENERAL NOTES:
CONCRETE OVERLAY DESIGN THICKNESS WILL VARY BASED ON TRAFFIC VOLUMES, BUT WILL TYPICALLY RANGE FROM 5" TO 6". THE CONSTRUCTION AND MATERIALS
PAVEMENT SECTION WILL DETERMINE THE DESIGN
THICKNESS.

MISSOURI HIGHWAYS AND TRANSPORTATION
COMMISSION
505 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-MO-MODOT (662-6636)
LOCATION SURVEY RIGHT-OF-WAY MARKER

TOP VIEW

2" DIA. FLAT ALUMINUM CAP

GROUND LINE

2" X 24" REBAR

SIDE VIEW

LOCATION SURVEY RIGHT-OF-WAY MARKER

FACE TOWARD E

DRAIN PIPE

OFFSET POST LATERALLY FROM PIPE OUTLET

IN EARTH

DRAIN MARKER

GROUT INTO ROCK

IN ROCK

GENERAL NOTES:

WHEN STEEL AND LOCATION SURVEY R/W MARKERS ARE NOT SUITABLE DUE TO NATURAL GROUND FEATURES OR MAN-MADE STRUCTURES, ALTERNATIVE MONUMENTATION (IN COMPLIANCE WITH THE APPROVED MONUMENTATION, AS SPECIFIED BY THE MISSOURI MINIMUM STANDARDS FOR PROPERTY BOUNDARY SURVEYS) MAY BE SET.
Legend:
- **Existing**
- **New**
  - Steel R/W Marker
  - Location Survey R/W Marker
  - Concrete R/W Marker
  - Drain Marker

Steel Right-of-Way Marker:
- Face toward $\S$
- Polyurethane foam or post may be driven
- Grout into rock

Section A-A:
- Typical Locations

Witness posts, when used, are to be set on MoDOT R/W line either 11" in front or behind R/W monument.

Typical Locations
### GENERAL NOTES:

1. Use right angle headwall for all installations.
2. Skew pipe by using a beveled end or elbow on pipe. In special cases, headwall may be turned to fit pipe skew and 1V to 6H slope warped to fit headwall.
3. All concrete shall be class "B".
4. 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.

### PIPE CULVERT HEADWALLS

**Cylindrical Headwall-12" to 24" diameters-1V:6H slopes**

**08/01/2006**

**JEFFERSON CITY, MO 65102**

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

**1012 WEST CAPITOL**

**JEFFERSON CITY, MO 65102**

**1-800-392-MODOT (1-800-392-6636)**

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

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

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

---

### PIPE SIZE

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>Dimensions</th>
<th>Quantities</th>
<th>Reinforcing</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;H&quot;</td>
<td>&quot;L&quot;</td>
<td>Total Length</td>
<td>Concrete</td>
</tr>
<tr>
<td>12&quot;</td>
<td>9'-9&quot;</td>
<td>9'-6&quot;</td>
<td>1,5</td>
</tr>
<tr>
<td>15&quot;</td>
<td>1'-0&quot;</td>
<td>5'-3&quot;</td>
<td>11'-0&quot;</td>
</tr>
<tr>
<td>18&quot;</td>
<td>3'-3&quot;</td>
<td>6'-9&quot;</td>
<td>12'-6&quot;</td>
</tr>
<tr>
<td>21&quot;</td>
<td>5'-11&quot;</td>
<td>8'-3&quot;</td>
<td>14'-0&quot;</td>
</tr>
<tr>
<td>24&quot;</td>
<td>9'-9&quot;</td>
<td>15'-6&quot;</td>
<td>3,0</td>
</tr>
</tbody>
</table>

---

### END SECTION

**SECTION A-A**

**SECTION B-B**

**SECTION C-C**

---

### PLAN VIEW

**B2 BARS**

**B3 BARS**

---

### BENDING DETAILS
NORMAL SLOPE OF 2' 3" -'
GUTTER AT THIS POINT
(4) E 2-BAR
(3) E 1-BARS 4 BZ-BARS AT 9" CTRS. 6" 3 B 1-BARS
OF TAR PAPER

(1) SEE DRAWING 609 00 OR SPECIAL
CURB DRAWING FOR THESE DIMENSIONS

CURB DRAWING FOR THESE DIMENSIONS

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

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

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

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

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

**PLAN VIEW**

**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 #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>T</th>
<th>B</th>
<th>M</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>5'-24&quot;</td>
<td>3'-6&quot;</td>
<td>4'-0&quot;</td>
<td>7&quot;</td>
<td>21&quot;</td>
</tr>
<tr>
<td>30&quot;</td>
<td>3'-6&quot;</td>
<td>4'-8&quot;</td>
<td>7&quot;</td>
<td>8&quot;</td>
</tr>
<tr>
<td>36&quot;</td>
<td>4'-0&quot;</td>
<td>5'-2&quot;</td>
<td>7&quot;</td>
<td>VARIABLE 8&quot;</td>
</tr>
<tr>
<td>42&quot;</td>
<td>4'-6&quot;</td>
<td>5'-8&quot;</td>
<td>8&quot;</td>
<td>91/4&quot;</td>
</tr>
<tr>
<td>48&quot;</td>
<td>5'-0&quot;</td>
<td>6'-2&quot;</td>
<td>9&quot;</td>
<td>71/2&quot;</td>
</tr>
</tbody>
</table>

**NOTES:**

- MINIMUM T shall be the outside diameter of largest pipe entering manhole plus 16" carried to the nearest 3".

- Horizontal and vertical bars horizontal and vertical bars around pipes.

- No direct payment will be made for manhole steps.

- Inner face of manhole wall.
### FOR PIPE OPENINGS

<table>
<thead>
<tr>
<th>SIZE (W)</th>
<th>TO AND INCLUDING 20' DEPTH</th>
<th>20' TO AND INCLUDING 30' DEPTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>3'-0&quot; X 3'-0&quot;</td>
<td>1.62 (D=3'-3&quot;)</td>
<td>0.37 (D=4'-3&quot;)</td>
</tr>
<tr>
<td>3'-0&quot; X 3'-3&quot;</td>
<td>1.77 (D=3'-3&quot;)</td>
<td>0.38 (D=4'-3&quot;)</td>
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<td>3'-0&quot; X 3'-6&quot;</td>
<td>1.93 (D=3'-3&quot;)</td>
<td>0.39 (D=4'-3&quot;)</td>
</tr>
<tr>
<td>3'-0&quot; X 4'-0&quot;</td>
<td>2.16 (D=3'-3&quot;)</td>
<td>0.40 (D=4'-3&quot;)</td>
</tr>
<tr>
<td>3'-0&quot; X 4'-3&quot;</td>
<td>2.32 (D=3'-3&quot;)</td>
<td>0.41 (D=4'-3&quot;)</td>
</tr>
<tr>
<td>3'-0&quot; X 4'-6&quot;</td>
<td>2.48 (D=3'-3&quot;)</td>
<td>0.42 (D=4'-3&quot;)</td>
</tr>
<tr>
<td>3'-0&quot; X 5'-0&quot;</td>
<td>2.64 (D=3'-3&quot;)</td>
<td>0.43 (D=4'-3&quot;)</td>
</tr>
<tr>
<td>3'-0&quot; X 5'-3&quot;</td>
<td>2.80 (D=3'-3&quot;)</td>
<td>0.44 (D=4'-3&quot;)</td>
</tr>
<tr>
<td>3'-0&quot; X 5'-6&quot;</td>
<td>3.00 (D=3'-3&quot;)</td>
<td>0.45 (D=4'-3&quot;)</td>
</tr>
<tr>
<td>4'-0&quot; X 4'-0&quot;</td>
<td>2.35 (D=3'-3&quot;)</td>
<td>0.40 (D=4'-3&quot;)</td>
</tr>
<tr>
<td>4'-0&quot; X 4'-3&quot;</td>
<td>2.51 (D=3'-3&quot;)</td>
<td>0.41 (D=4'-3&quot;)</td>
</tr>
<tr>
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<td>0.42 (D=4'-3&quot;)</td>
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<tr>
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<td>2.83 (D=3'-3&quot;)</td>
<td>0.43 (D=4'-3&quot;)</td>
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<tr>
<td>4'-0&quot; X 5'-3&quot;</td>
<td>3.00 (D=3'-3&quot;)</td>
<td>0.44 (D=4'-3&quot;)</td>
</tr>
<tr>
<td>4'-0&quot; X 5'-6&quot;</td>
<td>3.17 (D=3'-3&quot;)</td>
<td>0.45 (D=4'-3&quot;)</td>
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<tr>
<td>5'-0&quot; X 5'-0&quot;</td>
<td>2.80 (D=3'-3&quot;)</td>
<td>0.40 (D=4'-3&quot;)</td>
</tr>
</tbody>
</table>

### CONCRETE STEEL

<table>
<thead>
<tr>
<th>SIZE (W)</th>
<th>TO AND INCLUDING 20' DEPTH</th>
<th>20' TO AND INCLUDING 30' DEPTH</th>
</tr>
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<tbody>
<tr>
<td>3'-0&quot; X 3'-0&quot;</td>
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<td>0.43 (D=4'-3&quot;)</td>
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<tr>
<td>3'-0&quot; X 3'-6&quot;</td>
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<td>0.44 (D=4'-3&quot;)</td>
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<td>0.45 (D=4'-3&quot;)</td>
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<tr>
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<td>0.47 (D=4'-3&quot;)</td>
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<tr>
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<td>3.24 (D=3'-3&quot;)</td>
<td>0.48 (D=4'-3&quot;)</td>
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<tr>
<td>3'-0&quot; X 5'-3&quot;</td>
<td>3.40 (D=3'-3&quot;)</td>
<td>0.49 (D=4'-3&quot;)</td>
</tr>
<tr>
<td>3'-0&quot; X 5'-6&quot;</td>
<td>3.56 (D=3'-3&quot;)</td>
<td>0.50 (D=4'-3&quot;)</td>
</tr>
<tr>
<td>4'-0&quot; X 4'-0&quot;</td>
<td>3.00 (D=3'-3&quot;)</td>
<td>0.50 (D=4'-3&quot;)</td>
</tr>
<tr>
<td>4'-0&quot; X 4'-3&quot;</td>
<td>3.16 (D=3'-3&quot;)</td>
<td>0.51 (D=4'-3&quot;)</td>
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<tr>
<td>4'-0&quot; X 4'-6&quot;</td>
<td>3.32 (D=3'-3&quot;)</td>
<td>0.52 (D=4'-3&quot;)</td>
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<tr>
<td>4'-0&quot; X 5'-0&quot;</td>
<td>3.48 (D=3'-3&quot;)</td>
<td>0.53 (D=4'-3&quot;)</td>
</tr>
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<td>3.56 (D=3'-3&quot;)</td>
<td>0.50 (D=4'-3&quot;)</td>
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### NOTE

Concrete quantities in Table include invert. The quantity of steel for 3" of "D" is not of that for 1 foot of "D", and the quantity of steel for 6" of "D" is not of that for 1 foot of "D", neither is the quantity for 6" of "D" equal to 1/2 that for 1 foot of "D", so for quantity in 1 foot column for full feet and in 3" column for fractional feet.

### QUANTITIES

- TO AND INCLUDING 20 FOOT DEPTH
- 20' TO AND INCLUDING 30' DEPTH
- ADD OR SUBTRACT FOR EACH
- ADD OR SUBTRACT IN BOTTOM DIFFERENCE IN 1 1/4" AND 3/4" BARS
TABLE OF DIMENSIONS

<table>
<thead>
<tr>
<th>BOX</th>
<th>FIRE SIZE</th>
<th>LENGTH OF EARS / CONCRETE</th>
<th>QUANTITIES</th>
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</thead>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SIZE</td>
<td>FT.</td>
<td>FT.</td>
</tr>
<tr>
<td>D</td>
<td>B</td>
<td>C</td>
<td>A (FT.)</td>
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<tr>
<td>2 x 1 1/2</td>
<td>24</td>
<td>5-1</td>
<td>4-9</td>
</tr>
<tr>
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<td>5-3</td>
<td>5-3</td>
</tr>
<tr>
<td>3 x 2</td>
<td>36</td>
<td>6-1</td>
<td>5-10</td>
</tr>
<tr>
<td>3 x 3</td>
<td>42</td>
<td>6-5</td>
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</tr>
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</table>

BENDING DIAGRAM FOR B-BARS

SECTION B-B

TYPE COLLAR

PIPE COLLARS TYPE C
3.50"

SECTION 8-8

604.70

SLOTTED DRAIN

TYPE A

PLAN

LOCKING PLATE DETAIL

"C"

ISOMETRIC DETAIL

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

DATE EFFECTIVE: 03/01/1994

DATE PREPARED: 08/21/2009

PORTION OF END COVER PLATE IS NOT SHOWN FOR CLARITY ONLY

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

SLOTTED PIPE DETAIL

DIMENSION SCHEDULE

LOCKING PLATES REQUIRED (5)

<table>
<thead>
<tr>
<th>PIPE DIAMETER</th>
<th>A</th>
<th>B10</th>
<th>B20</th>
<th>C10</th>
<th>C20</th>
<th>D</th>
<th>10 FT.</th>
<th>20 FT.</th>
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<tbody>
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<td>25 .5&quot;</td>
<td>22 .5&quot;</td>
<td>19 .5&quot;</td>
<td>16 .5&quot;</td>
<td>28 .5&quot;</td>
<td>27 .5&quot;</td>
<td>9 17</td>
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<td>7&quot;</td>
<td>20&quot;</td>
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<td>24&quot;</td>
<td>23&quot;</td>
<td>10 19</td>
</tr>
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<td>12&quot;</td>
<td>33&quot;</td>
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<td>11 21</td>
</tr>
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<td>24&quot;</td>
<td>21&quot;</td>
<td>18&quot;</td>
<td>18&quot;</td>
<td>15&quot;</td>
<td>21&quot;</td>
<td>20&quot;</td>
<td>11 21</td>
</tr>
</tbody>
</table>

JOINT CONNECTION SECTION

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

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

12) LOCKING PLATE TO BE INSTALLED AT:
A. EACH END OF DRAIN GUIDE.
B. EACH SEAM.
C. EACH MID-POINT OF OPEN SLOT.

13) IN 20 FT. SECTION FOR TWO PIECE DRAIN GUIDE, INCREASE NUMBER OF LOCKING PLATES BY TWO.

14 GA. SHEET METAL

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

SLOTTED DRAIN TYPE A

DATE EFFECTIVE: 03/01/1994

DATE PREPARED: 08/21/2009

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

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

SHEET NO. 2 OF 2

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)
GEOTEXTILE FABRIC WITH 12" LAP ON TOP
POROUS BACKFILL
4" PERFORATED PIPE

FLEXIBLE PAVEMENT STRUCTURE
4" TYPE 5 AGGREGATE BASE

MEDIUM DUTY

EDGE OF PAVEMENT
FLOW
4" PIPE UNDERDRAIN
4" PIPE UNDERDRAIN
PVC SCHEDULE 40 LONG SWEEP 90° ELBOW OR EQUAL (TYPICAL)
GLUED CONNECTION (TYPICAL)

GENERAL NOTES:
ON SUPERELEVATED CURVES PLACE LONGITUDINAL UNDERDRAIN ON LOW SIDE ONLY.
CONSTRUCT OUTLETS AT LOW POINT OF SAG CURVE.

DETAIL OF PIPE AGGREGATE DRAIN OUTLETS

4" PIPE LATERAL
(NON-PERFORATED)
### 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.

### Cross Drain

- **Edge of Shoulder**
- **Edge of Traveled Way**

**2% Min. Slope**

**Section C-C**

**Section D-D**

- **With Permeable Base**
- **Without Permeable Base**

**Section A-A**

**Section B-B**

**Section D-D**

**Concreting Underdrainage**

**Cross Drains**

- **Pipe Diameter**
- **Pipe Material**
- **Pipe Type**
- **Pipe Diameter**

**Table of Dimensions**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>2 in</th>
<th>3 in</th>
<th>4 in</th>
<th>6 in</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>5.48'</td>
<td>6.19'</td>
<td>6.95'</td>
<td>8.58'</td>
</tr>
<tr>
<td>B</td>
<td>2.70'</td>
<td>3.07'</td>
<td>3.46'</td>
<td>4.28'</td>
</tr>
<tr>
<td>C</td>
<td>0.78'</td>
<td>1.12'</td>
<td>1.49'</td>
<td>2.30'</td>
</tr>
<tr>
<td>D</td>
<td>2.00'</td>
<td>2.00'</td>
<td>2.00'</td>
<td>2.00'</td>
</tr>
<tr>
<td>E</td>
<td>0.46'</td>
<td>0.61'</td>
<td>0.78'</td>
<td>1.18'</td>
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<td>F</td>
<td>0.71'</td>
<td>1.07'</td>
<td>1.46'</td>
<td>2.27'</td>
</tr>
<tr>
<td>G</td>
<td>2.31'</td>
<td>2.51'</td>
<td>2.71'</td>
<td>3.13'</td>
</tr>
<tr>
<td>CONC.</td>
<td>0.15 C.Y.</td>
<td>0.17 C.Y.</td>
<td>0.20 C.Y.</td>
<td>0.25 C.Y.</td>
</tr>
</tbody>
</table>

**Porosity Backfill (2)**

**Rigid or Flexible Pavement Structure**

**4" Type 6 Aggregate Base**

**4" Type 1 Aggregate Base**

**4" Stabilized Permeable Base**

**Porous Backfill (2)**

**8" Dia. Perforated Drain Pipe**

**6" Dia. Perforated Drain Pipe**

**Geotextile Fabric**

**Geotextile Fabric with 12" Lap on Top**

**ITEM 2: 13: 1 L1: 16: 1**

**A 5.48' 6.19' 6.95' 8.58'**

**B 2.70' 3.07' 3.46' 4.28'**

**C 0.78' 1.12' 1.49' 2.30'**

**D 2.00' 2.00' 2.00' 2.00'**

**E 2.00' 2.00' 2.00' 2.00'**

**F 0.46' 0.61' 0.78' 1.18'**

**G 0.71' 1.07' 1.46' 2.27'**

**H 2.31' 2.51' 2.71' 3.13'**

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

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

**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

**SHEET NO. 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.
PART SECTION SHOWING TYPE E TO TYPE A GUARDRAIL TRANSITION

The overall nominal dimensions shown shall be net. Although the shape of the plastic block may vary from the shape shown, except the 4 x 3" flange and the overall width dimensions may be varied if approved by project operations.

SECTION B-B

SECTION C-C

GENERAL NOTES:

Type E guardrail shall use 6'-3" foot spacing unless 3'-12" foot is specified.

The single three-beam rail for the Type E guardrail and the transition section shall be made of steel and shall be 12 gauge.

For protective coating and material requirements, see Sec 1005 of the standard specifications.

See sheet 7 of 7 for requirements for special installations.

All dimensions are subject to manufacturing tolerances except where alternate tolerances are shown.

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

1. Shoulders widening shall consist of embankment material compacted in accordance with Sec. 203.4 of the standard specifications.

2. Posts shall be spaced at 3'-1" on center.

3. Where guardrail is constructed over curbs, the curbs shall be constructed as shown.

ALTERNATE TYPICAL SECTION AT SLOPE BREAKPOINT

TYPE A GUARDRAIL

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

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

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

GUARDRAIL POST AND BLOCK

DELINEATORS ON NEW GUARDRAIL
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.
POSTS 2 THROUGH 8
STANDARD BLOCKS

BLOCKS FOR POSTS 9 AND 10
STANDARD BLOCKS

THREE BEAM ANCHOR POSTS

TAPERED BLOCK

THREE BEAM CRT POSTS
STEEL PLATE, A306
12\(\frac{1}{8}\)" x 5\(\frac{3}{4}\)" x \(\frac{3}{8}\)"

(1) STUD, THREADED ENTIRE LENGTH.

DETAIL OF CABLE ASSEMBLY

DETAIL OF STEEL BEARING PLATE
(1) TYPE E GUARDRAIL 12'-6" 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 CRASHWORTHY END TERMINAL SHALL BE LATEST VERSION AND SHALL BE INSTALLED ACCORDING TO MANUFACTURER'S RECOMMENDATIONS.
PIER AT 6' OF MEDIAN

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

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

GENERAL NOTES:

WOOD POSTS AND WOOD BLOCKS MAY BE USED ON TYPE E GUARDRAIL. END ANCHOR SECTION TO BE USED ON TERMINAL END OF TYPE E GUARDRAIL.

END ANCHOR TO BE LOCATED BEYOND THE LONGITUDINAL LIMITS OF TYPE A NON-FLARED CRASHWORTHY END TERMINAL.

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

21 1/2" WOOD BLOCK DETAIL

19" WOOD BLOCK DETAIL

14" WOOD BLOCK DETAIL

ALL HOLES DRILLED OR PUNCHED 1/8" CID.
THREE BEAM RAIL SPlice AT POST

(1) THE CONTRACTOR MAY, AT HIS OPTION, FURNISH EQUIVALENT SECTIONS FABRICATED FROM MATERIAL MEETING AND IN ACCORDANCE WITH THE REQUIREMENTS OF ASTM A763 GRADE 36 OR 40. THE SECTIONS SHALL BE GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH REQUIREMENTS OF AASHTO W 117.

GENERAL NOTES:

DESIGN BASED ON NCHRP REPORT 550 TEST LEVEL 3.

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

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

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

WASHERS SHALL BE USED AT ALL POST BOLTS.

STRUCTURAL TIERING BLOCK SHALL BE FABRICATED FROM ASTM A500 GRADE B STEEL AND GALVANIZED.

USE 1-1/4 ROUND HEAD DELTA BOLTS WITH HEX NUTS AT ALL SLOTS (THICKNESS OF HEX NUTS = 1/2 MIN.).

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

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

SEE STANDARD PLAN 606.00 FOR DETAILS NOT SHOWN.

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

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

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

GENERAL NOTES:

COVER PLATE PANELS ARE 4 1/2" THICK.
ALL STIFFENERS ARE 1" THICK.
CONNECTOR PLATE SHALL BE FABRICATED FROM A36 STEEL AND GALVANIZED.
FOR GALVANIZED REQUIREMENTS, SEE SECTION 1040 OF THE STANDARD SPECIFICATIONS.
ALL HOLE DIAMETERS SHALL BE 1".
PLATE AND STIFFENER IDENTIFICATION

STIFFENER #8: 1 EACH
STIFFENER #9: 1 EACH
STIFFENER #10: 1 EACH
STIFFENER #7: 1 EACH
STIFFENER #5: 1 EACH
STIFFENER #1: 1 EACH
STIFFENER #4: 1 EACH
STIFFENER #2: 1 EACH
STIFFENER #6: 1 EACH

COVER PLATE #2
COVER PLATE #1
STIFFENER #5: 4 EACH
WELDING INSTRUCTION

(1) STIFFENERS LOCATED AT THE OUTSIDE EDGES OF THE COVER PLATE SHALL BE REINFORCED AS FOLLOWS:
   - SINGLE BEVEL GROOVE 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 REINFORCED AS FOLLOWS:
   - 6" FILLET WELD BY 1" LONG SPACED AT 2".

PLATE AND STIFFENER IDENTIFICATION

CONNECTION PLATE DIMENSION (PER ASSEMBLY):

<table>
<thead>
<tr>
<th>PLATE</th>
<th>SHAPE</th>
<th>SIZE</th>
<th>THICKNESS</th>
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</thead>
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<tr>
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<tr>
<td>S11</td>
<td>1</td>
<td>8&quot; x 8&quot;</td>
<td>6&quot;</td>
</tr>
</tbody>
</table>

GENERAL NOTES:
- COVER PLATE PANELS ARE 1/8" THICK.
- ALL STIFFENERS ARE 1/4" THICK.
- CONNECTOR PLATE SHALL BE FABRICATED FROM 45 ST. GRADE 4330 STEEL AND GALVANIZED.
- FOR GEOMETRY REQUIREMENTS, SEE 1040 OF THE STANDARD SPECIFICATIONS.
- ALL HOLE DIAMETERS SHALL BE 1".

BRIDGE ANCHOR SECTION
SAFETY BARRIER CURB ON BRIDGE (CONNECTOR PLATE DETAIL)
SINGLE SLOPE BARRIERS
BRIDGE ANCHOR SECTION (THREE BEAM RAIL)
**Concrete Foundation for End Anchors**

- Ground line
- 6" x 6" welded wire reinforcement
- Two sides of post shall be faced with one layer of 2" thick expanded polystyrene foam sheeting and one wrap of light-weight building paper. For the high to be filled with rustproof concrete. GPLF or other approved water proof material.

**Steel Tube Foundation for End Anchors**

- 2" standard pipe
- Ground line
- Steel tube
- Soil plate

**Wood Breakaway Post**

- See Section 1050
- 1) 5"-11.5" for concrete foundation alternate.
- 2) 3"-8.5" for concrete foundation alternate.

**General Notes:**

- The contractor has the option to install wood post 1 and 2 in steel tube or concrete foundation.
- Trimming of wood post may be necessary for steel tube foundation.
- Steel tube foundations shall be filled and back-filled with a suitable material. The soil plate is welded, as shown, to the steel tube. Steel tube foundation may be driven when the soil plate is welded, as shown, to the steel tube.

**Missouri Highways and Transportation Commission**

105 West Capitol
Jefferson City, MO 65102

1-888-658-MODOT (663-6868)

**Guardrail Terminal Anchor Ends**

- Shop welded steel tube
- Soil plate connection
- Steel tube

---

**Sheet No.:** 606.30L  3 of 7

**Date Revised:** 10/26/2021
SECTION B-B
1.11 Max. cross slope shall not exceed 6:1. Guardrail is required when cross slope exceeds 10:1 or when the existence of other adverse conditions and the grade is 10% or increasing.

SECTION C-C

SECTION D-D
Concrete block anchor of embedded steel post

PLAN VIEW

10:1 Ditch Fore/Fore

HEIGHT OF GUARDRAIL TAPOES TO CONCRETE BLOCK

6" deep x 3" side ditch

ELEVATION

ANCHORED IN BACKSLOPE GUARDRAIL

Concrete block anchor

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-658-MODOT (663-6383)

GUARDRAIL EMBEDDED TERMINAL ENDS (FLAT DITCH)

DATE EFFECTIVE: 06/24/2021
DATE PREPARED: 10/29/2021

SHEET NO. 5 OF 7
3 - 1" Ø HOLES TO BE FIELD DRILLED IN W-BEAM ELEMENT AND ATTACHED WITH 3/8" HEX HEAD BOLTS 1/2" LONG EACH WITH ONE SQUARE WASHER AND HEX NUT.

1" Ø HOLE TO BE FIELD DRILLED THROUGH W-BEAM AND THROUGH POST FLANGE. ATTACHED WITH 3/8" HEX HEAD BOLT 2" LONG WITH ONE SQUARE WASHER AND HEX NUT.

4" FILLET WELD PLATE TO POST BOTH SIDES OF POST

EMBEDDED STEEL POST

3 - 1" Ø HOLES TO BE FIELD DRILLED IN W-BEAM ELEMENT AND ATTACHED WITH 3/8" HEX HEAD BOLTS 1/2" LONG EACH WITH ONE SQUARE WASHER AND HEX NUT.

1" Ø HOLE TO BE FIELD DRILLED THROUGH W-BEAM AND THROUGH POST FLANGE. ATTACHED WITH 3/8" HEX HEAD BOLT 2" LONG WITH ONE SQUARE WASHER AND HEX NUT.

2" FILLET WELD PLATE TO POST BOTH SIDES OF POST

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

ELEVATION
CONCRETE BLOCK ANCHOR
(24" x 24" x 36")

END OF INSERT
TO BE CLOSED

THREADED INSERTS FOR 2" x 2"
GALVANIZED HEAVY CAP SCREWS.
CAP SCREWS TO BE THREADED A
MINIMUM 1", INSERTS THREADED
MINIMUM 1/2".

TOP VIEW

TERMINAL CONNECTOR

3 - #10 HURFS
30" x 18"

36"
GRADING LIMITS FOR FLARED CRASHWORTHY END TERMINALS

STANDARD GRADING LIMITS FOR CRASHWORTHY END TERMINALS

ALTERNATE GRADING LIMITS FOR CRASHWORTHY END TERMINALS

GENERAL NOTES:

- Grading limits shall be used when constructing new paved or alternate grading limits are allowed on existing roadsides except when standard grading is indicated on the plans.
- The contractor shall provide the engineer with approved shop drawings of the approved crashworthy end terminal.
- END ANCHORS SHALL BE INSTALLED ON ENDS OF GUARDRAIL RUNS WHERE CRASHWORTHY END TERMINALS ARE NOT REQUIRED.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

CRASHWORTHY END TERMINALS TYPE A
GRADING LIMITS

(1) APPROVED CRASHWORTHY END TERMINAL
ANCHOR ASSEMBLY

EXPANDABLE OR SCREW TYPE ANCHOR

GROUND LINE OR SHOULDER ELEVATION

300' MAX. (BETWEEN ANCHORS)

END ANCHOR

LINE POST

INTERMEDIATE ANCHOR

ELEVATION

POST DETAILS

STEEL POST

WOOD POST

(53 X 5.7 STD. BEAM)

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

1" X ½" CLAMP

1½" DIA. NOT REQUIRED FOR LINE POST

1½" BOLT AND WASHER (½" HOLE)

1" X ½" CLAMP

5/8" X 2" LAG SCREW

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

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

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

606.40D SHEET NO. 1 OF 2
ACCESS-RESTRAINT CABLE GREATER THAN 300 FEET IN LENGTH REQUIRE AN INTER-MEDIATE ANCHOR AS SHOWN.

SPICE DETAIL

6'-6" ROD
ATTACH TO ANCHOR

1" DIA.

1'-1"

6"

1" DIA.

STANDARD TURNBUCKLE

5"

8"

1.5" FOR STEEL ROD
FOR WOOD ROD

PLATE WASHER
& HEX NUT

12"

1" EYE BOLT

3 CLIPS REQUIRED

1/4" CABLE

THIMBLE

CABLE END

TYPICAL LOCATION
SHOULDER INSTALLATION

ANCHOR ROD ASSEMBLY

ONE-STRAND ACCESS
RESTRAINT CABLE
PLAN VIEW

1. When site constraints prohibit or approach 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).

ELEVATION VIEW

General Notes:

For initial installation, construct the guardrail within 1" of the standard height to the top of the guardrail post. When subsequent projects, such as resurfacing, 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'-0" (±0") tolerance.

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

Refer to Section 1102 for dimensional details of beam, splice, bolt, and end sections. Beam splices, prefabricated splice bolts, nuts, and type I retaining transition sections to be used.

Beam washers are not to be used. Bolt shall be ASTM A325.

Unless otherwise specified, N-beam rail is 12 gauge steel with an effective length of 12'-0" (±0").

LSP splices between rails if between E or F rails and terminal connector in the direction of traffic. LSP the flaked end sections in the direction of traffic.
MGS GUARDRAIL AT CURB

ALTERNATE MGS AT CURB

FOR STEEL POST AND NOTCHED WOOD OR PLASTIC BLOCK

HOLE PUNCHING DETAIL

Two holes can be provided on each flange of post. Only one is required for flange of post that has a block attachment.

RAIL ELEMENT SPLICE DETAIL

GENERAL NOTES:

FOR GUARDRAIL DELINEATION DETAILS SEE
STC PLAN 903.03

Missouri Highways and Transportation Commission

MIDWEST GUARDRAIL SYSTEM (MGS)
POST AND BLOCK

Sheet No.: 3 of 8

Date Effective: 05/23/2021
Date Issued: 10/07/2021

MoDOT

MaDOT
MGS GUARDRAIL WITH 3'-1\frac{1}{2}'' POST SPACING

MGS GUARDRAIL 3'-14'' POST SPACING (1)

MGS GUARDRAIL 1'-6\frac{1}{2}'' POST SPACING (1)

MGS GUARDRAIL WITH 1'-6\frac{1}{2}'' POST SPACING

GENERAL NOTES:
1. POSTS CANNOT BE USED ALONE:
   - POST SPACING IS LESS THAN 6'-1''
   - WITHIN CRASHWORTHY END TERMINALS
   - WITHIN VERTICAL BARIER TRANSITIONS (606.40)
   - WITHIN BRIDGE APPROACH TRANSITIONS (606.70)

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

3. REDUCED POST SPACING SHALL USE 6'-0'' POSTS MAX. ANY DELETION OF 6'-0'' POSTS WILL ONLY BE ALLOWED IN ACCORDANCE WITH SPECIAL INSTALLATIONS AS SHOWN ON SHEET 6 OR 7.

MIDWEST GUARDRAIL SYSTEM (MGS)
REDUCED POST SPACINGS

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-458-MODOT (6636) 1-816-452-6881
SETTING POST IN SOLID ROCK

SETTING POST THROUGH ASPHALT ≤ 2" THICK

GENERAL NOTES:

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

Post may be shorter where placed in 2 feet of solid rock. Steel posts may be flare or flat cut. Repair of cut shall be in accordance with Sect. 711 of the Standard Specifications.

No additional payment will be made for cutting the oversized holes or placing aggregate in the holes, as indicated in this plan.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-MODOT-Help (1-888-663-6873)

MIDWEST GUARDRAIL SYSTEM (MGS)
SPECIAL INSTALLATIONS

Sheet No. 60650E 5 OF 8
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 SLOPE.

12. WHERE THERE IS NOT SUFFICIENT ENHANCEMENT
BEHIND THE SHOULDER TO PLACE THE BACKFILL POST,
THE POSTS MAY BE PLACED A MAXIMUM OF 12" BEYOND
THE SLIDE BREAK POINT IF A 2:1 OR FLATTER SLOPE.

GENERAL NOTES:
SEE STC. PLAN 605.81 FOR SITE GRADING REQUIREMENTS FOR CRASHWORTHY END
TERMINALS.

8' POSTS SHALL BE REQUIRED WHEN LESS THAN 2 FEET OF ENHANCEMENT IS PRESENT
BEHIND THE BACK OF THE GUARDRAIL POST AND THE SLIDE BREAK POINT. THE
SUBSTITUTION OF 6' POSTS IN LIEU OF REQUIRED ENHANCEMENT LESS THAN THE DESIGNED TYPICAL SECTION SHALL NOT BE ALLOWED.
MGS BLOCK AND HEIGHT TRANSITION FROM TYPE A GUARDRAIL TO MGS GUARDRAIL

ALTERNATE PLAN VIEW - ALIGNMENT TAPER

SEE NOTE 11
PIER AT MEDIAN

(1) 2'-6" MINIMUM CLEARANCE TO THE FACE OF OBSKOLACE WITH 6'-3" FOOT SPACING IS PREFERRED.
2'-0" MINIMUM CLEARANCE USE 6'-0" FOOT SPACING
SEE STC PLANS 606.30 FOR FOOT SPACING DETAILS.

(2) TRANSITION CURVE FACE CRASH GUARD, HEIGHT AND WIDTH IF NEEDED FOR TYPE B CRASHWORTHY END TERMINAL PER MANUFACTURER'S REQUIREMENTS. SEE STC PLANS 606.50 FOR HEIGHT TRANSITION DETAILS.

(3) CONTINUE 10'-1" SLOPE TO OBSCOLACE OR A MINIMUM OF 2'-0" PAST THE END OF THE GUARDRAIL FOOT.

(4) 10'-1" FLARE RATE OR AS RECOMMENDED BY TABLE 5-3 OF THE LATEST VERSION OF THE "ROADSIDE DESIGN GUIDE".

MEDIAN WIDTH LESS THAN 60'
PIER AT MEDIAN

1. 29' MINIMUM CLEARANCE TO THE FACE OF OBSTACLE WITH 6'-3" POST SPACING IS PREFERRED.
   29'-6" MINIMUM CLEARANCE FOR 1'-6" POST SPACING.
   SEE STANDARD PLANS 600.51 FOR FURTHER DETAILS.

2. FOR LENGTH-OF-REED SEE THE LATEST VERSION OF THE "ROADSIDE DESIGN GUIDE 5.6.4 LENGTH-OF-REED".

3. CONTINUE 10'11" SLOPE TO OBSTACLE OR A MINIMUM OF 2' PAST THE FACE 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 "ROADSIDE DESIGN GUIDE 5.1 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.
BRIDGE APPROACH TRANSITION (EXTENDED CURB) (2)

The contractor may, at their option, furnish equivalent sections fabricated from material meeting the requirements of ASTM A594 Grade 36 or 490. The sections shall be galvanized after fabrication in accordance with requirements of ASTM M 111.

1. Place the first foot of the MGS 6.5" fast the last foot of the bridge approach transition to keep feet offset from the rail splices.

2. Where curb extends upstream of foot no. 1 for drainage purposes, a stiffness transition consisting of an extra 12'-14" beam or 12'-20" beam must be placed prior to the transition section. For details, see SP Plan 609.40 for details. When there do not exist upstream of foot no. 1, pay for a bridge approach transition (regular curb/steel curb). For details of bridge approach transition (regular curb/steel curb), see sheet 2 of 4.

3. The additional required MGS CHAIDAIL is included in the total length of need and shall be paid for as a guardrail pay item.
BRIDGE APPROACH TRANSITION (WITH REGULAR LENGTH CURB OR NO CURB)(1)

VERTICAL CONCRETE BARRIER TRANSITION (REGULAR LENGTH CURB OR NO CURB)(1)

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

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

(1) WHERE CURB EXTENDS UPSTREAM OF POST NO. 13 FOR DRAINAGE PURPOSES,
A STIFFNESS TRANSITION CONSISTING OF AN EXTRA 12'-6" X-BEAM OF 12 GAUGE X-BEAM MUST BE NESTED PRIOR TO THE TRANSITION SECTION
UPSTREAM OF POST NO. 13. THE CURB SHALL BE EXTENDED TO THE END
OF THE 12'-6" X-BEAM X-BEAM STIFFNESS TRANSITION SEE ETD PLAN
SHEET 606.06B FOR DETAILS. IF CURB EXTENDS BEYOND POST NO. 13, PAY FOR
A BRIDGE APPROACH TRANSITION (EXTENDED CURB).
WELDING INSTRUCTION

ALL FILLET WELDS SHALL BE 1/8" LONG SPACED AT 2".
WELDING INSTRUCTION
(VIEWED FROM BACK SIDE OF PLATE)

(1) STIFFENERS LOCATED AT THE OUTSIDE EDGES OF THE COVER PLATES SHALL BE WELDED AS FOLLOWS:
- SINGLE REELED FROUDE WELD ON EXTERNAL SIDES ARE ½" FILLET WELD BY 1" LONG SPACING AT 90° ON INTERNAL SIDES.
- STIFFENERS LOCATED ON THE INSIDE OF THE COVER PLATE SHALL BE WELDED AS FOLLLOW:
  - ½" FILLET WELD BY 1" LONG SPACING AT 90°.

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

CONNECTOR PLATE DIMENSION (PER ASSEMBLY)

<table>
<thead>
<tr>
<th>PLATE</th>
<th>QUANTITY</th>
<th>SHAPE</th>
<th>SIZE (A x B x C x D)</th>
<th>THICKNESS</th>
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<td>C</td>
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<tr>
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<td>D</td>
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<td>1&quot;</td>
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<tr>
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<td>1</td>
<td>E</td>
<td>10&quot; x 20&quot; x 10&quot; x 20&quot;</td>
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<td>S3</td>
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<td>F</td>
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<tr>
<td>S4</td>
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<td>G</td>
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<tr>
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<td>H</td>
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<tr>
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<td>I</td>
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<tr>
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<td>L</td>
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<td>4&quot;</td>
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<tr>
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<td>1</td>
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<td>N</td>
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GENERAL NOTES:
- COVER PLATE PANELS ARE ½" THICK.
- ALL STIFFENERS ARE ½" THICK.
- CONNECTOR PLATE SHALL BE FABRICATED FROM ASTM GRADE 450 STEEL AND GALVANIZED.
- FOR GALVANIZED REQUIREMENTS, SEE SECTION 4.10 OF THE STANDARD SPECIFICATIONS.
- ALL HOLE DIAMETERS SHALL BE 1/2".

MIDWEST GUARDRAIL SYSTEM (MGS)
VERTICAL BARRIER TRANSITIONS (CONNECTOR PLATE DETAIL)
SINGLE SLOPE BARRIERS
STEEL POST AND WOOD BLOCK

SECTION F-F
POST SIDE VIEW
POST FRONT VIEW

THREE BEAM RAIL SPILCE AT POST

ASYMMETRICAL TRANSITION SECTION

MIDWEST GUARDRAIL SYSTEM (MGS)
BRIDGE APPROACH TRANSITION
(THREE BEAM ON BRIDGE)
GRADING LIMITS FOR FLARED CRASHWORTHY END TERMINALS

STANDARD GRADING LIMITS FOR CRASHWORTHY END TERMINALS

ALTERNATE GRADING LIMITS FOR CRASHWORTHY END TERMINALS
MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-ASK-MODOT (1-888-275-6636)

CHAIN-LINK FENCE

WIRE SIZE AND HEIGHT OF FABRIC

<table>
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<th>SPECIFIED DIAMETER</th>
<th>HEIGHT OF FABRIC</th>
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<tr>
<td>0.148</td>
<td>9 2</td>
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<td>0.192</td>
<td>6 2</td>
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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.

MINIMUM DEPTH FOR SETTING POSTS

DESCRIPTION | HEIGHT OF FENCE |
-------------|-----------------|
END CORNER OR PULL POST | 2 1/4 |
LINE POST | 2 1/4 |
GATE POST | 2 1/4 |
BRACE | 2 1/4 |
TRUSS ROD | 2 1/4 |
GATE FRAME | 2 1/4 |
STRETCHER BAR | 2 1/4 |
END OR CORNER CLAMP | 2 1/4 |
POST TOPS (OTHER THAN LINE POSTS) | 2 1/4 |
FABRIC TIES | 2 1/4 |
LINE POST TOPS WITH OR WITHOUT TOP RAILS | 2 1/4 |
ONE-HALF FABRIC HEIGHT OR AS RECOMMENDED BY MANUFACTURER | 2 1/4 |

LEGEND
1) FABRIC
2) END CORNER OR PULL POST
3) LINE POST
4) GATE POST
5) BRACE
6) TRUSS ROD
7) GATE FRAME
8) STRETCHER BAR
9) END OR CORNER CLAMP
10) POST TOPS (OTHER THAN LINE POSTS)
11) FABRIC TIES
12) LINE POST TOPS WITH OR WITHOUT TOP RAILS
13) ONE-HALF FABRIC HEIGHT OR AS RECOMMENDED BY MANUFACTURER

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'.

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

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.

ALTERNATE LINE POST ANCHORAGE (DRIVEN)
**U-BOLT**

**TERMINAL POST**

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

**PART ELEVATION (TYPICAL)**

- 2" I.D. pipe
- Fabric tie at alt. 12 centers (typ.)
- 3" dia. u-bolts (typ.)
- 2.5" dia. pipe for fence
- 2" dia. pipe for fence
- 4" bars

**ALTERNATE SECTION A-A FOR MSE WALLS**

- 2" or 2.5" diameter pipe
- 3"-4" bars at equal spaces
- 3'-6"

**PLAN OF FLOOR PLATE**

- 6" dia. u-bolts
- 1" TYP.
- 3'-4" bars at equal spaces
- 2'-1"

**GENERAL NOTES**

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

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

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

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

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

**CHAIN-LINK FENCE FOR RETAINING WALLS**

**DATE PREPARED:** 4/30/2009

**DATE EFFECTIVE:** 6/7/2009

**SHEET NO.** 1 OF 1

**607.11H**
End Post Assembly
Line Post
Pull Post Assembly
Wood Post
Corner Post Assembly

Typical Splice

Typical Fence Location

<table>
<thead>
<tr>
<th>Gate Opening</th>
<th>Gate Post Size</th>
<th>Height</th>
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</thead>
<tbody>
<tr>
<td>2' 6&quot;</td>
<td>2&quot; Dia.</td>
<td>3.57</td>
</tr>
<tr>
<td>3' 9&quot;</td>
<td>2&quot; Dia.</td>
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</tr>
<tr>
<td>5' 10&quot;</td>
<td>2&quot; Dia.</td>
<td>5.79</td>
</tr>
<tr>
<td>8' 11&quot;</td>
<td>2&quot; Dia.</td>
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</tr>
<tr>
<td>10' 1&quot;</td>
<td>2&quot; Dia.</td>
<td>10.77</td>
</tr>
</tbody>
</table>

1. Braces
2. Wire Ties
3. 3.8" Adjustable Trus Post

General Notes:
Steel line posts shall be of an approved "U", "Y", or "K" type channel section, notched or drilled with an anchor plate. Posts finished with Flange or Self-Fastening Caps will not be permitted.

Staples shall be screw Shank Type or equivalent 1/2" Masonry Length.

Stretched fabric and Barbed Wire on outside of Post on Corners are required.

Attachment of Fabric to Steel Line Posts in accordance with manufacturer's recommendation.

Gates for woven wire fence shall be in accordance with Sec. 607.2.0 of the standard specifications except the filler shall be woven wire fabric of the same gauge as used for the fence.

Single Leaf Gate require up to 12" opening. Double leaf gates require over 12" opening. Direction of swing of Gate shall be as designated on the plans or as directed by the Engineer.

MoDOT
Department of Transportation

Woven Wire Fence
GENERAL NOTES:

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

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

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

THE CROSS SLOPE OF THE CONTINUOUS PEDESTRIAN ACCESS ROUTE THROUGH ENTRANCES, ALLEYS, AND SIDEWALK CONNECTIONS WHERE 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.

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.

CONCRETE SIDEWALK JOINTS

1. See plans for width
2. See standard 608.00
3. Curb to be monolithic with pcc mainline pavement. Curb to be type S with asphalt concrete mainline pavement. See standard plan 609.00.
4. Min. 1/2 depth joint.
5. See typical pavement section
6. Slope 1.0% (2.0% max).
7. Spacing equal to width of walk
**STAIRWAY STEP DETAILS**

**SAFETY RAIL DETAILS**

**RAILING & POST SPECIFICATIONS**

<table>
<thead>
<tr>
<th>TYPE</th>
<th>SIZE (DIA.)</th>
<th>WEIGHT (LBS./FT.)</th>
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**STEP DIMENSIONS**

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<th>TREAD</th>
<th>RISE</th>
<th>X</th>
<th>Y</th>
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<td>115</td>
<td>14&quot;</td>
<td>4&quot;</td>
<td>12&quot;</td>
<td>54&quot;</td>
</tr>
</tbody>
</table>

**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 ASHBT M111.

ALL JOINTS SHALL BE CONTINUOUS WELDED AND GROUND SMOOTH.

ALL RAILING SHALL HAVE A 1/4" WEEP HOLE NEAR ALL INTERSECTING RAILING CONNECTIONS.

**CONCRETE STAIRS**

**DATE EFFECTIVE:** 4/1/2015

**DATE PREPARED:** 3/20/2015

**SHEET NO.:** 608.20E 1 OF 2
# Quantities for Concrete Steps

## Concrete C.Y. - Steel lb.

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<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
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<th>9</th>
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<th>12</th>
<th>13</th>
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<tr>
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<td></td>
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<td>104</td>
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<td>128</td>
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| **12'-3" Tread 1:2 Slope 6" Rise** | | | | | | | | | | | | | |
| Conc. | 0.18 | 0.26 | 0.33 | 0.41 | 0.49 | 0.56 | 0.64 | 0.72 | 0.80 | 0.87 | 0.95 | 1.02 | 1.08 |
| Steel | 10 | 12 | 16 | 19 | 23 | 25 | 29 | 33 | 36 | 39 | 42 | 46 | 50 |
| Conc. | 0.25 | 0.35 | 0.45 | 0.56 | 0.66 | 0.76 | 0.87 | 0.97 | 1.07 | 1.18 | 1.28 | 1.38 | 1.49 |
| Steel | 13 | 16 | 21 | 26 | 32 | 34 | 39 | 45 | 50 | 53 | 58 | 63 | 68 |
| Conc. | 0.31 | 0.44 | 0.57 | 0.70 | 0.85 | 1.00 | 1.12 | 1.22 | 1.35 | 1.48 | 1.61 | 1.74 | 1.87 |
| Steel | 17 | 20 | 27 | 33 | 40 | 47 | 53 | 60 | 67 | 73 | 79 | 81 | 87 |
| Conc. | 0.38 | 0.53 | 0.69 | 0.85 | 1.00 | 1.16 | 1.31 | 1.47 | 1.63 | 1.78 | 1.94 | 2.10 | 2.25 |
| Steel | 21 | 25 | 33 | 41 | 49 | 58 | 67 | 77 | 82 | 89 | 98 | 105 | 109 |
| Conc. | 0.44 | 0.62 | 0.81 | 1.00 | 1.17 | 1.36 | 1.54 | 1.72 | 1.90 | 2.09 | 2.27 | 2.45 | 2.64 |
| Steel | 26 | 29 | 39 | 48 | 58 | 69 | 81 | 90 | 96 | 105 | 115 | 124 | 128 |

| **14'-3" Tread 1:2 Slope 6" Rise** | | | | | | | | | | | | | |
| Conc. | 0.19 | 0.27 | 0.35 | 0.43 | 0.51 | 0.59 | 0.68 | 0.76 | 0.84 | 0.92 | 1.01 | 1.08 | 1.16 |
| Steel | 10 | 14 | 18 | 21 | 25 | 29 | 33 | 37 | 41 | 45 | 47 | 51 | 55 |
| Conc. | 0.26 | 0.37 | 0.48 | 0.59 | 0.70 | 0.80 | 0.91 | 1.02 | 1.13 | 1.24 | 1.35 | 1.46 | 1.56 |
| Steel | 14 | 19 | 25 | 28 | 34 | 39 | 45 | 50 | 56 | 59 | 65 | 70 | 76 |
| Conc. | 0.33 | 0.47 | 0.61 | 0.74 | 0.89 | 1.02 | 1.15 | 1.29 | 1.42 | 1.56 | 1.70 | 1.83 | 1.97 |
| Steel | 18 | 25 | 32 | 36 | 43 | 50 | 57 | 64 | 71 | 75 | 82 | 89 | 96 |
| Conc. | 0.40 | 0.57 | 0.73 | 0.90 | 1.06 | 1.22 | 1.39 | 1.55 | 1.72 | 1.88 | 2.05 | 2.21 | 2.38 |
| Steel | 22 | 30 | 39 | 44 | 52 | 61 | 69 | 78 | 86 | 91 | 100 | 108 | 117 |
| Conc. | 0.47 | 0.66 | 0.86 | 1.05 | 1.24 | 1.43 | 1.63 | 1.82 | 2.01 | 2.21 | 2.40 | 2.59 | 2.78 |
| Steel | 25 | 35 | 45 | 51 | 61 | 71 | 81 | 91 | 101 | 107 | 117 | 127 | 137 |

**Missouri Highways and Transportation Commission**

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

**Concrete Stairs**

*Date Effective:* 04/01/2015

*Date Prepared:* 02/20/2016

608.20E Sheet No. 2 of 2
TIE BAR LOCATIONS FOR CONCRETE MEDIAN STRIP

TIE BAR LOCATIONS FOR CONCRETE MEDIAN STRIP (ISLAND)

CONCRETE MEDIAN STRIP JOINT LOCATION

place joints at each existing joint (1)

EXISTING PAVEMENT JOINTS (1)

SECTION A-A
CONCRETE MEDIAN STRIP

CONCRETE MEDIAN STRIP

CONCRETE MEDIAN STRIP #5 TIE BAR (TYP.)

VAR.

5' (TYP.)

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SIDEWALK HANDRAILING WITHOUT BALUSTERS

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

WELDING SURFACE

CONCRETE SIDEWALK

SIDEWALK WITHOUT BUFFER STRIP
(SECTION A-A)

SIDEWALK WITH BUFFER STRIP
(SECTION A-A)

CONCRETE CEMENT

CONCRETE CEMENT

Cement

Steel Plate

Steel Plate

CONCRETE CEMENT

CONCRETE CEMENT

GROUT LINE

GROUT LINE

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-800-542-MODOT (66368)
SIDEWALK SAFETY RAIL WITH BALUSTERS AND HANDRAIL

SIDEWALK WITHOUT BUFFER STRIP (SECTION A-A)

CROSS-SECTION: 2.0% MIN. - 3.0% MAX.

SIDEWALK WITH BUFFER STRIP (SECTION A-A)

CROSS-SECTION: 1.0% MIN. - 2.0% MAX.

HANDRAIL

4" CONCRETE SIDEBelly

CONCRETE CURB ON CURB AND GUTTER

CONCRETE CURB ON CURB AND GUTTER

CONCRETE CURB ON CURB AND GUTTER

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-4-ASAKOM (1-888-427-8566)

HANDRAILING

DATE EFFECTIVE: 12/1/2020 SHEET NO. 608.40A
DATE PREPARED: 10/14/2020 SHEET 2 OF 4
GENERAL NOTES:

ALL ASPECTS OF THE PEDESTRIAN ACCESS ROUTE MUST BE COMPLIANT WITH THE AMERICANS WITH DISABILITIES ACT – GUIDELINES FOR ACCESSIBLE PUBLIC FACILITIES. ANY EXCEPTIONS MUST BE APPROVED BY THE ENGINEER. ALL OTHER ASPECTS OF NON-COMPLIANCE SHALL BE REMEDYED AND COMPLIANCE SECURED AT THE CONTRACTOR’S EXPENSE.

THE SURFACES OF PEDESTRIAN ACCESS ROUTES AND ELEMENTS THEREIN, AND SPACES REQUIRED TO CONNECT TO PEDESTRIAN ACCESS ROUTES, SHALL BE RUGGED, SLIP RESISTANT, AND SHALL NOT HAVE R.basename.

SCENIC, RAMP AND LANDING CROSS SLOPES SHALL BE 1.0% TO 3.0%; FAVORING 2.0% MAX.

THE CROSS-SLOPE OF THE CONTINUOUS PEDESTRIAN ACCESS ROUTE THROUGH ENTRANCES, ALLEYS, AND SIDE ROADS CONTINUING WITH STOP OR YIELD CONTROL SHALL BE 1.0% TO 3.0%; FAVORING 2.0% MAX.

WHERE PEDESTRIAN ACCESS ROUTES ARE CONTAINED WITHIN PEDESTRIAN STREET CROSSINGS, THE CROSS-SLOPE OF THE PEDESTRIAN ACCESS ROUTE SHALL BE 5.0% MAXIMUM.

WHERE PEDESTRIAN ACCESS ROUTES ARE CONTAINED WITHIN WIDEBORNE PEDESTRIAN STREET CROSSINGS, THE CROSS-SLOPE OF THE PEDESTRIAN ACCESS ROUTE SHALL BE PERMITTED TO EQUAL THE STREET OR MINIMUM 5.0%.

50° CLEARED SPACE SHALL BE PROVIDED CENTERED ON THE PEDESTRIAN PUSH BUTTON.

BEFORE THE BOTTOM EDGE DEPTH OF A CURB RAMP, A CLEAR SPACE 6.0 MILLIMETERS (0.25 INCH) IN WIDEBORNE SHALL BE PROVIDED WITHIN THE WIDTH OF THE PEDESTRIAN STREET CROSSING AND SHALL BESET OUTSIDE THE PARALLEL LANE TRAVEL LANE.

SIDE FLANGES OF CURB RAMPS, IN THE PATH OF PEDESTRIAN TRAVEL, ARE RECOMMENDED BUT SHALL NOT EXCEED A SLOPE OF 1:24. SIDE FLANGES OUTSIDE THE PEDESTRIAN PATH MAY BE VERTICAL.

TRANSITION FROM SCENIC OR CURB RAMP TO CURTIER ROAD SHALL BE FLUSH.

DETECTABLE WARNING SURFACES (TRUNCATED DOMES) SHALL BE PROVIDED AND INSTALLED PER MANUFACTURER’S RECOMMENDATION. STAINED CONCRETE WILL NOT BE ACCEPTED.

THE DETECTABLE WARNING SURFACES SHALL CONTRAST VISUALLY WITH SURROUNDING SURFACES. EITHER LIGHT-IN-LIGHT OR LIGHT-OUT-LIGHT TRUNCATED DOMES SHALL OPEN THE FULL WIDTH OF THE RAMP OR LANDING 24 DEEP.

DETECTABLE WARNING SURFACES SHALL BE ALLOWED PERPENDICULAR TO THE SIDEWALK, RAMP, OR LANDING LINING AND EXTENDING DOWNSTREAM.

WHERE THE BOTTOM EDGE DEPTH OF A CURB RAMP IS LESS THAN 6.0 MILLIMETERS (0.25 INCH) FROM THE EDGE OF CURB, THE DETECTABLE WARNING SHALL BE LOCATED IN THE RAMP SURFACE AT THE BACK OF THE CURB, WHERE THE EDGE DEPTH IS GREATER THAN 6.0 MILLIMETERS (0.25 INCH), THE DETECTABLE WARNING SHALL BE LOCATED IN THE LOWER LANDING.
**GENERAL NOTES:**

1. 1% 12% MAX. CROSS SLOPE OF ROAD PAVE SPACE EXCEPT 4 .
2. VARIABLE HEIGHT VERTICAL CURVE IF TRAVELER USE A MAXIMUM 12% CROSS SLOPE PARALLEL TO THE CURVE LINE.
3. MINIMUM 30 IN. FOR EXISTING CURB.
4. THE CURBER SLICE OF THE CURVE AT THE END OF RAMP SLOPES, EQUALLY TRANSITIONS, AND TANKING SPACES SHALL BE 2% MAXIMUM.
5. THE EDGE OF FEET ENTRANCE BUTTONS SHALL BE OFFSET 4" FOR SIDE APPROACHES TO THE CURB.
6. ENSURE THAT THE CURVE EDGE OF CURVING RENOS MAINTAIN AN 8.3% (1% MAXIMUM SLOPE).
**SECTION THROUGH DITCH (SHOWING THE WALL)**

**PLANT**

**SECTION A-A**

**GENERAL NOTES:**

STEEL VELED WIRE REINFORCEMENT SHALL BE IN ACCORDANCE WITH 230.5.

SIDE VELTED OXIDE OR EROSION CONTROL MATT. SHALL BE MTD ALONG THE Sides, IF SHOWN ON THE PLANS, OR AS DIRECTED BY THE ENGINEER.

THE SARLS SHALL BE CONSTRUCTED AT INLET AND OUTLET ENDS OF PAVED STREAMS AND AT ALL VARIOUS SPACING FOR INTERMEDIATE THE WALLS.
FLAT BOTTOM DITCH
WITHOUT BEDDING MATERIAL

FLAT BOTTOM DITCH
WITH BEDDING MATERIAL

TYPICAL DITCH LINER DETAILS

<table>
<thead>
<tr>
<th>TYPE</th>
<th>ROCK DITCH LINER MIN. THICKNESS</th>
<th>BEDDING MATERIAL MIN. THICKNESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6&quot;</td>
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<tr>
<td>2</td>
<td>12&quot;</td>
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<tr>
<td>3</td>
<td>22&quot;</td>
<td>8&quot;</td>
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<tr>
<td>4</td>
<td>30&quot;</td>
<td>12&quot;</td>
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</table>
### ROCK LINING FOR CULVERT OUTLETS

<table>
<thead>
<tr>
<th>SIZE (IN.)</th>
<th>MIN. DIAMETER (IN.)</th>
<th>MIN. DEPTH (FT.)</th>
<th>MIN. END VIEW LINING WIDTH (FT.)</th>
<th>ROCK LINING CULVERT (CU. YD.)</th>
<th>EQUIVALENT PIPE ARCH CULVERT (APPROX.)</th>
<th>EQUIVALENT CONCRETE BOX LINING CULVERT (APPROX.)</th>
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</thead>
<tbody>
<tr>
<td>18</td>
<td>1 x 4</td>
<td>12</td>
<td>2</td>
<td>2 x 1 1/2</td>
<td>2 x 1 1/2</td>
<td>2 x 1 1/2</td>
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<td>24</td>
<td>1 x 6</td>
<td>14</td>
<td>5</td>
<td>2 x 1 1/2</td>
<td>2 x 1 1/2</td>
<td>2 x 1 1/2</td>
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<tr>
<td>30</td>
<td>1 x 7</td>
<td>16</td>
<td>4</td>
<td>B-5</td>
<td>2 x 2 1/2</td>
<td>2 x 2 1/2</td>
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<tr>
<td>36</td>
<td>1.5 x 9</td>
<td>18</td>
<td>9</td>
<td>B-6</td>
<td>3 x 2 1/2</td>
<td>3 x 2 1/2</td>
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<td>42</td>
<td>2 x 10</td>
<td>20</td>
<td>15</td>
<td>B-7</td>
<td>3 x 3 1/2</td>
<td>3 x 3 1/2</td>
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<tr>
<td>48</td>
<td>2 x 12</td>
<td>22</td>
<td>18</td>
<td>B-8</td>
<td>4 x 3 1/2</td>
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<td>54</td>
<td>2 x 13.5</td>
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<td>22</td>
<td>B-9</td>
<td>4 x 4 1/2</td>
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<td>60</td>
<td>2 x 15</td>
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<td>28</td>
<td>B-10</td>
<td>5 x 4 1/2</td>
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<td>66</td>
<td>2 x 18</td>
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<td>33</td>
<td>B-11</td>
<td>5 x 5 1/2</td>
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<td>72</td>
<td>2 x 20</td>
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<td>44</td>
<td>B-12</td>
<td>5 x 6 1/2</td>
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<td>35</td>
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<td>96</td>
<td>2.5 x 30</td>
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<td>111</td>
<td>7 x 7 1/2</td>
<td>7 x 7 1/2</td>
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<td>108</td>
<td>3 x 32</td>
<td>40</td>
<td>142</td>
<td>8 x 8</td>
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**GENERAL NOTES:**

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

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**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

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

**ROCK LINING FOR CULVERT OUTLET**

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

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

**SHAP No. 609.70C 1 OF 1**
**GROUND NO. 1 OF BOTTOM OF BEAM PASSIVE PRESSURE WALL**

**TYP.**

PRE-FORMED FIBER EXPANSION JOINT MATERIAL (SECTION 1057)

4" CONCRETE SLOPE PROTECTION (ROADWAY ITEM)

FINISHED GROUND LINE

SEE BRIDGE PLANS FOR TYPE OF CURB

ELEVATION (STRAIGHT SLOPE TYPE)

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

LIMIT OF SLOPE PROTECTION (3)

APRON (1)

APRON (1)

LIMIT OF SLOPE PROTECTION (3)

SQUARE

PART PLAN

SKEWED

LIMIT OF SLOPE PROTECTION TO BE SPECIFIED ON PLANS

LIMIT OF SLOPE PROTECTION

SLOPE PROTECTION FOOTING

LIMIT OF SLOPE PROTECTION TO BE SPECIFIED ON PLANS

APRON (1)

APRON (1)

LIMIT OF SLOPE PROTECTION

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LIMIT OF SLOPE PROTECTION
ATTENUATOR LAYOUT:

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

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

LOCATION OF OBJECT MARKER

TRAFFIC PASSING
TO BOTH LEFT AND RIGHT

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

TRAFFIC PASSING TO LEFT
FLIP FOR TRAFFIC TO RIGHT

TYPE 3 OBJECT MARKER PLACEMENT
FOR PERMANENT INSTALLATIONS

TYPE 1 OBJECT MARKER PLACEMENT
FOR TEMPORARY INSTALLATIONS

GENERAL NOTES:
OBJECT MARKERS SHALL BE CENTERED VERTICALLY OR PLACED AS DIRECTED BY THE ENGINEER.
CONSTRUCT 6-JOINTS SPACED AT 18' 9" IF REPAIR LENGTH IS GREATER THAN OR EQUAL TO 30'. JOINTS SHALL BE AS EQUALLY SPACED AS POSSIBLE.

CONSTRUCT 6-JOINTS IF LENGTH OF REPAIR IS GREATER THAN OR EQUAL TO 30'. JOINTS SHALL BE CONSTRUCTED AT LOCATION OF EXISTING JOINTS OR CRACKS IN ADJACENT PAVEMENT AND EQUALLY SPACED AS MUCH AS POSSIBLE. THE PREFERRED JOINT SPACING IS 30' 6", BUT MAY BE A MAXIMUM OF 2'.

EXISTING CONTRACTION JOINT OR STABLE CRACK

INSTALL 6-JOINTS IF LENGTH OF REPAIR IS GREATER THAN OR EQUAL TO 30'.

EXISTING REINFORCING

SECTION A-A ALTERNATE WITH ASPHALT OVERLAY

SECTION A-A

THIN CIRCULAR DISK

DETAIL B

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

2. THE ANCHORING MATERIAL (EPoxy OR POLYESTER) SHALL BE PLACED TO THE EDGE OF THE PREPLUNGED HOLE BEFORE INSERTING THE DOWEL.

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

4. EPOXY OR RESIN COATED DOWEL SHALL BE COATED WITH A THIN UNIFORM LAYER OF GRAPHITE GREASE. DOWEL BASKET ASSEMBLIES SHALL BE CONSTRUCTED IN ACCORDANCE WITH STANDARD PAVEMENT GENERAL SPECIFICATIONS.

5. REPAIR ONLY ONE LANE AT A TIME.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 N GUSTAVUS \nJEFFERSON CITY, MO 65102
1-800-MISSOURI (1-800-647-7674)

Pavement Repair
Full Depth

G.A.A. SPECIFICATIONS
DATE EFFECTIVE: 03/01/2020
DATE ISSUED: 10/07/2019
613.00T SHEET NO. 1 OF 4

Non-reinforced and reinforced Portland cement concrete
CROSS STITCHING PLAN

GENERAL NOTES:

1. AT EACH REPAIR LOCATION, HOLES SHALL BE DRILLED AT 30° ANGLES TO THE PAVEMENT SURFACE, PERPENDICULAR TO THE CRACK. THE DRILL BIT DIAMETER SHALL NOT EXCEED 1/2'.

2. DRILLING SHALL ALTERNATE EACH 4 INCH OR 8 INCH INTERVAL DOWN THE LENGTH OF THE LONGITUDINAL JOINT FROM HOLE TO HOLE.

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

4. DRILLED HOLES SHALL BE CLEANED OF LOOSE DEBRIS AND DUST. EPOXY OR POLYESTER BONDING AGENTS FOR BONDS MEETING THE MATERIAL REQUIREMENTS OF SECTION 102.7.7 SHALL BE INJECTED OR PUMPED INTO EACH HOLE. A CROSS-STITCH BAR SHALL BE INSERTED IN EACH HOLE SUCH THAT THE EPOXY MATERIAL IS EQUALLY DISTRIBUTED ALONG THE BAR AND EXTENDING FROM THE SURFACE WEARING. EACH END OF THE BAR SHALL BE INSERTED FAR ENOUGH TO ALLOW 1/2 OF THE COVER AS SHOWN IN THE PROFILE DETAIL.

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

GENERAL NOTES:

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

PAVEMENT REPAIR
CROSS STITCHING

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

PLAN VIEW

SECTION A-A

SECTION B-B

SECTION C-C

PAVEMENT REPAIR
DOWEL BAR RETROFIT

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITAL
JEFFERSON CITY, MO 65102
1-888-306-MODOT (6636)
501-306-7426

FILE EFFECTIVE: 01/04/2020
613.00T SHEET NO.
4 OF 4
When specified, use a lock type frame and cover with a minimum of 3 lock blocks and bolts. A checkered design top shall be furnished.

General Notes:

Type 1A:
When "p" (Pavement Thickness) is 8" use manhole frame with 9" height (f) approximate weight of frame and cover, 540 Lbs., Class 35 casting.

Type 1B:
When "p" (Pavement Thickness) is 9" or 10", use manhole frame with 10" height (f) approximate weight of frame and cover, 570 Lbs., Class 35 casting.

Type 1C:
Type 1C manhole frame and cover will be accepted as an alternate to Type 1A or Type 1B. Approximate weight of frame and cover, 290 Lbs.

For "p" greater than 10", adjusting rings combined with manhole frames with "f" equal to 9" or 10" shall be used to match the pavement thickness.

The price bid for manhole frame and cover shall include the number of adjusting rings required to match pavement thickness.

When specified, use a lock type frame and cover with a minimum of 3 lock blocks and bolts.

Manhole adjusting rings shall be secured to either the frame or pavement to prevent movement under traffic.

A checkered design top shall be furnished.
**PLAN**

**SECTION B-B**

**ELEVATION**

**ADJUSTING RING**
SOLID OR ADJUSTABLE

**SECTION A-A**

**COVER**

**FRAME**

**INSTALLATION DETAILS**

**ADJUSTING RING**

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

**ALTERNATE TYPE 4 COVER**
<table>
<thead>
<tr>
<th>TYPE</th>
<th>SIGN SUPPORT</th>
<th>SIGN SUBSTRATE</th>
<th>MINIMUM MOUNTING HEIGHT (FT)</th>
<th>USAGE LIMITATIONS</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>POST</td>
<td>PERFORATED SQUARE STEEL TIME MAGNETIC HOOD</td>
<td>RIGID</td>
<td>5'</td>
<td>FINAL UNDIVIDED HIGHWAYS</td>
<td>NO LIMITATIONS</td>
</tr>
<tr>
<td>TYPE 1 FOOTSTAND</td>
<td>SHEET METAL STAND</td>
<td>FLEXIBLE</td>
<td>12'</td>
<td>FINAL UNDIVIDED HIGHWAYS</td>
<td>PERMITTED ONLY WHERE MOUNTING IS NOT POSSIBLE.</td>
</tr>
<tr>
<td>TYPE 2 FOOTSTAND</td>
<td>SELF-DRIVING POST</td>
<td>FLEXIBLE</td>
<td>48'</td>
<td>FINAL UNDIVIDED HIGHWAYS</td>
<td>PERMITTED ONLY WHERE LONGITUDINAL BARRIER IS PRESENT.</td>
</tr>
<tr>
<td>BARRIER</td>
<td>CONCRETE TRAFFIC BARRIER</td>
<td>FLEXIBLE</td>
<td>48'</td>
<td>FINAL DIVIDED HIGHWAYs</td>
<td>PERMITTED ONLY IN PILOT CAR OR MOVING OPERATIONS.</td>
</tr>
<tr>
<td>VEHICLE</td>
<td>PAYMENT MACHINERY EQUIPMENT</td>
<td>FLEXIBLE</td>
<td>48'</td>
<td>FINAL DIVIDED HIGHWAYs</td>
<td>PERMITTED ONLY IN PILOT CAR OR MOVING OPERATIONS.</td>
</tr>
</tbody>
</table>

**GENERAL NOTES:**

- Longitudinal spacing of signs shown in the plans are prefabricated distances and may be subject to meet existing field conditions with approval from the engineer.

- Signs shall not be mounted in or on channelizers.

- All posts and signs shall be installed and maintained in a plane position.

- Construction signs shall not be located on sidewalks, vehicle lanes, or areas designated for reception or bicycle traffic.

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

**MISSOURI DIVISION OF HIGHWAYS**

**TEMPORARY TRAFFIC CONTROL DEVICES**

**SIGN MOUNTING REQUIREMENTS**

**DATE:** 3/14/2023

**SHEET NO.:** 1 OF 9

**616.10BC**
USE OF SPlice IS OPTIONAL.
SPlice OVERLAP SHALL BE POSITION ENTIRELY BETWEEN GROUND LINE AND 18" ABOVE GROUND LINE.
ONLY ONE SPlice WILL BE ALLOWED PER POST.

U-CHANNEL POST DETAIL

WOOD POST DETAIL

PERFORATED SQUARE STEEL TUBE POST DETAIL

POST SPACING

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

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

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115 WEST CAPITOL, JEFFERSON CITY, MO 65102
1-800-457-MODOT (1-800-288-6638)

TEMPORARY TRAFFIC CONTROL DEVICES
POST INSTALLATION DETAILS

DATE PRINTED: 3/11/2023
DATE PREPARED: 3/11/2023
SHEET: 2 OF 9
**Direction Indicator Barricade**

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

**Advance Warning Rail System**
- Maximum weight of sign shall not exceed 25 lbs.
- The sign and rail system may be mounted as two separate crashworthy devices. The rail system shall be located directly in front of the sign with 1 to 10 feet separating the two devices.
- Where marking is not provided on the backside, strips of 3" wide Type IV Orange Reflective Sheeting may be applied to the ends of each rail to help delineate the device.
- White and Orange Reflective Sheeting shall be in accordance with Sec. 1042.2.4.4.

**Channelizers**
- Stripes on Trim-Line Channelizers shall be 6" to 8".
- Stripes on Drum-Like Channelizers shall be 4" to 6".
- White and Fluorescent Orange Reflective Sheeting shall be in accordance with Sec. 1042.2.4.4.

**General Notes**
- White, Orange, and Fluorescent Orange Reflective Sheeting shall be in accordance with Sec. 1042.2.7.
- Ballast for Traffic Control Devices shall conform to Highway Agency specifications and must be in accordance with Sec. 1065.5.
- Sequential flushing warning lights shall be in accordance with Sec. 1066.5.
- Upon approval of the Engineer, the Contractor may, at no additional cost, use directional channelizers in lieu of triple-line channelizers to provide longitudinal channelization within the activity area where no ramps, intersections or limited lateral clearance exists.
- Upon approval of the Engineer, the Contractor may, at no additional cost, use vertical panels in lieu of triple-line channelizers to provide longitudinal channelization within the activity area.
- Upon approval of the Engineer, the Contractor may, at no additional cost, use vertical panels in lieu of triple-line channelizers during daytime operations on minor routes.

**Temporary Traffic Control Devices**
- Channelizers and Direction Indicator Barricades shall be used for temporary installations and shall be removed as soon as possible.

---

**Missouri Highways and Transportation Commission**

**Temporary Traffic Control Devices**

**Sheet No.** 3 of 9

**Date Prepared:** 2/3/2023

**MoDOT**

**Temporary Traffic Control Devices**

**Channels and Direction Indicator Barricades**

**Date Prepared:** 2/3/2023

**Sheet No.** 3 of 9
TWO LANE / TWO WAY TRAFFIC DELINEATION PLAN
FOR DIVIDED HIGHWAY

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

SECTION A-A
TUBULAR DELINERATOR DETAIL

AN ADHESIVE, IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS,
SHALL BE USED TO APPLY THE TUBULAR DELINERATOR TO THE PAVEMENT SURFACE.
THE ADHESIVE SHALL PERTAIN EASILY REMOVE OF THE TUBULAR DELINERATOR WITHOUT
CAUSING DAMAGE TO THE PAVEMENT SURFACE.

REFLECTIVE SHEETING APPLIED TO TUBULAR DELINERATORS SHALL BE IN ACCORDANCE
WITH SEC 1043.7.5.

CHANGEABLE MESSAGE SIGN

TYPE 3 OBJECT MARKERS
FLUORESCENT ORANGE REFLECTIVE SHEETING SHALL BE
IN ACCORDANCE WITH SEC 1043.7.5.
<table>
<thead>
<tr>
<th>SIGN</th>
<th>SIZE</th>
<th>AREA</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>S/S</td>
<td>48x48</td>
<td>16.00</td>
<td>Turn signal (left arrow)</td>
</tr>
<tr>
<td>S/S</td>
<td>48x48</td>
<td>16.00</td>
<td>Turn signal (right arrow)</td>
</tr>
<tr>
<td>S/S</td>
<td>48x48</td>
<td>16.00</td>
<td>Curve signal (left arrow)</td>
</tr>
<tr>
<td>S/S</td>
<td>48x48</td>
<td>16.00</td>
<td>Curve signal (right arrow)</td>
</tr>
<tr>
<td>S/S</td>
<td>48x48</td>
<td>16.00</td>
<td>Double line (left arrow)</td>
</tr>
<tr>
<td>S/S</td>
<td>48x48</td>
<td>16.00</td>
<td>Double line (right arrow)</td>
</tr>
<tr>
<td>S/S</td>
<td>48x48</td>
<td>16.00</td>
<td>Three line (left arrow)</td>
</tr>
<tr>
<td>S/S</td>
<td>48x48</td>
<td>16.00</td>
<td>Three line (right arrow)</td>
</tr>
</tbody>
</table>

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

**TEMPORARY TRAFFIC CONTROL DEVICES**

**WARNING SIGNS**

GENERAL NOTES:
- Signs shall be in accordance with the latest edition of 'Standard Highway Signs' by the U.S. Department of Transportation - MHA. Unless specifically otherwise specified.
- All signs shall have 4 corners, flutes shall not be included.
- All signs shall be made of metal, flutes shall not be included.

---

**DATE IMPRINTED:** 10/1/2023
**DATE PRINTED:** 3/14/2023
**SHEET NO:** 6 OF 9
NOT TO SCALE

TEMPORARY TRAFFIC CONTROL PLANS
PAVEMENT TREATMENTS FOR TWO-LANE ROADWAYS

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

DATE PROJECTED: 1.1.2026
DATE PREPARED: 9.26.2023
616.20A SHEET NO. 1 OF 5

NOTES:
SIGN 1 AND 30 ARE ONLY USED IF PROJECT LENGTH IS 2 MILES OR GREATER.
PREVIOUS SIGNS IN SAME DIRECTION ON THROUGH HIGHWAY.
DISTANCE MAY BE ADJUSTED ACCORDING TO FIELD CONDITIONS.

THIS TEMPORARY TRAFFIC CONTROL IS FOR USE ON THE FOLLOWING PAVEMENT TREATMENT PROJECTS AND IS NOT INTENDED FOR USE WHEN ADDITIONAL CONSTRUCTION ITEMS SUCH AS SHOULDER WIDENING, PIPE REPLACEMENT OR EXTENSIONS, CAMPAIGN CONSTRUCTION OR REPAIR, AND/OR SIGN INSTALLATIONS ARE PART OF THE PROJECT:
- ASPHALTIC RESURFACING SECTIONS 401 AND 4021
- SEAL COAT
- SCRUB SEAL/SAND SEAL
CENTERLINE/EDGELINE STRIPING ON TWO-LANE HIGHWAYS

NOT TO SCALE

NOTES:

1. When approved by the Engineer, the Contractor may request additional pavement markings unless otherwise specified in the Contract. The additional markings shall be painted with high-intensity Pavement Marking Paint or other similar material.

2. Pavement markings shall be placed as follows:
   - Yellow striping: on the edge of the road or lane
   - White striping: on the centerline of the road or lane

3. The width of each lane shall be such that it can accommodate the maximum anticipated traffic flow.

4. The placement of the markings shall be such that they are clearly visible to drivers.

5. The Contractor shall ensure that the markings are maintained in good condition and are replaced as necessary.

6. The Contractor shall ensure that the markings are visible during all weather conditions.

7. The Contractor shall ensure that the markings are removed when no longer needed.

8. The Contractor shall submit a report to the Engineer detailing the work performed and the cost incurred.

9. The Contractor shall provide a warranty for the work performed for a period of one year from the date of completion.

TEMPORARY TRAFFIC CONTROL PLANS

PAVEMENT TREATMENTS FOR TWO-LANE ROADWAYS

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

1155 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-456-MODOT (663-6683)

MoDOT

1155 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-456-MODOT (663-6683)

DATE PREPARED: 8/24/2022
DATE DISCLOSED: 12/10/2023

616.20A SHEET NO. 5 OF 5
PLAN

TRANSITION DETAILS FOR PIER PROTECTION

TYPICAL FACE

SECTION A-A

SEE SECTION C-C FOR DIMENSIONS

SECTION B-B

16" PIER WIDTH

TYPICAL FACE

SECTION C-C

16" PIER WIDTH

TYPICAL FACE

40:1 TRANSITION WAX, RATE

6"

1/2" JOINT FILLER (TYP.)

40:1 TRANSITION WAX, RATE

1/2" JOINT FILLER (TYP.)

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JEFFERSON CITY, MO 65102
1-888-688-MODOT (66368) 1-800-296-4687

PERMANENT CONCRETE TRAFFIC BARRIER
TYPE C

SHEET NO. 5 OF 11
NOTES:

ALL REINFORCEMENT SHALL BE GRADE 60 EPOXY COATED. 
BAR SPACINGS SHALL BE A MINIMUM OF 24 TIMES THE 
HORIZONTAL DIAMETER OF THE BAR. 
MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1", 
UNLESS OTHERWISE SHOWN. 

ANY METHOD RECOMMENDED BY THE CONTRACTOR AND APPROVED BY 
THE ENGINEER WILL ASSURE THE LONGITUDINAL 
REINFORCEMENT WILL BE POSITIONED 2 1/2 INCH AS 
DIMENSIONED WILL BE SATISFACTORY.

THE CONTRACTOR HAS THE OPTION TO SLIP-FORM THE 
BARRIER IN MOST CASES. ADDITIONAL REINFORCEMENT MAY 
BE TIED TO THE OUTER TWO-THIRDS OF THE REINFORCING 
CAGE TO PROVIDE BEARING.

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

THIS BARRIER SHALL NOT BE USED FOR BRIDGE ROADWAY 
APPLICATIONS.

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

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

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

FOR CONCRETE TRAFFIC BARRIER DELINEATOR DETAILS SEE 
STD PLAN 903.03.

PERMANENT CONCRETE TRAFFIC BARRIER 
TYPE D BESIDE MSE WALL
GENERAL NOTES:

CONCRETE SHALL BE CLASS B (F’c = 4,000 PSF).

ALL REINFORCEMENT SHALL BE GRADE 60 EPOXY COATED.

ANGLE OF INTERNAL FRICTION: 45° FOR BACKFILL MATERIAL.

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

BAR SPACING WILL BE A MINIMUM OF 24 TIMES THE MODULUS DIAMETER OF THE BAR.

ANY METHOD DEvised BY THE CONTRACTOR AND APPROVED BY THE ENGINEER THAT WILL ASSURE THE LONGITUDINAL REINFORCEMENT STEEL WILL BE PLACED 4" INCH AS DIMENSIONS WILL BE SATISFACTORY.

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

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

THIS BARRIER SHALL NOT BE USED FOR BRIDGE ROADWAY APPLICATION.

Sewn joints shall be spaced at 15'-0". See Missouri standard plan for sewn joint detail.

TYPE E BARRIER MODIFIED RETAINING WALL WITH MONUMENT SLAB SHALL BE USED ONLY AT LOCATION SHOWN IN PLAN.

FOR CONCRETE TRAFFIC BARRIER DELINEATION DETAILS SEE STE PLAN 501.05.

REINFORCEMENT SYSTEM SHALL BE DRILLED IN THE PAINTED, WHEN BARRIER HEIGHT EXCEEDS 42" OR SLICE EXCEEDS 51.

MIN. WIDTH = 4'-0"

SECTION A-A
(FOR SLOPING AND NONSLOPING BACKSLOPE)

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1-888-MO-ROAD (667-6233)

PERMANENT CONCRETE TRAFFIC BARRIER
TYPE D AS RETAINING WALL

SIZE: 617.10M
DATE APPROVED: 7/20/2020
SHEET NO. 10 OF 11
CONCRETE BARRIER END ANCHORAGE ON GRADE

GENERAL NOTES:
ALL REINFORCEMENT SHALL BE GRADE 60 EPOXY COATED.
MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1/2", UNLESS OTHERWISE SHOWN.
A 1/2" BUFFER REQUIRED WITHIN THE LIMITS OF THE TRAFFIC BARRIER EXCLUDING THE MSE ANCHORAGE SECTIONS.
FOR CONCRETE TRAFFIC BARRIER DETAILS SEE STD PLAN 906.05.
PAVEMENT SURFACE DIFFERENTIAL SHALL NOT EXCEED 1/4".
BAR SPLICES SHALL BE A MINIMUM OF 2 TIMES THE MINIMUM DIAMETER OF THE BAR.

TRAFFIC BARRIER ON TOP OF MSE WALL

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1-800-896-MODOT 1-800-896-6636

PERMANENT CONCRETE TRAFFIC BARRIER
TYPE E ATOP MSE WALL

SHEET NO.
617.10M
110F11
PRECAST BARRIER HEIGHT TRANSITION
(Temporary Installations Only)

1. Optional 4" inch diameter 1/4" gauge steel rod mechanical tying sleeve for lift hole allowed. The location of the hole diameter to accommodate the differing height contributions of transition sections.

2. 3" x 4" slots for lifting - two per section. Location to be determined by contractor.

GENERAL NOTES:

Reinforcing steel clearance to edge of concrete shall be 15" unless otherwise shown.

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

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

Retaining bolt and nut must be used with transition barriers.

At the option of the contractor, height transitions may be fabricated in one section. The flange reinforcement across joint shall be approved by the engineer prior to manufacture.

SECTION A-A

SECTION B-B

SECTION C-C

NOTE: Sections to be connected with two 1" E14.14 bars or as required for reinforcing bars 3/4" long in 1/2" dia. holes as shown.

TEMPORARY CONCRETE TRAFFIC BARRIER TYPE F HEIGHT TRANSITIONS

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JEFFERSON CITY, MO 65102
1-800-MO-MAP (662-6275)

TEMPORARY EFFECTIVE: 01/04/2021
FIELD EFFECTIVE: 02/04/2020
617.20F SHEET NO.
3 OF 8
GENERAL NOTES:
DIMENSIONS ARE OUT TO OUT OF BARS UNLESS OTHERWISE NOTED.

TEMPORARY CONCRETE TRAFFIC BARRIER
TYPE F HEIGHT TRANSITIONS

1. Tie-down strap anchor shall be one of the following:
   - 3" dia. anchor with a 3 1/2" embedment and 1/2" dia. x 15" long grade 5 bolt.
   - Red head large diameter Tapcon (Screw): 2" x 4 3/4" long with a 4" embedment.
   - Simpson Titen WF 2 1/8" dia. x 5" long with a 4 3/4" embedment.

Details of Type F Temporary Barrier Tie-down Strap

General Notes:
- Tie-down strap systems are only applicable on rigid pavements.
- Contractor shall verify all dimensions in field before ordering new materials.
- See other sheets for details not shown.
ADJACENT TYPE F BARRIER SHALL BE INSTALLED WITH THREE ANCHOR BOLTS.

CONCRETE BRIDGE DECK

SECTION A-A

BOLT THROUGH DECK AT THERMAL EXPANSION JOINTS

GENERAL NOTES:

ANCHOR BOLT SYSTEMS ARE ONLY Applicable ON BRIDGE DECKS AND BIIDGE PAVEMENTS.

CONTRACTOR SHALL VERIFY ALL DIMENSIONS IN FIELD BEFORE HEADING HEC MATERIAL.

SEE OTHER SHEETS FOR DETAILS NOT SHOWN.

AFTER REMOVAL OF ANCHOR BOLTS HOLES SHALL BE FILLED WITH QUALIFIED SPECIAL MORTAR IN ACCORDANCE WITH SECTION OR AN EPOXY BONDING AGENT IN ACCORDANCE WITH SEC 1039.

MISSOURI HIGHWAYS AND TRANSPORTATION
COMMISSION

TEMPORARY CONCRETE
TRAFFIC BARRIER
ANCHORED
(BOLT SYSTEM)

DATE EFFECTIVE: 03/31/2021
DATE UPDATED: 06/15/2021
617.20F
6 OF 8
ELEVATION OF BARRIER WITH ANCHOR PINS

GENERAL NOTES:

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

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

COST OF FURNISHING AND INSTALLING THE ASPHALT RAP COMPLETE-TO-PLACE SHALL BE CONSIDERED INCIDENTAL TO OTHER PAV. ITEMS.

SEE OTHER SHEETS FOR DETAILS NOT SHOWN.

AFTER REMOVAL OF ANCHOR PIN HOLES SHALL BE FILLED WITH QUALIFIED SPECIAL WOODED IN ACCORDANCE WITH SECTION 704.

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105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-800-392-MODOT (6636) 709-2301

TEMPORARY CONCRETE TRAFFIC BARRIER
ANCHORED (PIN SYSTEM)

DATE EFFECTIVE: 03/01/2021
DATE MODIFIED: 10/14/2020
617.20F SHEET NO. 7 OF 8

DRIVEN ANCHOR PIN (A36)
### Cross Section

<table>
<thead>
<tr>
<th>Condition</th>
<th>Time</th>
<th>Treatment</th>
<th>Sign</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Differential</strong></td>
<td><strong>Time</strong></td>
<td><strong>Treatment</strong></td>
<td><strong>Mainline (1)</strong></td>
</tr>
<tr>
<td>1/16th slope of flatter</td>
<td>&gt; 2&quot; to 1.5&quot;</td>
<td>Non-working hours, reduce close to 1/16th of flatter</td>
<td>No edge treatment required</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Working hours</td>
<td></td>
</tr>
<tr>
<td>1/16th slope of flatter</td>
<td>&gt; 1.5&quot; to 1&quot;</td>
<td>Non-working hours, reduce close to 1/16th of flatter</td>
<td>No edge treatment required</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Working hours</td>
<td></td>
</tr>
<tr>
<td>1/16th slope of flatter</td>
<td>&lt; 1&quot;</td>
<td>Non-working hours, reduce close to 1/16th of flatter</td>
<td>No edge treatment required</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Working hours</td>
<td></td>
</tr>
</tbody>
</table>

---

**LEGEND**

- **Fixed Pavement**
- **Flexible Pavement**
- **All Pavement Types**

**General Notes**

- Signs shall be spaced at approximately 1 mile intervals and located within 50 ft. of any exit ramp. When a sign placed at the 1 mile interval fails within 1/2 mile of a stop sign, please use a sign located at the 1/2 mile interval in advance of the exit ramp. When shoulder flapdown signs with chevron lines are used, alternating signs shall be used at 1-mile intervals.

- On state roads, with posted speed of 45 mph or greater, signs shall be placed no more than 1 mile in advance of intersection with mainline.

- Signs shall be located on the side of the roadway where the pavement edge differential exists.

- Signs to remain visible until shoulder flapdown is complete.

- Signs shall be located on right side of non-shouldered lanes and on both sides of shoulder highways where a lane line differential exists.

- When the shoulder flapdown signs are in place for greater than three days, the shoulder flapdown sign shall be in addition with the shoulder flapdown sign.

---

**Pavement Edge Treatment**

- **Mainline (1)**
- **Side Road (2)**

---

**Notes**

- Signs shall be visible to traffic only when and where conditions exist.

- For additional sign spacing and details see standard plan 619.10J.
(1) 50'-TYP. SPACE BETWEEN BARS. A MINIMUM OF 3 BARS ARE REQUIRED. IF NECESSARY, THE DISTANCE BETWEEN THE BARS SHALL BE DECREASED TO INSTALL 5 BARS.

L = S x V WHEN POSTED SPEED 45 MPH OR GREATER OR 35 MPH WHEN POSTED SPEED IS 40 MPH OR LESS. EXTEND DEVIATION L AS REQUIRED BY SIGHT DISTANCE CONDITIONS.

L = LENGTH OF TASER IN FEET.

S = POSTED OR 85 PERCENTILE SPEED IN MPH.

V = OFFSET DISTANCE IN FEET.

D = WARNING SIGN SPACING MEASURED FROM BEGINNING OF THE TASER TO WARNING SIGN "LINE ENDS MERGE RIGHT".

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

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

CENTERLINE PIGEON STRIPS ON PASSING LANES SHALL FOLLOW PIGEON STRIPING THROUGH TRANSITIONS. SEE CONTRACT PLAN FOR STRIPING DETAILS.

PANEL STRIPS SHALL NOT BE PLACED ON BRIDGES.

ALL PIGEON STRIPS SHALL BE MELTED.

CENTERLINE PIGEON STRIPS SHALL BE CONTINUOUS THROUGH CONNECTING OR INTERSECTIONS WITH NO LEFT TURN LANES.

DISCONTINUE CENTERLINE PIGEON STRIPS THROUGH THE LIMIT OF ALL LEFT TURN LANES, INCLUDING ALL LANE TAPER SECTIONS.
ARROW MARKINGS

This lane use control arrows for first 200 feet with one additional arrow every 400 feet of
mandatory movement lane, first arrow 75 feet from stop line.

FISH-HOOK ARROW
ROUNDABOUT APPROACH MARKINGS

WORD MARKING
ELONGATED WORD & SYMBOL
BICYCLE SYMBOL
WORD MARKING
ELONGATED WORD & SYMBOL

MISSOURI HIGHWAYS AND TRANSPORTATION
COMMISSION

105 W. WHITETAIL DR.
JEFFERSON CITY, MO 65102
1-800-821-MODOT 1-800-821-6636

PAVEMENT MARKING

SHEET NO.

5 OF 6
THIS HOLE SHOULD ONLY BE USED ON PATCHES EXISTING PRIOR TO CONSTRUCTION. THE HOLE SHOULD BE LOCATED CLOSE TO THE CENTER OF THE PATCH. BY USING THIS HOLE, THE TWO HOLES LOCATED AT THE SHOULDER COULD BE ELIMINATED.

PATCH

CRACK

OPTIONAL HOLE

PASSING LANE

LONGITUDINAL JOINT

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

JOINT
Rumble Strips

14' Pavement Structures, All Shoulder Types

12' Pavement Structures, All Shoulder Types

Pavement Structures ≤ 12' With A2 Shoulder

Pavement Structures ≤ 12' With A3 Shoulder

Pavement Structures ≤ 12' With Earth Or Aggregate Shoulders

GENERAL NOTES

See Standard Plan 620-010 for Pavement Marking.

Rumble Strips shall not be placed on bridges.

All Rumble Strips shall be Mill Edged.

Rumble Strips shall not be Mill Edged onto Transverse Joints.

For concrete pavement with 15' Joint Spacing, at least twelve Rumble Strips shall be Mill Edged per Panel.

Rumble Strips shall be omitted if Shoulders are less than 2' Wide.

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Rumble Strip Layouts

Intersections

Acceleration or Deceleration Lane

Rumble Strip Plan View

Rumble Strip Cross Section View
SECTION C-C

LATERAL DEVIATION SHALL NOT EXCEED ONE INCH IN 100 FEET.

DETAIL B

EDGE OF TRAVELED WAY

EDGE OF TRAVELED WAY

SHOULDER

DETAIL B

TWO-WAY ROAD

GENERAL NOTES:

SEE STANDARD PLAN 620.00 FOR PAVEMENT MARKING.

RUMBLE STRIPS SHALL NOT BE PLACED ON BRIDGES.

ALL RUMBLE STRIPS SHALL BE MILLED.

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

DISCONTINUE CENTERLINE RUMBLE STRIPS THROUGH THE LIMITS OF ALL LEFT TURN LANES, INCLUDING ANY LANE TAPER SECTIONS.
CHANNEL BOTTOM SHALL BE GRADED WITHIN RIGHT OF WAY FOR TRANSITION OF CHANNEL BED EXCAVATION OF UNSUITABLE MATERIAL AND BACKFILL SHALL BE IN ACCORDANCE WITH FURNISHING AND PLACING OF GRANULAR CLARITY. SEE SHEET 3 OF 3 FOR DETAILS.

TO CULVERT OPENINGS. CHANNEL BANKS SHALL BE TAPERED TO MATCH CULVERT OPENINGS.

IF UNSUITABLE MATERIAL IS ENCOUNTERED.

--- JOINT

FLOW

--- GRANULAR BACKFILL

BARREL LENGTH

PLAN OF LAYOUT DIMENSIONS

(01) AHEAD STATION WHERE STREAM FLOWS LEFT TO RIGHT.  (10) AHEAD STATION WHERE STREAM FLOWS RIGHT TO LEFT.

GENERAL ELEVATION A-A

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

EQUATIONS FOR COMPUTING A, B, C AND G

\[ \begin{align*}
A &= \text{ANGLE OF BARREL SLOPE WITH HORIZONTAL NORMAL TO E ROADWAY OR E M EDIAN = ARCTAN} (C_1 - C_2) \\
B &= \text{ANGLE OF FILL SLOPE WITH HORIZONTAL NORMAL TO E ROADWAY OR E M EDIAN = ARCTAN} (D) \\
C &= \text{HORIZONTAL DISTANCE FROM UPSTREAM EDGE OF SHOULDER TO = E M EDIAN - FILL} \\
D &= \text{HORIZONTAL DISTANCE FROM DOWNSTREAM EDGE OF SHOULDER TO = E M EDIAN - FILL} \\
E &= \text{DOWNSLOPE FROM TOP OF ROADWAY INCLUDING CROWN, LANES AND SHOULDERS} \\
F &= \text{UPSTREAM HEADWALL NORMAL TO E ROADWAY OR E M EDIAN} \\
G &= \text{CROSS SLOPE OF EACH PART OF ROADWAY INCLUDING CROWN, LANES AND SHOULDERs} \\
H &= \text{POSITIVE IF RISING AND NEGATIVE IF FALLING AWAY FROM E ROADWAY OR E M EDIAN} \\
I &= \text{TOTAL LENGTH NORMAL TO E ROADWAY OR E M EDIAN. THIS TERM SHALL BE ADJUSTED FOR UNIFORMITY AND NONSTANDARD ROADWAYS. TO ACCOUNT FOR A VARYING PROFILE GRAD } \\
&\text{E THE R ADWAY FILL SHALL BE BASED ON STATIONS THAT CORRESPOND TO THE CORNERS OF THE INSIDE FACE OF THE HEADWALLS THAT PRODUCE MAXIMUM VALUES FOR B AND C.} \\
J &= \text{SEE ROADWAY PLANS FOR SLOPES, E ROADWAY FILL AND ELEVATIONS 1 AND 2, ELEVATIONS 1 AND 2 CORRESPOND TO UPPER AND LOWER FILL LINE ELEVATIONS AND MAY BE BELOW THE NATURAL STREAM BOTTOM DUE TO ENVIRONMENTAL REQUIREMENTS.}
\end{align*} \]
GENERAL NOTES:

- FOR SECTIONS THRU BARREL, WINGS AND HEADWALLS, SEE SHEET 2 OF 3. FOR BAR SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT EXCEPT J5 BARS, SEE T03-17. FOR J5 BARS, SEE T03-37.
- 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.
- LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.
- BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.
- GENERAL NOTES:
- SAME SIZE AND SPACING AS B2 BARS
- VARIES: 12" MAXIMUM
- NOT SPECIFIED ON THIS SHEET
- SAME SIZE AND SPACING AS B2 BARS
- FOR DESIGN FILLS 2'-0" OR LESS
- SAME SIZE AND SPACING AS B2 BARS
- FOR DESIGN FILLS OVER 2'-0"
- SAME SIZE AND SPACING AS B2 BARS

REINFORCEMENT

- ADJUST JOINT SPACING AT BASE OF BOX WINGS TO ALLOW SCALPING IN THE BOX BASE.
- ADJUST JOINT SPACING AT TOP OF BOX WINGS TO ALLOW FILLING CONCRETE IN THE BOX BARS
- FOR CUT SECTION DETAILS, SEE 703.16.
- USE A TRANSVERSE JOINT WHEN BARREL LENGTH IS OVER 80 FEET. USE ADDITIONAL JOINTS TO LIMIT SECTION LENGTH AND END SECTION BARREL LENGTH MEASURED ALONG 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.
- TRAVELED WAY UNDER THE BARREL.
- USE A TRANSVERSE JOINT WHEN BARREL LENGTH IS OVER 80 FEET. USE REINFORCEMENT TO LIMIT SECTION LENGTH AND END SECTION BARREL LENGTH MEASURED ALONG CENTERLINE OF CULVERT TO 50 FEET.
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- TRAVELED WAY UNDER THE BARREL.
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- TRAVELED WAY UNDER THE BARREL.
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- 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.
- TRAVELED WAY UNDER THE BARREL.
ELEVATION 1

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

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

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

GENERAL ELEVATION A-A

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

FLOW

GRANULAR BACKFILL

PLAN OF LAYOUT DIMENSIONS

D = TOTAL LENGTH NORMAL TO E ROADWAY OR MEDIAN
D = TOTAL LENGTH NORMAL TO E ROADWAY OR MEDIAN

CONCRETE SINGLE BOX CULVERT
SKEW: SQUARED
WINGS: FLARED

LAYOUT

EQUATIONS FOR COMPUTING a, b, B AND C

a = ANGLE OF BARREL SLOPE WITH HORIZONTAL NORMAL TO E ROADWAY OR MEDIAN = ARCTAN (ELEV. 1 - ELEV. 2)
b = ANGLE OF FILL SLOPE WITH HORIZONTAL NORMAL TO E ROADWAY OR MEDIAN = ARCTAN (V)
B = HORIZONTAL DISTANCE FROM UPSTREAM EDGE OF SHOULDER TO E ROADWAY OR MEDIAN
C = HORIZONTAL DISTANCE FROM DOWNSTREAM EDGE OF SHOULDER TO E ROADWAY OR MEDIAN

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

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

TO ACCOUNT FOR A VARIABLE PROFILE GRADIENT, THE E ROADWAY FILL SHALL BE BASED ON STATIONS THAT CORRESPOND TO THE POINTS OF MAXIMUM VALUES FOR B AND C.

SEE ROADWAY PLANS FOR SLOPES. 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 BOX CULVERTS IS 48".

THE MINIMUM DISTANCE BETWEEN BOX CULVERTS IS 24".

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

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

CONCRETE SINGLE BOX CULVERT
SKEW: SQUARED
WINGS: FLARED

LAYOUT

DATE EFFECTIVE:
07/01/2015

DATE PREPARED:
07/13/2015

703.11J
SHEET NO. 1 OF 3
GENERAL NOTES:

FOR SECTIONS THRU BARREL, WINGS AND HEADWALLS, SEE SHEET 2 OF 3. FOR BAR SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT EXCEPT J5 BARS, SEE 703.17. FOR J5 BARS, SEE 703.37.

CONSTRUCTION JOINT KEY NOT SHOWN FOR CLARITY IN HALF PLANS AND ELEVATION. DRIVING NOT TO SCALE, FOLLOW DIMENSIONS.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1½".

LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.

BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

1. SAME SIZE AND SPACING AS H2 BARS.
2. VARYED - 12" MAXIMUM
3. J5 BAR SPACING
4. SAME SIZE AND SPACING AS H2 BARS
5. H2 BAR SPACING
6. NOT SPECIFIED ON THIS SHEET
7. NOT SPECIFIED ON THIS SHEET
8. FOR DESIGN FILLS OVER 2' D
9. FOR DESIGN FILLS OVER 2' D OR LESS

LAYING OUT TRANVERSE JOINTS

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

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

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

TRANSVERSE JOINTS AT THE ROADWAY WIDTH SHOULDER WIDTHS.

FOR OUT SECTION DETAILS, SEE TO 5.16.

DATE PREPARED: 07/01/2015
DATE EFFECTIVE: 07/01/2015
LAYING OUT TRANVERSE JOINTS

UNLESS SHOWN ON ROADWAY OR BRIDGE PLANS

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

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

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

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

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

TRAVELED WAY IS THE ROADWAY WIDTH MINUS SHOULDER WIDTHS.

GENERAL NOTES:

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

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

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1".
LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.

BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

(a) SAME SIZE AND SPACING AS B2 BARS
(b) VARIES. 12" MAXIMUM
(c) J4 BAR SPACING
(d) SAME SIZE AND SPACING AS A2 BARS
(e) A2 BAR SPACING
(f) SAME SIZE AND SPACING AS A1 BARS
(g) AT BAR SPACING
(h) FOR DESIGN FILLS OVER 2'-0"
(i) FOR DESIGN FILLS 2'-0" OR LESS

CULVERT.

ELEVATION
J1 BARS MAY BE BENT IN FIELD OR SHOP.

TOP SLAB
BOTTOM SLAB

CONCRETE SINGLE BOX CULVERT

SKEW: LEFT ADVANCE
WINGS: STRAIGHT

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DATE EFFECTIVE: 07/01/2015
DATE PREPARED: 05/13/2015

CONSTRUCTION NUMBER: 703.12J

SHEET NO.: 2 OF 3
GENERAL ELEVATION A-A

PLAN OF LAYOUT DIMENSIONS

GENERAL NOTES:
- DESIGN SPECIFICATIONS: 2010 AMERICAN BRIDGE DESIGN SPECIFICATIONS AND 2010 INTERIM REVISIONS
- DESIGN LOADING: MISSOURI HIGHWAY 93 WING LANE LOAD, EARTH = 120 LB/FT; EQUIVALENT FLUID PRESSURE = 50 LB/FT; MIN. 1.60 LB/FT (MAX. 1.80)
- DESIGN UNIT STRESSES: CLASS II CONCRETE, BOX CULVERT F'0 = 4000 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 CONCRETE BOX CULVERT WALLS IS 4 " MINUS THE THICKNESS OF THE REINFORCEMENT AND DIMENSIONS FOR WINGS AND HEADWALLS SHALL BE IN ACCORDANCE WITH MISSOURI STANDARD PLANS.
GENERAL NOTES:

- For Sections thru Barrel, Wings and Headwalls, see Sheet 7 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 7 of 3 for Details.
- DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.
- MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1/4".
- LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.
- BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.
- SAME SIZE AND SPACING AS A1 BARS
- VARIOUS - 12" MAXIMUM
- J4 BAR SPACING
- SAME SIZE AND SPACING AS A2 BARS
- A2 BAR SPACING
- SAME SIZE AND SPACING AS A1 BARS
- A1 BAR SPACING
- FOR DESIGN FILLS OVER 21/2".
GENERAL ELEVATION A-A

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

EQUATIONS FOR COMPUTING α, β, θ AND C

\[ \alpha = \text{angle of barrel slope with horizontal normal to roadway or median} = \text{arc tan}(\text{ cosy}) \]
\[ \beta = \text{angle of fill slope with horizontal normal to roadway or median} = \text{arc tan}(\text{ sec z}) \]
\[ \theta = \text{horizontal distance from upstream edge of shoulder to} = \text{arc cos}(\text{ cosy}) \]
\[ C = \text{horizontal distance from downstream edge of shoulder to} = \text{arc cos}(\text{ sec z}) \]
\[ CS = \text{cross slope of each part of roadway including crown, lanes and shoulders.} \]

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

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

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

EXCAVATION OF UNSUITABLE MATERIAL AND BACKFILL SHALL BE IN ACCORDANCE WITH FURNISHING AND PLACING OF GRANULAR BACKFILL.

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

IF UNSUITABLE MATERIAL IS ENCOUNTERED.

GENERAL NOTES:

CONCRETE SINGLE BOX CULVERT

SKEW: RIGHT ADVANCE
WINGS: STRAIGHT

LAYOUT

DATE EFFECTIVE: 07/01/2008
DATE PREPARED: 05/10/2008

703.14J SHEET NO. 1 OF 3

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JEFFERSON CITY, MO 65102
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PLAN OF LAYOUT DIMENSIONS

(01) Ahead station where stream flows left to right.
(02) Ahead station where stream flows right to left.

EQUATIONS FOR COMPUTING \[ \alpha, \beta, \theta \text{ AND } C \]

\[ \alpha = \text{angle of barrel slope with horizontal normal to roadway or median} = \text{arc tan}(\text{ cosy}) \]
\[ \beta = \text{angle of fill slope with horizontal normal to roadway or median} = \text{arc tan}(\text{ sec z}) \]
\[ \theta = \text{horizontal distance from upstream edge of shoulder to} = \text{arc cos}(\text{ cosy}) \]
\[ C = \text{horizontal distance from downstream edge of shoulder to} = \text{arc cos}(\text{ sec z}) \]

CS = \text{cross slope of each part of roadway including crown, lanes and shoulders.} \]

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.
GENERAL NOTES:

FOR SECTIONS THRU BARRIERS, WINGS AND HEADWALLS, SEE SHEET 3 OF 3 FOR DETAILS.

EXCEPT J5 BARS, SEE 703.17 FOR J5 BARS, SEE 703.37.

LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.

BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

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

LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.

BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

1) SAME SIZE AND SPACING AS B2 BARS
2) VARIES, 12" MAXIMUM
3) J4 BAR SPACING
4) SAME SIZE AND SPACING AS A2 BARS
5) A2 BAR SPACING
6) SAME SIZE AND SPACING AS A1 BARS
7) AT BAR SPACING
8) FOR DESIGN FILLS OVER 2' 0"
9) FOR DESIGN FILLS OVER 2' 0" OR LESS

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 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:

BARRIL LENGTH UP TO 90 FEET WITHOUT A TRANVERSE JOINT CUTF 3 FEET OR LESS, THE JOINTS SHALL BE LOCATED TO MINIMIZE THE LENGTH OF JOINT UNDER A TRAVELED WAY.

FLOW VARIED A BARS

2-#7-J1 BARS

AT TOP (d)

L#4-F BAR AT IL-KEYED T#4-F BAR 2-#7-J1 BARS

A1 BARS AT TOP (e)

L#4-F BARS

TRANSVERSE JOINT

A1 BARS

A2 BARS AT TOP

A2 BARS

TOP SLAB

BOTTOM SLAB

HALF PLANS ARE SYMMETRICAL ABOUT CULVERT.

HALF PLANS ARE SYMMETRICAL ABOUT CULVERT.

ELEVATION

J1 BARS MAY BE BENT IN FIELD OR SHOP.
GENERAL ELEVATION A-A

The 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

DATE PREPARED: 07/01/2015
DATE EFFECTIVE: 

GENERAL NOTES:

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

DESIGN LOADINGS:
VEHICULAR LOAD - H-20 MINS LANE LOAD. EARTH = 120 LB/FT
EQUIVALENT FLUID PRESSURE = 20 LB/FT², 60 LB/FT² (MAX)

DESIGN UNIT STRESSES:
PLATED CONCRETE BOX CULVERT: Fc = 4,000 PSF
REINFORCING STEEL (GRADE 60): fy = 60,000 PSI

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

DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.

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CONCRETE SINGLE BOX CULVERT
SKEW: RIGHT ADVANCE WINGS: FLARED

LAYOUT

CONSTRUCTION JOINT KEY NOT SHOWN ON SHEET. 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.

EXCAVATION OF UNSUITABLE MATERIAL AND FURNISHING AND PLACING OF GRANULAR CONSTRUCTION JOINT KEY NOT SHOWN FOR TO CULVERT OPENINGS.

CHANNEL BANKS SHALL BE TAPERED TO MATCH CULVERT OPENINGS.

AHEAD STATION WHERE STREAM FLOWS LEFT TO RIGHT.
AHEAD STATION WHERE STREAM FLOWS RIGHT TO LEFT.

Details A, B, C.
Laying Out Transverse Joints

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

To avoid locating transverse joints under a traveled way with design fills 2 feet or less, the joints shall be located minimally the length of joint under a 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 7 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 clear space to reinforcing steel shall be 1 1/2 in.

Lap longitudinal bars a minimum of 23 in. at splices.

Beveled headwall shall be located at upstream end.

(l) Same size and spacing as B2 bars

(l) Varied, 12" maximum

(g) J4 bar spacing

(h) Same size and spacing as A2 bars

(i) A2 bar spacing

(f) Same size and spacing as A1 bars

(k) At bar spacing

(h) For design fills over 2 1/2 ft

(l) For design fills 2 1/2 ft or less

Reinforcement

Concrete Single Box Culvert

Skew: Right Advance Wings: Flared
## CONCRETE SINGLE BOX CULVERT

**Bar Size, Spacing & Dimensions**

**Member Thickness**

- **5 Feet Height (HT): 3 thru 8 Feet**

### Design SPAN (S) - 5 FT

<table>
<thead>
<tr>
<th>MEMBER THICKNESS</th>
<th>A1 BARS</th>
<th>A2 BARS</th>
<th>B2 BARS</th>
<th>C2 BARS</th>
<th>D2 BARS</th>
<th>E2 BARS</th>
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### General Notes:
- See Figure 15-1 and 15-2 for Culvert Models.
- Design fills are used when the fill is less than 3 feet.
- Borne loads are calculated based on the top of top slab to the top of fill.
- Culvert strength and serviceability requirements are based on the full live load.

### Bar Dimensions Diagram

- Symmetrical about the culvert centerline.

**Alternate 13 Bar**

- At contractor's option, alternate 13 bars may be used when the distance between the ends of 13 bars on top of the culvert is less than 1.5 feet.

---

**Missouri Highways and Transportation Commission**

115 West Capitol
Jefferson City, MO 65102
1-800-454-MODOT (663-6687)

**Sheet No:** 03-08A

**Sheet No:** 03-08B

**Date Prepared:** 3/22/2003

**Drawing No:** 703.17A

**Data Powered by:** 3/21/2003

---
### Concrete Single Box Culvert

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

**Span (S): 6 Feet Height (H): 3 Feet Through 9 Feet**

<table>
<thead>
<tr>
<th>Member Thickness</th>
<th>Bar Size, Spacing &amp; Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1 Bars</td>
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<tr>
<td>A2 Bars</td>
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<tr>
<td>Bottom Bar</td>
<td></td>
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<tr>
<td>Side Bar</td>
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</table>

**General Notes:**
- If Design Fill Is Between Tabulated Design Fill, Use the Next Higher Fill. For Design Fill Between 2 Feet and 4 Feet Use the Member Thickness Area of Reinforcement and Bar Dimensions from the 2' - 4' Tabulated Design Fill.
- Special Design Are Required When the Design Fill Is Lesser Than 3 Feet or Greater Than 10 Feet.

**Culverts Meet Strength and Serviceability Requirements for the Design Vehicular Live Load and Shall Meet Minimum Width Requirements as Per the Missouri Load Code.**

---

**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 Feet. Dimension J (Unit C) Shall Be Used With Alternate J3 Bars.

**Notes:**

- Always Use Minimum Required J3 Bars. Additional J3 Bars Required With Alternate J3 Bars With a Length Equal to All Bars, and 5 J3 bars for 2 bars, and 10 J3 bars for 3 bars. Additional Payment Will Be Made for this Substitution.

---

**Missouri Highways and Transportation Commission**

105 West Capitol
Jefferson City, MO 65102
1-888-456-MODT (6638)
www.modot.mo.gov

**Date Prepared:** 3/22/2012

**Sheet No.:** 4 of 14

**Publication Date:** 3/1/2013

**703.17A**
### Span (S) = 7 FT

<table>
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<tr>
<th>SPAN IS</th>
<th>TOP SLAB BARS</th>
<th>BOTTOM SLAB BARS</th>
<th>WALL BARS</th>
<th>SPAN (S) = 7 FT</th>
<th>HEIGHT (H)</th>
<th>TOP SLAB BARS</th>
<th>BOTTOM SLAB BARS</th>
<th>WALL BARS</th>
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</table>

**GENERAL NOTES:**
- If design fill is less than 2 feet, use the next size shown. If fill is 2 feet or more, use the next size shown. For design fills between 2 and 4 feet, use the next size shown. If fill is greater than 4 feet, use the next size shown.
- Dimensions are in inches unless otherwise specified.

**CONCRETE SINGLE BOX CULVERT**
- Member thickness, bar size, spacing & dimensions are based on the design vehicle level. Look at the local code for details.
- The alternate J3 bar may be used when 24" diameter or larger.
- The alternate J3 bar may be used when 24" and larger. For 24" and larger, there is an additional payment for this substitution.
### Memo from Missouri Highways and Transportation Commission

**Subject:** Single Box Culvert

**From:** [Name and Position]

**To:** [Recipient(s)]

**Date:** [Date]

**Attachment:** [Attachment Details]

---

**Single Box Culvert**

**Member Thickness**

**Bar Size**

**Span** (S) = 13 FT

**Height (Ht)** = 7 FT OR 8 FT OR 9 FT

**Bar Dimensions Diagram**

**Symmetrical About Culvert**

*Note:* This diagram depicts the bar dimensions for a single box culvert, focusing on member thickness, bar size, and span and height configurations. The diagram is symmetrical about the culvert's axis, indicating the bars' placement and distribution.

**General Notes:**

- Design fill is calculated with internal fill, not for fill over 2 feet and a 4-foot fill between 2 feet and 4 feet. The member thickness area of reinforcement and bar dimensions from the 2nd to the 4th fill are determined by the member thickness area of reinforcement and bar dimensions from the 2nd to the 4th fill.

- Design fill is calculated with internal fill, not for fill over 2 feet and a 4-foot fill between 2 feet and 4 feet. The member thickness area of reinforcement and bar dimensions from the 2nd to the 4th fill are determined by the member thickness area of reinforcement and bar dimensions from the 2nd to the 4th fill.

- 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.

- Bar dimensions are measured from the top of the culvert to the top of the culvert fill or runway.

- Concretes are modified with aggregate requirements for the design vehicle live load and/or moving the live load.

---

**Sheet No.:** 703.17A

**Page:** 11 of 14

---

**Data Accepted:** [Date]

**Data Prepared:** [Date]

**Design:** Single Box Culvert

**Bar Dimensions:**

**Spans (S):** 13 FT

**Heights (Ht):** 7 thru 16 FT

---

**Graphical Representation:**

- **Chart:** Graph showing bar dimensions for different spans and heights.

- **Diagram:** Visual representation of bar placement and distribution in a single box culvert.

---

**Referenced Standards:**

- Missouri Highways and Transportation Commission standards.

---

**Appendix:** Additional notes and specifications for the design of single box culverts.

---

**Conclusion:** This memo outlines the design and specifications for single box culverts, emphasizing the importance of member thickness, bar size, and span and height configurations. It also highlights the necessary considerations for special designs and modifications to meet specific design vehicle live load requirements.
### AREA OF STEEL REQUIRED FOR J5 BARS IN WINGS (SQ. IN./FT.)

**WALL HEIGHT VS. WALL THICKNESS**

- **Backfill Slope** = 3:1

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**NOTE:**

The wall height is equal to the barrel height (HT) plus the top slab thickness (TS). When wall height is in between or outside tabulated wall heights, the area of steel required should be interpolated between or extrapolated from adjacent areas of steel using the actual wall height. If area of steel in the wall of the culvert (J4 bars) is greater than that indicated in the table, use the same size and spacing for the J5 bars in the wings. However, if the area of steel provided by matching size and spacing of the J4 bars is insufficient, increase the size of the J5 bars (#8 max.) and/or decrease the spacing of the J5 bars (6" min.). Use smallest bar size possible based on minimum spacing. Minimum steel to be used in the wings for J5 bars is #4 bars at 14" centers (area of steel = 0.1683 SQ. IN./FT.).

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

---

**CONCRETE BOX CULVERT EXTERIOR WING REINFORCEMENT**

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

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

**CONCRETE BOX CULVERT EXTERIOR WING REINFORCEMENT**

**DATE EFFECTIVE:** 04/01/2011  
**DATE PREPARED:** 04/18/2011  
**SHEET NO.:** 703.37C SHEET 2 OF 2  
**FILL IN THE BLANKS WHEN SETTING OUT CULVERT MECHANICALS.
### Wing Backfill Table

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<th>B (Transition Angle, Degrees)</th>
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<td>10</td>
<td>2:1</td>
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**Plan of Wings and Slope Transition Lines**

- **Note**: Use 65° for angle E, for all wings that make an angle D greater than 90°.

- **Note**: Backfill transition angle and backfill slope shall apply to all box culverts regardless of type — single, double, or triple.
**GENERAL NOTES:**

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

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

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

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

1. FOR SECTIONS THRU BARREL, WINGS AND HEADWALLS, SEE SHEET 3 OF SHEET 1 OF 3.
2. FOR BAR SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT, SYSTEMS, SPACING AND DIMENSIONS OF ALL REINFORCEMENT, SEE TO 3-47.
3. CONSTRUCTION JOINT KEY NOT SHOWN FOR CLARITY IN PLAN AND ELEVATION; SEE SHEET 3 OF 3 FOR DETAILS.
4. DRAWING NOT TO SCALE; FOLLOW DIMENSIONS.
5. MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1/2".
6. LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.
7. BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.
8. SAME SIZE AND SPACING AS ADJACENT B BARS.
9. VARIES; 12" MAXIMUM.
10. J4 BAR SPACING.

LAYING OUT TRANVERSE JOINTS

UNLESS SHOWN ON BRIDGE PLAN

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

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

TO AVOID LOCATING TRANVERSE JOINTS UNDER A TRAVELED WAY WITH DESIGN FILL 5 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 OUT SECTION DETAILS, SEE TO 3-46.

PLAN OF BOTTOM SLAB

J5 BARS AT BOTTOM (a) J4 BARS AT BOTTOM (b) J3 BARS AT BOTTOM (c) J2 BARS AT BOTTOM (d)

J5 BARS AT FILL FACE (a) J4 BARS AT FILL FACE (b) J3 BARS AT FILL FACE (c) FILL FACE (d)

ELEVATION OF EXTERIOR WALL

J1 BARS MAY BE BENT IN FIELD OR SHIP.
GENERAL NOTES:

- FOR SECTIONS THRU BARCH, WINGS AND HEADWALLS, SEE SHEET 2 OF 3.
- FOR BAR SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT EXCEPT J5 BARS, SEE 703.47. FOR J5 BARS, SEE 703.37.
- DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.
- MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1/4'.
- LAP LONGITUDINAL BARS A MINIMUM OF 24" AT SPLICES.
- BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.
- (a) SAME SIZE AND SPACING AS ADJACENT BARS
- (b) VARIES. 12" MAXIMUM
- (c) NOT SPECIFIED ON THIS SHEET
- (d) NOT SPECIFIED ON THIS SHEET
- (e) NOT SPECIFIED ON THIS SHEET
- (f) NOT SPECIFIED ON THIS SHEET
- (g) NOT SPECIFIED ON THIS SHEET
- (h) FOR DESIGN FILLS OVER 2'-0'
- (i) FOR DESIGN FILLS 2'-0' OR LESS
- (j) NOT REQUIRED FOR CLEAR SPANS > 10'-0'
- (k) FOR CLEAR SPAN > 13'-0'
- IF REQUIRED, THE MINIMUM LENGTH EACH SIDE OF ¥ WALL SHALL BE THE GREATER OF 48 BAR DIAMETERS OR 3'-0' LONGER DIRECTION OF HEADWALL.

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

DATE PREPARED: 5/13/2015

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-456-MODOT 11-888-275-6038

REINFORCEMENT

CONCRETE
DOUBLE BOX CULVERT
SKEW: SQUARED
WINGS: STRAIGHT

REINFORCEMENT

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

703.40H SHEET NO. 2 OF 3

J5 BARS MAY BE BENT IN FIELD OR SHOP.
GENERAL NOTES:

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

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 4 BARS

(b) VARIES. 12" MAXIMUM

(c) NOT SPECIFIED ON THIS SHEET

(d) SAME SIZE AND SPACING AS A2 BARS

(e) A2 BAR SPACING

(f) NOT SPECIFIED ON THIS SHEET

(g) NOT SPECIFIED ON THIS SHEET

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

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

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

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

(l) IF REQUIRED, THE MINIMUM LENGTH EACH SIDE OF A WALL SHALL BE THE GREATER OF 48 BAR DIAMETERS OR 3 CLEAR SPANS.

THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.
GENERAL NOTES:

1) SAME SIZE AND SPACING AS ADJACENT B BARS
2) SAME SIZE AND SPACING AS A1 BARS
3) SAME SIZE AND SPACING AS A2 BARS
4) NOT REQUIRED FOR CLEAR SPANS > 13'-0"
5) FOR DESIGN FILLS OVER 2'-0"
6) FOR DESIGN FILLS OVER 2'-0" OR LESS
7) NOT REQUIRED FOR CLEAR SPANS > 10'-0"
8) FOR CLEAR SPAN > 5'-0"
9) FOR CLEAR SPAN > 15'-0"

IF REQUIRED, THE MINIMUM LENGTH EACH SIDE OF H WALL SHALL BE THE GREATER OF 40 OR THE CLEAR SPAN.

THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

H1 BARS ALTERNATED WITH H2 BARS

H1 BARS AT TOP

H1 BARS AT TOP

H2 BARS AT TOP

J3 BARS AT TOP

J3 BARS AT TOP

J3 BARS AT TOP

A1 BARS AT BOTTOM

A1 BARS AT BOTTOM

A1 BARS AT BOTTOM

B1 BARS AT EACH FACE

B1 BARS AT EACH FACE

B1 BARS AT EACH FACE

G BARS AT EACH FACE

G BARS AT EACH FACE

G BARS AT EACH FACE

A2 BARS

A2 BARS

A2 BARS

VAR. A BARS

VAR. A BARS

VAR. A BARS

4-#7-J1 BARS

4-#7-J1 BARS

4-#7-J1 BARS

B1 BAR

B1 BAR

B1 BAR

M-01 BAR

M-01 BAR

M-01 BAR

12" G BARS AT EACH FACE

12" G BARS AT EACH FACE

12" G BARS AT EACH FACE

4-#8-H BARS

4-#8-H BARS

4-#8-H BARS

#4-F BARS

#4-F BARS

#4-F BARS

PORTAL CULVERT

PLAN OF TOP SLAB

0 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.

DATE EFFECTIVE:
3/13/2015

DATE PREPARED:
3/13/2015

SHEET NO.
2 OF 3

CONCRETE DOUBLE BOX CULVERT

SKEW: LEFT ADVANCE
WINGS: STRAIGHT

REINFORCEMENT

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

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

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

LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.

BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

(a) SAME SIZE AND SPACING AS ADJACENT B BARS
(b) VARIES. 12" MAXIMUM
(c) NOT SPECIFIED ON THIS SHEET
(d) SAME SIZE AND SPACING AS A2 BARS
(e) A2 BAR SPACING
(f) SAME SIZE AND SPACING AS A1 BARS
(g) AT BAR SPACING
(h) FOR DESIGN FILLS OVER 2'-0"
(i) FOR DESIGN FILLS OVER 2'-0" OR LESS
(j) NOT REQUIRED FOR CLEAR SPANS > 10'-0"
(k) FOR CLEAR SPAN > 5'-0"
(l) FOR CLEAR SPAN > 15'-0"

IF REQUIRED, THE MINIMUM LENGTH EACH SIDE OF H WALL SHALL BE THE GREATER OF 40 OR CLEAR SPAN.

THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

H2 BARS AS REQUIRED. QUANTITY OF BARS VARIES WITH SKEW.

IF REQUIRED, THE MINIMUM LENGTH EACH SIDE OF H WALL SHALL BE THE GREATER OF 40 OR CLEAR SPAN.

THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

IF REQUIRED, THE MINIMUM LENGTH EACH SIDE OF H WALL SHALL BE THE GREATER OF 40 OR CLEAR SPAN.

THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

IF REQUIRED, THE MINIMUM LENGTH EACH SIDE OF H WALL SHALL BE THE GREATER OF 40 OR CLEAR SPAN.

THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

IF REQUIRED, THE MINIMUM LENGTH EACH SIDE OF H WALL SHALL BE THE GREATER OF 40 OR CLEAR SPAN.

THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

IF REQUIRED, THE MINIMUM LENGTH EACH SIDE OF H WALL SHALL BE THE GREATER OF 40 OR CLEAR SPAN.

THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

IF REQUIRED, THE MINIMUM LENGTH EACH SIDE OF H WALL SHALL BE THE GREATER OF 40 OR CLEAR SPAN.

THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

IF REQUIRED, THE MINIMUM LENGTH EACH SIDE OF H WALL SHALL BE THE GREATER OF 40 OR CLEAR SPAN.

THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

IF REQUIRED, THE MINIMUM LENGTH EACH SIDE OF H WALL SHALL BE THE GREATER OF 40 OR CLEAR SPAN.

THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

IF REQUIRED, THE MINIMUM LENGTH EACH SIDE OF H WALL SHALL BE THE GREATER OF 40 OR CLEAR SPAN.

THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

IF REQUIRED, THE MINIMUM LENGTH EACH SIDE OF H WALL SHALL BE THE GREATER OF 40 OR CLEAR SPAN.

THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

IF REQUIRED, THE MINIMUM LENGTH EACH SIDE OF H WALL SHALL BE THE GREATER OF 40 OR CLEAR SPAN.

THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

IF REQUIRED, THE MINIMUM LENGTH EACH SIDE OF H WALL SHALL BE THE GREATER OF 40 OR CLEAR SPAN.

THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

IF REQUIRED, THE MINIMUM LENGTH EACH SIDE OF H WALL SHALL BE THE GREATER OF 40 OR CLEAR SPAN.

THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

IF REQUIRED, THE MINIMUM LENGTH EACH SIDE OF H WALL SHALL BE THE GREATER OF 40 OR CLEAR SPAN.

THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

IF REQUIRED, THE MINIMUM LENGTH EACH SIDE OF H WALL SHALL BE THE GREATER OF 40 OR CLEAR SPAN.

THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

IF REQUIRED, THE MINIMUM LENGTH EACH SIDE OF H WALL SHALL BE THE GREATER OF 40 OR CLEAR SPAN.

THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

IF REQUIRED, THE MINIMUM LENGTH EACH SIDE OF H WALL SHALL BE THE GREATER OF 40 OR CLEAR SPAN.

THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.
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 the length of joint under traveled way. The traveled way is the roadway width minus shoulder widths.

For construction joint key not shown for clarity in plan and elevation. See Sheet 3 of 3 for details.

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.
- Lap longitudinal bars a minimum of 23" at splices.
- Beveled headwall shall be located at upstream end.
- Minimum clearance to reinforcing steel shall be 1".

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 Lap Length of SIMDOS Double Box Culvert

Minimum End Section Length Shall Be 3 Feet Measured Along the Shortest Wall From the Inside Face of Headwall to the Tranverse Joint Under the Traveled Way.

Daily Advance Flared

Concrete Double Box Culvert

Skew: Left Advance Wings: Flared

Reinforcement

General Notes:

- For Sections Thru Barrel, Wings and Headwalls, See Sheet 3 of 3. For Bar Sizes, Spacing and Dimensions of All Reinforcement Except J5 Bars, See 703.47. For J5 Bars, See 703.37.
- Lap Longitudinal Bars a Minimum of 23" at Splices.
- Beveled Headwall Shall Be Located at Upstream End.
- Minimum Clearance to Reinforcing Steel Shall Be 1/".

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 Lap Length of SIMDOS Double Box Culvert

Minimum End Section Length Shall Be 3 Feet Measured Along the Shortest Wall From the Inside Face of Headwall to the Tranverse Joint Under the Traveled Way.

Daily Advance Flared

Concrete Double Box Culvert

Skew: Left Advance Wings: Flared

Reinforcement

General Notes:

- For Sections Thru Barrel, Wings and Headwalls, See Sheet 3 of 3. For Bar Sizes, Spacing and Dimensions of All Reinforcement Except J5 Bars, See 703.47. For J5 Bars, See 703.37.
- Lap Longitudinal Bars a Minimum of 23" at Splices.
- Beveled Headwall Shall Be Located at Upstream End.
- Minimum Clearance to Reinforcing Steel Shall Be 1/".

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 Lap Length of SIMDOS Double Box Culvert

Minimum End Section Length Shall Be 3 Feet Measured Along the Shortest Wall From the Inside Face of Headwall to the Tranverse Joint Under the Traveled Way.

Daily Advance Flared

Concrete Double Box Culvert

Skew: Left Advance Wings: Flared

Reinforcement

General Notes:

- For Sections Thru Barrel, Wings and Headwalls, See Sheet 3 of 3. For Bar Sizes, Spacing and Dimensions of All Reinforcement Except J5 Bars, See 703.47. For J5 Bars, See 703.37.
- Lap Longitudinal Bars a Minimum of 23" at Splices.
- Beveled Headwall Shall Be Located at Upstream End.
- Minimum Clearance to Reinforcing Steel Shall Be 1/".

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 Lap Length of SIMDOS Double Box Culvert

Minimum End Section Length Shall Be 3 Feet Measured Along the Shortest Wall From the Inside Face of Headwall to the Tranverse Joint Under the Traveled Way.

Daily Advance Flared

Concrete Double Box Culvert

Skew: Left Advance Wings: Flared

Reinforcement

General Notes:

- For Sections Thru Barrel, Wings and Headwalls, See Sheet 3 of 3. For Bar Sizes, Spacing and Dimensions of All Reinforcement Except J5 Bars, See 703.47. For J5 Bars, See 703.37.
- Lap Longitudinal Bars a Minimum of 23" at Splices.
- Beveled Headwall Shall Be Located at Upstream End.
- Minimum Clearance to Reinforcing Steel Shall Be 1/".

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 Lap Length of SIMDOS Double Box Culvert

Minimum End Section Length Shall Be 3 Feet Measured Along the Shortest Wall From the Inside Face of Headwall to the Tranverse Joint Under the Traveled Way.
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 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 A2 bars.
- (e) A2 bar spacing.
- (f) Same size and spacing as A1 bars.
- (g) A1 bar spacing.
- (h) For design fills over 2'-0".
- (i) Not required for clear spans > 10'-0".
- (j) For clear span > 15'-0".
- If required, the minimum length each side of B bars shall be the greater of 48 bars diameters or 1½ clear span.
- The clear span is parallel to long direction of headwall.
- (k) H2 bars as required. Quantity of bars varies with skew.

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

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

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

703.43H SHEET NO. 2 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 P. 973. FOR J5 BARS SEE P. 975.

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

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

4. DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

5. LAP LONGITUDINAL BARS A MINIMUM OF 24" AT SPLICES.

6. BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

7. SAME SIZE AND SPACING AS ADJACENT B BARS
   (a) SAME SIZE AND SPACING AS A1 BARS
   (b) SAME SIZE AND SPACING AS A3 BARS
   (c) SAME SIZE AND SPACING AS A2 BARS
   (d) SAME SIZE AND SPACING AS A1 BARS
   (e) SAME SIZE AND SPACING AS A2 BARS
   (f) SAME SIZE AND SPACING AS A1 BARS
   (g) SAME SIZE AND SPACING AS A2 BARS

8. Minimum end section length shall be 3 feet measured along the shortest wall from the insibe face of headwall to the transverse joint.

9. To avoid locating transverse joints under a traveled way with design fills 2 feet or less, the following shall apply:
   a. Barrel length up to 90 feet without a transverse joint.
   b. 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 5 feet or less, the joints shall be located to minimize the length of joint under the traveled way.
   c. Traveled way is the roadway width with wings shoulder widths.

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 LENGTH MEASURED ALONG CENTERLINE OF CULVERT TO 50 FEET.

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

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

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

2. CUT SECTION LENGTHS UP TO 60 FEET WHEN BARREL AND CUT SECTION LENGTH RESTRICTIONS REQUIRE TRANSVERSE JOINTS TO BE LOCATED UNDER A TRAVELED WAY WITH DESIGN FILLS 5 FEET OR LESS, THE JOINTS SHALL BE LOCATED TO MINIMIZE THE LENGTH OF JOINT UNDER THE TRAVELED WAY.

3. TRAVELED WAY IS THE ROADWAY WIDTH WITH WINGS SHOULDER WIDTHS.

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 P. 973. FOR J5 BARS SEE P. 975.

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

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

4. DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

5. LAP LONGITUDINAL BARS A MINIMUM OF 24" AT SPLICES.

6. BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

7. SAME SIZE AND SPACING AS ADJACENT B BARS
   (a) SAME SIZE AND SPACING AS A1 BARS
   (b) SAME SIZE AND SPACING AS A3 BARS
   (c) SAME SIZE AND SPACING AS A2 BARS
   (d) SAME SIZE AND SPACING AS A1 BARS
   (e) SAME SIZE AND SPACING AS A2 BARS
   (f) SAME SIZE AND SPACING AS A1 BARS
   (g) SAME SIZE AND SPACING AS A2 BARS

8. Minimum end section length shall be 3 feet measured along the shortest wall from the insibe face of headwall to the transverse joint.

9. To avoid locating transverse joints under a traveled way with design fills 2 feet or less, the following shall apply:
   a. Barrel length up to 90 feet without a transverse joint.
   b. 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 5 feet or less, the joints shall be located to minimize the length of joint under the traveled way.
   c. Traveled way is the roadway width with wings shoulder widths.

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 LENGTH MEASURED ALONG CENTERLINE OF CULVERT TO 50 FEET.

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

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

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

2. CUT SECTION LENGTHS UP TO 60 FEET WHEN BARREL AND CUT SECTION LENGTH RESTRICTIONS REQUIRE TRANSVERSE JOINTS TO BE LOCATED UNDER A TRAVELED WAY WITH DESIGN FILLS 5 FEET OR LESS, THE JOINTS SHALL BE LOCATED TO MINIMIZE THE LENGTH OF JOINT UNDER THE TRAVELED WAY.

3. TRAVELED WAY IS THE ROADWAY WIDTH WITH WINGS SHOULDER WIDTHS.
GENERAL NOTES:

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

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

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 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) SAME SIZE AND SPACING AS A1 BARS
(c) SAME SIZE AND SPACING AS A2 BARS
(d) SAME SIZE AND SPACING AS A3 BARS
(e) SAME SIZE AND SPACING AS A4 BARS
(f) SAME SIZE AND SPACING AS A5 BARS
(g) AT BAR SPACING
(h) FOR DESIGN FILLS OVER 2'-0" OR LESS
(i) FOR DESIGN FILLS OVER 2'-0" OR LESS
(j) H2 BARS AS REQUIRED. QUANTITY OF BARS VARIES WITH SKEW.

DATE PREPARED: 10/01/2011
DATE EFFECTIVE: 5/13/2015

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

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

SHEET NO. 703.44H
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 CONSTRUCTION JOINT KEY NOT SHOWN FOR CLARITY IN PLAN AND ELEVATION. SEE SHEET 3 OF 3 FOR DETAILS.

MINIMUM CLEARSANCE TO REINFORCING STEEL SHALL BE 1".

LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.

BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

(a) SAME SIZE AND SPACING AS ADJACENT B BARS

(b) VARIES, 12" MAXIMUM

(c) J4 BAR SPACING

(d) SAME SIZE AND SPACING AS J2 BARS

(e) J2 BAR SPACING

CONCRETE DOUBLE BOX CULVERT

SKEW: RIGHT ADVANCE WINGS: FLARED

REINFORCEMENT

DATE PREPARED: 5/13/2015

DATE EFFECTIVE: 5/13/2015

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

JEFFERSON CITY, MO 65102

105 WEST CAPITOL

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

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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 OUTSIDE FACE OF HEADWALL TO THE TRANVERSE JOINT.

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

BARREL LENGTH UP TO 90 FEET WITHOUT A TRANSVERSE JOINT

CUT SECTION LENGTHS UP TO 60 FEET

WHEN BARREL AND CUT SECTION LENGTH REQUIREMENTS REQUIRE ADDITIONAL JOINTS TO BE LOCATED UNDER A TRAVELED WAY WITH DESIGN FILLS 5 FEET OR LESS, THE JOINTS SHALL BE LOCATED TO MINIMIZE THE LENGTH OF JOINT UNDER A TRAVELED WAY.

TRAVELED WAY IS THE ROADWAY WIDTH AND SHOULDER WIDTHS.

FOR CUT SECTION DETAILS, SEE TO 3-46.

DEVELOPED ELEVATION OF EXTERIOR WALL

J1 AND J6 BARS MAY BE BENT IN FIELD OR SHOP.
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 J1 bars, see 703.47. For J1 bars, see 703.37.

2. Construction joint key not shown for clarity in plan and section. See Sheet 5 of 3 for details.

3. Drawing not to scale. Follow dimensions.

4. Minimum clearance to reinforcing steel shall be 1/2".

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

6. Beveled headwall shall be located at upstream end.

7. (a) Same size and spacing as adjacent B bars

8. (b) Varies. 12" maximum

9. (c) Not specified on this sheet

10. (d) Same size and spacing as A2 bars

11. (e) A2 bar spacing

12. (f) Same size and spacing as A1 bars

13. (g) A1 bar spacing

14. (h) For design fills over 2'-0".

15. (i) For design fills 2'-0" or less

16. (j) Not required for clear spans > 10'-0"

17. # For clear span 10'-0".

18. # For clear span 15'-0".

19. If required: The minimum length each side of J1 bars shall be the greater of 18 bar diameters or 1.0A clear span. The clear span is parallel to long direction of headwall.

20. (k) J1 bars as required. Quantity of bars varies with skew.

**Note:** The image and drawing are proprietary and should not be used for any purpose without permission.
### Concre te Double Box Culvert

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

<table>
<thead>
<tr>
<th>SPAN (S)</th>
<th>3 FT</th>
<th>HEIGHT (H)</th>
<th>2 FT OR 3 FT OR 4 FT</th>
</tr>
</thead>
<tbody>
<tr>
<td>T5 B5 T1</td>
<td>D/BAR</td>
<td>11 G/2 SPA</td>
<td>6 G/1 SPA</td>
</tr>
<tr>
<td>T6 B6 T2</td>
<td>D/BAR</td>
<td>11 G/2 SPA</td>
<td>6 G/1 SPA</td>
</tr>
<tr>
<td>T7 B7 T3</td>
<td>D/BAR</td>
<td>11 G/2 SPA</td>
<td>6 G/1 SPA</td>
</tr>
</tbody>
</table>

**Bar Dimensions Diagram**

- **CULVERT**
- **A1 BAR**
- **A2 BAR**
- **B1 BAR**
- **B2 BAR**

**GENERAL NOTES:**

- If Design Fill is between tabulated Design Fill, use the next larger Design Fill. If Design Fill is between 2 feet and 4 feet, use the member thickness, area of reinforcement and bar dimensions from the 2' - 4' tabulated Design Fill.
- Special designs are modified when the Design Fill is less than 2 feet or greater than 3 feet.
- Dimensions are in inches unless otherwise specified.
- Design Fills are measured from the top of the top slab to the top of the earth fill or roadway.
- Culverts meet strength and serviceability requirements for the design vertical, live load, and flood flows of the bridge loads.

**Missouri Highways and Transportation Commission**

195 West Capitol
Jefferson City, MO 65102
1-888-ASK-MDOT (1-888-275-3668)

**Data Appr.:** 2/11/2023
**Date Prepared:** 3/22/2023

**703.47A**
**1 of 27**
### Design Fill

**Table:**

<table>
<thead>
<tr>
<th>Design</th>
<th>Height (ft)</th>
<th>Top Crushed Base</th>
<th>Mid Crushed Base</th>
<th>Bottom Crushed Base</th>
<th>Side Fill</th>
<th>Grading Fill</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 ft</td>
<td>3 ft or 4 ft</td>
<td>D1</td>
<td>D1</td>
<td>D1</td>
<td>D1</td>
<td>D1</td>
</tr>
<tr>
<td>6 ft</td>
<td>5 ft or 6 ft</td>
<td>D1</td>
<td>D1</td>
<td>D1</td>
<td>D1</td>
<td>D1</td>
</tr>
</tbody>
</table>

**Diagram:**

- **Concrete:**
  - Spans (5): 5 ft
  - Height (H): 3 ft or 4 ft

- **Grading:**
  - Crushed Base:
    - Top Crushed Base
    - Mid Crushed Base
    - Bottom Crushed Base
  - Side Fill
  - Grading Fill

**General Notes:**

- If design fill is between tabulated design fills, use the next larger fill.
- Design fill to be used for fills below 0.5 ft and 0.5 ft. Design fill for fills between 0.5 ft and 0.75 ft and 0.75 ft.
- Bar dimensions are to be followed for the given fill. Bar dimensions are to be used for the fill.
- The table shows the recommended bar sizes for the given fill. Bar sizes are in inches.
- The diagram shows the cross-section of the culvert with bar sizes indicated.

**Missouri Highways and Transportation Commission**

**Concrete Double Box Culvert**

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

**Spans:**
- (5): 5 ft
- Height (H): 3 thru 6 ft

**Date Approved:** 2/1/2023
**Date Prepared:** 3/22/2023

**Sheet No.:** 703.47A
**Page:** 4 of 27
## Concrete Double Box Culvert

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

**SPAN (S):** 5 FT  
**HEIGHT (H):** 7 FT OR 8 FT

### GENERAL NOTES:

- If design fill is between tabulated design fills, use the next larger design fill. If design fill is greater than 1 foot, use the next larger fill.
- The member thickness and bar size dimensions shown are from the 2'-4" tabulated design fill.
- Special designs are allowed for fill less than 1 foot or more than 2 feet.
- Dimensions are in inches unless otherwise specified.
- Design fills are measured from the top of the top slab to the top of earth fill or grade.
- Culverts must meet strength and serviceability requirements for the design vertical load, live load, and dead load.

### Bar Dimensions Diagram

**SYMETRICAL ABOUT CULVERT**

- **13 BAR:** H1, H2, H3, B1 & B2 BARS
- **12 BAR:** H1, H2, H3, B1 & B2 BARS
- **11 BAR:** H1, H2, H3, B1 & B2 BARS
- **10 BAR:** H1, H2, H3, B1 & B2 BARS
- **9 BAR:** H1, H2, H3, B1 & B2 BARS
- **8 BAR:** H1, H2, H3, B1 & B2 BARS
- **7 BAR:** H1, H2, H3, B1 & B2 BARS

### Table: Design Fill

<table>
<thead>
<tr>
<th>T5</th>
<th>T5</th>
<th>TA</th>
<th>T2</th>
<th>T3</th>
<th>T1</th>
<th>TA</th>
<th>T1</th>
<th>T2</th>
<th>T3</th>
<th>T5</th>
<th>T5</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

### Table: Member Thickness

<table>
<thead>
<tr>
<th>Design Fill</th>
<th>Top Bar Bars</th>
<th>Bottom Bar Bars</th>
<th>Top Bar Bars</th>
<th>Bottom Bar Bars</th>
</tr>
</thead>
<tbody>
<tr>
<td>T5</td>
<td>T5</td>
<td>T1</td>
<td>T2</td>
<td>T3</td>
</tr>
<tr>
<td>T5</td>
<td>TA</td>
<td>T1</td>
<td>T2</td>
<td>T3</td>
</tr>
<tr>
<td>T5</td>
<td>TA</td>
<td>T1</td>
<td>T2</td>
<td>T3</td>
</tr>
<tr>
<td>T5</td>
<td>TA</td>
<td>T1</td>
<td>T2</td>
<td>T3</td>
</tr>
</tbody>
</table>

### Table: Bar Size

<table>
<thead>
<tr>
<th>Design Fill</th>
<th>Top Bar Bars</th>
<th>Bottom Bar Bars</th>
<th>Top Bar Bars</th>
<th>Bottom Bar Bars</th>
</tr>
</thead>
<tbody>
<tr>
<td>T5</td>
<td>T5</td>
<td>T1</td>
<td>T2</td>
<td>T3</td>
</tr>
<tr>
<td>T5</td>
<td>TA</td>
<td>T1</td>
<td>T2</td>
<td>T3</td>
</tr>
<tr>
<td>T5</td>
<td>TA</td>
<td>T1</td>
<td>T2</td>
<td>T3</td>
</tr>
<tr>
<td>T5</td>
<td>TA</td>
<td>T1</td>
<td>T2</td>
<td>T3</td>
</tr>
</tbody>
</table>
GENERAL NOTES:

If design fill is between tabulated design fills, use the next larger fill.  Design fills are shown only between 2 ft and 4 ft.  For design fills between 2 ft and 4 ft use the member thickness, area of reinforcement and bar dimensions from the 2’-4’ tabulated design fill.

Special design are modified when the design fill is less than 2 ft or greater than 6 ft.

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

Culverts meet strength and serviceability requirements for the design vertical live load plus 93% of the axial load.
GENERAL NOTES:
If design fill is between tabulated design fills, use the next larger fill. If design fill is less than 2 feet or more than 4 feet, use the member thickness, area of reinforcement and bar dimensions from the 2', 4' tabulated design fill.
Special designs are required when the design fill is less than 3 feet or more than 8 feet.
Dimensions are in inches unless otherwise specified.
Design fills are measured from the top of top slab to the top of earth fill or roadway.
Curvatures meet strength and serviceability requirements for the design vertical level. Load fills 63 minus the lane loads.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
1155 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-MADOT-HELP (1-888-623-6683)

CONCRETE DOUBBLE BOX Culvert
MEMBER THICKNESS
BAR SIZE, SPACING & DIMENSIONS
SPAN (S): 7 FEET
HEIGHT (H): 4 THRU 8 FEET

DATA APPLICABLE: 2/23/2003
DATE PREPARED: 3/22/2003
703.47A
8 OF 27

BAR DIMENSIONS DIAGRAM
SYMMETRICAL ABOUT E CULVERT.

[a diagram showing bar dimensions for a concrete double box culvert]

[A table showing design fills, member thicknesses, bar sizes, and spacing for spans 2' to 8']

[Notes and instructions regarding design fills, member thicknesses, and bar dimensions for spans 2' to 8']
<table>
<thead>
<tr>
<th>SPAN (S)</th>
<th>HEIGHT (H)</th>
<th>SPANNING 12 FT</th>
<th>SPANNING 6 FT OR 7 FT OR 8 FT</th>
</tr>
</thead>
<tbody>
<tr>
<td>T5</td>
<td>B5</td>
<td>T1</td>
<td>SIZE SPA</td>
</tr>
<tr>
<td>A1 BARS</td>
<td>D1 BARS</td>
<td>A2 BARS</td>
<td>C1 BARS</td>
</tr>
<tr>
<td>C1 BARS</td>
<td>D1 BARS</td>
<td>A2 BARS</td>
<td>C1 BARS</td>
</tr>
</tbody>
</table>

**GENERAL NOTES:**
- If design fill is between tabulated design fills, use the next lower tabulated design fill. For design fills between 2 feet and 4 feet, use the lower thickness area of reinforcement and bar dimensions from the 2'-4' tabulated design fill.
- Special designs are not allowed when the design fill is less than 3 feet or greater than 25 feet.
- Dimensions are in inches unless otherwise specified.

**CONCRETE DOUBLE BOX CULVERT**

**DATE PREPARED:** 3/22/2023

**DATE APPLIED:** 2/16/2023

**703.47A**

18 OF 27
### General Notes:

If design fill is between tabulated design fill, use the next smaller tabulated design fill. Except for design fill, between 2 and 4 feet, for design fills between 2 and 4 feet use the member thickness and bar dimensions from the 2'-4" tabulated design fill.

Special designs are reviewed when the design fill is less than 2 foot or greater than 5 feet.

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

Culverts meet strength and serviceability requirements for the design vertical live load.
### Design Fill

<table>
<thead>
<tr>
<th>SPAN (S)</th>
<th>15 FT</th>
<th>HEIGHT (H)</th>
<th>8 FT OR 9 FT OR 10 FT</th>
</tr>
</thead>
</table>

#### Design Parameters

- **Top 5 Bars (B5)**
- **Top 3 Bars (B3)**
- **Top 2 Bars (B2)**
- **Bottom 4 Bars (B4)**
- **Bottom 3 Bars (B3)**
- **Bottom 2 Bars (B2)**

#### General Notes:

1. If design fill is between tabulated design fills, use the next greater tabulated design fill. Keep top 5 bars between 2 and 4 feet. For design fills between 2 and 4 feet, use the member thickness, area of reinforcement, and bar dimensions from the 2.4 tabulated design fill.
2. Special designs are modified when the design fill is less than 1 foot or greater than 20 feet.
3. Member thicknesses are in inches unless otherwise specified.

#### Concrete Double Box Culvert

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

#### Notes:

**SPAN (S): 15 FEET**

**HEIGHT (H): 8 FT OR 9 FT OR 10 FT**

---

**BAR DIMENSIONS DIAGRAM**

- Symmetrical about & Culvert,
- **C1**
- **C2**
- **C3**
- **C4**
- **C5**

---

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

1155 West Capitol
Jefferson City, MO 65102
1-800-ASK-MODOT (1-800-275-6636)

**DATA APPR.:** 3/21/2023
**DATE PREPARED:** 3/22/2023
**703.47A**

24 of 27
### General Notes:
- If design fill is between tabulated design fill, use the next smaller fill.
- For design fill less than 2 feet and 2.4 feet use the member thickness/diameter area of reinforcement and bar dimensions from the 2.4 feet tabulated design fill.
- Designs are revised when the design fill is less than 2 feet or greater than 20 feet.
- Dimensions are in inches unless otherwise specified.
- Design fills are measured from the top of the top slab to the top of earth fill or roadway.

### Culvert Capacity:
- Culverts meet strength and serviceability requirements for the design.

### Concretes:
- Double Box Culvert
- Member thickness: 3 inches
- Bar size, spacing, and dimensions:
  - Span (S): 15 feet
  - Height (H): 14 feet or 15 feet or 16 feet

### Design Fill:
<table>
<thead>
<tr>
<th>Design Fill</th>
<th>T5</th>
<th>B5</th>
<th>T1</th>
<th>S1</th>
<th>S2</th>
<th>C1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top Slab Bar</td>
<td>6</td>
<td>8</td>
<td>6</td>
<td>8</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Bottom Slab Bar</td>
<td>6</td>
<td>8</td>
<td>6</td>
<td>8</td>
<td>12</td>
<td>12</td>
</tr>
</tbody>
</table>

### Bar Dimensions Diagram:
- Symmetrical about the culvert's centerline.

### Missouri Highways and Transportation Commission:
- Date Approved: 2/23/2023
- Date Prepared: 3/22/2023
- SHEET NO: 703.47A
- SHEET: 25 of 27
### General Notes:

If design fill is between tabulated design fills, use the nearest lower fill. For design fills between 2 and 4 feet, use the member thickness, area of reinforcement, and bar dimensions from the 2 to 4 tabulated design fill. Special designs are provided when the design fill is less than 2 feet or greater than 30 feet. Dimensions are in inches unless otherwise specified. Design fills are measured from the top of the top slab to the top of earth fill or roadway.

Concrete double box culvert member thickness, bar size, spacing, and dimensions:

<table>
<thead>
<tr>
<th>SPAN (S)</th>
<th>16 FT</th>
<th>HEIGHT (H)</th>
<th>14 FT OR 15 FT OR 16 FT</th>
</tr>
</thead>
</table>

#### Design Fill

| DESIGN FILL | T5 | B5 | T1 | SIZE SPA | SIZE SPA | C1 | T2 | B2 | SIZE SPA | C2 | T3 | B3 | SIZE SPA | C3 | T4 | B4 | SIZE SPA | C4 | T4 | B4 | SIZE SPA | C4 | T5 | B5 | SIZE SPA | C5 | T6 | B6 | SIZE SPA | C6 | T7 | B7 | SIZE SPA | C7 | T8 | B8 | SIZE SPA | C8 | T9 | B9 | SIZE SPA | C9 |
|-------------|----|----|----|---------|---------|----|----|----|---------|----|----|----|---------|----|----|----|---------|----|----|----|---------|----|----|----|---------|----|----|----|---------|----|----|----|---------|----|----|----|---------|----|
| 0.00 | 12 | 5 | 5 | 3 | 0.8 | 0.8 | 0.8 | 12 | 5 | 5 | 3 | 0.8 | 0.8 | 0.8 | 12 | 5 | 5 | 3 | 0.8 | 0.8 | 0.8 | 12 | 5 | 5 | 3 | 0.8 | 0.8 | 0.8 | 12 | 5 | 5 | 3 | 0.8 | 0.8 | 0.8 | 12 | 5 | 5 | 3 | 0.8 | 0.8 | 0.8 | 12 | 5 | 5 | 3 | 0.8 | 0.8 | 0.8 | 12 | 5 | 5 | 3 | 0.8 | 0.8 | 0.8 | 12 | 5 | 5 | 3 | 0.8 | 0.8 | 0.8 | 12 | 5 | 5 | 3 | 0.8 | 0.8 | 0.8 | 12 | 5 | 5 | 3 | 0.8 | 0.8 | 0.8 | 12 | 5 | 5 | 3 | 0.8 | 0.8 | 0.8 |
| 0.50 | 16 | 8 | 8 | 6 | 1.2 | 1.2 | 1.2 | 16 | 8 | 8 | 6 | 1.2 | 1.2 | 1.2 | 16 | 8 | 8 | 6 | 1.2 | 1.2 | 1.2 | 16 | 8 | 8 | 6 | 1.2 | 1.2 | 1.2 | 16 | 8 | 8 | 6 | 1.2 | 1.2 | 1.2 | 16 | 8 | 8 | 6 | 1.2 | 1.2 | 1.2 | 16 | 8 | 8 | 6 | 1.2 | 1.2 | 1.2 | 16 | 8 | 8 | 6 | 1.2 | 1.2 | 1.2 | 16 | 8 | 8 | 6 | 1.2 | 1.2 | 1.2 |
| 1.00 | 20 | 10 | 10 | 8 | 1.6 | 1.6 | 1.6 | 20 | 10 | 10 | 8 | 1.6 | 1.6 | 1.6 | 20 | 10 | 10 | 8 | 1.6 | 1.6 | 1.6 | 20 | 10 | 10 | 8 | 1.6 | 1.6 | 1.6 | 20 | 10 | 10 | 8 | 1.6 | 1.6 | 1.6 | 20 | 10 | 10 | 8 | 1.6 | 1.6 | 1.6 | 20 | 10 | 10 | 8 | 1.6 | 1.6 | 1.6 | 20 | 10 | 10 | 8 | 1.6 | 1.6 | 1.6 |
| 1.50 | 24 | 12 | 12 | 10 | 2.0 | 2.0 | 2.0 | 24 | 12 | 12 | 10 | 2.0 | 2.0 | 2.0 | 24 | 12 | 12 | 10 | 2.0 | 2.0 | 2.0 | 24 | 12 | 12 | 10 | 2.0 | 2.0 | 2.0 | 24 | 12 | 12 | 10 | 2.0 | 2.0 | 2.0 | 24 | 12 | 12 | 10 | 2.0 | 2.0 | 2.0 | 24 | 12 | 12 | 10 | 2.0 | 2.0 | 2.0 |
| 2.00 | 28 | 14 | 14 | 12 | 2.4 | 2.4 | 2.4 | 28 | 14 | 14 | 12 | 2.4 | 2.4 | 2.4 | 28 | 14 | 14 | 12 | 2.4 | 2.4 | 2.4 | 28 | 14 | 14 | 12 | 2.4 | 2.4 | 2.4 | 28 | 14 | 14 | 12 | 2.4 | 2.4 | 2.4 | 28 | 14 | 14 | 12 | 2.4 | 2.4 | 2.4 | 28 | 14 | 14 | 12 | 2.4 | 2.4 | 2.4 |
| 2.50 | 32 | 16 | 16 | 14 | 2.8 | 2.8 | 2.8 | 32 | 16 | 16 | 14 | 2.8 | 2.8 | 2.8 | 32 | 16 | 16 | 14 | 2.8 | 2.8 | 2.8 | 32 | 16 | 16 | 14 | 2.8 | 2.8 | 2.8 | 32 | 16 | 16 | 14 | 2.8 | 2.8 | 2.8 | 32 | 16 | 16 | 14 | 2.8 | 2.8 | 2.8 | 32 | 16 | 16 | 14 | 2.8 | 2.8 | 2.8 |
| 3.00 | 36 | 18 | 18 | 16 | 3.2 | 3.2 | 3.2 | 36 | 18 | 18 | 16 | 3.2 | 3.2 | 3.2 | 36 | 18 | 18 | 16 | 3.2 | 3.2 | 3.2 | 36 | 18 | 18 | 16 | 3.2 | 3.2 | 3.2 | 36 | 18 | 18 | 16 | 3.2 | 3.2 | 3.2 | 36 | 18 | 18 | 16 | 3.2 | 3.2 | 3.2 | 36 | 18 | 18 | 16 | 3.2 | 3.2 | 3.2 |

#### Bar Dimensions Diagram

SYM: SYMMETRICAL ABOUT CULVERT C

**Concrete Double Box Culvert**

**Member Thickness**

**Bar Size, Spacing & Dimensions**

**Span (S): 16 FEET**

**Height (H): 14 THRU 16 FEET**

DATA SHEET: 2/27/2023

703.47A 27 OF 27
NOTE: DASHED BARS REPRESENT PLAN REINFORCEMENT.
SOLID BARS INDICATE ADDITIONAL M BARS.
BAR COVER FROM FACE OF CONCRETE = 1-1/2" CLEAT.
SEE ROAD PLANS FOR LOCATION, SIZE AND TYPE OF PIPE.
PLATE 6/16" JOINT FILLER AROUND REINFORCED CONCRETE PIPE AND EMBOSSING ASHALT AROUND CORRUGATED METAL PIPE AT PIPE INLET.
THE BLOCK-OUT MAY BE ELIMINATED AT OPTIONS.
SELECT THE BLOCK-OUT IS SELECTED.
REINFORCEMENT SHOWN EXCEPT PLAN REINFORCEMENT MAY BE BENT TO CLEAR PIPE.
ADDITIONAL REINFORCEMENT REQUIRED FOR BLOCK-OUT IS NOT INCLUDED IN ESTIMATED QUANTITIES. NO SEPARATE PAYMENT WILL BE MADE FOR ADDITIONAL REINFORCEMENT REQUIRED.
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 JB BARS, SEE TO5.07. FOR JB BARS, SEE TO5.37.

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

3. DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

4. MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1.5".

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

6. BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

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

8. (b) VARIES. 12" MAXIMUM

9. (c) NOT SPECIFIED ON THIS SHEET

10. (d) NOT SPECIFIED ON THIS SHEET

11. (e) NOT SPECIFIED ON THIS SHEET

12. (f) NOT SPECIFIED ON THIS SHEET

13. (g) NOT SPECIFIED ON THIS SHEET

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

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

16. (j) NOT REQUIRED FOR CLEAR SPANS < 10'-0"

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

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

19. IF REQUIRED, THE MINIMUM LENGTH EACH SIDE OF A WALL SHALL BE THE greater of 40 BAR DIAMETERS OR A CLEAR SPAN. THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

20. MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1.5".

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

22. BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

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

24. (b) VARIES. 12" MAXIMUM

25. (c) NOT SPECIFIED ON THIS SHEET

26. (d) NOT SPECIFIED ON THIS SHEET

27. (e) NOT SPECIFIED ON THIS SHEET

28. (f) NOT SPECIFIED ON THIS SHEET

29. (g) NOT SPECIFIED ON THIS SHEET

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

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

32. (j) NOT REQUIRED FOR CLEAR SPANS < 10'-0"

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

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

IF REQUIRED, THE MINIMUM LENGTH EACH SIDE OF A WALL SHALL BE THE greater of 40 BAR DIAMETERS OR A CLEAR SPAN. THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1.5".

LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.

BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

(a) SAME SIZE AND SPACING AS 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"

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

(j) NOT REQUIRED FOR CLEAR SPANS < 10'-0"

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

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

IF REQUIRED, THE MINIMUM LENGTH EACH SIDE OF A WALL SHALL BE THE greater of 40 BAR DIAMETERS OR A CLEAR SPAN. THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.
Laying Out Transverse Joints

Use a transverse joint when barrel length is over 90 feet. Use additional joints to limit cut section length and end section barrel length measured along centerline of culvert to the transverse joint.

Minimum end section length shall be 3 feet measured along the shortest wall from the inside face of headwall to the transverse joint.

To avoid locating transverse joints under a traveled way with design fills 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 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 703.66.

General Notes:

- For sections thru barrel, wings and headwalls, see Sheet 3 of 3. For bar sizes, spacing and dimensions of all reinforcement except G bars, see 703.67. For G bars, see 703.57.
- 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
- (d) same size and spacing as A2 bars
- (e) A2 bar spacing

Plan of Bottom Slab

General Notes:

- For sections thru barrel, wings and headwalls, see Sheet 3 of 3. For bar sizes, spacing and dimensions of all reinforcement except G bars, see 703.67. For G bars, see 703.57.
- 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
- (d) same size and spacing as A2 bars
- (e) A2 bar spacing
GENERAL NOTES:

FOR SECTIONS THRU BARREL, WINGS AND HEADWALLS, SEE SHEET 3 OF 3. FOR BAR SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT EXCEPT J5 BARS, SEE 703.87. FOR J5 BARS, SEE 703.37.

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

CONSTRUCTION JOINT KEY NOT SHOWN FOR CLARITY IN PLAN AND SECTION. SEE SHEET 3 FOR DETAILS.
Laying Out Tranverse Joints

Unless shown on bridge plans, use a tranverse joint when barrel length is over 60 feet. Use additional joints to limit cut section length and end section barrel length measured along centerline of culvert to short 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 a design fills 2 feet or less, the following shall apply:

- Barrel length up to 90 feet without a tranverse joint.
- Cut section lengths up to 60 feet when barrel and cut section length restrictions require tranverse joints to be located under a traveled way with a 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 703.86.

End of Wall Type (Not Shown)

General Notes:

- For sections thru barrel, wings and headwalls, see Sheet 5 of 3 for bar sizes, spacing and dimensions of all reinforcement except A2 bars. See 703.87. For J4 bars, see 703.87.
- 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.
  1(a) Same size and spacing as adjacent B bars
  1(b) Varies. 12" maximum
  1(c) J4 bar spacing
  1(e) Same size and spacing as A2 bars
  1(g) A2 bar spacing
  1(f) Same size and spacing as A1 bars

Concrete Triple Box Culvert

Skew: Left Advance
Wings: Flared

Reinforcement

Missouri Highways and Transportation Commission

Jefferson City, MO 65102
1-888-ASK-MODOT 1-888-275-6636
Jefferson City, MO 65102
1-888-ASK-MODOT 1-888-275-6636

Date Prepared: 3/13/2019

703.83H 1 OF 3
PLAN OF TOP SLAB

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

GENERAL NOTES:

FOR SECTIONS THRU BARREL, RINGS AND HEADWALLS, SEE SHEET 3 OF 3. FOR BAR SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT EXCEPT J5 BARS, SEE 703-87. FOR J5 BARS, SEE 703-37.

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

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 1/".

LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.

BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

(a) SAME SIZE AND SPACING AS ADJACENT B BARS
(b) VARIES. 12" MAXIMUM
(c) NOT SPECIFIED ON THIS SHEET
(d) SAME SIZE AND SPACING AS AZ BARS
(e) AZ BAR SPACING
(f) SAME SIZE AND SPACING AS A1 BARS
(g) AT BAR SPACING
(h) FOR DESIGN FILLS OVER 2'-0"
(i) FOR DESIGN FILLS 2'-0" OR LESS
(j) NOT REQUIRED FOR CLEAR SPANS 5'-0"-0"
(k) FOR CLEAR SPAN 5'-0"-0"
(l) FOR CLEAR SPAN > 15'-0"

IF REQUIRED, THE MINIMUM LENGTH EACH SIDE OF WALL SHALL BE THE GREATER OF 48 BAR DIAMETERS OR 3 CLEAR SPAN. THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

(h) DZ BAR (j) HZ BARS AS REQUIRED. QUANTITY OF BARS VARIES WITH SKEW.

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 1/4".

LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.

BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.

(a) SAME SIZE AND SPACING AS ADJACENT B BARS
(b) VARIES. 12" MAXIMUM
(c) NOT SPECIFIED ON THIS SHEET
(d) SAME SIZE AND SPACING AS AZ BARS
(e) AZ BAR SPACING
(f) SAME SIZE AND SPACING AS A1 BARS
(g) AT BAR SPACING
(h) FOR DESIGN FILLS OVER 2'-0"
(i) FOR DESIGN FILLS 2'-0" OR LESS
(j) NOT REQUIRED FOR CLEAR SPANS 5'-0"-0"
(k) FOR CLEAR SPAN 5'-0"-0"
(l) FOR CLEAR SPAN > 15'-0"

IF REQUIRED, THE MINIMUM LENGTH EACH SIDE OF WALL SHALL BE THE GREATER OF 48 BAR DIAMETERS OR 3 CLEAR SPAN. THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.

(h) DZ BAR (j) HZ BARS AS REQUIRED. QUANTITY OF BARS VARIES WITH SKEW.
GENERAL NOTES:

3. FOR BARS SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT EXCEPT J5 BARS, SEE 703.87. FOR J5 BARS, SEE 703.37.

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

LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.

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

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

FOR SECTIONS THRU BARREL, WINGS AND HEADWALLS, SEE SHEET 3 OF 3. FOR BAR SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT EXCEPT J5 BARS, SEE 703.87. FOR J5 BARS, SEE 703.37.

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

DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.

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

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

(f) SAME SIZE AND SPACING AS A1 BARS

(g) A1 BAR SPACING

DATE PREPARED: 10/1/2011
DATE EFFECTIVE: 11/1/2011
703.84H SHEET NO. 1 OF 3
Laying Out Transverse Joints

Unless shown on bridge plans:

Use a transverse joint when barrel length is over 80 feet.

Use additional joints to limit cut section length and end section barrel length measured along centerline of culvert to minimum end section length of 5 feet measured along shortest wall from the inside face of headwall to the transverse joint.

To avoid locating transverse joints under a traveled way with design fills 3 feet or less, the following shall apply:

Barrel length up to 90 feet without a transverse joint.

Cut section lengths up to 60 feet.

When barrel and cut section length restrictions require transverse joints to be located under a traveled way with design fills 9 feet or less, the joints shall be located to minimize the length of joint under the traveled way.

Traveled way is the roadway width minus shoulder widths.

For cut section details, see 703.86.

General Notes:

For sections thru barrel, wings and headwalls, see sheet 3 of 3. For bar sizes, spacing and dimensions of all reinforcement except J4 bars, see 703.87. For J4 bars, see 703.37.

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

Drawing not to scale. Follow dimensions.

Minimum clearance to reinforcing steel shall be 1/4.

Lap longitudinal bars a minimum of 23" at splices.

Beveled headwall shall be located at upstream end.

(a) same size and spacing as adjacent B bars.

(b) varies. 12" minimum.

(c) J4 bar spacing.

(d) same size and spacing as A2 bars.

(a) A2 bar spacing.
GENERAL NOTES:

- FOR SECTIONS THRU BARREL, WINGS AND HEADWALLS, SEE SHEET 3 OF 3. FOR BAR SIZES, SPACING AND DIMENSIONS OF ALL REINFORCEMENT EXCEPT J5 BARS, SEE 703.87. FOR J5 BARS, SEE 703.37.
- CONSTRUCTION JOINT KEY NOT SHOWN FOR CLARITY IN PLAN AND SECTION. SEE SHEET 3 OF 3 FOR DETAILS.
- DRAWING NOT TO SCALE. FOLLOW DIMENSIONS.
- MINIMUM CLEARANCE TO REINFORCING STEEL SHALL BE 11/2".
- LAP LONGITUDINAL BARS A MINIMUM OF 23" AT SPLICES.
- BEVELED HEADWALL SHALL BE LOCATED AT UPSTREAM END.
- SAME SIZE AND SPACING AS ADJACENT A BARS
- Varies, 12" maximum
- NOT SPECIFIED ON THIS SHEET
- SAME SIZE AND SPACING AS A2 BARS
- A2 BAR SPACING
- SAME SIZE AND SPACING AS A1 BARS
- A1 BAR SPACING
- FOR DESIGN FILLS OVER 2'-0":
  - #8 FOR CLEAR SPAN > 10'-0"
  - #9 FOR CLEAR SPAN > 13'-0"
- IF REQUIRED, THE MINIMUM LENGTH EACH SIDE OF WALL SHALL BE THE GREATER OF 48 BAR DIAMETERS OR CLEAR SPAN. THE CLEAR SPAN IS PARALLEL TO LONG DIRECTION OF HEADWALL.
- 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
### Design Fill

#### Span (S) = 3 FT

<table>
<thead>
<tr>
<th>Design Fill</th>
<th>A1 Bars</th>
<th>A2 Bars</th>
<th>H1 Bars</th>
<th>H2 Bars</th>
<th>I1 Bars</th>
<th>I2 Bars</th>
<th>J1 Bars</th>
<th>J2 Bars</th>
<th>K1 Bars</th>
<th>K2 Bars</th>
<th>L1 Bars</th>
<th>L2 Bars</th>
<th>M1 Bars</th>
<th>M2 Bars</th>
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<tr>
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<td>4, 12</td>
<td>34</td>
<td>34</td>
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<td>4</td>
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<td>4</td>
<td>4</td>
</tr>
<tr>
<td>T5 B5 T5 T5</td>
<td>4, 12</td>
<td>4, 12</td>
<td>34</td>
<td>34</td>
<td>4</td>
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<td>4</td>
</tr>
</tbody>
</table>

#### Height (H) = 2 FT OR 3 FT OR 4 FT

<table>
<thead>
<tr>
<th>Design Fill</th>
<th>A1 Bars</th>
<th>A2 Bars</th>
<th>H1 Bars</th>
<th>H2 Bars</th>
<th>I1 Bars</th>
<th>I2 Bars</th>
<th>J1 Bars</th>
<th>J2 Bars</th>
<th>K1 Bars</th>
<th>K2 Bars</th>
<th>L1 Bars</th>
<th>L2 Bars</th>
<th>M1 Bars</th>
<th>M2 Bars</th>
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</thead>
<tbody>
<tr>
<td>T5 B5 T5 T5</td>
<td>4, 12</td>
<td>4, 12</td>
<td>34</td>
<td>34</td>
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<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>T5 B5 T5 T5</td>
<td>4, 12</td>
<td>4, 12</td>
<td>34</td>
<td>34</td>
<td>4</td>
<td>4</td>
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<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>

### General Notes:
- If design fill is between tabulated design fills, use the next larger tabulated design fill. For design fills between 2 feet and 4 feet, use the member thickness, area of reinforcement, and bar dimensions from the 2.4-foot tabulated design fill.
- Special designs are required when the design fill is less than 2 feet or greater than 2 feet.
- Dimensions are in inches unless otherwise specified.
- Design fills are measured from the top of the top slab to the top of the earth fill or roadway.

### Missouri Highways and Transportation Commission

**Concrete Triple Box Culvert**

**Member Thickness**

<table>
<thead>
<tr>
<th>Bar Size</th>
<th>Spacing</th>
<th>Dimensions</th>
</tr>
</thead>
</table>

**SPAN (S): 3 FEET**

**HEIGHT (H): 2 FEET OR 3 FEET OR 4 FEET**

**Sheet No.: 703.87A**

**DATE: 3/22/2023**

**DATE PREPARED:**

**DATE APPRORVED:**

**CONCRETE TRIPLE BOX CULVERT**

**SYMPTOMATIC ABOUT THE CULVERT.**

**BAR DIMENSIONS DIAGRAM**
### General Notes:

- If design fill is between tabulated design fills, use the next vertical fill. For design fills between 2' and 4' feet, use the member thickness, areas of reinforcement, and bar dimensions from the 2' to 4' tabulated design fill.

- Special designs are reviewed when the design fill is less than 2 feet or greater than 12 feet.

- Dimensions are in inches unless otherwise specified.

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

- Culverts meet strength and serviceability requirements for the design vehicular live load fills. See the live load manual.

---

**Concrete Box Culvert**

**Member Thickness**

**Bar Size, Spacing & Dimensions**

**Span (S): 6 Feet**

**Height (H): 3 Thru 7 Feet**

---

**Bar Dimensions Diagram**

Symmetrical about Culvert.
### GENERAL NOTES:

- **If Design Fills is between tabulated Design Fills, use the next larger Design Fill.**
- **Keep the Approach Fill between 2 feet and 4 feet.**
- **For Design Fills between 2 feet and 4 feet, use the member thickness, area of reinforcement, and bar dimensions from the 2'-4' tabulated Design Fill.**
- **Special designs are provided when the design fill is less than 2 feet or greater than 5 feet.**
- **Dimensions are in inches unless otherwise specified.**
- **Design Fills are measured from the top of the slab to the top of the culvert.**
- **Culverts meet strength and servicability requirements for the design vertical live load.**

---

### BAR DIMENSIONS DIAGRAM

**Symmetrical about centerline.**

---

**CONCRETE TRIPLE BOX CULVERT**

- **Member Thickness:**
  - **Bar Size:** Symmetrical & Spacing & Dimensions
  - **Span (S):** 6 Feet
  - **Height (H):** 8 Feet thru 9 Feet

---

**Data Entered:** 3/15/2023

**Data Prepared:** 3/22/2023

**Sheet No.:** 703.87A

**7 of 27**
# Concreete Triple Box Culvert Design Table

<table>
<thead>
<tr>
<th>SPAN (S)</th>
<th>TOP SLAB BARS</th>
<th>&lt;br&gt;HEIGHT (H)</th>
<th>ALL BARS</th>
<th>&lt;br&gt;BOTTOM SLAB BARS</th>
<th>WALL, BARS</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 FT</td>
<td>C, B, A, X, T</td>
<td>1</td>
<td>T5 B5 T1 C1</td>
<td>T5 B5 T1 C1</td>
<td>T5 B5 T1 C1</td>
</tr>
<tr>
<td>5 FT</td>
<td>C, B, A, X, T</td>
<td>2</td>
<td>T5 B5 T1 C1</td>
<td>T5 B5 T1 C1</td>
<td>T5 B5 T1 C1</td>
</tr>
<tr>
<td>6 FT</td>
<td>C, B, A, X, T</td>
<td>3</td>
<td>T5 B5 T1 C1</td>
<td>T5 B5 T1 C1</td>
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<tr>
<td>7 FT</td>
<td>C, B, A, X, T</td>
<td>4</td>
<td>T5 B5 T1 C1</td>
<td>T5 B5 T1 C1</td>
<td>T5 B5 T1 C1</td>
</tr>
<tr>
<td>8 FT</td>
<td>C, B, A, X, T</td>
<td>5</td>
<td>T5 B5 T1 C1</td>
<td>T5 B5 T1 C1</td>
<td>T5 B5 T1 C1</td>
</tr>
</tbody>
</table>

## General Notes
- If design fill is between tabulated design fill, use the next higher tabulated design fill. Keep top outlet fill between 2 ft and 4 ft. For design fills between 2 ft and 4 ft, use the member thickness, area of reinforcement, and bar dimensions from the 2 ft tabulated design fill.
- Special designs are modified when the design fill is less than 2 ft or greater than 4 ft.
- Dimensions are in inches unless otherwise specified.
- Design fills are measured from the top of top slab to the top of earth fill or roadway.
- Culverts meet strength and serviceability requirements for the design vertical live load fill and minimum live load fill.
### GENERAL NOTES:

3.7 Design fill is between tabulated design fills. Use the next greater tabulated design fill. Design fill is less than 1 foot or greater than 30 feet.

Dimensions are in inches unless otherwise specified.

Design fill is measured from the top of the top slab to the top of earth fill in accordance with the Missouri Valley Clear Live Load HL-93 minus the lane load.

### MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

<logo>

### CONCRETE TRIPLE BOX CULVERT

**Member Thickness**

**Bar Size, Spacing & Dimensions**

**Span (S): 8 Feet**

**Height (H): 10 Through 11 Feet**

### BAR DIMENSIONS DIAGRAM

SYMMENTRICAL ABOUT $\phi$ CULVERT.

### SHEET NO.: 703.87A

### DATE PREPARED: 3/22/2023

### 11 OF 27
### General Notes:
- Design fill is between tabulated design fills. Use the next design fill if depth is greater than 3 feet.
- Design fills for a design fill between 3 feet and 5 feet use the member thickness, area of reinforcement, and bar dimensions from the 7.4 tabulated design fill.
- Special designs are required when the design fill is less than 3 feet or greater than 32 feet.
- Dimensions are in inches unless otherwise specified.
- Clearance fills are measured from the top of the curb to the top of the earth fill or the grade.

### Culverts Meet Strength and Serviceability Requirements for the Design Vehicular Load. Load fills 93 minus the usual loads.

#### MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

115 WEST CAPITOL
JEFFERSON CITY, MO 65102

1-888-456-MODOT (1-888-456-6636)

#### CONCRETE TRIPLE BOX CULVERT

<table>
<thead>
<tr>
<th>SPAN (S)</th>
<th>HEIGHT (H)</th>
<th>5 FT OR 6 FT OR 7 FT</th>
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<tbody>
<tr>
<td>9 FT</td>
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</table>

#### Design Fill

<table>
<thead>
<tr>
<th>Design Fill</th>
<th>Top Slab Bars</th>
<th>Middle Slab Bars</th>
<th>Wall Bars</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>A1, B1</td>
<td>A2, B2</td>
<td>A3, B3</td>
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<tr>
<td></td>
<td>A1, B1</td>
<td>A2, B2</td>
<td>A3, B3</td>
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<tr>
<td></td>
<td>A1, B1</td>
<td>A2, B2</td>
<td>A3, B3</td>
</tr>
</tbody>
</table>

#### Bar Dimensions Diagram

Symmetrical about 9 culvert.

#### Date Prepared: 3/22/2023

703.87A 12 of 27
### General Notes:
- The design fill is between tabulated design fills. Use the next lower design fill for fill depths between 2 feet and 6 inches and 2 feet and 6 inches. Use the member thickness, area of reinforcement, and bar dimensions from the 2.4 tabulated design fill.  
- Special designs are warranted when the design fill is less than 1 foot or greater than 12 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 vehicular live load fills. 

### Missouri Highways and Transportation Commission
105 West Capitol
Jefferson City, MO 65102 
1-888-456-MoDOT (1-888-456-6668)
### CONCRETE TRIPLE BOX CULVERT

**MEMBER THICKNESS**

- **SPAN (S):** 12 FEET
- **HEIGHT (H):** 12 FT OR 13 FT

### GENERAL NOTES:

- If Design Fill is between Tabulated Design Fills, use the next lower Design Fill. Except for Design Fills between 2 feet and 3 feet, use the member thickness, area of reinforcement, and bar dimensions from the 2'-4" Tabulated Design Fill.
- Special designs are provided when the Design Fill is less than 2 feet or greater than 3 feet.
- Dimensions are in inches unless otherwise specified.
- Design Fills are measured from the top of the top slab to the top of the earth fill or roadway.
- Culverts meet strength and serviceability requirements for the design vehicular live load and are shown as the live load.

---

**BAR DIMENSIONS DIAGRAM**

**SYMmetrical About Culvert**

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**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

115 WEST CAPITOL

JEFFERSON CITY, MO 65102

1-888-454-MODOT (1-888-263-6638)

**DATE APPROVED:** 11/3/2003

**DATE PREPARED:** 3/22/2023

**SHEET #:** 703.87A

**OF 27**
<table>
<thead>
<tr>
<th>DESIGN FILL</th>
<th>MID-FILL</th>
<th>A5 BARS</th>
<th>A4 BARS</th>
<th>A3 BARS</th>
<th>A2 BARS</th>
<th>A1 BARS</th>
<th>WALL BARS</th>
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<tbody>
<tr>
<td>SN 5</td>
<td>15</td>
<td>B5 B7 B8 B10</td>
<td>B5 B7 B8 B10</td>
<td>B5 B7 B8 B10</td>
<td>B5 B7 B8 B10</td>
<td>B5 B7 B8 B10</td>
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<td>SN 4</td>
<td>14</td>
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<td>B5 B7 B8 B10</td>
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<td>B5 B7 B8 B10</td>
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<td>B5 B7 B8 B10</td>
<td>B5 B7 B8 B10</td>
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<tr>
<td>SN 0</td>
<td>10</td>
<td>B5 B7 B8 B10</td>
<td>B5 B7 B8 B10</td>
<td>B5 B7 B8 B10</td>
<td>B5 B7 B8 B10</td>
<td>B5 B7 B8 B10</td>
<td>B5 B7 B8 B10</td>
</tr>
</tbody>
</table>

**GENERAL NOTES:**

1. **DESIGN FILL** IS BETWEEN TABULATED DESIGN FILL, USE THE NEXT LOWER DESIGN FILL. KEEP THE MID-FILL BETWEEN 2 FEET AND 1 FT. FOR DESIGN FILL BETWEEN 2 FEET AND 1 FT USE THE MID-FILL THICKNESS, AREA OF REINFORCEMENT AND BAR DIMENSIONS FROM THE 2' 4" TABULATED DESIGN FILL.

2. SPECIAL DESIGNS ARE AVAILABLE WHEN THE DESIGN FILL IS LESS THAN 1 FOOT OR GREATER THAN 10 FEET.

3. DETAILS ARE CHANGED OR ADDED TO PROVIDE THE DESIGN VEHICULAR LOAD FROM CULVERTS THE USUAL LOADS.

**BARS DIMENSIONS DIAGRAM**

SYMmetrical about & CULVERT.
GENERAL NOTES:

1. CROSS SECTIONS TO BE IN THE TABLED DESIGN FILL. USE THE NEXT COLUMN IF THE DESIGN FILL IS LESS THAN 9 FEET AND A FEET. FOR DESIGN FILL SIMILAR TO THE MEMBER THICKNESS, EXCEPT FOR DESIGN FILL, BETWEEN 9 FEET AND A FEET. FOR DESIGN FILL SIMILAR TO THE MEMBER THICKNESS, EXCEPT FOR DESIGN FILL, BETWEEN 9 FEET AND A FEET. FOR DESIGN FILL SIMILAR TO THE MEMBER THICKNESS, EXCEPT FOR DESIGN FILL, BETWEEN 9 FEET AND A FEET.

2. DESIGN FILLS ARE MEASURED FROM THE TOP OF THE MEMBER TO THE TOP OF THE MEMBER TO THE TOP OF THE MEMBER TO THE TOP OF THE MEMBER.

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39. DESIGN FILLS ARE MEASURED FROM THE TOP OF THE MEMBER TO THE TOP OF THE MEMBER.
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<tr>
<th>DESIGN</th>
<th>SPAN (5)</th>
<th>HEIGHT (HT)</th>
<th>BAR SIZE, SPACING</th>
<th>MEMBER THICKNESS</th>
<th>TOP SLAB BARS</th>
<th>MID SLAB BARS</th>
<th>BOTTOM SLAB BARS</th>
<th>WALL SIZES</th>
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<tbody>
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**BAR DIMENSIONS DIAGRAM**

- **SYMETRICAL ABOUT @ CULVERT.**

**GENERAL NOTES:**

- If design fill is between tabulated design fill, use the next greater fill.
- Special design fill is used for fill over 30 feet, and 20 feet or below.
- Design fill for fill between 20 and 30 feet is determined by the member thickness, area of reinforcement, and bar dimensions from the 2' x 4' tabulated design fill.

**SPECIAL DESIGN**:

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

**CURTAIN MEET STRENGTH AND SERVICEABILITY REQUIREMENTS FOR THE MEMBER AND TOP SLAB TO THE TOP OF EARTH FILL OR ROADWAY.**

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

**CONCRETE TRIPLE BOX CULVERT**

- **BAR SIZE, SPACING & DIMENSIONS**
  - SPAN (5): 16 FEET
  - HEIGHT (HT): 14 THRU 16 FEET

**DATE APPROVED:** 2/11/2022

**DATE PREPARED:** 3/22/2022

**703.87A** 27 OF 27
SLABS ON STRINGERS AND GIRDER

SLABS SPANS - NO VIDS (SOLID)

TRUSSES - NO LONGITUDINAL STRINGERS

DECK GIRDER SPANS

SLAB SPANS - NO VIDS (SOLID)

SLACK GIRDER SPANS

PRESTRESSED PANELS

MAX. SPACING

PART CROSS SECTION

MAX. SPACING

PART CROSS SECTION

MAX. SPACING

PART CROSS SECTION

MAX. SPACING

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MAX. SPACING

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MAX. SPACING

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SLABBAD ON STRINGERS AND GIRGER
TYPICAL TRENCH DETAIL
PIPE INSTALLATION AND BEDDING

NOTE:

A) MINIMUM STRUCTURAL BACKFILL OVER TOP OF PIPE SHALL BE ONE-EIGHTH DIAMETER OR SPAN OF PIPE OR ONE FOOT WHICHEVER IS GREATER.

B) BEDDING BLANKET OF LOOSE FILL SHALL BE ROUGHLY SHAPED TO FIT BOTTOM OF PIPE. MINIMUM THICKNESS BEFORE PLACING PIPE SHALL BE AS FOLLOWS:

<table>
<thead>
<tr>
<th>DEPTH OF CORRUGATION</th>
<th>MIN. BEDDING THICKNESS</th>
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</thead>
<tbody>
<tr>
<td>2&quot;</td>
<td>1&quot;</td>
</tr>
<tr>
<td>1&quot;</td>
<td>1&quot;</td>
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<tr>
<td>2&quot;</td>
<td>2&quot;</td>
</tr>
<tr>
<td>3&quot;</td>
<td>3&quot;</td>
</tr>
</tbody>
</table>

C) TRENCH INSTALLATIONS - 2 FEET MINIMUM EACH SIDE OF Culvert. THIS RECOMMENDED LIMIT SHOULD BE MODIFIED AS NECESSARY TO ACCOUNT FOR VARIABLES SUCH AS POOR IN-SITU SOILS. EMBANKMENT INSTALLATIONS - ONE DIAMETER OR SPAN EACH SIDE OF CULVERT.

MULTIPLE STRUCTURE SPACING

PIECE-ARCHES

<table>
<thead>
<tr>
<th>DIAMETER</th>
<th>SPACE S</th>
<th>SPAN</th>
<th>SPACE X</th>
</tr>
</thead>
<tbody>
<tr>
<td>UP TO 24&quot;</td>
<td>12&quot;</td>
<td>UP TO 36&quot;</td>
<td>12&quot;</td>
</tr>
<tr>
<td>24&quot; TO 72</td>
<td>1/3 PIPE DIA</td>
<td>50&quot; TO 108&quot;</td>
<td>1/3 ARCH SPAN</td>
</tr>
<tr>
<td>72&quot; AND OVER</td>
<td>36&quot;</td>
<td>108&quot; TO 189&quot;</td>
<td>36&quot;</td>
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</table>

PIECE-ARCHES

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<td>36&quot;</td>
<td>108&quot; TO 189&quot;</td>
<td>36&quot;</td>
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</table>

TYPICAL CAMBERED FLOW LINE

NOTE:

ON YIELDING SOIL, PIPE CULVERTS SHALL BE PLACED ON A CAMBERED FLOW LINE. THE AMOUNT OF CAMBER WILL VARY WITH SOIL CONDITIONS AND WILL BE SPECIFIED ON THE DESIGN PLANS.
## Corrugated Metallic-Coated Steel Circular Pipe Lock Seam

### Maximum Allowable Overfill Heights (1)

<table>
<thead>
<tr>
<th>Specified Diameter of Pipe</th>
<th>Maximum Allowable Overfill Heights</th>
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<th>0.055</th>
<th>0.062</th>
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### Corrugated Metallic-Coated Steel Circular Pipe Riveted Seam

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(1) Maximum overfill required from the top of pipe to surface.

**Missouri Highways and Transportation Commission**

105 West Capitol
Jefferson City, MO 65102

**Corrugated Metal Pipe Installation Methods**

<table>
<thead>
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<th>725.00C</th>
<th>MDT</th>
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*Notes for Trench Installation Only*
### Corrugated H32 Aluminum Circular Pipe Lock Seam

#### Maximum Allowable Overfill Heights (1)

<table>
<thead>
<tr>
<th>Specified Diameter of Pipe</th>
<th>Ø 0.25</th>
<th>Ø 0.275</th>
<th>Ø 0.375</th>
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<tr>
<td><strong>E</strong></td>
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### Corrugated H32 Aluminum Circular Pipe Riveted Seam

#### Maximum Allowable Overfill Heights (1)

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<th>Ø 0.375</th>
<th>Ø 0.464</th>
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### Notes

- A = 2-1/2" x 1/2" Corrugations
- B = 3" x 1" Corrugations
- C = 5" x 1" Corrugations
- D = 3/4" x 3/4" x 7-1/2" Spiral Rib

1. Maximum overfill required from the top of pipe to surface.

**Missouri Highways and Transportation Commission**

105 West Capitol
Jefferson City, MO 65102
1-888-658-MDOT (6368)

Corrugated Metal Pipe Installation Methods

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<tr>
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### Corrugated H34 Aluminum Circular Pipe Lock Seam

**Maximum Allowable Overfill Heights (1)**

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### Corrugated H34 Aluminum Circular Pipe Riveted Seam

**Maximum Allowable Overfill Heights (1)**

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(1) Maximum overfill required from the top of pipe to surface.
### Minimum Cover for Construction Loads (Round and Pipe-Arch)

<table>
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<th>Diameter or Pipe Span</th>
<th>Minimum Cover (ft.) for Indicated Axle Loads (2)</th>
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<td>20-22</td>
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<td>28-32</td>
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The contractor shall provide minimum cover plus any additional cover required to avoid damage to the pipe. In unpaved situations, the surface must be maintained to a level and non-rutted condition.

### Pipe-Arch Requirements

<table>
<thead>
<tr>
<th>MINIMUM COVER FOR CONSTRUCTION LOADS 2-2/3&quot; X 1/2&quot; CORRUGATIONS</th>
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<tr>
<td><strong>Diameter or Pipe Span</strong></td>
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<td>100K LBS.</td>
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<td>150K LBS.</td>
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### Pipe-Arch Requirements

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</tr>
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### Pipe-Arch Requirements

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<th><strong>Type</strong></th>
<th><strong>Span (5)</strong></th>
<th><strong>Rise (5)</strong></th>
<th><strong>GALVANIZED SHEET THICKNESS (IN.)</strong></th>
<th><strong>GAUGE</strong></th>
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(2) Minimum cover measured from top of pipe to bottom of flexible pavement or top of rigid pavement.

(3) A tolerance of plus or minus one inch or 2 percent of equivalent circular diameter, whichever is greater, will be permissible in span and rise.

(4) Tolerances in parentheses. No tolerance in opposite direction.

### Notes

- 2K LBS. (ROUND AND PIPE-ARCH) 2-2/3" X 1/2" CORRUGATIONS
- Minimum Cover (ft.) for Span Rise
- Galvanized Sheet
- Thickness (in.)
- Gauge

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

CORRUGATED METAL PIPE INSTALLATION METHODS

DATE EFFECTIVE: 04/01/2011
DATE PREPARED: 06/24/2011
725.00C SHEET NO. 5 OF 5
**TABLE FOR METAL CURTAIN WALL**

<table>
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<th>GALV. SH. THICK (IN)</th>
<th>W</th>
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*Note: Band shall be the same thickness as curtain wall material.*

**GENERAL NOTES:**

- Metal curtain wall with corrugations vertical.
- G.D. pipe (shop coat with asphalt base aluminum paint).
- Band shall be shaped to fit pipe (round or arch).
- Continuous weld.
- Band shall be the same thickness as curtain wall material.

**PLAN**

**SECTION A-A**

**SECTION B-B**

**DATE EFFECTIVE:** 07/01/2004

**DATE PREPARED:** 8/25/2009

**METAL CURTAIN WALL AND METAL INLETS**

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

**STATE OF MISSOURI**

**METAL CURTAIN WALL WITH CORRUGATIONS VERTICAL**

**METAL CURTAIN WALL**

**FILE SHEET NO. 1 OF 1**

**FOR PIPE ARCH**

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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>
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<th>INSTALLATION TYPE</th>
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<td>CLASS II</td>
<td>CLASS III</td>
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<td>MAXIMUM FILL HEIGHT IN FEET</td>
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<table>
<thead>
<tr>
<th>TYPE</th>
<th>BENDING THICKNESS (MIN. STANDARD PROCTOR %)</th>
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<tbody>
<tr>
<td>1</td>
<td>D₂/24 MINIMUM, NOT LESS THAN 3&quot;, IF ROCK FOUNDATION, USE D₀/12 MINIMUM, NOT LESS THAN 6&quot;.</td>
</tr>
<tr>
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<tr>
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</tr>
</tbody>
</table>

NOTES:
- 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.
- FLOW LINE AFTER EXPECTED SETTLEMENT

TYPICAL CAMBERED FLOW LINE

GENERAL NOTES:
- MULTIPLE PIPE CULVERTS SHALL BE INSTALLED WITH A MINIMUM CLEARANCE BETWEEN PIPES OF 3 D₀ OR 12", WHICHEVER IS GREATER, BUT NOT TO EXCEED 36".
- CLASS I AND CLASS II REINFORCED CONCRETE PIPE SHALL ONLY BE USED FOR SEWERS IN TRENCHES OUTSIDE ROADBED AND STREET LIMITS.

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

RIGID CULVERT INSTALLATION METHODS
REINFORCED CONCRETE PIPE CULVERTS

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

726.30J SHEET NO. 1 OF 2
### 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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<tbody>
<tr>
<td></td>
<td>Minimum Fill Height (feet)</td>
<td>Maximum Fill Height (feet)</td>
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<tr>
<td>6</td>
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</tr>
<tr>
<td>36</td>
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</table>

**Legend**

- Compacted Roadway Embankment
- Suitable Backfill
- Loose Dry Material
- Compacted Sand

**Rigid Culvert Installation Methods**

**Vitrified Clay Pipe Culverts**
**Trench Installation**

**Legend**
- **Suitable Material**: Installation in or above existing ground.
- **Unsuitable Material**: Installation in or below existing ground.

**Note:** Multiple pipe shall be installed with a minimum clearance between pipes of 2\(\text{D}_0\) or 12", whichever is greater. Note: Not to exceed 36°.

**Construction Sequence**
1. Place bedding material to grade.
2. Compact bedding outside the middle third of the pipe.
3. Install pipe to grade.
4. Complete structural backfill according to specifications.

**Fill Height Limits**

<table>
<thead>
<tr>
<th>Structural Backfill</th>
<th>Polyethylene</th>
<th>Steel Reinforced Polyethylene</th>
<th>Polyvinyl</th>
<th>Double Wall Polypropylene</th>
<th>Triple Wall Polypropylene</th>
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<tr>
<td>Specified Nominal Dia of Pipe (in.)</td>
<td>Compaqion/Compaction 90% SPD</td>
<td>Compaqion/Compaction 95% SPD</td>
<td>Compaqion/Compaction 90% SPD</td>
<td>Compaqion/Compaction 95% SPD</td>
<td>Compaqion/Compaction 90% SPD</td>
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<tr>
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<td>60</td>
<td>2</td>
<td>100</td>
<td>150</td>
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<td>150</td>
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**Minimum Cover for Construction Loads**

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<th>Nominal Pipe Dia. (in.)</th>
<th>Minimum Cover (ft.) for Indicated Axle Loads (in column in thousands of pounds)</th>
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<td>18-50</td>
<td>3</td>
</tr>
<tr>
<td>24-60</td>
<td>4</td>
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</table>

**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 long-term permanent water table depths above springline.**
- **When pipes are used as group A, fill heights are limited to shaded values.**

**Construction Notes:**
- **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.**

**Typical Cambered Flow Line**

**Flow Line as Laid**

**Fill Height**

**Camber**

**Flow Line After Expected Settlement**

**Not Higher Than Inlet Flow Line**

**Roadbed**

**Flow Line**

**Inlet**

**Date Prepared:** 2/27/2015

**Date Effective:** 04/01/2015

**730-00E SHEET NO. 1 OF 1**
GENERAL NOTES:

THE CONCRETE FOR INVERTS SHALL BE PLACED AFTER COMPLETION OF THE DROP INLET BOX. NO CEMENT PLACEMENT WILL BE MADE FOR FINISHING OR PLACING INVERT CONCRETE.

TYPICAL INVERTS

SECTION A-A
SECTION B-B
SECTION C-C
SECTION D-D
SECTION E-E
SECTION F-F
SECTION G-G
SECTION H-H

SEE STANDARD PLAN 610-10 FOR GRATES AND BEARING PLATES. TYPICAL LOCATION DETAILS ARE INDICATED ON SHEET 7 A AND B OF 6. THE INVERTS MAY BE CAST IN ONE PIECE OR BASE SECTION.
GENERAL NOTES:

The size of the drop inlet and type of cover will be shown on the plans.

The configuration details shown are descriptive only and may be varied to conform with established manufacturing procedures.

Top of drop inlet mold shall be constructed to the elevation of bottom of slab at the edge of pavement or bottom of curb and gutter at drop inlet.

Where the drop inlet is located in an unframed area, the top of the curb inlet walls shall be set to the elevation shown on the plans.

All concrete above the top face separation joint is to be constructed using paving operations or curb and gutter construction and will be paid for as square yards of concrete pavement or linear feet of curb and gutter.

Formers of cut-out openings shall be provided where pipe inlets and outlets are shown on the plans.

Reinforcing bars in pavement shall be epoxy coated and securely tied together or fastened to avoid any possible displacement during the placing of concrete. Reinforcement shown is in addition to any reinforcement shown for concrete pavement or curb and gutter.

Joints shall be sealed in accordance with Section 7265-1-1 of the Standard Specifications.

The contractor shall be permitted to cast in place the drop inlets caller for in the plans to the dimensions required for precast drop inlets.

Reinforcement may be in lieu of reinforcing bars. The reinforcement shall not be less than 2% square inches per linear foot both horizontally and vertically.

No direct payment will be made for reinforcing steel.

No direct payment will be made for cutting pipe nor for cutting or bending reinforcing steel.

The top of drop inlet pipes shall not be set below the top of the outlet pipe.

No direct payment will be made for forming for curved pipe grates and frames.

The reinforcement shown is the minimum required. At the contractor's option, additional reinforcement may be used.

Reinforcing steel edge distance will be 12" unless otherwise specified.

No more than two lift holes of lifting devices may be provided.

Class C excavation will be paid within vertical planes 18" outside of the outer walls of the base section of the drop inlets. Class D excavation will not be paid for outside the property limits.
### Dimensions

<table>
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<tr>
<th>Dia.</th>
<th>Wall</th>
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<th>B Min.</th>
<th>C Min.</th>
<th>D</th>
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</tr>
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<td>2-1/2</td>
<td>8&quot;</td>
<td>3'-10&quot;</td>
<td>6'-0&quot;</td>
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<td>2'-8&quot;</td>
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<td>10'-0&quot;</td>
<td>10'-0&quot;</td>
<td>36</td>
</tr>
</tbody>
</table>

### Reinforcement

#### Barrel Section Reinforcement

- **Circular**
  - Inner Case: 0.048
  - Outer Case: 0.054
  - Circular Area of Longitudinal: 0.060
  - Area of Transverse: 0.060

- **Elliptical**
  - Inner Case: 0.066
  - Outer Case: 0.072
  - Elliptical Area of Longitudinal: 0.069
  - Area of Transverse: 0.069

**Note:**
- General Notes: Slight variations in both shape and dimensions from those shown may be accepted if approved by the engineer.
- Not more than three lift holes may be drilled or cast in the end section for handling and lifting.
- Lift lugs or bars will be permitted in precast toe walls.
- Toe walls may be cast-in-place or precast.
- Steel fibers may be used in lieu of rebar or cold drawn steel wire per section 1032.3.4.
### CONNECTION REQUIREMENTS

<table>
<thead>
<tr>
<th>TYPE</th>
<th>CONNECTION TYPE</th>
<th>ALLOWABLE SIZE RANGE (IN.)</th>
<th>MATERIALS</th>
<th>TAPERED SLEEVE REQUIREMENT</th>
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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 ASTM A525.
- The length of tapered sleeve shall be sized to protect against 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 a minimum of 0.5% corrugation or lip designed to provide a secure connection with the end section.

**END SECTION FOR PIPE AND PIPE ARCH**

- **Pipe End Section**
  - Ordinary Flared End: Maintain inside diameter of sleeve. Finished end to be the same diameter as corrugated steel pipe diameter. Smooth tapered sleeve detail.

**Diagram Notes**

- For 12” thru 24” Round Pipe Only
  - Type 1 Connection
    - 2” x 2” x 0.125” Angle
    - Dimpled 4” x 0.064” Thick
    - Riveted or Bolted

- For 30” thru 48” Pipe and Equivalent Pipe Arch
  - Type 2 Connection
    - Angles Riveted, Bolted or Resistance Spot Welded to the Adapter Band
    - Welds shall be painted, as per standard specification 10010.19.5.

- For 12” thru 42” Pipe and Equivalent Pipe Arch
  - Type 4 Connection
    - 5” x 0.125” Angle
    - Welded to the Adapter Band
    - Welds shall be painted, as per standard specification 10010.19.5.
### 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>
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</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 1036 of the Standard Specifications.
  - Reinforcing steel used in construction of the beveled pipe encasement shall meet the requirements of Section 1036 of the Standard Specifications.
  - Beveled pipe encasement may be used with either polyethylene or corrugated metallic coated steel pipe.
  - The pipe size for each flanged pipe encasement shall be determined for piping of the appropriate Class C specifications. The carbon steel line back bolts shall be ASTM Grade 2.
  - Beveled pipe shall be spliced at locations shown on Plan. For placement of 3" x 6" galvanized bolts, the 4" x 6" galvanized bolt shall be a double nut as shown and placed in the valley of the pipe corrugations.

**Missouri Highways and Transportation Commission**

105 West Capitol
Jefferson City, MO 65102
1-800-392-MODOT (663-6868)

**Beveled Pipe End Treatment for Highways**

- Date Effective: 06/05/2013
- Date Revised: 10/14/2020
- File No.: 732.05D
- Sheet No.: 1 of 2
PIPE END DETAILS FOR PARALLEL DRAINAGE STRUCTURES FOR DRIVEWAYS
(SINGLE PIPE INSTALLATION)

NOTE:

FOR MULTIPLE PIPE INSTALLATIONS, END SECTIONS WITH SAFETY BAR SYSTEM OR OPTIONAL BAR SYSTEM SHALL BE PROVIDED. SEE STANDARD PLAN 152-140.

GENERAL NOTES:

CONCRETE USED IN CONSTRUCTION OF THE BEVELED PIPE ENCASMENT SHALL BE CLASS B CONCRETE OF 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 WELDED WITH EITHER POLYETHYLENE OR CORROSION-RESISTANT METALLIC COATED STEEL PIPE.

THE PRICE BID PER EACH FOR "BEVELED PIPE END TREATMENT" SHALL BE CONSIDERED FULL COMPENSATION FOR FURNISHING ALL MATERIALS AND INSTALLATION OF THE BEVELED PIPE SECTION AND BEVELED PIPE ENCASMENT AS SHOWN OR AS DIRECTED BY THE ENGINEER.

THE 1/2" X 6" BOLT AND NUTS SHALL BE GALVANIZED IN ACCORDANCE WITH AASHTO M632 (ASTM A453), CLASS C SPECIFICATIONS. LOW CARBON STEEL ANCHOR BOLTS SHALL BE ASTM F1564, GRADE 36.

BEVELED PIPE SHALL BE DRILLED AT LOCATIONS SHOWN ON PLANS FOR PLACEMENT OF 1/2" X 6" GALVANIZED BOLTS. THE 1/2" X 6" GALVANIZED BOLTS SHALL BE "DOUBLE NUTTED" AS SHOWN AND PLACED IN THE VALLEY OF PIPE CORRUGATIONS.
### Note:
For details of optional bar grate, see Sheet 3 of 3.

### SAFETY SLOPE END SECTION

**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>A (In.)</th>
<th>H (In.)</th>
<th>W (In.)</th>
<th>Overall Length (IN.)</th>
<th>Slope (IN.)</th>
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<td>60</td>
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<td>41</td>
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<td>12</td>
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<td>41</td>
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**For Details of Optional Bar Grate, see Sheet 3 of 3.**

---

**For Connection Details, see 732.00 Sheet 3 of 3.**
**BAR GRATE SYSTEM DATA**

<table>
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<tr>
<th>DRain pipe size</th>
<th>31° slope</th>
<th>41° slope</th>
<th>61° slope</th>
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<td>B</td>
<td>C</td>
<td>D</td>
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<td>0</td>
<td>4</td>
</tr>
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<td>30°</td>
<td>30</td>
<td>0</td>
<td>5</td>
</tr>
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<td>36°</td>
<td>36</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>42°</td>
<td>42</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>48°</td>
<td>48</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>54°</td>
<td>54</td>
<td>4</td>
<td>9</td>
</tr>
</tbody>
</table>

**NOTE:** BAR GRATE SYSTEM IS NOT REQUIRED FOR DRAIN PIPE DIAMETER OF 21" OR LESS, FOR SINGLE PIPE INSTALLATIONS.

---

**GENERAL NOTES:**

- ALL STEEL MATERIAL FOR BAR GRATE SYSTEM SHALL BE IN ACCORDANCE WITH ASTM A575 GRADE 1020 STEEL.
- ALL MATERIAL IN GRATE SYSTEM SHALL BE GALVANIZED.
- GALVANIZING SHALL BE DONE IN ACCORDANCE WITH ASTM A123.
- ALL MATERIALS, FABRICATION AND INSTALLATION OF OPTIONAL BAR GRATE SYSTEM USED IN LIEU OF SAFETY BAR SYSTEM SHALL BE INCLUDED IN CONTRACT UNIT PRICE BID FOR END SECTION (SAFETY SLOPE).
ROCK DITCH CHECK

END VIEW

SECTION A-A

GENERAL NOTES:

MINIMUM DITCH CHECK SPACING

DERIVED FROM CENTER TO CENTER

EXEMPLARY DITCH CHECK SPACING FOR STANDARD HEIGHTS (FT.)

DITCH LENGTH (FT.)  100  200

SLOPE %  1.0  1.5  2.5  3.5  4.5  5.5  6.0  6.5  7.0  7.5  8.0  8.5  9.0  9.5  10.0

MINIMUM DITCH CHECK SPACING
SEDIMENT TRAP

NOTES:
SEDIMENT TRAP IN THE CLEAR ZONE SHALL BE REMOVED OR LEVELLED IF ALLOWABLE AFTER THE VEGETATION HAS
SUFFICIENTLY NURTURED TO PROTECT THE EROSION OR SLALE.

ELEVATION DETAIL

NOTES:
ROCK/MESH SEDIMENT CONTROL FENCE MAY BE NECESSARY AS DETERMINED
BY THE ENGINEER. IN ISOLATED AREAS WHERE PERIMETER SILT FENCE IS
DEEMED INSUFFICIENT TO WITHSTAND SHEET FLOW, THEY REQUIRED. IT
WILL BE PAID PER LINEAR FOOT AS ROCK DITCH CHECK.
AGRUMENTS FOR DRAINAGE SHALL BE IN ACCORDANCE WITH SEC 9.9.9.
GRADE 4 OR 5.
USE HARDWARE CLOTH 24 GAUGE WIRE MESH WITH 4 INCH MESH OPENINGS.
INSTALL 5 FT. T-FOOT WITH A 2 FOOT DECENT DEPTH (MIN).
ATTACH HARDWARE CLOTH TO FOOT WITH WIRE STAPLE OR OTHER
ACCEPTABLE METHE.
SPACE FOOT A MAXIMUM OF 3 FT.
FOR INSTALLATION BETWEEN SECTIONS OF SALT FENCE, EXTEND
AGRUMENTS FOR DRAINAGE A MINIMUM OF 12 INCHES ON EACH SIDE OF
SPECIAL SEDIMENT CONTROL FENCE SECTION.
ROCK/MESH SEDIMENT CONTROL FENCE MAY BE USED IN LIEU OF ROCK DITCH
CHECK TO SURFACE A DITCH AT NO ADDITIONAL COST TO THE CONTRACTOR.

ROCK DITCH CHECKS

NOTES:
OPTIONAL TO PROVIDE SEDIMENT ENCLOSE AT DRAIN INLET
EXCESS LOG/STOCK TO BE PULLED IN AND TIED OFF TO WIRE STAKE OR BALLASTED
CURB INLET SEE DETAIL C

CURB INLET PROTECTION

NOTES:
PRIOR TO PLACEMENT OF CURB, LOG STOCKS AND WIRE
VEGETATION SHALL BE CLEANED.
LOG/STOCK PLACED ON PAYMENT SHALL BE LIMITING DOWN
WITH GRAVEL AND BALLAST.

GENERAL NOTES:
OTHER PROTECTIVE CURB PROTECTION MAY BE
SUBSTITUTED IN ACCORDANCE WITH SES 806 OR
AS DIRECTED BY THE ENGINEER.
FOR SEDIMENT CONTROL SPACING SEE SHEET 1 OF 6.
TEMPORARY SLOPE DRAIN INLET TREATMENT

PLAN VIEW

SECTION VIEW

TEMPORARY SLOPE DRAIN INLET TREATMENT

SECTION B-B
TYPE B BERM

SECTION A-A

TEMPORARY BERM
(METAL, FLEXIBLE PIPE, OR PLASTIC PIPE)

NOTE:
MCPMUM LENGTH BETWEEN SLOPE DRAINS SHALL BE APPROXIMATELY 500 FEET.
SECTION A-A
TYPE C BERM

1. Type C berm shall be placed above the 200-year high water O.H.W. or 6 ft. elevation as directed by the engineer.

SLOPE LINE

ROCK LINING, ROCK BLANKET OR AN APPROVED ALTERNATE IF SEDIMENT BASIN NOT AN OPTION.

FLAT BOTTOM DITCH

WE TYPE B TEMPORARY BERM WITH TEMPORARY SLOPE DRAIN FOR DOMERAGE CONDITIONS.

PLAN VIEW

+10 ft. or where the ditch slope is less than 1:5, where 1:5 is greater.

GENERAL NOTES:

Type C berm shall be built to handle significant runoff events and shall be installed prior to soil disturbance or placement of fill in the drainage area of the berm.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-MO-DOT.INFO 1-888-663-6684

TEMPORARY EROSION CONTROL MEASURES
BRIDGES AND BOX CULVERTS AT STREAM CROSSINGS

DATE EFFECTIVE: 04/04/2021
DATE ISSUED: 10/17/2022
806.10K SHEET NO. 6 OF 6
METHOD OF SUPPORTING DECIDUOUS TREES
3" CALIBER OR LARGER

METHOD OF SUPPORTING EVERGREEN TREES
3' OR MORE IN HEIGHT

SIX LAYERS OF BURLAP TO BE INSTALLED BEFORE BRACE BLOCKS

BRACE BLOCK MAY BE NAILED TO TREE

TWIST WIRE TO TIGHTEN

WIRE BEFORE TWISTING

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.

NOTES:

TREE WRAP SHALL BE INSTALLED BEFORE BRACING.
BRACE SHALL BE NAILED SECURELY TO POST AND BRACE BLOCK.
BANDING SHALL BE DONE WITH A COMMERCIAL BANDING MACHINE.

GENERAL NOTE:
ALL NUMBER MEASUREMENTS ARE NOMINAL.
MEASUREMENT OF SMALL TREES

- 24" branches on any stem may be counted
- Multi-stem trees acceptable if one stem is the caliber specified
- Measure caliber

WRAP ALL STEMS

TREE WRAP

MEASUREMENT OF LARGE TREES

- Measure caliber for trees 4" or less
- Measure caliber for trees more than 4"
- Base width measured not more than 10" above the ground line

MEASUREMENT OF EVERGREEN TREES

THINNING CUT

HEADING CUT

MEASUREMENT OF DECIDUOUS SHRUBS

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.
GENERAL NOTES:

THE CORRECT MOUNTING HEIGHT WILL BE OBTAINED BY ADJUSTING EASEMENT FROM THE EARTH'S CURVATURE BETWEEN THE POLE CAP AND THE TOP OF THE BRACKET ARM MOUNT.

POLES SHALL BE FINISHED ONLY FOR SPECIFIC BOLT SIZE.

TRANSFORMER BASE SHALL BE CASTING THE SPECIFICATIONS IN THE CURRICULUM SPECIFICATIONS FOR STRUCTURAL INQUIRIES, LUMINARIES, AND

DETAILS. TABLES AND THE CURRICULUM REQUIREMENTS OF MCAG 2850.

HANDLEbars shall be separate. 4 x 8 -1/2" ENDABLE.

THE PILE IS NOT RECOMMENDED.

TRANSFORMER BASES FOR THE MOUNTING HEIGHT SHALL BE FORGED WITH THE TRANSFORMER CORE AND POLE MOUNT AND THE SANDING LUG FOR GROUPING END.

DETAILS OF THE TRANSFORMER BASES.

THE MOUNTING HEIGHT BETWEEN THE TRANSFORMER BASE AND THE POLE MOUNT SHALL BE FOUR INCHES OR LESS. THE POLE MOUNTS SHALL BE A MINIMUM 1-1/8" "DIA. PILE.

THE POLE MOUNTS SHALL BE CONNECTED TO THE TRANSFORMER BASE BY A GROUPING LUG OR AN INSULATION BLOCK.

THE SIGNALS MOUNTS SHALL BE 45° COLUMNS AND SIGNALS MOUNTS THROUGH POLES.

SIGNS SHALL NOT BE MOUNTED ON LIGHTING POLES.

HIGHWAY LIGHTING
POLES, FOUNDATIONS
AND APPURTENANCES
FOR 45' MOUNTING HEIGHT

DATE: 04/01/2018
901-01AJ
1 OF 6
## TYPE AT POLE

<table>
<thead>
<tr>
<th>BRACKET SPEC</th>
<th>6' OR 10'</th>
<th>MAX. ALLOWABLE DEVIATION</th>
<th>50 LB</th>
<th>MAX. PROJECTED SPEC</th>
<th>3.3 SQ. FT.</th>
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<tbody>
<tr>
<td>婦</td>
<td>被</td>
<td>被</td>
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### LED LUMINAIRES

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<th>POLE HEIGHT</th>
<th>DESIGNATION</th>
<th>MAX. WATT</th>
<th>DISTRIBUTION TYP</th>
<th>OUTLINE/HEIGHT-LINE-EDGE DISTANCING</th>
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<td>3 A</td>
<td>LEE-2</td>
<td>115</td>
<td>III</td>
<td>E-30-03</td>
</tr>
<tr>
<td>3 B</td>
<td>LEE-2</td>
<td>170</td>
<td>III</td>
<td>E-34-03</td>
</tr>
<tr>
<td>5 A</td>
<td>LEE-2</td>
<td>275</td>
<td>III</td>
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</tr>
<tr>
<td>5 B</td>
<td>LEE-2</td>
<td>315</td>
<td>III</td>
<td>E-34-03</td>
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**LUMINAIRES PER CHAIN UNLESS OTHERWISE SPECIFIED ON PLAN.**

**GENERAL NOTES:**

1. THE MINIMUM ALLOWED DIAMETER SHALL BE 10' FOR A 60' POLE, 6-1/2' FOR A 42' POLE, 8-1/2' FOR A 35' POLE AND 8' FOR A 25' POLE.

## TYPE B POLE

<table>
<thead>
<tr>
<th>BRACKET SPEC</th>
<th>6' OR 10'</th>
<th>MAX. ALLOWABLE DEVIATION</th>
<th>50 LB</th>
<th>MAX. PROJECTED SPEC</th>
<th>3.3 SQ. FT.</th>
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<tbody>
<tr>
<td>婦</td>
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### SINGLE BRACKET ARM

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<th>BRACKET SPEC</th>
<th>E- NO.</th>
<th>ANCHOR BOLT DIA.</th>
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### TWO BRACKET ARM

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## TYPE MB POLE

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### SINGLE BRACKET ARM

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### TWO BRACKET ARM

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**GENERAL NOTES:**

1. THE MINIMUM ALLOWED DIAMETER SHALL BE 10' FOR A 60' POLE, 6-1/2' FOR A 42' POLE, 8-1/2' FOR A 35' POLE AND 8' FOR A 25' POLE.

**TRANSFORMER BASE SHALL BE CERTIFIED AS MEETING THE REQUIREMENTS OF THE TRANSFORMER BASES SPECIFICATIONS FOR TYPE B POLES. ALL TRANSFORMER BASES SHALL MEET THE REQUIREMENTS OF THE APPROPRIATE STANDARD SPECIFICATIONS.**

**TRANSFORMER BASES SHALL BE FURNISHED WITH FINISHING COPPER TYPE COPPER CLAD AND BRANDING COPPER TIP FOR TRANSFORMER TYPE B POLES.**

**ALL TRANSFORMER BASES SHALL CONFORM TO SECTION 1242 OF THE STANDARD SPECIFICATIONS.**

**TYPE AT POLES SHALL BE EQUIPPED WITH THE CHARGING LOOP INSIDE THE TRANSFORMER BASE. TYPE B POLES SHALL BE EQUIPPED WITH A CHARGING LOOP INSIDE THE POLE.**

**FOOT SHALL BE GRADED FROM GROUND L Heg IN POLE WITH 6-1/2' AND 8-1/2' SQUARE TOP TO COORDINATE SYSTEM. GROUND L Heg SHALL BE 2' OUT OF THE POLE FROM MOUNTING LINE.**

**THE CABLE ENTRANCE AT THE BRACKET ARM SHALL BE 6' FIELD FITTED 11/4' GAGE HOLE.**
COIL ENDS OF CABLE-CONDUIT DITCH LINE AND COVER WITH PLANKS.

IF WIRING IS INSTALLED PRIOR TO POLE INSTALLATION.

CURB SAME LOCATION BARRIER OR CURB SAME LOCATION

CABLE-CONDUIT OR RIGID CONDUIT

TRAVELED WAY EDGE OF SHOULDER

TRENCH LOCATION - INSIDE SHOULDER TRENCH LOCATION - OUTSIDE SHOULDER

OUTSIDE EDGE OF SHOULDER

PLAN

INSIDE SHOULDER (ALL SHOULDER TYPES)

CONCRETE PULL BOX

RIGID CONDUIT

POLE FOUNDATION

DITCH LINE

OUTSIDE EDGE OF SHOULDER

CABLE-CONDUIT

2" DRAIN PIPE

RIGID CONDUIT (AS SPECIFIED)

POLE FOUNDATION

IF WIRING IS INSTALLED PRIOR TO POLE INSTALLATION, COIL END OF CABLE-CONDUIT AND COVER WITH PLANKS.

OUTSIDE SHOULDER (ALL SHOULDER TYPES)

PLAN

2" MIN.

CABLE-CONDUIT OR RIGID CONDUIT

GUARD RAIL END TREATMENT (ANY TYPE)

SHOULDER

PLAN

BEHIND GUARD RAIL

GENERAL NOTES:

1. SEE DRAWING 902.20 FOR FULL BOXES.
2. CONDUIT MAY BE REMOVED FROM CABLES IN RIGID CONDUIT. SPLICES SHALL NOT BE MADE UNLESS SHOWN ON PLANS.
3. BRAND AND MODEL OF FUSE HOLDER SHALL BE APPROVED BY THE ENGINEER.
4. CABLES SHALL BE CONTINUOUS TO THE FIRST LIGHT POLE. SPLICES SHALL NOT BE MADE FOR THE PURPOSE OF TERMINATING CABLE-CONDUIT.
CABLE-CONDUIT TO LIGHTS PULL BOX 2 FT MIN. BETWEEN FILTER CUT 2/1 DIAM AND INSIDE CABINET ASHERS AND CRoUND 1/1 X 1/1 X 1/1 W/3 FLAT WASHERS CHAMFER 1.

CATCH WITH MOUNTING BRACKETS ON BACK AND SIDES BASE FLUSH WITH CABINET Drip Shield Stainless Steel Piano Hinge BASE FLUSH WITH CABINET ON BACK AND SIDES CABLE-CONDUIT OR RIGID CONDUIT TO LIGHTS SEAL BETWEEN LEXAN WINDOW AND CABINET AND GROUND BOLTS INSERT WASHERS BETWEEN FILTER AND INSIDE CABINET TO FORM AIR GAP.

PHOTOELECTRIC SWITCH SECTION A-A WINDOW DETAIL

BOLTS ON 3" CENTERS FOUR STAINLESS 8-20 BOLTS 2" LONG WITH 3 FLAT WASHERS AND 2 NUTS EACH

DETAIL A

POWER SUPPLY (REF.)

CABLE-CONDUIT OR RIGID CONDUIT TO LIGHTS

PULL BOX

SPACER PAN WINDOW

DETAIL A

TOP VIEW

SIDE VIEW

FRONT VIEW

LIST OF MATERIALS

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION</th>
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<tbody>
<tr>
<td>1</td>
<td>R0 CORD LOCK</td>
</tr>
<tr>
<td>2</td>
<td>RIGID CONDUIT</td>
</tr>
<tr>
<td>3</td>
<td>CLASS B CONCRETE, O.A.C. E.</td>
</tr>
<tr>
<td>4</td>
<td>NEMA 4, DUST-PROOF, WATERPROOF, CABINET</td>
</tr>
<tr>
<td>5</td>
<td>GROUND ROD, 2&quot; DIAM, X 8' MIN.</td>
</tr>
<tr>
<td>6</td>
<td>PHOTOELECTRIC SWITCH AND SOCKET. 105/285 V, 1000-WATT</td>
</tr>
<tr>
<td>7</td>
<td>TRANSLUCENT PLEXIGLASS FILTER #1/2&quot; THICK</td>
</tr>
<tr>
<td>8</td>
<td>CLEAN, LEXAN #034 WINDOW, 1/2&quot; THICK MIN.</td>
</tr>
<tr>
<td>9</td>
<td>MOUNTING PANE, 3 1/2&quot; X 12&quot; X 1/4&quot; ALUMINUM OR STAINLESS STEEL</td>
</tr>
<tr>
<td>10</td>
<td>PLASTIC DUCT SEALANT</td>
</tr>
<tr>
<td>11</td>
<td>LIFETIME SILICONE CAULK</td>
</tr>
<tr>
<td>12</td>
<td>ANCHOR BOLTS, 5/8 X 11 X 14&quot; LONG BOLTS, HOT DIP GALVANIZED, 4 REQUIRED USE BOLT HEAD OR TACK WELDED NUT ON EMBEDDED END</td>
</tr>
<tr>
<td>13</td>
<td>WEATHERPROOF ADHESIVE LABEL, VINYL RAISED LETTERING (OR EQUIVALENT, SEE DETAIL)</td>
</tr>
</tbody>
</table>

GENERAL NOTES:

- ALTERNATE CABINET DIMENSIONS WILL BE ALLOWED AS APPROVED BY THE ENGINEER. INTERIOR CABINET VOLUME SHALL BE EQUAL TO OR GREATER THAN THAT SHOWN ON PLANS AND PROPER CLEARANCES SHALL BE PROVIDED FOR ALL EQUIPMENT. CONCRETE BASE DIMENSIONS SHALL BE MODIFIED TO FIT THE CABINET SUPPLIER.
- PLACEMENT OF ALL ITEMS SHALL BE APPROVED BY THE ENGINEER.
- CABINET SHALL BE LOCATED AWAY FROM TRAFFIC. TOP MOUNT PHOTO CONTROL SHALL FACE AN OPEN SKY. SIDE MOUNT PHOTO CONTROL SHALL FACE NORTH.
- SEE PLANS FOR CIRCUIT WIRING: MAXIMUM LOADING PER CIRCUIT IS 1,000 WATTS FOR 240 VOLT AND 1,000 WATTS FOR 480 VOLT.
- SCHEMATIC DIAGRAM SHALL BE MOUNTED ON INSIDE OF CABINET DOOR.
- THE UTILITY SHALL BE NOTIFIED IN WRITING 30 DAYS PRIOR TO DATE SERVICE WILL BE REQUIRED.
- ALL OPENINGS IN CABINET SHALL BE COVERED AND SEALED WITH LIFETIME SILICONE CAULK.
- ALL MATERIALS REQUIRED EXCLUDING REFERENCE ITEMS AS SHOWN ON DRAWING SHALL BE INCLUDED IN PRICE BID FOR CONTROL STATION.

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

HIGHWAY LIGHTING
BASE MOUNTED CONTROL STATION
240 V OR 480 V - 4 CIRCUIT

DATE EFFECTIVE: 04/01/2005
DATE PREPARED: 06/01/2005
SHEET NO. 901-30F 1 OF 2
Lighting system voltage as specified on plans.

Photoelectric switch brackets may vary. Locate center of window over center of photoelectric switch.

If for reasons of voltage drop a wire size is specified larger than the breaker lugs can accommodate, an insulated heavy-duty terminal block shall be installed to terminate the larger wires and a smaller jumper connected to the breaker itself.

Lighting breaker sizing:

<table>
<thead>
<tr>
<th>Size (Lamps)</th>
<th>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>0 - 5500</td>
</tr>
<tr>
<td>20</td>
<td>2850-5700</td>
<td>5550 - 7400</td>
</tr>
<tr>
<td>25</td>
<td>5750-6600</td>
<td>7450 - 11,000</td>
</tr>
<tr>
<td>30</td>
<td>6600-9500</td>
<td>11,000 - 11,000</td>
</tr>
<tr>
<td>35</td>
<td>9500-11,000</td>
<td>11,000 - 11,000</td>
</tr>
<tr>
<td>40</td>
<td>11,000-14,000</td>
<td>14,000 - 14,000</td>
</tr>
</tbody>
</table>

Circuit load includes load due to line loss, lamp, and ballast load.

All circuit breakers shall conform to Section 901.4 of the standard specifications.
## List of Materials

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Service pole 30' min., Class 4 Mod. Contractor provided, Modot approved</td>
</tr>
<tr>
<td>2</td>
<td>#2 AWG min. cable, 600 volt</td>
</tr>
<tr>
<td>3</td>
<td>Service entrance head</td>
</tr>
<tr>
<td>4</td>
<td>Guy cable, as required</td>
</tr>
<tr>
<td>5</td>
<td>Rigid conduit, 2&quot; min., with preformed elbows</td>
</tr>
<tr>
<td>6</td>
<td>Lighting arrester, valve type, 2 pole, 650 volt</td>
</tr>
<tr>
<td>7</td>
<td>Meter socket, 200 amp, for signals</td>
</tr>
<tr>
<td>8</td>
<td>Meter socket, 200 amp, for lighting</td>
</tr>
<tr>
<td>9</td>
<td>Locking, raintight, Nema 4 service disconnect box</td>
</tr>
<tr>
<td>10</td>
<td>Insulated, groundable neutral wire, 200 amp minimum</td>
</tr>
<tr>
<td>11</td>
<td>Signal breakers, single pole, 40A min., type A or B</td>
</tr>
<tr>
<td>12</td>
<td>Lighting breaker, 2 pole, 240 volt, 100A, type A or B</td>
</tr>
<tr>
<td>13</td>
<td>3/8&quot; metal conduit</td>
</tr>
<tr>
<td>14</td>
<td>#2 AWG min. ground wire</td>
</tr>
<tr>
<td>15</td>
<td>Ground rod, 3/4&quot; x 8' min.</td>
</tr>
<tr>
<td>16</td>
<td>#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>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

## Wiring Diagram

**Lighting and/or Signals**

### Notes:

1. Service pole shall be guyed when span of overhead service wire exceeds 50 feet.
2. Increase 1 foot for each 5 feet above 30 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 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.
4. Schematic diagram shall be mounted on inside of cabinet 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 disconnect cabinet.
6. Lighting system voltage of 240 volts or 480 volts as shown on the plans.
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 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 camouflaged.

### General Notes:

- For cable types and installation, see standard specifications.
- The power supply assembly type is shown on the plans or is designated in the contract.
- The utility company shall be notified in writing 30 days prior to date service will be required.
- Where signal or lighting power only is designated, omit items not required.
- All openings in any service box or meter box shall be covered and sealed with lifetime silicone caulk.
- All materials required as shown on drawing, including cable and conduit from power supply assembly to utility company facilities, shall be included in unit bid price for power supply assembly.

---

**Missouri Highways and Transportation Commission**

**Highway Lighting Power Supply Assembly**

**Secondary Service**

**Date Effective:** 04/01/2002

**Date Prepared:** 06/01/2002

**MoDOT Use Only:** 901.800

---

**Customer Service:** 1-888-ASK-MODOT (1-888-275-6636)

**Jefferson City, MO 65102**

**105 West Capitol**

**Commission**

---

**Sheet No.: 1 of 2**
PEDESTAL OR NEW STATE-OWNED POLE TO BE SET WITHIN 2' TO 4' OF RIGHT-OF-WAY LINE.
ALL SERVICE POWER SUPPLY ASSEMBLIES ARE TO BE LOCATED ON STATE PROPERTY.

PRIVATE PROPERTY
STATE PROPERTY

CABLE AND CONDUIT FROM POWER SUPPLY ASSEMBLY TO UTILITY COMPANY FACILITIES SHALL BE INCLUDED IN PRICE BID FOR POWER SUPPLY ASSEMBLY.

NOTE:

UTILITY COMPANY POLE, PEDESTAL OR PAD MOUNT TRANSFORMER

POWER INPUT SHALL BE (MIN.): 2" RIGID STEEL CONDUIT WITH THREE #2 AWG CABLES.

SEPARATE FEEDS FOR LIGHTING AND SIGNALS

NOTE:
CABLE AND CONDUIT FROM POWER SUPPLY ASSEMBLY TO UTILITY COMPANY FACILITIES SHALL BE INCLUDED IN PRICE BID FOR POWER SUPPLY ASSEMBLY.

RISER OR TRIPLEX SECONDARY DROP BY UTILITY COMPANY
LOCATION OF FACILITIES SHALL COMPLY WITH UTILITY COMPANY CLEARANCE STANDARDS.

NOTE:
CABLE AND CONDUIT FROM POWER SUPPLY ASSEMBLY TO UTILITY COMPANY FACILITIES SHALL BE INCLUDED IN PRICE BID FOR POWER SUPPLY ASSEMBLY.
ACCESSIBLE PEDESTRIAN SIGNAL ASSEMBLY

WIRE ROUTING
PERSPECTIVE VIEW

PEDESTRIAN PUSHBUTTON
INSTRUCTIONAL SIGN

ACTUATOR & SIGN
INSTALLATION

MONOLITHIC INSTALLATION

PEDESTRIAN PUSHBUTTON
FRAME ADAPTER

GENERAL NOTES:

ACCESSIBLE PEDESTRIAN SIGNAL ASSEMBLY MAY BE
MONOLITHIC OR A SEPARATE ACTUATOR AND SIGN.

SIGNS FOR SIGNAL INSTALLATIONS, INCLUDING ALL MATERIAL
REQUIRED FOR SIGN MOUNTING, SHALL BE PROVIDED BY THE
CONTRACTOR. SIGNS SHALL BE MANUFACTURED IN ACCORDANCE
WITH SEC 903, AND MOUNTED AS SHOWN ON THE PLANS.

ACCESSIBLE PEDESTRIAN SIGNAL ASSEMBLY MAY BE MOUNTED
TO SIGNAL POLE, PEDESTRIAN POLE, OR PEDESTRIAN
PUSHBUTTON POLE.

INCLUDE A 9" X 16" #10-32 SIGN WITH EACH ASSEMBLY.

REQUIRED PEG ADAPTER WHEN MOUNTING TWO UNITS ON THE
SAME PEDESTRIAN POLE. ADJUNCT MOUNTING EXTENSION
BRACKET SHALL BE PROVIDED IF 6" MOUNTING PEGS FROM
AN ACCESSIBLE SIDEWALK CANNOT BE ACHIEVED.

IF THE CURB RAMP IS NOT ALIGNED WITH THE CROSSWALK,
THE ACCESSIBLE PEDESTRIAN SIGNAL ASSEMBLY SHALL POINT
IN THE DIRECTION OF TRAVEL, NOT IN THE DIRECTION
OF THE CURB RAMP ORIENTATION.

MISSTOU HIGHWAYS AND TRANSPORTATION
COMMISSION

110 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-800-804-MDOT (1-800-804-6368)

TRAFFIC SIGNALS
ACCESSIBLE PEDESTRIAN
SIGNS

DATE EFFECTIVE: 04/04/2021
DATE REVISED: 07/10/2021

SHEET NO. 1 OF 2

MoDOT 902.05
CONDUIT LOCATIONS

FOR CONTROLLER CABINETS WITH HEIGHTS FROM 4'-4" TO 6'-0"
TYPE 170

FOR TYPE 170 CONTROLLER CABINETS
TYPE 332

NOTES:
1. Dimension varies according to cabinet height.
2. Ground Rod - 3/4" Dia. x 8' Min. If subsurface conditions exist which prohibit the placement of the ground rod in a vertical position, the rod may be driven at an oblique angle, not to exceed 45 degrees from vertical or buried in a trench at least 30" deep. Connection to ground rod shall be cambered.
3. Lifetime silicone caulking between cabinet and base.
4. #2 Corbin lock
5. Anchor bolts (use bolt head or tack welded nut on embedded end) and size as specified by cabinet manufacturer.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-4MO-MODOT 1-888-466-6636

TRAFFIC SIGNALS
CONTROLLERS CONDUIT LOCATION

DATE EFFECTIVE: 06/01/2005
DATE PREPARED: 08/28/2009
902.100 1 OF 1
PEDESTAL OR NEW STATE-OWNED POLE TO BE SET WITHIN 2' TO 4' OF RIGHT-OF-WAY LINE. All SERVICE POWER SUPPLY ASSEMBLIES ARE TO BE LOCATED ON STATE PROPERTY.

SERVICE POLE SHALL BE GUYED WHEN SPAN OF OVERHEAD SERVICE WIRE EXCEEDS 50'.

SERVICE DISCONNECT BOXES AND METER BOXES SHALL BE ALUMINUM OR STAINLESS STEEL. All HARDWARE, HINGES, ETC. SHALL BE STAINLESS STEEL.

METER SOCKET AND OTHER EQUIPMENT AND MATERIALS SHALL BE UL APPROVED. AND CONFORM TO THE REQUIREMENTS OF THE UTILITY COMPANY OR MUNICIPALITY PROVIDING POWER.

SCHEMATIC DIAGRAM SHALL BE MOUNTED ON INSIDE OF DOOR.

UTILITY COMPANY SHALL DECIDE IF LIGHTNING ARRESTERS ARE TO BE CONNECTED ON THE LOAD OR LINE SIDE OF THE METER. THE UTILITY COMPANY SHALL ALSO DECIDE IF THE LIGHTNING ARRESTER IS TERMINATED IN THE METER OR DISCONNECT CABINET. IF TERMINATED IN THE DISCONNECT CABINET, IT SHALL BE INSTALLED ON THE CONNECT CABINET.

IF LIGHTING IS SPECIFIED, INSTALL LIGHTING CONTROL ON POWER SUPPLY.

BREAKERS SHALL CONFORM TO SEC. 901.4 OF THE STANDARD SPECIFICATIONS.

IF SUBSURFACE CONDITIONS EXIST WHICH PROHIBIT THE PLACEMENT OF THE GROUND ROD IN VERTICAL POSITION. THE ROD MAY BE DRIVEN AT AN OBLIQUE ANGLE NOT TO EXCEED 45 DEGREES FROM VERTICAL OR BURIED IN A TRENCH AT LEAST 30 IN. DEEP. CONNECTION TO GROUND ROD SHALL BE CADD WELDED.

NOTES:
1. SERVICE POLE SHALL BE QUENCHED 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, ETC. SHALL BE STAINLESS STEEL.
4. METER SOCKET AND OTHER EQUIPMENT AND MATERIALS SHALL BE UL APPROVED. AND CONFORM TO THE REQUIREMENTS OF THE UTILITY COMPANY OR MUNICIPALITY PROVIDING POWER.
5. SCHEMATIC DIAGRAM SHALL BE MOUNTED ON INSIDE OF DOOR.
6. UTILITY COMPANY SHALL DECIDE IF LIGHTNING ARRESTERS ARE TO BE CONNECTED ON THE LOAD OR LINE SIDE OF THE METER. THE UTILITY COMPANY SHALL ALSO DECIDE IF THE LIGHTNING ARRESTER IS TERMINATED IN THE METER OR DISCONNECT CABINET. IF TERMINATED IN THE DISCONNECT CABINET, IT SHALL BE INSTALLED ON THE CONNECT CABINET.
7. IF LIGHTING IS SPECIFIED, INSTALL LIGHTING CONTROL ON POWER SUPPLY.
8. BREAKERS SHALL CONFORM TO SEC. 901.4 OF THE STANDARD SPECIFICATIONS.
9. IF SUBSURFACE CONDITIONS EXIST WHICH PROHIBIT THE PLACEMENT OF THE GROUND ROD IN VERTICAL POSITION. THE ROD MAY BE DRIVEN AT AN OBLIQUE ANGLE NOT TO EXCEED 45 DEGREES FROM VERTICAL OR BURIED IN A TRENCH AT LEAST 30 IN. DEEP. CONNECTION TO GROUND ROD SHALL BE CADD WELDED.
TRAFFIC SIGNALS
POWER SUPPLY ASSEMBLY
240/120 VOLT SERVICE

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

FOR CABLE TYPES AND INSTALLATION, SEE STANDARD
SPECIFICATIONS.

THE TYPE POWER SUPPLY ASSEMBLY IS SHOWN ON THE PLANS
OR IS DESIGNATED IN THE CONTRACT.

THE UTILITY COMPANY SHALL BE NOTIFIED IN WRITING 30
DAYS PRIOR TO DATE SERVICE WILL BE REQUIRED.

WHERE SIGNAL OR LIGHTING POWER ONLY IS DESIGNATED,
OMIT ITEMS NOT REQUIRED.

All OPENINGS IN ANY SERVICE BOX OR METER BOX SHALL
BE COVERED AND SEALED WITH LIFETIME SILICONE CAULK.

All MATERIALS REQUIRED EXCLUDING REFERENCE ITEMS AS
SHOWN ON DRAWING SHALL BE INCLUDED IN PRICE BID FOR
POWER SUPPLY ASSEMBLY.

GENERAL NOTES:
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.

DATE EFFECTIVE: 07/01/2004
DATE PREPARED: 08/26/2009
902.15K
SHEET NO. 2 OF 3
TO FORM AIR GAP BETWEEN FILTER HOLE IN CABINET AND INSIDE CABINET

INSERT WAS~ ~x

SEAL BETWEEN & AROUND LEXAN WINDOW

BOLTS 16

standen.

PHOTOELECTRIC SWITCH (14)4" x 4" x 1-"

WINDOW DETAIL

12" MIN.

CHAMFER i"

4

FRONT VIEW

PHOTOELECTRIC SWITCH AND SOCKET, 105/285 V., 1000 WATT

15 AMP CONTROL BREAKER, SINGLE POLE, TYPE B

8 15 AMP AUTO-MANUAL SWITCH, SINGLE POLE BREAKER, TYPE B W/ LABEL

9 MAIN BREAKER, SINGLE POLE, TYPE B

10 NEUTRAL TERMINAL STRIP

11 LIGHTING TERMINAL BLOCK, INSULATED FROM BACK PANEL, 12 POSITION

12 POWER, CABLE, #8 AWG MIN., 600 V.

13 FILTER, TRANSLUCENT, PLEXIGLASS, 1 8" THICK

14 CLEAR LEXAN #9034 WINDOW, 1/4" THICK MIN. EXCEPT FOR 15A BREAKER MIN. WIRE SIZE 10 AWG.

CABLE, LIGHTING

15 CABLE, LIGHTING

16 LIFETIME SILICONE CAULK

17 PLASTIC DUCT SEALANT

18 LABEL-WEATHERPROOF ADHESIVE-VINYL RAISED LETTERING (OR EQUIV.)

19 CONDUIT, RIGID, 2" MIN.

20 CONDUIT, RIGID, 1" MIN.

21 LIGHTING CONTACTOR, 2 POLE, 30 AMP, 600 VOLT, 120 VOLT COIL

22 #2 CORBIN LOCK

23 CONDUIT. RIGID. 2" MIN.

TOTAL LUMINAIRE** BREAKER SIZE MIN. AWG

1610-1930 30 8

1270-1600 25 8

930-1260 20 8

0-920 15 10

* EXCLUDING BALLAST LOAD

** EXCLUDING BALLAST LOAD

MAIN BREAKER SIZE:

TOTAL LUMINAIRE** BREAKER SIZE MIN. AWG LOAD (WATTS) I AMPS

C-920 15 10

930-1260 20 8

1270-1650 25 8

1610-1930 30 8

TERMINAL BLOCK SHALL BE RATED AT 600V. SHALL ACCEPT WIRES UP TO 8 AWG AND SHALL HAVE A BARRIER BETWEEN EACH TERMINAL AND ON EACH END.

GENERAL NOTES:

ALL OPENINGS IN CABINET SHALL BE COVERED AND SEALED WITH LIFETIME SILICONE CAULK.

ALL CIRCUIT BREAKERS SHALL CONFORM TO SECTION 901.4 OF THE STANDARD SPECIFICATIONS.

PLACEMENT OF ALL ITEMS SHALL BE APPROVED BY THE ENGINEER.

CABINET SHALL BE LOCATED AWAY FROM TRAFFIC. TOP MOUNT PHOTO CONTROL SHALL FACE AN OPEN SKY. SIDE MOUNT PHOTO CONTROL SHALL FACE NORTH.
**PREFORMED PULL BOX COVER**

<table>
<thead>
<tr>
<th>Number of Entering Conductors</th>
<th>Class</th>
<th>Preformed Pull Box Minimum Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>1&quot;</td>
<td>17&quot;  30&quot;  22&quot;</td>
</tr>
<tr>
<td>23 - 68</td>
<td>2&quot;</td>
<td>24&quot;  36&quot;  24&quot;</td>
</tr>
<tr>
<td>&gt; 68</td>
<td>3&quot;</td>
<td>30&quot;  48&quot;  36&quot;</td>
</tr>
</tbody>
</table>

1. All metal conduits shall be electrically bonded by a ground bushing and no bare copper wire. For PVC conduit, all ground wires shall be connected.

2. Signal pull boxes shall be embossed "STATE SIGNALS" and lighting pull boxes "STATE LIGHTING."

3. Pull box frames and covers shall be cast iron and the following minimum dimensions:
   - Frame size: 23" x 23"
   - Opening size: 22½" x 22½"
   - Frame weight: 120 lbs.
   - Cover size: 23" x 23"
   - Cover thickness: ¾" in.
   - Cover weight: 140 lbs.

General Notes:

- If an extension is used with a preformed box, the lip of the extension may be interior or exterior. The extension shall be compatible and from the same manufacturer.

- If prefomed pull boxes are specified, the contractor may use the standard concrete pull box in lieu of the class 1 or 2 prefomed pull box or the double concrete pull box, type A, in lieu of the class 3 prefomed pull boxes.
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 CADOWELDED.

THE CIRCULAR PULL BOX COVER SHOULD BE SIZED TO FIT A BOX WITH A CLEAR OPENING OF 25".

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

TRAFFIC SIGNALS
CONCRETE AND PREFORMED PULL BOXES

DATE EFFECTIVE: 11/01/2010
DATE PREPARED: 9/3/2010
SHEET NO. 902.20G 3 OF 3

CIRCULAR PULL BOX
CLASS 5

SECTION B-B

SECTION A-A

TYPE I DRAIN TYPE

(SEE DRAIN OUTLET DETAILS)
(SECTION ABOVE BREAK APPLICABLE TO TYPE I DRAIN.)
FROM METER TO SIGNAL CABINET

TYPE 902.10-U
USE ON EXISTING ONLY

TELEPHONE OR UTILITY COMPANY POLE

TYPE TPA
USE ON NEW OR EXISTING

BY TELEPHONE COMPANY

TO SIGNAL CABINET

FLEXIBLE STEEL CONDUIT TO BE GROUNDED TO THE GROUND ROD AND POWER COMPANY GROUNDS.

TO SIGNAL CABINET

BUSHING FOR TELEPHONE WIRES TO TERMINALS IN CONTROL CABINET

SIGNAL CABINET

TYPICAL BURIED TELEPHONE CABLE TO SIGNAL CONTROLLER.

TYPE CM
USE ON NEW OR EXISTING

CONDUIT SIZE AS SHOWN ON PLANS

CONDUIT TO BE INSTALLED INTO TELEPHONE CO. MANHOLE BY TELEPHONE COMPANY.

CONDUIT SIZE AS SHOWN ON PLANS

NOTE: CONTRACTOR TO NOTIFY TELEPHONE COMPANY FOR ACCESS AND LOCATION OF CONDUIT INTO PEDESTAL.

TELEPHONE COMPANY MANHOLE

CONDUIT TO SIGNAL CABINET

END CONDUIT AND CAP

CONDUIT TO SIGNAL CABINET

END CONDUIT AND CAP

CONDUIT SIZE AS SHOWN ON PLAN SHEET

PAVED AREA

50' OR SHOULDER

CONDUIT SIZE AS SHOWN ON PLAN SHEET

TELEPHONE CO. MANHOLE

CONDUIT TO BE INSTALLED INTO TELEPHONE CO. MANHOLE BY TELEPHONE COMPANY.

UNDERGROUND TELEPHONE CONNECTION

NOTE: SCHEMATIC DIAGRAM APPLIES TO STANDARD PLANS 901.80 AND 902.15.

NOTE: CONDUCTOR TO NOTIFY TELEPHONE COMPANY FOR ACCESS AND LOCATION OF CONDUIT INTO PEDESTAL.

CONDUIT TO SIGNAL CABINET

DETAIL A

AERIAL TELEPHONE CONNECTION

① 12" x 12" x 6" JUNCTION BOX WITH 2" TO 1½" KNOCK-OUT IN BOTTOM.
② 3" MINIMUM METAL CONDUIT CONTAINING 1-2c #12 AWG AND 1c #12 AWG.
③ 3" MINIMUM FLEXIBLE CONDUIT CONTAINING 1-2c #12 AWG AND 1c #12 AWG.
ALL ITEMS CONTRACTOR FURNISHED AND INSTALLED.

1c POWER CABLES

1-2c #12 AWG CABLE (TELEPHONE)

CONDUIT TO SIGNAL CABINET

TELEPHONE COMPANY PEDESTAL (BURIED CABLE)

TYPE CP
USE ON NEW OR EXISTING

CONDUIT SIZE AS SHOWN ON PLANS

CONDUIT TO SIGNAL CABINET

NOTE: CONTRACTOR TO NOTIFY TELEPHONE COMPANY FOR ACCESS AND LOCATION OF CONDUIT INTO PEDESTAL.

CONDUIT TO SIGNAL CABINET

END CONDUIT AND CAP

CONDUIT SIZE AS SHOWN ON PLAN SHEET

TO SIGNAL CABINET

CONDUIT TO SIGNAL CABINET

END CONDUIT AND CAP

CONDUIT SIZE AS SHOWN ON PLAN SHEET

TELEPHONE COMPANY PEDESTAL

CONDUIT TO SIGNAL CABINET

CONDUIT TO SIGNAL CABINET

END CONDUIT AND CAP

CONDUIT SIZE AS SHOWN ON PLAN SHEET

TO SIGNAL CABINET

CONDUIT TO SIGNAL CABINET

END CONDUIT AND CAP

CONDUIT SIZE AS SHOWN ON PLAN SHEET

SIGNAL CABINET
**TRAFFIC SIGNALS**

**POST BASES**

**MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION**

**DATE EFFECTIVE:** 02/01/2008  
**DATE PREPARED:** 08/26/2009

**DETAIL A**

<table>
<thead>
<tr>
<th>Bolt T</th>
<th>Vert.</th>
<th>Thread</th>
<th>Dia.</th>
</tr>
</thead>
<tbody>
<tr>
<td>INCHES</td>
<td>WT. A</td>
<td>LEN. B</td>
<td>INCHES</td>
</tr>
<tr>
<td>19</td>
<td>17</td>
<td>1.50</td>
<td>0.625</td>
</tr>
<tr>
<td>57</td>
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</tr>
<tr>
<td>121</td>
<td>115</td>
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</tbody>
</table>

**NOTE:** All anchor bolts shall be fully galvanized.
ENDS OF STRAP CLAMPED IN SEAL

ARM ATTACHMENTS

STRAP TYPE SIGN SUPPORT

WELD DETAIL

MAST ARM MOUNTED SIGNAL HEAD

SIGN BRACKET ASSEMBLY

TRAFFIC SIGNALS
TUBULAR STEEL POSTS
LOOP SHALL BE #16 200' STRANDED WIRE IN PVC
CONTAINE TWO OF A NON-TWISTED TWINS IN SINGLE
SLOT OR AS RECOMMENDED BY MANUFACTURER OF THE
DETECTOR AMPLIFIER. LOOP SHALL BE PLACED IN
SIX SLOTS IN A FIGURE EIGHT MANNER.

VEHICLE
FLOWS

LOOP CONFIGURATION

ABANDONED LOOPS

IF EXISTING LOOP ARE TO BE ABANDONED AND NEW
LOOP INSTALLED, ABANDONED LOOP WIRES SHALL BE
REMOVED OR CUT COMPLETELY THROUGH.
**WooD PoiLe SPN Atte Wire SIgNAls**

1. **Multi-conductor cable (see plans).**
2. **Meter socket and cabinet.**
3. **Controller cabinet; all conduits shall enter the bottom of the cabinet; no poles shall be made in the top, back or sides of the cabinet.**
4. **Junction box (NEMA 4).**
5. **Disconnect hanger (not required if temporary).**
6. **Circuit breaker. See standard 902.15 for details.**
7. **Galvanized straight thimble eye bolt with galvanized nut and galvanized curved thimble eye.**
8. **Galvanized angle thimble eye.**
9. **Tether wire and clamp with quick release provisions. See detail for mounting to pole and signal; optional attachment permitted with approval of engineer.**
10. **Galvanized post plate fastened to pole with one ¾ x 4 galvanized lag screws.**
11. **Galvanized connector end fitting.**
12. **All locations require guy wire protector. 1½ min. 1 ¾ x 8 galvanized thimble eye anchor rod. (30 min. length in rock).**
13. **AWG bare copper wire in ½ conduit.**
14. **Automatic jaw type cable fitting with short bail. 5990 lbs minimum holding strength.**
15. **Lighting circuit breaker cabinet if luminaires are specified see standard 902.15 for details.**

**GENERAL NOTES:**

- Design of structural supports shall comply with AASHTO standard specifications for structural supports for highway signs, luminaires and traffic signals 2001 and current interims.
- **Maximum span length:**
  - 100' for one or two spans off post, with one 5-section head signal, two 3-section head signals and two signs per span.
  - All appurtenances to be mounted on pole shall be fastened to pole as recommended by the manufacturer.
  - Schedule no polyethylene or polyvinyl chloride conduit and weather head shall be used on utility company poles in lieu of rigid steel conduit.
  - No direct payment will be made for guys, conduit and junction boxes on poles, hardware, lighting bracket arms or any other items for which separate payment is not provided.
- **All guy wires shall be grounded.**
1. If located within 4’ of concrete median, 6’.
2. Double galvanized 7/16” steel messenger wire - T strand high strength grade.
3. 1/2” automatic jaw type cable fitting with short bail. 13,860 lbs. minimum holding strength.
4. 1” x 8’ min. copper ground rod. One pole shall be grounded by connecting no. 6 awg bare copper wire from grounding lug inside pole to ground rod by means of a galvanized wire clamp located inside of pole. Ground lug shall be oriented 90° or 90° to horizontal. If subsurface conditions exist which prohibit the placement of the ground rod in a vertical position, the rod may be driven at an oblique angle not to exceed 45° from vertical or buried in a trench at least 30” deep. Connection to ground rod shall be cadwelded.
5. Fully galvanized anchor bolt with bolt head or tack welded nut on embedded end.
6. Galvanized 1/4” steel clevis clamp to fasten to the pole with 1/2” galvanized carriage bolts.
7. Galvanized 1/2” steel clevis clamp to fasten to the pole with 1/2” galvanized carriage bolts.
8. Non-corrosive metal cable hangers at 12” centers.
9. Multi-conductor cable (as required).
10. 1/2” automatic jaw type cable fitting with short bail. 5990 lbs. minimum holding strength.
11. 4” x 6 1/2” handhole and cover with reinforced frame welded to pole.
12. One-piece or two-piece metal base cover or individual nut covers.
13. Fully galvanized anchor bolt with bolt head or tack welded nut on embedded end.
14. Wire entrance with insulated weatherproof bushing (as required).
15. Double galvanized 1/4” steel – T strand high strength grade tether wire and clamp with quick release provisions. Install horizontal or below horizontal.
16. Type A-10 base. See standard 902.30 for details.
17. Luminaire and bracket are as specified on plans. See standard 901.00 for mounting details.

**GENERAL NOTES:**
Design of structural supports shall comply with AASHTO standard specifications for structural supports for highway signs, luminaires and traffic signals 2001 and current interims.

Maximum span length:
- 160’ for one one or two spans off post, with guy wire, one 5-section head signal, two 3-section head signals and two signs per span.
- 100’ for one span off post, without guy wire, with three 3-section head signals and two signs per span.
- 100’ for two spans off post, without guy wire, with two 3-section head signals and one sign per span.

Concrete pole embedment shall be Class B concrete. See sheet 1 for down guy information when down guy is specified on plans.

Expansive grout shall be used between the pole base plate and the concrete base when individual nut covers are used. See standard 902.40 for screen details.
### Structural Sign Data

<table>
<thead>
<tr>
<th>Designation</th>
<th>Color Scheme</th>
<th>Sheet</th>
<th>Legend</th>
<th>Background</th>
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</thead>
<tbody>
<tr>
<td><strong>Structural (STF)</strong></td>
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**NOTE:** White Legend is direct applied unless specified otherwise.

### Flat Sheet Sign Data

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<th>Color Scheme</th>
<th>Sheet</th>
<th>Legend</th>
<th>Background</th>
</tr>
</thead>
<tbody>
<tr>
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**NOTE:** Legend and background colors are achieved through transference into film.

### Flat Sheet Thickness

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<th>Sign Size</th>
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<tr>
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<td>0.020 in</td>
</tr>
<tr>
<td>Lip to Tip</td>
<td>0.100 in</td>
</tr>
<tr>
<td>Tip to Lip</td>
<td>0.100 in</td>
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</tbody>
</table>
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

(1) USED ON SIGNS 9 SF AND LARGER

WARNING
UP TO $1000 FINE AND
1 YEAR IMPRISONMENT
FOR REMOVING OR
TAMPERING WITH THIS SIGN

(2) USED ON SIGNS LESS THAN 9 SF

VENDOR ID LABEL DETAILS
PLACED ON THE BACK OF THE SIGN

ACME SIGN COMPANY
MIDWEST, US 55555
800 555-5555
SIGN FABRICATION
DATE: JUNE 6, 2016

ACME SIGN COMPANY
MIDWEST, US 55555
800 555-5555
SIGN FABRICATION
DATE: JUNE 6, 2016

OPTIONAL

ACME SIGN COMPANY
MIDWEST, US 55555
800 555-5555
SIGN FABRICATION
DATE: JUNE 6, 2016

OPTIONAL

GENERAL NOTES:
ALL DECALS SHALL BE SILK SCREEN PRINTED WITH
MATERIAL CONFORMING TO THE SHEETING MATERIALS
TO PROVIDE A LABEL THAT HAS AN EQUAL LIFE
EXPECTANCY AS THE SIGN FACE.

MODOT ID LABELS SHALL BE PRINTED ON CLEAR
ELECTRONIC FILM BACKGROUND WITH BLACK Ink OR IT
MAY BE INCORPORATED INTO THE SIL SCREEN DETAIL
AND PRINTED ALONG WITH THE SIGN FACE.

IF THE LABEL IS APPLIED IN THIS MANNER THE LEGEND
OF THE LABEL SHALL MATCH THE COLOR OF THE SIGN
LEGEND. IF IT IS BEING APPLIED TO THE LABEL SHALL
NOT HAVE ANY BACKGROUND COLOR OR BLOCK-

VENDOR ID LABELS SHALL CONTAIN THE COMPANY
CONTACT INFORMATION INCLUDING FULL NAME, CITY,
STATE, PHONE NUMBER AND THE SIGN FABRICATION DATE.

VENDOR ID LABELS SHALL BE PRINTED ON A WHITE
BACKGROUND WITH BLACK Ink AND THE LEGEND SHALL BE
A MINIMUM OF 0.117".

MISSOURI HIGHWAYS AND TRANSPORTATION
COMMISSION
1240 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-MO-HWY-1 (689-9691)

HIGHWAY SIGNING
GENERAL SIGN DATA

DATE EFFECTIVE:
3-24-2004

903.02AP
2 OF 8
12" EXTRUDED ALUMINUM PANEL

MINIMUM WT. = 2.40 LBS./FT.

NOTE: WEIGHT AND THICKNESS DIMENSIONS SHOWN. MEASURE PANELS ONLY USE.

DETAIL A

PLAN VIEW

END VIEW

ELEVATION VIEW

DETAIL B

POST CLIP BOLT WITH FLAT WASHER AND LOCKNUT

NOTE: COARSE BOLT HEAT TREATED.

ELEVATED VIEW OF REPAIRS RECOMMENDED BOLT SIZE WITH LESS TENSION OF HOLE MAY BE USED.

BOLT = 1/4 x 1 ALUMINUM HEX LOCKNUT = 1/4 ALUMINUM WASHER = ALUMINUM

POST CLIP

POST CLIPS SHALL BE ASTM B 198, 356-T6 ALUMINUM ALLOY.
GENERAL NOTES:

SEE STANDARD PLAN 903.03 FOR WIDE FLANGE INSTALLATION.

SIGN BARRICADE SHALL BE CONSTRUCTED AS A STRUCTURAL SUBSTANCE.

DIRECTIONAL ARROWS SHALL BE SHARP AND CONSIDERED INCIDENTAL TO THE SIGN.

ALL REFLECTIVE SURFACES SHALL BE RETROREFLECTIVE SHEETING IN ACCORDANCE WITH SEE 1042.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITAL
JEFFERSON CITY, MO 65102
1-888-891-MODOT (6636) 1-888-663-6686

HIGHWAY SIGNING
SIGN BARRICADE

DATE EFFECTIVE: 06/04/2020
DATE REVISED: 07/06/2019
903.02AP
SHEET NO. 8 OF 8
### Wide Flange Structural Steel Posts Design Data

<table>
<thead>
<tr>
<th>POST DESIGN NO.</th>
<th>WEIGHT (LB/IN)</th>
<th>DEPTH (IN.)</th>
<th>FLANGE</th>
<th>WEB THICK (IN.)</th>
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<tr>
<td>5</td>
<td>123</td>
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</table>

**The weight of structural steel posts shown in the contract has been computed using the weights shown.**

### Perforated Fuse Plate Data Table

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<th>F (IN.)</th>
<th>G (IN.)</th>
<th>H (IN.)</th>
<th>L (IN.)</th>
<th>N (IN.)</th>
<th>K (IN.)</th>
<th>M (IN.)</th>
<th>D1 (IN.)</th>
<th>D2 (IN.)</th>
<th>BOLT 1/2 (IN.)</th>
<th>ST. (KPSI)</th>
<th>N.</th>
<th>WASHER</th>
</tr>
</thead>
<tbody>
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### Splice Plate Data Table

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<th>J (IN.)</th>
<th>L (IN.)</th>
<th>U (IN.)</th>
<th>D (IN.)</th>
<th>BOLT 1/2 (IN.)</th>
<th>ST. (KPSI)</th>
<th>N.</th>
<th>WASHER</th>
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</tr>
</tbody>
</table>

### Notes:
- For general notes, see Sheet 1 of 16.
- For Padways where traffic may strike the backside of the post, perforated fuse plates shall be installed on both sides of the post.

---

**Missouri Highways and Transportation Commission**

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

**Post Installation Details**

**Hinge Details**

**Wide Flange (WF) Posts**

**Elevation D-D**

**Splice Plate Thickness = F**

ELEVATION C-C
NOTES:

FOR GENERAL NOTES, SEE SHEET 1 OF 16.

FOR EXTRUDED ALUMINUM PANEL AND POST CLIP DETAILS, SEE STANDARD PLANS 903.02 SHEET 4 OF 7.

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

SIGN MOUNTING DETAILS
WIDE FLANGE (WF) POSTS

4 EXTRUDED ALUMINUM PANEL:
H = H1 + 12" - HAPPLIES TO SIGN UNDECK ABOVE OR BELOW THE PRIMARY SIGN. IF SECONDRY SIGN IS NOT ATTACHED TO THE MAIN SIGN POSTS.

POST CLIP DETAIL

PART PLAN

3 SIGNS SHALL BE FIELD ATTACHED TO POSTS WITH POST CLIPS AND BOLTS. SEE POST CLIP DETAIL. THE SHOWN OF THE POST CLIP BOLT SHALL FIT TIGHTLY AGAINST THE POST FLANGE AFTER THE LOCKNUT IS TIGHT. THE LOCKNUT ON THE POST CLIP BOLTS SHALL BE TIGHTENED TO 250 INCH-POUNDS WHEN USING EPOXY. CLEAN UNPOLISH TREATED PANELS.
### ROUND PIPE POST FOR GROUND MOUNTED SIGNS

<table>
<thead>
<tr>
<th>POST</th>
<th>BOLT</th>
<th>WASHER</th>
<th>BASE CONNECTION DETAILS</th>
<th>(IN.)</th>
<th>(IN.)</th>
<th>(IN.)</th>
<th>(IN.)</th>
<th>(IN.)</th>
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### ROUND PIPE POST AND FOOTING DATA TABLE

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<th>WEIGHT</th>
<th>LENGTH</th>
<th>FRICTION CAP</th>
<th>CONCRETE</th>
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<td>0.36</td>
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### BOLT RETAINER

Sheet Metal Bolt Retainer cut from 20 Gauge Galvanized Sheet Metal. Place between base plates. Drill to fit plate. Bolt holes shall be larger than required bolt size.

### PLAN VIEW

- Roll Crimp to engage pipe O.D.
- Pipe 0.00" - 0.025"
- Pipe 0.00" - 0.050"

### FOOTING DETAIL

- Diameter: 2" x 4" x 5" on bottom of pipe
- Finish flush with finish base. See "footing detail" for footings on slopes.
- Bolt Retainer: High strength bolt (see "bolt data" in table)
- Drilled Footing: 4" diameter
- Max 3" rock for 2" dia. pipe
- Max 3" rock for 4" dia. pipe

### MULTI-DIRECTION SLIP BASE

Top of footing, with finisher flat base. See "footing detail" for footings on slopes.

### ELEVATION

Steel pipe post base connection.
### Clamp Type Sign Support for Pipe Post

**Profile View**

**Plan View**

**Mounting Details for Extruded Panels on Pipe Post**

**Mounting Details for Flat Sheet Signs on Round Structures >4" Pipe Post**

<table>
<thead>
<tr>
<th>Width of Pipe Post Clamp</th>
<th>Sign Type</th>
<th>Minimum Width</th>
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</thead>
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<td>1.5&quot;</td>
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</tr>
<tr>
<td>Structural</td>
<td>3&quot;</td>
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</tr>
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</table>

**Notes:**
- For general notes, Sheet 1 of 16.
- For mounting weight and offset details, see Sheet 10 of 16.
- For details of extruded aluminum panel and post clip details, see standard plans 903.02 Sheet 2 of 7.

---

**Additional Details:**

- Flanged Leg Sign Bracket
- Strap Seal
- 1/4" Stainless Steel
- Hex Head All Thread
- 3/16" x 2" Thick Steel Washer
- 1/4" OD x 1/8" Thick Plastic Fiber Washer
- 3/4" x 1/2" Stainless Steel Bracket Material
- 2" x 5/16" Stainless Steel Strap Material

---

**Manufacturer:**

Missouri Highways and Transportation Commission

115 West Capitol
Jefferson City, MO 65102

1-800-456-MADOT (1-800-456-6236)

**Date:**

- Approved: 4/13/2023
- Prepared: 1/14/2023

**Sheet Number:**

- 6 of 16
ANCHOR BOLT DETAIL

12-GAUGE 4" POST
1 1/2" CORNER BOLT AND NUT
MINIMUM 1 CORNER BOLT REQUIRED
7-GAUGE ANCHOR

FOR 2" FOOT FOR 2.5" FOOT
BOLT HOLE DIAMETER = 5/8"
2 PER SIDE ON ALL 4 SIDES
7-GAUGE ANCHOR
FABRICATION DETAIL

BARRIER WALL MOUNTING DETAIL

ANCHOR TUBE SHALL BE 7-GAUGE
1/2" x 4 1/2" GALVANIZED MECHANICAL
FASTENERS SHALL BE USED TO ATTACH
ANCHOR TO BARRIER WALL

SHOULDER BOLTS SHALL BE USED
TO ATTACH POST TO ANCHOR
(SEE ANCHOR BOLT DETAIL)

ANCHOR SHALL BE NOT GIPPER GALVANIZED
AFTER FABRICATION PER SECTION 1000

FINISHING AND INSTALLATION
OF BARRIER WALL POST ANCHOR
FOR POST SHALL BE 1/2" PER
EACH AS CONCRETE POST ANCHOR

NOTES:

FOR GENERAL NOTES, SEE SHEET 1 OF 16.
FOR MOUNTING HEIGHT AND OFFSET DETAILS, SEE
SHEET 11 OF 16.

ALL BARRIER WALLS USED IN AN INSTALLATION
SHALL BE CERTIFIED NKFS COMPLIANT.
Wood Post Details

U-Channel Post Stub Detail

Number of Bolts to Attach Steel Channel to Wood Post

<table>
<thead>
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<th>Sign Height</th>
<th>No. of Bolts per Wood Post Hole</th>
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</thead>
<tbody>
<tr>
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<td>2</td>
</tr>
<tr>
<td>2'</td>
<td>3</td>
</tr>
<tr>
<td>3'</td>
<td>4</td>
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<td>4'</td>
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<td>6</td>
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<tr>
<td>6'</td>
<td>7</td>
</tr>
<tr>
<td>7'</td>
<td>8</td>
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Plan View
Mounting Details for Extruded Panels on Wood Post

Notes:
- For general notes, see Sheet 1 of 16.
- All posts shall be embedded a minimum of 3 feet into the ground.
- H-Channel post stub overlap shall be positioned entirely between ground line and 10 feet above ground line.
- For post sizing, see engineering policy guide.
- For post clip details, see standard plans 903.02 sheet 4 of 7.
- For mounting height and offset details, see sheet 10 of 16.

Post Size Requirements

Post Type

<table>
<thead>
<tr>
<th>Sign Area (sq. ft.)</th>
<th>H-Channel</th>
<th>Wood</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 10</td>
<td>1 - 3.0 lb./ft.</td>
<td>1 - 4&quot; x 4&quot;</td>
</tr>
<tr>
<td>&gt; 10 ≤ 24</td>
<td>2 - 3.0 lb./ft.</td>
<td>2 - 4&quot; x 4&quot;</td>
</tr>
<tr>
<td>&gt; 24 ≤ 30</td>
<td>3 - 3.0 lb./ft.</td>
<td>2 - 4&quot; x 6&quot;</td>
</tr>
<tr>
<td>&gt; 30 ≤ 50</td>
<td>N/A</td>
<td>2 - 6&quot; x 6&quot;</td>
</tr>
</tbody>
</table>

+ Signs greater than 4 feet in width require two posts, except broader-than-warning signs, yield signs, and one way signs.
ONE POST - SINGLE SIGN

ONE POST - SINGLE SIGN WITH SUPPLEMENTAL PLAQUE

TWO POST

CHEVRON SIGN

TYPE III OBJECT MARKER

ADJACENT TO CURB

MOUNTING HEIGHT DETAILS

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 BOLT TO THE POST.

VERTICAL CLEARANCE FROM THE PAVEMENT SHALL BE 8 INCHES AND INCREASED 10" TO MEET THE MINIMUM VERTICAL CLEARANCE FROM THE CURB.

HORIZONTAL OFFSET MAY BE ADJUSTED BASED ON FIELD CONDITIONS.
DELINEATORS ON CONCRETE TRAFFIC BARRIER
FOR CONCRETE BARRIER DETAILS, SEE SHEET 517.10 OF BRIDGE PLANS.

ROADWAY OR BRIDGE CONCRETE TRAFFIC BARRIER DELINEATION

NOTES:
FOR GENERAL NOTES, SEE SHEET 1 OF 16.

RETROREFLECTIVE YELLOW, WHITE OR RED SHEETING IN ACCORDANCE WITH SEC 109.22.7.5 SHALL BE APPLIED TO ONLY ONE SIDE OF THE DELINEATOR REFLECTOR BODY.

THE COLOR OF THE SHEETING SHALL CORRESPOND TO THE COLLECTIVE ADJACENT PAVEMENT MARKING.

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

SIGN MOUNTING DETAILS
CONCRETE BARRIER DELINEATORS

DATE APPROVED: 2/11/2022
DATE PREPARED: 2/14/2023
903.03BR 12 OF 16
DELINEATORS ON GUARDRAIL

FOR GUARDRAIL DETAILS, SEE STIE PLANS 606.00 AND 606.50.

(1) A SECONDARY DELINERATOR WITH REFLECTIVE SHEETING SHALL BE ATTACHED TO THE BACK SIDE OF THE CHANNEL WHEN THE DELINERATOR IS PLACED ALONG AN INTERCHANGE RAMP AND SHALL BE VISIBLE BY APPROACH TRAFFIC.
LEGEND
- WHITE DELINERATOR
- YELLOW DELINERATOR
- WHITE DOUBLE STACKED DELINERATOR
- RED DELINERATOR

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>
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<tbody>
<tr>
<td>50</td>
<td>20</td>
<td>100</td>
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<tr>
<td>100</td>
<td>30</td>
<td>90</td>
</tr>
<tr>
<td>150</td>
<td>40</td>
<td>85</td>
</tr>
<tr>
<td>200</td>
<td>50</td>
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<td>250</td>
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<td>350</td>
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<td>400</td>
<td>85</td>
<td>100</td>
</tr>
<tr>
<td>450</td>
<td>90</td>
<td>100</td>
</tr>
</tbody>
</table>

100'-SPACING
TABLE

200'-SPACING

TYPICAL DIAMOND EXIT RAMP

TYPICAL DIAMOND ENTRANCE RAMP

NOTES:

1. USE YELLOW DOUBLE STACKED DELINERATORS FOR LEFT HAND TOLL/EVELEV LINES.

2. DELETE IF EMERGENCY REFERENCE MARKERS ARE USED.

3. EXTENT OF DELINERATION ON ROUTES WITH EMERGENCY REFERENCE MARKERS.

4. ON ROUTES WITHOUT EMERGENCY REFERENCE MARKERS DELINERATORS SHALL BE INSTALLED BETWEEN INTERCHANGES EVERY 300'.

CHANNEL POST DELINERATORS SHALL BE INSTALLED ON SUBURBS WHERE GUARDRAIL IS PRESENT. THESE PORTIONS SHALL BE DELINERATED UTILIZING THE GUARDRAIL DELINERATOR. IN AREAS WHERE RER DELINERATORS ARE INSTALLED, REFLECTIVE SHEETING WILL BE PLACED ON THE EXHIBIT SIDE OF THE GUARDRAIL DELINERATOR.

REFLECTIVE SHEETING SHALL BE IN ACCORDANCE WITH SEC 1042.2.T.S.
WEIGH STATION

NOTE: CHANGEABLE "OPEN/CLOSE" AND "BUSES WEIGH" SIGNS MOUNTED BELOW THIS SIGN. SEE DETAILS THIS SHEET.

ISOMETRIC VIEW

BUSES WEIGH MOUNTING ASSEMBLY

MAXIMUM HEIGHT FROM BOTTOM OF BUSES WEIGH SIGN TO GROUND SHALL BE 60".

CHANGEABLE SIGN DETAIL

SUBSTRATE LEGEND, SYMBOLS, & BORDER
2 SH SHEET
L-3 DIRECT APPLIED (CUT FROM MATERIAL SHOWN ON PLANS.)

REFLECTIVE SHEETING
R1 ENGINEERING GRADE IN ACCORDANCE WITH SEC 1042.2.7.1
R4 PRISMATIC IN ACCORDANCE WITH SEC 1042.2.7.3

GENERAL SIGN DATA

PERMIT SIGN DETAIL

MATERIAL LIST

GENERAL NOTES:

DESIGN SPEC: AASHTO STANDARD SPECIFICATIONS FOR STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINARIES, AND TRAFFIC SIGNALS - 1975.

MATERIALS AND FABRICATION SHALL CONFORM TO REQUIREMENTS OF THE STATE HIGHWAY AND TRANSPORTATION COMMISSION STANDARD SPECIFICATIONS AND PROVISIONS.

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

DATE EFFECTIVE: 02/01/2012
DATE PREPARED: 12/19/2011
903.04F SHEET NO. 1 OF 1

LICENSE FUEL
MoDOT PERMITS AVAILABLE HERE
FOR SIGNS WITH SIGN AREAS LESS THAN THE
SMALLEST LISTED IN THE TABLE BELOW, E CAN BE
RECALCULATED USING THE FOLLOWING EQUATION:

\[
E = \frac{1}{2} \left( \frac{\text{MAX. SIGN AREA}}{\text{MAX. B WITH SIGN AREA}} \right)
\]

The calculated value of E cannot
result in a distance greater than
\( \frac{1}{4} \) of the sign width.

THE MODIFIED FOOTINGS IN SOLID ROCK

MODIFIED FOOTINGS IN SOLID ROCK

ANCHOR BOLTS

CONCRETE TO BE
PLACED TO EXHAUST
FACE OF FOOT

ANCHOR BOLTS

GENERAL NOTE:
ALL SIGNS SHALL BE CENTERED VERTICALLY ABOUT THE
HORIZONTAL CENTERLINE OF THE TRUSS.

MISSOURI HIGHWAYS AND TRANSPORTATION
COMMISSION
105 N. S.W. CAPITAL
JEFFERSON CITY, MO 65102
1-888-MO-DOT-MX | 1-888-663-6689

HIGHWAY SIGNING
TUBULAR SUPPORT STEEL
TYPE B

DATE EFFECTIVE: 9/24/2022
DATE REVISED: 7/29/2022
903.08K
SHEET NO. 1 OF 2
ARM ATTACHMENT DETAIL

2" DIAMETER HOLE
1/4" HIGH STRENGTH BOLTS, NO NUTS

HEAVY HEX NUT AND WASHER

HOLD INSIDE AND OUTSIDE

ELEVATION

A GALVANIZED SCREEN SHALL BE MOUNTED BETWEEN THE POST BASE PLATE AND CONCRETE BASE. SCREENS SHALL BE PRE-FORMED OF 3/8 OR 1/2 MESH STAINLESS STEEL OR NON-CORRODIBLE GALVANIZED STEEL SCREEN OR APPROVED EQUIVALENT.

HEAVY HEX OR HEAVY JEM NUT AND WASHER

PLAN

GALVANIZED SIGN BRACKET ASSEMBLY

SHEET: 2 OF 2

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 WEST CAPITOL
JEFFERSON CITY, MO 65102
1-888-540-MODOT (1-888-540-6636)

HIGHWAY SIGNING
TUBULAR SUPPORT STEEL
TYPE B

DETAIL A
POST BASE DETAIL

<table>
<thead>
<tr>
<th>SIGN WEIGHT</th>
<th>WALL LBR. FT.</th>
<th># OF SIGNS</th>
<th># PER BRACKET</th>
</tr>
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<tbody>
<tr>
<td>20 # - 3999</td>
<td>16</td>
<td>16</td>
<td>6</td>
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<td>40 # - 5999</td>
<td>22</td>
<td>15</td>
<td>6</td>
</tr>
<tr>
<td>60 # - 7999</td>
<td>26</td>
<td>14</td>
<td>6</td>
</tr>
<tr>
<td>80 # - 9999</td>
<td>32</td>
<td>13</td>
<td>6</td>
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</table>

4 MINIMUM OF TWO BRACKETS REQUIRED ON SIGNS OVER 42" IN LENGTH.
TRUSS ELEVATION

MEMBER "C": SEE TABLE OF TRUSS VARIABLES.

MEMBER "D": SEE TABLE OF TRUSS VARIABLES.

TRUSS VARIABLES

<table>
<thead>
<tr>
<th>SPAN</th>
<th>L/100</th>
<th>&quot;C&quot;</th>
<th>&quot;D&quot;</th>
<th>&quot;E&quot;</th>
<th>&quot;E&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>UP TO 70' 6&quot;</td>
<td>6'0&quot;</td>
<td>6'0&quot;</td>
<td>24'</td>
<td>14'</td>
<td>14'</td>
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<tr>
<td>71' TO 80' 6&quot;</td>
<td>6'0&quot;</td>
<td>6'0&quot;</td>
<td>24'</td>
<td>14'</td>
<td>14'</td>
</tr>
<tr>
<td>81' TO 90' 6&quot;</td>
<td>6'0&quot;</td>
<td>6'0&quot;</td>
<td>24'</td>
<td>14'</td>
<td>14'</td>
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<tr>
<td>91' TO 100' 6&quot;</td>
<td>6'0&quot;</td>
<td>6'0&quot;</td>
<td>24'</td>
<td>14'</td>
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<td>101' TO 110' 6&quot;</td>
<td>6'0&quot;</td>
<td>6'0&quot;</td>
<td>24'</td>
<td>14'</td>
<td>14'</td>
</tr>
<tr>
<td>111' TO 120' 6&quot;</td>
<td>6'0&quot;</td>
<td>6'0&quot;</td>
<td>24'</td>
<td>14'</td>
<td>14'</td>
</tr>
<tr>
<td>121' TO 130' 6&quot;</td>
<td>6'0&quot;</td>
<td>6'0&quot;</td>
<td>24'</td>
<td>14'</td>
<td>14'</td>
</tr>
<tr>
<td>131' TO 140' 6&quot;</td>
<td>6'0&quot;</td>
<td>6'0&quot;</td>
<td>24'</td>
<td>14'</td>
<td>14'</td>
</tr>
<tr>
<td>141' TO 150' 6&quot;</td>
<td>6'0&quot;</td>
<td>6'0&quot;</td>
<td>24'</td>
<td>14'</td>
<td>14'</td>
</tr>
<tr>
<td>151' TO 160' 6&quot;</td>
<td>6'0&quot;</td>
<td>6'0&quot;</td>
<td>24'</td>
<td>14'</td>
<td>14'</td>
</tr>
</tbody>
</table>

GENERAL NOTES:

ALL STRUCTURAL STEEL AND COLUMN BASE PLATES ASTM A36.

ALL ANCHOR BOLTS SHALL BE ASTM F813, GRADE 5.

PROFITIZED FIELD SPlices SHALL BE ShOWN ON SHOP DRAWINGS FOR APPROVAL OF THE ENGINEER.

TRUSSES SHALL BE FabRICATED WITH A MINIMUM OF 10 SPlices IN TRUSS CHORDS.

FIELD SPlicing WILl NOT BE PERMITTED WITHIN THE MIDDLE 1/3-THIRD OF SPAN.

OVERHEAD SIGN TRUSSES

ALUMINUM

FOR ADDITIONAL INFORMATION SEE DATA SHEET.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION

OVERHEAD SIGN SUPPORTS

ALUMINUM

DATE PREPARED: 7/12/2023

903.10BE SHEET NO. 1 OF 6
DETAIL OF ALTERNATE END CAP

When the verticals, struts and struts obstruct the placing of bolts in the flanges these members may be welded back in order to clear the bolts (one side of splice only).

DETAIL OF END CAP CASTING
(Drive Fit Type)

ELEVATION

PLAN

25' - CANTILEVER SECTIONS

20' - CANTILEVER SECTIONS

15' - CANTILEVER SECTIONS

TYPICAL ISOMETRIC VIEW OF TRUSS

HIGH STRENGTH BOLTS, HEX HEAD AND NUT
WITH TWO HARDENED WASHERS (ALL ONLY)

- 4 4" SMALLER TUBE WALL THICKNESS.
### PART ELEVATION (TYPE A CONCRETE TRAFFIC BARRIER)

**Details of Alternate Pedestal (To be used adjacent to type "A" or "C" median barrier)**

#### Section C-C

**Typical Section Showing Reinforcing Steel**

---

### Table: Column Size and Footing Size

<table>
<thead>
<tr>
<th>POST TYPE</th>
<th>FIRE COLUMN (PVC SCHEDULE 40)</th>
<th>FEEDING SIDE</th>
<th>ELEVATING SIDE</th>
</tr>
</thead>
<tbody>
<tr>
<td>12&quot; STD.</td>
<td>12&quot; STD. 65.40</td>
<td>2 x 12 - 2&quot;</td>
<td>1 x 12 - 2&quot;</td>
</tr>
<tr>
<td>14&quot; O.D.</td>
<td>14&quot; O.D. 72.00</td>
<td>2 x 12 - 2&quot;</td>
<td>1 x 12 - 2&quot;</td>
</tr>
<tr>
<td>16&quot; O.D.</td>
<td>16&quot; O.D. 82.77</td>
<td>2 x 12 - 2&quot;</td>
<td>1 x 12 - 2&quot;</td>
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<tr>
<td>18&quot; O.D.</td>
<td>18&quot; O.D. 93.45</td>
<td>2 x 12 - 2&quot;</td>
<td>1 x 12 - 2&quot;</td>
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<tr>
<td>20&quot; O.D.</td>
<td>20&quot; O.D. 104.13</td>
<td>2 x 12 - 2&quot;</td>
<td>1 x 12 - 2&quot;</td>
</tr>
<tr>
<td>22&quot; O.D.</td>
<td>22&quot; O.D. 115.40</td>
<td>2 x 12 - 2&quot;</td>
<td>1 x 12 - 2&quot;</td>
</tr>
<tr>
<td>24&quot; O.D.</td>
<td>24&quot; O.D. 126.46</td>
<td>2 x 12 - 2&quot;</td>
<td>1 x 12 - 2&quot;</td>
</tr>
</tbody>
</table>

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### General Notes:

- All steel pipe columns shall be either Grade "B" seamless steel pipe or Grade "B" electric resistance welded steel pipe, A.S.T.M. specification 423.
- No objectionable seams will be permitted.
- ALL STRUCTURES SHALL BE GROOVED.
- BOLT THREADS ON ALL ANCHOR BOLTS.
- ALL STRUCTURES SHALL BE GROOVED.
- BOLT THREADS ON ALL ANCHOR BOLTS.
- ALL STRUCTURES SHALL BE GROOVED.
### DRILLED SHAFT OPTION

<table>
<thead>
<tr>
<th>Post Type</th>
<th>Pipe Column</th>
<th>&quot;E&quot;</th>
<th>Split</th>
<th>Base Plate Size</th>
<th>Anchor Bolt 4&quot;</th>
<th>COLLE REINFORCEMENT</th>
<th>Shift Reinforcement 6&quot;</th>
<th>Concrete Columns</th>
<th>Rebar Total (lbs.)</th>
<th>Concrete (lbs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>131</td>
<td>12</td>
<td>4</td>
<td>0&quot;</td>
<td>2&quot; x 10&quot; x 24&quot;</td>
<td>16</td>
<td>10&quot; x 12&quot; x 12&quot;</td>
<td>12&quot; x 12&quot;</td>
<td>12&quot; x 12&quot;</td>
<td>12&quot; x 12&quot;</td>
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<tr>
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<tr>
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<td>12&quot; x 12&quot;</td>
<td>12&quot; x 12&quot;</td>
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### ALTERNATE PEDESTALS

<table>
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<th>Shift Reinforcement 6&quot;</th>
<th>Concrete Columns</th>
<th>Rebar Total (lbs.)</th>
<th>Concrete (lbs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>131</td>
<td>12</td>
<td>4</td>
<td>0&quot;</td>
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<td>12&quot; x 12&quot;</td>
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<td>16</td>
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<tr>
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<td>12&quot; x 12&quot;</td>
<td>12&quot; x 12&quot;</td>
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</table>

### SPREAD FOOTING OPTION

<table>
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<th>Post Type</th>
<th>Pipe Column</th>
<th>&quot;E&quot;</th>
<th>Split</th>
<th>Base Plate Size</th>
<th>Anchor Bolt 4&quot;</th>
<th>Longitudinal Footing Reinforcement 6&quot;</th>
<th>Fsaldoal Footing Reinforcement 6&quot;</th>
<th>Rebar Total (lbs.)</th>
<th>Concrete (lbs.)</th>
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</thead>
<tbody>
<tr>
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<td>4</td>
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### SPREAD FOOTING OPTION WITH ALTERNATE PEDESTALS

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<th>Longitudinal Footing Reinforcement 6&quot;</th>
<th>Fsaldoal Footing Reinforcement 6&quot;</th>
<th>Rebar Total (lbs.)</th>
<th>Concrete (lbs.)</th>
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<td>12&quot; x 12&quot;</td>
<td>12&quot; x 12&quot;</td>
<td>12&quot; x 12&quot;</td>
</tr>
</tbody>
</table>

+ Base plates, pedestal and footings, longer sides shall be normal to axis of sign.
++ Base plates, pedestal and footings, longer sides shall be normal to axis of sign.